

ST MICHAELS,
MANCHESTER

DRAINAGE STRATEGY

Project No: 2203-05

May 2024

Rev: P02

STM-REN-00-ZZ-RP-00010

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Author **HENRY WILKINSON**

Date **25.09.2023**

Approved **ANDREW ISHERWOOD**

Date **25.09.2023**

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P01	First Issue	H. Wilkinson	A. Isherwood	25.09.2023
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1. INTRODUCTION

1.1 Purpose of this Report

This Drainage strategy report has been prepared to support planning application 131612/JO/2021– *"Variation of conditions 1 (implementation), 2 (approved drawings and documents), 4 (construction management plan), 5 (ground conditions), 6 (archaeology), 7 (waste management), 10 (drainage), 12 (solid panels), 15 (highway surfacing), 20 (parking strategy), 37 (air quality), 45 (wheel wash), 47 (television reception), 48 (building contract) and 51 (phasing) so as to make minor material changes to consent referenced 125549/JO/2019 (as amended by 127950/NMC/2020) for the partial demolition of existing buildings. Development up to 171.6m AOD comprising residential (Use Class C3), offices (Use Class B1), hotel (Use Class C1), place of worship (Use Class D1) and leisure/ food and drink uses (Classes A1, A3, A4, A5 and D2). Creation of public spaces and new public realm, provision of basement car parking, highway alterations, landscaping and associated works."*

This report includes the information required in respect to Condition 10 of planning application 131612/JO/2021

"10) Prior to the commencement of each part of development, except demolition works, (as defined by condition 51), details of surface water drainage for that part of the development shall have been submitted to and approved in writing by the Local Planning Authority. For the avoidance of doubt these shall be in accordance with Non Statutory Technical Standards for Sustainable Drainage Systems (March 2015) or any subsequent replacements national standards.

Reason: To promote sustainable development, secure proper drainage and to manage the risk of flooding and pollution. This condition is imposed in light of national policies within the NPPF and NPPG and local policies EN08 and EN14"

Further correspondence with Manchester City Council has confirmed that the information should in include the following:

- A finalised drainage layout showing all components (including tank dimensions), outfalls, levels and connectivity, for all levels / above ground drainage;

  Refer to Appendices C and D for information.

- 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;

  Due to the nature of the development it is not feasible to constrain the run-off volume to the greenfield run-off volume. Microdrainage calculations indicates the total run-off volume to be 113.441m^3 for the 1 in 100 year 6 hour rainfall event (Refer to Appendix E for calculations) and this is less than the existing run-off volume of 123.157m^3 (Refer to Section 3.1.2 for details).

- 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 % climate change in any part of a building;

  The drainage network have been designed to accommodate the 1 in 100 year +45% climate change rainfall event with no flooding, refer to Appendix F for Microdrainage run-off calculations.

- Assessment of overland flow routes for extreme events that is diverted away from buildings (including basements). 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 Appendix G for Overland Flood Flow Routes. External Levels have been designed to fall away from buildings and towards highways.

- Where surface water is connected to the public sewer, agreement in principle from United Utilities (UU) 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;

  Refer to Appendix B for United Utilities Pre-Development response.

- Hydraulic calculation of the proposed drainage system, including all engineering parameters;

  Refer to Appendix F for Proposed Surface Water Microdrainage Calculations for the 1, 2, 30 and 100 Year + 45% CC rainfall events.

- Construction details of flow control and SuDS elements. - attenuation tank sections must include foundation details to ensure no clashes.

  Refer to Appendix H for flow control detail and Appendix D for above ground attenuation tank details.

The report should be read in conjunction with the previously approved strategy produced by WSP:

WSP Drainage Strategy date November 2019:	70061860-DSR001
WSP Drainage Strategy Addendum date September 2021	70088013-DSR-001:
WSP Drainage Strategy Addendum date October 2022	70101665-DSR-001

2. THE SITE

2.1 Site Location

The proposed development site is located off Jackson Row, Manchester.

The site location is described below:

- Post Code M2 5GU
- OS X (Easting) 383643
- OS Y (Northing) 398030
- Nat. Grid SJ836980

The site location is illustrated in Figure 2.1 below.



Figure 2.1: Site Location

3. EXISTING & PROPOSED SURFACE WATER DISCHARGE RATES

3.1 Pre-Development Surface Water Run-Off Rates

The St Michaels site historically had various existing buildings and hardstanding that were positively drained into the surrounding public sewer network.

The existing site run-off rates and volume have been calculated as brownfield and greenfield to provide a comparison that will inform the proposed design.

3.1.1 Existing Brownfield Run-Off Rates

The previously approved Drainage Strategies produced by WSP calculated the brownfield run off rate based on a 140 l/s/ha allowance. The phase of the development is circa 0.230 ha.

Modified Rational Method: $\boldsymbol{Q = 140 \times 0.230}$

$$\boldsymbol{Q = 32.2\ l/s}$$

The previously used area included the existing Sir Ralph Abercromby public house and as such this area has been excluded from the calculation to approximate the existing brownfield run-off rate for the remaining developable area.

Modified Rational Method: $\boldsymbol{Q = 140 \times 0.207}$

$$\boldsymbol{Q = 28.98\ l/s}$$

3.1.2 Existing Brownfield Run-Off Volume

The existing brownfield run off volume expected for a site of this size for a 100-year 6-hour storm has been calculated using the modified rational method.

$$\boldsymbol{Runoff\ Volume = 10C \times i_{(average)} \times A \times storm\ duration}$$

$$\boldsymbol{Runoff\ Volume = 10 \times 1 \times 9.916 \times 0.207 \times 6}$$

$$\boldsymbol{Runoff\ Volume = 123.157 m^3}$$

3.1.3 Existing Greenfield Run-Off Volume

The existing greenfield run off volume expected for a site of this size for a 100-year 6-hour storm has been calculated using the Greenfield Volume calculator within Microdrainage assuming an urbanised catchment ratio of 0.75. The Greenfield Runoff Volume is calculated to be **66.510m³**. Refer to Appendix A for Microdrainage Drainage Greenfield Run-Off Volume calculation.

3.2 Proposed Surface Water Discharge Rates

As per the Strategic Flood Risk Assessment (SFRA), the drainage strategy submitted as part of the original planning submission proposed that discharge rates where to be reduced by at least 50% compared to the existing brownfield rates with an aim to reduce to greenfield run-off rates wherever possible.

As such the proposed discharge rate is as follows:

$$\boldsymbol{Q = 28.98\ l/s \times 50\%}$$

$$\boldsymbol{Q = 14.5\ l/s}$$

A predevelopment enquiry has been submitted to United Utilities (UU) and they have requested that the surface water discharge from the development does not exceed 15.8 l/s and have agreed in principle the connection locations. Refer to Appendix B for the predevelopment enquiry correspondence.

4. SURFACE WATER DISCHARGE & SUDS ASSESSMENT

4.1 Surface Water Discharge Assessment

In accordance with the National Planning Practice Guidance (PPG), the following hierarchy of surface water drainage options has been considered:

- Discharge into the ground (infiltration);
- Discharge to a surface water body;
- Discharge to a surface water sewer, highway drain, or another drainage system;
- Discharge to a combined sewer.

The drainage hierarchy was previously assessed as part of the approved Drainage Strategy produced by WSP. This reasoning is presented below with additional justification for ease of reference.

4.1.1 Discharge to Ground (Infiltration)

Wallingford WRAP Class Maps indicate that the site has limited potential for infiltration. Additionally, the site is space constrained in a city centre context with three level basement construction. Subsequent intrusive site investigations have also found the site to have a high groundwater table. Therefore, infiltration is considered an unsuitable method for discharge of surface water.

4.1.2 Connection to a Watercourse

Opportunities to discharge to a watercourse have also been considered. There are no suitable watercourses in the vicinity of the site for surface water discharge. If a connection was to be made to a suitable watercourse then a sewer requisition of a minimum of 0.5km would be required which is considered to be unfeasible. As such a connection a watercourse has been discounted.

4.1.3 Connection to a Sewer

There are no surface water sewers in close proximity to the site however there are several combined sewers in the highways surrounding the site. It is therefore proposed that surface water should be discharged into the combined sewer network, and this has been agreed in principle via a predevelopment enquiry with UU. Connection to the public sewer will be subject to a S106 application with UU. Each connection would require a separate S106 application.

4.2 Sustainable Drainage Systems (SuDS) Assessment

The table below provides a summary of typical SuDS outlined within CIRIA guide C753 ‘The SuDS Manual’. It provides an assessment of the various above and below ground SuDS that can provide water quality treatment and management of flows to reduce runoff rates and volumes and whether they can be suitably incorporated into this development. The purpose of this assessment is to set out the options that can be considered within the final drainage network and do not mean that all suitable features need to be incorporated into the final design.

SuDS Technique	Description	Suitability for development site	
Rainwater Harvesting	Collection of rainwater run-off for use	Running and maintenance costs would not be acceptable to the client	×
Green Roof	Vegetated roof area that reduces runoff and increases time of concentration.	Not efficient due to stepped roofs. Also, additional structure and costs due to increased loading.	×
Blue Roof	Roof area designed to store and reduce peak runoff rates during intense storms.	Not efficient due to stepped roofs. Also, additional structure and costs due to increased loading.	×
Infiltration systems	Systems that collect and storage runoff allowing it to infiltrate into the ground.	Shallow groundwater and 3 level basement mean infiltration is not viable.	×
Proprietary treatment systems	Underground structures designed to provide treatment to runoff	The site has a low pollution hazard rating so does not require a proprietary treatment system	×
Filter Strips	Grass strips that promote sedimentation and filtration as runoff is conveyed over the surface	Urban nature of the development means there are no large grass strips	×
Filter Drains	Granular filled Linear drains / soakaway with either granular fill and perforated pipe, or dense vegetation that treat runoff from adjacent impermeable areas	Urban nature of the development means this is not a viable option.	×
Swales	Shallow landscape channels that treat and convey runoff.	Urban nature of the development means this is not a viable option.	×
Bioretention systems	Shallow landscape depressions that allow runoff to pond temporarily on the surface, before filtering through vegetation and underling soils. Can either infiltrate or convey via perforated pipes.	Urban nature of the development means this is not a viable option.	✓
Trees	Tress within soil filled pits or permeable paving that can collect, store and treat run off	Limited external areas in order to be feasible	?
Pervious Paving	Granular build-up beneath permeable paving systems that can be used to either store runoff (lined system) and increase time of concentration or allow percolation into the ground.	Limited external areas in order to be feasible	×
Attenuation Storage tanks/ large diameter pipes	Large underground voided spaces used to storage runoff before infiltration or controlled discharge	Suitable to store and convey surface water run off	✓
Ponds and wetlands	Permanent pools of water used to treat run-off and provide attenuation above normal water level	Urban nature of the development means this is not a viable option.	×
Detention Basins	Dry basins that are designed to temporarily store runoff providing water quality treatment. Can either be positively drained or infiltrate or both.	Urban nature of the development means this is not a viable option.	×

× Not suitable ? Potentially suitable subject to further investigation ✓ Suitable

Table 4.1: SuDS Techniques & Suitability for Development Site

4.3 Water Quality Assessment

To assess the water quality consideration will be given to the guidance with the National Standard for Sustainable Urban Drainage (NSSUD) and CIRIA Guide C753. The pollution hazard levels for

difference land uses are presented in table 4.2 and are based on the definitions in the NSSUD and C753.

Pollution Hazard Level	Land Use
Very Low	Residential roofs
Low	Individual property driveways, non-residential roofs, residential car parks, low traffic roads, non-residential car parking with infrequent change (e.g. Schools, offices)
Medium	Commercial yards and delivery areas, non-residential car parking with frequent change (e.g. hospital, retail), minor roads
High	Site with heavy pollution (e.g. Haulage yards, lorry parks, waste sites, sites with chemical and fuels are delivered, handled, stored etc.)

Table 4.2: Pollution Hazard Levels

The runoff from the site will be from the building roofs and external hard landscaped areas which will be predominately pedestrian areas with infrequent emergency, refuse and delivery vehicles. As such the pollution hazard level is considered to be low with the primary consideration given to the removal of gross solids and sediment.

Given surface water runoff from the development is to discharge into the combined sewers no treatment is required. However the use of silt traps will provide inherent treatment.

4.4 SuDS Maintenance and Management Plan

The SuDS and below ground drainage networks are to be maintained by the property owners or a maintenance company employment on their behalf. They will be required to maintain the SuDS in line with the recommendations set out within the 'The SuDS Manual C753' and the suppliers' requirements.

The following operation and maintenance requirements for the SuDS that may be incorporated into the development are to be adopted by the Building Management Company. These requirements are general and have been extracted from 'The SuDS Manual C753'.

- Table 21.3 – Operation and maintenance requirement for Attenuation storage tanks

The contractor delivering the development is to produce a verification report of the installed SuDS which should include any product specification requirements, and this should form part of the Operation & Maintenance Manual for the development.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	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 may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial Actions	Repair/ rehabilitate inlets, outlets, overflows and vents	As required
Monitoring	Inspect/ check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tanks for sediment build-up and remove if necessary	Every 5 years or as required

Table 4.3 - Operation and Maintenance requirements for Attenuation Storage Tanks (Table 21.3 'The SuDS Manual C753)

5. DRAINAGE STRATEGY

5.1 Surface Water System

The development will have a dedicated surface water drainage network. This network will discharge into the public combined sewer within Bootle Street and will be restricted to 50% of the pre-development brownfield run off, as detailed within Section 3.0.

There will be a small below ground drainage network that collects and stores run-off associated with the small external landscaped areas. This network will incorporate a vortex flow control to restrict the discharge to 2 l/s. The attenuation for the building roof will be provided via an above ground storage tank situated within the level 3 basement. The discharge from this tank will be restricted via a pump set which will pump rainwater into the below ground network prior to discharge into the public sewer. The vortex flow control and pump set will ensure the total discharge does not exceed the approved rate, 14.5 l/s.

The connection to the combined sewer will require a S106 application with UU.

The surface water drainage networks are to be designed and constructed in accordance with Building Regulations Part H, BS EN 752 and the Sewerage Sector Guidance (SSG). In addition the following requirements will also be adopted in accordance with the Non-Statutory Technical Standards for Sustainable Drainage, National Planning Policy Framework and Planning Practice Guidance:

- Foul and surface water are to be drained via separate systems.
- The below ground drainage system will be designed to ensure flooding does not occur on site for the 1 in 30 year events and no internal flooding for the 1 in 100 year events.
- The surface water system is to be designed to accommodate the 1, 2, 30 and 100 year events with a 45% climate change allowance for the 100 year event.
- The system will be designed for a maximum storm duration of 6 hours.

Refer to Appendix C for the Below Ground Drainage drawings.

Refer to Appendix D for Above Ground Drainage Information and Drawings

Refer to Appendix E & F for supporting surface water microdrainage calculations.

Refer to Appendix G for Overland Flow Routes

Refer to Appendix H for Flow Control

5.2 Foul Water System

The development is to have 2 dedicated foul water networks that each connect into the surround public combined sewer network.

UU have confirmed in principle via a pre-development enquiry to the discharge points and have requested that foul flows are kept to a minimum.

The foul water from upper levels associated with residential units etc will be consolidated beneath the ground floor slab and discharge via gravity to an external foul manhole before combining with the surface water network and discharging into the combined public sewer network in Bootle Street.

The foul water associated with the amenity activities and back of house and plant areas located within the basement levels will utilise package pumping stations that will discharge into new external manholes along Jacksons Row before discharging into the public combined sewer via an existing private connection. One pump r will be located above the B3 slab and will drain the B1 and B2 amenities, this is an above ground system that is designed by the M&E engineer. The

second pump will be situated beneath the B3 slab and will drain the gullies within the level B3 plants areas. As such the flows will be minimal.

Each connection to the combined sewers that surround the development will require a S106 applications with UU.

The foul networks are to be designed and constructed in accordance with Building Regulations Part H, BS EN 752 and the Sewerage Sector Guidance (SSG).

The pumping stations will provide 24 hour emergency storage and include high level alarms

APPENDIX A

MICRODRAINAGE GREENFIELD RUN-OFF VOLUME

Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	18.000
Ratio R	0.360
Areal Reduction Factor	1.00
Area (ha)	0.207
SAAR (mm)	899
CWI	120.055
Urban	0.750
SPR	47.000

Results

Percentage Runoff (%)	54.01
Greenfield Runoff Volume (m^3)	66.510

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APPENDIX B

UNITED UTILITIES PRE-DEVELOPMENT ENQUIRY CORRESPONDENCE

JoeBullough

From: seweradoptions@uuplc.co.uk
Sent: 18 September 2023 15:30
To: Henry Wilkinson
Cc: Andrew Isherwood
Subject: RE: Pre Development Enquiry for: 35 Bootle Street, Civic Quarter, Manchester, M2 5GU UU Reference Number : 04435568

Categories: Filed by Mail Manager

Good Afternoon Henry,

As discussed I can confirm the proposed surface water flow rate of 15.8ls is acceptable to United Utilities, however please note the ultimate decision is to be made by the Lead Local Flood Authority.

For your foul connection we would only request that the flow rate is minimal as possible whilst maintaining acceptable operating standards safely.

Both the proposed connection points for foul and surface water are also acceptable to United Utilities.

Kind regards,

United Utilities
Water for the North West

Eireann Thompson
Assistant Developer Engineer
Developer Services & Metering
Customer Services
Mobex: 07553074138
unitedutilities.com

Did you know we now have a live chat facility available to you Mon to Friday 8 -5pm. You just click on the orange live chat box on our webpage and one of our advisors will be ready to chat to you and help you with your enquiry https://www.unitedutilities.com/builders-developers/ or you can email us at developerserviceswater@uuplc.co.uk

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---------- Original Message ----------
From: seweradoptions@uuplc.co.uk [seweradoptions@uuplc.co.uk]
Sent: 18/09/2023 10:48
To: henrywilkinson@renaissance-ltd.com
Cc: andrewisherwood@renaissance-ltd.com
Subject: RE: Pre Development Enquiry for: 35 Bootle Street, Civic Quarter, Manchester, M2 5GU UU Reference Number : 04435568

Hello Henry

Eireann's number is 07553074138 she may have been on holiday when you tried to call.
I've asked her to call you also

Samantha

---------- Original Message ----------
From: Henry Wilkinson [henrywilkinson@renaissance-ltd.com]
Sent: 18/09/2023 09:49
To: seweradoptions@uuplc.co.uk
Cc: andrewisherwood@renaissance-ltd.com
Subject: RE: Pre Development Enquiry for: 35 Bootle Street, Civic Quarter, Manchester, M2 5GU UU Reference Number : 04435568

Good Morning,

Is there another number to contact Eireann on? Can't seem to get through on the one noted below.

Just want to make sure we are clear with what is required.

Kind regards,

Henry Wilkinson | Engineer

MEng

Carvers Warehouse, 77 Dale Street

Manchester, M1 2HG

e: henrywilkinson@renaissance-ltd.com

t: 0161 393 6509

w: www.renaissance-ltd.com

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From: seweradoptions@uuplc.co.uk <seweradoptions@uuplc.co.uk>
Sent: Friday, September 15, 2023 9:23 AM
To: Henry Wilkinson <HenryWilkinson@renaissance-ltd.com>
Cc: Andrew Isherwood <AndrewIsherwood@renaissance-ltd.com>
Subject: RE: Pre Development Enquiry for: 35 Bootle Street, Civic Quarter, Manchester, M2 5GU UU Reference Number : 04435568 [Filed 18 Sep 2023 09:41]

Good Morning,

Thank you for your email this has been logged to the engineer Eireann their number is 07553074138. They have a service level agreement to respond on or before 28/09/2023.

Kind regards,

United Utilities
Water for the North West

Tonicha Wilde
Customer Advisor Advanced
Developer Services & Metering
Customer Services
Direct Tel: N/A
Tel: 0345 026 8989 (option 4)
unitedutilities.com

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---------- Original Message ----------
From: Henry Wilkinson [henrywilkinson@renaissance-ltd.com]

Sent: 14/09/2023 16:57
To: seweradoptions@uuplc.co.uk
Cc: andrewisherwood@renaissance-ltd.com
Subject: RE: Pre Development Enquiry for: 35 Bootle Street, Civic Quarter, Manchester, M2 5GU UU Reference Number : 04435568

Good Afternoon,

Thanks for the feedback below however, the principles of the drainage strategy have been developed in accordance with the previously approved FRA and Drainage Strategy by WSP and incorporating the advice set out below at this stage would result in significant changes to the wider approved scheme.

Planning for the development has already been approved and we are looking to renew the previously set out predevelopment advice that the approved drainage strategy was based on in order to aid the section 106 application.

Is this something that you are able to provide, or would it be preferable to submit a S106 based on the original predevelopment advice that the scheme was approved on?

Trust the above makes sense but feel free to call if you need to discuss.

Kind regards,

Henry Wilkinson | Engineer

MEng

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From: seweradoptions@uuplc.co.uk <seweradoptions@uuplc.co.uk>
Sent: Wednesday, August 9, 2023 11:48 AM
To: Henry Wilkinson <HenryWilkinson@renaissance-ltd.com>
Cc: Andrew Isherwood <AndrewIsherwood@renaissance-ltd.com>
Subject: Pre Development Enquiry for: 35 Bootle Street, Civic Quarter, Manchester, M2 5GU UU Reference Number : 04435568

Good morning Henry,

Pre Development Enquiry for: 35 Bootle Street, Civic Quarter, Manchester, M2 5GU UU Reference Number : 04435568

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.
If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 6723 723 or refer to the link below:
https://www.unitedutilities.com/builders-developers/working-near-our-assets/

Foul Water
Foul flow from this site will be allowed to drain into the public foul water/combined sewer system.
Our preferred point of discharge would be to the 460 x 710mm diameter public combined sewer within Jackson's Row located to the North of your proposed development, we would request that the flow rate is minimal as possible whilst maintaining acceptable operating standards safely, can you please confirm the intended flow rate? I can see on your plans this is shown to be 18.4 L/s however this does not seem to take any flow from the rising main from level B3 into account.
If you are able to identify an alternative, more suitable point of discharge, we request that you contact us at your earliest convenience so that we can assess suitability.
In accordance with our infrastructure plans we may ask you to change your point of connection.
Therefore please contact us when you are ready to formalise your drainage proposals, we would suggest before you submit for Full Planning.

Surface Water

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

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

This is outlined as follows, in order of priority:

1. **into the ground (infiltration);**
2. **to a surface waterbody;**
3. **to a surface water sewer or highway drain;**
4. **to a combined sewer.**

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

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

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

Infiltration

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

A detailed evidence based feasibility assessment must be carried out in line with Chapter 25 of the CIRIA SuDS Manual 2015 to determine whether infiltration is a suitable method of surface water disposal. Particular attention must be paid to Ground Water Source Protection Zones to ensure that the risk of pollution to these valuable resources is not compromised. Details can be obtained from the government website:

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

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

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

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

Highway Drainage

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

Public Sewer

In accordance with the hierarchy of drainage options within the National Planning Practice Guidance,

both discharge to ground via infiltration and discharge to a waterbody should be discounted prior to consideration of discharging surface water to the public sewer system. Evidence should be provided to demonstrate how these have been discounted, as outlined in the North West SuDS pro-forma.
Once evidence is provided as outlined above, United Utilities will consider a connection to the 460 x 710mm diameter public combined sewer within Jackson's Row located to the North of your proposed development at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities request that any agreed rate does not exceed 5l/s.
As a Water Company, we have no obligation to accept highway drainage into our public sewer network. However, should your proposals include runoff from highways, we would request that consideration is given to SuDS components that deliver source control are incorporated within the design of the scheme to reduce the volume and frequency of discharges of these flows to the public sewer.

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

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

Existing Wastewater Assets Crossing the Site
According to our public sewer records there are public sewers located within your site boundary. We will require unrestricted access to the sewer for maintenance purposes, we would ask that you maintain a minimum clearance of 6m which is measured 3m from the centre line of the pipe unless there happens to be a formal easement agreement in place, in which case the specified easement width would apply. If you cannot achieve this then you may wish to consider diverting and or abandoning the public sewer. *Please be aware that any proposed diversion may require modelling. This process may take up to 6 months in order to reach an acceptable design*.
Please refer to the link below to obtain full details of the processes involved with sewer diversions:
https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-diversions/

Existing Water Assets Crossing the Site
It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address: DeveloperServicesWater@uuplc.co.uk. Further information for this service can be found on our website via the link below:
https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/water-pre-dev/

Connection Application
Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the

link below:
https://www.unitedutilities.com/builders-developers/wastewater-services/sewer-connections/sewer-connection/
We recommend that the detailed design should confirm the locations of all utilities in the area and ensure that any proposed drainage solution considers routing and clash checks where required.
If we can be of any further assistance please don't hesitate to contact us further.

Kind regards,

United Utilities
Water for the North West

Eireann Thompson
Assistant Developer Engineer
Developer Services & Metering
Customer Services
Mobex: 07553074138
unitedutilities.com

Did you know we now have a live chat facility available to you Mon to Friday 8 -5pm. You just click on the orange live chat box on our webpage and one of our advisors will be ready to chat to you and help you with your enquiry https://www.unitedutilities.com/builders-developers/ or you can email us at developerserviceswater@uuplc.co.uk

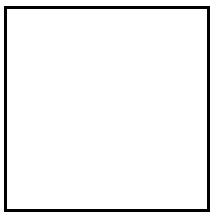
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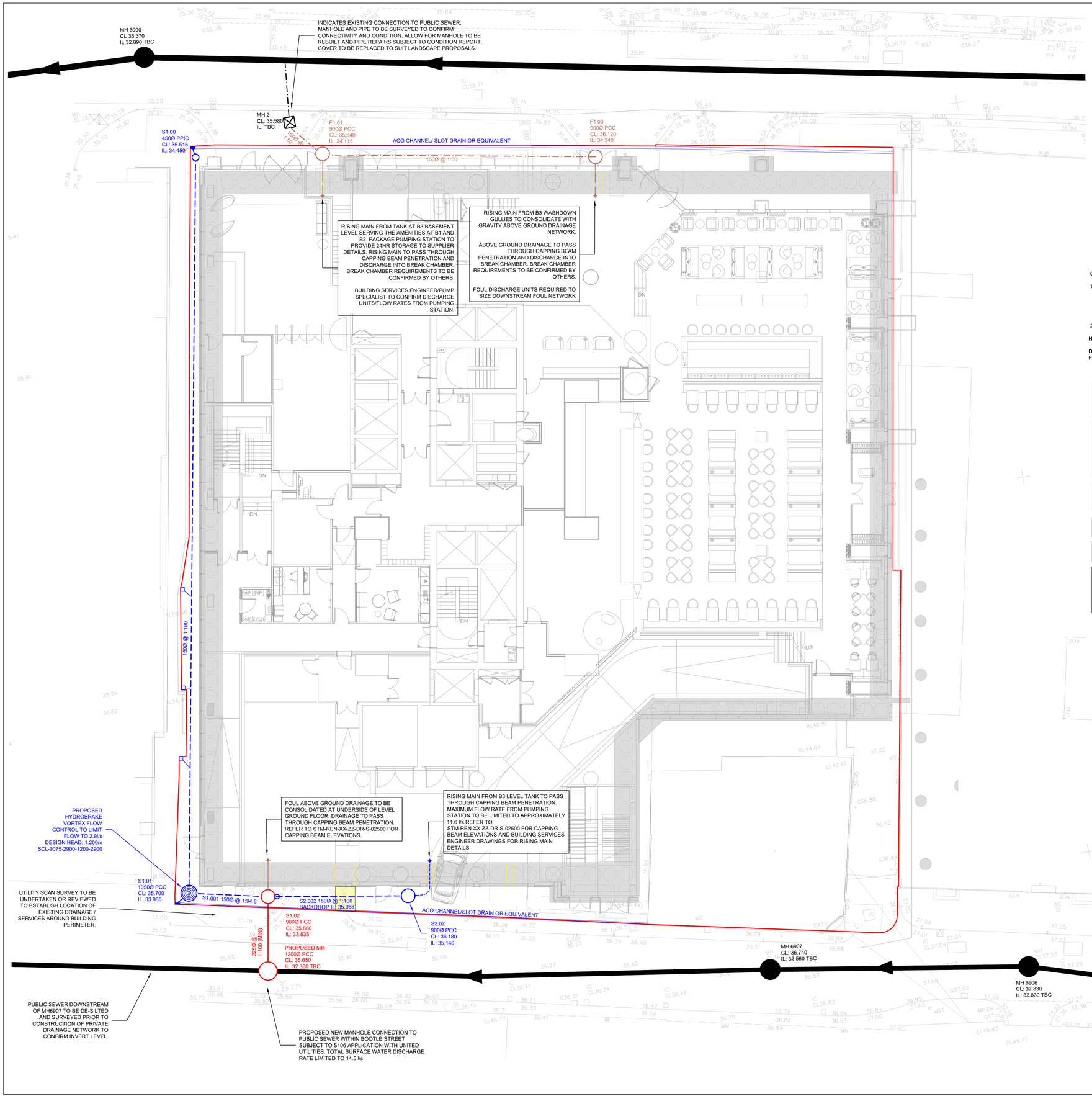
http://www.unitedutilities.com
http://www.unitedutilities.com/subsidiaries





APPENDIX C

BELOW GROUND DRAINAGE DRAWINGS



LEGEND	
REF	DESCRIPTION
	SITE PLANNING BOUNDARY
	PUBLIC COMBINED WATER SEWER
	PROPOSED PRIVATE SURFACE WATER DRAINAGE (100Ø @ 1:100 UNO)
	PROPOSED PRIVATE FOUL WATER DRAINAGE (100Ø @ 1:40 UNO)
	PROPOSED PRIVATE COMBINED WATER DRAINAGE (100Ø @ 1:100 UNO)
	INDICATIVE CHANNEL/ SLOT DRAINS
■G	INDICATIVE YARD GULLY
	INDICATIVE EXTENT OF SERVICE TRENCH - REFER TO BUILDING SERVICES ENGINEERS TRENCHING DRAWINGS FOR DETAILS
	INDICATIVE EXTENT OF CAPPING BEAM PENETRATIONS

CDM NOTES:

1. REFER TO BELOW GROUND SURVEYS AND UTILITY RECORDS DRAWINGS FOR KNOWN PAVEMENT SERVCIES. DESIGN ASSUMES THAT SERVICES CAN BE TEMPORARILY SUPPORTED OR DIVERTED TO ALLOW INSTALLATION OF DRAINAGE WHERE THERE ARE CONFLICTS. MANHOLE POSITIONS HAVE BEEN LOCATED TO AVOID EXISTING KNOWN SERVICES.
2. FOR GROUND CONDITIONS, REFER TO WSP Prelim SI Nov 2016.

HEALTH AND SAFETY:

DEEP EXCAVATIONS: TEMPORARY EARTH RETAINING WORKS REQUIRED FOR FOUNDATION EXCAVATIONS AT SITE BOUNDARIES

LANDSCAPE ARCHITECT INPUT
THE DRAINAGE INDICATE ON THIS DRAWING HAS BEEN PRODUCED WITH NO INPUT FROM THE LANDSCAPE ARCHITECT. ALL LEVELS, GULLEY CHANNEL DRAIN AND MANHOLE LOCATIONS ARE ALL INDICATIVE SUIBJECT TO ADJUSTMENT AND ALTERATION AT RIBA STAGE 4.

SVP & RWP SETTING OUT
THE DRAINAGE UNDICATED ON THIS DRAWING HAS BEEN DEVELOPED WITHOUT THE INPUT FROM BUILDING SERVICES ENGINEER INPUT. ASSUMED THAT ALL ABOVE GROUND DRAINAGE WILL BE CONSOLIDATED AT UNDERSIDE AT GROUND FLOOR SLAB AND DISCHARGE INTO CONCRETE TANK.

ALL CONNECTIONS BETWEEN ABOVE GROUND DRAINAGE AND BELOW GROUND DRAINAGE TO BE SIZED TO SUIT ABOVE GROUND DRAINAGE.

EXTERNAL WORKS SETTING OUT
FOR PROPOSED SITE LEVELS REFER TO LANDSCAPE DRAWINGS. CHANNELS/ GULLY LOCATIONS TO LANDSCAPE ARCHITECT SPECIFICATION UNLESS NOTES OTHER WISE.

COVER LEVELS
LANDSCAPE ARCHITECT TO VALIDATE COVER LEVELS IN ALL EXTERNAL AREAS. ARCHITECT TO VALIDATE COVER LEVELS IN ALL INTERNAL AREAS.

SWIMMING POOL:
TRADE EFFLUENT DISCHARGE CONSENT ASSOCIATED WITH POOL DRAIN DOWN TO BE MANAGED BY POOL SPECIALIST.

RIBA STAGE 4
THIS DRAWING IS INTENDED TO COMMUNICATE THE INTERIM PROGRESS OF THE TECHNICAL DESIGN AND IS APPROPRIATE FOR RIBA STAGE 4
A DESIGN CONTINGENCY OF 10-15% IS RECOMMENDED TO ALLOW FOR DESIGN DEVELOPMENT DURING RIBA STAGE 5 AND TO REFLECT INPUT FROM THE CONTRACTOR DESIGNED PACKAGES. THIS DRAWING HAS BEEN DEVELOPED WITHOUT FULL STAGE 4 INFORMATION FROM THE WIDER DESIGN TEAM.

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RENAISSANCE, ARCHITECTS, LANDSCAPE ARCHITECTS AND BUILDING SERVICES ENGINEERS DRAWINGS.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE BELOW GROUND DRAINAGE SPECIFICATION SP-C-00050 AND DETAILS SHOWN ON DRAWING SERIES C-03100 & C-03101 TO C-03102.
3. THE FINAL CONNECTIONS TO THE PUBLIC SEWER ARE SUBJECT TO UNITED UTILITIES APPROVAL AND ARE TO BE IN ACCORDANCE WITH THEIR AGREED DETAILS.
4. FOR ALL ABOVE GROUND DRAINAGE AND ASSOCIATED PUMPS REFER TO BUILDING SERVICES AND ARCHITECT'S DRAWINGS.
5. ALL BELOW GROUND DRAINAGE WORKS TO BE IN ACCORDANCE WITH RELEVANT BUILDING REGULATIONS AND SEWER SECTOR GUIDANCE APPENDIX C- DESIGN AND CONSTRUCTION GUIDANCE. IF DISCREPANCIES ARE NOTED BETWEEN SSG AND DRAWINGS THESE SHOULD BE BROUGHT TO THE ATTENTION OF RENAISSANCE FOR REVIEW.
6. THE CONTRACTOR IS TO UNDERTAKE A FULL CCTV SURVEY AT COMPLETION OF THE PROJECT TO DEMONSTRATE THAT THE DRAINAGE IS CLEAN. ANY DEFECTS ARE TO BE CORRECTED BY THE CONTRACTOR PRIOR TO HANDOVER OF THE SYSTEM TO THE CLIENT.
7. THE CONTRACTOR IS TO KEEP A RECORD SET OF THE AS INSTALLED DRAINAGE ON SITE AND PROVIDE THIS TO RENAISSANCE UPON COMPLETION OF THE WORKS TO ALLOW FOR PRODUCTION OF A 'FINAL CONSTRUCTION' ISSUE DRAWING.
8. DURING THE WORKS ALTERATIONS TO THE DRAINAGE LAYOUT ARE TO BE MARKED UP BY THE CONTRACTOR AND AGREED WITH RENAISSANCE IN WRITING.
9. THE CHAMBER SIZE OF PCC MANHOLES WITH MORE THAN ONE CONNECTION IN THEM MAY NEED TO BE INCREASED AN INCREMENT TO ACCOMMODATE THE CONNECTIONS AND BENDS.
10. MANHOLE COVERS ARE TO BE IN ACCORDANCE WITH BS EN 124 FOR THE RATING INDICATED IN THE MANHOLE SCHEDULE. THE CONTRACTOR IS TO SUBMIT DETAILS FOR THE PROPOSED MANHOLE COVERS TO THE ENGINEER AND LANDSCAPE ARCHITECT FOR REVIEW PRIOR TO INSTALLATION.
11. ALL INTERNAL COVERS TO BE RECESSED AND TRIPLE SEALED
12. COVER SLABS MUST CARRY THE BSI KITEMARK. WHERE THE CLEAR OPENING OF THE KITEMARKED PRODUCT IS DIFFERENT TO THAT OF THE COVER AND FRAME, A LOAD BEARING REDUCING SLAB SHOULD BE FITTED ABOVE THE COVER SLAB TO BRING THE SIZE DOWN TO REQUIRED SIZE.
13. ALL SEWERS TO BE BSI KITEMARK (CERTIFIED TO WIS 4-35-01)
14. ALL CONCRETE PIPES TO BE TO ES EN 1916 CLASS 120 (54kN/m).
15. BEDDING AND BACKFILL MATERIAL TO CONFORM TO THE REQUIREMENTS OF THE WATER INDUSTRY SPECIFICATION 4-08092 (TABLE A2).
16. IF PLASTIC PIPES ARE TO BE USED THEN THE FOLLOWING MUST APPLY:
    A. BSI KITEMARK (CERTIFIED TO BS EN 13476-1 AND WIS 4-35-01)
    B. PIPES LESS THAN OR EQUAL TO 500mm DIA
    C. BEDDING AND BACKFILL MATERIAL TO CONFORM TO THE REQUIREMENTS OF THE WATER INDUSTRY SPECIFICATION 4-08092 (TABLE A2)
19. THE MINIMUM CRUSHING STRENGTH FOR CLAY PIPES SHOULD BE AS FOLLOWS: 100mm DIA. 40kN/m, 150mm DIA. 40kN/m, 225mm DIA. 45kN/m AND 300mm DIA. 72kN/m.
20. THE MINIMUM CRUSHING STRENGTH FOR CONCRETE PIPES SHOULD BE - (CLASS 120 TO EN 1916/BS5911-1 2002). PLASTIC PIPES SHOULD CONFORM TO WIS 4-35-01 AND BS EN13476.
21. SULPHATE RESISTANT CEMENT (C20-DC2) AND PRECAST CONCRETE PRODUCTS MUST BE USED OR A LABORATORY REPORT PROVIDED PROVIDING THAT SUCH PRECAUTIONS ARE NOT NECESSARY.
22. SEWER PIPES TO BE LAID IN MAXIMUM 3 METER LENGTHS UNLESS THERE IS A SPECIFIC OPERATIONAL NEED TO LAY LONGER PIPES, AND THIS IS AGREED BY THE CONTRACTOR WITH THE PIPE MANUFACTURER.
23. FLOW CONTROL IS INDICATIVE AND SUBJECT TO STAGE 4 TECHNICAL DESIGN.
24. ALL CHANNEL LOCATIONS, MANHOLE AND DRAINAGE LOCATIONS SUBJECT TO RECEIPT OF STAGE 4 STACK LOCATIONS AND CONFIRMATION OF FLOW RATE / DISCHARGE UNITS BY BUILDING SERVICES ENGINEER.
25. ALL COVER LEVELS ASSUMED. SCHEME DEVELOPED WITHOUT INPUT FROM LANDSCAPE ARCHITECT.
26. ALL FOUL AND SURFACE WATER BELOW GROUND SYSTEMS ARE TO BE VENTED WITHIN THE ABOVE GROUND DRAINAGE TO THE BUILDING SERVICES ENGINEERS DETAILS.

Rev:	Description:	Date:	By:	Chkd:
P05	STAGE 4 UPDATE	14.05.24	JB	AI
P04	STAGE 4 ISSUE	26.04.24	JB	AI
P03	STAGE 3	15.02.23	HW	AI
P02	STAGE 2 UPDATE	24.11.22	JB	AI
P01	STAGE 2	09.09.22	SA	AI

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Project:
ST MICHAELS, MANCHESTER

Drawing Title:
BELOW GROUND DRAINAGE PLAN

Status:
STAGE 4

Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	FEB 23	HW	HW	AI

Scale: 1:125 | Project No: 2203-05

Project – Originator – Volume – Level – Type – Role – Number: STM-REN-XX-FN-DR-C-01103 | Revision: P05

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ALLOWANCE SHOULD BE MADE FOR FOUL WATER STORAGE TANK AND PUMP SET CONSTRUCTED OFF B3 SLAB - TANK DEVELOPED TO PROVIDE 24 HOUR FOUL STORAGE FROM SPA AND FACILITIES AT B2 AND B1 LEVELS.

STORAGE DESIGN DEVELOPED BASED ON THE BRITISH WATER WAYS CODE OF PRACTICE - FLOWS AND LOADS 4 - SIZING CRITERIA, TREATMENT, CAPACITY FOR SEWAGE TREATMENT SYSTEMS, FOR THE FOLLOWING OCCUPANCY CRITERIA DEFINED BY THE CLIENT BY EMAIL FEBRUARY 2023 :-

40% AVERAGE OCCUPANCY OF 672 PEOPLE OVER THE FOLLOWING OPERATIONAL HOURS :-
24 HOURS GYM
16 HOURS POOL
12 HOURS SPA

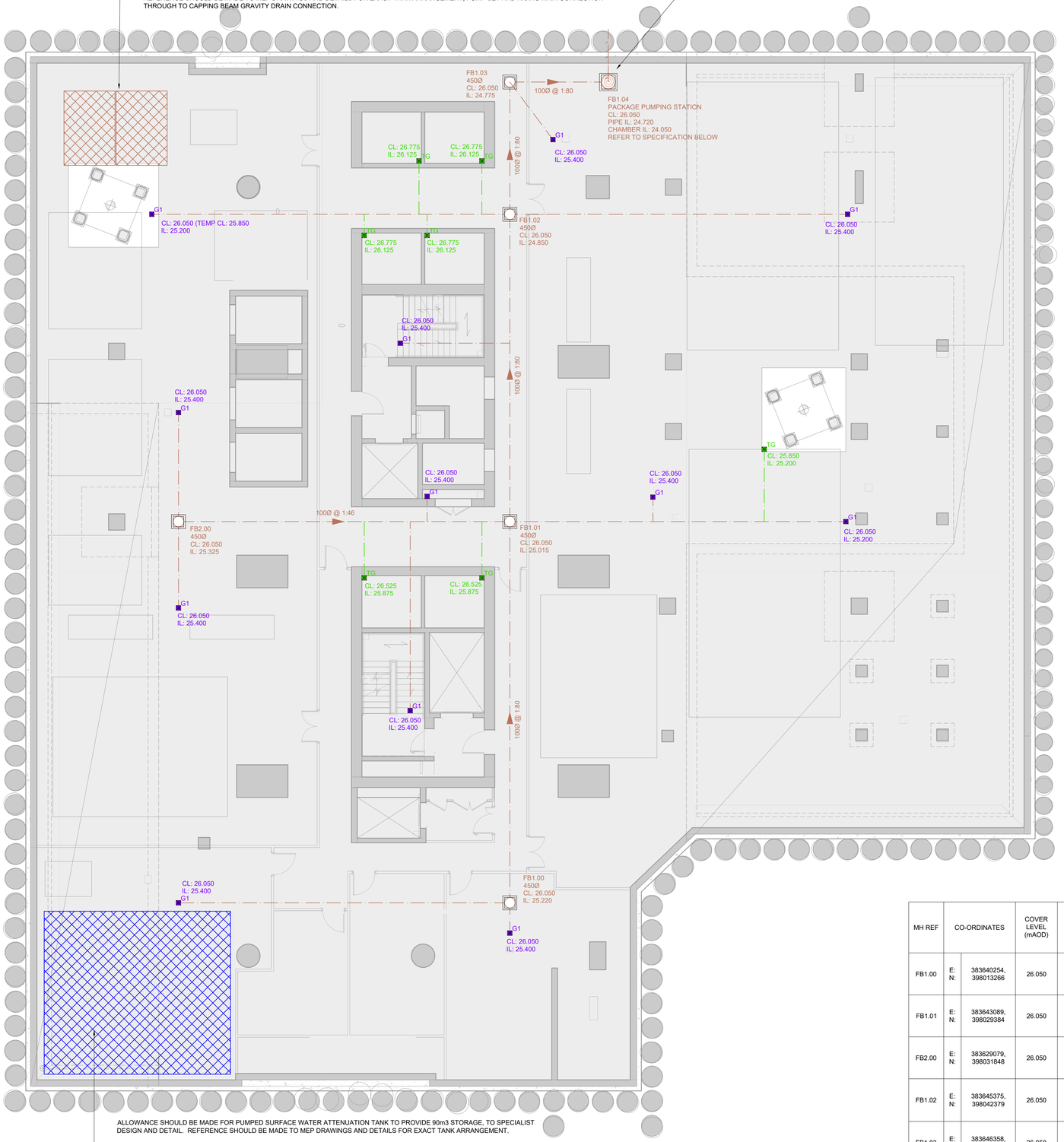
BASED ON THE ABOVE TANK STORAGE VOLUME 20m3 TO SPECIALIST DESIGN AND DETAIL. IF OCCUPANCY OR OPERATIONAL HOURS DIFFER THE ABOVE VOLUME MAY NEED TO INCREASE AND THE MAIN CONTRACTOR SHOULD AGREE ACCEPTANCE OF THE OCCUPANCY.

REFERENCE SHOULD BE MADE TO MEP DRAWINGS AND DETAILS FOR EXACT TANK ARRANGEMENT, PUMP SET AND RISING MAIN CONNECTION THROUGH TO CAPPING BEAM GRAVITY DRAIN CONNECTION.

MEP DESIGNER TO CONFIRM POWER REQUIREMENTS, LOCATION, CONDUIT REQUIRMENTS AND RISING MAIN LOCATION / PATH TO PACKAGE PUMP STATION INSTALLATION.

PACKAGED PUMP SET DEVELOPED FOR PERMANENT CONDITION, MAIN CONTRACTOR TO PROVIDE TEMPORARY SUMP PUMP AND RISING MAIN TO MANAGE SURFACE WATER DURING CONSTRUCTION.

THE MAIN CONTRACTOR TO COMPLETE ANY APPLICATIONS TO THE STATUTORY AUTHORITIES FOR ANY TEMPORARY APPROVALS FOR DISCHARGE TO THE PUBLIC SEWER SYSTEM.



ALLOWANCE SHOULD BE MADE FOR PUMPED SURFACE WATER ATTENUATION TANK TO PROVIDE 90m3 STORAGE, TO SPECIALIST DESIGN AND DETAIL. REFERENCE SHOULD BE MADE TO MEP DRAWINGS AND DETAILS FOR EXACT TANK ARRANGEMENT.

IN LINE WITH THE WSP DRAINAGE STRATEGY, DUE TO THE RISK OF BASEMENT FLOODING IN THE EVENT OF PUMP FAILURE THE MEP SPECIALIST TO MAKE PROVISION'S TO MANAGE RISK FOR BOTH FOUL AND SURFACE WATER TANK'S. IN ADDITION TO THE MEP SPECIALIST DESIGN FOUL AND SURFACE WATER ABOVE GROUND SYSTEM THE FOLLOWING REQURIEMENTS SHOULD BE INCLUDED TO BE COMPLIANT WITH THE DRAINAGE STRATEGY :-

1. PUMP SET / TANK CONNECTION TO CENTRAL BMS
2. STANDBY PUMP WITHIN PUMP SET IN EVENT OF FAILURE SUFFICIENT TO ATTAIN DESIGN FLOWS
3. PUMP SET CONNECTION TO STAND BY POWER SUPPLY IN THE EVENT OF MAINS INTERUPTION
4. MAINTENANCE STRATEGY THAT ENSURES NO INTERUPTION OF PUMP OPERATION TO SEWER SYSTEM

PRINCIPALS OF LEVEL B3 BASEMENT DRAINAGE DESIGN & OPERATION
THE BELOW GROUND DRAINAGE INDICATED IS BASED UPON NORMAL OPERATION i.e. GENERAL CLEANING, WASHDOWN AND SPILLAGES ON THE BASEMENT FLOOR. HIGH CAPACITY FLOWS ARE NOT PERMITTED AS THESE WILL EXCEED THE PUMP CAPACITY AND RESULT IN FLOODING OF THE BASEMENT.

NO ALLOWANCE HAS BEEN MADE WITHIN THE DESIGN FOR THE BASEMENT FLOODING OR DRAIN-DOWN OF THE SPRINKLER TANK. WATER ASSOCIATED WITH EMPTYING OR TESTING OF THE SPRINKLER TANK IS TO BE MANAGED SEPARATELY AND IS NOT TO DISCHARGE INTO THE BASEMENT DRAINAGE.

THE BUILDING MANAGERS ARE TO MANAGE AND OPERATE THE SPACES TO ENSURE THAT THE BASEMENT PUMP IS NOT OVERLOADED.

FOUL WATER PUMPING STATION
FOUL WATER PUMPING STATION TO SPECIALIST SUPPLIERS DESIGN AND DETAIL. TO SUIT THE BELOW SPECIFICATION AND PERFORMANCE REQUIREMENTS. RISING MAIN LENGTH TO BE CONFIRMED ON SITE. CONNECTION OF RISING MAIN TO ABOVE GROUND DRAINAGE TO BE DETAILED BY BUILDING SERVICES ENGINEER.

FOUL WATER PUMPING STATION SPECIFICATION
SINGLE SEWAGE PUMPING STATION
- CHAMBER SIZE: 610x2000mm HDPE (584 LITRES)
- COVER: ECOGRID ALUMINIUM TRIPLE SEAL RECESS MANHOLE COVER - 600x600x60mm - TSL-60-60-60
- RISING MAIN: 63mm MDPE CONNECTOR TO CONNECT TO DISCHARGE PIPEWORK.
- INLET: 1 NUMBER 100/110mm INLET SEAL
- PUMP: FEKA VS1000 AUTO FOUL PUMP WITH ON PUMP AND INTEGRAL FLOAT OR EQUALLY APPROVED.
- INTERNAL: 2" PIPEWORK AND FITTINGS INCLUDING BACKWATER VALVE
- ALARM: TO BE INCLUDED - ELECTRICAL SUPPLY BY BUILDING SERVICES ENGINEER. ARCHITECT TO SPECIFY LOCATION
- POWER: POWER SUPPLY TO BE PROVIDED BY BUILDING SERVICES ENGINEER
- VENT PIPE: TO BE PROVIDED - ARCHITECT TO SPECIFY LOCATION

NOTE:
1. THERE MUST BE A MINIMUM OF 450MM BELOW THE BOTTOM OF THE INLET PIPE TO THE BASE OF THE CHAMBER TO ALLOW FOR THE PUMP TO OPERATE.
2. INLETS TO BE CUT ON SITE AND SEALED.
3. ALLOW FOR MAINTENANCE ACCESS OF PUMP STATION. REFER TO PUMP STATION MAINTENANCE REQUIREMENTS.

LEGEND	
REF	DESCRIPTION
	PROPOSED FOUL WATER DRAINAGE (100Ø @ 1:80 U.N.O.)
	INDICATIVE FOUL WATER RISING MAIN
G1	PERMANENT GULLY - ACO TOTAL FLOW GULLY, CAST IRON, WITH VERTICAL OUTLET AND FOUL AIR TRAP. ARCH TO CONFIRM GULLY GRATING FINISH
TG	TEMPORARY GULLY - REFER TO NOTES
	FOUL WATER PUMPING STATION REFER TO SPECIFICATION.

MH REF	CO-ORDINATES		COVER LEVEL (mAOD)	INVERT LEVEL (mAOD)	DEPTH TO INVERT (m)	DEPTH TO SOFFIT (m)	PIPES IN		PIPE OUT (mm)	INTERNAL SIZE (mm)	MANHOLE TYPE	COVER		COMMENTS
							SIZE (mm)	INVERT LEVEL mAOD)				SIZE	RATING	
FB1.00	E: N:	383640254, 398013266	26.050	25.470	0.580	0.480	100 Ø 100 Ø	25.470 25.470	100 Ø	450 Ø	PPIC	450x450	FACTA AAA	ALUMINIUM RECESSED TRIPLE SEALED ECOGRID TSL-60-45-45
FB1.01	E: N:	383643089, 398029384	26.050	25.265	0.785	0.685	100 Ø 100 Ø 100 Ø	25.265 25.265 25.265	100 Ø	450 Ø	PPIC	450x450	FACTA AAA	ALUMINIUM RECESSED TRIPLE SEALED ECOGRID TSL-60-45-45
FB2.00	E: N:	383629079, 398031848	26.050	25.450	0.600	0.500	100 Ø 100 Ø	25.450 25.450	100 Ø	450 Ø	PPIC	450x450	FACTA AAA	ALUMINIUM RECESSED TRIPLE SEALED ECOGRID TSL-60-45-45
FB1.02	E: N:	383645375, 398042379	26.050	25.100	0.950	0.850	100 Ø 100 Ø	33.935 33.935	100 Ø	450 Ø	PPIC	450x450	FACTA AAA	ALUMINIUM RECESSED TRIPLE SEALED ECOGRID TSL-60-45-45
FB1.03	E: N:	383646358, 398047969	26.050	25.025	1.025	0.925	100 Ø 100 Ø	33.804 33.804	100 Ø	450 Ø	PPIC	450x450	FACTA AAA	ALUMINIUM RECESSED TRIPLE SEALED ECOGRID TSL-60-45-45
FB1.04	E: N:	383650519, 398047237	26.050	24.050	2.000	N/A	100 Ø	24.970	RISING MAIN	REFER TO FOUL WATER PUMPING STATION SPECIFICATION FOR DETAILS				

NOTES:
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RENAISSANCE, ARCHITECTS, LANDSCAPE ARCHITECTS AND BUILDING SERVICES ENGINEERS DRAWINGS.
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9. THE CHAMBER SIZE OF PCC MANHOLES WITH MORE THAN ONE CONNECTION IN THEM MAY NEED TO BE INCREASED AN INCREMENT TO ACCOMMODATE THE CONNECTIONS AND BENDS.
10. MANHOLE COVERS ARE TO BE IN ACCORDANCE WITH BS EN 124 FOR THE RATING INDICATED IN THE MANHOLE SCHEDULE. THE CONTRACTOR IS TO SUBMIT DETAILS FOR THE PROPOSED MANHOLE COVERS TO THE ENGINEER AND LANDSCAPE ARCHITECT FOR REVIEW PRIOR TO INSTALLATION.
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13. ALL SEWERS TO BE BSI KITEMARK (CERTIFIED TO WIS 4-35-01)
14. ALL CONCRETE PIPES TO BE TO ES EN 1916 CLASS 120 (54kN/m).
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    B. PIPES LESS THAN OR EQUAL TO 500mm DIA
    C. BEDDING AND BACKFILL MATERIAL TO CONFORM TO THE REQUIREMENTS OF THE WATER INDUSTRY SPECIFICATION 4-08092 (TABLE A2)
19. THE MINIMUM CRUSHING STRENGTH FOR CLAY PIPES SHOULD BE AS FOLLOWS: 100mm DIA. 40kN/m, 150mm DIA. 40kN/m, 225mm DIA. 45kN/m AND 300mm DIA. 72kN/m.
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23. FLOW CONTROL IS INDICATIVE AND SUBJECT TO STAGE 4 TECHNICAL DESIGN.
24. ALL CHANNEL LOCATIONS, MANHOLE AND DRAINAGE LOCATIONS SUBJECT TO RECEIPT OF STAGE 4 STACK LOCATIONS AND CONFIRMATION OF FLOW RATE / DISCHARGE UNITS BY BUILDING SERVICES ENGINEER.
25. ALL COVER LEVELS ASSUMED. SCHEME DEVELOPED WITHOUT INPUT FROM LANDSCAPE ARCHITECT.
26. ALL FOUL AND SURFACE WATER BELOW GROUND SYSTEMS ARE TO BE VENTED WITHIN THE ABOVE GROUND DRAINAGE TO THE BUILDING SERVICES ENGINEERS DETAILS.

NOTE :-
ALL TEMP SUMPS NOTED IN GREEN ARE INCLUDED TO FACILITATE RAIN WATER MANAGEMENT ON SITE. THESE DRAINS ARE TO BE CAPPED / PLUGGED IN THE PERMANENT CONDITION.
IT IS ASSUMED A TEMPORARY PUMP WILL BE UTILISED TO REMOVE WATER FROM THE COLLECTION SUMP.

THIS DRAWING HAS BEEN PREPARED WITH REFERENCE TO NOVO INTEGRATION LTD DRAWING P1785-NOV-XX-B3-DR-P-5301_P02

Rev:	Description:	Date:	By:	Chkd:
P02	STAGE 4	14.05.24	JB	AI
P01	STAGE 3	15.02.23	HW	AI

renaissance
Renaissance Associates Ltd
Carvers Warehouse
77 Dale Street
Manchester
M1 2HG

Project:
ST MICHAELS, MANCHESTER

Drawing Title:
B3 LEVEL BELOW GROUND DRAINAGE PLAN

Status:
STAGE 4

Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	FEB 23	HW	HW	AI

Scale:	Project No:
1:100	2203-05

Project – Originator – Volume – Level – Type – Role – Number: STM-REN-XX-B3-DR-C-01106

Revision: P02

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PROPOSED IMPERMEABLE AREAS		
MH REFERENCE	HATCH	AREA (Ha)
S1.00		0.012
S1.01		0.005
S2.02 / RISING MAIN		0.210
	TOTAL	0.227

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RENAISSANCE, ARCHITECTS, LANDSCAPE ARCHITECTS AND BUILDING SERVICES ENGINEERS DRAWINGS.
2. REFER TO DRAWING STM-REN-XX-FN-DR-C-01103 FOR BELOW GROUND DRAINAGE PLAN
3. THIS DRAWING IS INTENDED TO COMMUNICATE THE PROPOSED IMPERMEABLE AREAS WHICH HAVE BEEN ACCOUNTED FOR WITHIN THE BELOW GROUND DRAINAGE DESIGN.

MH 6090
CL 35.370
IL 32.890 TBC

INDICATES EXISTING CONNECTION TO PUBLIC SEWER. MANHOLE AND PIPE TO BE SURVEYED TO CONFIRM CONNECTIVITY AND CONDITION. ALLOW FOR MANHOLE TO BE REBUILT AND PIPE REPAIRS SUBJECT TO CONDITION REPORT. COVER TO BE REPLACED TO SUIT LANDSCAPE PROPOSALS.

MH 2
CL: 35.580
IL: TBC

1500 @ 1:60

S1.00
450Ø PPIC
CL: 35.515
IL: 34.450

F1.01
900Ø PCC
CL: 35.640
IL: 34.115

ACO CHANNEL / SLOT DRAIN OR EQUIVALENT

F1.00
900Ø PCC
CL: 36.120
IL: 34.340

RISING MAIN FROM TANK AT B3 BASEMENT LEVEL SERVING THE AMENITIES AT B1 AND B2. PACKAGE PUMPING STATION TO PROVIDE 24HR STORAGE TO SUPPLIER DETAILS. RISING MAIN TO PASS THROUGH CAPPING BEAM PENETRATION AND DISCHARGE INTO BREAK CHAMBER. BREAK CHAMBER REQUIREMENTS TO BE CONFIRMED BY OTHERS.

BUILDING SERVICES ENGINEER/PUMP SPECIALIST TO CONFIRM DISCHARGE UNITS/FLOW RATES FROM PUMPING STATION.

RISING MAIN FROM B3 WASHDOWN GULLIES TO CONSOLIDATE WITH GRAVITY ABOVE GROUND DRAINAGE NETWORK.

ABOVE GROUND DRAINAGE TO PASS THROUGH CAPPING BEAM PENETRATION AND DISCHARGE INTO BREAK CHAMBER. BREAK CHAMBER REQUIREMENTS TO BE CONFIRMED BY OTHERS.

FOUL DISCHARGE UNITS REQUIRED TO SIZE DOWNSTREAM FOUL NETWORK

FOUL ABOVE GROUND DRAINAGE TO BE CONSOLIDATED AT UNDERSIDE OF LEVEL GROUND FLOOR. DRAINAGE TO PASS THROUGH CAPPING BEAM PENETRATION. REFER TO STM-REN-XX-ZZ-DR-S-02500 FOR CAPPING BEAM ELEVATIONS

RISING MAIN FROM B3 LEVEL TANK TO PASS THROUGH CAPPING BEAM PENETRATION. MAXIMUM FLOW RATE FROM PUMPING STATION TO BE LIMITED TO APPROXIMATELY 11.6 l/s REFER TO STM-REN-XX-ZZ-DR-S-02500 FOR CAPPING BEAM ELEVATIONS AND BUILDING SERVICES ENGINEER DRAWINGS FOR RISING MAIN DETAILS

PROPOSED HYDROBRAKE VORTEX FLOW CONTROL TO LIMIT FLOW TO 2.9l/s
DESIGN HEAD: 1.200m
SCL-0075-2900-1200-2900

S1.01
1050Ø PCC
CL: 35.700
IL: 33.965

S1.001 150Ø @ 1.94 %

S2.002 160Ø @ 1.100
BACKDROP IL: 35.058

S1.02
900Ø PCC
CL: 35.860
IL: 33.835

S2.02
900Ø PCC
CL: 36.180
IL: 35.140

ACO CHANNEL/SLOT DRAIN OR EQUIVALENT

PROPOSED MH
1200Ø PCC
CL: 35.650
IL: 32.300 TBC

2250 @ 1:100 (MIN)

UTILITY SCAN SURVEY TO BE UNDERTAKEN OR REVIEWED TO ESTABLISH LOCATION OF EXISTING DRAINAGE / SERVICES AROUND BUILDING PERIMETER.

PUBLIC SEWER DOWNSTREAM OF MH6907 TO BE DE-SILTED AND SURVEYED PRIOR TO CONSTRUCTION OF PRIVATE DRAINAGE NETWORK TO CONFIRM INVERT LEVEL.

PROPOSED NEW MANHOLE CONNECTION TO PUBLIC SEWER WITHIN BOOTLE STREET SUBJECT TO S106 APPLICATION WITH UNITED UTILITIES. TOTAL SURFACE WATER DISCHARGE RATE LIMITED TO 14.5 l/s

MH 6907
CL: 36.740
IL: 32.560 TBC

MH 6906
CL: 37.830
IL: 32.830 TBC

BOOTLE STREET

Rev:	Description:	Date:	By:	Chkd:
P01	STAGE 4	14.05.24	JB	AI

renaissance
Renaissance Associates Ltd
Carvers Warehouse
77 Dale Street
Manchester
M1 2HG

Project:
ST MICHAELS, MANCHESTER

Drawing Title:
IMPERMEABLE AREAS PLAN

Status:
STAGE 4

Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	MAY 24	JB	JB	AI

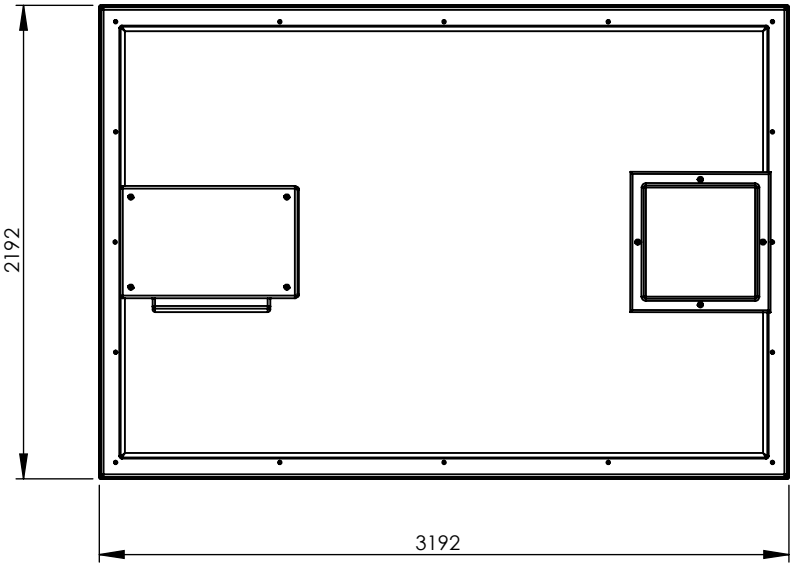
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Project – Originator – Volume – Level – Type – Role – Number: STM-REN-XX-FN-DR-C-00060 | Revision: P01

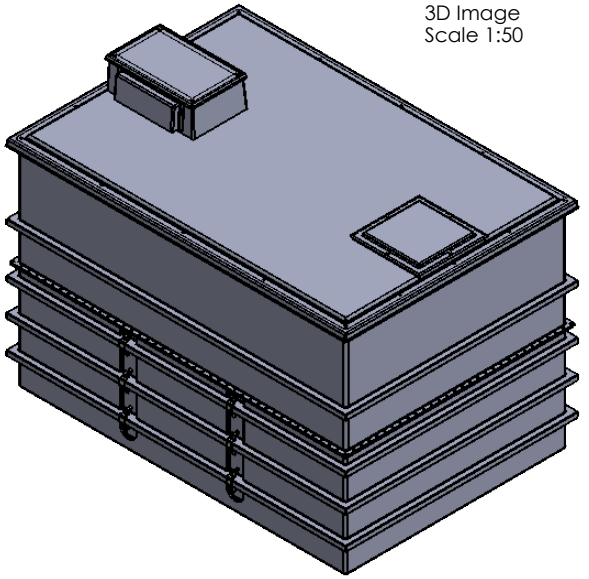
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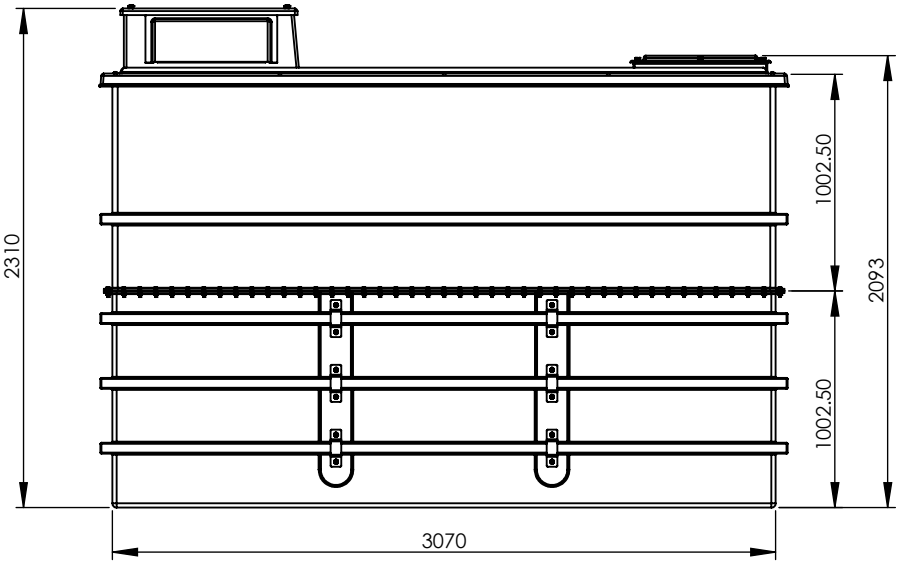
APPENDIX D

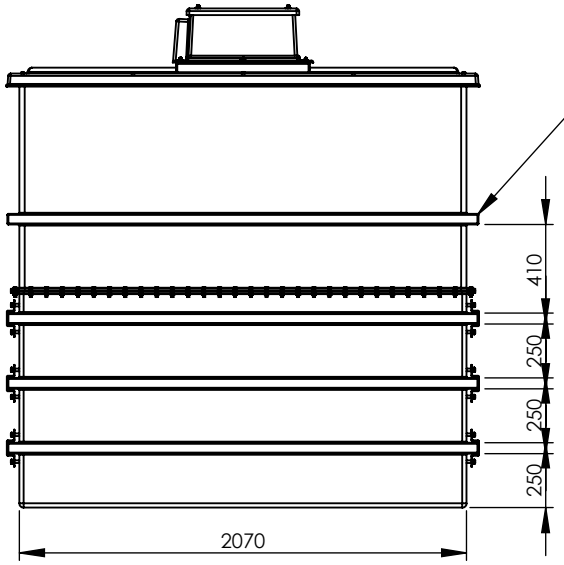
ABOVE GROUND DRAINAGE INFORMATION/ DRAWINGS



3D Image
Scale 1:50







TITLE

PW12000.INS-2.AB.4

DRAWN BY C.MORRIS DATE 12/12/2017

CUSTOMER CUSTOMER

NOTE:
All tanks must be fully supported on a flat,level & continuous foundation providing structural support to the tank when full to maximum operating capacity.It is essential that the user refers to the conditions of installation document prior to the installation of the tank.Under no circumstances should the tank body be used to provide support to pipework and ancillary items. The tank lid is a structural part of the tank and must be in place and fitted correctly when water is contained within the tank.

ALL DIMENSIONS+/- 5mm
UNLESS OTHERWISE STATED

A4

DESCRIPTION:
PW12000-2 piece cold water storage tank c/w raised float valve housing to provide an AB Air gap

ALL DIMENSIONS IN MM - DO NOT SCALE

DATE	VERSION	NOTES
06/09/2017	A	FIRST ISSUE

TANK SPECIFICATION :

INTERNAL DIMENSIONS	3000 x 2000 x 2000mm
EXTERNAL DIMENSIONS	3192 x 2192 x 2310mm
NOM. CAPACITY	12,000 Litres
DRY WEIGHT	525 KG Estimated
INSULATION THICKNESS	25mm
WRAS CERT. NUMBER	131006
MATERIAL	GRP

SCALE:1:50

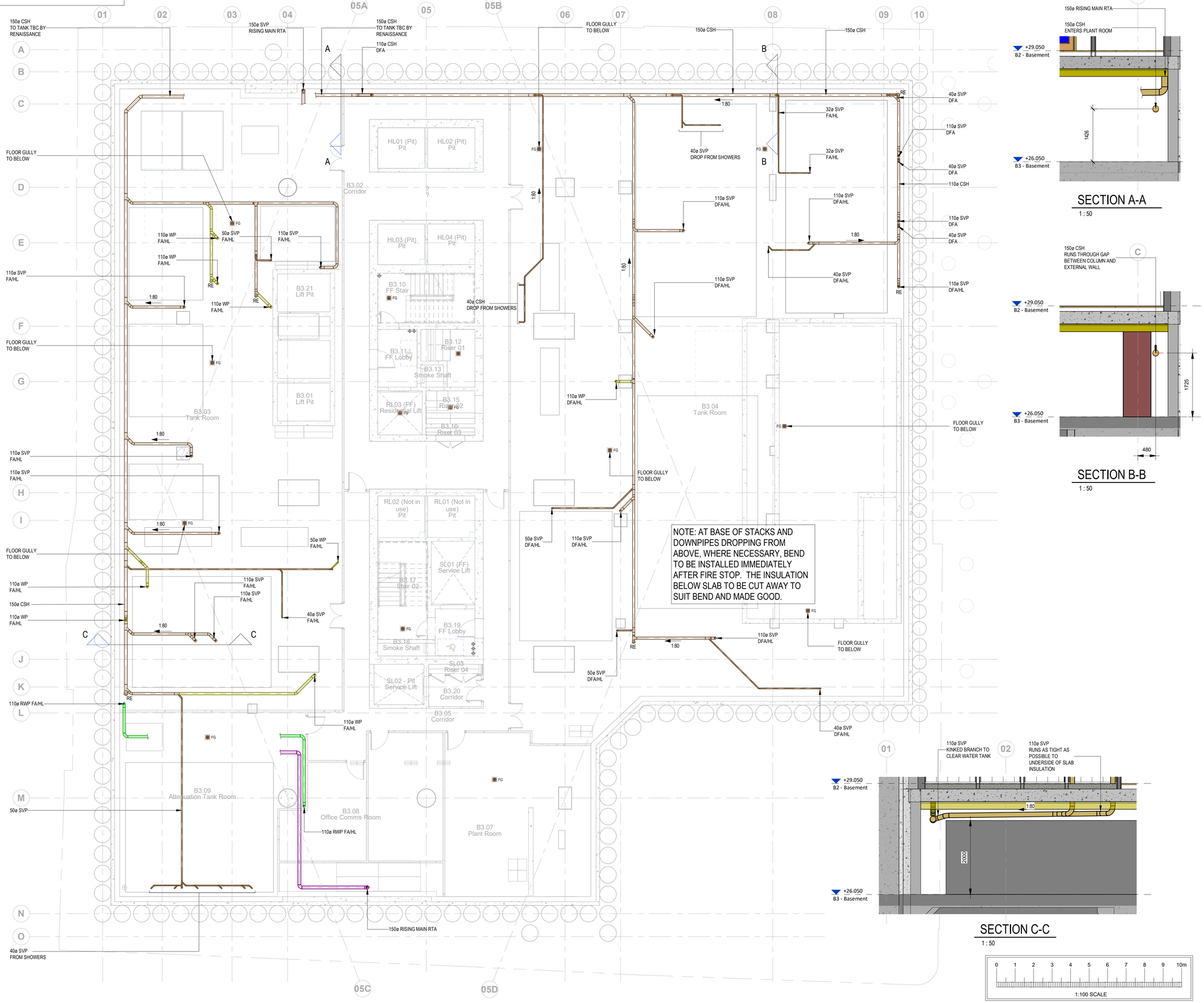
SHEET 1 OF 1

PROJECT I ORIGINATOR I ZONE I LEVEL I TYPE I ROLE I CLASS I NUMBER
P1785-NOV-XX-B3-DR-P-5201

REVISION
P03

ARCHITECTS MODEL
240415_0643-HOD-ZZ-ZZ-M3-A-0002_WIP

STRUCTURAL MODEL
240408_STM-REN-XX-XX-M3-S-0001_P12_1



SECTION A-A
1 : 50

SECTION B-B
1 : 50

SECTION C-C
1 : 50

0 1 2 3 4 5 6 7 8 9 10m
1:100 SCALE

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DO NOT SCALE OFF THIS DRAWING

DESIGNERS RISK ASSESSMENT
under section 11, 18 - Construction (Design and Management) Regulations 2015

SAFETY, HEALTH & ENVIRONMENTAL INFORMATION
There are no significant, unusual or location specific risks which are not obvious to a competent contractor or likely to be difficult to manage

ABOVE GROUND DRAINAGE NOTES

1. ALL EQUIPMENT AND THE INSTALLATION SHALL COMPLY WITH BS EN 12056.
2. ALL WC OVERFLOW SHALL BE INTEGRAL i.e. OVERFLOW INTO PAN.
3. ALL CONNECTIONS FROM SINKS. WHBs AND URINALS SHALL BE VIA 75mm DEEP TRAP.
4. WCs SHALL CONNECT TO HEADERS VIA SWEPT TEES.
5. OVAL ACCESS POINTS SHALL BE INSTALLED AT LOW LEVEL ON SOIL VENT PIPES ABOVE LOWEST FLOOD LEVEL.
6. ALL HORIZONTAL PIPEWORK AND BRANCHES SHALL BE PVC TO BS4545 14/5255 SOLVENT WELDED.
7. ALL VENTING MUST EITHER BE TO ATMOSPHERE OR BY THE USE OF AAVs SUBJECT TO BUILDING CONTROL APPROVAL.
8. CROSSFLOW MUST BE PREVENTED AT BRANCH CONNECTIONS.
9. PENETRATION BY SANITARY PIPEWORK MUST BE SUITABLY FIRE STOPPED TO PROVIDE COMPARTMENTATION; AS BUILDING REGULATIONS 1991 (PART B 3(2)) SCHEDULE 1 FIREBRAKE INTUMESCENT SLEEVE OR SIMILAR MUST MEET THE HIGHEST FIRE STOPPING REQUIREMENT TO BUILDING CONTROL.
10. PIPES MUST BE ADEQUATELY SUPPORTED WHEN INSTALLED BOTH VERTICALLY AND HORIZONTALLY TO FALLS.
11. UNDER NO CIRCUMSTANCES SHOULD PIPES OF A LARGE DIAMETER BE CONNECTED TO A PIPE OF A SMALLER DIAMETER IN THE DIRECTION OF FLOW.
12. THE CORRECT ADAPTORS AND COUPLINGS MUST BE UTILISED WHERE DISSIMILAR PIPE MATERIALS MEET.
13. SANITATION PIPEWORK MUST COMPLY WITH PART H OF BUILDING REGULATIONS.
14. ALL SVP's & RWP's TO BE ACOUSTICALLY INSULATED TO ACOUSTICIAN'S SPECIFICATION.

ABOVE GROUND DRAINAGE	
SYMBOL	REFERENCE
	PIPEWORK IN CEILING VOID
	PIPEWORK AT HIGH LEVEL
	PIPEWORK AT LOW LEVEL
	PIPEWORK UNDER FLOOR
	PIPE VERTICAL FALL/RISE
	PIPE BREAK/CONTINUATION
	DRAINAGE STACK
FG	FLOOR GULLY
RE	RODDING EYE/ACCESS POINT
URE	UPTURNED RODDING EYE/ACCESS POINT
	DRAINAGE CONNECTION FROM SINK/WHB/BATH/ETC
	DRAINAGE CONNECTION FROM WC
FALL 1:80	DIRECTION OF FLOW & GRADIENT

4
Technical Design

S2	P03	08.05.24	PJM	STAGE 4 ISSUE	BD	BD
S2	P02	06.10.23	PJM	STAGE 4 ISSUE	BD	BD
S2	P01	19.12.22	PJM	PRELIMINARY ISSUE	BD	BD
STA	REV	DATE	BY	DESCRIPTION	CHK	APP

PURPOSE OF ISSUE
STAGE 4

NOVO Integration Ltd
7 Feast Field, Horsforth, Leeds,
West Yorkshire, LS18 4TJ
t: +44(0)113 257 7300 e: cad@novo.eu.com

CLIENT
STM

ARCHITECT
Hodder + Partners

PROJECT
ST MICHAEL'S
MANCHESTER

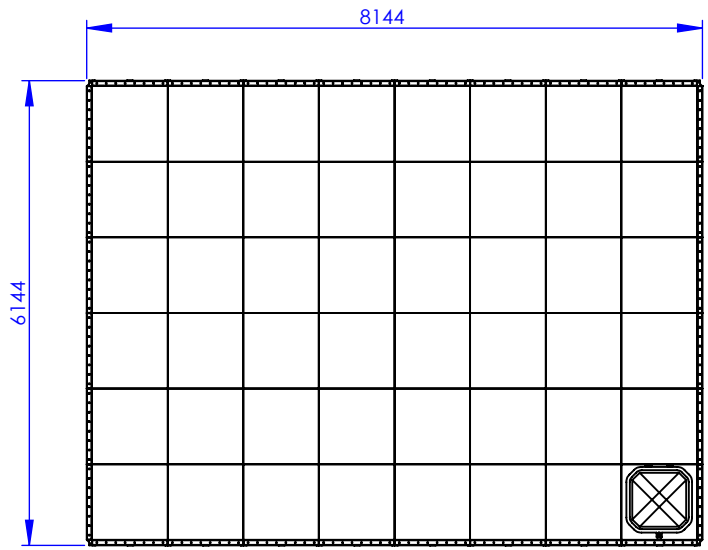
TITLE
PUBLIC HEALTH SERVICES
LEVEL B3
ABOVE GROUND DRAINAGE

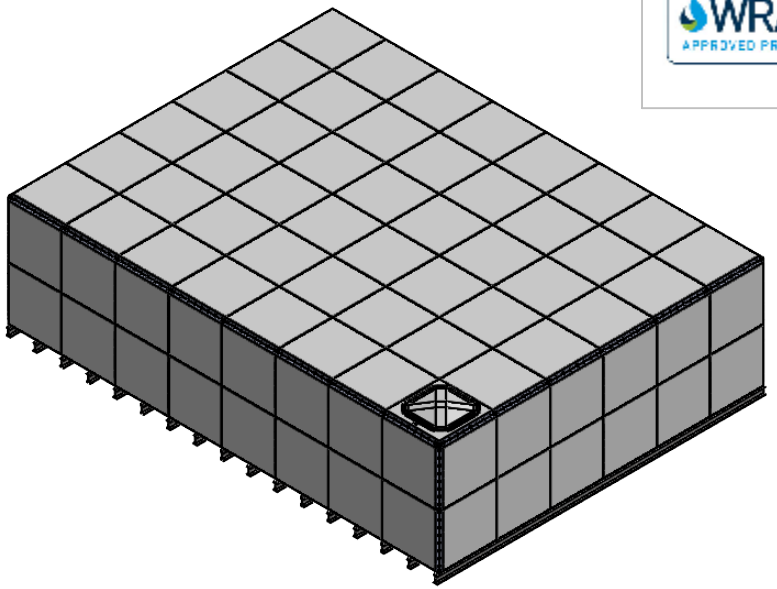
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1:100	A1	NOV '22
DRAWN	DESIGNED	CHECKED
PJM	BD	BD

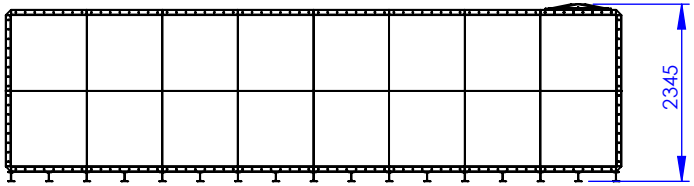
PROJECT I ORIGINATOR I ZONE I LEVEL I TYPE I ROLE I CLASS I NUMBER
P1785-NOV-XX-B3-DR-P-5201

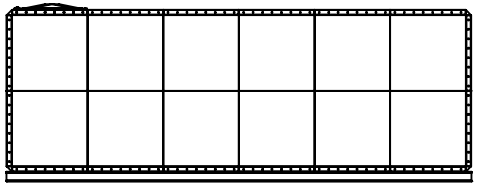
REVISION
P03

ABOVE GROUND DRAINAGE









TITLE	PW.8X6X2.TIF.UN.AG		
DRAWN BY	D.PRYJMACHUK	DATE	02/05/2024
CUSTOMER	CUSTOMER		

NOTE:
Sectional tanks must be fully supported on a flat, level & continuous foundation which provides structural support to the tank when full to maximum capacity. It is essential that the installer and/or user refers to the conditions of the installation document prior to the installation of the tank. Under no circumstances should any part of the tank structure be used to provide support to pipework and/or any ancillary items.

ALL DIMENSIONS+/- 5mm UNLESS OTHERWISE STATED

A4

DESCRIPTION:

PW.8X6X2.TIF.UN.AG Sectional cold water storage tank

ALL DIMENSIONS IN MM - DO NOT SCALE

DATE	VERSION	NOTES
02/05/2024	A	FIRST ISSUE

TANK SPECIFICATION :

INTERNAL DIMENSIONS	8000 x 6000 x 2000mm
EXTERNAL DIMENSIONS	8250 x 6250 x 2400mm
NOM. CAPACITY	107763 Litres
INSULATION THICKNESS	NONE
MATERIAL	Hot press moulded GRP
ASSEMBLED DRY WEIGHT	xxx Kg

SCALE:1:100

SHEET 1 OF 1

LOWARA
a xylem brand

ESHE 32-160/22/P25RSSA

Technical data

Company name
Contact
Phone number
e-mail address

Operating data

1	Pumpe type	Single head pump		Fluid	Water, pure		
2	No. of pumps	1		Operating temperature t A	°C	4	
3	Nominal flow	m³/h	22	Max / Min Operating Temperature mech. Seal	°C	120 / -10	
4	Nominal head	m	19.8	pH-value at t A		7	
5	Static head	m	0	Density at t A	kg/m³	1000	
6	Inlet pressure	kPa	0	Kin. viscosity at t A	mm²/s	1.569	
7	Environmental temperature	°C	20	Vapor pressure at t A	kPa	100	
8	Available system NPSH	m	0	Altitude		0	

Pump data

9	Lubrication	Standard, Grease lubrication [Std]					
10	Execution			Impeller Ø	Max.	mm	154
11	Design	Horizontal			designed	mm	154
12	Operating speed	2880 rpm	Stages 1		Min.	mm	141
13	Suction nozzle	DN 50 / PN 16 / EN1092-1		Flow	Nominal	m³/h	22.2
14	Discharge nozzle	DN 32 / PN 16 / EN1092-1			Max-	m³/h	26.8
15	Max. casing pressure	kPa	1200		Min-	m³/h	8.9
16	Max. working pressure	kPa	297.6	Head	Nominal	m	20.2
17	Impeller type		Radial impeller		at Qmax	m	15.4
18	Head H(Q=0)	m	30		at Qmin	m	29.3
19	Max. shaft power	kW	2.1	Shaft power		kW	2.1
20	Pump weight	kg		Efficiency		%	59.1
21	Total weight	kg	29.0	NPSH 3%		m	4.2

Materials

	Pump		Shaft Seal	
22				
23	Pump body	Stainless steel / AISI 316L	Single mechanical seal, without shaft sleeve	
24	Impeller	Stainless steel / AISI 316L	Uniten 3K	VBVGG
25	SEAL HOUSING	Stainless steel / AISI 316L	Mechanical seal diameter	22 mm
26	Wear ring	Stainless steel / AISI 316L	1. Rotating ring	Ceramic
27	Counterwear ring	Stainless steel / AISI 316L	2. Stationary ring	Carbon graphite resin impregnated
28	Shaft extension	Stainless steel / AISI 316L	3. Secondary seal	Fluorine rubber (FKM)
29	Rigid shaft coupling	Stainless steel / AISI 316	4. Springs	CrNiMo - Steel
30	Impeller locknut and washer	Stainless steel / AISI 316	5. Others	CrNiMo - Steel
31	Tab	Stainless steel / AISI 316L	Gaskets of the pump	Fluorine rubber (FKM)
32	Fill/drain plugs	Stainless steel / AISI 316		
33				
34				
35				
36				
37				
38				
39				
40				
41				

Motor data

Electrical and dimensional data refer to IE3 motor

42	Manufacturer	Lowara PLM		
43	Specific design	IE3 3ph Flange Motor		
44	Type	PLM 90 B14 2,2 kW		
45	Rated power	2.2 kW	Rated current	4.56 A
46	Nominal speed	2880 rpm	Rated voltage	400 V
47	Frame size	90	Service factor	1
48	Weight kg	18.0	Degree of protection	IP55

Remarks

49	
50	
50	
52	

LOWARA
a xylem brand

ESHE 32-160/22/P25RSSA

Performance curve

Company name
Contact
Phone number
e-mail address

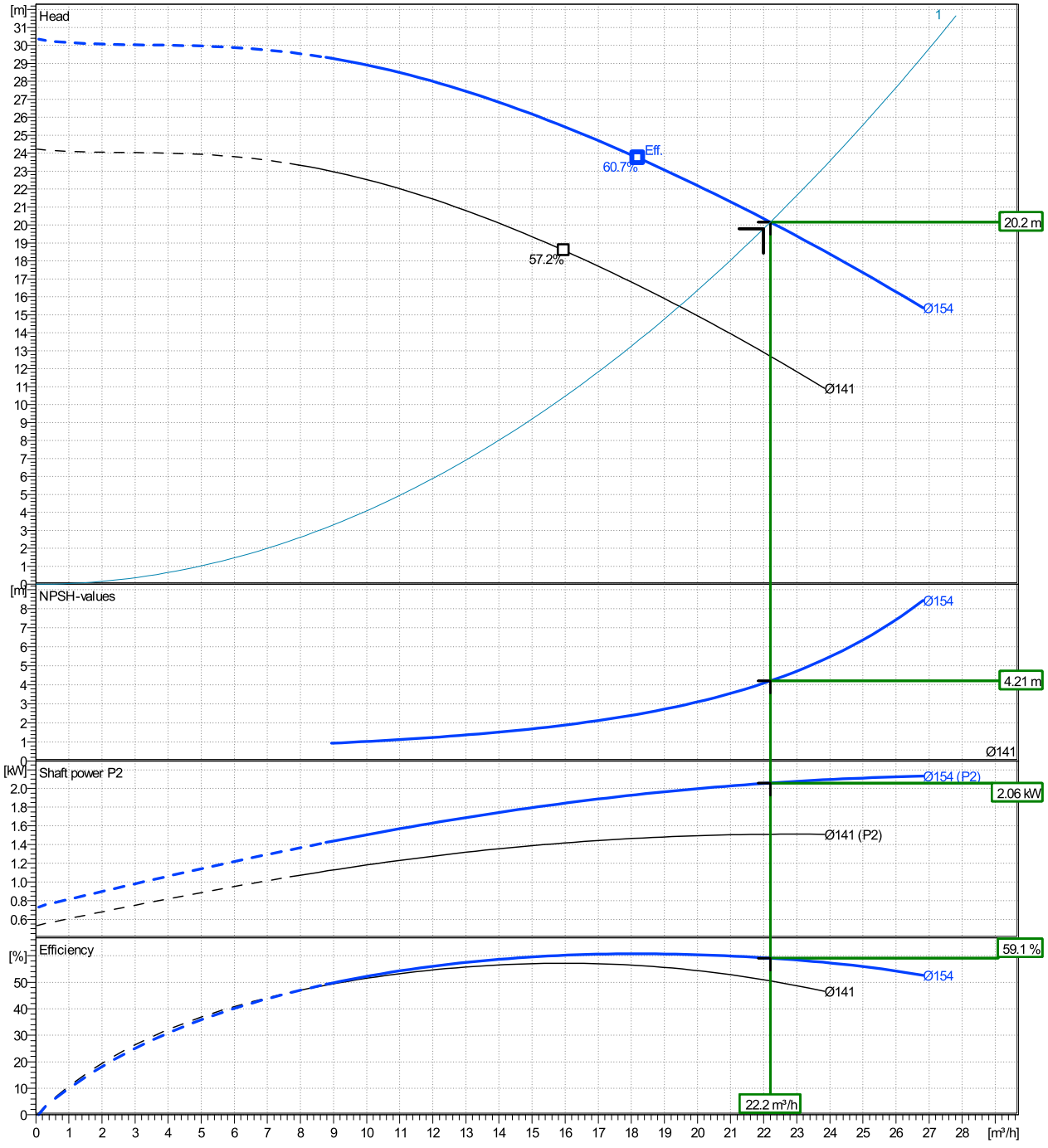
	Ø	Pump capacity Operating range Min.	Max.	η Max.	Pump head H(Q=0)	η Max.	Shaft power P2 P2(Q=0)	Max.	η Max.			
	mm	m³/h	m³/h	m³/h	m	m	kW	kW	kW			
actual	154			18.2	30.3	23.7		2.13	1.94	Frequency	Hz	50
Min.	0	/	/	16	24.2	18.6		/	1.42	Operating speed	rpm	2880
Max.	154	/	/	18.2	30.3	23.7		/	1.94	Nominal flow	m³/h	22
										Nominal head	m	19.8
										Inlet pressure	kPa	0
										Static head	m	0

Power datas refered to:

Water, pure [100%] ; 4°C; 1000kg/m³; 1.57mm²/s

hydr. Performance acceptance acc. To EN ISO 9906 Class Grade 3B

MEI: N.A - according to Ecodesign Directive 2009/125/EC and Regulation (EU) No.547/2012



Project	Xylect-22269596	Created by	Last update 5/10/2024
Block	ESHE 32-160/22/P25RSSA	Created on 5/10/2024	

Program version: 73.0 - 23/04/2024 (Build 125)
Data version: 07/05/2024 08:15
User group(s): Xylem:United Kingdom - EXT

LOWARA
a xylem brand

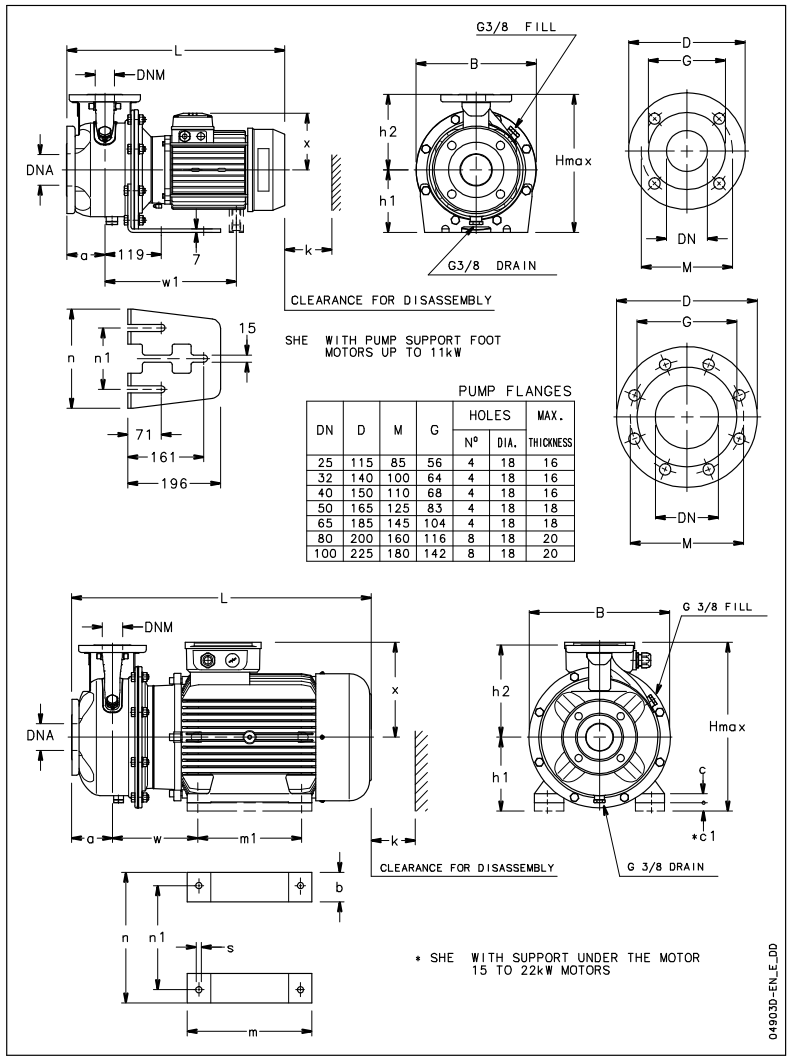
ESHE 32-160/22/P25RSSA

Dimensions

Company name
Contact
Phone number
e-mail address

Close coupled

PLM 90 B14 2,2 kW



Electrical and dimensional data refer to IE3 motor

Dimensions [mm]			
a	80		
B	253		
DNA	50		
DNM	32		
h1	132		
h2	160		
Hmax	292		
k	98		
L	478		
n	210		
n1	130		
x	134		

Weight	
Total weight	**29 kg**

Connections			
Suction nozzle		**Discharge nozzle**	
DN 50		**DN 32**	
PN 16		**PN 16**	
EN1092-1		**EN1092-1**	
D	165	D	140
Dia. Holes	18	Dia. Holes	18
DN	50	DN	32
G	83	G	64
M	125	M	100
Max thickness	18	Max thickness	16

Dimensions and weight without obligation

Project	Xylect-22269596	**Created by**		**Last update**	5/10/2024
Block	ESHE 32-160/22/P25RSSA	**Created on**	5/10/2024		

APPENDIX E

PROPOSED SURFACE WATER RUN-OFF VOLUME CALCULATIONS

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.360	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.124	4-8	0.103

Total Area Contributing (ha) = 0.227

Total Pipe Volume (m³) = 1.673

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	48.376	0.485	99.7	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	5.203	0.055	94.6	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	6.192	0.675	9.2	0.210	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	6.555	-9.100	-0.7	0.000	0.00	0.0	0.600	o	154	Pipe/Conduit	
S2.002	9.220	0.092	100.0	0.000	0.00	0.0	0.600	o	150	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	50.00	5.80	34.450	0.012	0.0	0.0	0.0	1.01	17.8	1.6
S1.001	50.00	5.89	33.965	0.017	0.0	0.0	0.0	1.03	18.3	2.3
S2.000	50.00	5.02	28.500	0.210	0.0	0.0	0.0	4.35	172.8	28.4
S2.001	50.00	6.18	26.050	0.210	0.0	0.0	0.0	0.09	1.8«	28.4
S2.002	50.00	6.33	35.150	0.210	0.0	0.0	0.0	1.00	17.8«	28.4

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.002	4.893	1.535	3.2	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)
S1.002	50.00	6.34	33.835	0.227	0.0	0.0	0.0	7.38	293.5	30.7

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Manhole Schedules for Storm

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)
S1.00	35.515	1.065	Open Manhole	450	S1.000	34.450	150				
S1.01	35.700	1.735	Open Manhole	1050	S1.001	33.965	150	S1.000	33.965	150	
SRWP	30.000	1.500	Open Manhole	225	S2.000	28.500	225				
S3	28.050	2.000	Open Manhole	8000 x 6000	S2.001	26.050	154	S2.000	27.825	225	1846
S2.02	36.180	1.030	Open Manhole	900	S2.002	35.150	150	S2.001	35.150	154	
S1.02	36.270	2.435	Open Manhole	900	S1.002	33.835	225	S1.001	33.910	150	
								S2.002	35.058	150	1148
S2.01	35.650	3.350	Open Manhole	1200		OUTFALL		S1.002	32.300	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1.00	383625.056	398055.135	383625.056	398055.135	Required	
S1.01	383616.253	398007.568	383616.253	398007.568	Required	
SRWP	383637.276	398015.635	383637.276	398015.635	Required	
S3	383633.723	398010.563	383633.723	398010.563	Required	
S2.02	383630.423	398004.899	383630.423	398004.899	Required	
S1.02	383621.334	398006.446	383621.334	398006.446	Required	
S2.01	383620.486	398001.627			No Entry	



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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.012	0.012	0.012
1.001	-	-	100	0.005	0.005	0.005
2.000	-	-	100	0.210	0.210	0.210
2.001	-	-	100	0.000	0.000	0.000
2.002	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.227	0.227	0.227

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.002	S2.01	35.650	32.300	0.000	1200	0

Simulation Criteria for Storm

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	2	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.360		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S1.01, DS/PN: S1.001, Volume (m³): 2.3

Unit Reference	MD-SCL-0075-2900-1200-2900
Design Head (m)	1.200
Design Flow (l/s)	2.9
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	33.965
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.9	Kick-Flo®	0.666	2.2
Flush-Flo™	0.302	2.9	Mean Flow over Head Range	-	2.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.3	1.200	2.9	3.000	4.4	7.000	6.6
0.200	2.8	1.400	3.1	3.500	4.7	7.500	6.8
0.300	2.9	1.600	3.3	4.000	5.0	8.000	7.0
0.400	2.8	1.800	3.5	4.500	5.3	8.500	7.2
0.500	2.7	2.000	3.7	5.000	5.6	9.000	7.4
0.600	2.5	2.200	3.8	5.500	5.9	9.500	7.6
0.800	2.4	2.400	4.0	6.000	6.1		
1.000	2.7	2.600	4.1	6.500	6.3		

Pump Manhole: S3, DS/PN: S2.001, Volume (m³): 96.1

Invert Level (m) 26.050

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	11.6000	0.900	11.6000	1.700	11.6000	2.500	11.6000
0.200	11.6000	1.000	11.6000	1.800	11.6000	2.600	11.6000
0.300	11.6000	1.100	11.6000	1.900	11.6000	2.700	11.6000
0.400	11.6000	1.200	11.6000	2.000	11.6000	2.800	11.6000
0.500	11.6000	1.300	11.6000	2.100	11.6000	2.900	11.6000
0.600	11.6000	1.400	11.6000	2.200	11.6000	3.000	11.6000
0.700	11.6000	1.500	11.6000	2.300	11.6000		
0.800	11.6000	1.600	11.6000	2.400	11.6000		

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100 year Return Period Summary of Critical Results by Maximum Discharge Volume (Rank 1) for Storm

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 2 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	360
Return Period(s) (years)	100
Climate Change (%)	0

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1.00	360 minute 100 year Winter I+0%	360	35.515	34.469	-0.131	0.000	0.04
S1.001	S1.01	360 minute 100 year Winter I+0%	360	35.700	34.014	-0.101	0.000	0.07
S2.000	SRWP	360 minute 100 year Winter I+0%	360	30.000	28.549	-0.176	0.000	0.11
S2.001	S3	360 minute 100 year Winter I+0%	360	28.050	26.161	-0.043	0.000	1.38
S2.002	S2.02	360 minute 100 year Winter I+0%	360	36.180	35.246	-0.054	0.000	0.74
S1.002	S1.02	360 minute 100 year Winter I+0%	360	36.270	33.875	-0.185	0.000	0.07

PN	US/MH Name	Overflow (l/s)	Infil. Flow (l/s)	Infil. Vol (m³)	Total Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S1.000	S1.00					0.002	5.997	0.5	0.7	OK
S1.001	S1.01					0.061	8.495	0.6	1.0	OK
S2.000	SRWP					0.002	104.948	1.9	12.3	OK
S2.001	S3					5.071	104.948	2.3	11.6	OK
S2.002	S2.02					0.059	104.948	1.0	11.6	OK
S1.002	S1.02					0.023	113.441	2.7	12.6	OK

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APPENDIX F

PROPOSED SURFACE WATER MICRODRAINAGE CALCULATIONS

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.360	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.124	4-8	0.103

Total Area Contributing (ha) = 0.227

Total Pipe Volume (m³) = 1.673

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	48.376	0.485	99.7	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	5.203	0.055	94.6	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	6.192	0.675	9.2	0.210	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	6.555	-9.100	-0.7	0.000	0.00	0.0	0.600	o	154	Pipe/Conduit	
S2.002	9.220	0.092	100.0	0.000	0.00	0.0	0.600	o	150	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	50.00	5.80	34.450	0.012	0.0	0.0	0.0	1.01	17.8	1.6
S1.001	50.00	5.89	33.965	0.017	0.0	0.0	0.0	1.03	18.3	2.3
S2.000	50.00	5.02	28.500	0.210	0.0	0.0	0.0	4.35	172.8	28.4
S2.001	50.00	6.18	26.050	0.210	0.0	0.0	0.0	0.09	1.8«	28.4
S2.002	50.00	6.33	35.150	0.210	0.0	0.0	0.0	1.00	17.8«	28.4

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.002	4.893	1.535	3.2	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)
S1.002	50.00	6.34	33.835	0.227	0.0	0.0	0.0	7.38	293.5	30.7

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Manhole Schedules for Storm

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)
S1.00	35.515	1.065	Open Manhole	450	S1.000	34.450	150				
S1.01	35.700	1.735	Open Manhole	1050	S1.001	33.965	150	S1.000	33.965	150	
SRWP	30.000	1.500	Open Manhole	225	S2.000	28.500	225				
S3	28.050	2.000	Open Manhole	8000 x 6000	S2.001	26.050	154	S2.000	27.825	225	1846
S2.02	36.180	1.030	Open Manhole	900	S2.002	35.150	150	S2.001	35.150	154	
S1.02	36.270	2.435	Open Manhole	900	S1.002	33.835	225	S1.001	33.910	150	
								S2.002	35.058	150	1148
S2.01	35.650	3.350	Open Manhole	1200		OUTFALL		S1.002	32.300	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1.00	383625.056	398055.135	383625.056	398055.135	Required	
S1.01	383616.253	398007.568	383616.253	398007.568	Required	
SRWP	383637.276	398015.635	383637.276	398015.635	Required	
S3	383633.723	398010.563	383633.723	398010.563	Required	
S2.02	383630.423	398004.899	383630.423	398004.899	Required	
S1.02	383621.334	398006.446	383621.334	398006.446	Required	
S2.01	383620.486	398001.627			No Entry	



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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.012	0.012	0.012
1.001	-	-	100	0.005	0.005	0.005
2.000	-	-	100	0.210	0.210	0.210
2.001	-	-	100	0.000	0.000	0.000
2.002	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.227	0.227	0.227

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.002	S2.01	35.650	32.300	0.000	1200	0

Simulation Criteria for Storm

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	2	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.360		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S1.01, DS/PN: S1.001, Volume (m³): 2.3

Unit Reference	MD-SCL-0075-2900-1200-2900
Design Head (m)	1.200
Design Flow (l/s)	2.9
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	33.965
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.9	Kick-Flo®	0.666	2.2
Flush-Flo™	0.302	2.9	Mean Flow over Head Range	-	2.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.3	1.200	2.9	3.000	4.4	7.000	6.6
0.200	2.8	1.400	3.1	3.500	4.7	7.500	6.8
0.300	2.9	1.600	3.3	4.000	5.0	8.000	7.0
0.400	2.8	1.800	3.5	4.500	5.3	8.500	7.2
0.500	2.7	2.000	3.7	5.000	5.6	9.000	7.4
0.600	2.5	2.200	3.8	5.500	5.9	9.500	7.6
0.800	2.4	2.400	4.0	6.000	6.1		
1.000	2.7	2.600	4.1	6.500	6.3		

Pump Manhole: S3, DS/PN: S2.001, Volume (m³): 96.1

Invert Level (m) 26.050

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	11.6000	0.900	11.6000	1.700	11.6000	2.500	11.6000
0.200	11.6000	1.000	11.6000	1.800	11.6000	2.600	11.6000
0.300	11.6000	1.100	11.6000	1.900	11.6000	2.700	11.6000
0.400	11.6000	1.200	11.6000	2.000	11.6000	2.800	11.6000
0.500	11.6000	1.300	11.6000	2.100	11.6000	2.900	11.6000
0.600	11.6000	1.400	11.6000	2.200	11.6000	3.000	11.6000
0.700	11.6000	1.500	11.6000	2.300	11.6000		
0.800	11.6000	1.600	11.6000	2.400	11.6000		

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

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 2 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 45

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1.00	15 minute 1 year Winter I+0%	15	35.515	34.479	-0.121	0.000	0.08
S1.001	S1.01	15 minute 1 year Winter I+0%	15	35.700	34.045	-0.070	0.000	0.13
S2.000	SRWP	15 minute 1 year Winter I+0%	15	30.000	28.571	-0.154	0.000	0.22
S2.001	S3	15 minute 1 year Winter I+0%	15	28.050	26.179	-0.025	0.000	1.38
S2.002	S2.02	15 minute 1 year Winter I+0%	15	36.180	35.246	-0.054	0.000	0.74
S1.002	S1.02	15 minute 1 year Winter I+0%	15	36.270	33.876	-0.184	0.000	0.08

PN	US/MH Name	Overflow (l/s)	Infil. Flow (l/s)	Infil. Vol (m³)	Total Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S1.000	S1.00					0.004	0.676	0.6	1.4	OK
S1.001	S1.01					0.105	0.957	0.7	1.8	OK
S2.000	SRWP					0.003	11.831	2.4	25.3	OK
S2.001	S3					5.946	11.830	2.2	11.6	OK
S2.002	S2.02					0.059	11.829	1.0	11.6	OK
S1.002	S1.02					0.024	12.786	2.7	13.4	OK

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

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 2 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 45

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1.00	15 minute 2 year Winter I+0%	15	35.515	34.483	-0.117	0.000	0.10
S1.001	S1.01	15 minute 2 year Winter I+0%	15	35.700	34.070	-0.045	0.000	0.16
S2.000	SRWP	15 minute 2 year Winter I+0%	15	30.000	28.582	-0.143	0.000	0.28
S2.001	S3	30 minute 2 year Winter I+0%	30	28.050	26.235	0.031	0.000	1.38
S2.002	S2.02	15 minute 2 year Summer I+0%	15	36.180	35.247	-0.053	0.000	0.74
S1.002	S1.02	15 minute 2 year Winter I+0%	15	36.270	33.877	-0.183	0.000	0.08

PN	US/MH Name	Overflow (l/s)	Infil. Flow (l/s)	Infil. Vol (m³)	Total Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S1.000	S1.00					0.004	0.875	0.7	1.8	OK
S1.001	S1.01					0.140	1.238	0.7	2.3	OK
S2.000	SRWP					0.003	15.311	2.5	32.7	OK
S2.001	S3					8.648	20.123	2.2	11.6	SURCHARGED
S2.002	S2.02					0.059	13.668	1.0	11.6	OK
S1.002	S1.02					0.024	16.545	2.7	13.9	OK

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

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 2 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 45

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1.00	15 minute 30 year Winter I+0%	15	35.515	34.496	-0.104	0.000	0.20
S1.001	S1.01	15 minute 30 year Winter I+0%	15	35.700	34.264	0.149	0.000	0.20
S2.000	SRWP	15 minute 30 year Winter I+0%	15	30.000	28.618	-0.107	0.000	0.53
S2.001	S3	30 minute 30 year Winter I+0%	30	28.050	26.531	0.327	0.000	1.38
S2.002	S2.02	30 minute 30 year Winter I+0%	30	36.180	35.247	-0.053	0.000	0.74
S1.002	S1.02	15 minute 30 year Winter I+0%	15	36.270	33.878	-0.182	0.000	0.08

PN	US/MH Name	Overflow (l/s)	Infil. Flow (l/s)	Infil. Vol (m³)	Total Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S1.000	S1.00					0.007	1.654	0.8	3.4	OK
S1.001	S1.01					0.634	2.342	0.8	2.9	SURCHARGED
S2.000	SRWP					0.004	28.942	3.0	61.9	OK
S2.001	S3					22.854	35.502	2.0	11.6	SURCHARGED
S2.002	S2.02					0.059	35.389	1.0	11.6	OK
S1.002	S1.02					0.025	31.136	2.7	14.5	OK

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

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 2 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.360
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	200.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 45

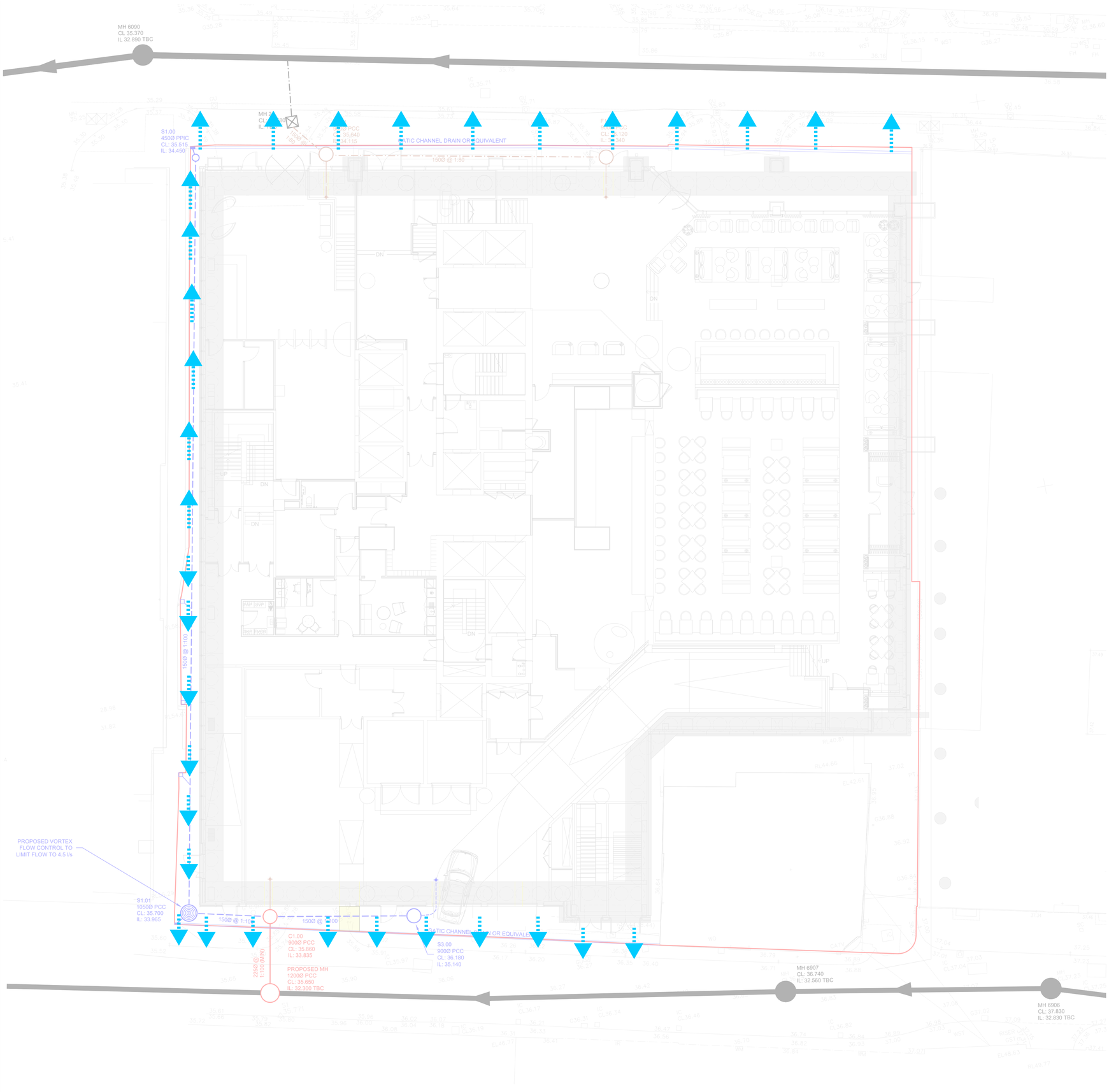
PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1.00	30 minute 100 year Winter I+45%	30	35.515	35.216	0.616	0.000	0.29
S1.001	S1.01	30 minute 100 year Winter I+45%	30	35.700	35.198	1.083	0.000	0.20
S2.000	SRWP	15 minute 100 year Winter I+45%	15	30.000	28.713	-0.012	0.000	0.99
S2.001	S3	60 minute 100 year Winter I+45%	60	28.050	27.256	1.052	0.000	1.38
S2.002	S2.02	30 minute 100 year Summer I+45%	30	36.180	35.246	-0.054	0.000	0.74
S1.002	S1.02	30 minute 100 year Winter I+45%	30	36.270	33.878	-0.182	0.000	0.08

PN	US/MH Name	Overflow (l/s)	Infil. Flow (l/s)	Infil. Vol (m³)	Total Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S1.000	S1.00					0.121	4.145	0.9	5.0	SURCHARGED
S1.001	S1.01					1.905	5.870	0.8	2.9	SURCHARGED
S2.000	SRWP					0.008	54.178	3.4	114.3	OK
S2.001	S3					57.652	76.607	1.9	11.6	SURCHARGED
S2.002	S2.02					0.059	37.168	1.0	11.6	OK
S1.002	S1.02					0.025	43.164	2.7	14.5	OK

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APPENDIX G

OVERLAND FLOOD FLOW ROUTES



NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RENAISSANCE, ARCHITECTS, LANDSCAPE ARCHITECTS AND BUILDING SERVICES ENGINEERS DRAWINGS.
2. THE DRAINAGE SYSTEM HAS BEEN DESIGNED TO ACCOMMODATE RAINFALL EVENTS UPTO 1 IN 100 YEAR + 45% CLIMATE CHANGE AND AS SUCH THIS DRAWING INDICATES THE OVERLAND FLOW ROUTES FOR AN EXCEEDANCE EVENT OF THE DRAINAGE SYSTEM.

DRAWING LEGEND

PLANNING BOUNDARY

EXCEEDANCE FLOOD FLOW ROUTES

Rev:	Description:	Date:	By:	Chkd:
P01	STAGE 4	00.05.24	JB	AI

Renaissance Associates Ltd
Carvers Warehouse
77 Dale Street
Manchester
M1 2HG

Project:

ST MICHAELS, MANCHESTER

Drawing Title:

OVERLAND FLOOD FLOW ROUTES

Status:

STAGE 4

Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	MAY 24	JB	-	AI

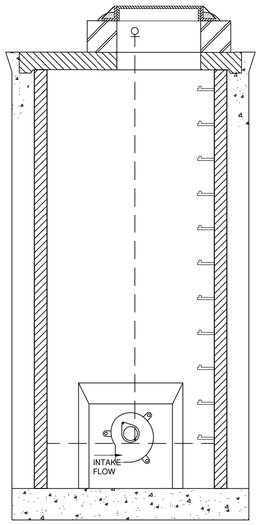
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1:125	2203-05

Project - Originator - Volume - Level - Type - Role - Number:	Revision:
STM-REN-XX-FN-DR-C-01150	P01

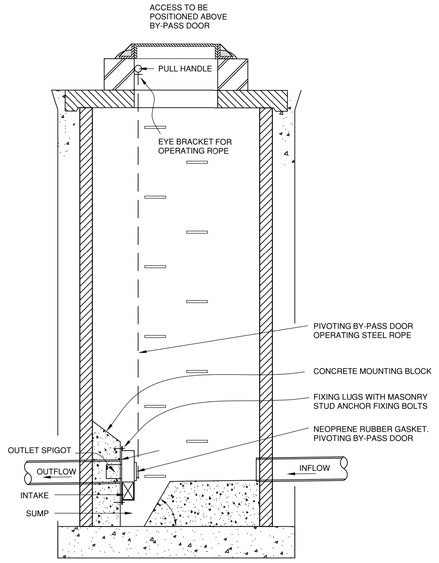
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APPENDIX H

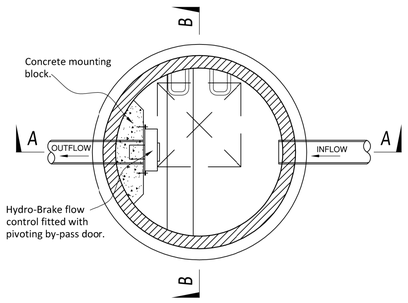
FLOW CONTROL



SECTION A-A



SECTION B-B



TYPICAL PLAN OF HYDRO-BRAKE MANHOLE

NOTES:

1. FOR GENERAL NOTES REFER TO RENAISSANCE DRAWING STM-REN-00-FN-DR-C-01100. FOR DRAINAGE NOTES REFER TO C-03100 SERIES.
2. DO NOT SCALE FROM THIS DRAWING. ANY AMBIGUITIES OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS TO BE CHECKED/ VERIFIED ON SITE.

Rev:	Description:	Date:	By:	Chkd:
P01	STAGE 4	14.05.24	JB	AI

renaissance

Renaissance Associates Ltd
Carvers Warehouse
77 Dale Street
Manchester
M1 2HG

Project:

ST MICHAELS, MANCHESTER

Drawing Title:

TYPICAL FLOW CONTROL DETAIL

Status:

STAGE 4

Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	MAY 24	JB		AI

Scale:	Project No:
NTS	2203-05

Project - Originator - Volume - Level - Type - Role - Number:	Revision:
STM-REN-00-FN-DR-C-03104	P01

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Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.200	2.900
Flush-Flo™	0.302	2.887
Kick-Flo®	0.666	2.221
Mean Flow		2.516

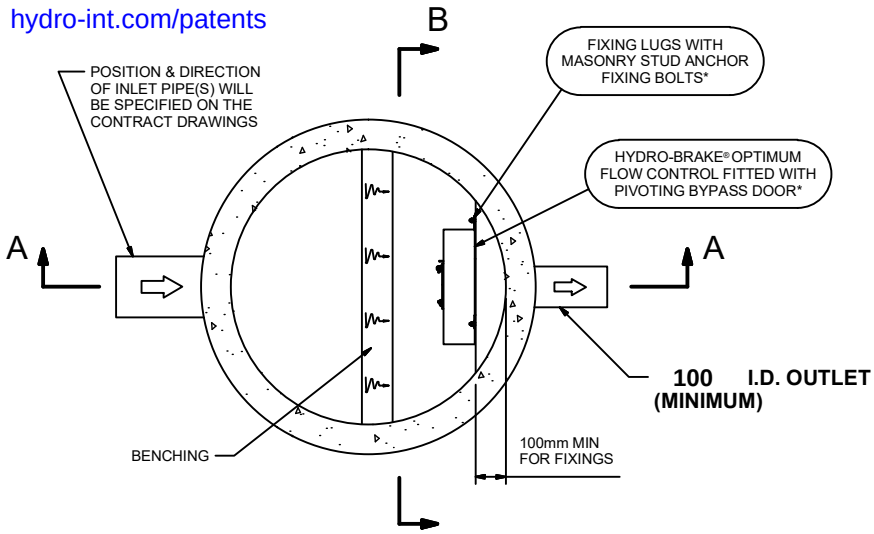
Hydro-Brake® Optimum Flow Control including:

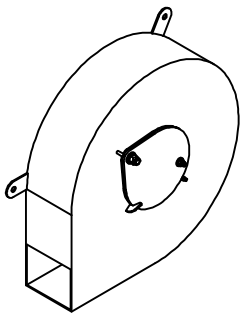
- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet
- Indicative Weight: 10 kg

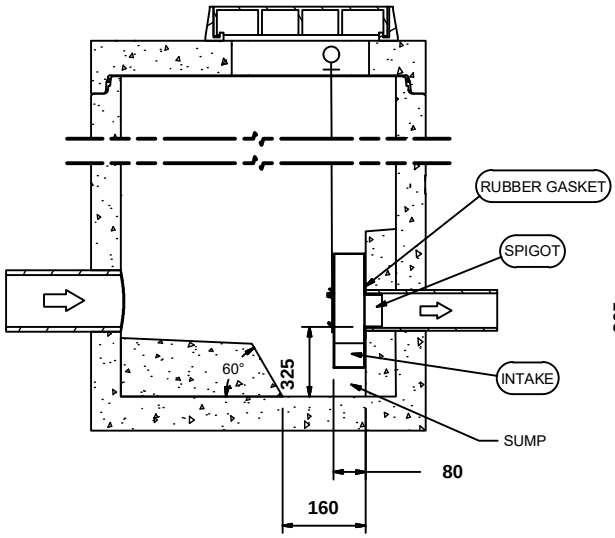
BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE 08/4596

wrc approved PT/503/0422 Valid: 01/04/2022 - 31/03/2027

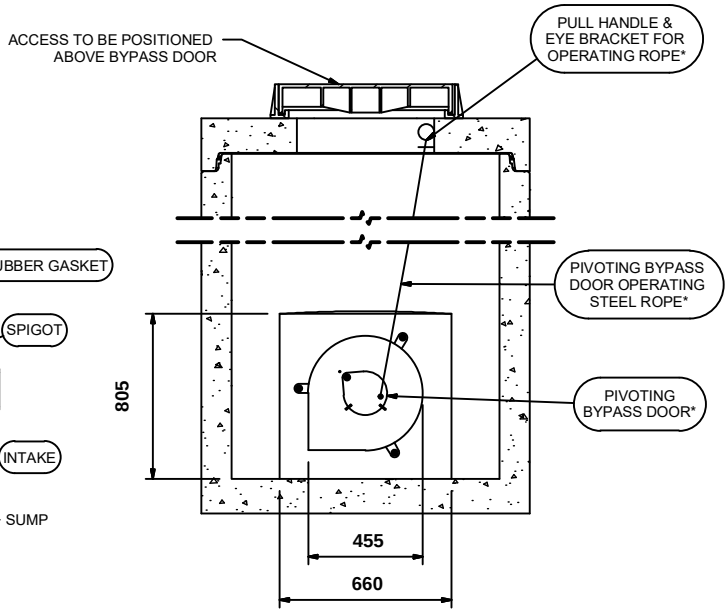
hydro-int.com/patents







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 SCL-0075-2900-1200-2900 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.

Hydro International A CRH COMPANY

DATE	14/05/2024 15:10
SITE	St Michaels
DESIGNER	Joe Bullough
REF	S1.02

SCL-0075-2900-1200-2900
Hydro-Brake® Optimum

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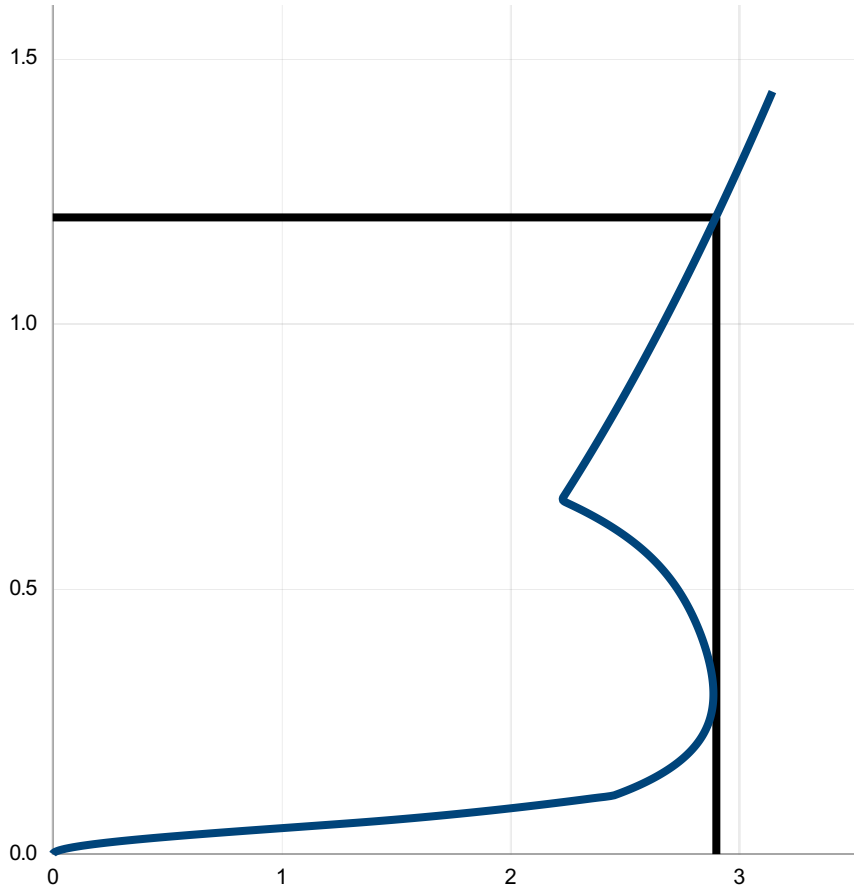
joebullough@renaissance-ltd.com

Technical Specification		
Control Point	Head (m)	Flow (l/s)
Primary Design	1.200	2.900
Flush-Flo™	0.302	2.887
Kick-Flo®	0.666	2.221
Mean Flow		2.516

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4596

wrc approved™
PT/503/0422
Valid: 01/04/2022 - 31/03/2027

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Head (m)	Flow (l/s)
0.000	0.000
0.041	0.760
0.083	1.926
0.124	2.533
0.166	2.710
0.207	2.813
0.248	2.867
0.290	2.886
0.331	2.883
0.372	2.863
0.414	2.832
0.455	2.790
0.497	2.735
0.538	2.662
0.579	2.563
0.621	2.428
0.662	2.247
0.703	2.276
0.745	2.336
0.786	2.393
0.828	2.449
0.869	2.503
0.910	2.556
0.952	2.608
0.993	2.659
1.034	2.709
1.076	2.757
1.117	2.805
1.159	2.851
1.200	2.897

DESIGN ADVICE

The head/flow characteristics of this SCL-0075-2900-1200-2900 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.**

Hydro International
A CRH COMPANY

DATE	14/05/2024 15:10
Site	St Michaels
DESIGNER	Joe Bullough
Ref	S1.02

SCL-0075-2900-1200-2900

Hydro-Brake® Optimum

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