Project Title

Report to Discharge Drainage Related Planning Condition

At

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Chorlton

Manchester

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Document Revision

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Paul Graveney Consulting Ltd

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1.0 Introduction

1.1 In March 2026 a planning application was submitted to Manchester City Council (MCC) for the erection of a 3/4 storey building to provide 8no. two-bedroom apartments, with access, informal amenity space, landscaping and associated works access, on land at 404 Wilbraham Road, Chorlton, Manchester, M21 0UU.

1.2 Planning approval, Ref: 145297/FO/2026 was granted in June 2026 that included a planning condition relating to the drainage of the development.

1.3 This report has been prepared to support the discharge of this condition; Number 20.

2.0 Drainage Strategy

2.1 Existing Drainage

2.1.1 The United Utilities (UU) sewer records have been reviewed and indicate no public sewers passing through the site. Within Wilbraham Road to the south of the site is a 450mm diameter combined sewer that flows east and merges with a 900x600mm brick egg sewer flowing south down Egerton Road North. No surface water sewer has been identified in close proximity. Refer to Figure 1 below.

2.1.2 An investigation of the site has determined an existing historic manhole on the eastern side with a pipe outflowing to the combined sewer in Egerton Road.

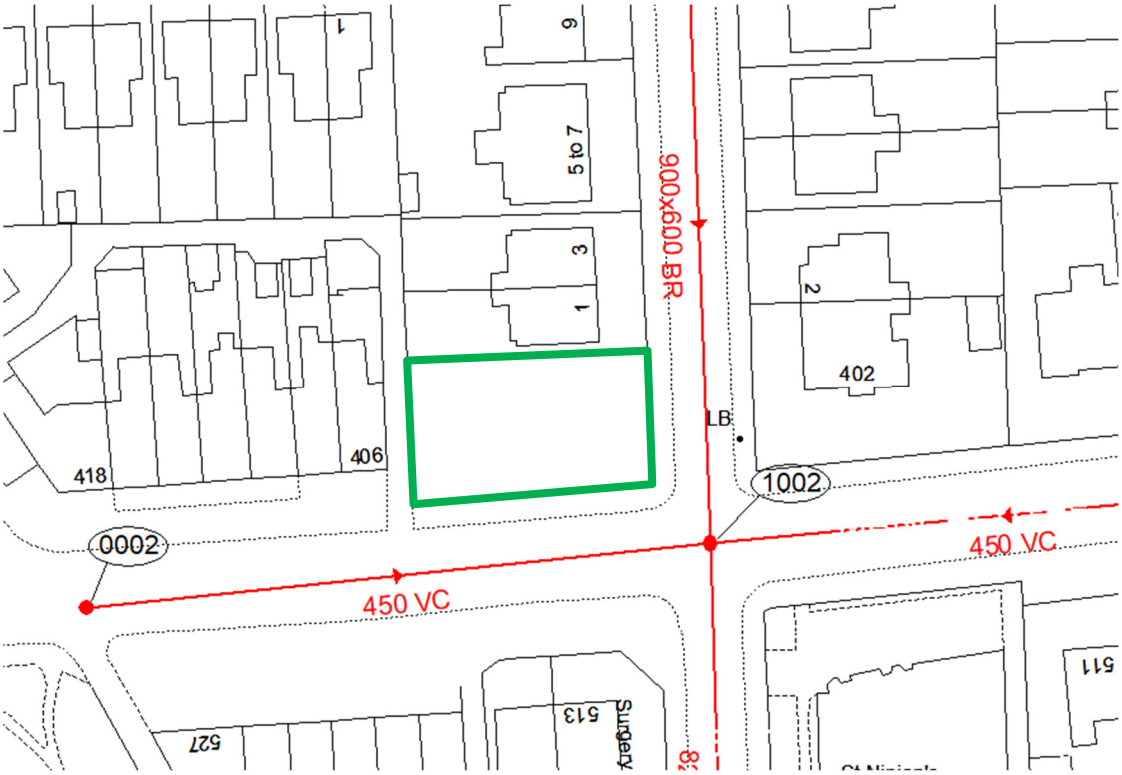


Figure 1: UU Sewer Records

2.2 Existing Runoff

2.2.1 The site area is undeveloped and so is considered to be greenfield. As the site is relatively small the greenfield runoff rates have not been defined.

2.3 Existing Geology

2.3.1 At this time no site-specific intrusive Phase 2 Site Investigation has been carried out at the site. A review of the Geological Mapping on the BGS website would indicate that the superficial deposits comprise Glaciofluvial Sheet Deposits, Devensian Sand and Gravel. The Bedrock Geology comprises the Wilmslow Sandstone Formation – Sandstone. A local BGS borehole would indicate the ground to encompass shallow Topsoil and a thin layer of clay over 1.5m of Loose Brown Sand, over firm boulder Clay from 2.5m depth.

2.3.2 Based on the assessment of the BGS data set, the shallow sand layer has the potential to be suitable for infiltration. However, due to the lower ground floor level the base of the soakaway would be in the clay layer. Furthermore, the 5m offset distance from foundations and boundaries could not be achieved. In light of this infiltration as a means of draining the site is discounted.

2.4 Hydrological Assessment

2.4.1 Chorlton Brook is located approximately 800m to the south of the site flowing in a westerly direction.

2.5 SuDS Hierarchal Approach

2.5.1 Based on the existing drainage configuration, plus an assessment of the local site conditions, the SuDS hierarchal approach for discharge of surface water at the development site is considered in detail below:

Method	Suitability	Suitability for Development
Infiltration to Ground	No	BGS mapping and local site investigations would indicate the deeper cohesive ground and close proximity to foundations and boundaries would preclude infiltration.
Connection to Watercourse	No	Chorlton Brook located some 800m from the site boundary.
Connection to Surface Water Sewer	No	No surface water sewers in close proximity.
Connection to a Combined Water Sewer	Yes	Connect to the combined water sewer in Egerton Road via the existing pipework at a peak rate not exceeding 2l/s.

Figure 2: SuDS Hierarchal Approach

2.6 Surface Water Drainage Strategy

2.6.1 The general principal of the surface water drainage strategy is to collect the runoff from the roof areas of the new residential building and direct it into an underground drainage network that will outfall to a geocellular attenuation tank located beneath the rear landscaping area. The water will then outflow at a peak runoff rate of 2l/s to the combined water sewer in Egerton Road via an existing connection.

2.6.2 SuDS in the form of water butts will also be incorporated to slow the rate of runoff and provide treatment.

2.6.3 The proposed drainage layout for the new development site will be designed in accordance with BS EN 752: 2008, Building Regulations Part H, and tested for the 1 in 100-year return period including a 45% increase to account for climate change to confirm that there is no flood risk to the building.

2.6.4 A hydraulic model of the proposed surface water network has been simulated within the Causeway Flow design software and confirms that no flooding will occur up to the extreme 100 year + 45% CC storm event.

2.6.5 The drainage GA can be found in Appendix A with the calculations in Appendix B.

2.7 Foul Flows

2.7.1 Foul flows generated by the new residential dwelling will discharge via a new below ground foul drainage network and outfall to the same combined water drain to the UU combined sewer in Egerton Road.

2.8 Maintenance

2.8.1 This section is intended to give an overview of the operation and maintenance for the drainage features included with the drainage strategy and in relation to typical details. Where proprietary products are specified, the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints. The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the operation and then adjusted to suit the site requirements.

2.8.2 There are three types of maintenance activities associated with surface water drainage systems. The SuDS Manual, CIRIA C753, defines these as:

- Regular Maintenance – '*basic tasks undertaken on a frequent and predictable schedule' including vegetation management, litter and debris removal, and inspections*.'
- Occasional Maintenance – *'tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example.'*
- Remedial Maintenance – *'intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.*'

2.8.3 Specific maintenance needs should be monitored, and maintenance schedules adjusted to suit the location and condition of the drainage feature in question.

2.8.4 <u>Piped Networks, Inspection, Manhole and Catchpit Chambers</u>

The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained where required.

Pipes are proprietary products, and the materials can vary across the site and as such where used the manufacture's recommendations should be followed.

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

Access for maintenance is provided through access chambers and manholes.

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

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any features that are not operating correctly. If required, take remedial action	Monthly for three months, then six monthly
	Debris removal from catchment surface / gratings (where may cause risks to performance)	Monthly (and after large storms)
	Remove sediment from trapped sumps, manholes and catchpits.	Annually or as required
Remedial Maintenance	Repair / rehabilitation of gratings, inlets and outlets	As required
Monitoring	Inspect / check all gratings, trapped sumps, manholes and catchpits to ensure that they are in good condition and operating as designed	Annually and after large storm events
Structure Rehabilitation / Repair	Regular Maintenance and Monitoring to identify if repair and / or replacement of features or pipework is required.	As required

Figure 3: Operation and Maintenance Requirements of Piped Networks and Inspection Chambers

2.8.5 Flow Control Units

The flow control units are intended for flood control and flow restriction.

The flow control is specified as an orifice plate and is a proprietary product; therefore, manufacturer's recommendations should also be taken into consideration.

Access for maintenance has been provided by locating within manhole chambers.

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

Figure 4: Operation and Maintenance Requirements for Flow Controls

2.8.7 Attenuation Storage

Geocellular tanks are modular storage systems made with plastic units. These units can be assembled to achieved re required volume and usually on multiple layers. Generally, the units have 95% of voids content and are used to create an efficient below ground structure to store surface water.

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

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

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

Maintenance Schedule	Required Action	Frequency
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 form 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 blockages by sediment, algae or other matter; remove and replace surface infiltration medium as required.	Annually.
	Remove sediments from pre-treatment structures and/or internal forebays.	Annually, or as required.
Occasional Maintenance	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually
Remedial Actions	Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years or as required.

Figure 5: Operation and Maintenance Requirements for Attenuation Crates

3.0 Drainage Related Planning Condition and Responses

3.1 Planning Conditions

3.1.1 The detailed planning condition is listed below in *italics* with the PG Consulting response in Blue beneath.

Condition 20

Prior to the commencement of the development hereby approved, a surface water drainage scheme for the development site, based on sustainable drainage principles, shall be submitted for approval in writing by the City Council, as Local Planning Authority. This shall include:

i. Progression through the drainage hierarchy must be evidence based and supported by site investigation including assessments of ground conditions and infiltration testing in accordance with BRE365. Proposals of attenuation should achieve half drain time within 24 hours.

As described in the report, the SuDS hierarchal approach has been incorporated. Due to the underlying sandy clay and close proximity to existing and new foundations, infiltration is discounted.

ii. For surface water connections, evidence of agreement in principle from the relevant authority/service provider is required to ensure there is adequate spare capacity in the existing system taking future development requirements into account. An email of acceptance of proposednew connection will suffice.

An indirect sewer connection application has been submitted to UU. Their formal approval is awaited and will be supplied upon receipt.

iii. Details of surface water attenuation that offers a reduction in surface water runoff rate in line with the Manchester Trafford and Salford Strategic Flood Risk Assessment. Provide at least a 50% reduction in brownfield runoff rate or greenfield runoff rate.

The proposal is to discharge at a peak rate of 2l/s, considered the minimum rate to prevent blockage.

iv. Finalised surface water drainage layout including all components, levels, connectivity and proposed overland flow routes for extreme events.

Refer to the Drainage GA in Appendix A.

v. Hydraulic calculations of the proposed drainage system, including all design parameters. Results must demonstrate no surcharge for the 1 in 2, no flooding in the 1 in 30 and no flooding of buildings for the 1 in 100 + 45% Climate Change.

Refer to the Hydraulic Calculations in Appendix B.

vi. *Where flows less than 5 l/s are proposed, a blockage risk assessment must be undertaken. If the risk cannot be adequately managed, a higher minimum discharge rate should be considered / agreed with relevant authority.*

High level overflow pipe incorporated within the hydrobrake chamber to pass forward any flow in case of blockage to the existing manhole.

vii. *A plan indicating easements. SuDS features (including attenuation tanks) should be appropriately positioned, including a 2.5m easement from the existing highway and a 5m easement from any dwellings, guaranteeing accessibility for future maintenance and contingency for asset failure. This practice is in accordance with SuDS Manual (C753).*

Refer to drainage GA for dimensions that can be achieved due to the tight nature of the development.

viii. *Construction details of flow control and SuDS components.*

Refer to the details drawings in Appendix A.

ix. *Details of how the scheme shall be maintained and managed after completion. Maintenance and management plan, including responsible party and a schedule of tasks/frequencies for the components.*

Refer to the maintenance strategy in Section 2.8.

Appendix A – PG Consulting Drawing

PGC 1463-DR-C-001: Drainage GA

SURFACE WATER DRAINAGE

CONSIDERATION HAS BEEN GIVEN TO THE HIERARCHY OF DRAINAGE OPTIONS FOR THE SITE AS FOLLOWS:

- DISCHARGE INTO GROUND - UNDERLYING COHESIVE GROUND IS UNSUITABLE FOR INFILTRATION BASED OPTIONS.
- DISCHARGE TO SURFACE WATER BODY - NO WATERCOURSE IN CLOSE PROXIMITY.
- DISCHARGE TO SURFACE WATER SEWER, HIGHWAY DRAIN OR OTHER DRAINAGE SYSTEM - NO SURFACE WATER SEWER IN CLOSE PROXIMITY.
- DISCHARGE TO COMBINED WATER SEWER - NEW OUTFALL TO ADJACENT COMBINED WATER SEWER AT RESTRICTED RATES.

SUMMARY

REUSE EXISTING CONNECTION TO COMBINED SEWER WITH FLOWS RESTRICTED TO A PEAK RATE OF 2L/S.

SUDS TO ENCOMPASS:

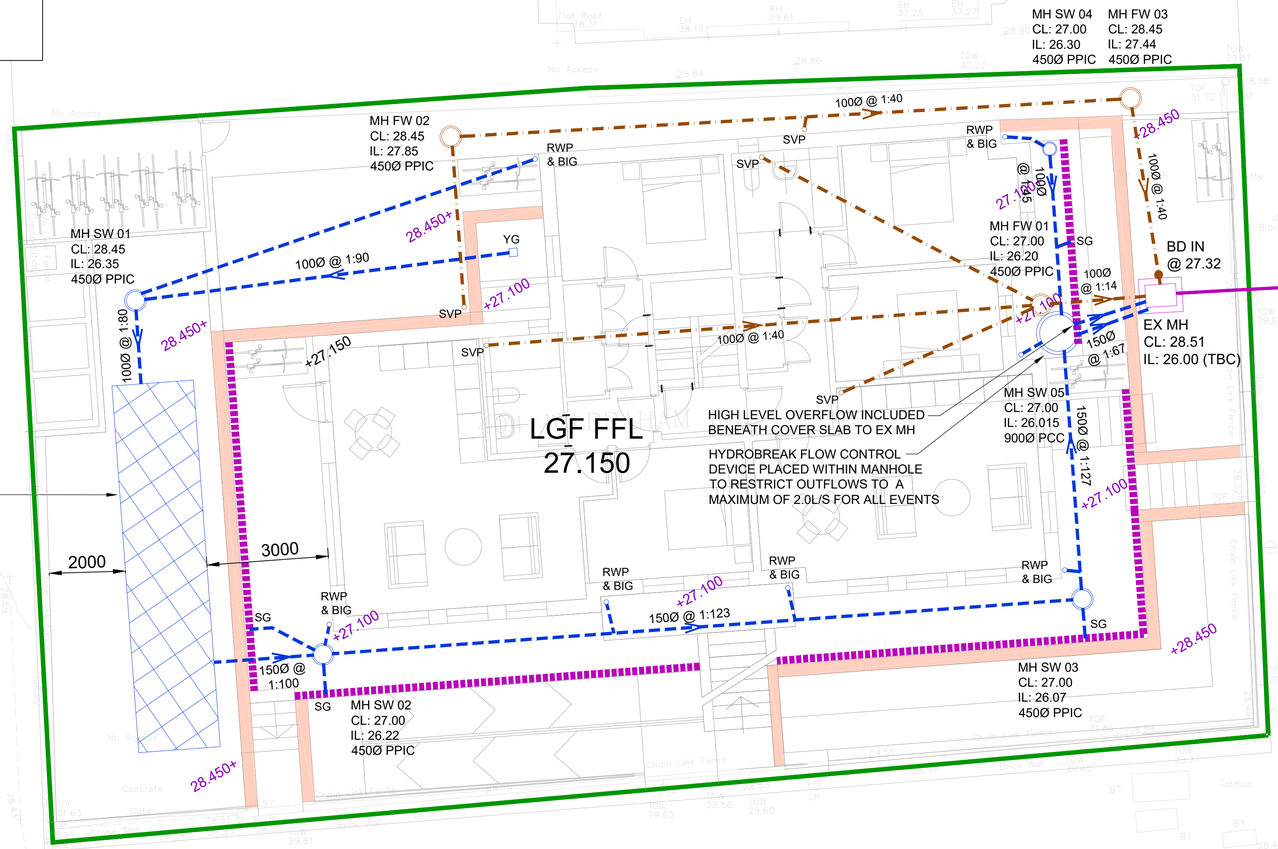
- FLOW CONTROLS.
- GEOCELLULAR ATTENUATION TANK.

SUMMARY

IMPERMEABLE AREA:	280m² (NEW)
OUTFALL LOCATION:	SEWER
PEAK DISCHARGE RATE:	2.0 L/S (100YR + 45%)
ATTENUATION VOLUME:	7.2m³ (100YR + 45% CC)

FOUL WATER DRAINAGE

FOUL WATER GENERATED BY THE NEW RESIDENTIAL BUILDING WILL DISCHARGE TO THE COMBINED SEWER VIA THE SAME EXISTING CONNECTION AS THE SURFACE WATER SEWER.



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GENERAL NOTES

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KEY

- EXISTING COMBINED PUBLIC SEWER
- EXISTING COMBINED WATER DRAINAGE
- PROPOSED FOUL WATER DRAINAGE
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED RETAINING WALL
- SITE BOUNDARY

RWP & BIG	RAINWATER PIPE & BACK INLET GULLY
SVP	SOIL VENT PIPE
SG	SUMP GULLY TO DRAINAGE CHANNEL
YG	YARD GULLY
RE	RODDING EYE

NOTE ALL RWP AND WPC LOCATIONS TO BE CONFIRMED BY OTHERS

ALL PIPEWORK TO BE 100Ø UNLESS NOTED OTHERWISE

ALL COVER AND FRAMES IN FEATURE PAVING TO BE RECESSED

ALL LEVELS AND FALLS TO DRIVEWAYS TO BE CONFIRMED BY OTHERS

REV	DATE	DRAWN	REV'D ENG.	NOTES
P3	27.08.26	PG	PG	GENERAL UPDATES
P2	24.08.26	PG	PG	GENERAL UPDATES
P1	27.01.26	PG	PG	PRELIMINARY ISSUE

CLIENT
ARMISTEAD PROPERTY

PROJECT
404 WILBRAHAM ROAD, MANCHESTER

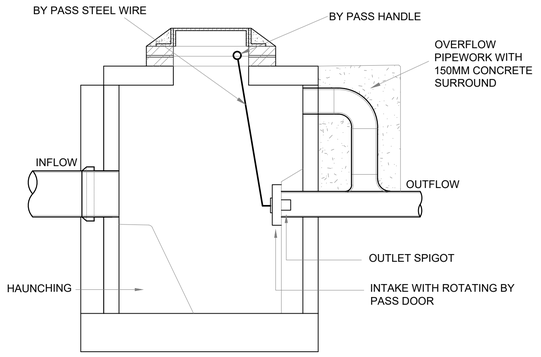
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DRAINAGE STRATEGY PLAN

DRAWING STATUS
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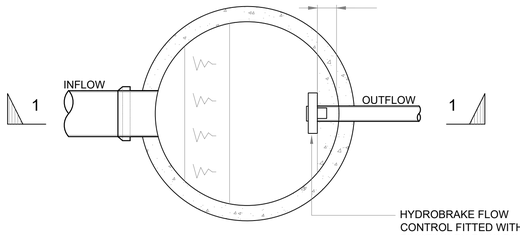
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REVISION: P3

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108 Ack Lane West, Cheadle Hulme, Cheshire, SK8 7ES
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Email: paul@pgcd.co.uk



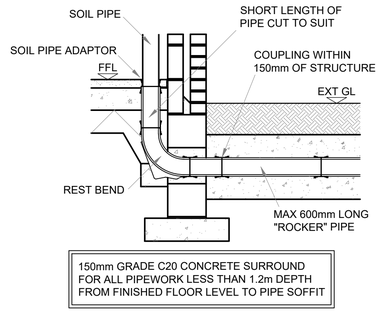
SECTION 1-1

NOTE :
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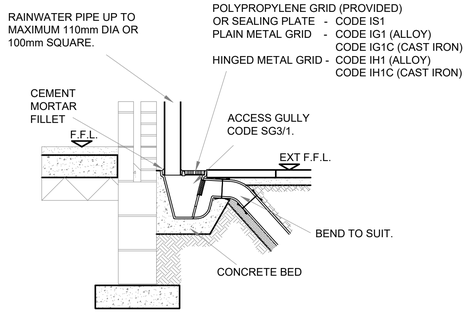


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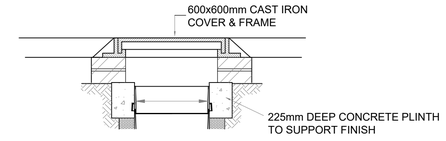
VORTEX CONTROL CHAMBER



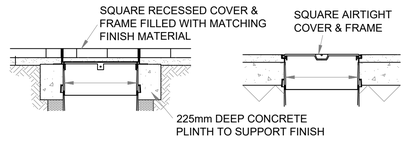
SOIL AND VENT PIPE CONNECTION



RWP AND GULLY (SHOWN AS HEPWORTH BUT SIMILAR CAN BE USED)

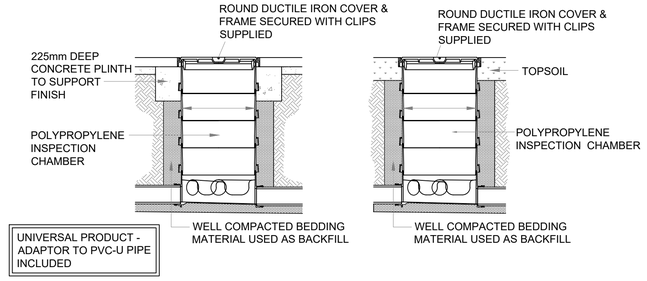


SITED IN EXTERNAL HARD STANDING AREAS WITH 600x600 CAST IRON COVER



SITED IN DRIVEWAYS / HARD LANDSCAPED AREAS WITH RECESSED COVER

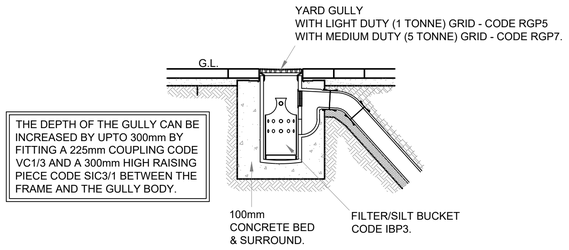
SITED IN CONCRETE FLOOR SLAB



SITED IN DRIVEWAYS / HARD LANDSCAPED AREAS WITH STANDARD ROUND COVER

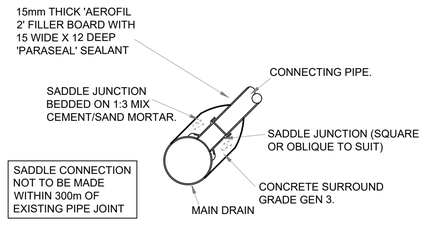
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POLYPROPYLENE INSPECTION CHAMBER INSTALLATION DETAIL



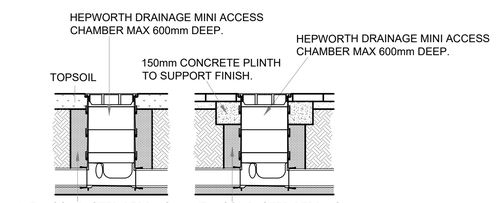
YARD GULLY

(SHOWN AS HEPWORTH PRODUCT BUT OTHER SIMILAR CAN BE USED)



SADDLE CONNECTION DETAIL

(DIAMETER OF MAIN DRAIN TO BE A MINIMUM OF DOUBLE THE SIZE OF THE CONNECTING PIPE. IN ALL OTHER CASES A PRE-FORMED JUNCTION IS TO BE USED.)



SITED IN LANDSCAPED AREAS

SITED IN PAVED AREAS

MINI ACCESS CHAMBERS (600mm DEEP)

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REV	DATE	DRAWN	REV'D ENG.	NOTES
P1	27.08.26	PG	PG	PRELIMINARY ISSUE

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DRAWING TITLE
DRAINAGE DETAILS SHEET 1

DRAWING STATUS
INFORMATION

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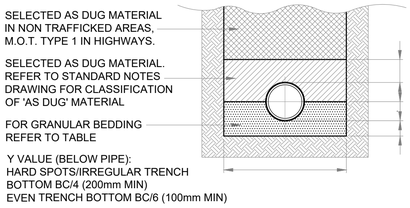
DRAWING No	REVISION
PGC1463-DR-C-002	P1

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Tel: 07710 758971
Email: paul@pgcl.co.uk

BS EN 1610:1997 Annex B Table B.15 Coarse Aggregate - Pipe Bedding							
Sieve Size (mm)	Percentage by mass passing BS sieves for nominal sizes						
	Graded Aggregate (mm)			Single-sized Aggregate (mm)			
	40 to 5	20 to 5	14 to 5	40	20	14	10
50.0	100	-----	-----	100	-----	-----	-----
37.5	90 - 100	100	-----	85 - 100	100	-----	-----
20.0	35 - 70	90 - 100	100	0 - 25	85 - 100	100	-----
14.0	-----	-----	90 - 100	-----	-----	85 - 100	100
10.0	10 - 40	30 - 60	50 - 85	0 - 5	0 - 25	0 - 50	85 - 100
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2.36	-----	-----	-----	-----	-----	-----	0 - 5

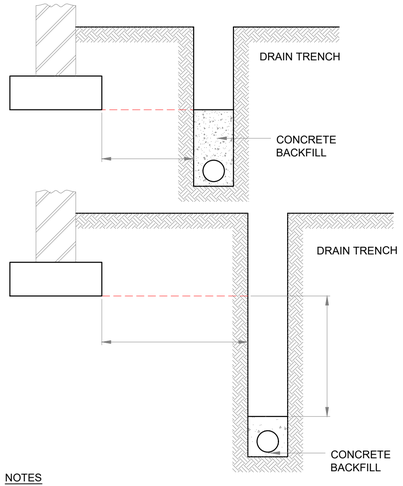
RIGID PIPES BEDDING GRADING

BASED ON BS EN 1610 : 1997 TABLE B.15
FOR RIGID PIPES THE BEDDING SHOULD BE SINGLE SIZE MATERIAL OR GRADED MATERIAL FROM 5MM UP TO A MAX SIZE OF 10MM FOR 100MM PIPES; 14MM FOR 150MM PIPES; 20MM FOR 225MM TO 600MM PIPES; 40MM FOR OVER 675MM PIPES



PIPE BEDDING CLASS B

BEDDING FACTOR 1.9



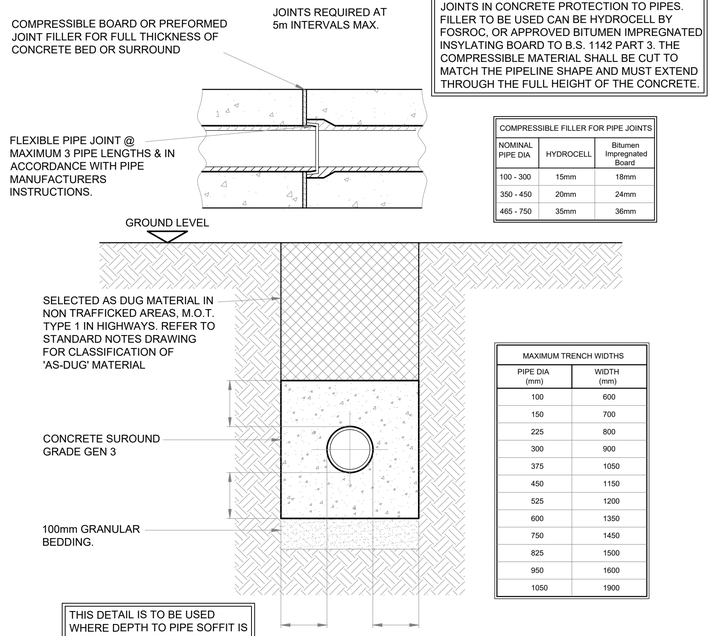
NOTES

1. CONCRETE TO BE GRADE GEN 3

2. JOINTS TO BE PROVIDED IN CONCRETE SURROUND AT NOT GREATER THAN 5.0m CENTRES. BUILDING REGULATIONS PART H1 PARA A11

3. WHERE THE TRENCH IS WITHIN 1m OF THE BUILDING THE TRENCH SHALL BE FILLED WITH CONCRETE UP TO THE LOWEST LEVEL OF THE FOUNDATIONS. WHERE THE TRENCH IS FURTHER THAN 1000mm FROM THE BUILDING, THE TRENCH SHALL BE FILLED WITH CONCRETE UP TO A LEVEL, BELOW THE LOWEST LEVEL OF THE FOUNDATION, EQUAL TO THE DISTANCE FROM THE BUILDING LESS 150mm.

PIPE RUNS ADJACENT TO BUILDING



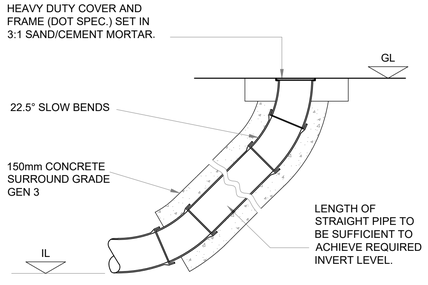
COMPRESSIBLE FILLER IS TO BE USED AT PIPE JOINTS IN CONCRETE PROTECTION TO PIPES. FILLER TO BE USED CAN BE HYDROCELL BY FOSROC, OR APPROVED BITUMEN IMPREGNATED INSYLATING BOARD TO B.S. 1142 PART 3. THE COMPRESSIBLE MATERIAL SHALL BE CUT TO MATCH THE PIPELINE SHAPE AND MUST EXTEND THROUGH THE FULL HEIGHT OF THE CONCRETE.

COMPRESSIBLE FILLER FOR PIPE JOINTS		
NOMINAL PIPE DIA	HYDROCELL	Bitumen Impregnated Board
100 - 300	15mm	18mm
350 - 450	20mm	24mm
465 - 750	35mm	36mm

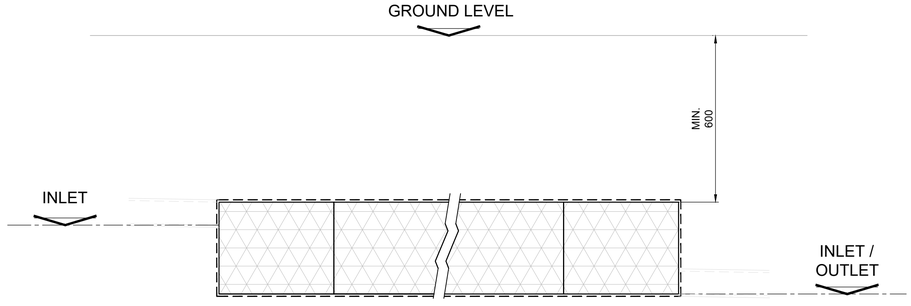
MAXIMUM TRENCH WIDTHS	
PIPE DIA (mm)	WIDTH (mm)
100	600
150	700
225	800
300	900
375	1050
450	1150
525	1200
600	1350
750	1450
825	1500
950	1600
1050	1900

THIS DETAIL IS TO BE USED WHERE DEPTH TO PIPE SOFFIT IS LESS THAN: HARDSTANDING & ROADS 1.2m, FOOTPATHS 0.9m AND SOFT LANDSCAPING 0.6m

CLASS 'Z' PIPE BEDDING



RODDING EYE DETAIL



9m x 2m x 0.4m DEEP ATTENUATION CRATES INSTALLED IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS COMPLETE WITH AIR VENT, AND ACCESS FOR RODDING / INSPECTION. WRAPPED IN IMPERMEABLE MEMBRANE, LAPPED AND SEALED

ATTENUATION TANK DETAIL

GENERAL NOTES

1. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, ENGINEERS, ARCHITECTS & SERVICES DRAWINGS, INCLUDING APPROVED BUILDERS WORK DRAWINGS. CONTRACTOR TO NOTIFY ENGINEER OF DISCREPANCIES BETWEEN STRUCTURAL DRAWINGS AND SPECIFICATIONS OR OTHER DRAWINGS.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. DO NOT SCALE FROM THIS DRAWN, WORK TO DIMENSIONS OR COORDINATES PROVIDED. ALL LEVELS ARE IN MILLIMETRES, UNLESS OTHERWISE NOTED. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.

REV	DATE	DRAWN	REVD ENG.	NOTES
P1	27.08.26	PG	PG	PRELIMINARY ISSUE

CLIENT
ARMISTEAD PROPERTY

PROJECT
404 WILBRAHAM ROAD, MANCHESTER

DRAWING TITLE
DRAINAGE DETAILS SHEET 2

DRAWING STATUS
INFORMATION

SCALE	DRAWN BY	ENGINEER	SHEET
1:75	PG	PG	A1

DRAWING No: PGC1463-DR-C-003
REVISION: P1

PG Consulting
Civil & Infrastructure Engineers
108 Ack Lane West, Cheadle Hulme, Cheshire, SK8 7ES
Tel: 07710 758971
Email: paul@pgcl.co.uk

Appendix B – Hydraulic Calculations

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	20.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.400	Starting Level (m)	
Summer CV	1.000	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960
30	120	240	480	720	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	40	0	0
100	45	0	0

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Design Settings

Rainfall Methodology	FSR
Return Period (years)	10
Additional Flow (%)	0
FSR Region	England and Wales
M5-60 (mm)	20.000
Ratio-R	0.400
CV	1.000
Time of Entry (mins)	4.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	✓
Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)	Invert Level (m)
YG	0.007	4.00	27.100	100	0.450	26.650
SW01			28.450	450	1.900	26.550
TANK			28.450		2.100	26.350
SW02	0.012	4.00	27.000	450	0.680	26.320
SW03	0.003	4.00	27.000	450	0.830	26.170
SW04	0.006	4.00	27.000	450	0.700	26.300
SW05			27.000	1200	0.885	26.115
EX MH			28.450	900	2.365	26.085
SEWER			28.500	100	3.215	25.285

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	YG	SW01	9.000	0.600	26.650	26.550	0.100	90.0	100	4.18	50.0
1.001	SW01	TANK	4.000	0.600	26.550	26.500	0.050	80.0	100	4.26	50.0
1.002	TANK	SW02	3.000	0.600	26.350	26.320	0.030	100.0	150	4.31	50.0
1.003	SW02	SW03	18.500	0.600	26.320	26.170	0.150	123.3	150	4.65	50.0
1.004	SW03	SW05	7.000	0.600	26.170	26.115	0.055	127.3	150	4.78	50.0
2.000	SW04	SW05	4.500	0.600	26.300	26.200	0.100	45.0	100	4.07	50.0
1.005	SW05	EX MH	2.000	0.600	26.115	26.085	0.030	66.7	150	4.81	50.0
1.006	EX MH	SEWER	9.000	0.600	26.085	25.285	0.800	11.3	150	4.86	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.811	6.4	1.3	0.350	1.800	0.007	0.0	30	0.629
1.001	0.861	6.8	1.3	1.800	1.850	0.007	0.0	29	0.658
1.002	1.005	17.8	1.3	1.950	0.530	0.007	0.0	27	0.583
1.003	0.903	16.0	3.4	0.530	0.680	0.019	0.0	47	0.721
1.004	0.889	15.7	4.0	0.680	0.735	0.022	0.0	51	0.742
2.000	1.152	9.0	1.1	0.600	0.700	0.006	0.0	23	0.767
1.005	1.233	21.8	5.1	0.735	2.215	0.028	0.0	49	1.004
1.006	3.020	53.4	5.1	2.215	3.065	0.028	0.0	31	1.918

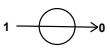
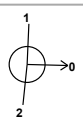
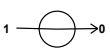
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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	9.000	90.0	100	Circular	27.100	26.650	0.350	28.450	26.550	1.800
1.001	4.000	80.0	100	Circular	28.450	26.550	1.800	28.450	26.500	1.850
1.002	3.000	100.0	150	Circular	28.450	26.350	1.950	27.000	26.320	0.530
1.003	18.500	123.3	150	Circular	27.000	26.320	0.530	27.000	26.170	0.680
1.004	7.000	127.3	150	Circular	27.000	26.170	0.680	27.000	26.115	0.735
2.000	4.500	45.0	100	Circular	27.000	26.300	0.600	27.000	26.200	0.700
1.005	2.000	66.7	150	Circular	27.000	26.115	0.735	28.450	26.085	2.215
1.006	9.000	11.3	150	Circular	28.450	26.085	2.215	28.500	25.285	3.065

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	YG	100	Manhole	Adoptable	SW01	450	Manhole	Adoptable
1.001	SW01	450	Manhole	Adoptable	TANK		Junction	
1.002	TANK		Junction		SW02	450	Manhole	Adoptable
1.003	SW02	450	Manhole	Adoptable	SW03	450	Manhole	Adoptable
1.004	SW03	450	Manhole	Adoptable	SW05	1200	Manhole	Adoptable
2.000	SW04	450	Manhole	Adoptable	SW05	1200	Manhole	Adoptable
1.005	SW05	1200	Manhole	Adoptable	EX MH	900	Manhole	Adoptable
1.006	EX MH	900	Manhole	Adoptable	SEWER	100	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
YG	25.944	85.254	27.100	0.450	100				
						0	1.000	26.650	100
SW01	2.353	78.475	28.450	1.900	450		1	1.000	26.550	100
						0	1.001	26.550	100
TANK	1.844	47.257	28.450	2.100			1	1.001	26.500	100
						0	1.002	26.350	150
SW02	27.299	46.918	27.000	0.680	450		1	1.002	26.320	150
						0	1.003	26.320	150
SW03	81.449	45.930	27.000	0.830	450		1	1.003	26.170	150
						0	1.004	26.170	150
SW04	84.187	88.974	27.000	0.700	450				
						0	2.000	26.300	100
SW05	82.953	60.426	27.000	0.885	1200		1	2.000	26.200	100
							2	1.004	26.115	150
						0	1.005	26.115	150
EX MH	91.298	60.216	28.450	2.365	900		1	1.005	26.085	150
						0	1.006	26.085	150

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SEWER	109.067	60.469	28.500	3.215	100	1	1.006	25.285	150



Node SW05 Online Hydro-Brake® Control

Flap Valve	x
Replaces Downstream Link	x
Invert Level (m)	26.115
Design Depth (m)	1.000
Design Flow (l/s)	2.0
Objective	(HE) Minimise upstream storage
Sump Available	✓
Product Number	CTL-SHE-0067-2000-1000-2000
Min Outlet Diameter (m)	0.100
Min Node Diameter (mm)	1200

Node TANK Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	26.350
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	44

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	18.0	18.0	0.400	18.0	24.0	0.401	0.0	24.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991
1 year 15 minute winter	76.857	30.991
1 year 30 minute summer	71.439	20.215
1 year 30 minute winter	50.133	20.215
1 year 60 minute summer	48.435	12.800
1 year 60 minute winter	32.179	12.800
1 year 120 minute summer	30.053	7.942
1 year 120 minute winter	19.966	7.942
1 year 180 minute summer	23.233	5.979
1 year 180 minute winter	15.102	5.979
1 year 240 minute summer	18.475	4.882
1 year 240 minute winter	12.274	4.882
1 year 360 minute summer	14.169	3.646
1 year 360 minute winter	9.210	3.646
1 year 480 minute summer	11.185	2.956
1 year 480 minute winter	7.431	2.956
1 year 600 minute summer	9.182	2.511
1 year 600 minute winter	6.274	2.511
1 year 720 minute summer	8.203	2.199
1 year 720 minute winter	5.513	2.199
1 year 960 minute summer	6.768	1.782
1 year 960 minute winter	4.483	1.782
1 year 1440 minute summer	4.949	1.326
1 year 1440 minute winter	3.326	1.326
30 year +40% CC 15 minute summer	376.189	106.449
30 year +40% CC 15 minute winter	263.992	106.449
30 year +40% CC 30 minute summer	244.900	69.298

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year +40% CC 30 minute winter	171.860	69.298
30 year +40% CC 60 minute summer	163.225	43.136
30 year +40% CC 60 minute winter	108.443	43.136
30 year +40% CC 120 minute summer	98.613	26.061
30 year +40% CC 120 minute winter	65.516	26.061
30 year +40% CC 180 minute summer	74.617	19.202
30 year +40% CC 180 minute winter	48.503	19.202
30 year +40% CC 240 minute summer	58.245	15.393
30 year +40% CC 240 minute winter	38.697	15.393
30 year +40% CC 360 minute summer	43.710	11.248
30 year +40% CC 360 minute winter	28.413	11.248
30 year +40% CC 480 minute summer	34.053	8.999
30 year +40% CC 480 minute winter	22.624	8.999
30 year +40% CC 600 minute summer	27.658	7.565
30 year +40% CC 600 minute winter	18.898	7.565
30 year +40% CC 720 minute summer	24.485	6.562
30 year +40% CC 720 minute winter	16.456	6.562
30 year +40% CC 960 minute summer	19.901	5.240
30 year +40% CC 960 minute winter	13.183	5.240
30 year +40% CC 1440 minute summer	14.225	3.812
30 year +40% CC 1440 minute winter	9.560	3.812
100 year +45% CC 15 minute summer	505.670	143.087
100 year +45% CC 15 minute winter	354.856	143.087
100 year +45% CC 30 minute summer	332.000	93.944
100 year +45% CC 30 minute winter	232.982	93.944
100 year +45% CC 60 minute summer	222.268	58.739
100 year +45% CC 60 minute winter	147.669	58.739
100 year +45% CC 120 minute summer	134.215	35.469
100 year +45% CC 120 minute winter	89.169	35.469
100 year +45% CC 180 minute summer	101.219	26.047
100 year +45% CC 180 minute winter	65.795	26.047
100 year +45% CC 240 minute summer	78.690	20.795
100 year +45% CC 240 minute winter	52.280	20.795
100 year +45% CC 360 minute summer	58.701	15.106
100 year +45% CC 360 minute winter	38.157	15.106
100 year +45% CC 480 minute summer	45.550	12.038
100 year +45% CC 480 minute winter	30.262	12.038
100 year +45% CC 600 minute summer	36.875	10.086
100 year +45% CC 600 minute winter	25.195	10.086
100 year +45% CC 720 minute summer	32.556	8.725
100 year +45% CC 720 minute winter	21.879	8.725
100 year +45% CC 960 minute summer	26.340	6.936
100 year +45% CC 960 minute winter	17.448	6.936
100 year +45% CC 1440 minute summer	18.700	5.012
100 year +45% CC 1440 minute winter	12.567	5.012

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Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	YG	10	26.683	0.033	1.4	0.0105	0.0000	OK
15 minute summer	SW01	10	26.582	0.032	1.4	0.0051	0.0000	OK
30 minute summer	TANK	22	26.372	0.022	1.2	0.3837	0.0000	OK
30 minute summer	SW02	20	26.375	0.055	2.5	0.0282	0.0000	OK
30 minute summer	SW03	21	26.372	0.202	3.0	0.0466	0.0000	SURCHARGED
30 minute summer	SW04	20	26.371	0.071	1.0	0.0235	0.0000	OK
30 minute summer	SW05	21	26.370	0.255	3.1	0.2882	0.0000	SURCHARGED
30 minute summer	EX MH	21	26.105	0.020	1.9	0.0127	0.0000	OK
30 minute summer	SEWER	21	25.305	0.020	1.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	YG	1.000	SW01	1.4	0.640	0.220	0.0197	
15 minute summer	SW01	1.001	TANK	1.4	0.668	0.207	0.0084	
30 minute summer	TANK	1.002	SW02	0.9	0.332	0.048	0.0109	
30 minute summer	SW02	1.003	SW03	2.5	0.449	0.155	0.2170	
30 minute summer	SW03	1.004	SW05	2.2	0.323	0.143	0.1232	
30 minute summer	SW04	2.000	SW05	1.0	0.663	0.111	0.0310	
30 minute summer	SW05	1.005	EX MH	1.9	0.906	0.088	0.0043	
30 minute summer	EX MH	1.006	SEWER	1.9	1.413	0.036	0.0123	2.8

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Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	YG	10	26.719	0.069	4.8	0.0221	0.0000	OK
60 minute summer	SW01	46	26.631	0.081	3.0	0.0128	0.0000	OK
60 minute summer	TANK	47	26.631	0.281	8.1	4.7968	0.0000	SURCHARGED
60 minute summer	SW02	47	26.631	0.311	5.6	0.1590	0.0000	SURCHARGED
60 minute summer	SW03	46	26.629	0.459	3.0	0.1061	0.0000	SURCHARGED
60 minute summer	SW04	46	26.629	0.329	2.5	0.1086	0.0000	SURCHARGED
60 minute summer	SW05	46	26.629	0.514	3.1	0.5810	0.0000	SURCHARGED
15 minute summer	EX MH	9	26.105	0.020	2.0	0.0128	0.0000	OK
15 minute summer	SEWER	9	25.305	0.020	2.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	YG	1.000	SW01	4.8	0.854	0.754	0.0506	
60 minute summer	SW01	1.001	TANK	3.0	0.812	0.439	0.0292	
60 minute summer	TANK	1.002	SW02	-5.2	0.387	-0.290	0.0528	
60 minute summer	SW02	1.003	SW03	2.5	0.419	0.157	0.3257	
60 minute summer	SW03	1.004	SW05	2.6	0.377	0.162	0.1232	
60 minute summer	SW04	2.000	SW05	2.1	0.569	0.231	0.0352	
60 minute summer	SW05	1.005	EX MH	2.0	0.910	0.090	0.0044	
15 minute summer	EX MH	1.006	SEWER	2.0	1.418	0.037	0.0124	7.4

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	YG	57	26.910	0.260	2.8	0.0829	0.0000	FLOOD RISK
60 minute winter	SW01	58	26.909	0.359	2.8	0.0571	0.0000	SURCHARGED
60 minute winter	TANK	58	26.909	0.559	7.6	6.8486	0.0000	SURCHARGED
60 minute winter	SW02	58	26.909	0.589	5.2	0.3015	0.0000	FLOOD RISK
60 minute winter	SW03	58	26.908	0.738	2.8	0.1705	0.0000	FLOOD RISK
60 minute winter	SW04	58	26.908	0.608	2.4	0.2006	0.0000	FLOOD RISK
60 minute winter	SW05	58	26.908	0.793	2.4	0.8965	0.0000	FLOOD RISK
15 minute summer	EX MH	65	26.105	0.020	2.0	0.0128	0.0000	OK
15 minute summer	SEWER	65	25.305	0.020	2.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	YG	1.000	SW01	2.8	0.765	0.440	0.0704	
60 minute winter	SW01	1.001	TANK	2.8	0.798	0.417	0.0313	
60 minute winter	TANK	1.002	SW02	-4.8	0.391	-0.269	0.0528	
60 minute winter	SW02	1.003	SW03	2.3	0.436	0.145	0.3257	
60 minute winter	SW03	1.004	SW05	2.3	0.394	0.147	0.1232	
60 minute winter	SW04	2.000	SW05	2.0	0.570	0.217	0.0352	
60 minute winter	SW05	1.005	EX MH	2.0	0.910	0.090	0.0044	
15 minute summer	EX MH	1.006	SEWER	2.0	1.418	0.037	0.0124	9.9

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