Project

Clonminch Residential Development

Report Title

Infrastructure Design Report

Client

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INFRASTRUCTURE

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3	**02.09.2021**	**Revised SHD Application**	**EJD**	**BK**	

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1.0 INTRODUCTION

1.1 Background

DBFL have been instructed to prepare an Infrastructure Design Report to support a planning application for a proposed residential development at Clonminch, Tullamore, Co. Offaly.

The proposed development ("the site") comprises of 349 residential dwellings, a creche and neighbourhood centre on a 14.28 Ha site (approximately 2.0 km south of Tullamore Town Centre along Clonminch Road).

The development area is 10.73 Ha (omitting the proposed cycle scheme along Clonminch Road and the area required to construct the developments surface water outfall and foul pump station).

The proposed development is located within the Eastern Node of the Southern Environs of Tullamore as detailed in Chapter 5 – Masterplans of the Tullamore Town and Environs Development Plan 2010-2016 (extended to 2020). Refer to Figure 1.1 below.

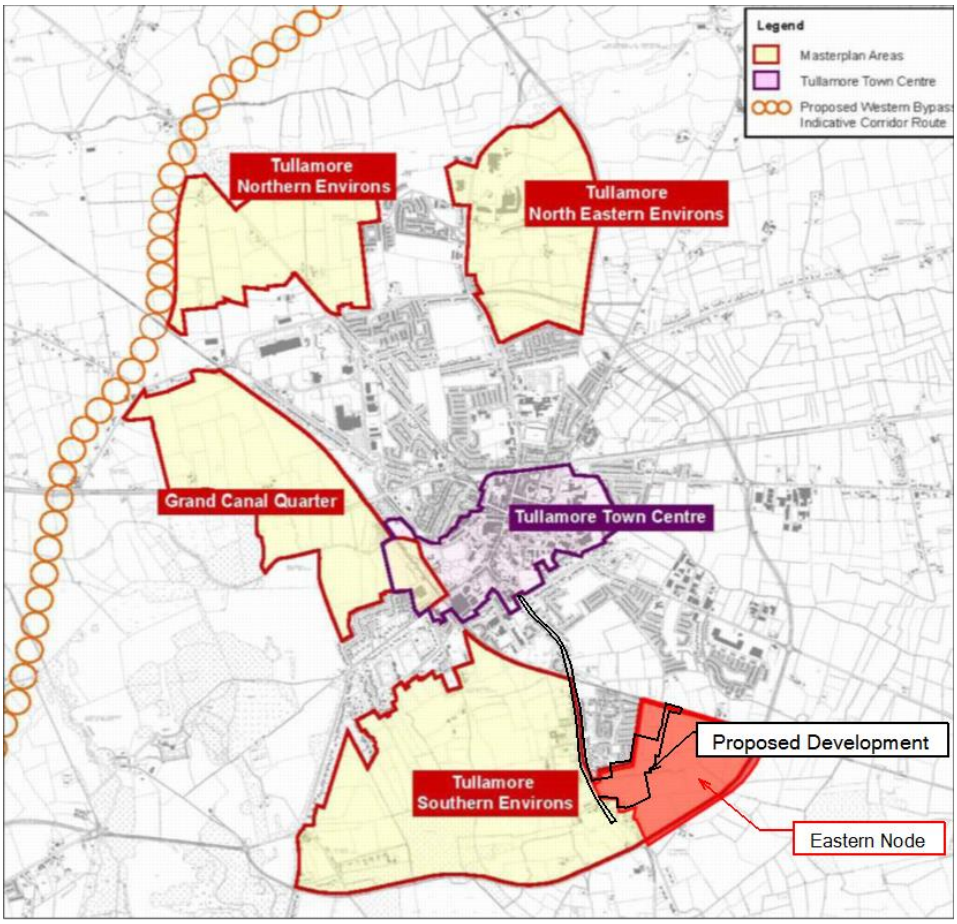


Figure 1.1: Extract from Tullamore Town and Environs Development Plan 2010-2016 (Extended to 2020)

1.2 Objectives

This report provides information regarding the existing site and addresses the infrastructural demands of the proposed development including the following:

- Site Access and Road Layout
- Surface Water Drainage
- Flood Risk
- Foul Drainage
- Water Supply

1.3 Location

The subject site is located east of the Clonminch Road approximately 2.0 km south of Tullamore Town Centre.

The site is bound to the south-west and north-west by existing residential development. The Dublin to Galway railway line is located to the north of the site.

Lands to the east and south of the site are currently greenfield and fall within the Eastern Node of the Southern Environs of Tullamore as defined by the Tullamore Town and Environs Development Plan. Refer to Figure 1.2 below.

Figure 1.2: Site Location Map (Site Boundary Indicative)

1.4 Topography and Site Characteristics

The site generally falls from south-west towards north-east at gradients ranging from 1:20 (adjacent to the southern boundary) to 1:80 (typical surface gradient over the majority of the site). Also refer to Figure 1.3 below.

Review of the site topographic survey shows existing open drains / ditches along the site's western boundary (adjacent to Clonminch Woods), northern boundary (along the Dublin to Galway railway line) and at other locations adjacent to the northern portion of the site.

Existing surface gradients across the site and the open drains / ditches noted above have been a key factor in regard to design of roads levels, finished floor levels, surface water drainage and foul drainage.

Topographical survey information is shown in the background of the Road Layout Plans (DBFL Drawings 180002-2000, 180002-2001, 180002-2002) and Surface Water and Foul Sewer Layout Drawings (DBFL Drawings 180002-3001, 180002-3002).

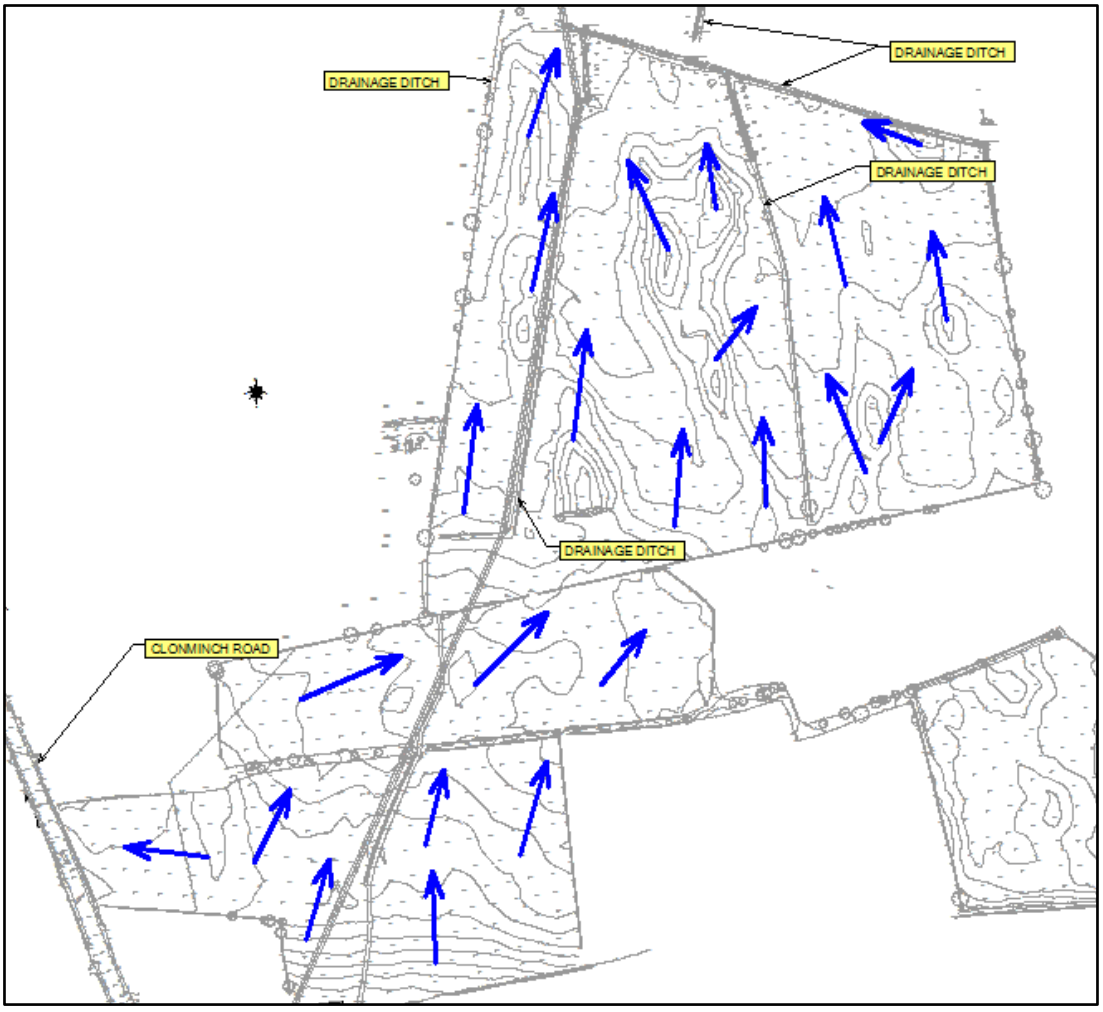


Figure 1.3: Extract from Topographic Survey

1.5 Ground Conditions

Preliminary Ground Investigations for the proposed development were carried out by Ground Investigations Ireland (GII) in May 2020.

A 200mm to 250mm deep topsoil layer overlies cohesive deposits comprising of sandy clayey silts or silty clays with occasional cobbles and boulders.

Infiltration tests were carried out at twelve locations in the vicinity of proposed attenuation facilities (refer to Appendix F). Infiltration rates (f), where observed at 4 No. test locations, ranged from 6.192 X 10-6 m/min to 1.262 X 10 -5 m/min while infiltration was not recorded at the remaining test locations indicating low permeability soils. Taking a conservative approach, infiltration has not been allowed for in attenuation calculations. Also, refer to Section 3.2.4 of this report.

1.6 Proposed Development

The proposed development comprises of 349 residential dwellings. Refer to Van Dijk Architects Schedule of Accommodation and Site Layout Plans for further detail.

The development will also include the following associated engineering infrastructure:

- Provision of a site access point / formation of a new junction on Clonminch Road.
- Provision of improved facilities for cyclists between the proposed site access and Tullamore Town Centre.
- Delivery of a portion of the roads objective between the Clonminch Road and Chancery Lane (as shown in the Tullamore Town and Environs Development Plan) including high quality cycle infrastructure.
- Facilitation of potential future pedestrian links through adjacent lands.
- Provision of internal site road network including associated footpaths.
- Provision of surface water drainage, foul drainage and water supply infrastructure.
- Provision of a foul pumping station discharging to the existing public foul drain located on the Clonminch Road.

2.0 SITE ACCESS AND STREET LAYOUT

2.1 Tullamore Town and Environs Development Plan

The Tullamore Town and Environs Development Plan identifies a number of road objectives one of which traverses the site. This objective proposes a road link between Clonminch Road and Chancery Lane. A new rail overbridge also forms part of this objective.

Refer to Figure 2.1 below which is an extract from Map 8.1 of the Tullamore Town and Environs Development Plan. The road link between Clonminch Road and Chancery Lane is identified by Point H and Point G.

The proposed development intends to deliver approx. 550m of this road link in the form of a DMURS style “Link Street”, typically consisting of a 6.5m carriageway, 2m cycleway and a 2m footway. A new junction will also be constructed at the intersection with Clonminch Road enabling access to the site (identified by Point H in Figure 2.1).

Also refer to DBFL Drawing 180002-DBFL-RD-SP-DR-C-1005 (Link Road Alignment).

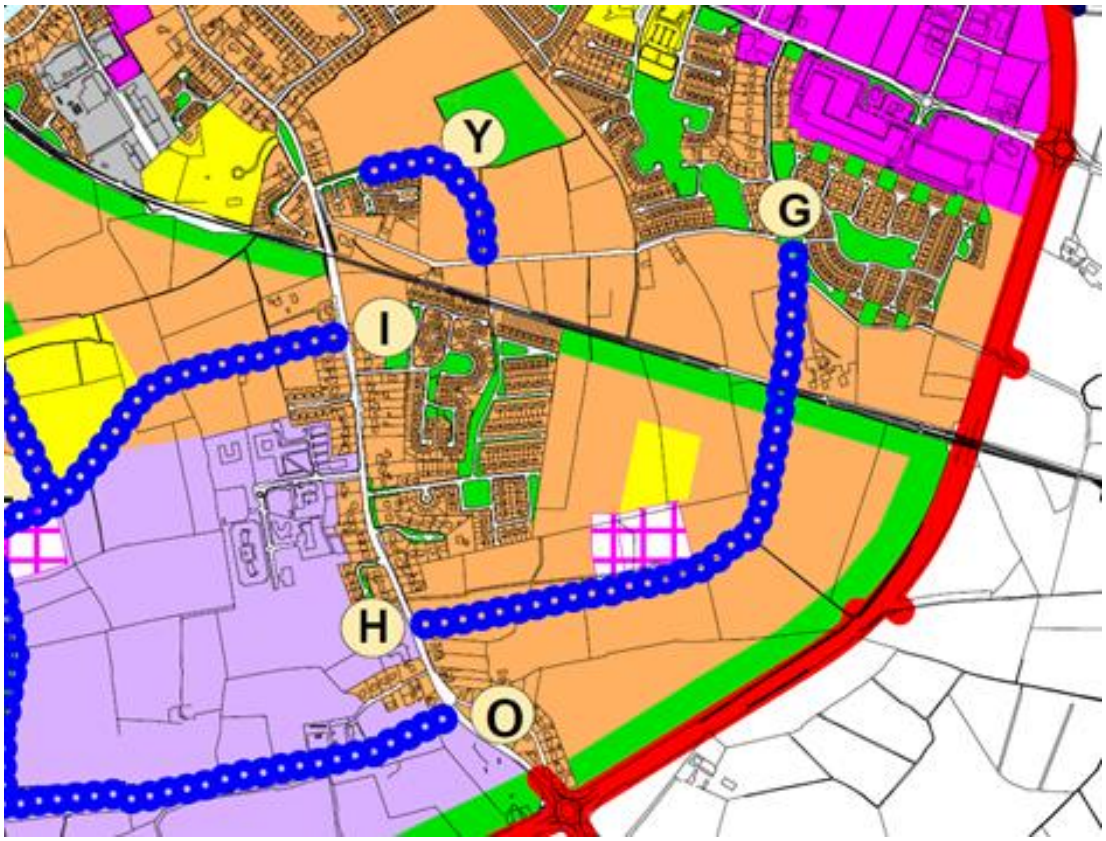


Figure 2.1: Extract from Map 8.1 of the Tullamore Town and Environs Development Plan

2.2 Site Access

2.2.1 Primary Site Access

As noted previously, it is proposed to construct a portion of the road link between Clonminch Road and Chancery Lane in the form of a DMURS style “Link Street”.

A new junction is also to be constructed at Clonminch Road (refer to Figure 2.2 below).

Also refer to DBFL Drawings 180002-2000, 180002-2001 and 180002-2002 (Road Layout Plans).

These works will facilitate the primary site access points for vehicles and are designed in accordance with the requirements of the Design Manual for Urban Roads and Streets (corner radii, pedestrian facilities, visibility splays etc.) and the Department of Transport’s Traffic Signs Manual (signage and line marking). Provision is made in the design of the site access for bus stops on both sides of Clonminch Road in close proximity to the proposed development (refer to DBFL Drawing 180002-2001).

The infrastructure noted above also facilitate access for pedestrians and cyclists.

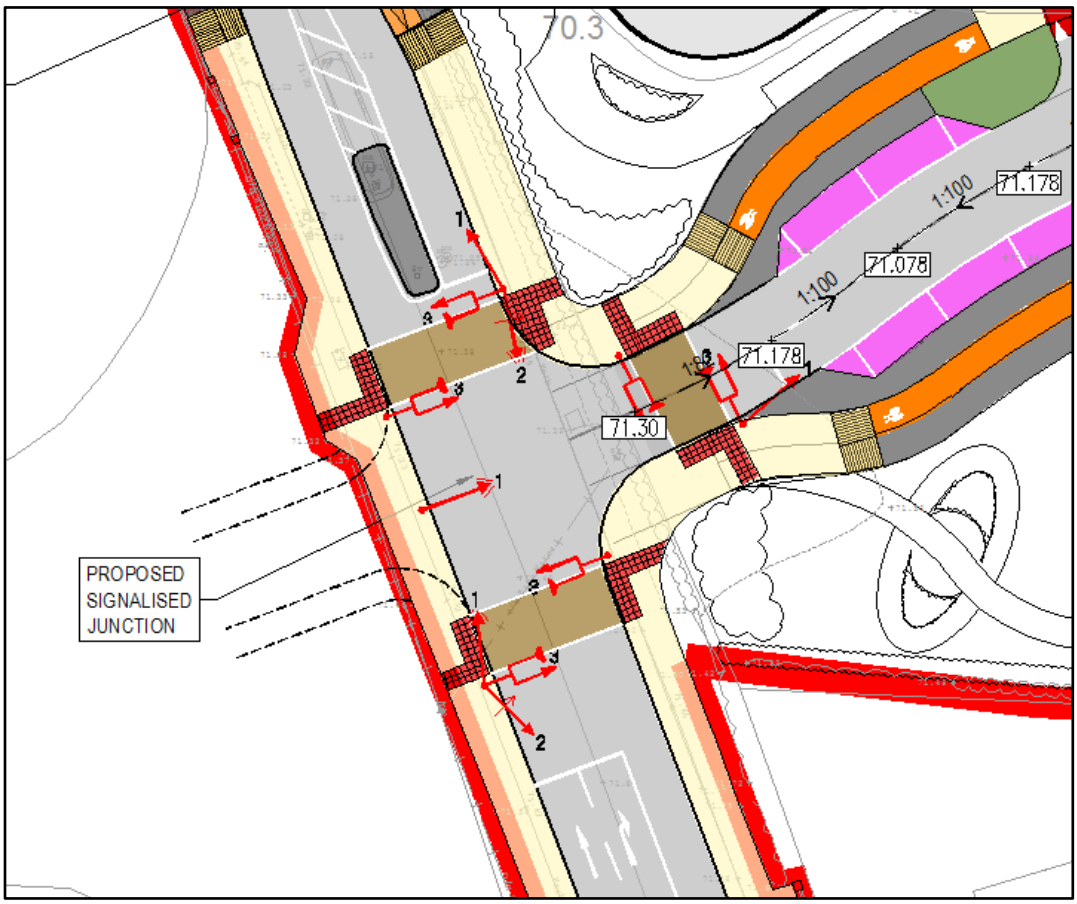


Figure 2.2: Primary Site Access Junction

2.2.2 Improved Cycle Access to Tullamore Town Centre

A cycle scheme is proposed between the subject site and Tullamore Town Centre. Preliminary design of the proposed cycle scheme is shown on DBFL Drawings 180002-DBFL-RD-SP-DR-C-1009, 1010, 1011, 1012 and 1013.

The proposal includes for the provision of new dedicated cycle infrastructure along the Clonminch Road (R443) including 2no. new Toucan crossing facilities (additional to the existing 3 no. Toucan crossings at site access junctions). The Clonminch Road enhancements commence approximately 100m south of the proposed site access junction and continue along Clonminch Road to tie into the existing road carriageway at a location approximately 80m northwest of the Bachelor's Walk junction. Total length of cycle scheme from Clonminch to Town Centre is approx. 1,700m.

The cycle facilities comprise predominantly segregated cycle tracks, however, on approach to the town centre where the available carriageway width narrows, a shared cycle / pedestrian facility is proposed in the northbound direction over a distance of approximately 190m. For a short 90m section south of the Bachelor's Walk junction, the narrow carriageway width at this section results in southbound cyclist having to share the road with vehicular traffic.

In order to facilitate the proposed segregated cycle infrastructure proposals, all space facilitating the existing right turn pockets have been reassigned to accommodate the introduction of high-quality cycle facilities. It is predicted that the quantum of vehicles availing of these existing right turn facilities is not sufficient to result in a material impact on the capacity of the Clonminch Road corridor once removed. The inclusion of dedicated cycle infrastructure along Clonminch Road will make travel by bicycle a safer option and subsequently increase the likelihood of residents in the local vicinity to consider travel by bicycle as a viable mode of travel and choose cycling over travel by car thereby reducing the number of motorised vehicles on the road network.

The guidelines set out in the NTA documents "*Preliminary Design Guidance Booklet for Bus Connects Core Bus Corridors*" and "National Cycle Manual" have has been incorporated into the subject scheme design. Cycle tracks are generally 2m in width (reducing to 1.75m and over a short section 1.5m where available carriageway width is restricted) and segregated vertically and / or horizontally from the vehicular carriageway. Vehicular traffic lanes have been designed to a standard width of 3m in each direction as per the standards set out in the Design Manual for Urban Roads and Streets for "*Arterial and Link streets*".

2.2.3 Potential Future Permeability & Linkages

The proposed site layout facilitates potential future permeability and linkage for pedestrians and cyclists to existing residential settlements to the north of the site. In addition, pedestrian, cycle and vehicle connections have been designed up to the eastern site boundary to facilitate connectivity with future development on lands which fall within the Eastern Node of the Southern Environs of Tullamore to the east and south of the site.

Potential permeability and linkage for pedestrians, cyclists and vehicles are identified on DBFL Drawing 180002-DBFL-RD-SP-DR-C-1017.

2.3 Street Layout Design

The site's street layout is shown on DBFL Drawing Nos. 180002-2000, 180002-2001 and 180002-2002.

The proposed residential scheme's internal road hierarchy comprises of a Link Street (6.5m wide), Local Streets (5.5m wide) and some shared surface Local Streets (4.8m wide with adjacent 1.2m wide walkway).

Shared surface Local Streets are used in limited circumstances to serve a limited number of houses.

The roads hierarchy as outlined above is shown on DBFL Drawing 180002-DBFL-RD-SP-DR-C-1017 (pedestrian linkages to, through and within the proposed development are also indicated on this drawing).

DMURS Street Design guidelines incorporated in the site's road layout including the following:

- Link Street – 6.5m wide
- Local Streets –5.5m wide
- Local Streets (Shared Surface) – 4.8m wide with adjacent 1.2m wide walkway
- Footpaths – 2.0m wide
- Corner Radii at junctions within the site – Typically 3.0m

A design speed limit of 30 km/hour has been applied throughout the development in accordance with the Design Manual for Urban Roads and Streets (pedestrian priority, function – local road, context – neighbourhood).

2.4 Access Driveways

Access driveways are set to accommodate targeted gradients of 1:40 to 1:80.

The design allows for dropped kerbs and an increased concrete pavement thickness of 150mm where access driveways cross footpaths.

Access driveways (outside road and footpath areas to be taken in charge by Offaly County Council) are designed as permeable type pavements.

2.5 Pavement Design Standards

Local Streets within the site are designed in accordance with the Department of the Environment Recommendations for Site Development Works, the Design Manual for Urban Roads and Streets (DMURS) and Local Authority requirements.

Proposed road construction materials and thicknesses are based on an existing minimum subsoil CBR of 2.0% at road formation level.

Actual CBR values and ground conditions are to be confirmed by site specific investigations prior to road construction.

2.6 Traffic & Transportation

A separate Traffic and Transportation Assessment has been prepared as part of this planning application (refer to DBFL Report No. 180002-DBFL-XX-XX-RP-C-1001).

3.0 SURFACE WATER DRAINAGE

3.1 Existing Surface Water

As noted in Section 1.4, Topography and Site Characteristics, the site generally falls from south-west towards north-east at gradients ranging from 1:20 (adjacent to the southern boundary) to 1:80 (typical surface gradient over the majority of the site).

The site currently drains via a network of open drains which ultimately discharge to an open drain located adjacent to the northern portion of the site (along the Dublin to Galway railway line). Refer to Figure 3.1 below and Irish Water's Network Plan as included in Appendix A of this report.

A topographic survey was carried out in May 2020 to confirm the existing surface water outfall route beyond the northern boundary. There are a number of culverts beneath the railway line which direct flow from network of open drains within the site to an existing open drain on the northern side of the railway. This open drain then directs flows towards an existing 375mm diameter surface water drain at Chancery Lane. Refer to Figure 3.2 below.

It is proposed to discharge attenuated surface water flows from the proposed development to the existing network of open drains described above. Refer to DBFL Drawings 180002-3001 and 180002-3002.

Figure 3.1 Extract from Irish Water Network Plan (Site Boundary Indicative)

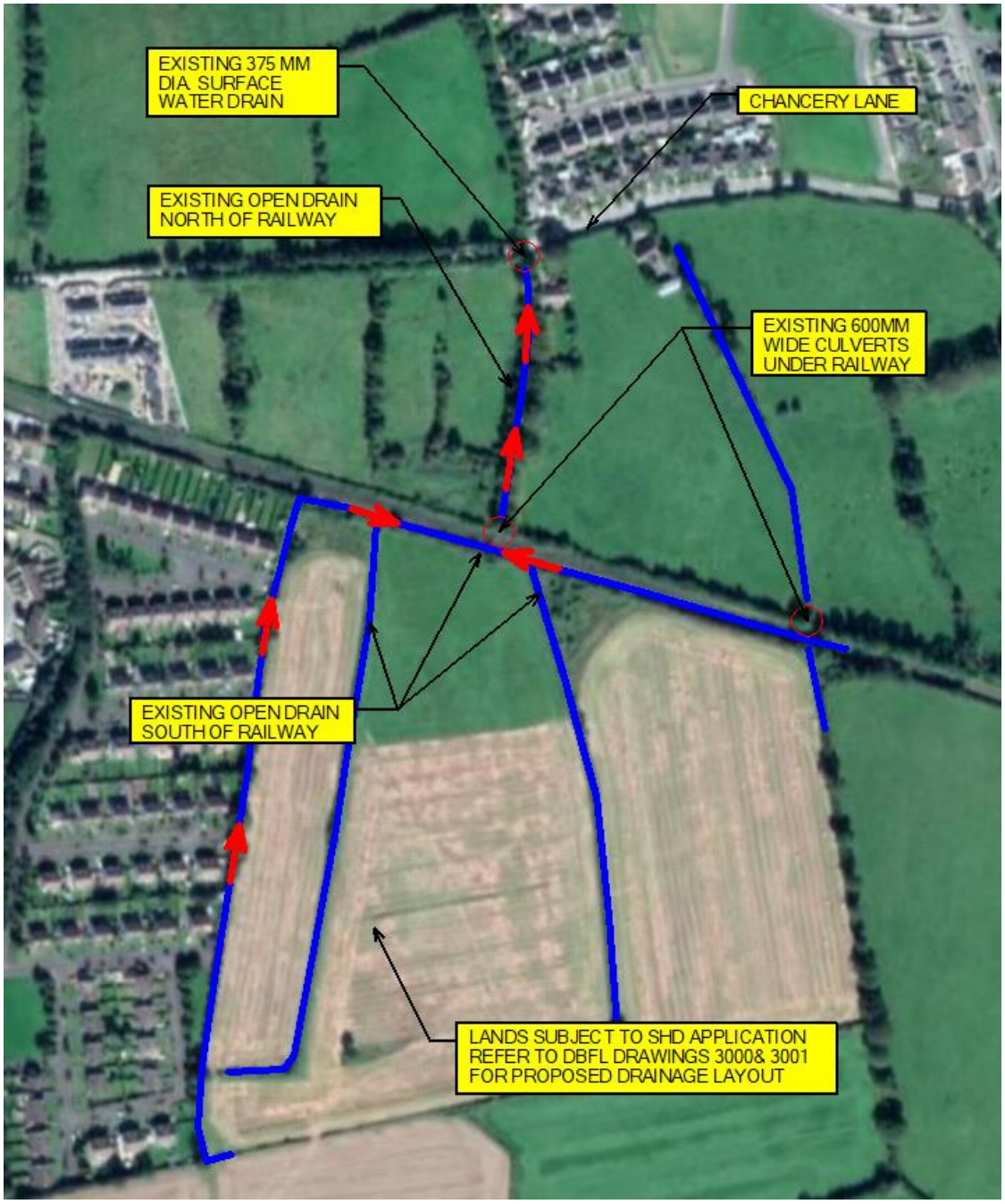


Figure 3.2 Existing Drainage Network at Northern End of the Site

3.2 Basis of Design

3.2.1 General Description of Surface Water Design

The surface water drainage strategy, as outlined below, has been discussed with Offaly County Council Water Services Section.

The proposed developments surface water drainage network is shown on DBFL Drawings 180002-3001 and 180002-3002.

It is proposed to discharge attenuated surface water flows from the proposed development to the existing network of open drains described in Section 3.1 of this report.

Four surface water catchments are proposed within the development (refer to DBFL Drawing 180002-3004 for the locations of the surface water catchments). All catchments discharge to an existing open drain located along the site's northern boundary.

Above ground detention basins are sized to attenuate up to a 1 in 100 year storm event. Surface water discharge rates from the proposed surface water drainage network will be controlled by a vortex flow control device (Hydrobrake or equivalent) and associated above ground attenuation. Surface water discharge will also pass via a full retention fuel / oil separator (sized in accordance with permitted discharge from the site).

The proposed surface water drainage network will collect surface water runoff from the site via a piped network prior to discharging off site via flow control device, attenuation and separator arrangement as noted above.

Surface water runoff from the site's road network will be directed to tree pits via conventional road gullies (with high level overflow to the piped surface water network). Surface water runoff from driveways will be captured by permeable paving.

Surface water runoff from house roofs will be routed to the proposed surface water pipe network via the porous aggregates beneath permeable paved driveways (providing an additional element of attenuation). Surface water runoff from apartments, the neighbourhood centre and creche will be captured by green roofs (sedum blanket) prior to being routed to the piped surface water drainage network.

3.2.2 Compliance with Surface Water Policy

The site's surface water management infrastructure has been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS).

The GDSDS (Vol. 2, Chapter 6.3.4) requires that the following design criteria are applied to all sites:

- Criterion 1:

  River Water Quality Protection – satisfied by providing interception storage and treatment of run-off by SUDS features such as permeable paving of driveways, tree pits, green roofs, detention basins and full retention fuel/oil interceptors at surface water discharge points.

- Criterion 2:

  River Regime Protection – satisfied by attenuating run-off with flow control devices prior to discharge to the outfall.

- Criterion 3:

  Level of Service (flooding) for the site – satisfied by the Site being outside the 1000 year coastal and fluvial flood levels and extents. Pluvial flood risk addressed by development designed to accommodate surface water runoff from a 100-year period storm (1& AEP) plus climate change (20%) as per the recommendations of the GDSDS. Planned flood routing for storms greater than 100-year return period level considered in design and development run-off contained within site.

- Criterion 4:

  River flood protection – Satisfied by attenuating surface water discharge to allowable greenfield runoff rates, addressing pluvial flood risk associated with the 1 in 100 year storm and avoiding development in flood plains.

3.2.3 Design Standards

Proposed surface water drains have been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS), the Department of the Environment's Recommendations for Site Development Works for Housing Areas, the Department of the Environment's Building Regulations "Technical Guidance Document Part H Drainage and Waste Water Disposal" and BS EN 752: 2008 Drain and Sewer Systems Outside Buildings.

Design Criteria:

• Return period for pipe work design	5 years
• Return period for attenuation design	100 years
• Allowable Outflow	2.38 l/sec/ha
• Standard Average Annual Rainfall	876 mm
• Time of entry	4 minutes
• M5 - 60	14.7 mm
• Ratio "r"	0.281
• Pipe Friction (Ks)	0.6 mm
• Minimum Velocity (based on pipe flowing full)	1.0 m/s
• Rainfall Runoff from Roofs	95%
• Rainfall Runoff from House Roofs (draining via porous aggregates beneath permeable driveways)	70%
• Rainfall Runoff from Apartments, Neighbourhood Centres and Creche (via green roof)	70%
• Rainfall Runoff from Driveways (draining via porous aggregates beneath permeable driveways)	50%
• Rainfall Runoff from Roads and Footpaths	95%
• Rainfall Runoff from Roads and Footpaths (via tree pits)	80%
• Rainfall Runoff from Soft Landscaped / Grassed Areas	10%
• Rainfall Depth Factored for Climate Change (in accordance with GDSDS Volume 2, Chapter 6, Table 6.2 – see below)	20%

Refer to Appendix B for attenuation design calculations and Appendix C for Surface Water Network Design calculations which have been carried out using Microdrainage WinDes analysis software.

Climate Change Category	Characteristics
River flows	20% increase in flows for all return periods up to 100 years
Sea level	400+mm rise (see Climate Change policy document for sea levels as a function of return period)
Rainfall	10% increase in depth (factor all intensities by 1.1)
	Modify time series rainfall in accordance with the GDSDS climate change policy document

Table 6.2 Climate Change Factors to be Applied to Drainage Design

3.2.4 SuDS, Proposed Runoff Coefficients & Factored Impermeable Areas

Noted below is a summary of the methodologies are being implemented as part of a SuDS treatment train approach and associated reduction factors / runoff coefficients. Factored impermeable areas are calculated and summarised in Table 3.1.

- House Roofs Draining via SuDS (permeable paving) – Runoff Coefficient 0.7

  Reduction of velocity as the aggregate/filter material used in the SuDS feature (permeable paving) slows the run-off at source ultimately reduce the peak inflow for attenuation calculations. Note, this detail does not rely on infiltration (although some degree if infiltration will occur), the stone reservoir is intended to provide an additional element of attenuation storage.

- Apartments – Green Roof – Runoff Coefficient 0.7

  The proposed build-up will be an extensive type with 200mm minimum construction depth and sedum planting (refer to DBFL Drawing 180002-3012). The soil build-up will partially absorb some of the initial run-off and once saturated will reduce flow rates through the green roof medium to the outlets and final attenuation storage location.

- Impermeable Roads / Footpaths Drained via Tree Pits – Runoff Coefficient 0.80

  Typically, road gullies discharge to tree pits (with high level overflow to the piped surface water network). Also takes account of run-off stored within the micro and macro texture of the surfacing (i.e. runoff not collected by piped network).

- Impermeable Areas– Runoff Coefficient 0.95

  A 5% reduction of the surface area is applied to take account of run-off not collected and stored within the micro and macro texture of the surfacing

- Permeable Paved Areas Draining via SUDS – Runoff Coefficient 0.5

  Reduction of velocity as the aggregate/filter material used in the SuDS feature (permeable paving) slows the run-off at source ultimately reduce the peak inflow for attenuation calculations.

- Soft Landscaped / Grassed Areas – Runoff Coefficient 0.10

  Grassed / Landscaped areas slows the run-off at source ultimately reduce the peak inflow for attenuation calculations.

- Attenuation of the 100 year storm events in over ground detention basins (see Section 3.2.7 for Attenuation Calculations). As noted in Section 1.5, infiltration test results indicate low permeability soils above rock level and as such infiltration has not been allowed for in surface water / attenuation design calculations for the proposed development.

- Installation of a vortex flow control device (Hydrobrake or equivalent), limiting surface water discharge from the site to 2.38 l/sec/ha (see Section 3.2.6 for calculation of Allowable Green Field Runoff Rate).

- Surface water discharge will also pass via a Class 1 full retention fuel / oil separator (sized in accordance with permitted discharge from the site).

		Catchment A		Catchment B		Catchment C		Catchment D		Total	
	Runoff Coefficients	Gross Area (m^2)	Factored Area (m^2)	Gross Area (m^2)	Factored Area (m^2)	Gross Area (m^2)	Factored Area (m^2)	Gross Area (m^2)	Factored Area (m^2)	Gross Area (m^2)	Factored Area (m^2)
Roof	0.95	983	934	57.6	54.72	2346	2228.7	0	0	3,387	3,217
Roof Draining Via SUDs	0.7	2,384	1,669	3,976	2,783	3,604	2,523	0	0	9,963	6,974
Apartment -Green Roof	0.7	1,740	1,218	1,200	840	3,816	2,671	0	0	6,757	4,730
Driveways - Permeable Paving	0.5	1,397	699	3,031	1,516	2,542	1,271	0	0	6,970	3,485
Paved Areas draining via Tree pits/SUDs	0.8	5,350	4,280	1,120	896	7,478	5,982	0	0	13,948	11,158
Road & Footpaths draining via conventional gullies	0.95	2,830	2,688	4,585	4,355	7,040	6,688	0	0	14,454	13,732
Soft Landscaping	0.1	15,052	1,505	15,665	1,567	21,104	2,110	0	0	51,821	5,182
		29,736	12,993	29,634	12,011	47,930	23,475	0	0	107,300	45,261

Table 3.1 Proposed Runoff Coefficients and Factored Impermeable Areas

3.2.5 Allowable Greenfield Runoff Rate

Qbar has been assessed based on GDSDS requirements.

i.e. Qbar(m3/s)=0.00108x(Area)0.89(SAAR)1.17(SOIL)2.17

SAAR – 876mm (based on local information from Met Eireann)

SOIL – Soil Type 2

Area Catchment A-B-C-D

Approx.10.73 Ha

Qbar = 25.5 l/sec (equivalent to 2.38 l/sec/Ha)

Assessment of Soil Type (see Table 3.2)

- Drainage Group 1 (rarely waterlogged within 60cm at any time)
- Depth to Impermeable Layer 2 (40-80cm)
- Permeability Group 3 (Slow)
- Slope 2 (0-2deg)

Drainage ~~class~~ Group	Depth to impermeable layer (cm)	Slope classes								
		0 - 2°			2 - 8°			>8°		
		Permeability rates above impermeable layers								
		Rapid (1)	Medium (2)	Slow (3)	Rapid (1)	Medium (2)	Slow (3)	Rapid (1)	Medium (2)	Slow (3)
1	>80	1			1			1	2	3
	40 - 80					2		3		4
	<40	—	—	—	—	—	—	—	—	—
2	>80	2		3			4	—		
	40 - 80									
	<40	3								
3	>80					5		—		
	40 - 80							—		
	<40									

Table 3.2 Classification of Soils Type *(Soil index /SPR value calculated from Flood Studies Report, The Classification of Soils from Winter Rainfall Acceptance Rate ,Table 4.5)*.

3.2.6 Attenuation Calculation

Attenuation volumes have been calculated based on an allowable outflow / greenfield runoff rate outlined above.

Run-off from the proposed development will be controlled / attenuated using vortex type flow control devices (Hydrobrake or equivalent).

The resultant storage system, discharge limits and storage volumes for each catchment are detailed in Table 3.3. The locations of the proposed attenuation systems are shown on DBFL Drawings 180002-3001 and 180002-3002.

We note that the M5-60 and "r value" (as noted in Section 3.2.3 above) are sourced from Met Eireann. The inflow hydrograph for each storm is then calculated using Microdrainage software using the Flood Studies Report Method as recommended by Section 6.4 of the GDSDS.

Refer to Appendix B for Attenuation Design Calculations.

Catchment/ Attenuation Area	Catchment Area (Total)	Impermeable Catchment Area (Total)	Allowable Outflow (Max.)	Storage Volume required (100 Yr.)	Storage Volume Provided (Detention Basin)
A	2.974 Ha	1.299 Ha	6.0 l/s	699.3 m^3	980m^3
B	2.963 Ha	1.201 Ha	20.0 l/s	340.0 m^3	350m^3
C	4.793 Ha	2.352 Ha	26 l/s	1418.0 m^3	1650 m^3
D	0	0	25.6 l/s	55.3m^3	173 m^3
TOTAL	**10.73 Ha**	**4.852 Ha**		**2512.6 m^3**	**3153 m^3**

Table 3.3 – Surface Water Attenuation Storage and Discharge Limits

Catchment A and B cascade into Catchment C which cascades into Catchment D. Catchment D discharges to an existing open drain located along the site's northern boundary at an allowable outflow of 25.5 l/sec (or 2.38 l/sec/Ha).

In total, 2,512.6m^3 of attenuated storage is required with 3,153m^3 proposed.

3.2.7 Interception Volume

The GDSDS (Vol. 2, Table 6.3) requires interception storage to be incorporated into surface water drainage design in order to limit discharge of sediment and pollutants into the downstream surface water drainage network and receiving water courses.

This interception storage is designed to capture surface water run-off from rainfall depths of 5mm (and up to 10mm if possible).

The SuDS features included in the development (refer to Section 3.2.4) will provide the necessary interception volume required by the GDSDS (within stone reservoirs beneath permeable paved driveways, tree pits and detention basins).

3.3 Flood Risk

A separate Site-Specific Flood Risk Assessment (SSFRA) has been prepared as part of this planning application (refer to DBFL Report No. 180002-rep-002).

This flood risk assessment has been undertaken by reviewing information from the Office of Public Works (OPW) National Flood Hazard Mapping (www.floodmaps.ie) and the Eastern CFRAM Study and has been carried out in accordance with the OPW's Guidelines for Planning Authorities – The Planning System and Flood Risk Management (November 2009).

The SSFRA concluded that the proposed residential development is suitably located in Flood Zone C and is considered to have the required level of flood protection up to and including the 1% AEP flood event.

3.4 Surface Water Quality Impact

Run-off rates from the site are controlled by flow control devices.

Surface water management proposals for the development also incorporate the following impact reduction measures;

- Surface water network designed in accordance with GDSDS requirements
- Incorporates SUDS features e.g. green roofs, tree pits and permeable paving in the higher risk parking areas at the front of houses (i.e. treatment / filtration provided within the stone reservoir beneath permeable paved driveways)
- Surface water attenuation (i.e. treatment / filtration provided within the landscaped areas in the detention basins) in conjunction with a final Class 1 fuel / oil separator prior to discharge to the downstream surface water network.

4.0 Foul Drainage

4.1 Existing Foul Drainage

An existing 225mm diameter public foul sewer is located west of the site along the Clonminch Road which discharges northwards towards Church Road Pump Station (refer to Figures 4.1 and 4.2 and the Irish Water records drawings in Appendix A).

As the site generally falls from south-west to north-east, a foul pumping station will be required to service the development. Refer to DBFL Drawings 180002-3001 and 180002-3002 for the location of the existing foul drainage infrastructure noted above and the proposed foul drainage discharge arrangement.

Figure 4.1 Extract from Irish Water Network Plan (Site Boundary Indicative)

Figure 4.2 Extract from Irish Water Network Plan – Existing Foul Sewer, Clonminch Road

4.2 Design Strategy

As noted previously, the site generally falls from south-west to north-east at gradients ranging from 1/20 to 1/80.

The proposed foul discharge point is located along the western boundary and is somewhat elevated above the north-east of the site, therefore, a strategic pumping station and associated rising main will be required to service the development.

The proposed strategic foul pumping station is to be located in the north-east corner of the site (adjacent to the railway line). As such, this pump station has potential to also serve other lands within the Eastern Node of the Southern Environs of Tullamore where a gravity drainage connection to the existing foul drainage infrastructure in Clonminch Road cannot be achieved.

The proposed foul drainage network within the development has been designed in compliance with Irish Water's Code of Practice for Wastewater Infrastructure and comprises of a series of 225mm diameter pipes, discharging to the strategic pumping station described above.

Individual dwellings will be serviced by an individual 100mm diameter connections.

Refer to DBFL Drawing No.'s 180002-3001 and 180002-3002 for the proposed foul drainage layout.

4.3 Engagement with Irish Water

Confirmation of feasibility was received from Irish Water on 1st September 2021 (included in Appendix D). Irish Water have advised as follows:

- There is sufficient capacity available at the Tullamore Wastewater Treatment Plant to facilitate your proposed development.
- The proposed connection to the existing wastewater network is feasible subject to upgrades. The Southern Interceptor Sewer (SIS) project is currently being progressed by Irish Water and will be delivered by Irish Water in conjunction with Offaly County Council along with specific road projects in this area of Tullamore. The SIS will provide the long-term wastewater solution for the proposed development. The SIS project is not likely to be completed prior to the proposed development and as such interim upgrade works are required.
- Options for delivery of interim upgrade works include surface water separation works within St. Columbas Place and / or along Clonminch Road (R443), which would remove sufficient volumes of surface water from the combined sewer system to free up capacity for the expected wastewater loading from the proposed development. Irish Water also note that "*It is envisaged the extent of the surface water separation works would be within the public road*".
- The applicant is advised to agree the exact scope of surface water separation works and storage requirements in conjunction with any future Connection Application for the proposed development

4.4 Surface Water Separation Works – St Columba's Place

An area has been identified to the west of the site, within St. Columba's Place, where road gullies currently discharge to an existing combined sewer network, with the combined sewer outfalling directly to St. Columba's Pump Station (refer to Figure 4.3 below).

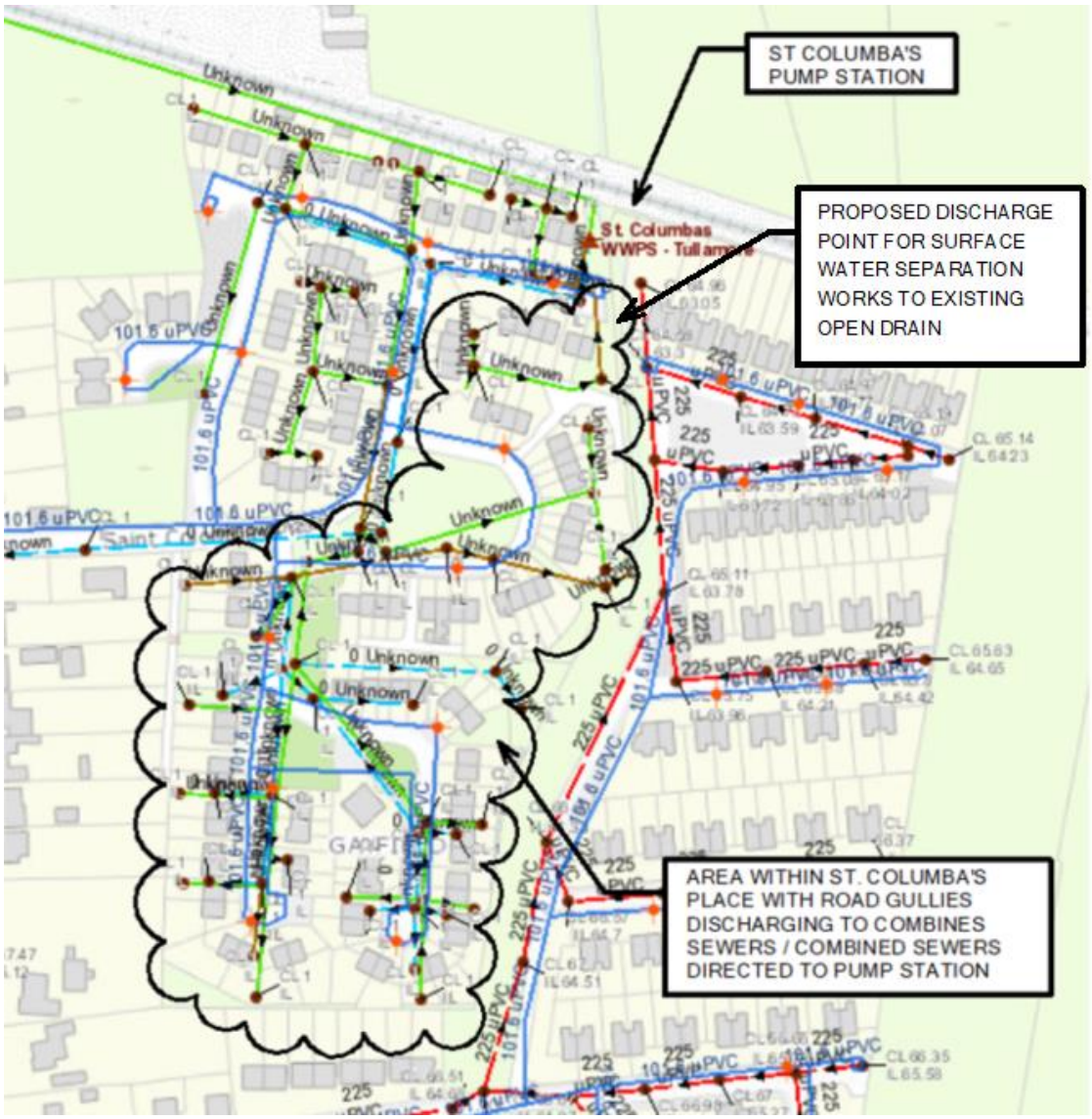


Figure 4.3 Extract from Irish Water Network Plan – St Columba's Park

Separation Strategy for area identified within St Columba's Place:

- Construct surface water outfall to existing open drain running along the eastern side of St.Columba's Place, see Figure 4.3 (taking flows from road gullies away from the combined sewer discharging to St. Columba's Pump Station).
- The existing open drain running along the eastern side of St.Columba's Place (as noted above) discharges to an open drain running along the Dublin to Galway railway line). Similar to comments in Section 3.1 of this report, there are a number of culverts beneath the railway line which direct flow from the open drain along the railway line towards the existing 375mm diameter surface water drain at Chancery Lane, see Figure 4.4
- Attenuate flows from road areas highlighted in Figure 4.3 to 2.0 l/sec (30 year storm event). Attenuated flows to discharge via a hydrocarbon interceptor.
- Potential surface water flow removal from combined sewer (5 year storm event) – approx. 38.5 l/sec
- Foul Drainage Flow from Subject Application at Clonminch, Peak Discharge (6DWF), 10.8 l/sec
- Taking 38.5 l/sec of surface water flow away from St. Columba's Pump Station when compared to the peak foul discharge from the subject application (10.8 l/sec) results in a potential reduction in hydraulic loading by a factor of 3.5 on the waste water network during problematic rainfall events.

Additional areas have also been identified by Irish Water on Clonminch Road where possible separation works may also be considered.

As per Irish Water's Confirmation of Feasibility (September 2021), the applicant shall agree the exact scope of surface water separation works and storage requirements in conjunction with any future Connection Application for the proposed development

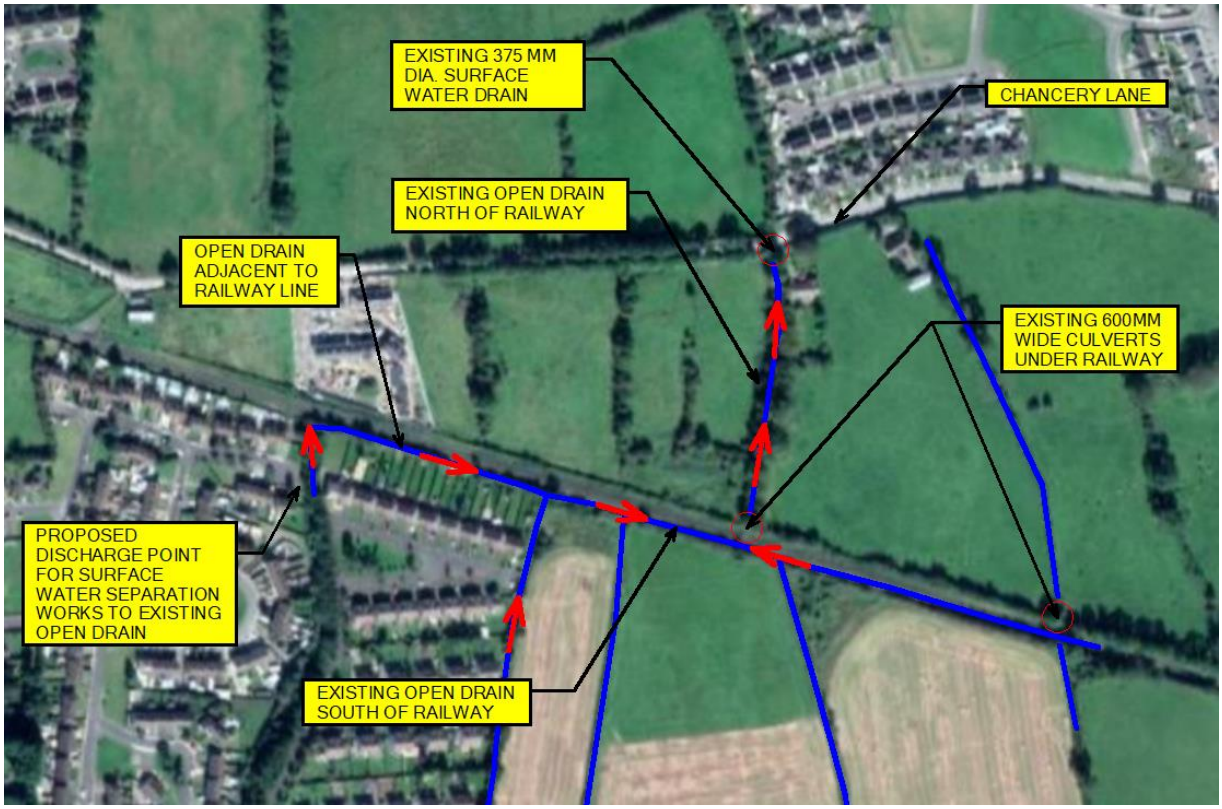


Figure 4.4 Outfall from Surface Water Separation Works at St. Columba's Place

4.5 Storage at Strategic Pump Station

It is noted that there is an alternative interim measure that could be considered as well as that described by Irish Water in the confirmation of feasibility letter. The principal of storage at the subject lands strategic pump station during critical rainfall events is also seen as a workable solution that could be developed further at connection application stage.

Telemetry could be installed at the developments foul pumping station linking to the problematic Church Road Pump Station in the town centre which could allow the developments foul storage tank to be activated and store flows generated by the development should the network in the town centre become inundated.

The developments foul storage tank could be utilised to store development discharge during surcharge events in the town centre and therefore allow the proposed development to proceed on a phased basis in advance of any network upgrades (subject to Connection Agreement with Irish Water). Such optimisation / balancing of pump stations within existing foul drainage networks is a commonly used methodology to maximise network capacity.

4.6 Design Calculations

The foul drainage network for the proposed development has been designed in accordance with the following guidelines:

- Irish Water Code of Practice for Wastewater Infrastructure
- Department of the Environment's Recommendations for Site Development Works for Housing Areas
- Department of the Environment's Building Regulations "Technical Guidance Document Part H Drainage and Waste Water Disposal"
- BS EN 752: 2008 Drain and Sewer Systems Outside Buildings
- IS EN 12056: Part 2 (2000) Gravity Drainage Systems Inside Buildings

Foul drainage network design has been carried out using Microstation WinDes analysis software (refer to Appendix E for foul drainage network calculation).

Design Criteria:

Demand	446 l/dwelling/day
Discharge units	14 units per house (as BS8301)
Pipe Friction (Ks)	1.5 mm
Minimum Velocity	0.75 m/s (self-cleansing velocity)
Maximum Velocity	3.0 m/s (1:18 maximum pipe gradient)
Frequency Factor	0.5 for domestic use
Manhole Depths	< 4.0m

4.7 Foul Drainage – Environmental Impacts

Wastewater Discharge Calculation

(as outlined in Irish Water's Pre-Connection Enquiry Application Form)

No. of Housing Units	349
Post Development Average Discharge (DWF)	1.8 l/sec
Post Development Peak Discharge (6DWF)	10.8 l/sec
Daily Foul Discharge Volume (446l per dwelling)	155,654 l (156m^3)

5.0 WATER SUPPLY AND DISTRIBUTION

5.1 Existing Public Water Mains

An existing 12" asbestos watermain, 9" asbestos watermain and 6" cast iron watermain are located to the west of the site along the Clonminch Road.

Refer to the Irish Water's Network Plan included in Appendix A for the location of the existing public watermains described above (extract also shown in Figure 5.1).

Figure 5.1 Extract from Irish Water Network Plan (Site Boundary Indicative)

5.2 Irish Water Pre-Connection Feedback

Pre-connection enquiry feedback has been received from Irish Water in September 2021 (included in Appendix D). Irish Water have advised that provision of a water connection is "*feasible without infrastructure upgrade*".

5.3 Proposed Water Main Layout

The site's proposed water main layout is shown on DBFL Drawing 180002-3003.

It is proposed to connect to the existing 300mm diameter watermain on the Clonminch Road to service the proposed development (as advised by Irish Water in the Confirmation of Feasibility). A 200mm diameter spine water main will be provided along the development's arterial roads with a number of 150mm / 100mm diameter looped branch mains provided elsewhere.

The proposed water main layout has been designed in accordance with Irish Water Standard Detail STD-W-02 including provision of a bulk flow meter at the connection point to the existing water supply network on Clonminch Road.

Sluice Valves have been arranged in accordance with Irish Water Standard Detail STD-W-02, Note 6 ("*valves shall be arranged in such a manner to allow the network to be managed to ensure that no more than 40 properties lose water from a burst on the system, at any one time*").

Individual houses will have their own connections (25mm O.D. PE pipe) to distribution water mains via service connections and boundary boxes. Individual connections are to be installed in accordance with Irish Water Standard Detail STD-W-03.

5.4 Hydrants

The proposed water main layout is arranged such that all buildings are a maximum of 46.0m from a hydrant in accordance with the Department of the Environment's Building Regulations "Technical Guidance Document Part B Fire Safety".

Hydrants shall comply with the requirements of BS 750:2012 and shall be installed in accordance with Irish Water's Code of Practice and Standard Details.

5.5 Materials

Proposed water mains and connections to individual houses are to be PE100 SDR17.

5.6 Water Demand

Water Demand has been calculated in accordance with the guidelines outlined in Irish Water's Pre-Connection Enquiry Application Form:

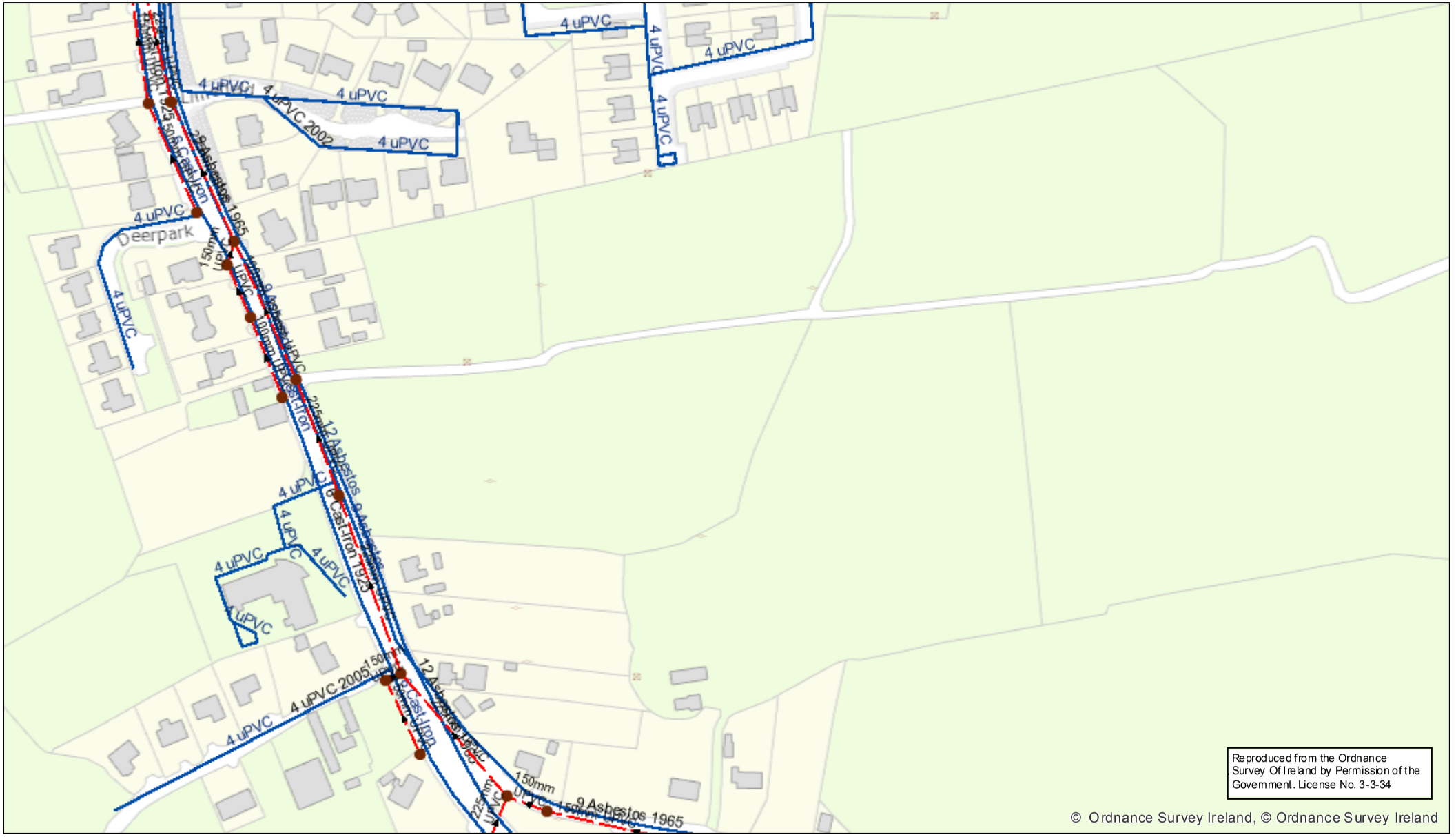
- No. of Housing Units 349
- Average Occupancy Ration (Persons Per Dwelling) 2.7
- Per-Capita Consumption (l/person/day) 150
- Average Domestic Daily Demand (l/sec) 1.64
- Post Development Average Hour Water Demand (l/sec) 2.05

  (1.25 x Average Domestic Daily Demand)
- Post Development Peak Hour Water Demand (l/sec) 10.25

  (5.0 x Post Development Average Hour Water Demand)

APPENDIX A – IRISH WATER NETWORK PLANS

Irish Water Web Map



January 31, 2018

1:4,514

0 0.0375 0.075 0.15 mi

0 0.05 0.1 0.2 km

Legend

Gravity Main (Irish Water Owned)
- Surface

Gravity Main (Non-Irish Water Owned)
- Surface

Storm Manholes
- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other; Unknown

Storm Inlets
- Gully
- Standard
- Other; Unknown

Storm Fittings
- Vent/Col
- Other; Unknown

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Irish Water Web Map

January 31, 2018

1:9,028

0 0.075 0.15 0.3 mi

0 0.1 0.2 0.4 km

Legend

Gravity Main (Irish Water Owned)

Surface

Gravity Main (Non-Irish Water Owned)

Surface

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Irish Water Web Map

Print Date: 20/05/2020

Printed by:Irish Water

Water Distribution Network
- Water Treatment Plant
- Water Pump Station
- Storage Cell/Tower
- Dosing Point
- Meter Station
- Abstraction Point
- Telemetry Kiosk

Reservoir
- Potable
- Raw Water

Water Distribution Mains
- Irish Water
- Private

Trunk Water Mains
- Irish Water
- Private

Water Lateral Lines
- Irish Water
- Non IW
- Water Casings
- Water Abandoned Lines
- Boundary Meter
- Bulk/Check Meter
- Group Scheme
- Source Meter
- Waste Meter
- Unknown Meter ; Other Meter
- Non-Return
- PRV
- PSV
- Sluice Line Valve Open/Closed
- Butterfly Line Valve Open/Closed
- Sluice Boundary Valve Open/Closed
- Butterfly Boundary Valve Open/Closed
- Scour Valves
- Single Air Control Valve
- Double Air Control Valve
- Water Stop Valves
- Water Service Connections
- Water Distribution Chambers
- Water Network Junctions
- Pressure Monitoring Point
- Fire Hydrant
- Fire Hydrant/Washout

Water Fittings
- Cap
- Reducer
- Tap
- Other Fittings

Sewer Foul Combined Network
- Waste Water Treatment Plant
- Waste Water Pump station

Sewer Mains Irish Water
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow

Sewer Mains Private
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow
- Sewer Lateral Lines
- Sewer Casings

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Inlet Type
- Gully
- Standard
- Other; Unknown

Storm Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Gas Networks Ireland
- Transmission High Pressure Gasline
- Distribution Medium Pressure Gasline
- Distribution Low Pressure Gasline

ESB Networks

ESB HV Lines
- HV Underground
- HV Overhead
- HV Abandoned

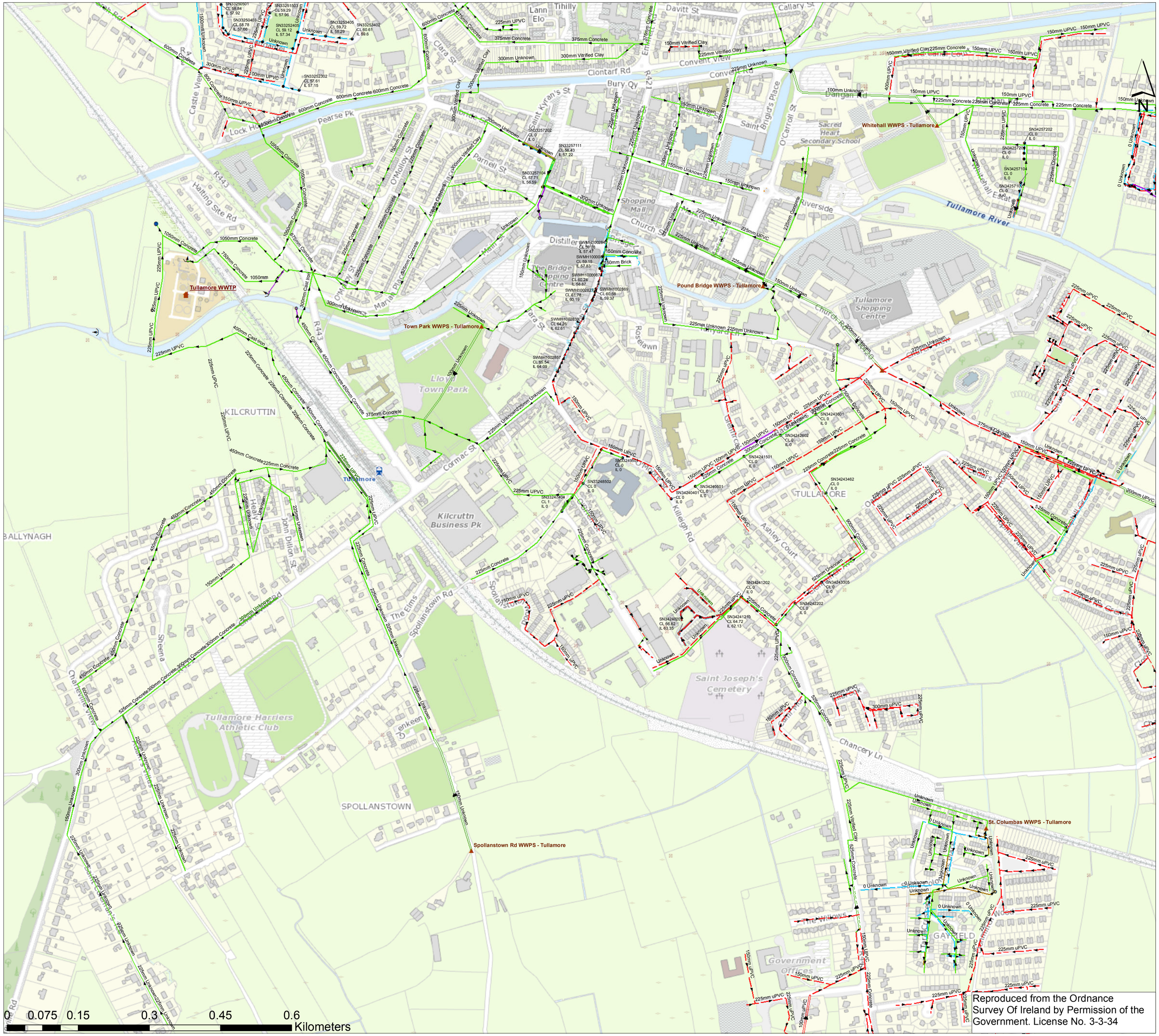
ESB MVLV Lines
- MV Overhead Three Phase
- MV Overhead Single Phase
- LV Overhead Three Phase
- LV Overhead Single Phase
- MVLV Underground
- Abandoned

Non Service Categories
- Proposed
- Under Construction
- Out of Service
- Decommissioned

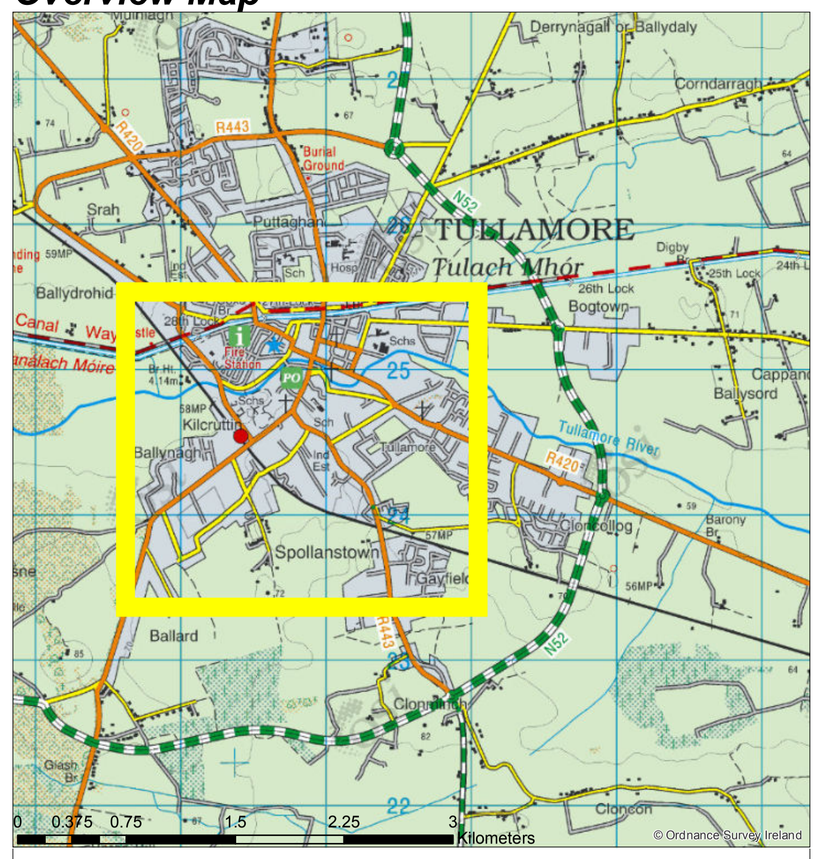
Water Non Service Assets
- Water Point Feature
- Water Pipe
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

Storm & Foul Layout



Overview Map



Legend

Sewer Manholes
Manhole Type
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Sewer Discharge Points
Discharge Type
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Sewer Clean Outs
Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown
- Waste Water Treatment Plant
- Pump Station

Sewer Inlets
Inlet Type
- Catchpit
- Gully
- Standard
- Other; Unknown
- Gravity - Combined
- Gravity - Foul
- Gravity - Overflow
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Overflow
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Syphon - Overflow
- Overflow
- Gravity - Combined
- Gravity - Foul
- Gravity - Overflow
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Overflow
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Syphon - Overflow
- Overflow

Storm Manholes
Manhole Type
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Storm Discharge Points
Discharge Type
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Storm Inlets
Inlet Type
- Gully
- Standard
- Other; Unknown

- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Storm Open Drains
- SUDsArea
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

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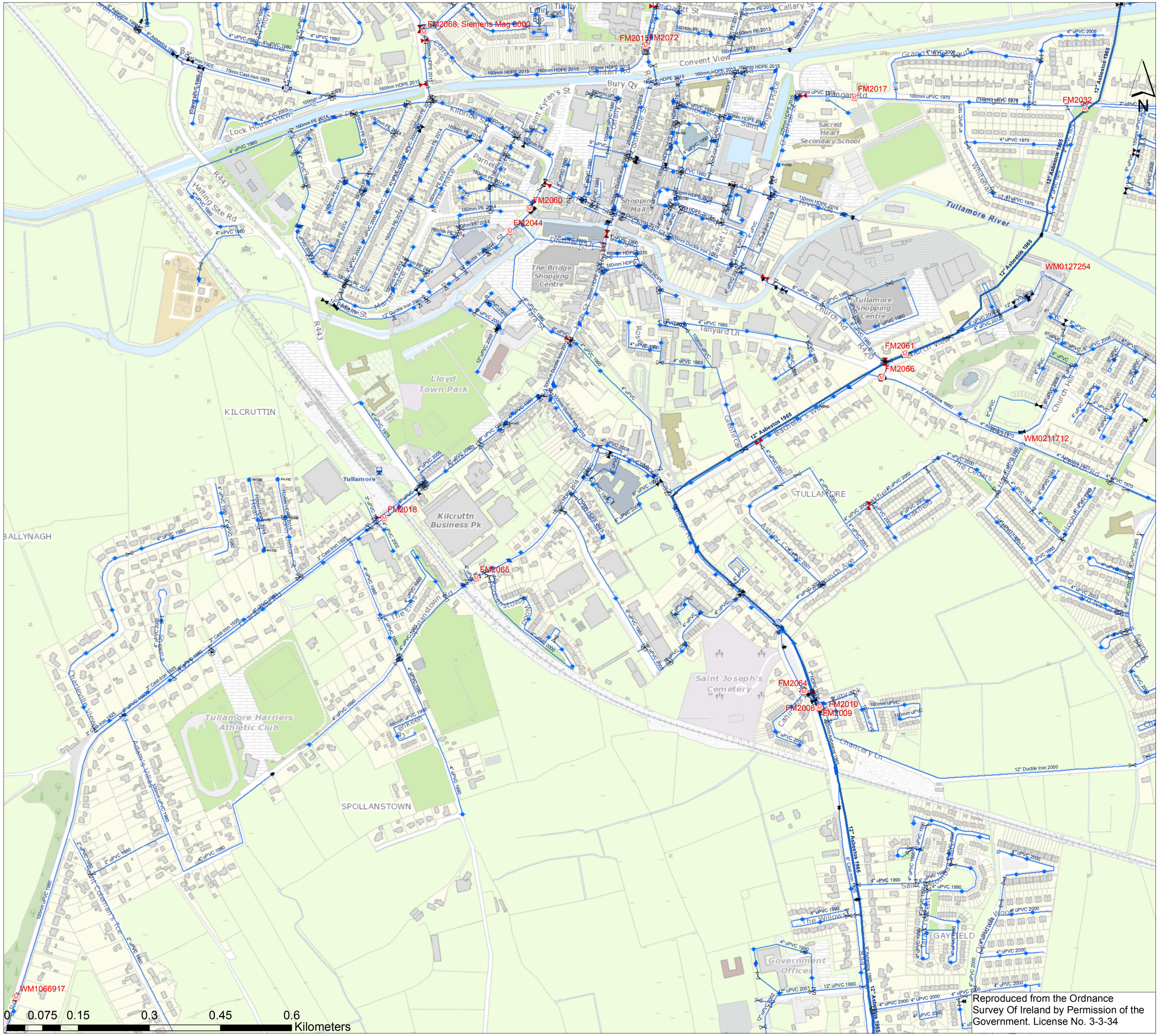
Document Size: A1

Water Layout



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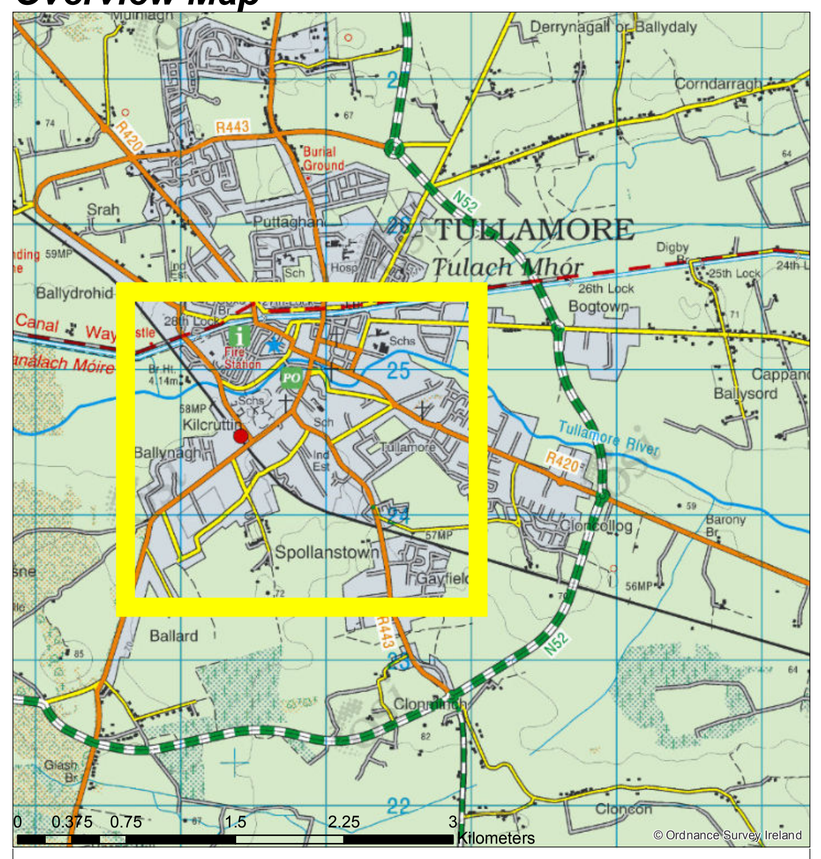
Overview Map



Legend

- Boundary Meter
- Bulk Meter
- Check Meter
- Group Scheme
- Source Meter
- Waste Meter
- Unknown Meter ; Other Meter
- Non-Return
- PRV
- PSV
- Sluice Valve Open
- Sluice Valve Part Open
- Sluice Valve Closed
- Butterfly Valve Open
- Butterfly Valve Part Open
- Butterfly Valve Closed
- Sluice Valve Open
- Sluice Valve Closed
- Butterfly Valve Open
- Butterfly Valve Closed
- Scour Valves
- Single Air Control Valve
- Double Air Control Valve

Water Hydrants

Hydrant Function

- Fire Hydrant
- Fire Hydrant/Wash...
- Washout
- Water Treatment Plant

Reservoir

Reservoir Type

- Reservior - Potable
- Private Reservoir - Potable
- Reservoir - Raw
- Private Reservoir - Raw
- Out of Service Reservoir
- Out of Service Reservoir - Private
- Storage Cell
- Storage Tower
- Dosing Point
- Meter Station
- Other, Unknow
- Abstraction Point
- Telemetry Kiosk

Water Distribution Mains

Owned By

- Irish Water
- Private
- Irish Water
- Private
- Irish Water
- Non IW

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APPENDIX B – ATTENUATION CALCULATIONS

Cascade Summary of Results for 100YR - Catchment A 02.09.2021.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	100YR - Catchment C 02.09.2021.SRCX	(None)

Half Drain Time : 1576 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	68.940	0.507	0.0	3.8	3.8	183.3	O K
30 min Summer	69.082	0.649	0.0	3.8	3.8	252.7	O K
60 min Summer	69.218	0.785	0.0	3.8	3.8	327.1	O K
120 min Summer	69.346	0.913	0.0	3.8	3.8	403.7	O K
180 min Summer	69.417	0.984	0.0	3.8	3.8	449.5	O K
240 min Summer	69.465	1.032	0.0	3.8	3.8	481.2	O K
360 min Summer	69.528	1.095	0.0	3.8	3.8	524.0	O K
480 min Summer	69.565	1.132	0.0	3.8	3.8	550.8	O K
600 min Summer	69.590	1.157	0.0	3.9	3.9	568.2	O K
720 min Summer	69.605	1.172	0.0	3.9	3.9	579.5	O K
960 min Summer	69.620	1.187	0.0	3.9	3.9	589.9	O K
1440 min Summer	69.614	1.181	0.0	3.9	3.9	586.1	O K
2160 min Summer	69.601	1.168	0.0	3.9	3.9	576.6	O K
2880 min Summer	69.588	1.155	0.0	3.8	3.8	567.1	O K
4320 min Summer	69.555	1.122	0.0	3.8	3.8	543.4	O K
5760 min Summer	69.514	1.081	0.0	3.8	3.8	514.6	O K
7200 min Summer	69.469	1.036	0.0	3.8	3.8	484.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.883	0.0	187.1	19
30 min Summer	53.275	0.0	259.4	34
60 min Summer	34.911	0.0	340.2	64
120 min Summer	22.052	0.0	429.5	124
180 min Summer	16.721	0.0	488.4	184
240 min Summer	13.696	0.0	533.3	242
360 min Summer	10.318	0.0	602.9	362
480 min Summer	8.425	0.0	604.3	482
600 min Summer	7.195	0.0	604.5	602
720 min Summer	6.322	0.0	605.6	722
960 min Summer	5.152	0.0	610.4	960
1440 min Summer	3.859	0.0	625.1	1286
2160 min Summer	2.889	0.0	1013.0	1668
2880 min Summer	2.353	0.0	1100.3	2072
4320 min Summer	1.758	0.0	1106.3	2896
5760 min Summer	1.429	0.0	1336.7	3744
7200 min Summer	1.216	0.0	1421.1	4544

Cascade Summary of Results for 100YR - Catchment A 02.09.2021.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	69.422	0.989	0.0	3.8	3.8	452.5	O K
10080 min Summer	69.373	0.940	0.0	3.8	3.8	421.2	O K
15 min Winter	68.988	0.555	0.0	3.8	3.8	205.8	O K
30 min Winter	69.140	0.707	0.0	3.8	3.8	283.7	O K
60 min Winter	69.287	0.854	0.0	3.8	3.8	367.8	O K
120 min Winter	69.426	0.993	0.0	3.8	3.8	455.5	O K
180 min Winter	69.505	1.072	0.0	3.8	3.8	508.6	O K
240 min Winter	69.559	1.126	0.0	3.8	3.8	546.0	O K
360 min Winter	69.630	1.197	0.0	3.9	3.9	597.4	O K
480 min Winter	69.675	1.242	0.0	4.0	4.0	630.9	O K
600 min Winter	69.705	1.272	0.0	4.0	4.0	654.2	O K
720 min Winter	69.726	1.293	0.0	4.0	4.0	670.6	O K
960 min Winter	69.751	1.318	0.0	4.1	4.1	690.1	O K
1440 min Winter	69.763	1.330	0.0	4.1	4.1	699.3	O K
2160 min Winter	69.741	1.308	0.0	4.0	4.0	681.9	O K
2880 min Winter	69.720	1.287	0.0	4.0	4.0	666.0	O K
4320 min Winter	69.670	1.237	0.0	4.0	4.0	627.1	O K
5760 min Winter	69.605	1.172	0.0	3.9	3.9	579.2	O K
7200 min Winter	69.534	1.101	0.0	3.8	3.8	528.6	O K
8640 min Winter	69.460	1.027	0.0	3.8	3.8	478.1	O K
10080 min Winter	69.385	0.952	0.0	3.8	3.8	428.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.066	0.0	1495.2	5368
10080 min Summer	0.953	0.0	1560.0	6160
15 min Winter	76.883	0.0	209.5	19
30 min Winter	53.275	0.0	290.4	33
60 min Winter	34.911	0.0	380.8	64
120 min Winter	22.052	0.0	481.0	122
180 min Winter	16.721	0.0	547.1	180
240 min Winter	13.696	0.0	598.0	240
360 min Winter	10.318	0.0	605.6	356
480 min Winter	8.425	0.0	607.6	474
600 min Winter	7.195	0.0	611.6	590
720 min Winter	6.322	0.0	617.7	704
960 min Winter	5.152	0.0	631.4	932
1440 min Winter	3.859	0.0	643.5	1370
2160 min Winter	2.889	0.0	1134.9	1756
2880 min Winter	2.353	0.0	1222.5	2216
4320 min Winter	1.758	0.0	1159.9	3152
5760 min Winter	1.429	0.0	1497.8	4040
7200 min Winter	1.216	0.0	1591.9	4968
8640 min Winter	1.066	0.0	1674.8	5800
10080 min Winter	0.953	0.0	1746.9	6656

Cascade Rainfall Details for 100YR - Catchment A 02.09.2021.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	14.700	Shortest Storm (mins)	15
Ratio R	0.281	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 1.299

Time (mins) From:	To:	Area (ha)
0	4	1.299

Cascade Model Details for 100YR - Catchment A 02.09.2021.SRCX

Storage is Online Cover Level (m) 70.700

Infiltration Basin Structure

Invert Level (m) 68.433 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	260.0	0.600	500.0	1.200	740.0	1.800	980.0
0.100	300.0	0.700	540.0	1.300	780.0	1.900	1020.0
0.200	340.0	0.800	580.0	1.400	820.0	2.000	1060.0
0.300	380.0	0.900	620.0	1.500	860.0	2.100	1100.0
0.400	420.0	1.000	660.0	1.600	900.0	2.200	1140.0
0.500	460.0	1.100	700.0	1.700	940.0	2.250	1160.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0088-6000-3500-6000
Design Head (m)	3.500
Design Flow (l/s)	6.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	88
Invert Level (m)	68.233
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	3.500	6.0
Flush-Flo™	0.380	3.8
Kick-Flo®	0.788	3.0
Mean Flow over Head Range	-	4.4

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	2.7	1.000	3.3	2.400	5.0	5.500	7.4
0.200	3.5	1.200	3.6	2.600	5.2	6.000	7.7
0.300	3.7	1.400	3.9	3.000	5.6	6.500	8.0
0.400	3.8	1.600	4.2	3.500	6.0	7.000	8.3
0.500	3.7	1.800	4.4	4.000	6.4	7.500	8.6
0.600	3.6	2.000	4.6	4.500	6.7	8.000	8.9
0.800	3.0	2.200	4.8	5.000	7.1	8.500	9.1

Hydro-Brake® Optimum Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
9.000	9.4	9.500	9.6				

Cascade Summary of Results for 100YR - Catchment B 02.09.2021.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	100YR - Catchment C 02.09.2021.SRCX	(None)

Half Drain Time : 145 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	66.037	0.499	0.0	20.0	20.0	157.0	O K
30 min Summer	66.167	0.629	0.0	20.0	20.0	210.1	O K
60 min Summer	66.276	0.738	0.0	20.0	20.0	258.6	O K
120 min Summer	66.337	0.799	0.0	20.0	20.0	287.6	O K
180 min Summer	66.348	0.810	0.0	20.0	20.0	292.9	O K
240 min Summer	66.348	0.810	0.0	20.0	20.0	292.7	O K
360 min Summer	66.334	0.796	0.0	20.0	20.0	286.0	O K
480 min Summer	66.310	0.772	0.0	20.0	20.0	274.6	O K
600 min Summer	66.280	0.742	0.0	20.0	20.0	260.8	O K
720 min Summer	66.245	0.707	0.0	20.0	20.0	244.8	O K
960 min Summer	66.174	0.636	0.0	20.0	20.0	213.2	O K
1440 min Summer	66.036	0.498	0.0	20.0	20.0	156.8	O K
2160 min Summer	65.866	0.328	0.0	20.0	20.0	94.9	O K
2880 min Summer	65.758	0.220	0.0	19.6	19.6	60.1	O K
4320 min Summer	65.684	0.146	0.0	16.9	16.9	38.1	O K
5760 min Summer	65.657	0.119	0.0	14.0	14.0	30.5	O K
7200 min Summer	65.641	0.103	0.0	11.9	11.9	26.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.883	0.0	173.0	18
30 min Summer	53.275	0.0	239.7	32
60 min Summer	34.911	0.0	314.4	62
120 min Summer	22.052	0.0	397.0	120
180 min Summer	16.721	0.0	451.8	152
240 min Summer	13.696	0.0	493.3	184
360 min Summer	10.318	0.0	557.4	252
480 min Summer	8.425	0.0	607.0	322
600 min Summer	7.195	0.0	648.0	392
720 min Summer	6.322	0.0	683.2	458
960 min Summer	5.152	0.0	742.4	588
1440 min Summer	3.859	0.0	834.0	836
2160 min Summer	2.889	0.0	936.8	1172
2880 min Summer	2.353	0.0	1017.0	1504
4320 min Summer	1.758	0.0	1140.5	2204
5760 min Summer	1.429	0.0	1235.6	2936
7200 min Summer	1.216	0.0	1314.4	3672

Cascade Summary of Results for 100YR - Catchment B 02.09.2021.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	65.629	0.091	0.0	10.5	10.5	23.1	O K
10080 min Summer	65.620	0.082	0.0	9.3	9.3	20.8	O K
15 min Winter	66.088	0.550	0.0	20.0	20.0	177.4	O K
30 min Winter	66.233	0.695	0.0	20.0	20.0	239.2	O K
60 min Winter	66.354	0.816	0.0	20.0	20.0	295.7	Flood Risk
120 min Winter	66.429	0.891	0.0	20.0	20.0	332.9	Flood Risk
180 min Winter	66.443	0.905	0.0	20.0	20.0	340.0	Flood Risk
240 min Winter	66.439	0.901	0.0	20.0	20.0	337.9	Flood Risk
360 min Winter	66.418	0.880	0.0	20.0	20.0	327.0	Flood Risk
480 min Winter	66.381	0.843	0.0	20.0	20.0	309.0	Flood Risk
600 min Winter	66.337	0.799	0.0	20.0	20.0	287.5	O K
720 min Winter	66.285	0.747	0.0	20.0	20.0	263.1	O K
960 min Winter	66.161	0.623	0.0	20.0	20.0	207.8	O K
1440 min Winter	65.939	0.401	0.0	20.0	20.0	120.2	O K
2160 min Winter	65.727	0.189	0.0	19.3	19.3	50.6	O K
2880 min Winter	65.679	0.141	0.0	16.5	16.5	36.9	O K
4320 min Winter	65.645	0.107	0.0	12.5	12.5	27.3	O K
5760 min Winter	65.627	0.089	0.0	10.1	10.1	22.4	O K
7200 min Winter	65.615	0.077	0.0	8.6	8.6	19.2	O K
8640 min Winter	65.605	0.067	0.0	7.4	7.4	16.7	O K
10080 min Winter	65.538	0.000	0.0	6.8	6.8	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.066	0.0	1382.2	4384
10080 min Summer	0.953	0.0	1442.0	5136
15 min Winter	76.883	0.0	193.6	18
30 min Winter	53.275	0.0	268.6	32
60 min Winter	34.911	0.0	352.1	60
120 min Winter	22.052	0.0	444.7	116
180 min Winter	16.721	0.0	505.8	170
240 min Winter	13.696	0.0	552.5	194
360 min Winter	10.318	0.0	624.5	272
480 min Winter	8.425	0.0	679.9	350
600 min Winter	7.195	0.0	725.8	426
720 min Winter	6.322	0.0	765.2	500
960 min Winter	5.152	0.0	831.6	628
1440 min Winter	3.859	0.0	934.3	866
2160 min Winter	2.889	0.0	1049.1	1164
2880 min Winter	2.353	0.0	1139.0	1472
4320 min Winter	1.758	0.0	1277.2	2200
5760 min Winter	1.429	0.0	1384.0	2928
7200 min Winter	1.216	0.0	1472.2	3608
8640 min Winter	1.066	0.0	1548.1	4496
10080 min Winter	0.953	0.0	1615.2	0

Cascade Rainfall Details for 100YR - Catchment B 02.09.2021.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	14.700	Shortest Storm (mins)	15
Ratio R	0.281	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 1.201

Time (mins) From:	To:	Area (ha)
0	4	1.201

Cascade Model Details for 100YR - Catchment B 02.09.2021.SRCX

Storage is Offline Dividing Weir Level (m) 65.600
Cover Level (m) 66.650

Infiltration Basin Structure

Invert Level (m) 65.538 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	240.0	0.300	330.0	0.600	420.0	0.900	510.0
0.100	270.0	0.400	360.0	0.700	450.0	1.000	540.0
0.200	300.0	0.500	390.0	0.800	480.0	1.100	570.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0197-2000-1100-2000
Design Head (m)	1.100
Design Flow (l/s)	20.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	197
Invert Level (m)	65.500
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	20.0
Flush-Flo™	0.356	20.0
Kick-Flo®	0.773	16.9
Mean Flow over Head Range	-	17.0

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	6.8	1.200	20.8	3.000	32.3	7.000	48.7
0.200	18.5	1.400	22.4	3.500	34.8	7.500	50.3
0.300	19.9	1.600	23.9	4.000	37.1	8.000	51.9
0.400	19.9	1.800	25.3	4.500	39.3	8.500	53.5
0.500	19.6	2.000	26.6	5.000	41.4	9.000	55.0
0.600	19.2	2.200	27.8	5.500	43.3	9.500	56.5
0.800	17.2	2.400	29.0	6.000	45.2		
1.000	19.1	2.600	30.2	6.500	47.0		

Cascade Summary of Results for 100YR - Catchment C 02.09.2021.SRCX

Upstream Structures	Outflow To	Overflow To
100YR - Catchment A 02.09.2021.SRCX 100YR - Catchment B 02.09.2021.SRCX	100YR - Catchment D 02.09.2021.SRCX	(None)

Half Drain Time : 473 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	65.261	0.427	0.0	25.9	25.9	335.8	O K
30 min Summer	65.403	0.569	0.0	25.9	25.9	462.8	O K
60 min Summer	65.547	0.713	0.0	25.9	25.9	600.7	O K
120 min Summer	65.694	0.860	0.0	25.9	25.9	749.5	O K
180 min Summer	65.784	0.950	0.0	25.9	25.9	844.9	O K
240 min Summer	65.864	1.030	0.0	25.9	25.9	932.6	O K
360 min Summer	65.948	1.114	0.0	25.9	25.9	1028.0	O K
480 min Summer	66.003	1.169	0.0	25.9	25.9	1091.5	O K
600 min Summer	66.046	1.212	0.0	25.9	25.9	1141.8	O K
720 min Summer	66.084	1.250	0.0	25.9	25.9	1187.2	O K
960 min Summer	66.097	1.263	0.0	25.9	25.9	1202.8	O K
1440 min Summer	66.071	1.237	0.0	25.9	25.9	1172.0	O K
2160 min Summer	66.012	1.178	0.0	25.9	25.9	1101.7	O K
2880 min Summer	65.934	1.100	0.0	25.9	25.9	1012.3	O K
4320 min Summer	65.721	0.887	0.0	25.9	25.9	778.1	O K
5760 min Summer	65.520	0.686	0.0	25.9	25.9	574.7	O K
7200 min Summer	65.350	0.516	0.0	25.9	25.9	414.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.883	0.0	698.1	19
30 min Summer	53.275	0.0	967.6	34
60 min Summer	34.911	0.0	1269.1	64
120 min Summer	22.052	0.0	1602.3	124
180 min Summer	16.721	0.0	1822.5	184
240 min Summer	13.696	0.0	1990.4	452
360 min Summer	10.318	0.0	2249.1	538
480 min Summer	8.425	0.0	2396.9	614
600 min Summer	7.195	0.0	2518.5	682
720 min Summer	6.322	0.0	2623.9	744
960 min Summer	5.152	0.0	2804.1	882
1440 min Summer	3.859	0.0	3089.1	1088
2160 min Summer	2.889	0.0	3781.1	1452
2880 min Summer	2.353	0.0	4105.3	1872
4320 min Summer	1.758	0.0	4475.0	2636
5760 min Summer	1.429	0.0	4986.9	3344
7200 min Summer	1.216	0.0	5304.2	4032

Cascade Summary of Results for 100YR - Catchment C 02.09.2021.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	65.215	0.381	0.0	25.8	25.8	295.8	O K
10080 min Summer	65.115	0.281	0.0	25.5	25.5	212.3	O K
15 min Winter	65.307	0.473	0.0	25.9	25.9	376.2	O K
30 min Winter	65.462	0.628	0.0	25.9	25.9	518.6	O K
60 min Winter	65.622	0.788	0.0	25.9	25.9	675.7	O K
120 min Winter	65.787	0.953	0.0	25.9	25.9	849.1	O K
180 min Winter	65.907	1.073	0.0	25.9	25.9	981.2	O K
240 min Winter	65.972	1.138	0.0	25.9	25.9	1055.9	O K
360 min Winter	66.062	1.228	0.0	25.9	25.9	1161.6	O K
480 min Winter	66.123	1.289	0.0	25.9	25.9	1235.0	O K
600 min Winter	66.170	1.336	0.0	25.9	25.9	1291.9	O K
720 min Winter	66.211	1.377	0.0	25.9	25.9	1343.5	O K
960 min Winter	66.270	1.436	0.0	25.9	25.9	1418.0	O K
1440 min Winter	66.229	1.395	0.0	25.9	25.9	1365.6	O K
2160 min Winter	66.126	1.292	0.0	25.9	25.9	1238.4	O K
2880 min Winter	66.002	1.168	0.0	25.9	25.9	1090.0	O K
4320 min Winter	65.646	0.812	0.0	25.9	25.9	700.6	O K
5760 min Winter	65.338	0.504	0.0	25.9	25.9	404.0	O K
7200 min Winter	65.123	0.289	0.0	25.5	25.5	218.7	O K
8640 min Winter	64.995	0.161	0.0	24.2	24.2	118.0	O K
10080 min Winter	64.942	0.108	0.0	23.0	23.0	78.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.066	0.0	5578.4	4672
10080 min Summer	0.953	0.0	5819.9	5352
15 min Winter	76.883	0.0	781.6	19
30 min Winter	53.275	0.0	1083.5	34
60 min Winter	34.911	0.0	1420.8	64
120 min Winter	22.052	0.0	1795.1	124
180 min Winter	16.721	0.0	2041.1	444
240 min Winter	13.696	0.0	2230.2	494
360 min Winter	10.318	0.0	2450.7	582
480 min Winter	8.425	0.0	2616.0	480
600 min Winter	7.195	0.0	2756.0	720
720 min Winter	6.322	0.0	2878.8	772
960 min Winter	5.152	0.0	3088.2	924
1440 min Winter	3.859	0.0	3403.5	1120
2160 min Winter	2.889	0.0	4235.2	1560
2880 min Winter	2.353	0.0	4588.2	2020
4320 min Winter	1.758	0.0	4933.2	2808
5760 min Winter	1.429	0.0	5586.6	3456
7200 min Winter	1.216	0.0	5940.8	4040
8640 min Winter	1.066	0.0	6248.2	4672
10080 min Winter	0.953	0.0	6518.3	5104

Cascade Rainfall Details for 100YR - Catchment C 02.09.2021.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	14.700	Shortest Storm (mins)	15
Ratio R	0.281	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 2.347

Time (mins) From:	To:	Area (ha)
0	4	2.347

Cascade Model Details for 100YR - Catchment C 02.09.2021.SRCX

Storage is Online Cover Level (m) 66.700

Infiltration Basin Structure

Invert Level (m) 64.834 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	700.0	0.500	900.0	1.000	1100.0	1.500	1300.0
0.100	740.0	0.600	940.0	1.100	1140.0	1.600	1340.0
0.200	780.0	0.700	980.0	1.200	1180.0	1.700	1360.0
0.300	820.0	0.800	1020.0	1.300	1220.0	1.800	1400.0
0.400	860.0	0.900	1060.0	1.400	1260.0	1.850	1420.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0211-2600-1783-2600
Design Head (m)	1.783
Design Flow (l/s)	26.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	211
Invert Level (m)	64.717
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.783	26.0
Flush-Flo™	0.528	25.9
Kick-Flo®	1.143	21.0
Mean Flow over Head Range	-	22.4

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	7.2	1.200	21.5	3.000	33.3	7.000	50.2
0.200	20.5	1.400	23.1	3.500	35.9	7.500	51.9
0.300	24.5	1.600	24.7	4.000	38.3	8.000	53.5
0.400	25.5	1.800	26.1	4.500	40.5	8.500	55.1
0.500	25.8	2.000	27.4	5.000	42.6	9.000	56.7
0.600	25.8	2.200	28.7	5.500	44.6	9.500	58.2
0.800	25.1	2.400	29.9	6.000	46.6		
1.000	23.6	2.600	31.1	6.500	48.4		

Cascade Summary of Results for 100YR - Catchment D 02.09.2021.SRCX

Upstream Structures	Outflow To	Overflow To
100YR - Catchment C 02.09.2021.SRCX 100YR - Catchment A 02.09.2021.SRCX 100YR - Catchment B 02.09.2021.SRCX	(None)	(None)

Half Drain Time : 19 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	64.543	0.243	0.0	25.2	25.2	38.0	O K
30 min Summer	64.559	0.259	0.0	25.4	25.4	41.0	O K
60 min Summer	64.558	0.258	0.0	25.4	25.4	40.9	O K
120 min Summer	64.554	0.254	0.0	25.3	25.3	40.1	O K
180 min Summer	64.554	0.254	0.0	25.3	25.3	40.1	O K
240 min Summer	64.554	0.254	0.0	25.3	25.3	40.1	O K
360 min Summer	64.554	0.254	0.0	25.3	25.3	40.1	O K
480 min Summer	64.554	0.254	0.0	25.3	25.3	40.1	O K
600 min Summer	64.554	0.254	0.0	25.3	25.3	40.1	O K
720 min Summer	64.554	0.254	0.0	25.3	25.3	40.2	O K
960 min Summer	64.554	0.254	0.0	25.3	25.3	40.2	O K
1440 min Summer	64.554	0.254	0.0	25.3	25.3	40.2	O K
2160 min Summer	64.554	0.254	0.0	25.3	25.3	40.2	O K
2880 min Summer	64.561	0.261	0.0	25.4	25.4	41.4	O K
4320 min Summer	64.566	0.266	0.0	25.4	25.4	42.6	O K
5760 min Summer	64.581	0.281	0.0	25.5	25.5	45.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.883	0.0	698.1	249
30 min Summer	53.275	0.0	967.6	384
60 min Summer	34.911	0.0	1269.1	560
120 min Summer	22.052	0.0	1602.3	776
180 min Summer	16.721	0.0	1822.5	936
240 min Summer	13.696	0.0	1990.4	1072
360 min Summer	10.318	0.0	2243.0	1252
480 min Summer	8.425	0.0	2390.2	1388
600 min Summer	7.195	0.0	2511.9	1502
720 min Summer	6.322	0.0	2617.4	1606
960 min Summer	5.152	0.0	2798.1	1794
1440 min Summer	3.859	0.0	3083.1	2134
2160 min Summer	2.889	0.0	3781.1	2596
2880 min Summer	2.353	0.0	4105.3	2996
4320 min Summer	1.758	0.0	4468.5	3476
5760 min Summer	1.429	0.0	4986.9	4000

Cascade Summary of Results for 100YR - Catchment D 02.09.2021.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
7200 min Summer	64.612	0.312	0.0	25.6	25.6	52.0	O K
8640 min Summer	64.595	0.295	0.0	25.6	25.6	48.5	O K
10080 min Summer	64.550	0.250	0.0	25.3	25.3	39.2	O K
15 min Winter	64.550	0.250	0.0	25.3	25.3	39.3	O K
30 min Winter	64.560	0.260	0.0	25.4	25.4	41.3	O K
60 min Winter	64.555	0.255	0.0	25.3	25.3	40.2	O K
120 min Winter	64.554	0.254	0.0	25.3	25.3	40.1	O K
180 min Winter	64.554	0.254	0.0	25.3	25.3	40.1	O K
240 min Winter	64.554	0.254	0.0	25.3	25.3	40.1	O K
360 min Winter	64.554	0.254	0.0	25.3	25.3	40.1	O K
480 min Winter	64.554	0.254	0.0	25.3	25.3	40.2	O K
600 min Winter	64.554	0.254	0.0	25.3	25.3	40.2	O K
720 min Winter	64.554	0.254	0.0	25.3	25.3	40.2	O K
960 min Winter	64.555	0.255	0.0	25.3	25.3	40.2	O K
1440 min Winter	64.555	0.255	0.0	25.3	25.3	40.2	O K
2160 min Winter	64.555	0.255	0.0	25.3	25.3	40.2	O K
2880 min Winter	64.555	0.255	0.0	25.3	25.3	40.3	O K
4320 min Winter	64.569	0.269	0.0	25.4	25.4	43.0	O K
5760 min Winter	64.627	0.327	0.0	25.6	25.6	55.3	O K
7200 min Winter	64.560	0.260	0.0	25.4	25.4	41.3	O K
8640 min Winter	64.499	0.199	0.0	24.2	24.2	29.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Summer	1.216	0.0	5304.2	4536
8640 min Summer	1.066	0.0	5578.3	5040
10080 min Summer	0.953	0.0	5819.8	5560
15 min Winter	76.883	0.0	781.6	288
30 min Winter	53.275	0.0	1081.2	447
60 min Winter	34.911	0.0	1420.8	654
120 min Winter	22.052	0.0	1795.1	916
180 min Winter	16.721	0.0	2041.1	1112
240 min Winter	13.696	0.0	2227.2	1234
360 min Winter	10.318	0.0	2444.0	1418
480 min Winter	8.425	0.0	2609.5	1564
600 min Winter	7.195	0.0	2749.8	1686
720 min Winter	6.322	0.0	2873.0	1792
960 min Winter	5.152	0.0	3082.3	1982
1440 min Winter	3.859	0.0	3397.2	2324
2160 min Winter	2.889	0.0	4235.2	2792
2880 min Winter	2.353	0.0	4581.6	3212
4320 min Winter	1.758	0.0	4927.5	3616
5760 min Winter	1.429	0.0	5586.5	4008
7200 min Winter	1.216	0.0	5940.8	4296
8640 min Winter	1.066	0.0	6248.1	4688

Cascade Summary of Results for 100YR - Catchment D 02.09.2021.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	64.490	0.190	0.0	23.0	23.0	28.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.953	0.0	6518.2	5112

Cascade Rainfall Details for 100YR - Catchment D 02.09.2021.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	14.700	Shortest Storm (mins)	15
Ratio R	0.281	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

Cascade Model Details for 100YR - Catchment D 02.09.2021.SRCX

Storage is Online Cover Level (m) 65.004

Infiltration Basin Structure

Invert Level (m) 64.300 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	120.0	0.200	180.0	0.400	240.0	0.600	300.0
0.100	150.0	0.300	210.0	0.500	270.0	0.700	330.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0224-2560-0700-2560
Design Head (m)	0.700
Design Flow (l/s)	25.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	224
Invert Level (m)	64.284
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	25.6
Flush-Flo™	0.334	25.6
Kick-Flo®	0.564	23.1
Mean Flow over Head Range	-	20.2

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	7.5	1.200	33.1	3.000	51.5	7.000	77.8
0.200	22.3	1.400	35.7	3.500	55.5	7.500	79.9
0.300	25.5	1.600	38.0	4.000	59.2	8.000	82.6
0.400	25.4	1.800	40.3	4.500	62.7	8.500	85.2
0.500	24.4	2.000	42.4	5.000	66.0	9.000	87.7
0.600	23.8	2.200	44.3	5.500	69.2	9.500	90.1
0.800	27.3	2.400	46.2	6.000	72.1		
1.000	30.3	2.600	48.1	6.500	75.0		

APPENDIX C – SURFACE WATER DRAINAGE CALCULATIONS

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	14.700	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.281	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	20	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

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

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)

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
S1.000	16.609	0.276	60.2	0.100	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	19.351	0.193	100.3	0.048	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	15.338	0.102	150.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	19.611	0.269	72.9	0.067	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	19.442	0.098	198.4	0.050	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	48.798	0.195	250.2	0.162	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.000	37.137	0.528	70.3	0.045	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.16	69.953	0.100	0.0	0.0	2.7	1.69	67.2	16.2
S1.001	50.00	4.41	69.677	0.148	0.0	0.0	4.0	1.31	51.9	24.0
S1.002	50.00	4.65	69.484	0.148	0.0	0.0	4.0	1.06	42.3	24.0
S2.000	50.00	4.21	69.653	0.067	0.0	0.0	1.8	1.53	61.0	10.9
S1.003	50.00	4.94	69.307	0.265	0.0	0.0	7.2	1.11	78.6	43.1
S1.004	50.00	5.76	69.209	0.427	0.0	0.0	11.6	0.99	69.9	69.4
S3.000	50.00	4.40	70.100	0.045	0.0	0.0	1.2	1.56	62.1	7.3

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
S4.000	33.506	0.428	78.3	0.042	4.00	0.0	0.600	o	225	Pipe/Conduit	
S3.001	39.860	0.483	82.5	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	25.186	0.101	249.4	0.148	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.006	21.697	0.086	252.3	0.001	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.007	11.729	0.046	255.0	0.031	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.008	30.147	0.110	274.1	0.019	0.00	0.0	0.600	o	375	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)
S4.000	50.00	4.38	70.000	0.042	0.0	0.0	1.1	1.48	58.8	6.8
S3.001	50.00	4.86	69.572	0.111	0.0	0.0	3.0	1.44	57.3	18.0
S1.005	50.00	6.13	68.939	0.686	0.0	0.0	18.6	1.14	126.2	111.5
S1.006	50.00	6.45	68.838	0.687	0.0	0.0	18.6	1.14	125.5	111.6
S1.007	49.87	6.62	68.752	0.718	0.0	0.0	19.4	1.13	124.8	116.4
S1.008	48.48	7.08	68.706	0.737	0.0	0.0	19.4	1.09	120.3	116.4

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
S5.000	41.960	1.493	28.1	0.123	4.00	0.0	0.600	o	225	Pipe/Conduit	
S5.001	34.296	1.106	31.0	0.086	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.009	71.947	0.288	249.8	0.038	0.00	0.0	0.600	o	450	Pipe/Conduit	
S6.000	65.552	1.273	51.5	0.183	4.00	0.0	0.600	o	225	Pipe/Conduit	
S6.001	72.100	0.986	73.1	0.116	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.000	15.180	0.200	76.0	0.017	4.00	0.0	0.600	o	450	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)
S5.000	50.00	4.28	71.358	0.123	0.0	0.0	3.3	2.48	98.5	20.0
S5.001	50.00	4.52	69.865	0.209	0.0	0.0	5.7	2.36	93.8	34.0
S1.009	45.93	8.02	68.521	0.984	0.0	0.0	24.5	1.28	203.8	146.9
S6.000	50.00	4.60	71.862	0.183	0.0	0.0	5.0	1.83	72.6	29.7
S6.001	50.00	5.38	70.589	0.299	0.0	0.0	8.1	1.53	60.9	48.6
S7.000	50.00	4.11	68.433	0.017	0.0	0.0	0.5	2.33	371.2	2.8

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
S1.010	44.056	0.266	165.6	0.068	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.000	20.962	0.262	80.0	0.075	4.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	53.784	0.672	80.0	0.139	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.011	21.473	0.145	148.1	0.067	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.012	15.203	0.100	152.0	0.078	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.013	14.648	0.097	151.0	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.000	55.526	0.922	60.2	0.132	4.00	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)
S1.010	44.46	8.62	68.233	1.368	0.0	0.0	32.9	1.22	86.2«	197.7
S8.000	50.00	4.24	69.359	0.075	0.0	0.0	2.0	1.46	58.2	12.2
S8.001	50.00	4.85	69.097	0.214	0.0	0.0	5.8	1.46	58.2	34.8
S1.011	43.82	8.90	67.967	1.649	0.0	0.0	39.1	1.29	91.2«	234.8
S1.012	43.38	9.10	67.822	1.727	0.0	0.0	40.6	1.27	90.0«	243.5
S1.013	42.96	9.29	67.722	1.744	0.0	0.0	40.6	1.28	90.3«	243.5
S9.000	50.00	4.55	70.475	0.132	0.0	0.0	3.6	1.69	67.1	21.4

Reduced Flow of 6.0 l/s downstream of hydrobrake at manhole S16

Reduced Flow of 6.0 l/s downstream of hydrobrake at manhole

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
S9.001	6.563	0.179	36.7	0.005	0.00	0.0	0.600	o	225	Pipe/Conduit	
S10.000	26.995	0.321	84.1	0.063	4.00	0.0	0.600	o	225	Pipe/Conduit	
S10.001	6.500	0.080	81.3	0.005	0.00	0.0	0.600	o	225	Pipe/Conduit	
S9.002	43.825	0.664	66.0	0.116	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.003	57.759	1.088	53.1	0.153	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.000	22.315	0.372	60.0	0.033	4.00	0.0	0.600	o	225	Pipe/Conduit	
S11.001	7.379	0.107	69.0	0.003	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)
S9.001	50.00	4.60	69.553	0.137	0.0	0.0	3.7	2.17	86.2	22.3
S10.000	50.00	4.32	69.775	0.063	0.0	0.0	1.7	1.43	56.7	10.2
S10.001	50.00	4.39	69.454	0.068	0.0	0.0	1.8	1.45	57.7	11.0
S9.002	50.00	4.98	69.299	0.321	0.0	0.0	8.7	1.94	137.0	52.2
S9.003	50.00	5.42	68.635	0.474	0.0	0.0	12.8	2.16	152.9	77.0
S11.000	50.00	4.22	68.100	0.033	0.0	0.0	0.9	1.69	67.3	5.4
S11.001	50.00	4.30	67.728	0.036	0.0	0.0	1.0	1.58	62.7	5.8

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
S9.004	30.054	0.199	151.0	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.014	39.442	0.393	100.4	0.097	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.015	18.679	0.184	101.5	0.053	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.016	17.248	0.175	98.6	0.031	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.017	50.196	0.462	108.6	0.193	0.00	0.0	0.600	o	450	Pipe/Conduit	
S12.000	48.805	0.568	85.9	0.064	4.00	0.0	0.600	o	225	Pipe/Conduit	
S12.001	5.560	0.063	88.3	0.002	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)
S9.004	50.00	5.81	67.546	0.549	0.0	0.0	14.9	1.28	90.3	89.2
S1.014	42.28	9.61	67.197	2.390	0.0	0.0	54.7	2.03	322.8«	328.4
S1.015	41.96	9.77	66.804	2.443	0.0	0.0	55.5	2.02	320.9«	333.2
S1.016	41.68	9.91	66.620	2.474	0.0	0.0	55.9	2.05	325.7«	335.1
S1.017	40.85	10.34	66.445	2.667	0.0	0.0	59.0	1.95	310.1«	354.0
S12.000	50.00	4.58	67.071	0.064	0.0	0.0	1.7	1.41	56.1	10.4
S12.001	50.00	4.64	66.504	0.066	0.0	0.0	1.8	1.39	55.4	10.7

Reduced Flow of 6.0 l/s downstream of hydrobrake at manhole S16 plus additional flow of 178 l/s accumulated beyond S16- Adequate capacity

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
S13.000	34.117	0.724	47.1	0.042	4.00	0.0	0.600	o	225	Pipe/Conduit	
S12.002	5.963	0.058	102.8	0.002	0.00	0.0	0.600	o	225	Pipe/Conduit	
S14.000	50.234	0.586	85.7	0.093	4.00	0.0	0.600	o	225	Pipe/Conduit	
S12.003	35.053	0.175	200.3	0.021	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.018	18.638	0.093	200.4	0.002	0.00	0.0	0.600	o	600	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)
S13.000	50.00	4.30	67.165	0.042	0.0	0.0	1.1	1.91	76.0	6.8
S12.002	50.00	4.72	66.441	0.110	0.0	0.0	3.0	1.29	51.3	17.9
S14.000	50.00	4.59	66.969	0.093	0.0	0.0	2.5	1.41	56.2	15.1
S12.003	50.00	5.35	66.383	0.224	0.0	0.0	6.1	0.92	36.6	36.4
S1.018	40.51	10.52	65.833	2.893	0.0	0.0	63.5	1.72	485.3	380.8

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
S15.000	54.956	0.610	90.1	0.153	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.019	6.943	0.036	192.9	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.020	53.441	0.298	179.3	0.032	0.00	0.0	0.600	o	600	Pipe/Conduit	
S16.000	16.649	0.370	45.0	0.015	4.00	0.0	0.600	o	225	Pipe/Conduit	
S16.001	17.874	0.308	58.0	0.015	0.00	0.0	0.600	o	225	Pipe/Conduit	
S16.002	13.147	0.212	62.0	0.003	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)
S15.000	50.00	4.66	66.725	0.153	0.0	0.0	4.1	1.38	54.8	24.9
S1.019	40.38	10.58	65.740	3.046	0.0	0.0	66.6	1.75	494.8	399.8
S1.020	39.50	11.08	65.704	3.078	0.0	0.0	66.6	1.82	513.3	399.8
S16.000	50.00	4.14	66.675	0.015	0.0	0.0	0.4	1.96	77.7	2.4
S16.001	50.00	4.32	66.305	0.030	0.0	0.0	0.8	1.72	68.4	4.9
S16.002	50.00	4.45	65.997	0.033	0.0	0.0	0.9	1.66	66.1	5.4

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
S1.021	67.019	0.684	98.0	0.211	0.00	0.0	0.600	o	600	Pipe/Conduit	
S17.000	17.624	0.295	59.7	0.031	4.00	0.0	0.600	o	225	Pipe/Conduit	
S17.001	7.050	0.118	59.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S18.000	18.555	0.562	33.0	0.031	4.00	0.0	0.600	o	225	Pipe/Conduit	
S17.002	5.815	0.058	100.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.003	42.884	0.214	200.4	0.144	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.004	8.760	0.044	199.1	0.058	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.021	38.73	11.53	65.406	3.322	0.0	0.0	69.7	2.46	695.7	418.2
S17.000	50.00	4.17	69.025	0.031	0.0	0.0	0.8	1.70	67.4	5.0
S17.001	50.00	4.24	68.730	0.031	0.0	0.0	0.8	1.70	67.4	5.0
S18.000	50.00	4.14	69.175	0.031	0.0	0.0	0.8	2.28	90.8	5.0
S17.002	50.00	4.32	68.612	0.062	0.0	0.0	1.7	1.31	51.9	10.1
S17.003	50.00	5.09	68.554	0.206	0.0	0.0	5.6	0.92	36.6	33.5
S17.004	50.00	5.23	68.265	0.264	0.0	0.0	7.1	1.11	78.5	42.9

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
S17.005	58.718	0.236	248.8	0.107	0.00	0.0	0.600	o	300	Pipe/Conduit	
S19.000	62.278	0.715	87.1	0.147	4.00	0.0	0.600	o	225	Pipe/Conduit	
S17.006	38.832	0.331	117.3	0.049	0.00	0.0	0.600	o	300	Pipe/Conduit	
S20.000	14.705	0.204	72.1	0.036	4.00	0.0	0.600	o	225	Pipe/Conduit	
S20.001	35.899	0.342	105.0	0.034	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.007	51.903	0.309	168.0	0.128	0.00	0.0	0.600	o	375	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)
S17.005	50.00	6.21	68.221	0.371	0.0	0.0	10.0	0.99	70.1	60.3
S19.000	50.00	4.74	68.775	0.147	0.0	0.0	4.0	1.40	55.7	23.9
S17.006	49.76	6.66	67.985	0.567	0.0	0.0	15.3	1.45	102.5	91.7
S20.000	50.00	4.16	68.275	0.036	0.0	0.0	1.0	1.54	61.3	5.8
S20.001	50.00	4.63	68.071	0.070	0.0	0.0	1.9	1.28	50.7	11.4
S17.007	47.92	7.28	67.579	0.765	0.0	0.0	19.9	1.40	154.1	119.1

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
S17.008	13.005	0.112	116.1	0.011	0.00	0.0	0.600	o	375	Pipe/Conduit	
S21.000	8.002	0.167	47.9	0.024	4.00	0.0	0.600	o	225	Pipe/Conduit	
S17.009	63.800	0.532	120.0	0.127	0.00	0.0	0.600	o	375	Pipe/Conduit	
S17.010	11.713	0.097	121.0	0.008	0.00	0.0	0.600	o	375	Pipe/Conduit	
S17.011	30.282	0.304	99.6	0.029	0.00	0.0	0.600	o	375	Pipe/Conduit	
S22.000	16.272	0.198	82.2	0.048	4.00	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)
S17.008	47.56	7.41	67.270	0.776	0.0	0.0	20.0	1.68	185.6	119.9
S21.000	50.00	4.07	67.475	0.024	0.0	0.0	0.6	1.89	75.3	3.9
S17.009	45.86	8.05	67.158	0.927	0.0	0.0	23.0	1.65	182.6	138.1
S17.010	45.56	8.17	66.626	0.935	0.0	0.0	23.1	1.65	181.8	138.4
S17.011	44.88	8.45	66.530	0.964	0.0	0.0	23.4	1.82	200.5	140.6
S22.000	50.00	4.19	66.575	0.048	0.0	0.0	1.3	1.44	57.4	7.8

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
S17.012	57.205	0.520	110.0	0.094	0.00	0.0	0.600	o	375	Pipe/Conduit	
S17.013	29.500	0.132	223.5	0.075	0.00	0.0	0.600	o	450	Pipe/Conduit	
S23.000	9.965	0.038	262.2	0.110	4.00	0.0	0.600	o	450	Pipe/Conduit	
S17.014	61.960	0.251	246.9	0.150	0.00	0.0	0.600	o	300	Pipe/Conduit	
S17.015	38.803	0.158	245.6	0.133	0.00	0.0	0.600	o	300	Pipe/Conduit	
S24.000	12.747	0.042	303.5	0.018	4.00	0.0	0.600	o	600	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)
S17.012	43.60	9.00	66.226	1.106	0.0	0.0	26.1	1.73	190.7	156.7
S17.013	42.81	9.36	65.631	1.181	0.0	0.0	27.4	1.36	215.6	164.3
S23.000	50.00	4.13	65.538	0.110	0.0	0.0	3.0	1.25	198.9	17.9
S17.014	40.73	10.40	65.500	1.441	0.0	0.0	31.8	1.00	70.4«	190.8
S17.015	39.56	11.05	65.249	1.574	0.0	0.0	33.7	1.00	70.6«	202.3
S24.000	50.00	4.15	64.834	0.018	0.0	0.0	0.5	1.39	393.7	2.9

Reduced Flow of 20.0 l/s downstream of hydrobrake at manhole S4-3

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
S17.016	40.618	0.074	548.9	0.036	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.022	87.947	0.160	549.7	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.023	90.045	0.164	549.1	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.024	57.211	0.109	524.9	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S25.000	9.436	0.016	600.0	0.000	4.00	0.0	0.600	o	600	Pipe/Conduit	
S1.025	53.352	0.144	370.5	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.026	4.285	0.008	535.6	0.000	0.00	0.0	0.600	o	600	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)
S17.016	38.45	11.70	64.791	1.628	0.0	0.0	33.9	1.03	291.9	203.4
S1.022	36.29	13.12	64.717	4.950	0.0	0.0	97.3	1.03	291.7«	583.8
S1.023	34.38	14.58	64.557	4.950	0.0	0.0	97.3	1.03	291.8«	583.8
S1.024	33.31	15.48	64.393	4.950	0.0	0.0	97.3	1.06	298.6«	583.8
S25.000	50.00	4.16	64.300	0.000	0.0	0.0	0.0	0.99	279.0	0.0
S1.025	32.52	16.19	64.284	4.950	0.0	0.0	97.3	1.26	356.0«	583.8
S1.026	32.45	16.25	64.140	4.950	0.0	0.0	97.3	1.05	295.5«	583.8

Reduced Flow of 26.0 l/s downstream of hydrobrake at manhole S4

Reduced Flow of 25.5 l/s downstream of hydrobrake at manhole S1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S26	71.560	1.607	Open Manhole	1200	S1.000	69.953	225				
S25	71.418	1.741	Open Manhole	1200	S1.001	69.677	225	S1.000	69.677	225	
S24	71.442	1.958	Open Manhole	1200	S1.002	69.484	225	S1.001	69.484	225	
S23-1	71.099	1.446	Open Manhole	1200	S2.000	69.653	225				
S23	71.102	1.795	Open Manhole	1200	S1.003	69.307	300	S1.002	69.382	225	
								S2.000	69.384	225	2
S22	71.476	2.267	Open Manhole	1200	S1.004	69.209	300	S1.003	69.209	300	
S21-2	71.521	1.421	Open Manhole	1200	S3.000	70.100	225				
S21-1-1	71.505	1.505	Open Manhole	1200	S4.000	70.000	225				
S21-1	70.534	0.962	Open Manhole	1200	S3.001	69.572	225	S3.000	69.572	225	
								S4.000	69.572	225	
S21	71.563	2.624	Open Manhole	1350	S1.005	68.939	375	S1.004	69.014	300	
								S3.001	69.089	225	
S20	71.282	2.444	Open Manhole	1350	S1.006	68.838	375	S1.005	68.838	375	
S19	71.049	2.297	Open Manhole	1350	S1.007	68.752	375	S1.006	68.752	375	
S18	70.979	2.273	Open Manhole	1350	S1.008	68.706	375	S1.007	68.706	375	
S17-2	72.951	1.593	Open Manhole	1200	S5.000	71.358	225				
S17-1	71.343	1.478	Open Manhole	1200	S5.001	69.865	225	S5.000	69.865	225	
S17	71.107	2.586	Open Manhole	1350	S1.009	68.521	450	S1.008	68.596	375	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
								S5.001	68.759	225	13
S16-2	73.192	1.330	Open Manhole	1200	S6.000	71.862	225				
S16-1	72.058	1.469	Open Manhole	1200	S6.001	70.589	225	S6.000	70.589	225	
S19	70.770	2.337	Open Manhole	1350	S7.000	68.433	450				
S16	70.663	2.430	Open Manhole	1350	S1.010	68.233	300	S1.009	68.233	450	
								S6.001	69.603	225	1295
								S7.000	68.233	450	
S15-2	70.787	1.428	Open Manhole	1200	S8.000	69.359	225				
S15-1	70.562	1.465	Open Manhole	1200	S8.001	69.097	225	S8.000	69.097	225	
S15	70.118	2.151	Open Manhole	1200	S1.011	67.967	300	S1.010	67.967	300	
								S8.001	68.425	225	383
S14	69.928	2.106	Open Manhole	1200	S1.012	67.822	300	S1.011	67.822	300	
S13	69.780	2.058	Open Manhole	1200	S1.013	67.722	300	S1.012	67.722	300	
S12-5	71.962	1.487	Open Manhole	1200	S9.000	70.475	225				
S12-4	71.075	1.522	Open Manhole	1200	S9.001	69.553	225	S9.000	69.553	225	
S12-3-2	71.283	1.508	Open Manhole	1200	S10.000	69.775	225				
S12-3-1	71.083	1.629	Open Manhole	1200	S10.001	69.454	225	S10.000	69.454	225	
S12-3	70.001	0.702	Open Manhole	1200	S9.002	69.299	300	S9.001	69.374	225	
								S10.001	69.374	225	

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)
S12-2	70.243	1.608	Open Manhole	1200	S9.003	68.635	300	S9.002	68.635	300	
S12-1-2	69.560	1.460	Open Manhole	1200	S11.000	68.100	225				
S12-1-1	69.499	1.771	Open Manhole	1200	S11.001	67.728	225	S11.000	67.728	225	
S12-1	69.414	1.868	Open Manhole	1200	S9.004	67.546	300	S9.003	67.547	300	1
								S11.001	67.621	225	
S12	69.635	2.438	Open Manhole	1350	S1.014	67.197	450	S1.013	67.625	300	278
								S9.004	67.347	300	
S11	69.238	2.434	Open Manhole	1350	S1.015	66.804	450	S1.014	66.804	450	
S10	69.042	2.422	Open Manhole	1350	S1.016	66.620	450	S1.015	66.620	450	
S9	68.866	2.421	Open Manhole	1350	S1.017	66.445	450	S1.016	66.445	450	
S8-4	68.180	1.109	Open Manhole	1200	S12.000	67.071	225				
S8-3	68.351	1.848	Open Manhole	1200	S12.001	66.504	225	S12.000	66.503	225	
S8-2-1	68.533	1.368	Open Manhole	1200	S13.000	67.165	225				
S8-2	68.423	1.982	Open Manhole	1200	S12.002	66.441	225	S12.001	66.441	225	
								S13.000	66.441	225	
S8-1-1	68.240	1.271	Open Manhole	1200	S14.000	66.969	225				
S8-1	68.530	2.147	Open Manhole	1200	S12.003	66.383	225	S12.002	66.383	225	
								S14.000	66.383	225	
S8	68.507	2.674	Open Manhole	1500	S1.018	65.833	600	S1.017	65.983	450	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
								S12.003	66.208	225	
S7-1	68.429	1.704	Open Manhole	1200	S15.000	66.725	225				
S7	68.280	2.540	Open Manhole	1500	S1.019	65.740	600	S1.018	65.740	600	
								S15.000	66.115	225	
S6	68.194	2.490	Open Manhole	1500	S1.020	65.704	600	S1.019	65.704	600	
S5-3	68.139	1.464	Open Manhole	1200	S16.000	66.675	225				
S5-2	67.948	1.643	Open Manhole	1200	S16.001	66.305	225	S16.000	66.305	225	
S5-1	67.756	1.759	Open Manhole	1200	S16.002	65.997	225	S16.001	65.997	225	
S5	67.616	2.210	Open Manhole	1500	S1.021	65.406	600	S1.020	65.406	600	
								S16.002	65.785	225	4
S4-17	70.449	1.424	Open Manhole	1200	S17.000	69.025	225				
S4-16	70.481	1.751	Open Manhole	1200	S17.001	68.730	225	S17.000	68.730	225	
S4-15-1	70.627	1.452	Open Manhole	1200	S18.000	69.175	225				
S4-15	70.443	1.831	Open Manhole	1200	S17.002	68.612	225	S17.001	68.612	225	
								S18.000	68.613	225	1
S4-14	70.377	1.823	Open Manhole	1200	S17.003	68.554	225	S17.002	68.554	225	
S4-13	69.943	1.678	Open Manhole	1200	S17.004	68.265	300	S17.003	68.340	225	
S4-12	69.844	1.623	Open Manhole	1200	S17.005	68.221	300	S17.004	68.221	300	
S4-11-1	70.413	1.638	Open Manhole	1200	S19.000	68.775	225				

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S4-11	69.677	1.692	Open Manhole	1200	S17.006	67.985	300	S17.005	67.985	300	
								S19.000	68.060	225	
S4-10-2	69.781	1.506	Open Manhole	1200	S20.000	68.275	225				
S4-10-1	69.850	1.779	Open Manhole	1200	S20.001	68.071	225	S20.000	68.071	225	
S4-10	69.572	1.993	Open Manhole	1350	S17.007	67.579	375	S17.006	67.654	300	
								S20.001	67.729	225	
S4-9	68.948	1.678	Open Manhole	1350	S17.008	67.270	375	S17.007	67.270	375	
S4-8-1	68.929	1.454	Open Manhole	1200	S21.000	67.475	225				
S4-8	68.698	1.540	Open Manhole	1350	S17.009	67.158	375	S17.008	67.158	375	
								S21.000	67.308	225	
S4-7	68.245	1.619	Open Manhole	1350	S17.010	66.626	375	S17.009	66.626	375	
S4-6	68.185	1.655	Open Manhole	1350	S17.011	66.530	375	S17.010	66.530	375	
S4-5-1	68.033	1.458	Open Manhole	1200	S22.000	66.575	225				
S4-5	68.101	1.875	Open Manhole	1350	S17.012	66.226	375	S17.011	66.226	375	
								S22.000	66.377	225	1
S4-4	66.493	0.862	Open Manhole	1350	S17.013	65.631	450	S17.012	65.706	375	
S73	66.650	1.112	Open Manhole	1350	S23.000	65.538	450				
S4-3	66.661	1.162	Open Manhole	1350	S17.014	65.500	300	S17.013	65.499	450	
								S23.000	65.500	450	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S4-2	67.194	1.945	Open Manhole	1200	S17.015	65.249	300	S17.014	65.249	300	
S75	66.700	1.866	Open Manhole	1500	S24.000	64.834	600				
S4-1	66.675	1.884	Open Manhole	1500	S17.016	64.791	600	S17.015	65.091	300	
								S24.000	64.792	600	1
S4	66.708	1.991	Open Manhole	1500	S1.022	64.717	600	S1.021	64.722	600	5
								S17.016	64.717	600	
S3	65.648	1.091	Open Manhole	1500	S1.023	64.557	600	S1.022	64.557	600	
S2	66.608	2.215	Open Manhole	1500	S1.024	64.393	600	S1.023	64.393	600	
S81	65.000	0.700	Open Manhole	1500	S25.000	64.300	600				
S1	65.275	0.991	Open Manhole	1500	S1.025	64.284	600	S1.024	64.284	600	
								S25.000	64.284	600	
S0	65.231	1.091	Open Manhole	1500	S1.026	64.140	600	S1.025	64.140	600	
S	65.040	0.908	Open Manhole	0		OUTFALL		S1.026	64.132	600	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S26	634507.618	723207.062	634507.618	723207.062	Required	
S25	634524.241	723207.151	634524.241	723207.151	Required	
S24	634526.066	723187.876	634526.066	723187.876	Required	
S23-1	634514.253	723162.674	634514.253	723162.674	Required	
S23	634530.813	723173.318	634530.813	723173.318	Required	
S22	634549.763	723177.661	634549.763	723177.661	Required	
S21-2	634562.967	723140.189	634562.967	723140.189	Required	
S21-1-1	634633.608	723139.830	634633.608	723139.830	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S21-1	634600.105	723140.176	634600.105	723140.176	Required	
S21	634598.505	723180.004	634598.505	723180.004	Required	
S20	634623.639	723181.623	634623.639	723181.623	Required	
S19	634643.442	723190.489	634643.442	723190.489	Required	
S18	634653.017	723197.263	634653.017	723197.263	Required	
S17-2	634678.532	723096.415	634678.532	723096.415	Required	
S17-1	634673.932	723138.122	634673.932	723138.122	Required	
S17	634669.707	723172.157	634669.707	723172.157	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S16-2	634685.965	723092.235	634685.965	723092.235	Required	
S16-1	634748.946	723110.416	634748.946	723110.416	Required	
S19	634729.116	723172.587	634729.116	723172.587	Required	
S16	634740.968	723182.073	634740.968	723182.073	Required	
S15-2	634664.288	723207.516	634664.288	723207.516	Required	
S15-1	634683.253	723216.445	634683.253	723216.445	Required	
S15	634736.204	723225.871	634736.204	723225.871	Required	
S14	634757.227	723230.246	634757.227	723230.246	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S13	634770.435	723237.774	634770.435	723237.774	Required	
S12-5	634760.026	723111.973	634760.026	723111.973	Required	
S12-4	634814.160	723124.328	634814.160	723124.328	Required	
S12-3-2	634850.552	723132.658	634850.552	723132.658	Required	
S12-3-1	634824.044	723127.550	634824.044	723127.550	Required	
S12-3	634817.914	723129.712	634817.914	723129.712	Required	
S12-2	634812.486	723173.200	634812.486	723173.200	Required	
S12-1-2	634832.845	723238.835	634832.845	723238.835	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S12-1-1	634810.734	723235.821	634810.734	723235.821	Required	
S12-1	634805.577	723230.544	634805.577	723230.544	Required	
S12	634781.032	723247.887	634781.032	723247.887	Required	
S11	634800.109	723282.409	634800.109	723282.409	Required	
S10	634813.311	723295.622	634813.311	723295.622	Required	
S9	634828.752	723303.309	634828.752	723303.309	Required	
S8-4	634938.626	723285.144	634938.626	723285.144	Required	
S8-3	634891.014	723274.420	634891.014	723274.420	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S8-2-1	634854.010	723267.994	634854.010	723267.994	Required	
S8-2	634886.662	723277.881	634886.662	723277.881	Required	
S8-1-1	634936.326	723295.124	634936.326	723295.124	Required	
S8-1	634887.385	723283.799	634887.385	723283.799	Required	
S8	634876.968	723317.269	634876.968	723317.269	Required	
S7-1	634948.566	723334.256	634948.566	723334.256	Required	
S7	634895.037	723321.836	634895.037	723321.836	Required	
S6	634893.825	723328.672	634893.825	723328.672	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S5-3	634938.017	723348.411	634938.017	723348.411	Required	
S5-2	634930.918	723363.471	634930.918	723363.471	Required	
S5-1	634917.944	723375.765	634917.944	723375.765	Required	
S5	634905.782	723380.758	634905.782	723380.758	Required	
S4-17	634608.030	723225.091	634608.030	723225.091	Required	
S4-16	634625.630	723226.014	634625.630	723226.014	Required	
S4-15-1	634644.221	723217.866	634644.221	723217.866	Required	
S4-15	634630.860	723230.741	634630.860	723230.741	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S4-14	634628.171	723235.896	634628.171	723235.896	Required	
S4-13	634627.175	723278.769	634627.175	723278.769	Required	
S4-12	634633.021	723285.294	634633.021	723285.294	Required	
S4-11-1	634699.071	723235.205	634699.071	723235.205	Required	
S4-11	634690.580	723296.901	634690.580	723296.901	Required	
S4-10-2	634748.409	723271.503	634748.409	723271.503	Required	
S4-10-1	634733.939	723268.887	634733.939	723268.887	Required	
S4-10	634728.682	723304.399	634728.682	723304.399	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S4-9	634779.521	723314.855	634779.521	723314.855	Required	
S4-8-1	634793.370	723303.420	634793.370	723303.420	Required	
S4-8	634792.033	723311.309	634792.033	723311.309	Required	
S4-7	634804.820	723373.815	634804.820	723373.815	Required	
S4-6	634797.211	723382.720	634797.211	723382.720	Required	
S4-5-1	634751.539	723391.844	634751.539	723391.844	Required	
S4-5	634767.553	723388.655	634767.553	723388.655	Required	
S4-4	634777.343	723445.080	634777.343	723445.080	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S73	634774.252	723468.556	634774.252	723468.556	Required	
S4-3	634782.493	723474.128	634782.493	723474.128	Required	
S4-2	634843.362	723462.410	634843.362	723462.410	Required	
S75	634871.534	723446.676	634871.534	723446.676	Required	
S4-1	634881.376	723454.724	634881.376	723454.724	Required	
S4	634921.028	723445.998	634921.028	723445.998	Required	
S3	634936.029	723532.698	634936.029	723532.698	Required	
S2	634950.615	723621.536	634950.615	723621.536	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S81	634972.983	723666.486	634972.983	723666.486	Required	
S1	634970.112	723675.339	634970.112	723675.339	Required	
S0	634988.245	723725.381	634988.245	723725.381	Required	
S	634989.492	723729.595			No Entry	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	S26	71.560	69.953	1.382	Open Manhole	1200
S1.001	o	225	S25	71.418	69.677	1.516	Open Manhole	1200
S1.002	o	225	S24	71.442	69.484	1.733	Open Manhole	1200
S2.000	o	225	S23-1	71.099	69.653	1.221	Open Manhole	1200
S1.003	o	300	S23	71.102	69.307	1.495	Open Manhole	1200
S1.004	o	300	S22	71.476	69.209	1.967	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	16.609	60.2	S25	71.418	69.677	1.516	Open Manhole	1200
S1.001	19.351	100.3	S24	71.442	69.484	1.733	Open Manhole	1200
S1.002	15.338	150.4	S23	71.102	69.382	1.495	Open Manhole	1200
S2.000	19.611	72.9	S23	71.102	69.384	1.493	Open Manhole	1200
S1.003	19.442	198.4	S22	71.476	69.209	1.967	Open Manhole	1200
S1.004	48.798	250.2	S21	71.563	69.014	2.249	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.000	o	225	S21-2	71.521	70.100	1.196	Open Manhole	1200
S4.000	o	225	S21-1-1	71.505	70.000	1.280	Open Manhole	1200
S3.001	o	225	S21-1	70.534	69.572	0.737	Open Manhole	1200
S1.005	o	375	S21	71.563	68.939	2.249	Open Manhole	1350
S1.006	o	375	S20	71.282	68.838	2.069	Open Manhole	1350
S1.007	o	375	S19	71.049	68.752	1.922	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.000	37.137	70.3	S21-1	70.534	69.572	0.737	Open Manhole	1200
S4.000	33.506	78.3	S21-1	70.534	69.572	0.737	Open Manhole	1200
S3.001	39.860	82.5	S21	71.563	69.089	2.249	Open Manhole	1350
S1.005	25.186	249.4	S20	71.282	68.838	2.069	Open Manhole	1350
S1.006	21.697	252.3	S19	71.049	68.752	1.922	Open Manhole	1350
S1.007	11.729	255.0	S18	70.979	68.706	1.898	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.008	o	375	S18	70.979	68.706	1.898	Open Manhole	1350
S5.000	o	225	S17-2	72.951	71.358	1.368	Open Manhole	1200
S5.001	o	225	S17-1	71.343	69.865	1.253	Open Manhole	1200
S1.009	o	450	S17	71.107	68.521	2.136	Open Manhole	1350
S6.000	o	225	S16-2	73.192	71.862	1.105	Open Manhole	1200
S6.001	o	225	S16-1	72.058	70.589	1.244	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.008	30.147	274.1	S17	71.107	68.596	2.136	Open Manhole	1350
S5.000	41.960	28.1	S17-1	71.343	69.865	1.253	Open Manhole	1200
S5.001	34.296	31.0	S17	71.107	68.759	2.123	Open Manhole	1350
S1.009	71.947	249.8	S16	70.663	68.233	1.980	Open Manhole	1350
S6.000	65.552	51.5	S16-1	72.058	70.589	1.244	Open Manhole	1200
S6.001	72.100	73.1	S16	70.663	69.603	0.835	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S7.000	o	450	S19	70.770	68.433	1.887	Open Manhole	1350
S1.010	o	300	S16	70.663	68.233	2.130	Open Manhole	1350
S8.000	o	225	S15-2	70.787	69.359	1.203	Open Manhole	1200
S8.001	o	225	S15-1	70.562	69.097	1.240	Open Manhole	1200
S1.011	o	300	S15	70.118	67.967	1.851	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S7.000	15.180	76.0	S16	70.663	68.233	1.980	Open Manhole	1350
S1.010	44.056	165.6	S15	70.118	67.967	1.851	Open Manhole	1200
S8.000	20.962	80.0	S15-1	70.562	69.097	1.240	Open Manhole	1200
S8.001	53.784	80.0	S15	70.118	68.425	1.468	Open Manhole	1200
S1.011	21.473	148.1	S14	69.928	67.822	1.806	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.012	o	300	S14	69.928	67.822	1.806	Open Manhole	1200
S1.013	o	300	S13	69.780	67.722	1.758	Open Manhole	1200
S9.000	o	225	S12-5	71.962	70.475	1.262	Open Manhole	1200
S9.001	o	225	S12-4	71.075	69.553	1.297	Open Manhole	1200
S10.000	o	225	S12-3-2	71.283	69.775	1.283	Open Manhole	1200
S10.001	o	225	S12-3-1	71.083	69.454	1.404	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.012	15.203	152.0	S13	69.780	67.722	1.758	Open Manhole	1200
S1.013	14.648	151.0	S12	69.635	67.625	1.710	Open Manhole	1350
S9.000	55.526	60.2	S12-4	71.075	69.553	1.297	Open Manhole	1200
S9.001	6.563	36.7	S12-3	70.001	69.374	0.402	Open Manhole	1200
S10.000	26.995	84.1	S12-3-1	71.083	69.454	1.404	Open Manhole	1200
S10.001	6.500	81.3	S12-3	70.001	69.374	0.402	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S9.002	o	300	S12-3	70.001	69.299	0.402	Open Manhole	1200
S9.003	o	300	S12-2	70.243	68.635	1.308	Open Manhole	1200
S11.000	o	225	S12-1-2	69.560	68.100	1.235	Open Manhole	1200
S11.001	o	225	S12-1-1	69.499	67.728	1.546	Open Manhole	1200
S9.004	o	300	S12-1	69.414	67.546	1.568	Open Manhole	1200
S1.014	o	450	S12	69.635	67.197	1.988	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S9.002	43.825	66.0	S12-2	70.243	68.635	1.308	Open Manhole	1200
S9.003	57.759	53.1	S12-1	69.414	67.547	1.567	Open Manhole	1200
S11.000	22.315	60.0	S12-1-1	69.499	67.728	1.546	Open Manhole	1200
S11.001	7.379	69.0	S12-1	69.414	67.621	1.568	Open Manhole	1200
S9.004	30.054	151.0	S12	69.635	67.347	1.988	Open Manhole	1350
S1.014	39.442	100.4	S11	69.238	66.804	1.984	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.015	o	450	S11	69.238	66.804	1.984	Open Manhole	1350
S1.016	o	450	S10	69.042	66.620	1.972	Open Manhole	1350
S1.017	o	450	S9	68.866	66.445	1.971	Open Manhole	1350
S12.000	o	225	S8-4	68.180	67.071	0.884	Open Manhole	1200
S12.001	o	225	S8-3	68.351	66.504	1.622	Open Manhole	1200
S13.000	o	225	S8-2-1	68.533	67.165	1.143	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.015	18.679	101.5	S10	69.042	66.620	1.972	Open Manhole	1350
S1.016	17.248	98.6	S9	68.866	66.445	1.971	Open Manhole	1350
S1.017	50.196	108.6	S8	68.507	65.983	2.074	Open Manhole	1500
S12.000	48.805	85.9	S8-3	68.351	66.503	1.623	Open Manhole	1200
S12.001	5.560	88.3	S8-2	68.423	66.441	1.757	Open Manhole	1200
S13.000	34.117	47.1	S8-2	68.423	66.441	1.757	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S12.002	o	225	S8-2	68.423	66.441	1.757	Open Manhole	1200
S14.000	o	225	S8-1-1	68.240	66.969	1.046	Open Manhole	1200
S12.003	o	225	S8-1	68.530	66.383	1.922	Open Manhole	1200
S1.018	o	600	S8	68.507	65.833	2.074	Open Manhole	1500
S15.000	o	225	S7-1	68.429	66.725	1.479	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S12.002	5.963	102.8	S8-1	68.530	66.383	1.922	Open Manhole	1200
S14.000	50.234	85.7	S8-1	68.530	66.383	1.922	Open Manhole	1200
S12.003	35.053	200.3	S8	68.507	66.208	2.074	Open Manhole	1500
S1.018	18.638	200.4	S7	68.280	65.740	1.940	Open Manhole	1500
S15.000	54.956	90.1	S7	68.280	66.115	1.940	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.019	o	600	S7	68.280	65.740	1.940	Open Manhole	1500
S1.020	o	600	S6	68.194	65.704	1.890	Open Manhole	1500
S16.000	o	225	S5-3	68.139	66.675	1.239	Open Manhole	1200
S16.001	o	225	S5-2	67.948	66.305	1.418	Open Manhole	1200
S16.002	o	225	S5-1	67.756	65.997	1.534	Open Manhole	1200
S1.021	o	600	S5	67.616	65.406	1.610	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.019	6.943	192.9	S6	68.194	65.704	1.890	Open Manhole	1500
S1.020	53.441	179.3	S5	67.616	65.406	1.610	Open Manhole	1500
S16.000	16.649	45.0	S5-2	67.948	66.305	1.418	Open Manhole	1200
S16.001	17.874	58.0	S5-1	67.756	65.997	1.534	Open Manhole	1200
S16.002	13.147	62.0	S5	67.616	65.785	1.606	Open Manhole	1500
S1.021	67.019	98.0	S4	66.708	64.722	1.386	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S17.000	o	225	S4-17	70.449	69.025	1.199	Open Manhole	1200
S17.001	o	225	S4-16	70.481	68.730	1.526	Open Manhole	1200
S18.000	o	225	S4-15-1	70.627	69.175	1.227	Open Manhole	1200
S17.002	o	225	S4-15	70.443	68.612	1.606	Open Manhole	1200
S17.003	o	225	S4-14	70.377	68.554	1.598	Open Manhole	1200
S17.004	o	300	S4-13	69.943	68.265	1.378	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S17.000	17.624	59.7	S4-16	70.481	68.730	1.526	Open Manhole	1200
S17.001	7.050	59.7	S4-15	70.443	68.612	1.606	Open Manhole	1200
S18.000	18.555	33.0	S4-15	70.443	68.613	1.605	Open Manhole	1200
S17.002	5.815	100.3	S4-14	70.377	68.554	1.598	Open Manhole	1200
S17.003	42.884	200.4	S4-13	69.943	68.340	1.378	Open Manhole	1200
S17.004	8.760	199.1	S4-12	69.844	68.221	1.323	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S17.005	o	300	S4-12	69.844	68.221	1.323	Open Manhole	1200
S19.000	o	225	S4-11-1	70.413	68.775	1.413	Open Manhole	1200
S17.006	o	300	S4-11	69.677	67.985	1.392	Open Manhole	1200
S20.000	o	225	S4-10-2	69.781	68.275	1.281	Open Manhole	1200
S20.001	o	225	S4-10-1	69.850	68.071	1.554	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S17.005	58.718	248.8	S4-11	69.677	67.985	1.392	Open Manhole	1200
S19.000	62.278	87.1	S4-11	69.677	68.060	1.392	Open Manhole	1200
S17.006	38.832	117.3	S4-10	69.572	67.654	1.618	Open Manhole	1350
S20.000	14.705	72.1	S4-10-1	69.850	68.071	1.554	Open Manhole	1200
S20.001	35.899	105.0	S4-10	69.572	67.729	1.618	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S17.007	o	375	S4-10	69.572	67.579	1.618	Open Manhole	1350
S17.008	o	375	S4-9	68.948	67.270	1.303	Open Manhole	1350
S21.000	o	225	S4-8-1	68.929	67.475	1.229	Open Manhole	1200
S17.009	o	375	S4-8	68.698	67.158	1.165	Open Manhole	1350
S17.010	o	375	S4-7	68.245	66.626	1.244	Open Manhole	1350
S17.011	o	375	S4-6	68.185	66.530	1.280	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S17.007	51.903	168.0	S4-9	68.948	67.270	1.303	Open Manhole	1350
S17.008	13.005	116.1	S4-8	68.698	67.158	1.165	Open Manhole	1350
S21.000	8.002	47.9	S4-8	68.698	67.308	1.165	Open Manhole	1350
S17.009	63.800	120.0	S4-7	68.245	66.626	1.244	Open Manhole	1350
S17.010	11.713	121.0	S4-6	68.185	66.530	1.280	Open Manhole	1350
S17.011	30.282	99.6	S4-5	68.101	66.226	1.500	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S22.000	o	225	S4-5-1	68.033	66.575	1.233	Open Manhole	1200
S17.012	o	375	S4-5	68.101	66.226	1.500	Open Manhole	1350
S17.013	o	450	S4-4	66.493	65.631	0.412	Open Manhole	1350
S23.000	o	450	S73	66.650	65.538	0.662	Open Manhole	1350
S17.014	o	300	S4-3	66.661	65.500	0.861	Open Manhole	1350
S17.015	o	300	S4-2	67.194	65.249	1.645	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S22.000	16.272	82.2	S4-5	68.101	66.377	1.499	Open Manhole	1350
S17.012	57.205	110.0	S4-4	66.493	65.706	0.412	Open Manhole	1350
S17.013	29.500	223.5	S4-3	66.661	65.499	0.712	Open Manhole	1350
S23.000	9.965	262.2	S4-3	66.661	65.500	0.711	Open Manhole	1350
S17.014	61.960	246.9	S4-2	67.194	65.249	1.645	Open Manhole	1200
S17.015	38.803	245.6	S4-1	66.675	65.091	1.284	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S24.000	o	600	S75	66.700	64.834	1.266	Open Manhole	1500
S17.016	o	600	S4-1	66.675	64.791	1.284	Open Manhole	1500
S1.022	o	600	S4	66.708	64.717	1.391	Open Manhole	1500
S1.023	o	600	S3	65.648	64.557	0.491	Open Manhole	1500
S1.024	o	600	S2	66.608	64.393	1.615	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S24.000	12.747	303.5	S4-1	66.675	64.792	1.283	Open Manhole	1500
S17.016	40.618	548.9	S4	66.708	64.717	1.391	Open Manhole	1500
S1.022	87.947	549.7	S3	65.648	64.557	0.491	Open Manhole	1500
S1.023	90.045	549.1	S2	66.608	64.393	1.615	Open Manhole	1500
S1.024	57.211	524.9	S1	65.275	64.284	0.391	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S25.000	o	600	S81	65.000	64.300	0.100	Open Manhole	1500
S1.025	o	600	S1	65.275	64.284	0.391	Open Manhole	1500
S1.026	o	600	S0	65.231	64.140	0.491	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S25.000	9.436	600.0	S1	65.275	64.284	0.391	Open Manhole	1500
S1.025	53.352	370.5	S0	65.231	64.140	0.491	Open Manhole	1500
S1.026	4.285	535.6	S	65.040	64.132	0.308	Open Manhole	0

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)
S1.026	S	65.040	64.132	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	20.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	4	Number of Storage Structures	4	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	14.700	Cv (Summer)	0.750
Return Period (years)	5	Ratio R	0.281	Cv (Winter)	0.840
Region	Scotland and Ireland	Profile Type	Summer	Storm Duration (mins)	30

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S16, DS/PN: S1.010, Volume (m³): 19.7

Unit Reference	MD-SHE-0088-6000-3500-6000	Sump Available	Yes
Design Head (m)	3.500	Diameter (mm)	88
Design Flow (l/s)	6.0	Invert Level (m)	68.233
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	3.500	6.0	Kick-Flo®	0.788	3.0
Flush-Flo™	0.380	3.8	Mean Flow over Head Range	-	4.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.7	0.600	3.6	1.600	4.2	2.600	5.2	5.000	7.1	7.500	8.6
0.200	3.5	0.800	3.0	1.800	4.4	3.000	5.6	5.500	7.4	8.000	8.9
0.300	3.7	1.000	3.3	2.000	4.6	3.500	6.0	6.000	7.7	8.500	9.1
0.400	3.8	1.200	3.6	2.200	4.8	4.000	6.4	6.500	8.0	9.000	9.4
0.500	3.7	1.400	3.9	2.400	5.0	4.500	6.7	7.000	8.3	9.500	9.6

Hydro-Brake® Optimum Manhole: S4-3, DS/PN: S17.014, Volume (m³): 7.5

Unit Reference	MD-SHE-0197-2000-1100-2000	Sump Available	Yes
Design Head (m)	1.100	Diameter (mm)	197
Design Flow (l/s)	20.0	Invert Level (m)	65.500
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1500
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	20.0	Kick-Flo®	0.773	16.9
Flush-Flo™	0.356	20.0	Mean Flow over Head Range	-	17.0

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.8	0.600	19.2	1.600	23.9	2.600	30.2	5.000	41.4	7.500	50.3
0.200	18.5	0.800	17.2	1.800	25.3	3.000	32.3	5.500	43.3	8.000	51.9
0.300	19.9	1.000	19.1	2.000	26.6	3.500	34.8	6.000	45.2	8.500	53.5
0.400	19.9	1.200	20.8	2.200	27.8	4.000	37.1	6.500	47.0	9.000	55.0
0.500	19.6	1.400	22.4	2.400	29.0	4.500	39.3	7.000	48.7	9.500	56.5

Hydro-Brake® Optimum Manhole: S4, DS/PN: S1.022, Volume (m³): 33.1

Unit Reference	MD-SHE-0211-2600-1783-2600	Flush-Flo™	Calculated
Design Head (m)	1.783	Objective	Minimise upstream storage
Design Flow (l/s)	26.0	Application	Surface

Hydro-Brake® Optimum Manhole: S4, DS/PN: S1.022, Volume (m³): 33.1

Sump Available	Yes	Minimum Outlet Pipe Diameter (mm)	225
Diameter (mm)	211	Suggested Manhole Diameter (mm)	1800
Invert Level (m)	64.717		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.783	26.0	Kick-Flo®	1.143	21.0
Flush-Flo™	0.528	25.9	Mean Flow over Head Range	-	22.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.2	0.600	25.8	1.600	24.7	2.600	31.1	5.000	42.6	7.500	51.9
0.200	20.5	0.800	25.1	1.800	26.1	3.000	33.3	5.500	44.6	8.000	53.5
0.300	24.5	1.000	23.6	2.000	27.4	3.500	35.9	6.000	46.6	8.500	55.1
0.400	25.5	1.200	21.5	2.200	28.7	4.000	38.3	6.500	48.4	9.000	56.7
0.500	25.8	1.400	23.1	2.400	29.9	4.500	40.5	7.000	50.2	9.500	58.2

Hydro-Brake® Optimum Manhole: S1, DS/PN: S1.025, Volume (m³): 19.7

Unit Reference	MD-SHE-0224-2550-0700-2550	Sump Available	Yes
Design Head (m)	0.700	Diameter (mm)	224
Design Flow (l/s)	25.5	Invert Level (m)	64.284
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	300
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1500
Application	Surface		

Hydro-Brake® Optimum Manhole: S1, DS/PN: S1.025, Volume (m³): 19.7

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	25.5	Kick-Flo®	0.561	22.9
Flush-Flo™	0.331	25.5	Mean Flow over Head Range	-	20.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.5	0.600	23.7	1.600	37.9	2.600	47.9	5.000	65.8	7.500	79.6
0.200	22.2	0.800	27.2	1.800	40.1	3.000	51.3	5.500	68.9	8.000	82.3
0.300	25.4	1.000	30.2	2.000	42.2	3.500	55.3	6.000	71.9	8.500	84.8
0.400	25.3	1.200	33.0	2.200	44.2	4.000	59.0	6.500	74.7	9.000	87.3
0.500	24.2	1.400	35.5	2.400	46.1	4.500	62.5	7.000	77.5	9.500	89.8

Summary of Results for 30 minute 5 year Summer (Storm)

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S26	70.036	-0.142	0.000	0.29			17.4	OK
S1.001	S25	69.793	-0.109	0.000	0.52			24.2	OK
S1.002	S24	69.616	-0.093	0.000	0.65			24.2	OK
S2.000	S23-1	69.723	-0.155	0.000	0.21			11.7	OK
S1.003	S23	69.495	-0.112	0.000	0.61			41.9	OK
S1.004	S22	69.447	-0.062	0.000	0.95			62.6	OK
S3.000	S21-2	70.155	-0.170	0.000	0.13			7.7	OK
S4.000	S21-1-1	70.055	-0.170	0.000	0.13			7.2	OK
S3.001	S21-1	69.663	-0.134	0.000	0.34			18.3	OK
S1.005	S21	69.299	-0.015	0.000	0.80			87.8	OK
S1.006	S20	69.234	0.021	0.000	0.81			86.7	SURCHARGED
S1.007	S19	69.178	0.051	0.000	0.95			90.1	SURCHARGED
S1.008	S18	69.138	0.057	0.000	0.87			92.1	SURCHARGED
S5.000	S17-2	71.431	-0.152	0.000	0.23			21.3	OK
S5.001	S17-1	69.961	-0.129	0.000	0.38			33.5	OK
S1.009	S17	69.059	0.088	0.000	0.59			113.0	SURCHARGED
S6.000	S16-2	71.969	-0.118	0.000	0.45			31.3	OK
S6.001	S16-1	70.743	-0.071	0.000	0.81			47.8	OK
S7.000	S19	68.789	-0.094	0.000	0.01			3.0	OK

Upstream of hydrobrake at manhole S16

Summary of Results for 30 minute 5 year Summer (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.010	S16	68.953	0.420	0.000	0.05			3.8	SURCHARGED
S8.000	S15-2	69.435	-0.149	0.000	0.25			13.1	OK
S8.001	S15-1	69.221	-0.101	0.000	0.59			32.7	OK
S1.011	S15	68.129	-0.138	0.000	0.56			45.2	OK
S1.012	S14	68.016	-0.106	0.000	0.74			56.0	OK
S1.013	S13	67.921	-0.101	0.000	0.77			58.0	OK
S9.000	S12-5	70.568	-0.132	0.000	0.35			22.6	OK
S9.001	S12-4	69.651	-0.127	0.000	0.39			23.4	OK
S10.000	S12-3-2	69.845	-0.155	0.000	0.21			10.9	OK
S10.001	S12-3-1	69.538	-0.141	0.000	0.29			11.6	OK
S9.002	S12-3	69.431	-0.168	0.000	0.40			51.2	OK
S9.003	S12-2	68.786	-0.149	0.000	0.50			72.3	OK
S11.000	S12-1-2	68.146	-0.179	0.000	0.09			5.8	OK
S11.001	S12-1-1	67.804	-0.149	0.000	0.13			6.0	OK
S9.004	S12-1	67.798	-0.048	0.000	0.99			81.5	OK
S1.014	S12	67.431	-0.216	0.000	0.53			152.1	OK
S1.015	S11	67.072	-0.182	0.000	0.66			159.2	OK
S1.016	S10	66.896	-0.174	0.000	0.69			162.9	OK
S1.017	S9	66.713	-0.182	0.000	0.65			184.4	OK
S12.000	S8-4	67.141	-0.155	0.000	0.20			11.0	OK
S12.001	S8-3	66.613	-0.116	0.000	0.30			10.7	OK
S13.000	S8-2-1	67.213	-0.177	0.000	0.10			7.2	OK
S12.002	S8-2	66.605	-0.061	0.000	0.51			17.2	OK
S14.000	S8-1-1	67.054	-0.140	0.000	0.30			15.9	OK
S12.003	S8-1	66.590	-0.018	0.000	1.00			34.5	OK

Upstream of hydrobrake at manhole S16

Summary of Results for 30 minute 5 year Summer (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.018	S8	66.215	-0.218	0.000	0.63			219.2	OK
S15.000	S7-1	66.839	-0.111	0.000	0.51			26.8	OK
S1.019	S7	66.168	-0.172	0.000	0.85			236.0	OK
S1.020	S6	66.014	-0.290	0.000	0.52			237.5	OK
S16.000	S5-3	66.703	-0.197	0.000	0.04			2.6	OK
S16.001	S5-2	66.347	-0.183	0.000	0.08			4.7	OK
S16.002	S5-1	66.043	-0.179	0.000	0.09			5.2	OK
S1.021	S5	65.745	-0.261	0.000	0.41			259.0	OK
S17.000	S4-17	69.071	-0.179	0.000	0.09			5.4	OK
S17.001	S4-16	68.780	-0.175	0.000	0.11			5.4	OK
S18.000	S4-15-1	69.213	-0.187	0.000	0.07			5.4	OK
S17.002	S4-15	68.729	-0.108	0.000	0.31			10.6	OK
S17.003	S4-14	68.720	-0.059	0.000	0.87			30.4	OK
S17.004	S4-13	68.449	-0.116	0.000	0.64			38.4	OK
S17.005	S4-12	68.424	-0.097	0.000	0.77			51.4	OK
S19.000	S4-11-1	68.885	-0.115	0.000	0.46			25.0	OK
S17.006	S4-11	68.195	-0.090	0.000	0.83			78.5	OK
S20.000	S4-10-2	68.326	-0.174	0.000	0.12			6.3	OK
S20.001	S4-10-1	68.144	-0.152	0.000	0.23			11.0	OK
S17.007	S4-10	67.819	-0.135	0.000	0.72			103.3	OK
S17.008	S4-9	67.525	-0.120	0.000	0.80			104.2	OK
S21.000	S4-8-1	67.515	-0.185	0.000	0.07			4.2	OK
S17.009	S4-8	67.392	-0.141	0.000	0.70			119.9	OK
S17.010	S4-7	66.925	-0.076	0.000	0.99			120.2	OK
S17.011	S4-6	66.761	-0.144	0.000	0.70			123.3	OK

Summary of Results for 30 minute 5 year Summer (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S22.000	S4-5-1	66.636	-0.164	0.000	0.16			8.4	OK
S17.012	S4-5	66.472	-0.129	0.000	0.75			134.4	OK
S17.013	S4-4	66.112	0.031	0.000	0.76			140.6	SURCHARGED
S23.000	S73	65.890	-0.098	0.000	0.13			18.5	OK
S17.014	S4-3	66.035	0.235	0.000	0.30			19.9	SURCHARGED
S17.015	S4-2	65.536	-0.013	0.000	0.55			35.7	OK
S24.000	S75	65.099	-0.335	0.000	0.01			2.8	OK
S17.016	S4-1	65.487	0.096	0.000	0.09			22.2	SURCHARGED
S1.022	S4	65.627	0.310	0.000	0.10			25.8	SURCHARGED
S1.023	S3	64.683	-0.474	0.000	0.10			25.7	OK
S1.024	S2	64.536	-0.457	0.000	0.10			25.6	OK
S25.000	S81	64.437	-0.463	0.000	0.00			0.0	OK
S1.025	S1	64.464	-0.420	0.000	0.06			19.5	OK
S1.026	S0	64.260	-0.480	0.000	0.09			19.3	OK

Upstream of hydrobrake at manhole S4-3

Upstream of hydrobrake at manhole S4

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	30	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	14.700	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.281	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	20	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

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

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)

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
S1.000	16.609	0.276	60.2	0.100	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	19.351	0.193	100.3	0.048	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	15.338	0.102	150.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	19.611	0.269	72.9	0.067	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	19.442	0.098	198.4	0.050	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	48.798	0.195	250.2	0.162	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.000	37.137	0.528	70.3	0.045	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.16	69.953	0.100	0.0	0.0	2.7	1.69	67.2	16.2
S1.001	50.00	4.41	69.677	0.148	0.0	0.0	4.0	1.31	51.9	24.0
S1.002	50.00	4.65	69.484	0.148	0.0	0.0	4.0	1.06	42.3	24.0
S2.000	50.00	4.21	69.653	0.067	0.0	0.0	1.8	1.53	61.0	10.9
S1.003	50.00	4.94	69.307	0.265	0.0	0.0	7.2	1.11	78.6	43.1
S1.004	50.00	5.76	69.209	0.427	0.0	0.0	11.6	0.99	69.9	69.4
S3.000	50.00	4.40	70.100	0.045	0.0	0.0	1.2	1.56	62.1	7.3

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
S4.000	33.506	0.428	78.3	0.042	4.00	0.0	0.600	o	225	Pipe/Conduit	
S3.001	39.860	0.483	82.5	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	25.186	0.101	249.4	0.148	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.006	21.697	0.086	252.3	0.001	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.007	11.729	0.046	255.0	0.031	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.008	30.147	0.110	274.1	0.019	0.00	0.0	0.600	o	375	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)
S4.000	50.00	4.38	70.000	0.042	0.0	0.0	1.1	1.48	58.8	6.8
S3.001	50.00	4.86	69.572	0.111	0.0	0.0	3.0	1.44	57.3	18.0
S1.005	50.00	6.13	68.939	0.686	0.0	0.0	18.6	1.14	126.2	111.5
S1.006	50.00	6.45	68.838	0.687	0.0	0.0	18.6	1.14	125.5	111.6
S1.007	50.00	6.62	68.752	0.718	0.0	0.0	19.4	1.13	124.8	116.7
S1.008	50.00	7.08	68.706	0.737	0.0	0.0	20.0	1.09	120.3	119.8

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
S5.000	41.960	1.493	28.1	0.123	4.00	0.0	0.600	o	225	Pipe/Conduit	
S5.001	34.296	1.106	31.0	0.086	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.009	71.947	0.288	249.8	0.038	0.00	0.0	0.600	o	450	Pipe/Conduit	
S6.000	65.552	1.273	51.5	0.183	4.00	0.0	0.600	o	225	Pipe/Conduit	
S6.001	72.100	0.986	73.1	0.116	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.000	15.180	0.200	76.0	0.017	4.00	0.0	0.600	o	450	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)
S5.000	50.00	4.28	71.358	0.123	0.0	0.0	3.3	2.48	98.5	20.0
S5.001	50.00	4.52	69.865	0.209	0.0	0.0	5.7	2.36	93.8	34.0
S1.009	50.00	8.02	68.521	0.984	0.0	0.0	26.6	1.28	203.8	159.9
S6.000	50.00	4.60	71.862	0.183	0.0	0.0	5.0	1.83	72.6	29.7
S6.001	50.00	5.38	70.589	0.299	0.0	0.0	8.1	1.53	60.9	48.6
S7.000	50.00	4.11	68.433	0.017	0.0	0.0	0.5	2.33	371.2	2.8

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
S1.010	44.056	0.266	165.6	0.068	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.000	20.962	0.262	80.0	0.075	4.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	53.784	0.672	80.0	0.139	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.011	21.473	0.145	148.1	0.067	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.012	15.203	0.100	152.0	0.078	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.013	14.648	0.097	151.0	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.000	55.526	0.922	60.2	0.132	4.00	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)
S1.010	50.00	8.62	68.233	1.368	0.0	0.0	37.0	1.22	86.2«	222.3
S8.000	50.00	4.24	69.359	0.075	0.0	0.0	2.0	1.46	58.2	12.2
S8.001	50.00	4.85	69.097	0.214	0.0	0.0	5.8	1.46	58.2	34.8
S1.011	50.00	8.90	67.967	1.649	0.0	0.0	44.7	1.29	91.2«	268.0
S1.012	50.00	9.10	67.822	1.727	0.0	0.0	46.8	1.27	90.0«	280.6
S1.013	50.00	9.29	67.722	1.744	0.0	0.0	47.2	1.28	90.3«	283.4
S9.000	50.00	4.55	70.475	0.132	0.0	0.0	3.6	1.69	67.1	21.4

Reduced Flow of 6.0 l/s downstream of hydrobrake at manhole S16

Reduced Flow of 6.0 l/s downstream of hydrobrake at manhole

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
S9.001	6.563	0.179	36.7	0.005	0.00	0.0	0.600	o	225	Pipe/Conduit	
S10.000	26.995	0.321	84.1	0.063	4.00	0.0	0.600	o	225	Pipe/Conduit	
S10.001	6.500	0.080	81.3	0.005	0.00	0.0	0.600	o	225	Pipe/Conduit	
S9.002	43.825	0.664	66.0	0.116	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.003	57.759	1.088	53.1	0.153	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.000	22.315	0.372	60.0	0.033	4.00	0.0	0.600	o	225	Pipe/Conduit	
S11.001	7.379	0.107	69.0	0.003	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)
S9.001	50.00	4.60	69.553	0.137	0.0	0.0	3.7	2.17	86.2	22.3
S10.000	50.00	4.32	69.775	0.063	0.0	0.0	1.7	1.43	56.7	10.2
S10.001	50.00	4.39	69.454	0.068	0.0	0.0	1.8	1.45	57.7	11.0
S9.002	50.00	4.98	69.299	0.321	0.0	0.0	8.7	1.94	137.0	52.2
S9.003	50.00	5.42	68.635	0.474	0.0	0.0	12.8	2.16	152.9	77.0
S11.000	50.00	4.22	68.100	0.033	0.0	0.0	0.9	1.69	67.3	5.4
S11.001	50.00	4.30	67.728	0.036	0.0	0.0	1.0	1.58	62.7	5.8

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
S9.004	30.054	0.199	151.0	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.014	39.442	0.393	100.4	0.097	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.015	18.679	0.184	101.5	0.053	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.016	17.248	0.175	98.6	0.031	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.017	50.196	0.462	108.6	0.193	0.00	0.0	0.600	o	450	Pipe/Conduit	
S12.000	48.805	0.568	85.9	0.064	4.00	0.0	0.600	o	225	Pipe/Conduit	
S12.001	5.560	0.063	88.3	0.002	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)
S9.004	50.00	5.81	67.546	0.549	0.0	0.0	14.9	1.28	90.3	89.2
S1.014	50.00	9.61	67.197	2.390	0.0	0.0	64.7	2.03	322.8«	388.4
S1.015	50.00	9.77	66.804	2.443	0.0	0.0	66.2	2.02	320.9«	397.0
S1.016	50.00	9.91	66.620	2.474	0.0	0.0	67.0	2.05	325.7«	402.0
S1.017	50.00	10.34	66.445	2.667	0.0	0.0	72.2	1.95	310.1«	433.4
S12.000	50.00	4.58	67.071	0.064	0.0	0.0	1.7	1.41	56.1	10.4
S12.001	50.00	4.64	66.504	0.066	0.0	0.0	1.8	1.39	55.4	10.7

Reduced Flow of 6.0 l/s downstream of hydrobrake at manhole S16 plus additional flow of 178 l/s accumulated beyond S16- Adequate capacity

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
S13.000	34.117	0.724	47.1	0.042	4.00	0.0	0.600	o	225	Pipe/Conduit	
S12.002	5.963	0.058	102.8	0.002	0.00	0.0	0.600	o	225	Pipe/Conduit	
S14.000	50.234	0.586	85.7	0.093	4.00	0.0	0.600	o	225	Pipe/Conduit	
S12.003	35.053	0.175	200.3	0.021	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.018	18.638	0.093	200.4	0.002	0.00	0.0	0.600	o	600	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)
S13.000	50.00	4.30	67.165	0.042	0.0	0.0	1.1	1.91	76.0	6.8
S12.002	50.00	4.72	66.441	0.110	0.0	0.0	3.0	1.29	51.3	17.9
S14.000	50.00	4.59	66.969	0.093	0.0	0.0	2.5	1.41	56.2	15.1
S12.003	50.00	5.35	66.383	0.224	0.0	0.0	6.1	0.92	36.6	36.4
S1.018	50.00	10.52	65.833	2.893	0.0	0.0	78.3	1.72	485.3	470.1

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
S15.000	54.956	0.610	90.1	0.153	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.019	6.943	0.036	192.9	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.020	53.441	0.298	179.3	0.032	0.00	0.0	0.600	o	600	Pipe/Conduit	
S16.000	16.649	0.370	45.0	0.015	4.00	0.0	0.600	o	225	Pipe/Conduit	
S16.001	17.874	0.308	58.0	0.015	0.00	0.0	0.600	o	225	Pipe/Conduit	
S16.002	13.147	0.212	62.0	0.003	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)
S15.000	50.00	4.66	66.725	0.153	0.0	0.0	4.1	1.38	54.8	24.9
S1.019	50.00	10.58	65.740	3.046	0.0	0.0	82.5	1.75	494.8«	495.0
S1.020	50.00	11.08	65.704	3.078	0.0	0.0	83.4	1.82	513.3	500.2
S16.000	50.00	4.14	66.675	0.015	0.0	0.0	0.4	1.96	77.7	2.4
S16.001	50.00	4.32	66.305	0.030	0.0	0.0	0.8	1.72	68.4	4.9
S16.002	50.00	4.45	65.997	0.033	0.0	0.0	0.9	1.66	66.1	5.4

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
S1.021	67.019	0.684	98.0	0.211	0.00	0.0	0.600	o	600	Pipe/Conduit	
S17.000	17.624	0.295	59.7	0.031	4.00	0.0	0.600	o	225	Pipe/Conduit	
S17.001	7.050	0.118	59.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S18.000	18.555	0.562	33.0	0.031	4.00	0.0	0.600	o	225	Pipe/Conduit	
S17.002	5.815	0.058	100.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.003	42.884	0.214	200.4	0.144	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.004	8.760	0.044	199.1	0.058	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.021	50.00	11.53	65.406	3.322	0.0	0.0	90.0	2.46	695.7	539.8
S17.000	50.00	4.17	69.025	0.031	0.0	0.0	0.8	1.70	67.4	5.0
S17.001	50.00	4.24	68.730	0.031	0.0	0.0	0.8	1.70	67.4	5.0
S18.000	50.00	4.14	69.175	0.031	0.0	0.0	0.8	2.28	90.8	5.0
S17.002	50.00	4.32	68.612	0.062	0.0	0.0	1.7	1.31	51.9	10.1
S17.003	50.00	5.09	68.554	0.206	0.0	0.0	5.6	0.92	36.6	33.5
S17.004	50.00	5.23	68.265	0.264	0.0	0.0	7.1	1.11	78.5	42.9

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
S17.005	58.718	0.236	248.8	0.107	0.00	0.0	0.600	o	300	Pipe/Conduit	
S19.000	62.278	0.715	87.1	0.147	4.00	0.0	0.600	o	225	Pipe/Conduit	
S17.006	38.832	0.331	117.3	0.049	0.00	0.0	0.600	o	300	Pipe/Conduit	
S20.000	14.705	0.204	72.1	0.036	4.00	0.0	0.600	o	225	Pipe/Conduit	
S20.001	35.899	0.342	105.0	0.034	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.007	51.903	0.309	168.0	0.128	0.00	0.0	0.600	o	375	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)
S17.005	50.00	6.21	68.221	0.371	0.0	0.0	10.0	0.99	70.1	60.3
S19.000	50.00	4.74	68.775	0.147	0.0	0.0	4.0	1.40	55.7	23.9
S17.006	50.00	6.66	67.985	0.567	0.0	0.0	15.4	1.45	102.5	92.1
S20.000	50.00	4.16	68.275	0.036	0.0	0.0	1.0	1.54	61.3	5.8
S20.001	50.00	4.63	68.071	0.070	0.0	0.0	1.9	1.28	50.7	11.4
S17.007	50.00	7.28	67.579	0.765	0.0	0.0	20.7	1.40	154.1	124.3

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
S17.008	13.005	0.112	116.1	0.011	0.00	0.0	0.600	o	375	Pipe/Conduit	
S21.000	8.002	0.167	47.9	0.024	4.00	0.0	0.600	o	225	Pipe/Conduit	
S17.009	63.800	0.532	120.0	0.127	0.00	0.0	0.600	o	375	Pipe/Conduit	
S17.010	11.713	0.097	121.0	0.008	0.00	0.0	0.600	o	375	Pipe/Conduit	
S17.011	30.282	0.304	99.6	0.029	0.00	0.0	0.600	o	375	Pipe/Conduit	
S22.000	16.272	0.198	82.2	0.048	4.00	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)
S17.008	50.00	7.41	67.270	0.776	0.0	0.0	21.0	1.68	185.6	126.1
S21.000	50.00	4.07	67.475	0.024	0.0	0.0	0.6	1.89	75.3	3.9
S17.009	50.00	8.05	67.158	0.927	0.0	0.0	25.1	1.65	182.6	150.6
S17.010	50.00	8.17	66.626	0.935	0.0	0.0	25.3	1.65	181.8	151.9
S17.011	50.00	8.45	66.530	0.964	0.0	0.0	26.1	1.82	200.5	156.6
S22.000	50.00	4.19	66.575	0.048	0.0	0.0	1.3	1.44	57.4	7.8

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
S17.012	57.205	0.520	110.0	0.094	0.00	0.0	0.600	o	375	Pipe/Conduit	
S17.013	29.500	0.132	223.5	0.075	0.00	0.0	0.600	o	450	Pipe/Conduit	
S23.000	9.965	0.038	262.2	0.110	4.00	0.0	0.600	o	450	Pipe/Conduit	
S17.014	61.960	0.251	246.9	0.150	0.00	0.0	0.600	o	300	Pipe/Conduit	
S17.015	38.803	0.158	245.6	0.133	0.00	0.0	0.600	o	300	Pipe/Conduit	
S24.000	12.747	0.042	303.5	0.018	4.00	0.0	0.600	o	600	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)
S17.012	50.00	9.00	66.226	1.106	0.0	0.0	30.0	1.73	190.7	179.7
S17.013	50.00	9.36	65.631	1.181	0.0	0.0	32.0	1.36	215.6	191.9
S23.000	50.00	4.13	65.538	0.110	0.0	0.0	3.0	1.25	198.9	17.9
S17.014	50.00	10.40	65.500	1.441	0.0	0.0	39.0	1.00	70.4«	234.2
S17.015	50.00	11.05	65.249	1.574	0.0	0.0	42.6	1.00	70.6«	255.8
S24.000	50.00	4.15	64.834	0.018	0.0	0.0	0.5	1.39	393.7	2.9

Reduced Flow of 20.0 l/s downstream of hydrobrake at manhole S4-3

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
S17.016	40.618	0.074	548.9	0.036	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.022	87.947	0.160	549.7	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.023	90.045	0.164	549.1	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.024	57.211	0.109	524.9	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S25.000	9.436	0.016	600.0	0.000	4.00	0.0	0.600	o	600	Pipe/Conduit	
S1.025	53.352	0.144	370.5	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.026	4.285	0.008	535.6	0.000	0.00	0.0	0.600	o	600	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)
S17.016	50.00	11.70	64.791	1.628	0.0	0.0	44.1	1.03	291.9	264.5
S1.022	50.00	13.12	64.717	4.950	0.0	0.0	134.1	1.03	291.7«	804.4
S1.023	50.00	14.58	64.557	4.950	0.0	0.0	134.1	1.03	291.8«	804.4
S1.024	48.80	15.48	64.393	4.950	0.0	0.0	134.1	1.06	298.6«	804.4
S25.000	50.00	4.16	64.300	0.000	0.0	0.0	0.0	0.99	279.0	0.0
S1.025	47.71	16.19	64.284	4.950	0.0	0.0	134.1	1.26	356.0«	804.4
S1.026	47.61	16.25	64.140	4.950	0.0	0.0	134.1	1.05	295.5«	804.4

Reduced Flow of 26.0 l/s downstream of hydrobrake at manhole S4

Reduced Flow of 25.5 l/s downstream of hydrobrake at manhole S1

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)
S1.026	S	65.040	64.132	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	20.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 4 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	14.700	Cv (Summer)	0.750
Return Period (years)	30	Ratio R	0.281	Cv (Winter)	0.840
Region	Scotland and Ireland	Profile Type	Summer	Storm Duration (mins)	30

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S16, DS/PN: S1.010, Volume (m³): 19.7

Unit Reference	MD-SHE-0088-6000-3500-6000	Sump Available	Yes
Design Head (m)	3.500	Diameter (mm)	88
Design Flow (l/s)	6.0	Invert Level (m)	68.233
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	3.500	6.0	Kick-Flo®	0.788	3.0
Flush-Flo™	0.380	3.8	Mean Flow over Head Range	-	4.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.7	0.600	3.6	1.600	4.2	2.600	5.2	5.000	7.1	7.500	8.6
0.200	3.5	0.800	3.0	1.800	4.4	3.000	5.6	5.500	7.4	8.000	8.9
0.300	3.7	1.000	3.3	2.000	4.6	3.500	6.0	6.000	7.7	8.500	9.1
0.400	3.8	1.200	3.6	2.200	4.8	4.000	6.4	6.500	8.0	9.000	9.4
0.500	3.7	1.400	3.9	2.400	5.0	4.500	6.7	7.000	8.3	9.500	9.6

Hydro-Brake® Optimum Manhole: S4-3, DS/PN: S17.014, Volume (m³): 7.5

Unit Reference	MD-SHE-0197-2000-1100-2000	Sump Available	Yes
Design Head (m)	1.100	Diameter (mm)	197
Design Flow (l/s)	20.0	Invert Level (m)	65.500
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1500
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	20.0	Kick-Flo®	0.773	16.9
Flush-Flo™	0.356	20.0	Mean Flow over Head Range	-	17.0

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.8	0.600	19.2	1.600	23.9	2.600	30.2	5.000	41.4	7.500	50.3
0.200	18.5	0.800	17.2	1.800	25.3	3.000	32.3	5.500	43.3	8.000	51.9
0.300	19.9	1.000	19.1	2.000	26.6	3.500	34.8	6.000	45.2	8.500	53.5
0.400	19.9	1.200	20.8	2.200	27.8	4.000	37.1	6.500	47.0	9.000	55.0
0.500	19.6	1.400	22.4	2.400	29.0	4.500	39.3	7.000	48.7	9.500	56.5

Hydro-Brake® Optimum Manhole: S4, DS/PN: S1.022, Volume (m³): 33.1

Unit Reference	MD-SHE-0211-2600-1783-2600	Flush-Flo™	Calculated
Design Head (m)	1.783	Objective	Minimise upstream storage
Design Flow (l/s)	26.0	Application	Surface

Hydro-Brake® Optimum Manhole: S4, DS/PN: S1.022, Volume (m³): 33.1

Sump Available	Yes	Minimum Outlet Pipe Diameter (mm)	225
Diameter (mm)	211	Suggested Manhole Diameter (mm)	1800
Invert Level (m)	64.717		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.783	26.0	Kick-Flo®	1.143	21.0
Flush-Flo™	0.528	25.9	Mean Flow over Head Range	-	22.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.2	0.600	25.8	1.600	24.7	2.600	31.1	5.000	42.6	7.500	51.9
0.200	20.5	0.800	25.1	1.800	26.1	3.000	33.3	5.500	44.6	8.000	53.5
0.300	24.5	1.000	23.6	2.000	27.4	3.500	35.9	6.000	46.6	8.500	55.1
0.400	25.5	1.200	21.5	2.200	28.7	4.000	38.3	6.500	48.4	9.000	56.7
0.500	25.8	1.400	23.1	2.400	29.9	4.500	40.5	7.000	50.2	9.500	58.2

Hydro-Brake® Optimum Manhole: S1, DS/PN: S1.025, Volume (m³): 19.7

Unit Reference	MD-SHE-0224-2550-0700-2550	Sump Available	Yes
Design Head (m)	0.700	Diameter (mm)	224
Design Flow (l/s)	25.5	Invert Level (m)	64.284
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	300
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1500
Application	Surface		

Hydro-Brake® Optimum Manhole: S1, DS/PN: S1.025, Volume (m³): 19.7

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	25.5	Kick-Flo®	0.561	22.9
Flush-Flo™	0.331	25.5	Mean Flow over Head Range	-	20.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.5	0.600	23.7	1.600	37.9	2.600	47.9	5.000	65.8	7.500	79.6
0.200	22.2	0.800	27.2	1.800	40.1	3.000	51.3	5.500	68.9	8.000	82.3
0.300	25.4	1.000	30.2	2.000	42.2	3.500	55.3	6.000	71.9	8.500	84.8
0.400	25.3	1.200	33.0	2.200	44.2	4.000	59.0	6.500	74.7	9.000	87.3
0.500	24.2	1.400	35.5	2.400	46.1	4.500	62.5	7.000	77.5	9.500	89.8

Summary of Results for 30 minute 30 year Summer (Storm)

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S26	70.151	-0.027	0.000	0.43			25.9	OK
S1.001	S25	70.118	0.216	0.000	0.73			34.1	SURCHARGED
S1.002	S24	70.065	0.356	0.000	0.76			28.5	SURCHARGED
S2.000	S23-1	70.044	0.166	0.000	0.29			15.8	SURCHARGED
S1.003	S23	70.021	0.414	0.000	0.68			46.2	SURCHARGED
S1.004	S22	69.977	0.468	0.000	1.14			74.9	SURCHARGED
S3.000	S21-2	70.168	-0.157	0.000	0.19			11.4	OK
S4.000	S21-1-1	70.068	-0.157	0.000	0.19			10.7	OK
S3.001	S21-1	69.789	-0.008	0.000	0.49			26.8	OK
S1.005	S21	69.736	0.422	0.000	1.10			120.0	SURCHARGED
S1.006	S20	69.616	0.403	0.000	1.11			118.1	SURCHARGED
S1.007	S19	69.510	0.383	0.000	1.30			123.4	SURCHARGED
S1.008	S18	69.410	0.329	0.000	1.18			126.0	SURCHARGED
S5.000	S17-2	71.449	-0.134	0.000	0.34			31.6	OK
S5.001	S17-1	69.994	-0.096	0.000	0.61			53.4	OK
S1.009	S17	69.256	0.285	0.000	0.86			163.4	SURCHARGED
S6.000	S16-2	71.999	-0.088	0.000	0.66			46.5	OK
S6.001	S16-1	71.111	0.297	0.000	1.14			67.4	SURCHARGED
S7.000	S19	68.934	0.051	0.000	0.01			3.1	SURCHARGED

Summary of Results for 30 minute 30 year Summer (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.010	S16	69.026	0.493	0.000	0.05			3.8	SURCHARGED
S8.000	S15-2	69.454	-0.130	0.000	0.37			19.4	OK
S8.001	S15-1	69.278	-0.044	0.000	0.99			55.5	OK
S1.011	S15	68.271	0.004	0.000	0.86			68.6	SURCHARGED
S1.012	S14	68.167	0.045	0.000	1.11			84.1	SURCHARGED
S1.013	S13	68.042	0.020	0.000	1.16			87.3	SURCHARGED
S9.000	S12-5	70.592	-0.108	0.000	0.52			33.5	OK
S9.001	S12-4	69.678	-0.100	0.000	0.59			35.0	OK
S10.000	S12-3-2	69.861	-0.139	0.000	0.31			16.1	OK
S10.001	S12-3-1	69.559	-0.120	0.000	0.44			17.5	OK
S9.002	S12-3	69.474	-0.125	0.000	0.64			81.4	OK
S9.003	S12-2	68.845	-0.090	0.000	0.81			117.9	OK
S11.000	S12-1-2	68.160	-0.165	0.000	0.14			8.5	OK
S11.001	S12-1-1	68.133	0.180	0.000	0.26			12.0	SURCHARGED
S9.004	S12-1	68.127	0.281	0.000	1.56			128.2	SURCHARGED
S1.014	S12	67.510	-0.137	0.000	0.81			232.2	OK
S1.015	S11	67.212	-0.042	0.000	0.97			234.8	OK
S1.016	S10	67.043	-0.027	0.000	1.00			235.8	OK
S1.017	S9	66.839	-0.056	0.000	0.95			267.7	OK
S12.000	S8-4	67.157	-0.139	0.000	0.30			16.3	OK
S12.001	S8-3	66.799	0.070	0.000	0.42			14.8	SURCHARGED
S13.000	S8-2-1	67.224	-0.166	0.000	0.15			10.7	OK
S12.002	S8-2	66.787	0.121	0.000	0.71			24.0	SURCHARGED
S14.000	S8-1-1	67.075	-0.119	0.000	0.44			23.6	OK
S12.003	S8-1	66.765	0.157	0.000	1.38			47.7	SURCHARGED

Summary of Results for 30 minute 30 year Summer (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.018	S8	66.413	-0.020	0.000	0.91			316.2	OK
S15.000	S7-1	66.873	-0.077	0.000	0.74			38.9	OK
S1.019	S7	66.342	0.002	0.000	1.25			345.8	SURCHARGED
S1.020	S6	66.136	-0.168	0.000	0.76			342.2	OK
S16.000	S5-3	66.709	-0.191	0.000	0.06			3.9	OK
S16.001	S5-2	66.358	-0.172	0.000	0.13			7.7	OK
S16.002	S5-1	66.055	-0.167	0.000	0.15			8.5	OK
S1.021	S5	65.974	-0.032	0.000	0.58			363.2	OK
S17.000	S4-17	69.080	-0.170	0.000	0.13			8.0	OK
S17.001	S4-16	68.985	0.030	0.000	0.17			8.1	SURCHARGED
S18.000	S4-15-1	69.222	-0.178	0.000	0.10			8.0	OK
S17.002	S4-15	68.980	0.143	0.000	0.48			16.3	SURCHARGED
S17.003	S4-14	68.972	0.193	0.000	1.23			42.8	SURCHARGED
S17.004	S4-13	68.667	0.102	0.000	0.88			52.7	SURCHARGED
S17.005	S4-12	68.635	0.114	0.000	1.06			70.3	SURCHARGED
S19.000	S4-11-1	68.916	-0.084	0.000	0.69			37.1	OK
S17.006	S4-11	68.365	0.080	0.000	1.12			106.7	SURCHARGED
S20.000	S4-10-2	68.338	-0.162	0.000	0.17			9.3	OK
S20.001	S4-10-1	68.167	-0.129	0.000	0.37			17.9	OK
S17.007	S4-10	67.936	-0.018	0.000	0.97			139.0	OK
S17.008	S4-9	67.651	0.006	0.000	1.06			138.7	SURCHARGED
S21.000	S4-8-1	67.527	-0.173	0.000	0.11			6.2	OK
S17.009	S4-8	67.522	-0.011	0.000	0.92			158.5	OK
S17.010	S4-7	67.082	0.081	0.000	1.29			156.9	SURCHARGED
S17.011	S4-6	66.923	0.018	0.000	0.90			159.7	SURCHARGED

Summary of Results for 30 minute 30 year Summer (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S22.000	S4-5-1	66.690	-0.110	0.000	0.24			12.4	OK
S17.012	S4-5	66.678	0.077	0.000	0.97			173.0	SURCHARGED
S17.013	S4-4	66.186	0.105	0.000	0.97			180.3	SURCHARGED
S23.000	S73	66.064	0.076	0.000	0.14			18.8	SURCHARGED
S17.014	S4-3	66.087	0.287	0.000	0.30			19.9	SURCHARGED
S17.015	S4-2	65.605	0.056	0.000	0.73			47.8	SURCHARGED
S24.000	S75	65.220	-0.214	0.000	0.02			6.4	OK
S17.016	S4-1	65.545	0.154	0.000	0.09			22.5	SURCHARGED
S1.022	S4	65.744	0.427	0.000	0.10			25.8	SURCHARGED
S1.023	S3	64.684	-0.473	0.000	0.10			25.8	OK
S1.024	S2	64.538	-0.455	0.000	0.10			25.7	OK
S25.000	S81	64.440	-0.460	0.000	0.00			0.0	OK
S1.025	S1	64.467	-0.417	0.000	0.06			19.8	OK
S1.026	S0	64.261	-0.479	0.000	0.09			19.7	OK

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	100	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	14.700	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.281	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	20	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

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

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)

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
S1.000	16.609	0.276	60.2	0.100	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	19.351	0.193	100.3	0.048	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	15.338	0.102	150.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	19.611	0.269	72.9	0.067	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	19.442	0.098	198.4	0.050	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	48.798	0.195	250.2	0.162	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.000	37.137	0.528	70.3	0.045	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.16	69.953	0.100	0.0	0.0	2.7	1.69	67.2	16.2
S1.001	50.00	4.41	69.677	0.148	0.0	0.0	4.0	1.31	51.9	24.0
S1.002	50.00	4.65	69.484	0.148	0.0	0.0	4.0	1.06	42.3	24.0
S2.000	50.00	4.21	69.653	0.067	0.0	0.0	1.8	1.53	61.0	10.9
S1.003	50.00	4.94	69.307	0.265	0.0	0.0	7.2	1.11	78.6	43.1
S1.004	50.00	5.76	69.209	0.427	0.0	0.0	11.6	0.99	69.9	69.4
S3.000	50.00	4.40	70.100	0.045	0.0	0.0	1.2	1.56	62.1	7.3

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
S4.000	33.506	0.428	78.3	0.042	4.00	0.0	0.600	o	225	Pipe/Conduit	
S3.001	39.860	0.483	82.5	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	25.186	0.101	249.4	0.148	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.006	21.697	0.086	252.3	0.001	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.007	11.729	0.046	255.0	0.031	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.008	30.147	0.110	274.1	0.019	0.00	0.0	0.600	o	375	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)
S4.000	50.00	4.38	70.000	0.042	0.0	0.0	1.1	1.48	58.8	6.8
S3.001	50.00	4.86	69.572	0.111	0.0	0.0	3.0	1.44	57.3	18.0
S1.005	50.00	6.13	68.939	0.686	0.0	0.0	18.6	1.14	126.2	111.5
S1.006	50.00	6.45	68.838	0.687	0.0	0.0	18.6	1.14	125.5	111.6
S1.007	50.00	6.62	68.752	0.718	0.0	0.0	19.4	1.13	124.8	116.7
S1.008	50.00	7.08	68.706	0.737	0.0	0.0	20.0	1.09	120.3	119.8

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
S5.000	41.960	1.493	28.1	0.123	4.00	0.0	0.600	o	225	Pipe/Conduit	
S5.001	34.296	1.106	31.0	0.086	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.009	71.947	0.288	249.8	0.038	0.00	0.0	0.600	o	450	Pipe/Conduit	
S6.000	65.552	1.273	51.5	0.183	4.00	0.0	0.600	o	225	Pipe/Conduit	
S6.001	72.100	0.986	73.1	0.116	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.000	15.180	0.200	76.0	0.017	4.00	0.0	0.600	o	450	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)
S5.000	50.00	4.28	71.358	0.123	0.0	0.0	3.3	2.48	98.5	20.0
S5.001	50.00	4.52	69.865	0.209	0.0	0.0	5.7	2.36	93.8	34.0
S1.009	50.00	8.02	68.521	0.984	0.0	0.0	26.6	1.28	203.8	159.9
S6.000	50.00	4.60	71.862	0.183	0.0	0.0	5.0	1.83	72.6	29.7
S6.001	50.00	5.38	70.589	0.299	0.0	0.0	8.1	1.53	60.9	48.6
S7.000	50.00	4.11	68.433	0.017	0.0	0.0	0.5	2.33	371.2	2.8

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
S1.010	44.056	0.266	165.6	0.068	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.000	20.962	0.262	80.0	0.075	4.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	53.784	0.672	80.0	0.139	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.011	21.473	0.145	148.1	0.067	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.012	15.203	0.100	152.0	0.078	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.013	14.648	0.097	151.0	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.000	55.526	0.922	60.2	0.132	4.00	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)
S1.010	50.00	8.62	68.233	1.368	0.0	0.0	37.0	1.22	86.2«	222.3
S8.000	50.00	4.24	69.359	0.075	0.0	0.0	2.0	1.46	58.2	12.2
S8.001	50.00	4.85	69.097	0.214	0.0	0.0	5.8	1.46	58.2	34.8
S1.011	50.00	8.90	67.967	1.649	0.0	0.0	44.7	1.29	91.2«	268.0
S1.012	50.00	9.10	67.822	1.727	0.0	0.0	46.8	1.27	90.0«	280.6
S1.013	50.00	9.29	67.722	1.744	0.0	0.0	47.2	1.28	90.3«	283.4
S9.000	50.00	4.55	70.475	0.132	0.0	0.0	3.6	1.69	67.1	21.4

Reduced Flow of 6.0 l/s downstream of hydrobrake at manhole S16

Reduced Flow of 6.0 l/s downstream of hydrobrake at manhole

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
S9.001	6.563	0.179	36.7	0.005	0.00	0.0	0.600	o	225	Pipe/Conduit	
S10.000	26.995	0.321	84.1	0.063	4.00	0.0	0.600	o	225	Pipe/Conduit	
S10.001	6.500	0.080	81.3	0.005	0.00	0.0	0.600	o	225	Pipe/Conduit	
S9.002	43.825	0.664	66.0	0.116	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.003	57.759	1.088	53.1	0.153	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.000	22.315	0.372	60.0	0.033	4.00	0.0	0.600	o	225	Pipe/Conduit	
S11.001	7.379	0.107	69.0	0.003	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)
S9.001	50.00	4.60	69.553	0.137	0.0	0.0	3.7	2.17	86.2	22.3
S10.000	50.00	4.32	69.775	0.063	0.0	0.0	1.7	1.43	56.7	10.2
S10.001	50.00	4.39	69.454	0.068	0.0	0.0	1.8	1.45	57.7	11.0
S9.002	50.00	4.98	69.299	0.321	0.0	0.0	8.7	1.94	137.0	52.2
S9.003	50.00	5.42	68.635	0.474	0.0	0.0	12.8	2.16	152.9	77.0
S11.000	50.00	4.22	68.100	0.033	0.0	0.0	0.9	1.69	67.3	5.4
S11.001	50.00	4.30	67.728	0.036	0.0	0.0	1.0	1.58	62.7	5.8

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
S9.004	30.054	0.199	151.0	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.014	39.442	0.393	100.4	0.097	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.015	18.679	0.184	101.5	0.053	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.016	17.248	0.175	98.6	0.031	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.017	50.196	0.462	108.6	0.193	0.00	0.0	0.600	o	450	Pipe/Conduit	
S12.000	48.805	0.568	85.9	0.064	4.00	0.0	0.600	o	225	Pipe/Conduit	
S12.001	5.560	0.063	88.3	0.002	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)
S9.004	50.00	5.81	67.546	0.549	0.0	0.0	14.9	1.28	90.3	89.2
S1.014	50.00	9.61	67.197	2.390	0.0	0.0	64.7	2.03	322.8«	388.4
S1.015	50.00	9.77	66.804	2.443	0.0	0.0	66.2	2.02	320.9«	397.0
S1.016	50.00	9.91	66.620	2.474	0.0	0.0	67.0	2.05	325.7«	402.0
S1.017	50.00	10.34	66.445	2.667	0.0	0.0	72.2	1.95	310.1«	433.4
S12.000	50.00	4.58	67.071	0.064	0.0	0.0	1.7	1.41	56.1	10.4
S12.001	50.00	4.64	66.504	0.066	0.0	0.0	1.8	1.39	55.4	10.7

Reduced Flow of 6.0 l/s downstream of hydrobrake at manhole S16 plus additional flow of 178 l/s accumulated beyond S16- Adequate capacity

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
S13.000	34.117	0.724	47.1	0.042	4.00	0.0	0.600	o	225	Pipe/Conduit	
S12.002	5.963	0.058	102.8	0.002	0.00	0.0	0.600	o	225	Pipe/Conduit	
S14.000	50.234	0.586	85.7	0.093	4.00	0.0	0.600	o	225	Pipe/Conduit	
S12.003	35.053	0.175	200.3	0.021	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.018	18.638	0.093	200.4	0.002	0.00	0.0	0.600	o	600	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)
S13.000	50.00	4.30	67.165	0.042	0.0	0.0	1.1	1.91	76.0	6.8
S12.002	50.00	4.72	66.441	0.110	0.0	0.0	3.0	1.29	51.3	17.9
S14.000	50.00	4.59	66.969	0.093	0.0	0.0	2.5	1.41	56.2	15.1
S12.003	50.00	5.35	66.383	0.224	0.0	0.0	6.1	0.92	36.6	36.4
S1.018	50.00	10.52	65.833	2.893	0.0	0.0	78.3	1.72	485.3	470.1

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
S15.000	54.956	0.610	90.1	0.153	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.019	6.943	0.036	192.9	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.020	53.441	0.298	179.3	0.032	0.00	0.0	0.600	o	600	Pipe/Conduit	
S16.000	16.649	0.370	45.0	0.015	4.00	0.0	0.600	o	225	Pipe/Conduit	
S16.001	17.874	0.308	58.0	0.015	0.00	0.0	0.600	o	225	Pipe/Conduit	
S16.002	13.147	0.212	62.0	0.003	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)
S15.000	50.00	4.66	66.725	0.153	0.0	0.0	4.1	1.38	54.8	24.9
S1.019	50.00	10.58	65.740	3.046	0.0	0.0	82.5	1.75	494.8«	495.0
S1.020	50.00	11.08	65.704	3.078	0.0	0.0	83.4	1.82	513.3	500.2
S16.000	50.00	4.14	66.675	0.015	0.0	0.0	0.4	1.96	77.7	2.4
S16.001	50.00	4.32	66.305	0.030	0.0	0.0	0.8	1.72	68.4	4.9
S16.002	50.00	4.45	65.997	0.033	0.0	0.0	0.9	1.66	66.1	5.4

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
S1.021	67.019	0.684	98.0	0.211	0.00	0.0	0.600	o	600	Pipe/Conduit	
S17.000	17.624	0.295	59.7	0.031	4.00	0.0	0.600	o	225	Pipe/Conduit	
S17.001	7.050	0.118	59.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S18.000	18.555	0.562	33.0	0.031	4.00	0.0	0.600	o	225	Pipe/Conduit	
S17.002	5.815	0.058	100.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.003	42.884	0.214	200.4	0.144	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.004	8.760	0.044	199.1	0.058	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.021	50.00	11.53	65.406	3.322	0.0	0.0	90.0	2.46	695.7	539.8
S17.000	50.00	4.17	69.025	0.031	0.0	0.0	0.8	1.70	67.4	5.0
S17.001	50.00	4.24	68.730	0.031	0.0	0.0	0.8	1.70	67.4	5.0
S18.000	50.00	4.14	69.175	0.031	0.0	0.0	0.8	2.28	90.8	5.0
S17.002	50.00	4.32	68.612	0.062	0.0	0.0	1.7	1.31	51.9	10.1
S17.003	50.00	5.09	68.554	0.206	0.0	0.0	5.6	0.92	36.6	33.5
S17.004	50.00	5.23	68.265	0.264	0.0	0.0	7.1	1.11	78.5	42.9

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
S17.005	58.718	0.236	248.8	0.107	0.00	0.0	0.600	o	300	Pipe/Conduit	
S19.000	62.278	0.715	87.1	0.147	4.00	0.0	0.600	o	225	Pipe/Conduit	
S17.006	38.832	0.331	117.3	0.049	0.00	0.0	0.600	o	300	Pipe/Conduit	
S20.000	14.705	0.204	72.1	0.036	4.00	0.0	0.600	o	225	Pipe/Conduit	
S20.001	35.899	0.342	105.0	0.034	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.007	51.903	0.309	168.0	0.128	0.00	0.0	0.600	o	375	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)
S17.005	50.00	6.21	68.221	0.371	0.0	0.0	10.0	0.99	70.1	60.3
S19.000	50.00	4.74	68.775	0.147	0.0	0.0	4.0	1.40	55.7	23.9
S17.006	50.00	6.66	67.985	0.567	0.0	0.0	15.4	1.45	102.5	92.1
S20.000	50.00	4.16	68.275	0.036	0.0	0.0	1.0	1.54	61.3	5.8
S20.001	50.00	4.63	68.071	0.070	0.0	0.0	1.9	1.28	50.7	11.4
S17.007	50.00	7.28	67.579	0.765	0.0	0.0	20.7	1.40	154.1	124.3

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
S17.008	13.005	0.112	116.1	0.011	0.00	0.0	0.600	o	375	Pipe/Conduit	
S21.000	8.002	0.167	47.9	0.024	4.00	0.0	0.600	o	225	Pipe/Conduit	
S17.009	63.800	0.532	120.0	0.127	0.00	0.0	0.600	o	375	Pipe/Conduit	
S17.010	11.713	0.097	121.0	0.008	0.00	0.0	0.600	o	375	Pipe/Conduit	
S17.011	30.282	0.304	99.6	0.029	0.00	0.0	0.600	o	375	Pipe/Conduit	
S22.000	16.272	0.198	82.2	0.048	4.00	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)
S17.008	50.00	7.41	67.270	0.776	0.0	0.0	21.0	1.68	185.6	126.1
S21.000	50.00	4.07	67.475	0.024	0.0	0.0	0.6	1.89	75.3	3.9
S17.009	50.00	8.05	67.158	0.927	0.0	0.0	25.1	1.65	182.6	150.6
S17.010	50.00	8.17	66.626	0.935	0.0	0.0	25.3	1.65	181.8	151.9
S17.011	50.00	8.45	66.530	0.964	0.0	0.0	26.1	1.82	200.5	156.6
S22.000	50.00	4.19	66.575	0.048	0.0	0.0	1.3	1.44	57.4	7.8

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
S17.012	57.205	0.520	110.0	0.094	0.00	0.0	0.600	o	375	Pipe/Conduit	
S17.013	29.500	0.132	223.5	0.075	0.00	0.0	0.600	o	450	Pipe/Conduit	
S23.000	9.965	0.038	262.2	0.110	4.00	0.0	0.600	o	450	Pipe/Conduit	
S17.014	61.960	0.251	246.9	0.150	0.00	0.0	0.600	o	300	Pipe/Conduit	
S17.015	38.803	0.158	245.6	0.133	0.00	0.0	0.600	o	300	Pipe/Conduit	
S24.000	12.747	0.042	303.5	0.018	4.00	0.0	0.600	o	600	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)
S17.012	50.00	9.00	66.226	1.106	0.0	0.0	30.0	1.73	190.7	179.7
S17.013	50.00	9.36	65.631	1.181	0.0	0.0	32.0	1.36	215.6	191.9
S23.000	50.00	4.13	65.538	0.110	0.0	0.0	3.0	1.25	198.9	17.9
S17.014	50.00	10.40	65.500	1.441	0.0	0.0	39.0	1.00	70.4«	234.2
S17.015	50.00	11.05	65.249	1.574	0.0	0.0	42.6	1.00	70.6«	255.8
S24.000	50.00	4.15	64.834	0.018	0.0	0.0	0.5	1.39	393.7	2.9

Reduced Flow of 20.0 l/s downstream of hydrobrake at manhole S4-3

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
S17.016	40.618	0.074	548.9	0.036	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.022	87.947	0.160	549.7	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.023	90.045	0.164	549.1	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.024	57.211	0.109	524.9	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S25.000	9.436	0.016	600.0	0.000	4.00	0.0	0.600	o	600	Pipe/Conduit	
S1.025	53.352	0.144	370.5	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.026	4.285	0.008	535.6	0.000	0.00	0.0	0.600	o	600	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)
S17.016	50.00	11.70	64.791	1.628	0.0	0.0	44.1	1.03	291.9	264.5
S1.022	50.00	13.12	64.717	4.950	0.0	0.0	134.1	1.03	291.7«	804.4
S1.023	50.00	14.58	64.557	4.950	0.0	0.0	134.1	1.03	291.8«	804.4
S1.024	50.00	15.48	64.393	4.950	0.0	0.0	134.1	1.06	298.6«	804.4
S25.000	50.00	4.16	64.300	0.000	0.0	0.0	0.0	0.99	279.0	0.0
S1.025	50.00	16.19	64.284	4.950	0.0	0.0	134.1	1.26	356.0«	804.4
S1.026	50.00	16.25	64.140	4.950	0.0	0.0	134.1	1.05	295.5«	804.4

Reduced Flow of 26.0 l/s downstream of hydrobrake at manhole S4

Reduced Flow of 25.5 l/s downstream of hydrobrake at manhole S1

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)
S1.026	S	65.040	64.132	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	20.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 4 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	14.700	Cv (Summer)	0.750
Return Period (years)	100	Ratio R	0.281	Cv (Winter)	0.840
Region	Scotland and Ireland	Profile Type	Summer	Storm Duration (mins)	30

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S16, DS/PN: S1.010, Volume (m³): 19.7

Unit Reference	MD-SHE-0088-6000-3500-6000	Sump Available	Yes
Design Head (m)	3.500	Diameter (mm)	88
Design Flow (l/s)	6.0	Invert Level (m)	68.233
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	3.500	6.0	Kick-Flo®	0.788	3.0
Flush-Flo™	0.380	3.8	Mean Flow over Head Range	-	4.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.7	0.600	3.6	1.600	4.2	2.600	5.2	5.000	7.1	7.500	8.6
0.200	3.5	0.800	3.0	1.800	4.4	3.000	5.6	5.500	7.4	8.000	8.9
0.300	3.7	1.000	3.3	2.000	4.6	3.500	6.0	6.000	7.7	8.500	9.1
0.400	3.8	1.200	3.6	2.200	4.8	4.000	6.4	6.500	8.0	9.000	9.4
0.500	3.7	1.400	3.9	2.400	5.0	4.500	6.7	7.000	8.3	9.500	9.6

Hydro-Brake® Optimum Manhole: S4-3, DS/PN: S17.014, Volume (m³): 7.5

Unit Reference	MD-SHE-0197-2000-1100-2000	Sump Available	Yes
Design Head (m)	1.100	Diameter (mm)	197
Design Flow (l/s)	20.0	Invert Level (m)	65.500
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1500
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	20.0	Kick-Flo®	0.773	16.9
Flush-Flo™	0.356	20.0	Mean Flow over Head Range	-	17.0

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.8	0.600	19.2	1.600	23.9	2.600	30.2	5.000	41.4	7.500	50.3
0.200	18.5	0.800	17.2	1.800	25.3	3.000	32.3	5.500	43.3	8.000	51.9
0.300	19.9	1.000	19.1	2.000	26.6	3.500	34.8	6.000	45.2	8.500	53.5
0.400	19.9	1.200	20.8	2.200	27.8	4.000	37.1	6.500	47.0	9.000	55.0
0.500	19.6	1.400	22.4	2.400	29.0	4.500	39.3	7.000	48.7	9.500	56.5

Hydro-Brake® Optimum Manhole: S4, DS/PN: S1.022, Volume (m³): 33.1

Unit Reference	MD-SHE-0211-2600-1783-2600	Flush-Flo™	Calculated
Design Head (m)	1.783	Objective	Minimise upstream storage
Design Flow (l/s)	26.0	Application	Surface

Hydro-Brake® Optimum Manhole: S4, DS/PN: S1.022, Volume (m³): 33.1

Sump Available	Yes	Minimum Outlet Pipe Diameter (mm)	225
Diameter (mm)	211	Suggested Manhole Diameter (mm)	1800
Invert Level (m)	64.717		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.783	26.0	Kick-Flo®	1.143	21.0
Flush-Flo™	0.528	25.9	Mean Flow over Head Range	-	22.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.2	0.600	25.8	1.600	24.7	2.600	31.1	5.000	42.6	7.500	51.9
0.200	20.5	0.800	25.1	1.800	26.1	3.000	33.3	5.500	44.6	8.000	53.5
0.300	24.5	1.000	23.6	2.000	27.4	3.500	35.9	6.000	46.6	8.500	55.1
0.400	25.5	1.200	21.5	2.200	28.7	4.000	38.3	6.500	48.4	9.000	56.7
0.500	25.8	1.400	23.1	2.400	29.9	4.500	40.5	7.000	50.2	9.500	58.2

Hydro-Brake® Optimum Manhole: S1, DS/PN: S1.025, Volume (m³): 19.7

Unit Reference	MD-SHE-0224-2550-0700-2550	Sump Available	Yes
Design Head (m)	0.700	Diameter (mm)	224
Design Flow (l/s)	25.5	Invert Level (m)	64.284
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	300
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1500
Application	Surface		

Hydro-Brake® Optimum Manhole: S1, DS/PN: S1.025, Volume (m³): 19.7

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	25.5	Kick-Flo®	0.561	22.9
Flush-Flo™	0.331	25.5	Mean Flow over Head Range	-	20.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.5	0.600	23.7	1.600	37.9	2.600	47.9	5.000	65.8	7.500	79.6
0.200	22.2	0.800	27.2	1.800	40.1	3.000	51.3	5.500	68.9	8.000	82.3
0.300	25.4	1.000	30.2	2.000	42.2	3.500	55.3	6.000	71.9	8.500	84.8
0.400	25.3	1.200	33.0	2.200	44.2	4.000	59.0	6.500	74.7	9.000	87.3
0.500	24.2	1.400	35.5	2.400	46.1	4.500	62.5	7.000	77.5	9.500	89.8

Summary of Results for 30 minute 100 year Summer (Storm)

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status OFF

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S26	70.720	0.542	0.000	0.51			30.7	SURCHARGED
S1.001	S25	70.679	0.777	0.000	0.75			35.3	SURCHARGED
S1.002	S24	70.596	0.887	0.000	0.87			32.3	SURCHARGED
S2.000	S23-1	70.562	0.684	0.000	0.30			16.3	SURCHARGED
S1.003	S23	70.535	0.928	0.000	0.83			56.7	SURCHARGED
S1.004	S22	70.478	0.969	0.000	1.33			87.7	SURCHARGED
S3.000	S21-2	70.204	-0.121	0.000	0.25			14.9	OK
S4.000	S21-1-1	70.202	-0.023	0.000	0.25			13.9	OK
S3.001	S21-1	70.179	0.382	0.000	0.52			28.2	SURCHARGED
S1.005	S21	70.118	0.804	0.000	1.27			138.6	SURCHARGED
S1.006	S20	69.947	0.734	0.000	1.31			139.1	SURCHARGED
S1.007	S19	69.802	0.675	0.000	1.53			145.5	SURCHARGED
S1.008	S18	69.667	0.586	0.000	1.41			149.6	SURCHARGED
S5.000	S17-2	71.463	-0.120	0.000	0.44			41.2	OK
S5.001	S17-1	70.035	-0.055	0.000	0.79			69.6	OK
S1.009	S17	69.458	0.487	0.000	1.06			201.5	SURCHARGED
S6.000	S16-2	72.224	0.137	0.000	0.79			55.8	SURCHARGED
S6.001	S16-1	71.593	0.779	0.000	1.34			79.2	SURCHARGED
S7.000	S19	69.056	0.173	0.000	0.03			7.0	SURCHARGED

Summary of Results for 30 minute 100 year Summer (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.010	S16	69.137	0.604	0.000	0.05			3.8	SURCHARGED
S8.000	S15-2	69.580	-0.004	0.000	0.44			23.1	OK
S8.001	S15-1	69.532	0.210	0.000	1.14			63.9	SURCHARGED
S1.011	S15	68.449	0.182	0.000	1.04			83.7	SURCHARGED
S1.012	S14	68.293	0.171	0.000	1.34			101.5	SURCHARGED
S1.013	S13	68.106	0.084	0.000	1.39			105.1	SURCHARGED
S9.000	S12-5	70.614	-0.086	0.000	0.68			43.7	OK
S9.001	S12-4	69.702	-0.076	0.000	0.76			45.6	OK
S10.000	S12-3-2	69.875	-0.125	0.000	0.40			21.0	OK
S10.001	S12-3-1	69.591	-0.088	0.000	0.56			22.2	OK
S9.002	S12-3	69.574	-0.025	0.000	0.78			100.3	OK
S9.003	S12-2	69.229	0.294	0.000	0.92			133.1	SURCHARGED
S11.000	S12-1-2	68.398	0.073	0.000	0.17			10.2	SURCHARGED
S11.001	S12-1-1	68.386	0.433	0.000	0.49			22.4	SURCHARGED
S9.004	S12-1	68.379	0.533	0.000	1.76			144.4	SURCHARGED
S1.014	S12	67.814	0.167	0.000	0.90			257.6	SURCHARGED
S1.015	S11	67.501	0.247	0.000	1.09			262.3	SURCHARGED
S1.016	S10	67.289	0.219	0.000	1.13			266.5	SURCHARGED
S1.017	S9	67.069	0.174	0.000	1.05			294.5	SURCHARGED
S12.000	S8-4	67.171	-0.125	0.000	0.39			21.2	OK
S12.001	S8-3	67.020	0.291	0.000	0.47			16.8	SURCHARGED
S13.000	S8-2-1	67.233	-0.157	0.000	0.20			14.0	OK
S12.002	S8-2	67.006	0.340	0.000	0.80			27.2	SURCHARGED
S14.000	S8-1-1	67.096	-0.098	0.000	0.57			30.7	OK
S12.003	S8-1	66.977	0.369	0.000	1.61			55.5	SURCHARGED

Summary of Results for 30 minute 100 year Summer (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.018	S8	66.560	0.127	0.000	1.00			347.1	SURCHARGED
S15.000	S7-1	66.916	-0.034	0.000	0.95			50.0	OK
S1.019	S7	66.468	0.128	0.000	1.35			373.2	SURCHARGED
S1.020	S6	66.332	0.028	0.000	0.83			377.8	SURCHARGED
S16.000	S5-3	66.715	-0.185	0.000	0.07			5.1	OK
S16.001	S5-2	66.366	-0.164	0.000	0.16			10.1	OK
S16.002	S5-1	66.136	-0.086	0.000	0.19			11.0	OK
S1.021	S5	66.127	0.121	0.000	0.66			413.4	SURCHARGED
S17.000	S4-17	69.422	0.172	0.000	0.16			9.5	SURCHARGED
S17.001	S4-16	69.411	0.456	0.000	0.25			12.2	SURCHARGED
S18.000	S4-15-1	69.418	0.018	0.000	0.13			10.5	SURCHARGED
S17.002	S4-15	69.407	0.570	0.000	0.62			21.1	SURCHARGED
S17.003	S4-14	69.401	0.622	0.000	1.29			44.8	SURCHARGED
S17.004	S4-13	69.107	0.542	0.000	0.95			56.6	SURCHARGED
S17.005	S4-12	69.072	0.551	0.000	1.18			78.9	SURCHARGED
S19.000	S4-11-1	69.056	0.056	0.000	0.86			46.2	SURCHARGED
S17.006	S4-11	68.783	0.498	0.000	1.27			120.8	SURCHARGED
S20.000	S4-10-2	68.348	-0.152	0.000	0.23			12.1	OK
S20.001	S4-10-1	68.306	0.010	0.000	0.49			23.3	SURCHARGED
S17.007	S4-10	68.282	0.328	0.000	1.07			152.5	SURCHARGED
S17.008	S4-9	67.950	0.305	0.000	1.15			150.7	SURCHARGED
S21.000	S4-8-1	67.810	0.110	0.000	0.13			7.7	SURCHARGED
S17.009	S4-8	67.806	0.273	0.000	0.99			170.6	SURCHARGED
S17.010	S4-7	67.286	0.285	0.000	1.40			170.1	SURCHARGED
S17.011	S4-6	67.101	0.196	0.000	0.98			173.3	SURCHARGED

Summary of Results for 30 minute 100 year Summer (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S22.000	S4-5-1	66.835	0.035	0.000	0.31			16.0	SURCHARGED
S17.012	S4-5	66.820	0.219	0.000	1.06			188.2	SURCHARGED
S17.013	S4-4	66.331	0.250	0.000	1.08			200.0	FLOOD RISK
S23.000	S73	66.212	0.224	0.000	0.13			18.0	SURCHARGED
S17.014	S4-3	66.255	0.455	0.000	0.30			19.9	SURCHARGED
S17.015	S4-2	65.692	0.143	0.000	0.86			56.0	SURCHARGED
S24.000	S75	65.326	-0.108	0.000	0.02			5.9	OK
S17.016	S4-1	65.596	0.205	0.000	0.09			22.6	SURCHARGED
S1.022	S4	65.829	0.512	0.000	0.10			25.8	SURCHARGED
S1.023	S3	64.683	-0.474	0.000	0.10			25.8	OK
S1.024	S2	64.538	-0.455	0.000	0.10			25.7	OK
S25.000	S81	64.439	-0.461	0.000	0.00			0.0	OK
S1.025	S1	64.467	-0.417	0.000	0.06			19.8	OK
S1.026	S0	64.261	-0.479	0.000	0.09			19.7	OK

APPENDIX D – CORRESPONDANCE WITH IRISH WATER

Emma Daly

DBFL Consulting Engineers
Ormond House
Upper Ormond Quay
Dublin 7
Co. Dublin
D07W704

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

1 September 2021

Re: CDS21000215 pre-connection enquiry - Subject to contract | Contract denied

Connection for Housing Development of 358 unit(s) at Lands at Clonminch Road, Tullamore, Co. Offaly

Dear Sir/Madam,

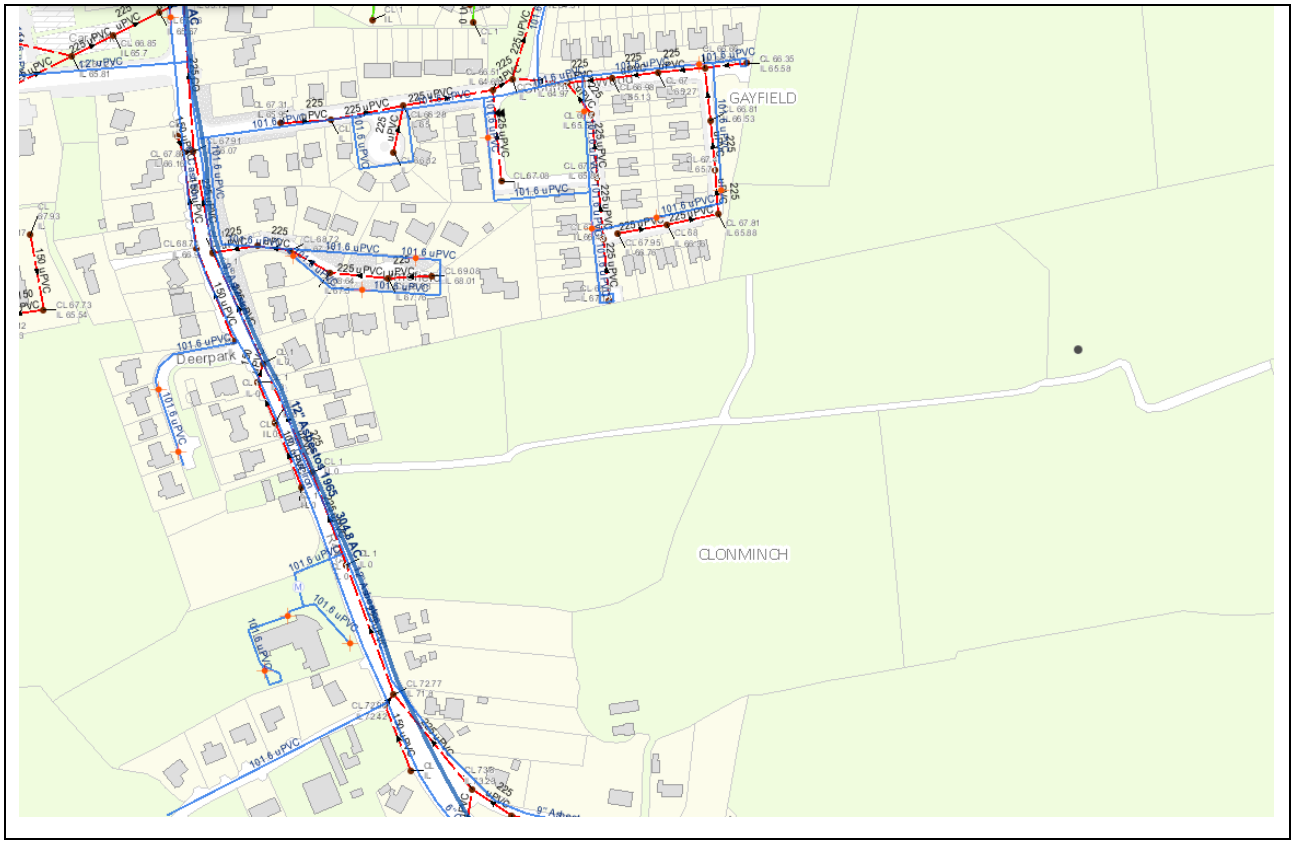
Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Lands at Clonminch Road, Tullamore, Co. Offaly (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	**OUTCOME OF PRE-CONNECTION ENQUIRY** **THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.**
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	Irish Water is currently in the process of undertaking upgrade works to provide additional capacity at the Clonaslee Water Treatment Plant. It is envisaged the additional capacity that could facilitate this development will be in place by the end of Q3 2021. An existing 300mm diameter water main located on Clonminch Road (R443) along the western boundary of the site has sufficient capacity to supply the proposed development.

Wastewater Connection	There is sufficient capacity available at the Tullamore Wastewater Treatment Plant to facilitate your proposed development. A wastewater connection from this development could be facilitated subject to the completion of interim works on the network. The interim works would primarily include surface water separation works within St. Columbas Place and along Clonminch Road (R443), which would remove sufficient volumes of surface water from the combined sewer system to free up capacity for the expected wastewater loading from the proposed development. We advise that you complete further hydraulic assessments of the said downstream network and include 1 in 1 year storm events in your assessment. Please feel free to liaise further with Irish Water when you are progressing further hydraulic assessments of storm events. It is envisaged the extent of the surface water separation works would be in the public road/space. Please note your Developer would be permitted to complete these works with the agreement of Offaly County Council, who is the owner of the surface water network. Further to this we would advise you enter a Project Works Service Agreement (PWSA) with Irish Water to establish and agree the optimum location for a storm water storage tank on the downstream network. The enduring wastewater solution for this site is the planned Southern Interceptor Sewer (SIS). This project is currently being progressed by Irish Water and will be delivered by Irish Water in conjunction with Offaly County Council along with specific road projects in this area of Tullamore. Please note the SIS project is not likely to be completed before your proposed development. Accordingly, the identified interim works outlined above would be required to facilitate a wastewater connection from your site in the short term. Once the SIS project is completed the long-term wastewater connection for this development can be completed to an agreed location on the SIS. Please note the exact scope of surface water separation works and storage should be agreed with Irish Water in due course and in advance of the Connection Agreement for this development.

The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.

The map included below outlines the current Irish Water infrastructure adjacent to your site:



Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

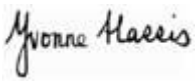
General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**
2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.
3) The feedback provided is subject to a Connection Agreement/contract being signed at a later date.
4) A Connection Agreement will be required to commencing the connection works associated with the enquiry this can be applied for at https://www.water.ie/connections/get-connected/
5) A Connection Agreement cannot be issued until all statutory approvals are successfully in place.

6) Irish Water Connection Policy/ Charges can be found at https://www.water.ie/connections/information/connection-charges/
7) Please note the Confirmation of Feasibility does not extend to your fire flow requirements.
8) Irish Water is not responsible for the management or disposal of storm water or ground waters. You are advised to contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges
9) To access Irish Water Maps email datarequests@water.ie
10) All works to the Irish Water infrastructure, including works in the Public Space, shall have to be carried out by Irish Water.

If you have any further questions, please contact Peter O'Halloran from the design team on 086 8824642 or email PeOHalloran@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations

APPENDIX E – FOUL DRAINAGE CALCULATION

Ormond House
Upper Ormond Quay
Dublin 7

Date 07/09/2021 18:30 | Designed by dalye
File 180002- Drainage Design 100 yr 07.09.2021... | Checked by
Innovyze | Network 2020.1

FOUL SEWERAGE DESIGN

Design Criteria for Foul

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Domestic (l/s/ha)	0.00	Maximum Backdrop Height (m)	1.500
Industrial Peak Flow Factor	0.00	Domestic Peak Flow Factor	6.00	Min Design Depth for Optimisation (m)	1.200
Calculation Method	EN 752	Add Flow / Climate Change (%)	20	Min Vel for Auto Design only (m/s)	1.00
Frequency Factor	0.50	Minimum Backdrop Height (m)	0.200	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	18.819	0.290	64.9	0.000	27.0	0.0	1.500	o	225	Pipe/Conduit	
F1.001	20.384	0.255	79.9	0.000	12.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	69.953	0.000	0.0	27.0	0.5	36	0.76	1.43	56.7	3.1
F1.001	69.663	0.000	0.0	39.0	0.6	41	0.75	1.28	51.1	3.7

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.002	12.716	0.159	80.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F1.003	20.862	0.209	99.8	0.000	30.0	0.0	1.500	o	225	Pipe/Conduit	
F1.004	70.086	0.538	130.3	0.000	72.0	0.0	1.500	o	225	Pipe/Conduit	
F1.005	22.198	0.172	129.1	0.000	6.0	0.0	1.500	o	225	Pipe/Conduit	
F1.006	9.049	0.069	131.1	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F2.000	44.064	1.255	35.1	0.000	27.0	0.0	1.500	o	225	Pipe/Conduit	
F2.001	33.584	0.534	62.9	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F2.002	31.813	0.436	73.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.002	69.408	0.000	0.0	39.0	0.6	41	0.75	1.28	51.1	3.7
F1.003	69.249	0.000	0.0	69.0	0.8	50	0.75	1.15	45.7	5.0
F1.004	69.040	0.000	0.0	141.0	1.2	64	0.76	1.01	40.0	7.1
F1.005	68.502	0.000	0.0	147.0	1.2	65	0.77	1.01	40.2	7.3
F1.006	68.330	0.000	0.0	147.0	1.2	65	0.76	1.00	39.8	7.3
F2.000	71.500	0.000	0.0	27.0	0.5	31	0.94	1.94	77.2	3.1
F2.001	70.243	0.000	0.0	27.0	0.5	36	0.77	1.45	57.6	3.1
F2.002	69.709	0.000	0.0	27.0	0.5	37	0.73	1.34	53.5	3.1

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.007	17.071	0.115	148.4	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F1.008	21.579	0.144	149.9	0.000	30.0	0.0	1.500	o	225	Pipe/Conduit	
F1.009	55.834	0.329	169.7	0.000	60.0	0.0	1.500	o	225	Pipe/Conduit	
F3.000	68.293	1.136	60.1	0.000	33.0	0.0	1.500	o	225	Pipe/Conduit	
F3.001	65.089	1.302	50.0	0.000	12.0	0.0	1.500	o	225	Pipe/Conduit	
F3.002	53.829	0.673	80.0	0.000	18.0	0.0	1.500	o	225	Pipe/Conduit	
F1.010	19.415	0.194	100.1	0.000	15.0	0.0	1.500	o	225	Pipe/Conduit	
F1.011	14.634	0.147	99.6	0.000	9.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.007	68.261	0.000	0.0	174.0	1.3	70	0.75	0.94	37.4	7.9
F1.008	68.146	0.000	0.0	204.0	1.4	73	0.76	0.94	37.2	8.6
F1.009	68.002	0.000	0.0	264.0	1.6	81	0.75	0.88	35.0	9.7
F3.000	71.675	0.000	0.0	33.0	0.6	37	0.81	1.48	58.9	3.4
F3.001	70.539	0.000	0.0	45.0	0.7	38	0.90	1.63	64.6	4.0
F3.002	69.237	0.000	0.0	63.0	0.8	46	0.80	1.28	51.1	4.8
F1.010	67.673	0.000	0.0	342.0	1.8	76	0.95	1.15	45.6	11.1
F1.011	67.479	0.000	0.0	351.0	1.9	76	0.95	1.15	45.7	11.2

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.012	12.268	0.135	90.9	0.000	6.0	0.0	1.500	o	225	Pipe/Conduit	
F4.000	55.962	0.934	59.9	0.000	21.0	0.0	1.500	o	225	Pipe/Conduit	
F4.001	4.262	0.071	60.0	0.000	6.0	0.0	1.500	o	225	Pipe/Conduit	
F5.000	26.054	0.563	46.3	0.000	12.0	0.0	1.500	o	225	Pipe/Conduit	
F5.001	9.985	0.208	48.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F4.002	42.798	0.535	80.0	0.000	24.0	0.0	1.500	o	225	Pipe/Conduit	
F4.003	58.363	0.731	79.8	0.000	39.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.012	67.332	0.000	0.0	357.0	1.9	75	0.99	1.20	47.9	11.3
F4.000	70.475	0.000	0.0	21.0	0.5	33	0.75	1.48	59.0	2.7
F4.001	69.541	0.000	0.0	27.0	0.5	35	0.78	1.48	59.0	3.1
F5.000	69.839	0.000	0.0	12.0	0.3	27	0.76	1.69	67.2	2.1
F5.001	69.276	0.000	0.0	12.0	0.3	28	0.74	1.66	66.0	2.1
F4.002	69.068	0.000	0.0	63.0	0.8	46	0.80	1.28	51.1	4.8
F4.003	68.533	0.000	0.0	102.0	1.0	52	0.86	1.29	51.1	6.1

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F4.004	32.064	0.605	53.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F1.013	39.840	0.199	200.2	0.000	21.0	0.0	1.500	o	225	Pipe/Conduit	
F1.014	22.060	0.111	198.7	0.000	9.0	0.0	1.500	o	225	Pipe/Conduit	
F1.015	16.538	0.082	201.7	0.000	6.0	0.0	1.500	o	225	Pipe/Conduit	
F1.016	48.890	0.244	200.4	0.000	96.0	0.0	1.500	o	225	Pipe/Conduit	
F1.017	17.794	0.089	199.9	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F6.000	55.989	0.727	77.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F4.004	67.803	0.000	0.0	102.0	1.0	47	1.00	1.58	62.8	6.1
F1.013	67.197	0.000	0.0	480.0	2.2	100	0.77	0.81	32.2	13.1
F1.014	66.998	0.000	0.0	489.0	2.2	100	0.77	0.81	32.3	13.3
F1.015	66.887	0.000	0.0	495.0	2.2	101	0.77	0.81	32.1	13.3
F1.016	66.805	0.000	0.0	591.0	2.4	106	0.79	0.81	32.2	14.6
F1.017	66.561	0.000	0.0	591.0	2.4	106	0.79	0.81	32.2	14.6
F6.000	67.275	0.000	0.0	0.0	0.0	0	0.00	1.31	52.0	0.0

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.018	4.318	0.022	196.3	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F1.019	10.842	0.136	79.7	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F1.020	52.715	0.659	80.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F1.021	59.498	1.455	40.9	0.000	153.0	0.0	1.500	o	225	Pipe/Conduit	
F7.000	45.428	0.604	75.2	0.000	36.0	0.0	1.500	o	225	Pipe/Conduit	
F7.001	10.720	0.134	80.0	0.000	15.0	0.0	1.500	o	225	Pipe/Conduit	
F7.002	60.983	0.678	89.9	0.000	9.0	0.0	1.500	o	225	Pipe/Conduit	
F8.000	49.377	1.345	36.7	0.000	36.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.018	66.472	0.000	0.0	591.0	2.4	106	0.80	0.82	32.5	14.6
F1.019	66.450	0.000	0.0	591.0	2.4	82	1.11	1.29	51.1	14.6
F1.020	66.314	0.000	0.0	591.0	2.4	82	1.11	1.28	51.1	14.6
F1.021	65.654	0.000	0.0	744.0	2.7	73	1.46	1.80	71.5	16.4
F7.000	68.875	0.000	0.0	36.0	0.6	40	0.75	1.32	52.7	3.6
F7.001	68.271	0.000	0.0	51.0	0.7	44	0.78	1.28	51.1	4.3
F7.002	68.137	0.000	0.0	60.0	0.8	47	0.76	1.21	48.1	4.6
F8.000	68.805	0.000	0.0	36.0	0.6	34	0.97	1.90	75.5	3.6

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F7.003	38.281	0.319	120.0	0.000	6.0	0.0	1.500	o	225	Pipe/Conduit	
F7.004	51.918	0.433	119.9	0.000	27.0	0.0	1.500	o	225	Pipe/Conduit	
F7.005	10.528	0.089	118.3	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F9.000	6.292	0.252	25.0	0.000	3.0	0.0	1.500	o	225	Pipe/Conduit	
F7.006	61.255	0.437	140.2	0.000	18.0	0.0	1.500	o	225	Pipe/Conduit	
F7.007	9.683	0.070	138.3	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F7.008	29.028	0.205	141.6	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F7.003	67.459	0.000	0.0	102.0	1.0	58	0.75	1.05	41.6	6.1
F7.004	67.140	0.000	0.0	129.0	1.1	62	0.77	1.05	41.7	6.8
F7.005	66.707	0.000	0.0	129.0	1.1	61	0.78	1.05	41.9	6.8
F9.000	66.871	0.000	0.0	3.0	0.2	17	0.75	2.30	91.5	1.0
F7.006	66.618	0.000	0.0	150.0	1.2	67	0.75	0.97	38.5	7.3
F7.007	66.181	0.000	0.0	150.0	1.2	66	0.75	0.98	38.8	7.3
F7.008	66.111	0.000	0.0	150.0	1.2	67	0.74	0.96	38.3	7.3

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F10.000	14.386	0.959	15.0	0.000	9.0	0.0	1.500	o	225	Pipe/Conduit	
F7.009	31.000	0.220	140.9	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F7.010	60.359	0.689	87.6	0.000	84.0	0.0	1.500	o	225	Pipe/Conduit	
F11.000	21.530	0.428	50.3	0.000	12.0	0.0	1.500	o	225	Pipe/Conduit	
F7.011	68.498	0.412	166.3	0.000	18.0	0.0	1.500	o	225	Pipe/Conduit	
F7.012	69.689	0.387	180.1	0.000	24.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F10.000	66.885	0.000	0.0	9.0	0.3	20	1.07	2.97	118.2	1.8
F7.009	65.906	0.000	0.0	159.0	1.3	68	0.75	0.97	38.4	7.6
F7.010	65.686	0.000	0.0	243.0	1.6	67	0.95	1.23	48.8	9.4
F11.000	65.425	0.000	0.0	12.0	0.3	28	0.73	1.62	64.4	2.1
F7.011	64.997	0.000	0.0	273.0	1.7	81	0.76	0.89	35.4	9.9
F7.012	64.585	0.000	0.0	297.0	1.7	85	0.75	0.85	34.0	10.3

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.022	80.105	0.401	199.8	0.000	6.0	0.0	1.500	o	225	Pipe/Conduit	
F1.023	78.633	0.393	200.1	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F1.024	22.580	0.112	201.6	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F1.025	51.507	0.258	199.6	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F1.026	51.491	0.258	199.6	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F1.027	44.580	0.826	54.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.022	64.198	0.000	0.0	1047.0	3.2	126	0.85	0.81	32.2	19.4
F1.023	63.797	0.000	0.0	1047.0	3.2	126	0.85	0.81	32.2	19.4
F1.024	63.404	0.000	0.0	1047.0	3.2	126	0.84	0.81	32.1	19.4
F1.025	63.292	0.000	0.0	1047.0	3.2	126	0.85	0.81	32.2	19.4
F1.026	63.034	0.000	0.0	1047.0	3.2	126	0.85	0.81	32.2	19.4
F1.027	62.776	0.000	0.0	1047.0	3.2	86	1.38	1.56	62.2	19.4

Manhole Schedules for Foul

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
F28	71.560	1.607	Open Manhole	1200	F1.000	69.953	225				
F27	71.458	1.795	Open Manhole	1200	F1.001	69.663	225	F1.000	69.663	225	
F26	71.440	2.032	Open Manhole	1200	F1.002	69.408	225	F1.001	69.408	225	
F25	71.318	2.069	Open Manhole	1200	F1.003	69.249	225	F1.002	69.249	225	
F24	71.474	2.434	Open Manhole	1200	F1.004	69.040	225	F1.003	69.040	225	
F23	71.252	2.750	Open Manhole	1200	F1.005	68.502	225	F1.004	68.502	225	
F22	71.045	2.715	Open Manhole	1200	F1.006	68.330	225	F1.005	68.330	225	
F21-3	72.990	1.490	Open Manhole	1200	F2.000	71.500	225				
F21-2	71.332	1.089	Open Manhole	1200	F2.001	70.243	225	F2.000	70.245	225	2
F21-1	71.123	1.414	Open Manhole	1200	F2.002	69.709	225	F2.001	69.709	225	
F21	70.964	2.703	Open Manhole	1200	F1.007	68.261	225	F1.006	68.261	225	
								F2.002	69.273	225	1012
F20	70.793	2.647	Open Manhole	1200	F1.008	68.146	225	F1.007	68.146	225	
F19	70.588	2.586	Open Manhole	1200	F1.009	68.002	225	F1.008	68.002	225	
F18-3	73.159	1.484	Open Manhole	1200	F3.000	71.675	225				
F18-2	72.092	1.553	Open Manhole	1200	F3.001	70.539	225	F3.000	70.539	225	
F18-1	70.818	1.581	Open Manhole	1200	F3.002	69.237	225	F3.001	69.237	225	
F18	70.104	2.431	Open Manhole	1200	F1.010	67.673	225	F1.009	67.673	225	
								F3.002	68.564	225	891

Manhole Schedules for Foul

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
F17	69.914	2.435	Open Manhole	1200	F1.011	67.479	225	F1.010	67.479	225	
F16	69.775	2.443	Open Manhole	1200	F1.012	67.332	225	F1.011	67.332	225	
F15-5	71.994	1.519	Open Manhole	1200	F4.000	70.475	225				
F15-4	71.068	1.527	Open Manhole	1200	F4.001	69.541	225	F4.000	69.541	225	
F15-3-2	71.297	1.458	Open Manhole	1200	F5.000	69.839	225				
F15-3-1	71.083	1.807	Open Manhole	1200	F5.001	69.276	225	F5.000	69.276	225	
F15-3	71.018	1.950	Open Manhole	1200	F4.002	69.068	225	F4.001	69.470	225	402
								F5.001	69.068	225	
F15-2	70.293	1.760	Open Manhole	1200	F4.003	68.533	225	F4.002	68.533	225	
F15-1	69.441	1.639	Open Manhole	1200	F4.004	67.803	225	F4.003	67.802	225	
F15	69.653	2.456	Open Manhole	1200	F1.013	67.197	225	F1.012	67.197	225	
								F4.004	67.198	225	1
F14	69.233	2.235	Open Manhole	1200	F1.014	66.998	225	F1.013	66.998	225	
F13	69.016	2.129	Open Manhole	1200	F1.015	66.887	225	F1.014	66.887	225	
F12	68.871	2.066	Open Manhole	1200	F1.016	66.805	225	F1.015	66.805	225	
F11	67.123	0.562	Open Manhole	1200	F1.017	66.561	225	F1.016	66.561	225	
F10-1	68.425	1.150	Open Manhole	1200	F6.000	67.275	225				
F10	68.253	1.781	Open Manhole	1200	F1.018	66.472	225	F1.017	66.472	225	
								F6.000	66.548	225	76

Ormond House
Upper Ormond Quay
Dublin 7

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Manhole Schedules for Foul

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
F9	68.181	1.731	Open Manhole	1200	F1.019	66.450	225	F1.018	66.450	225	
F8	68.066	1.752	Open Manhole	1200	F1.020	66.314	225	F1.019	66.314	225	
F7	67.531	1.877	Open Manhole	1200	F1.021	65.654	225	F1.020	65.655	225	1
F6-13	70.397	1.522	Open Manhole	1200	F7.000	68.875	225				
F6-12	69.951	1.680	Open Manhole	1200	F7.001	68.271	225	F7.000	68.271	225	
F6-11	69.857	1.720	Open Manhole	1200	F7.002	68.137	225	F7.001	68.137	225	
F6-10-1	70.233	1.428	Open Manhole	1200	F8.000	68.805	225				
F6-10	69.646	2.187	Open Manhole	1200	F7.003	67.459	225	F7.002	67.459	225	
								F8.000	67.460	225	1
F6-9	69.520	2.380	Open Manhole	1200	F7.004	67.140	225	F7.003	67.140	225	
F6-8	68.959	2.252	Open Manhole	1200	F7.005	66.707	225	F7.004	66.707	225	
F6-7-1	68.891	2.020	Open Manhole	1200	F9.000	66.871	225				
F6-7	68.815	2.197	Open Manhole	1200	F7.006	66.618	225	F7.005	66.618	225	
								F9.000	66.619	225	1
F6-6	68.217	2.036	Open Manhole	1200	F7.007	66.181	225	F7.006	66.181	225	
F6-5	68.161	2.050	Open Manhole	1200	F7.008	66.111	225	F7.007	66.111	225	
F6-4-1	68.045	1.160	Open Manhole	1200	F10.000	66.885	225				
F6-4	68.113	2.207	Open Manhole	1200	F7.009	65.906	225	F7.008	65.906	225	
								F10.000	65.926	225	20

Manhole Schedules for Foul

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
F6-3	67.060	1.374	Open Manhole	1200	F7.010	65.686	225	F7.009	65.686	225	
F6-2-1	66.614	1.189	Open Manhole	1200	F11.000	65.425	225				
F6-2	66.650	1.653	Open Manhole	1200	F7.011	64.997	225	F7.010	64.997	225	
								F11.000	64.997	225	
F6-1	67.215	2.630	Open Manhole	1200	F7.012	64.585	225	F7.011	64.585	225	
F6	66.139	1.941	Open Manhole	1200	F1.022	64.198	225	F1.021	64.199	225	1
								F7.012	64.198	225	
F5	66.358	2.561	Open Manhole	1200	F1.023	63.797	225	F1.022	63.797	225	
F4	66.590	3.186	Open Manhole	1200	F1.024	63.404	225	F1.023	63.404	225	
F3	65.754	2.462	Open Manhole	1200	F1.025	63.292	225	F1.024	63.292	225	
F2	64.982	1.948	Open Manhole	1200	F1.026	63.034	225	F1.025	63.034	225	
F1	64.571	1.795	Open Manhole	1200	F1.027	62.776	225	F1.026	62.776	225	
F	0.000		Open Manhole	0		OUTFALL		F1.027	61.950	225	

Manhole Schedules for Foul

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F28	634506.450	723208.517	634506.450	723208.517	Required	
F27	634525.297	723208.798	634525.297	723208.798	Required	
F26	634527.539	723188.537	634527.539	723188.537	Required	
F25	634531.946	723176.609	634531.946	723176.609	Required	
F24	634552.544	723179.915	634552.544	723179.915	Required	
F23	634622.536	723183.536	634622.536	723183.536	Required	
F22	634642.811	723192.574	634642.811	723192.574	Required	
F21-3	634677.383	723094.596	634677.383	723094.596	Required	

Manhole Schedules for Foul

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F21-2	634671.860	723138.312	634671.860	723138.312	Required	
F21-1	634667.974	723171.670	634667.974	723171.670	Required	
F21	634650.075	723197.971	634650.075	723197.971	Required	
F20	634662.607	723209.796	634662.607	723209.796	Required	
F19	634682.168	723218.908	634682.168	723218.908	Required	
F18-3	634684.884	723090.671	634684.884	723090.671	Required	
F18-2	634750.592	723109.283	634750.592	723109.283	Required	
F18-1	634743.262	723173.953	634743.262	723173.953	Required	

Manhole Schedules for Foul

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F18	634737.340	723227.454	634737.340	723227.454	Required	
F17	634756.095	723232.501	634756.095	723232.501	Required	
F16	634768.560	723240.213	634768.560	723240.213	Required	
F15-5	634758.058	723113.283	634758.058	723113.283	Required	
F15-4	634812.669	723125.355	634812.669	723125.355	Required	
F15-3-2	634850.638	723130.658	634850.638	723130.658	Required	
F15-3-1	634825.019	723125.918	634825.019	723125.918	Required	
F15-3	634815.417	723128.631	634815.417	723128.631	Required	

Manhole Schedules for Foul

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F15-2	634810.991	723171.199	634810.991	723171.199	Required	
F15-1	634804.172	723229.159	634804.172	723229.159	Required	
F15	634778.115	723247.864	634778.115	723247.864	Required	
F14	634797.734	723282.515	634797.734	723282.515	Required	
F13	634813.410	723297.997	634813.410	723297.997	Required	
F12	634827.992	723305.875	634827.992	723305.875	Required	
F11	634874.919	723319.594	634874.919	723319.594	Required	
F10-1	634946.651	723336.837	634946.651	723336.837	Required	

Manhole Schedules for Foul

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F10	634892.099	723324.249	634892.099	723324.249	Required	
F9	634892.058	723328.557	634892.058	723328.557	Required	
F8	634895.049	723338.967	634895.049	723338.967	Required	
F7	634906.338	723390.465	634906.338	723390.465	Required	
F6-13	634627.093	723233.753	634627.093	723233.753	Required	
F6-12	634625.468	723279.148	634625.468	723279.148	Required	
F6-11	634632.518	723287.185	634632.518	723287.185	Required	
F6-10-1	634698.843	723250.371	634698.843	723250.371	Required	

Manhole Schedules for Foul

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F6-10	634692.360	723299.121	634692.360	723299.121	Required	
F6-9	634729.872	723306.633	634729.872	723306.633	Required	
F6-8	634780.836	723316.618	634780.836	723316.618	Required	
F6-7-1	634790.948	723307.400	634790.948	723307.400	Required	
F6-7	634790.954	723313.694	634790.954	723313.694	Required	
F6-6	634803.297	723373.697	634803.297	723373.697	Required	
F6-5	634796.816	723380.902	634796.816	723380.902	Required	
F6-4-1	634754.232	723389.349	634754.232	723389.349	Required	

Manhole Schedules for Foul

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F6-4	634768.352	723386.548	634768.352	723386.548	Required	
F6-3	634773.641	723417.090	634773.641	723417.090	Required	
F6-2-1	634763.511	723480.677	634763.511	723480.677	Required	
F6-2	634784.637	723476.384	634784.637	723476.384	Required	
F6-1	634851.816	723463.007	634851.816	723463.007	Required	
F6	634919.958	723448.403	634919.958	723448.403	Required	
F5	634931.974	723527.596	634931.974	723527.596	Required	
F4	634944.890	723605.184	634944.890	723605.184	Required	

Manhole Schedules for Foul

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F3	634965.724	723613.847	634965.724	723613.847	Required	
F2	634983.511	723662.169	634983.511	723662.169	Required	
F1	635001.298	723710.491	635001.298	723710.491	Required	
F	635044.138	723698.144			No Entry	

Ormond House
Upper Ormond Quay
Dublin 7

Date 07/09/2021 18:30 | Designed by dalye
File 180002- Drainage Design 100 yr 07.09.2021... | Checked by
Innovyze | Network 2020.1

PIPELINE SCHEDULES for Foul

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	o	225	F28	71.560	69.953	1.382	Open Manhole	1200
F1.001	o	225	F27	71.458	69.663	1.570	Open Manhole	1200
F1.002	o	225	F26	71.440	69.408	1.807	Open Manhole	1200
F1.003	o	225	F25	71.318	69.249	1.844	Open Manhole	1200
F1.004	o	225	F24	71.474	69.040	2.209	Open Manhole	1200
F1.005	o	225	F23	71.252	68.502	2.525	Open Manhole	1200
F1.006	o	225	F22	71.045	68.330	2.490	Open Manhole	1200
F2.000	o	225	F21-3	72.990	71.500	1.265	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	18.819	64.9	F27	71.458	69.663	1.570	Open Manhole	1200
F1.001	20.384	79.9	F26	71.440	69.408	1.807	Open Manhole	1200
F1.002	12.716	80.0	F25	71.318	69.249	1.844	Open Manhole	1200
F1.003	20.862	99.8	F24	71.474	69.040	2.209	Open Manhole	1200
F1.004	70.086	130.3	F23	71.252	68.502	2.525	Open Manhole	1200
F1.005	22.198	129.1	F22	71.045	68.330	2.490	Open Manhole	1200
F1.006	9.049	131.1	F21	70.964	68.261	2.478	Open Manhole	1200
F2.000	44.064	35.1	F21-2	71.332	70.245	0.862	Open Manhole	1200

PIPELINE SCHEDULES for Foul

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F2.001	o	225	F21-2	71.332	70.243	0.864	Open Manhole	1200
F2.002	o	225	F21-1	71.123	69.709	1.189	Open Manhole	1200
F1.007	o	225	F21	70.964	68.261	2.478	Open Manhole	1200
F1.008	o	225	F20	70.793	68.146	2.422	Open Manhole	1200
F1.009	o	225	F19	70.588	68.002	2.361	Open Manhole	1200
F3.000	o	225	F18-3	73.159	71.675	1.259	Open Manhole	1200
F3.001	o	225	F18-2	72.092	70.539	1.328	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F2.001	33.584	62.9	F21-1	71.123	69.709	1.189	Open Manhole	1200
F2.002	31.813	73.0	F21	70.964	69.273	1.466	Open Manhole	1200
F1.007	17.071	148.4	F20	70.793	68.146	2.422	Open Manhole	1200
F1.008	21.579	149.9	F19	70.588	68.002	2.361	Open Manhole	1200
F1.009	55.834	169.7	F18	70.104	67.673	2.206	Open Manhole	1200
F3.000	68.293	60.1	F18-2	72.092	70.539	1.328	Open Manhole	1200
F3.001	65.089	50.0	F18-1	70.818	69.237	1.356	Open Manhole	1200

PIPELINE SCHEDULES for Foul

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F3.002	o	225	F18-1	70.818	69.237	1.356	Open Manhole	1200
F1.010	o	225	F18	70.104	67.673	2.206	Open Manhole	1200
F1.011	o	225	F17	69.914	67.479	2.210	Open Manhole	1200
F1.012	o	225	F16	69.775	67.332	2.218	Open Manhole	1200
F4.000	o	225	F15-5	71.994	70.475	1.294	Open Manhole	1200
F4.001	o	225	F15-4	71.068	69.541	1.302	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F3.002	53.829	80.0	F18	70.104	68.564	1.315	Open Manhole	1200
F1.010	19.415	100.1	F17	69.914	67.479	2.210	Open Manhole	1200
F1.011	14.634	99.6	F16	69.775	67.332	2.218	Open Manhole	1200
F1.012	12.268	90.9	F15	69.653	67.197	2.231	Open Manhole	1200
F4.000	55.962	59.9	F15-4	71.068	69.541	1.302	Open Manhole	1200
F4.001	4.262	60.0	F15-3	71.018	69.470	1.323	Open Manhole	1200

PIPELINE SCHEDULES for Foul

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F5.000	o	225	F15-3-2	71.297	69.839	1.233	Open Manhole	1200
F5.001	o	225	F15-3-1	71.083	69.276	1.582	Open Manhole	1200
F4.002	o	225	F15-3	71.018	69.068	1.725	Open Manhole	1200
F4.003	o	225	F15-2	70.293	68.533	1.535	Open Manhole	1200
F4.004	o	225	F15-1	69.441	67.803	1.413	Open Manhole	1200
F1.013	o	225	F15	69.653	67.197	2.231	Open Manhole	1200
F1.014	o	225	F14	69.233	66.998	2.010	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F5.000	26.054	46.3	F15-3-1	71.083	69.276	1.582	Open Manhole	1200
F5.001	9.985	48.0	F15-3	71.018	69.068	1.725	Open Manhole	1200
F4.002	42.798	80.0	F15-2	70.293	68.533	1.535	Open Manhole	1200
F4.003	58.363	79.8	F15-1	69.441	67.802	1.414	Open Manhole	1200
F4.004	32.064	53.0	F15	69.653	67.198	2.230	Open Manhole	1200
F1.013	39.840	200.2	F14	69.233	66.998	2.010	Open Manhole	1200
F1.014	22.060	198.7	F13	69.016	66.887	1.904	Open Manhole	1200

PIPELINE SCHEDULES for Foul

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.015	o	225	F13	69.016	66.887	1.904	Open Manhole	1200
F1.016	o	225	F12	68.871	66.805	1.841	Open Manhole	1200
F1.017	o	225	F11	67.123	66.561	0.337	Open Manhole	1200
F6.000	o	225	F10-1	68.425	67.275	0.925	Open Manhole	1200
F1.018	o	225	F10	68.253	66.472	1.556	Open Manhole	1200
F1.019	o	225	F9	68.181	66.450	1.506	Open Manhole	1200
F1.020	o	225	F8	68.066	66.314	1.527	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.015	16.538	201.7	F12	68.871	66.805	1.841	Open Manhole	1200
F1.016	48.890	200.4	F11	67.123	66.561	0.337	Open Manhole	1200
F1.017	17.794	199.9	F10	68.253	66.472	1.556	Open Manhole	1200
F6.000	55.989	77.0	F10	68.253	66.548	1.480	Open Manhole	1200
F1.018	4.318	196.3	F9	68.181	66.450	1.506	Open Manhole	1200
F1.019	10.842	79.7	F8	68.066	66.314	1.527	Open Manhole	1200
F1.020	52.715	80.0	F7	67.531	65.655	1.651	Open Manhole	1200

PIPELINE SCHEDULES for Foul

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.021	o	225	F7	67.531	65.654	1.652	Open Manhole	1200
F7.000	o	225	F6-13	70.397	68.875	1.297	Open Manhole	1200
F7.001	o	225	F6-12	69.951	68.271	1.455	Open Manhole	1200
F7.002	o	225	F6-11	69.857	68.137	1.495	Open Manhole	1200
F8.000	o	225	F6-10-1	70.233	68.805	1.203	Open Manhole	1200
F7.003	o	225	F6-10	69.646	67.459	1.962	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.021	59.498	40.9	F6	66.139	64.199	1.715	Open Manhole	1200
F7.000	45.428	75.2	F6-12	69.951	68.271	1.455	Open Manhole	1200
F7.001	10.720	80.0	F6-11	69.857	68.137	1.495	Open Manhole	1200
F7.002	60.983	89.9	F6-10	69.646	67.459	1.962	Open Manhole	1200
F8.000	49.377	36.7	F6-10	69.646	67.460	1.961	Open Manhole	1200
F7.003	38.281	120.0	F6-9	69.520	67.140	2.155	Open Manhole	1200

PIPELINE SCHEDULES for Foul

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F7.004	o	225	F6-9	69.520	67.140	2.155	Open Manhole	1200
F7.005	o	225	F6-8	68.959	66.707	2.027	Open Manhole	1200
F9.000	o	225	F6-7-1	68.891	66.871	1.795	Open Manhole	1200
F7.006	o	225	F6-7	68.815	66.618	1.972	Open Manhole	1200
F7.007	o	225	F6-6	68.217	66.181	1.811	Open Manhole	1200
F7.008	o	225	F6-5	68.161	66.111	1.825	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F7.004	51.918	119.9	F6-8	68.959	66.707	2.027	Open Manhole	1200
F7.005	10.528	118.3	F6-7	68.815	66.618	1.972	Open Manhole	1200
F9.000	6.292	25.0	F6-7	68.815	66.619	1.971	Open Manhole	1200
F7.006	61.255	140.2	F6-6	68.217	66.181	1.811	Open Manhole	1200
F7.007	9.683	138.3	F6-5	68.161	66.111	1.825	Open Manhole	1200
F7.008	29.028	141.6	F6-4	68.113	65.906	1.982	Open Manhole	1200

PIPELINE SCHEDULES for Foul

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F10.000	o	225	F6-4-1	68.045	66.885	0.935	Open Manhole	1200
F7.009	o	225	F6-4	68.113	65.906	1.982	Open Manhole	1200
F7.010	o	225	F6-3	67.060	65.686	1.149	Open Manhole	1200
F11.000	o	225	F6-2-1	66.614	65.425	0.964	Open Manhole	1200
F7.011	o	225	F6-2	66.650	64.997	1.428	Open Manhole	1200
F7.012	o	225	F6-1	67.215	64.585	2.405	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F10.000	14.386	15.0	F6-4	68.113	65.926	1.962	Open Manhole	1200
F7.009	31.000	140.9	F6-3	67.060	65.686	1.149	Open Manhole	1200
F7.010	60.359	87.6	F6-2	66.650	64.997	1.428	Open Manhole	1200
F11.000	21.530	50.3	F6-2	66.650	64.997	1.428	Open Manhole	1200
F7.011	68.498	166.3	F6-1	67.215	64.585	2.405	Open Manhole	1200
F7.012	69.689	180.1	F6	66.139	64.198	1.716	Open Manhole	1200

PIPELINE SCHEDULES for Foul

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.022	o	225	F6	66.139	64.198	1.716	Open Manhole	1200
F1.023	o	225	F5	66.358	63.797	2.336	Open Manhole	1200
F1.024	o	225	F4	66.590	63.404	2.961	Open Manhole	1200
F1.025	o	225	F3	65.754	63.292	2.237	Open Manhole	1200
F1.026	o	225	F2	64.982	63.034	1.723	Open Manhole	1200
F1.027	o	225	F1	64.571	62.776	1.570	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.022	80.105	199.8	F5	66.358	63.797	2.336	Open Manhole	1200
F1.023	78.633	200.1	F4	66.590	63.404	2.961	Open Manhole	1200
F1.024	22.580	201.6	F3	65.754	63.292	2.237	Open Manhole	1200
F1.025	51.507	199.6	F2	64.982	63.034	1.723	Open Manhole	1200
F1.026	51.491	199.6	F1	64.571	62.776	1.570	Open Manhole	1200
F1.027	44.580	54.0	F	0.000	61.950		Open Manhole	0

Free Flowing Outfall Details for Foul

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F1.027	F	0.000	61.950	0.000	0	0

Simulation Criteria for Foul

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	20.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	14.700	Cv (Summer)	0.750
Return Period (years)	100	Ratio R	0.281	Cv (Winter)	0.840
Region	Scotland and Ireland	Profile Type	Summer	Storm Duration (mins)	30

APPENDIX F – EXTRACTS FROM SITE INVESTIGATION REPORT

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

Client:

Project Title:
Clonminch, Tullamore

Drawing Title:
Figure 2 Trial Pit Locations

GII Project Reference:
9551-03-20

0 40 80 120 m

Drawn By:
NM

Date:
08/06/2020

Indicative Site Boundary
Trial Pit
Soakaway

APPENDIX 3 – Soakaway Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Clonminch, Tullamore			**Trial Pit Number** SK01
Machine : 13T **Method :** Trial Pit	**Dimensions** 0.7m W x 2.20m L	**Ground Level (mOD)** 70.50	**Client** DBFL	**Job Number** 9551-03-20
	Location 234728.7 E 223159 N	**Dates** 21/05/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Dark brown slightly sandy slightly gravelly TOPSOIL.		
				70.25	0.25	Firm light brown slightly sandy slightly gravelly SILT with occasional sub-rounded cobbles.		
					(0.30)			
				69.95	0.55	Stiff light grey sandy gravelly SILT with occasional sub-angular to sub-rounded cobbles and boulders.		
					(0.45)			
				69.50	1.00	Very stiff light grey sandy gravelly SILT with occasional sub-angular to sub-rounded cobbles and boulders.		
					(1.00)			
				68.50	2.00	Complete at 2.00m		

Plan

Remarks

Trial pit stable.
No groundwater encountered.
Trial pit terminated at 2.0m BGL and backfilled upon completion of soakaway.

Scale (approx)	Logged By	Figure No.
1:25	NM	9551-03-20.SK01

Ground Investigations Ireland Ltd
www.gii.ie

Site Clonminch, Tullamore			**Trial Pit Number** SK02
Machine : 13T **Method :** Trial Pit	**Dimensions** 0.7m W x 2.30m L	**Ground Level (mOD)** 70.62	**Client** DBFL	**Job Number** 9551-03-20
	Location 234724.5 E 223134.3 N	**Dates** 21/05/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Dark brown slightly sandy slightly gravelly TOPSOIL.		
				70.37	0.25			
					(0.30)	Firm light brown slightly sandy slightly gravelly SILT with occasional sub-rounded cobbles.		
				70.07	0.55			
					(0.45)	Firm light grey sandy gravelly SILT with occasional sub-angular to sub-rounded cobbles.		
				69.62	1.00			
					(1.00)	Loose to medium dense light grey brown silty gravelly fine to coarse SAND with occasional sub-angular to sub-rounded cobbles and boulders.		
				68.62	2.00			
						Complete at 2.00m		

Plan

Remarks

Trial pit stable.
No groundwater encountered.
Trial pit terminated at 2.0m BGL and backfilled upon completion of soakaway.

Scale (approx)	Logged By	Figure No.
1:25	NM	9551-03-20.SK02

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Site Clonminch, Tullamore			**Trial Pit Number** SK03
Machine : 13T **Method :** Trial Pit	**Dimensions** 0.7m W x 2.20m L	**Ground Level (mOD)** 70.13	**Client** DBFL	**Job Number** 9551-03-20
	Location 234782.3 E 223158 N	**Dates** 21/05/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Dark brown slightly sandy slightly gravelly TOPSOIL.		
				69.88	0.25	Firm light brown slightly sandy slightly gravelly SILT.		
					(0.25)			
				69.63	0.50	Firm light grey gravelly very sandy SILT with occasional sub-angular to sub-rounded cobbles and boulders.		
					(1.50)			
				68.13	2.00	Complete at 2.00m		

Plan

Remarks

Trial pit stable.
No groundwater encountered.
Trial pit terminated at 2.0m BGL and backfilled upon completion of soakaway.

Scale (approx)	Logged By	Figure No.
1:25	NM	9551-03-20.SK03

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Site Clonminch, Tullamore			**Trial Pit Number** SK04
Machine : 13T **Method :** Trial Pit	**Dimensions** 0.7m W x 2.20m L	**Ground Level (mOD)** 70.35	**Client** DBFL	**Job Number** 9551-03-20
	Location 234776.3 E 223132.7 N	**Dates** 21/05/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Dark brown slightly sandy slightly gravelly TOPSOIL.		
				70.15	0.20	Firm light brown slightly sandy slightly gravelly SILT.		
					(0.50)			
				69.65	0.70	Firm light grey gravelly very sandy SILT with occasional sub-angular to sub-rounded cobbles and boulders.		
					(1.20)			
				68.45	1.90	Complete at 1.90m		

Plan

Remarks

Trial pit stable.
No groundwater encountered.
Trial pit terminated at 1.90m BGL and backfilled upon completion of soakaway.

Scale (approx)	Logged By	Figure No.
1:25	NM	9551-03-20.SK04

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Site Clonminch, Tullamore			**Trial Pit Number** SK05
Machine : 13T **Method :** Trial Pit	**Dimensions** 0.7m W x 2.10m L	**Ground Level (mOD)** 67.83	**Client** DBFL	**Job Number** 9551-03-20
	Location 234865 E 223326.7 N	**Dates** 22/05/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Dark brown slightly sandy slightly gravelly TOPSOIL.		
				67.58	0.25			
					(0.25)	Soft to firm light brown slightly sandy slightly gravelly clayey SILT.		
				67.33	0.50			
					(0.70)	Soft to firm light grey brown sandy gravelly clayey SILT with occasional sub-angular to sub-rounded cobbles.		
				66.63	1.20			
					(0.30)	Stiff to very stiff light grey gravelly clayey very sandy SILT with occasional sub-angular to sub-rounded cobbles.		
				66.33	1.50	Complete at 1.50m		

Plan

Remarks

Trial pit stable.
No groundwater encountered.
Trial pit terminated at 1.5m BGL and backfilled upon completion of soakaway.

Scale (approx)	Logged By	Figure No.
1:25	NM	9551-03-20.SK05

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Site Clonminch, Tullamore			**Trial Pit Number** SK06
Machine : 13T **Method :** Trial Pit	**Dimensions** 0.7m W x 2.20m L	**Ground Level (mOD)** 68.04	**Client** DBFL	**Job Number** 9551-03-20
	Location 234919.5 E 223321.7 N	**Dates** 22/05/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Dark brown slightly sandy slightly gravelly TOPSOIL.		
				67.79	0.25	Firm brown slightly sandy slightly gravelly clayey SILT.		
					(0.35)			
0.50	B			67.44	0.60	Stiff light grey brown sandy gravelly clayey SILT with occasional sub-angular to sub-rounded cobbles and boulders		
1.00	B				(0.90)			
1.50	B			66.54	1.50	Complete at 1.50m		

Plan

Remarks

Trial pit stable.
No groundwater encountered.
Trial pit terminated at 1.5m BGL and backfilled upon completion of soakaway.

Scale (approx)	Logged By	Figure No.
1:25	NM	9551-03-20.SK06

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Site Clonminch, Tullamore			**Trial Pit Number** SK07
Machine : 13T **Method :** Trial Pit	**Dimensions** 0.7m W x 2.20m L	**Ground Level (mOD)** 68.27	**Client** DBFL	**Job Number** 9551-03-20
	Location 234867.2 E 223279 N	**Dates** 21/05/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Dark brown slightly sandy slightly gravelly TOPSOIL.		
				68.02	0.25	Firm light brown slightly sandy slightly gravelly clayey SILT.		
					(0.25)			
				67.77	0.50	Firm to stiff light grey gravelly very sandy SILT with occasional sub-angular to sub-rounded cobbles and boulders.		
					(1.00)			
				66.77	1.50	Stiff to very stiff light grey very sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles and boulders.		
					(0.50)			
				66.27	2.00	Complete at 2.00m		

Plan

Remarks

Trial pit stable.
No groundwater encountered.
Trial pit terminated at 2.0m BGL and backfilled upon completion of soakaway.

Scale (approx)	Logged By	Figure No.
1:25	NM	9551-03-20.SK07

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Site Clonminch, Tullamore			**Trial Pit Number** SK08
Machine : 13T **Method :** Trial Pit	**Dimensions** 0.7m W x 2.20m L	**Ground Level (mOD)** 68.07	**Client** DBFL	**Job Number** 9551-03-20
	Location 234927.9 E 223279.4 N	**Dates** 21/05/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Dark brown slightly sandy slightly gravelly TOPSOIL.		
				67.82	0.25	Firm light brown slightly sandy slightly gravelly clayey SILT.		
					(0.35)			
				67.47	0.60	Stiff light grey brown sandy gravelly clayey SILT with occasional sub-angular to sub-rounded cobbles and boulders.		
					(1.40)			
				66.07	2.00	Complete at 2.00m		

Plan

Remarks

Trial pit stable.
No groundwater encountered.
Trial pit terminated at 2.0m BGL and backfilled upon completion of soakaway.

Scale (approx)	Logged By	Figure No.
1:25	NM	9551-03-20.SK08

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Site Clonminch, Tullamore			**Trial Pit Number** SK09
Machine : 13T **Method :** Trial Pit	**Dimensions** 0.7m W x 2.20m L	**Ground Level (mOD)** 66.37	**Client** DBFL	**Job Number** 9551-03-20
	Location 234816.2 E 223424.2 N	**Dates** 22/05/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Dark brown slightly sandy slightly gravelly TOPSOIL.		
				66.12	0.25			
					(0.15)	Soft to firm grey orange mottled slightly sandy slightly gravelly CLAY.		
				65.97	0.40			
					(0.80)	Stiff grey brown mottled slightly sandy gravelly silty CLAY with occasional sub-angular to sub-rounded cobbles.		
				65.17	1.20			
					(0.30)	Firm grey brown mottled slightly sandy gravelly silty CLAY with occasional sub-angular to sub-rounded cobbles.		
				64.87	1.50	Complete at 1.50m		

Plan

Remarks

Trial pit stable.
No groundwater encountered.
Trial pit terminated at 1.5m BGL and backfilled upon completion of soakaway.

Scale (approx)	Logged By	Figure No.
1:25	NM	9551-03-20.SK09

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Site Clonminch, Tullamore			**Trial Pit Number** SK10
Machine : 13T **Method :** Trial Pit	**Dimensions** 0.7m W x 2.20m L	**Ground Level (mOD)** 65.60	**Client** DBFL	**Job Number** 9551-03-20
	Location 234972.3 E 223499.2 N	**Dates** 25/05/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Dark brown slightly sandy slightly gravelly TOPSOIL.		
				65.35	0.25	Firm to stiff light brown grey orange mottled slightly sandy slightly gravelly CLAY.		
					(0.30)			
				65.05	0.55	Stiff grey brown mottled slightly sandy gravelly silty CLAY with occasional sub-angular to sub-rounded cobbles.		
					(0.65)			
				64.40	1.20	Stiff grey gravelly very sandy CLAY with occasional sub-angular to sub-rounded cobbles.		
					(0.30)			
				64.10	1.50	Complete at 1.50m		

Plan

Remarks

Trial pit stable.
No groundwater encountered.
Trial pit terminated at 1.5m BGL and backfilled upon completion of soakaway.

Scale (approx)	Logged By	Figure No.
1:25	NM	9551-03-20.SK10

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Site Clonminch, Tullamore			**Trial Pit Number** SK11
Machine : 13T **Method :** Trial Pit	**Dimensions** 0.7m W x 2.20m L	**Ground Level (mOD)** 66.80	**Client** DBFL	**Job Number** 9551-03-20
	Location 234985.3 E 223546.4 N	**Dates** 25/05/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Dark brown slightly sandy slightly gravelly TOPSOIL.		
				66.55	0.25	Firm light brown slightly sandy slightly gravelly SILT.		
0.50	B				(0.45)			
				66.10	0.70	Firm to stiff grey brown gravelly very sandy CLAY with occasional sub-angular to sub-rounded cobbles.		
1.00	B				(0.60)			
				65.50	1.30	Stiff grey brown mottled sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles.		
					(0.20)			
1.50	B			65.30	1.50	Complete at 1.50m		

Plan

Remarks

Trial pit stable.
No groundwater encountered.
Trial pit terminated at 1.5m BGL and backfilled upon completion of soakaway.

Scale (approx)	Logged By	Figure No.
1:25	NM	9551-03-20.SK11

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Site Clonminch, Tullamore			**Trial Pit Number** SK12
Machine : 13T **Method :** Trial Pit	**Dimensions** 0.7m W x 2.20m L	**Ground Level (mOD)** 66.57	**Client** DBFL	**Job Number** 9551-03-20
	Location 234992.8 E 223571.6 N	**Dates** 25/05/2020	**Project Contractor** GII	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Dark brown slightly sandy slightly gravelly TOPSOIL.		
				66.32	0.25	Firm to stiff light brown slightly sandy slightly gravelly silty CLAY.		
					(0.40)			
				65.92	0.65	Stiff light brown grey mottled slightly sandy slightly gravelly very silty CLAY with occasional sub-angular to sub-rounded cobbles.		
					(0.85)			
				65.07	1.50	Complete at 1.50m		

Plan

Remarks

Trial pit stable.
No groundwater encountered.
Trial pit terminated at 1.5m BGL and backfilled upon completion of soakaway.

Scale (approx)	Logged By	Figure No.
1:25	NM	9551-03-20.SK12

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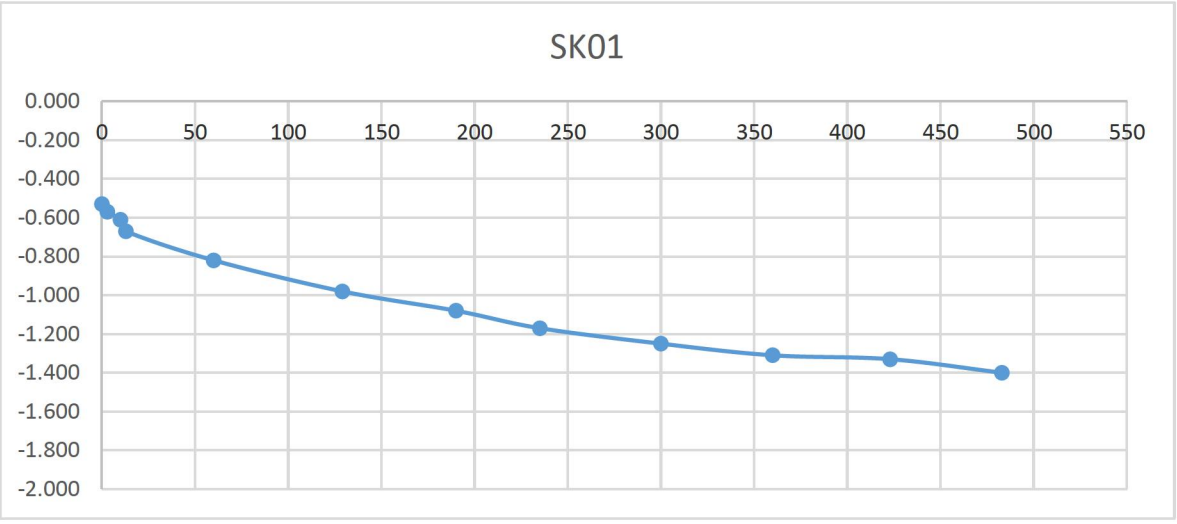
SK01

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.20m x 0.70m 2.00m (L x W x D)

Date	Time	Water level (m bgl)
21/05/2020	0	-0.530
21/05/2020	3	-0.570
21/05/2020	10	-0.610
21/05/2020	13	-0.670
21/05/2020	60	-0.820
21/05/2020	129	-0.980
21/05/2020	190	-1.080
21/05/2020	235	-1.170
21/05/2020	300	-1.250
21/05/2020	360	-1.310
21/05/2020	423	-1.330
21/05/2020	483	-1.400

Start depth	Depth of Pit		Diff	75% full	25%full
0.53	**2.000**		**1.470**	**0.8975**	**1.6325**
Length of pit (m)	Width of pit (m)			75-25Ht (m)	Vp75-25 (m3)
2.200	0.700			0.735	1.13
Tp75-25 (from graph) (s)		**31500**		50% Eff Depth	ap50 (m2)
				0.735	5.803
f =	**6.192E-06**	**m/s**			



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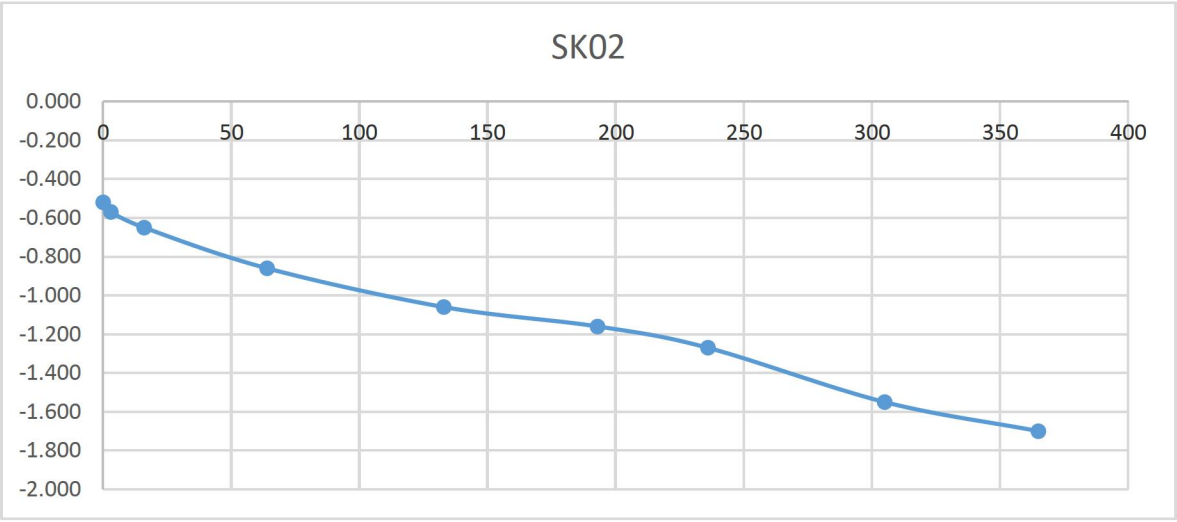
SK02

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.30m x 0.70m 2.00m (L x W x D)

Date	Time	Water level (m bgl)
21/05/2020	0	-0.520
21/05/2020	3	-0.570
21/05/2020	16	-0.650
21/05/2020	64	-0.860
21/05/2020	133	-1.060
21/05/2020	193	-1.160
21/05/2020	236	-1.270
21/05/2020	305	-1.550
21/05/2020	365	-1.700

Start depth	Depth of Pit		Diff	75% full	25%full
0.52	**2.000**		**1.480**	**0.89**	**1.63**

Length of pit (m)	Width of pit (m)		75-25Ht (m)	Vp75-25 (m3)
2.300	0.700		0.740	1.19
Tp75-25 (from graph) (s)		**15600**	50% Eff Depth	ap50 (m2)
			0.740	6.05
f =	**1.262E-05**	**m/s**		



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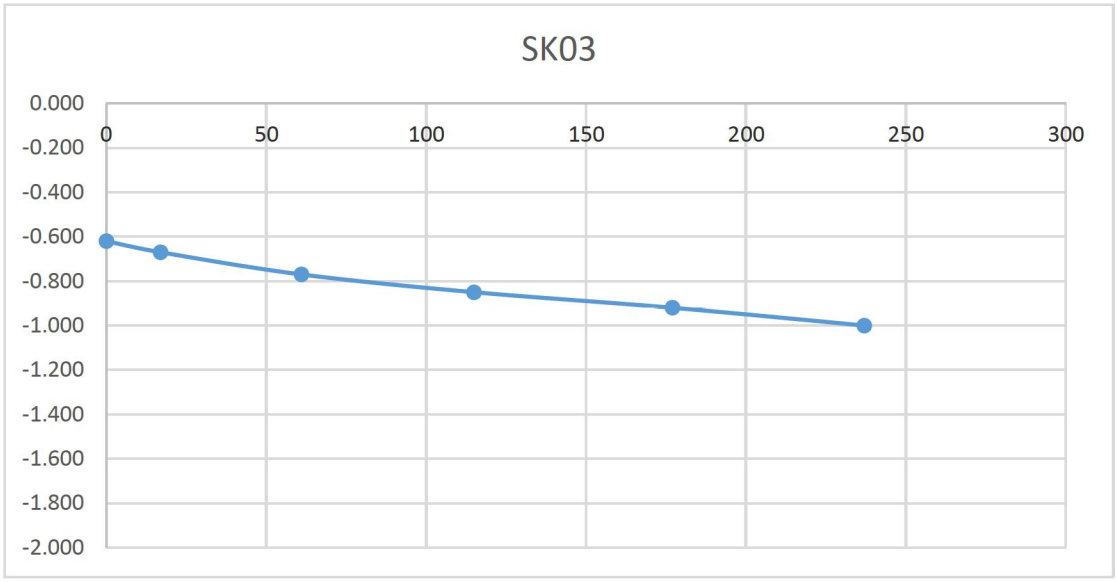
SK03

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.20m x 0.70m 2.0m (L x W x D)

Date	Time	Water level (m bgl)
21/05/2020	0	-0.620
21/05/2020	17	-0.670
21/05/2020	61	-0.770
21/05/2020	115	-0.850
21/05/2020	177	-0.920
21/05/2020	237	-1.000

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.62	2.000	1.380	0.965	1.655



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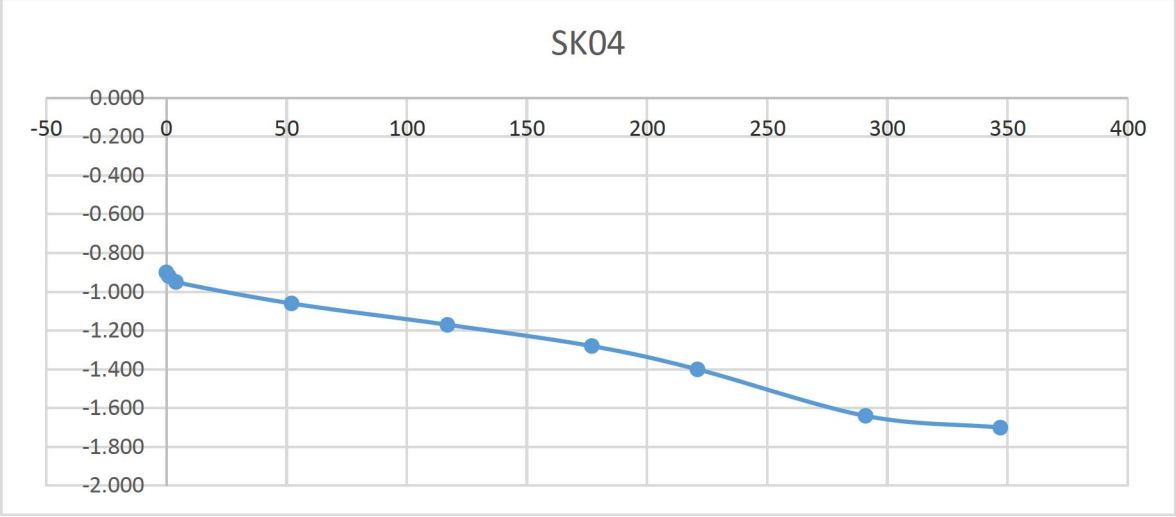
SK04

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.20m x 0.70m 2.00m (L x W x D)

Date	Time	Water level (m bgl)
21/05/2020	0	-0.900
21/05/2020	1	-0.920
21/05/2020	4	-0.950
21/05/2020	52	-1.060
21/05/2020	117	-1.170
21/05/2020	177	-1.280
21/05/2020	221	-1.400
21/05/2020	291	-1.640
21/05/2020	347	-1.700

Start depth	Depth of Pit		Diff	75% full	25%full
0.90	**2.000**		**1.100**	**1.175**	**1.725**

Length of pit (m)	Width of pit (m)		75-25Ht (m)	Vp75-25 (m3)
2.200	0.700		0.550	0.85
Tp75-25 (from graph) (s)		**14400**	50% Eff Depth	ap50 (m2)
			0.550	4.73
f =	**1.244E-05**	**m/s**		



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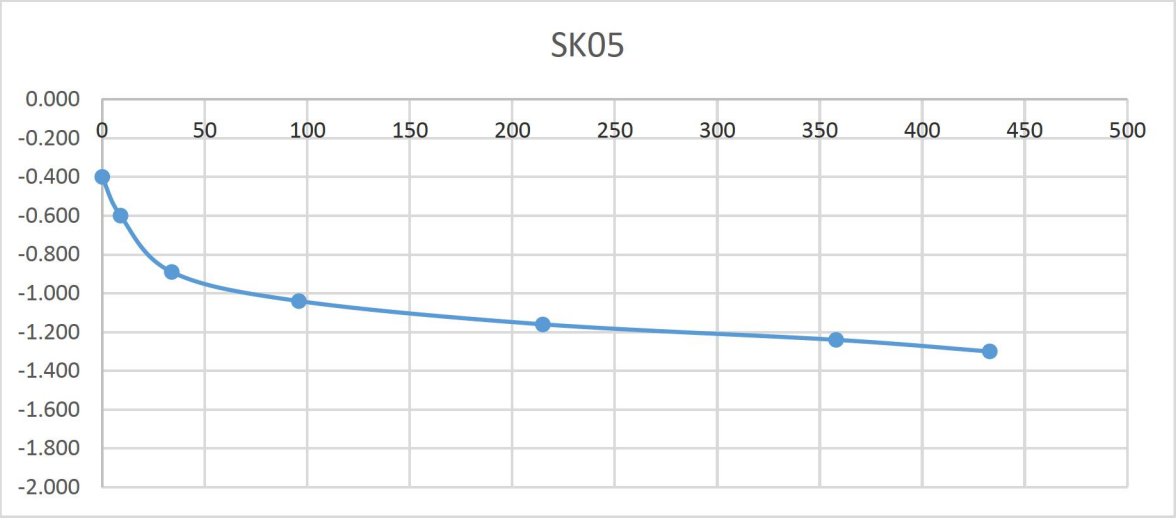
SK05

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.10m x 0.70m 1.50m (L x W x D)

Date	Time	Water level (m bgl)
22/05/2020	0	-0.400
22/05/2020	9	-0.600
22/05/2020	34	-0.890
22/05/2020	96	-1.040
22/05/2020	215	-1.160
22/05/2020	358	-1.240
22/05/2020	433	-1.300

Start depth	Depth of Pit		Diff	75% full	25%full
0.40	**1.500**		**1.100**	**0.675**	**1.225**

Length of pit (m)	Width of pit (m)			75-25Ht (m)	Vp75-25 (m3)
2.100	0.700			0.550	0.81
Tp75-25 (from graph) (s)		**18600**		50% Eff Depth	ap50 (m2)
				0.550	4.55
f =	**9.553E-06**	**m/s**			



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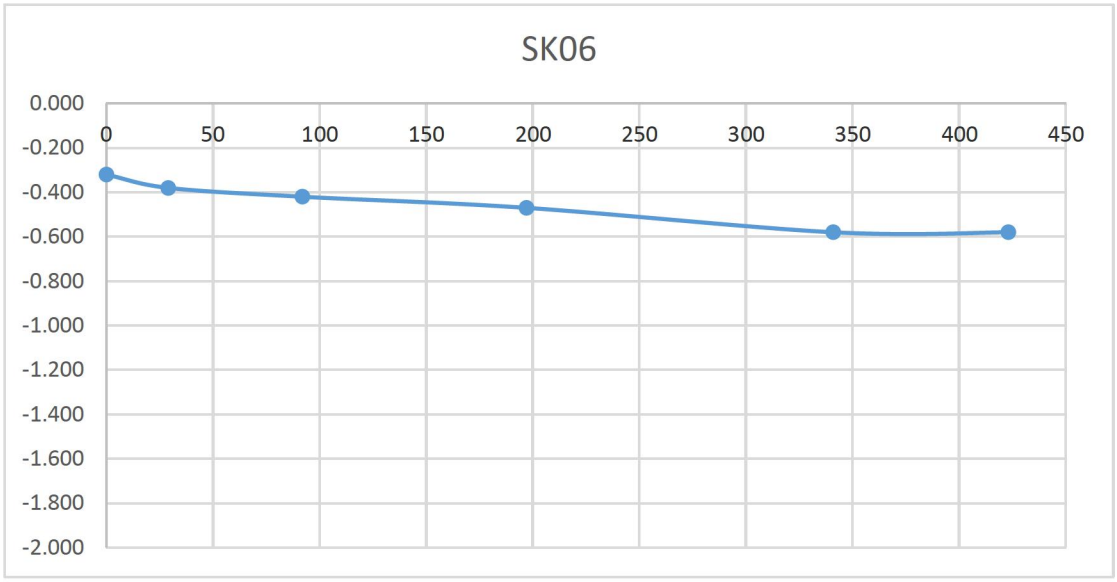
SK06

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.20m x 0.70m 1.50m (L x W x D)

Date	Time	Water level (m bgl)
22/05/2020	0	-0.320
22/05/2020	29	-0.380
22/05/2020	92	-0.420
22/05/2020	197	-0.470
22/05/2020	341	-0.580
22/05/2020	423	-0.580

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.32	1.500	1.180	0.615	1.205



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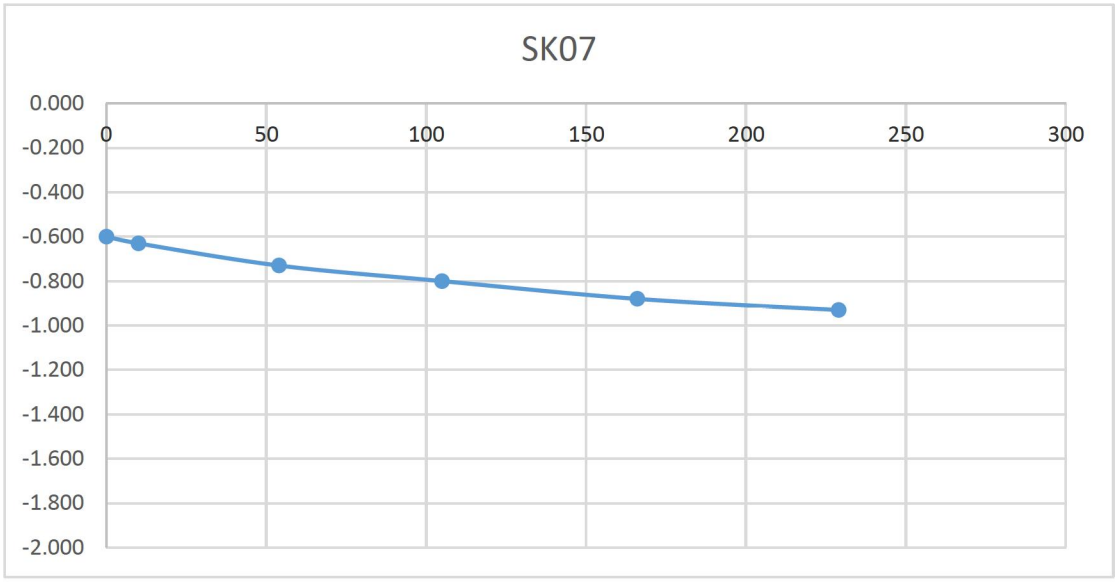
SK07

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.20m x 0.70m 2.0m (L x W x D)

Date	Time	Water level (m bgl)
21/05/2020	0	-0.600
21/05/2020	10	-0.630
21/05/2020	54	-0.730
21/05/2020	105	-0.800
21/05/2020	166	-0.880
21/05/2020	229	-0.930

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.60	2.000	1.400	0.95	1.65



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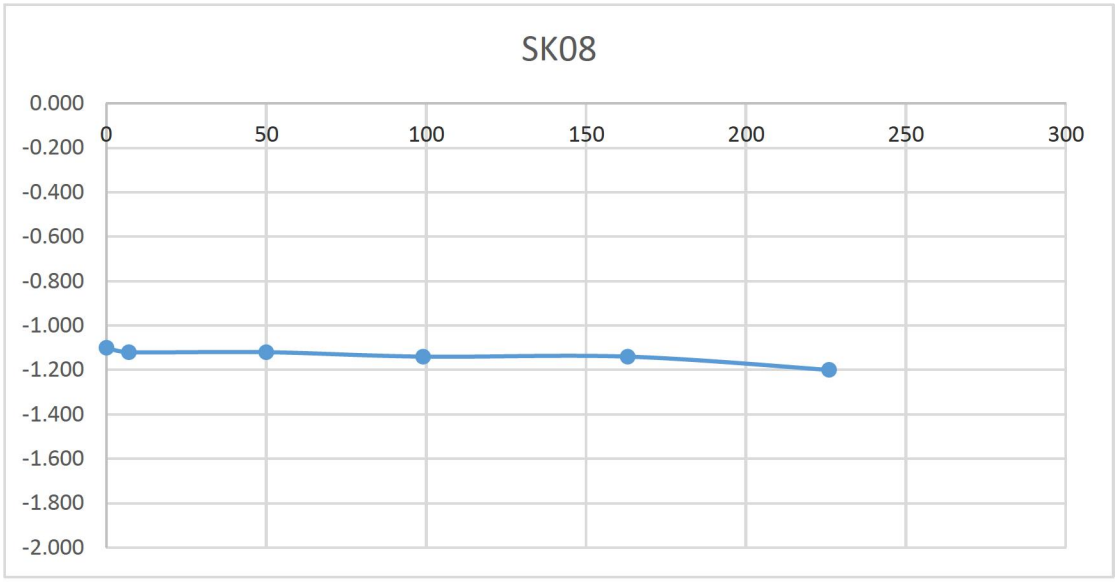
SK08

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.20m x 0.70m 2.0m (L x W x D)

Date	Time	Water level (m bgl)
21/05/2020	0	-1.100
21/05/2020	7	-1.120
21/05/2020	50	-1.120
21/05/2020	99	-1.140
21/05/2020	163	-1.140
21/05/2020	226	-1.200

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
1.10	2.000	0.900	1.325	1.775



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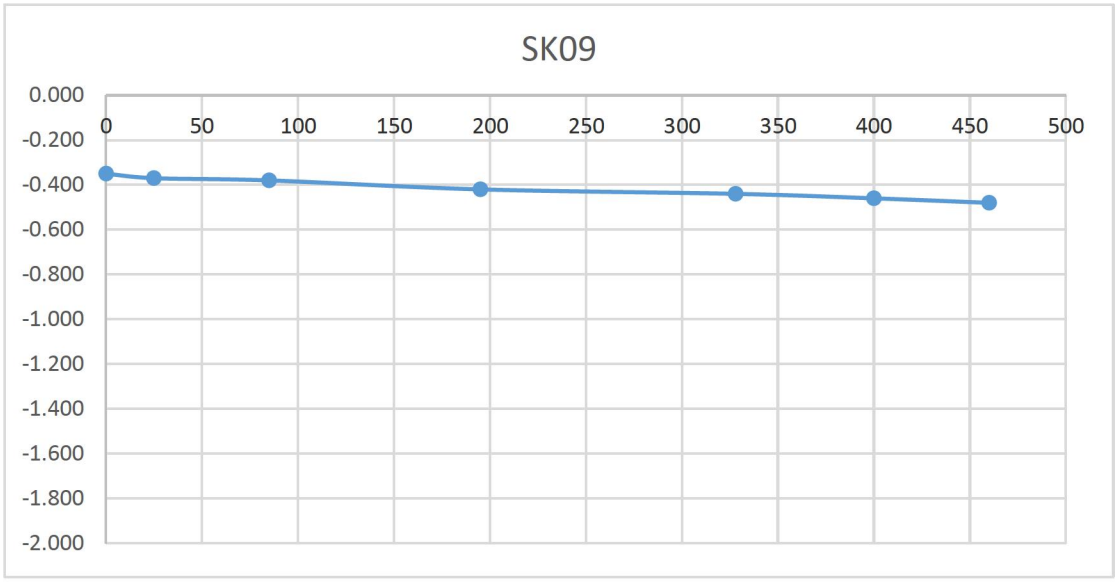
SK09

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.20m x 0.70m 1.50m (L x W x D)

Date	Time	Water level (m bgl)
22/05/2020	0	-0.350
22/05/2020	25	-0.370
22/05/2020	85	-0.380
22/05/2020	195	-0.420
22/05/2020	328	-0.440
22/05/2020	400	-0.460
22/05/2020	460	-0.480

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.35	1.500	1.150	0.6375	1.2125



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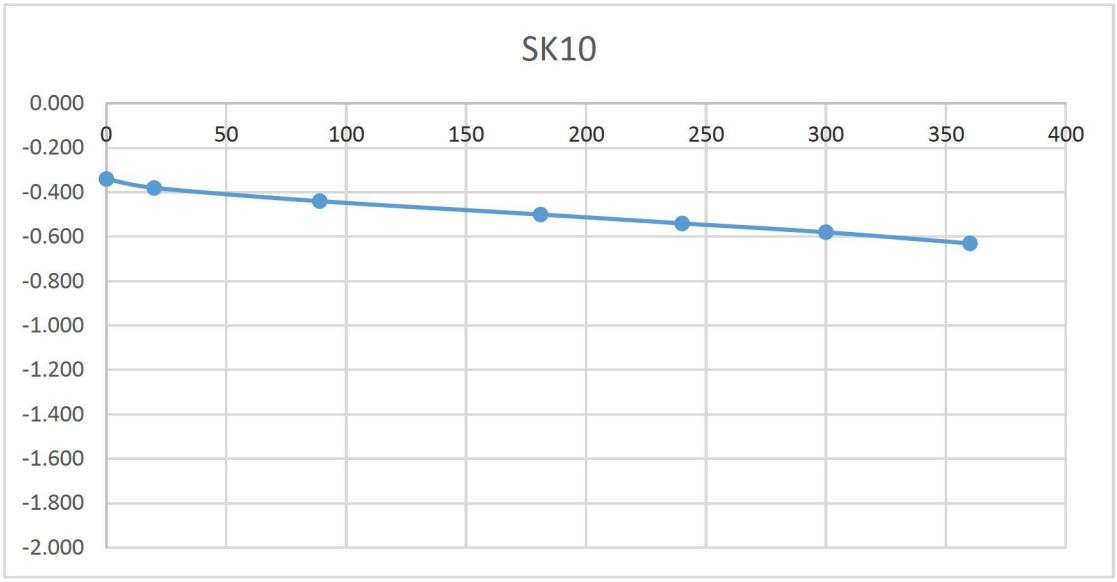
SK10

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.20m x 0.70m 1.50m (L x W x D)

Date	Time	Water level (m bgl)
25/05/2020	0	-0.340
25/05/2020	20	-0.380
25/05/2020	89	-0.440
25/05/2020	181	-0.500
25/05/2020	240	-0.540
25/05/2020	300	-0.580
25/05/2020	360	-0.630

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.34	1.500	1.160	0.63	1.21



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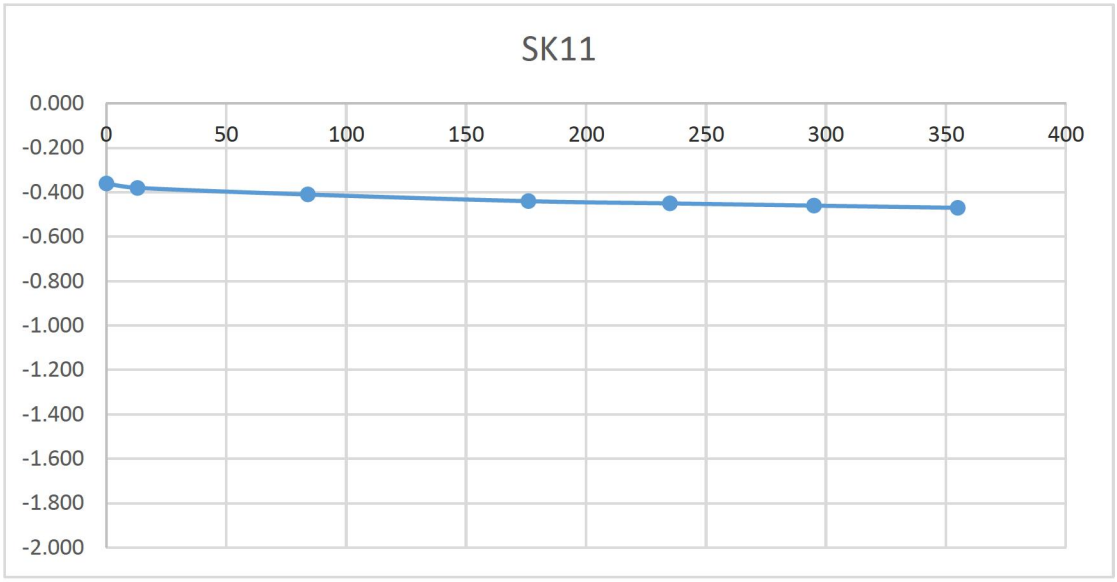
SK11

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.20m x 0.70m 1.50m (L x W x D)

Date	Time	Water level (m bgl)
25/05/2020	0	-0.360
25/05/2020	13	-0.380
25/05/2020	84	-0.410
25/05/2020	176	-0.440
25/05/2020	235	-0.450
25/05/2020	295	-0.460
25/05/2020	355	-0.470

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.36	1.500	1.140	0.645	1.215



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SK12

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.20m x 0.70m 1.50m (L x W x D)

Date	Time	Water level (m bgl)
25/05/2020	0	-0.360
25/05/2020	4	-0.390
25/05/2020	79	-0.520
25/05/2020	171	-0.590
25/05/2020	231	-0.620
25/05/2020	291	-0.660
25/05/2020	351	-0.690

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.36	1.500	1.140	0.645	1.215