Project

Residential Development at Lissywollen, Athlone, Co. Westmeath

Report Title

Engineering Services Report

Report Ref

180176-DBFL-XX-XX-RP-C-0002

INFRASTRUCTURE

JANUARY 2021

DBFL CONSULTING ENGINEERS

Project Title:	Development at Lissywollen, Athlone Co. Westmeath		
Document Title:	Engineering Services Report		
File Ref:	180176-DBFL-XX-XX-RP-C-0002	rev:	P01

Rev.	Status	Date	Description	Prepared	Reviewed	Approved
P01	S2 - For Information	18.01.2021	Engineering Services Report	Rory Moynihan	Shane Moynihan	Laura McLoughlin

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1. INTRODUCTION

DBFL Consulting Engineers were commissioned by the Applicant (Alanna Roadbridge Developments Ltd.) to prepare an Engineering Services Report for the proposed Strategic Housing Development at Brawny Road, Lissywollen, Athlone, Co. Westmeath.

The proposed site (i.e. that within the red line boundaries detailed on the below site location map) is generally bounded to the north by the N6, and to the south by the Old Rail Trail Greenway. To the west, the site is bounded by Scoil na gCeithre Máistrí primary school and the facilities of the Athlone Regional Sports Centre. The eastern boundary of the site is defined by an old boreen road further east of which lies undeveloped greenfield lands, ESB Regional Headquarters and Athlone Training Centre (formerly known as FÁS).

The proposed site is a 'Greenfield' site and the proposed development seeks to provide for the construction of 576 no. residential units, childcare facilities, a community hub, open space and all associated site and infrastructural works. It is located approximately 1km from Athlone town centre and has a red-line site boundary area of 17.64ha.

The western portion of the development slopes in a south westerly direction at an approximate gradient of 1 in 230. The eastern portion of the development slopes in a north easterly direction at an approximate gradient of 1 in 165. There are existing surface water and foul networks that traverse the site.

Figure 1.1 – Site Location – Athlone, Co. Meath

The development will consist of:

1. 576 no. residential units comprising of:
   - 285 no. 2 storey detached, semi-detached & terraced houses comprising 50 no. 4 bedroom houses, 200 no. 3 bedroom houses & 35 no. 2 bedroom houses;
   - 8 no. apartments & duplexes (4 no. one beds & 4 no. three beds) in Block A (3 storeys);
   - 8 no. apartments & duplexes (4 no. one beds & 4 no. three beds) in Block B (3 storeys);
   - 15 no. apartments (15 no. two beds) in Block C (3 storeys);
   - 16 no. apartments & duplexes (7 no. one beds, 5 no. two beds & 4 no. three beds) in Block D (3 storeys);
   - 9 no. apartments & duplexes (5 no. one beds, 1 no. two bed & 3 no. three beds) in Block E (3 storeys);
   - 8 no. apartments & duplexes (4 no. one beds & 4 no. three beds) in Block F (3 storeys);
   - 4 no. apartments (4 no. one beds) in Block G (2 storeys);
   - 12 no. apartments & duplexes (12 no. three beds) in Block H (3 storeys);
   - 21 no. apartments (21 no. two beds) in Block K (3 storeys);
   - 36 no. apartments (36 no. two beds) in Block L (5 storeys with 5th storey setback);
   - 20 no. apartments & duplexes (6 no. one beds, 6 no. two beds & 8 no. three beds) in Block M (4 storeys with 4th storey setback);
   - 27 no. apartments (27 no. two beds) in Block N (3 storeys);
   - 43 no. apartments & duplexes (14 no. one beds, 24 no. two beds & 5 no. three beds) in Block O (2 to 4 storeys);
   - 12 no. apartments (6 no. one beds & 6 no. 2 beds) in Block P (3 storeys);
   - 8 no. apartments & duplexes (4 no. two beds & 4 no. three beds) in Block Q (3 storeys);
   - 18 no. apartments (6 no. one beds & 12 no. two beds) in Block R (3 storeys);
   - 12 no. apartments & duplexes (6 no. two beds & 6 no. three beds) in Block S (3 storeys);
   - 14 no. apartments (4 no. one beds & 10 no. two beds) in Block T (3 storeys).
2. 1no. community hub located on the ground floor of the Block D.
3. 2 no. crèches comprised of a 2 storey crèche located on the ground and first floors of Block C and a 1 storey crèche on the ground floor of Block T.
4. Construction of basement level car parking forming part of Block L.
5. Two vehicular accesses, one at Brawny Road, the other connecting to the at-present unnamed road parallel to the ESB Networks Depot which will connect to the Garrycastle roundabout on the R916.
6. Construction of an east-west access road through the application site from the Ballymahon roundabout (on the R915 – to the west) to the Garrycastle roundabout (on the R916 – to the east).

Which is to be delivered as part of the objectives for the Lissywollen South Framework Plan 2018-2024, and all associated road development works.

7. All associated site development and infrastructural works including amenity spaces, landscaping, open space, boundary treatments, vehicular parking, bicycle parking, utilities, internal roads, footpaths and shared surfaces, playground, site clearance and temporary construction development.

The aim of this report is to provide information on the calculations, estimates and assumptions used to design the foul sewers, surface water sewers, surface water attenuation and SuDS systems, watermains and road access for the proposed development.

2.0 FOUL SEWERS

2.1 Existing Services

Foul sewage from the site will drain by gravity to an existing 525mm diameter foul sewer that traverses the site from east to west, which outfalls towards the Old Rail Trail Greenway

Athlone Wastewater Treatment Plant is located approximately 1,400m south west of the proposed development. The existing 525mm diameter foul sewer traversing the site ultimately discharges to this plant. It is also noted that there are two separate Irish Water projects to improve foul drainage infrastructure in Athlone increase capacity at the Athlone wastewater treatment plant.

The Applicant was informed at the pre-application consultations that there may be existing foul infrastructure located within the western portion of the site for a previous planned development – since abandoned. However, there are no records available from Westmeath County Council regarding these and the Applicant has been unable to confirm same. Further investigatory work is to be undertaken following receipt of planning approval to determine the presence/location of this infrastructure. Where possible this existing infrastructure will be incorporated into the design.

2.2 Proposed services

The proposed foul discharge point is to the existing 525mm diameter sewer located at the south-west corner of the western catchment. As mentioned above, an existing 525mm sewer traversing the site from east to west ultimately discharges to this point. Diversion of this existing sewer will be required in order to accommodate the proposed site layout. Raising of ground levels may also be required in localised areas, particularly in the eastern catchment, in order to enable gravity connections with acceptable levels of cover to the proposed foul drainage network. The proposed foul drainage network will comprise of a series of main sewers 150mm/225mm diameter in size, which will serve the majority of the residential units. These will then discharge to the diverted 525mm trunk sewer. Some residential units will discharge directly to the diverted trunk sewer due to its proximity. Each residential unit will be serviced by individual 100mm diameter connections in accordance with Irish Water Code of Practice.

See drawings 180176-DBFL-FW-SP-DR-C-1022 and 180176-DBFL-FW-SP-DR-C-1021 for a layout of the proposed foul network and existing foul sewer diversion.

Foul sewers have been designed and will be constructed in accordance with the Irish Water's 'Standard Details for Wastewater Infrastructure' and 'Code of Practice for Wastewater Infrastructure'. In addition the foul sewers have been designed in accordance with the Building Regulations and specifically in accordance with the principles and methods set out in EN 752:2008 and DOE *'Recommendations for Site Development Works'.* In addition, HR Wallingford 'Tables for

the hydraulic design of pipes, sewers and channels' and Water UK/WRc 'Sewers for Adoption – 7th Edition' have been applied. Values for roughness of uPVC pipes were obtained from Wallingford "Tables for the Hydraulic Design of Pipes, Sewers and Channels" and Wavin sewer systems catalogue.

Foul sewers were sized using the EN752:2008 method in MICRODRAINAGE where:

$$Q = kDU\sqrt{\sum DU}$$

The following design criteria have been applied in the design of foul sewers:

(i) Discharge units (DU)	3.0 per housing unit
(ii) Unit Consumption Allowance	10%
(iii) EN 752 Frequency Factor (*k*DU)	0.5
(iv) Pipe Ks	1.5 mm (concrete) 0.6mm (uPVC for flow>0.5D) 0.15mm (uPVC for flow<0.5D)
(v) Minimum velocity	0.75 m/s (self-cleansing vel. partial flow) 0.6 m/s (Full flow)
(vi) Maximum velocity	3 m/s
(vii) Minimum gradients:	

No. of Houses	Minimum Pipe Size & Gradient
1-9	150mm dia. @ 1:60 or self-cleansing gradient
10-20	150mm dia. @ 1:150 or self-cleansing gradient
>20	Min 225mm dia.; 1:200 or self-cleansing gradient

Using Irish Water parameters, the peak flow from the site is calculated as 20.51 l/s, however using the EN752 method in MICRODRAINAGE the peak flow is 24.7 l/s. The pipes have been sized in MICRODRAINAGE to accommodate the larger value.

Sewers and drains shall be laid to comply with the requirements of the Building Regulations 2010 in accordance with the recommendations contained in the Technical Guidance Documents, Section H (revised 2005) and Irish Water connection and developer services Code of Practice for Wastewater Infrastructure. Standard drainage details will be in accordance with Irish Water connection and developer services standard details for Wastewater Infrastructure.

A Pre-connection enquiry was made to Irish Water and a Confirmation of Feasibility (COF) received stating that there is sufficient capacity at the Athlone Wastewater Treatment Plant and local wastewater network to facilitate this development (see appendix A for COF). As required prior to planning the proposed foul drainage design was issued to Irish Water for Design Acceptance. This was received and the Statement of Design Acceptance can be found in appendix A.

Foul sewer calculations are included in Appendix A of this report.

Refer to Dwgs. No. 180176-DBFL-FW-SP-DR-C-1022 and 180176-DBFL-FW-SP-DR-C-1021 for a layout of the proposed foul network and existing foul sewer diversion. Refer to Dwgs. No 180176-DBFL-FW-SP-DR-C-3021 to 180176-DBFL-FW-SP-DR-C-3022 for foul sewer longitudinal sections both proposed and diverted.

3.0 SURFACE WATER

3.1 Existing services

There is an existing 1350mm diameter surface water sewer traversing the proposed site from east to west - of which a length of approximately 563m will be diverted. 2no. 750mm diameter surface water sewer from existing developments north of the proposed development also currently discharge to the existing 1350mm diameter sewer at separate locations. The easternmost of these 750mm sewer will need to be diverted as part of the proposed development (approx. 109m). These 2no. sewers will be picked up by the diverted sewer as shown in drawings 180176-DBFL-SW-SP-DR-C-1011 and 180176-DBFL-SW-SP-DR-C-1012.

See drawing 180176-DBFL-SW-SP-DR-C-3011, 180176-DBFL-SW-SP-DR-C-3012, 180176-DBFL-SW-SP-DR-C-3013 and 180176-DBFL-SW-SP-DR-C-3014 for longitudinal sections of the diverted surface water sewers.

The surface water network will be split into two catchments east and west which each having its own attenuation system and outfall.

Historical 25" map (1888-1913) indicates the presence of a drainage ditch traversing the site and parts of this ditch appear to exist today. It is considered likely that this ditch only drained lands within the boundary of the proposed development. Regardless, it has partly been built over by residential development. Therefore, it is considered likely that much of this ditch has been made redundant by the aforementioned 1350mm surface water sewer.

As with the existing foul infrastructure (noted above) the Applicant was informed at the pre-application consultations that there may be existing surface water infrastructure located within the western portion of the site for a previous planned development – since abandoned. However, there are no records available from Westmeath County Council regarding these and the Applicant has been unable to confirm same. Further investigatory work is to be undertaken following receipt of planning approval to determine the presence/location of this infrastructure. Where possible this existing infrastructure will be incorporated into the design.

3.2 Proposed services

The Greater Dublin Strategic Drainage Study (GDSDS) and CIRIA Design Manuals C753, C697 and C609 have been used to design the surface water drainage system within the site.

Surface water management for the proposed development is designed to comply with the 'Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Technical Document – Volume 2, New Developments, 2005' and the 'Greater Dublin Regional Code of

Practice for Drainage Works, V6.0 2005'. CIRIA Design Manuals C753, C697 and C609 have also been used to design the surface water drainage system within the site.

The GDSDS guidelines require the following main 4 main criteria to be provided by the development's surface water design;

- Criterion 1: River Water Quality Protection – satisfied by providing interception storage and treatment of run-off within the SUDS features. This is satisfied using filter drains, petrol interceptors and on-line detention basins with underground stone storage.
- 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. Pluvial flood risk addressed by development designed to accommodate a 100 year storm (plus climate change) as per GDSDS. Planned flood routing for storms greater than 100 year level considered in design and development run-off contained within site.
- Criterion 4: River flood protection – attenuation provided within the SuDS features i.e. green roofs, and on-line detention basins with underground stone storage.

3.2.1 Surface Water Sewers

The proposed surface water discharge point is to the existing 1350mm sewer noted above. The site has been split into two separate catchments, which will be served by its own surface water drainage network, both discharging to the existing 1350mm trunk sewer. As mentioned above, this existing sewer traverses the site from east to west, which ultimately discharges to the south-west corner of the western catchment. Diversion of this existing sewer will be required in order to accommodate the proposed site layout. The existing 750mm diameter surface water sewers will continue to discharge to the diverted 1350mm sewer, however, the easternmost of these sewers will need to be diverted as part of the proposed development works. Lengths of this sewer will be diverted as shown in drawings 180176-DBFL-SW-SP-DR-C-1011 & 1012
Surface water runoff from the site's road network will be directed to a proposed surface water pipe network via road gullies while surface water from 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 sewers were designed in MICRODRAINAGE using the Modified Rational Method. The return period for sizing pipes is based on the following:-

- Department of Environment – Recommendations for Site Development Works for

Housing Areas (1998), Table 3.1;

- GDSDS – Regional Drainage Policies – Volume 2 – New Development (2005), Section 6.5;
- IS EN 752:2008 - Drain and Sewer Systems Outside Buildings, Table 2;
- Building Regulations (2005) – Section H - Drainage and Wastewater Disposal, Section 1.5.7.

In addition, the pipe system was checked for the 30 year return period where no flooding from manholes was encountered. The following parameters applied:

Return period	2 year (flooding check for 30 year event)
Time of entry	4 minutes
Pipe Ks	0.6mm (concrete); 0.15mm (uPVC)
Minimum velocity	0.75 m/s
Maximum velocity	3.0 m/s
Soffit to Soffit network design	

Effective runoff coefficients for each pipe catchment have been determined based on the runoff characteristics for each surface contributing to flows within the catchment.

The minimum pipe diameter for public surface water sewers is 225mm.
Values for roughness of uPVC pipes were obtained from Wallingford "Tables for the Hydraulic Design of Pipes, Sewers and Channels" and Wavinsewer systems catalogue.

Surface water calculations are included in Appendix C of this report.

Refer to Dwg. No 180176-DBFL-SW-SP-DR-C-1011 and 180176-DBFL-SW-SP-DR-C-1012.for the proposed site surface water network layout.
Refer to Dwg. No. 180176-DBFL-SW-SP-DR-C-3011, 180176-DBFL-SW-SP-DR-C-3012, 180176-DBFL-SW-SP-DR-C-3013 and 180176-DBFL-SW-SP-DR-C-3014 for surface water sewer longitudinal sections.

3.2.2 SuDS

It is proposed to use a sustainable urban drainage system (SuDS) approach to stormwater management throughout the site, the overall strategy aims to provide an effective system to mitigate the adverse effects of urban stormwater runoff on the environment by reducing runoff rates, volumes and frequency, reducing pollutant concentrations in stormwater, contributing to amenity, aesthetics and biodiversity enhancement and allow for the maximum collection of rainwater for re-use where possible. In addition, SuDS features should aim to replicate the natural

characteristics of rainfall runoff for any site by providing control of run-off at source. SuDS are a requirement of Westmeath County Council, and 'The Greater Dublin Strategic Drainage Study' and the 'Greater Dublin Regional Code of Practice for Drainage Works'. Additionally, these systems are recommended under the 2009 guidelines, 'The Planning System and Flood Risk Management'.

There are a number of SuDS features proposed which have been designed in accordance with CIRIA documents C753, C697 and C609 as follows:

- Permeable Pavement: Porous surfacing (paving block or open graded material) which can treat rainwater at source and allow infiltration through to an underlying porous sub-base where water can be stored within the voids before being slowly released to the drainage collection system through natural flow via the porous medium.

  Partial infiltration systems are proposed to be used as the existing subgrade (ground) is not capable of absorbing all the water through infiltration. This type of permeable paving system includes a permeable geotextile at its base and also includes an outlet to the surface water system. These systems will allow some form of storage for small rainfall events and will result in infiltration, water evaporation and adsorption in small quantities, therefore there will be less run-off from these areas in small rainfall events thus mimicking the natural response for this catchment.

  As well as reducing the amount of run-off from the surface, permeable paving will slow down the rate of runoff from the pavement in extreme rainfall events contributing to attenuation of flows. In addition, permeable paving will increase the quality of water which is intercepted by the system through filtration, biodegradation, pollutant adsorption and settlement and retention of solids. The reduction in peak flows to the outfall will enhance settlement and biodegradation of pollutants.

  It is proposed to use these systems in private driveways and surface water storage within these systems will be further mobilised by providing a 100mm diameter pipe at the outlet to the site drainage system. This pipe outlet will restrict flow to its capacity of 7.1 l/s (Ks=0.15 and gradient at 1 in 100) thereby reducing the runoff rate from the permeable paving even further.

- Catchpit Manhole: Catchpit manholes collect silt and debris from the surface water drainage system to prevent blockages and help ensure proper function and reduced maintenance of treatment and storage systems downstream of the catchpit manhole. Catchpit manholes are easily accessible and simple to clean. For these reasons catchpit manholes are recommended to reduce risk of system flooding due to blockages and help the surface water system perform optimally.

- Filter Drain: Trenches filled with permeable material and a perforated collection pipe at the invert with an optional permeable 'sandy' topsoil at surface. These can treat, convey and attenuate runoff at source, and can infiltrate to the ground where the subgrade is suitable. These systems will allow some form of storage for small rainfall events and can result in water evaporation and adsorption in small quantities, therefore there will be less run-off from these areas in small rainfall events thus mimicking the natural response for this catchment. These will be located in the back-gardens of each unit and will result in an improvement in the quality of surface water draining from roofs of houses and paved areas in rear gardens and will also allow groundwater to recharge to its natural state.
- Detention Basins: Normally dry vegetated surface depression which provides flow control through attenuation of stormwater runoff. This can provide water quality treatment and amenity or can be constructed to serve more than one purpose such as car-park, playground or sports fields. On this site, the detention basin will serve as a grassed open space recreational area and will be underlined with porous stone media which will also allow some slow infiltration of flood waters into the ground. The attenuation has been designed to contain any storm event under 1 in 30yr in the underground attenuation system with the basin filling for any larger storm event. Therefore the area will be more regularly available for amenity use.
- Cellular Attenuation System: Proprietary modular block system with a maintenance/inspection tunnel for providing underground surface water attenuation storage and can infiltrate runoff to the ground where the subgrade is suitable. The attenuation has been designed so that any storm event under 1 in 30yr will be contained in the Pluvial Cube attenuation system provided underground, beneath the basin. Water will be contained in the detention basins for storm events greater than these. The Pluvial Cube system is preferred due to its flexibility in both plan area and depth of excavation. It will allow for the effective removal of nutrients and gross pollutants and thus delivering a higher water quality discharging to the existing environment.
- Petrol Interceptor: A proprietary oil/water separator which prevents hazardous chemical and petroleum products from entering watercourses and public sewers. These are proposed at each outfall from the site in addition to a silt trap chamber.
- Green roofs: Green roofs provide ecological, aesthetic and amenity benefits and intercept and retain rainfall, at source, reducing the volume of runoff and attenuating peak flows. Green roofs absorb most of the rainfall that they receive during ordinary events although they will only contribute to attenuation of flows for larger events. Additionally, green roofs treat surface water through removal of atmospherically deposited urban pollutants. Finally, green roofs may reduce heating (by adding mass and thermal resistance value) and cooling

(by evaporative cooling) loads on a building. For maintenance purposes, green roofs will be accessed from within the apartment buildings themselves.

SuDS calculations and summary are included in Appendix F of this report.
See drawing 180176-DBFL-SW-SP-DR-C-1013 Schematic SUDS Layout Plan for details.

3.2.3 Long Term Storage

In addition to limiting the runoff rate through attenuation, the GDSDS requires that runoff volume from the site is limited in extreme events. The objective is to match the runoff volume discharged to the downstream receiving watercourse/surface water network after development to that which occurred prior to development. This volume is calculated by comparing the 100 year 6 hour event for 'pre' and 'post' development and is referred to as "Long-Term Storage".

Where long-term storage is provided, this has a direct effect on the permissible site discharge rate from the site, as explained further forward.

Due to the large extent of development within the site it is not possible to provide long-term storage, this effects the permissible site discharge and resulting attenuation volumes required and will be explained in the following section.

3.2.4 Greenfield Runoff - Permissible Site Discharge

According to the GDSDS section 6.6.1.2, the method used for determining peak flow rates for small greenfield catchments is the UK '*Institute of Hydrology Report 124, Flood Estimation for small Catchments'*. Where long-term storage can be provided, or is not necessary, surface water can be discharged at a higher value than $QBAR_{rural}$, this discharge rate ($QBAR_{growth}$) is dependent on the design return period and the corresponding growth factor from the GDSDS Table 6.6. However, if long-term storage cannot be provided on-site the discharge rate from the site should be kept to $QBAR_{rural.}$ or 2 l/s/ha. This is the case for this development.

The IH 124 method calculates $QBAR_{rural}$ which is the mean annual flood flow from a rural catchment. As the subject site area is less than 50 hectares, the calculated QBAR is to be linearly interpolated from the calculated value to produce a reduced available outflow based on the actual site area, as per GDSDS section 6.6.1.

$$QBAR_{rural} = 0.00108 \times (Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$$

where:-

$QBAR_{rural}$ = Mean Annual Flood (m^3/s)
Area = Catchment Area (km^2)

SAAR = Standard Average Annual Rainfall (mm)
SOIL = SOIL index from Flood Studies Report

Using data received from Met Eireann for Irish Grid co-ordinates E20600, N241000 (site co-ordinates are: E 206020, N241712), the SAAR is determined as 920mm.

Met Eireann Rainfall Data is included in Appendix B of this report.

The SOIL value can be determined from the Flood Studies Report - Winter Rainfall Acceptance Maps (WRAP). A more accurate approach is to use the 'The Classification of Soils from Winter Rainfall Acceptance Rate, Flood Studies Report Table 4.5' if more information is available relating to the site, this approach is used for this development.

Appendix B shows how the SOIL value for the site was determined as being type 3.
Permissible site discharge for the site has been determined as follows: -

Total Combined Catchment Area = 16.54 Ha
SAAR = 920mm
SOIL = Type 3
CATCHMENT 1 (West) PSD = 20.7 l/s
CATCHMENT 2 (East) PSD = 56.8 l/s

Therefore the permissible site discharge for the development ($QBAR_{rural}$) is 77.5 l/s

Permissible site discharge calculations are included in Appendix B of this report.

3.2.5 Surface Water Runoff Coefficients

As a large proportion of runoff is routed through SuDS features these will have an attenuating effect which reduce the rate of stormwater runoff for every rainfall event. Also, SuDS features would reduce the runoff volume through evaporation, transpiration, infiltration and depression storage of the water within each system.

Runoff coefficients have been applied as follows:

Roofs - Type 1 (Draining to traditional) = 1.0
Roofs - Type 2 (Draining to SUDS features) = 0.50
Roads and Footpaths - Type 1 (Draining to gullies) = 0.80
Roads and Footpaths - Type 2 (Draining to SUDS features) = 0.70

Paved Areas = 0.60

Permeable Paving = 0.50

Grassed Areas = 0.37 (soil type 3 - Flood Studies Report)

3.2.6 Surface Water Attenuation

The GDSDS requires flood waters for a 100 year return period to be managed on-site, therefore this return period is adopted for attenuation calculations with a factor included for climate change.

The site will be divided into two catchments, eastern and western. Each surface water catchment will have its own separate attenuation storage system and outfall.

The surface water attenuation in each catchment will be provided by an on-line detention basin within the site boundary. This open space area will consist of a normally dry vegetated surface depression approximately 1.2m to 2m deep with side slopes of 1 in 4 and will provide flow control through attenuation of surface water runoff. The basins will also provide water quality treatment, act as an amenity and will promote biodiversity creation.

The attenuation has been designed so that any storm event under 1 in 30yr will be contained in the Pluvial Cube attenuation system provided underground, beneath the basin. Water will be contained in the detention basins for storm events greater than these. The maximum depth of water storage within each basin for the 1 in 100yr return period will not exceed 0.33m and the basin will be accessible and maintainable on all sides.

The discharge rate from each detention basin will be controlled using a Hydrobrake or similar approved vortex flow control device, installed in a smart manhole at the outfall of each detention basin.

The hydraulic modelling software system MICRODRAINAGE was used to calculate attenuation volumes, using maximum rainfall data from Extreme Rainfall Return Period Values produced by Met Eireann to calculate maximum flood volumes for the 1 in 100 year rainfall event.

Rainfall data for the site was sourced from an Annual Average Rainfall (AAR) Grid (1981-2010) and a Depth Duration Frequency model produced by Met Éireann (Available from: http://www.met.ie/climate/products03.asp):

AAR	=	920mm
Ratio M560/M52d	=	0.28
$M_5$60	=	14.5mm

As required under the GDSDS the above data was increased by a factor of 10% for the hydraulic analysis.

The Attenuation Volumes were calculated as follows:

Catchment 1 - East: 1,623m^3
Catchment 2 - West: 718m^3

It should be noted that attenuation volume required is based on the results of the MICRODRAINAGE hydraulic simulation summary of Critical Results by Maximum Level. Hydrobrake maximum head and discharge is based on results of MICRODRAINAGE hydraulic simulation summary of Critical Results by Maximum Outflow.

Also, it should be noted that within the site overland flowpaths will be provided to direct run-off from high intensity, short duration storms which might fail to enter the drainage system. Drop kerbs will be provided at road edges at low spots in order to allow overland flow to enter open space areas or discharge to watercourses. Additionally, a minimum freeboard of 500mm has been provided above the 1 in 100 year flood levels to all building finished floor levels and critical operational areas.

Refer to Dwg. No. 180176-DBFL-SW-SP-DR-C-1011 & 180176-DBFL-SW-SP-DR-C-1012 for the proposed surface water layout.

Surface water network and attenuation calculations and details are included in Appendix C of this report.

3.2.7 Interception Volume

The GDSDS requires that no run-off should directly pass to the receiving watercourse/surface water network for rainfall depths of 5mm, therefore interception should be provided at source where practicable. The volume of interception required is based on 5mm of rainfall depth from 80% of the runoff from impermeable areas as defined in the GDSDS (Appendix E section E2.1.1).

The interception volume attributable to each SuDS feature (detention areas, permeable paving etc.) consists of the volume of water that can infiltrate to the ground, that will evaporate into the atmosphere and that can transpirate through plants and vegetation. Additionally, there will some be losses of water due to absorption and wetting of stone and soil media.

Not all SuDS features will be able to achieve infiltration, evaporation, transpiration and losses due to absorption/wetting. The limits for each SuDS feature type are taken into account when calculating interception volumes.

Extensive Green Roofs are to cover 50% of flat roof as agreed with West Meath County Council. Extensive green roofs provide ecological, aesthetic and amenity benefits and intercept, treat and retain rainfall, reducing the volume of runoff and attenuation peak flows. Extensive roofs are usually only accessed for maintenance.

Finally, as a large proportion of filter drains and permeable paving areas will be constructed in made ground which will have a much higher infiltration rate than the natural subsoil, it is anticipated that the actual interception storage achievable for the site will far exceed what is required. Furthermore, the interception storage attributable to the losses in stone and soil media, such as the stone media used in filter drains, was not included in the calculations which is considered to be conservative.
The total interception volume required for the site is 373.53m^3, the volume provided for the site is 463.10m^3

Interception Volume calculations are included in Appendix D of this report.

3.2.8 Treatment Volume

The GDSDS requires that a "treatment volume" (Vt) be provided in order to prevent any pollutants or sediments discharging into river systems, additionally a 'treatment train' stormwater runoff management system is required. According to CIRIA document C697 the following treatment train approach is necessary:

Roofs – 1 Treatment Stage
Road Areas – 2 Treatment Stages
Paved Areas excluding Roads - 1 Treatment Stage

The treatment volume is based on treatment 15mm of rainfall depth from 80% of the runoff from impermeable areas as defined in the GDSDS (Appendix section E2.1.2).
All run-off areas will pass through the required number of treatment stages prior to discharging to the downstream outfall. Treatment methods include filter drains, permeable paving, detention areas, catchpits and petrol interceptors.

The total treatment volume required for the site is 1,120.60m^3, the volume provided for the site is 1,755.90m^3.

Treatment Volume calculations are included in Appendix E of this report.

3.2.9 Amenity

SuDS features should be designed to replicate a natural environment with a visual appeal, promote both public and wildlife usage and promote biodiversity within urban environments. In addition, SuDS features should aim to use water as a resource where possible.

Amenities, biodiversity and water usage provision has been included in the proposed site which includes greenroofs and two detention basins.

Please refer to landscape documentation prepared by Ronan MacDiarmada & Associates (RMDA) enclosed with this application for further details.

3.2.10 SuDS Maintenance

The SuDS features proposed above for the site will require the following maintenance:

Permeable Surfacing: Regular brushing and removal of leaves, removal of weeds as necessary. Stabilise and mow contributing and adjacent landscaped areas regularly. Repair any depressions, rutting, cracked or broken blocks considered detrimental to the structural performance or a hazard to users.

Catchpit Manhole: Catchpit manholes collect silt and debris from upstream SuDS features and gullys in the surface water system. Due to large volumes of silt and debris building up in catchpit manhole sumps, it is essential for them to be cleaned regularly. Inadequate maintenance of the catchpit manholes can lead to reduced performance of storage and treatment systems and can cause blockages leading to flooding of the surface water system. It is recommended that suction equipment is used by skilled personnel when cleaning to ensure effective and safe removal of silt and debris from catchpit manholes.

Hydrobrake Manhole: Normally little maintenance is required as there are no moving parts within a hydrobrake, however, after installation, the hydrobrake orifice should be inspected to ensure it is not blocked, on a monthly basis for three months and thereafter at six monthly intervals and hosed down if required. Remove rubbish or debris from hydrobrake if present. Hydro-Brake Flow Controls are fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.

Petrol Interceptor: Systems should be visually inspected for every rainfall event for 30 days after installation and the amount of sediment measured to give the operator an idea of the expected rate of deposition. Systems should then be inspected every 6 months to verify the appropriate level of maintenance. Floating debris and solids should be removed and the sump cleaned with

a conventional sump vacuum cleaner. Filter media should be replaced and sediments, oils and grease should be removed where required.

Detention Basin: The detention basin will require regular mowing and inspection of the inlet/outlet and vegetation and the removal of nuisance plants and rubbish as necessary. The grass should be cut monthly during the growing season and erosion at the inlet/outlet should be repaired as required. The maintenance will be undertaken as part of the overall landscaping maintenance for the site.

Green Roofs: Green roofs should be maintained as per the details of the proprietary product brochure or manual. This varies from product to product but generally involves the application of fertilisers in the spring months, removal of flowers at the end of summer and the application of slow release fertilisers in autumn.

3.2.11 SuDS Safety

Each detention basin will have a maximum water level of 0.35m which is in compliance with the SuDS Manual, CIRIA C697.

Embankment slopes are no steeper than 1:4 which is compliant with the SuDS manual.

Education boards can be provided to inform the public of the function of the pond and also provide information on the flora and fauna that the system supports.

There are no envisaged safety concerns with the other SuDS features proposed for the site provided maintenance is undertaken on each feature as required.

SuDS features calculations are included in Appendix F of this report.

4.0 WATERMAINS

4.1 Existing Services

There is an existing 200mm diameter uPVC in the Brawny Road to the north west corner of the site, which branches off into 2no. 100mm mains, and an existing 200mm diameter uPVC watermain on the R916 to the east of the site.

4.2 Proposed Services

A connection will be made to the existing 200mm diameter watermain in Brawny Road to the northwest corner of the site. A second connection will be made to the main in the R916 road to supply the site from the east also.

A proposed 200mm diameter watermain with fire hydrants will be provided along the spine of the development with a number of 100mm/150mm looped branch mains off this spine along adjoining roads to service the wider development.

Individual houses will have their own 25mm connections to the distribution water mains via service connections and meter / boundary boxes.

The average total water demand for the site is 245.68 m3 per day. The supply arrangements will be carried out to the requirements of Irish Water.

A Pre-connection enquiry was made to Irish Water and a Confirmation of Feasibility (COF) received stating that the existing watermain network can accommodate the proposed development without upgrade (see appendix A for COF). As required prior to planning the proposed watermain design was issued to Irish Water for Design Acceptance. This was received and the Statement of Design Acceptance can be found in appendix A.

Watermain calculations are included in Appendix G of this report.

Refer to Dwg. No. 180176-DBFL-WM-SP-DR-C-1031 & 180176-DBFL-WM-SP-DR-C-1032 for the proposed watermain layout.

5.0 Roads

5.1 Existing roads

General vehicular access to the site is currently limited to the existing Brawny Road serving the Brawny residential estate, which bisects the application site and the existing primary school/ Regional Sports Centre / Athlone Town Stadium to the west of the application site. Access to the R916, to the east of the site has been created via a recently constructed roundabout. Estate roads serve the dwellings at Brawny residential development.

5.2 Proposed roads

Access to the development will be from two entrances in the north west and east of the development. Both entrances can achieve a 2.4m x 70m sightline which is greater than the distance recommended for a 50 Km/h design speed zone as outlined in the Design Manual for Urban Roads and Streets (DMURS).

Road infrastructure within the site comprises of 6.0m and 5.5m access roads, 2m wide footpaths, 2.5m cyclepaths and a number of shared surface areas throughout the site, varying in width from 4-5m. Internal estate roads and homezones have been designed for a 30Km/h limit and comply with sightline splays of 23m. Parking is a mix of in-curtilage and on street, see plan drawings and TTA for details under separate heading.

For further information regarding the road layout and design refer to the separate Traffic and Transport Assessment, prepared by DBFL Consulting Engineers.

Refer to Dwg. No. 180176-DBFL-RD-SP-DR-C-1000 & Dwg. No. 180176-DBFL-RD-SP-DR-C-1001 for the proposed road layout plan.
Refer to Dwg. No. 180176-DBFL-RD-SP-DR-C-3000, 180176-DBFL-RD-SP-DR-C-3001 and 180176-DBFL-RD-SP-DR-C-3002 for the proposed road longitudinal sections.

DBFL CONSULTING ENGINEERS

January 2021

APPENDIX A

FOUL SEWER CALCULATIONS

TITLE	Job Reference
Mixed Use Development at Lissywollen, Athlone, Co.Westmeath	180176
SUBJECT	**Calc. Sheet No.**
Wastewater Hydraulic Load - Irish Water - Residential	1

DRAWING NUMBER	Calculations by	Checked by	Date
Lissywollen Masterplan (Architect's)	RTM	SMM	20.10.20

Foul Drainage

Housing Units	576	no.
Dry Weather Flow (DWF)[1]	150	litres/person/day
Average Occupancy Ratio[2]	3.0	person/unit
Total Site Occupancy (i.e. population)	1728	person
Total Daily Wastewater Discharge + 10% Unit Consumption Allowance[3]	285,120	l/day
Peak Flow Factor[4]	3.0	

Post Development Average Discharge	**3.300**	l/s
Post Development Peak Discharge[5]	**19.800**	l/s

Foul Sewer Organic Loading

	Average Concentration[6]	Maximum Concentration[7]
BOD (mg/l)	168	422
SS (mg/l)	163	435
N (mg/l)	40.6	78.6
P (mg/l)	7.1	15.5
COD (mg/l)	389	1000

Notes:

1. Dry Weather Flow (DWF) is 150 litres/person/day from the Irish Water "Code of Practice for Wastewater Infrastructure".
2. Occupancy ratio of 2.7 persons per dwelling from Irish Water Code of Practice for Wastewater Infrastructure.
3. The unit consumption allowance is 10% in accordance with the Irish Water "Code of Practice for Wastewater Infrastructure".
4. The Peak Flow factor is taken as 6 times Dry Weather Flow (0 to 750 population), 4.5 DWF for 751 to 1000 and 3.0 DWF for 1001 to 5000
5. The peak discharge is equal to the Total Wastewater Discharge multiplied by the peak flow factor, expressed in litres/second.
6. The average concentrations of wastewater parameters taken from EPA "Wastewater Treatment Manuals, Treatment Systems for Small Communities, Business, Leisure Centres and Hotels".
7. Assumed Maximum concentration is equal to the average concentration plus 2 times the standard deviation (for the 95%ile) taken from EPA "Wastewater Treatment Manuals, Treatment Systems for Small Communities, Business, Leisure Centres and Hotels".

TITLE		Job Reference	
Mixed Use Development at Lissywollen, Athlone, Co.Westmeath		180176	
SUBJECT		Calc. Sheet No.	
Wastewater Hydraulic Load - Irish Water - Creche Block C		1	
DRAWING NUMBER	Calculations by	Checked by	Date
Lissywollen Masterplan (Architect's)	RTM	SMM	20.10.20

Foul Drainage

Community Hub

Amenity space		144	m^2
Patrons[1]		32	no.
Day Staff[1]		6	no.
Dry Weather Flow (DWF)[2]	(Assumes no canteen)	50	litres/person/day
Total Daily Wastewater Discharge + 10% Unit Consumption Allowance[3]		2,067	l/day
Peak Flow Factor[4]		4.5	

Post Development Average Discharge	**0.024**	l/s
Post Development Peak Discharge[5]	**0.108**	l/s

Foul Sewer Organic Loading

	Average Concentration[6]	Maximum Concentration[7]
BOD (mg/l)	168	422
SS (mg/l)	163	435
N (mg/l)	40.6	78.6
P (mg/l)	7.1	15.5
COD (mg/l)	389	1000

Notes:

1. Assumed patron density of 4.5m^2 and patron to staff ration of 1:5.74.
2. Dry Weather Flow (DWF) is 50 litres/person/day for Staff and Patrons taken from Irish Water "Code of Practice for Wasterwater Infrastructure".
3. The unit consumption allowance is 10% in accordance with the Irish Water "Code of Practice for Wastewater Infrastructure".
4. The Peak Flow factor is taken as 4.5 times Dry Weather Flow"Code of Practice for Wasterwater Infrastructure".
5. The peak discharge is equal to the Total Wastewater Discharge multiplied by the peak flow factor, expressed in litres/second.
6. The average concentrations of wastewater parameters taken from EPA "Wastewater Treatment Manuals, Treatment Systems for Small Communities, Business, Leisure Centres and Hotels".
7. Assumed Maximum concentration is equal to the average concentration plus 2 times the standard deviation (for the 95%ile) taken from EPA "Wastewater Treatment Manuals, Treatment Systems for Small Communities, Business, Leisure Centres and Hotels".

TITLE		Job Reference	
Mixed Use Development at Lissywollen, Athlone, Co.Westmeath		180176	
SUBJECT		**Calc. Sheet No.**	
Wastewater Hydraulic Load - Irish Water - Creche Block C		1	
DRAWING NUMBER	**Calculations by**	**Checked by**	**Date**
Lissywollen Masterplan (Architect's)	RTM	SMM	20.10.20

Foul Drainage

Creche (Block C)

Creche space		321	m^2
Patrons[1]		71	no.
Day Staff[1]		12	no.
Dry Weather Flow (DWF)[2]	(Assumes no canteen)	50	litres/person/day
Total Daily Wastewater Discharge + 10% Unit Consumption Allowance[3]		4,613	l/day
Peak Flow Factor[4]		4.5	

Post Development Average Discharge	**0.053**	l/s
Post Development Peak Discharge[5]	**0.240**	l/s

Foul Sewer Organic Loading

	Average Concentration[6]	Maximum Concentration[7]
BOD (mg/l)	168	422
SS (mg/l)	163	435
N (mg/l)	40.6	78.6
P (mg/l)	7.1	15.5
COD (mg/l)	389	1000

Notes:

1. Assumed patron density of 4.5m^2 and patron to staff ration of 1:5.74.
2. Dry Weather Flow (DWF) is 50 litres/person/day for Staff and Patrons taken from Irish Water "Code of Practice for Wasterwater Infrastructure".
3. The unit consumption allowance is 10% in accordance with the Irish Water "Code of Practice for Wastewater Infrastructure".
4. The Peak Flow factor is taken as 4.5 times Dry Weather Flow"Code of Practice for Wasterwater Infrastructure".
5. The peak discharge is equal to the Total Wastewater Discharge multiplied by the peak flow factor, expressed in litres/second.
6. The average concentrations of wastewater parameters taken from EPA "Wastewater Treatment Manuals, Treatment Systems for Small Communities, Business, Leisure Centres and Hotels".
7. Assumed Maximum concentration is equal to the average concentration plus 2 times the standard deviation (for the 95%ile) taken from EPA "Wastewater Treatment Manuals, Treatment Systems for Small Communities, Business, Leisure Centres and Hotels".

TITLE		Job Reference	
Mixed Use Development at Lissywollen, Athlone, Co.Westmeath		180176	
SUBJECT		Calc. Sheet No.	
Wastewater Hydraulic Load - Irish Water - Creche Block T		1	
DRAWING NUMBER	Calculations by	Checked by	Date
Lissywollen Masterplan (Architect's)	RTM	SMM	20.10.20

Foul Drainage

Creche (Block T)

Creche space		485	m^2
Patrons[1]		108	no.
Day Staff[1]		19	no.
Dry Weather Flow (DWF)[2]	(Assumes no canteen)	50	litres/person/day
Total Daily Wastewater Discharge + 10% Unit Consumption Allowance[3]		6,962	l/day
Peak Flow Factor[4]		4.5	
Post Development Average Discharge		**0.081**	l/s
Post Development Peak Discharge[5]		**0.363**	l/s

Foul Sewer Organic Loading

	Average Concentration[6]	Maximum Concentration[7]
BOD (mg/l)	168	422
SS (mg/l)	163	435
N (mg/l)	40.6	78.6
P (mg/l)	7.1	15.5
COD (mg/l)	389	1000

Notes:

1. Assumed patron density of 4.5m^2 and patron to staff ration of 1:5.74.
2. Dry Weather Flow (DWF) is 50 litres/person/day for Staff and Patrons taken from Irish Water "Code of Practice for Wasterwater Infrastructure".
3. The unit consumption allowance is 10% in accordance with the Irish Water "Code of Practice for Wastewater Infrastructure".
4. The Peak Flow factor is taken as 4.5 times Dry Weather Flow"Code of Practice for Wasterwater Infrastructure".
5. The peak discharge is equal to the Total Wastewater Discharge multiplied by the peak flow factor, expressed in litres/second.
6. The average concentrations of wastewater parameters taken from EPA "Wastewater Treatment Manuals, Treatment Systems for Small Communities, Business, Leisure Centres and Hotels".
7. Assumed Maximum concentration is equal to the average concentration plus 2 times the standard deviation (for the 95%ile) taken from EPA "Wastewater Treatment Manuals, Treatment Systems for Small Communities, Business, Leisure Centres and Hotels".

FOUL SEWERAGE DESIGN

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	23.374	0.390	59.9	0.000	6.0	0.0	0.600	o	150	Pipe/Conduit	
F1.001	21.538	0.140	153.8	0.000	0.0	0.0	0.600	o	525	Pipe/Conduit	
F1.002	21.156	0.140	151.1	0.000	24.0	0.0	0.600	o	525	Pipe/Conduit	
F1.003	33.943	0.058	585.2	0.000	0.0	0.0	0.600	o	525	Pipe/Conduit	
F2.000	28.338	0.094	301.5	0.000	0.0	0.0	0.600	o	300	Pipe/Conduit	
F1.004	61.005	0.105	581.0	0.000	51.0	0.0	0.600	o	525	Pipe/Conduit	
F3.000	43.364	0.667	65.0	0.000	15.0	0.0	0.600	o	150	Pipe/Conduit	
F4.000	69.519	0.869	80.0	0.000	24.0	0.0	0.600	o	150	Pipe/Conduit	
F4.001	3.817	0.048	79.5	0.000	0.0	0.0	0.600	o	150	Pipe/Conduit	
F4.002	58.137	0.655	88.8	0.000	33.0	0.0	0.600	o	150	Pipe/Conduit	
F5.000	73.713	1.229	60.0	0.000	51.0	0.0	0.600	o	150	Pipe/Conduit	
F4.003	34.907	0.233	149.8	0.000	18.0	0.0	0.600	o	225	Pipe/Conduit	
F6.000	43.191	0.720	60.0	0.000	15.0	0.0	0.600	o	225	Pipe/Conduit	
F6.001	95.052	0.951	99.9	0.000	27.0	0.0	0.600	o	225	Pipe/Conduit	
F6.002	5.527	0.055	100.5	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	
F6.003	29.673	0.251	118.2	0.000	18.0	0.0	0.600	o	225	Pipe/Conduit	
F4.004	61.490	0.410	150.0	0.000	36.0	0.0	0.600	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	42.170	0.000	0.0	6.0	0.1	25	0.71	1.30	23.0	1.3
F1.001	41.780	0.000	0.0	6.0	0.1	22	0.43	1.80	390.4	1.3
F1.002	41.640	0.000	0.0	30.0	0.3	32	0.55	1.82	394.0	3.0
F1.003	41.500	0.000	0.0	30.0	0.3	45	0.34	0.92	198.9	3.0
F2.000	41.630	0.000	0.0	0.0	0.0	0	0.00	0.90	63.6	0.0
F1.004	41.442	0.000	0.0	81.0	0.5	56	0.40	0.92	199.6	5.0
F3.000	42.135	0.000	0.0	15.0	0.2	31	0.79	1.25	22.1	2.1
F4.000	43.997	0.000	0.0	24.0	0.2	37	0.79	1.12	19.9	2.7
F4.001	43.128	0.000	0.0	24.0	0.2	37	0.79	1.13	19.9	2.7
F4.002	43.080	0.000	0.0	57.0	0.4	48	0.86	1.07	18.9	4.2
F5.000	43.654	0.000	0.0	51.0	0.4	42	0.97	1.30	23.0	3.9
F4.003	42.350	0.000	0.0	126.0	0.6	58	0.76	1.07	42.4	6.2
F6.000	44.094	0.000	0.0	15.0	0.2	27	0.78	1.69	67.3	2.1
F6.001	43.374	0.000	0.0	42.0	0.3	40	0.75	1.31	52.0	3.6
F6.002	42.423	0.000	0.0	42.0	0.3	40	0.75	1.30	51.9	3.6
F6.003	42.368	0.000	0.0	60.0	0.4	45	0.75	1.20	47.8	4.3
F4.004	42.117	0.000	0.0	222.0	0.7	67	0.83	1.07	42.4	8.2

FOUL SEWERAGE DESIGN

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
F4.005	10.507	0.070	150.1	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	
F1.005	64.650	0.111	582.4	0.000	24.0	0.0	0.600	o	525	Pipe/Conduit	
F7.000	13.538	0.226	59.9	0.000	6.0	0.0	0.600	o	150	Pipe/Conduit	
F7.001	43.565	0.726	60.0	0.000	18.0	0.0	0.600	o	150	Pipe/Conduit	
F7.002	37.115	0.387	95.9	0.000	12.0	0.0	0.600	o	150	Pipe/Conduit	
F8.000	53.229	0.887	60.0	0.000	24.0	0.0	0.600	o	150	Pipe/Conduit	
F1.006	61.673	0.106	581.8	0.000	18.0	0.0	0.600	o	525	Pipe/Conduit	
F9.000	25.811	0.430	60.0	0.000	12.0	0.0	0.600	o	150	Pipe/Conduit	
F10.000	25.811	0.430	60.0	0.000	6.0	0.0	0.600	o	150	Pipe/Conduit	
F9.001	43.565	0.726	60.0	0.000	18.0	0.0	0.600	o	150	Pipe/Conduit	
F9.002	37.094	0.343	108.1	0.000	12.0	0.0	0.600	o	150	Pipe/Conduit	
F11.000	20.242	0.337	60.1	0.000	6.0	0.0	0.600	o	150	Pipe/Conduit	
F1.007	59.764	0.103	580.2	0.000	12.0	0.0	0.600	o	525	Pipe/Conduit	
F1.008	6.745	0.012	562.1	0.000	0.0	0.0	0.600	o	525	Pipe/Conduit	
F12.000	21.247	0.354	60.0	0.000	6.0	0.0	0.600	o	150	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)
F4.005	41.707	0.000	0.0	222.0	0.7	67	0.83	1.06	42.3	8.2
F1.005	41.337	0.000	0.0	342.0	0.9	80	0.49	0.92	199.4	10.2
F7.000	42.940	0.000	0.0	6.0	0.1	25	0.71	1.30	23.0	1.3
F7.001	42.714	0.000	0.0	24.0	0.2	35	0.87	1.30	23.0	2.7
F7.002	41.988	0.000	0.0	36.0	0.3	43	0.78	1.03	18.1	3.3
F8.000	42.488	0.000	0.0	24.0	0.2	35	0.87	1.30	23.0	2.7
F1.006	41.226	0.000	0.0	420.0	1.0	84	0.51	0.92	199.5	11.3
F9.000	42.994	0.000	0.0	12.0	0.2	29	0.79	1.30	23.0	1.9
F10.000	42.994	0.000	0.0	6.0	0.1	25	0.71	1.30	23.0	1.3
F9.001	42.564	0.000	0.0	36.0	0.3	38	0.93	1.30	23.0	3.3
F9.002	41.838	0.000	0.0	48.0	0.3	48	0.78	0.97	17.1	3.8
F11.000	41.832	0.000	0.0	6.0	0.1	25	0.71	1.30	23.0	1.3
F1.007	41.120	0.000	0.0	486.0	1.1	87	0.52	0.92	199.7	12.1
F1.008	41.017	0.000	0.0	486.0	1.1	86	0.52	0.94	203.0	12.1
F12.000	43.191	0.000	0.0	6.0	0.1	25	0.71	1.30	23.0	1.3

FOUL SEWERAGE DESIGN

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
F12.001	96.801	1.041	93.0	0.000	27.0	0.0	0.600	o	150	Pipe/Conduit	
F12.002	4.211	0.046	91.5	0.000	0.0	0.0	0.600	o	150	Pipe/Conduit	
F12.003	42.559	0.370	115.0	0.000	24.0	0.0	0.600	o	150	Pipe/Conduit	
F1.009	26.714	0.046	580.7	0.000	0.0	0.0	0.600	o	525	Pipe/Conduit	
F13.000	18.925	0.315	60.1	0.000	6.0	0.0	0.600	o	150	Pipe/Conduit	
F13.001	27.372	0.456	60.0	0.000	3.0	0.0	0.600	o	150	Pipe/Conduit	
F14.000	72.534	1.209	60.0	0.000	21.0	0.0	0.600	o	150	Pipe/Conduit	
F13.002	42.432	0.393	108.0	0.000	18.0	0.0	0.600	o	150	Pipe/Conduit	
F13.003	13.397	0.120	111.6	0.000	6.0	0.0	0.600	o	150	Pipe/Conduit	
F1.010	12.594	0.022	572.5	0.000	3.0	0.0	0.600	o	525	Pipe/Conduit	
F1.011	40.713	0.070	581.6	0.000	60.0	0.0	0.600	o	525	Pipe/Conduit	
F1.012	13.963	0.024	581.8	0.000	6.0	0.0	0.600	o	525	Pipe/Conduit	
F1.013	8.125	0.035	232.1	0.000	18.0	0.0	0.600	o	525	Pipe/Conduit	
F15.000	20.234	0.337	60.0	0.000	6.0	0.0	0.600	o	150	Pipe/Conduit	
F15.001	62.397	0.819	76.2	0.000	12.0	0.0	0.600	o	150	Pipe/Conduit	
F16.000	46.080	0.658	70.0	0.000	12.0	0.0	0.600	o	150	Pipe/Conduit	
F15.002	13.021	0.057	228.4	0.000	0.0	0.0	0.600	o	150	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)
F12.001	42.837	0.000	0.0	33.0	0.3	42	0.78	1.04	18.4	3.2
F12.002	41.796	0.000	0.0	33.0	0.3	42	0.78	1.05	18.6	3.2
F12.003	41.750	0.000	0.0	57.0	0.4	51	0.78	0.94	16.5	4.2
F1.009	41.005	0.000	0.0	543.0	1.2	89	0.53	0.92	199.6	12.8
F13.000	42.619	0.000	0.0	6.0	0.1	25	0.71	1.30	23.0	1.3
F13.001	42.304	0.000	0.0	9.0	0.2	27	0.76	1.30	23.0	1.7
F14.000	43.056	0.000	0.0	21.0	0.2	34	0.86	1.30	23.0	2.5
F13.002	41.847	0.000	0.0	48.0	0.3	48	0.78	0.97	17.1	3.8
F13.003	41.454	0.000	0.0	54.0	0.4	50	0.78	0.95	16.8	4.0
F1.010	40.959	0.000	0.0	600.0	1.2	91	0.54	0.93	201.1	13.5
F1.011	40.937	0.000	0.0	660.0	1.3	94	0.54	0.92	199.5	14.1
F1.012	40.867	0.000	0.0	666.0	1.3	94	0.54	0.92	199.5	14.2
F1.013	40.843	0.000	0.0	684.0	1.3	75	0.76	1.47	317.3	14.4
F15.000	42.866	0.000	0.0	6.0	0.1	25	0.71	1.30	23.0	1.3
F15.001	42.529	0.000	0.0	18.0	0.2	34	0.77	1.15	20.4	2.3
F16.000	42.370	0.000	0.0	12.0	0.2	30	0.75	1.20	21.3	1.9
F15.002	41.710	0.000	0.0	30.0	0.3	52	0.55	0.66	11.7	3.0

FOUL SEWERAGE DESIGN

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
F15.003	13.376	0.047	284.6	0.000	0.0	0.0	0.600	o	150	Pipe/Conduit	
F1.014	31.816	0.035	909.0	0.000	0.0	0.0	0.600	o	525	Pipe/Conduit	
F1.015	8.755	0.015	583.7	0.000	0.0	0.0	0.600	o	525	Pipe/Conduit	
F17.000	19.772	0.330	59.9	0.000	6.0	0.0	0.600	o	150	Pipe/Conduit	
F17.001	14.711	0.245	60.0	0.000	0.0	0.0	0.600	o	150	Pipe/Conduit	
F17.002	6.920	0.115	60.2	0.000	0.0	0.0	0.600	o	150	Pipe/Conduit	
F18.000	31.474	0.525	60.0	0.000	15.0	0.0	0.600	o	150	Pipe/Conduit	
F18.001	25.152	0.419	60.0	0.000	0.0	0.0	0.600	o	150	Pipe/Conduit	
F17.003	63.314	0.576	109.9	0.000	30.0	0.0	0.600	o	150	Pipe/Conduit	
F19.000	25.811	0.430	60.0	0.000	6.0	0.0	0.600	o	150	Pipe/Conduit	
F20.000	25.811	0.430	60.0	0.000	6.0	0.0	0.600	o	150	Pipe/Conduit	
F19.001	80.895	0.809	100.0	0.000	30.0	0.0	0.600	o	150	Pipe/Conduit	
F21.000	18.340	0.306	59.9	0.000	6.0	0.0	0.600	o	150	Pipe/Conduit	
F19.002	62.573	0.432	144.8	0.000	27.0	0.7	0.600	o	225	Pipe/Conduit	
F22.000	33.744	0.562	60.0	0.000	15.0	0.0	0.600	o	150	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)
F15.003	41.653	0.000	0.0	30.0	0.3	55	0.51	0.59	10.4	3.0
F1.014	40.808	0.000	0.0	714.0	1.3	107	0.47	0.73	159.1	14.7
F1.015	40.774	0.000	0.0	714.0	1.3	96	0.55	0.92	199.1	14.7
F17.000	43.059	0.000	0.0	6.0	0.1	25	0.71	1.30	23.0	1.3
F17.001	42.729	0.000	0.0	6.0	0.1	25	0.71	1.30	23.0	1.3
F17.002	42.484	0.000	0.0	6.0	0.1	25	0.71	1.30	23.0	1.3
F18.000	43.313	0.000	0.0	15.0	0.2	31	0.82	1.30	23.0	2.1
F18.001	42.788	0.000	0.0	15.0	0.2	31	0.82	1.30	23.0	2.1
F17.003	42.369	0.000	0.0	51.0	0.4	49	0.78	0.96	16.9	3.9
F19.000	43.281	0.000	0.0	6.0	0.1	25	0.71	1.30	23.0	1.3
F20.000	43.165	0.000	0.0	6.0	0.1	25	0.71	1.30	23.0	1.3
F19.001	42.735	0.000	0.0	42.0	0.3	45	0.79	1.00	17.8	3.6
F21.000	42.231	0.000	0.0	6.0	0.1	25	0.71	1.30	23.0	1.3
F19.002	41.850	0.000	0.7	75.0	0.5	54	0.75	1.08	43.1	5.5
F22.000	42.055	0.000	0.0	15.0	0.2	31	0.82	1.30	23.0	2.1

FOUL SEWERAGE DESIGN

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
F17.004	39.114	0.261	149.9	0.000	60.0	0.0	0.600	o	225	Pipe/Conduit	
F17.005	14.809	0.098	151.1	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	
F1.016	14.009	0.024	583.7	0.000	0.0	0.0	0.600	o	525	Pipe/Conduit	
F1.017	30.647	0.053	578.2	0.000	18.0	0.0	0.600	o	525	Pipe/Conduit	
F23.000	20.544	0.342	60.1	0.000	6.0	0.0	0.600	o	150	Pipe/Conduit	
F24.000	33.324	0.555	60.0	0.000	12.0	0.0	0.600	o	150	Pipe/Conduit	
F23.001	63.033	0.584	107.9	0.000	30.0	0.0	0.600	o	150	Pipe/Conduit	
F23.002	41.250	0.350	117.9	0.000	12.0	0.0	0.600	o	225	Pipe/Conduit	
F1.018	62.537	0.108	579.0	0.000	45.0	0.0	0.600	o	525	Pipe/Conduit	
F25.000	19.573	0.326	60.0	0.000	6.0	0.0	0.600	o	150	Pipe/Conduit	
F25.001	85.912	0.859	100.0	0.000	45.0	0.0	0.600	o	150	Pipe/Conduit	
F1.019	13.365	0.023	581.1	0.000	3.0	0.0	0.600	o	525	Pipe/Conduit	
F1.020	27.312	0.047	581.1	0.000	3.0	0.0	0.600	o	525	Pipe/Conduit	
F1.021	19.805	0.034	582.5	0.000	0.0	0.0	0.600	o	525	Pipe/Conduit	
F1.022	40.967	0.071	577.0	0.000	0.0	0.0	0.600	o	525	Pipe/Conduit	
F1.023	93.090	0.160	581.8	0.000	0.0	0.0	0.600	o	525	Pipe/Conduit	
F1.024	15.174	0.026	583.6	0.000	0.0	0.0	0.600	o	525	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)
F17.004	41.418	0.000	0.7	201.0	0.8	68	0.84	1.07	42.4	8.6
F17.005	41.157	0.000	0.7	201.0	0.8	69	0.84	1.06	42.2	8.6
F1.016	40.759	0.000	0.7	915.0	1.6	104	0.57	0.92	199.1	17.4
F1.017	40.735	0.000	0.7	933.0	1.6	104	0.58	0.92	200.1	17.6
F23.000	42.752	0.000	0.0	6.0	0.1	25	0.71	1.30	23.0	1.3
F24.000	42.965	0.000	0.0	12.0	0.2	29	0.79	1.30	23.0	1.9
F23.001	42.410	0.000	0.0	48.0	0.3	48	0.78	0.97	17.1	3.8
F23.002	41.751	0.000	0.0	60.0	0.4	45	0.75	1.20	47.8	4.3
F1.018	40.682	0.000	0.7	1038.0	1.7	107	0.59	0.92	199.9	18.5
F25.000	42.534	0.000	0.0	6.0	0.1	25	0.71	1.30	23.0	1.3
F25.001	42.208	0.000	0.0	51.0	0.4	48	0.81	1.00	17.8	3.9
F1.019	40.574	0.000	0.7	1092.0	1.7	108	0.59	0.92	199.6	18.9
F1.020	40.551	0.000	0.7	1095.0	1.7	108	0.59	0.92	199.6	19.0
F1.021	40.504	0.000	0.7	1095.0	1.7	108	0.59	0.92	199.3	19.0
F1.022	40.470	0.000	0.7	1095.0	1.7	108	0.59	0.93	200.3	19.0
F1.023	40.399	0.000	0.7	1095.0	1.7	108	0.59	0.92	199.5	19.0
F1.024	40.239	0.000	0.7	1095.0	1.7	108	0.59	0.92	199.1	19.0

FOUL SEWERAGE DESIGN

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
F26.000	52.569	0.361	145.6	0.000	102.0	0.0	0.600	o	225	Pipe/Conduit	
F26.001	17.559	0.127	138.3	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	
F26.002	37.499	0.260	144.2	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	
F26.003	22.171	0.148	149.8	0.000	27.0	0.0	0.600	o	225	Pipe/Conduit	
F26.004	17.574	0.117	150.2	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	
F26.005	17.374	0.106	163.9	0.000	27.0	0.0	0.600	o	225	Pipe/Conduit	
F26.006	13.268	0.078	170.1	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	
F26.007	65.613	0.337	194.7	0.000	87.0	0.0	0.600	o	225	Pipe/Conduit	
F26.008	68.470	0.346	197.9	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	
F1.025	32.125	0.055	584.1	0.000	12.0	0.0	0.600	o	525	Pipe/Conduit	
F27.000	35.434	0.261	135.8	0.000	69.0	0.0	0.600	o	225	Pipe/Conduit	
F1.026	41.172	0.069	596.7	0.000	72.0	0.0	0.600	o	525	Pipe/Conduit	
F28.000	60.574	0.509	119.0	0.000	60.0	0.0	0.600	o	225	Pipe/Conduit	
F28.001	11.984	0.101	118.7	0.000	0.0	0.0	0.600	o	225	Pipe/Conduit	
F28.002	50.413	0.342	147.4	0.000	54.0	0.0	0.600	o	225	Pipe/Conduit	
F1.027	110.443	0.190	581.3	0.000	30.0	0.0	0.600	o	525	Pipe/Conduit	
F29.000	25.123	0.419	60.0	0.000	12.0	0.0	0.600	o	150	Pipe/Conduit	
F29.001	25.207	0.420	60.0	0.000	0.0	0.0	0.600	o	150	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)
F26.000	42.724	0.000	0.0	102.0	0.5	54	0.75	1.08	43.0	5.6
F26.001	42.363	0.000	0.0	102.0	0.5	54	0.76	1.11	44.1	5.6
F26.002	42.236	0.000	0.0	102.0	0.5	54	0.75	1.09	43.2	5.6
F26.003	41.976	0.000	0.0	129.0	0.6	58	0.77	1.07	42.4	6.2
F26.004	41.828	0.000	0.0	129.0	0.6	58	0.77	1.06	42.3	6.2
F26.005	41.711	0.000	0.0	156.0	0.6	62	0.76	1.02	40.5	6.9
F26.006	41.605	0.000	0.0	156.0	0.6	63	0.75	1.00	39.7	6.9
F26.007	41.527	0.000	0.0	243.0	0.8	73	0.76	0.93	37.1	8.6
F26.008	41.190	0.000	0.0	243.0	0.8	74	0.76	0.93	36.8	8.6
F1.025	40.213	0.000	0.7	1350.0	1.9	114	0.60	0.92	199.1	21.0
F27.000	41.610	0.000	0.0	69.0	0.4	48	0.73	1.12	44.5	4.6
F1.026	40.158	0.000	0.7	1491.0	2.0	117	0.61	0.91	196.9	22.0
F28.000	41.341	0.000	0.0	60.0	0.4	45	0.75	1.20	47.6	4.3
F28.001	40.832	0.000	0.0	60.0	0.4	45	0.75	1.20	47.7	4.3
F28.002	40.731	0.000	0.0	114.0	0.5	56	0.76	1.07	42.7	5.9
F1.027	40.089	0.000	0.7	1635.0	2.1	119	0.62	0.92	199.6	23.0
F29.000	41.198	0.000	0.0	12.0	0.2	29	0.79	1.30	23.0	1.9
F29.001	40.779	0.000	0.0	12.0	0.2	29	0.79	1.30	23.0	1.9

FOUL SEWERAGE DESIGN

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
F1.028	64.513	0.113	570.9	0.000	45.0	1.0	0.600	o	525	Pipe/Conduit	
F1.029	6.205	0.011	564.1	0.000	0.0	0.0	0.600	o	525	Pipe/Conduit	
F30.000	75.583	0.779	97.0	0.000	36.0	0.0	0.600	o	150	Pipe/Conduit	
F30.001	6.631	0.068	97.5	0.000	0.0	0.0	0.600	o	150	Pipe/Conduit	
F1.030	8.958	0.015	597.2	0.000	0.0	0.0	0.600	o	525	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)
F1.028	39.899	0.000	1.7	1692.0	2.2	123	0.64	0.93	201.4	24.5
F1.029	39.786	0.000	1.7	1692.0	2.2	122	0.64	0.94	202.6	24.5
F30.000	40.997	0.000	0.0	36.0	0.3	43	0.78	1.02	18.0	3.3
F30.001	40.218	0.000	0.0	36.0	0.3	44	0.78	1.02	18.0	3.3
F1.030	39.775	0.000	1.7	1728.0	2.2	125	0.63	0.91	196.8	24.7

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)
F31	43.822	1.652	Open Manhole	1200	F1.000	42.170	150				
F30	43.668	1.888	Open Manhole	1500	F1.001	41.780	525	F1.000	41.780	150	
F29	43.548	1.908	Open Manhole	1500	F1.002	41.640	525	F1.001	41.640	525	
F28	43.385	1.885	Open Manhole	1500	F1.003	41.500	525	F1.002	41.500	525	
F27.1	43.504	1.874	Open Manhole	1200	F2.000	41.630	300				
F27	43.226	1.784	Open Manhole	1500	F1.004	41.442	525	F1.003	41.442	525	
								F2.000	41.536	300	
F26.1.1	43.356	1.221	Open Manhole	1200	F3.000	42.135	150				
F26.6	45.591	1.594	Open Manhole	1200	F4.000	43.997	150				
F26.5	44.426	1.298	Open Manhole	1200	F4.001	43.128	150	F4.000	43.128	150	
F26.4	44.386	1.306	Open Manhole	1200	F4.002	43.080	150	F4.001	43.080	150	
F26.3.1	45.045	1.391	Open Manhole	1200	F5.000	43.654	150				
F26.3	43.663	1.313	Open Manhole	1200	F4.003	42.350	225	F4.002	42.425	150	
								F5.000	42.425	150	
F26.2.4	45.219	1.125	Open Manhole	1200	F6.000	44.094	225				
F26.2.3	44.645	1.271	Open Manhole	1200	F6.001	43.374	225	F6.000	43.374	225	
F26.2.2	43.985	1.562	Open Manhole	1200	F6.002	42.423	225	F6.001	42.423	225	
F26.2.1	43.962	1.594	Open Manhole	1200	F6.003	42.368	225	F6.002	42.368	225	
F26.2	43.753	1.636	Open Manhole	1200	F4.004	42.117	225	F4.003	42.117	225	
								F6.003	42.117	225	
F26.1	42.970	1.263	Open Manhole	1200	F4.005	41.707	225	F4.004	41.707	225	
F26	43.112	1.775	Open Manhole	1500	F1.005	41.337	525	F1.004	41.337	525	
								F3.000	41.468	150	
								F4.005	41.637	225	
F25.3	44.459	1.519	Open Manhole	1200	F7.000	42.940	150				
F25.2	44.550	1.836	Open Manhole	1200	F7.001	42.714	150	F7.000	42.714	150	
F25.1	43.450	1.462	Open Manhole	1200	F7.002	41.988	150	F7.001	41.988	150	
F25.1.1	43.673	1.185	Open Manhole	1200	F8.000	42.488	150				
F25	43.504	2.278	Open Manhole	1500	F1.006	41.226	525	F1.005	41.226	525	
								F7.002	41.601	150	
								F8.000	41.601	150	
F24.3	44.800	1.806	Open Manhole	1200	F9.000	42.994	150				
F24.2.1	45.148	2.154	Open Manhole	1200	F10.000	42.994	150				
F24.2	44.974	2.410	Open Manhole	1200	F9.001	42.564	150	F9.000	42.564	150	
								F10.000	42.564	150	
F24.1	44.408	2.570	Open Manhole	1200	F9.002	41.838	150	F9.001	41.838	150	
F24.1.1	43.756	1.924	Open Manhole	1200	F11.000	41.832	150				
F24	43.969	2.849	Open Manhole	1500	F1.007	41.120	525	F1.006	41.120	525	
								F9.002	41.495	150	
								F11.000	41.495	150	
F23	43.484	2.467	Open Manhole	1500	F1.008	41.017	525	F1.007	41.017	525	
F22.4	44.241	1.050	Open Manhole	1200	F12.000	43.191	150				
F22.3	44.365	1.528	Open Manhole	1200	F12.001	42.837	150	F12.000	42.837	150	
F22.2	43.725	1.929	Open Manhole	1200	F12.002	41.796	150	F12.001	41.796	150	

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)
F22.1	43.704	1.954	Open Manhole	1200	F12.003	41.750	150	F12.002	41.750	150	
F22	43.447	2.442	Open Manhole	1500	F1.009	41.005	525	F1.008	41.005	525	
								F12.003	41.380	150	
F21.4	43.669	1.050	Open Manhole	1200	F13.000	42.619	150				
F21.3	43.354	1.050	Open Manhole	1200	F13.001	42.304	150	F13.000	42.304	150	
F21.2.1	43.981	0.925	Open Manhole	1200	F14.000	43.056	150				
F21.2	43.604	1.757	Open Manhole	1200	F13.002	41.847	150	F13.001	41.848	150	1
								F14.000	41.847	150	
F21.1	43.324	1.870	Open Manhole	1200	F13.003	41.454	150	F13.002	41.454	150	
F21	43.325	2.366	Open Manhole	1500	F1.010	40.959	525	F1.009	40.959	525	
								F13.003	41.334	150	
F20	43.247	2.310	Open Manhole	1500	F1.011	40.937	525	F1.010	40.937	525	
F19	43.017	2.150	Open Manhole	1500	F1.012	40.867	525	F1.011	40.867	525	
F18	42.940	2.097	Open Manhole	1500	F1.013	40.843	525	F1.012	40.843	525	
F17.4	43.916	1.050	Open Manhole	1200	F15.000	42.866	150				
F17.3	43.879	1.350	Open Manhole	1200	F15.001	42.529	150	F15.000	42.529	150	
F17.2.1	43.442	1.072	Open Manhole	1200	F16.000	42.370	150				
F17.2	43.457	1.747	Open Manhole	1200	F15.002	41.710	150	F15.001	41.710	150	
								F16.000	41.712	150	2
F17.1	43.132	1.479	Open Manhole	1200	F15.003	41.653	150	F15.002	41.653	150	
F17	42.892	2.084	Open Manhole	1500	F1.014	40.808	525	F1.013	40.808	525	
								F15.003	41.606	150	423
F16	42.943	2.170	Open Manhole	1500	F1.015	40.774	525	F1.014	40.773	525	
F15.6	45.007	1.948	Open Manhole	1200	F17.000	43.059	150				
F15.5	44.774	2.045	Open Manhole	1200	F17.001	42.729	150	F17.000	42.729	150	
F15.4	44.566	2.082	Open Manhole	1200	F17.002	42.484	150	F17.001	42.484	150	
F15.3.2	44.849	1.536	Open Manhole	1200	F18.000	43.313	150				
F15.3.1	44.604	1.816	Open Manhole	1200	F18.001	42.788	150	F18.000	42.788	150	
F15.3	44.481	2.112	Open Manhole	1200	F17.003	42.369	150	F17.002	42.369	150	
								F18.001	42.369	150	
F15.2.3	45.230	1.949	Open Manhole	1200	F19.000	43.281	150				
F15.2.2.1	45.097	1.932	Open Manhole	1200	F20.000	43.165	150				
F15.2.2	45.250	2.515	Open Manhole	1200	F19.001	42.735	150	F19.000	42.851	150	116
								F20.000	42.735	150	
F15.2.1.1	43.369	1.138	Open Manhole	1200	F21.000	42.231	150				
F15.2.1	43.133	1.283	Open Manhole	1200	F19.002	41.850	225	F19.001	41.926	150	1
								F21.000	41.925	150	
F15.2.1.1.1	43.391	1.336	Open Manhole	1200	F22.000	42.055	150				
F15.2	43.692	2.274	Open Manhole	1200	F17.004	41.418	225	F17.003	41.793	150	300
								F19.002	41.418	225	
								F22.000	41.493	150	
F15.1	43.193	2.036	Open Manhole	1200	F17.005	41.157	225	F17.004	41.157	225	
F15	42.956	2.197	Open Manhole	1500	F1.016	40.759	525	F1.015	40.759	525	
								F17.005	41.059	225	

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)
F14	42.872	2.137	Open Manhole	1500	F1.017	40.735	525	F1.016	40.735	525	
F13.3	43.802	1.050	Open Manhole	1200	F23.000	42.752	150				
F13.2.1	44.146	1.181	Open Manhole	1200	F24.000	42.965	150				
F13.2	44.340	1.930	Open Manhole	1200	F23.001	42.410	150	F23.000	42.410	150	
								F24.000	42.410	150	
F13.1	43.223	1.472	Open Manhole	1200	F23.002	41.751	225	F23.001	41.826	150	
F13	42.689	2.007	Open Manhole	1500	F1.018	40.682	525	F1.017	40.682	525	
								F23.002	41.401	225	419
F12.2	43.555	1.021	Open Manhole	1200	F25.000	42.534	150				
F12.1	43.655	1.447	Open Manhole	1200	F25.001	42.208	150	F25.000	42.208	150	
F12	42.449	1.875	Open Manhole	1500	F1.019	40.574	525	F1.018	40.574	525	
								F25.001	41.349	150	400
F11	42.525	1.974	Open Manhole	1500	F1.020	40.551	525	F1.019	40.551	525	
F10	42.709	2.205	Open Manhole	1500	F1.021	40.504	525	F1.020	40.504	525	
F9	42.832	2.362	Open Manhole	1500	F1.022	40.470	525	F1.021	40.470	525	
F8	42.562	2.163	Open Manhole	1500	F1.023	40.399	525	F1.022	40.399	525	
F7	42.980	2.741	Open Manhole	1500	F1.024	40.239	525	F1.023	40.239	525	
F6.9	43.849	1.125	Open Manhole	1200	F26.000	42.724	225				
F6.8	43.578	1.215	Open Manhole	1200	F26.001	42.363	225	F26.000	42.363	225	
F6.7	43.826	1.590	Open Manhole	1200	F26.002	42.236	225	F26.001	42.236	225	
F6.6	44.398	2.422	Open Manhole	1200	F26.003	41.976	225	F26.002	41.976	225	
F6.5	44.260	2.432	Open Manhole	1200	F26.004	41.828	225	F26.003	41.828	225	
F6.4	44.132	2.421	Open Manhole	1200	F26.005	41.711	225	F26.004	41.711	225	
F6.3	44.014	2.409	Open Manhole	1200	F26.006	41.605	225	F26.005	41.605	225	
F6.2	43.928	2.401	Open Manhole	1200	F26.007	41.527	225	F26.006	41.527	225	
F6.1	43.509	2.319	Open Manhole	1200	F26.008	41.190	225	F26.007	41.190	225	
F6	43.139	2.926	Open Manhole	1500	F1.025	40.213	525	F1.024	40.213	525	
								F26.008	40.844	225	331
F5.1	43.421	1.811	Open Manhole	1200	F27.000	41.610	225				
F5	43.068	2.910	Open Manhole	1500	F1.026	40.158	525	F1.025	40.158	525	
								F27.000	41.349	225	891
F4.3	43.614	2.273	Open Manhole	1200	F28.000	41.341	225				
F4.2	42.662	1.830	Open Manhole	1200	F28.001	40.832	225	F28.000	40.832	225	
F4.1	42.699	1.968	Open Manhole	1200	F28.002	40.731	225	F28.001	40.731	225	
F4	43.033	2.944	Open Manhole	1500	F1.027	40.089	525	F1.026	40.089	525	
								F28.002	40.389	225	
F3.2	42.093	0.895	Open Manhole	1200	F29.000	41.198	150				
F3.1	41.548	0.769	Open Manhole	1200	F29.001	40.779	150	F29.000	40.779	150	
F3	41.464	1.565	Open Manhole	1500	F1.028	39.899	525	F1.027	39.899	525	
								F29.001	40.359	150	85
F2	41.827	2.041	Open Manhole	1500	F1.029	39.786	525	F1.028	39.786	525	
F1.2	42.501	1.504	Open Manhole	1200	F30.000	40.997	150				
F1.1	41.933	1.715	Open Manhole	1200	F30.001	40.218	150	F30.000	40.218	150	
F1	41.858	2.083	Open Manhole	1500	F1.030	39.775	525	F1.029	39.775	525	

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)
								F30.001	40.150	150	
FExMH	42.000	2.240	Open Manhole	1800		OUTFALL		F1.030	39.760	525	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F31	606138.864	741805.220	606138.864	741805.220	Required	
F30	606161.357	741798.862	606161.357	741798.862	Required	
F29	606180.443	741788.884	606180.443	741788.884	Required	
F28	606186.625	741768.651	606186.625	741768.651	Required	
F27.1	606224.621	741735.808	606224.621	741735.808	Required	
F27	606196.284	741736.112	606196.284	741736.112	Required	
F26.1.1	606149.563	741760.598	606149.563	741760.598	Required	
F26.6	606225.232	741554.686	606225.232	741554.686	Required	
F26.5	606220.376	741624.035	606220.376	741624.035	Required	
F26.4	606218.284	741627.227	606218.284	741627.227	Required	
F26.3.1	606142.304	741572.159	606142.304	741572.159	Required	
F26.3	606162.354	741643.093	606162.354	741643.093	Required	
F26.2.4	606110.902	741555.213	606110.902	741555.213	Required	
F26.2.3	606069.339	741566.961	606069.339	741566.961	Required	
F26.2.2	606095.193	741658.429	606095.193	741658.429	Required	

Manhole Schedules for Foul

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F26.2.1	606100.225	741660.716	606100.225	741660.716	Required	
F26.2	606128.772	741652.619	606128.772	741652.619	Required	
F26.1	606145.524	741711.783	606145.524	741711.783	Required	
F26	606137.767	741718.869	606137.767	741718.869	Required	
F25.3	606111.764	741810.037	606111.764	741810.037	Required	
F25.2	606098.736	741813.720	606098.736	741813.720	Required	
F25.1	606086.905	741771.791	606086.905	741771.791	Required	
F25.1.1	606061.076	741685.232	606061.076	741685.232	Required	
F25	606075.555	741736.454	606075.555	741736.454	Required	
F24.3	606062.949	741823.838	606062.949	741823.838	Required	
F24.2.1	606013.274	741837.879	606013.274	741837.879	Required	
F24.2	606038.112	741830.859	606038.112	741830.859	Required	
F24.1	606026.281	741788.930	606026.281	741788.930	Required	
F24.1.1	605996.669	741758.519	605996.669	741758.519	Required	
F24	606016.207	741753.230	606016.207	741753.230	Required	
F23	605999.954	741695.718	605999.954	741695.718	Required	
F22.4	605990.833	741584.344	605990.833	741584.344	Required	
F22.3	606011.934	741581.853	606011.934	741581.853	Required	
F22.2	606038.267	741675.004	606038.267	741675.004	Required	

Manhole Schedules for Foul

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F22.1	606036.671	741678.900	606036.671	741678.900	Required	
F22	605995.715	741690.471	605995.715	741690.471	Required	
F21.4	605973.492	741590.437	605973.492	741590.437	Required	
F21.3	605955.854	741597.297	605955.854	741597.297	Required	
F21.2.1	605893.008	741643.459	605893.008	741643.459	Required	
F21.2	605962.818	741623.769	605962.818	741623.769	Required	
F21.1	605973.614	741664.805	605973.614	741664.805	Required	
F21	605972.035	741678.108	605972.035	741678.108	Required	
F20	605959.771	741675.242	605959.771	741675.242	Required	
F19	605920.593	741686.316	605920.593	741686.316	Required	
F18	605909.329	741694.567	605909.329	741694.567	Required	
F17.4	605853.221	741627.134	605853.221	741627.134	Required	
F17.3	605872.730	741621.769	605872.730	741621.769	Required	
F17.2.1	605845.292	741694.286	605845.292	741694.286	Required	
F17.2	605889.655	741681.826	605889.655	741681.826	Required	
F17.1	605894.268	741694.002	605894.268	741694.002	Required	
F17	605905.273	741701.607	605905.273	741701.607	Required	
F16	605889.834	741729.426	605889.834	741729.426	Required	
F15.6	605944.869	741857.215	605944.869	741857.215	Required	

Manhole Schedules for Foul

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F15.5	605925.839	741862.582	605925.839	741862.582	Required	
F15.4	605913.239	741854.990	605913.239	741854.990	Required	
F15.3.2	605855.707	741856.493	605855.707	741856.493	Required	
F15.3.1	605887.153	741855.173	605887.153	741855.173	Required	
F15.3	605911.356	741848.332	605911.356	741848.332	Required	
F15.2.3	606001.468	741841.216	606001.468	741841.216	Required	
F15.2.2.1	605951.793	741855.258	605951.793	741855.258	Required	
F15.2.2	605976.631	741848.237	605976.631	741848.237	Required	
F15.2.1.1	605972.107	741764.842	605972.107	741764.842	Required	
F15.2.1	605954.627	741770.392	605954.627	741770.392	Required	
F15.2.1.1.1	605860.760	741790.079	605860.760	741790.079	Required	
F15.2	605894.392	741787.334	605894.392	741787.334	Required	
F15.1	605883.494	741749.768	605883.494	741749.768	Required	
F15	605883.056	741734.966	605883.056	741734.966	Required	
F14	605869.884	741730.195	605869.884	741730.195	Required	
F13.3	605832.114	741631.873	605832.114	741631.873	Required	
F13.2.1	605780.341	741646.712	605780.341	741646.712	Required	
F13.2	605812.518	741638.042	605812.518	741638.042	Required	
F13.1	605829.173	741698.835	605829.173	741698.835	Required	

Manhole Schedules for Foul

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F13	605840.393	741738.530	605840.393	741738.530	Required	
F12.2	605737.471	741678.530	605737.471	741678.530	Required	
F12.1	605756.326	741673.276	605756.326	741673.276	Required	
F12	605780.282	741755.780	605780.282	741755.780	Required	
F11	605770.166	741764.516	605770.166	741764.516	Required	
F10	605754.206	741786.679	605754.206	741786.679	Required	
F9	605737.336	741797.053	605737.336	741797.053	Required	
F8	605696.933	741803.830	605696.933	741803.830	Required	
F7	605607.353	741829.150	605607.353	741829.150	Required	
F6.9	605590.830	742008.239	605590.830	742008.239	Required	
F6.8	605541.931	742027.537	605541.931	742027.537	Required	
F6.7	605525.081	742022.598	605525.081	742022.598	Required	
F6.6	605525.503	741985.101	605525.503	741985.101	Required	
F6.5	605529.414	741963.278	605529.414	741963.278	Required	
F6.4	605537.869	741947.872	605537.869	741947.872	Required	
F6.3	605549.813	741935.254	605549.813	741935.254	Required	
F6.2	605560.890	741927.950	605560.890	741927.950	Required	
F6.1	605624.029	741910.103	605624.029	741910.103	Required	
F6	605605.442	741844.204	605605.442	741844.204	Required	

Manhole Schedules for Foul

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F5.1	605584.092	741886.767	605584.092	741886.767	Required	
F5	605574.453	741852.670	605574.453	741852.670	Required	
F4.3	605504.120	741945.836	605504.120	741945.836	Required	
F4.2	605484.096	741888.668	605484.096	741888.668	Required	
F4.1	605486.120	741876.856	605486.120	741876.856	Required	
F4	605534.743	741863.543	605534.743	741863.543	Required	
F3.2	605522.019	741726.182	605522.019	741726.182	Required	
F3.1	605497.841	741733.008	605497.841	741733.008	Required	
F3	605504.695	741757.274	605504.695	741757.274	Required	
F2	605442.632	741774.884	605442.632	741774.884	Required	
F1.2	605468.575	741857.093	605468.575	741857.093	Required	
F1.1	605440.263	741787.013	605440.263	741787.013	Required	
F1	605439.789	741780.399	605439.789	741780.399	Required	
FExMH	605430.858	741781.093			No Entry	

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	150	F31	43.822	42.170	1.502	Open Manhole	1200
F1.001	o	525	F30	43.668	41.780	1.363	Open Manhole	1500
F1.002	o	525	F29	43.548	41.640	1.383	Open Manhole	1500
F1.003	o	525	F28	43.385	41.500	1.360	Open Manhole	1500
F2.000	o	300	F27.1	43.504	41.630	1.574	Open Manhole	1200
F1.004	o	525	F27	43.226	41.442	1.259	Open Manhole	1500
F3.000	o	150	F26.1.1	43.356	42.135	1.071	Open Manhole	1200
F4.000	o	150	F26.6	45.591	43.997	1.444	Open Manhole	1200
F4.001	o	150	F26.5	44.426	43.128	1.148	Open Manhole	1200
F4.002	o	150	F26.4	44.386	43.080	1.156	Open Manhole	1200
F5.000	o	150	F26.3.1	45.045	43.654	1.241	Open Manhole	1200
F4.003	o	225	F26.3	43.663	42.350	1.088	Open Manhole	1200
F6.000	o	225	F26.2.4	45.219	44.094	0.900	Open Manhole	1200
F6.001	o	225	F26.2.3	44.645	43.374	1.046	Open Manhole	1200
F6.002	o	225	F26.2.2	43.985	42.423	1.337	Open Manhole	1200
F6.003	o	225	F26.2.1	43.962	42.368	1.369	Open Manhole	1200
F4.004	o	225	F26.2	43.753	42.117	1.411	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	23.374	59.9	F30	43.668	41.780	1.738	Open Manhole	1500
F1.001	21.538	153.8	F29	43.548	41.640	1.383	Open Manhole	1500
F1.002	21.156	151.1	F28	43.385	41.500	1.360	Open Manhole	1500
F1.003	33.943	585.2	F27	43.226	41.442	1.259	Open Manhole	1500
F2.000	28.338	301.5	F27	43.226	41.536	1.390	Open Manhole	1500
F1.004	61.005	581.0	F26	43.112	41.337	1.250	Open Manhole	1500
F3.000	43.364	65.0	F26	43.112	41.468	1.494	Open Manhole	1500
F4.000	69.519	80.0	F26.5	44.426	43.128	1.148	Open Manhole	1200
F4.001	3.817	79.5	F26.4	44.386	43.080	1.156	Open Manhole	1200
F4.002	58.137	88.8	F26.3	43.663	42.425	1.088	Open Manhole	1200
F5.000	73.713	60.0	F26.3	43.663	42.425	1.088	Open Manhole	1200
F4.003	34.907	149.8	F26.2	43.753	42.117	1.411	Open Manhole	1200
F6.000	43.191	60.0	F26.2.3	44.645	43.374	1.046	Open Manhole	1200
F6.001	95.052	99.9	F26.2.2	43.985	42.423	1.337	Open Manhole	1200
F6.002	5.527	100.5	F26.2.1	43.962	42.368	1.369	Open Manhole	1200
F6.003	29.673	118.2	F26.2	43.753	42.117	1.411	Open Manhole	1200
F4.004	61.490	150.0	F26.1	42.970	41.707	1.038	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)
F4.005	o	225	F26.1	42.970	41.707	1.038	Open Manhole	1200
F1.005	o	525	F26	43.112	41.337	1.250	Open Manhole	1500
F7.000	o	150	F25.3	44.459	42.940	1.369	Open Manhole	1200
F7.001	o	150	F25.2	44.550	42.714	1.686	Open Manhole	1200
F7.002	o	150	F25.1	43.450	41.988	1.312	Open Manhole	1200
F8.000	o	150	F25.1.1	43.673	42.488	1.035	Open Manhole	1200
F1.006	o	525	F25	43.504	41.226	1.753	Open Manhole	1500
F9.000	o	150	F24.3	44.800	42.994	1.656	Open Manhole	1200
F10.000	o	150	F24.2.1	45.148	42.994	2.004	Open Manhole	1200
F9.001	o	150	F24.2	44.974	42.564	2.260	Open Manhole	1200
F9.002	o	150	F24.1	44.408	41.838	2.420	Open Manhole	1200
F11.000	o	150	F24.1.1	43.756	41.832	1.774	Open Manhole	1200
F1.007	o	525	F24	43.969	41.120	2.324	Open Manhole	1500
F1.008	o	525	F23	43.484	41.017	1.942	Open Manhole	1500
F12.000	o	150	F22.4	44.241	43.191	0.900	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)
F4.005	10.507	150.1	F26	43.112	41.637	1.250	Open Manhole	1500
F1.005	64.650	582.4	F25	43.504	41.226	1.753	Open Manhole	1500
F7.000	13.538	59.9	F25.2	44.550	42.714	1.686	Open Manhole	1200
F7.001	43.565	60.0	F25.1	43.450	41.988	1.312	Open Manhole	1200
F7.002	37.115	95.9	F25	43.504	41.601	1.753	Open Manhole	1500
F8.000	53.229	60.0	F25	43.504	41.601	1.753	Open Manhole	1500
F1.006	61.673	581.8	F24	43.969	41.120	2.324	Open Manhole	1500
F9.000	25.811	60.0	F24.2	44.974	42.564	2.260	Open Manhole	1200
F10.000	25.811	60.0	F24.2	44.974	42.564	2.260	Open Manhole	1200
F9.001	43.565	60.0	F24.1	44.408	41.838	2.420	Open Manhole	1200
F9.002	37.094	108.1	F24	43.969	41.495	2.324	Open Manhole	1500
F11.000	20.242	60.1	F24	43.969	41.495	2.324	Open Manhole	1500
F1.007	59.764	580.2	F23	43.484	41.017	1.942	Open Manhole	1500
F1.008	6.745	562.1	F22	43.447	41.005	1.917	Open Manhole	1500
F12.000	21.247	60.0	F22.3	44.365	42.837	1.378	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)
F12.001	o	150	F22.3	44.365	42.837	1.378	Open Manhole	1200
F12.002	o	150	F22.2	43.725	41.796	1.779	Open Manhole	1200
F12.003	o	150	F22.1	43.704	41.750	1.804	Open Manhole	1200
F1.009	o	525	F22	43.447	41.005	1.917	Open Manhole	1500
F13.000	o	150	F21.4	43.669	42.619	0.900	Open Manhole	1200
F13.001	o	150	F21.3	43.354	42.304	0.900	Open Manhole	1200
F14.000	o	150	F21.2.1	43.981	43.056	0.775	Open Manhole	1200
F13.002	o	150	F21.2	43.604	41.847	1.607	Open Manhole	1200
F13.003	o	150	F21.1	43.324	41.454	1.720	Open Manhole	1200
F1.010	o	525	F21	43.325	40.959	1.841	Open Manhole	1500
F1.011	o	525	F20	43.247	40.937	1.785	Open Manhole	1500
F1.012	o	525	F19	43.017	40.867	1.625	Open Manhole	1500
F1.013	o	525	F18	42.940	40.843	1.572	Open Manhole	1500
F15.000	o	150	F17.4	43.916	42.866	0.900	Open Manhole	1200
F15.001	o	150	F17.3	43.879	42.529	1.200	Open Manhole	1200
F16.000	o	150	F17.2.1	43.442	42.370	0.922	Open Manhole	1200
F15.002	o	150	F17.2	43.457	41.710	1.597	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)
F12.001	96.801	93.0	F22.2	43.725	41.796	1.779	Open Manhole	1200
F12.002	4.211	91.5	F22.1	43.704	41.750	1.804	Open Manhole	1200
F12.003	42.559	115.0	F22	43.447	41.380	1.917	Open Manhole	1500
F1.009	26.714	580.7	F21	43.325	40.959	1.841	Open Manhole	1500
F13.000	18.925	60.1	F21.3	43.354	42.304	0.900	Open Manhole	1200
F13.001	27.372	60.0	F21.2	43.604	41.848	1.606	Open Manhole	1200
F14.000	72.534	60.0	F21.2	43.604	41.847	1.607	Open Manhole	1200
F13.002	42.432	108.0	F21.1	43.324	41.454	1.720	Open Manhole	1200
F13.003	13.397	111.6	F21	43.325	41.334	1.841	Open Manhole	1500
F1.010	12.594	572.5	F20	43.247	40.937	1.785	Open Manhole	1500
F1.011	40.713	581.6	F19	43.017	40.867	1.625	Open Manhole	1500
F1.012	13.963	581.8	F18	42.940	40.843	1.572	Open Manhole	1500
F1.013	8.125	232.1	F17	42.892	40.808	1.559	Open Manhole	1500
F15.000	20.234	60.0	F17.3	43.879	42.529	1.200	Open Manhole	1200
F15.001	62.397	76.2	F17.2	43.457	41.710	1.597	Open Manhole	1200
F16.000	46.080	70.0	F17.2	43.457	41.712	1.595	Open Manhole	1200
F15.002	13.021	228.4	F17.1	43.132	41.653	1.329	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)
F15.003	o	150	F17.1	43.132	41.653	1.329	Open Manhole	1200
F1.014	o	525	F17	42.892	40.808	1.559	Open Manhole	1500
F1.015	o	525	F16	42.943	40.774	1.644	Open Manhole	1500
F17.000	o	150	F15.6	45.007	43.059	1.798	Open Manhole	1200
F17.001	o	150	F15.5	44.774	42.729	1.895	Open Manhole	1200
F17.002	o	150	F15.4	44.566	42.484	1.932	Open Manhole	1200
F18.000	o	150	F15.3.2	44.849	43.313	1.386	Open Manhole	1200
F18.001	o	150	F15.3.1	44.604	42.788	1.666	Open Manhole	1200
F17.003	o	150	F15.3	44.481	42.369	1.962	Open Manhole	1200
F19.000	o	150	F15.2.3	45.230	43.281	1.799	Open Manhole	1200
F20.000	o	150	F15.2.2.1	45.097	43.165	1.782	Open Manhole	1200
F19.001	o	150	F15.2.2	45.250	42.735	2.365	Open Manhole	1200
F21.000	o	150	F15.2.1.1	43.369	42.231	0.988	Open Manhole	1200
F19.002	o	225	F15.2.1	43.133	41.850	1.058	Open Manhole	1200
F22.000	o	150	F15.2.1.1.1	43.391	42.055	1.186	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)
F15.003	13.376	284.6	F17	42.892	41.606	1.136	Open Manhole	1500
F1.014	31.816	909.0	F16	42.943	40.773	1.645	Open Manhole	1500
F1.015	8.755	583.7	F15	42.956	40.759	1.672	Open Manhole	1500
F17.000	19.772	59.9	F15.5	44.774	42.729	1.895	Open Manhole	1200
F17.001	14.711	60.0	F15.4	44.566	42.484	1.932	Open Manhole	1200
F17.002	6.920	60.2	F15.3	44.481	42.369	1.962	Open Manhole	1200
F18.000	31.474	60.0	F15.3.1	44.604	42.788	1.666	Open Manhole	1200
F18.001	25.152	60.0	F15.3	44.481	42.369	1.962	Open Manhole	1200
F17.003	63.314	109.9	F15.2	43.692	41.793	1.749	Open Manhole	1200
F19.000	25.811	60.0	F15.2.2	45.250	42.851	2.249	Open Manhole	1200
F20.000	25.811	60.0	F15.2.2	45.250	42.735	2.365	Open Manhole	1200
F19.001	80.895	100.0	F15.2.1	43.133	41.926	1.057	Open Manhole	1200
F21.000	18.340	59.9	F15.2.1	43.133	41.925	1.058	Open Manhole	1200
F19.002	62.573	144.8	F15.2	43.692	41.418	2.049	Open Manhole	1200
F22.000	33.744	60.0	F15.2	43.692	41.493	2.049	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)
F17.004	o	225	F15.2	43.692	41.418	2.049	Open Manhole	1200
F17.005	o	225	F15.1	43.193	41.157	1.811	Open Manhole	1200
F1.016	o	525	F15	42.956	40.759	1.672	Open Manhole	1500
F1.017	o	525	F14	42.872	40.735	1.612	Open Manhole	1500
F23.000	o	150	F13.3	43.802	42.752	0.900	Open Manhole	1200
F24.000	o	150	F13.2.1	44.146	42.965	1.031	Open Manhole	1200
F23.001	o	150	F13.2	44.340	42.410	1.780	Open Manhole	1200
F23.002	o	225	F13.1	43.223	41.751	1.247	Open Manhole	1200
F1.018	o	525	F13	42.689	40.682	1.482	Open Manhole	1500
F25.000	o	150	F12.2	43.555	42.534	0.871	Open Manhole	1200
F25.001	o	150	F12.1	43.655	42.208	1.297	Open Manhole	1200
F1.019	o	525	F12	42.449	40.574	1.350	Open Manhole	1500
F1.020	o	525	F11	42.525	40.551	1.449	Open Manhole	1500
F1.021	o	525	F10	42.709	40.504	1.680	Open Manhole	1500
F1.022	o	525	F9	42.832	40.470	1.837	Open Manhole	1500
F1.023	o	525	F8	42.562	40.399	1.638	Open Manhole	1500
F1.024	o	525	F7	42.980	40.239	2.216	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)
F17.004	39.114	149.9	F15.1	43.193	41.157	1.811	Open Manhole	1200
F17.005	14.809	151.1	F15	42.956	41.059	1.672	Open Manhole	1500
F1.016	14.009	583.7	F14	42.872	40.735	1.612	Open Manhole	1500
F1.017	30.647	578.2	F13	42.689	40.682	1.482	Open Manhole	1500
F23.000	20.544	60.1	F13.2	44.340	42.410	1.780	Open Manhole	1200
F24.000	33.324	60.0	F13.2	44.340	42.410	1.780	Open Manhole	1200
F23.001	63.033	107.9	F13.1	43.223	41.826	1.247	Open Manhole	1200
F23.002	41.250	117.9	F13	42.689	41.401	1.063	Open Manhole	1500
F1.018	62.537	579.0	F12	42.449	40.574	1.350	Open Manhole	1500
F25.000	19.573	60.0	F12.1	43.655	42.208	1.297	Open Manhole	1200
F25.001	85.912	100.0	F12	42.449	41.349	0.950	Open Manhole	1500
F1.019	13.365	581.1	F11	42.525	40.551	1.449	Open Manhole	1500
F1.020	27.312	581.1	F10	42.709	40.504	1.680	Open Manhole	1500
F1.021	19.805	582.5	F9	42.832	40.470	1.837	Open Manhole	1500
F1.022	40.967	577.0	F8	42.562	40.399	1.638	Open Manhole	1500
F1.023	93.090	581.8	F7	42.980	40.239	2.216	Open Manhole	1500
F1.024	15.174	583.6	F6	43.139	40.213	2.401	Open Manhole	1500

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)
F26.000	o	225	F6.9	43.849	42.724	0.900	Open Manhole	1200
F26.001	o	225	F6.8	43.578	42.363	0.990	Open Manhole	1200
F26.002	o	225	F6.7	43.826	42.236	1.365	Open Manhole	1200
F26.003	o	225	F6.6	44.398	41.976	2.197	Open Manhole	1200
F26.004	o	225	F6.5	44.260	41.828	2.207	Open Manhole	1200
F26.005	o	225	F6.4	44.132	41.711	2.196	Open Manhole	1200
F26.006	o	225	F6.3	44.014	41.605	2.184	Open Manhole	1200
F26.007	o	225	F6.2	43.928	41.527	2.176	Open Manhole	1200
F26.008	o	225	F6.1	43.509	41.190	2.094	Open Manhole	1200
F1.025	o	525	F6	43.139	40.213	2.401	Open Manhole	1500
F27.000	o	225	F5.1	43.421	41.610	1.586	Open Manhole	1200
F1.026	o	525	F5	43.068	40.158	2.385	Open Manhole	1500
F28.000	o	225	F4.3	43.614	41.341	2.048	Open Manhole	1200
F28.001	o	225	F4.2	42.662	40.832	1.605	Open Manhole	1200
F28.002	o	225	F4.1	42.699	40.731	1.743	Open Manhole	1200
F1.027	o	525	F4	43.033	40.089	2.419	Open Manhole	1500
F29.000	o	150	F3.2	42.093	41.198	0.745	Open Manhole	1200
F29.001	o	150	F3.1	41.548	40.779	0.619	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)
F26.000	52.569	145.6	F6.8	43.578	42.363	0.990	Open Manhole	1200
F26.001	17.559	138.3	F6.7	43.826	42.236	1.365	Open Manhole	1200
F26.002	37.499	144.2	F6.6	44.398	41.976	2.197	Open Manhole	1200
F26.003	22.171	149.8	F6.5	44.260	41.828	2.207	Open Manhole	1200
F26.004	17.574	150.2	F6.4	44.132	41.711	2.196	Open Manhole	1200
F26.005	17.374	163.9	F6.3	44.014	41.605	2.184	Open Manhole	1200
F26.006	13.268	170.1	F6.2	43.928	41.527	2.176	Open Manhole	1200
F26.007	65.613	194.7	F6.1	43.509	41.190	2.094	Open Manhole	1200
F26.008	68.470	197.9	F6	43.139	40.844	2.070	Open Manhole	1500
F1.025	32.125	584.1	F5	43.068	40.158	2.385	Open Manhole	1500
F27.000	35.434	135.8	F5	43.068	41.349	1.494	Open Manhole	1500
F1.026	41.172	596.7	F4	43.033	40.089	2.419	Open Manhole	1500
F28.000	60.574	119.0	F4.2	42.662	40.832	1.605	Open Manhole	1200
F28.001	11.984	118.7	F4.1	42.699	40.731	1.743	Open Manhole	1200
F28.002	50.413	147.4	F4	43.033	40.389	2.419	Open Manhole	1500
F1.027	110.443	581.3	F3	41.464	39.899	1.040	Open Manhole	1500
F29.000	25.123	60.0	F3.1	41.548	40.779	0.619	Open Manhole	1200
F29.001	25.207	60.0	F3	41.464	40.359	0.955	Open Manhole	1500

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)
F1.028	o	525	F3	41.464	39.899	1.040	Open Manhole	1500
F1.029	o	525	F2	41.827	39.786	1.516	Open Manhole	1500
F30.000	o	150	F1.2	42.501	40.997	1.354	Open Manhole	1200
F30.001	o	150	F1.1	41.933	40.218	1.565	Open Manhole	1200
F1.030	o	525	F1	41.858	39.775	1.558	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)
F1.028	64.513	570.9	F2	41.827	39.786	1.516	Open Manhole	1500
F1.029	6.205	564.1	F1	41.858	39.775	1.558	Open Manhole	1500
F30.000	75.583	97.0	F1.1	41.933	40.218	1.565	Open Manhole	1200
F30.001	6.631	97.5	F1	41.858	40.150	1.558	Open Manhole	1500
F1.030	8.958	597.2	FExMH	42.000	39.760	1.715	Open Manhole	1800

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)
F1.030	FExMH	42.000	39.760	39.770	1800	0

Daniel Hodnett
DBFL Consulting Engineers
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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

10 November 2020

Re: CDS20004573 pre-connection enquiry - Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 605 unit(s) at Residential Development At Lissywollen, Athlone, Co. Westmeath

Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Residential Development At Lissywollen, Athlone, Co. Westmeath (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 without infrastructure upgrade by Irish Water
SITE SPECIFIC COMMENTS	
Water Connection	While there are on-going supply demand issues in Athlone at present, the Water Treatment Plant upgrade works currently underway will resolve these issues and provide adequate headroom capacity for this development. The Primary Connection Point for this development should be the proposed 200mm diameter connection from the R916, on the eastern side of the development site, as shown on your Dwg. No. 180176-DBFL-CS-SP-SK-C-9100 included with your PCE. This connection should also include the bulk meter, which will be linked up with telemetry online. The Secondary Connection Point for this development should be the proposed 200mm diameter connection on Brawney Road on the western side of the proposed development site, as shown on your Dwg. No. 180176-DBFL-CS-SP-SK-C-9100. The control valve on this secondary connection main to be closed during normal

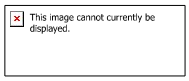
	operation. The development should include for onsite storage for the average day peak week demand rate of the commercial section for 24-hour period. This separate storage is required to supply this demand and will have a re-fill time of 12 hours.
Wastewater Connection	There is sufficient capacity at the Athlone Wastewater Treatment Plant and local wastewater network to facilitate this development. It is noted a sewer diversion is proposed under this development; accordingly please contact our diversion team on diversions@water.ie to agree the diversion requirements.
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.	

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 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 094 90 43319 or email PeOHalloran@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations

Daniel Hodnett
DBFL Consulting Engineers, Ormond House
Ormond Quay Upper, Dublin 7
Dublin D07W7704

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

25 November 2020

Re: Design Submission for Residential Development At Lissywollen, Athlone, Co. Westmeath (the "Development")
(the "Design Submission") / Connection Reference No: CDS20004573

Dear Daniel Hodnett,

Many thanks for your recent Design Submission.

We have reviewed your proposal for the connection(s) at the Development. Based on the information provided, which included the documents outlined in Appendix A to this letter, Irish Water has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before you can connect to our network you must sign a connection agreement with Irish Water. This can be applied for by completing the connection application form at www.water.ie/connections. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities (CRU)(https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/).

You the Customer (including any designers/contractors or other related parties appointed by you) is entirely responsible for the design and construction of all water and/or wastewater infrastructure within the Development which is necessary to facilitate connection(s) from the boundary of the Development to Irish Water's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Irish Water does not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Irish Water representative:
Name: Alvaro Garcia
Email: agarcia@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

APPENDIX B

PERMISSIBLE DISCHARGE CALCULATIONS

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 206020, Northing: 241712,

	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.5,	3.4,	3.9,	4.6,	5.1,	5.4,	6.6,	7.8,	8.7,	9.8,	10.8,	11.6,	12.8,	13.7,	14.4,	N/A ,
10 mins	3.5,	4.8,	5.4,	6.4,	7.1,	7.6,	9.2,	10.9,	12.1,	13.7,	15.1,	16.1,	17.8,	19.0,	20.1,	N/A ,
15 mins	4.1,	5.6,	6.4,	7.5,	8.3,	8.9,	10.8,	12.8,	14.2,	16.1,	17.7,	19.0,	20.9,	22.4,	23.6,	N/A ,
30 mins	5.5,	7.3,	8.3,	9.7,	10.6,	11.4,	13.6,	16.2,	17.8,	20.0,	22.0,	23.5,	25.7,	27.5,	28.9,	N/A ,
1 hours	7.2,	9.6,	10.8,	12.5,	13.6,	14.5,	17.3,	20.3,	22.3,	24.9,	27.3,	29.0,	31.7,	33.7,	35.4,	N/A ,
2 hours	9.6,	12.5,	14.0,	16.1,	17.5,	18.6,	21.9,	25.6,	27.9,	31.1,	33.8,	35.9,	39.0,	41.4,	43.4,	N/A ,
3 hours	11.3,	14.6,	16.3,	18.7,	20.2,	21.4,	25.2,	29.2,	31.8,	35.3,	38.3,	40.6,	44.1,	46.7,	48.8,	N/A ,
4 hours	12.7,	16.3,	18.1,	20.7,	22.4,	23.7,	27.8,	32.1,	34.9,	38.7,	41.9,	44.4,	48.0,	50.8,	53.1,	N/A ,
6 hours	14.9,	19.0,	21.1,	24.0,	25.9,	27.4,	31.9,	36.8,	39.8,	44.0,	47.5,	50.2,	54.3,	57.3,	59.8,	N/A ,
9 hours	17.5,	22.2,	24.5,	27.9,	30.0,	31.6,	36.7,	42.0,	45.4,	50.0,	53.9,	56.9,	61.3,	64.6,	67.3,	N/A ,
12 hours	19.7,	24.8,	27.3,	30.9,	33.3,	35.0,	40.5,	46.2,	49.9,	54.8,	58.9,	62.1,	66.8,	70.3,	73.2,	N/A ,
18 hours	23.2,	29.0,	31.8,	35.9,	38.5,	40.4,	46.5,	52.9,	56.9,	62.3,	66.9,	70.3,	75.4,	79.3,	82.4,	N/A ,
24 hours	26.0,	32.3,	35.4,	39.8,	42.6,	44.8,	51.3,	58.2,	62.4,	68.2,	73.1,	76.8,	82.2,	86.3,	89.6,	100.8,
2 days	32.4,	39.3,	42.6,	47.3,	50.2,	52.4,	59.2,	66.1,	70.5,	76.2,	81.0,	84.6,	90.0,	94.0,	97.2,	107.8,
3 days	37.9,	45.3,	48.8,	53.8,	56.9,	59.2,	66.2,	73.4,	77.8,	83.7,	88.6,	92.3,	97.6,	101.6,	104.8,	115.4,
4 days	42.9,	50.8,	54.5,	59.7,	62.9,	65.3,	72.6,	80.1,	84.6,	90.6,	95.7,	99.4,	104.8,	108.9,	112.1,	122.7,
6 days	52.0,	60.7,	64.8,	70.4,	73.9,	76.5,	84.3,	92.2,	97.0,	103.3,	108.5,	112.3,	118.0,	122.1,	125.4,	136.3,
8 days	60.4,	69.8,	74.2,	80.2,	83.9,	86.7,	94.9,	103.2,	108.2,	114.7,	120.2,	124.1,	130.0,	134.2,	137.6,	148.8,
10 days	68.4,	78.4,	83.1,	89.4,	93.3,	96.2,	104.8,	113.5,	118.7,	125.4,	131.0,	135.1,	141.1,	145.5,	149.0,	160.4,
12 days	76.1,	86.6,	91.5,	98.2,	102.3,	105.3,	114.3,	123.2,	128.6,	135.6,	141.3,	145.6,	151.7,	156.2,	159.8,	171.4,
16 days	90.7,	102.2,	107.6,	114.8,	119.2,	122.4,	132.0,	141.5,	147.2,	154.6,	160.7,	165.1,	171.5,	176.2,	179.9,	192.0,
20 days	104.7,	117.1,	122.8,	130.5,	135.2,	138.6,	148.8,	158.8,	164.8,	172.5,	178.8,	183.4,	190.0,	194.9,	198.7,	211.2,
25 days	121.7,	135.1,	141.2,	149.4,	154.4,	158.0,	168.8,	179.3,	185.6,	193.6,	200.2,	205.0,	211.9,	217.0,	221.0,	233.8,

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

PROJECT			JOB REF.
Lissywollen, Athlone - Catchment 1			180176
SUBJECT			**Calc. Sheet No.**
Surface Water Calculations - Soil Characteristics from FSR			4
Drawing ref.	**Calculations by**	**Checked by**	**Date**
180176-INFO1	RTM	SMM	19-Aug-20

Estimation of flood peaks from catchment characteristics

Table 4.4 Classification of soil factors.

Property		Classes
A Drainage group	1	Rarely waterlogged within 60 cm at any time (well and moderately well drained)
	2	Commonly waterlogged within 60 cm during winter (imperfect and poor)
	3	Commonly waterlogged within 60 cm during winter and summer (very poorly drained)
B Depth to 'impermeable' layers	1	>80 cm
	2	80–40 cm
	3	<40 cm
C Permeability group (above 'impermeable' layers or to 80 cm)	1	Rapid
	2	Medium
	3	Slow
D Slope	1	0–2°
	2	2–8°
	3	>8°

Having decided all four parameters, Table 4.5 was used to reach the index of 'winter rain acceptance'.

Table 4.5 The classification of soils by winter rain acceptance rate from soil survey data.

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									

Winter rain acceptance indices: 1, very high; 2, high; 3, moderate; 4, low; 5, very low. Upland peat and peaty soils are in Class 5. Urban areas are unclassified.

1. Soil index (SPR) value calculated from Flood Studies Report - The Classification of Soils from Winter Rainfall Acceptance Rate (Table 4.5).

PROJECT			JOB REF.
Lissywollen, Athlone - Catchment 1 (West)			180176
SUBJECT			Calc. Sheet No.
Surface Water Calculations - Permissible Site Discharge - Sample			1
Drawing ref.	Calculations by	Checked by	Date
180176-INFO1	LMCL	SMM	10/11/2020

PERMISSIBLE SURFACE WATER DISCHARGE CALCULATIONS

Site Area

What is the overall site area? **4.41** Hectares (ha) Site is Less than 50 Hectares

Pre-Development Catchment Soil Characteristics

Are there different soil types present on the pre-developed site? No

Catchment (This refers to the entire site area)	1	
Area	4.41	Hectares (ha)
Drainage Group	2	Class
Depth to Impermeable Layers	2	Class
Permeability Group above Impermeable Layers	2	Class
Slope (°)	1	Class
SOIL Type	3	From FSR Table
[1]SOIL Index	0.40	

SOIL	SOIL Value	SPR
1	0.15	0.10
2	0.30	0.30
3	0.40	0.37
4	0.45	0.47
5	0.50	0.53

Site SOIL Index Value **0.40**

Site SPR Value **0.37**

Post-Development Catchment Characteristics

Is the development divided into sub-catchments?

What is the overall site area for catchment? 4.41 Hectares (ha)

Catchment 1	Area (m^2)	Runoff Coeff.	Effective Area (m^2)
Roofs - Type 1 (Draining to gullies)	3629	1.00	3629.0
Roofs - Type 2 (Draining to SUDS features)	1443	0.50	721.5
Green Roofs	3615	0.50	1807.5
Roads and Footpaths - Type 1 (Draining to gullies)	8534	0.80	6827.2
Roads and Footpaths - Type 2 (Draining to Suds features)	0	0.70	0.0
Paved Areas	10417	0.70	7291.9
Permeable Paving	3517	0.50	1758.5
Filter Drains	467	0.70	326.9
Grassed Areas (drained)	8936	0.37	3306.3
Grassed areas (not drained)	3560	0.00	0.0

Include Public Open Space in Effective Catchment Area? No Assumed open space area does not drain to surface water network

Effective Catchment Area **25668.8** m^2

Effective Catchment Runoff Coefficient **0.63**

Long-Term Storage

Is long-term Storage provided? No

Permissible Site Discharge

What is the Standard Average Annual Rainfall (SAAR)? 920.0 mm From Met Eireann, Co-ordinates 206020, 241712

Is the overall site area less than 50 hectares? Yes

[5]$QBAR_{Rural}$ calculated for 50 ha and linearly interpolated for area of site 20.7 Litres/sec

[7]Site Discharge = **20.7** Litres/sec

Notes and Formulae

1. SOIL index value calculated from Flood Studies Report - The Classification of Soils from Winter Rainfall Acceptance Rate (Table 4.5).
2. SPR value calculated from GDSDS - Table 6.7.
3. Rainfall depth for 100 year return period, 6 hour duration with additional 10% for climate change.
4. Long-term storage Vol_{ss} (m^3) = Rainfall.Area.10.[(PIMP/100)(0.8.α)+(1-PIMP/100)(β.SPR)-SPR]. (GDSDS Section 6.7.3).
   Where long-term storage cannot be provided on-site due to ground conditions, Total Permissible Outflow is to be kept to $QBAR_{(Rural)}$.
5. Total Permissible Outflow - $QBAR_{(Rural)}$ calculated in accordance with GDSDS - Regional Drainage Policies (Volume 2 - Chapter 6), i.e. $QBAR(m3/s)=0.00108x(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$ - For catchments greater than 50 hectares in area. Flow rates are linearly interpolated for areas samller than 50hectares.
6. Where Total Permissible Outflow is less than 2.0l/s and not achievable, use 2.0 l/s or closest value possible.
7. QBAR multiplied by growth factors of 0.85 for 1 year, 2.1 for 30 year and 2.6 for 100 year return period events, from GDSDS Figure C2.

PROJECT			JOB REF.
Lissywollen, Athlone - Catchment 2 (East)			180176
SUBJECT			**Calc. Sheet No.**
Surface Water Calculations - Permissible Site Discharge - Sample			1
Drawing ref.	**Calculations by**	**Checked by**	**Date**
180176-INFO1	LMCL	SMM	18/11/2020

PERMISSIBLE SURFACE WATER DISCHARGE CALCULATIONS

Site Area

What is the overall site area? **12.13** Hectares (ha) Site is Less than 50 Hectares

Pre-Development Catchment Soil Characteristics

Are there different soil types present on the pre-developed site? No

Catchment	This refers to the entire site area	1	
Area		12.13	Hectares (ha)
Drainage Group		2	Class
Depth to Impermeable Layers		2	Class
Permeability Group above Impermeable Layers		2	Class
Slope (°)		1	Class
SOIL Type		3	From FSR Table
[1]SOIL Index		0.40	

SOIL	SOIL Value	SPR
1	0.15	0.10
2	0.30	0.30
3	0.40	0.37
4	0.45	0.47
5	0.50	0.53

Site SOIL Index Value **0.40**

Site SPR Value **0.37**

Post-Development Catchment Characteristics

Is the development divided into sub-catchments?

What is the overall site area for catchment? 12.13 Hectares (ha)

Catchment 1	Area (m^2)	Runoff Coeff.	Effective Area (m^2)
Roofs - Type 1 (Draining to gullies)	9177	1.00	9177.0
Roofs - Type 2 (Draining to SUDS features)	13353	0.50	6676.5
Green Roofs	1810	0.50	905.0
Roads and Footpaths - Type 1 (Draining to gullies)	17568	0.80	14054.4
Roads and Footpaths - Type 2 (Draining to Suds features)	0	0.70	0.0
Paved Areas	18389	0.60	11033.4
Permeable Paving	7356	0.50	3678.0
Filter Drains	6895	0.70	4826.5
Grassed Areas (drained)	11607	0.37	4294.6
Grassed areas (not drained)	35171	0.00	0.0

Include Public Open Space in Effective Catchment Area? No Assumed open space area does not drain to surface water network

Effective Catchment Area **54645.4** m^2

Effective Catchment Runoff Coefficient **0.63**

Long-Term Storage

Is long-term Storage provided? No

Permissible Site Discharge

What is the Standard Average Annual Rainfall (SAAR)? 920.0 mm From Met Eireann, Co-ordinates 206020, 241712

Is the overall site area less than 50 hectares? Yes

[5]$QBAR_{Rural}$ calculated for 50 ha and linearly interpolated for area of site 56.8 Litres/sec

[7]Site Discharge = **56.8** Litres/sec

Notes and Formulae

1. SOIL index value calculated from Flood Studies Report - The Classification of Soils from Winter Rainfall Acceptance Rate (Table 4.5).
2. SPR value calculated from GDSDS - Table 6.7.
3. Rainfall depth for 100 year return period, 6 hour duration with additional 10% for climate change.
4. Long-term storage Vol_{ss} (m^3) = Rainfall.Area.10.[(PIMP/100)(0.8.α)+(1-PIMP/100)(β.SPR)-SPR]. (GDSDS Section 6.7.3).
   Where long-term storage cannot be provided on-site due to ground conditions, Total Permissible Outflow is to be kept to $QBAR_{(Rural)}$.
5. Total Permissible Outflow - $QBAR_{(Rural)}$ calculated in accordance with GDSDS - Regional Drainage Policies
   (Volume 2 - Chapter 6), i.e. $QBAR(m3/s)=0.00108x(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$ - For catchments greater than 50 hectares in area. Flow rates are linearly interpolated for areas samller than 50hectares.
6. Where Total Permissible Outflow is less than 2.0l/s and not achievable, use 2.0 l/s or closest value possible.
7. QBAR multiplied by growth factors of 0.85 for 1 year, 2.1 for 30 year and 2.6 for 100 year return period events, from GDSDS Figure C2.

APPENDIX C

SURFACE WATER NETWORK &

ATTENUATION CALCULATIONS

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Water East

Pipe Sizes DBFL SW Manhole Sizes Test MH

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	PIMP (%)	63
M5-60 (mm)	14.500	Add Flow / Climate Change (%)	0
Ratio R	0.280	Minimum Backdrop Height (m)	0.500
Maximum Rainfall (mm/hr)	150	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.900
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	0.75
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	650

Designed with Level Soffits

Network Design Table for Surface Water East

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
SE1.000	25.775	0.129	199.8	0.040	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE1.001	25.907	0.130	199.3	0.023	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE1.002	76.080	0.380	200.2	0.067	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE1.003	25.132	0.126	199.5	0.019	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE1.004	61.611	0.308	200.0	0.050	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE1.005	33.065	0.165	200.4	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE1.006	29.889	0.149	200.6	0.020	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE1.007	50.013	0.250	200.1	0.026	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE1.008	29.438	0.147	200.3	0.007	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE1.009	16.708	0.084	198.9	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE2.000	54.678	0.273	200.3	0.098	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE1.010	45.459	0.152	299.1	0.050	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE1.011	25.990	0.130	199.9	0.147	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)
SE1.000	45.83	4.47	44.100	0.040	0.0	0.0	0.0	0.92	36.6	6.6
SE1.001	44.21	4.93	43.971	0.063	0.0	0.0	0.0	0.92	36.7	10.1
SE1.002	40.18	6.31	43.841	0.130	0.0	0.0	0.0	0.92	36.6	18.8
SE1.003	39.04	6.77	43.461	0.149	0.0	0.0	0.0	0.92	36.7	21.0
SE1.004	36.56	7.88	43.335	0.199	0.0	0.0	0.0	0.92	36.6	26.3
SE1.005	35.38	8.48	43.027	0.223	0.0	0.0	0.0	0.92	36.6	28.5
SE1.006	34.39	9.02	42.862	0.243	0.0	0.0	0.0	0.92	36.6	30.1
SE1.007	32.88	9.93	42.713	0.268	0.0	0.0	0.0	0.92	36.6	31.9
SE1.008	32.07	10.46	42.463	0.275	0.0	0.0	0.0	0.92	36.6	31.9
SE1.009	31.75	10.68	42.166	0.275	0.0	0.0	0.0	1.28	141.5	31.9
SE2.000	44.03	4.99	42.505	0.098	0.0	0.0	0.0	0.92	36.6	15.5
SE1.010	30.74	11.40	42.082	0.423	0.0	0.0	0.0	1.04	115.1	47.0
SE1.011	30.30	11.74	41.930	0.570	0.0	0.0	0.0	1.28	141.1	62.4

Network Design Table for Surface Water East

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
SE3.000	18.488	0.092	201.0	0.031	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE3.001	36.523	0.183	199.6	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE3.002	34.993	0.175	200.0	0.092	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE3.003	7.427	0.037	200.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE1.012	59.625	0.558	106.9	0.138	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE4.000	24.771	0.124	199.8	0.070	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE4.001	40.660	0.203	200.3	0.123	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE4.002	40.660	0.203	200.3	0.091	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE1.013	61.673	0.284	217.2	0.108	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE5.000	24.771	0.291	85.1	0.069	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE5.001	81.320	1.024	79.4	0.158	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE1.014	4.022	0.020	201.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
SE1.015	14.319	0.072	198.9	0.088	0.00	0.0	0.600	o	450	Pipe/Conduit	
SE6.000	31.756	0.159	199.7	0.099	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE6.001	27.753	0.139	199.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE6.002	64.317	0.322	199.7	0.149	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE7.000	9.822	0.049	200.4	0.127	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE8.000	18.556	0.168	110.5	0.127	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)
SE3.000	46.31	4.34	42.064	0.031	0.0	0.0	0.0	0.92	36.5	5.2
SE3.001	44.01	5.00	41.972	0.055	0.0	0.0	0.0	0.92	36.7	8.7
SE3.002	42.37	5.52	41.714	0.147	0.0	0.0	0.0	1.11	78.3	22.5
SE3.003	42.04	5.63	41.539	0.147	0.0	0.0	0.0	1.11	78.2	22.5
SE1.012	29.59	12.31	41.427	0.855	0.0	0.0	0.0	1.75	193.5	91.4
SE4.000	45.89	4.45	41.549	0.070	0.0	0.0	0.0	0.92	36.6	11.6
SE4.001	43.41	5.18	41.425	0.193	0.0	0.0	0.0	0.92	36.6	30.3
SE4.002	41.58	5.80	41.147	0.284	0.0	0.0	0.0	1.11	78.3	42.7
SE1.013	28.62	13.15	40.869	1.247	0.0	0.0	0.0	1.23	135.4	128.9
SE5.000	46.47	4.29	42.050	0.069	0.0	0.0	0.0	1.42	56.4	11.6
SE5.001	43.31	5.21	41.759	0.227	0.0	0.0	0.0	1.47	58.4	35.6
SE1.014	28.57	13.20	40.510	1.475	0.0	0.0	0.0	1.43	227.4	152.1
SE1.015	28.38	13.36	40.490	1.563	0.0	0.0	0.0	1.44	228.7	160.2
SE6.000	45.44	4.57	41.832	0.099	0.0	0.0	0.0	0.92	36.6	16.2
SE6.001	43.75	5.08	41.673	0.099	0.0	0.0	0.0	0.92	36.6	16.2
SE6.002	40.37	6.24	41.534	0.248	0.0	0.0	0.0	0.92	36.6	36.1
SE7.000	46.90	4.18	41.616	0.127	0.0	0.0	0.0	0.92	36.6	21.6
SE8.000	46.63	4.25	41.735	0.127	0.0	0.0	0.0	1.24	49.4	21.4

Network Design Table for Surface Water East

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
SE7.001	36.890	0.184	200.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE7.002	4.189	0.171	24.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE6.003	4.754	0.024	198.1	0.147	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE9.000	14.464	0.402	36.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE9.001	12.116	0.330	36.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE6.004	58.457	0.292	200.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE10.000	27.651	0.357	77.5	0.075	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE10.001	85.342	1.015	84.1	0.166	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE6.005	45.331	0.253	179.2	0.064	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE1.016	38.223	0.247	154.7	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
SE1.017	13.617	0.247	55.1	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
SE11.000	26.456	0.132	200.4	0.071	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE11.001	30.280	0.151	200.5	0.064	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE11.002	11.629	0.133	87.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE12.000	103.479	0.862	120.0	0.286	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE11.003	5.613	0.022	255.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
SE7.001	44.65	4.80	41.492	0.255	0.0	0.0	0.0	1.11	78.2	41.0
SE7.002	44.57	4.83	41.308	0.255	0.0	0.0	0.0	3.19	225.5	41.0
SE6.003	40.21	6.30	41.062	0.650	0.0	0.0	0.0	1.28	141.8	94.3
SE9.000	47.16	4.11	41.920	0.000	0.0	0.0	0.0	2.19	87.0	0.0
SE9.001	46.80	4.20	41.518	0.000	0.0	0.0	0.0	2.17	86.2	0.0
SE6.004	38.34	7.06	41.038	0.650	0.0	0.0	0.0	1.28	141.0	94.3
SE10.000	46.40	4.31	43.050	0.075	0.0	0.0	0.0	1.49	59.1	12.6
SE10.001	43.02	5.31	42.693	0.241	0.0	0.0	0.0	1.43	56.7	37.4
SE6.005	37.10	7.62	40.746	0.954	0.0	0.0	0.0	1.35	149.2	127.8
SE1.016	28.00	13.72	40.418	2.517	0.0	0.0	0.0	1.80	389.3	254.5
SE1.017	27.93	13.79	40.171	2.517	0.0	0.0	0.0	3.02	654.1	254.5
SE11.000	45.78	4.48	41.354	0.071	0.0	0.0	0.0	0.92	36.6	11.7
SE11.001	43.91	5.03	41.222	0.135	0.0	0.0	0.0	0.92	36.6	21.4
SE11.002	43.46	5.17	41.071	0.135	0.0	0.0	0.0	1.40	55.6	21.4
SE12.000	42.60	5.45	41.800	0.286	0.0	0.0	0.0	1.19	47.4	44.0
SE11.003	42.31	5.54	40.863	0.421	0.0	0.0	0.0	0.98	69.2	64.3

Network Design Table for Surface Water East

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
SE11.004	56.853	0.227	250.5	0.081	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE13.000	49.323	1.393	35.4	0.167	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE13.001	49.323	1.033	47.7	0.083	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE11.005	32.754	0.131	250.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE11.006	23.670	0.125	189.4	0.116	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE11.007	26.593	0.096	277.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE11.008	49.945	0.118	423.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
SE11.009	24.366	0.145	168.0	0.165	0.00	0.0	0.600	o	450	Pipe/Conduit	
SE14.000	68.601	0.365	187.9	0.126	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE14.001	16.450	0.082	200.6	0.109	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE14.002	10.722	0.054	198.6	0.064	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE14.003	45.569	0.228	199.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE14.004	6.364	0.411	15.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE15.000	24.647	0.151	163.2	0.060	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE16.000	67.686	0.445	152.1	0.113	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE15.001	41.365	0.207	199.8	0.162	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE15.002	12.419	0.062	200.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE14.005	30.283	0.123	246.2	0.058	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)
SE11.004	40.02	6.37	40.766	0.502	0.0	0.0	0.0	1.14	125.9	72.6
SE13.000	46.17	4.37	43.115	0.167	0.0	0.0	0.0	2.21	87.7	27.8
SE13.001	44.64	4.81	41.722	0.249	0.0	0.0	0.0	1.90	75.5	40.2
SE11.005	38.84	6.85	40.539	0.752	0.0	0.0	0.0	1.14	126.1	105.4
SE11.006	38.14	7.15	40.408	0.868	0.0	0.0	0.0	1.31	145.0	119.5
SE11.007	37.23	7.56	40.283	0.868	0.0	0.0	0.0	1.08	119.7	119.5
SE11.008	35.51	8.41	40.112	0.868	0.0	0.0	0.0	0.98	156.2	119.5
SE11.009	35.03	8.67	40.069	1.033	0.0	0.0	0.0	1.57	249.0	130.6
SE14.000	43.35	5.20	41.958	0.126	0.0	0.0	0.0	0.95	37.8	19.7
SE14.001	42.43	5.50	41.593	0.235	0.0	0.0	0.0	0.92	36.6	36.0
SE14.002	41.96	5.66	41.316	0.299	0.0	0.0	0.0	1.11	78.6	45.2
SE14.003	40.09	6.35	41.262	0.299	0.0	0.0	0.0	1.11	78.4	45.2
SE14.004	40.02	6.37	41.034	0.299	0.0	0.0	0.0	4.02	283.8	45.2
SE15.000	46.06	4.40	41.118	0.060	0.0	0.0	0.0	1.02	40.6	10.0
SE16.000	43.78	5.07	41.412	0.113	0.0	0.0	0.0	1.06	42.1	17.8
SE15.001	41.89	5.69	40.892	0.335	0.0	0.0	0.0	1.11	78.4	50.6
SE15.002	41.36	5.88	40.685	0.335	0.0	0.0	0.0	1.11	78.3	50.6
SE14.005	38.93	6.81	40.548	0.691	0.0	0.0	0.0	1.15	127.0	97.2

Network Design Table for Surface Water East

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
SE17.000	62.581	0.313	199.9	0.147	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE17.001	6.633	0.033	201.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE17.002	56.738	0.542	104.7	0.150	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE18.000	29.232	0.145	201.6	0.026	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE18.001	85.298	0.426	200.2	0.238	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE17.003	34.556	0.473	73.1	0.068	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE19.000	44.187	0.221	199.9	0.130	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE17.004	38.894	0.194	200.5	0.084	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE20.000	32.911	0.165	199.5	0.046	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE20.001	99.098	0.599	165.4	0.204	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE17.005	40.021	0.200	200.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
SE21.000	45.820	0.229	200.1	0.082	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE17.006	13.672	0.069	198.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
SE22.000	102.288	0.511	200.2	0.173	4.00	0.0	0.600	o	225	Pipe/Conduit	
SE17.007	51.594	0.840	61.4	0.076	0.00	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)
SE17.000	43.57	5.13	43.239	0.147	0.0	0.0	0.0	0.92	36.6	23.1
SE17.001	43.19	5.25	42.926	0.147	0.0	0.0	0.0	0.92	36.5	23.1
SE17.002	41.03	5.99	42.893	0.297	0.0	0.0	0.0	1.28	50.8	44.0
SE18.000	45.60	4.53	43.327	0.026	0.0	0.0	0.0	0.92	36.5	4.4
SE18.001	41.53	5.81	43.107	0.265	0.0	0.0	0.0	1.11	78.3	39.7
SE17.003	40.20	6.31	42.276	0.629	0.0	0.0	0.0	1.84	130.2	91.4
SE19.000	44.66	4.80	42.099	0.130	0.0	0.0	0.0	0.92	36.6	20.9
SE17.004	38.93	6.81	41.728	0.843	0.0	0.0	0.0	1.28	140.9	118.5
SE20.000	45.37	4.59	42.448	0.046	0.0	0.0	0.0	0.92	36.7	7.5
SE20.001	40.41	6.22	42.283	0.250	0.0	0.0	0.0	1.01	40.3	36.5
SE17.005	37.85	7.28	41.459	1.093	0.0	0.0	0.0	1.43	228.0	149.4
SE21.000	44.56	4.83	41.713	0.082	0.0	0.0	0.0	0.92	36.6	13.2
SE17.006	37.50	7.44	41.259	1.175	0.0	0.0	0.0	1.44	229.1	159.1
SE22.000	41.42	5.85	42.483	0.173	0.0	0.0	0.0	0.92	36.6	25.9
SE17.007	36.79	7.77	41.190	1.424	0.0	0.0	0.0	2.60	413.2	189.2

Network Design Table for Surface Water East

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
SE14.006	24.229	0.081	299.1	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
SE14.007	26.925	0.090	299.2	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
SE1.018	26.969	0.088	306.5	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
SE1.019	9.957	0.038	262.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE23.000	15.245	0.023	662.8	0.000	4.00	0.0	0.600	o	1350	Pipe/Conduit	
SE23.001	157.935	0.240	658.1	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
SE1.020	89.337	0.137	652.1	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
SE1.021	37.954	0.058	654.4	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
SE1.022	17.439	0.027	645.9	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
SE1.023	15.263	0.023	663.6	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
SE1.024	93.553	0.144	649.7	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
SE1.025	15.675	0.024	653.1	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
SE1.026	30.431	0.047	647.5	0.000	0.00	0.0	0.600	o	1350	Pipe/Conduit	
SE1.027	23.527	0.036	653.5	0.000	0.00	0.0	0.600	o	1350	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)
SE14.006	36.20	8.06	40.200	2.115	0.0	0.0	0.0	1.40	396.6	276.5
SE14.007	35.58	8.38	40.119	2.115	0.0	0.0	0.0	1.40	396.6	276.5
SE1.018	27.67	14.04	39.024	5.664	0.0	0.0	0.0	1.78	1135.3	565.9
SE1.019	47.01	4.15	38.936	0.000	56.8	0.0	0.0	1.11	123.1	56.8
SE23.000	46.96	4.16	38.750	0.000	0.0	0.0	0.0	1.55	2225.0	0.0
SE23.001	41.42	5.85	38.727	0.000	0.0	0.0	0.0	1.56	2233.1	0.0
SE1.020	38.96	6.80	38.487	0.000	56.8	0.0	0.0	1.57	2243.4	56.8
SE1.021	38.01	7.21	38.350	0.000	56.8	0.0	0.0	1.56	2239.4	56.8
SE1.022	37.60	7.39	38.291	0.000	56.8	0.0	0.0	1.57	2254.2	56.8
SE1.023	37.25	7.55	38.264	0.000	56.8	0.0	0.0	1.55	2223.7	56.8
SE1.024	35.25	8.55	38.241	0.000	56.8	0.0	0.0	1.57	2247.6	56.8
SE1.025	34.94	8.71	38.097	0.000	56.8	0.0	0.0	1.57	2241.6	56.8
SE1.026	34.36	9.04	38.073	0.000	56.8	0.0	0.0	1.57	2251.4	56.8
SE1.027	33.93	9.29	38.026	0.000	56.8	0.0	0.0	1.57	2240.9	56.8

Manhole Schedules for Surface Water East

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)
SE19	45.525	1.425	Open Manhole	1200	SE1.000	44.100	225				
SE18	45.096	1.125	Open Manhole	1200	SE1.001	43.971	225	SE1.000	43.971	225	
SE17	44.966	1.125	Open Manhole	1200	SE1.002	43.841	225	SE1.001	43.841	225	
SE16	44.586	1.125	Open Manhole	1200	SE1.003	43.461	225	SE1.002	43.461	225	
SE15	44.460	1.125	Open Manhole	1200	SE1.004	43.335	225	SE1.003	43.335	225	
SE14	44.152	1.125	Open Manhole	1200	SE1.005	43.027	225	SE1.004	43.027	225	
SE13	43.987	1.125	Open Manhole	1200	SE1.006	42.862	225	SE1.005	42.862	225	
SE12	43.838	1.125	Open Manhole	1200	SE1.007	42.713	225	SE1.006	42.713	225	
SE11	43.588	1.125	Open Manhole	1200	SE1.008	42.463	225	SE1.007	42.463	225	
SE10	43.420	1.254	Open Manhole	1500	SE1.009	42.166	375	SE1.008	42.316	225	
SE9.1	43.503	0.998	Open Manhole	1200	SE2.000	42.505	225				
SE9	43.255	1.173	Open Manhole	1500	SE1.010	42.082	375	SE1.009	42.082	375	
								SE2.000	42.232	225	
SE8	42.984	1.054	Open Manhole	1500	SE1.011	41.930	375	SE1.010	41.930	375	
SE7.4	43.829	1.765	Open Manhole	1200	SE3.000	42.064	225				
SE7.3	43.701	1.729	Open Manhole	1200	SE3.001	41.972	225	SE3.000	41.972	225	
SE7.2	43.372	1.658	Open Manhole	1500	SE3.002	41.714	300	SE3.001	41.789	225	
SE7.1	43.128	1.589	Open Manhole	1500	SE3.003	41.539	300	SE3.002	41.539	300	
SE7	43.111	1.684	Open Manhole	1500	SE1.012	41.427	375	SE1.011	41.800	375	373
								SE3.003	41.502	300	
SE6.3	44.742	3.193	Open Manhole	1200	SE4.000	41.549	225				
SE6.2	44.575	3.150	Open Manhole	1200	SE4.001	41.425	225	SE4.000	41.425	225	
SE6.1	43.558	2.411	Open Manhole	1200	SE4.002	41.147	300	SE4.001	41.222	225	
SE6	43.626	2.757	Open Manhole	1500	SE1.013	40.869	375	SE1.012	40.869	375	
								SE4.002	40.944	300	
SE5.2	45.157	3.107	Open Manhole	1200	SE5.000	42.050	225				
SE5.1	44.990	3.231	Open Manhole	1200	SE5.001	41.759	225	SE5.000	41.759	225	
SE5	44.024	3.514	Open Manhole	1500	SE1.014	40.510	450	SE1.013	40.585	375	
								SE5.001	40.735	225	
SE4	43.977	3.487	Open Manhole	1500	SE1.015	40.490	450	SE1.014	40.490	450	
SE3.6	44.879	3.047	Open Manhole	1200	SE6.000	41.832	225				
SE3.5	44.634	2.961	Open Manhole	1200	SE6.001	41.673	225	SE6.000	41.673	225	
SE3.4	44.526	2.992	Open Manhole	1200	SE6.002	41.534	225	SE6.001	41.534	225	
SE3.3.3	43.291	1.675	Open Manhole	1200	SE7.000	41.616	225				
SE3.3.2.1	43.082	1.347	Open Manhole	1200	SE8.000	41.735	225				
SE3.3.2	43.368	1.876	Open Manhole	1200	SE7.001	41.492	300	SE7.000	41.567	225	
								SE8.000	41.567	225	
SE3.3.1	43.806	2.498	Open Manhole	1200	SE7.002	41.308	300	SE7.001	41.308	300	
SE3.3	43.717	2.655	Open Manhole	1500	SE6.003	41.062	375	SE6.002	41.212	225	
								SE7.002	41.137	300	
SE3.2.2	43.340	1.420	Open Manhole	1200	SE9.000	41.920	225				
SE3.2.1	43.563	2.045	Open Manhole	1200	SE9.001	41.518	225	SE9.000	41.518	225	
SE3.2	43.594	2.556	Open Manhole	1500	SE6.004	41.038	375	SE6.003	41.038	375	
								SE9.001	41.188	225	

Manhole Schedules for Surface Water East

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)
SE3.1.2	45.097	2.047	Open Manhole	1200	SE10.000	43.050	225				
SE3.1.1	45.254	2.561	Open Manhole	1200	SE10.001	42.693	225	SE10.000	42.693	225	
SE3.1	43.098	2.352	Open Manhole	1500	SE6.005	40.746	375	SE6.004	40.746	375	
								SE10.001	41.678	225	782
SE3	43.809	3.391	Open Manhole	1800	SE1.016	40.418	525	SE1.015	40.418	450	
								SE6.005	40.493	375	
SE2	43.556	3.385	Open Manhole	1800	SE1.017	40.171	525	SE1.016	40.171	525	
SE110	42.723	1.369	Open Manhole	1200	SE11.000	41.354	225				
SE109	42.713	1.491	Open Manhole	1200	SE11.001	41.222	225	SE11.000	41.222	225	
SE108	42.572	1.501	Open Manhole	1200	SE11.002	41.071	225	SE11.001	41.071	225	
SE107.1	44.004	2.204	Open Manhole	1200	SE12.000	41.800	225				
SE107	42.477	1.614	Open Manhole	1500	SE11.003	40.863	300	SE11.002	40.938	225	
								SE12.000	40.938	225	
SE106	42.446	1.680	Open Manhole	1200	SE11.004	40.766	375	SE11.003	40.841	300	
SE105.2	44.286	1.171	Open Manhole	1200	SE13.000	43.115	225				
SE105.1	43.397	1.675	Open Manhole	1200	SE13.001	41.722	225	SE13.000	41.722	225	
SE105	42.709	2.170	Open Manhole	1500	SE11.005	40.539	375	SE11.004	40.539	375	
								SE13.001	40.689	225	
SE104	42.875	2.467	Open Manhole	1500	SE11.006	40.408	375	SE11.005	40.408	375	
SE103	42.961	2.678	Open Manhole	1500	SE11.007	40.283	375	SE11.006	40.283	375	
SE102	42.855	2.743	Open Manhole	1500	SE11.008	40.112	450	SE11.007	40.187	375	
SE101	43.499	3.505	Open Manhole	1500	SE11.009	40.069	450	SE11.008	39.994	450	
SE208	44.234	2.276	Open Manhole	1200	SE14.000	41.958	225				
SE207	43.158	1.565	Open Manhole	1200	SE14.001	41.593	225	SE14.000	41.593	225	
SE206	42.916	1.600	Open Manhole	1200	SE14.002	41.316	300	SE14.001	41.511	225	120
SE205	42.996	1.734	Open Manhole	1200	SE14.003	41.262	300	SE14.002	41.262	300	
SE204	43.252	2.218	Open Manhole	1200	SE14.004	41.034	300	SE14.003	41.034	300	
SE203.3	43.748	2.630	Open Manhole	1200	SE15.000	41.118	225				
SE203.2.1	43.921	2.509	Open Manhole	1200	SE16.000	41.412	225				
SE203.2	43.571	2.679	Open Manhole	1200	SE15.001	40.892	300	SE15.000	40.967	225	
								SE16.000	40.967	225	
SE203.1	43.308	2.623	Open Manhole	1200	SE15.002	40.685	300	SE15.001	40.685	300	
SE203	43.301	2.753	Open Manhole	1500	SE14.005	40.548	375	SE14.004	40.623	300	
								SE15.002	40.623	300	
SE202.8	45.450	2.211	Open Manhole	1200	SE17.000	43.239	225				
SE202.7	44.452	1.526	Open Manhole	1200	SE17.001	42.926	225	SE17.000	42.926	225	
SE202.6	44.354	1.461	Open Manhole	1200	SE17.002	42.893	225	SE17.001	42.893	225	
SE202.5.2	45.321	1.994	Open Manhole	1200	SE18.000	43.327	225				
SE202.5.1	45.268	2.161	Open Manhole	1200	SE18.001	43.107	300	SE18.000	43.182	225	
SE202.5	43.630	1.354	Open Manhole	1200	SE17.003	42.276	300	SE17.002	42.351	225	
								SE18.001	42.681	300	405
SE202.4.1	42.867	0.768	Open Manhole	1200	SE19.000	42.099	225				
SE202.4	43.693	1.965	Open Manhole	1500	SE17.004	41.728	375	SE17.003	41.803	300	
								SE19.000	41.878	225	

Manhole Schedules for Surface Water East

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)
SE202.3.2	44.966	2.518	Open Manhole	1200	SE20.000	42.448	225				
SE202.3.1	44.657	2.374	Open Manhole	1200	SE20.001	42.283	225	SE20.000	42.283	225	
SE202.3	43.498	2.039	Open Manhole	1500	SE17.005	41.459	450	SE17.004	41.534	375	
								SE20.001	41.684	225	
SE202.2.1	43.585	1.872	Open Manhole	1200	SE21.000	41.713	225				
SE202.2	43.647	2.388	Open Manhole	1500	SE17.006	41.259	450	SE17.005	41.259	450	
								SE21.000	41.484	225	
SE202.1.1	44.390	1.907	Open Manhole	1200	SE22.000	42.483	225				
SE202.1	43.687	2.497	Open Manhole	1800	SE17.007	41.190	450	SE17.006	41.190	450	
								SE22.000	41.972	225	557
SE202	43.478	3.278	Open Manhole	1800	SE14.006	40.200	600	SE14.005	40.425	375	
								SE17.007	40.350	450	
SE201	43.740	3.621	Open Manhole	1800	SE14.007	40.119	600	SE14.006	40.119	600	
SE1	43.535	4.511	Open Manhole	1800	SE1.018	39.024	900	SE1.017	39.924	525	525
								SE11.009	39.924	450	450
								SE14.007	40.029	600	705
SE0	43.340	4.404	Open Manhole	1800	SE1.019	38.936	375	SE1.018	38.936	900	
SED11	43.024	4.274	Open Manhole	2100	SE23.000	38.750	1350				
SED10	43.102	4.375	Open Manhole	2100	SE23.001	38.727	1350	SE23.000	38.727	1350	
SED9	43.458	4.971	Open Manhole	2100	SE1.020	38.487	1350	SE1.019	38.898	375	
								SE23.001	38.487	1350	
SED8	43.627	5.277	Open Manhole	2100	SE1.021	38.350	1350	SE1.020	38.350	1350	
SED7	43.176	4.885	Open Manhole	2100	SE1.022	38.291	1350	SE1.021	38.292	1350	1
SED6	42.898	4.634	Open Manhole	2100	SE1.023	38.264	1350	SE1.022	38.264	1350	
SED5	42.837	4.596	Open Manhole	2100	SE1.024	38.241	1350	SE1.023	38.241	1350	
SED4	42.403	4.306	Open Manhole	2100	SE1.025	38.097	1350	SE1.024	38.097	1350	
SED3	42.528	4.455	Open Manhole	2100	SE1.026	38.073	1350	SE1.025	38.073	1350	
SED2	42.709	4.683	Open Manhole	2100	SE1.027	38.026	1350	SE1.026	38.026	1350	
SED1	42.731	4.741	Open Manhole	2100		OUTFALL		SE1.027	37.990	1350	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SE19	606449.210	741535.720	606449.210	741535.720	Required	
SE18	606428.460	741551.010	606428.460	741551.010	Required	
SE17	606416.870	741574.180	606416.870	741574.180	Required	
SE16	606405.800	741649.450	606405.800	741649.450	Required	

Manhole Schedules for Surface Water East

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SE15	606394.190	741671.740	606394.190	741671.740	Required	
SE14	606344.570	741708.260	606344.570	741708.260	Required	
SE13	606324.180	741734.290	606324.180	741734.290	Required	
SE12	606295.510	741742.740	606295.510	741742.740	Required	
SE11	606245.502	741743.448	606245.502	741743.448	Required	
SE10	606216.442	741738.742	606216.442	741738.742	Required	
SE9.1	606183.864	741786.291	606183.864	741786.291	Required	
SE9	606200.373	741734.165	606200.373	741734.165	Required	
SE8	606157.067	741720.341	606157.067	741720.341	Required	
SE7.4	606138.089	741802.671	606138.089	741802.671	Required	
SE7.3	606155.806	741797.390	606155.806	741797.390	Required	
SE7.2	606145.871	741762.244	606145.871	741762.244	Required	
SE7.1	606136.353	741728.570	606136.353	741728.570	Required	
SE7	606131.233	741723.189	606131.233	741723.189	Required	
SE6.3	606072.140	741824.399	606072.140	741824.399	Required	
SE6.2	606095.976	741817.662	606095.976	741817.662	Required	
SE6.1	606084.917	741778.535	606084.917	741778.535	Required	
SE6	606073.857	741739.408	606073.857	741739.408	Required	
SE5.2	606012.792	741841.175	606012.792	741841.175	Required	

Manhole Schedules for Surface Water East

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SE5.1	606036.629	741834.437	606036.629	741834.437	Required	
SE5	606014.510	741756.183	606014.510	741756.183	Required	
SE4	606013.416	741752.313	606013.416	741752.313	Required	
SE3.6	605855.807	741858.891	605855.807	741858.891	Required	
SE3.5	605887.535	741857.559	605887.535	741857.559	Required	
SE3.4	605914.242	741850.010	605914.242	741850.010	Required	
SE3.3.3	605846.611	741792.304	605846.611	741792.304	Required	
SE3.3.2.1	605851.378	741774.064	605851.378	741774.064	Required	
SE3.3.2	605856.425	741791.920	605856.425	741791.920	Required	
SE3.3.1	605893.286	741790.480	605893.286	741790.480	Required	
SE3.3	605896.746	741788.118	605896.746	741788.118	Required	
SE3.2.2	605888.371	741761.040	605888.371	741761.040	Required	
SE3.2.1	605892.185	741774.993	605892.185	741774.993	Required	
SE3.2	605899.764	741784.445	605899.764	741784.445	Required	
SE3.1.2	605952.620	741858.183	605952.620	741858.183	Required	
SE3.1.1	605979.228	741850.662	605979.228	741850.662	Required	
SE3.1	605956.015	741768.538	605956.015	741768.538	Required	
SE3	605999.637	741756.208	605999.637	741756.208	Required	
SE2	605986.742	741720.226	605986.742	741720.226	Required	

Manhole Schedules for Surface Water East

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SE110	605724.931	741796.544	605724.931	741796.544	Required	
SE109	605749.672	741787.176	605749.672	741787.176	Required	
SE108	605768.594	741763.535	605768.594	741763.535	Required	
SE107.1	605749.067	741656.259	605749.067	741656.259	Required	
SE107	605777.290	741755.815	605777.290	741755.815	Required	
SE106	605782.213	741753.117	605782.213	741753.117	Required	
SE105.2	605809.948	741642.233	605809.948	741642.233	Required	
SE105.1	605823.364	741689.697	605823.364	741689.697	Required	
SE105	605836.780	741737.161	605836.780	741737.161	Required	
SE104	605868.300	741728.252	605868.300	741728.252	Required	
SE103	605891.394	741733.439	605891.394	741733.439	Required	
SE102	605904.196	741710.130	605904.196	741710.130	Required	
SE101	605950.031	741729.972	605950.031	741729.972	Required	
SE208	605877.082	741625.454	605877.082	741625.454	Required	
SE207	605895.667	741691.489	605895.667	741691.489	Required	
SE206	605910.025	741699.519	605910.025	741699.519	Required	
SE205	605916.451	741690.937	605916.451	741690.937	Required	
SE204	605960.302	741678.542	605960.302	741678.542	Required	
SE203.3	605954.192	741603.816	605954.192	741603.816	Required	

Manhole Schedules for Surface Water East

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SE203.2.1	605895.479	741645.983	605895.479	741645.983	Required	
SE203.2	605960.623	741627.609	605960.623	741627.609	Required	
SE203.1	605971.880	741667.413	605971.880	741667.413	Required	
SE203	605966.664	741678.683	605966.664	741678.683	Required	
SE202.8	606228.239	741561.851	606228.239	741561.851	Required	
SE202.7	606223.867	741624.279	606223.867	741624.279	Required	
SE202.6	606219.687	741629.429	606219.687	741629.429	Required	
SE202.5.2	606170.096	741555.332	606170.096	741555.332	Required	
SE202.5.1	606141.832	741562.795	606141.832	741562.795	Required	
SE202.5	606165.088	741644.861	606165.088	741644.861	Required	
SE202.4.1	606142.818	741697.061	606142.818	741697.061	Required	
SE202.4	606131.835	741654.260	606131.835	741654.260	Required	
SE202.3.2	606099.365	741561.434	606099.365	741561.434	Required	
SE202.3.1	606067.452	741569.476	606067.452	741569.476	Required	
SE202.3	606094.407	741664.838	606094.407	741664.838	Required	
SE202.2.1	606068.358	741719.816	606068.358	741719.816	Required	
SE202.2	606055.894	741675.723	606055.894	741675.723	Required	
SE202.1.1	606014.917	741581.010	606014.917	741581.010	Required	
SE202.1	606042.738	741679.442	606042.738	741679.442	Required	

Manhole Schedules for Surface Water East

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SE202	605993.089	741693.474	605993.089	741693.474	Required	
SE201	605999.604	741716.811	605999.604	741716.811	Required	
SE1	605973.581	741723.720	605973.581	741723.720	Required	
SE0	605980.345	741749.827	605980.345	741749.827	Required	
SED11	606150.107	741718.851	606150.107	741718.851	Required	
SED10	606135.046	741716.485	606135.046	741716.485	Required	
SED9	605983.056	741759.408	605983.056	741759.408	Required	
SED8	605897.098	741783.744	605897.098	741783.744	Required	
SED7	605885.998	741747.449	605885.998	741747.449	Required	
SED6	605885.481	741730.018	605885.481	741730.018	Required	
SED5	605870.670	741726.335	605870.670	741726.335	Required	
SED4	605780.643	741751.780	605780.643	741751.780	Required	
SED3	605768.468	741761.654	605768.468	741761.654	Required	
SED2	605748.798	741784.873	605748.798	741784.873	Required	
SED1	605726.825	741793.280			No Entry	

PIPELINE SCHEDULES for Surface Water East

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)
SE1.000	o	225	SE19	45.525	44.100	1.200	Open Manhole	1200
SE1.001	o	225	SE18	45.096	43.971	0.900	Open Manhole	1200
SE1.002	o	225	SE17	44.966	43.841	0.900	Open Manhole	1200
SE1.003	o	225	SE16	44.586	43.461	0.900	Open Manhole	1200
SE1.004	o	225	SE15	44.460	43.335	0.900	Open Manhole	1200
SE1.005	o	225	SE14	44.152	43.027	0.900	Open Manhole	1200
SE1.006	o	225	SE13	43.987	42.862	0.900	Open Manhole	1200
SE1.007	o	225	SE12	43.838	42.713	0.900	Open Manhole	1200
SE1.008	o	225	SE11	43.588	42.463	0.900	Open Manhole	1200
SE1.009	o	375	SE10	43.420	42.166	0.879	Open Manhole	1500
SE2.000	o	225	SE9.1	43.503	42.505	0.773	Open Manhole	1200
SE1.010	o	375	SE9	43.255	42.082	0.798	Open Manhole	1500
SE1.011	o	375	SE8	42.984	41.930	0.679	Open Manhole	1500
SE3.000	o	225	SE7.4	43.829	42.064	1.540	Open Manhole	1200
SE3.001	o	225	SE7.3	43.701	41.972	1.504	Open Manhole	1200
SE3.002	o	300	SE7.2	43.372	41.714	1.358	Open Manhole	1500
SE3.003	o	300	SE7.1	43.128	41.539	1.289	Open Manhole	1500
SE1.012	o	375	SE7	43.111	41.427	1.309	Open Manhole	1500
SE4.000	o	225	SE6.3	44.742	41.549	2.968	Open Manhole	1200
SE4.001	o	225	SE6.2	44.575	41.425	2.925	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)
SE1.000	25.775	199.8	SE18	45.096	43.971	0.900	Open Manhole	1200
SE1.001	25.907	199.3	SE17	44.966	43.841	0.900	Open Manhole	1200
SE1.002	76.080	200.2	SE16	44.586	43.461	0.900	Open Manhole	1200
SE1.003	25.132	199.5	SE15	44.460	43.335	0.900	Open Manhole	1200
SE1.004	61.611	200.0	SE14	44.152	43.027	0.900	Open Manhole	1200
SE1.005	33.065	200.4	SE13	43.987	42.862	0.900	Open Manhole	1200
SE1.006	29.889	200.6	SE12	43.838	42.713	0.900	Open Manhole	1200
SE1.007	50.013	200.1	SE11	43.588	42.463	0.900	Open Manhole	1200
SE1.008	29.438	200.3	SE10	43.420	42.316	0.879	Open Manhole	1500
SE1.009	16.708	198.9	SE9	43.255	42.082	0.798	Open Manhole	1500
SE2.000	54.678	200.3	SE9	43.255	42.232	0.798	Open Manhole	1500
SE1.010	45.459	299.1	SE8	42.984	41.930	0.679	Open Manhole	1500
SE1.011	25.990	199.9	SE7	43.111	41.800	0.936	Open Manhole	1500
SE3.000	18.488	201.0	SE7.3	43.701	41.972	1.504	Open Manhole	1200
SE3.001	36.523	199.6	SE7.2	43.372	41.789	1.358	Open Manhole	1500
SE3.002	34.993	200.0	SE7.1	43.128	41.539	1.289	Open Manhole	1500
SE3.003	7.427	200.7	SE7	43.111	41.502	1.309	Open Manhole	1500
SE1.012	59.625	106.9	SE6	43.626	40.869	2.382	Open Manhole	1500
SE4.000	24.771	199.8	SE6.2	44.575	41.425	2.925	Open Manhole	1200
SE4.001	40.660	200.3	SE6.1	43.558	41.222	2.111	Open Manhole	1200

PIPELINE SCHEDULES for Surface Water East

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)
SE4.002	o	300	SE6.1	43.558	41.147	2.111	Open Manhole	1200
SE1.013	o	375	SE6	43.626	40.869	2.382	Open Manhole	1500
SE5.000	o	225	SE5.2	45.157	42.050	2.882	Open Manhole	1200
SE5.001	o	225	SE5.1	44.990	41.759	3.006	Open Manhole	1200
SE1.014	o	450	SE5	44.024	40.510	3.064	Open Manhole	1500
SE1.015	o	450	SE4	43.977	40.490	3.037	Open Manhole	1500
SE6.000	o	225	SE3.6	44.879	41.832	2.822	Open Manhole	1200
SE6.001	o	225	SE3.5	44.634	41.673	2.736	Open Manhole	1200
SE6.002	o	225	SE3.4	44.526	41.534	2.767	Open Manhole	1200
SE7.000	o	225	SE3.3.3	43.291	41.616	1.450	Open Manhole	1200
SE8.000	o	225	SE3.3.2.1	43.082	41.735	1.122	Open Manhole	1200
SE7.001	o	300	SE3.3.2	43.368	41.492	1.576	Open Manhole	1200
SE7.002	o	300	SE3.3.1	43.806	41.308	2.198	Open Manhole	1200
SE6.003	o	375	SE3.3	43.717	41.062	2.280	Open Manhole	1500
SE9.000	o	225	SE3.2.2	43.340	41.920	1.195	Open Manhole	1200
SE9.001	o	225	SE3.2.1	43.563	41.518	1.820	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)
SE4.002	40.660	200.3	SE6	43.626	40.944	2.382	Open Manhole	1500
SE1.013	61.673	217.2	SE5	44.024	40.585	3.064	Open Manhole	1500
SE5.000	24.771	85.1	SE5.1	44.990	41.759	3.006	Open Manhole	1200
SE5.001	81.320	79.4	SE5	44.024	40.735	3.064	Open Manhole	1500
SE1.014	4.022	201.1	SE4	43.977	40.490	3.037	Open Manhole	1500
SE1.015	14.319	198.9	SE3	43.809	40.418	2.941	Open Manhole	1800
SE6.000	31.756	199.7	SE3.5	44.634	41.673	2.736	Open Manhole	1200
SE6.001	27.753	199.7	SE3.4	44.526	41.534	2.767	Open Manhole	1200
SE6.002	64.317	199.7	SE3.3	43.717	41.212	2.280	Open Manhole	1500
SE7.000	9.822	200.4	SE3.3.2	43.368	41.567	1.576	Open Manhole	1200
SE8.000	18.556	110.5	SE3.3.2	43.368	41.567	1.576	Open Manhole	1200
SE7.001	36.890	200.5	SE3.3.1	43.806	41.308	2.198	Open Manhole	1200
SE7.002	4.189	24.5	SE3.3	43.717	41.137	2.280	Open Manhole	1500
SE6.003	4.754	198.1	SE3.2	43.594	41.038	2.181	Open Manhole	1500
SE9.000	14.464	36.0	SE3.2.1	43.563	41.518	1.820	Open Manhole	1200
SE9.001	12.116	36.7	SE3.2	43.594	41.188	2.181	Open Manhole	1500

PIPELINE SCHEDULES for Surface Water East

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)
SE6.004	o	375	SE3.2	43.594	41.038	2.181	Open Manhole	1500
SE10.000	o	225	SE3.1.2	45.097	43.050	1.822	Open Manhole	1200
SE10.001	o	225	SE3.1.1	45.254	42.693	2.336	Open Manhole	1200
SE6.005	o	375	SE3.1	43.098	40.746	1.977	Open Manhole	1500
SE1.016	o	525	SE3	43.809	40.418	2.866	Open Manhole	1800
SE1.017	o	525	SE2	43.556	40.171	2.860	Open Manhole	1800
SE11.000	o	225	SE110	42.723	41.354	1.144	Open Manhole	1200
SE11.001	o	225	SE109	42.713	41.222	1.266	Open Manhole	1200
SE11.002	o	225	SE108	42.572	41.071	1.276	Open Manhole	1200
SE12.000	o	225	SE107.1	44.004	41.800	1.979	Open Manhole	1200
SE11.003	o	300	SE107	42.477	40.863	1.314	Open Manhole	1500
SE11.004	o	375	SE106	42.446	40.766	1.305	Open Manhole	1200
SE13.000	o	225	SE105.2	44.286	43.115	0.946	Open Manhole	1200
SE13.001	o	225	SE105.1	43.397	41.722	1.450	Open Manhole	1200
SE11.005	o	375	SE105	42.709	40.539	1.795	Open Manhole	1500
SE11.006	o	375	SE104	42.875	40.408	2.092	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)
SE6.004	58.457	200.2	SE3.1	43.098	40.746	1.977	Open Manhole	1500
SE10.000	27.651	77.5	SE3.1.1	45.254	42.693	2.336	Open Manhole	1200
SE10.001	85.342	84.1	SE3.1	43.098	41.678	1.195	Open Manhole	1500
SE6.005	45.331	179.2	SE3	43.809	40.493	2.941	Open Manhole	1800
SE1.016	38.223	154.7	SE2	43.556	40.171	2.860	Open Manhole	1800
SE1.017	13.617	55.1	SE1	43.535	39.924	3.086	Open Manhole	1800
SE11.000	26.456	200.4	SE109	42.713	41.222	1.266	Open Manhole	1200
SE11.001	30.280	200.5	SE108	42.572	41.071	1.276	Open Manhole	1200
SE11.002	11.629	87.4	SE107	42.477	40.938	1.314	Open Manhole	1500
SE12.000	103.479	120.0	SE107	42.477	40.938	1.314	Open Manhole	1500
SE11.003	5.613	255.1	SE106	42.446	40.841	1.305	Open Manhole	1200
SE11.004	56.853	250.5	SE105	42.709	40.539	1.795	Open Manhole	1500
SE13.000	49.323	35.4	SE105.1	43.397	41.722	1.450	Open Manhole	1200
SE13.001	49.323	47.7	SE105	42.709	40.689	1.795	Open Manhole	1500
SE11.005	32.754	250.0	SE104	42.875	40.408	2.092	Open Manhole	1500
SE11.006	23.670	189.4	SE103	42.961	40.283	2.303	Open Manhole	1500

PIPELINE SCHEDULES for Surface Water East

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)
SE11.007	o	375	SE103	42.961	40.283	2.303	Open Manhole	1500
SE11.008	o	450	SE102	42.855	40.112	2.293	Open Manhole	1500
SE11.009	o	450	SE101	43.499	40.069	2.980	Open Manhole	1500
SE14.000	o	225	SE208	44.234	41.958	2.051	Open Manhole	1200
SE14.001	o	225	SE207	43.158	41.593	1.340	Open Manhole	1200
SE14.002	o	300	SE206	42.916	41.316	1.300	Open Manhole	1200
SE14.003	o	300	SE205	42.996	41.262	1.434	Open Manhole	1200
SE14.004	o	300	SE204	43.252	41.034	1.918	Open Manhole	1200
SE15.000	o	225	SE203.3	43.748	41.118	2.405	Open Manhole	1200
SE16.000	o	225	SE203.2.1	43.921	41.412	2.284	Open Manhole	1200
SE15.001	o	300	SE203.2	43.571	40.892	2.379	Open Manhole	1200
SE15.002	o	300	SE203.1	43.308	40.685	2.323	Open Manhole	1200
SE14.005	o	375	SE203	43.301	40.548	2.378	Open Manhole	1500
SE17.000	o	225	SE202.8	45.450	43.239	1.986	Open Manhole	1200
SE17.001	o	225	SE202.7	44.452	42.926	1.301	Open Manhole	1200
SE17.002	o	225	SE202.6	44.354	42.893	1.236	Open Manhole	1200
SE18.000	o	225	SE202.5.2	45.321	43.327	1.769	Open Manhole	1200
SE18.001	o	300	SE202.5.1	45.268	43.107	1.861	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)
SE11.007	26.593	277.0	SE102	42.855	40.187	2.293	Open Manhole	1500
SE11.008	49.945	423.3	SE101	43.499	39.994	3.055	Open Manhole	1500
SE11.009	24.366	168.0	SE1	43.535	39.924	3.161	Open Manhole	1800
SE14.000	68.601	187.9	SE207	43.158	41.593	1.340	Open Manhole	1200
SE14.001	16.450	200.6	SE206	42.916	41.511	1.180	Open Manhole	1200
SE14.002	10.722	198.6	SE205	42.996	41.262	1.434	Open Manhole	1200
SE14.003	45.569	199.9	SE204	43.252	41.034	1.918	Open Manhole	1200
SE14.004	6.364	15.5	SE203	43.301	40.623	2.378	Open Manhole	1500
SE15.000	24.647	163.2	SE203.2	43.571	40.967	2.379	Open Manhole	1200
SE16.000	67.686	152.1	SE203.2	43.571	40.967	2.379	Open Manhole	1200
SE15.001	41.365	199.8	SE203.1	43.308	40.685	2.323	Open Manhole	1200
SE15.002	12.419	200.3	SE203	43.301	40.623	2.378	Open Manhole	1500
SE14.005	30.283	246.2	SE202	43.478	40.425	2.678	Open Manhole	1800
SE17.000	62.581	199.9	SE202.7	44.452	42.926	1.301	Open Manhole	1200
SE17.001	6.633	201.0	SE202.6	44.354	42.893	1.236	Open Manhole	1200
SE17.002	56.738	104.7	SE202.5	43.630	42.351	1.054	Open Manhole	1200
SE18.000	29.232	201.6	SE202.5.1	45.268	43.182	1.861	Open Manhole	1200
SE18.001	85.298	200.2	SE202.5	43.630	42.681	0.649	Open Manhole	1200

PIPELINE SCHEDULES for Surface Water East

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)
SE17.003	o	300	SE202.5	43.630	42.276	1.054	Open Manhole	1200
SE19.000	o	225	SE202.4.1	42.867	42.099	0.543	Open Manhole	1200
SE17.004	o	375	SE202.4	43.693	41.728	1.590	Open Manhole	1500
SE20.000	o	225	SE202.3.2	44.966	42.448	2.293	Open Manhole	1200
SE20.001	o	225	SE202.3.1	44.657	42.283	2.149	Open Manhole	1200
SE17.005	o	450	SE202.3	43.498	41.459	1.589	Open Manhole	1500
SE21.000	o	225	SE202.2.1	43.585	41.713	1.647	Open Manhole	1200
SE17.006	o	450	SE202.2	43.647	41.259	1.938	Open Manhole	1500
SE22.000	o	225	SE202.1.1	44.390	42.483	1.682	Open Manhole	1200
SE17.007	o	450	SE202.1	43.687	41.190	2.047	Open Manhole	1800
SE14.006	o	600	SE202	43.478	40.200	2.678	Open Manhole	1800
SE14.007	o	600	SE201	43.740	40.119	3.021	Open Manhole	1800
SE1.018	o	900	SE1	43.535	39.024	3.611	Open Manhole	1800
SE1.019	o	375	SE0	43.340	38.936	4.029	Open Manhole	1800

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)
SE17.003	34.556	73.1	SE202.4	43.693	41.803	1.590	Open Manhole	1500
SE19.000	44.187	199.9	SE202.4	43.693	41.878	1.590	Open Manhole	1500
SE17.004	38.894	200.5	SE202.3	43.498	41.534	1.589	Open Manhole	1500
SE20.000	32.911	199.5	SE202.3.1	44.657	42.283	2.149	Open Manhole	1200
SE20.001	99.098	165.4	SE202.3	43.498	41.684	1.589	Open Manhole	1500
SE17.005	40.021	200.1	SE202.2	43.647	41.259	1.938	Open Manhole	1500
SE21.000	45.820	200.1	SE202.2	43.647	41.484	1.938	Open Manhole	1500
SE17.006	13.672	198.1	SE202.1	43.687	41.190	2.047	Open Manhole	1800
SE22.000	102.288	200.2	SE202.1	43.687	41.972	1.490	Open Manhole	1800
SE17.007	51.594	61.4	SE202	43.478	40.350	2.678	Open Manhole	1800
SE14.006	24.229	299.1	SE201	43.740	40.119	3.021	Open Manhole	1800
SE14.007	26.925	299.2	SE1	43.535	40.029	2.906	Open Manhole	1800
SE1.018	26.969	306.5	SE0	43.340	38.936	3.504	Open Manhole	1800
SE1.019	9.957	262.0	SED9	43.458	38.898	4.185	Open Manhole	2100

PIPELINE SCHEDULES for Surface Water East

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)
SE23.000	o	1350	SED11	43.024	38.750	2.924	Open Manhole	2100
SE23.001	o	1350	SED10	43.102	38.727	3.025	Open Manhole	2100
SE1.020	o	1350	SED9	43.458	38.487	3.621	Open Manhole	2100
SE1.021	o	1350	SED8	43.627	38.350	3.927	Open Manhole	2100
SE1.022	o	1350	SED7	43.176	38.291	3.535	Open Manhole	2100
SE1.023	o	1350	SED6	42.898	38.264	3.284	Open Manhole	2100
SE1.024	o	1350	SED5	42.837	38.241	3.246	Open Manhole	2100
SE1.025	o	1350	SED4	42.403	38.097	2.956	Open Manhole	2100
SE1.026	o	1350	SED3	42.528	38.073	3.105	Open Manhole	2100
SE1.027	o	1350	SED2	42.709	38.026	3.333	Open Manhole	2100

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)
SE23.000	15.245	662.8	SED10	43.102	38.727	3.025	Open Manhole	2100
SE23.001	157.935	658.1	SED9	43.458	38.487	3.621	Open Manhole	2100
SE1.020	89.337	652.1	SED8	43.627	38.350	3.927	Open Manhole	2100
SE1.021	37.954	654.4	SED7	43.176	38.292	3.534	Open Manhole	2100
SE1.022	17.439	645.9	SED6	42.898	38.264	3.284	Open Manhole	2100
SE1.023	15.263	663.6	SED5	42.837	38.241	3.246	Open Manhole	2100
SE1.024	93.553	649.7	SED4	42.403	38.097	2.956	Open Manhole	2100
SE1.025	15.675	653.1	SED3	42.528	38.073	3.105	Open Manhole	2100
SE1.026	30.431	647.5	SED2	42.709	38.026	3.333	Open Manhole	2100
SE1.027	23.527	653.5	SED1	42.731	37.990	3.391	Open Manhole	2100

Free Flowing Outfall Details for Surface Water East

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
SE1.027	SED1	42.731	37.990	37.990	2100	0

Simulation Criteria for Surface Water East

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

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

Synthetic Rainfall Details

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	14.500	Storm Duration (mins)	30
Ratio R	0.280		

Online Controls for Surface Water East

Hydro-Brake® Optimum Manhole: SE1, DS/PN: SE1.018, Volume (m³): 24.8

Unit Reference	MD-SHE-0285-5680-2850-5680
Design Head (m)	2.850
Design Flow (l/s)	56.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	285
Invert Level (m)	39.024
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.850	56.7	Kick-Flo®	1.761	45.0
Flush-Flo™	0.818	56.8	Mean Flow over Head Range	-	49.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.9	0.800	56.7	2.000	47.8	4.000	66.9	7.000	87.7
0.200	29.4	1.000	56.4	2.200	50.1	4.500	70.8	7.500	90.7
0.300	48.4	1.200	55.2	2.400	52.2	5.000	74.5	8.000	93.6
0.400	52.1	1.400	53.3	2.600	54.3	5.500	78.0	8.500	96.4
0.500	54.4	1.600	49.8	3.000	58.2	6.000	81.4	9.000	99.2
0.600	55.8	1.800	45.5	3.500	62.7	6.500	84.6	9.500	101.8

Storage Structures for Surface Water East

Tank or Pond Manhole: SE1, DS/PN: SE1.018

Invert Level (m) 39.024

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1250.0	1.100	1250.0	2.586	760.2	3.186	1062.8	3.786	1409.8
0.200	1250.0	1.101	2.6	2.686	807.5	3.286	1117.6	4.000	1409.8
0.400	1250.0	1.500	2.6	2.786	856.1	3.386	1173.6		
0.600	1250.0	2.000	2.6	2.886	906.0	3.486	1230.8		
0.800	1250.0	2.500	2.6	2.986	957.0	3.586	1289.2		
1.000	1250.0	2.585	2.6	3.086	1009.3	3.686	1348.9		

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Water East

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	14.500
Region	Scotland and Ireland	Ratio R	0.280
Cv (Summer)	0.750		
Cv (Winter)	0.840		

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 10

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Pipe Flow (l/s)	Status
SE1.000	SE19	15 minute 1 year Winter I+0%	45.525	44.152	-0.173	0.000	0.12	4.2	OK
SE1.001	SE18	15 minute 1 year Winter I+0%	45.096	44.035	-0.161	0.000	0.18	6.0	OK
SE1.002	SE17	15 minute 1 year Winter I+0%	44.966	43.929	-0.137	0.000	0.30	10.7	OK
SE1.003	SE16	15 minute 1 year Winter I+0%	44.586	43.554	-0.132	0.000	0.35	11.9	OK
SE1.004	SE15	15 minute 1 year Winter I+0%	44.460	43.439	-0.121	0.000	0.42	14.8	OK
SE1.005	SE14	15 minute 1 year Winter I+0%	44.152	43.136	-0.116	0.000	0.47	16.0	OK
SE1.006	SE13	15 minute 1 year Winter I+0%	43.987	42.975	-0.112	0.000	0.50	17.0	OK
SE1.007	SE12	15 minute 1 year Winter I+0%	43.838	42.828	-0.110	0.000	0.51	17.8	OK
SE1.008	SE11	15 minute 1 year Winter I+0%	43.588	42.579	-0.109	0.000	0.53	17.9	OK
SE1.009	SE10	15 minute 1 year Winter I+0%	43.420	42.265	-0.276	0.000	0.16	17.9	OK
SE2.000	SE9.1	15 minute 1 year Winter I+0%	43.503	42.588	-0.142	0.000	0.29	10.4	OK
SE1.010	SE9	30 minute 1 year Winter I+0%	43.255	42.205	-0.252	0.000	0.23	24.8	OK
SE1.011	SE8	30 minute 1 year Winter I+0%	42.984	42.063	-0.242	0.000	0.27	33.6	OK
SE3.000	SE7.4	15 minute 1 year Winter I+0%	43.829	42.111	-0.178	0.000	0.10	3.3	OK
SE3.001	SE7.3	15 minute 1 year Winter I+0%	43.701	42.030	-0.167	0.000	0.15	5.3	OK
SE3.002	SE7.2	15 minute 1 year Winter I+0%	43.372	41.799	-0.215	0.000	0.18	12.7	OK
SE3.003	SE7.1	15 minute 1 year Winter I+0%	43.128	41.634	-0.205	0.000	0.22	12.7	OK
SE1.012	SE7	30 minute 1 year Winter I+0%	43.111	41.566	-0.236	0.000	0.29	52.9	OK
SE4.000	SE6.3	15 minute 1 year Winter I+0%	44.742	41.620	-0.154	0.000	0.22	7.3	OK
SE4.001	SE6.2	15 minute 1 year Winter I+0%	44.575	41.539	-0.111	0.000	0.50	17.2	OK
SE4.002	SE6.1	15 minute 1 year Winter I+0%	43.558	41.267	-0.180	0.000	0.33	24.2	OK
SE1.013	SE6	15 minute 1 year Winter I+0%	43.626	41.090	-0.154	0.000	0.64	81.2	OK
SE5.000	SE5.2	15 minute 1 year Winter I+0%	45.157	42.106	-0.169	0.000	0.14	7.3	OK
SE5.001	SE5.1	15 minute 1 year Winter I+0%	44.990	41.853	-0.131	0.000	0.36	20.4	OK
SE1.014	SE5	15 minute 1 year Winter I+0%	44.024	40.820	-0.140	0.000	0.81	96.7	OK
SE1.015	SE4	15 minute 1 year Winter I+0%	43.977	40.743	-0.197	0.000	0.60	101.9	OK
SE6.000	SE3.6	15 minute 1 year Winter I+0%	44.879	41.917	-0.140	0.000	0.30	10.3	OK
SE6.001	SE3.5	15 minute 1 year Winter I+0%	44.634	41.758	-0.140	0.000	0.30	10.1	OK

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Water East

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Pipe Flow (l/s)	Status
SE6.002	SE3.4	15 minute 1 year Winter I+0%	44.526	41.664	-0.095	0.000	0.60	21.2	OK
SE7.000	SE3.3.3	15 minute 1 year Summer I+0%	43.291	41.721	-0.120	0.000	0.45	13.5	OK
SE8.000	SE3.3.2.1	15 minute 1 year Winter I+0%	43.082	41.820	-0.140	0.000	0.30	13.5	OK
SE7.001	SE3.3.2	15 minute 1 year Winter I+0%	43.368	41.619	-0.173	0.000	0.36	26.3	OK
SE7.002	SE3.3.1	15 minute 1 year Winter I+0%	43.806	41.410	-0.198	0.000	0.26	26.5	OK
SE6.003	SE3.3	15 minute 1 year Winter I+0%	43.717	41.293	-0.144	0.000	0.68	58.2	OK
SE9.000	SE3.2.2	15 minute 1 year Summer I+0%	43.340	41.920	-0.225	0.000	0.00	0.0	OK
SE9.001	SE3.2.1	15 minute 1 year Summer I+0%	43.563	41.518	-0.225	0.000	0.00	0.0	OK
SE6.004	SE3.2	15 minute 1 year Winter I+0%	43.594	41.213	-0.200	0.000	0.43	56.8	OK
SE10.000	SE3.1.2	15 minute 1 year Winter I+0%	45.097	43.107	-0.168	0.000	0.14	7.9	OK
SE10.001	SE3.1.1	15 minute 1 year Winter I+0%	45.254	42.791	-0.127	0.000	0.40	21.9	OK
SE6.005	SE3.1	15 minute 1 year Winter I+0%	43.098	40.956	-0.165	0.000	0.59	81.2	OK
SE1.016	SE3	15 minute 1 year Winter I+0%	43.809	40.693	-0.250	0.000	0.54	180.9	OK
SE1.017	SE2	15 minute 1 year Winter I+0%	43.556	40.425	-0.271	0.000	0.47	180.2	OK
SE11.000	SE110	15 minute 1 year Winter I+0%	42.723	41.425	-0.154	0.000	0.22	7.4	OK
SE11.001	SE109	15 minute 1 year Winter I+0%	42.713	41.317	-0.130	0.000	0.37	12.6	OK
SE11.002	SE108	15 minute 1 year Winter I+0%	42.572	41.149	-0.147	0.000	0.26	12.5	OK
SE12.000	SE107.1	15 minute 1 year Winter I+0%	44.004	41.933	-0.092	0.000	0.59	27.5	OK
SE11.003	SE107	15 minute 1 year Winter I+0%	42.477	41.075	-0.088	0.000	0.83	39.4	OK
SE11.004	SE106	15 minute 1 year Winter I+0%	42.446	40.930	-0.211	0.000	0.38	44.6	OK
SE13.000	SE105.2	15 minute 1 year Winter I+0%	44.286	43.185	-0.155	0.000	0.21	17.6	OK
SE13.001	SE105.1	15 minute 1 year Winter I+0%	43.397	41.813	-0.134	0.000	0.33	24.1	OK
SE11.005	SE105	15 minute 1 year Winter I+0%	42.709	40.745	-0.169	0.000	0.58	64.8	OK
SE11.006	SE104	15 minute 1 year Winter I+0%	42.875	40.614	-0.169	0.000	0.58	72.6	OK
SE11.007	SE103	15 minute 1 year Winter I+0%	42.961	40.514	-0.144	0.000	0.69	71.9	OK
SE11.008	SE102	15 minute 1 year Winter I+0%	42.855	40.346	-0.216	0.000	0.49	69.3	OK
SE11.009	SE101	15 minute 1 year Winter I+0%	43.499	40.258	-0.261	0.000	0.36	75.7	OK
SE14.000	SE208	15 minute 1 year Winter I+0%	44.234	42.052	-0.131	0.000	0.34	12.3	OK
SE14.001	SE207	15 minute 1 year Winter I+0%	43.158	41.726	-0.092	0.000	0.65	21.0	OK
SE14.002	SE206	15 minute 1 year Winter I+0%	42.916	41.453	-0.163	0.000	0.42	26.0	OK
SE14.003	SE205	15 minute 1 year Winter I+0%	42.996	41.386	-0.176	0.000	0.35	25.7	OK
SE14.004	SE204	15 minute 1 year Winter I+0%	43.252	41.114	-0.220	0.000	0.16	25.5	OK
SE15.000	SE203.3	15 minute 1 year Winter I+0%	43.748	41.180	-0.163	0.000	0.17	6.3	OK
SE16.000	SE203.2.1	15 minute 1 year Winter I+0%	43.921	41.495	-0.142	0.000	0.27	11.2	OK
SE15.001	SE203.2	15 minute 1 year Winter I+0%	43.571	41.029	-0.163	0.000	0.42	30.4	OK
SE15.002	SE203.1	15 minute 1 year Winter I+0%	43.308	40.833	-0.152	0.000	0.48	30.2	OK
SE14.005	SE203	15 minute 1 year Winter I+0%	43.301	40.743	-0.180	0.000	0.53	59.1	OK
SE17.000	SE202.8	15 minute 1 year Winter I+0%	45.450	43.343	-0.121	0.000	0.41	14.5	OK
SE17.001	SE202.7	15 minute 1 year Winter I+0%	44.452	43.039	-0.112	0.000	0.51	14.3	OK
SE17.002	SE202.6	15 minute 1 year Winter I+0%	44.354	43.012	-0.106	0.000	0.53	26.0	OK
SE18.000	SE202.5.2	15 minute 1 year Winter I+0%	45.321	43.370	-0.182	0.000	0.08	2.7	OK
SE18.001	SE202.5.1	15 minute 1 year Winter I+0%	45.268	43.220	-0.187	0.000	0.30	22.7	OK
SE17.003	SE202.5	15 minute 1 year Winter I+0%	43.630	42.418	-0.158	0.000	0.45	53.9	OK
SE19.000	SE202.4.1	15 minute 1 year Winter I+0%	42.867	42.197	-0.127	0.000	0.38	13.4	OK
SE17.004	SE202.4	15 minute 1 year Winter I+0%	43.693	41.931	-0.172	0.000	0.56	71.4	OK
SE20.000	SE202.3.2	15 minute 1 year Winter I+0%	44.966	42.504	-0.169	0.000	0.14	4.8	OK
SE20.001	SE202.3.1	15 minute 1 year Winter I+0%	44.657	42.403	-0.105	0.000	0.55	21.8	OK
SE17.005	SE202.3	15 minute 1 year Winter I+0%	43.498	41.673	-0.236	0.000	0.46	92.6	OK
SE21.000	SE202.2.1	15 minute 1 year Winter I+0%	43.585	41.789	-0.149	0.000	0.25	8.6	OK
SE17.006	SE202.2	15 minute 1 year Winter I+0%	43.647	41.505	-0.204	0.000	0.58	97.6	OK
SE22.000	SE202.1.1	15 minute 1 year Winter I+0%	44.390	42.597	-0.111	0.000	0.51	18.3	OK
SE17.007	SE202.1	15 minute 1 year Winter I+0%	43.687	41.363	-0.277	0.000	0.31	117.9	OK
SE14.006	SE202	15 minute 1 year Winter I+0%	43.478	40.524	-0.276	0.000	0.56	174.7	OK
SE14.007	SE201	15 minute 1 year Winter I+0%	43.740	40.438	-0.281	0.000	0.55	175.1	OK
SE1.018	SE1	360 minute 1 year Winter I+0%	43.535	39.432	-0.492	0.000	0.06	48.3	OK

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Water East

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Pipe Flow (l/s)	Status
SE1.019	SE0	360 minute 1 year Winter I+0%	43.340	39.131	-0.180	0.000	0.53	48.3	OK
SE23.000	SED11	15 minute 1 year Summer I+0%	43.024	38.750	-1.350	0.000	0.00	0.0	OK
SE23.001	SED10	15 minute 1 year Summer I+0%	43.102	38.727	-1.350	0.000	0.00	0.0	OK
SE1.020	SED9	360 minute 1 year Winter I+0%	43.458	38.654	-1.183	0.000	0.03	48.3	OK
SE1.021	SED8	360 minute 1 year Winter I+0%	43.627	38.556	-1.144	0.000	0.03	48.3	OK
SE1.022	SED7	360 minute 1 year Winter I+0%	43.176	38.518	-1.123	0.000	0.05	48.2	OK
SE1.023	SED6	360 minute 1 year Winter I+0%	42.898	38.480	-1.134	0.000	0.06	48.2	OK
SE1.024	SED5	360 minute 1 year Winter I+0%	42.837	38.407	-1.184	0.000	0.03	48.2	OK
SE1.025	SED4	360 minute 1 year Winter I+0%	42.403	38.310	-1.137	0.000	0.06	48.2	OK
SE1.026	SED3	360 minute 1 year Winter I+0%	42.528	38.258	-1.165	0.000	0.03	48.2	OK
SE1.027	SED2	360 minute 1 year Winter I+0%	42.709	38.203	-1.173	0.000	0.04	48.2	OK

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	14.500
Region	Scotland and Ireland	Ratio R	0.280
Cv (Summer)	0.750		
Cv (Winter)	0.840		

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 10

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Pipe Flow (l/s)	Status
SE1.000	SE19	15 minute 30 year Winter I+0%	45.525	44.180	-0.145	0.000	0.27	9.2	OK
SE1.001	SE18	15 minute 30 year Winter I+0%	45.096	44.074	-0.122	0.000	0.42	14.2	OK
SE1.002	SE17	15 minute 30 year Winter I+0%	44.966	43.998	-0.068	0.000	0.74	26.5	OK
SE1.003	SE16	15 minute 30 year Winter I+0%	44.586	43.627	-0.059	0.000	0.86	29.0	OK
SE1.004	SE15	15 minute 30 year Winter I+0%	44.460	43.539	-0.021	0.000	0.97	34.4	OK
SE1.005	SE14	15 minute 30 year Winter I+0%	44.152	43.258	0.006	0.000	1.00	34.4	SURCHARGED
SE1.006	SE13	15 minute 30 year Winter I+0%	43.987	43.095	0.008	0.000	1.02	34.9	SURCHARGED
SE1.007	SE12	30 minute 30 year Winter I+0%	43.838	42.948	0.010	0.000	1.02	35.8	SURCHARGED
SE1.008	SE11	30 minute 30 year Winter I+0%	43.588	42.692	0.004	0.000	1.05	35.9	SURCHARGED
SE1.009	SE10	30 minute 30 year Winter I+0%	43.420	42.318	-0.223	0.000	0.32	35.9	OK
SE2.000	SE9.1	15 minute 30 year Winter I+0%	43.503	42.638	-0.092	0.000	0.63	22.2	OK
SE1.010	SE9	30 minute 30 year Winter I+0%	43.255	42.276	-0.181	0.000	0.52	55.0	OK
SE1.011	SE8	15 minute 30 year Winter I+0%	42.984	42.148	-0.157	0.000	0.63	76.8	OK
SE3.000	SE7.4	15 minute 30 year Winter I+0%	43.829	42.135	-0.154	0.000	0.22	7.2	OK
SE3.001	SE7.3	15 minute 30 year Winter I+0%	43.701	42.067	-0.130	0.000	0.36	12.3	OK
SE3.002	SE7.2	15 minute 30 year Winter I+0%	43.372	41.859	-0.155	0.000	0.45	32.5	OK
SE3.003	SE7.1	15 minute 30 year Winter I+0%	43.128	41.821	-0.018	0.000	0.51	29.4	OK
SE1.012	SE7	15 minute 30 year Winter I+0%	43.111	41.793	-0.009	0.000	0.68	122.8	OK
SE4.000	SE6.3	15 minute 30 year Winter I+0%	44.742	41.819	0.045	0.000	0.44	14.8	SURCHARGED
SE4.001	SE6.2	15 minute 30 year Winter I+0%	44.575	41.799	0.149	0.000	1.11	38.7	SURCHARGED
SE4.002	SE6.1	15 minute 30 year Winter I+0%	43.558	41.689	0.242	0.000	0.67	48.9	SURCHARGED
SE1.013	SE6	15 minute 30 year Winter I+0%	43.626	41.592	0.348	0.000	1.26	159.6	SURCHARGED
SE5.000	SE5.2	15 minute 30 year Winter I+0%	45.157	42.136	-0.139	0.000	0.31	16.3	OK
SE5.001	SE5.1	15 minute 30 year Winter I+0%	44.990	41.931	-0.053	0.000	0.89	50.6	OK
SE1.014	SE5	15 minute 30 year Winter I+0%	44.024	41.166	0.206	0.000	1.58	188.0	SURCHARGED
SE1.015	SE4	15 minute 30 year Winter I+0%	43.977	41.061	0.121	0.000	1.16	195.6	SURCHARGED
SE6.000	SE3.6	15 minute 30 year Winter I+0%	44.879	42.096	0.039	0.000	0.63	21.6	SURCHARGED
SE6.001	SE3.5	15 minute 30 year Winter I+0%	44.634	42.051	0.153	0.000	0.62	21.2	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Pipe Flow (l/s)	Status
SE6.002	SE3.4	15 minute 30 year Winter I+0%	44.526	42.010	0.251	0.000	1.19	42.1	SURCHARGED
SE7.000	SE3.3.3	15 minute 30 year Summer I+0%	43.291	41.795	-0.046	0.000	0.99	30.0	OK
SE8.000	SE3.3.2.1	15 minute 30 year Winter I+0%	43.082	41.870	-0.090	0.000	0.67	29.9	OK
SE7.001	SE3.3.2	15 minute 30 year Winter I+0%	43.368	41.701	-0.091	0.000	0.80	58.2	OK
SE7.002	SE3.3.1	15 minute 30 year Winter I+0%	43.806	41.620	0.012	0.000	0.49	50.7	SURCHARGED
SE6.003	SE3.3	15 minute 30 year Winter I+0%	43.717	41.500	0.063	0.000	1.41	119.8	SURCHARGED
SE9.000	SE3.2.2	15 minute 30 year Summer I+0%	43.340	41.920	-0.225	0.000	0.00	0.0	OK
SE9.001	SE3.2.1	15 minute 30 year Summer I+0%	43.563	41.518	-0.225	0.000	0.00	0.0	OK
SE6.004	SE3.2	15 minute 30 year Winter I+0%	43.594	41.429	0.017	0.000	0.84	111.2	SURCHARGED
SE10.000	SE3.1.2	15 minute 30 year Winter I+0%	45.097	43.137	-0.138	0.000	0.32	17.6	OK
SE10.001	SE3.1.1	15 minute 30 year Winter I+0%	45.254	42.892	-0.026	0.000	1.00	55.3	OK
SE6.005	SE3.1	15 minute 30 year Winter I+0%	43.098	41.237	0.116	0.000	1.16	159.5	SURCHARGED
SE1.016	SE3	15 minute 30 year Winter I+0%	43.809	40.943	0.000	0.000	1.02	342.2	OK
SE1.017	SE2	15 minute 30 year Winter I+0%	43.556	40.558	-0.138	0.000	0.89	340.5	OK
SE11.000	SE110	15 minute 30 year Winter I+0%	42.723	41.465	-0.114	0.000	0.48	16.4	OK
SE11.001	SE109	15 minute 30 year Winter I+0%	42.713	41.399	-0.048	0.000	0.85	29.1	OK
SE11.002	SE108	15 minute 30 year Winter I+0%	42.572	41.312	0.016	0.000	0.56	26.7	SURCHARGED
SE12.000	SE107.1	15 minute 30 year Winter I+0%	44.004	42.508	0.483	0.000	1.16	54.0	SURCHARGED
SE11.003	SE107	15 minute 30 year Winter I+0%	42.477	41.234	0.071	0.000	1.68	79.5	SURCHARGED
SE11.004	SE106	15 minute 30 year Winter I+0%	42.446	41.129	-0.012	0.000	0.75	87.9	OK
SE13.000	SE105.2	15 minute 30 year Winter I+0%	44.286	43.223	-0.117	0.000	0.47	39.1	OK
SE13.001	SE105.1	15 minute 30 year Winter I+0%	43.397	41.876	-0.071	0.000	0.79	57.2	OK
SE11.005	SE105	15 minute 30 year Winter I+0%	42.709	40.996	0.082	0.000	1.09	122.7	SURCHARGED
SE11.006	SE104	15 minute 30 year Winter I+0%	42.875	40.846	0.063	0.000	1.07	133.2	SURCHARGED
SE11.007	SE103	15 minute 30 year Winter I+0%	42.961	40.701	0.043	0.000	1.27	132.9	SURCHARGED
SE11.008	SE102	15 minute 30 year Winter I+0%	42.855	40.455	-0.107	0.000	0.92	130.1	OK
SE11.009	SE101	30 minute 30 year Winter I+0%	43.499	40.339	-0.180	0.000	0.67	138.7	OK
SE14.000	SE208	15 minute 30 year Winter I+0%	44.234	42.126	-0.057	0.000	0.74	27.3	OK
SE14.001	SE207	15 minute 30 year Winter I+0%	43.158	41.909	0.091	0.000	1.48	48.0	SURCHARGED
SE14.002	SE206	15 minute 30 year Winter I+0%	42.916	41.556	-0.060	0.000	0.99	60.6	OK
SE14.003	SE205	15 minute 30 year Winter I+0%	42.996	41.471	-0.091	0.000	0.81	59.4	OK
SE14.004	SE204	15 minute 30 year Winter I+0%	43.252	41.160	-0.174	0.000	0.37	59.2	OK
SE15.000	SE203.3	15 minute 30 year Winter I+0%	43.748	41.213	-0.130	0.000	0.37	14.0	OK
SE16.000	SE203.2.1	15 minute 30 year Winter I+0%	43.921	41.544	-0.093	0.000	0.61	24.7	OK
SE15.001	SE203.2	15 minute 30 year Winter I+0%	43.571	41.173	-0.019	0.000	0.94	68.7	OK
SE15.002	SE203.1	15 minute 30 year Winter I+0%	43.308	41.034	0.049	0.000	0.99	62.0	SURCHARGED
SE14.005	SE203	15 minute 30 year Winter I+0%	43.301	40.965	0.042	0.000	1.12	125.9	SURCHARGED
SE17.000	SE202.8	15 minute 30 year Winter I+0%	45.450	43.473	0.009	0.000	0.87	30.7	SURCHARGED
SE17.001	SE202.7	15 minute 30 year Winter I+0%	44.452	43.288	0.137	0.000	1.06	29.9	SURCHARGED
SE17.002	SE202.6	15 minute 30 year Winter I+0%	44.354	43.230	0.112	0.000	1.03	50.5	SURCHARGED
SE18.000	SE202.5.2	15 minute 30 year Winter I+0%	45.321	43.392	-0.160	0.000	0.18	6.1	OK
SE18.001	SE202.5.1	15 minute 30 year Winter I+0%	45.268	43.315	-0.092	0.000	0.81	61.5	OK
SE17.003	SE202.5	15 minute 30 year Winter I+0%	43.630	42.665	0.089	0.000	1.01	120.3	SURCHARGED
SE19.000	SE202.4.1	15 minute 30 year Winter I+0%	42.867	42.292	-0.032	0.000	0.80	28.1	OK
SE17.004	SE202.4	15 minute 30 year Winter I+0%	43.693	42.184	0.081	0.000	1.21	154.8	SURCHARGED
SE20.000	SE202.3.2	15 minute 30 year Winter I+0%	44.966	42.825	0.152	0.000	0.27	9.5	SURCHARGED
SE20.001	SE202.3.1	15 minute 30 year Winter I+0%	44.657	42.802	0.294	0.000	1.16	45.6	SURCHARGED
SE17.005	SE202.3	15 minute 30 year Winter I+0%	43.498	41.924	0.015	0.000	0.94	190.3	SURCHARGED
SE21.000	SE202.2.1	15 minute 30 year Winter I+0%	43.585	41.832	-0.106	0.000	0.53	18.6	OK
SE17.006	SE202.2	15 minute 30 year Winter I+0%	43.647	41.744	0.035	0.000	1.18	198.7	SURCHARGED
SE22.000	SE202.1.1	15 minute 30 year Winter I+0%	44.390	42.784	0.076	0.000	1.07	38.3	SURCHARGED
SE17.007	SE202.1	15 minute 30 year Winter I+0%	43.687	41.450	-0.190	0.000	0.62	235.1	OK
SE14.006	SE202	15 minute 30 year Winter I+0%	43.478	40.829	0.029	0.000	1.11	346.7	SURCHARGED
SE14.007	SE201	15 minute 30 year Winter I+0%	43.740	40.719	0.000	0.000	1.09	345.8	SURCHARGED
SE1.018	SE1	360 minute 30 year Winter I+0%	43.535	39.979	0.055	0.000	0.07	56.7	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Pipe Flow (l/s)	Status
SE1.019	SE0	240 minute 30 year Winter I+0%	43.340	39.151	-0.160	0.000	0.63	56.7	OK
SE23.000	SED11	15 minute 30 year Summer I+0%	43.024	38.750	-1.350	0.000	0.00	0.0	OK
SE23.001	SED10	15 minute 30 year Summer I+0%	43.102	38.727	-1.350	0.000	0.00	0.0	OK
SE1.020	SED9	240 minute 30 year Winter I+0%	43.458	38.670	-1.167	0.000	0.03	56.7	OK
SE1.021	SED8	240 minute 30 year Winter I+0%	43.627	38.578	-1.122	0.000	0.04	56.7	OK
SE1.022	SED7	240 minute 30 year Winter I+0%	43.176	38.540	-1.101	0.000	0.06	56.7	OK
SE1.023	SED6	240 minute 30 year Winter I+0%	42.898	38.502	-1.112	0.000	0.07	56.7	OK
SE1.024	SED5	240 minute 30 year Winter I+0%	42.837	38.423	-1.168	0.000	0.03	56.7	OK
SE1.025	SED4	240 minute 30 year Winter I+0%	42.403	38.330	-1.117	0.000	0.07	56.7	OK
SE1.026	SED3	240 minute 30 year Winter I+0%	42.528	38.274	-1.149	0.000	0.04	56.7	OK
SE1.027	SED2	240 minute 30 year Winter I+0%	42.709	38.218	-1.158	0.000	0.05	56.7	OK

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	14.500
Region	Scotland and Ireland	Ratio R	0.280
Cv (Summer)	0.750		
Cv (Winter)	0.840		

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 10

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Pipe Flow (l/s)	Status
SE1.000	SE19	15 minute 100 year Winter I+10%	45.525	44.197	-0.128	0.000	0.39	13.1	OK
SE1.001	SE18	15 minute 100 year Winter I+10%	45.096	44.143	-0.053	0.000	0.54	18.3	OK
SE1.002	SE17	15 minute 100 year Winter I+10%	44.966	44.106	0.040	0.000	0.93	33.0	SURCHARGED
SE1.003	SE16	30 minute 100 year Winter I+10%	44.586	43.841	0.155	0.000	0.84	28.4	SURCHARGED
SE1.004	SE15	30 minute 100 year Winter I+10%	44.460	43.757	0.197	0.000	1.04	36.7	SURCHARGED
SE1.005	SE14	30 minute 100 year Winter I+10%	44.152	43.477	0.225	0.000	1.07	36.7	SURCHARGED
SE1.006	SE13	30 minute 100 year Winter I+10%	43.987	43.294	0.207	0.000	1.12	38.2	SURCHARGED
SE1.007	SE12	30 minute 100 year Winter I+10%	43.838	43.108	0.170	0.000	1.15	40.4	SURCHARGED
SE1.008	SE11	30 minute 100 year Winter I+10%	43.588	42.778	0.090	0.000	1.24	42.4	SURCHARGED
SE1.009	SE10	30 minute 100 year Winter I+10%	43.420	42.585	0.044	0.000	0.50	57.2	SURCHARGED
SE2.000	SE9.1	15 minute 100 year Winter I+10%	43.503	42.675	-0.055	0.000	0.88	30.9	OK
SE1.010	SE9	30 minute 100 year Winter I+10%	43.255	42.483	0.026	0.000	0.70	74.1	SURCHARGED
SE1.011	SE8	30 minute 100 year Winter I+10%	42.984	42.397	0.092	0.000	0.87	106.6	SURCHARGED
SE3.000	SE7.4	30 minute 100 year Winter I+10%	43.829	42.407	0.118	0.000	0.25	8.1	SURCHARGED
SE3.001	SE7.3	30 minute 100 year Winter I+10%	43.701	42.398	0.201	0.000	0.40	13.8	SURCHARGED
SE3.002	SE7.2	30 minute 100 year Winter I+10%	43.372	42.375	0.361	0.000	0.46	33.4	SURCHARGED
SE3.003	SE7.1	15 minute 100 year Winter I+10%	43.128	42.310	0.471	0.000	0.67	38.4	SURCHARGED
SE1.012	SE7	15 minute 100 year Winter I+10%	43.111	42.300	0.498	0.000	0.74	134.4	SURCHARGED
SE4.000	SE6.3	15 minute 100 year Winter I+10%	44.742	42.525	0.751	0.000	0.48	16.2	SURCHARGED
SE4.001	SE6.2	15 minute 100 year Winter I+10%	44.575	42.493	0.843	0.000	1.35	47.0	SURCHARGED
SE4.002	SE6.1	360 minute 100 year Winter I+10%	43.558	42.290	0.843	0.000	0.22	15.7	SURCHARGED
SE1.013	SE6	360 minute 100 year Winter I+10%	43.626	42.282	1.038	0.000	0.54	68.5	SURCHARGED
SE5.000	SE5.2	15 minute 100 year Winter I+10%	45.157	42.493	0.218	0.000	0.41	21.2	SURCHARGED
SE5.001	SE5.1	15 minute 100 year Winter I+10%	44.990	42.455	0.471	0.000	1.06	60.3	SURCHARGED
SE1.014	SE5	360 minute 100 year Winter I+10%	44.024	42.231	1.271	0.000	0.68	81.0	SURCHARGED
SE1.015	SE4	360 minute 100 year Winter I+10%	43.977	42.228	1.288	0.000	0.51	85.8	SURCHARGED
SE6.000	SE3.6	15 minute 100 year Winter I+10%	44.879	42.779	0.722	0.000	0.70	23.9	SURCHARGED
SE6.001	SE3.5	15 minute 100 year Winter I+10%	44.634	42.723	0.825	0.000	0.66	22.3	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Pipe Flow (l/s)	Status
SE6.002	SE3.4	15 minute 100 year Winter I+10%	44.526	42.670	0.911	0.000	1.50	53.1	SURCHARGED
SE7.000	SE3.3.3	15 minute 100 year Winter I+10%	43.291	42.265	0.424	0.000	1.34	40.7	SURCHARGED
SE8.000	SE3.3.2.1	15 minute 100 year Winter I+10%	43.082	42.267	0.307	0.000	0.88	39.3	SURCHARGED
SE7.001	SE3.3.2	15 minute 100 year Winter I+10%	43.368	42.208	0.416	0.000	0.98	71.2	SURCHARGED
SE7.002	SE3.3.1	360 minute 100 year Winter I+10%	43.806	42.152	0.544	0.000	0.14	14.1	SURCHARGED
SE6.003	SE3.3	360 minute 100 year Winter I+10%	43.717	42.151	0.714	0.000	0.42	35.9	SURCHARGED
SE9.000	SE3.2.2	360 minute 100 year Winter I+10%	43.340	42.149	0.004	0.000	0.00	0.2	SURCHARGED
SE9.001	SE3.2.1	360 minute 100 year Winter I+10%	43.563	42.149	0.406	0.000	0.03	1.9	SURCHARGED
SE6.004	SE3.2	360 minute 100 year Winter I+10%	43.594	42.149	0.736	0.000	0.27	35.8	SURCHARGED
SE10.000	SE3.1.2	15 minute 100 year Winter I+10%	45.097	43.436	0.161	0.000	0.41	22.6	SURCHARGED
SE10.001	SE3.1.1	15 minute 100 year Winter I+10%	45.254	43.387	0.469	0.000	1.21	66.9	SURCHARGED
SE6.005	SE3.1	360 minute 100 year Winter I+10%	43.098	42.139	1.018	0.000	0.38	52.6	SURCHARGED
SE1.016	SE3	360 minute 100 year Winter I+10%	43.809	42.126	1.183	0.000	0.41	138.4	SURCHARGED
SE1.017	SE2	360 minute 100 year Winter I+10%	43.556	41.977	1.281	0.000	0.36	138.4	SURCHARGED
SE11.000	SE110	360 minute 100 year Winter I+10%	42.723	41.918	0.339	0.000	0.12	3.9	SURCHARGED
SE11.001	SE109	360 minute 100 year Winter I+10%	42.713	41.916	0.469	0.000	0.22	7.4	SURCHARGED
SE11.002	SE108	360 minute 100 year Winter I+10%	42.572	41.913	0.617	0.000	0.16	7.4	SURCHARGED
SE12.000	SE107.1	15 minute 100 year Winter I+10%	44.004	43.485	1.460	0.000	1.44	66.9	SURCHARGED
SE11.003	SE107	360 minute 100 year Winter I+10%	42.477	41.911	0.748	0.000	0.49	23.2	SURCHARGED
SE11.004	SE106	360 minute 100 year Winter I+10%	42.446	41.909	0.768	0.000	0.24	27.7	SURCHARGED
SE13.000	SE105.2	15 minute 100 year Winter I+10%	44.286	43.249	-0.091	0.000	0.66	55.5	OK
SE13.001	SE105.1	15 minute 100 year Winter I+10%	43.397	42.226	0.279	0.000	1.01	73.3	SURCHARGED
SE11.005	SE105	360 minute 100 year Winter I+10%	42.709	41.905	0.991	0.000	0.37	41.5	SURCHARGED
SE11.006	SE104	360 minute 100 year Winter I+10%	42.875	41.899	1.116	0.000	0.38	47.8	SURCHARGED
SE11.007	SE103	480 minute 100 year Winter I+10%	42.961	41.894	1.236	0.000	0.37	39.1	SURCHARGED
SE11.008	SE102	480 minute 100 year Winter I+10%	42.855	41.889	1.327	0.000	0.28	39.1	SURCHARGED
SE11.009	SE101	480 minute 100 year Winter I+10%	43.499	41.885	1.366	0.000	0.22	46.5	SURCHARGED
SE14.000	SE208	15 minute 100 year Winter I+10%	44.234	42.449	0.266	0.000	0.98	36.0	SURCHARGED
SE14.001	SE207	15 minute 100 year Winter I+10%	43.158	42.062	0.244	0.000	1.99	64.6	SURCHARGED
SE14.002	SE206	360 minute 100 year Winter I+10%	42.916	41.901	0.285	0.000	0.27	16.5	SURCHARGED
SE14.003	SE205	360 minute 100 year Winter I+10%	42.996	41.899	0.337	0.000	0.22	16.5	SURCHARGED
SE14.004	SE204	480 minute 100 year Winter I+10%	43.252	41.894	0.560	0.000	0.08	13.5	SURCHARGED
SE15.000	SE203.3	360 minute 100 year Winter I+10%	43.748	41.901	0.558	0.000	0.09	3.3	SURCHARGED
SE16.000	SE203.2.1	360 minute 100 year Winter I+10%	43.921	41.904	0.267	0.000	0.15	6.2	SURCHARGED
SE15.001	SE203.2	360 minute 100 year Winter I+10%	43.571	41.900	0.708	0.000	0.25	18.5	SURCHARGED
SE15.002	SE203.1	360 minute 100 year Winter I+10%	43.308	41.896	0.911	0.000	0.30	18.5	SURCHARGED
SE14.005	SE203	480 minute 100 year Winter I+10%	43.301	41.893	0.970	0.000	0.28	31.2	SURCHARGED
SE17.000	SE202.8	15 minute 100 year Winter I+10%	45.450	44.176	0.712	0.000	1.03	36.5	SURCHARGED
SE17.001	SE202.7	15 minute 100 year Winter I+10%	44.452	43.936	0.785	0.000	1.18	33.3	SURCHARGED
SE17.002	SE202.6	15 minute 100 year Winter I+10%	44.354	43.872	0.754	0.000	1.25	61.4	SURCHARGED
SE18.000	SE202.5.2	15 minute 100 year Winter I+10%	45.321	43.493	-0.059	0.000	0.24	8.1	OK
SE18.001	SE202.5.1	15 minute 100 year Winter I+10%	45.268	43.473	0.066	0.000	1.05	78.9	SURCHARGED
SE17.003	SE202.5	15 minute 100 year Winter I+10%	43.630	43.021	0.445	0.000	1.13	135.0	SURCHARGED
SE19.000	SE202.4.1	15 minute 100 year Winter I+10%	42.867	42.540	0.216	0.000	0.98	34.2	SURCHARGED
SE17.004	SE202.4	15 minute 100 year Winter I+10%	43.693	42.420	0.317	0.000	1.37	175.4	SURCHARGED
SE20.000	SE202.3.2	15 minute 100 year Winter I+10%	44.966	43.541	0.868	0.000	0.37	12.9	SURCHARGED
SE20.001	SE202.3.1	15 minute 100 year Winter I+10%	44.657	43.514	1.006	0.000	1.48	58.4	SURCHARGED
SE17.005	SE202.3	15 minute 100 year Winter I+10%	43.498	42.066	0.157	0.000	1.14	230.2	SURCHARGED
SE21.000	SE202.2.1	360 minute 100 year Winter I+10%	43.585	41.915	-0.023	0.000	0.13	4.5	OK
SE17.006	SE202.2	360 minute 100 year Winter I+10%	43.647	41.910	0.201	0.000	0.38	64.8	SURCHARGED
SE22.000	SE202.1.1	15 minute 100 year Winter I+10%	44.390	43.234	0.526	0.000	1.42	50.9	SURCHARGED
SE17.007	SE202.1	360 minute 100 year Winter I+10%	43.687	41.896	0.256	0.000	0.21	78.6	SURCHARGED
SE14.006	SE202	480 minute 100 year Winter I+10%	43.478	41.889	1.089	0.000	0.31	95.4	SURCHARGED
SE14.007	SE201	480 minute 100 year Winter I+10%	43.740	41.886	1.167	0.000	0.30	95.4	SURCHARGED
SE1.018	SE1	480 minute 100 year Winter I+10%	43.535	41.882	1.958	0.000	0.07	56.7	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Pipe Flow (l/s)	Status
SE1.019	SE0	2160 minute 100 year Summer I+10%	43.340	39.151	-0.160	0.000	0.63	56.7	OK
SE23.000	SED11	15 minute 100 year Summer I+10%	43.024	38.750	-1.350	0.000	0.00	0.0	OK
SE23.001	SED10	15 minute 100 year Summer I+10%	43.102	38.727	-1.350	0.000	0.00	0.0	OK
SE1.020	SED9	2160 minute 100 year Summer I+10%	43.458	38.670	-1.167	0.000	0.03	56.7	OK
SE1.021	SED8	2160 minute 100 year Summer I+10%	43.627	38.578	-1.122	0.000	0.04	56.7	OK
SE1.022	SED7	2160 minute 100 year Summer I+10%	43.176	38.540	-1.101	0.000	0.06	56.7	OK
SE1.023	SED6	2160 minute 100 year Summer I+10%	42.898	38.502	-1.112	0.000	0.07	56.7	OK
SE1.024	SED5	2160 minute 100 year Summer I+10%	42.837	38.423	-1.168	0.000	0.03	56.7	OK
SE1.025	SED4	2160 minute 100 year Summer I+10%	42.403	38.330	-1.117	0.000	0.07	56.7	OK
SE1.026	SED3	2160 minute 100 year Summer I+10%	42.528	38.274	-1.149	0.000	0.04	56.7	OK
SE1.027	SED2	2160 minute 100 year Summer I+10%	42.709	38.218	-1.158	0.000	0.05	56.7	OK

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Water West

Pipe Sizes DBFL SW Manhole Sizes Test MH

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	PIMP (%)	63
M5-60 (mm)	14.500	Add Flow / Climate Change (%)	0
Ratio R	0.280	Minimum Backdrop Height (m)	0.500
Maximum Rainfall (mm/hr)	150	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	0.75
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	300

Designed with Level Soffits

Network Design Table for Surface Water West

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
SW1.000	60.742	0.304	199.8	0.181	4.00	0.0	0.600	o	225	Pipe/Conduit	
SW2.000	17.965	0.090	199.6	0.159	4.00	0.0	0.600	o	225	Pipe/Conduit	
SW1.001	62.592	0.383	163.4	0.046	0.00	0.0	0.600	o	300	Pipe/Conduit	
SW3.000	26.570	0.133	199.8	0.142	4.00	0.0	0.600	o	225	Pipe/Conduit	
SW3.001	29.561	0.148	199.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SW3.002	35.664	0.178	200.4	0.011	0.00	0.0	0.600	o	225	Pipe/Conduit	
SW3.003	15.290	0.076	201.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SW4.000	28.691	0.143	200.6	0.029	4.00	0.0	0.600	o	300	Pipe/Conduit	
SW3.004	17.830	0.089	200.3	0.058	0.00	0.0	0.600	o	300	Pipe/Conduit	
SW1.002	39.562	0.105	376.8	0.032	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)
SW1.000	43.68	5.10	42.401	0.181	0.0	0.0	0.0	0.92	36.6	21.4
SW2.000	46.35	4.32	42.187	0.159	0.0	0.0	0.0	0.92	36.7	20.0
SW1.001	41.15	5.95	42.022	0.386	0.0	0.0	0.0	1.23	86.7	43.0
SW3.000	45.78	4.48	41.467	0.142	0.0	0.0	0.0	0.92	36.6	17.6
SW3.001	43.95	5.02	41.334	0.142	0.0	0.0	0.0	0.92	36.6	17.6
SW3.002	41.96	5.66	41.186	0.153	0.0	0.0	0.0	0.92	36.6	17.6
SW3.003	41.18	5.94	41.008	0.153	0.0	0.0	0.0	0.92	36.5	17.6
SW4.000	45.95	4.43	41.000	0.029	0.0	0.0	0.0	1.11	78.2	3.6
SW3.004	40.45	6.21	40.857	0.240	0.0	0.0	0.0	1.11	78.3	26.3
SW1.002	38.68	6.92	40.418	0.658	0.0	0.0	0.0	0.93	102.4	68.9

Network Design Table for Surface Water West

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
SW5.000	33.458	0.169	198.0	0.193	4.00	0.0	0.600	o	225	Pipe/Conduit	
SW1.003	35.948	0.096	374.5	0.135	0.00	0.0	0.600	o	375	Pipe/Conduit	
SW1.004	60.476	0.233	259.6	0.153	0.00	0.0	0.600	o	375	Pipe/Conduit	
SW6.000	16.462	0.082	200.8	0.104	4.00	0.0	0.600	o	225	Pipe/Conduit	
SW6.001	12.923	0.065	198.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SW6.002	19.840	0.099	200.4	0.105	0.00	0.0	0.600	o	225	Pipe/Conduit	
SW6.003	19.047	0.063	302.3	0.070	0.00	0.0	0.600	o	300	Pipe/Conduit	
SW7.000	21.364	0.302	70.7	0.139	4.00	0.0	0.600	o	225	Pipe/Conduit	
SW6.004	16.996	0.057	298.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
SW6.005	15.667	0.052	301.3	0.026	0.00	0.0	0.600	o	300	Pipe/Conduit	
SW6.006	30.682	0.082	374.2	0.084	0.00	0.0	0.600	o	300	Pipe/Conduit	
SW6.007	35.929	0.240	149.7	0.046	0.00	0.0	0.600	o	375	Pipe/Conduit	
SW1.005	33.355	0.180	185.3	0.043	0.00	0.0	0.600	o	525	Pipe/Conduit	
SW1.006	40.000	0.203	197.0	0.149	0.00	0.0	0.600	o	525	Pipe/Conduit	
SW1.007	42.384	0.241	175.9	0.078	0.00	0.0	0.600	o	525	Pipe/Conduit	
SW1.008	8.669	0.019	456.3	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
SW1.009	11.000	0.027	407.4	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
SW1.010	35.860	0.097	369.7	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
SW8.000	33.499	0.156	214.7	0.069	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)
SW5.000	45.34	4.60	42.004	0.193	0.0	0.0	0.0	0.93	36.8	23.7
SW1.003	37.23	7.56	40.313	0.986	0.0	0.0	0.0	0.93	102.8	99.4
SW1.004	35.41	8.46	40.217	1.139	0.0	0.0	0.0	1.12	123.7	109.2
SW6.000	46.44	4.30	40.874	0.104	0.0	0.0	0.0	0.92	36.5	13.1
SW6.001	45.59	4.53	40.792	0.104	0.0	0.0	0.0	0.92	36.7	13.1
SW6.002	44.36	4.89	40.727	0.209	0.0	0.0	0.0	0.92	36.6	25.0
SW6.003	43.22	5.24	40.553	0.278	0.0	0.0	0.0	0.90	63.5	32.6
SW7.000	46.71	4.23	42.609	0.139	0.0	0.0	0.0	1.56	61.9	17.5
SW6.004	42.27	5.56	40.490	0.417	0.0	0.0	0.0	0.91	64.0	47.7
SW6.005	41.43	5.85	40.433	0.443	0.0	0.0	0.0	0.90	63.7	49.7
SW6.006	39.75	6.48	40.381	0.527	0.0	0.0	0.0	0.81	57.0	56.8
SW6.007	38.75	6.89	40.224	0.573	0.0	0.0	0.0	1.48	163.3	60.2
SW1.005	34.78	8.80	39.834	1.755	0.0	0.0	0.0	1.64	355.5	165.3
SW1.006	34.05	9.22	39.654	1.904	0.0	0.0	0.0	1.59	344.7	175.5
SW1.007	33.34	9.64	39.451	1.982	0.0	0.0	0.0	1.69	365.0	179.0
SW1.008	33.12	9.78	39.210	1.982	0.0	0.0	0.0	1.04	225.6	179.0
SW1.009	32.86	9.94	39.191	1.982	0.0	0.0	0.0	1.10	238.9	179.0
SW1.010	32.07	10.46	39.164	1.982	0.0	0.0	0.0	1.16	250.9	179.0
SW8.000	45.25	4.63	41.132	0.069	0.0	0.0	0.0	0.89	35.3	8.5

Network Design Table for Surface Water West

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
SW8.001	73.438	0.805	91.2	0.206	0.00	0.0	0.600	o	225	Pipe/Conduit	
SW9.000	24.056	0.120	200.5	0.076	4.00	0.0	0.600	o	225	Pipe/Conduit	
SW9.001	24.100	0.121	199.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SW8.002	20.660	0.207	99.8	0.010	0.00	0.0	0.600	o	225	Pipe/Conduit	
SW1.011	23.419	0.110	212.9	0.105	0.00	0.0	0.600	o	525	Pipe/Conduit	
SW1.012	21.809	0.149	146.4	0.073	0.00	0.0	0.600	o	525	Pipe/Conduit	
SW1.013	13.714	0.069	198.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
SW8.001	42.37	5.52	40.976	0.275	0.0	0.0	0.0	1.37	54.5	31.6
SW9.000	45.94	4.44	40.412	0.076	0.0	0.0	0.0	0.92	36.6	9.5
SW9.001	44.42	4.87	40.292	0.076	0.0	0.0	0.0	0.92	36.7	9.5
SW8.002	41.61	5.79	40.171	0.362	0.0	0.0	0.0	1.31	52.0	40.8
SW1.011	31.70	10.71	39.067	2.449	0.0	0.0	0.0	1.53	331.5	210.2
SW1.012	31.42	10.91	38.957	2.522	0.0	0.0	0.0	1.85	400.3	214.6
SW1.013	46.64	4.25	38.808	0.000	20.7	0.0	0.0	0.92	36.7	20.7

Manhole Schedules for Surface Water West

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)
SW14	43.840	1.439	Open Manhole	1200	SW1.000	42.401	225				
SW13.1	43.166	0.979	Open Manhole	1200	SW2.000	42.187	225				
SW13	43.562	1.540	Open Manhole	1200	SW1.001	42.022	300	SW1.000	42.097	225	
								SW2.000	42.097	225	
SW12.5	42.642	1.175	Open Manhole	1200	SW3.000	41.467	225				
SW12.4	42.431	1.097	Open Manhole	1200	SW3.001	41.334	225	SW3.000	41.334	225	
SW12.3	42.399	1.213	Open Manhole	1200	SW3.002	41.186	225	SW3.001	41.186	225	
SW12.2	42.767	1.759	Open Manhole	1200	SW3.003	41.008	225	SW3.002	41.008	225	
SW12.1.1	42.142	1.142	Open Manhole	1200	SW4.000	41.000	300				
SW12.1	42.992	2.135	Open Manhole	1200	SW3.004	40.857	300	SW3.003	40.932	225	
								SW4.000	40.857	300	
SW12	43.148	2.730	Open Manhole	1200	SW1.002	40.418	375	SW1.001	41.639	300	1146
								SW3.004	40.768	300	275
SW11.1	43.421	1.417	Open Manhole	1200	SW5.000	42.004	225				
SW11	43.028	2.715	Open Manhole	1500	SW1.003	40.313	375	SW1.002	40.313	375	
								SW5.000	41.835	225	1372
SW10	43.011	2.794	Open Manhole	1500	SW1.004	40.217	375	SW1.003	40.217	375	
SW9.8	43.603	2.729	Open Manhole	1200	SW6.000	40.874	225				
SW9.7	43.829	3.037	Open Manhole	1200	SW6.001	40.792	225	SW6.000	40.792	225	
SW9.6	44.131	3.404	Open Manhole	1200	SW6.002	40.727	225	SW6.001	40.727	225	
SW9.5	44.388	3.835	Open Manhole	1200	SW6.003	40.553	300	SW6.002	40.628	225	
SW9.4.1	44.152	1.543	Open Manhole	1200	SW7.000	42.609	225				
SW9.4	44.290	3.800	Open Manhole	1200	SW6.004	40.490	300	SW6.003	40.490	300	
								SW7.000	42.307	225	1742
SW9.3	43.919	3.486	Open Manhole	1200	SW6.005	40.433	300	SW6.004	40.433	300	
SW9.2	43.636	3.255	Open Manhole	1200	SW6.006	40.381	300	SW6.005	40.381	300	
SW9.1	43.043	2.819	Open Manhole	1200	SW6.007	40.224	375	SW6.006	40.299	300	
SW9	42.657	2.823	Open Manhole	1500	SW1.005	39.834	525	SW1.004	39.984	375	
								SW6.007	39.984	375	
SW8	42.481	2.827	Open Manhole	1500	SW1.006	39.654	525	SW1.005	39.654	525	
SW7	42.175	2.724	Open Manhole	1500	SW1.007	39.451	525	SW1.006	39.451	525	
SW6	41.858	2.648	Open Manhole	1500	SW1.008	39.210	525	SW1.007	39.210	525	
SW5	41.827	2.636	Open Manhole	1500	SW1.009	39.191	525	SW1.008	39.191	525	
SW4	41.738	2.574	Open Manhole	1500	SW1.010	39.164	525	SW1.009	39.164	525	
SW3.3	42.554	1.422	Open Manhole	1200	SW8.000	41.132	225				
SW3.2	42.488	1.512	Open Manhole	1200	SW8.001	40.976	225	SW8.000	40.976	225	
SW3.1.2	42.090	1.678	Open Manhole	1200	SW9.000	40.412	225				
SW3.1.1	41.568	1.276	Open Manhole	1200	SW9.001	40.292	225	SW9.000	40.292	225	
SW3.1	41.392	1.221	Open Manhole	1200	SW8.002	40.171	225	SW8.001	40.171	225	
								SW9.001	40.171	225	
SW3	41.648	2.581	Open Manhole	1500	SW1.011	39.067	525	SW1.010	39.067	525	
								SW8.002	39.964	225	597
SWATTN	41.655	2.698	Open Manhole	1800	SW1.012	38.957	525	SW1.011	38.957	525	
SW2	42.000	3.192	Open Manhole	1800	SW1.013	38.808	225	SW1.012	38.808	525	

Manhole Schedules for Surface Water West

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)
SW1	41.722	2.983	Open Manhole	2100		OUTFALL		SW1.013	38.739	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW14	605568.065	741921.765	605568.065	741921.765	Required	
SW13.1	605631.403	741922.531	605631.403	741922.531	Required	
SW13	605626.516	741905.243	605626.516	741905.243	Required	
SW12.5	605705.812	741798.009	605705.812	741798.009	Required	
SW12.4	605680.041	741804.474	605680.041	741804.474	Required	
SW12.3	605651.589	741812.498	605651.589	741812.498	Required	
SW12.2	605617.333	741822.418	605617.333	741822.418	Required	
SW12.1.1	605584.569	741806.547	605584.569	741806.547	Required	
SW12.1	605603.235	741828.336	605603.235	741828.336	Required	
SW12	605609.705	741844.952	605609.705	741844.952	Required	
SW11.1	605580.684	741887.730	605580.684	741887.730	Required	
SW11	605571.584	741855.534	605571.584	741855.534	Required	
SW10	605536.997	741865.332	605536.997	741865.332	Required	
SW9.8	605534.727	742029.072	605534.727	742029.072	Required	
SW9.7	605520.033	742021.650	605520.033	742021.650	Required	
SW9.6	605523.470	742009.193	605523.470	742009.193	Required	

Manhole Schedules for Surface Water West

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW9.5	605523.394	741989.354	605523.394	741989.354	Required	
SW9.4.1	605532.302	741950.570	605532.302	741950.570	Required	
SW9.4	605524.160	741970.322	605524.160	741970.322	Required	
SW9.3	605509.004	741962.632	605509.004	741962.632	Required	
SW9.2	605502.600	741948.332	605502.600	741948.332	Required	
SW9.1	605492.031	741919.528	605492.031	741919.528	Required	
SW9	605480.040	741885.660	605480.040	741885.660	Required	
SW8	605466.232	741855.297	605466.232	741855.297	Required	
SW7	605451.410	741818.144	605451.410	741818.144	Required	
SW6	605435.372	741778.912	605435.372	741778.912	Required	
SW5	605440.533	741771.946	605440.533	741771.946	Required	
SW4	605450.942	741768.387	605450.942	741768.387	Required	
SW3.3	605493.346	741832.655	605493.346	741832.655	Required	
SW3.2	605525.645	741823.768	605525.645	741823.768	Required	
SW3.1.2	605521.891	741723.470	605521.891	741723.470	Required	
SW3.1.1	605498.742	741730.013	605498.742	741730.013	Required	
SW3.1	605505.378	741753.182	605505.378	741753.182	Required	
SW3	605485.453	741758.644	605485.453	741758.644	Required	
SWATTN	605462.897	741752.345	605462.897	741752.345	Required	

Manhole Schedules for Surface Water West

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW2	605441.580	741756.950	605441.580	741756.950	Required	
SW1	605428.790	741761.900			No Entry	

PIPELINE SCHEDULES for Surface Water West

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)
SW1.000	o	225	SW14	43.840	42.401	1.214	Open Manhole	1200
SW2.000	o	225	SW13.1	43.166	42.187	0.754	Open Manhole	1200
SW1.001	o	300	SW13	43.562	42.022	1.240	Open Manhole	1200
SW3.000	o	225	SW12.5	42.642	41.467	0.950	Open Manhole	1200
SW3.001	o	225	SW12.4	42.431	41.334	0.872	Open Manhole	1200
SW3.002	o	225	SW12.3	42.399	41.186	0.988	Open Manhole	1200
SW3.003	o	225	SW12.2	42.767	41.008	1.534	Open Manhole	1200
SW4.000	o	300	SW12.1.1	42.142	41.000	0.842	Open Manhole	1200
SW3.004	o	300	SW12.1	42.992	40.857	1.835	Open Manhole	1200
SW1.002	o	375	SW12	43.148	40.418	2.355	Open Manhole	1200
SW5.000	o	225	SW11.1	43.421	42.004	1.192	Open Manhole	1200
SW1.003	o	375	SW11	43.028	40.313	2.340	Open Manhole	1500
SW1.004	o	375	SW10	43.011	40.217	2.419	Open Manhole	1500
SW6.000	o	225	SW9.8	43.603	40.874	2.504	Open Manhole	1200
SW6.001	o	225	SW9.7	43.829	40.792	2.812	Open Manhole	1200
SW6.002	o	225	SW9.6	44.131	40.727	3.179	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)
SW1.000	60.742	199.8	SW13	43.562	42.097	1.240	Open Manhole	1200
SW2.000	17.965	199.6	SW13	43.562	42.097	1.240	Open Manhole	1200
SW1.001	62.592	163.4	SW12	43.148	41.639	1.209	Open Manhole	1200
SW3.000	26.570	199.8	SW12.4	42.431	41.334	0.872	Open Manhole	1200
SW3.001	29.561	199.7	SW12.3	42.399	41.186	0.988	Open Manhole	1200
SW3.002	35.664	200.4	SW12.2	42.767	41.008	1.534	Open Manhole	1200
SW3.003	15.290	201.2	SW12.1	42.992	40.932	1.835	Open Manhole	1200
SW4.000	28.691	200.6	SW12.1	42.992	40.857	1.835	Open Manhole	1200
SW3.004	17.830	200.3	SW12	43.148	40.768	2.080	Open Manhole	1200
SW1.002	39.562	376.8	SW11	43.028	40.313	2.340	Open Manhole	1500
SW5.000	33.458	198.0	SW11	43.028	41.835	0.968	Open Manhole	1500
SW1.003	35.948	374.5	SW10	43.011	40.217	2.419	Open Manhole	1500
SW1.004	60.476	259.6	SW9	42.657	39.984	2.298	Open Manhole	1500
SW6.000	16.462	200.8	SW9.7	43.829	40.792	2.812	Open Manhole	1200
SW6.001	12.923	198.8	SW9.6	44.131	40.727	3.179	Open Manhole	1200
SW6.002	19.840	200.4	SW9.5	44.388	40.628	3.535	Open Manhole	1200

PIPELINE SCHEDULES for Surface Water West

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)
SW6.003	o	300	SW9.5	44.388	40.553	3.535	Open Manhole	1200
SW7.000	o	225	SW9.4.1	44.152	42.609	1.318	Open Manhole	1200
SW6.004	o	300	SW9.4	44.290	40.490	3.500	Open Manhole	1200
SW6.005	o	300	SW9.3	43.919	40.433	3.186	Open Manhole	1200
SW6.006	o	300	SW9.2	43.636	40.381	2.955	Open Manhole	1200
SW6.007	o	375	SW9.1	43.043	40.224	2.444	Open Manhole	1200
SW1.005	o	525	SW9	42.657	39.834	2.298	Open Manhole	1500
SW1.006	o	525	SW8	42.481	39.654	2.302	Open Manhole	1500
SW1.007	o	525	SW7	42.175	39.451	2.199	Open Manhole	1500
SW1.008	o	525	SW6	41.858	39.210	2.123	Open Manhole	1500
SW1.009	o	525	SW5	41.827	39.191	2.111	Open Manhole	1500
SW1.010	o	525	SW4	41.738	39.164	2.049	Open Manhole	1500
SW8.000	o	225	SW3.3	42.554	41.132	1.197	Open Manhole	1200
SW8.001	o	225	SW3.2	42.488	40.976	1.287	Open Manhole	1200
SW9.000	o	225	SW3.1.2	42.090	40.412	1.453	Open Manhole	1200
SW9.001	o	225	SW3.1.1	41.568	40.292	1.051	Open Manhole	1200
SW8.002	o	225	SW3.1	41.392	40.171	0.996	Open Manhole	1200
SW1.011	o	525	SW3	41.648	39.067	2.056	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)
SW6.003	19.047	302.3	SW9.4	44.290	40.490	3.500	Open Manhole	1200
SW7.000	21.364	70.7	SW9.4	44.290	42.307	1.758	Open Manhole	1200
SW6.004	16.996	298.2	SW9.3	43.919	40.433	3.186	Open Manhole	1200
SW6.005	15.667	301.3	SW9.2	43.636	40.381	2.955	Open Manhole	1200
SW6.006	30.682	374.2	SW9.1	43.043	40.299	2.444	Open Manhole	1200
SW6.007	35.929	149.7	SW9	42.657	39.984	2.298	Open Manhole	1500
SW1.005	33.355	185.3	SW8	42.481	39.654	2.302	Open Manhole	1500
SW1.006	40.000	197.0	SW7	42.175	39.451	2.199	Open Manhole	1500
SW1.007	42.384	175.9	SW6	41.858	39.210	2.123	Open Manhole	1500
SW1.008	8.669	456.3	SW5	41.827	39.191	2.111	Open Manhole	1500
SW1.009	11.000	407.4	SW4	41.738	39.164	2.049	Open Manhole	1500
SW1.010	35.860	369.7	SW3	41.648	39.067	2.056	Open Manhole	1500
SW8.000	33.499	214.7	SW3.2	42.488	40.976	1.287	Open Manhole	1200
SW8.001	73.438	91.2	SW3.1	41.392	40.171	0.996	Open Manhole	1200
SW9.000	24.056	200.5	SW3.1.1	41.568	40.292	1.051	Open Manhole	1200
SW9.001	24.100	199.2	SW3.1	41.392	40.171	0.996	Open Manhole	1200
SW8.002	20.660	99.8	SW3	41.648	39.964	1.459	Open Manhole	1500
SW1.011	23.419	212.9	SWATTN	41.655	38.957	2.173	Open Manhole	1800

PIPELINE SCHEDULES for Surface Water West

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)
SW1.012	o	525	SWATTN	41.655	38.957	2.173	Open Manhole	1800
SW1.013	o	225	SW2	42.000	38.808	2.967	Open Manhole	1800

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)
SW1.012	21.809	146.4	SW2	42.000	38.808	2.667	Open Manhole	1800
SW1.013	13.714	198.8	SW1	41.722	38.739	2.758	Open Manhole	2100

Free Flowing Outfall Details for Surface Water West

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
SW1.013	SW1	41.722	38.739	39.176	2100	0

Simulation Criteria for Surface Water West

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	14.500	Storm Duration (mins)	30
Ratio R	0.280		

Online Controls for Surface Water West

Hydro-Brake® Optimum Manhole: SW2, DS/PN: SW1.013, Volume (m³): 12.5

Unit Reference	MD-SHE-0184-2070-2200-2070
Design Head (m)	2.200
Design Flow (l/s)	20.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	184
Invert Level (m)	38.808
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.200	20.7	Kick-Flo®	1.335	16.3
Flush-Flo™	0.631	20.7	Mean Flow over Head Range	-	18.0

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)
0.100	6.5	0.800	20.5	2.000	19.8	4.000	27.5	7.000	36.1
0.200	16.6	1.000	19.8	2.200	20.7	4.500	29.1	7.500	37.3
0.300	18.8	1.200	18.3	2.400	21.6	5.000	30.7	8.000	38.5
0.400	19.9	1.400	16.7	2.600	22.4	5.500	32.1	8.500	39.6
0.500	20.5	1.600	17.8	3.000	24.0	6.000	33.5	9.000	40.7
0.600	20.7	1.800	18.8	3.500	25.8	6.500	34.8	9.500	41.8

Storage Structures for Surface Water West

Tank or Pond Manhole: SWATTN, DS/PN: SW1.012

Invert Level (m) 38.960

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	475.0	1.101	0.0	1.600	605.4	2.200	887.1	2.800	1157.1
0.200	475.0	1.200	0.0	1.700	649.2	2.300	938.6	2.900	1157.1
0.400	475.0	1.300	0.0	1.800	694.2	2.400	991.3		
0.600	475.0	1.400	0.0	1.900	740.5	2.500	1045.3		
0.800	475.0	1.500	0.0	2.000	788.1	2.600	1100.5		
1.100	475.0	1.599	0.0	2.100	837.0	2.700	1157.1		

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Water West

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm) 14.500 Cv (Summer)	0.750
Region	Scotland and Ireland	Ratio R 0.280 Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 10

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Pipe Flow (l/s)	Status
SW1.000	SW14	15 minute 1 year Winter I+0%	43.840	42.519	-0.107	0.000	0.51	17.9	OK
SW2.000	SW13.1	15 minute 1 year Winter I+0%	43.166	42.301	-0.111	0.000	0.51	16.7	OK
SW1.001	SW13	15 minute 1 year Winter I+0%	43.562	42.166	-0.156	0.000	0.46	37.9	OK
SW3.000	SW12.5	15 minute 1 year Winter I+0%	42.642	41.572	-0.120	0.000	0.43	14.8	OK
SW3.001	SW12.4	15 minute 1 year Winter I+0%	42.431	41.437	-0.122	0.000	0.43	14.5	OK
SW3.002	SW12.3	15 minute 1 year Winter I+0%	42.399	41.291	-0.120	0.000	0.44	15.0	OK
SW3.003	SW12.2	15 minute 1 year Winter I+0%	42.767	41.116	-0.117	0.000	0.46	14.7	OK
SW4.000	SW12.1.1	15 minute 1 year Winter I+0%	42.142	41.040	-0.260	0.000	0.04	3.0	OK
SW3.004	SW12.1	15 minute 1 year Winter I+0%	42.992	40.972	-0.185	0.000	0.31	21.1	OK
SW1.002	SW12	15 minute 1 year Winter I+0%	43.148	40.658	-0.135	0.000	0.64	59.2	OK
SW5.000	SW11.1	15 minute 1 year Winter I+0%	43.421	42.129	-0.100	0.000	0.59	20.2	OK
SW1.003	SW11	15 minute 1 year Winter I+0%	43.028	40.594	-0.094	0.000	0.89	82.7	OK
SW1.004	SW10	15 minute 1 year Winter I+0%	43.011	40.471	-0.121	0.000	0.77	89.2	OK
SW6.000	SW9.8	15 minute 1 year Winter I+0%	43.603	40.964	-0.135	0.000	0.34	11.0	OK
SW6.001	SW9.7	15 minute 1 year Winter I+0%	43.829	40.888	-0.129	0.000	0.34	10.7	OK
SW6.002	SW9.6	15 minute 1 year Winter I+0%	44.131	40.852	-0.100	0.000	0.59	19.5	OK
SW6.003	SW9.5	15 minute 1 year Winter I+0%	44.388	40.719	-0.134	0.000	0.45	24.5	OK
SW7.000	SW9.4.1	15 minute 1 year Summer I+0%	44.152	42.687	-0.147	0.000	0.26	14.7	OK
SW6.004	SW9.4	15 minute 1 year Winter I+0%	44.290	40.682	-0.108	0.000	0.67	36.5	OK
SW6.005	SW9.3	15 minute 1 year Winter I+0%	43.919	40.635	-0.098	0.000	0.71	38.1	OK
SW6.006	SW9.2	15 minute 1 year Winter I+0%	43.636	40.595	-0.086	0.000	0.84	43.6	OK
SW6.007	SW9.1	15 minute 1 year Winter I+0%	43.043	40.369	-0.230	0.000	0.31	46.3	OK
SW1.005	SW9	15 minute 1 year Winter I+0%	42.657	40.082	-0.277	0.000	0.45	135.6	OK
SW1.006	SW8	15 minute 1 year Winter I+0%	42.481	39.911	-0.268	0.000	0.48	143.1	OK
SW1.007	SW7	15 minute 1 year Winter I+0%	42.175	39.747	-0.229	0.000	0.44	139.9	OK
SW1.008	SW6	15 minute 1 year Winter I+0%	41.858	39.689	-0.046	0.000	1.10	133.8	OK
SW1.009	SW5	15 minute 1 year Winter I+0%	41.827	39.599	-0.117	0.000	0.96	133.5	OK
SW1.010	SW4	15 minute 1 year Winter I+0%	41.738	39.464	-0.225	0.000	0.62	133.3	OK

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Water West

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Pipe Flow (l/s)	Status
SW8.000	SW3.3	15 minute 1 year Winter I+0%	42.554	41.203	-0.154	0.000	0.21	7.1	OK
SW8.001	SW3.2	15 minute 1 year Winter I+0%	42.488	41.084	-0.117	0.000	0.44	23.5	OK
SW9.000	SW3.1.2	15 minute 1 year Winter I+0%	42.090	40.486	-0.151	0.000	0.24	8.0	OK
SW9.001	SW3.1.1	15 minute 1 year Winter I+0%	41.568	40.366	-0.151	0.000	0.23	7.9	OK
SW8.002	SW3.1	15 minute 1 year Winter I+0%	41.392	40.307	-0.089	0.000	0.68	32.0	OK
SW1.011	SW3	30 minute 1 year Winter I+0%	41.648	39.356	-0.236	0.000	0.58	148.7	OK
SW1.012	SWATTN	180 minute 1 year Winter I+0%	41.655	39.317	-0.165	0.000	0.07	21.2	OK
SW1.013	SW2	180 minute 1 year Winter I+0%	42.000	39.300	0.267	0.000	0.64	20.4	SURCHARGED

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm) 14.500 Cv (Summer)	0.750
Region	Scotland and Ireland	Ratio R 0.280 Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 10

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Pipe Flow (l/s)	Status
SW1.000	SW14	15 minute 30 year Winter I+0%	43.840	42.710	0.084	0.000	1.08	38.1	SURCHARGED
SW2.000	SW13.1	15 minute 30 year Winter I+0%	43.166	42.426	0.014	0.000	1.07	35.2	SURCHARGED
SW1.001	SW13	15 minute 30 year Winter I+0%	43.562	42.261	-0.061	0.000	1.00	82.5	OK
SW3.000	SW12.5	15 minute 30 year Winter I+0%	42.642	41.644	-0.048	0.000	0.96	32.7	OK
SW3.001	SW12.4	15 minute 30 year Winter I+0%	42.431	41.558	-0.001	0.000	0.93	31.9	OK
SW3.002	SW12.3	15 minute 30 year Winter I+0%	42.399	41.519	0.108	0.000	0.85	29.4	SURCHARGED
SW3.003	SW12.2	15 minute 30 year Winter I+0%	42.767	41.447	0.214	0.000	0.96	31.0	SURCHARGED
SW4.000	SW12.1.1	15 minute 30 year Winter I+0%	42.142	41.396	0.096	0.000	0.09	6.3	SURCHARGED
SW3.004	SW12.1	15 minute 30 year Winter I+0%	42.992	41.393	0.236	0.000	0.79	53.1	SURCHARGED
SW1.002	SW12	15 minute 30 year Winter I+0%	43.148	41.304	0.511	0.000	1.17	109.1	SURCHARGED
SW5.000	SW11.1	15 minute 30 year Winter I+0%	43.421	42.326	0.097	0.000	1.26	43.7	SURCHARGED
SW1.003	SW11	15 minute 30 year Winter I+0%	43.028	41.150	0.462	0.000	1.68	155.1	SURCHARGED
SW1.004	SW10	15 minute 30 year Winter I+0%	43.011	40.883	0.291	0.000	1.47	170.4	SURCHARGED
SW6.000	SW9.8	15 minute 30 year Winter I+0%	43.603	41.391	0.292	0.000	0.60	19.5	SURCHARGED
SW6.001	SW9.7	15 minute 30 year Winter I+0%	43.829	41.342	0.325	0.000	0.61	19.3	SURCHARGED
SW6.002	SW9.6	15 minute 30 year Winter I+0%	44.131	41.307	0.355	0.000	1.12	37.1	SURCHARGED
SW6.003	SW9.5	15 minute 30 year Winter I+0%	44.388	41.177	0.324	0.000	0.90	49.4	SURCHARGED
SW7.000	SW9.4.1	15 minute 30 year Summer I+0%	44.152	42.732	-0.102	0.000	0.58	32.6	OK
SW6.004	SW9.4	15 minute 30 year Winter I+0%	44.290	41.102	0.312	0.000	1.39	75.7	SURCHARGED
SW6.005	SW9.3	15 minute 30 year Winter I+0%	43.919	40.989	0.256	0.000	1.50	80.5	SURCHARGED
SW6.006	SW9.2	15 minute 30 year Winter I+0%	43.636	40.871	0.190	0.000	1.81	93.9	SURCHARGED
SW6.007	SW9.1	15 minute 30 year Winter I+0%	43.043	40.452	-0.147	0.000	0.67	99.2	OK
SW1.005	SW9	240 minute 30 year Winter I+0%	42.657	40.338	-0.021	0.000	0.30	90.6	OK
SW1.006	SW8	240 minute 30 year Winter I+0%	42.481	40.236	0.057	0.000	0.33	98.1	SURCHARGED
SW1.007	SW7	240 minute 30 year Winter I+0%	42.175	40.112	0.136	0.000	0.31	100.0	SURCHARGED
SW1.008	SW6	360 minute 30 year Winter I+0%	41.858	40.033	0.298	0.000	0.63	76.6	SURCHARGED
SW1.009	SW5	360 minute 30 year Winter I+0%	41.827	40.029	0.313	0.000	0.55	76.6	SURCHARGED
SW1.010	SW4	360 minute 30 year Winter I+0%	41.738	40.024	0.335	0.000	0.35	76.4	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Pipe Flow (l/s)	Status
SW8.000	SW3.3	15 minute 30 year Winter I+0%	42.554	41.350	-0.007	0.000	0.43	14.3	OK
SW8.001	SW3.2	15 minute 30 year Winter I+0%	42.488	41.316	0.115	0.000	0.97	51.4	SURCHARGED
SW9.000	SW3.1.2	15 minute 30 year Winter I+0%	42.090	40.608	-0.029	0.000	0.51	17.2	OK
SW9.001	SW3.1.1	15 minute 30 year Winter I+0%	41.568	40.583	0.066	0.000	0.38	12.7	SURCHARGED
SW8.002	SW3.1	15 minute 30 year Winter I+0%	41.392	40.557	0.161	0.000	1.35	63.7	SURCHARGED
SW1.011	SW3	360 minute 30 year Winter I+0%	41.648	40.015	0.423	0.000	0.36	92.5	SURCHARGED
SW1.012	SWATTN	240 minute 30 year Winter I+0%	41.655	39.929	0.447	0.000	0.08	23.2	SURCHARGED
SW1.013	SW2	240 minute 30 year Winter I+0%	42.000	39.935	0.902	0.000	0.65	20.6	SURCHARGED

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	14.500
Region	Scotland and Ireland	Ratio R	0.280
Cv (Summer)	0.750		
Cv (Winter)	0.840		

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 10

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Pipe Flow (l/s)	Status
SW1.000	SW14	15 minute 100 year Winter I+10%	43.840	43.099	0.473	0.000	1.38	48.9	SURCHARGED
SW2.000	SW13.1	15 minute 100 year Winter I+10%	43.166	42.642	0.230	0.000	1.44	47.2	SURCHARGED
SW1.001	SW13	15 minute 100 year Winter I+10%	43.562	42.496	0.174	0.000	1.19	98.7	SURCHARGED
SW3.000	SW12.5	30 minute 100 year Winter I+10%	42.642	42.326	0.634	0.000	1.01	34.1	SURCHARGED
SW3.001	SW12.4	30 minute 100 year Winter I+10%	42.431	42.283	0.724	0.000	0.88	30.0	FLOOD RISK
SW3.002	SW12.3	30 minute 100 year Winter I+10%	42.399	42.237	0.826	0.000	0.93	32.1	FLOOD RISK
SW3.003	SW12.2	30 minute 100 year Winter I+10%	42.767	42.182	0.949	0.000	1.18	38.0	SURCHARGED
SW4.000	SW12.1.1	30 minute 100 year Winter I+10%	42.142	42.137	0.837	0.000	0.13	9.0	FLOOD RISK
SW3.004	SW12.1	30 minute 100 year Winter I+10%	42.992	42.132	0.975	0.000	0.89	59.7	SURCHARGED
SW1.002	SW12	30 minute 100 year Winter I+10%	43.148	42.036	1.243	0.000	1.33	123.6	SURCHARGED
SW5.000	SW11.1	15 minute 100 year Winter I+10%	43.421	42.582	0.353	0.000	1.75	60.7	SURCHARGED
SW1.003	SW11	30 minute 100 year Winter I+10%	43.028	41.892	1.204	0.000	1.95	180.5	SURCHARGED
SW1.004	SW10	30 minute 100 year Winter I+10%	43.011	41.599	1.007	0.000	1.74	201.2	SURCHARGED
SW6.000	SW9.8	15 minute 100 year Winter I+10%	43.603	42.017	0.918	0.000	0.78	25.2	SURCHARGED
SW6.001	SW9.7	15 minute 100 year Winter I+10%	43.829	41.949	0.932	0.000	0.81	25.8	SURCHARGED
SW6.002	SW9.6	15 minute 100 year Winter I+10%	44.131	41.885	0.933	0.000	1.52	50.4	SURCHARGED
SW6.003	SW9.5	15 minute 100 year Winter I+10%	44.388	41.652	0.799	0.000	1.22	67.2	SURCHARGED
SW7.000	SW9.4.1	15 minute 100 year Summer I+10%	44.152	42.765	-0.069	0.000	0.82	46.3	OK
SW6.004	SW9.4	30 minute 100 year Winter I+10%	44.290	41.565	0.775	0.000	1.72	93.9	SURCHARGED
SW6.005	SW9.3	30 minute 100 year Winter I+10%	43.919	41.470	0.737	0.000	1.84	98.9	SURCHARGED
SW6.006	SW9.2	30 minute 100 year Winter I+10%	43.636	41.366	0.685	0.000	2.23	115.9	SURCHARGED
SW6.007	SW9.1	360 minute 100 year Winter I+10%	43.043	41.291	0.692	0.000	0.22	31.6	SURCHARGED
SW1.005	SW9	360 minute 100 year Winter I+10%	42.657	41.283	0.924	0.000	0.31	93.2	SURCHARGED
SW1.006	SW8	360 minute 100 year Winter I+10%	42.481	41.164	0.985	0.000	0.32	97.4	SURCHARGED
SW1.007	SW7	360 minute 100 year Winter I+10%	42.175	41.033	1.057	0.000	0.31	100.5	SURCHARGED
SW1.008	SW6	360 minute 100 year Winter I+10%	41.858	40.940	1.205	0.000	0.82	100.3	SURCHARGED
SW1.009	SW5	360 minute 100 year Winter I+10%	41.827	40.936	1.220	0.000	0.72	100.2	SURCHARGED
SW1.010	SW4	360 minute 100 year Winter I+10%	41.738	40.931	1.242	0.000	0.46	99.4	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Pipe Flow (l/s)	Status
SW8.000	SW3.3	15 minute 100 year Winter I+10%	42.554	41.994	0.637	0.000	0.50	16.7	SURCHARGED
SW8.001	SW3.2	15 minute 100 year Winter I+10%	42.488	41.954	0.753	0.000	1.20	63.3	SURCHARGED
SW9.000	SW3.1.2	360 minute 100 year Winter I+10%	42.090	40.934	0.297	0.000	0.13	4.2	SURCHARGED
SW9.001	SW3.1.1	360 minute 100 year Winter I+10%	41.568	40.932	0.415	0.000	0.12	4.2	SURCHARGED
SW8.002	SW3.1	360 minute 100 year Winter I+10%	41.392	40.930	0.534	0.000	0.42	20.0	SURCHARGED
SW1.011	SW3	360 minute 100 year Winter I+10%	41.648	40.923	1.331	0.000	0.48	122.4	SURCHARGED
SW1.012	SWATTN	360 minute 100 year Winter I+10%	41.655	40.838	1.356	0.000	0.13	38.2	SURCHARGED
SW1.013	SW2	360 minute 100 year Winter I+10%	42.000	40.843	1.810	0.000	0.65	20.6	SURCHARGED

APPENDIX D

SURFACE WATER INTERCEPTION CALCULATIONS

PROJECT			JOB REF.
Lissywollen, Athlone - Catchment 1 (West)			180176
SUBJECT			**Calc. Sheet No.**
Surface Water Calculations - Interception Volume			3
Drawing ref.	**Calculations by**	**Checked by**	**Date**
180176-INFO1	RTM	SMM	19-Aug-20

SURFACE WATER CALCULATIONS

Site Area

Total Site Area =	4.41	Hectares (ha)

Infiltration Volume (Post-Development)

Impermeable Area =	3.05	Hectares (ha)
Rainfall Depth =	5	mm
[1]Interception Volume =	121.9	m^3

Notes

1. Interception Volume (m^3) = Impermeable Area (ha) x 5mm x 10 (GDSDS Section 6.3.1.2.1). For sites where a pond is applicable.

80% runoff from impermeable areas assumed.

PROJECT			JOB REF.
Lissywollen, Athlone - Catchment 2 (East)			180176
SUBJECT			**Calc. Sheet No.**
Surface Water Calculations - Interception Volume			3
Drawing ref.	**Calculations by**	**Checked by**	**Date**
180176-INFO1	RTM	SMM	19-Aug-20

SURFACE WATER CALCULATIONS

Site Area

Total Site Area =	12.34	Hectares (ha)

Infiltration Volume (Post-Development)

Impermeable Area =	6.87	Hectares (ha)
Rainfall Depth =	5	mm
[1]Interception Volume =	275.0	m^3

Notes

1. Interception Volume (m^3) = Impermeable Area (ha) x 5mm x 10 (GDSDS Section 6.3.1.2.1). For sites where a pond is applicable.

80% runoff from impermeable areas assumed.

APPENDIX E

SURFACE WATER TREATMENT CALCULATIONS

PROJECT			JOB REF.
Lissywollen, Athlone - Catchment 1 (West)			180176
SUBJECT			**Calc. Sheet No.**
Surface Water Calculations - Treatment Volume			2
Drawing ref.	**Calculations by**	**Checked by**	**Date**
180176-INFO1	RTM	SMM	19-Aug-20

SURFACE WATER CALCULATIONS

Site Area

Total Site Area =	4.41	Hectares (ha)

Pond Treatment Volume (Post-Development)

Impermeable Area =	3.048	Hectares (ha)
Rainfall Depth =	15	mm
[1]Treatment Volume (Vt) =	365.7	m^3

Notes

1. Treatment Volume Vt (m^3) = Impermeable Area (ha) x 15mm x 10 (GDSDS Section 6.3.1.2.1). For sites where a pond is applicable.

80% runoff from impermeable areas assumed.

PROJECT			JOB REF.
Lissywollen, Athlone - Catchment 2 (East)			180176
SUBJECT			**Calc. Sheet No.**
Surface Water Calculations - Treatment Volume			2
Drawing ref.	**Calculations by**	**Checked by**	**Date**
180176-INFO1	RTM	SMM	19-Aug-20

SURFACE WATER CALCULATIONS

Site Area

Total Site Area =	12.34	Hectares (ha)

Pond Treatment Volume (Post-Development)

Impermeable Area =	6.874	Hectares (ha)
Rainfall Depth =	15	mm
[1]Treatment Volume (Vt) =	824.9	m^3

Notes

1. Treatment Volume Vt (m^3) = Impermeable Area (ha) x 15mm x 10 (GDSDS Section 6.3.1.2.1). For sites where a pond is applicable.

80% runoff from impermeable areas assumed.

APPENDIX F

SuDS CALCULATIONS

TITLE		Job Reference		
Residential Developmentat Lissywolllen		180176		
SUBJECT		**Calc. Sheet No.**		
Permeable Paving Design		1		
DRAWING NUMBER	**Calculations by**	**Checked by**	**Date**	
180176-INFO1	DCH	LMCL	02.11.20	

FLAT SITES

INPUT DATA

Pavement Area (A)	10873.0	m^2
Pavement Perimeter (P)	7899.8	m
Sub-base Depth (d)	0.400	m
[1]Sub-base Voids Ratio (η)	0.30	
Sub-base Infiltration Rate per hour	1000	mm/hr
Sub-base Infiltration Rate (k)	0.278	mm/s
Subgrade Infiltration Rate per hour	5.0	mm/hr
Subgrade Infiltration Rate (f)	0.001	mm/s

VOLUME (STORAGE AND TREATMENT)

Permeable Paving Storage Volume per m^2	0.120	m^3/m^2
Total Permeable Paving Storage Volume	1304.8	m^3

INFILTRATION / INTERCEPTION VOLUME

Approx. Permeable Paving Infiltration per m^2	0.002	$l/s/m^2$
[2]Total Permeable Paving Infiltration Rate	**19.490**	l/s
[3]Total Permeable Paving Infiltration Volume	421.0	m^3

FLOW

Average Distance between Outlet Drains	6.0	m	Assumed one outlet per house
Flow Velocity through Permeable Paving	**0.000038**	m/s	
Trench Retention Time	**44.2**	hr	

TITLE		Job Reference	
Residential Developmentat Lissywolllen		180176	
SUBJECT		**Calc. Sheet No.**	
Permeable Paving Design		1	
DRAWING NUMBER	**Calculations by**	**Checked by**	**Date**
180176-INFO1	DCH	LMCL	02.11.20

Notes:

1 Sub-base material has a void ratio of approximately 30%, source 'BRE Digest 365'.

2 Wetted perimeter assuming 50% of trench depth, source 'BRE Digest 365'.

3 Volume calculated using 6 hour storm event.

4 For Paving on slopes includes infiltration, provide 500mmx500mm trenches at 10m centres along slope with 1000mmx500mm at base of slope. source 'Formpave - Aquaflow Permeable Paving System'.

Table: 1

Material	void Ratio, η
Clean stone	0.40 - 0.50
Uniform gravel	0.30 - 0.40
Graded sand or gravel	0.20 - 0.30
Source: The SUDS manual, Published by CIRIA.	

Table: 2

Pavement Type	Effective Depth (m)
Car-Parking	0.40
Footpath	0.20
Effective Depths are provided from source 'Formpave - Aquaflow Permeable Paving System' and may subject to change as per site requirement.	

Total Permeable Paving Outflow:

$= A \cdot k \cdot i$

where:

A = Cross Sectional Area of Subbase
k = Subbase Infiltration Rate
i = Hydraulic Gradient

Hydraulic gradient has been assumed as the pavement gradient with an additional 250mm fall per 100m length.

Table: 3

Material	Infiltration Rate (m/hr)
Gravel	10 - 1000
Sand	0.1 - 100
Loamy sand	0.01 - 1
Sandy loam	0.05 - 0.5
Loam	0.001 - 0.1
Silt loam	0.0005 - 0.005
Chalk	0.001 - 100
Sandy clay loam	0.001 - 0.01
Silty clay loam	0.00005 - 0.005
Clay	< 0.0001
Till	0.00001 - 0.01
Rock	0.00001 - 1
Cutoff point for most infiltration drainage systems = 0.001 mm/hr Source: Microdrainage	

Total Trench Infiltration:

$= 1/2 \cdot D \cdot L \cdot f$

where:

L = Length
D = Depth to Invert
f = Subgrade infiltration rate

TITLE	Job Reference		
Residentail Development at Lissywollen	180176		
SUBJECT	**Calc. Sheet No.**		
FILTER TRENCH DESIGN	1		
DRAWING NUMBER	**Calculations by**	**Checked by**	**Date**
180176-DBFL-SW-SP-DR-C-1000	DCH	LMcL	03.12.20

INPUT DATA

Pipe Diameter (∅)	0.150	m	
Average Width (W)	0.600	m	
Average Depth to Invert (D)	0.600	m	
Length (L)	2453.4	m	
Slope (S)	150	1 in ….	
[1]Trench Backfill Voids Ratio (η)	0.30		
Trench Backfill Infiltration Rate per hour	3600.0	mm/hr	
Trench Backfill Infiltration Rate (k)	1.000	mm/s	
Subgrade Infiltration Rate per hour	5.0	mm/hr	Assumed - subject to testing on site
Subgrade Infiltration Rate (*f*)	0.001	mm/s	

VOLUME (STORAGE AND TREATMENT)

Filter Trench Storage Volume per metre	0.123	m^3/m
Total Filter Trench Storage Volume (V)	301.8	m^3

INFILTRATION/ INTERCEPTION VOLUME

[2]Filter Trench Infiltration per metre	0.001	l/s/m
Total Filter Trench Infiltration Rate (I)	**2.045**	l/s/m
[3]Total Filter Trench Infiltration Volume	44.2	m^3

FLOW

Filter Trench Cross-Sectional Area (A)	0.24	m^2
Total Filter Trench Flow (Q)	**14.434**	l/s
Trench Retention Time	**11.4**	hr

Notes:

1 Trench backfill material has a void ratio of approximately 30%, source 'BRE Digest 365'.
2 Wetted perimeter assuming 50% of trench depth, source 'BRE Digest 365'.
3 Volume calculated using 6 hour storm event.

Table: 1

Material	void Ratio, η
Clean stone	0.40 - 050
Uniform gravel	0.30 - 0.40
Graded sand or gravel	0.20 - 0.30

Total Trench Flow:
= A . k . i + Pipe Flow
where:
A = Cross Sectional Area of Backfill
k = Trench Backfill Infiltration Rate
i = Hydraulic Gradient
Hydraulic gradient has been assumed as the trench gradient with an additional 250mm fall per 100m length.
Pipe Flow calculated using Colebrook White Eqn.

Table: 2

Material	Infiltration Rate (m/hr)
Gravel	10 - 1000
Sand	0.1 - 100
Loamy sand	0.01 - 1
Sandy loam	0.05 - 0.5
Loam	0.001 - 0.1
Silt loam	0.0005 - 0.005
Chalk	0.001 - 100
Sandy clay loam	0.001 - 0.01
Silty clay loam	0.00005 - 0.005
Clay	< 0.0001
Till	0.00001 - 0.01
Rock	0.00001 - 1
Cutoff point for most infiltration drainage systems = 0.001 mm/hr	
Source: Microdrainage	

Total Trench Infiltration:
= 1/2 . D . L . *f*
where:
L = Length
D = Depth to Invert
f = Subgrade infiltration rate

TITLE		**Job Reference**	
Residential Development Lissywollen		180176	
SUBJECT		**Calc. Sheet No.**	
GREEN ROOF DESIGN -50% Green Roof across all blocks		1	
DRAWING NUMBER	**Calculations by**	**Checked by**	**Date**
180176-DBFL-SW-SP-DR-C-1000	DCH	LMCL	03.12.20

INPUT DATA

Green Roof Area (A)	5425.0	m^2	Total Roof Area	10850.0	m^2
[1]Filter Layer Depth (d)	0.150	m	% Green Roof Area	50.000	%
[1]Filter Layer Voids Ratio (η)	30.0	%			

TREATMENT VOLUME

[2]Treatment Volume (V_T)	244.1	m^3

EVAPOTRANSPIRATION / INTERCEPTION VOLUME

[3]Evapotranspiration Rate per Day	4.00	mm/day
Evapotranspiration Volume	21.7	m^3

Notes:

1 Filter Bed depth typically between 0.15 and 0.35m. This consists of the substrate and drainage layer.

2 Treatment Volume Vt (m^3) = Green Roof Area (m^2) x d x η

3 Assumed 2mm evaporation and 3mm transpiration.

TITLE		**Job Reference**	
Residential Development at Lissywollen, Athlone		180176	
SUBJECT		**Calc. Sheet No.**	
Interception/Treatment Volume Summary		1	
DRAWING NUMBER	**Calculations by**	**Checked by**	**Date**
180176-DBFL-SW-SP-DR-C-1001/1002	DCH	LMCL	03.12.20

INPUT DATA

Interception Volume Required	373.532	m^3
Treatment Volume Required	1120.596	m^3

Catchment	**Interception Volumes**		**Treatment Volumes**	
Swales	n/a	m^3	n/a	m^3
Permeable Paving	397.3	m^3	1209.9	
Filter Drain	44.2	m^3	301.8	m^3
Green Roofs	21.7	m^3	244.1	m^3
Bio Pond	n/a	m^3	n/a	m^3
Stormtech Isolator Row	n/a	m^3	n/a	m^3
				m^3
Total Volumes Provided	463.1	m^3	1755.9	m^3
Check Provided Volumes are greater than Required Volumes	PASS		PASS	

APPENDIX G

WATERMAIN CALCULATIONS

TITLE		Job Reference	
Mixed Use Development at Lissywollen, Athlone, Co.Westmeath		180176	
SUBJECT		Calc. Sheet No.	
Water Demand for Irish Water - Residential		1	
DRAWING NUMBER	Calculations by	Checked by	Date
180176-INFO1	RTM	SMM	20/08/2020

DEMAND

Housing Units	576	no.
Daily Demand per person[1]	150	litres/person/day
Average Occupancy Ratio[2]	2.7	person/unit
Total Site Occupancy	1555	people
Average Daily Demand	233,280	l/day
Average Day in Peak Week[3]	291,600	l/day
Normal Length of Day[4]	12	hours
Peak Factor[5]	5.0	

Post Development Peak Water Demand[6]	**16.875**	l/s
Post Development Average Water Demand	**2.700**	l/s
Normal Demand[7]	**5.400**	l/s

Notes:

1. Daily demand per person is 150 litres/person/day from the Irish Water Code of Practice for Wastewater Infrastructure.
2. Occupancy ratio of 2.7 persons per dwelling from Irish Water Pre-Connection Enquiry Form (PCEF Rev 2).
3. Average Day in Peak Week is 1.25 times the average daily demand.
4. Assumed normal demand is the total daily demand during the normal length of day.
5. Peak Factor for pipe sizing from Irish Water Code of Practice for Waster Infratructure .
6. Peak Factor multiplied by Average Day in Peak Week flow.
7. Normal demand is the total daily demand during the normal length of day.
8. Fire flow is required at 25l/s as per B.S. 5306-1:1976.

TITLE		Job Reference	
Mixed Use Development at Lissywollen, Athlone, Co.Westmeath		180176	
SUBJECT		Calc. Sheet No.	
Water Demand for Irish Water-Community Hub		1	
DRAWING NUMBER	Calculations by	Checked by	Date
180176-info1	RTM	SMM	20/08/2020

DEMAND Community Hub

Amenity Space	144	m^2
Patrons[1]	32	no.
Day Staff[1]	6	no.
Daily Demand per person[2]	50	litres/person/day
Average Daily Demand	1,879	l/day
Average Day in Peak Week[3]	2,348	l/day
Normal Length of Day[4]	12	hours
Peak Factor[5]	5.0	

Post Development Peak Water Demand[6]	**0.136**	l/s
Post Development Average Water Demand	**0.022**	l/s
Normal Demand[7]	**0.043**	l/s

Notes:

1. Assumed patron density of 4.5m^2 and patron to staff ration of 1:5.74.
2. Daily Demand per person is an approximate value comparing to similar water use buildings - 50 litres/person/day for Staff taken from Irish Water "Code of Practice for Wasterwater Infrastructure".
3. Average Day in Peak Week is 1.25 times the average daily demand.
4. Assumed normal demand is the total daily demand during the normal length of day.
5. Peak Factor 5 from irish water code of practice for water infrastructure.
6. Peak Factor multiplied by Average Day in Peak Week flow
7. Normal demand is the total daily demand during the normal length of day.
8. Fire flow is required at 25l/s as per B.S. 5306-1:1976.

TITLE	Job Reference
Mixed Use Development at Lissywollen, Athlone, Co.Westmeath	180176
SUBJECT	**Calc. Sheet No.**
Water Demand for Irish Water-Creche Block C	1

DRAWING NUMBER	Calculations by	Checked by	Date
Lissywollen Masterplan	RTM	SMM	20/08/2020

DEMAND Creche

Creche space	321	m^2
Patrons[1]	71	no.
Day Staff[1]	12	no.
Daily Demand per person[2]	50	litres/person/day
Average Daily Demand	4,188	l/day
Average Day in Peak Week[3]	5,235	l/day
Normal Length of Day[4]	12	hours
Peak Factor[5]	5.0	

Post Development Peak Water Demand[6]	**0.303**	l/s
Post Development Average Water Demand	**0.048**	l/s
Normal Demand[7]	**0.097**	l/s

Notes:

1. Assumed patron density of 4.5m^2 and patron to staff ration of 1:5.74.
2. Daily Demand per person is 50 litres/person/day for Staff taken from Irish Water "Code of Practice for Wasterwater Infrastructure".
3. Average Day in Peak Week is 1.25 times the average daily demand.
4. Assumed normal demand is the total daily demand during the normal length of day.
5. Peak Factor 5 from irish water code of practice for water infrastructure.
6. Peak Factor multiplied by Average Day in Peak Week flow
7. Normal demand is the total daily demand during the normal length of day.
8. Fire flow is required at 25l/s as per B.S. 5306-1:1976.

TITLE	Job Reference
Mixed Use Development at Lissywollen, Athlone, Co.Westmeath	180176
SUBJECT	**Calc. Sheet No.**
Water Demand for Irish Water-Creche Block T	1

DRAWING NUMBER	Calculations by	Checked by	Date
Lissywollen Masterplan	RTM	SMM	20/08/2020

DEMAND Creche

Creche space	485	m^2
Patrons[1]	108	no.
Day Staff[1]	19	no.
Daily Demand per person[2]	50	litres/person/day
Average Daily Demand	6,328	l/day
Average Day in Peak Week[3]	7,910	l/day
Normal Length of Day[4]	12	hours
Peak Factor[5]	5.0	

Post Development Peak Water Demand[6]	**0.458**	l/s
Post Development Average Water Demand	**0.073**	l/s
Normal Demand[7]	**0.146**	l/s

Notes:

1. Assumed patron density of 4.5m^2 and patron to staff ration of 1:5.74.
2. Daily Demand per person is 50 litres/person/day for Staff taken from Irish Water "Code of Practice for Wasterwater Infrastructure".
3. Average Day in Peak Week is 1.25 times the average daily demand.
4. Assumed normal demand is the total daily demand during the normal length of day.
5. Peak Factor 5 from irish water code of practice for water infrastructure.
6. Peak Factor multiplied by Average Day in Peak Week flow
7. Normal demand is the total daily demand during the normal length of day.
8. Fire flow is required at 25l/s as per B.S. 5306-1:1976.