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Email: leeds@fairhurst.co.uk
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Our Ref: 135675/FO/2002

Date: 17th July 2023

SENT BY EMAIL ONLY

Dear Angela Leckie,

PLANNING APPLICATION 135675/FO/2022 – PROPOSAL: ERECTION OF TWO RESIDENTIAL APARTMENT BUILDINGS (USE CLASS C3) COMPRISING BLOCK 1 – PART 9, PART 10 (PLUS ROOF LEVEL AMENITY BLOCK) AND BLOCK 2 – 12 STOREY BUILDING (COMPRISING OF 261 DWELLINGS IN TOTAL) ABOVE BASEMENT LEVELS WITH GROUND FLOOD COMMERCIAL UNITS (USE CLASS E (EXCLUDING CLASS E(B))), ASSOCIATED RESIDENTS AMENITY SPACE, CYCLE PARKING, LANDSCAPING, ACCESS, STREET LOADING AND OTHER ASSOCIATED WORKS FOLLOWING DEMOLITION OF THE EXISTING BUILDING AND STRUCTURES ON SITE.

Following the planning approval for the proposed development stated above, I have compiled the following information to support the approval and discharge condition 8.

I have referenced each comment to a specific query raised within condition 8.

“A finalised drainage layout showing all components, outfalls, levels and connectivity”

Finalised drainage layouts (REF: 143404/2001/B, 143404/2003, 143404/2004, 143404/2005/B & 143404/2006/A) have been included within this submission, supporting this, the drainage details have also been provided (REF: 143404/2002/A & 143404/2014).

“Maximised integration of green SuDS components (utilising infiltration or attenuation) if practicable”

Below ground attenuation has been integrated into the proposed surface water drainage system, this is shown in the drainage layout (REF: 143404/2005/B & 143404/2012). The Flood Risk Assessment and Drainage Strategy Report (REF: 143404/02B) notes the use of infiltration is not to be feasible due to the site likely to be underlain by impermeable clay, the presence of this clay was confirmed within Ground Investigation Report (REF: 143404/R2). In addition, the contamination from the former industrial use is expected to be found within the made ground overlying the clay.

“An existing and proposed impermeable areas drawing to accompany all discharge rate calculations”

The existing site is entirely made up of impermeable surfaces, currently relying on a limited but unsurveyed on site drainage network and overland flow to discharge any surface water flooding. The proposed impermeable areas drawing has been provided (REF: 143404/2013).

“Surface water should be restricted to a rate of 5l/s”

The surface water discharge rate has been restricted to 5.0l/s, this is shown in the drainage layout (REF: 143404/2005/B & 143404/2006/A).

“A blockage risk assessment is undertaken as part of the drainage strategy to support proposed flows less than 5l/s. If the risk cannot be adequately managed, a higher minimum discharge rate should be considered / agreed with relevant parties”

The discharge from the attenuation tank within Block 1NQ is restricted to 2.6l/s to leave capacity for the second block and external areas within an overall site restriction to 5.0l/s. In the event of a blockage upstream of flow restrictions <5l/s, continued flooding will generate overland flow, this overland flow will follow the flood paths depicted in the overland flow routes plan (REF: 143404/2011). The risk assessment associated with this is classified as a low risk. The overland flow will prompt maintenance to unblock.

“Runoff volumes in the 1 in 100 year, 6 hour rainfall shall be constrained to a value as close as is reasonable practicable to the greenfield runoff volume for the same event, but never exceed the runoff volume from the development site prior to redevelopment”

The runoff volume for the proposed development is restricted to 5.0l/s. The supporting evidence, MicroDrainage analysis, is included within at the end of this document.

“Assessment of the overland flow routes for extreme events. Overland flow routes need to be designed to convey the flood water in a safe manner in the event of a blockage or exceedance of the proposed drainage system capacity including inlet structures. A layout with overland flow routes needs to be presented with appreciation of these overland flow routes with regards to the properties on site and adjacent properties off site”

In the event of surface water exceedance, overland flow routes are shown in the overland flow routes plan (REF: 143404/2011). To ensure the risk to properties is minimised, all external ground levels are proposed to have a slope gradient directing overland flow away from buildings ensuring overland flow will continue away from the site. The site is located within flood zone 1, therefore, is in an area with a low probability of flooding.

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

The Flood Risk Assessment and Drainage Strategy Report (REF: 143404/02B) states the use of infiltration is not feasible as the site is likely to be underlain by impermeable clay, further to this, the Ground Investigation Report (REF: 143404/R2) confirmed the presence of clay between the depth of 4.5m and 18mbgl. Therefore, the use of underground attenuation has been adopted. The attenuation for Block Clement will empty, from full, in 1.4 hours, the attenuation for Block 1 NQ will empty, from full, in 11.5 hours.

“CRT consent / approval confirmation required. An email of acceptance will suffice”

The route to discharge to the Rochdale Canal was assed and considered not viable due to access being bound by third party land and restricted by services and a brick arch bridge. United Utilities have accepted the route is not viable and agreed to discharge to the public sewer. CRT consent has not been pursued.

“The LLFA would require the landowner’s consent / approval for drainage within highway / third-party land. An email of acceptance will suffice”

An S106 application is currently in progress and will be forwarded on once approval is received, but United Utilities have accepted discharge to the public sewer (email attached).

“Where surface water is connected to the public sewer, agreement in principle from United Utilities is required that there is adequate spare capacity in the existing system taking future development requirements into account. An email acceptance of proposed flows and/or new connection will suffice”

Confirmation from United Utilities is included in the Flood Risk Assessment and Drainage Strategy Report (REF: 143404/02B), this has also been included at the end of this document for reference. This agreement, by email dated 18/04/2023, accepts surface water discharge to the canal is not viable and accepting discharge to the public sewer.

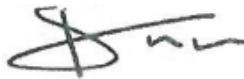
“Hydraulic calculations of the proposed drainage system”

The MicroDrainage analysis of the proposed drainage system is shown at the end of this document.

“Construction details of flow control and SuDS elements”

The construction details for the flow control can be seen in the Hydrobrake Typical detail drawing (REF: 143404/2012). The SuDS elements detail can be seen in the GeoCellular Typical Detail Drawing (REF: PSM_SD_PSM_003).

Yours sincerely,



Anthony Simmons
Partner
Fairhurst

From: wastewaterdeveloperservices@uuplc.co.uk [mailto:wastewaterdeveloperservices@uuplc.co.uk]

Sent: 04 October 2022 14:10

To: Serhat Kilinc <serhat.kilinc@fairhurst.co.uk>

Subject: Pre Development Enquiry for: Tariff Street, Manchester, M1 2EG UU Reference Number : 02852111

Good Afternoon, Serhat

Pre Development Enquiry for: Tariff Street, Manchester, M1 2EG UU Reference Number : 02852111

Please ignore previous email with incorrect case number. Please use case number above for all future correspondence.

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 300mm diameter public combined sewer within Tariff Street located to the South of your proposed development at an unrestricted rate.

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

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

Surface Water

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

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

reasonably practicable.

This is outlined as follows, in order of priority:

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

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

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

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

Infiltration

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

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

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

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

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

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

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

Waterbody

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

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

Highway Drainage

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

to a watercourse, by contacting the relevant Highway Authority.

Public Sewer

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

Once evidence is provided as outlined above, United Utilities will consider a connection to the 300mm diameter public combined sewer within Tariff Street located South of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities request that any agreed rate does not exceed 5l/s. This is based on the peak greenfield flowrate for this development based on impermeable ground.

Please note the given discharge rate is based on the full site area as the specifics of the area being developed are not yet clear. If there are significant areas of the site that will not be developed, the discharge rate should be reduced accordingly.

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

Levels

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

Land drainage / Overland flows / track drainage

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

Existing Wastewater Assets Crossing the Site

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

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.

Sewer Adoptions

You have indicated on your application form that you intend to put the sewers forward for adoption (including any SuDS components that can come within the meaning of a sewer).

United Utilities assess adoption applications based on the current Design & Construction Guidance and local practices which have now replaced 'Sewers For Adoption 6th Edition'.

We recommend that you submit a pre design assessment to the sewer adoption mailbox (SewerAdoptions@uuplc.co.uk) stating pre design assessment in the title

Please refer to links below to obtain further guidance:

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

Site drainage must be designed in accordance with Building Regulations, National Planning Policy, and local flood authority guidelines, we would recommend that you speak and make suitable agreements with the relevant statutory bodies.

If you intend to put forward your wastewater assets for adoption by United Utilities, the proposed detail design will be subject to a technical appraisal by an Adoption Engineer as we need to be sure that the proposals meets the requirements set out in the Design & Construction Guidance. The proposed design should give consideration to long term operability and give United Utilities a safe and cost effective proposal for the lifetime of the assets. In these cases, we strongly recommend that no construction commences until the detailed drainage design, submitted as part of the Section 104 application, has been assessed and accepted in writing by United Utilities. Any work carried out prior to the technical assessment being approved is done entirely at the developer's own risk and could be subject to change.

SuDS

If your development proposal incorporates any SuDS component(s) which interact with a sewer network you plan on offering for adoption to United Utilities; contact should be made with our technical team at your earliest convenience, please complete the 'Section 104 pre-application form : ' and include as much relevant detail as you can. These discussions can help prevent delays later in the development process.

Section 104 Pre application form (1b)

As per the sewerage sector guidance, all SuDS should be designed in accordance with the standards within the Design & construction guidance & the CIRIA SuDS manual (C753)

Codes For Adoption

The new Codes for Adoption are outlined on the Water UK Website. The link below takes you to their webpage:

<https://www.water.org.uk/technical-guidance/developers-services/codes-for-adoption/>

A free copy of the new Design & Construction Guidance can be downloaded via the link below:

<https://www.water.org.uk/sewerage-sector-guidance-approved-documents/>

Many thanks and kind regards,



Gary Jaundrell

Assistant Developer Engineer
Developer Services & Metering
Customer Services
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Josh McLaughlin

From: Jeremy Tetley
Sent: 17 July 2023 17:27
To: Josh McLaughlin
Subject: FW: 143404: Tariff Street, Manchester, M1 2EG UU Reference Number : 02852111

Josh

Email referred to.

Kind Regards
Jeremy Tetley



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Jeremy Tetley
Technical Director

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From: wastewaterdeveloperservices@uuplc.co.uk [mailto:wastewaterdeveloperservices@uuplc.co.uk]
Sent: 18 April 2023 14:20
To: Catherine Meredith <catherine.meredith@fairhurst.co.uk>
Cc: Jeremy Tetley <jeremy.tetley@fairhurst.co.uk>
Subject: 143404: Tariff Street, Manchester, M1 2EG UU Reference Number : 02852111

Good afternoon Catherine,

I have now picked this up on behalf of Gary.

In line with the evidence provided, subject to section 106 approval I would not object to a connection at a maximum pass forward flow of 5 l/s to the 300mm combined sewer in Tariff Street.

Below I have linked the connection application form.

<https://www.unitedutilities.com/builders-developers/wastewater-services/sewer-connections/sewer-connection/>

If I can be of any further assistance please do get in touch.

Kind regards



Ashleigh Bellerby
Assistant Developer Engineer
Developer Services & Metering
Customer Services
T: 07826891650
unitedutilities.com

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----- Original Message -----

From: Catherine Meredith [catherine.meredith@fairhurst.co.uk]

Sent: 13/04/2023 16:46

To: wastewaterdeveloperservices@uuplc.co.uk

Cc: jeremy.tetley@fairhurst.co.uk

Subject: 143404: Tariff Street, Manchester, M1 2EG UU Reference Number : 02852111

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For the Attention of Gary Jaundrell,

Good afternoon Gary,

Following receipt of your Pre-development advice issued by email to Serhat on 4/10/22, we spoke on the phone this afternoon.

As discussed,

1. Infiltration of Surface water

Please see attached borehole records and extract from the FRA and Drainage Strategy Report below.

Historical Borehole Records

A series of historical borehole records are available from the BGS. The nearest records are directly north of the site, and approximately 100m to the South, East and West of the site and they indicate the following:

1. Made Ground, consisting of ash, cinders and stone.
2. Made Ground recovered as a firm clayey sandy sandstone
3. Stiff to very stiff sandy Clay to depths of 15m+
4. Sandstone bedrock was identified at depths of around 28m

These indicate the site is expected to be underlain by made ground and impermeable clay horizons and, as such, indicate **that the site is unlikely to be suitable for the use of soakaways.**

The historical plans indicate that the site has been subject to extensive historical built development since the 1890's which includes warehouses, garages and an infilled canal wharf with no recent surface water infiltration, and the potential for made ground and ground and water contaminants. As such, **the infiltration of surface water discharge is not recommend due to the risk of increased ground water flooding and contaminant mobilisation.**

In addition, an SI for the adjacent site shows the site is underlain by clay with variable water levels, probably associated with the route of a former canal.

1. Waterbody – Discharge to Rochdale Canal

We have looked at the possibility of discharging to the canal but have concluded that it is not feasible / practical to construct. It would be necessary to construct a new surface water sewer down Tariff street (due to constraints of third party land ownership) which would need to be taken through an existing brick arch bridge abutment (which crosses the width of the whole highway) and then discharge above the water level into the canal.

Given the above, as there are no surface water sewers in the vicinity, the only viable solution is to connect into the 300mm diameter sewer in Tariff Street (at a rate not to exceed 5L/s as stated in the pre-development device). Is the next step to submit a section 106 Application?

Kind regards

Catherine



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Catherine Meredith

Engineer

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225 Bath Street Glasgow G2 4GZ	143404 Tariff Street	
Date 14/07/2023 16:45 File 143404 preliminary Calc...	Designed by CMM Checked by	
Innovyze	Network 2020.1	

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)	1	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.356	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

Network Design Table for Storm

- Indicates pipe length does not match coordinates

« - 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	5.038	0.054	93.3	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	8.954	0.089	100.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	1.473	0.015	98.2	0.180	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	0.500#	1.375	0.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	3.502	0.044	79.6	0.073	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	10.473	1.450	7.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.004	1.861	0.028	66.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.005	9.266	0.092	100.7	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	46.30	5.06	48.043	0.000	0.0	0.0	0.0	1.35	53.8	0.0
S1.001	45.87	5.18	47.989	0.000	0.0	0.0	0.0	1.30	51.8	0.0
S1.002	45.80	5.20	47.900	0.180	0.0	0.0	0.0	1.32	52.5	22.3
S1.003	45.79	5.20	47.885	0.180	0.0	0.0	0.0	21.88	870.1	22.3
S2.000	46.34	5.05	48.004	0.073	0.0	0.0	0.0	1.13	19.9	9.1
S2.001	46.16	5.10	47.960	0.073	0.0	0.0	0.0	3.77	66.7	9.1
S1.004	45.73	5.21	46.510	0.253	0.0	0.0	0.0	1.93	136.5	31.3
S1.005	45.17	5.37	46.482	0.253	0.0	0.0	0.0	1.00	17.7«	31.3

[illegible]

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Synthetic Rainfall Details

Ratio R 0.356 Cv (Winter) 0.840
 Profile Type Summer Storm Duration (mins) 30
 Cv (Summer) 0.750

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S5(HB), DS/PN: S1.005, Volume (m³): 4.4

Unit Reference	MD-SHE-0069-2600-1600-2600
Design Head (m)	1.600
Design Flow (l/s)	2.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	69
Invert Level (m)	46.482
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	2.6
Flush-Flo™	0.302	2.1
Kick-Flo®	0.614	1.7
Mean Flow over Head Range	-	2.0

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.7	1.200	2.3	3.000	3.5	7.000	5.2
0.200	2.0	1.400	2.4	3.500	3.7	7.500	5.3
0.300	2.1	1.600	2.6	4.000	4.0	8.000	5.5
0.400	2.0	1.800	2.7	4.500	4.2	8.500	5.7
0.500	2.0	2.000	2.9	5.000	4.4	9.000	5.8
0.600	1.7	2.200	3.0	5.500	4.6	9.500	6.0
0.800	1.9	2.400	3.1	6.000	4.8		
1.000	2.1	2.600	3.2	6.500	5.0		

Hydro-Brake® Optimum Manhole: S10(HB), DS/PN: S1.008, Volume (m³): 2.4

Unit Reference	MD-SHE-0098-5000-1500-5000
Design Head (m)	1.500
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level (m)	46.106
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Fairhurst		Page 5																																																																								
225 Bath Street Glasgow G2 4GZ	143404 Tariff Street																																																																									
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<u>Hydro-Brake® Optimum Manhole: S10(HB), DS/PN: S1.008, Volume (m³): 2.4</u>																																																																										
<table><tr><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td></tr><tr><td>Design Point (Calculated)</td><td>1.500</td><td>5.0</td></tr><tr><td>Flush-Flo™</td><td>0.431</td><td>4.9</td></tr><tr><td>Kick-Flo®</td><td>0.878</td><td>3.9</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>4.3</td></tr></table>			Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.500	5.0	Flush-Flo™	0.431	4.9	Kick-Flo®	0.878	3.9	Mean Flow over Head Range	-	4.3																																																									
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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 Coefficient 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 Storage Structures 2

Number of Online Controls 2

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.356

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status ON

DVD Status ON

Inertia Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Summer	1	+0%	100/15 Summer			
S1.001	S2	15 Winter	1	+0%	30/15 Summer			
S1.002	S3	15 Winter	1	+0%	30/15 Summer			
S1.003	STK inlet	15 Winter	1	+0%				
S2.000	S4	15 Winter	1	+0%	30/15 Summer			
S2.001	STank inlet	15 Winter	1	+0%				
S1.004	STank Outlet	180 Winter	1	+0%	30/15 Summer			
S1.005	S5(HB)	180 Winter	1	+0%	1/15 Summer			
S1.006	S6	240 Winter	1	+0%	30/15 Winter			
S1.007	S7	30 Winter	1	+0%	30/15 Summer			
S3.000	STk 2 inlet	15 Winter	1	+0%				
S3.001	STk 2 Outlet	30 Winter	1	+0%	30/15 Summer			
S1.008	S10(HB)	30 Winter	1	+0%	1/15 Summer			
S1.009	S11	30 Winter	1	+0%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	48.043	-0.225	0.000	0.00		0.0	OK
S1.001	S2	48.017	-0.197	0.000	0.00		0.2	OK
S1.002	S3	48.027	-0.098	0.000	0.61		18.1	OK
S1.003	STK inlet	47.935	-0.175	0.000	0.11		18.1	OK*
S2.000	S4	48.094	-0.060	0.000	0.65		8.6	OK
S2.001	STank inlet	47.996	-0.114	0.000	0.13		8.7	OK*
S1.004	STank Outlet	46.781	-0.029	0.000	0.06		3.9	OK*
S1.005	S5(HB)	46.788	0.156	0.000	0.13		2.1	SURCHARGED
S1.006	S6	46.426	-0.114	0.000	0.13		2.1	OK
S1.007	S7	46.331	-0.114	0.000	0.13		2.1	OK
S3.000	STk 2 inlet	47.010	-0.115	0.000	0.13		7.2	OK*
S3.001	STk 2 Outlet	46.305	-0.045	0.000	0.09		2.6	OK*
S1.008	S10(HB)	46.304	0.048	0.000	0.30		4.2	SURCHARGED
S1.009	S11	46.120	-0.085	0.000	0.39		4.2	OK

PN	US/MH Name	Level Exceeded
S1.000	S1	
S1.001	S2	
S1.002	S3	
S1.003	STK inlet	
S2.000	S4	
S2.001	STank inlet	
S1.004	STank Outlet	
S1.005	S5(HB)	
S1.006	S6	
S1.007	S7	
S3.000	STk 2 inlet	
S3.001	STk 2 Outlet	
S1.008	S10(HB)	
S1.009	S11	

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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 Coefficient 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 Storage Structures 2 Number of Online Controls 2 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0 Synthetic Rainfall Details Rainfall Model FSR Ratio R 0.356 Region England and Wales Cv (Summer) 0.750 M5-60 (mm) 18.000 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 Analysis Timestep 2.5 Second Increment (Extended) DTS Status ON DVD Status ON Inertia Status OFF Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 Return Period(s) (years) 1, 30, 100 Climate Change (%) 0, 0, 45 <table><tr><th>PN</th><th>US/MH Name</th><th>Storm</th><th>Return Period</th><th>Climate Change</th><th>First (X) Surge</th><th>First (Y) Flood</th><th>First (Z) Overflow</th><th>Overflow Act.</th></tr><tr><td>S1.000</td><td>S1</td><td>15 Winter</td><td>30</td><td>+0%</td><td>100/15 Summer</td><td></td><td></td><td></td></tr><tr><td>S1.001</td><td>S2</td><td>15 Winter</td><td>30</td><td>+0%</td><td>30/15 Summer</td><td></td><td></td><td></td></tr><tr><td>S1.002</td><td>S3</td><td>15 Winter</td><td>30</td><td>+0%</td><td>30/15 Summer</td><td></td><td></td><td></td></tr><tr><td>S1.003</td><td>STK inlet</td><td>15 Winter</td><td>30</td><td>+0%</td><td></td><td></td><td></td><td></td></tr><tr><td>S2.000</td><td>S4</td><td>15 Winter</td><td>30</td><td>+0%</td><td>30/15 Summer</td><td></td><td></td><td></td></tr><tr><td>S2.001</td><td>STank inlet</td><td>15 Winter</td><td>30</td><td>+0%</td><td></td><td></td><td></td><td></td></tr><tr><td>S1.004</td><td>STank Outlet</td><td>240 Winter</td><td>30</td><td>+0%</td><td>30/15 Summer</td><td></td><td></td><td></td></tr><tr><td>S1.005</td><td>S5(HB)</td><td>240 Winter</td><td>30</td><td>+0%</td><td>1/15 Summer</td><td></td><td></td><td></td></tr><tr><td>S1.006</td><td>S6</td><td>60 Winter</td><td>30</td><td>+0%</td><td>30/15 Winter</td><td></td><td></td><td></td></tr><tr><td>S1.007</td><td>S7</td><td>60 Winter</td><td>30</td><td>+0%</td><td>30/15 Summer</td><td></td><td></td><td></td></tr><tr><td>S3.000</td><td>STk 2 inlet</td><td>15 Winter</td><td>30</td><td>+0%</td><td></td><td></td><td></td><td></td></tr><tr><td>S3.001</td><td>STk 2 Outlet</td><td>60 Winter</td><td>30</td><td>+0%</td><td>30/15 Summer</td><td></td><td></td><td></td></tr><tr><td>S1.008</td><td>S10(HB)</td><td>60 Winter</td><td>30</td><td>+0%</td><td>1/15 Summer</td><td></td><td></td><td></td></tr><tr><td>S1.009</td><td>S11</td><td>30 Summer</td><td>30</td><td>+0%</td><td></td><td></td><td></td><td></td></tr></table>			PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	S1.000	S1	15 Winter	30	+0%	100/15 Summer				S1.001	S2	15 Winter	30	+0%	30/15 Summer				S1.002	S3	15 Winter	30	+0%	30/15 Summer				S1.003	STK inlet	15 Winter	30	+0%					S2.000	S4	15 Winter	30	+0%	30/15 Summer				S2.001	STank inlet	15 Winter	30	+0%					S1.004	STank Outlet	240 Winter	30	+0%	30/15 Summer				S1.005	S5(HB)	240 Winter	30	+0%	1/15 Summer				S1.006	S6	60 Winter	30	+0%	30/15 Winter				S1.007	S7	60 Winter	30	+0%	30/15 Summer				S3.000	STk 2 inlet	15 Winter	30	+0%					S3.001	STk 2 Outlet	60 Winter	30	+0%	30/15 Summer				S1.008	S10(HB)	60 Winter	30	+0%	1/15 Summer				S1.009	S11	30 Summer	30	+0%				
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.																																																																																																																																	
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S1.005	S5(HB)	240 Winter	30	+0%	1/15 Summer																																																																																																																																				
S1.006	S6	60 Winter	30	+0%	30/15 Winter																																																																																																																																				
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000		S1 48.250	-0.018	0.000	0.04		1.2
S1.001		S2 48.250	0.036	0.000	0.08		3.3
S1.002		S3 48.252	0.127	0.000	1.76		52.6
S1.003	STK inlet	47.974	-0.136	0.000	0.32		53.1
S2.000		S4 48.221	0.067	0.000	1.60		21.1
S2.001	STank inlet	48.018	-0.092	0.000	0.32		21.2
S1.004	STank Outlet	47.369	0.559	0.000	0.08		5.0
S1.005	S5(HB)	47.383	0.751	0.000	0.13		2.1
S1.006	S6	46.672	0.132	0.000	0.14		2.2
S1.007	S7	46.664	0.219	0.000	0.16		2.6
S3.000	STk 2 inlet	47.032	-0.093	0.000	0.31		17.7
S3.001	STk 2 Outlet	46.658	0.308	0.000	0.16		4.9
S1.008	S10(HB)	46.659	0.403	0.000	0.34		4.9
S1.009	S11	46.125	-0.080	0.000	0.45		4.9

PN	US/MH Name	Status	Level Exceeded
S1.000	S1	OK	
S1.001	S2	SURCHARGED	
S1.002	S3	SURCHARGED	
S1.003	STK inlet	OK*	
S2.000	S4	SURCHARGED	
S2.001	STank inlet	OK*	
S1.004	STank Outlet	SURCHARGED*	
S1.005	S5(HB)	SURCHARGED	
S1.006	S6	SURCHARGED	
S1.007	S7	SURCHARGED	
S3.000	STk 2 inlet	OK*	
S3.001	STk 2 Outlet	SURCHARGED*	
S1.008	S10(HB)	SURCHARGED	
S1.009	S11	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 Coefficient 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 Storage Structures 2
Number of Online Controls 2 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

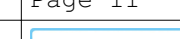
Rainfall Model FSR Ratio R 0.356
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	360 Winter	100	+45%	100/15 Summer			
S1.001	S2	240 Winter	100	+45%	30/15 Summer			
S1.002	S3	240 Winter	100	+45%	30/15 Summer			
S1.003	STK inlet	960 Winter	100	+45%				
S2.000	S4	360 Winter	100	+45%	30/15 Summer			
S2.001	STank inlet	960 Winter	100	+45%				
S1.004	STank Outlet	720 Winter	100	+45%	30/15 Summer			
S1.005	S5(HB)	240 Winter	100	+45%	1/15 Summer			
S1.006	S6	120 Winter	100	+45%	30/15 Winter			
S1.007	S7	120 Winter	100	+45%	30/15 Summer			
S3.000	STk 2 inlet	60 Winter	100	+45%				
S3.001	STk 2 Outlet	30 Winter	100	+45%	30/15 Summer			
S1.008	S10(HB)	120 Winter	100	+45%	1/15 Summer			
S1.009	S11	120 Winter	100	+45%				

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Fairhurst		Page 11
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000		S1 48.946	0.678	0.000	0.04		1.4
S1.001		S2 48.947	0.733	0.000	0.03		1.4
S1.002		S3 48.948	0.823	0.000	0.70		20.9
S1.003	STK inlet	48.110	0.000	0.000	0.04		7.2
S2.000		S4 48.949	0.795	0.000	0.47		6.2
S2.001	STank inlet	48.110	0.000	0.000	0.04		2.9
S1.004	STank Outlet	48.111	1.301	0.000	0.09		5.3
S1.005	S5(HB)	48.947	2.315	0.000	0.18		2.8
S1.006		S6 47.651	1.111	0.000	0.18		2.8
S1.007		S7 47.644	1.199	0.000	0.19		3.1
S3.000	STk 2 inlet	47.125	0.000	0.000	0.32		18.2
S3.001	STk 2 Outlet	47.126	0.776	0.000	0.31		9.1
S1.008	S10(HB)	47.636	1.380	0.000	0.36		5.0
S1.009	S11	46.127	-0.078	0.000	0.46		5.0

PN	US/MH Name	Status	Level Exceeded
S1.000	S1	FLOOD RISK	
S1.001	S2	FLOOD RISK	
S1.002	S3	FLOOD RISK	
S1.003	STK inlet	SURCHARGED*	
S2.000	S4	FLOOD RISK	
S2.001	STank inlet	SURCHARGED*	
S1.004	STank Outlet	SURCHARGED*	
S1.005	S5(HB)	FLOOD RISK	
S1.006	S6	SURCHARGED	
S1.007	S7	SURCHARGED	
S3.000	STk 2 inlet	SURCHARGED*	
S3.001	STk 2 Outlet	SURCHARGED*	
S1.008	S10(HB)	SURCHARGED	
S1.009	S11	OK	