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DESIGN
PARTNERSHIP

Kingsbridge Consultancy Ltd.

Proposed Strategic Housing Development

@

Haggardstown, Blackrock, Dundalk, Co. Louth

Engineering & Services Report

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1.0 Introduction

1.01 Proposed Development

Finn Design Partnership have been commissioned by Kingsbridge Consultancy Ltd to complete the Engineering Design in support of a planning application to An Bord Planeála for a Strategic Housing Development on a site that extends to 17.55 ha at Haggardstown, Blackrock, Dundalk, Co. Louth.

The site is located off the R172 coastal roadway linking the village of Blackrock to the South and the town of Dundalk to the North. (see Figure 1). The site is bounded by Dundalk Golf Club to the West, residential dwellings to the North and East where there is residentially zoned land and the practice area of the adjoining Golf Club to the South.

The entrance to the site is from the R172 from where there will be a new service roadway extending circa 250 m in a westerly direction to the main part of the development site where the new units will be constructed.

This report considers the design criteria for the main infrastructural elements of the development to include the onsite road layout/site access, surface water strategy and servicing, foul sewer strategy and servicing, and potable water supply and servicing.

Consultations have been held with the executive road and services engineers of Louth Co Council to discuss the design proposals and agree the criteria for the development.

Figure 1 Site Location

1.02 Nature of Proposed Development

The proposed development will consist of the construction of 483 no. residential units including;

- 258 no. houses (41 no. five bedroom units, 101 no. four bedroom units and 116 no. three bedroom units.)
- 213 no. apartments (64 no. one bedroom units and 149 no. two bedroom units)
- 6 no Duplex Units (6 no. two bedroom below duplexes and 6 no. three bedroom duplexes)
- Construction of the access road and priority junction with right turning lane off the R172 (Dundalk to Blackrock Roadway).
- Landscaped zoned open space and associated site works.

Figure 2 Proposed Site Plan

- Foul sewerage pumping station with rising main to connect to the public gravity mains at stand-off manhole located at the N52 junction with the Crowne Plaza Hotel/DKIT entrance.
- Potable water DMA with a 300 mm/200 mm dia pipeline extending from the existing 700 mm pipeline located at the same junction and extending along Bothar Maol before passing through the site and connecting into the existing mains located along the R172 at the North end of Blackrock village near the site entrance.

1.03 Site Topography

The existing ground levels within the developable area are within the range of 7.0 m in the north-east corner and up to 23.0m in the south west corner. (All levels relate to the Malin Head datum). . (see Figure 3). A topographical survey has been completed of the site and the surrounding areas, which is included as drawing 1703-Eng-001.

Figure 3 Site Topography

2.0 Access and Roads

2.01 General

The section of the document refers to the design of the onsite roadways where for an analysis of the relevant traffic and roads in the wider Blackrock and Dundalk areas reference should be made to the Traffic and Transport assessment prepared by W.S Atkins Ireland Ltd.

Also, reference should be made to the statement of consistency with DMURS which is included as part of this submission.

2.02 Priority Junction Access Layout

The proposed development will be accessed via the R172 north of the village of Blackrock. The entrance to the site will be via a new priority junction with a right turning central reservation for traffic entering the site from a northerly direction. The design of this priority junction has been completed by W.S Atkins Ireland Ltd where a copy of their drawing 5161486 / HTR / SK / 009 is included as Appendix A. Reference should also be made to their Technical Note dated 8th February 2018 where confirmation is provided on the capacity of the proposed junction to serve the proposed lands and also the residentially zoned lands to the South of the development site.

The priority junction with ghost islands have been designed to align with the design principles set out in DN-GEO-03060.

These include: -

- 20m turning length, allowing for stacking of 3 no. cars.
- 25m deceleration length, which is in compliance with Table 5.11 of DN-GEO-03060.
- 5m direct taper length, which is in compliance with Table 5.10 of DN-GEO-03060.
- 60m ghost island taper, which is in compliance with Table 5.9 of DN-GEO-03060.

The road markings being provided for the new entrance comply with item 7.3.25 of DN-GEO-03060 where drivers may cross a continuous centre line to enter or leave at existing land or premises.

The enclosed drawing no. 1703-ENG-100 Rev A shows where the new entrance layout is being accommodated within the lands controlled by the site owner where there is also a legal agreement in place with the owner of the residential property to the South of the proposed entrance to re-align part of their front boundary wall to accommodate the visibility sightline to the South. The 60km/hr speed limit that exists along the public roadway requires a 65.00m x 2.45m x 1.05m forward visibility splay at new entrance. Letters of consent are attached from both the Local Authority and the residential property owner to the South to undertake the works necessary to construct the new junction that will serve the development.

2.03 Internal Road Layout Design

The internal service roadways have been designed with speed reduction bends to provide traffic calming together with a combination of road vertical and horizontal geometry and forward sight visibility to reduce speeds. Flat top table ramps have been provided at strategic locations to calm traffic at junctions. Design speed limits of 30km/hr are applied throughout the development

The proposed development's road layout and hierarchy is shown on drawings 1703-Eng-100 to 104. Longitudinal sections of the roadway are included on drawings 1703-Eng-105 to 108 where standard road cross-sections and construction details are shown on drawings 1703-Eng-109.

The design of the roadways comprises of the following;

Main Access Road – 6.0m wide carriageway with a 2.0m footpath, 2.0m cycle path (part) with 1.50 m (minimum) wide verge.

Local Streets – typically 5.50 m wide carriageway with 2.0m footpaths.

Shared Home-Zone Streets – 5.00 m wide for entrance section with 6.00 m wide in car parking areas. Shared roads/surfaces shall have contrasting colours and textures to Local Street (no footpaths).

Maximum road corner radii of 3.00 m are provided within the local streets and 6.00 m on the main access road as per DMURS.

2.04 Pavement Design Standards

The main internal access roads are designed in accordance with the Design Manual for Urban Roads and Streets (DMURS) and Local Authority requirements. Refer to drawings 1703-Eng-109 for the proposed road construction thicknesses based on an assumed existing ground minimum design CBR of 3%. Actual CBRs and ground conditions will be confirmed by site investigations prior to construction.

2.05 Vehicle Tracking

The proposed development has been tracked to show that the development's proposed turning heads will accommodate a large refuse vehicle as shown on drawings 1703-Eng 147 & 148.

2.06 Driveway Access

Each house will have a driveway designed to provide two private parking spaces. Driveway slopes will be in compliance with Technical Guidance Document M of the Building Regulations. Footpaths across driveway entrances will be dished and incorporate dropped kerbs. All driveways will be paved within private curtilage.

2.07 Car Parking

A total of 824 car spaces are being provided as part of the development where 2 spaces per dwelling have been provided in most cases, 1 space per duplex unit/apartment with an additional visitor space for every 4 no. duplexes/apartments. See table 1 below. The provision of the proposed car parking will exceed the requirements included in section 7.3.9.1 of the Louth County Development Plan 2015-2021.

Unit Type	No. Units	Spaces/Unit	No of Spaces
Dwelling Units	259	2	518
GF Apartment + Duplexes	12	12	12
Apartment Unit	213	1 space per unit	213
Apartment (Visitor Spaces)		1 space per 4 units	57
Creche	1	Spaces provided for staff and drop-off area	24
Total			**824**

Table 1 Car Parking Provision

2.08 Refuse Storage and Collection.

Generally, refuse storage for individual dwellings will be within the curtilage of each site where in the case of home zones where suitable access will not be provided for refuse trucks, a paved collection area will be provided at the entrance to the home zone where the residents can leave their bins on the day of collection. Communal waste collection areas shall be provided for the duplex and apartment units at the rates shown in table 2 below.

Refer to Architects drawing no 1806-OMP-00-ZZ-DR-A-XX-10004 to 10006 for location of such.

Duplexes/Apartments	Provision
Requirement to provide following capacity for family households: - 120L waste and 75L recycling per week with mini recycling centre	Bulk waste bin dimensions (mm) - 1375 width, 1000 depth, 1470 height (2470 lid open)

Table 2 Waste Refuse Collection

The refuse collection areas shall be located within walking distance of all the units, where the location shall be clearly identified, overlooked and have adequate lighting, drainage, where it shall also be easily accessible for the bin collection crews to access.

3.0 Surface Water Drainage

The surface water drainage system will collect the stormwater run-off from the roofs, pavements and other impermeable areas of the proposed development using underground pipework and manholes primarily laid along the access roads throughout the development. The SUDS philosophy has been incorporated into the design to reduce run-off volumes and improve run-off water quality.

The surface water drainage system has been designed with 4 separate catchment areas as shown on drawings 1703-Eng-110 to 119. The runoff flows from the two larger catchment areas (1 & 2) will be attenuated in an infiltration basin located on site before being allowed to discharge to an open channel within the estuary of Dundalk Bay, at the allowable greenfield rate for development area of the site. Catchment area includes the surface water pipeline that conveys the greenfield runoff to the open channel within Dundalk Bay where the network also serves the group of 20 residential units that are proposed within the Northeast portion of the site. The allowable discharge from the infiltration basin/pond is adjusted to compensate for surface water runoff that will not be attenuated from the area of these residential units.

Catchment area 4 is a small local network that will serve the main access roadway into the development where the runoff from this portion will also be attenuated to the greenfield runoff rate for this part of the development site.

The detention basin/pond will be located within the large zoned open space and will be incorporated into the landscape plan with gently sloping side slopes and the max open water depth of 1.466 m for a 100-year critical storm. Typical construction details are shown on drawings 1703-Eng-140, 141 & 142.

3.01 Compliance with Surface Water Policy

Surface water management for the proposed development is designed to comply with the Greater Dublin Strategic Drainage Study (GDSDS) policies and guidelines and the requirements of Louth County Council. The GDSDS guidelines require that the following four main criteria be provided as part of the development's surface water design.

Criterion 1: River Water Quality Protection –

This shall be satisfied by providing interception storage and treatment of runoff within the SUDS features. This will be satisfied by providing permeable paving, swales, filter drains, silt traps and oil separators and the on-site attenuation, storage and infiltration basin.

Criterion 2: River Regime Protection –

This requirement shall be satisfied by attenuating run-off with a flow control device fitted on the discharge pipe from the attenuation infiltration basin/pond and on the discharge from catchment 4.

Criterion 3: Level of Service (flooding) for the site –

The site is outside the 1000 year fluvial flood zones, (See separate Flood Risk Assessment). Pluvial flood risk is addressed by the development being designed to accommodate a 100 year storm as per GDSDS. Planned flood routing for storms greater than 100 year level, (considered in design) have been designed to provide an overland flood route towards the onsite attenuation basin/pond and which can be accommodated within the structure.

Criterion 4: River flood protection – attenuation and long-term storage provided within the onsite attenuation basin/pond.

3.02 SuDS

It is proposed to use a sustainable urban drainage system (SuDS) approach for the stormwater management throughout the site where the overall strategy is to provide an effective system that mitigates the adverse effects of urban stormwater runoff on the environment. This will be achieved 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 aim to replicate the natural characteristics of rainfall runoff for any site by providing control of run-off at source and this has been achieved by the current proposals.

There are a number of SuDS features being proposed which have been designed in accordance with The Greater Dublin Strategic Drainage Study, CIRIA documents C753, C697 and C609 and include:

- Filter Strips: Wide, gently sloping areas of grass which treat runoff from adjacent impermeable areas, at source, running over its surface. Filter strips also have an attenuating effect on runoff and can allow some infiltration to the ground where the subgrade is suitable. These are located adjacent to roads and swales.
- Swales (wet): Broad, shallow drainage channels covered in grass which can treat, convey and attenuate runoff, at source, and can infiltrate to the ground where the subgrade is suitable. Swales also can promote biodiversity. These are located adjacent to the car parking and hard-standing areas.

- Swales (dry): Similar to wet swales but are under-drained by a filter drain. These are located adjacent to roads and hard-standing areas.
- Filter Drain: Trenches filled with permeable stone 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 the catchment. These will be located in the rear-gardens of each unit and will result in a reduction of peak runoff, 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.
- 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 of the sub-base before being slowly released to the swale collection network proposed as part of the development.

  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, also the reduction in peak flows to the outfall will enhance settlement and biodegradation of pollutants.

  It is proposed to use these systems in the apartment car parks and surface water storage within these systems will be further mobilised by providing a 100mm diameter pipe at the outlet to the site swale network.

- Bioretention Areas: Shallow landscaped depressions which are under-drained with engineered soils and enhanced vegetation and planting on the surface which manage and treat runoff, at source, and promote biodiversity development. These are located adjacent to roads.
- Attenuation/infiltration Basin: Normally dry vegetated surface depression which provides flow control through storage of stormwater runoff. On this site, the detention basin will also serve as a grassed open space area.
- Petrol Interceptor: A proprietary oil/water separator which prevents hazardous chemical and petroleum products from entering watercourses and public sewers. These are proposed at the end of the each of the 4 surface water drainage networks.

3.03 Surface Water Design Approach

As the site is currently in agricultural use the proposal for the stormwater design is to mimic the existing runoff where the following systems are proposed;

- Attenuation storage will be provided to ensure that there is adequate attenuation storage for limited discharge surface water volumes. Attenuation will be provided for events up to, and including, the 1.0% AEP rainfall event. A 500 mm freeboard will be maintained from the lowest FFL of the dwellings within the vicinity of the structure the top water level of the attenuation/infiltration basin.
- Limiting discharges to ensure that discharge rates are maintained below the greenfield runoff rate of 2.873 l/s/ha for soil type 2. A discharge rate of 50.40 l/s has been calculated for that portion of the site where the residential units will be located (Part A) where a rate of 1.0 l/s has been calculated for the area where the site access roadway will be constructed (Part B). These rates are used to calculate the allowable runoff for the 1 in 30 and 1 in 100 yr events by applying the relevant growth factors.
- Infiltration to ground for surface water runoff will be facilitated underneath permeable paving used for car park 4 to 6 inclusive and car parks 8 and 9. Further opportunities will be provided for infiltration into the sub-soil where piping from under the permeable paving will connect to adjoining swales constructed along the edge of the parking areas. A network of dry and wet swales are shown within each of the development zones where they follow the topography of the sight and ultimately connect to the attenuation/infiltration basin. The design of the swales will provide further opportunities for surface water runoff to infiltrate into and within the central landscaped area.;

  Trees and planters will be provided as a first level of treatment for surface water run off around the site;

- A Full Retention Interceptor will be provided for the treatment of all surface water runoff from the site before it discharges into the onsite attenuation basin/pond.

An assessment of the potential SUDS that could be incorporated within the site was conducted using the site investigation data, www.uksuds.com/irish_suds/index.htm website and the SUDS Manual. A SUDS evaluation report is provided in Appendix B. Since the proposed development drainage will be constructed to a taking in charge standard, the range of SUDS features available are restricted but include the following;

1. Extents of impermeable areas reduced where allowable.
2. Permeable, self-draining areas incorporated into the landscaped areas.
3. Footpaths and the main access road to direct run-off into the adjacent grass verge or permeable paving where possible for infiltration, attenuation and storage.
4. Attenuation storage system.
5. A silt trap and petrol interceptor will be provided before the outfall from each catchment into the attenuation basin/pond.

3.04 Allowable discharge design calculation (QBAR)

In accordance with the recommendations of sustainable urban drainage systems (SUDS) the allowable stormwater discharge from site was calculated by means of the QBAR equation for small rural catchments (< 25 km2) as indicated in the institute of Hydrology, UK Report No. 124. QBAR is calculated using the following formula:

QBAR = (0.00108 [AREA]0.89 [SAAR]1.17 [SOIL]2.17)

Where,

QBAR (m3/sec) = Annual peak flow

AREA (km2) = Catchment area

SAAR (mm) = Standard annual average rainfall

SOIL = Index with values between 0.15 and 0.50

The variables for Part A of the site are as follows:

AREA The catchment area is 17.55 ha = 0.1755km2

SAAR The standard average rainfall for the site was obtained from Met Eireann and is approximately 1000 mm/year

SOIL This index was obtained using the UKSUDS greenfield runoff map which places the site in an area of Type 2 soil with an SPR of 0.3

For developments smaller than 50 ha, the allowable discharge is linearly interpolated from the QBAR value obtained for a 50 ha site. Inputting the above data into the QBAR equation,

QBAR Actual is calculated as follows:

QBAR = 0.00108 x $(0.5)^{0.89}$ $(1033)^{1.17}$ $(0.3)^{2.17}$

= 0.1436 m3/s

= 143.5 l/sec

By linear interpolation = QBAR Actual = 50.40 l/sec

This equates to = $QBAR_{1yr}$ = 42.9 l/sec

= $QBAR_{30yr}$ = 105.9 l/sec

The formula is also used to calculate the $QBAR_{1yr}$ and $QBAR_{30yr}$ for Part B of the site where the site access roadway for the development will be constructed.

See Appendix C for QBAR calculations for both Part A and B of the site.

The QBAR rate calculated for Part A should be used as the discharge rate from the onsite attenuation/infiltration basin but needs to be adjusted to take account of unattenuated flows from the Northeast portion of the development site where it is proposed to construct 20 residential units. The surface water runoff from the onsite impermeable areas that connect into network 3 will not be attenuated as this network conveys the overall allowable greenfield rate to the discharge point at the existing open channel that flows into Dundalk Bay Estuary. As the runoff from the onsite impermeable areas that are connected to network 3 has been calculated at 25.3lts/sec then the allowable greenfield runoff rate for Part A of the site needs to be reduced by this amount (105.9-25.3 = 80.6Lts/sec). This revised allowable discharge rate has been used to complete the design of the attenuation/infiltration basin.

3.05 Attenuation

In accordance with the Wallingford Procedure, using only impermeable areas in the modified rational method, a Cv (Volumetric Runoff Coefficient) of 0.75 is used for summer events and 0.84 for winter. For the purpose of calculating the volume and rate of flow in each network, the maximum hardstanding area contributing to each pipe run in all networks was calculated. The hardstanding consists of all roofs, paths, driveways, roads and other paving within the contributing area.

A hydro brake limiting the outfall from the network to the permitted QBAR of 80.60 l/s was added to manhole SMH71 and this resulted in the requirement for an attenuation basin/pond with a total capacity 2979 m3 of storm-water storage

Due to the sloping nature of the site and proposed green areas the attenuation basin/pond has been designed so that no site flooding will occur in any winter or summer storm up to and including a 6 hr duration, 1 in 100 year return period storm. A future increase in rainfall of up to 10%, due to climate

change, has been allowed for in the simulation of all storms. See Appendix D for Source Control Calculation

3.06 Interception Volume

To prevent pollutants or sediments discharging into water courses the GDSDS requires "interception storage" to be incorporated into the development. This interception storage is designed to receive the run-off for rainfall depths of 5mm up to 10mm if possible. The SUDS features will provide the necessary interception volume required by the GDSDS.

3.07 Attenuated Surface Water Discharges

The attenuated greenfield run-off from Part A (Networks 1, 2 & 3) of the development will discharge to the proposed outfall location at the existing open channel north east of the site (which drains naturally to Dundalk SAC), via network 3 and which is shown on drawing 1703-ENG-114-Zone 4 - Surface Drainage Layout. The new discharge point will include a new headwall constructed at the end of the proposed 1000mm wide 750mm high box culvert. This culvert will be laid at an invert and slope to maintain a minimum depth of 150mm of water in the culvert . Additional flow control measures including the provision of a riprap apron (2m long and 0.25m deep) at the outlet of the culvert will be installed to ensure the velocity of water exiting the culvert at all times will not exceed 0.465 litres per second (l/s).

The attenuated flows from Part B (Network 4) will be retained in oversized pipes before discharging to the existing wetlands area North of the proposed new access roadway and west of the R172 as shown on 1703-ENG-110-Entrance Road - Surface Drainage Layout. An allowable greenfield runoff rate of 2.1 lts/sec has been calculated for this area of the site.

The impact of the above discharges on the receiving waters and adjoining properties has been assessed within the hydraulic modelling that has been completed on the existing open channels and which is included as appendix E within the Flood Risk Assessment that forms part of this application. The model showed that with a maximum discharge rate of 106.0lts/s from network 3 into the existing open channel that there is the potential to increase 1% AEP and 0.1% AEP flood levels to between 0.03m (30mm) and 0.04m (40mm) within a short length downstream of the head wall location. It is noted that these small predictive increases in flood levels within this channel are imperceptible and immeasurable and would not result in an adverse impact to the existing hydrological regime or result in an increased flood risk to adjacent lands or properties. It is also noted that the model is based on a worst case scenario where the maximum discharge rate (106.0lts/s) of attenuated stormwater from the proposed development site would discharge into the channel with the occurrence of a 1% AEP or a 0.1% AEP fluvial flood event where the probability of both of these events occurring at the same time is extremely low.

The hydraulic model also finds that the attenuated surface water flows of 2.1lts/sec from Part B (Network 4) will not result in any measurable increase in current scenario fluvial flood levels within these drainage channel or the existing wetland areas.

In addition to the considering the effects of the discharges of the attenuated flows to the existing open channels and wetland areas, the model considers the effect of constructing the proposed new access roadway through part of the existing wetlands area west of the R172. The hydraulic modelling found that while there will be a small displacement of tidal/coastal flood waters, that it is imperceptible in consideration of the occurrence of a 0.1% AEP mid-range future climate change scenario tidal/coastal flood event in Dundalk Bay Estuary and the wholly massive volume of flood waters associated with this tidal/coastal flood event. In conclusion the development of the access road as proposed is not predicted to result in any adverse impact to the existing hydrological regime of the area or to result in an increased flood risk elsewhere where it is considered to be appropriate from a hydrological and flood risk perspective.

3.08 Surface Water Network - Design Criteria

The surface water drainage has been designed in accordance with the Greater Dublin Regional Code of Practice for Drainage Works. Surface water pipe-work was sized using the Microdrainage Windes drainage modelling software. The extent of the 4 networks included in the development are shown on drawing 1703-ENG-116-Storm Drainage Networks Layout.

The following parameters apply to the design:

Return Period for Pipeline	1 in 2yr return period *check 30 year 15 minute, no flooding.* *check 100 year 15 minute, flooding in designated areas.*
Time of Entry	4 minutes
Minimum velocity	0,.8m/s
Pipe Friction (Ks)	1.5
SAAR	1033 mm
M5-60	16.1 mm (Met Eireann)
Ratio r	(M5-60/M5-2D) 0.28 (Met Eireann)
Climate Change Allowance	10%
Factor of Safety for infiltration	2

Surface water sewers have been designed in accordance with IS EN 752 and the recommendations of the 'Greater Dublin Strategic Drainage Study', (GDSDS). Standard drainage details, as outlined in 1703-Eng-111 to 115, are in accordance with the Greater Dublin Regional Code of Practice for Drainage Works. The minimum pipe diameter for public surface water sewers is 225mm. The storm networks were tested by simulating winter storms with durations of between 15 minutes and 360 minutes and return periods of 30 and 100 years where the following criteria was used:

- Winter volumetric runoff coefficient of 0.84,
- Areal runoff factor of 1.0,
- Additional flow for climate change of 10%,
- Madd Factor of 3.

In addition, the system has been modelled and each individual pipe run has been designed such that no flooding will occur to individual elements during any storm up to and including 6 hour 100 year return period, for winter storms. In all storm simulations an additional flow of 10% was added to account for future climate change.

Surface water network and modelling results for the main drainage networks is included in Appendix E.

3.09 Climate Change

Rainfall intensities for the surface water calculations were increased by a factor of 10% (flows factored by 20%) to take account of climate change, as required by the GDSDS for attenuation storage design.

3.10 Surface Water Quality Impact

Run-off rates from the site are controlled by vortex flow control devices. Surface water management proposals for the development also incorporate the following to reduce its impact;

- Designed in accordance with GDSDS requirements;
- Incorporates SUDS features e.g. permeable paving in high risk parking areas.
- On-line attenuation/infiltration facilities with silt traps and oil separators on network lines prior to discharge to onsite attenuation basin/pond.

4.0 Foul Water Drainage

4.01 Overview

A new foul drainage network will be constructed throughout the development that will include 150 mm and 225 mm diameter gravity pipelines with manholes

The proposed design includes an onsite pumping station with an adjoining emergency storage tank capable of 12 hours of dry weather flow or 447 lts/dwelling. Wastewater from the new pumping station will be pumped to the public mains located at junction of the N52 and the entrance to the Crowne Plaza Hotel and DKIT. The design includes the laying of a new circa 1473 m long 150 mm diameter mains from the pumping station to a stand-off manhole to be constructed prior to the connection to the existing gravity mains. The new rising main will extend through the site and extend along Bothar Maol in a north-westerly direction prior to connecting to the mains. During a pre-planning submission meeting with Irish Water it was confirmed that all works relating to the construction of the rising main outside the site boundary would have to be constructed by the approved Irish Water contractor whereas the works inside the site boundary (pumping station and rising main section) would be constructed by the developer under a self-lay agreement with Irish Water. Once the construction of the pumping station and rising main are completed they will be vested to Irish Water.

The design of all gravity sewers, rising mains and the pumping station and all materials used will be in accordance with the Irish Water Code of practice for Wastewater Infrastructure, December 2017 (Revision 1) and Irish Water Wastewater Infrastructure Standard Details, December 2017 (Revision 3).

The foul drainage system has been designed as a single catchment area as shown on drawings 1703-Eng-121 to 127.

4.02 Design Strategy

The proposed foul drainage system for the site has been designed as a single catchment area based on the topography of the site and the layout of the proposed development. All gravity main sewers will join at manhole FMH 72 prior to flowing into the wet well of the new pumping station. The overall foul sewer calculation for the site is included as Appendix F. The foul sewers are designed to accommodate six times average dry weather flow (DWF) where the total design flow from the site is 15.66 lts/sec. The design calculations for the foul sewer network are included as appendix G

Individual houses will be connected to the 150/250 mm diameter foul drains via individual 100mm diameter house connections that will include an inspection chamber located on the individual residential property, as per Irish Water Code of Practice for Wastewater Infrastructure.

4.03 Design Calculations

Foul sewers have been designed in accordance with the Building Regulations and specifically in accordance with the principles and methods set out in the Irish Water Code of Practice, IS EN752 (2008), IS EN12056: Part 2 (2000) and the recommendations of the 'Greater Dublin Strategic Drainage Study', (GDSDS).

The following criteria has been used for the design of the new network.

Daily flow/dwelling *(based on 3 persons/dwelling)*	447 lts
Creche *(occupancy 75 persons)*	60 lts/person
Minimum velocity	0.8 m/s
Maximum Velocity	3.0 m/s
Pipe Friction (Ks)	1.5
Frequency Factor	.5 for domestic use
Manhole Depth	< 5.0 m

All foul sewers and manholes will be constructed in accordance with the Irish Water Standard Details and the Irish Water Code of Practice for Wastewater. See Appendix G for foul sewer network calculations.

4.04 Foul Drainage - Statement of Design Acceptance

The layout plans, longitudinal sections and details included with this application have been submitted to Irish Water in advance of this application where a statement of design acceptance has been received from the authority and which is included as appendix M.

4.05 Wastewater Pumping Station & Rising Main

The Type 3 pumping station will include an inlet valve chamber where the wastewater entering from the gravity network can flow into the wet well of the pump sump (normal case) or be diverted into the adjoining emergency holding tank if the need arises. Under normal conditions the wastewater will be pumped from the wet well through the rising main pipeline to the public gravity mains. In the case of pump failure, the wastewater from the wet well can also flow into the emergency holding tank. The emergency holding tank will include the provision for tipping buckets where the walls of the tank can be cleaned in the case where wastewater has been in the tank and after it is removed.

It is proposed that the wastewater pumping station and rising main will be vested to Irish Water when the development in completed. The design of the pumping station and rising main including all materials used in their construction will be in accordance with the Irish Water Code of practice for Wastewater Infrastructure, December 2017 (Revision 1) and Irish Water Wastewater Infrastructure Standard Details, December 2017 (Revision 3).

See Appendix H for design of foul sewer pumping station and rising main.

4.06 Foul Sewer Works Outside Site Boundary

Irish Water have confirmed that all sections of the wastewater services that are to be installed outside the site boundary and which are needed to serve the development, would be undertaken by the authority where they would engage their regionally appointed approved contractor to undertake the works. The proposed designs which have been discussed with the authority are shown on the drawing included in Appendix J.

5.0 Water Supply & Distribution

5.01 Overview

The potable water supply for the development will be taken from the existing public mains located at junction of the N52 and the entrance to the Crowne Plaza Hotel and DKIT. Consultations with Irish Water have confirmed that a new DMA will be installed where a new pipeline will be installed from the connection point and will extend along Bothar Maol in southeast direction before entering and passing through the site and connecting to the existing public watermains on the R172 at the north end of Blackrock village near the proposed new entrance to the site. The initial section of the mains will be constructed in 300 mm diameter pipeline where the remaining length shall be 200 mm diameter. The works will also include connecting the existing public potable watermain that extends along and serves the dwellings on Bothar Maol into the new main. A single connection will be taken off the new mains at the location shown on the attached watermain layout plans to serve the proposed development.

Similar to the foul sewerage infrastructure Irish Water have confirmed that all works relating to the construction of the potable water infrastructure outside the site boundary will be constructed by the approved Irish Water contractor whereas the works associated with the new DMA pipeline passing through the development site will be constructed by the developer under a self-lay agreement with Irish Water. This section of the DMA watermain will be vested to Irish Water once completed.

5.02 Development Water Main Layout

The proposed connections that will serve the new development will be metered with ABB Magmaster electromagnetic flow meters or similar approved. The mains for the new for the development will be provided with hydrants and valves as per Irish Water requirements.

The development's water-main distribution system is indicated on drawings 1703-ENG-130 to 139.

A 150mm diameter spine water main will be provided along the main access road through the site with a number of 100 mm diameter looped watermains provided along the Local Streets.

A sluice valve arrangement in accordance with the requirements of Irish Water shall be provided at all connection points.

The selected pipe material options for the development will be PE-80. Individual houses will have their own connections to the distribution main via service connections and boundary boxes. Individual service boundary boxes will be of the type to suit Irish Water and to facilitate domestic meter installation.

Hydrants are provided for fire-fighting at locations to ensure that each dwelling is within the required Building Regulations distance of a hydrant.

5.03 Water Demand & Conservation

The average daily domestic demand (ADDD) for the proposed development is approximately 232.20 m^3 where the average day/peak week demand of 290.25 m^3 has been calculated as outlined in the Irish Water Code of Practice for Water Infrastructure.

The average water demand is estimated to be 2.7 l/s. The peak demand for sizing of the pipe network (5 times the average day, peak week demand) is calculated as 16.80 l/s.

5.04 Watermain - Statement of Design Acceptance

The layout plans, longitudinal sections and details included with this application have been submitted to Irish Water in advance of this application where a statement of design acceptance has been received from the authority and which is included as appendix M.

5.05 Potable Water Services Works Outside Site Boundary

Irish Water have confirmed that all sections of the potable water services that are to be installed outside the site boundary and which are needed to serve the development, would be undertaken by the authority where they would engage their regionally appointed approved contractor to undertake the works. The proposed designs which have been discussed with the authority are shown on the drawing included in Appendix N.

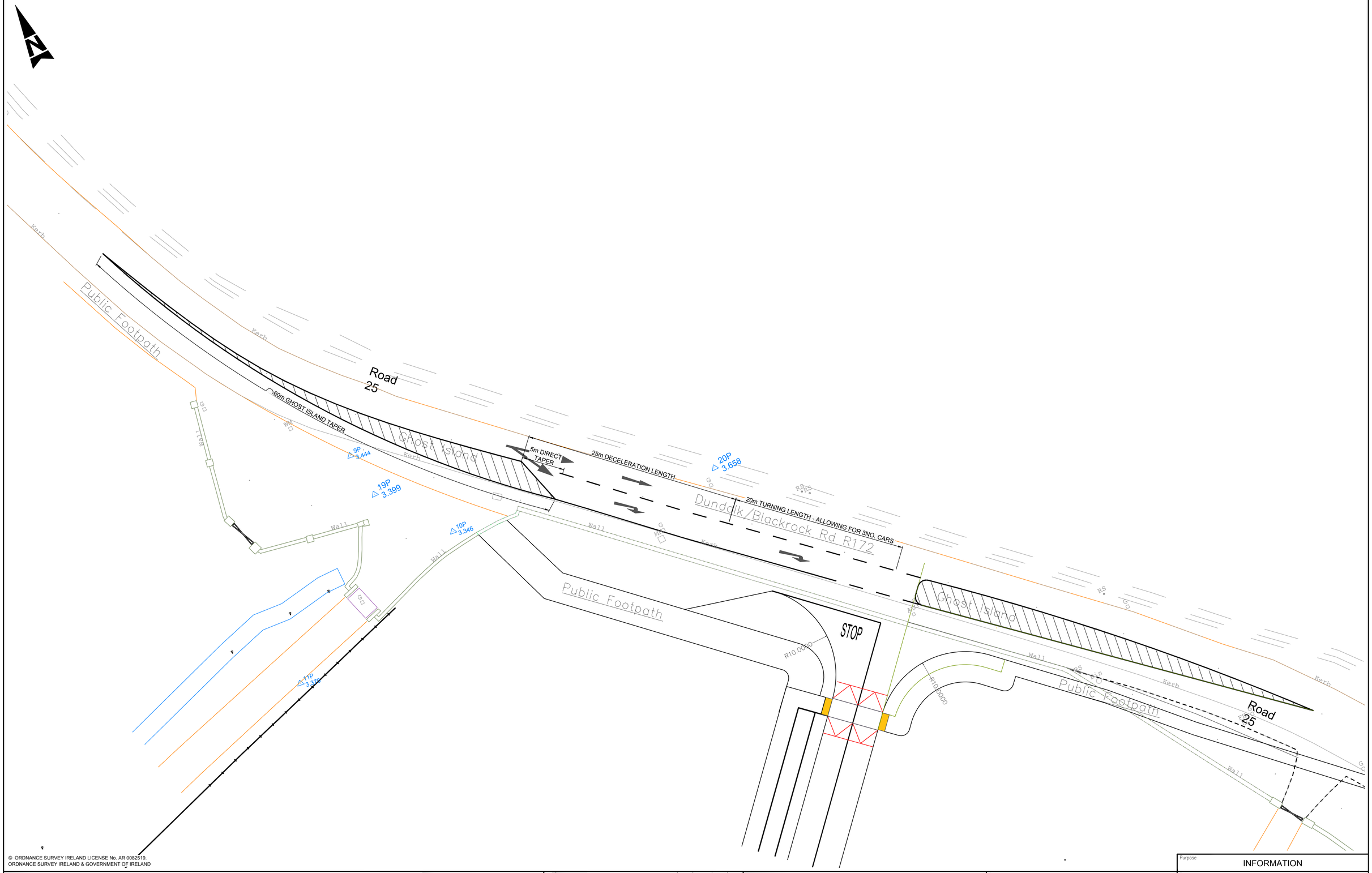
Appendix A

Priority Junction Layout for New Entrance

A1

0 10 100

DO NOT SCALE



Rev	Description	By	Date	Chk'd	Auth
-	FOR INFORMATION	BH	26.02.19	CF	KB

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Client: KINGSBRIDGE CONSULTANCY LTD

Project: BLACKROCK, LOUTH RESIDENTIAL DEVELOPMENT

Purpose: INFORMATION

Title: PROPOSED ENTRANCE

Original Scale	Design/Drawn	Checked	Authorised
1:200 at A1 1:400 at A3	BH Date 26.02.19	CF Date 26.02.19	KB Date 26.02.19

Status	Drawing Number	Rev
I	5161486 / HTR / SK / 009	-

File: 5161486_SK_009.dwg
Date: Feb 26, 2019 - 11:42am
Plotted by: bholland

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Appendix B

IRISHSUDS REPORT

Site Drainage Evaluation

Site name: Kingsbridge Consultancy Ltd
Site location: Haggardstown Blackrock, Co Louth

Report Reference: 1535108560732
Date: 24/8/2018

1. INTRODUCTION

This is a bespoke report providing initial guidance on potential implementation of SuDS for the development site in line with current best practice.

The use of this tool should be supplemented by more detailed guidance on SuDS best practice provided in a number of sources, principally the CIRIA SUDS Manual (2007), other CIRIA documents; the Use of SUDS in High Density Developments, HR Wallingford, (2005) and other HR Wallingford documents.

The objective is to provide some early guidance on the numbers and types of components that might be suitable for consideration within the site design. This may facilitate pre-application discussions with planners and other relevant authorities.

This guidance has been provided prior to the completion of the SUDS standards and the supporting guidance. However the principles of this tool are unlikely to be very different to the aims of the SUDS standards. HR Wallingford is not liable for the use of any output from the use of this tool and the performance of the drainage system. It is recommended that detailed design using appropriately experienced engineers professionals and tools is undertaken before finalising any drainage scheme arrangement for a site.

THE CONTENT OF THE REPORT

This report is split into 8 sections as follows:

2. Generic SuDS Best Practice Principles
3. Runoff Destination
4. Hydraulic Design Criteria
5. Water Quality Design Criteria
6. Site-Specific Drainage Design Considerations
7. SuDS Construction
8. SuDS Components Performance
9. Guidance on The Use of Individual Components

2. GENERIC SuDS BEST PRACTICE PRINCIPLES

To comply with current best practice, the drainage system should:

(i) manage runoff at or close to its source;
(ii) manage runoff at the surface;
(iii) be integrated with public open space areas and contribute towards meeting the objectives of the urban plan;
(iv) be cost-effective to operate and maintain.

The drainage system should endeavour to ensure that, for any particular site:

(i) natural hydrological processes are protected through maintaining Interception of an initial depth of rainfall and prioritising infiltration, where appropriate;
(ii) flood risk is managed through the control of runoff peak flow rates and volumes discharged from the site;
(iii) stormwater runoff is treated to prevent detrimental impacts to the receiving water body as a result of urban contaminants.

In addition, it is desirable to maximise the amenity and ecological benefits associated with the drainage system where there are appropriate opportunities. SuDS are green infrastructure components and can provide health benefits, and reduce the vulnerability of developments to the impacts of climate change.

3. RUNOFF DESTINATION

Introduction

Infiltration should be prioritised as the method of controlling surface water runoff from the development site, unless it can be demonstrated that the use of infiltration would have a detrimental environmental impact.

Groundwater (via Infiltration)
Infiltration may not be appropriate for managing runoff from this site. Robust studies are reqired to confirm the significance of the following constraints to infiltration:

(1) The maximum groundwater level beneath the site is within 2 m of the ground surface. This means that there is unlikely to be in excess of the required 1m depth of unsaturated zone between the infiltration surface and the water table.

(2) The groundwater beneath the site poses a flood hazard - either to the site, or to flood risk areas downstream. Infiltration should not be considered where it may exacerbate the risk of groundwater flooding.

The groundwater beneath the site is designated as *Principal Aquifer*, and this designation will define the treatment requirement for any infiltrated water (See Water Quality Design Criteria).

4. HYDRAULIC DESIGN CRITERIA

Introduction
Best practice criteria for hydraulic control require Interception, runoff and volume control.

Interception
To fulfill the requirements for Interception, there should normally be no runoff from the site for an initial depth of rainfall - usually 5mm. This is achieved through the use of infiltration, evapotranspiration, or rainwater harvesting.

Flow and Volume Control
The site is a greenfield development, therefore runoff from the site needs to be constrained to the equivalent greenfield rates and volumes.

Attenuation and hydraulic controls will be used to manage flow rates.

Rainwater harvesting, or the use of Long Term Storage can be used to achieve greenfield runoff volume control. Where volume control is not practicable, flows discharged from the site will be constrained to Qbar or 2 l/s/ha (whichever is the greater).

5. WATER QUALITY DESIGN CRITERIA

Introduction
Current best practice takes a risk-based approach to managing discharges of surface runoff to the receiving environment. The following text provides guidance on the extent of water quality management likely to be appropriate for the site.

Hazard Classification
Runoff from clean roof surfaces (ie not metal roofs, roofs close to polluted atmospheric discharges, or roofs close to populations of flocking birds) is classified as Low in terms of hazard status.

Runoff from roads, parking and other areas of residential, commercial and industrial sites (that are not contaminated with waste, high levels of hydrocarbons, or other chemicals) is classified as Medium in terms of hazard status.

Treatment requirements for disposal to surface water systems
Roof runoff will not require treatment prior to discharge.

Runoff from other parts of this site such as roads, parking and other areas will require at least 2 treatment stages prior to discharge.

6. SITE-SPECIFIC DRAINAGE DESIGN CONSIDERATIONS

The site is a high density residential site. The HR Wallingford documenet 'SuDS for high density developments' is a useful guidance document for efficient drainage design where space is heavily constrained.

Components likely to be particularly suitable for high density sites include:

• permeable pavement parking areas which can often manage roof runoff as well as rainfall falling on the parking surface;

• green roofs which limit runoff from roof surfaces;
• bioretention areas integrated within impermeable zones;
• individual property soakaways;
• subsurface infiltration and/or detention systems (eg beneath functional, permeable surfaces);
• infiltration/detention/retention ponds/basins/channels integrated within public open space areas.

The design of SuDS with access to temporary or permanent water should consider public health and safety as well as issues associated with construction and operational management of the structures. Health and safety issues and risk mitigation features are presented in the CIRIA SuDS Manual.

Individual SuDS components should not be treated in isolation, but should be seen together as providing a suite of drainage features which are appropriate in different combinations for varying scales. It is always desirable to have a mix of SuDS components across the site as different components have different capacities for treatment of individual pollutants.

7. SuDS CONSTRUCTION

SuDS are a combination of civil engineering structures and landscaping practice. Due to the limited experience of building SuDS in the water industry, there are a number of key issues which need to be particularly considered as their construction requires a change in approach to some standard construction practices.

• SuDS components should be constructed in line with either the manufacturer's guidelines or best practice methods.
• The construction of SuDS usually only requires the use of fairly standard civil engineering construction and landscaping operations, such as excavation, filling, grading, top-soiling, seeding, planting etc. These operations are specified in various standard construction documents, such as the Civil Engineering Specification for the Water Industry (CESWI).
• Construction of soakaways is regulated by the Buildings Regulations part H (Drainage and waste disposal) which sets out the requirements for drainage of rainwater from the roofs of buildings.
• During construction, any surfaces which are intended to enable infiltration must be protected from compaction. This includes protecting from heavy traffic or storage of materials.
• Water contaminated with silt must not be allowed to enter a watercourse or drain as it can cause pollution. All parts of the drainage system must be protected from construction runoff to prevent silt clogging the system and causing pollution downstream. Measures to prevent this include soil stabilisation, early construction of sediment management basins, channelling run-off away from watercourses and surface water drains, and erosion prevention measures.
• After the end of the construction period and prior to handover to the site owner/operator:
  - Subsoil that has been compacted during construction activities should be broken up prior to the re-application of topsoil to garden areas and other areas of public open space to reinstate the natural infiltration performance of the ground;
  - Any areas of the SuDs that have been compacted during construction but are intended to permit infiltration must be completely refurbished;
  - Checks must be made for blockages or partial blockages of orifices or pipe systems;
  - Any silt deposited during the construction must be completely removed;
  - Soils must be stabilised and protected from erosion whilst planting becomes established.

Detailed guidance on the construction related issues for SuDS is available in the SuDS Manual and the associated Construction Site handbook (CIRIA, 2007).

8. SuDS COMPONENTS PERFORMANCE

	Interception	Peak flow control: Low	Peak flow control: High	Volume reduction	Volume control	Gross sediments	Fine sediments	Hydrocarbons/ PAHs	Metals	Nutrients
Rainwater Harvesting	Y	Y	S	Y	N	N	N	N	N	N
Pervious Pavement	Y	Y	Y	Y	Y	Y	Y	Y	Y	Var
Filter Strips	Y	N	N	N	N	Y	N	Y	Y	Var
Swales	Y	Y	S	Y(*)	N	Y	Y(+)	Y	Y	Y(-)
Trenches	Y	Y	S	Y(*)	N	N	N	Y	Y	Y(-)
Detention Basins	Y	Y	Y	N	Y	Y	Y(+)	Y	Y	Var
Ponds	N	Y	Y	N	Y	N(~)	Y	Limited	Y	Var
Wetlands	N	Y	S	N	Y	N(~)	Y	Limited	Y	Y
Green Roofs	Y	Y	N	N	N	N	N	Y	N	N
Bioretention Systems	Y	Y	S	Y(*)	N	N(~)	Y	Y	Y	Y
Proprietary Treatment Systems	N	N	N	N	N	Y	Y	Y(!)	Y(!)	Y(!)
Subsurface Storage	N	Y	Y	N	Y	N(~)	N	N	N	N
Subsurface Conveyance	N	N	N	N	Y	N(~)	N	N	N	N

Pipes										

Notes:
S: Not normally with standard designs, but possible where space is available and designs mitigate impact of high flow rates.
Y(*): Where infiltration is facilitated by the design.
N(~): Gross sediment retention is possible, but not recommended due to negative maintenance and performance implications.
Y(+): Where designs minimise the risk of fine sediment mobilisation during larger events.
Y(!): Where designs specifically promote the trapping and breakdown of oils and PAH based constitutents.
Y("): Where subsurface soil structure facilitates the trapping and breakdown of oils and PAH based constituents.
Var: The nutrient removal performance is variable, and can be negative in some situations.
Y(-): Good nutrient removal performance where subsurface biofiltration systems with a permanently saturated zone included within the design.

9. GUIDANCE ON THE USE OF INDIVIDUAL COMPONENTS

Rainwater Harvesting

• *High density*
For large occupancy buildings (offices, supermarkets, etc.), communal rainwater harvesting systems may provide significant stormwater management benefits.

• *Roofs*
Rainwater harvesting systems can be used to effectively drain roofs and provide both water supply and stormwater management benefits.

Pervious Pavement

• *High density*
Pervious pavement systems provide an effective way to drain, store and treat the surface runoff, all within the footprint of the car park area. Larger areas of communal parking will provide the most cost effective systems.

• *Roofs*
Roof water can be drained into pervious pavement areas using diffusers to dissipate the point inflows. Detailed design of the pavement will need to take account of the additional impermeable roof area.

• *Roads*
Some types of pervious pavement can be used for relatively highly trafficked roads and pavement manufacturers should be consulted on the appropriate specification.

• *Car parks/other impermable surfaces*
Pervious pavements provide effective drainage, storage and treatment of car park surfacing,

• *Groundwater < 2m below surface*
The design of the drainage system will need to fully mitigate the risks posed by: a) the groundwater surface potentially rising above the base of the drainage system; and b) the reduction in unsaturated zone depth which may compromise any treatment function provided by the subsurface soils.

• *Groundwater flood risk*
The pervious pavement system may require an effective liner to minimise the risks of infiltrating water exacerbating groundwater flood risks

Filter Strips

• *High density*
Filter strips can be used as treatment for road or car park runoff where space allows.

• *Roads*
Filter strips can provide treatment for road runoff, upstream of swales or trench components. They can reduce the need for kerbing and runoff collection systems.

• *Car parks/other impermable surfaces*
Filter strips can provide treatment for runoff from impermeable surfaces, upstream of swales or trench components. They can reduce the need for kerbing and runoff collection systems.

• *Site size > 50 ha*

The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

• *Groundwater < 2m below surface*
The design of the drainage system will need to fully mitigate the risks posed by: a) the groundwater surface potentially rising above the base of the drainage system; and b) the reduction in unsaturated zone depth which may compromise any treatment function provided by the subsurface soils.

• *Groundwater flood risk*
The filter strip may require a to minimise the risks of infiltrating water exacerbating groundwater flood risks.

Swales

• *High density*
Swales can be used for road or car park drainage where space allows. Underdrained swales (ie with a subsurface gravel filled conveyance and treatment trench) can provide a more efficient solution for hydraulic control and water quality treatment.

• *Roofs*
Swales can be used to convey roof water to other parts of the site.

• *Roads*
Swales provide treatment and conveyance of road runoff. There are a range of swale types - standard grass channels, underdrained swales, and wetland swales - depending on drainage requirements.

• *Car parks/other impermable surfaces*
Swales provide treatment and conveyance of runoff from impermeable areas. There are a range of swale types - standard grass channels, underdrained swales, and wetland swales - depending on drainage requirements.

• *Site size > 50 ha*
The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

• *Groundwater < 2m below surface*
The design of the drainage system will need to fully mitigate the risks posed by: a) the groundwater surface potentially rising above the base of the drainage system; and b) the reduction in unsaturated zone depth which may compromise any treatment function provided by the subsurface soils.

• *Groundwater flood risk*
The swale may require a liner to minimise the risks of infiltrating water exacerbating groundwater flood risks.

Trenches

• *High density*
Trenches can provide treatment and runoff control for road or car park drainage.

• *Roofs*
Trenches can be used to convey roof water to other parts of the site.

• *Roads*
Trenches can provide treatment and conveyance of road runoff. They require effective pretreatment to minimise the risk of blockage.

• *Car parks/other impermable surfaces*
Trenches can provide treatment and conveyance of runoff for impermeable areas.

• *Site size > 50 ha*
The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

• *Groundwater < 2m below surface*
The design of the drainage system will need to fully mitigate the risks posed by: a) the groundwater surface potentially rising above the base of the drainage system; and b) the reduction in unsaturated zone depth which may compromise any treatment function provided by the subsurface soils.

• *Groundwater flood risk*
The trench may require a liner to minimise the risks of infiltrating water exacerbating groundwater flood risks.

Detention Basins

• *High density*
Detention basins can be used in high density developments when effectively integrated within public open space areas.

• *Roofs*
Detention basins can be used to attenuate and treat runoff.

• *Roads*
Detention basins can be used to attenuate and treat runoff.

• *Car parks/other impermable surfaces*
Detention basins can be used to attenuate and treat runoff.

• *Site size > 50 ha*
The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria. A risk assessment should be used to determine the maximum appropriate depth of stored water in the basin.

• *Groundwater flood risk*
The trench may require a liner to minimise the risks of infiltrating water exacerbating groundwater flood risks.

Ponds

• *High density*
It is unlikely that a pond would be suitable for high density development, unless it is an integral amenity feature within the public open space area.

• *Roofs*
Ponds can be used to attenuate and treat roof runoff.

• *Roads*
Ponds can be used to attenuate and treat runoff. However, they are best implemented at the lower end of the treatment train as a 'polishing' component. They should not be used as sediment management devices, as sediment and wet vegetation is relatively costly to extract and dispose of. If poor quality water remains in ponds for extended periods, nutrient concentrations can rise - particularly in the summer months, and the pond can become unattractive with poor amenity and biodiversity potential.

• *Car parks/other impermable surfaces*
Ponds can be used to attenuate and treat runoff. However, they are best implemented at the lower end of the treatment train as a 'polishing' component. They should not be used as sediment management devices, as sediment and wet vegetation is relatively costly to extract and dispose of. If poor quality water remains in ponds for extended periods, nutrient concentrations can rise - particularly in the summer months, and the pond can become unattractive with poor amenity and biodiversity potential.

• *Site size > 50 ha*
The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

• *Other*
Ponds built in permeable soils will require lining to maintain the water level of the permanent pool. The lining may be finished 100 or 200 mm lower than the outlet invert to encourage some infiltration to take place to contribute to interception.

Wetlands

• *High density*
It is unlikely that a wetland would be suitable for high density development, unless it is an integral amenity feature within the public open space area.

• *Roofs*
Wetlands can be used to attenuate and treat roof runoff.

• *Roads*
Wetlands can be used to attenuate and treat runoff. However, they are best implemented at the lower end of the treatment train as a 'polishing' component. They should not be used as sediment management devices, as sediment and wet vegetation is relatively costly to extract and dispose of. If poor quality water remains in wetlands for extended periods, nutrient concentrations can rise - particularly in the summer months, and the wetland can become unattractive with poor amenity and biodiversity potential.

• *Car parks/other impermable surfaces*
Wetlands can be used to attenuate and treat runoff. However, they are best implemented at the lower end of the treatment train as a 'polishing' component. They should not be used as sediment management devices, as sediment and

wet vegetation is relatively costly to extract and dispose of. If poor quality water remains in wetlands for extended periods, nutrient concentrations can rise - particularly in the summer months, and the wetland can become unattractive with poor amenity and biodiversity potential.

• *Site size > 50 ha*
The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

• *Groundwater < 2m below surface*
Wetlands can perform satisfactorily where the groundwater level supports baseflows in the system. However, if there is a risk of higher levels then the loss in wetland capacity should be evaluated in the design. Consideration should also be given to any potential lowering of levels which may cause exfiltration from the system, and the system to dry out.

• *Groundwater flood risk*
The wetland may require a liner to minimise the risks of infiltrating water exacerbating groundwater flood risks.

Green Roofs

• *HighDensity*
Green roofs can be implemented most cost-effectively on larger roofs. They provide a range of benefits in addition to stormwater management, including combatting the heat island effect, biodiversity and amenity functions.

• *Roofs*
Green roofs can be designed to provide interception, management and treatment of rainfall up to specified rainfall depths.

Bioretention Systems

• *High density*
Biorention systems (either cells or linear systems) can be used for road or car park drainage where space allows.

• *Roofs*
Bioretention systems can be used to attenuate and treat roof runoff.

• *Roads*
Linear bioretention systems (ie biofiltration swales) can be used to attenuate and treat road runoff.

• *Car parks/other impermable surfaces*
Bioretention systems canbe used for car park drainage.

• *Site size > 50 ha*
Bioretention systems will tend to be suitable for managing small areas only.The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

• *Groundwater < 2m below surface*
Infiltration systems should not be designed where maximum predicted groundwater levels are less than 1m below base of the the proposed infiltration unit.

• *Groundwater flood risk*
Infiltration should not be promoted where the risks of downstream groundwater flooding may be exacerbated.

Proprietary Treatment Systems

• *High density*
Proprietary treatment systems may be appropriate to use particularly where there is no space for surface, vegetated treatment systems. However, regular monitoring needs to be ensured so that they are maintained so that they continue to function effectively.

• *Roads*
Proprietary treatment systems can be used where surface vegetated systems are impracticable. However, regular monitoring needs to be ensured so that they are maintained so that they continue to function effectively.

• *Car parks/other impermable surfaces*
Proprietary treatment systems could be used where surface vegetated systems are impracticable. However, regular monitoring needs to be ensured so that they are maintained so that they continue to function effectively.

• *Site size > 50 ha*
Proprietary treatment systems will tend to be suitable for managing small areas only. The size of area that can be drained will be limited by meeting the hydraulic and water quality criteria.

Subsurface Storage

• *High density*
Subsurface storage of runoff is likely to be needed for high density developments. This can be implemented via a range of proprietary high void systems, or within gravels beneath permeable pavements which provide treatment as well. Sub-surface storage allows the land above the storage system to be used for car parking or public open space areas.

• *Roofs*
Subsurface storage can be used to attenuate roof runoff.

• *Roads*
Subsurface storage can be used to attenuate road runoff.

• *Car parks/other impermable surfaces*
Subsurface storage can be used to attenuate car park runoff.

Subsurface Conveyance Pipes

• *High density*
Subsurface conveyance systems may be an important means of connecting drainage components together and routing flows downstream. Space constraints in high density developments are likely to constrain the use of surface conveyance options.

Appendix C

QQBar Calculation

Appendix C -1

Development Site

For a development less than 24 hectares in area, the permissible outflow is calculated using the estimation method contained in the Institute of Hydrology Report No. 124:

Input cells	
Output cells	

Soil	Soil Value	SPR
1	0.15	0.10
2	0.30	0.30
3	0.04	0.37
4	0.45	0.47
5	0.50	0.53

Area of site = 175540.0574 m^2 = 0.175540057 km^2 = 17.5540057 Ha

Is area of site > 50 Ha? No
therefore use area of 50 Ha in QBARrural equation and interpolate result for actual site area, therefore A = 50 Ha
(as per GDSDS)

Location of site = Dundalk
SAAR = 1033 (standard annual average rainfall for local area in mm)

SOIL = 0.3 (soil index with values within the range 0.15 - 0.5; assumed value)

$QBAR_{rural}$ = $0.00108 \times (AREA)^{0.89} (SAAR)^{1.17} (SOIL)^{2.17}$ (mean annual peak flow measured in m^3/s)

therefore $QBAR_{rural}$ = 0.143667177 m^3/s for 50Ha site = 50.4 l/s for 17.554006 Ha site 2.873 /ha

Apply growth curve factor to QBAR:

Return period (years)	Factor
1	0.85
QBAR	1
10	1.7
30	2.1
100	2.6
200	2.9

Storm event = 1 in :	1 yr	30 yrs	100 yrs
therefore growth factor =	0.85	2.1	2.6
therefore QBARrural =	42.9 l/s	105.9 l/s	131.1 l/s

Appendix C -2

Site Access Roadway

For a development less than 24 hectares in area, the permissible outflow is calculated using the estimation method contained in the Institute of Hydrology Report No. 124:

Input cells	
Output cells	

Soil	Soil Value	SPR
1	0.15	0.10
2	0.30	0.30
3	0.04	0.37
4	0.45	0.47
5	0.50	0.53

Area of site = 3425 m^2 = 0.003425 km^2 = 0.3425 Ha

Is area of site > 50 Ha? No
therefore use area of 50 Ha in QBARrural equation and interpolate result for actual site area, therefore A = 50 Ha
(as per GDSDS)

Location of site = Dundalk
SAAR = 1033 (standard annual average rainfall for local area in mm)

SOIL = 0.3 (soil index with values within the range 0.15 - 0.5; assumed value)

$QBAR_{rural}$ = $0.00108 \times (AREA)^{0.89} (SAAR)^{1.17} (SOIL)^{2.17}$ (mean annual peak flow measured in m^3/s)

therefore $QBAR_{rural}$ = 0.143667177 m^3/s for 50Ha site = 1.0 l/s for 0.3425 Ha site 2.873 /ha

Apply growth curve factor to QBAR:

Return period (years)	Factor
1	0.85
QBAR	1
10	1.7
30	2.1
100	2.6
200	2.9

Storm event = 1 in :	1 yr	30 yrs	100 yrs
therefore growth factor =	0.85	2.1	2.6
therefore QBARrural =	0.8 l/s	2.1 l/s	2.6 l/s

Appendix D

Surface Water Source Control

Appendix D-1

Surface Water Source Control
Development Site - 1 in 30 Yr Event

Summary of Results for 30 year Return Period (+10%)

Half Drain Time : 199 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
15 Summer	86.7	14.5	0.0	101.1	7.6133	0.6133	0.0	972.0	O K
30 Summer	86.8	16.0	0.0	101.2	7.7793	0.7793	0.0	1290.5	O K
60 Summer	86.7	17.6	0.0	101.1	7.9218	0.9218	0.0	1588.8	O K
120 Summer	86.8	18.9	0.0	101.2	8.0298	1.0298	0.0	1833.9	O K
180 Summer	86.6	19.3	0.0	101.1	8.0648	1.0648	0.0	1917.4	O K
240 Summer	86.6	19.5	0.0	101.1	8.0818	1.0818	0.0	1958.4	O K
360 Summer	86.8	19.6	0.0	101.2	8.0918	1.0918	0.0	1981.9	O K
480 Summer	86.6	19.5	0.0	101.1	8.0848	1.0848	0.0	1964.6	O K
600 Summer	86.7	19.3	0.0	101.1	8.0683	1.0683	0.0	1925.4	O K
720 Summer	86.7	19.1	0.0	101.1	8.0468	1.0468	0.0	1874.4	O K
960 Summer	86.8	18.4	0.0	101.2	7.9948	0.9948	0.0	1753.1	O K
1440 Summer	86.8	17.0	0.0	101.2	7.8748	0.8748	0.0	1487.0	O K
2160 Summer	86.7	15.3	0.0	101.1	7.6973	0.6973	0.0	1129.8	O K
2880 Summer	85.6	14.2	0.0	99.7	7.5717	0.5717	0.0	896.2	O K
4320 Summer	74.4	13.1	0.0	87.5	7.4457	0.4457	0.0	678.3	O K
5760 Summer	63.0	12.5	0.0	75.5	7.3797	0.3797	0.0	570.0	O K
7200 Summer	53.6	12.3	0.0	65.9	7.3387	0.3387	0.0	504.6	O K
8640 Summer	46.5	12.2	0.0	58.7	7.3077	0.3077	0.0	456.2	O K
10080 Summer	41.1	12.0	0.0	53.1	7.2842	0.2842	0.0	419.2	O K
15 Winter	86.8	15.1	0.0	101.2	7.6788	0.6788	0.0	1094.2	O K
30 Winter	86.7	16.9	0.0	101.1	7.8613	0.8613	0.0	1459.0	O K
60 Winter	86.7	18.7	0.0	101.1	8.0173	1.0173	0.0	1804.8	O K
120 Winter	86.7	20.1	0.0	101.1	8.1378	1.1378	0.0	2095.4	O K
180 Winter	86.7	20.6	0.0	101.1	8.1803	1.1803	0.0	2203.3	O K
240 Winter	86.7	20.8	0.0	101.1	8.1933	1.1933	0.0	2236.5	O K
360 Winter	86.6	20.8	0.0	101.1	8.1963	1.1963	0.0	2243.7	O K
480 Winter	86.7	20.6	0.0	101.1	8.1793	1.1793	0.0	2200.6	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	62.93	22
30 Summer	42.65	36
60 Summer	27.44	66
120 Summer	17.24	122
180 Summer	13.04	164
240 Summer	10.67	196
360 Summer	8.03	262
480 Summer	6.56	332
600 Summer	5.60	400
720 Summer	4.92	468
960 Summer	4.02	606
1440 Summer	3.01	866
2160 Summer	2.26	1216
2880 Summer	1.84	1560
4320 Summer	1.38	2252
5760 Summer	1.12	2944
7200 Summer	0.95	3680
8640 Summer	0.84	4408
10080 Summer	0.75	5144
15 Winter	62.93	22
30 Winter	42.65	36
60 Winter	27.44	64
120 Winter	17.24	120
180 Winter	13.04	176
240 Winter	10.67	226
360 Winter	8.03	282
480 Winter	6.56	360

Summary of Results for 30 year Return Period (+10%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
600 Winter	86.8	20.3	0.0	101.2	8.1503	1.1503	0.0	2127.3	O K
720 Winter	86.8	19.9	0.0	101.2	8.1143	1.1143	0.0	2037.5	O K
960 Winter	86.7	18.9	0.0	101.1	8.0293	1.0293	0.0	1832.9	O K
1440 Winter	86.8	16.5	0.0	101.2	7.8268	0.8268	0.0	1386.7	O K
2160 Winter	85.5	14.1	0.0	99.7	7.5712	0.5712	0.0	895.0	O K
2880 Winter	76.3	13.2	0.0	89.5	7.4587	0.4587	0.0	699.7	O K
4320 Winter	57.7	12.4	0.0	70.1	7.3567	0.3567	0.0	533.6	O K
5760 Winter	45.6	12.1	0.0	57.8	7.3037	0.3037	0.0	449.3	O K
7200 Winter	37.6	12.0	0.0	49.5	7.2692	0.2692	0.0	395.6	O K
8640 Winter	31.7	11.8	0.0	43.5	7.2442	0.2442	0.0	357.7	O K
10080 Winter	27.4	11.7	0.0	39.1	7.2257	0.2257	0.0	329.1	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	5.60	436
720 Winter	4.92	510
960 Winter	4.02	656
1440 Winter	3.01	914
2160 Winter	2.26	1236
2880 Winter	1.84	1560
4320 Winter	1.38	2252
5760 Winter	1.12	2992
7200 Winter	0.95	3680
8640 Winter	0.84	4408
10080 Winter	0.75	5144

Rainfall Details

Region	SCOT+NI	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	30	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	16.500	Shortest Storm (mins)	15	Climate Change %	+10
Ratio-R	0.300	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 8.873

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	2.694	4	8	5.359	8	12	0.820

Infiltration Basin Details

Infil Coef - Base (m/hr)	0.054355	Porosity	1.00
Infil Coef - Sides (m/hr)	0.054355	Invert Level (m)	7.000
Safety Factor	2.0	Ground Level (m)	8.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.00	1394.0	2.40	0.6	4.80	0.6	7.20	0.6	9.60	0.6
0.40	1621.0	2.80	0.6	5.20	0.6	7.60	0.6	10.00	0.6
0.80	2025.0	3.20	0.6	5.60	0.6	8.00	0.6		
1.20	2581.0	3.60	0.6	6.00	0.6	8.40	0.6		
1.60	3015.0	4.00	0.6	6.40	0.6	8.80	0.6		
2.00	3465.0	4.40	0.6	6.80	0.6	9.20	0.6		

Hydro-Brake Outflow Control

Design Head (m)	1.600	Hydro-Brake Type	MD4	Invert Level (m)	7.000
Design Flow (l/s)	80.6	Diameter (mm)	285		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	4.8	0.60	86.8	1.60	80.6	2.60	102.3	5.00	141.9	7.50	173.8
0.20	21.3	0.80	78.5	1.80	85.2	3.00	109.9	5.50	148.8	8.00	179.5
0.30	44.8	1.00	72.0	2.00	89.8	3.50	118.7	6.00	155.4	8.50	185.0
0.40	67.6	1.20	72.4	2.20	94.1	4.00	126.9	6.50	161.8	9.00	190.3
0.50	82.5	1.40	76.0	2.40	98.3	4.50	134.6	7.00	167.9	9.50	195.6

Pipe Overflow Control

Pipe Diameter (m)	0.150	Roughness (mm)	1.500	Invert Level (m)	8.200
Slope (1:x)	150.0	Entry Loss Coef	0.500		
Length (m)	35.000	Coef of Contraction	0.600		

Flood Routing through Storage Structure

Storm Duration 360 Mins (Winter)

Total Volume over Overflow (Spill Flow) 0.0m³

Time (mins)	Level (m)	Depth (m)	Inflow (l/s)	Control (l/s)	Overflow (l/s)	Filtration (l/s)	Outflow (l/s)	Volume (m³)
2	7.000	0.000	0.8	0.0	0.0	0.1	0.1	0.0
4	7.000	0.000	2.1	0.0	0.0	0.1	0.1	0.2
6	7.001	0.001	6.2	0.0	0.0	0.2	0.2	0.7
8	7.001	0.001	11.5	0.1	0.0	0.3	0.3	1.7
10	7.002	0.002	18.6	0.1	0.0	0.5	0.6	3.5
12	7.004	0.004	26.6	0.2	0.0	0.9	1.1	6.1
14	7.007	0.007	32.9	0.3	0.0	1.4	1.8	9.5
16	7.010	0.010	39.7	0.5	0.0	2.1	2.5	13.6
18	7.013	0.013	44.9	0.6	0.0	2.8	3.5	18.3
20	7.017	0.017	50.1	0.8	0.0	3.6	4.4	23.5
22	7.021	0.021	54.3	1.0	0.0	4.4	5.4	29.2
24	7.025	0.025	58.1	1.2	0.0	5.4	6.6	35.2
26	7.030	0.030	61.6	1.4	0.0	6.4	7.8	41.6
28	7.034	0.034	64.1	1.7	0.0	7.3	9.0	48.1
30	7.039	0.039	66.6	1.9	0.0	8.3	10.2	54.8
32	7.044	0.044	68.3	2.1	0.0	9.4	11.5	61.6
34	7.049	0.049	70.0	2.4	0.0	10.5	12.9	68.4
36	7.053	0.053	71.2	2.6	0.0	10.8	13.4	75.3
38	7.058	0.058	72.2	2.8	0.0	10.8	13.7	82.3
40	7.063	0.063	72.9	3.1	0.0	10.9	13.9	89.4
42	7.068	0.068	73.4	3.3	0.0	10.9	14.2	96.4
44	7.073	0.073	73.8	3.5	0.0	10.9	14.5	103.6
46	7.078	0.078	74.0	3.8	0.0	10.9	14.7	110.7
48	7.083	0.083	74.1	4.0	0.0	11.0	15.0	117.8
50	7.088	0.088	74.1	4.3	0.0	11.0	15.2	124.9
52	7.093	0.093	74.1	4.5	0.0	11.0	15.5	131.9
54	7.098	0.098	74.0	4.7	0.0	11.0	15.8	138.9
56	7.102	0.102	74.0	5.2	0.0	11.1	16.3	145.9
58	7.107	0.107	74.0	6.0	0.0	11.1	17.1	152.7
60	7.112	0.112	74.0	6.8	0.0	11.1	17.9	159.5
62	7.116	0.116	74.2	7.5	0.0	11.1	18.7	166.2
64	7.121	0.121	74.4	8.3	0.0	11.2	19.5	172.8
66	7.125	0.125	74.8	9.0	0.0	11.2	20.2	179.4
68	7.130	0.130	75.2	9.7	0.0	11.2	21.0	185.9
70	7.134	0.134	76.0	10.5	0.0	11.2	21.7	192.5
72	7.139	0.139	76.7	11.2	0.0	11.3	22.5	199.0
74	7.143	0.143	77.9	12.0	0.0	11.3	23.3	205.5
76	7.148	0.148	79.1	12.7	0.0	11.3	24.0	212.1
78	7.152	0.152	80.6	13.5	0.0	11.3	24.8	218.7
80	7.157	0.157	82.5	14.2	0.0	11.4	25.5	225.5
82	7.161	0.161	84.3	14.9	0.0	11.4	26.3	232.4
84	7.166	0.166	86.7	15.8	0.0	11.4	27.2	239.5
86	7.171	0.171	89.0	16.6	0.0	11.4	28.0	246.7
88	7.176	0.176	92.1	17.4	0.0	11.5	28.9	254.1
90	7.181	0.181	94.8	18.2	0.0	11.5	29.7	261.8
92	7.186	0.186	98.5	19.1	0.0	11.5	30.6	269.8
94	7.192	0.192	102.0	20.0	0.0	11.5	31.6	278.1
96	7.198	0.198	106.1	20.9	0.0	11.6	32.5	286.8
98	7.204	0.204	110.7	22.2	0.0	11.6	33.8	295.8
100	7.210	0.210	114.9	23.6	0.0	11.6	35.2	305.2
102	7.216	0.216	120.2	25.1	0.0	11.7	36.8	315.0
104	7.223	0.223	124.9	26.8	0.0	11.7	38.5	325.2
106	7.230	0.230	130.9	28.4	0.0	11.7	40.2	335.8
108	7.237	0.237	136.1	30.1	0.0	11.8	41.8	346.9
110	7.245	0.245	142.7	31.8	0.0	11.8	43.6	358.5
112	7.253	0.253	148.8	33.7	0.0	11.9	45.6	370.6
114	7.261	0.261	155.6	35.7	0.0	11.9	47.6	383.3
116	7.270	0.270	163.0	37.7	0.0	12.0	49.6	396.6
118	7.279	0.279	169.6	39.8	0.0	12.0	51.8	410.5

Flood Routing through Storage Structure

Storm Duration 360 Mins (Winter)

Time (mins)	Level (m)	Depth (m)	Inflow (l/s)	Control (l/s)	Overflow (l/s)	Filtration (l/s)	Outflow (l/s)	Volume (m³)
120	7.288	0.288	177.6	41.9	0.0	12.1	53.9	424.9
122	7.298	0.298	184.6	44.2	0.0	12.1	56.3	440.1
124	7.308	0.308	193.1	46.5	0.0	12.2	58.7	455.8
126	7.318	0.318	200.4	48.9	0.0	12.2	61.1	472.2
128	7.329	0.329	209.4	51.4	0.0	12.3	63.7	489.3
130	7.340	0.340	217.5	53.9	0.0	12.3	66.3	507.2
132	7.352	0.352	226.4	56.6	0.0	12.4	69.0	525.7
134	7.364	0.364	235.7	59.3	0.0	12.5	71.8	545.0
136	7.376	0.376	243.9	62.2	0.0	12.5	74.7	565.0
138	7.389	0.389	253.7	65.1	0.0	12.6	77.7	585.7
140	7.403	0.403	261.9	68.0	0.0	12.7	80.7	607.1
142	7.416	0.416	271.7	70.0	0.0	12.8	82.8	629.3
144	7.430	0.430	280.0	72.1	0.0	12.9	85.0	652.3
146	7.445	0.445	289.9	74.3	0.0	13.0	87.3	676.2
148	7.459	0.459	298.6	76.4	0.0	13.2	89.6	700.9
150	7.474	0.474	308.0	78.7	0.0	13.3	92.0	726.4
152	7.490	0.490	317.5	81.0	0.0	13.4	94.4	752.7
154	7.506	0.506	325.7	82.7	0.0	13.6	96.3	779.9
156	7.522	0.522	335.1	83.4	0.0	13.7	97.1	807.9
158	7.538	0.538	342.8	84.1	0.0	13.9	98.0	836.9
160	7.555	0.555	351.8	84.9	0.0	14.0	98.9	866.8
162	7.572	0.572	359.2	85.6	0.0	14.2	99.7	897.5
164	7.590	0.590	367.6	86.3	0.0	14.3	100.7	929.1
166	7.608	0.608	374.8	86.5	0.0	14.5	100.9	961.5
168	7.626	0.626	382.0	85.7	0.0	14.6	100.3	994.9
170	7.644	0.644	389.2	84.9	0.0	14.8	99.7	1029.1
172	7.663	0.663	394.9	84.2	0.0	15.0	99.1	1064.3
174	7.682	0.682	401.1	83.4	0.0	15.1	98.5	1100.2
176	7.701	0.701	405.8	82.6	0.0	15.3	97.9	1136.8
178	7.720	0.720	410.8	81.8	0.0	15.5	97.2	1174.1
180	7.740	0.740	414.5	81.0	0.0	15.6	96.6	1212.0
182	7.759	0.759	417.5	80.2	0.0	15.8	96.0	1250.3
184	7.779	0.779	419.5	79.4	0.0	16.0	95.3	1289.1
186	7.798	0.798	419.3	78.6	0.0	16.1	94.7	1328.0
188	7.817	0.817	418.0	77.9	0.0	16.4	94.3	1366.9
190	7.836	0.836	415.2	77.3	0.0	16.6	93.9	1405.6
192	7.854	0.854	411.1	76.7	0.0	16.8	93.5	1443.9
194	7.872	0.872	407.0	76.1	0.0	17.0	93.1	1481.8
196	7.890	0.890	401.4	75.6	0.0	17.2	92.8	1519.2
198	7.907	0.907	396.4	75.0	0.0	17.4	92.4	1555.9
200	7.923	0.923	389.6	74.5	0.0	17.6	92.1	1592.0
202	7.939	0.939	383.4	73.9	0.0	17.8	91.7	1627.4
204	7.955	0.955	376.1	73.4	0.0	18.0	91.4	1662.0
206	7.970	0.970	368.2	72.9	0.0	18.2	91.1	1695.7
208	7.984	0.984	361.1	72.5	0.0	18.3	90.8	1728.5
210	7.998	0.998	352.4	72.0	0.0	18.5	90.5	1760.4
212	8.011	1.011	344.9	72.0	0.0	18.6	90.6	1791.4
214	8.024	1.024	335.7	72.0	0.0	18.8	90.8	1821.4
216	8.037	1.037	327.8	72.0	0.0	18.9	91.0	1850.3
218	8.048	1.048	318.2	72.1	0.0	19.1	91.1	1878.1
220	8.060	1.060	309.7	72.1	0.0	19.2	91.3	1904.8
222	8.070	1.070	300.4	72.1	0.0	19.3	91.5	1930.5
224	8.081	1.081	290.6	72.1	0.0	19.5	91.6	1954.9
226	8.090	1.090	282.2	72.2	0.0	19.6	91.7	1978.3
228	8.099	1.099	272.3	72.2	0.0	19.7	91.9	2000.6
230	8.108	1.108	264.1	72.2	0.0	19.8	92.0	2021.7
232	8.116	1.116	254.2	72.2	0.0	19.9	92.1	2041.8
234	8.124	1.124	246.1	72.2	0.0	20.0	92.2	2060.7
236	8.131	1.131	236.5	72.3	0.0	20.1	92.3	2078.6
238	8.138	1.138	228.0	72.3	0.0	20.1	92.4	2095.4
240	8.144	1.144	219.1	72.3	0.0	20.2	92.5	2111.1
242	8.150	1.150	210.1	72.3	0.0	20.3	92.6	2125.8

Flood Routing through Storage Structure

Storm Duration 360 Mins (Winter)

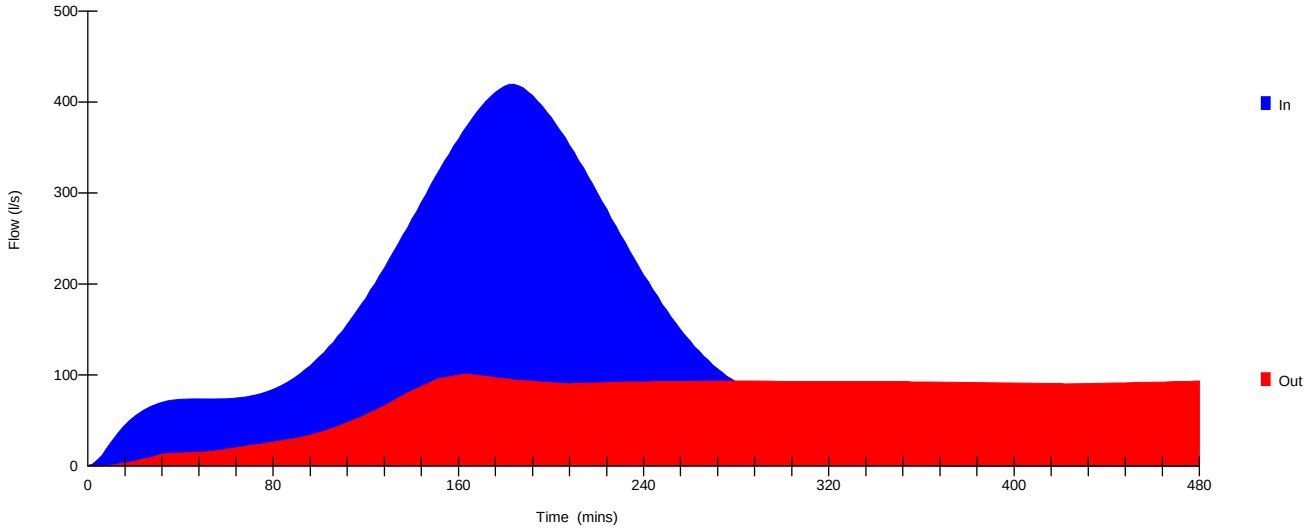
Time (mins)	Level (m)	Depth (m)	Inflow (l/s)	Control (l/s)	Overflow (l/s)	Filtration (l/s)	Outflow (l/s)	Volume (m³)
244	8.155	1.155	202.4	72.3	0.0	20.3	92.7	2139.4
246	8.160	1.160	193.6	72.3	0.0	20.4	92.7	2152.1
248	8.165	1.165	186.5	72.3	0.0	20.5	92.8	2163.7
250	8.169	1.169	178.1	72.3	0.0	20.5	92.9	2174.5
252	8.173	1.173	171.4	72.4	0.0	20.6	92.9	2184.3
254	8.177	1.177	163.6	72.4	0.0	20.6	93.0	2193.2
256	8.180	1.180	156.9	72.4	0.0	20.6	93.0	2201.3
258	8.183	1.183	150.0	72.4	0.0	20.7	93.0	2208.6
260	8.185	1.185	143.2	72.4	0.0	20.7	93.1	2215.0
262	8.187	1.187	137.6	72.4	0.0	20.7	93.1	2220.7
264	8.189	1.189	131.2	72.4	0.0	20.7	93.1	2225.6
266	8.191	1.191	126.2	72.4	0.0	20.8	93.2	2229.9
268	8.192	1.192	120.6	72.4	0.0	20.8	93.2	2233.5
270	8.193	1.193	116.1	72.4	0.0	20.8	93.2	2236.5
272	8.194	1.194	111.1	72.4	0.0	20.8	93.2	2239.0
274	8.195	1.195	106.9	72.4	0.0	20.8	93.2	2240.9
276	8.196	1.196	102.8	72.4	0.0	20.8	93.2	2242.2
278	8.196	1.196	98.8	72.4	0.0	20.8	93.2	2243.2
280	8.196	1.196	95.7	72.4	0.0	20.8	93.2	2243.6
282	8.196	1.196	92.2	72.4	0.0	20.8	93.2	2243.7
284	8.196	1.196	89.7	72.4	0.0	20.8	93.2	2243.4
286	8.196	1.196	86.9	72.4	0.0	20.8	93.2	2242.9
288	8.196	1.196	84.8	72.4	0.0	20.8	93.2	2242.0
290	8.195	1.195	82.7	72.4	0.0	20.8	93.2	2240.8
292	8.195	1.195	80.9	72.4	0.0	20.8	93.2	2239.5
294	8.194	1.194	79.4	72.4	0.0	20.8	93.2	2237.9
296	8.193	1.193	78.0	72.4	0.0	20.8	93.2	2236.1
298	8.193	1.193	77.0	72.4	0.0	20.8	93.2	2234.3
300	8.192	1.192	76.0	72.4	0.0	20.8	93.2	2232.3
302	8.191	1.191	75.4	72.4	0.0	20.8	93.2	2230.2
304	8.190	1.190	74.8	72.4	0.0	20.8	93.2	2228.0
306	8.189	1.189	74.5	72.4	0.0	20.7	93.1	2225.8
308	8.188	1.188	74.2	72.4	0.0	20.7	93.1	2223.5
310	8.187	1.187	74.0	72.4	0.0	20.7	93.1	2221.2
312	8.187	1.187	74.0	72.4	0.0	20.7	93.1	2219.0
314	8.186	1.186	74.0	72.4	0.0	20.7	93.1	2216.7
316	8.185	1.185	74.0	72.4	0.0	20.7	93.1	2214.4
318	8.184	1.184	74.1	72.4	0.0	20.7	93.1	2212.1
320	8.183	1.183	74.1	72.4	0.0	20.7	93.1	2209.8
322	8.182	1.182	74.1	72.4	0.0	20.7	93.0	2207.5
324	8.181	1.181	74.0	72.4	0.0	20.6	93.0	2205.3
326	8.180	1.180	73.8	72.4	0.0	20.6	93.0	2203.0
328	8.179	1.179	73.5	72.4	0.0	20.6	93.0	2200.7
330	8.179	1.179	73.0	72.4	0.0	20.6	93.0	2198.3
332	8.178	1.178	72.3	72.4	0.0	20.6	93.0	2195.8
334	8.177	1.177	71.4	72.4	0.0	20.6	93.0	2193.3
336	8.176	1.176	70.1	72.4	0.0	20.6	92.9	2190.7
338	8.174	1.174	68.8	72.4	0.0	20.6	92.9	2187.8
340	8.173	1.173	66.7	72.4	0.0	20.6	92.9	2184.8
342	8.172	1.172	64.8	72.4	0.0	20.5	92.9	2181.6
344	8.171	1.171	61.8	72.3	0.0	20.5	92.9	2178.0
346	8.169	1.169	58.9	72.3	0.0	20.5	92.9	2174.1
348	8.167	1.167	55.0	72.3	0.0	20.5	92.8	2169.8
350	8.165	1.165	50.6	72.3	0.0	20.5	92.8	2165.0
352	8.163	1.163	46.0	72.3	0.0	20.4	92.8	2159.7
354	8.161	1.161	40.1	72.3	0.0	20.4	92.7	2153.7
356	8.158	1.158	34.5	72.3	0.0	20.4	92.7	2147.1
358	8.155	1.155	27.0	72.3	0.0	20.3	92.7	2139.6
360	8.152	1.152	20.1	72.3	0.0	20.3	92.6	2131.3
362	8.148	1.148	12.7	72.3	0.0	20.3	92.6	2122.2
364	8.144	1.144	6.5	72.3	0.0	20.2	92.5	2112.2
366	8.140	1.140	3.0	72.3	0.0	20.2	92.4	2101.7

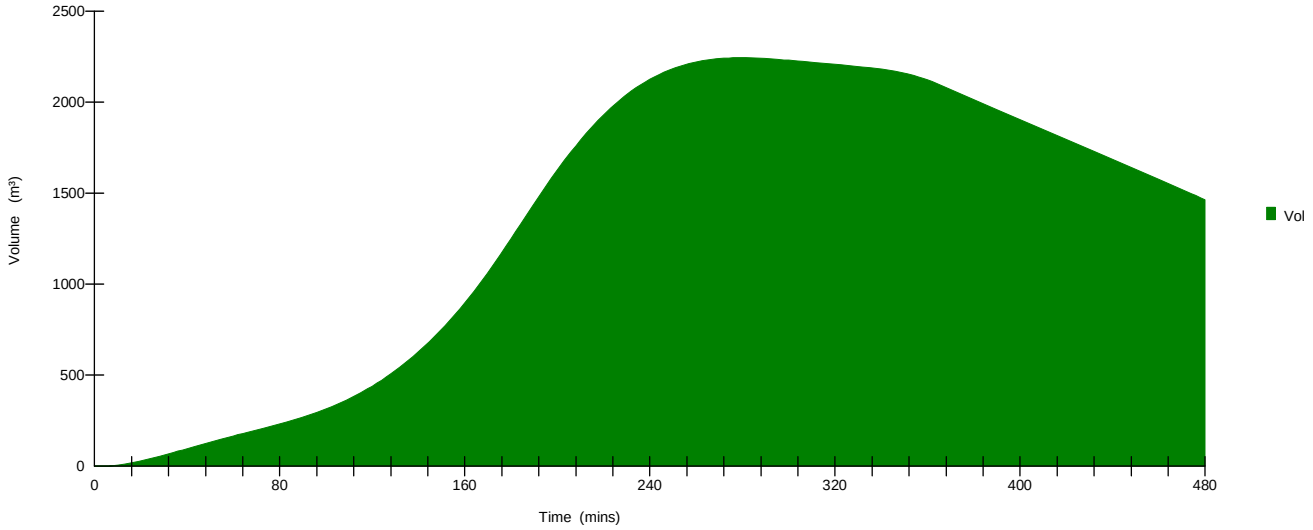
Flood Routing through Storage Structure

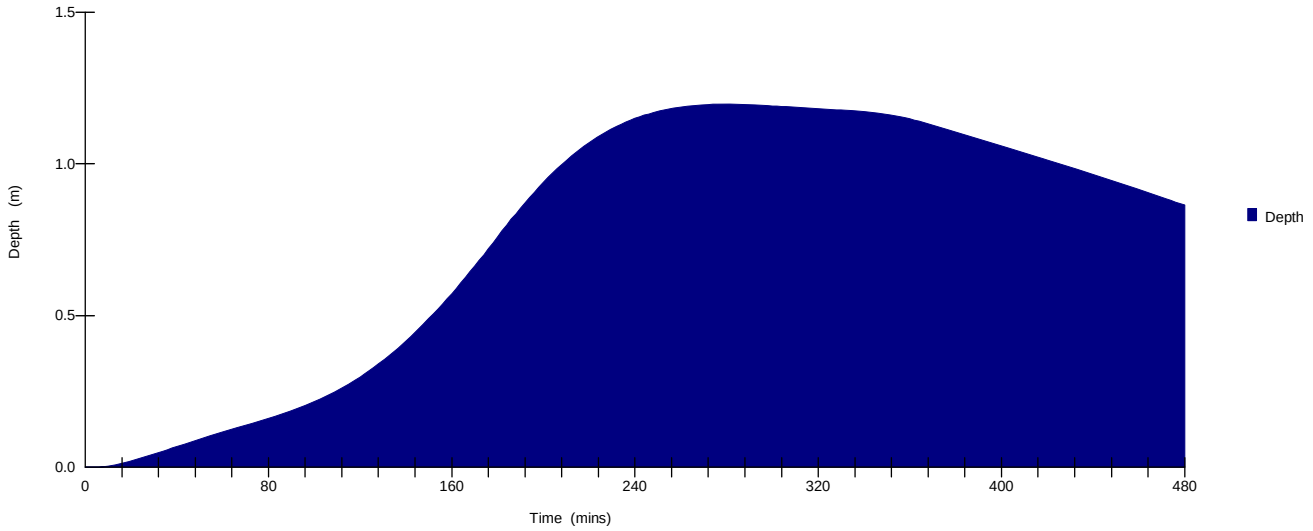
Storm Duration 360 Mins (Winter)

Time (mins)	Level (m)	Depth (m)	Inflow (l/s)	Control (l/s)	Overflow (l/s)	Filtration (l/s)	Outflow (l/s)	Volume (m³)
368	8.136	1.136	0.7	72.3	0.0	20.1	92.4	2090.8
370	8.131	1.131	0.3	72.3	0.0	20.1	92.3	2079.8
372	8.127	1.127	0.0	72.2	0.0	20.0	92.3	2068.8
374	8.123	1.123	0.0	72.2	0.0	20.0	92.2	2057.7
376	8.118	1.118	0.0	72.2	0.0	19.9	92.1	2046.6
378	8.114	1.114	0.0	72.2	0.0	19.8	92.1	2035.6
380	8.109	1.109	0.0	72.2	0.0	19.8	92.0	2024.5
382	8.105	1.105	0.0	72.2	0.0	19.7	91.9	2013.5
384	8.100	1.100	0.0	72.2	0.0	19.7	91.9	2002.5
386	8.096	1.096	0.0	72.2	0.0	19.6	91.8	1991.5
388	8.091	1.091	0.0	72.2	0.0	19.6	91.8	1980.4
390	8.086	1.086	0.0	72.2	0.0	19.5	91.7	1969.4
392	8.082	1.082	0.0	72.1	0.0	19.5	91.6	1958.4
394	8.077	1.077	0.0	72.1	0.0	19.4	91.6	1947.4
396	8.073	1.073	0.0	72.1	0.0	19.4	91.5	1936.5
398	8.068	1.068	0.0	72.1	0.0	19.3	91.4	1925.5
400	8.064	1.064	0.0	72.1	0.0	19.3	91.4	1914.5
402	8.059	1.059	0.0	72.1	0.0	19.2	91.3	1903.6
404	8.054	1.054	0.0	72.1	0.0	19.1	91.2	1892.6
406	8.050	1.050	0.0	72.1	0.0	19.1	91.2	1881.7
408	8.045	1.045	0.0	72.1	0.0	19.0	91.1	1870.7
410	8.041	1.041	0.0	72.0	0.0	19.0	91.0	1859.8
412	8.036	1.036	0.0	72.0	0.0	18.9	91.0	1848.9
414	8.031	1.031	0.0	72.0	0.0	18.9	90.9	1838.0
416	8.027	1.027	0.0	72.0	0.0	18.8	90.8	1827.1
418	8.022	1.022	0.0	72.0	0.0	18.8	90.8	1816.2
420	8.017	1.017	0.0	72.0	0.0	18.7	90.7	1805.3
422	8.013	1.013	0.0	72.0	0.0	18.7	90.6	1794.4
424	8.008	1.008	0.0	72.0	0.0	18.6	90.6	1783.5
426	8.003	1.003	0.0	72.0	0.0	18.5	90.5	1772.7
428	7.999	0.999	0.0	72.0	0.0	18.5	90.5	1761.8
430	7.994	0.994	0.0	72.2	0.0	18.4	90.6	1750.9
432	7.989	0.989	0.0	72.3	0.0	18.4	90.7	1740.1
434	7.984	0.984	0.0	72.5	0.0	18.3	90.8	1729.2
436	7.980	0.980	0.0	72.6	0.0	18.3	90.9	1718.3
438	7.975	0.975	0.0	72.8	0.0	18.2	91.0	1707.4
440	7.970	0.970	0.0	72.9	0.0	18.2	91.1	1696.4
442	7.965	0.965	0.0	73.1	0.0	18.1	91.2	1685.5
444	7.960	0.960	0.0	73.3	0.0	18.0	91.3	1674.5
446	7.955	0.955	0.0	73.4	0.0	18.0	91.4	1663.6
448	7.950	0.950	0.0	73.6	0.0	17.9	91.5	1652.6
450	7.946	0.946	0.0	73.7	0.0	17.9	91.6	1641.6
452	7.941	0.941	0.0	73.9	0.0	17.8	91.7	1630.6
454	7.936	0.936	0.0	74.1	0.0	17.8	91.8	1619.6
456	7.931	0.931	0.0	74.2	0.0	17.7	91.9	1608.6
458	7.926	0.926	0.0	74.4	0.0	17.6	92.0	1597.6
460	7.921	0.921	0.0	74.5	0.0	17.6	92.1	1586.5
462	7.916	0.916	0.0	74.7	0.0	17.5	92.2	1575.4
464	7.910	0.910	0.0	74.9	0.0	17.5	92.3	1564.4
466	7.905	0.905	0.0	75.0	0.0	17.4	92.4	1553.3
468	7.900	0.900	0.0	75.2	0.0	17.3	92.5	1542.2
470	7.895	0.895	0.0	75.4	0.0	17.3	92.7	1531.1
472	7.890	0.890	0.0	75.6	0.0	17.2	92.8	1519.9
474	7.885	0.885	0.0	75.7	0.0	17.2	92.9	1508.8
476	7.880	0.880	0.0	75.9	0.0	17.1	93.0	1497.7
478	7.874	0.874	0.0	76.1	0.0	17.0	93.1	1486.5
480	7.869	0.869	0.0	76.2	0.0	17.0	93.2	1475.3

Storm Duration 360 Mins (Winter)







Appendix D-2

Surface Water Source Control
Development Site - 1 in 100 Yr Event

Summary of Results for 100 year Return Period (+10%)

Half Drain Time : 264 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
15 Summer	86.8	15.9	0.0	101.2	7.7723	0.7723	0.0	1276.4	O K
30 Summer	86.7	18.3	0.0	101.1	7.9798	0.9798	0.0	1718.4	O K
60 Summer	86.7	20.3	0.0	101.1	8.1488	1.1488	0.0	2123.3	O K
120 Summer	86.8	21.6	3.4	101.2	8.2772	1.2772	6.9	2456.3	O K
180 Summer	86.7	22.0	6.9	103.4	8.3177	1.3177	29.6	2565.0	O K
240 Summer	86.8	22.1	8.5	105.5	8.3332	1.3332	49.4	2607.3	O K
360 Summer	86.7	22.2	9.6	106.8	8.3432	1.3432	69.0	2634.9	O K
480 Summer	86.8	22.2	9.1	106.2	8.3387	1.3387	66.3	2622.0	O K
600 Summer	86.7	22.1	7.7	104.5	8.3257	1.3257	53.7	2586.7	O K
720 Summer	86.7	21.9	6.1	102.4	8.3077	1.3077	39.6	2538.4	O K
960 Summer	86.8	21.5	2.4	101.2	8.2653	1.2653	12.2	2424.1	O K
1440 Summer	86.7	20.4	0.0	101.1	8.1608	1.1608	0.0	2152.6	O K
2160 Summer	86.7	18.4	0.0	101.1	7.9883	0.9883	0.0	1738.5	O K
2880 Summer	86.8	16.3	0.0	101.2	7.8088	0.8088	0.0	1349.8	O K
4320 Summer	85.0	14.0	0.0	99.1	7.5587	0.5587	0.0	872.7	O K
5760 Summer	75.6	13.1	0.0	88.7	7.4537	0.4537	0.0	691.8	O K
7200 Summer	66.5	12.6	0.0	79.1	7.3952	0.3952	0.0	595.0	O K
8640 Summer	57.8	12.4	0.0	70.2	7.3572	0.3572	0.0	534.0	O K
10080 Summer	51.0	12.3	0.0	63.2	7.3272	0.3272	0.0	486.9	O K
15 Winter	86.7	16.8	0.0	101.1	7.8508	0.8508	0.0	1437.2	O K
30 Winter	86.7	19.4	0.0	101.1	8.0733	1.0733	0.0	1937.6	O K
60 Winter	86.8	21.4	1.8	101.2	8.2558	1.2558	1.8	2398.4	O K
120 Winter	86.8	22.7	12.7	111.4	8.3942	1.3942	53.8	2775.5	O K
180 Winter	86.7	23.2	13.8	114.1	8.4442	1.4442	93.8	2916.2	O K
240 Winter	86.8	23.4	14.2	115.0	8.4607	1.4607	121.0	2962.9	O K
360 Winter	86.8	23.4	14.3	115.3	8.4662	1.4662	153.2	2978.7	O K
480 Winter	86.8	23.3	14.0	114.6	8.4537	1.4537	167.4	2943.2	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	81.66	23
30 Summer	55.68	37
60 Summer	35.66	66
120 Summer	22.22	124
180 Summer	16.71	180
240 Summer	13.63	206
360 Summer	10.19	268
480 Summer	8.28	338
600 Summer	7.05	408
720 Summer	6.18	478
960 Summer	5.01	620
1440 Summer	3.73	894
2160 Summer	2.78	1280
2880 Summer	2.25	1640
4320 Summer	1.67	2292
5760 Summer	1.35	2992
7200 Summer	1.15	3680
8640 Summer	1.00	4408
10080 Summer	0.89	5144
15 Winter	81.66	23
30 Winter	55.68	37
60 Winter	35.66	64
120 Winter	22.22	122
180 Winter	16.71	176
240 Winter	13.63	228
360 Winter	10.19	284
480 Winter	8.28	360

Summary of Results for 100 year Return Period (+10%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
600 Winter	86.8	23.1	13.5	113.3	8.4297	1.4297	164.1	2875.0	O K
720 Winter	86.7	22.8	12.9	111.7	8.3997	1.3997	142.4	2790.4	O K
960 Winter	86.7	22.2	8.6	105.6	8.3342	1.3342	73.4	2609.5	O K
1440 Winter	86.7	20.6	0.0	101.1	8.1788	1.1788	0.0	2198.4	O K
2160 Winter	86.7	17.2	0.0	101.1	7.8858	0.8858	0.0	1511.0	O K
2880 Winter	86.8	14.5	0.0	101.2	7.6093	0.6093	0.0	964.3	O K
4320 Winter	71.4	12.9	0.0	84.3	7.4257	0.4257	0.0	644.9	O K
5760 Winter	57.3	12.4	0.0	69.7	7.3547	0.3547	0.0	530.1	O K
7200 Winter	47.2	12.2	0.0	59.4	7.3107	0.3107	0.0	460.8	O K
8640 Winter	40.1	12.0	0.0	52.1	7.2802	0.2802	0.0	413.0	O K
10080 Winter	34.7	11.9	0.0	46.6	7.2572	0.2572	0.0	377.4	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	7.05	438
720 Winter	6.18	514
960 Winter	5.01	664
1440 Winter	3.73	960
2160 Winter	2.78	1344
2880 Winter	2.25	1624
4320 Winter	1.67	2292
5760 Winter	1.35	2992
7200 Winter	1.15	3680
8640 Winter	1.00	4408
10080 Winter	0.89	5144

Rainfall Details

Region	SCOT+NI	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	16.500	Shortest Storm (mins)	15	Climate Change %	+10
Ratio-R	0.300	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 8.873

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	2.694	4	8	5.359	8	12	0.820

Infiltration Basin Details

Infil Coef - Base (m/hr)	0.054355	Porosity	1.00
Infil Coef - Sides (m/hr)	0.054355	Invert Level (m)	7.000
Safety Factor	2.0	Ground Level (m)	8.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.00	1394.0	2.40	0.6	4.80	0.6	7.20	0.6	9.60	0.6
0.40	1621.0	2.80	0.6	5.20	0.6	7.60	0.6	10.00	0.6
0.80	2025.0	3.20	0.6	5.60	0.6	8.00	0.6		
1.20	2581.0	3.60	0.6	6.00	0.6	8.40	0.6		
1.60	3015.0	4.00	0.6	6.40	0.6	8.80	0.6		
2.00	3465.0	4.40	0.6	6.80	0.6	9.20	0.6		

Hydro-Brake Outflow Control

Design Head (m)	1.600	Hydro-Brake Type	MD4	Invert Level (m)	7.000
Design Flow (l/s)	80.6	Diameter (mm)	285		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	4.8	0.60	86.8	1.60	80.6	2.60	102.3	5.00	141.9	7.50	173.8
0.20	21.3	0.80	78.5	1.80	85.2	3.00	109.9	5.50	148.8	8.00	179.5
0.30	44.8	1.00	72.0	2.00	89.8	3.50	118.7	6.00	155.4	8.50	185.0
0.40	67.6	1.20	72.4	2.20	94.1	4.00	126.9	6.50	161.8	9.00	190.3
0.50	82.5	1.40	76.0	2.40	98.3	4.50	134.6	7.00	167.9	9.50	195.6

Pipe Overflow Control

Pipe Diameter (m)	0.150	Roughness (mm)	1.500	Invert Level (m)	8.200
Slope (1:x)	150.0	Entry Loss Coef	0.500		
Length (m)	35.000	Coef of Contraction	0.600		

Flood Routing through Storage Structure

Storm Duration 360 Mins (Winter)

Total Volume over Overflow (Spill Flow) 153.2m³

Time (mins)	Level (m)	Depth (m)	Inflow (l/s)	Control (l/s)	Overflow (l/s)	Filtration (l/s)	Outflow (l/s)	Volume (m³)
2	7.000	0.000	1.1	0.0	0.0	0.1	0.1	0.1
4	7.000	0.000	2.7	0.0	0.0	0.1	0.1	0.3
6	7.001	0.001	7.9	0.0	0.0	0.2	0.2	0.9
8	7.002	0.002	14.6	0.1	0.0	0.4	0.5	2.2
10	7.003	0.003	23.6	0.2	0.0	0.7	0.8	4.4
12	7.006	0.006	33.7	0.3	0.0	1.2	1.5	7.7
14	7.009	0.009	41.7	0.4	0.0	1.9	2.3	12.0
16	7.012	0.012	50.4	0.6	0.0	2.6	3.2	17.2
18	7.017	0.017	56.9	0.8	0.0	3.6	4.4	23.2
20	7.021	0.021	63.6	1.0	0.0	4.5	5.6	29.8
22	7.026	0.026	69.0	1.3	0.0	5.6	6.9	37.0
24	7.032	0.032	73.8	1.5	0.0	6.8	8.3	44.7
26	7.038	0.038	78.2	1.8	0.0	8.1	9.9	52.7
28	7.043	0.043	81.3	2.1	0.0	9.3	11.4	61.0
30	7.049	0.049	84.6	2.4	0.0	10.6	13.0	69.5
32	7.055	0.055	86.7	2.7	0.0	10.8	13.5	78.2
34	7.062	0.062	88.9	3.0	0.0	10.9	13.8	87.1
36	7.068	0.068	90.3	3.3	0.0	10.9	14.2	96.1
38	7.074	0.074	91.6	3.6	0.0	10.9	14.5	105.3
40	7.081	0.081	92.5	3.9	0.0	11.0	14.9	114.6
42	7.087	0.087	93.2	4.2	0.0	11.0	15.2	124.0
44	7.094	0.094	93.7	4.5	0.0	11.0	15.6	133.3
46	7.100	0.100	93.9	4.9	0.0	11.1	15.9	142.7
48	7.107	0.107	94.0	6.0	0.0	11.1	17.0	152.0
50	7.113	0.113	94.0	7.0	0.0	11.1	18.2	161.1
52	7.119	0.119	94.0	8.0	0.0	11.2	19.2	170.2
54	7.125	0.125	93.9	9.0	0.0	11.2	20.2	179.1
56	7.131	0.131	93.9	10.0	0.0	11.2	21.2	187.9
58	7.137	0.137	93.9	11.0	0.0	11.3	22.2	196.5
60	7.143	0.143	93.9	11.9	0.0	11.3	23.2	205.1
62	7.149	0.149	94.1	12.9	0.0	11.3	24.2	213.5
64	7.154	0.154	94.4	13.8	0.0	11.3	25.1	221.9
66	7.160	0.160	94.9	14.7	0.0	11.4	26.1	230.2
68	7.165	0.165	95.5	15.6	0.0	11.4	27.0	238.4
70	7.171	0.171	96.4	16.5	0.0	11.4	27.9	246.6
72	7.176	0.176	97.3	17.4	0.0	11.5	28.9	254.8
74	7.182	0.182	98.8	18.3	0.0	11.5	29.8	263.1
76	7.188	0.188	100.3	19.3	0.0	11.5	30.8	271.4
78	7.193	0.193	102.3	20.2	0.0	11.5	31.8	279.8
80	7.199	0.199	104.6	21.1	0.0	11.6	32.7	288.4
82	7.205	0.205	107.0	22.4	0.0	11.6	34.0	297.0
84	7.210	0.210	110.1	23.7	0.0	11.6	35.4	305.9
86	7.216	0.216	113.0	25.1	0.0	11.7	36.8	315.0
88	7.223	0.223	116.8	26.7	0.0	11.7	38.4	324.2
90	7.229	0.229	120.3	28.1	0.0	11.7	39.8	333.8
92	7.235	0.235	125.0	29.6	0.0	11.8	41.4	343.6
94	7.242	0.242	129.4	31.1	0.0	11.8	42.9	353.8
96	7.249	0.249	134.7	32.7	0.0	11.8	44.6	364.4
98	7.256	0.256	140.4	34.5	0.0	11.9	46.4	375.5
100	7.263	0.263	145.8	36.1	0.0	11.9	48.1	387.0
102	7.271	0.271	152.5	38.0	0.0	12.0	50.0	399.0
104	7.279	0.279	158.5	39.9	0.0	12.0	51.9	411.5
106	7.288	0.288	166.1	41.9	0.0	12.1	53.9	424.7
108	7.297	0.297	172.6	44.0	0.0	12.1	56.1	438.4
110	7.306	0.306	181.0	46.1	0.0	12.1	58.2	452.7
112	7.315	0.315	188.7	48.2	0.0	12.2	60.4	467.8
114	7.325	0.325	197.5	50.5	0.0	12.3	62.8	483.6
116	7.336	0.336	206.8	52.9	0.0	12.3	65.2	500.2
118	7.347	0.347	215.2	55.4	0.0	12.4	67.8	517.5

Flood Routing through Storage Structure

Storm Duration 360 Mins (Winter)

Time (mins)	Level (m)	Depth (m)	Inflow (l/s)	Control (l/s)	Overflow (l/s)	Filtration (l/s)	Outflow (l/s)	Volume (m³)
120	7.358	0.358	225.4	58.1	0.0	12.4	70.5	535.6
122	7.370	0.370	234.2	60.7	0.0	12.5	73.2	554.6
124	7.382	0.382	245.0	63.5	0.0	12.6	76.1	574.4
126	7.395	0.395	254.3	66.5	0.0	12.6	79.1	595.0
128	7.408	0.408	265.7	68.8	0.0	12.7	81.5	616.6
130	7.422	0.422	276.0	70.9	0.0	12.8	83.7	639.2
132	7.436	0.436	287.2	73.0	0.0	13.0	86.0	662.8
134	7.451	0.451	299.1	75.2	0.0	13.1	88.3	687.5
136	7.467	0.467	309.5	77.5	0.0	13.2	90.8	713.3
138	7.482	0.482	321.8	79.8	0.0	13.4	93.2	740.1
140	7.499	0.499	332.2	82.3	0.0	13.5	95.8	768.0
142	7.516	0.516	344.8	83.2	0.0	13.7	96.8	797.1
144	7.533	0.533	355.2	83.9	0.0	13.8	97.7	827.4
146	7.551	0.551	367.8	84.7	0.0	14.0	98.6	859.0
148	7.569	0.569	378.9	85.5	0.0	14.1	99.6	891.9
150	7.588	0.588	390.7	86.3	0.0	14.3	100.6	926.1
152	7.608	0.608	402.9	86.5	0.0	14.5	100.9	961.6
154	7.628	0.628	413.2	85.6	0.0	14.6	100.3	998.5
156	7.648	0.648	425.2	84.8	0.0	14.8	99.6	1036.8
158	7.669	0.669	435.0	83.9	0.0	15.0	98.9	1076.5
160	7.691	0.691	446.4	83.0	0.0	15.2	98.2	1117.6
162	7.713	0.713	455.7	82.1	0.0	15.4	97.5	1160.0
164	7.735	0.735	466.4	81.2	0.0	15.6	96.8	1203.6
166	7.758	0.758	475.5	80.2	0.0	15.8	96.0	1248.6
168	7.781	0.781	484.7	79.3	0.0	16.0	95.3	1294.7
170	7.805	0.805	493.8	78.3	0.0	16.2	94.5	1342.0
172	7.828	0.828	501.0	77.6	0.0	16.5	94.1	1390.4
174	7.852	0.852	508.9	76.8	0.0	16.8	93.6	1439.7
176	7.876	0.876	514.9	76.0	0.0	17.0	93.1	1490.0
178	7.900	0.900	521.2	75.2	0.0	17.3	92.6	1541.0
180	7.923	0.923	525.9	74.5	0.0	17.6	92.1	1592.8
182	7.947	0.947	529.8	73.7	0.0	17.9	91.6	1645.1
184	7.971	0.971	532.2	72.9	0.0	18.2	91.1	1697.8
186	7.994	0.994	532.0	72.2	0.0	18.4	90.6	1750.8
188	8.017	1.017	530.4	72.0	0.0	18.7	90.7	1803.7
190	8.039	1.039	526.7	72.0	0.0	19.0	91.0	1856.2
192	8.061	1.061	521.6	72.1	0.0	19.2	91.3	1908.2
194	8.082	1.082	516.4	72.1	0.0	19.5	91.6	1959.5
196	8.103	1.103	509.3	72.2	0.0	19.7	91.9	2010.0
198	8.123	1.123	502.9	72.2	0.0	20.0	92.2	2059.7
200	8.143	1.143	494.4	72.3	0.0	20.2	92.5	2108.4
202	8.162	1.162	486.4	72.3	0.0	20.4	92.7	2156.2
204	8.180	1.180	477.2	72.4	0.0	20.6	93.0	2202.8
206	8.198	1.198	467.2	72.4	0.0	20.9	93.3	2248.3
208	8.215	1.215	458.1	72.7	0.2	21.0	93.9	2292.6
210	8.232	1.232	447.1	73.0	0.6	21.2	94.8	2335.6
212	8.248	1.248	437.6	73.3	1.3	21.3	95.9	2377.2
214	8.263	1.263	425.9	73.5	2.2	21.5	97.2	2417.5
216	8.277	1.277	416.0	73.8	3.4	21.6	98.9	2456.2
218	8.291	1.291	403.8	74.1	4.8	21.7	100.6	2493.4
220	8.305	1.305	392.9	74.3	5.9	21.9	102.1	2529.1
222	8.317	1.317	381.1	74.5	6.9	22.0	103.4	2563.2
224	8.329	1.329	368.8	74.7	8.1	22.1	104.9	2595.7
226	8.340	1.340	358.1	74.9	9.3	22.2	106.4	2626.6
228	8.351	1.351	345.5	75.1	10.5	22.3	107.9	2656.0
230	8.361	1.361	335.0	75.3	11.6	22.4	109.3	2683.8
232	8.371	1.371	322.6	75.5	12.2	22.5	110.2	2710.0
234	8.380	1.380	312.2	75.7	12.4	22.6	110.7	2734.9
236	8.388	1.388	300.0	75.8	12.6	22.7	111.1	2758.3
238	8.396	1.396	289.3	76.0	12.8	22.8	111.5	2780.3
240	8.403	1.403	278.0	76.1	12.9	22.8	111.9	2801.0
242	8.410	1.410	266.5	76.3	13.1	22.9	112.2	2820.2

Flood Routing through Storage Structure

Storm Duration 360 Mins (Winter)

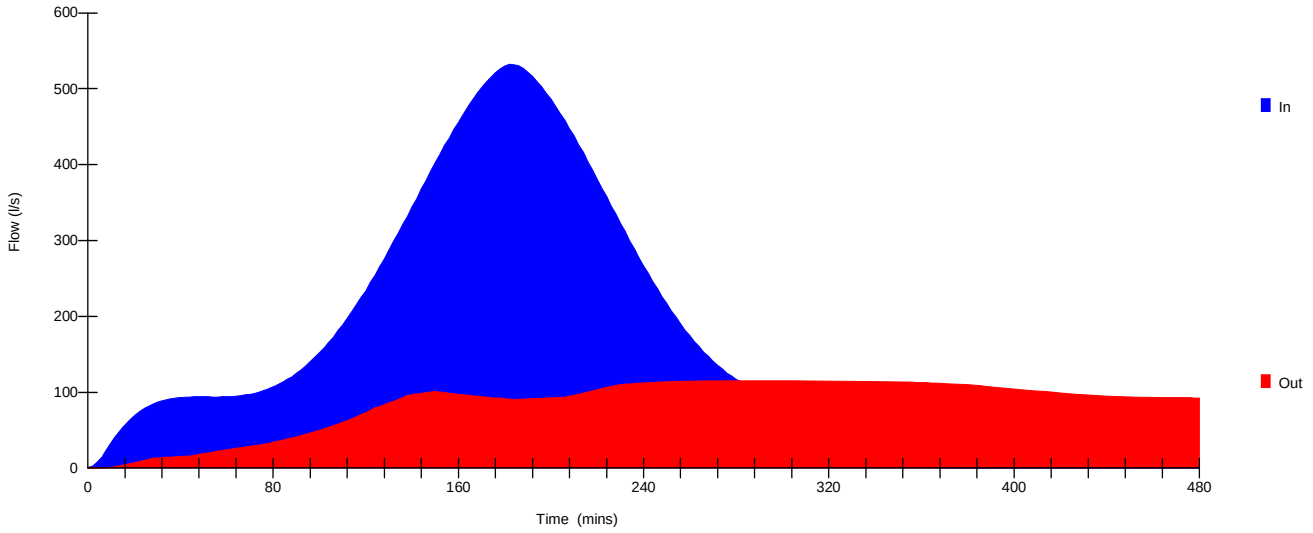
Time (mins)	Level (m)	Depth (m)	Inflow (l/s)	Control (l/s)	Overflow (l/s)	Filtration (l/s)	Outflow (l/s)	Volume (m³)
244	8.417	1.417	256.8	76.4	13.3	22.9	112.6	2838.1
246	8.423	1.423	245.7	76.5	13.4	23.0	112.9	2854.7
248	8.428	1.428	236.6	76.7	13.5	23.1	113.2	2870.1
250	8.433	1.433	226.0	76.8	13.6	23.1	113.5	2884.2
252	8.438	1.438	217.4	76.9	13.7	23.1	113.7	2897.2
254	8.442	1.442	207.5	77.0	13.8	23.2	114.0	2909.0
256	8.446	1.446	199.0	77.1	13.9	23.2	114.2	2919.7
258	8.449	1.449	190.4	77.1	13.9	23.3	114.3	2929.4
260	8.452	1.452	181.6	77.2	14.0	23.3	114.5	2938.0
262	8.455	1.455	174.5	77.3	14.1	23.3	114.7	2945.6
264	8.457	1.457	166.5	77.3	14.1	23.3	114.8	2952.3
266	8.459	1.459	160.2	77.4	14.2	23.4	114.9	2958.1
268	8.461	1.461	153.0	77.4	14.2	23.4	115.0	2963.1
270	8.462	1.462	147.3	77.4	14.2	23.4	115.0	2967.3
272	8.463	1.463	140.9	77.5	14.2	23.4	115.1	2970.8
274	8.464	1.464	135.6	77.5	14.3	23.4	115.2	2973.6
276	8.465	1.465	130.4	77.5	14.3	23.4	115.2	2975.7
278	8.466	1.466	125.3	77.5	14.3	23.4	115.2	2977.2
280	8.466	1.466	121.4	77.5	14.3	23.4	115.2	2978.2
282	8.466	1.466	117.0	77.5	14.3	23.4	115.3	2978.7
284	8.466	1.466	113.8	77.5	14.3	23.4	115.3	2978.7
286	8.466	1.466	110.3	77.5	14.3	23.4	115.3	2978.3
288	8.466	1.466	107.6	77.5	14.3	23.4	115.2	2977.6
290	8.465	1.465	104.9	77.5	14.3	23.4	115.2	2976.5
292	8.465	1.465	102.7	77.5	14.3	23.4	115.2	2975.1
294	8.464	1.464	100.7	77.5	14.3	23.4	115.2	2973.5
296	8.464	1.464	98.9	77.5	14.3	23.4	115.1	2971.7
298	8.463	1.463	97.7	77.4	14.2	23.4	115.1	2969.6
300	8.462	1.462	96.4	77.4	14.2	23.4	115.0	2967.5
302	8.461	1.461	95.7	77.4	14.2	23.4	115.0	2965.2
304	8.461	1.461	94.9	77.4	14.2	23.4	115.0	2962.9
306	8.460	1.460	94.5	77.4	14.2	23.4	114.9	2960.4
308	8.459	1.459	94.1	77.4	14.2	23.4	114.9	2958.0
310	8.458	1.458	93.9	77.3	14.1	23.3	114.8	2955.5
312	8.457	1.457	93.9	77.3	14.1	23.3	114.8	2952.9
314	8.456	1.456	93.9	77.3	14.1	23.3	114.7	2950.4
316	8.455	1.455	93.9	77.3	14.1	23.3	114.7	2947.9
318	8.455	1.455	94.0	77.3	14.1	23.3	114.7	2945.5
320	8.454	1.454	94.0	77.2	14.0	23.3	114.6	2943.0
322	8.453	1.453	94.0	77.2	14.0	23.3	114.5	2940.5
324	8.452	1.452	93.9	77.2	14.0	23.3	114.5	2938.1
326	8.451	1.451	93.7	77.2	14.0	23.3	114.5	2935.6
328	8.450	1.450	93.3	77.2	14.0	23.3	114.4	2933.1
330	8.449	1.449	92.6	77.1	14.0	23.3	114.4	2930.5
332	8.448	1.448	91.7	77.1	13.9	23.3	114.3	2927.8
334	8.447	1.447	90.6	77.1	13.9	23.2	114.3	2925.1
336	8.446	1.446	89.0	77.1	13.9	23.2	114.2	2922.1
338	8.445	1.445	87.3	77.1	13.9	23.2	114.1	2919.0
340	8.444	1.444	84.7	77.0	13.8	23.2	114.1	2915.6
342	8.443	1.443	82.2	77.0	13.8	23.2	114.0	2911.9
344	8.441	1.441	78.4	77.0	13.8	23.2	113.9	2907.9
346	8.440	1.440	74.7	76.9	13.8	23.2	113.8	2903.4
348	8.438	1.438	69.8	76.9	13.7	23.2	113.8	2898.4
350	8.436	1.436	64.2	76.8	13.7	23.1	113.7	2892.8
352	8.434	1.434	58.4	76.8	13.6	23.1	113.5	2886.6
354	8.431	1.431	50.9	76.7	13.6	23.1	113.4	2879.5
356	8.429	1.429	43.8	76.7	13.5	23.1	113.3	2871.6
358	8.425	1.425	34.2	76.6	13.4	23.0	113.1	2862.7
360	8.422	1.422	25.5	76.5	13.4	23.0	112.9	2852.7
362	8.418	1.418	16.1	76.4	13.3	23.0	112.7	2841.7
364	8.414	1.414	8.2	76.3	13.2	22.9	112.4	2829.6
366	8.409	1.409	3.9	76.2	13.1	22.9	112.2	2816.9

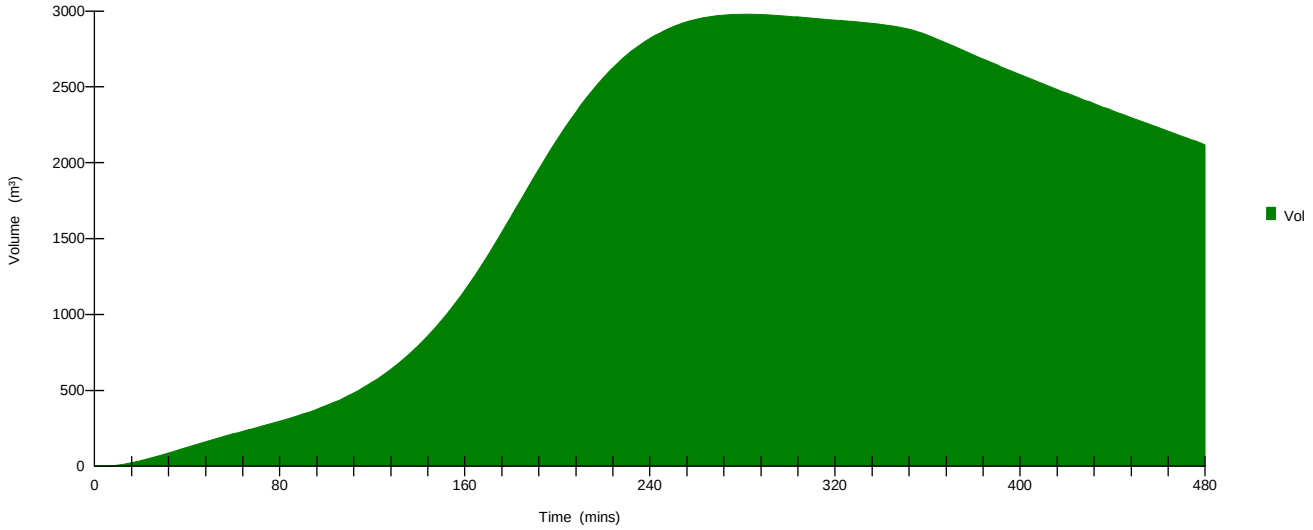
Flood Routing through Storage Structure

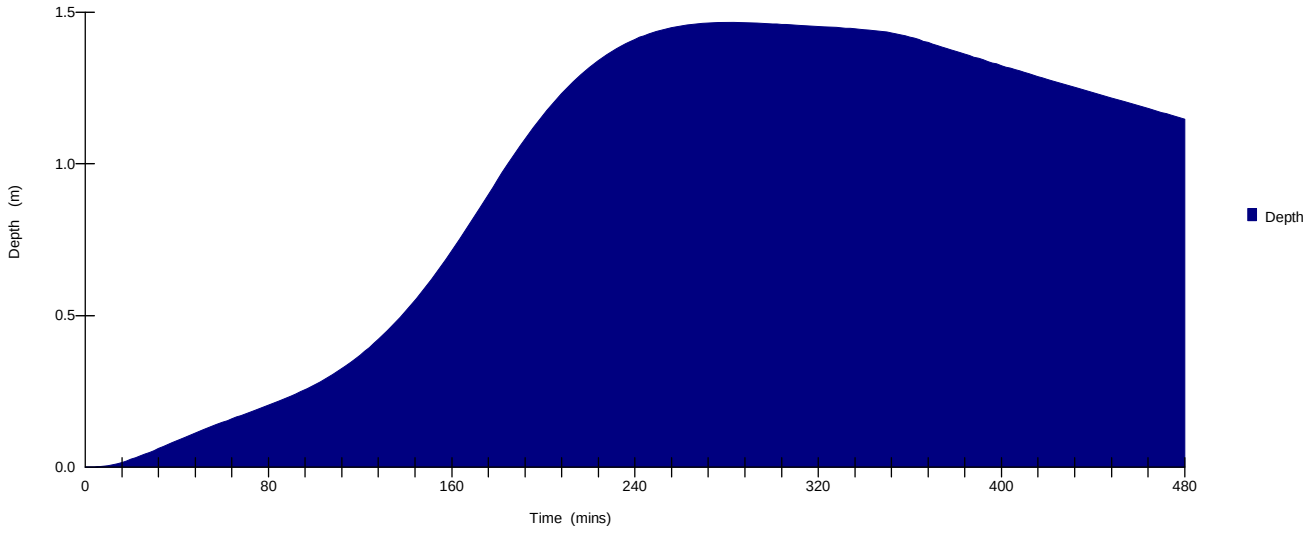
Storm Duration 360 Mins (Winter)

Time (mins)	Level (m)	Depth (m)	Inflow (l/s)	Control (l/s)	Overflow (l/s)	Filtration (l/s)	Outflow (l/s)	Volume (m³)
368	8.404	1.404	0.8	76.1	13.0	22.8	111.9	2803.7
370	8.400	1.400	0.3	76.0	12.9	22.8	111.7	2790.4
372	8.395	1.395	0.0	75.9	12.8	22.7	111.4	2777.0
374	8.390	1.390	0.0	75.9	12.6	22.7	111.2	2763.7
376	8.385	1.385	0.0	75.8	12.5	22.6	110.9	2750.3
378	8.381	1.381	0.0	75.7	12.4	22.6	110.7	2737.0
380	8.376	1.376	0.0	75.6	12.3	22.6	110.4	2723.8
382	8.371	1.371	0.0	75.5	12.2	22.5	110.2	2710.5
384	8.366	1.366	0.0	75.4	12.1	22.5	110.0	2697.3
386	8.361	1.361	0.0	75.3	11.6	22.4	109.3	2684.2
388	8.357	1.357	0.0	75.2	11.1	22.4	108.7	2671.1
390	8.352	1.352	0.0	75.2	10.5	22.3	108.0	2658.1
392	8.347	1.347	0.0	75.1	10.0	22.3	107.4	2645.1
394	8.343	1.343	0.0	75.0	9.5	22.2	106.8	2632.3
396	8.338	1.338	0.0	74.9	9.0	22.2	106.1	2619.5
398	8.333	1.333	0.0	74.8	8.5	22.1	105.5	2606.8
400	8.329	1.329	0.0	74.7	8.0	22.1	104.9	2594.2
402	8.324	1.324	0.0	74.7	7.5	22.1	104.2	2581.7
404	8.319	1.319	0.0	74.6	7.0	22.0	103.6	2569.2
406	8.315	1.315	0.0	74.5	6.7	22.0	103.1	2556.8
408	8.310	1.310	0.0	74.4	6.3	21.9	102.6	2544.5
410	8.306	1.306	0.0	74.3	6.0	21.9	102.2	2532.2
412	8.301	1.301	0.0	74.2	5.6	21.8	101.7	2519.9
414	8.297	1.297	0.0	74.2	5.2	21.8	101.2	2507.8
416	8.292	1.292	0.0	74.1	4.9	21.8	100.7	2495.6
418	8.288	1.288	0.0	74.0	4.5	21.7	100.2	2483.6
420	8.283	1.283	0.0	73.9	4.1	21.7	99.7	2471.6
422	8.279	1.279	0.0	73.8	3.6	21.6	99.1	2459.7
424	8.274	1.274	0.0	73.8	3.1	21.6	98.5	2447.8
426	8.270	1.270	0.0	73.7	2.7	21.5	97.9	2436.0
428	8.265	1.265	0.0	73.6	2.4	21.5	97.5	2424.3
430	8.261	1.261	0.0	73.5	2.1	21.5	97.1	2412.6
432	8.257	1.257	0.0	73.4	1.9	21.4	96.7	2401.0
434	8.252	1.252	0.0	73.4	1.6	21.4	96.3	2389.4
436	8.248	1.248	0.0	73.3	1.3	21.3	95.9	2377.9
438	8.243	1.243	0.0	73.2	1.1	21.3	95.6	2366.4
440	8.239	1.239	0.0	73.1	0.9	21.2	95.3	2355.0
442	8.235	1.235	0.0	73.0	0.7	21.2	95.0	2343.6
444	8.230	1.230	0.0	73.0	0.5	21.2	94.7	2332.2
446	8.226	1.226	0.0	72.9	0.4	21.1	94.4	2320.8
448	8.222	1.222	0.0	72.8	0.3	21.1	94.2	2309.5
450	8.217	1.217	0.0	72.7	0.2	21.0	94.0	2298.2
452	8.213	1.213	0.0	72.6	0.1	21.0	93.8	2287.0
454	8.209	1.209	0.0	72.6	0.0	21.0	93.6	2275.7
456	8.204	1.204	0.0	72.5	0.0	20.9	93.4	2264.5
458	8.200	1.200	0.0	72.4	0.0	20.9	93.3	2253.3
460	8.196	1.196	0.0	72.4	0.0	20.8	93.2	2242.1
462	8.191	1.191	0.0	72.4	0.0	20.8	93.2	2230.9
464	8.187	1.187	0.0	72.4	0.0	20.7	93.1	2219.8
466	8.183	1.183	0.0	72.4	0.0	20.7	93.0	2208.6
468	8.178	1.178	0.0	72.4	0.0	20.6	93.0	2197.4
470	8.174	1.174	0.0	72.4	0.0	20.6	92.9	2186.3
472	8.169	1.169	0.0	72.3	0.0	20.5	92.9	2175.1
474	8.165	1.165	0.0	72.3	0.0	20.5	92.8	2164.0
476	8.161	1.161	0.0	72.3	0.0	20.4	92.7	2152.9
478	8.156	1.156	0.0	72.3	0.0	20.4	92.7	2141.7
480	8.152	1.152	0.0	72.3	0.0	20.3	92.6	2130.6

Storm Duration 360 Mins (Winter)







Appendix D -3

Surface Water Source Control
Site Access Roadway - 1 in 30 Yr Event

Summary of Results for 30 year Return Period (+10%)

Half Drain Time : 199 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
15 Summer	86.7	14.5	0.0	101.1	7.6133	0.6133	0.0	972.0	O K
30 Summer	86.8	16.0	0.0	101.2	7.7793	0.7793	0.0	1290.5	O K
60 Summer	86.7	17.6	0.0	101.1	7.9218	0.9218	0.0	1588.8	O K
120 Summer	86.8	18.9	0.0	101.2	8.0298	1.0298	0.0	1833.9	O K
180 Summer	86.6	19.3	0.0	101.1	8.0648	1.0648	0.0	1917.4	O K
240 Summer	86.6	19.5	0.0	101.1	8.0818	1.0818	0.0	1958.4	O K
360 Summer	86.8	19.6	0.0	101.2	8.0918	1.0918	0.0	1981.9	O K
480 Summer	86.6	19.5	0.0	101.1	8.0848	1.0848	0.0	1964.6	O K
600 Summer	86.7	19.3	0.0	101.1	8.0683	1.0683	0.0	1925.4	O K
720 Summer	86.7	19.1	0.0	101.1	8.0468	1.0468	0.0	1874.4	O K
960 Summer	86.8	18.4	0.0	101.2	7.9948	0.9948	0.0	1753.1	O K
1440 Summer	86.8	17.0	0.0	101.2	7.8748	0.8748	0.0	1487.0	O K
2160 Summer	86.7	15.3	0.0	101.1	7.6973	0.6973	0.0	1129.8	O K
2880 Summer	85.6	14.2	0.0	99.7	7.5717	0.5717	0.0	896.2	O K
4320 Summer	74.4	13.1	0.0	87.5	7.4457	0.4457	0.0	678.3	O K
5760 Summer	63.0	12.5	0.0	75.5	7.3797	0.3797	0.0	570.0	O K
7200 Summer	53.6	12.3	0.0	65.9	7.3387	0.3387	0.0	504.6	O K
8640 Summer	46.5	12.2	0.0	58.7	7.3077	0.3077	0.0	456.2	O K
10080 Summer	41.1	12.0	0.0	53.1	7.2842	0.2842	0.0	419.2	O K
15 Winter	86.8	15.1	0.0	101.2	7.6788	0.6788	0.0	1094.2	O K
30 Winter	86.7	16.9	0.0	101.1	7.8613	0.8613	0.0	1459.0	O K
60 Winter	86.7	18.7	0.0	101.1	8.0173	1.0173	0.0	1804.8	O K
120 Winter	86.7	20.1	0.0	101.1	8.1378	1.1378	0.0	2095.4	O K
180 Winter	86.7	20.6	0.0	101.1	8.1803	1.1803	0.0	2203.3	O K
240 Winter	86.7	20.8	0.0	101.1	8.1933	1.1933	0.0	2236.5	O K
360 Winter	86.6	20.8	0.0	101.1	8.1963	1.1963	0.0	2243.7	O K
480 Winter	86.7	20.6	0.0	101.1	8.1793	1.1793	0.0	2200.6	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	62.93	22
30 Summer	42.65	36
60 Summer	27.44	66
120 Summer	17.24	122
180 Summer	13.04	164
240 Summer	10.67	196
360 Summer	8.03	262
480 Summer	6.56	332
600 Summer	5.60	400
720 Summer	4.92	468
960 Summer	4.02	606
1440 Summer	3.01	866
2160 Summer	2.26	1216
2880 Summer	1.84	1560
4320 Summer	1.38	2252
5760 Summer	1.12	2944
7200 Summer	0.95	3680
8640 Summer	0.84	4408
10080 Summer	0.75	5144
15 Winter	62.93	22
30 Winter	42.65	36
60 Winter	27.44	64
120 Winter	17.24	120
180 Winter	13.04	176
240 Winter	10.67	226
360 Winter	8.03	282
480 Winter	6.56	360

Summary of Results for 30 year Return Period (+10%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
600 Winter	86.8	20.3	0.0	101.2	8.1503	1.1503	0.0	2127.3	O K
720 Winter	86.8	19.9	0.0	101.2	8.1143	1.1143	0.0	2037.5	O K
960 Winter	86.7	18.9	0.0	101.1	8.0293	1.0293	0.0	1832.9	O K
1440 Winter	86.8	16.5	0.0	101.2	7.8268	0.8268	0.0	1386.7	O K
2160 Winter	85.5	14.1	0.0	99.7	7.5712	0.5712	0.0	895.0	O K
2880 Winter	76.3	13.2	0.0	89.5	7.4587	0.4587	0.0	699.7	O K
4320 Winter	57.7	12.4	0.0	70.1	7.3567	0.3567	0.0	533.6	O K
5760 Winter	45.6	12.1	0.0	57.8	7.3037	0.3037	0.0	449.3	O K
7200 Winter	37.6	12.0	0.0	49.5	7.2692	0.2692	0.0	395.6	O K
8640 Winter	31.7	11.8	0.0	43.5	7.2442	0.2442	0.0	357.7	O K
10080 Winter	27.4	11.7	0.0	39.1	7.2257	0.2257	0.0	329.1	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	5.60	436
720 Winter	4.92	510
960 Winter	4.02	656
1440 Winter	3.01	914
2160 Winter	2.26	1236
2880 Winter	1.84	1560
4320 Winter	1.38	2252
5760 Winter	1.12	2992
7200 Winter	0.95	3680
8640 Winter	0.84	4408
10080 Winter	0.75	5144

Rainfall Details

Region	SCOT+NI	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	30	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	16.500	Shortest Storm (mins)	15	Climate Change %	+10
Ratio-R	0.300	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 8.873

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	2.694	4	8	5.359	8	12	0.820

Infiltration Basin Details

Infil Coef - Base (m/hr)	0.054355	Porosity	1.00
Infil Coef - Sides (m/hr)	0.054355	Invert Level (m)	7.000
Safety Factor	2.0	Ground Level (m)	8.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.00	1394.0	2.40	0.6	4.80	0.6	7.20	0.6	9.60	0.6
0.40	1621.0	2.80	0.6	5.20	0.6	7.60	0.6	10.00	0.6
0.80	2025.0	3.20	0.6	5.60	0.6	8.00	0.6		
1.20	2581.0	3.60	0.6	6.00	0.6	8.40	0.6		
1.60	3015.0	4.00	0.6	6.40	0.6	8.80	0.6		
2.00	3465.0	4.40	0.6	6.80	0.6	9.20	0.6		

Hydro-Brake Outflow Control

Design Head (m)	1.600	Hydro-Brake Type	MD4	Invert Level (m)	7.000
Design Flow (l/s)	80.6	Diameter (mm)	285		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	4.8	0.60	86.8	1.60	80.6	2.60	102.3	5.00	141.9	7.50	173.8
0.20	21.3	0.80	78.5	1.80	85.2	3.00	109.9	5.50	148.8	8.00	179.5
0.30	44.8	1.00	72.0	2.00	89.8	3.50	118.7	6.00	155.4	8.50	185.0
0.40	67.6	1.20	72.4	2.20	94.1	4.00	126.9	6.50	161.8	9.00	190.3
0.50	82.5	1.40	76.0	2.40	98.3	4.50	134.6	7.00	167.9	9.50	195.6

Pipe Overflow Control

Pipe Diameter (m)	0.150	Roughness (mm)	1.500	Invert Level (m)	8.200
Slope (1:x)	150.0	Entry Loss Coef	0.500		
Length (m)	35.000	Coef of Contraction	0.600		

Flood Routing through Storage Structure

Storm Duration 30 Mins (Winter)

Total Volume over Overflow (Spill Flow) 22.1m³

Time (mins)	Level (m)	Depth (m)	Inflow (l/s)	Control (l/s)	Overflow (l/s)	Outflow (l/s)	Volume (m³)
1	2.600	0.000	0.1	0.1	0.0	0.1	0.0
2	2.600	0.000	0.6	0.6	0.0	0.6	0.0
3	2.612	0.012	2.1	1.3	0.0	1.3	0.0
4	2.644	0.044	3.9	1.3	0.0	1.3	0.1
5	2.682	0.082	5.8	1.3	0.0	1.3	0.3
6	2.715	0.115	6.7	1.3	0.0	1.3	0.6
7	2.745	0.145	8.1	1.3	0.0	1.3	1.0
8	2.772	0.172	8.6	1.3	0.0	1.3	1.4
9	2.799	0.199	10.8	1.3	0.0	1.3	1.9
10	2.827	0.227	12.7	1.3	0.0	1.3	2.6
11	2.856	0.256	16.0	1.4	0.0	1.4	3.3
12	2.888	0.288	19.8	1.4	0.0	1.4	4.3
13	2.922	0.322	24.0	1.5	0.0	1.5	5.6
14	2.959	0.359	29.6	1.5	0.0	1.5	7.1
15	3.000	0.400	35.7	1.6	0.0	1.6	8.9
16	3.044	0.444	40.1	1.6	1.1	2.7	11.1
17	3.089	0.489	44.8	1.7	4.6	6.3	13.4
18	3.131	0.531	44.8	1.7	8.3	10.0	15.6
19	3.168	0.568	44.8	1.8	12.4	14.1	17.5
20	3.200	0.600	41.3	1.8	15.7	17.5	19.2
21	3.224	0.624	37.9	1.9	17.5	19.4	20.4
22	3.243	0.643	33.6	1.9	18.8	20.7	21.4
23	3.255	0.655	28.6	1.9	19.6	21.5	22.0
24	3.260	0.660	23.1	1.9	19.9	21.8	22.2
25	3.259	0.659	19.8	1.9	19.9	21.8	22.2
26	3.255	0.655	16.0	1.9	19.6	21.5	22.0
27	3.247	0.647	13.3	1.9	19.1	21.0	21.6
28	3.237	0.637	11.4	1.9	18.4	20.3	21.1
29	3.227	0.627	10.8	1.9	17.7	19.6	20.6
30	3.216	0.616	8.6	1.8	16.9	18.8	20.0
31	3.204	0.604	7.2	1.8	16.0	17.9	19.4
32	3.191	0.591	5.0	1.8	14.9	16.7	18.7
33	3.178	0.578	3.9	1.8	13.4	15.2	18.0
34	3.165	0.565	2.7	1.8	12.0	13.7	17.3
35	3.152	0.552	1.7	1.8	10.6	12.3	16.7
36	3.141	0.541	1.3	1.7	9.3	11.1	16.1
37	3.130	0.530	0.6	1.7	8.1	9.9	15.5
38	3.120	0.520	0.3	1.7	7.1	8.8	15.0
39	3.110	0.510	0.2	1.7	6.3	8.0	14.5
40	3.102	0.502	0.1	1.7	5.6	7.3	14.0
41	3.094	0.494	0.1	1.7	5.0	6.7	13.6
42	3.086	0.486	0.0	1.7	4.4	6.1	13.2
43	3.080	0.480	0.0	1.7	3.7	5.4	12.9
44	3.074	0.474	0.0	1.7	3.1	4.7	12.6
45	3.069	0.469	0.0	1.7	2.6	4.2	12.3
46	3.064	0.464	0.0	1.6	2.3	3.9	12.1
47	3.059	0.459	0.0	1.6	2.0	3.7	11.9
48	3.055	0.455	0.0	1.6	1.8	3.4	11.6
49	3.051	0.451	0.0	1.6	1.5	3.2	11.4
50	3.048	0.448	0.0	1.6	1.3	2.9	11.3
51	3.044	0.444	0.0	1.6	1.1	2.7	11.1
52	3.041	0.441	0.0	1.6	1.0	2.6	10.9
53	3.038	0.438	0.0	1.6	0.8	2.5	10.8
54	3.035	0.435	0.0	1.6	0.7	2.3	10.6
55	3.032	0.432	0.0	1.6	0.6	2.2	10.5
56	3.030	0.430	0.0	1.6	0.5	2.1	10.4
57	3.027	0.427	0.0	1.6	0.4	2.0	10.2
58	3.025	0.425	0.0	1.6	0.4	2.0	10.1
59	3.022	0.422	0.0	1.6	0.3	1.9	10.0

Flood Routing through Storage Structure

Storm Duration 30 Mins (Winter)

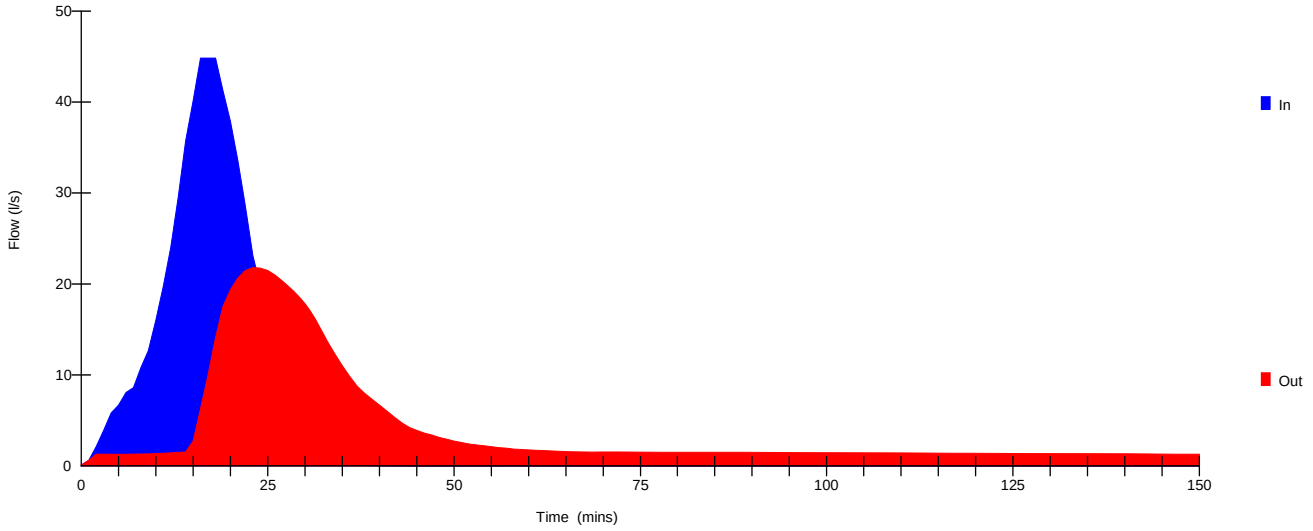
Time (mins)	Level (m)	Depth (m)	Inflow (l/s)	Control (l/s)	Overflow (l/s)	Outflow (l/s)	Volume (m³)
60	3.020	0.420	0.0	1.6	0.3	1.8	9.9
61	3.018	0.418	0.0	1.6	0.2	1.8	9.8
62	3.016	0.416	0.0	1.6	0.2	1.8	9.7
63	3.013	0.413	0.0	1.6	0.1	1.7	9.6
64	3.011	0.411	0.0	1.6	0.1	1.7	9.5
65	3.009	0.409	0.0	1.6	0.1	1.6	9.4
66	3.007	0.407	0.0	1.6	0.0	1.6	9.3
67	3.005	0.405	0.0	1.6	0.0	1.6	9.2
68	3.003	0.403	0.0	1.6	0.0	1.6	9.1
69	3.001	0.401	0.0	1.6	0.0	1.6	9.0
70	2.999	0.399	0.0	1.6	0.0	1.6	8.9
71	2.997	0.397	0.0	1.6	0.0	1.6	8.8
72	2.995	0.395	0.0	1.6	0.0	1.6	8.7
73	2.993	0.393	0.0	1.6	0.0	1.6	8.6
74	2.991	0.391	0.0	1.5	0.0	1.5	8.5
75	2.989	0.389	0.0	1.5	0.0	1.5	8.4
76	2.987	0.387	0.0	1.5	0.0	1.5	8.3
77	2.985	0.385	0.0	1.5	0.0	1.5	8.3
78	2.983	0.383	0.0	1.5	0.0	1.5	8.2
79	2.981	0.381	0.0	1.5	0.0	1.5	8.1
80	2.979	0.379	0.0	1.5	0.0	1.5	8.0
81	2.977	0.377	0.0	1.5	0.0	1.5	7.9
82	2.975	0.375	0.0	1.5	0.0	1.5	7.8
83	2.973	0.373	0.0	1.5	0.0	1.5	7.7
84	2.971	0.371	0.0	1.5	0.0	1.5	7.6
85	2.969	0.369	0.0	1.5	0.0	1.5	7.5
86	2.967	0.367	0.0	1.5	0.0	1.5	7.4
87	2.965	0.365	0.0	1.5	0.0	1.5	7.3
88	2.963	0.363	0.0	1.5	0.0	1.5	7.2
89	2.961	0.361	0.0	1.5	0.0	1.5	7.2
90	2.959	0.359	0.0	1.5	0.0	1.5	7.1
91	2.957	0.357	0.0	1.5	0.0	1.5	7.0
92	2.955	0.355	0.0	1.5	0.0	1.5	6.9
93	2.953	0.353	0.0	1.5	0.0	1.5	6.8
94	2.951	0.351	0.0	1.5	0.0	1.5	6.7
95	2.949	0.349	0.0	1.5	0.0	1.5	6.6
96	2.946	0.346	0.0	1.5	0.0	1.5	6.5
97	2.944	0.344	0.0	1.5	0.0	1.5	6.4
98	2.942	0.342	0.0	1.5	0.0	1.5	6.3
99	2.940	0.340	0.0	1.5	0.0	1.5	6.3
100	2.938	0.338	0.0	1.5	0.0	1.5	6.2
101	2.936	0.336	0.0	1.5	0.0	1.5	6.1
102	2.933	0.333	0.0	1.5	0.0	1.5	6.0
103	2.931	0.331	0.0	1.5	0.0	1.5	5.9
104	2.929	0.329	0.0	1.5	0.0	1.5	5.8
105	2.927	0.327	0.0	1.5	0.0	1.5	5.7
106	2.925	0.325	0.0	1.5	0.0	1.5	5.6
107	2.922	0.322	0.0	1.5	0.0	1.5	5.6
108	2.920	0.320	0.0	1.5	0.0	1.5	5.5
109	2.918	0.318	0.0	1.4	0.0	1.4	5.4
110	2.915	0.315	0.0	1.4	0.0	1.4	5.3
111	2.913	0.313	0.0	1.4	0.0	1.4	5.2
112	2.911	0.311	0.0	1.4	0.0	1.4	5.1
113	2.908	0.308	0.0	1.4	0.0	1.4	5.0
114	2.906	0.306	0.0	1.4	0.0	1.4	4.9
115	2.903	0.303	0.0	1.4	0.0	1.4	4.9
116	2.901	0.301	0.0	1.4	0.0	1.4	4.8
117	2.899	0.299	0.0	1.4	0.0	1.4	4.7
118	2.896	0.296	0.0	1.4	0.0	1.4	4.6
119	2.894	0.294	0.0	1.4	0.0	1.4	4.5
120	2.891	0.291	0.0	1.4	0.0	1.4	4.4
121	2.889	0.289	0.0	1.4	0.0	1.4	4.3

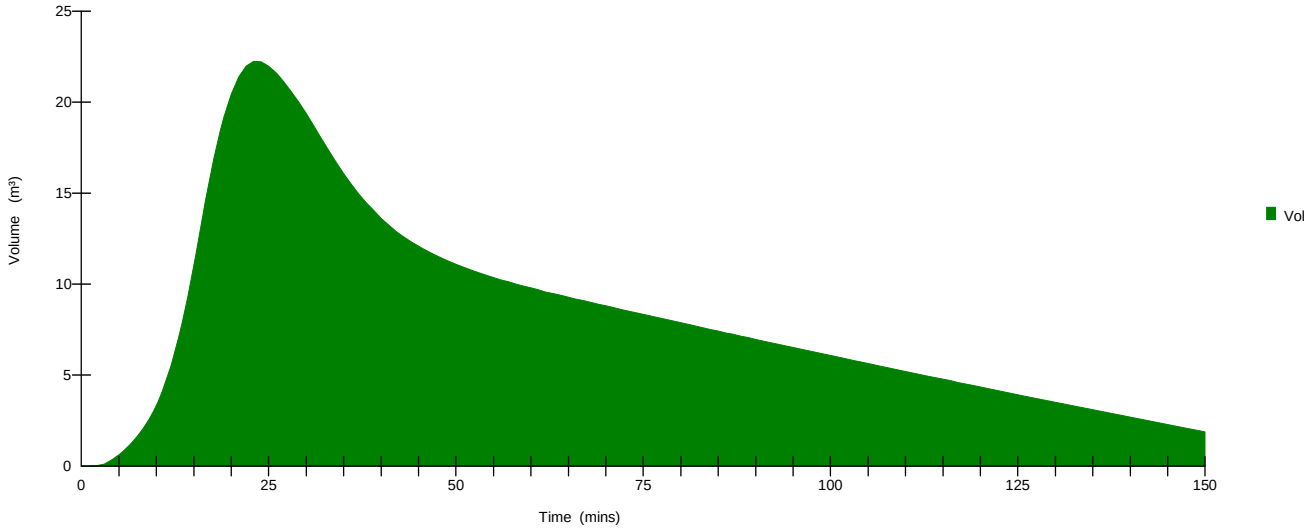
Flood Routing through Storage Structure

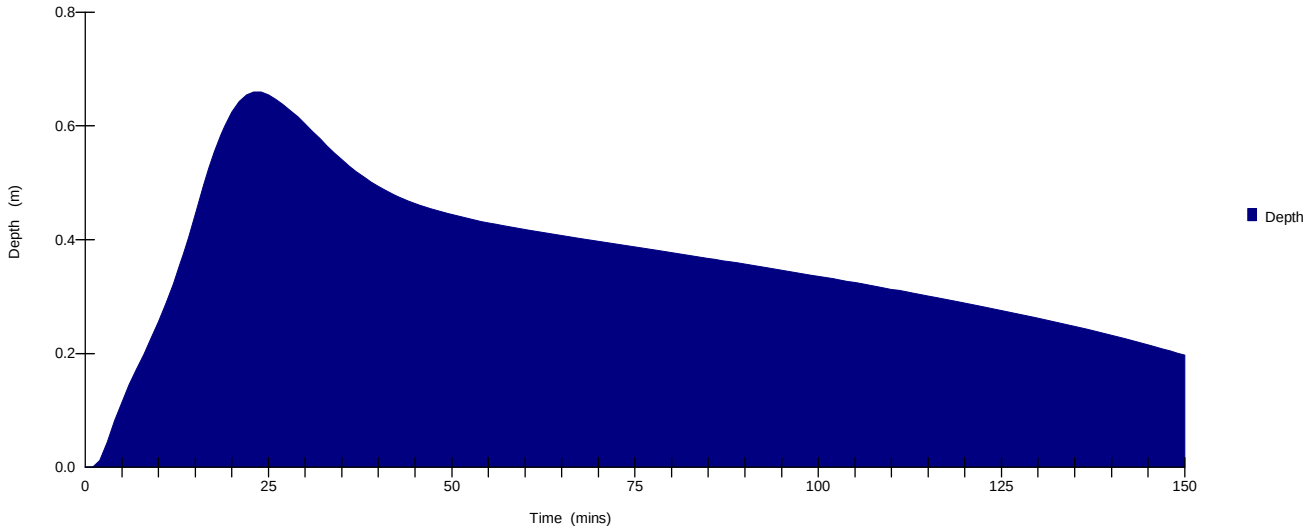
Storm Duration 30 Mins (Winter)

Time (mins)	Level (m)	Depth (m)	Inflow (l/s)	Control (l/s)	Overflow (l/s)	Outflow (l/s)	Volume (m³)
122	2.886	0.286	0.0	1.4	0.0	1.4	4.3
123	2.883	0.283	0.0	1.4	0.0	1.4	4.2
124	2.881	0.281	0.0	1.4	0.0	1.4	4.1
125	2.878	0.278	0.0	1.4	0.0	1.4	4.0
126	2.876	0.276	0.0	1.4	0.0	1.4	3.9
127	2.873	0.273	0.0	1.4	0.0	1.4	3.8
128	2.870	0.270	0.0	1.4	0.0	1.4	3.8
129	2.868	0.268	0.0	1.4	0.0	1.4	3.7
130	2.865	0.265	0.0	1.4	0.0	1.4	3.6
131	2.862	0.262	0.0	1.4	0.0	1.4	3.5
132	2.859	0.259	0.0	1.4	0.0	1.4	3.4
133	2.856	0.256	0.0	1.4	0.0	1.4	3.3
134	2.853	0.253	0.0	1.4	0.0	1.4	3.3
135	2.851	0.251	0.0	1.4	0.0	1.4	3.2
136	2.848	0.248	0.0	1.4	0.0	1.4	3.1
137	2.845	0.245	0.0	1.4	0.0	1.4	3.0
138	2.842	0.242	0.0	1.4	0.0	1.4	2.9
139	2.838	0.238	0.0	1.4	0.0	1.4	2.9
140	2.835	0.235	0.0	1.4	0.0	1.4	2.8
141	2.832	0.232	0.0	1.3	0.0	1.3	2.7
142	2.829	0.229	0.0	1.3	0.0	1.3	2.6
143	2.826	0.226	0.0	1.3	0.0	1.3	2.5
144	2.822	0.222	0.0	1.3	0.0	1.3	2.5
145	2.819	0.219	0.0	1.3	0.0	1.3	2.4
146	2.815	0.215	0.0	1.3	0.0	1.3	2.3
147	2.812	0.212	0.0	1.3	0.0	1.3	2.2
148	2.808	0.208	0.0	1.3	0.0	1.3	2.1
149	2.805	0.205	0.0	1.3	0.0	1.3	2.1
150	2.801	0.201	0.0	1.3	0.0	1.3	2.0

Storm Duration 30 Mins (Winter)







Appendix D-4

Surface Water Source Control
Site Access Roadway - 1 in 100 Yr Event

Summary of Results for 100 year Return Period (+10%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
15 Summer	1.9	20.1	22.0	3.2633	0.6633	17.6	22.4	O K
30 Summer	2.0	24.0	26.0	3.3368	0.7368	27.9	25.9	O K
60 Summer	2.0	25.0	27.0	3.3588	0.7588	38.0	26.8	O K
120 Summer	2.0	22.6	24.6	3.3068	0.7068	47.0	24.5	O K
180 Summer	1.9	19.8	21.7	3.2578	0.6578	51.0	22.1	O K
240 Summer	1.9	17.5	19.4	3.2238	0.6238	52.8	20.4	O K
360 Summer	1.8	14.0	15.8	3.1832	0.5832	53.5	18.3	O K
15 Winter	2.0	22.8	24.7	3.3103	0.7103	21.2	24.7	O K
30 Winter	2.0	26.3	28.4	3.3898	0.7898	33.0	28.0	O K
60 Winter	2.0	25.5	27.6	3.3708	0.7708	44.5	27.3	O K
120 Winter	1.9	21.0	22.9	3.2773	0.6773	55.4	23.1	O K
180 Winter	1.8	17.1	19.0	3.2183	0.6183	60.4	20.1	O K
240 Winter	1.8	14.4	16.2	3.1862	0.5862	63.2	18.5	O K
360 Winter	1.8	10.6	12.3	3.1522	0.5522	65.0	16.7	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	81.66	16
30 Summer	55.68	24
60 Summer	35.66	40
120 Summer	22.22	70
180 Summer	16.71	100
240 Summer	13.63	130
360 Summer	10.19	190
15 Winter	81.66	16
30 Winter	55.68	24
60 Winter	35.66	42
120 Winter	22.22	72
180 Winter	16.71	102
240 Winter	13.63	128
360 Winter	10.19	194

Rainfall Details

Region	SCOT+NI	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	16.500	Shortest Storm (mins)	15	Climate Change %	+10
Ratio-R	0.300	Longest Storm (mins)	360		

Pipe Network

Volume in Pipe Network (m^3)	14	Dia of Outfall Pipe (m)	0.300
Slope of Outfall Pipe (1:x)	100.0	Mannings n of Outfall Pipe	0.001

Time / Area Diagram

Total Area (ha) = 0.210

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	0.150	4	8	0.060

Double Pipe Details

Diameter (m) 0.750 Length (m) 35.000 Cover Level (m) 3.772
Slope (1:x) 100.0 Invert Level (m) 2.600

Hydro-Brake Outflow Control

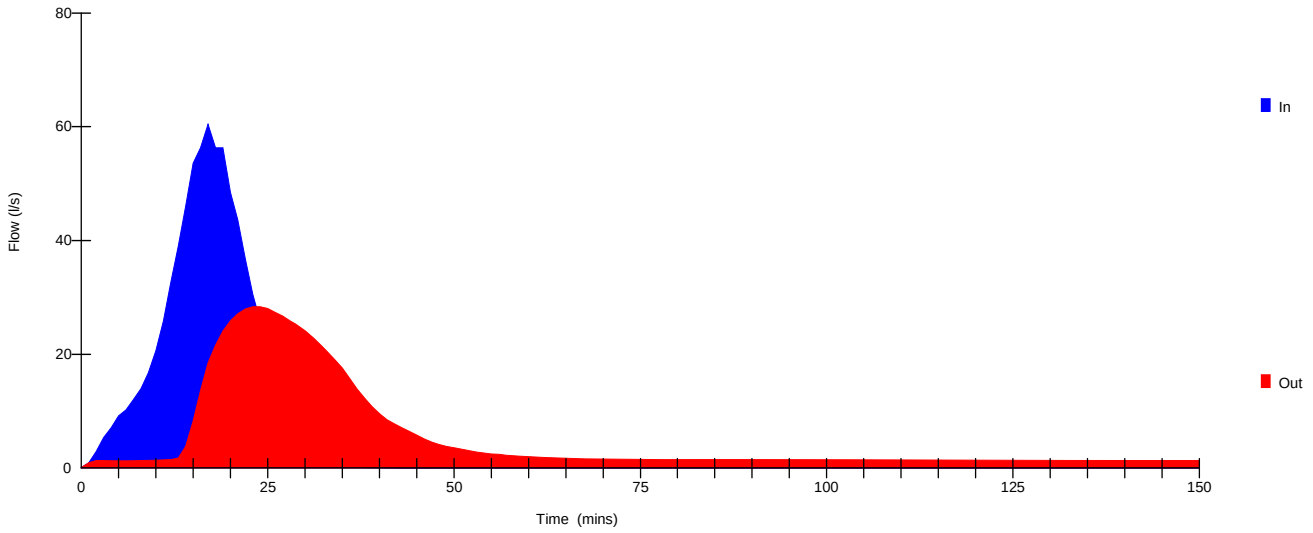
Design Head (m) 1.000 Hydro-Brake Type MD6 Invert Level (m) 2.470
Design Flow (l/s) 2.1 Diameter (mm) 61

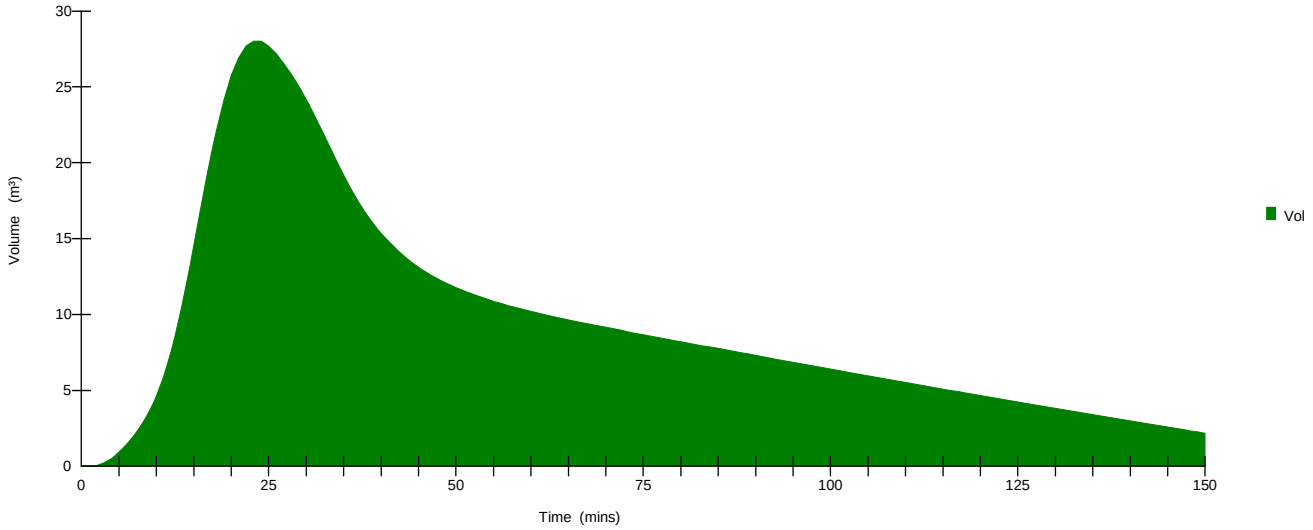
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	1.3	0.60	1.7	1.60	2.7	2.60	3.4	5.00	4.8	7.50	5.8
0.20	1.3	0.80	1.9	1.80	2.9	3.00	3.7	5.50	5.0	8.00	6.0
0.30	1.3	1.00	2.1	2.00	3.0	3.50	4.0	6.00	5.2	8.50	6.2
0.40	1.4	1.20	2.3	2.20	3.2	4.00	4.3	6.50	5.4	9.00	6.4
0.50	1.5	1.40	2.5	2.40	3.3	4.50	4.5	7.00	5.6	9.50	6.6

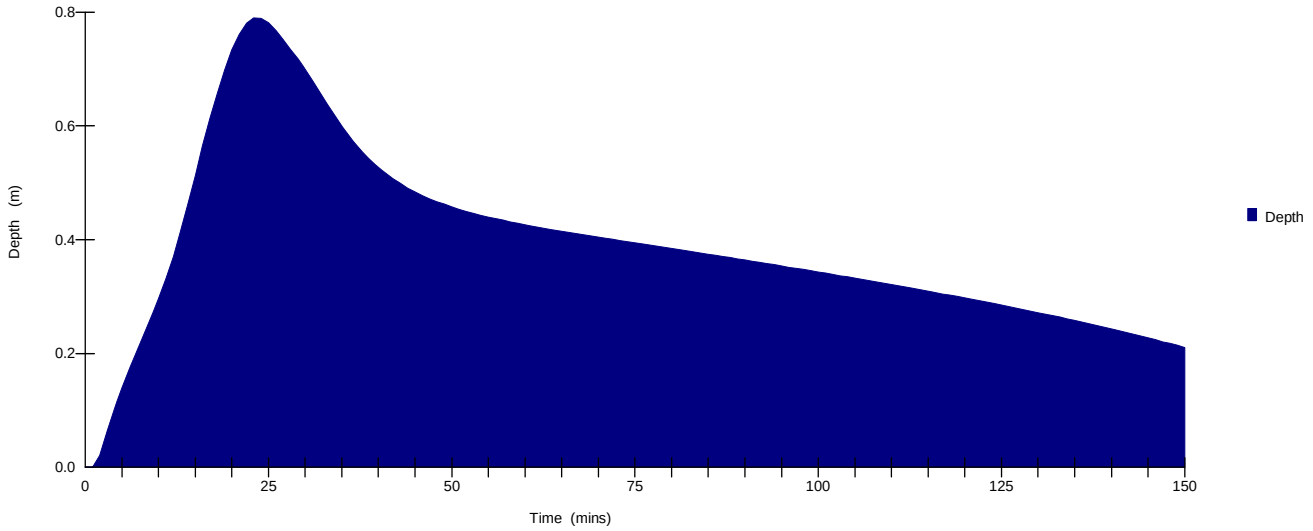
Pipe Overflow Control

Pipe Diameter (m) 0.150 Roughness (mm) 0.600 Invert Level (m) 3.000
Slope (1:x) 100.0 Entry Loss Coef 0.500
Length (m) 5.000 Coef of Contraction 0.600

Storm Duration 30 Mins (Winter)





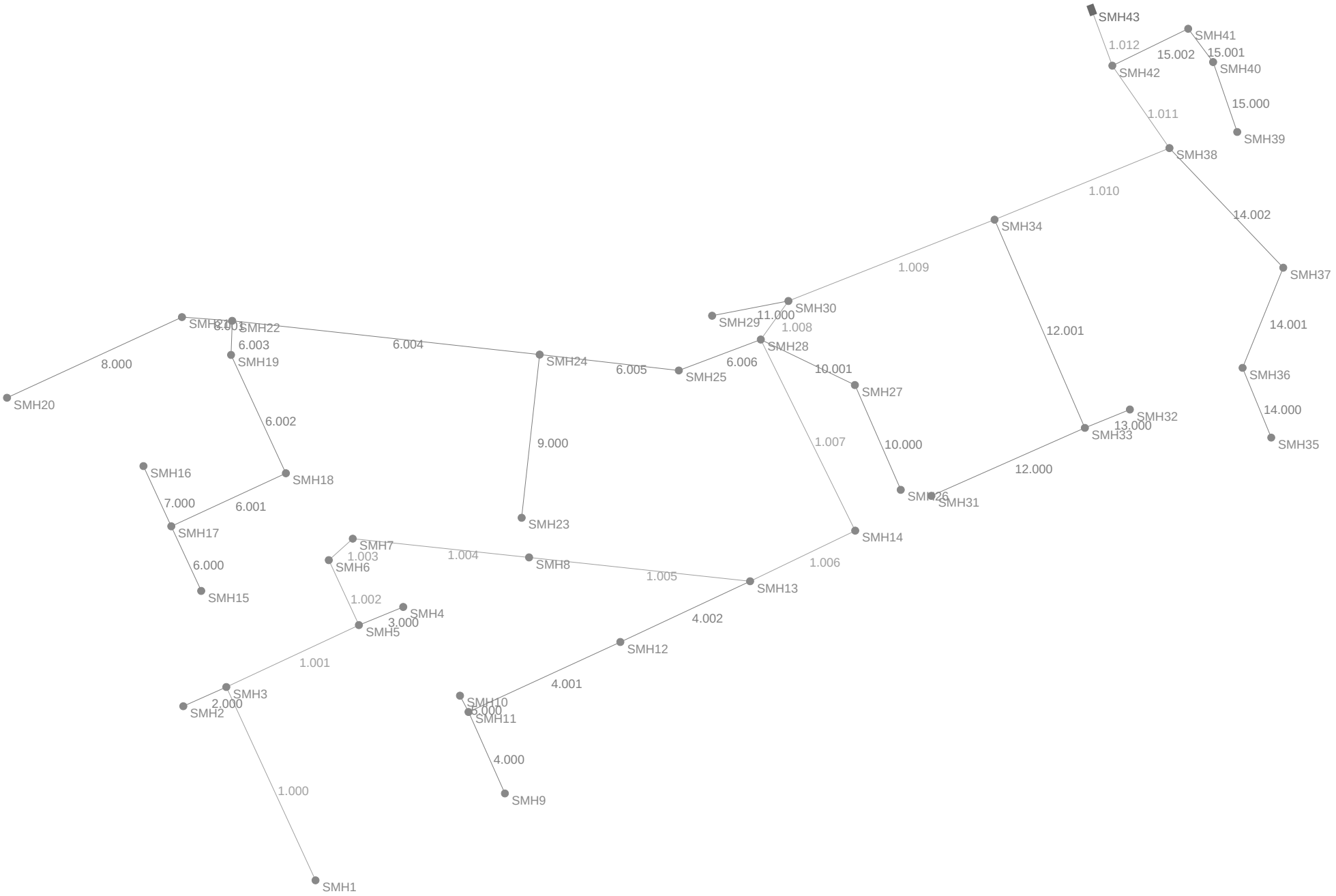


Appendix E

Surface Water Network Calculation

Appendix E-1

Surface Water Network 1 Calculation


SMH43
SMH41
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15.002
15.001
SMH42
SMH40
15.000
1.011
SMH39
SMH38
1.010
14.002
SMH34
SMH37
1.009
SMH30
SMH29
11.000
1.008
12.001
14.001
SMH28
SMH36
6.006
10.001
SMH27
14.000
SMH32
13.000
SMH33
SMH35
1.007
10.000
12.000
SMH26
SMH31
SMH14
1.006
SMH13
1.005
1.004
SMH8
SMH7
1.003
SMH6
4.002
1.002
SMH4
3.000
SMH5
SMH12
1.001
4.001
SMH3
SMH10
2.000
5.000
SMH2
SMH11
4.000
SMH9
1.000
SMH1
SMH23
9.000
6.004
SMH24
6.005
SMH25
8.000
SMH20
6.003
SMH19
6.002
SMH18
7.000
6.001
SMH16
SMH17
6.000
SMH15

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Pipe Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.PIP
Manhole Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.MHS

Location - Scotland & Ireland

Return Period (years)	2	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	16.500	Min Cover Depth for Optimisation (m)	1.200
Ratio R	0.300	Min Vel for Auto Design Only (m/s)	0.80
Maximum Rainfall (mm/hr)	50	Min Slope for Optimisation (1:X)	200
Foul Sewage (l/s/ha)	0.00	Minimum Outfall Invert (m)	7.416
O'flow Setting (*Foul only)	0	Ground Level at Outfall (m)	9.240
Volumetric Runoff Coeff.	0.75	Outfall Manhole Name	SMH43
Add Flow / Climate Change (%)	10	Outfall Manhole Dia/Length (mm)	3000
Minimum Backdrop Height (m)	0.200	Outfall Manhole Width (mm)	3000

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	79.48	1.946	40.8	0.186	4.00	0.0	0.600	o	225
2.000	17.63	0.255	69.1	0.057	4.00	0.0	0.600	o	225
1.001	54.62	0.338	161.6	0.148	0.00	0.0	0.600	o	300
3.000	17.92	0.119	150.6	0.035	4.00	0.0	0.600	o	225
1.002	26.73	0.178	150.2	0.022	0.00	0.0	0.600	o	300
1.003	11.98	0.295	40.6	0.022	0.00	0.0	0.600	o	300
1.004	66.25	1.430	46.3	0.140	0.00	0.0	0.600	o	300
1.005	83.02	2.438	34.1	0.150	0.00	0.0	0.600	o	300
4.000	33.34	0.299	111.5	0.100	4.00	0.0	0.600	o	225
5.000	6.84	0.109	62.8	0.025	4.00	0.0	0.600	o	225

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	50.0	4.6	21.645	0.186	0.0	0.0	2.5	2.05	81.6	27.7
2.000	50.0	4.2	20.250	0.057	0.0	0.0	0.8	1.57	62.6	8.5
1.001	50.0	5.4	19.615	0.391	0.0	0.0	5.3	1.23	87.2	58.2
3.000	50.0	4.3	19.916	0.035	0.0	0.0	0.5	1.06	42.3	5.2
1.002	49.2	5.7	19.276	0.448	0.0	0.0	6.0	1.28	90.5	65.6
1.003	48.9	5.8	19.098	0.470	0.0	0.0	6.2	2.47	174.9	68.5
1.004	47.3	6.3	18.803	0.610	0.0	0.0	7.8	2.32	163.7	86.0
1.005	45.8	6.8	17.373	0.760	0.0	0.0	9.4	2.70	191.1	103.7
4.000	50.0	4.4	20.227	0.100	0.0	0.0	1.4	1.24	49.2	14.9
5.000	50.0	4.1	19.728	0.025	0.0	0.0	0.3	1.65	65.8	3.7

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
4.001	62.36	2.070	30.1	0.175	0.00	0.0	0.600	o	225
4.002	53.55	1.785	30.0	0.175	0.00	0.0	0.600	o	225
1.006	43.51	0.934	46.6	0.100	0.00	0.0	0.600	o	375
1.007	79.61	1.157	68.8	0.180	0.00	0.0	0.600	o	525
6.000	26.56	0.188	141.3	0.090	4.00	0.0	0.600	o	225
7.000	24.77	0.175	141.5	0.060	4.00	0.0	0.600	o	225
6.001	47.17	0.240	196.5	0.137	0.00	0.0	0.600	o	300
6.002	48.71	0.269	181.1	0.050	0.00	0.0	0.600	o	300
6.003	12.76	0.049	260.4	0.008	0.00	0.0	0.600	o	300
8.000	71.86	0.601	119.6	0.199	4.00	0.0	0.600	o	225
8.001	18.86	0.105	179.6	0.005	0.00	0.0	0.600	o	225
6.004	115.49	0.593	194.8	0.650	0.00	0.0	0.600	o	450
9.000	61.33	1.923	31.9	0.217	4.00	0.0	0.600	o	225
6.005	52.26	1.004	52.1	0.260	0.00	0.0	0.600	o	450
6.006	32.75	0.766	42.8	0.030	0.00	0.0	0.600	o	450
10.000	42.71	1.195	35.7	0.122	4.00	0.0	0.600	o	225
10.001	38.98	0.359	108.6	0.005	0.00	0.0	0.600	o	225

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
4.001	50.0	4.9	19.200	0.300	0.0	0.0	4.1	2.39	95.1	44.7
4.002	50.0	5.3	17.130	0.475	0.0	0.0	6.4	2.40	95.3	70.8
1.006	45.0	7.1	14.781	1.335	0.0	0.0	16.3	2.66	293.9	179.0
1.007	43.7	7.6	13.696	1.515	0.0	0.0	17.9	2.70	585.2	197.2
6.000	50.0	4.4	17.706	0.090	0.0	0.0	1.2	1.10	43.7	13.4
7.000	50.0	4.4	16.226	0.060	0.0	0.0	0.8	1.10	43.6	8.9
6.001	50.0	5.1	15.976	0.287	0.0	0.0	3.9	1.12	79.0	42.7
6.002	48.9	5.8	15.736	0.337	0.0	0.0	4.5	1.17	82.4	49.1
6.003	48.2	6.0	15.467	0.345	0.0	0.0	4.5	0.97	68.5	49.5
8.000	50.0	5.0	16.819	0.199	0.0	0.0	2.7	1.19	47.5	29.6
8.001	50.0	5.3	16.218	0.204	0.0	0.0	2.8	0.97	38.7	30.4
6.004	44.3	7.3	15.270	1.199	0.0	0.0	14.4	1.45	231.1	158.1
9.000	50.0	4.4	17.398	0.217	0.0	0.0	2.9	2.32	92.4	32.3
6.005	43.5	7.7	14.677	1.676	0.0	0.0	19.7	2.82	449.0	217.0
6.006	43.0	7.8	13.461	1.706	0.0	0.0	19.9	3.12	495.6	218.6
10.000	50.0	4.3	13.884	0.122	0.0	0.0	1.7	2.20	87.3	18.2
10.001	50.0	4.8	12.689	0.127	0.0	0.0	1.7	1.25	49.9	18.9

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.008	17.71	0.086	205.9	0.022	0.00	0.0	0.600	o	675
11.000	29.04	0.235	123.6	0.036	4.00	0.0	0.600	o	225
1.009	82.70	1.654	50.0	0.191	0.00	0.0	0.600	o	675
12.000	62.70	0.539	116.3	0.195	4.00	0.0	0.600	o	225
13.000	18.12	0.181	100.1	0.060	4.00	0.0	0.600	o	225
12.001	84.83	2.746	30.9	0.230	0.00	0.0	0.600	o	300
1.010	70.59	1.412	50.0	0.260	0.00	0.0	0.600	o	675
14.000	28.16	1.377	20.5	0.100	4.00	0.0	0.600	o	225
14.001	40.32	1.147	35.2	0.105	0.00	0.0	0.600	o	225
14.002	61.69	1.259	49.0	0.070	0.00	0.0	0.600	o	225
1.011	37.36	0.580	64.4	0.050	0.00	0.0	0.600	o	750
15.000	27.60	1.095	25.2	0.186	4.00	0.0	0.600	o	225
15.001	15.53	0.150	103.5	0.063	0.00	0.0	0.600	o	225
15.002	31.53	0.205	153.8	0.048	0.00	0.0	0.600	o	300
1.012	22.23	0.134	165.9	0.040	0.00	0.0	0.600	o	750

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.008	42.6	8.0	11.897	3.370	0.0	0.0	38.9	1.82	652.2	427.8
11.000	50.0	4.4	12.244	0.036	0.0	0.0	0.5	1.17	46.7	5.4
1.009	41.7	8.4	11.736	3.597	0.0	0.0	40.7	3.71	1328.4	447.2
12.000	50.0	4.9	14.014	0.195	0.0	0.0	2.6	1.21	48.2	29.0
13.000	50.0	4.2	13.500	0.060	0.0	0.0	0.8	1.31	52.0	8.9
12.001	50.0	5.4	13.310	0.485	0.0	0.0	6.6	2.84	200.7	72.2
1.010	41.0	8.7	9.550	4.342	0.0	0.0	48.2	3.71	1328.5	530.6
14.000	50.0	4.2	12.260	0.100	0.0	0.0	1.4	2.91	115.6	14.9
14.001	50.0	4.5	10.857	0.205	0.0	0.0	2.8	2.21	88.0	30.5
14.002	50.0	5.0	9.710	0.275	0.0	0.0	3.7	1.87	74.5	41.0
1.011	40.6	8.9	8.130	4.667	0.0	0.0	51.3	3.49	1542.0	564.8
15.000	50.0	4.2	9.200	0.186	0.0	0.0	2.5	2.62	104.0	27.7
15.001	50.0	4.4	8.100	0.249	0.0	0.0	3.4	1.28	51.1	37.1
15.002	50.0	4.8	7.870	0.297	0.0	0.0	4.0	1.27	89.4	44.2
1.012	40.3	9.0	7.550	5.004	0.0	0.0	54.6	2.17	958.7	600.2

Time Area Diagram

Time From (mins)	Time To (mins)	Area (ha)
0	4	2.119
4	8	2.765
8	12	0.120

Total Area Contributing (ha) = 5.004

Total Pipe Volume (m³) = 207.870

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	o	225	SMH1	23.029	21.645	1.159	1200
2.000	o	225	SMH2	21.234	20.250	0.759	1200
1.001	o	300	SMH3	20.997	19.615	1.082	1200
3.000	o	225	SMH4	21.272	19.916	1.131	1200
1.002	o	300	SMH5	21.015	19.276	1.439	1350
1.003	o	300	SMH6	20.591	19.098	1.193	1350
1.004	o	300	SMH7	20.327	18.803	1.224	1350
1.005	o	300	SMH8	18.982	17.373	1.309	1350
4.000	o	225	SMH9	21.630	20.227	1.178	1200
5.000	o	225	SMH10	21.141	19.728	1.188	1200
4.001	o	225	SMH11	20.993	19.200	1.568	1200
4.002	o	225	SMH12	18.814	17.130	1.459	1200
1.006	o	375	SMH13	16.992	14.781	1.836	1350
1.007	o	525	SMH14	15.500	13.696	1.279	1500
6.000	o	225	SMH15	19.069	17.706	1.138	1200
7.000	o	225	SMH16	17.682	16.226	1.231	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	79.48	40.8	SMH3	20.997	19.699	1.073	1200
2.000	17.63	69.1	SMH3	20.997	19.995	0.777	1200
1.001	54.62	161.6	SMH5	21.015	19.277	1.438	1350
3.000	17.92	150.6	SMH5	21.015	19.797	0.993	1350
1.002	26.73	150.2	SMH6	20.591	19.098	1.193	1350
1.003	11.98	40.6	SMH7	20.327	18.803	1.224	1350
1.004	66.25	46.3	SMH8	18.982	17.373	1.309	1350
1.005	83.02	34.1	SMH13	16.992	14.935	1.757	1350
4.000	33.34	111.5	SMH11	20.993	19.928	0.840	1200
5.000	6.84	62.8	SMH11	20.993	19.619	1.149	1200
4.001	62.36	30.1	SMH12	18.814	17.130	1.459	1200
4.002	53.55	30.0	SMH13	16.992	15.345	1.422	1350
1.006	43.51	46.6	SMH14	15.500	13.847	1.278	1500
1.007	79.61	68.8	SMH28	14.375	12.539	1.311	1500
6.000	26.56	141.3	SMH17	18.351	17.518	0.608	1200
7.000	24.77	141.5	SMH17	18.351	16.051	2.075	1200

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
6.001	o	300	SMH17	18.351	15.976	2.075	1200
6.002	o	300	SMH18	20.192	15.736	4.156	1350
6.003	o	300	SMH19	19.641	15.467	3.874	1350
8.000	o	225	SMH20	18.291	16.819	1.247	1200
8.001	o	225	SMH21	19.637	16.218	3.194	1200
6.004	o	450	SMH22	19.580	15.270	3.860	1350
9.000	o	225	SMH23	18.804	17.398	1.181	1200
6.005	o	450	SMH24	17.422	14.677	2.295	1350
6.006	o	450	SMH25	15.525	13.461	1.614	1350
10.000	o	225	SMH26	14.996	13.884	0.887	1200
10.001	o	225	SMH27	13.812	12.689	0.898	1200
1.008	o	675	SMH28	14.375	11.897	1.803	1500
11.000	o	225	SMH29	13.602	12.244	1.133	1200
1.009	o	675	SMH30	14.017	11.736	1.606	1500
12.000	o	225	SMH31	15.217	14.014	0.978	1200
13.000	o	225	SMH32	14.764	13.500	1.039	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
6.001	47.17	196.5	SMH18	20.192	15.736	4.156	1350
6.002	48.71	181.1	SMH19	19.641	15.467	3.874	1350
6.003	12.76	260.4	SMH22	19.580	15.418	3.862	1350
8.000	71.86	119.6	SMH21	19.637	16.218	3.194	1200
8.001	18.86	179.6	SMH22	19.580	16.113	3.242	1350
6.004	115.49	194.8	SMH24	17.422	14.677	2.295	1350
9.000	61.33	31.9	SMH24	17.422	15.475	1.722	1350
6.005	52.26	52.1	SMH25	15.525	13.673	1.402	1350
6.006	32.75	42.8	SMH28	14.375	12.695	1.230	1500
10.000	42.71	35.7	SMH27	13.812	12.689	0.898	1200
10.001	38.98	108.6	SMH28	14.375	12.330	1.820	1500
1.008	17.71	205.9	SMH30	14.017	11.811	1.531	1500
11.000	29.04	123.6	SMH30	14.017	12.009	1.783	1500
1.009	82.70	50.0	SMH34	12.133	10.082	1.376	1500
12.000	62.70	116.3	SMH33	14.978	13.475	1.278	1200
13.000	18.12	100.1	SMH33	14.978	13.319	1.434	1200

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
12.001	o	300	SMH33	14.978	13.310	1.368	1200
1.010	o	675	SMH34	12.133	9.550	1.908	1500
14.000	o	225	SMH35	14.269	12.260	1.784	1200
14.001	o	225	SMH36	13.220	10.857	2.138	1200
14.002	o	225	SMH37	11.871	9.710	1.936	1200
1.011	o	750	SMH38	10.266	8.130	1.386	1800
15.000	o	225	SMH39	10.450	9.200	1.025	1200
15.001	o	225	SMH40	9.239	8.100	0.914	1200
15.002	o	300	SMH41	8.916	7.870	0.746	1200
1.012	o	750	SMH42	9.255	7.550	0.955	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
12.001	84.83	30.9	SMH34	12.133	10.564	1.269	1500
1.010	70.59	50.0	SMH38	10.266	8.138	1.453	1800
14.000	28.16	20.5	SMH36	13.220	10.883	2.112	1200
14.001	40.32	35.2	SMH37	11.871	9.710	1.936	1200
14.002	61.69	49.0	SMH38	10.266	8.451	1.590	1800
1.011	37.36	64.4	SMH42	9.255	7.550	0.955	1800
15.000	27.60	25.2	SMH40	9.239	8.105	0.909	1200
15.001	15.53	103.5	SMH41	8.916	7.950	0.741	1200
15.002	31.53	153.8	SMH42	9.255	7.665	1.290	1800
1.012	22.23	165.9	SMH43	9.240	7.416	1.074	3000 x 3000

MANHOLE SCHEDULES

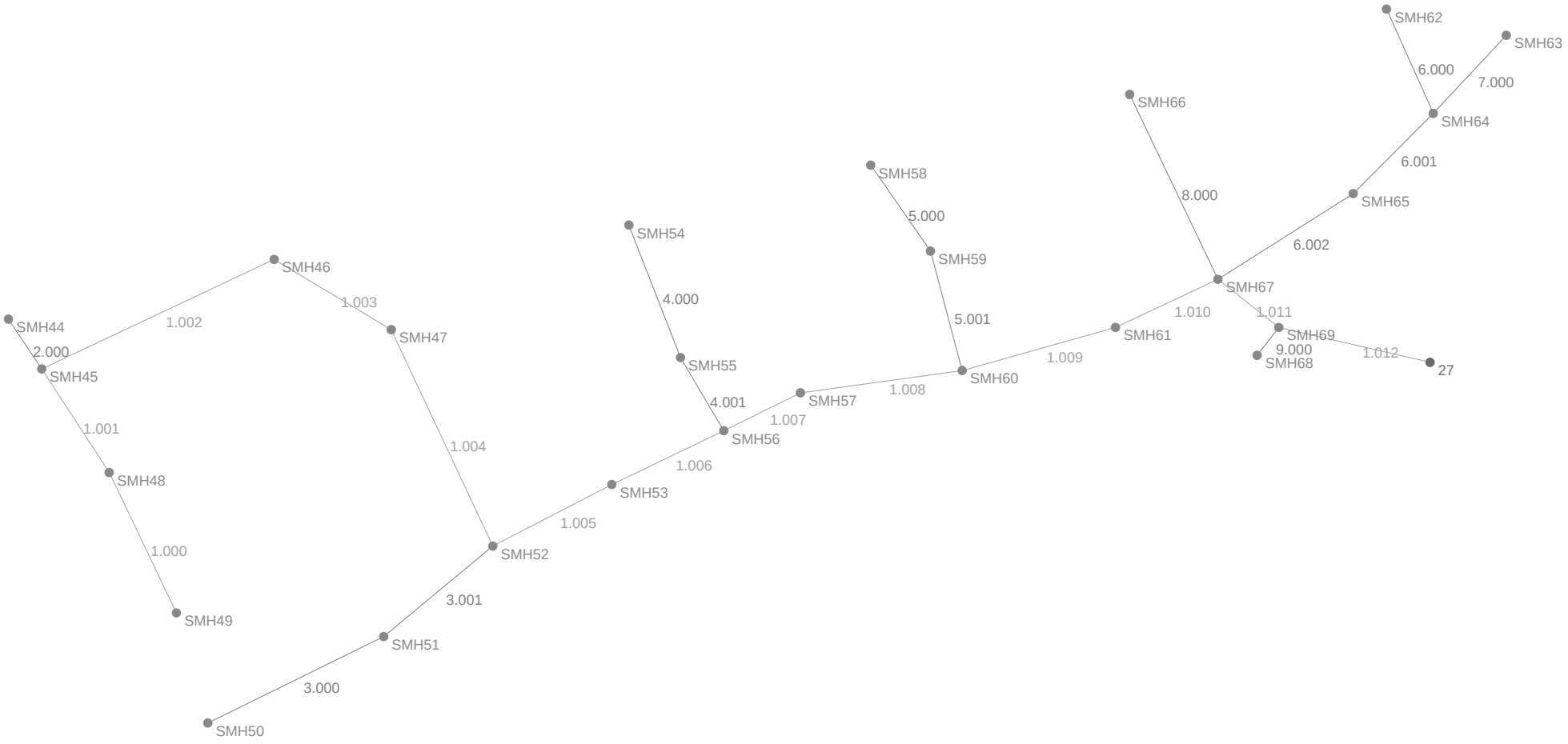
M/Hole Number	Cover Level (m)	M/Hole Depth (m)	M/Hole Diam.,L*W (mm)	Pipes Out PN	Pipes Out IL.(m)	Pipes Out D (mm)	Pipes In PN	Pipes In IL.(m)	Pipes In D (mm)
SMH1	23.029	1.384	1200	1.000	21.645	225			
SMH2	21.234	0.984	1200	2.000	20.250	225			
SMH3	20.997	1.382	1200	1.001	19.615	300	1.000	19.699	225
							2.000	19.995	225
SMH4	21.272	1.356	1200	3.000	19.916	225			
SMH5	21.015	1.739	1350	1.002	19.276	300	1.001	19.277	300
							3.000	19.797	225
SMH6	20.591	1.493	1350	1.003	19.098	300	1.002	19.098	300
SMH7	20.327	1.524	1350	1.004	18.803	300	1.003	18.803	300
SMH8	18.982	1.609	1350	1.005	17.373	300	1.004	17.373	300
SMH9	21.630	1.403	1200	4.000	20.227	225			
SMH10	21.141	1.413	1200	5.000	19.728	225			
SMH11	20.993	1.793	1200	4.001	19.200	225	4.000	19.928	225
							5.000	19.619	225
SMH12	18.814	1.684	1200	4.002	17.130	225	4.001	17.130	225
SMH13	16.992	2.211	1350	1.006	14.781	375	1.005	14.935	300
							4.002	15.345	225
SMH14	15.500	1.804	1500	1.007	13.696	525	1.006	13.847	375
SMH15	19.069	1.363	1200	6.000	17.706	225			
SMH16	17.682	1.456	1200	7.000	16.226	225			
SMH17	18.351	2.375	1200	6.001	15.976	300	6.000	17.518	225
							7.000	16.051	225
SMH18	20.192	4.456	1350	6.002	15.736	300	6.001	15.736	300
SMH19	19.641	4.174	1350	6.003	15.467	300	6.002	15.467	300
SMH20	18.291	1.472	1200	8.000	16.819	225			
SMH21	19.637	3.419	1200	8.001	16.218	225	8.000	16.218	225
SMH22	19.580	4.310	1350	6.004	15.270	450	6.003	15.418	300
							8.001	16.113	225
SMH23	18.804	1.406	1200	9.000	17.398	225			
SMH24	17.422	2.745	1350	6.005	14.677	450	6.004	14.677	450
							9.000	15.475	225
SMH25	15.525	2.064	1350	6.006	13.461	450	6.005	13.673	450
SMH26	14.996	1.112	1200	10.000	13.884	225			
SMH27	13.812	1.123	1200	10.001	12.689	225	10.000	12.689	225
SMH28	14.375	2.478	1500	1.008	11.897	675	1.007	12.539	525
							6.006	12.695	450

MANHOLE SCHEDULES

M/Hole Number	Cover Level (m)	M/Hole Depth (m)	M/Hole Diam.,L*W (mm)	Pipes Out PN	Pipes Out IL.(m)	Pipes Out D (mm)	Pipes In PN	Pipes In IL.(m)	Pipes In D (mm)
							10.001	12.330	225
SMH29	13.602	1.358	1200	11.000	12.244	225			
SMH30	14.017	2.281	1500	1.009	11.736	675	1.008	11.811	675
							11.000	12.009	225
SMH31	15.217	1.203	1200	12.000	14.014	225			
SMH32	14.764	1.264	1200	13.000	13.500	225			
SMH33	14.978	1.668	1200	12.001	13.310	300	12.000	13.475	225
							13.000	13.319	225
SMH34	12.133	2.583	1500	1.010	9.550	675	1.009	10.082	675
							12.001	10.564	300
SMH35	14.269	2.009	1200	14.000	12.260	225			
SMH36	13.220	2.363	1200	14.001	10.857	225	14.000	10.883	225
SMH37	11.871	2.161	1200	14.002	9.710	225	14.001	9.710	225
SMH38	10.266	2.136	1800	1.011	8.130	750	1.010	8.138	675
							14.002	8.451	225
SMH39	10.450	1.250	1200	15.000	9.200	225			
SMH40	9.239	1.139	1200	15.001	8.100	225	15.000	8.105	225
SMH41	8.916	1.046	1200	15.002	7.870	300	15.001	7.950	225
SMH42	9.255	1.705	1800	1.012	7.550	750	1.011	7.550	750
							15.002	7.665	300
SMH43	9.240	1.824	3000 x 3000		OUTFALL		1.012	7.416	750

Appendix E -2

Surface Water Network 2 Calculations


SMH62
SMH63
6.000
7.000
SMH66
SMH64
6.001
SMH58
8.000
SMH65
5.000
SMH54
SMH59
6.002
4.000
SMH67
SMH46
1.003
5.001
1.010
1.011
SMH44
1.002
SMH47
SMH61
SMH69
2.000
SMH55
1.009
9.000
1.012
SMH45
SMH60
SMH68
27
1.008
4.001
SMH57
1.007
1.001
SMH56
1.004
1.006
SMH48
SMH53
1.005
1.000
SMH52
3.001
SMH49
SMH51
3.000
SMH50

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Pipe Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.PIP
Manhole Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.MHS

Location - Scotland & Ireland

Return Period (years)	2	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	16.500	Min Cover Depth for Optimisation (m)	1.200
Ratio R	0.300	Min Vel for Auto Design Only (m/s)	0.80
Maximum Rainfall (mm/hr)	50	Min Slope for Optimisation (1:X)	200
Foul Sewage (l/s/ha)	0.00	Minimum Outfall Invert (m)	7.267
O'flow Setting (*Foul only)	0	Ground Level at Outfall (m)	0.000
Volumetric Runoff Coeff.	0.75	Outfall Manhole Name	27
Add Flow / Climate Change (%)	10	Outfall Manhole Dia/Length (mm)	1500
Minimum Backdrop Height (m)	0.200	Outfall Manhole Width (mm)	0

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	42.66	1.383	30.8	0.150	4.00	0.0	0.600	o	225
1.001	33.85	0.484	69.9	0.080	0.00	0.0	0.600	o	225
2.000	16.42	0.108	152.0	0.070	4.00	0.0	0.600	o	225
1.002	70.40	1.767	39.8	0.150	0.00	0.0	0.600	o	225
1.003	37.43	0.200	187.1	0.050	0.00	0.0	0.600	o	300
1.004	65.49	0.437	149.9	0.200	0.00	0.0	0.600	o	375
3.000	53.67	0.329	163.1	0.100	4.00	0.0	0.600	o	300
3.001	38.87	0.259	150.1	0.045	0.00	0.0	0.600	o	300
1.005	36.74	0.245	150.0	0.054	0.00	0.0	0.600	o	450
1.006	34.01	0.227	149.8	0.054	0.00	0.0	0.600	o	450
4.000	38.99	0.390	100.0	0.140	4.00	0.0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	50.0	4.3	16.000	0.150	0.0	0.0	2.0	2.36	94.0	22.3
1.001	50.0	4.7	14.617	0.230	0.0	0.0	3.1	1.57	62.3	34.3
2.000	50.0	4.3	14.241	0.070	0.0	0.0	0.9	1.06	42.1	10.4
1.002	50.0	5.2	14.133	0.450	0.0	0.0	6.1	2.08	82.7	67.0
1.003	49.0	5.8	12.291	0.500	0.0	0.0	6.6	1.15	81.0	73.0
1.004	46.7	6.5	12.016	0.700	0.0	0.0	8.8	1.48	163.2	97.3
3.000	50.0	4.7	13.850	0.100	0.0	0.0	1.4	1.23	86.8	14.9
3.001	50.0	5.2	13.520	0.145	0.0	0.0	2.0	1.28	90.6	21.6
1.005	45.6	6.9	11.504	0.899	0.0	0.0	11.1	1.66	263.7	122.0
1.006	44.6	7.2	11.259	0.953	0.0	0.0	11.5	1.66	263.8	126.6
4.000	50.0	4.4	11.425	0.140	0.0	0.0	1.9	1.57	111.2	20.9

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
4.001	23.29	0.233	100.0	0.018	0.00	0.0	0.600	o	300
1.007	23.42	0.156	150.1	0.070	0.00	0.0	0.600	o	450
1.008	44.76	0.320	139.9	0.175	0.00	0.0	0.600	o	525
5.000	28.69	0.287	100.0	0.090	4.00	0.0	0.600	o	300
5.001	33.89	0.339	100.0	0.080	0.00	0.0	0.600	o	225
1.009	43.61	0.291	149.9	0.060	0.00	0.0	0.600	o	525
1.010	30.99	0.207	149.7	0.180	0.00	0.0	0.600	o	525
6.000	31.34	0.313	100.1	0.100	4.00	0.0	0.600	o	225
7.000	29.27	0.293	99.9	0.036	4.00	0.0	0.600	o	225
6.001	31.05	0.207	150.0	0.036	0.00	0.0	0.600	o	300
6.002	43.89	0.148	296.6	0.170	0.00	0.0	0.600	o	300
8.000	56.19	0.273	205.8	0.130	4.00	0.0	0.600	o	225
1.011	21.28	0.142	149.9	0.100	0.00	0.0	0.600	o	525
9.000	9.65	0.062	155.6	0.015	4.00	0.0	0.600	o	225
1.012	42.56	0.170	250.4	0.060	0.00	0.0	0.600	o	525

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
4.001	50.0	4.7	11.035	0.158	0.0	0.0	2.1	1.57	111.2	23.5
1.007	44.0	7.5	10.800	1.181	0.0	0.0	14.1	1.66	263.5	154.7
1.008	43.0	7.8	10.574	1.356	0.0	0.0	15.8	1.89	409.6	173.6
5.000	50.0	4.3	9.450	0.090	0.0	0.0	1.2	1.57	111.2	13.4
5.001	50.0	4.7	9.160	0.170	0.0	0.0	2.3	1.31	52.0	25.3
1.009	42.0	8.2	8.800	1.586	0.0	0.0	18.0	1.83	395.6	198.5
1.010	41.4	8.5	8.500	1.766	0.0	0.0	19.8	1.83	395.8	217.6
6.000	50.0	4.4	8.603	0.100	0.0	0.0	1.4	1.31	52.0	14.9
7.000	50.0	4.4	8.902	0.036	0.0	0.0	0.5	1.31	52.0	5.4
6.001	50.0	4.8	8.250	0.172	0.0	0.0	2.3	1.28	90.6	25.6
6.002	49.6	5.6	8.040	0.342	0.0	0.0	4.6	0.91	64.2	50.5
8.000	50.0	5.0	8.494	0.130	0.0	0.0	1.8	0.91	36.1	19.4
1.011	40.9	8.7	7.850	2.338	0.0	0.0	25.9	1.83	395.6	285.0
9.000	50.0	4.2	7.500	0.015	0.0	0.0	0.2	1.05	41.6	2.2
1.012	39.8	9.2	7.437	2.413	0.0	0.0	26.0	1.41	305.5	286.5

Time Area Diagram

Time From (mins)	Time To (mins)	Area (ha)
0	4	0.929
4	8	1.383
8	12	0.100

Total Area Contributing (ha) = 2.413

Total Pipe Volume (m³) = 95.652

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	o	225	SMH49	17.278	16.000	1.053	1200
1.001	o	225	SMH48	16.185	14.617	1.343	1200
2.000	o	225	SMH44	15.647	14.241	1.181	1200
1.002	o	225	SMH45	15.825	14.133	1.467	1200
1.003	o	300	SMH46	13.731	12.291	1.140	1200
1.004	o	375	SMH47	15.613	12.016	3.222	1200
3.000	o	300	SMH50	18.318	13.850	4.168	1200
3.001	o	300	SMH51	17.397	13.520	3.577	1200
1.005	o	450	SMH52	16.567	11.504	4.613	1350
1.006	o	450	SMH53	15.450	11.259	3.741	1350
4.000	o	300	SMH54	12.879	11.425	1.154	1200
4.001	o	300	SMH55	13.906	11.035	2.571	1200
1.007	o	450	SMH56	14.415	10.800	3.165	1350
1.008	o	525	SMH57	13.602	10.574	2.503	1500
5.000	o	300	SMH58	10.871	9.450	1.121	1200
5.001	o	225	SMH59	11.464	9.160	2.079	1200
1.009	o	525	SMH60	12.059	8.800	2.734	1500
1.010	o	525	SMH61	11.273	8.500	2.248	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	42.66	30.8	SMH48	16.185	14.617	1.343	1200
1.001	33.85	69.9	SMH45	15.825	14.133	1.467	1200
2.000	16.42	152.0	SMH45	15.825	14.133	1.467	1200
1.002	70.40	39.8	SMH46	13.731	12.366	1.140	1200
1.003	37.43	187.1	SMH47	15.613	12.091	3.222	1200
1.004	65.49	149.9	SMH52	16.567	11.579	4.613	1350
3.000	53.67	163.1	SMH51	17.397	13.521	3.576	1200
3.001	38.87	150.1	SMH52	16.567	13.261	3.006	1350
1.005	36.74	150.0	SMH53	15.450	11.259	3.741	1350
1.006	34.01	149.8	SMH56	14.415	11.032	2.933	1350
4.000	38.99	100.0	SMH55	13.906	11.035	2.571	1200
4.001	23.29	100.0	SMH56	14.415	10.802	3.313	1350
1.007	23.42	150.1	SMH57	13.602	10.644	2.508	1500
1.008	44.76	139.9	SMH60	12.059	10.254	1.280	1500
5.000	28.69	100.0	SMH59	11.464	9.163	2.001	1200
5.001	33.89	100.0	SMH60	12.059	8.821	3.013	1500
1.009	43.61	149.9	SMH61	11.273	8.509	2.239	1500
1.010	30.99	149.7	SMH67	10.474	8.293	1.656	1500

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
6.000	o	225	SMH62	9.948	8.603	1.120	1200
7.000	o	225	SMH63	10.252	8.902	1.125	1200
6.001	o	300	SMH64	10.161	8.250	1.611	1200
6.002	o	300	SMH65	10.109	8.040	1.769	1200
8.000	o	225	SMH66	9.905	8.494	1.186	1200
1.011	o	525	SMH67	10.474	7.850	2.099	1500
9.000	o	225	SMH68	8.326	7.500	0.601	1200
1.012	o	525	SMH69	9.910	7.437	1.948	1500

Downstream Manhole

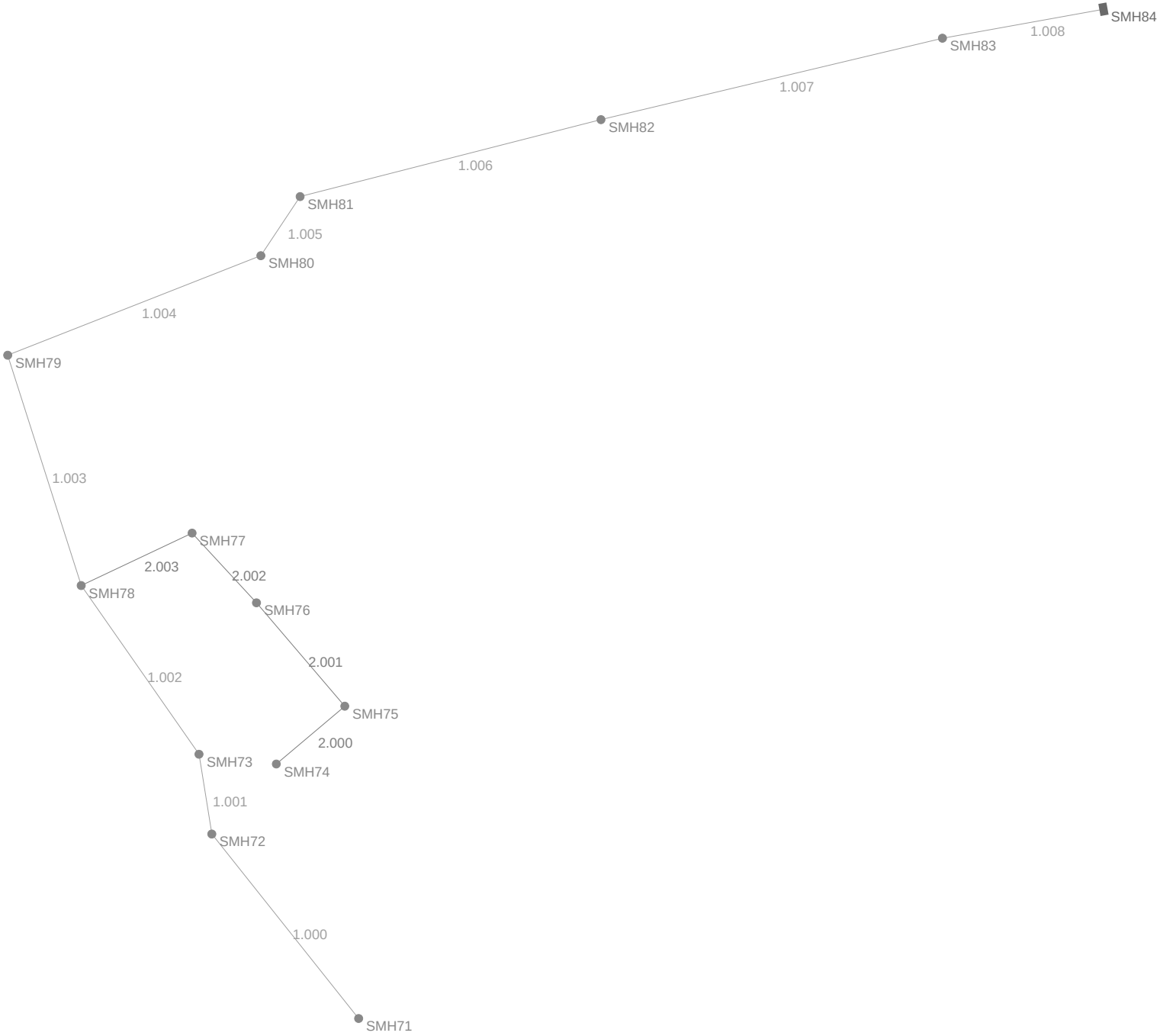
PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
6.000	31.34	100.1	SMH64	10.161	8.290	1.646	1200
7.000	29.27	99.9	SMH64	10.161	8.609	1.327	1200
6.001	31.05	150.0	SMH65	10.109	8.043	1.766	1200
6.002	43.89	296.6	SMH67	10.474	7.892	2.282	1500
8.000	56.19	205.8	SMH67	10.474	8.221	2.028	1500
1.011	21.28	149.9	SMH69	9.910	7.708	1.677	1500
9.000	9.65	155.6	SMH69	9.910	7.438	2.247	1500
1.012	42.56	250.4	27	0.000	7.267	-7.792	1500

MANHOLE SCHEDULES

M/Hole Number	Cover Level (m)	M/Hole Depth (m)	M/Hole Diam.,L*W (mm)	Pipes Out PN	Pipes Out IL.(m)	Pipes Out D (mm)	Pipes In PN	Pipes In IL.(m)	Pipes In D (mm)
SMH49	17.278	1.278	1200	1.000	16.000	225			
SMH48	16.185	1.568	1200	1.001	14.617	225	1.000	14.617	225
SMH44	15.647	1.406	1200	2.000	14.241	225			
SMH45	15.825	1.692	1200	1.002	14.133	225	1.001	14.133	225
							2.000	14.133	225
SMH46	13.731	1.440	1200	1.003	12.291	300	1.002	12.366	225
SMH47	15.613	3.597	1200	1.004	12.016	375	1.003	12.091	300
SMH50	18.318	4.468	1200	3.000	13.850	300			
SMH51	17.397	3.877	1200	3.001	13.520	300	3.000	13.521	300
SMH52	16.567	5.063	1350	1.005	11.504	450	1.004	11.579	375
							3.001	13.261	300
SMH53	15.450	4.191	1350	1.006	11.259	450	1.005	11.259	450
SMH54	12.879	1.454	1200	4.000	11.425	300			
SMH55	13.906	2.871	1200	4.001	11.035	300	4.000	11.035	300
SMH56	14.415	3.615	1350	1.007	10.800	450	1.006	11.032	450
							4.001	10.802	300
SMH57	13.602	3.028	1500	1.008	10.574	525	1.007	10.644	450
SMH58	10.871	1.421	1200	5.000	9.450	300			
SMH59	11.464	2.304	1200	5.001	9.160	225	5.000	9.163	300
SMH60	12.059	3.259	1500	1.009	8.800	525	1.008	10.254	525
							5.001	8.821	225
SMH61	11.273	2.773	1500	1.010	8.500	525	1.009	8.509	525
SMH62	9.948	1.345	1200	6.000	8.603	225			
SMH63	10.252	1.350	1200	7.000	8.902	225			
SMH64	10.161	1.911	1200	6.001	8.250	300	6.000	8.290	225
							7.000	8.609	225
SMH65	10.109	2.069	1200	6.002	8.040	300	6.001	8.043	300
SMH66	9.905	1.411	1200	8.000	8.494	225			
SMH67	10.474	2.624	1500	1.011	7.850	525	1.010	8.293	525
							6.002	7.892	300
							8.000	8.221	225
SMH68	8.326	0.826	1200	9.000	7.500	225			
SMH69	9.910	2.473	1500	1.012	7.437	525	1.011	7.708	525
							9.000	7.438	225
27	0.000	-7.267	1500		OUTFALL		1.012	7.267	525

Appendix E -3

Surface Water Network 3 Calculations


SMH84
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SMH83
1.007
SMH82
1.006
SMH81
1.005
SMH80
1.004
SMH79
1.003
SMH77
2.003
2.002
SMH78
SMH76
2.001
1.002
SMH75
2.000
SMH73
SMH74
1.001
SMH72
1.000
SMH71

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Pipe Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.PIP
Manhole Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.MHS

Location - Scotland & Ireland

Return Period (years)	2	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	16.500	Min Cover Depth for Optimisation (m)	1.200
Ratio R	0.300	Min Vel for Auto Design Only (m/s)	0.80
Maximum Rainfall (mm/hr)	50	Min Slope for Optimisation (1:X)	200
Foul Sewage (l/s/ha)	0.00	Minimum Outfall Invert (m)	1.518
O'flow Setting (*Foul only)	0	Ground Level at Outfall (m)	3.420
Volumetric Runoff Coeff.	0.75	Outfall Manhole Name	SMH84
Add Flow / Climate Change (%)	10	Outfall Manhole Dia/Length (mm)	1500
Minimum Backdrop Height (m)	0.200	Outfall Manhole Width (mm)	3000

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	46.90	0.313	150.0	0.000	4.00	106.0	0.600	o	375
1.001	16.08	0.107	150.3	0.000	0.00	0.0	0.600	o	375
1.002	40.94	0.421	97.2	0.075	0.00	0.0	0.600	o	375
2.000	17.84	0.648	27.5	0.050	4.00	0.0	0.600	o	225
2.001	27.06	0.361	75.0	0.040	0.00	0.0	0.600	o	225
2.002	18.92	0.407	46.5	0.040	0.00	0.0	0.600	o	225
2.003	24.36	0.500	48.7	0.040	0.00	0.0	0.600	o	300
1.003	48.04	1.850	26.0	0.000	0.00	0.0	0.600	o	375
1.004	54.12	0.361	149.9	0.060	0.00	0.0	0.600	o	450
1.005	14.15	0.094	150.5	0.050	0.00	0.0	0.600	o	450
1.006	61.79	0.412	150.0	0.000	0.00	0.0	0.600	o	450
1.007	69.87	0.467	149.6	0.000	0.00	0.0	0.600	o	450
1.008	32.51	0.217	149.8	0.000	0.00	0.0	0.600	o	1000

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	50.0	4.5	6.800	0.000	106.0	0.0	10.6	1.48	163.1	116.6
1.001	50.0	4.7	6.480	0.000	106.0	0.0	10.6	1.48	163.0	116.6
1.002	50.0	5.1	6.370	0.075	106.0	0.0	11.6	1.84	203.0	127.8
2.000	50.0	4.1	8.225	0.050	0.0	0.0	0.7	2.50	99.5	7.4
2.001	50.0	4.4	7.271	0.090	0.0	0.0	1.2	1.51	60.1	13.4
2.002	50.0	4.6	6.907	0.130	0.0	0.0	1.8	1.92	76.5	19.4
2.003	50.0	4.8	6.500	0.170	0.0	0.0	2.3	2.26	159.6	25.3
1.003	50.0	5.3	5.000	0.245	106.0	0.0	13.9	3.57	394.1	153.1
1.004	48.8	5.9	3.070	0.305	106.0	0.0	14.6	1.66	263.7	160.9
1.005	48.3	6.0	2.709	0.355	106.0	0.0	15.2	1.65	263.2	167.7
1.006	46.3	6.6	2.614	0.355	106.0	0.0	15.2	1.66	263.7	167.7
1.007	44.3	7.3	2.202	0.355	106.0	0.0	15.2	1.66	264.0	167.7
1.008	43.8	7.5	1.735	0.355	106.0	0.0	15.2	2.73	2144.1	167.7

Time Area Diagram

Time From (mins)	Time To (mins)	Area (ha)
0	4	0.124
4	8	0.231

Total Area Contributing (ha) = 0.355

Total Pipe Volume (m³) = 78.373

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	o	375	SMH71	8.782	6.800	1.607	1350
1.001	o	375	SMH72	9.890	6.480	3.035	1350
1.002	o	375	SMH73	9.996	6.370	3.251	1350
2.000	o	225	SMH74	9.400	8.225	0.950	1200
2.001	o	225	SMH75	8.500	7.271	1.004	1200
2.002	o	225	SMH76	8.350	6.907	1.218	1200
2.003	o	300	SMH77	7.800	6.500	1.000	1200
1.003	o	375	SMH78	8.337	5.000	2.962	1350
1.004	o	450	SMH79	4.680	3.070	1.160	1350
1.005	o	450	SMH80	4.195	2.709	1.036	1350
1.006	o	450	SMH81	3.952	2.614	0.888	1350
1.007	o	450	SMH82	3.500	2.202	0.848	1350
1.008	o	1000	SMH83	3.555	1.735	0.820	1900

Downstream Manhole

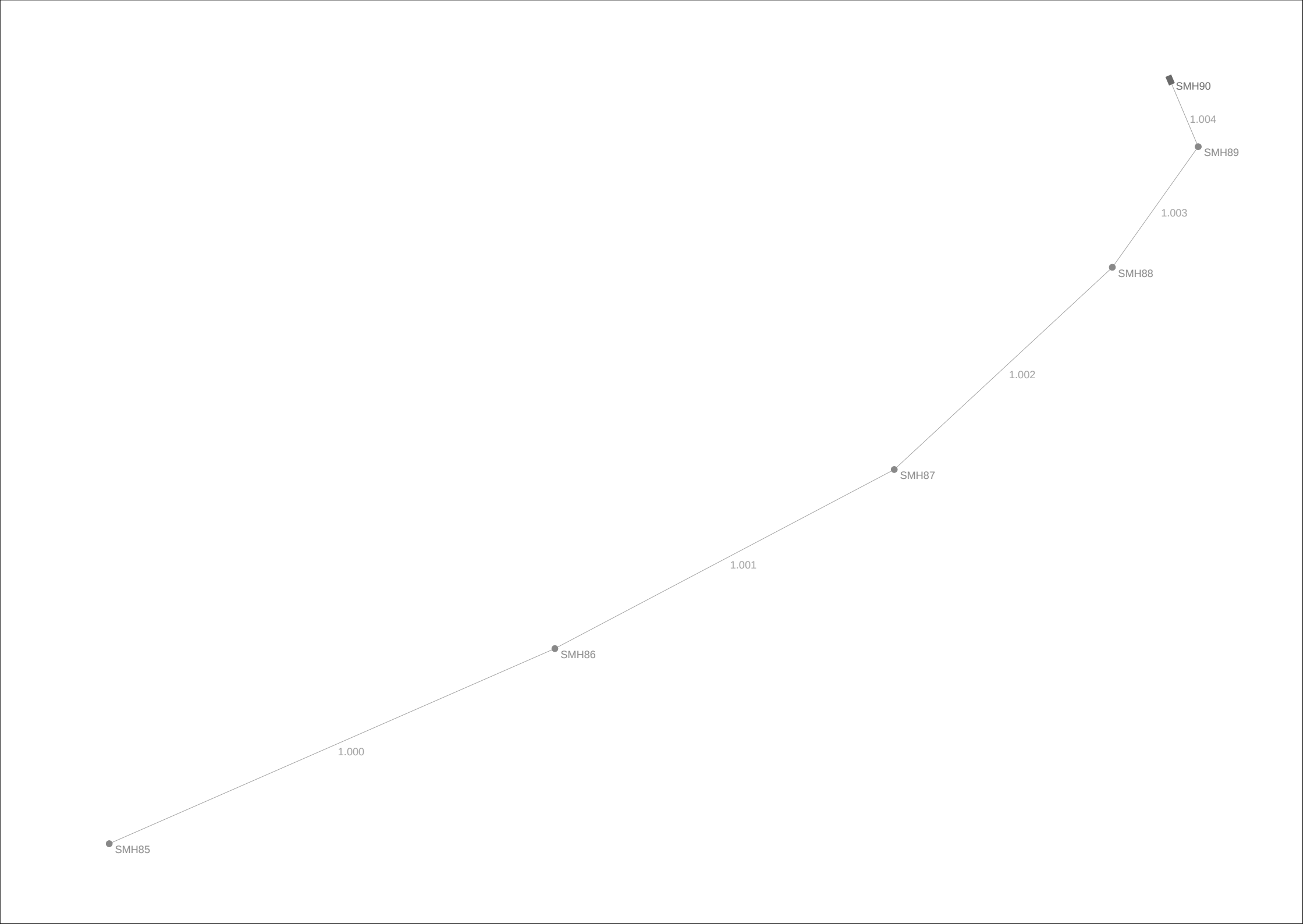
PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	46.90	150.0	SMH72	9.890	6.487	3.028	1350
1.001	16.08	150.3	SMH73	9.996	6.373	3.248	1350
1.002	40.94	97.2	SMH78	8.337	5.949	2.013	1350
2.000	17.84	27.5	SMH75	8.500	7.577	0.698	1200
2.001	27.06	75.0	SMH76	8.350	6.910	1.215	1200
2.002	18.92	46.5	SMH77	7.800	6.500	1.075	1200
2.003	24.36	48.7	SMH78	8.337	6.000	2.037	1350
1.003	48.04	26.0	SMH79	4.680	3.150	1.155	1350
1.004	54.12	149.9	SMH80	4.195	2.709	1.036	1350
1.005	14.15	150.5	SMH81	3.952	2.615	0.887	1350
1.006	61.79	150.0	SMH82	3.500	2.202	0.848	1350
1.007	69.87	149.6	SMH83	3.555	1.735	1.370	1900
1.008	32.51	149.8	SMH84	3.420	1.518	0.902	1500 x 3000

MANHOLE SCHEDULES

M/Hole Number	Cover Level (m)	M/Hole Depth (m)	M/Hole Diam.,L*W (mm)	Pipes Out PN	Pipes Out IL.(m)	Pipes Out D (mm)	Pipes In PN	Pipes In IL.(m)	Pipes In D (mm)
SMH71	8.782	1.982	1350	1.000	6.800	375			
SMH72	9.890	3.410	1350	1.001	6.480	375	1.000	6.487	375
SMH73	9.996	3.626	1350	1.002	6.370	375	1.001	6.373	375
SMH74	9.400	1.175	1200	2.000	8.225	225			
SMH75	8.500	1.229	1200	2.001	7.271	225	2.000	7.577	225
SMH76	8.350	1.443	1200	2.002	6.907	225	2.001	6.910	225
SMH77	7.800	1.300	1200	2.003	6.500	300	2.002	6.500	225
SMH78	8.337	3.337	1350	1.003	5.000	375	1.002 2.003	5.949 6.000	375 300
SMH79	4.680	1.610	1350	1.004	3.070	450	1.003	3.150	375
SMH80	4.195	1.486	1350	1.005	2.709	450	1.004	2.709	450
SMH81	3.952	1.338	1350	1.006	2.614	450	1.005	2.615	450
SMH82	3.500	1.298	1350	1.007	2.202	450	1.006	2.202	450
SMH83	3.555	1.820	1900	1.008	1.735	1000	1.007	1.735	450
SMH84	3.420	1.902	1500 x 3000		OUTFALL		1.008	1.518	1000

Appendix E -4

Surface Water Network 4 Calculations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SMH89
1.003
SMH88
1.002
SMH87
1.001
SMH86
1.000
SMH85

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Pipe Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.PIP
Manhole Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.MHS

Location - Scotland & Ireland

Return Period (years)	2	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	16.500	Min Cover Depth for Optimisation (m)	1.200
Ratio R	0.300	Min Vel for Auto Design Only (m/s)	0.80
Maximum Rainfall (mm/hr)	50	Min Slope for Optimisation (1:X)	200
Foul Sewage (l/s/ha)	0.00	Minimum Outfall Invert (m)	2.000
O'flow Setting (*Foul only)	0	Ground Level at Outfall (m)	3.000
Volumetric Runoff Coeff.	0.75	Outfall Manhole Name	SMH90
Add Flow / Climate Change (%)	10	Outfall Manhole Dia/Length (mm)	3000
Minimum Backdrop Height (m)	0.200	Outfall Manhole Width (mm)	3000

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	86.43	3.284	26.3	0.072	4.00	0.0	0.600	o	225
1.001	68.20	2.965	23.0	0.056	0.00	0.0	0.600	o	300
1.002	43.00	1.321	32.6	0.042	0.00	0.0	0.600	o	300
1.003	35.00	0.234	149.6	0.033	0.00	0.0	0.600	o	750
1.004	12.84	0.128	100.3	0.070	0.00	0.0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	50.0	4.6	10.434	0.072	0.0	0.0	1.0	2.56	101.8	10.7
1.001	50.0	4.9	7.150	0.128	0.0	0.0	1.7	3.29	232.7	19.1
1.002	50.0	5.2	4.185	0.170	0.0	0.0	2.3	2.77	195.5	25.3
1.003	50.0	5.4	2.414	0.203	0.0	0.0	2.7	2.29	1009.9	30.2
1.004	49.8	5.6	2.180	0.273	0.0	0.0	3.7	1.57	111.0	40.5

Time Area Diagram

Time From (mins)	Time To (mins)	Area (ha)
0	4	0.219
4	8	0.054

Total Area Contributing (ha) = 0.273

Total Pipe Volume (m³) = 27.667

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	o	225	SMH85	11.406	10.434	0.747	1200
1.001	o	300	SMH86	8.297	7.150	0.847	1200
1.002	o	300	SMH87	5.408	4.185	0.923	1200
1.003	o	750	SMH88	3.863	2.414	0.699	1200
1.004	o	300	SMH89	3.772	2.180	1.292	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	86.43	26.3	SMH86	8.297	7.150	0.922	1200
1.001	68.20	23.0	SMH87	5.408	4.185	0.923	1200
1.002	43.00	32.6	SMH88	3.863	2.864	0.699	1200
1.003	35.00	149.6	SMH89	3.772	2.180	0.842	1200
1.004	12.84	100.3	SMH90	3.000	2.052	0.648	3000 x 3000

MANHOLE SCHEDULES

M/Hole Number	Cover Level (m)	M/Hole Depth (m)	M/Hole Diam.,L*W (mm)	Pipes Out PN	Pipes Out IL.(m)	Pipes Out D (mm)	Pipes In PN	Pipes In IL.(m)	Pipes In D (mm)
SMH85	11.406	0.972	1200	1.000	10.434	225			
SMH86	8.297	1.147	1200	1.001	7.150	300	1.000	7.150	225
SMH87	5.408	1.223	1200	1.002	4.185	300	1.001	4.185	300
SMH88	3.863	1.449	1200	1.003	2.414	750	1.002	2.864	300
SMH89	3.772	1.592	1200	1.004	2.180	300	1.003	2.180	750
SMH90	3.000	0.948	3000 x 3000		OUTFALL		1.004	2.052	300

Appendix E -5

Surface Water Network 1 Simulation 1 in 30Yr
Infiltration Basin/Pond Source Control 1 in 100 Yr (Winter 360)

Global Variables

Region	FSR - Scotland & Ireland
Return Period (yrs)	30
M5-60 (mm)	16.500
Ratio R	0.300
Volumetric Runoff Coef	0.750
Profile Type	Summer
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	360
Hot Start (mins)	0
Hot Start Level (mm)	0
Manhole Headloss Coefficient	0.500
MADD Factor * 10m³/ha Storage	3.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	10
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of On-Line Controls	0

Starting Storm file name

F:\17-03 Kingsbridge Consultancy Ltd Blackrock\Services (May 2019)\Storm Drainage\19-05-20 Storm Drainage Network 1.sws

Surcharged Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.012	SMH43	9.240	7.416	3000	3000

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
0	0.000	0.000	56	7.131	-0.675	112	7.315	-0.675	168	7.781	-0.385
2	7.000	-0.675	58	7.137	-0.675	114	7.325	-0.675	170	7.805	-0.361
4	7.000	-0.675	60	7.143	-0.675	116	7.336	-0.675	172	7.828	-0.338
6	7.001	-0.675	62	7.149	-0.675	118	7.347	-0.675	174	7.852	-0.314
8	7.002	-0.675	64	7.154	-0.675	120	7.358	-0.675	176	7.876	-0.290
10	7.003	-0.675	66	7.160	-0.675	122	7.370	-0.675	178	7.900	-0.266
12	7.006	-0.675	68	7.165	-0.675	124	7.382	-0.675	180	7.923	-0.243
14	7.009	-0.675	70	7.171	-0.675	126	7.395	-0.675	182	7.947	-0.219
16	7.012	-0.675	72	7.176	-0.675	128	7.408	-0.675	184	7.971	-0.195
18	7.017	-0.675	74	7.182	-0.675	130	7.422	-0.675	186	7.994	-0.172
20	7.021	-0.675	76	7.188	-0.675	132	7.436	-0.675	188	8.017	-0.149
22	7.026	-0.675	78	7.193	-0.675	134	7.451	-0.675	190	8.039	-0.127
24	7.032	-0.675	80	7.199	-0.675	136	7.467	-0.675	192	8.061	-0.105
26	7.038	-0.675	82	7.205	-0.675	138	7.482	-0.675	194	8.082	-0.084
28	7.043	-0.675	84	7.210	-0.675	140	7.499	-0.667	196	8.103	-0.063
30	7.049	-0.675	86	7.216	-0.675	142	7.516	-0.650	198	8.123	-0.043
32	7.055	-0.675	88	7.223	-0.675	144	7.533	-0.633	200	8.143	-0.023
34	7.062	-0.675	90	7.229	-0.675	146	7.551	-0.615	202	8.162	-0.004
36	7.068	-0.675	92	7.235	-0.675	148	7.569	-0.597	204	8.180	0.014
38	7.074	-0.675	94	7.242	-0.675	150	7.588	-0.578	206	8.198	0.032
40	7.081	-0.675	96	7.249	-0.675	152	7.608	-0.558	208	8.215	0.049
42	7.087	-0.675	98	7.256	-0.675	154	7.628	-0.538	210	8.232	0.066
44	7.094	-0.675	100	7.263	-0.675	156	7.648	-0.518	212	8.248	0.082
46	7.100	-0.675	102	7.271	-0.675	158	7.669	-0.497	214	8.263	0.097
48	7.107	-0.675	104	7.279	-0.675	160	7.691	-0.475	216	8.277	0.111
50	7.113	-0.675	106	7.288	-0.675	162	7.713	-0.453	218	8.291	0.125
52	7.119	-0.675	108	7.297	-0.675	164	7.735	-0.431	220	8.305	0.139
54	7.125	-0.675	110	7.306	-0.675	166	7.758	-0.408	222	8.317	0.151

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
224	8.329	0.163	354	8.431	0.265	484	8.143	-0.023	614	7.829	-0.337
226	8.340	0.174	356	8.429	0.263	486	8.138	-0.028	616	7.824	-0.342
228	8.351	0.185	358	8.425	0.259	488	8.134	-0.032	618	7.818	-0.348
230	8.361	0.195	360	8.422	0.256	490	8.130	-0.036	620	7.813	-0.353
232	8.371	0.205	362	8.418	0.252	492	8.125	-0.041	622	7.807	-0.359
234	8.380	0.214	364	8.414	0.248	494	8.121	-0.045	624	7.802	-0.364
236	8.388	0.222	366	8.409	0.243	496	8.116	-0.050	626	7.796	-0.370
238	8.396	0.230	368	8.404	0.238	498	8.112	-0.054	628	7.790	-0.376
240	8.403	0.237	370	8.400	0.234	500	8.107	-0.059	630	7.785	-0.381
242	8.410	0.244	372	8.395	0.229	502	8.103	-0.063	632	7.779	-0.387
244	8.417	0.251	374	8.390	0.224	504	8.098	-0.068	634	7.773	-0.393
246	8.423	0.257	376	8.385	0.219	506	8.094	-0.072	636	7.767	-0.399
248	8.428	0.262	378	8.381	0.215	508	8.089	-0.077	638	7.762	-0.404
250	8.433	0.267	380	8.376	0.210	510	8.085	-0.081	640	7.756	-0.410
252	8.438	0.272	382	8.371	0.205	512	8.080	-0.086	642	7.750	-0.416
254	8.442	0.276	384	8.366	0.200	514	8.075	-0.091	644	7.744	-0.422
256	8.446	0.280	386	8.361	0.195	516	8.071	-0.095	646	7.738	-0.428
258	8.449	0.283	388	8.357	0.191	518	8.066	-0.100	648	7.732	-0.434
260	8.452	0.286	390	8.352	0.186	520	8.062	-0.104	650	7.726	-0.440
262	8.455	0.289	392	8.347	0.181	522	8.057	-0.109	652	7.720	-0.446
264	8.457	0.291	394	8.343	0.177	524	8.053	-0.113	654	7.714	-0.452
266	8.459	0.293	396	8.338	0.172	526	8.048	-0.118	656	7.708	-0.458
268	8.461	0.295	398	8.333	0.167	528	8.043	-0.123	658	7.702	-0.464
270	8.462	0.296	400	8.329	0.163	530	8.039	-0.127	660	7.696	-0.470
272	8.463	0.297	402	8.324	0.158	532	8.034	-0.132	662	7.690	-0.476
274	8.464	0.298	404	8.319	0.153	534	8.029	-0.137	664	7.684	-0.482
276	8.465	0.299	406	8.315	0.149	536	8.025	-0.141	666	7.678	-0.488
278	8.466	0.300	408	8.310	0.144	538	8.020	-0.146	668	7.671	-0.495
280	8.466	0.300	410	8.306	0.140	540	8.015	-0.151	670	7.665	-0.501
282	8.466	0.300	412	8.301	0.135	542	8.011	-0.155	672	7.659	-0.507
284	8.466	0.300	414	8.297	0.131	544	8.006	-0.160	674	7.652	-0.514
286	8.466	0.300	416	8.292	0.126	546	8.001	-0.165	676	7.646	-0.520
288	8.466	0.300	418	8.288	0.122	548	7.997	-0.169	678	7.640	-0.526
290	8.465	0.299	420	8.283	0.117	550	7.992	-0.174	680	7.633	-0.533
292	8.465	0.299	422	8.279	0.113	552	7.987	-0.179	682	7.627	-0.539
294	8.464	0.298	424	8.274	0.108	554	7.982	-0.184	684	7.620	-0.546
296	8.464	0.298	426	8.270	0.104	556	7.978	-0.188	686	7.614	-0.552
298	8.463	0.297	428	8.265	0.099	558	7.973	-0.193	688	7.607	-0.559
300	8.462	0.296	430	8.261	0.095	560	7.968	-0.198	690	7.600	-0.566
302	8.461	0.295	432	8.257	0.091	562	7.963	-0.203	692	7.594	-0.572
304	8.461	0.295	434	8.252	0.086	564	7.958	-0.208	694	7.587	-0.579
306	8.460	0.294	436	8.248	0.082	566	7.953	-0.213	696	7.580	-0.586
308	8.459	0.293	438	8.243	0.077	568	7.948	-0.218	698	7.574	-0.592
310	8.458	0.292	440	8.239	0.073	570	7.943	-0.223	700	7.567	-0.599
312	8.457	0.291	442	8.235	0.069	572	7.938	-0.228	702	7.560	-0.606
314	8.456	0.290	444	8.230	0.064	574	7.933	-0.233	704	7.554	-0.612
316	8.455	0.289	446	8.226	0.060	576	7.928	-0.238	706	7.547	-0.619
318	8.455	0.289	448	8.222	0.056	578	7.923	-0.243	708	7.540	-0.626
320	8.454	0.288	450	8.217	0.051	580	7.918	-0.248	710	7.534	-0.632
322	8.453	0.287	452	8.213	0.047	582	7.913	-0.253	712	7.527	-0.639
324	8.452	0.286	454	8.209	0.043	584	7.908	-0.258	714	7.520	-0.646
326	8.451	0.285	456	8.204	0.038	586	7.903	-0.263	716	7.514	-0.652
328	8.450	0.284	458	8.200	0.034	588	7.898	-0.268	718	7.507	-0.659
330	8.449	0.283	460	8.196	0.030	590	7.893	-0.273	720	7.500	-0.666
332	8.448	0.282	462	8.191	0.025	592	7.888	-0.278	722	7.494	-0.672
334	8.447	0.281	464	8.187	0.021	594	7.883	-0.283	724	7.487	-0.675
336	8.446	0.280	466	8.183	0.017	596	7.877	-0.289	726	7.480	-0.675
338	8.445	0.279	468	8.178	0.012	598	7.872	-0.294	728	7.474	-0.675
340	8.444	0.278	470	8.174	0.008	600	7.867	-0.299	730	7.467	-0.675
342	8.443	0.277	472	8.169	0.003	602	7.861	-0.305	732	7.461	-0.675
344	8.441	0.275	474	8.165	-0.001	604	7.856	-0.310	734	7.455	-0.675
346	8.440	0.274	476	8.161	-0.005	606	7.851	-0.315	736	7.448	-0.675
348	8.438	0.272	478	8.156	-0.010	608	7.845	-0.321	738	7.442	-0.675
350	8.436	0.270	480	8.152	-0.014	610	7.840	-0.326	740	7.436	-0.675
352	8.434	0.268	482	8.147	-0.019	612	7.835	-0.331	742	7.430	-0.675

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
744	7.423	-0.675	874	7.170	-0.675	1004	7.069	-0.675	1134	7.017	-0.675
746	7.417	-0.675	876	7.168	-0.675	1006	7.068	-0.675	1136	7.017	-0.675
748	7.411	-0.675	878	7.165	-0.675	1008	7.067	-0.675	1138	7.016	-0.675
750	7.405	-0.675	880	7.163	-0.675	1010	7.065	-0.675	1140	7.016	-0.675
752	7.399	-0.675	882	7.161	-0.675	1012	7.064	-0.675	1142	7.015	-0.675
754	7.393	-0.675	884	7.159	-0.675	1014	7.063	-0.675	1144	7.015	-0.675
756	7.388	-0.675	886	7.157	-0.675	1016	7.062	-0.675	1146	7.015	-0.675
758	7.382	-0.675	888	7.155	-0.675	1018	7.061	-0.675	1148	7.014	-0.675
760	7.376	-0.675	890	7.153	-0.675	1020	7.060	-0.675	1150	7.014	-0.675
762	7.371	-0.675	892	7.151	-0.675	1022	7.058	-0.675	1152	7.014	-0.675
764	7.365	-0.675	894	7.149	-0.675	1024	7.057	-0.675	1154	7.013	-0.675
766	7.360	-0.675	896	7.147	-0.675	1026	7.056	-0.675	1156	7.013	-0.675
768	7.355	-0.675	898	7.145	-0.675	1028	7.055	-0.675	1158	7.013	-0.675
770	7.349	-0.675	900	7.143	-0.675	1030	7.054	-0.675	1160	7.013	-0.675
772	7.344	-0.675	902	7.141	-0.675	1032	7.053	-0.675	1162	7.012	-0.675
774	7.339	-0.675	904	7.139	-0.675	1034	7.052	-0.675	1164	7.012	-0.675
776	7.334	-0.675	906	7.138	-0.675	1036	7.050	-0.675	1166	7.012	-0.675
778	7.329	-0.675	908	7.136	-0.675	1038	7.049	-0.675	1168	7.012	-0.675
780	7.325	-0.675	910	7.134	-0.675	1040	7.048	-0.675	1170	7.011	-0.675
782	7.320	-0.675	912	7.132	-0.675	1042	7.047	-0.675	1172	7.011	-0.675
784	7.315	-0.675	914	7.130	-0.675	1044	7.046	-0.675	1174	7.011	-0.675
786	7.311	-0.675	916	7.129	-0.675	1046	7.045	-0.675	1176	7.011	-0.675
788	7.306	-0.675	918	7.127	-0.675	1048	7.044	-0.675	1178	7.010	-0.675
790	7.302	-0.675	920	7.125	-0.675	1050	7.043	-0.675	1180	7.010	-0.675
792	7.297	-0.675	922	7.124	-0.675	1052	7.042	-0.675	1182	7.010	-0.675
794	7.293	-0.675	924	7.122	-0.675	1054	7.041	-0.675	1184	7.010	-0.675
796	7.289	-0.675	926	7.121	-0.675	1056	7.040	-0.675	1186	7.009	-0.675
798	7.285	-0.675	928	7.119	-0.675	1058	7.039	-0.675	1188	7.009	-0.675
800	7.281	-0.675	930	7.117	-0.675	1060	7.039	-0.675	1190	7.009	-0.675
802	7.277	-0.675	932	7.116	-0.675	1062	7.038	-0.675	1192	7.009	-0.675
804	7.273	-0.675	934	7.114	-0.675	1064	7.037	-0.675	1194	7.009	-0.675
806	7.269	-0.675	936	7.113	-0.675	1066	7.036	-0.675	1196	7.008	-0.675
808	7.265	-0.675	938	7.111	-0.675	1068	7.035	-0.675	1198	7.008	-0.675
810	7.261	-0.675	940	7.110	-0.675	1070	7.035	-0.675	1200	7.008	-0.675
812	7.258	-0.675	942	7.108	-0.675	1072	7.034	-0.675	1202	7.008	-0.675
814	7.254	-0.675	944	7.107	-0.675	1074	7.033	-0.675	1204	7.008	-0.675
816	7.251	-0.675	946	7.106	-0.675	1076	7.032	-0.675	1206	7.008	-0.675
818	7.247	-0.675	948	7.104	-0.675	1078	7.032	-0.675	1208	7.007	-0.675
820	7.244	-0.675	950	7.103	-0.675	1080	7.031	-0.675	1210	7.007	-0.675
822	7.240	-0.675	952	7.102	-0.675	1082	7.030	-0.675	1212	7.007	-0.675
824	7.237	-0.675	954	7.100	-0.675	1084	7.030	-0.675	1214	7.007	-0.675
826	7.234	-0.675	956	7.099	-0.675	1086	7.029	-0.675	1216	7.007	-0.675
828	7.230	-0.675	958	7.098	-0.675	1088	7.028	-0.675	1218	7.007	-0.675
830	7.227	-0.675	960	7.096	-0.675	1090	7.028	-0.675	1220	7.006	-0.675
832	7.224	-0.675	962	7.095	-0.675	1092	7.027	-0.675	1222	7.006	-0.675
834	7.221	-0.675	964	7.094	-0.675	1094	7.026	-0.675	1224	7.006	-0.675
836	7.218	-0.675	966	7.092	-0.675	1096	7.026	-0.675	1226	7.006	-0.675
838	7.215	-0.675	968	7.091	-0.675	1098	7.025	-0.675	1228	7.006	-0.675
840	7.212	-0.675	970	7.090	-0.675	1100	7.025	-0.675	1230	7.006	-0.675
842	7.210	-0.675	972	7.089	-0.675	1102	7.024	-0.675	1232	7.006	-0.675
844	7.207	-0.675	974	7.087	-0.675	1104	7.024	-0.675	1234	7.006	-0.675
846	7.204	-0.675	976	7.086	-0.675	1106	7.023	-0.675	1236	7.005	-0.675
848	7.202	-0.675	978	7.085	-0.675	1108	7.023	-0.675	1238	7.005	-0.675
850	7.199	-0.675	980	7.084	-0.675	1110	7.022	-0.675	1240	7.005	-0.675
852	7.196	-0.675	982	7.082	-0.675	1112	7.022	-0.675	1242	7.005	-0.675
854	7.194	-0.675	984	7.081	-0.675	1114	7.021	-0.675	1244	7.005	-0.675
856	7.191	-0.675	986	7.080	-0.675	1116	7.021	-0.675	1246	7.005	-0.675
858	7.189	-0.675	988	7.079	-0.675	1118	7.020	-0.675	1248	7.005	-0.675
860	7.186	-0.675	990	7.077	-0.675	1120	7.020	-0.675	1250	7.005	-0.675
862	7.184	-0.675	992	7.076	-0.675	1122	7.019	-0.675	1252	7.004	-0.675
864	7.181	-0.675	994	7.075	-0.675	1124	7.019	-0.675	1254	7.004	-0.675
866	7.179	-0.675	996	7.074	-0.675	1126	7.018	-0.675	1256	7.004	-0.675
868	7.177	-0.675	998	7.073	-0.675	1128	7.018	-0.675	1258	7.004	-0.675
870	7.174	-0.675	1000	7.071	-0.675	1130	7.018	-0.675	1260	7.004	-0.675
872	7.172	-0.675	1002	7.070	-0.675	1132	7.017	-0.675	1262	7.004	-0.675

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
1264	7.004	-0.675	1394	7.001	-0.675	1524	7.000	-0.675	1654	7.000	-0.675
1266	7.004	-0.675	1396	7.001	-0.675	1526	7.000	-0.675	1656	7.000	-0.675
1268	7.004	-0.675	1398	7.001	-0.675	1528	7.000	-0.675	1658	7.000	-0.675
1270	7.004	-0.675	1400	7.001	-0.675	1530	7.000	-0.675	1660	7.000	-0.675
1272	7.004	-0.675	1402	7.001	-0.675	1532	7.000	-0.675	1662	7.000	-0.675
1274	7.004	-0.675	1404	7.001	-0.675	1534	7.000	-0.675	1664	7.000	-0.675
1276	7.003	-0.675	1406	7.001	-0.675	1536	7.000	-0.675	1666	7.000	-0.675
1278	7.003	-0.675	1408	7.001	-0.675	1538	7.000	-0.675	1668	7.000	-0.675
1280	7.003	-0.675	1410	7.001	-0.675	1540	7.000	-0.675	1670	7.000	-0.675
1282	7.003	-0.675	1412	7.001	-0.675	1542	7.000	-0.675	1672	7.000	-0.675
1284	7.003	-0.675	1414	7.001	-0.675	1544	7.000	-0.675	1674	7.000	-0.675
1286	7.003	-0.675	1416	7.001	-0.675	1546	7.000	-0.675	1676	7.000	-0.675
1288	7.003	-0.675	1418	7.001	-0.675	1548	7.000	-0.675	1678	7.000	-0.675
1290	7.003	-0.675	1420	7.001	-0.675	1550	7.000	-0.675	1680	7.000	-0.675
1292	7.003	-0.675	1422	7.001	-0.675	1552	7.000	-0.675	1682	7.000	-0.675
1294	7.003	-0.675	1424	7.001	-0.675	1554	7.000	-0.675	1684	7.000	-0.675
1296	7.003	-0.675	1426	7.001	-0.675	1556	7.000	-0.675	1686	7.000	-0.675
1298	7.003	-0.675	1428	7.001	-0.675	1558	7.000	-0.675	1688	7.000	-0.675
1300	7.003	-0.675	1430	7.001	-0.675	1560	7.000	-0.675	1690	7.000	-0.675
1302	7.003	-0.675	1432	7.001	-0.675	1562	7.000	-0.675	1692	7.000	-0.675
1304	7.003	-0.675	1434	7.001	-0.675	1564	7.000	-0.675	1694	7.000	-0.675
1306	7.002	-0.675	1436	7.001	-0.675	1566	7.000	-0.675	1696	7.000	-0.675
1308	7.002	-0.675	1438	7.001	-0.675	1568	7.000	-0.675	1698	7.000	-0.675
1310	7.002	-0.675	1440	7.001	-0.675	1570	7.000	-0.675	1700	7.000	-0.675
1312	7.002	-0.675	1442	7.001	-0.675	1572	7.000	-0.675	1702	7.000	-0.675
1314	7.002	-0.675	1444	7.001	-0.675	1574	7.000	-0.675	1704	7.000	-0.675
1316	7.002	-0.675	1446	7.000	-0.675	1576	7.000	-0.675	1706	7.000	-0.675
1318	7.002	-0.675	1448	7.000	-0.675	1578	7.000	-0.675	1708	7.000	-0.675
1320	7.002	-0.675	1450	7.000	-0.675	1580	7.000	-0.675	1710	7.000	-0.675
1322	7.002	-0.675	1452	7.000	-0.675	1582	7.000	-0.675	1712	7.000	-0.675
1324	7.002	-0.675	1454	7.000	-0.675	1584	7.000	-0.675	1714	7.000	-0.675
1326	7.002	-0.675	1456	7.000	-0.675	1586	7.000	-0.675	1716	7.000	-0.675
1328	7.002	-0.675	1458	7.000	-0.675	1588	7.000	-0.675	1718	7.000	-0.675
1330	7.002	-0.675	1460	7.000	-0.675	1590	7.000	-0.675	1720	7.000	-0.675
1332	7.002	-0.675	1462	7.000	-0.675	1592	7.000	-0.675	1722	7.000	-0.675
1334	7.002	-0.675	1464	7.000	-0.675	1594	7.000	-0.675	1724	7.000	-0.675
1336	7.002	-0.675	1466	7.000	-0.675	1596	7.000	-0.675	1726	7.000	-0.675
1338	7.002	-0.675	1468	7.000	-0.675	1598	7.000	-0.675	1728	7.000	-0.675
1340	7.002	-0.675	1470	7.000	-0.675	1600	7.000	-0.675	1730	7.000	-0.675
1342	7.002	-0.675	1472	7.000	-0.675	1602	7.000	-0.675	1732	7.000	-0.675
1344	7.002	-0.675	1474	7.000	-0.675	1604	7.000	-0.675	1734	7.000	-0.675
1346	7.002	-0.675	1476	7.000	-0.675	1606	7.000	-0.675	1736	7.000	-0.675
1348	7.002	-0.675	1478	7.000	-0.675	1608	7.000	-0.675	1738	7.000	-0.675
1350	7.001	-0.675	1480	7.000	-0.675	1610	7.000	-0.675	1740	7.000	-0.675
1352	7.001	-0.675	1482	7.000	-0.675	1612	7.000	-0.675	1742	7.000	-0.675
1354	7.001	-0.675	1484	7.000	-0.675	1614	7.000	-0.675	1744	7.000	-0.675
1356	7.001	-0.675	1486	7.000	-0.675	1616	7.000	-0.675	1746	7.000	-0.675
1358	7.001	-0.675	1488	7.000	-0.675	1618	7.000	-0.675	1748	7.000	-0.675
1360	7.001	-0.675	1490	7.000	-0.675	1620	7.000	-0.675	1750	7.000	-0.675
1362	7.001	-0.675	1492	7.000	-0.675	1622	7.000	-0.675	1752	7.000	-0.675
1364	7.001	-0.675	1494	7.000	-0.675	1624	7.000	-0.675	1754	7.000	-0.675
1366	7.001	-0.675	1496	7.000	-0.675	1626	7.000	-0.675	1756	7.000	-0.675
1368	7.001	-0.675	1498	7.000	-0.675	1628	7.000	-0.675	1758	7.000	-0.675
1370	7.001	-0.675	1500	7.000	-0.675	1630	7.000	-0.675	1760	7.000	-0.675
1372	7.001	-0.675	1502	7.000	-0.675	1632	7.000	-0.675	1762	7.000	-0.675
1374	7.001	-0.675	1504	7.000	-0.675	1634	7.000	-0.675	1764	7.000	-0.675
1376	7.001	-0.675	1506	7.000	-0.675	1636	7.000	-0.675	1766	7.000	-0.675
1378	7.001	-0.675	1508	7.000	-0.675	1638	7.000	-0.675	1768	7.000	-0.675
1380	7.001	-0.675	1510	7.000	-0.675	1640	7.000	-0.675	1770	7.000	-0.675
1382	7.001	-0.675	1512	7.000	-0.675	1642	7.000	-0.675	1772	7.000	-0.675
1384	7.001	-0.675	1514	7.000	-0.675	1644	7.000	-0.675	1774	7.000	-0.675
1386	7.001	-0.675	1516	7.000	-0.675	1646	7.000	-0.675	1776	7.000	-0.675
1388	7.001	-0.675	1518	7.000	-0.675	1648	7.000	-0.675	1778	7.000	-0.675
1390	7.001	-0.675	1520	7.000	-0.675	1650	7.000	-0.675	1780	7.000	-0.675
1392	7.001	-0.675	1522	7.000	-0.675	1652	7.000	-0.675	1782	7.000	-0.675

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
1784	7.000	-0.675	1914	7.000	-0.675	2044	7.000	-0.675	2174	7.000	-0.675
1786	7.000	-0.675	1916	7.000	-0.675	2046	7.000	-0.675	2176	7.000	-0.675
1788	7.000	-0.675	1918	7.000	-0.675	2048	7.000	-0.675	2178	7.000	-0.675
1790	7.000	-0.675	1920	7.000	-0.675	2050	7.000	-0.675	2180	7.000	-0.675
1792	7.000	-0.675	1922	7.000	-0.675	2052	7.000	-0.675	2182	7.000	-0.675
1794	7.000	-0.675	1924	7.000	-0.675	2054	7.000	-0.675	2184	7.000	-0.675
1796	7.000	-0.675	1926	7.000	-0.675	2056	7.000	-0.675	2186	7.000	-0.675
1798	7.000	-0.675	1928	7.000	-0.675	2058	7.000	-0.675	2188	7.000	-0.675
1800	7.000	-0.675	1930	7.000	-0.675	2060	7.000	-0.675	2190	7.000	-0.675
1802	7.000	-0.675	1932	7.000	-0.675	2062	7.000	-0.675	2192	7.000	-0.675
1804	7.000	-0.675	1934	7.000	-0.675	2064	7.000	-0.675	2194	7.000	-0.675
1806	7.000	-0.675	1936	7.000	-0.675	2066	7.000	-0.675	2196	7.000	-0.675
1808	7.000	-0.675	1938	7.000	-0.675	2068	7.000	-0.675	2198	7.000	-0.675
1810	7.000	-0.675	1940	7.000	-0.675	2070	7.000	-0.675	2200	7.000	-0.675
1812	7.000	-0.675	1942	7.000	-0.675	2072	7.000	-0.675	2202	7.000	-0.675
1814	7.000	-0.675	1944	7.000	-0.675	2074	7.000	-0.675	2204	7.000	-0.675
1816	7.000	-0.675	1946	7.000	-0.675	2076	7.000	-0.675	2206	7.000	-0.675
1818	7.000	-0.675	1948	7.000	-0.675	2078	7.000	-0.675	2208	7.000	-0.675
1820	7.000	-0.675	1950	7.000	-0.675	2080	7.000	-0.675	2210	7.000	-0.675
1822	7.000	-0.675	1952	7.000	-0.675	2082	7.000	-0.675	2212	7.000	-0.675
1824	7.000	-0.675	1954	7.000	-0.675	2084	7.000	-0.675	2214	7.000	-0.675
1826	7.000	-0.675	1956	7.000	-0.675	2086	7.000	-0.675	2216	7.000	-0.675
1828	7.000	-0.675	1958	7.000	-0.675	2088	7.000	-0.675	2218	7.000	-0.675
1830	7.000	-0.675	1960	7.000	-0.675	2090	7.000	-0.675	2220	7.000	-0.675
1832	7.000	-0.675	1962	7.000	-0.675	2092	7.000	-0.675	2222	7.000	-0.675
1834	7.000	-0.675	1964	7.000	-0.675	2094	7.000	-0.675	2224	7.000	-0.675
1836	7.000	-0.675	1966	7.000	-0.675	2096	7.000	-0.675	2226	7.000	-0.675
1838	7.000	-0.675	1968	7.000	-0.675	2098	7.000	-0.675	2228	7.000	-0.675
1840	7.000	-0.675	1970	7.000	-0.675	2100	7.000	-0.675	2230	7.000	-0.675
1842	7.000	-0.675	1972	7.000	-0.675	2102	7.000	-0.675	2232	7.000	-0.675
1844	7.000	-0.675	1974	7.000	-0.675	2104	7.000	-0.675	2234	7.000	-0.675
1846	7.000	-0.675	1976	7.000	-0.675	2106	7.000	-0.675	2236	7.000	-0.675
1848	7.000	-0.675	1978	7.000	-0.675	2108	7.000	-0.675	2238	7.000	-0.675
1850	7.000	-0.675	1980	7.000	-0.675	2110	7.000	-0.675	2240	7.000	-0.675
1852	7.000	-0.675	1982	7.000	-0.675	2112	7.000	-0.675	2242	7.000	-0.675
1854	7.000	-0.675	1984	7.000	-0.675	2114	7.000	-0.675	2244	7.000	-0.675
1856	7.000	-0.675	1986	7.000	-0.675	2116	7.000	-0.675	2246	7.000	-0.675
1858	7.000	-0.675	1988	7.000	-0.675	2118	7.000	-0.675	2248	7.000	-0.675
1860	7.000	-0.675	1990	7.000	-0.675	2120	7.000	-0.675	2250	7.000	-0.675
1862	7.000	-0.675	1992	7.000	-0.675	2122	7.000	-0.675	2252	7.000	-0.675
1864	7.000	-0.675	1994	7.000	-0.675	2124	7.000	-0.675	2254	7.000	-0.675
1866	7.000	-0.675	1996	7.000	-0.675	2126	7.000	-0.675	2256	7.000	-0.675
1868	7.000	-0.675	1998	7.000	-0.675	2128	7.000	-0.675	2258	7.000	-0.675
1870	7.000	-0.675	2000	7.000	-0.675	2130	7.000	-0.675	2260	7.000	-0.675
1872	7.000	-0.675	2002	7.000	-0.675	2132	7.000	-0.675	2262	7.000	-0.675
1874	7.000	-0.675	2004	7.000	-0.675	2134	7.000	-0.675	2264	7.000	-0.675
1876	7.000	-0.675	2006	7.000	-0.675	2136	7.000	-0.675	2266	7.000	-0.675
1878	7.000	-0.675	2008	7.000	-0.675	2138	7.000	-0.675	2268	7.000	-0.675
1880	7.000	-0.675	2010	7.000	-0.675	2140	7.000	-0.675	2270	7.000	-0.675
1882	7.000	-0.675	2012	7.000	-0.675	2142	7.000	-0.675	2272	7.000	-0.675
1884	7.000	-0.675	2014	7.000	-0.675	2144	7.000	-0.675	2274	7.000	-0.675
1886	7.000	-0.675	2016	7.000	-0.675	2146	7.000	-0.675	2276	7.000	-0.675
1888	7.000	-0.675	2018	7.000	-0.675	2148	7.000	-0.675	2278	7.000	-0.675
1890	7.000	-0.675	2020	7.000	-0.675	2150	7.000	-0.675	2280	7.000	-0.675
1892	7.000	-0.675	2022	7.000	-0.675	2152	7.000	-0.675	2282	7.000	-0.675
1894	7.000	-0.675	2024	7.000	-0.675	2154	7.000	-0.675	2284	7.000	-0.675
1896	7.000	-0.675	2026	7.000	-0.675	2156	7.000	-0.675	2286	7.000	-0.675
1898	7.000	-0.675	2028	7.000	-0.675	2158	7.000	-0.675	2288	7.000	-0.675
1900	7.000	-0.675	2030	7.000	-0.675	2160	7.000	-0.675	2290	7.000	-0.675
1902	7.000	-0.675	2032	7.000	-0.675	2162	7.000	-0.675	2292	7.000	-0.675
1904	7.000	-0.675	2034	7.000	-0.675	2164	7.000	-0.675	2294	7.000	-0.675
1906	7.000	-0.675	2036	7.000	-0.675	2166	7.000	-0.675	2296	7.000	-0.675
1908	7.000	-0.675	2038	7.000	-0.675	2168	7.000	-0.675	2298	7.000	-0.675
1910	7.000	-0.675	2040	7.000	-0.675	2170	7.000	-0.675	2300	7.000	-0.675
1912	7.000	-0.675	2042	7.000	-0.675	2172	7.000	-0.675	2302	7.000	-0.675

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
2304	7.000	-0.675	2434	7.000	-0.675	2564	7.000	-0.675	2694	7.000	-0.675
2306	7.000	-0.675	2436	7.000	-0.675	2566	7.000	-0.675	2696	7.000	-0.675
2308	7.000	-0.675	2438	7.000	-0.675	2568	7.000	-0.675	2698	7.000	-0.675
2310	7.000	-0.675	2440	7.000	-0.675	2570	7.000	-0.675	2700	7.000	-0.675
2312	7.000	-0.675	2442	7.000	-0.675	2572	7.000	-0.675	2702	7.000	-0.675
2314	7.000	-0.675	2444	7.000	-0.675	2574	7.000	-0.675	2704	7.000	-0.675
2316	7.000	-0.675	2446	7.000	-0.675	2576	7.000	-0.675	2706	7.000	-0.675
2318	7.000	-0.675	2448	7.000	-0.675	2578	7.000	-0.675	2708	7.000	-0.675
2320	7.000	-0.675	2450	7.000	-0.675	2580	7.000	-0.675	2710	7.000	-0.675
2322	7.000	-0.675	2452	7.000	-0.675	2582	7.000	-0.675	2712	7.000	-0.675
2324	7.000	-0.675	2454	7.000	-0.675	2584	7.000	-0.675	2714	7.000	-0.675
2326	7.000	-0.675	2456	7.000	-0.675	2586	7.000	-0.675	2716	7.000	-0.675
2328	7.000	-0.675	2458	7.000	-0.675	2588	7.000	-0.675	2718	7.000	-0.675
2330	7.000	-0.675	2460	7.000	-0.675	2590	7.000	-0.675	2720	7.000	-0.675
2332	7.000	-0.675	2462	7.000	-0.675	2592	7.000	-0.675	2722	7.000	-0.675
2334	7.000	-0.675	2464	7.000	-0.675	2594	7.000	-0.675	2724	7.000	-0.675
2336	7.000	-0.675	2466	7.000	-0.675	2596	7.000	-0.675	2726	7.000	-0.675
2338	7.000	-0.675	2468	7.000	-0.675	2598	7.000	-0.675	2728	7.000	-0.675
2340	7.000	-0.675	2470	7.000	-0.675	2600	7.000	-0.675	2730	7.000	-0.675
2342	7.000	-0.675	2472	7.000	-0.675	2602	7.000	-0.675	2732	7.000	-0.675
2344	7.000	-0.675	2474	7.000	-0.675	2604	7.000	-0.675	2734	7.000	-0.675
2346	7.000	-0.675	2476	7.000	-0.675	2606	7.000	-0.675	2736	7.000	-0.675
2348	7.000	-0.675	2478	7.000	-0.675	2608	7.000	-0.675	2738	7.000	-0.675
2350	7.000	-0.675	2480	7.000	-0.675	2610	7.000	-0.675	2740	7.000	-0.675
2352	7.000	-0.675	2482	7.000	-0.675	2612	7.000	-0.675	2742	7.000	-0.675
2354	7.000	-0.675	2484	7.000	-0.675	2614	7.000	-0.675	2744	7.000	-0.675
2356	7.000	-0.675	2486	7.000	-0.675	2616	7.000	-0.675	2746	7.000	-0.675
2358	7.000	-0.675	2488	7.000	-0.675	2618	7.000	-0.675	2748	7.000	-0.675
2360	7.000	-0.675	2490	7.000	-0.675	2620	7.000	-0.675	2750	7.000	-0.675
2362	7.000	-0.675	2492	7.000	-0.675	2622	7.000	-0.675	2752	7.000	-0.675
2364	7.000	-0.675	2494	7.000	-0.675	2624	7.000	-0.675	2754	7.000	-0.675
2366	7.000	-0.675	2496	7.000	-0.675	2626	7.000	-0.675	2756	7.000	-0.675
2368	7.000	-0.675	2498	7.000	-0.675	2628	7.000	-0.675	2758	7.000	-0.675
2370	7.000	-0.675	2500	7.000	-0.675	2630	7.000	-0.675	2760	7.000	-0.675
2372	7.000	-0.675	2502	7.000	-0.675	2632	7.000	-0.675	2762	7.000	-0.675
2374	7.000	-0.675	2504	7.000	-0.675	2634	7.000	-0.675	2764	7.000	-0.675
2376	7.000	-0.675	2506	7.000	-0.675	2636	7.000	-0.675	2766	7.000	-0.675
2378	7.000	-0.675	2508	7.000	-0.675	2638	7.000	-0.675	2768	7.000	-0.675
2380	7.000	-0.675	2510	7.000	-0.675	2640	7.000	-0.675	2770	7.000	-0.675
2382	7.000	-0.675	2512	7.000	-0.675	2642	7.000	-0.675	2772	7.000	-0.675
2384	7.000	-0.675	2514	7.000	-0.675	2644	7.000	-0.675	2774	7.000	-0.675
2386	7.000	-0.675	2516	7.000	-0.675	2646	7.000	-0.675	2776	7.000	-0.675
2388	7.000	-0.675	2518	7.000	-0.675	2648	7.000	-0.675	2778	7.000	-0.675
2390	7.000	-0.675	2520	7.000	-0.675	2650	7.000	-0.675	2780	7.000	-0.675
2392	7.000	-0.675	2522	7.000	-0.675	2652	7.000	-0.675	2782	7.000	-0.675
2394	7.000	-0.675	2524	7.000	-0.675	2654	7.000	-0.675	2784	7.000	-0.675
2396	7.000	-0.675	2526	7.000	-0.675	2656	7.000	-0.675	2786	7.000	-0.675
2398	7.000	-0.675	2528	7.000	-0.675	2658	7.000	-0.675	2788	7.000	-0.675
2400	7.000	-0.675	2530	7.000	-0.675	2660	7.000	-0.675	2790	7.000	-0.675
2402	7.000	-0.675	2532	7.000	-0.675	2662	7.000	-0.675	2792	7.000	-0.675
2404	7.000	-0.675	2534	7.000	-0.675	2664	7.000	-0.675	2794	7.000	-0.675
2406	7.000	-0.675	2536	7.000	-0.675	2666	7.000	-0.675	2796	7.000	-0.675
2408	7.000	-0.675	2538	7.000	-0.675	2668	7.000	-0.675	2798	7.000	-0.675
2410	7.000	-0.675	2540	7.000	-0.675	2670	7.000	-0.675	2800	7.000	-0.675
2412	7.000	-0.675	2542	7.000	-0.675	2672	7.000	-0.675	2802	7.000	-0.675
2414	7.000	-0.675	2544	7.000	-0.675	2674	7.000	-0.675	2804	7.000	-0.675
2416	7.000	-0.675	2546	7.000	-0.675	2676	7.000	-0.675	2806	7.000	-0.675
2418	7.000	-0.675	2548	7.000	-0.675	2678	7.000	-0.675	2808	7.000	-0.675
2420	7.000	-0.675	2550	7.000	-0.675	2680	7.000	-0.675	2810	7.000	-0.675
2422	7.000	-0.675	2552	7.000	-0.675	2682	7.000	-0.675	2812	7.000	-0.675
2424	7.000	-0.675	2554	7.000	-0.675	2684	7.000	-0.675	2814	7.000	-0.675
2426	7.000	-0.675	2556	7.000	-0.675	2686	7.000	-0.675	2816	7.000	-0.675
2428	7.000	-0.675	2558	7.000	-0.675	2688	7.000	-0.675	2818	7.000	-0.675
2430	7.000	-0.675	2560	7.000	-0.675	2690	7.000	-0.675	2820	7.000	-0.675
2432	7.000	-0.675	2562	7.000	-0.675	2692	7.000	-0.675	2822	7.000	-0.675

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
2824	7.000	-0.675	2840	7.000	-0.675	2856	7.000	-0.675	2872	7.000	-0.675
2826	7.000	-0.675	2842	7.000	-0.675	2858	7.000	-0.675	2874	7.000	-0.675
2828	7.000	-0.675	2844	7.000	-0.675	2860	7.000	-0.675	2876	7.000	-0.675
2830	7.000	-0.675	2846	7.000	-0.675	2862	7.000	-0.675	2878	7.000	-0.675
2832	7.000	-0.675	2848	7.000	-0.675	2864	7.000	-0.675	2880	7.000	-0.675
2834	7.000	-0.675	2850	7.000	-0.675	2866	7.000	-0.675	2882	0.000	0.000
2836	7.000	-0.675	2852	7.000	-0.675	2868	7.000	-0.675			
2838	7.000	-0.675	2854	7.000	-0.675	2870	7.000	-0.675			

Network Details

* - Indicates pipe has been modified outside of WinDes's Storm/Foul & Schedules

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
1.000	79.48	1.946	40.8	0.186	4.00	1	0.600	o	225
2.000	17.63	0.255	69.1	0.057	4.00	1	0.600	o	225
1.001	54.62	0.338	161.6	0.148	0.00	1	0.600	o	300
3.000	17.92	0.119	150.6	0.035	4.00	1	0.600	o	225
1.002	26.73	0.178	150.2	0.022	0.00	1	0.600	o	300
1.003	11.98	0.295	40.6	0.022	0.00	1	0.600	o	300
1.004	66.25	1.430	46.3	0.140	0.00	1	0.600	o	300
1.005	83.02	2.438	34.1	0.150	0.00	1	0.600	o	300
4.000	33.34	0.299	111.5	0.100	4.00	1	0.600	o	225
5.000	6.84	0.109	62.8	0.025	4.00	1	0.600	o	225
4.001	62.36	2.070	30.1	0.175	0.00	1	0.600	o	225
4.002	53.55	1.785	30.0	0.175	0.00	1	0.600	o	225
1.006	43.51	0.934	46.6	0.100	0.00	1	0.600	o	375
1.007	79.61	1.157	68.8	0.180	0.00	1	0.600	o	525
6.000	26.56	0.188	141.3	0.090	4.00	1	0.600	o	225
7.000	24.77	0.175	141.5	0.060	4.00	1	0.600	o	225
6.001	47.17	0.240	196.5	0.137	0.00	1	0.600	o	300

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
1.000	SMH1	23.029	21.645	1.159	20.997	19.699	1.073		1200
2.000	SMH2	21.234	20.250	0.759	20.997	19.995	0.777		1200
1.001	SMH3	20.997	19.615	1.082	21.015	19.277	1.438		1200
3.000	SMH4	21.272	19.916	1.131	21.015	19.797	0.993		1200
1.002	SMH5	21.015	19.276	1.439	20.591	19.098	1.193		1350
1.003	SMH6	20.591	19.098	1.193	20.327	18.803	1.224		1350
1.004	SMH7	20.327	18.803	1.224	18.982	17.373	1.309		1350
1.005	SMH8	18.982	17.373	1.309	16.992	14.935	1.757		1350
4.000	SMH9	21.630	20.227	1.178	20.993	19.928	0.840		1200
5.000	SMH10	21.141	19.728	1.188	20.993	19.619	1.149		1200
4.001	SMH11	20.993	19.200	1.568	18.814	17.130	1.459		1200
4.002	SMH12	18.814	17.130	1.459	16.992	15.345	1.422		1200
1.006	SMH13	16.992	14.781	1.836	15.500	13.847	1.278		1350
1.007	SMH14	15.500	13.696	1.279	14.375	12.539	1.311		1500
6.000	SMH15	19.069	17.706	1.138	18.351	17.518	0.608		1200
7.000	SMH16	17.682	16.226	1.231	18.351	16.051	2.075		1200
6.001	SMH17	18.351	15.976	2.075	20.192	15.736	4.156		1200

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
6.002	48.71	0.269	181.1	0.050	0.00	1	0.600	o	300
6.003	12.76	0.049	260.4	0.008	0.00	1	0.600	o	300
8.000	71.86	0.601	119.6	0.199	4.00	1	0.600	o	225
8.001	18.86	0.105	179.6	0.005	0.00	1	0.600	o	225
6.004	115.49	0.593	194.8	0.650	0.00	1	0.600	o	450
9.000	61.33	1.923	31.9	0.217	4.00	1	0.600	o	225
6.005	52.26	1.004	52.1	0.260	0.00	1	0.600	o	450
6.006	32.75	0.766	42.8	0.030	0.00	1	0.600	o	450
10.000	42.71	1.195	35.7	0.122	4.00	1	0.600	o	225
10.001	38.98	0.359	108.6	0.005	0.00	1	0.600	o	225
1.008	17.71	0.086	205.9	0.022	0.00	1	0.600	o	675
11.000	29.04	0.235	123.6	0.036	4.00	1	0.600	o	225
1.009	82.70	1.654	50.0	0.191	0.00	1	0.600	o	675
12.000	62.70	0.539	116.3	0.195	4.00	1	0.600	o	225
13.000	18.12	0.181	100.1	0.060	4.00	1	0.600	o	225
12.001	84.83	2.746	30.9	0.230	0.00	1	0.600	o	300
1.010	70.59	1.412	50.0	0.260	0.00	1	0.600	o	675

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
6.002	SMH18	20.192	15.736	4.156	19.641	15.467	3.874		1350
6.003	SMH19	19.641	15.467	3.874	19.580	15.418	3.862		1350
8.000	SMH20	18.291	16.819	1.247	19.637	16.218	3.194		1200
8.001	SMH21	19.637	16.218	3.194	19.580	16.113	3.242		1200
6.004	SMH22	19.580	15.270	3.860	17.422	14.677	2.295		1350
9.000	SMH23	18.804	17.398	1.181	17.422	15.475	1.722		1200
6.005	SMH24	17.422	14.677	2.295	15.525	13.673	1.402		1350
6.006	SMH25	15.525	13.461	1.614	14.375	12.695	1.230		1350
10.000	SMH26	14.996	13.884	0.887	13.812	12.689	0.898		1200
10.001	SMH27	13.812	12.689	0.898	14.375	12.330	1.820		1200
1.008	SMH28	14.375	11.897	1.803	14.017	11.811	1.531		1500
11.000	SMH29	13.602	12.244	1.133	14.017	12.009	1.783		1200
1.009	SMH30	14.017	11.736	1.606	12.133	10.082	1.376		1500
12.000	SMH31	15.217	14.014	0.978	14.978	13.475	1.278		1200
13.000	SMH32	14.764	13.500	1.039	14.978	13.319	1.434		1200
12.001	SMH33	14.978	13.310	1.368	12.133	10.564	1.269		1200
1.010	SMH34	12.133	9.550	1.908	10.266	8.138	1.453		1500

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
14.000	28.16	1.377	20.5	0.100	4.00	1	0.600	o	225
14.001	40.32	1.147	35.2	0.105	0.00	1	0.600	o	225
14.002	61.69	1.259	49.0	0.070	0.00	1	0.600	o	225
1.011	37.36	0.580	64.4	0.050	0.00	1	0.600	o	750
15.000	27.60	1.095	25.2	0.186	4.00	1	0.600	o	225
15.001	15.53	0.150	103.5	0.063	0.00	1	0.600	o	225
15.002	31.53	0.205	153.8	0.048	0.00	1	0.600	o	300
1.012	22.23	0.134	165.9	0.040	0.00	1	0.600	o	750

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
14.000	SMH35	14.269	12.260	1.784	13.220	10.883	2.112		1200
14.001	SMH36	13.220	10.857	2.138	11.871	9.710	1.936		1200
14.002	SMH37	11.871	9.710	1.936	10.266	8.451	1.590		1200
1.011	SMH38	10.266	8.130	1.386	9.255	7.550	0.955		1800
15.000	SMH39	10.450	9.200	1.025	9.239	8.105	0.909		1200
15.001	SMH40	9.239	8.100	0.914	8.916	7.950	0.741		1200
15.002	SMH41	8.916	7.870	0.746	9.255	7.665	1.290		1200
1.012	SMH42	9.255	7.550	0.955	9.240	7.416	1.074		1800

Summary of Results

Return Period (years)	30	Analysis Time Step	Fine
Storm Duration (mins)	360	DTS Status	ON
Profile Type	Summer	DVD Status	OFF
Margin for Flood Risk warning (mm)	300	Inertia Status	OFF

PN	Water Lev. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	21.702	-0.168	0.000	0.15	0.0	11.8	O K
2.000	20.287	-0.188	0.000	0.06	0.0	3.6	O K
1.001	19.727	-0.188	0.000	0.30	0.0	24.8	O K
3.000	19.951	-0.190	0.000	0.06	0.0	2.2	O K
1.002	19.398	-0.178	0.000	0.35	0.0	28.4	O K
1.003	19.193	-0.205	0.000	0.22	0.0	29.8	O K
1.004	18.904	-0.199	0.000	0.25	0.0	38.6	O K
1.005	17.477	-0.196	0.000	0.26	0.0	48.1	O K
4.000	20.282	-0.170	0.000	0.14	0.0	6.3	O K
5.000	19.755	-0.198	0.000	0.03	0.0	1.6	O K
4.001	19.269	-0.156	0.000	0.21	0.0	19.0	O K
4.002	17.218	-0.137	0.000	0.33	0.0	30.1	O K
1.006	14.925	-0.231	0.000	0.31	0.0	84.6	O K
1.007	13.844	-0.377	0.000	0.18	0.0	96.0	O K
6.000	17.762	-0.169	0.000	0.14	0.0	5.7	O K
7.000	16.272	-0.179	0.000	0.09	0.0	3.8	O K
6.001	16.076	-0.200	0.000	0.24	0.0	18.2	O K
6.002	15.843	-0.193	0.000	0.28	0.0	21.3	O K
6.003	15.597	-0.170	0.000	0.39	0.0	21.9	O K
8.000	16.899	-0.145	0.000	0.27	0.0	12.6	O K
8.001	16.313	-0.130	0.000	0.37	0.0	12.9	O K
6.004	15.451	-0.269	0.000	0.34	0.0	75.7	O K
9.000	17.457	-0.166	0.000	0.15	0.0	13.7	O K
6.005	14.832	-0.295	0.000	0.26	0.0	105.8	O K
6.006	13.613	-0.298	0.000	0.25	0.0	107.7	O K
10.000	13.930	-0.179	0.000	0.09	0.0	7.7	O K
10.001	12.751	-0.163	0.000	0.17	0.0	8.0	O K
1.008	12.219	-0.353	0.000	0.46	0.0	213.0	O K
11.000	12.277	-0.192	0.000	0.05	0.0	2.3	O K
1.009	11.933	-0.478	0.000	0.19	0.0	227.1	O K
12.000	14.092	-0.147	0.000	0.27	0.0	12.4	O K
13.000	13.543	-0.182	0.000	0.08	0.0	3.8	O K
12.001	13.389	-0.221	0.000	0.16	0.0	30.7	O K
1.010	9.769	-0.456	0.000	0.23	0.0	274.2	O K
14.000	12.295	-0.190	0.000	0.06	0.0	6.3	O K
14.001	10.916	-0.166	0.000	0.16	0.0	13.0	O K
14.002	9.785	-0.150	0.000	0.24	0.0	17.4	O K
1.011	8.436	-0.444	0.000	0.25	0.0	294.5	O K
15.000	9.252	-0.173	0.000	0.12	0.0	11.8	O K
15.001	8.437	0.112	0.000	0.35	0.0	15.8	SURCH'ED
15.002	8.435	0.265	0.000	0.22	0.0	18.4	SURCH'ED
1.012	8.433	0.133	0.000	0.16	0.0	94.1	SURCH'ED

Rainfall Hyetograph

Region	FSR - Scotland & Ireland	Profile Type	Summer
Return Period (yrs)	30	Storm Duration (mins)	360
M5-60 (mm)	16.500		
Ratio R	0.300		

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
6	2.37	78	3.42	150	12.94	222	10.63	294	3.26
12	2.42	84	3.59	156	15.19	228	8.98	300	3.14
18	2.48	90	3.77	162	17.62	234	7.55	306	3.02
24	2.56	96	4.00	168	20.77	240	6.44	312	2.89
30	2.61	102	4.25	174	23.98	246	5.70	318	2.79
36	2.67	108	4.59	180	27.64	252	5.08	324	2.73
42	2.73	114	5.08	186	27.64	258	4.59	330	2.67
48	2.79	120	5.70	192	23.98	264	4.25	336	2.61
54	2.89	126	6.44	198	20.77	270	4.00	342	2.56
60	3.02	132	7.55	204	17.62	276	3.77	348	2.48
66	3.14	138	8.98	210	15.19	282	3.59	354	2.42
72	3.26	144	10.63	216	12.94	288	3.42	360	2.37

Appendix E -6

Surface Water Network 1 Simulation 1 in 100Yr
Infiltration Basin/Pond Source Control 1 in 100 Yr (Winter 360)

Global Variables

Region	FSR - Scotland & Ireland
Return Period (yrs)	100
M5-60 (mm)	16.500
Ratio R	0.300
Volumetric Runoff Coef	0.750
Profile Type	Summer
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	360
Hot Start (mins)	0
Hot Start Level (mm)	0
Manhole Headloss Coefficient	0.500
MADD Factor * 10m³/ha Storage	3.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	10
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of On-Line Controls	0

Starting Storm file name

F:\17-03 Kingsbridge Consultancy Ltd Blackrock\Services (May 2019)\Storm Drainage\19-05-20 Storm Drainage Network 1.sws

Surcharged Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.012	SMH43	9.240	7.416	3000	3000

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
0	0.000	0.000	56	7.131	-0.675	112	7.315	-0.675	168	7.781	-0.385
2	7.000	-0.675	58	7.137	-0.675	114	7.325	-0.675	170	7.805	-0.361
4	7.000	-0.675	60	7.143	-0.675	116	7.336	-0.675	172	7.828	-0.338
6	7.001	-0.675	62	7.149	-0.675	118	7.347	-0.675	174	7.852	-0.314
8	7.002	-0.675	64	7.154	-0.675	120	7.358	-0.675	176	7.876	-0.290
10	7.003	-0.675	66	7.160	-0.675	122	7.370	-0.675	178	7.900	-0.266
12	7.006	-0.675	68	7.165	-0.675	124	7.382	-0.675	180	7.923	-0.243
14	7.009	-0.675	70	7.171	-0.675	126	7.395	-0.675	182	7.947	-0.219
16	7.012	-0.675	72	7.176	-0.675	128	7.408	-0.675	184	7.971	-0.195
18	7.017	-0.675	74	7.182	-0.675	130	7.422	-0.675	186	7.994	-0.172
20	7.021	-0.675	76	7.188	-0.675	132	7.436	-0.675	188	8.017	-0.149
22	7.026	-0.675	78	7.193	-0.675	134	7.451	-0.675	190	8.039	-0.127
24	7.032	-0.675	80	7.199	-0.675	136	7.467	-0.675	192	8.061	-0.105
26	7.038	-0.675	82	7.205	-0.675	138	7.482	-0.675	194	8.082	-0.084
28	7.043	-0.675	84	7.210	-0.675	140	7.499	-0.667	196	8.103	-0.063
30	7.049	-0.675	86	7.216	-0.675	142	7.516	-0.650	198	8.123	-0.043
32	7.055	-0.675	88	7.223	-0.675	144	7.533	-0.633	200	8.143	-0.023
34	7.062	-0.675	90	7.229	-0.675	146	7.551	-0.615	202	8.162	-0.004
36	7.068	-0.675	92	7.235	-0.675	148	7.569	-0.597	204	8.180	0.014
38	7.074	-0.675	94	7.242	-0.675	150	7.588	-0.578	206	8.198	0.032
40	7.081	-0.675	96	7.249	-0.675	152	7.608	-0.558	208	8.215	0.049
42	7.087	-0.675	98	7.256	-0.675	154	7.628	-0.538	210	8.232	0.066
44	7.094	-0.675	100	7.263	-0.675	156	7.648	-0.518	212	8.248	0.082
46	7.100	-0.675	102	7.271	-0.675	158	7.669	-0.497	214	8.263	0.097
48	7.107	-0.675	104	7.279	-0.675	160	7.691	-0.475	216	8.277	0.111
50	7.113	-0.675	106	7.288	-0.675	162	7.713	-0.453	218	8.291	0.125
52	7.119	-0.675	108	7.297	-0.675	164	7.735	-0.431	220	8.305	0.139
54	7.125	-0.675	110	7.306	-0.675	166	7.758	-0.408	222	8.317	0.151

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
224	8.329	0.163	354	8.431	0.265	484	8.143	-0.023	614	7.829	-0.337
226	8.340	0.174	356	8.429	0.263	486	8.138	-0.028	616	7.824	-0.342
228	8.351	0.185	358	8.425	0.259	488	8.134	-0.032	618	7.818	-0.348
230	8.361	0.195	360	8.422	0.256	490	8.130	-0.036	620	7.813	-0.353
232	8.371	0.205	362	8.418	0.252	492	8.125	-0.041	622	7.807	-0.359
234	8.380	0.214	364	8.414	0.248	494	8.121	-0.045	624	7.802	-0.364
236	8.388	0.222	366	8.409	0.243	496	8.116	-0.050	626	7.796	-0.370
238	8.396	0.230	368	8.404	0.238	498	8.112	-0.054	628	7.790	-0.376
240	8.403	0.237	370	8.400	0.234	500	8.107	-0.059	630	7.785	-0.381
242	8.410	0.244	372	8.395	0.229	502	8.103	-0.063	632	7.779	-0.387
244	8.417	0.251	374	8.390	0.224	504	8.098	-0.068	634	7.773	-0.393
246	8.423	0.257	376	8.385	0.219	506	8.094	-0.072	636	7.767	-0.399
248	8.428	0.262	378	8.381	0.215	508	8.089	-0.077	638	7.762	-0.404
250	8.433	0.267	380	8.376	0.210	510	8.085	-0.081	640	7.756	-0.410
252	8.438	0.272	382	8.371	0.205	512	8.080	-0.086	642	7.750	-0.416
254	8.442	0.276	384	8.366	0.200	514	8.075	-0.091	644	7.744	-0.422
256	8.446	0.280	386	8.361	0.195	516	8.071	-0.095	646	7.738	-0.428
258	8.449	0.283	388	8.357	0.191	518	8.066	-0.100	648	7.732	-0.434
260	8.452	0.286	390	8.352	0.186	520	8.062	-0.104	650	7.726	-0.440
262	8.455	0.289	392	8.347	0.181	522	8.057	-0.109	652	7.720	-0.446
264	8.457	0.291	394	8.343	0.177	524	8.053	-0.113	654	7.714	-0.452
266	8.459	0.293	396	8.338	0.172	526	8.048	-0.118	656	7.708	-0.458
268	8.461	0.295	398	8.333	0.167	528	8.043	-0.123	658	7.702	-0.464
270	8.462	0.296	400	8.329	0.163	530	8.039	-0.127	660	7.696	-0.470
272	8.463	0.297	402	8.324	0.158	532	8.034	-0.132	662	7.690	-0.476
274	8.464	0.298	404	8.319	0.153	534	8.029	-0.137	664	7.684	-0.482
276	8.465	0.299	406	8.315	0.149	536	8.025	-0.141	666	7.678	-0.488
278	8.466	0.300	408	8.310	0.144	538	8.020	-0.146	668	7.671	-0.495
280	8.466	0.300	410	8.306	0.140	540	8.015	-0.151	670	7.665	-0.501
282	8.466	0.300	412	8.301	0.135	542	8.011	-0.155	672	7.659	-0.507
284	8.466	0.300	414	8.297	0.131	544	8.006	-0.160	674	7.652	-0.514
286	8.466	0.300	416	8.292	0.126	546	8.001	-0.165	676	7.646	-0.520
288	8.466	0.300	418	8.288	0.122	548	7.997	-0.169	678	7.640	-0.526
290	8.465	0.299	420	8.283	0.117	550	7.992	-0.174	680	7.633	-0.533
292	8.465	0.299	422	8.279	0.113	552	7.987	-0.179	682	7.627	-0.539
294	8.464	0.298	424	8.274	0.108	554	7.982	-0.184	684	7.620	-0.546
296	8.464	0.298	426	8.270	0.104	556	7.978	-0.188	686	7.614	-0.552
298	8.463	0.297	428	8.265	0.099	558	7.973	-0.193	688	7.607	-0.559
300	8.462	0.296	430	8.261	0.095	560	7.968	-0.198	690	7.600	-0.566
302	8.461	0.295	432	8.257	0.091	562	7.963	-0.203	692	7.594	-0.572
304	8.461	0.295	434	8.252	0.086	564	7.958	-0.208	694	7.587	-0.579
306	8.460	0.294	436	8.248	0.082	566	7.953	-0.213	696	7.580	-0.586
308	8.459	0.293	438	8.243	0.077	568	7.948	-0.218	698	7.574	-0.592
310	8.458	0.292	440	8.239	0.073	570	7.943	-0.223	700	7.567	-0.599
312	8.457	0.291	442	8.235	0.069	572	7.938	-0.228	702	7.560	-0.606
314	8.456	0.290	444	8.230	0.064	574	7.933	-0.233	704	7.554	-0.612
316	8.455	0.289	446	8.226	0.060	576	7.928	-0.238	706	7.547	-0.619
318	8.455	0.289	448	8.222	0.056	578	7.923	-0.243	708	7.540	-0.626
320	8.454	0.288	450	8.217	0.051	580	7.918	-0.248	710	7.534	-0.632
322	8.453	0.287	452	8.213	0.047	582	7.913	-0.253	712	7.527	-0.639
324	8.452	0.286	454	8.209	0.043	584	7.908	-0.258	714	7.520	-0.646
326	8.451	0.285	456	8.204	0.038	586	7.903	-0.263	716	7.514	-0.652
328	8.450	0.284	458	8.200	0.034	588	7.898	-0.268	718	7.507	-0.659
330	8.449	0.283	460	8.196	0.030	590	7.893	-0.273	720	7.500	-0.666
332	8.448	0.282	462	8.191	0.025	592	7.888	-0.278	722	7.494	-0.672
334	8.447	0.281	464	8.187	0.021	594	7.883	-0.283	724	7.487	-0.675
336	8.446	0.280	466	8.183	0.017	596	7.877	-0.289	726	7.480	-0.675
338	8.445	0.279	468	8.178	0.012	598	7.872	-0.294	728	7.474	-0.675
340	8.444	0.278	470	8.174	0.008	600	7.867	-0.299	730	7.467	-0.675
342	8.443	0.277	472	8.169	0.003	602	7.861	-0.305	732	7.461	-0.675
344	8.441	0.275	474	8.165	-0.001	604	7.856	-0.310	734	7.455	-0.675
346	8.440	0.274	476	8.161	-0.005	606	7.851	-0.315	736	7.448	-0.675
348	8.438	0.272	478	8.156	-0.010	608	7.845	-0.321	738	7.442	-0.675
350	8.436	0.270	480	8.152	-0.014	610	7.840	-0.326	740	7.436	-0.675
352	8.434	0.268	482	8.147	-0.019	612	7.835	-0.331	742	7.430	-0.675

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
744	7.423	-0.675	874	7.170	-0.675	1004	7.069	-0.675	1134	7.017	-0.675
746	7.417	-0.675	876	7.168	-0.675	1006	7.068	-0.675	1136	7.017	-0.675
748	7.411	-0.675	878	7.165	-0.675	1008	7.067	-0.675	1138	7.016	-0.675
750	7.405	-0.675	880	7.163	-0.675	1010	7.065	-0.675	1140	7.016	-0.675
752	7.399	-0.675	882	7.161	-0.675	1012	7.064	-0.675	1142	7.015	-0.675
754	7.393	-0.675	884	7.159	-0.675	1014	7.063	-0.675	1144	7.015	-0.675
756	7.388	-0.675	886	7.157	-0.675	1016	7.062	-0.675	1146	7.015	-0.675
758	7.382	-0.675	888	7.155	-0.675	1018	7.061	-0.675	1148	7.014	-0.675
760	7.376	-0.675	890	7.153	-0.675	1020	7.060	-0.675	1150	7.014	-0.675
762	7.371	-0.675	892	7.151	-0.675	1022	7.058	-0.675	1152	7.014	-0.675
764	7.365	-0.675	894	7.149	-0.675	1024	7.057	-0.675	1154	7.013	-0.675
766	7.360	-0.675	896	7.147	-0.675	1026	7.056	-0.675	1156	7.013	-0.675
768	7.355	-0.675	898	7.145	-0.675	1028	7.055	-0.675	1158	7.013	-0.675
770	7.349	-0.675	900	7.143	-0.675	1030	7.054	-0.675	1160	7.013	-0.675
772	7.344	-0.675	902	7.141	-0.675	1032	7.053	-0.675	1162	7.012	-0.675
774	7.339	-0.675	904	7.139	-0.675	1034	7.052	-0.675	1164	7.012	-0.675
776	7.334	-0.675	906	7.138	-0.675	1036	7.050	-0.675	1166	7.012	-0.675
778	7.329	-0.675	908	7.136	-0.675	1038	7.049	-0.675	1168	7.012	-0.675
780	7.325	-0.675	910	7.134	-0.675	1040	7.048	-0.675	1170	7.011	-0.675
782	7.320	-0.675	912	7.132	-0.675	1042	7.047	-0.675	1172	7.011	-0.675
784	7.315	-0.675	914	7.130	-0.675	1044	7.046	-0.675	1174	7.011	-0.675
786	7.311	-0.675	916	7.129	-0.675	1046	7.045	-0.675	1176	7.011	-0.675
788	7.306	-0.675	918	7.127	-0.675	1048	7.044	-0.675	1178	7.010	-0.675
790	7.302	-0.675	920	7.125	-0.675	1050	7.043	-0.675	1180	7.010	-0.675
792	7.297	-0.675	922	7.124	-0.675	1052	7.042	-0.675	1182	7.010	-0.675
794	7.293	-0.675	924	7.122	-0.675	1054	7.041	-0.675	1184	7.010	-0.675
796	7.289	-0.675	926	7.121	-0.675	1056	7.040	-0.675	1186	7.009	-0.675
798	7.285	-0.675	928	7.119	-0.675	1058	7.039	-0.675	1188	7.009	-0.675
800	7.281	-0.675	930	7.117	-0.675	1060	7.039	-0.675	1190	7.009	-0.675
802	7.277	-0.675	932	7.116	-0.675	1062	7.038	-0.675	1192	7.009	-0.675
804	7.273	-0.675	934	7.114	-0.675	1064	7.037	-0.675	1194	7.009	-0.675
806	7.269	-0.675	936	7.113	-0.675	1066	7.036	-0.675	1196	7.008	-0.675
808	7.265	-0.675	938	7.111	-0.675	1068	7.035	-0.675	1198	7.008	-0.675
810	7.261	-0.675	940	7.110	-0.675	1070	7.035	-0.675	1200	7.008	-0.675
812	7.258	-0.675	942	7.108	-0.675	1072	7.034	-0.675	1202	7.008	-0.675
814	7.254	-0.675	944	7.107	-0.675	1074	7.033	-0.675	1204	7.008	-0.675
816	7.251	-0.675	946	7.106	-0.675	1076	7.032	-0.675	1206	7.008	-0.675
818	7.247	-0.675	948	7.104	-0.675	1078	7.032	-0.675	1208	7.007	-0.675
820	7.244	-0.675	950	7.103	-0.675	1080	7.031	-0.675	1210	7.007	-0.675
822	7.240	-0.675	952	7.102	-0.675	1082	7.030	-0.675	1212	7.007	-0.675
824	7.237	-0.675	954	7.100	-0.675	1084	7.030	-0.675	1214	7.007	-0.675
826	7.234	-0.675	956	7.099	-0.675	1086	7.029	-0.675	1216	7.007	-0.675
828	7.230	-0.675	958	7.098	-0.675	1088	7.028	-0.675	1218	7.007	-0.675
830	7.227	-0.675	960	7.096	-0.675	1090	7.028	-0.675	1220	7.006	-0.675
832	7.224	-0.675	962	7.095	-0.675	1092	7.027	-0.675	1222	7.006	-0.675
834	7.221	-0.675	964	7.094	-0.675	1094	7.026	-0.675	1224	7.006	-0.675
836	7.218	-0.675	966	7.092	-0.675	1096	7.026	-0.675	1226	7.006	-0.675
838	7.215	-0.675	968	7.091	-0.675	1098	7.025	-0.675	1228	7.006	-0.675
840	7.212	-0.675	970	7.090	-0.675	1100	7.025	-0.675	1230	7.006	-0.675
842	7.210	-0.675	972	7.089	-0.675	1102	7.024	-0.675	1232	7.006	-0.675
844	7.207	-0.675	974	7.087	-0.675	1104	7.024	-0.675	1234	7.006	-0.675
846	7.204	-0.675	976	7.086	-0.675	1106	7.023	-0.675	1236	7.005	-0.675
848	7.202	-0.675	978	7.085	-0.675	1108	7.023	-0.675	1238	7.005	-0.675
850	7.199	-0.675	980	7.084	-0.675	1110	7.022	-0.675	1240	7.005	-0.675
852	7.196	-0.675	982	7.082	-0.675	1112	7.022	-0.675	1242	7.005	-0.675
854	7.194	-0.675	984	7.081	-0.675	1114	7.021	-0.675	1244	7.005	-0.675
856	7.191	-0.675	986	7.080	-0.675	1116	7.021	-0.675	1246	7.005	-0.675
858	7.189	-0.675	988	7.079	-0.675	1118	7.020	-0.675	1248	7.005	-0.675
860	7.186	-0.675	990	7.077	-0.675	1120	7.020	-0.675	1250	7.005	-0.675
862	7.184	-0.675	992	7.076	-0.675	1122	7.019	-0.675	1252	7.004	-0.675
864	7.181	-0.675	994	7.075	-0.675	1124	7.019	-0.675	1254	7.004	-0.675
866	7.179	-0.675	996	7.074	-0.675	1126	7.018	-0.675	1256	7.004	-0.675
868	7.177	-0.675	998	7.073	-0.675	1128	7.018	-0.675	1258	7.004	-0.675
870	7.174	-0.675	1000	7.071	-0.675	1130	7.018	-0.675	1260	7.004	-0.675
872	7.172	-0.675	1002	7.070	-0.675	1132	7.017	-0.675	1262	7.004	-0.675

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
1264	7.004	-0.675	1394	7.001	-0.675	1524	7.000	-0.675	1654	7.000	-0.675
1266	7.004	-0.675	1396	7.001	-0.675	1526	7.000	-0.675	1656	7.000	-0.675
1268	7.004	-0.675	1398	7.001	-0.675	1528	7.000	-0.675	1658	7.000	-0.675
1270	7.004	-0.675	1400	7.001	-0.675	1530	7.000	-0.675	1660	7.000	-0.675
1272	7.004	-0.675	1402	7.001	-0.675	1532	7.000	-0.675	1662	7.000	-0.675
1274	7.004	-0.675	1404	7.001	-0.675	1534	7.000	-0.675	1664	7.000	-0.675
1276	7.003	-0.675	1406	7.001	-0.675	1536	7.000	-0.675	1666	7.000	-0.675
1278	7.003	-0.675	1408	7.001	-0.675	1538	7.000	-0.675	1668	7.000	-0.675
1280	7.003	-0.675	1410	7.001	-0.675	1540	7.000	-0.675	1670	7.000	-0.675
1282	7.003	-0.675	1412	7.001	-0.675	1542	7.000	-0.675	1672	7.000	-0.675
1284	7.003	-0.675	1414	7.001	-0.675	1544	7.000	-0.675	1674	7.000	-0.675
1286	7.003	-0.675	1416	7.001	-0.675	1546	7.000	-0.675	1676	7.000	-0.675
1288	7.003	-0.675	1418	7.001	-0.675	1548	7.000	-0.675	1678	7.000	-0.675
1290	7.003	-0.675	1420	7.001	-0.675	1550	7.000	-0.675	1680	7.000	-0.675
1292	7.003	-0.675	1422	7.001	-0.675	1552	7.000	-0.675	1682	7.000	-0.675
1294	7.003	-0.675	1424	7.001	-0.675	1554	7.000	-0.675	1684	7.000	-0.675
1296	7.003	-0.675	1426	7.001	-0.675	1556	7.000	-0.675	1686	7.000	-0.675
1298	7.003	-0.675	1428	7.001	-0.675	1558	7.000	-0.675	1688	7.000	-0.675
1300	7.003	-0.675	1430	7.001	-0.675	1560	7.000	-0.675	1690	7.000	-0.675
1302	7.003	-0.675	1432	7.001	-0.675	1562	7.000	-0.675	1692	7.000	-0.675
1304	7.003	-0.675	1434	7.001	-0.675	1564	7.000	-0.675	1694	7.000	-0.675
1306	7.002	-0.675	1436	7.001	-0.675	1566	7.000	-0.675	1696	7.000	-0.675
1308	7.002	-0.675	1438	7.001	-0.675	1568	7.000	-0.675	1698	7.000	-0.675
1310	7.002	-0.675	1440	7.001	-0.675	1570	7.000	-0.675	1700	7.000	-0.675
1312	7.002	-0.675	1442	7.001	-0.675	1572	7.000	-0.675	1702	7.000	-0.675
1314	7.002	-0.675	1444	7.001	-0.675	1574	7.000	-0.675	1704	7.000	-0.675
1316	7.002	-0.675	1446	7.000	-0.675	1576	7.000	-0.675	1706	7.000	-0.675
1318	7.002	-0.675	1448	7.000	-0.675	1578	7.000	-0.675	1708	7.000	-0.675
1320	7.002	-0.675	1450	7.000	-0.675	1580	7.000	-0.675	1710	7.000	-0.675
1322	7.002	-0.675	1452	7.000	-0.675	1582	7.000	-0.675	1712	7.000	-0.675
1324	7.002	-0.675	1454	7.000	-0.675	1584	7.000	-0.675	1714	7.000	-0.675
1326	7.002	-0.675	1456	7.000	-0.675	1586	7.000	-0.675	1716	7.000	-0.675
1328	7.002	-0.675	1458	7.000	-0.675	1588	7.000	-0.675	1718	7.000	-0.675
1330	7.002	-0.675	1460	7.000	-0.675	1590	7.000	-0.675	1720	7.000	-0.675
1332	7.002	-0.675	1462	7.000	-0.675	1592	7.000	-0.675	1722	7.000	-0.675
1334	7.002	-0.675	1464	7.000	-0.675	1594	7.000	-0.675	1724	7.000	-0.675
1336	7.002	-0.675	1466	7.000	-0.675	1596	7.000	-0.675	1726	7.000	-0.675
1338	7.002	-0.675	1468	7.000	-0.675	1598	7.000	-0.675	1728	7.000	-0.675
1340	7.002	-0.675	1470	7.000	-0.675	1600	7.000	-0.675	1730	7.000	-0.675
1342	7.002	-0.675	1472	7.000	-0.675	1602	7.000	-0.675	1732	7.000	-0.675
1344	7.002	-0.675	1474	7.000	-0.675	1604	7.000	-0.675	1734	7.000	-0.675
1346	7.002	-0.675	1476	7.000	-0.675	1606	7.000	-0.675	1736	7.000	-0.675
1348	7.002	-0.675	1478	7.000	-0.675	1608	7.000	-0.675	1738	7.000	-0.675
1350	7.001	-0.675	1480	7.000	-0.675	1610	7.000	-0.675	1740	7.000	-0.675
1352	7.001	-0.675	1482	7.000	-0.675	1612	7.000	-0.675	1742	7.000	-0.675
1354	7.001	-0.675	1484	7.000	-0.675	1614	7.000	-0.675	1744	7.000	-0.675
1356	7.001	-0.675	1486	7.000	-0.675	1616	7.000	-0.675	1746	7.000	-0.675
1358	7.001	-0.675	1488	7.000	-0.675	1618	7.000	-0.675	1748	7.000	-0.675
1360	7.001	-0.675	1490	7.000	-0.675	1620	7.000	-0.675	1750	7.000	-0.675
1362	7.001	-0.675	1492	7.000	-0.675	1622	7.000	-0.675	1752	7.000	-0.675
1364	7.001	-0.675	1494	7.000	-0.675	1624	7.000	-0.675	1754	7.000	-0.675
1366	7.001	-0.675	1496	7.000	-0.675	1626	7.000	-0.675	1756	7.000	-0.675
1368	7.001	-0.675	1498	7.000	-0.675	1628	7.000	-0.675	1758	7.000	-0.675
1370	7.001	-0.675	1500	7.000	-0.675	1630	7.000	-0.675	1760	7.000	-0.675
1372	7.001	-0.675	1502	7.000	-0.675	1632	7.000	-0.675	1762	7.000	-0.675
1374	7.001	-0.675	1504	7.000	-0.675	1634	7.000	-0.675	1764	7.000	-0.675
1376	7.001	-0.675	1506	7.000	-0.675	1636	7.000	-0.675	1766	7.000	-0.675
1378	7.001	-0.675	1508	7.000	-0.675	1638	7.000	-0.675	1768	7.000	-0.675
1380	7.001	-0.675	1510	7.000	-0.675	1640	7.000	-0.675	1770	7.000	-0.675
1382	7.001	-0.675	1512	7.000	-0.675	1642	7.000	-0.675	1772	7.000	-0.675
1384	7.001	-0.675	1514	7.000	-0.675	1644	7.000	-0.675	1774	7.000	-0.675
1386	7.001	-0.675	1516	7.000	-0.675	1646	7.000	-0.675	1776	7.000	-0.675
1388	7.001	-0.675	1518	7.000	-0.675	1648	7.000	-0.675	1778	7.000	-0.675
1390	7.001	-0.675	1520	7.000	-0.675	1650	7.000	-0.675	1780	7.000	-0.675
1392	7.001	-0.675	1522	7.000	-0.675	1652	7.000	-0.675	1782	7.000	-0.675

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
1784	7.000	-0.675	1914	7.000	-0.675	2044	7.000	-0.675	2174	7.000	-0.675
1786	7.000	-0.675	1916	7.000	-0.675	2046	7.000	-0.675	2176	7.000	-0.675
1788	7.000	-0.675	1918	7.000	-0.675	2048	7.000	-0.675	2178	7.000	-0.675
1790	7.000	-0.675	1920	7.000	-0.675	2050	7.000	-0.675	2180	7.000	-0.675
1792	7.000	-0.675	1922	7.000	-0.675	2052	7.000	-0.675	2182	7.000	-0.675
1794	7.000	-0.675	1924	7.000	-0.675	2054	7.000	-0.675	2184	7.000	-0.675
1796	7.000	-0.675	1926	7.000	-0.675	2056	7.000	-0.675	2186	7.000	-0.675
1798	7.000	-0.675	1928	7.000	-0.675	2058	7.000	-0.675	2188	7.000	-0.675
1800	7.000	-0.675	1930	7.000	-0.675	2060	7.000	-0.675	2190	7.000	-0.675
1802	7.000	-0.675	1932	7.000	-0.675	2062	7.000	-0.675	2192	7.000	-0.675
1804	7.000	-0.675	1934	7.000	-0.675	2064	7.000	-0.675	2194	7.000	-0.675
1806	7.000	-0.675	1936	7.000	-0.675	2066	7.000	-0.675	2196	7.000	-0.675
1808	7.000	-0.675	1938	7.000	-0.675	2068	7.000	-0.675	2198	7.000	-0.675
1810	7.000	-0.675	1940	7.000	-0.675	2070	7.000	-0.675	2200	7.000	-0.675
1812	7.000	-0.675	1942	7.000	-0.675	2072	7.000	-0.675	2202	7.000	-0.675
1814	7.000	-0.675	1944	7.000	-0.675	2074	7.000	-0.675	2204	7.000	-0.675
1816	7.000	-0.675	1946	7.000	-0.675	2076	7.000	-0.675	2206	7.000	-0.675
1818	7.000	-0.675	1948	7.000	-0.675	2078	7.000	-0.675	2208	7.000	-0.675
1820	7.000	-0.675	1950	7.000	-0.675	2080	7.000	-0.675	2210	7.000	-0.675
1822	7.000	-0.675	1952	7.000	-0.675	2082	7.000	-0.675	2212	7.000	-0.675
1824	7.000	-0.675	1954	7.000	-0.675	2084	7.000	-0.675	2214	7.000	-0.675
1826	7.000	-0.675	1956	7.000	-0.675	2086	7.000	-0.675	2216	7.000	-0.675
1828	7.000	-0.675	1958	7.000	-0.675	2088	7.000	-0.675	2218	7.000	-0.675
1830	7.000	-0.675	1960	7.000	-0.675	2090	7.000	-0.675	2220	7.000	-0.675
1832	7.000	-0.675	1962	7.000	-0.675	2092	7.000	-0.675	2222	7.000	-0.675
1834	7.000	-0.675	1964	7.000	-0.675	2094	7.000	-0.675	2224	7.000	-0.675
1836	7.000	-0.675	1966	7.000	-0.675	2096	7.000	-0.675	2226	7.000	-0.675
1838	7.000	-0.675	1968	7.000	-0.675	2098	7.000	-0.675	2228	7.000	-0.675
1840	7.000	-0.675	1970	7.000	-0.675	2100	7.000	-0.675	2230	7.000	-0.675
1842	7.000	-0.675	1972	7.000	-0.675	2102	7.000	-0.675	2232	7.000	-0.675
1844	7.000	-0.675	1974	7.000	-0.675	2104	7.000	-0.675	2234	7.000	-0.675
1846	7.000	-0.675	1976	7.000	-0.675	2106	7.000	-0.675	2236	7.000	-0.675
1848	7.000	-0.675	1978	7.000	-0.675	2108	7.000	-0.675	2238	7.000	-0.675
1850	7.000	-0.675	1980	7.000	-0.675	2110	7.000	-0.675	2240	7.000	-0.675
1852	7.000	-0.675	1982	7.000	-0.675	2112	7.000	-0.675	2242	7.000	-0.675
1854	7.000	-0.675	1984	7.000	-0.675	2114	7.000	-0.675	2244	7.000	-0.675
1856	7.000	-0.675	1986	7.000	-0.675	2116	7.000	-0.675	2246	7.000	-0.675
1858	7.000	-0.675	1988	7.000	-0.675	2118	7.000	-0.675	2248	7.000	-0.675
1860	7.000	-0.675	1990	7.000	-0.675	2120	7.000	-0.675	2250	7.000	-0.675
1862	7.000	-0.675	1992	7.000	-0.675	2122	7.000	-0.675	2252	7.000	-0.675
1864	7.000	-0.675	1994	7.000	-0.675	2124	7.000	-0.675	2254	7.000	-0.675
1866	7.000	-0.675	1996	7.000	-0.675	2126	7.000	-0.675	2256	7.000	-0.675
1868	7.000	-0.675	1998	7.000	-0.675	2128	7.000	-0.675	2258	7.000	-0.675
1870	7.000	-0.675	2000	7.000	-0.675	2130	7.000	-0.675	2260	7.000	-0.675
1872	7.000	-0.675	2002	7.000	-0.675	2132	7.000	-0.675	2262	7.000	-0.675
1874	7.000	-0.675	2004	7.000	-0.675	2134	7.000	-0.675	2264	7.000	-0.675
1876	7.000	-0.675	2006	7.000	-0.675	2136	7.000	-0.675	2266	7.000	-0.675
1878	7.000	-0.675	2008	7.000	-0.675	2138	7.000	-0.675	2268	7.000	-0.675
1880	7.000	-0.675	2010	7.000	-0.675	2140	7.000	-0.675	2270	7.000	-0.675
1882	7.000	-0.675	2012	7.000	-0.675	2142	7.000	-0.675	2272	7.000	-0.675
1884	7.000	-0.675	2014	7.000	-0.675	2144	7.000	-0.675	2274	7.000	-0.675
1886	7.000	-0.675	2016	7.000	-0.675	2146	7.000	-0.675	2276	7.000	-0.675
1888	7.000	-0.675	2018	7.000	-0.675	2148	7.000	-0.675	2278	7.000	-0.675
1890	7.000	-0.675	2020	7.000	-0.675	2150	7.000	-0.675	2280	7.000	-0.675
1892	7.000	-0.675	2022	7.000	-0.675	2152	7.000	-0.675	2282	7.000	-0.675
1894	7.000	-0.675	2024	7.000	-0.675	2154	7.000	-0.675	2284	7.000	-0.675
1896	7.000	-0.675	2026	7.000	-0.675	2156	7.000	-0.675	2286	7.000	-0.675
1898	7.000	-0.675	2028	7.000	-0.675	2158	7.000	-0.675	2288	7.000	-0.675
1900	7.000	-0.675	2030	7.000	-0.675	2160	7.000	-0.675	2290	7.000	-0.675
1902	7.000	-0.675	2032	7.000	-0.675	2162	7.000	-0.675	2292	7.000	-0.675
1904	7.000	-0.675	2034	7.000	-0.675	2164	7.000	-0.675	2294	7.000	-0.675
1906	7.000	-0.675	2036	7.000	-0.675	2166	7.000	-0.675	2296	7.000	-0.675
1908	7.000	-0.675	2038	7.000	-0.675	2168	7.000	-0.675	2298	7.000	-0.675
1910	7.000	-0.675	2040	7.000	-0.675	2170	7.000	-0.675	2300	7.000	-0.675
1912	7.000	-0.675	2042	7.000	-0.675	2172	7.000	-0.675	2302	7.000	-0.675

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
2304	7.000	-0.675	2434	7.000	-0.675	2564	7.000	-0.675	2694	7.000	-0.675
2306	7.000	-0.675	2436	7.000	-0.675	2566	7.000	-0.675	2696	7.000	-0.675
2308	7.000	-0.675	2438	7.000	-0.675	2568	7.000	-0.675	2698	7.000	-0.675
2310	7.000	-0.675	2440	7.000	-0.675	2570	7.000	-0.675	2700	7.000	-0.675
2312	7.000	-0.675	2442	7.000	-0.675	2572	7.000	-0.675	2702	7.000	-0.675
2314	7.000	-0.675	2444	7.000	-0.675	2574	7.000	-0.675	2704	7.000	-0.675
2316	7.000	-0.675	2446	7.000	-0.675	2576	7.000	-0.675	2706	7.000	-0.675
2318	7.000	-0.675	2448	7.000	-0.675	2578	7.000	-0.675	2708	7.000	-0.675
2320	7.000	-0.675	2450	7.000	-0.675	2580	7.000	-0.675	2710	7.000	-0.675
2322	7.000	-0.675	2452	7.000	-0.675	2582	7.000	-0.675	2712	7.000	-0.675
2324	7.000	-0.675	2454	7.000	-0.675	2584	7.000	-0.675	2714	7.000	-0.675
2326	7.000	-0.675	2456	7.000	-0.675	2586	7.000	-0.675	2716	7.000	-0.675
2328	7.000	-0.675	2458	7.000	-0.675	2588	7.000	-0.675	2718	7.000	-0.675
2330	7.000	-0.675	2460	7.000	-0.675	2590	7.000	-0.675	2720	7.000	-0.675
2332	7.000	-0.675	2462	7.000	-0.675	2592	7.000	-0.675	2722	7.000	-0.675
2334	7.000	-0.675	2464	7.000	-0.675	2594	7.000	-0.675	2724	7.000	-0.675
2336	7.000	-0.675	2466	7.000	-0.675	2596	7.000	-0.675	2726	7.000	-0.675
2338	7.000	-0.675	2468	7.000	-0.675	2598	7.000	-0.675	2728	7.000	-0.675
2340	7.000	-0.675	2470	7.000	-0.675	2600	7.000	-0.675	2730	7.000	-0.675
2342	7.000	-0.675	2472	7.000	-0.675	2602	7.000	-0.675	2732	7.000	-0.675
2344	7.000	-0.675	2474	7.000	-0.675	2604	7.000	-0.675	2734	7.000	-0.675
2346	7.000	-0.675	2476	7.000	-0.675	2606	7.000	-0.675	2736	7.000	-0.675
2348	7.000	-0.675	2478	7.000	-0.675	2608	7.000	-0.675	2738	7.000	-0.675
2350	7.000	-0.675	2480	7.000	-0.675	2610	7.000	-0.675	2740	7.000	-0.675
2352	7.000	-0.675	2482	7.000	-0.675	2612	7.000	-0.675	2742	7.000	-0.675
2354	7.000	-0.675	2484	7.000	-0.675	2614	7.000	-0.675	2744	7.000	-0.675
2356	7.000	-0.675	2486	7.000	-0.675	2616	7.000	-0.675	2746	7.000	-0.675
2358	7.000	-0.675	2488	7.000	-0.675	2618	7.000	-0.675	2748	7.000	-0.675
2360	7.000	-0.675	2490	7.000	-0.675	2620	7.000	-0.675	2750	7.000	-0.675
2362	7.000	-0.675	2492	7.000	-0.675	2622	7.000	-0.675	2752	7.000	-0.675
2364	7.000	-0.675	2494	7.000	-0.675	2624	7.000	-0.675	2754	7.000	-0.675
2366	7.000	-0.675	2496	7.000	-0.675	2626	7.000	-0.675	2756	7.000	-0.675
2368	7.000	-0.675	2498	7.000	-0.675	2628	7.000	-0.675	2758	7.000	-0.675
2370	7.000	-0.675	2500	7.000	-0.675	2630	7.000	-0.675	2760	7.000	-0.675
2372	7.000	-0.675	2502	7.000	-0.675	2632	7.000	-0.675	2762	7.000	-0.675
2374	7.000	-0.675	2504	7.000	-0.675	2634	7.000	-0.675	2764	7.000	-0.675
2376	7.000	-0.675	2506	7.000	-0.675	2636	7.000	-0.675	2766	7.000	-0.675
2378	7.000	-0.675	2508	7.000	-0.675	2638	7.000	-0.675	2768	7.000	-0.675
2380	7.000	-0.675	2510	7.000	-0.675	2640	7.000	-0.675	2770	7.000	-0.675
2382	7.000	-0.675	2512	7.000	-0.675	2642	7.000	-0.675	2772	7.000	-0.675
2384	7.000	-0.675	2514	7.000	-0.675	2644	7.000	-0.675	2774	7.000	-0.675
2386	7.000	-0.675	2516	7.000	-0.675	2646	7.000	-0.675	2776	7.000	-0.675
2388	7.000	-0.675	2518	7.000	-0.675	2648	7.000	-0.675	2778	7.000	-0.675
2390	7.000	-0.675	2520	7.000	-0.675	2650	7.000	-0.675	2780	7.000	-0.675
2392	7.000	-0.675	2522	7.000	-0.675	2652	7.000	-0.675	2782	7.000	-0.675
2394	7.000	-0.675	2524	7.000	-0.675	2654	7.000	-0.675	2784	7.000	-0.675
2396	7.000	-0.675	2526	7.000	-0.675	2656	7.000	-0.675	2786	7.000	-0.675
2398	7.000	-0.675	2528	7.000	-0.675	2658	7.000	-0.675	2788	7.000	-0.675
2400	7.000	-0.675	2530	7.000	-0.675	2660	7.000	-0.675	2790	7.000	-0.675
2402	7.000	-0.675	2532	7.000	-0.675	2662	7.000	-0.675	2792	7.000	-0.675
2404	7.000	-0.675	2534	7.000	-0.675	2664	7.000	-0.675	2794	7.000	-0.675
2406	7.000	-0.675	2536	7.000	-0.675	2666	7.000	-0.675	2796	7.000	-0.675
2408	7.000	-0.675	2538	7.000	-0.675	2668	7.000	-0.675	2798	7.000	-0.675
2410	7.000	-0.675	2540	7.000	-0.675	2670	7.000	-0.675	2800	7.000	-0.675
2412	7.000	-0.675	2542	7.000	-0.675	2672	7.000	-0.675	2802	7.000	-0.675
2414	7.000	-0.675	2544	7.000	-0.675	2674	7.000	-0.675	2804	7.000	-0.675
2416	7.000	-0.675	2546	7.000	-0.675	2676	7.000	-0.675	2806	7.000	-0.675
2418	7.000	-0.675	2548	7.000	-0.675	2678	7.000	-0.675	2808	7.000	-0.675
2420	7.000	-0.675	2550	7.000	-0.675	2680	7.000	-0.675	2810	7.000	-0.675
2422	7.000	-0.675	2552	7.000	-0.675	2682	7.000	-0.675	2812	7.000	-0.675
2424	7.000	-0.675	2554	7.000	-0.675	2684	7.000	-0.675	2814	7.000	-0.675
2426	7.000	-0.675	2556	7.000	-0.675	2686	7.000	-0.675	2816	7.000	-0.675
2428	7.000	-0.675	2558	7.000	-0.675	2688	7.000	-0.675	2818	7.000	-0.675
2430	7.000	-0.675	2560	7.000	-0.675	2690	7.000	-0.675	2820	7.000	-0.675
2432	7.000	-0.675	2562	7.000	-0.675	2692	7.000	-0.675	2822	7.000	-0.675

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
2824	7.000	-0.675	2840	7.000	-0.675	2856	7.000	-0.675	2872	7.000	-0.675
2826	7.000	-0.675	2842	7.000	-0.675	2858	7.000	-0.675	2874	7.000	-0.675
2828	7.000	-0.675	2844	7.000	-0.675	2860	7.000	-0.675	2876	7.000	-0.675
2830	7.000	-0.675	2846	7.000	-0.675	2862	7.000	-0.675	2878	7.000	-0.675
2832	7.000	-0.675	2848	7.000	-0.675	2864	7.000	-0.675	2880	7.000	-0.675
2834	7.000	-0.675	2850	7.000	-0.675	2866	7.000	-0.675	2882	0.000	0.000
2836	7.000	-0.675	2852	7.000	-0.675	2868	7.000	-0.675			
2838	7.000	-0.675	2854	7.000	-0.675	2870	7.000	-0.675			

Network Details

* - Indicates pipe has been modified outside of WinDes's Storm/Foul & Schedules

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
1.000	79.48	1.946	40.8	0.186	4.00	1	0.600	o	225
2.000	17.63	0.255	69.1	0.057	4.00	1	0.600	o	225
1.001	54.62	0.338	161.6	0.148	0.00	1	0.600	o	300
3.000	17.92	0.119	150.6	0.035	4.00	1	0.600	o	225
1.002	26.73	0.178	150.2	0.022	0.00	1	0.600	o	300
1.003	11.98	0.295	40.6	0.022	0.00	1	0.600	o	300
1.004	66.25	1.430	46.3	0.140	0.00	1	0.600	o	300
1.005	83.02	2.438	34.1	0.150	0.00	1	0.600	o	300
4.000	33.34	0.299	111.5	0.100	4.00	1	0.600	o	225
5.000	6.84	0.109	62.8	0.025	4.00	1	0.600	o	225
4.001	62.36	2.070	30.1	0.175	0.00	1	0.600	o	225
4.002	53.55	1.785	30.0	0.175	0.00	1	0.600	o	225
1.006	43.51	0.934	46.6	0.100	0.00	1	0.600	o	375
1.007	79.61	1.157	68.8	0.180	0.00	1	0.600	o	525
6.000	26.56	0.188	141.3	0.090	4.00	1	0.600	o	225
7.000	24.77	0.175	141.5	0.060	4.00	1	0.600	o	225
6.001	47.17	0.240	196.5	0.137	0.00	1	0.600	o	300

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
1.000	SMH1	23.029	21.645	1.159	20.997	19.699	1.073		1200
2.000	SMH2	21.234	20.250	0.759	20.997	19.995	0.777		1200
1.001	SMH3	20.997	19.615	1.082	21.015	19.277	1.438		1200
3.000	SMH4	21.272	19.916	1.131	21.015	19.797	0.993		1200
1.002	SMH5	21.015	19.276	1.439	20.591	19.098	1.193		1350
1.003	SMH6	20.591	19.098	1.193	20.327	18.803	1.224		1350
1.004	SMH7	20.327	18.803	1.224	18.982	17.373	1.309		1350
1.005	SMH8	18.982	17.373	1.309	16.992	14.935	1.757		1350
4.000	SMH9	21.630	20.227	1.178	20.993	19.928	0.840		1200
5.000	SMH10	21.141	19.728	1.188	20.993	19.619	1.149		1200
4.001	SMH11	20.993	19.200	1.568	18.814	17.130	1.459		1200
4.002	SMH12	18.814	17.130	1.459	16.992	15.345	1.422		1200
1.006	SMH13	16.992	14.781	1.836	15.500	13.847	1.278		1350
1.007	SMH14	15.500	13.696	1.279	14.375	12.539	1.311		1500
6.000	SMH15	19.069	17.706	1.138	18.351	17.518	0.608		1200
7.000	SMH16	17.682	16.226	1.231	18.351	16.051	2.075		1200
6.001	SMH17	18.351	15.976	2.075	20.192	15.736	4.156		1200

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
6.002	48.71	0.269	181.1	0.050	0.00	1	0.600	o	300
6.003	12.76	0.049	260.4	0.008	0.00	1	0.600	o	300
8.000	71.86	0.601	119.6	0.199	4.00	1	0.600	o	225
8.001	18.86	0.105	179.6	0.005	0.00	1	0.600	o	225
6.004	115.49	0.593	194.8	0.650	0.00	1	0.600	o	450
9.000	61.33	1.923	31.9	0.217	4.00	1	0.600	o	225
6.005	52.26	1.004	52.1	0.260	0.00	1	0.600	o	450
6.006	32.75	0.766	42.8	0.030	0.00	1	0.600	o	450
10.000	42.71	1.195	35.7	0.122	4.00	1	0.600	o	225
10.001	38.98	0.359	108.6	0.005	0.00	1	0.600	o	225
1.008	17.71	0.086	205.9	0.022	0.00	1	0.600	o	675
11.000	29.04	0.235	123.6	0.036	4.00	1	0.600	o	225
1.009	82.70	1.654	50.0	0.191	0.00	1	0.600	o	675
12.000	62.70	0.539	116.3	0.195	4.00	1	0.600	o	225
13.000	18.12	0.181	100.1	0.060	4.00	1	0.600	o	225
12.001	84.83	2.746	30.9	0.230	0.00	1	0.600	o	300
1.010	70.59	1.412	50.0	0.260	0.00	1	0.600	o	675

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
6.002	SMH18	20.192	15.736	4.156	19.641	15.467	3.874		1350
6.003	SMH19	19.641	15.467	3.874	19.580	15.418	3.862		1350
8.000	SMH20	18.291	16.819	1.247	19.637	16.218	3.194		1200
8.001	SMH21	19.637	16.218	3.194	19.580	16.113	3.242		1200
6.004	SMH22	19.580	15.270	3.860	17.422	14.677	2.295		1350
9.000	SMH23	18.804	17.398	1.181	17.422	15.475	1.722		1200
6.005	SMH24	17.422	14.677	2.295	15.525	13.673	1.402		1350
6.006	SMH25	15.525	13.461	1.614	14.375	12.695	1.230		1350
10.000	SMH26	14.996	13.884	0.887	13.812	12.689	0.898		1200
10.001	SMH27	13.812	12.689	0.898	14.375	12.330	1.820		1200
1.008	SMH28	14.375	11.897	1.803	14.017	11.811	1.531		1500
11.000	SMH29	13.602	12.244	1.133	14.017	12.009	1.783		1200
1.009	SMH30	14.017	11.736	1.606	12.133	10.082	1.376		1500
12.000	SMH31	15.217	14.014	0.978	14.978	13.475	1.278		1200
13.000	SMH32	14.764	13.500	1.039	14.978	13.319	1.434		1200
12.001	SMH33	14.978	13.310	1.368	12.133	10.564	1.269		1200
1.010	SMH34	12.133	9.550	1.908	10.266	8.138	1.453		1500

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
14.000	28.16	1.377	20.5	0.100	4.00	1	0.600	o	225
14.001	40.32	1.147	35.2	0.105	0.00	1	0.600	o	225
14.002	61.69	1.259	49.0	0.070	0.00	1	0.600	o	225
1.011	37.36	0.580	64.4	0.050	0.00	1	0.600	o	750
15.000	27.60	1.095	25.2	0.186	4.00	1	0.600	o	225
15.001	15.53	0.150	103.5	0.063	0.00	1	0.600	o	225
15.002	31.53	0.205	153.8	0.048	0.00	1	0.600	o	300
1.012	22.23	0.134	165.9	0.040	0.00	1	0.600	o	750

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
14.000	SMH35	14.269	12.260	1.784	13.220	10.883	2.112		1200
14.001	SMH36	13.220	10.857	2.138	11.871	9.710	1.936		1200
14.002	SMH37	11.871	9.710	1.936	10.266	8.451	1.590		1200
1.011	SMH38	10.266	8.130	1.386	9.255	7.550	0.955		1800
15.000	SMH39	10.450	9.200	1.025	9.239	8.105	0.909		1200
15.001	SMH40	9.239	8.100	0.914	8.916	7.950	0.741		1200
15.002	SMH41	8.916	7.870	0.746	9.255	7.665	1.290		1200
1.012	SMH42	9.255	7.550	0.955	9.240	7.416	1.074		1800

Summary of Results

Return Period (years)	100	Analysis Time Step	Fine
Storm Duration (mins)	360	DTS Status	ON
Profile Type	Summer	DVD Status	OFF
Margin for Flood Risk warning (mm)	300	Inertia Status	OFF

PN	Water Lev. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	21.711	-0.159	0.000	0.19	0.0	14.9	O K
2.000	20.293	-0.182	0.000	0.08	0.0	4.6	O K
1.001	19.743	-0.172	0.000	0.38	0.0	31.4	O K
3.000	19.956	-0.185	0.000	0.07	0.0	2.8	O K
1.002	19.415	-0.161	0.000	0.44	0.0	36.0	O K
1.003	19.205	-0.193	0.000	0.28	0.0	37.8	O K
1.004	18.918	-0.185	0.000	0.31	0.0	49.0	O K
1.005	17.492	-0.181	0.000	0.33	0.0	61.1	O K
4.000	20.290	-0.162	0.000	0.17	0.0	8.0	O K
5.000	19.758	-0.195	0.000	0.04	0.0	2.0	O K
4.001	19.278	-0.147	0.000	0.26	0.0	24.1	O K
4.002	17.231	-0.124	0.000	0.42	0.0	38.2	O K
1.006	14.945	-0.211	0.000	0.40	0.0	107.3	O K
1.007	13.864	-0.357	0.000	0.22	0.0	121.7	O K
6.000	17.770	-0.161	0.000	0.18	0.0	7.2	O K
7.000	16.278	-0.173	0.000	0.12	0.0	4.8	O K
6.001	16.090	-0.186	0.000	0.31	0.0	23.1	O K
6.002	15.858	-0.178	0.000	0.35	0.0	27.1	O K
6.003	15.616	-0.151	0.000	0.49	0.0	27.7	O K
8.000	16.910	-0.134	0.000	0.35	0.0	16.0	O K
8.001	16.326	-0.117	0.000	0.47	0.0	16.4	O K
6.004	15.477	-0.243	0.000	0.43	0.0	96.1	O K
9.000	17.465	-0.158	0.000	0.20	0.0	17.4	O K
6.005	14.854	-0.273	0.000	0.33	0.0	134.2	O K
6.006	13.635	-0.276	0.000	0.32	0.0	136.7	O K
10.000	13.935	-0.174	0.000	0.12	0.0	9.8	O K
10.001	12.760	-0.154	0.000	0.22	0.0	10.2	O K
1.008	12.269	-0.303	0.000	0.59	0.0	270.2	O K
11.000	12.282	-0.187	0.000	0.07	0.0	2.9	O K
1.009	11.959	-0.452	0.000	0.24	0.0	288.1	O K
12.000	14.104	-0.135	0.000	0.34	0.0	15.7	O K
13.000	13.548	-0.177	0.000	0.10	0.0	4.8	O K
12.001	13.401	-0.209	0.000	0.20	0.0	39.0	O K
1.010	9.799	-0.426	0.000	0.29	0.0	347.8	O K
14.000	12.300	-0.185	0.000	0.07	0.0	8.0	O K
14.001	10.925	-0.157	0.000	0.20	0.0	16.5	O K
14.002	9.795	-0.140	0.000	0.31	0.0	22.1	O K
1.011	8.473	-0.407	0.000	0.31	0.0	373.6	O K
15.000	9.259	-0.166	0.000	0.15	0.0	14.9	O K
15.001	8.475	0.150	0.000	0.44	0.0	20.0	SURCH'ED
15.002	8.471	0.301	0.000	0.29	0.0	23.3	SURCH'ED
1.012	8.467	0.167	0.000	0.21	0.0	126.0	SURCH'ED

Rainfall Hyetograph

Region	FSR - Scotland & Ireland	Profile Type	Summer
Return Period (yrs)	100	Storm Duration (mins)	360
M5-60 (mm)	16.500		
Ratio R	0.300		

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
6	3.00	78	4.34	150	16.42	222	13.49	294	4.13
12	3.08	84	4.56	156	19.27	228	11.40	300	3.98
18	3.15	90	4.78	162	22.35	234	9.58	306	3.84
24	3.24	96	5.08	168	26.35	240	8.17	312	3.67
30	3.32	102	5.39	174	30.43	246	7.23	318	3.54
36	3.39	108	5.82	180	35.06	252	6.45	324	3.47
42	3.47	114	6.45	186	35.06	258	5.82	330	3.39
48	3.54	120	7.23	192	30.43	264	5.39	336	3.32
54	3.67	126	8.17	198	26.35	270	5.08	342	3.24
60	3.84	132	9.58	204	22.35	276	4.78	348	3.15
66	3.98	138	11.40	210	19.27	282	4.56	354	3.08
72	4.13	144	13.49	216	16.42	288	4.34	360	3.00

Appendix E -7

Surface Water Network 2 Simulation 1 in 30Yr
Infiltration Basin/Pond Source Control 1 in 100 Yr (Winter 360)

Global Variables

Region	FSR - Scotland & Ireland
Return Period (yrs)	30
M5-60 (mm)	16.500
Ratio R	0.300
Volumetric Runoff Coef	0.750
Profile Type	Summer
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	360
Hot Start (mins)	0
Hot Start Level (mm)	0
Manhole Headloss Coefficient	0.500
MADD Factor * 10m³/ha Storage	3.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	10
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of On-Line Controls	0

Starting Storm file name

F:\17-03 Kingsbridge Consultancy Ltd Blackrock\Services (May 2019)\Storm Drainage\19-05-20 Storm Drainage Network 2.sws

Surcharged Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.012	27	8.092	7.267	1500	0

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
0	0.000	0.000	56	7.131	-0.473	112	7.315	-0.473	168	7.781	-0.011
2	7.000	-0.473	58	7.137	-0.473	114	7.325	-0.467	170	7.805	0.013
4	7.000	-0.473	60	7.143	-0.473	116	7.336	-0.456	172	7.828	0.036
6	7.001	-0.473	62	7.149	-0.473	118	7.347	-0.445	174	7.852	0.060
8	7.002	-0.473	64	7.154	-0.473	120	7.358	-0.434	176	7.876	0.084
10	7.003	-0.473	66	7.160	-0.473	122	7.370	-0.422	178	7.900	0.108
12	7.006	-0.473	68	7.165	-0.473	124	7.382	-0.410	180	7.923	0.131
14	7.009	-0.473	70	7.171	-0.473	126	7.395	-0.397	182	7.947	0.155
16	7.012	-0.473	72	7.176	-0.473	128	7.408	-0.384	184	7.971	0.179
18	7.017	-0.473	74	7.182	-0.473	130	7.422	-0.370	186	7.994	0.202
20	7.021	-0.473	76	7.188	-0.473	132	7.436	-0.356	188	8.017	0.225
22	7.026	-0.473	78	7.193	-0.473	134	7.451	-0.341	190	8.039	0.247
24	7.032	-0.473	80	7.199	-0.473	136	7.467	-0.325	192	8.061	0.269
26	7.038	-0.473	82	7.205	-0.473	138	7.482	-0.310	194	8.082	0.290
28	7.043	-0.473	84	7.210	-0.473	140	7.499	-0.293	196	8.103	0.311
30	7.049	-0.473	86	7.216	-0.473	142	7.516	-0.276	198	8.123	0.331
32	7.055	-0.473	88	7.223	-0.473	144	7.533	-0.259	200	8.143	0.351
34	7.062	-0.473	90	7.229	-0.473	146	7.551	-0.241	202	8.162	0.370
36	7.068	-0.473	92	7.235	-0.473	148	7.569	-0.223	204	8.180	0.388
38	7.074	-0.473	94	7.242	-0.473	150	7.588	-0.204	206	8.198	0.406
40	7.081	-0.473	96	7.249	-0.473	152	7.608	-0.184	208	8.215	0.423
42	7.087	-0.473	98	7.256	-0.473	154	7.628	-0.164	210	8.232	0.440
44	7.094	-0.473	100	7.263	-0.473	156	7.648	-0.144	212	8.248	0.456
46	7.100	-0.473	102	7.271	-0.473	158	7.669	-0.123	214	8.263	0.471
48	7.107	-0.473	104	7.279	-0.473	160	7.691	-0.101	216	8.277	0.485
50	7.113	-0.473	106	7.288	-0.473	162	7.713	-0.079	218	8.291	0.499
52	7.119	-0.473	108	7.297	-0.473	164	7.735	-0.057	220	8.305	0.513
54	7.125	-0.473	110	7.306	-0.473	166	7.758	-0.034	222	8.317	0.525

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
224	8.329	0.537	354	8.431	0.639	484	8.143	0.351	614	7.829	0.037
226	8.340	0.548	356	8.429	0.637	486	8.138	0.346	616	7.824	0.032
228	8.351	0.559	358	8.425	0.633	488	8.134	0.342	618	7.818	0.026
230	8.361	0.569	360	8.422	0.630	490	8.130	0.338	620	7.813	0.021
232	8.371	0.579	362	8.418	0.626	492	8.125	0.333	622	7.807	0.015
234	8.380	0.588	364	8.414	0.622	494	8.121	0.329	624	7.802	0.010
236	8.388	0.596	366	8.409	0.617	496	8.116	0.324	626	7.796	0.004
238	8.396	0.604	368	8.404	0.612	498	8.112	0.320	628	7.790	-0.002
240	8.403	0.611	370	8.400	0.608	500	8.107	0.315	630	7.785	-0.007
242	8.410	0.618	372	8.395	0.603	502	8.103	0.311	632	7.779	-0.013
244	8.417	0.625	374	8.390	0.598	504	8.098	0.306	634	7.773	-0.019
246	8.423	0.631	376	8.385	0.593	506	8.094	0.302	636	7.767	-0.025
248	8.428	0.636	378	8.381	0.589	508	8.089	0.297	638	7.762	-0.030
250	8.433	0.641	380	8.376	0.584	510	8.085	0.293	640	7.756	-0.036
252	8.438	0.646	382	8.371	0.579	512	8.080	0.288	642	7.750	-0.042
254	8.442	0.650	384	8.366	0.574	514	8.075	0.283	644	7.744	-0.048
256	8.446	0.654	386	8.361	0.569	516	8.071	0.279	646	7.738	-0.054
258	8.449	0.657	388	8.357	0.565	518	8.066	0.274	648	7.732	-0.060
260	8.452	0.660	390	8.352	0.560	520	8.062	0.270	650	7.726	-0.066
262	8.455	0.663	392	8.347	0.555	522	8.057	0.265	652	7.720	-0.072
264	8.457	0.665	394	8.343	0.551	524	8.053	0.261	654	7.714	-0.078
266	8.459	0.667	396	8.338	0.546	526	8.048	0.256	656	7.708	-0.084
268	8.461	0.669	398	8.333	0.541	528	8.043	0.251	658	7.702	-0.090
270	8.462	0.670	400	8.329	0.537	530	8.039	0.247	660	7.696	-0.096
272	8.463	0.671	402	8.324	0.532	532	8.034	0.242	662	7.690	-0.102
274	8.464	0.672	404	8.319	0.527	534	8.029	0.237	664	7.684	-0.108
276	8.465	0.673	406	8.315	0.523	536	8.025	0.233	666	7.678	-0.114
278	8.466	0.674	408	8.310	0.518	538	8.020	0.228	668	7.671	-0.121
280	8.466	0.674	410	8.306	0.514	540	8.015	0.223	670	7.665	-0.127
282	8.466	0.674	412	8.301	0.509	542	8.011	0.219	672	7.659	-0.133
284	8.466	0.674	414	8.297	0.505	544	8.006	0.214	674	7.652	-0.140
286	8.466	0.674	416	8.292	0.500	546	8.001	0.209	676	7.646	-0.146
288	8.466	0.674	418	8.288	0.496	548	7.997	0.205	678	7.640	-0.152
290	8.465	0.673	420	8.283	0.491	550	7.992	0.200	680	7.633	-0.159
292	8.465	0.673	422	8.279	0.487	552	7.987	0.195	682	7.627	-0.165
294	8.464	0.672	424	8.274	0.482	554	7.982	0.190	684	7.620	-0.172
296	8.464	0.672	426	8.270	0.478	556	7.978	0.186	686	7.614	-0.178
298	8.463	0.671	428	8.265	0.473	558	7.973	0.181	688	7.607	-0.185
300	8.462	0.670	430	8.261	0.469	560	7.968	0.176	690	7.600	-0.192
302	8.461	0.669	432	8.257	0.465	562	7.963	0.171	692	7.594	-0.198
304	8.461	0.669	434	8.252	0.460	564	7.958	0.166	694	7.587	-0.205
306	8.460	0.668	436	8.248	0.456	566	7.953	0.161	696	7.580	-0.212
308	8.459	0.667	438	8.243	0.451	568	7.948	0.156	698	7.574	-0.218
310	8.458	0.666	440	8.239	0.447	570	7.943	0.151	700	7.567	-0.225
312	8.457	0.665	442	8.235	0.443	572	7.938	0.146	702	7.560	-0.232
314	8.456	0.664	444	8.230	0.438	574	7.933	0.141	704	7.554	-0.238
316	8.455	0.663	446	8.226	0.434	576	7.928	0.136	706	7.547	-0.245
318	8.455	0.663	448	8.222	0.430	578	7.923	0.131	708	7.540	-0.252
320	8.454	0.662	450	8.217	0.425	580	7.918	0.126	710	7.534	-0.258
322	8.453	0.661	452	8.213	0.421	582	7.913	0.121	712	7.527	-0.265
324	8.452	0.660	454	8.209	0.417	584	7.908	0.116	714	7.520	-0.272
326	8.451	0.659	456	8.204	0.412	586	7.903	0.111	716	7.514	-0.278
328	8.450	0.658	458	8.200	0.408	588	7.898	0.106	718	7.507	-0.285
330	8.449	0.657	460	8.196	0.404	590	7.893	0.101	720	7.500	-0.292
332	8.448	0.656	462	8.191	0.399	592	7.888	0.096	722	7.494	-0.298
334	8.447	0.655	464	8.187	0.395	594	7.883	0.091	724	7.487	-0.305
336	8.446	0.654	466	8.183	0.391	596	7.877	0.085	726	7.480	-0.312
338	8.445	0.653	468	8.178	0.386	598	7.872	0.080	728	7.474	-0.318
340	8.444	0.652	470	8.174	0.382	600	7.867	0.075	730	7.467	-0.325
342	8.443	0.651	472	8.169	0.377	602	7.861	0.069	732	7.461	-0.331
344	8.441	0.649	474	8.165	0.373	604	7.856	0.064	734	7.455	-0.337
346	8.440	0.648	476	8.161	0.369	606	7.851	0.059	736	7.448	-0.344
348	8.438	0.646	478	8.156	0.364	608	7.845	0.053	738	7.442	-0.350
350	8.436	0.644	480	8.152	0.360	610	7.840	0.048	740	7.436	-0.356
352	8.434	0.642	482	8.147	0.355	612	7.835	0.043	742	7.430	-0.362

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
744	7.423	-0.369	874	7.170	-0.473	1004	7.069	-0.473	1134	7.017	-0.473
746	7.417	-0.375	876	7.168	-0.473	1006	7.068	-0.473	1136	7.017	-0.473
748	7.411	-0.381	878	7.165	-0.473	1008	7.067	-0.473	1138	7.016	-0.473
750	7.405	-0.387	880	7.163	-0.473	1010	7.065	-0.473	1140	7.016	-0.473
752	7.399	-0.393	882	7.161	-0.473	1012	7.064	-0.473	1142	7.015	-0.473
754	7.393	-0.399	884	7.159	-0.473	1014	7.063	-0.473	1144	7.015	-0.473
756	7.388	-0.404	886	7.157	-0.473	1016	7.062	-0.473	1146	7.015	-0.473
758	7.382	-0.410	888	7.155	-0.473	1018	7.061	-0.473	1148	7.014	-0.473
760	7.376	-0.416	890	7.153	-0.473	1020	7.060	-0.473	1150	7.014	-0.473
762	7.371	-0.421	892	7.151	-0.473	1022	7.058	-0.473	1152	7.014	-0.473
764	7.365	-0.427	894	7.149	-0.473	1024	7.057	-0.473	1154	7.013	-0.473
766	7.360	-0.432	896	7.147	-0.473	1026	7.056	-0.473	1156	7.013	-0.473
768	7.355	-0.437	898	7.145	-0.473	1028	7.055	-0.473	1158	7.013	-0.473
770	7.349	-0.443	900	7.143	-0.473	1030	7.054	-0.473	1160	7.013	-0.473
772	7.344	-0.448	902	7.141	-0.473	1032	7.053	-0.473	1162	7.012	-0.473
774	7.339	-0.453	904	7.139	-0.473	1034	7.052	-0.473	1164	7.012	-0.473
776	7.334	-0.458	906	7.138	-0.473	1036	7.050	-0.473	1166	7.012	-0.473
778	7.329	-0.463	908	7.136	-0.473	1038	7.049	-0.473	1168	7.012	-0.473
780	7.325	-0.467	910	7.134	-0.473	1040	7.048	-0.473	1170	7.011	-0.473
782	7.320	-0.472	912	7.132	-0.473	1042	7.047	-0.473	1172	7.011	-0.473
784	7.315	-0.473	914	7.130	-0.473	1044	7.046	-0.473	1174	7.011	-0.473
786	7.311	-0.473	916	7.129	-0.473	1046	7.045	-0.473	1176	7.011	-0.473
788	7.306	-0.473	918	7.127	-0.473	1048	7.044	-0.473	1178	7.010	-0.473
790	7.302	-0.473	920	7.125	-0.473	1050	7.043	-0.473	1180	7.010	-0.473
792	7.297	-0.473	922	7.124	-0.473	1052	7.042	-0.473	1182	7.010	-0.473
794	7.293	-0.473	924	7.122	-0.473	1054	7.041	-0.473	1184	7.010	-0.473
796	7.289	-0.473	926	7.121	-0.473	1056	7.040	-0.473	1186	7.009	-0.473
798	7.285	-0.473	928	7.119	-0.473	1058	7.039	-0.473	1188	7.009	-0.473
800	7.281	-0.473	930	7.117	-0.473	1060	7.039	-0.473	1190	7.009	-0.473
802	7.277	-0.473	932	7.116	-0.473	1062	7.038	-0.473	1192	7.009	-0.473
804	7.273	-0.473	934	7.114	-0.473	1064	7.037	-0.473	1194	7.009	-0.473
806	7.269	-0.473	936	7.113	-0.473	1066	7.036	-0.473	1196	7.008	-0.473
808	7.265	-0.473	938	7.111	-0.473	1068	7.035	-0.473	1198	7.008	-0.473
810	7.261	-0.473	940	7.110	-0.473	1070	7.035	-0.473	1200	7.008	-0.473
812	7.258	-0.473	942	7.108	-0.473	1072	7.034	-0.473	1202	7.008	-0.473
814	7.254	-0.473	944	7.107	-0.473	1074	7.033	-0.473	1204	7.008	-0.473
816	7.251	-0.473	946	7.106	-0.473	1076	7.032	-0.473	1206	7.008	-0.473
818	7.247	-0.473	948	7.104	-0.473	1078	7.032	-0.473	1208	7.007	-0.473
820	7.244	-0.473	950	7.103	-0.473	1080	7.031	-0.473	1210	7.007	-0.473
822	7.240	-0.473	952	7.102	-0.473	1082	7.030	-0.473	1212	7.007	-0.473
824	7.237	-0.473	954	7.100	-0.473	1084	7.030	-0.473	1214	7.007	-0.473
826	7.234	-0.473	956	7.099	-0.473	1086	7.029	-0.473	1216	7.007	-0.473
828	7.230	-0.473	958	7.098	-0.473	1088	7.028	-0.473	1218	7.007	-0.473
830	7.227	-0.473	960	7.096	-0.473	1090	7.028	-0.473	1220	7.006	-0.473
832	7.224	-0.473	962	7.095	-0.473	1092	7.027	-0.473	1222	7.006	-0.473
834	7.221	-0.473	964	7.094	-0.473	1094	7.026	-0.473	1224	7.006	-0.473
836	7.218	-0.473	966	7.092	-0.473	1096	7.026	-0.473	1226	7.006	-0.473
838	7.215	-0.473	968	7.091	-0.473	1098	7.025	-0.473	1228	7.006	-0.473
840	7.212	-0.473	970	7.090	-0.473	1100	7.025	-0.473	1230	7.006	-0.473
842	7.210	-0.473	972	7.089	-0.473	1102	7.024	-0.473	1232	7.006	-0.473
844	7.207	-0.473	974	7.087	-0.473	1104	7.024	-0.473	1234	7.006	-0.473
846	7.204	-0.473	976	7.086	-0.473	1106	7.023	-0.473	1236	7.005	-0.473
848	7.202	-0.473	978	7.085	-0.473	1108	7.023	-0.473	1238	7.005	-0.473
850	7.199	-0.473	980	7.084	-0.473	1110	7.022	-0.473	1240	7.005	-0.473
852	7.196	-0.473	982	7.082	-0.473	1112	7.022	-0.473	1242	7.005	-0.473
854	7.194	-0.473	984	7.081	-0.473	1114	7.021	-0.473	1244	7.005	-0.473
856	7.191	-0.473	986	7.080	-0.473	1116	7.021	-0.473	1246	7.005	-0.473
858	7.189	-0.473	988	7.079	-0.473	1118	7.020	-0.473	1248	7.005	-0.473
860	7.186	-0.473	990	7.077	-0.473	1120	7.020	-0.473	1250	7.005	-0.473
862	7.184	-0.473	992	7.076	-0.473	1122	7.019	-0.473	1252	7.004	-0.473
864	7.181	-0.473	994	7.075	-0.473	1124	7.019	-0.473	1254	7.004	-0.473
866	7.179	-0.473	996	7.074	-0.473	1126	7.018	-0.473	1256	7.004	-0.473
868	7.177	-0.473	998	7.073	-0.473	1128	7.018	-0.473	1258	7.004	-0.473
870	7.174	-0.473	1000	7.071	-0.473	1130	7.018	-0.473	1260	7.004	-0.473
872	7.172	-0.473	1002	7.070	-0.473	1132	7.017	-0.473	1262	7.004	-0.473

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
1264	7.004	-0.473	1394	7.001	-0.473	1524	7.000	-0.473	1654	7.000	-0.473
1266	7.004	-0.473	1396	7.001	-0.473	1526	7.000	-0.473	1656	7.000	-0.473
1268	7.004	-0.473	1398	7.001	-0.473	1528	7.000	-0.473	1658	7.000	-0.473
1270	7.004	-0.473	1400	7.001	-0.473	1530	7.000	-0.473	1660	7.000	-0.473
1272	7.004	-0.473	1402	7.001	-0.473	1532	7.000	-0.473	1662	7.000	-0.473
1274	7.004	-0.473	1404	7.001	-0.473	1534	7.000	-0.473	1664	7.000	-0.473
1276	7.003	-0.473	1406	7.001	-0.473	1536	7.000	-0.473	1666	7.000	-0.473
1278	7.003	-0.473	1408	7.001	-0.473	1538	7.000	-0.473	1668	7.000	-0.473
1280	7.003	-0.473	1410	7.001	-0.473	1540	7.000	-0.473	1670	7.000	-0.473
1282	7.003	-0.473	1412	7.001	-0.473	1542	7.000	-0.473	1672	7.000	-0.473
1284	7.003	-0.473	1414	7.001	-0.473	1544	7.000	-0.473	1674	7.000	-0.473
1286	7.003	-0.473	1416	7.001	-0.473	1546	7.000	-0.473	1676	7.000	-0.473
1288	7.003	-0.473	1418	7.001	-0.473	1548	7.000	-0.473	1678	7.000	-0.473
1290	7.003	-0.473	1420	7.001	-0.473	1550	7.000	-0.473	1680	7.000	-0.473
1292	7.003	-0.473	1422	7.001	-0.473	1552	7.000	-0.473	1682	7.000	-0.473
1294	7.003	-0.473	1424	7.001	-0.473	1554	7.000	-0.473	1684	7.000	-0.473
1296	7.003	-0.473	1426	7.001	-0.473	1556	7.000	-0.473	1686	7.000	-0.473
1298	7.003	-0.473	1428	7.001	-0.473	1558	7.000	-0.473	1688	7.000	-0.473
1300	7.003	-0.473	1430	7.001	-0.473	1560	7.000	-0.473	1690	7.000	-0.473
1302	7.003	-0.473	1432	7.001	-0.473	1562	7.000	-0.473	1692	7.000	-0.473
1304	7.003	-0.473	1434	7.001	-0.473	1564	7.000	-0.473	1694	7.000	-0.473
1306	7.002	-0.473	1436	7.001	-0.473	1566	7.000	-0.473	1696	7.000	-0.473
1308	7.002	-0.473	1438	7.001	-0.473	1568	7.000	-0.473	1698	7.000	-0.473
1310	7.002	-0.473	1440	7.001	-0.473	1570	7.000	-0.473	1700	7.000	-0.473
1312	7.002	-0.473	1442	7.001	-0.473	1572	7.000	-0.473	1702	7.000	-0.473
1314	7.002	-0.473	1444	7.001	-0.473	1574	7.000	-0.473	1704	7.000	-0.473
1316	7.002	-0.473	1446	7.000	-0.473	1576	7.000	-0.473	1706	7.000	-0.473
1318	7.002	-0.473	1448	7.000	-0.473	1578	7.000	-0.473	1708	7.000	-0.473
1320	7.002	-0.473	1450	7.000	-0.473	1580	7.000	-0.473	1710	7.000	-0.473
1322	7.002	-0.473	1452	7.000	-0.473	1582	7.000	-0.473	1712	7.000	-0.473
1324	7.002	-0.473	1454	7.000	-0.473	1584	7.000	-0.473	1714	7.000	-0.473
1326	7.002	-0.473	1456	7.000	-0.473	1586	7.000	-0.473	1716	7.000	-0.473
1328	7.002	-0.473	1458	7.000	-0.473	1588	7.000	-0.473	1718	7.000	-0.473
1330	7.002	-0.473	1460	7.000	-0.473	1590	7.000	-0.473	1720	7.000	-0.473
1332	7.002	-0.473	1462	7.000	-0.473	1592	7.000	-0.473	1722	7.000	-0.473
1334	7.002	-0.473	1464	7.000	-0.473	1594	7.000	-0.473	1724	7.000	-0.473
1336	7.002	-0.473	1466	7.000	-0.473	1596	7.000	-0.473	1726	7.000	-0.473
1338	7.002	-0.473	1468	7.000	-0.473	1598	7.000	-0.473	1728	7.000	-0.473
1340	7.002	-0.473	1470	7.000	-0.473	1600	7.000	-0.473	1730	7.000	-0.473
1342	7.002	-0.473	1472	7.000	-0.473	1602	7.000	-0.473	1732	7.000	-0.473
1344	7.002	-0.473	1474	7.000	-0.473	1604	7.000	-0.473	1734	7.000	-0.473
1346	7.002	-0.473	1476	7.000	-0.473	1606	7.000	-0.473	1736	7.000	-0.473
1348	7.002	-0.473	1478	7.000	-0.473	1608	7.000	-0.473	1738	7.000	-0.473
1350	7.001	-0.473	1480	7.000	-0.473	1610	7.000	-0.473	1740	7.000	-0.473
1352	7.001	-0.473	1482	7.000	-0.473	1612	7.000	-0.473	1742	7.000	-0.473
1354	7.001	-0.473	1484	7.000	-0.473	1614	7.000	-0.473	1744	7.000	-0.473
1356	7.001	-0.473	1486	7.000	-0.473	1616	7.000	-0.473	1746	7.000	-0.473
1358	7.001	-0.473	1488	7.000	-0.473	1618	7.000	-0.473	1748	7.000	-0.473
1360	7.001	-0.473	1490	7.000	-0.473	1620	7.000	-0.473	1750	7.000	-0.473
1362	7.001	-0.473	1492	7.000	-0.473	1622	7.000	-0.473	1752	7.000	-0.473
1364	7.001	-0.473	1494	7.000	-0.473	1624	7.000	-0.473	1754	7.000	-0.473
1366	7.001	-0.473	1496	7.000	-0.473	1626	7.000	-0.473	1756	7.000	-0.473
1368	7.001	-0.473	1498	7.000	-0.473	1628	7.000	-0.473	1758	7.000	-0.473
1370	7.001	-0.473	1500	7.000	-0.473	1630	7.000	-0.473	1760	7.000	-0.473
1372	7.001	-0.473	1502	7.000	-0.473	1632	7.000	-0.473	1762	7.000	-0.473
1374	7.001	-0.473	1504	7.000	-0.473	1634	7.000	-0.473	1764	7.000	-0.473
1376	7.001	-0.473	1506	7.000	-0.473	1636	7.000	-0.473	1766	7.000	-0.473
1378	7.001	-0.473	1508	7.000	-0.473	1638	7.000	-0.473	1768	7.000	-0.473
1380	7.001	-0.473	1510	7.000	-0.473	1640	7.000	-0.473	1770	7.000	-0.473
1382	7.001	-0.473	1512	7.000	-0.473	1642	7.000	-0.473	1772	7.000	-0.473
1384	7.001	-0.473	1514	7.000	-0.473	1644	7.000	-0.473	1774	7.000	-0.473
1386	7.001	-0.473	1516	7.000	-0.473	1646	7.000	-0.473	1776	7.000	-0.473
1388	7.001	-0.473	1518	7.000	-0.473	1648	7.000	-0.473	1778	7.000	-0.473
1390	7.001	-0.473	1520	7.000	-0.473	1650	7.000	-0.473	1780	7.000	-0.473
1392	7.001	-0.473	1522	7.000	-0.473	1652	7.000	-0.473	1782	7.000	-0.473

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
1784	7.000	-0.473	1914	7.000	-0.473	2044	7.000	-0.473	2174	7.000	-0.473
1786	7.000	-0.473	1916	7.000	-0.473	2046	7.000	-0.473	2176	7.000	-0.473
1788	7.000	-0.473	1918	7.000	-0.473	2048	7.000	-0.473	2178	7.000	-0.473
1790	7.000	-0.473	1920	7.000	-0.473	2050	7.000	-0.473	2180	7.000	-0.473
1792	7.000	-0.473	1922	7.000	-0.473	2052	7.000	-0.473	2182	7.000	-0.473
1794	7.000	-0.473	1924	7.000	-0.473	2054	7.000	-0.473	2184	7.000	-0.473
1796	7.000	-0.473	1926	7.000	-0.473	2056	7.000	-0.473	2186	7.000	-0.473
1798	7.000	-0.473	1928	7.000	-0.473	2058	7.000	-0.473	2188	7.000	-0.473
1800	7.000	-0.473	1930	7.000	-0.473	2060	7.000	-0.473	2190	7.000	-0.473
1802	7.000	-0.473	1932	7.000	-0.473	2062	7.000	-0.473	2192	7.000	-0.473
1804	7.000	-0.473	1934	7.000	-0.473	2064	7.000	-0.473	2194	7.000	-0.473
1806	7.000	-0.473	1936	7.000	-0.473	2066	7.000	-0.473	2196	7.000	-0.473
1808	7.000	-0.473	1938	7.000	-0.473	2068	7.000	-0.473	2198	7.000	-0.473
1810	7.000	-0.473	1940	7.000	-0.473	2070	7.000	-0.473	2200	7.000	-0.473
1812	7.000	-0.473	1942	7.000	-0.473	2072	7.000	-0.473	2202	7.000	-0.473
1814	7.000	-0.473	1944	7.000	-0.473	2074	7.000	-0.473	2204	7.000	-0.473
1816	7.000	-0.473	1946	7.000	-0.473	2076	7.000	-0.473	2206	7.000	-0.473
1818	7.000	-0.473	1948	7.000	-0.473	2078	7.000	-0.473	2208	7.000	-0.473
1820	7.000	-0.473	1950	7.000	-0.473	2080	7.000	-0.473	2210	7.000	-0.473
1822	7.000	-0.473	1952	7.000	-0.473	2082	7.000	-0.473	2212	7.000	-0.473
1824	7.000	-0.473	1954	7.000	-0.473	2084	7.000	-0.473	2214	7.000	-0.473
1826	7.000	-0.473	1956	7.000	-0.473	2086	7.000	-0.473	2216	7.000	-0.473
1828	7.000	-0.473	1958	7.000	-0.473	2088	7.000	-0.473	2218	7.000	-0.473
1830	7.000	-0.473	1960	7.000	-0.473	2090	7.000	-0.473	2220	7.000	-0.473
1832	7.000	-0.473	1962	7.000	-0.473	2092	7.000	-0.473	2222	7.000	-0.473
1834	7.000	-0.473	1964	7.000	-0.473	2094	7.000	-0.473	2224	7.000	-0.473
1836	7.000	-0.473	1966	7.000	-0.473	2096	7.000	-0.473	2226	7.000	-0.473
1838	7.000	-0.473	1968	7.000	-0.473	2098	7.000	-0.473	2228	7.000	-0.473
1840	7.000	-0.473	1970	7.000	-0.473	2100	7.000	-0.473	2230	7.000	-0.473
1842	7.000	-0.473	1972	7.000	-0.473	2102	7.000	-0.473	2232	7.000	-0.473
1844	7.000	-0.473	1974	7.000	-0.473	2104	7.000	-0.473	2234	7.000	-0.473
1846	7.000	-0.473	1976	7.000	-0.473	2106	7.000	-0.473	2236	7.000	-0.473
1848	7.000	-0.473	1978	7.000	-0.473	2108	7.000	-0.473	2238	7.000	-0.473
1850	7.000	-0.473	1980	7.000	-0.473	2110	7.000	-0.473	2240	7.000	-0.473
1852	7.000	-0.473	1982	7.000	-0.473	2112	7.000	-0.473	2242	7.000	-0.473
1854	7.000	-0.473	1984	7.000	-0.473	2114	7.000	-0.473	2244	7.000	-0.473
1856	7.000	-0.473	1986	7.000	-0.473	2116	7.000	-0.473	2246	7.000	-0.473
1858	7.000	-0.473	1988	7.000	-0.473	2118	7.000	-0.473	2248	7.000	-0.473
1860	7.000	-0.473	1990	7.000	-0.473	2120	7.000	-0.473	2250	7.000	-0.473
1862	7.000	-0.473	1992	7.000	-0.473	2122	7.000	-0.473	2252	7.000	-0.473
1864	7.000	-0.473	1994	7.000	-0.473	2124	7.000	-0.473	2254	7.000	-0.473
1866	7.000	-0.473	1996	7.000	-0.473	2126	7.000	-0.473	2256	7.000	-0.473
1868	7.000	-0.473	1998	7.000	-0.473	2128	7.000	-0.473	2258	7.000	-0.473
1870	7.000	-0.473	2000	7.000	-0.473	2130	7.000	-0.473	2260	7.000	-0.473
1872	7.000	-0.473	2002	7.000	-0.473	2132	7.000	-0.473	2262	7.000	-0.473
1874	7.000	-0.473	2004	7.000	-0.473	2134	7.000	-0.473	2264	7.000	-0.473
1876	7.000	-0.473	2006	7.000	-0.473	2136	7.000	-0.473	2266	7.000	-0.473
1878	7.000	-0.473	2008	7.000	-0.473	2138	7.000	-0.473	2268	7.000	-0.473
1880	7.000	-0.473	2010	7.000	-0.473	2140	7.000	-0.473	2270	7.000	-0.473
1882	7.000	-0.473	2012	7.000	-0.473	2142	7.000	-0.473	2272	7.000	-0.473
1884	7.000	-0.473	2014	7.000	-0.473	2144	7.000	-0.473	2274	7.000	-0.473
1886	7.000	-0.473	2016	7.000	-0.473	2146	7.000	-0.473	2276	7.000	-0.473
1888	7.000	-0.473	2018	7.000	-0.473	2148	7.000	-0.473	2278	7.000	-0.473
1890	7.000	-0.473	2020	7.000	-0.473	2150	7.000	-0.473	2280	7.000	-0.473
1892	7.000	-0.473	2022	7.000	-0.473	2152	7.000	-0.473	2282	7.000	-0.473
1894	7.000	-0.473	2024	7.000	-0.473	2154	7.000	-0.473	2284	7.000	-0.473
1896	7.000	-0.473	2026	7.000	-0.473	2156	7.000	-0.473	2286	7.000	-0.473
1898	7.000	-0.473	2028	7.000	-0.473	2158	7.000	-0.473	2288	7.000	-0.473
1900	7.000	-0.473	2030	7.000	-0.473	2160	7.000	-0.473	2290	7.000	-0.473
1902	7.000	-0.473	2032	7.000	-0.473	2162	7.000	-0.473	2292	7.000	-0.473
1904	7.000	-0.473	2034	7.000	-0.473	2164	7.000	-0.473	2294	7.000	-0.473
1906	7.000	-0.473	2036	7.000	-0.473	2166	7.000	-0.473	2296	7.000	-0.473
1908	7.000	-0.473	2038	7.000	-0.473	2168	7.000	-0.473	2298	7.000	-0.473
1910	7.000	-0.473	2040	7.000	-0.473	2170	7.000	-0.473	2300	7.000	-0.473
1912	7.000	-0.473	2042	7.000	-0.473	2172	7.000	-0.473	2302	7.000	-0.473

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
2304	7.000	-0.473	2434	7.000	-0.473	2564	7.000	-0.473	2694	7.000	-0.473
2306	7.000	-0.473	2436	7.000	-0.473	2566	7.000	-0.473	2696	7.000	-0.473
2308	7.000	-0.473	2438	7.000	-0.473	2568	7.000	-0.473	2698	7.000	-0.473
2310	7.000	-0.473	2440	7.000	-0.473	2570	7.000	-0.473	2700	7.000	-0.473
2312	7.000	-0.473	2442	7.000	-0.473	2572	7.000	-0.473	2702	7.000	-0.473
2314	7.000	-0.473	2444	7.000	-0.473	2574	7.000	-0.473	2704	7.000	-0.473
2316	7.000	-0.473	2446	7.000	-0.473	2576	7.000	-0.473	2706	7.000	-0.473
2318	7.000	-0.473	2448	7.000	-0.473	2578	7.000	-0.473	2708	7.000	-0.473
2320	7.000	-0.473	2450	7.000	-0.473	2580	7.000	-0.473	2710	7.000	-0.473
2322	7.000	-0.473	2452	7.000	-0.473	2582	7.000	-0.473	2712	7.000	-0.473
2324	7.000	-0.473	2454	7.000	-0.473	2584	7.000	-0.473	2714	7.000	-0.473
2326	7.000	-0.473	2456	7.000	-0.473	2586	7.000	-0.473	2716	7.000	-0.473
2328	7.000	-0.473	2458	7.000	-0.473	2588	7.000	-0.473	2718	7.000	-0.473
2330	7.000	-0.473	2460	7.000	-0.473	2590	7.000	-0.473	2720	7.000	-0.473
2332	7.000	-0.473	2462	7.000	-0.473	2592	7.000	-0.473	2722	7.000	-0.473
2334	7.000	-0.473	2464	7.000	-0.473	2594	7.000	-0.473	2724	7.000	-0.473
2336	7.000	-0.473	2466	7.000	-0.473	2596	7.000	-0.473	2726	7.000	-0.473
2338	7.000	-0.473	2468	7.000	-0.473	2598	7.000	-0.473	2728	7.000	-0.473
2340	7.000	-0.473	2470	7.000	-0.473	2600	7.000	-0.473	2730	7.000	-0.473
2342	7.000	-0.473	2472	7.000	-0.473	2602	7.000	-0.473	2732	7.000	-0.473
2344	7.000	-0.473	2474	7.000	-0.473	2604	7.000	-0.473	2734	7.000	-0.473
2346	7.000	-0.473	2476	7.000	-0.473	2606	7.000	-0.473	2736	7.000	-0.473
2348	7.000	-0.473	2478	7.000	-0.473	2608	7.000	-0.473	2738	7.000	-0.473
2350	7.000	-0.473	2480	7.000	-0.473	2610	7.000	-0.473	2740	7.000	-0.473
2352	7.000	-0.473	2482	7.000	-0.473	2612	7.000	-0.473	2742	7.000	-0.473
2354	7.000	-0.473	2484	7.000	-0.473	2614	7.000	-0.473	2744	7.000	-0.473
2356	7.000	-0.473	2486	7.000	-0.473	2616	7.000	-0.473	2746	7.000	-0.473
2358	7.000	-0.473	2488	7.000	-0.473	2618	7.000	-0.473	2748	7.000	-0.473
2360	7.000	-0.473	2490	7.000	-0.473	2620	7.000	-0.473	2750	7.000	-0.473
2362	7.000	-0.473	2492	7.000	-0.473	2622	7.000	-0.473	2752	7.000	-0.473
2364	7.000	-0.473	2494	7.000	-0.473	2624	7.000	-0.473	2754	7.000	-0.473
2366	7.000	-0.473	2496	7.000	-0.473	2626	7.000	-0.473	2756	7.000	-0.473
2368	7.000	-0.473	2498	7.000	-0.473	2628	7.000	-0.473	2758	7.000	-0.473
2370	7.000	-0.473	2500	7.000	-0.473	2630	7.000	-0.473	2760	7.000	-0.473
2372	7.000	-0.473	2502	7.000	-0.473	2632	7.000	-0.473	2762	7.000	-0.473
2374	7.000	-0.473	2504	7.000	-0.473	2634	7.000	-0.473	2764	7.000	-0.473
2376	7.000	-0.473	2506	7.000	-0.473	2636	7.000	-0.473	2766	7.000	-0.473
2378	7.000	-0.473	2508	7.000	-0.473	2638	7.000	-0.473	2768	7.000	-0.473
2380	7.000	-0.473	2510	7.000	-0.473	2640	7.000	-0.473	2770	7.000	-0.473
2382	7.000	-0.473	2512	7.000	-0.473	2642	7.000	-0.473	2772	7.000	-0.473
2384	7.000	-0.473	2514	7.000	-0.473	2644	7.000	-0.473	2774	7.000	-0.473
2386	7.000	-0.473	2516	7.000	-0.473	2646	7.000	-0.473	2776	7.000	-0.473
2388	7.000	-0.473	2518	7.000	-0.473	2648	7.000	-0.473	2778	7.000	-0.473
2390	7.000	-0.473	2520	7.000	-0.473	2650	7.000	-0.473	2780	7.000	-0.473
2392	7.000	-0.473	2522	7.000	-0.473	2652	7.000	-0.473	2782	7.000	-0.473
2394	7.000	-0.473	2524	7.000	-0.473	2654	7.000	-0.473	2784	7.000	-0.473
2396	7.000	-0.473	2526	7.000	-0.473	2656	7.000	-0.473	2786	7.000	-0.473
2398	7.000	-0.473	2528	7.000	-0.473	2658	7.000	-0.473	2788	7.000	-0.473
2400	7.000	-0.473	2530	7.000	-0.473	2660	7.000	-0.473	2790	7.000	-0.473
2402	7.000	-0.473	2532	7.000	-0.473	2662	7.000	-0.473	2792	7.000	-0.473
2404	7.000	-0.473	2534	7.000	-0.473	2664	7.000	-0.473	2794	7.000	-0.473
2406	7.000	-0.473	2536	7.000	-0.473	2666	7.000	-0.473	2796	7.000	-0.473
2408	7.000	-0.473	2538	7.000	-0.473	2668	7.000	-0.473	2798	7.000	-0.473
2410	7.000	-0.473	2540	7.000	-0.473	2670	7.000	-0.473	2800	7.000	-0.473
2412	7.000	-0.473	2542	7.000	-0.473	2672	7.000	-0.473	2802	7.000	-0.473
2414	7.000	-0.473	2544	7.000	-0.473	2674	7.000	-0.473	2804	7.000	-0.473
2416	7.000	-0.473	2546	7.000	-0.473	2676	7.000	-0.473	2806	7.000	-0.473
2418	7.000	-0.473	2548	7.000	-0.473	2678	7.000	-0.473	2808	7.000	-0.473
2420	7.000	-0.473	2550	7.000	-0.473	2680	7.000	-0.473	2810	7.000	-0.473
2422	7.000	-0.473	2552	7.000	-0.473	2682	7.000	-0.473	2812	7.000	-0.473
2424	7.000	-0.473	2554	7.000	-0.473	2684	7.000	-0.473	2814	7.000	-0.473
2426	7.000	-0.473	2556	7.000	-0.473	2686	7.000	-0.473	2816	7.000	-0.473
2428	7.000	-0.473	2558	7.000	-0.473	2688	7.000	-0.473	2818	7.000	-0.473
2430	7.000	-0.473	2560	7.000	-0.473	2690	7.000	-0.473	2820	7.000	-0.473
2432	7.000	-0.473	2562	7.000	-0.473	2692	7.000	-0.473	2822	7.000	-0.473

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
2824	7.000	-0.473	2840	7.000	-0.473	2856	7.000	-0.473	2872	7.000	-0.473
2826	7.000	-0.473	2842	7.000	-0.473	2858	7.000	-0.473	2874	7.000	-0.473
2828	7.000	-0.473	2844	7.000	-0.473	2860	7.000	-0.473	2876	7.000	-0.473
2830	7.000	-0.473	2846	7.000	-0.473	2862	7.000	-0.473	2878	7.000	-0.473
2832	7.000	-0.473	2848	7.000	-0.473	2864	7.000	-0.473	2880	7.000	-0.473
2834	7.000	-0.473	2850	7.000	-0.473	2866	7.000	-0.473	2882	0.000	0.000
2836	7.000	-0.473	2852	7.000	-0.473	2868	7.000	-0.473			
2838	7.000	-0.473	2854	7.000	-0.473	2870	7.000	-0.473			

Network Details

* - Indicates pipe has been modified outside of WinDes's Storm/Foul & Schedules

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
1.000	42.66	1.383	30.8	0.150	4.00	1	0.600	o	225
1.001	33.85	0.484	69.9	0.080	0.00	1	0.600	o	225
2.000	16.42	0.108	152.0	0.070	4.00	1	0.600	o	225
1.002	70.40	1.767	39.8	0.150	0.00	1	0.600	o	225
1.003	37.43	0.200	187.1	0.050	0.00	1	0.600	o	300
1.004	65.49	0.437	149.9	0.200	0.00	1	0.600	o	375
3.000	53.67	0.329	163.1	0.100	4.00	1	0.600	o	300
3.001	38.87	0.259	150.1	0.045	0.00	1	0.600	o	300
1.005	36.74	0.245	150.0	0.054	0.00	1	0.600	o	450
1.006	34.01	0.227	149.8	0.054	0.00	1	0.600	o	450
4.000	38.99	0.390	100.0	0.140	4.00	1	0.600	o	300
4.001	23.29	0.233	100.0	0.018	0.00	1	0.600	o	300
1.007	23.42	0.156	150.1	0.070	0.00	1	0.600	o	450
1.008	44.76	0.320	139.9	0.175	0.00	1	0.600	o	525
5.000	28.69	0.287	100.0	0.090	4.00	1	0.600	o	300
5.001	33.89	0.339	100.0	0.080	0.00	1	0.600	o	225
1.009	43.61	0.291	149.9	0.060	0.00	1	0.600	o	525
1.010	30.99	0.207	149.7	0.180	0.00	1	0.600	o	525
6.000	31.34	0.313	100.1	0.100	4.00	1	0.600	o	225

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
1.000	SMH49	17.278	16.000	1.053	16.185	14.617	1.343		1200
1.001	SMH48	16.185	14.617	1.343	15.825	14.133	1.467		1200
2.000	SMH44	15.647	14.241	1.181	15.825	14.133	1.467		1200
1.002	SMH45	15.825	14.133	1.467	13.731	12.366	1.140		1200
1.003	SMH46	13.731	12.291	1.140	15.613	12.091	3.222		1200
1.004	SMH47	15.613	12.016	3.222	16.567	11.579	4.613		1200
3.000	SMH50	18.318	13.850	4.168	17.397	13.521	3.576		1200
3.001	SMH51	17.397	13.520	3.577	16.567	13.261	3.006		1200
1.005	SMH52	16.567	11.504	4.613	15.450	11.259	3.741		1350
1.006	SMH53	15.450	11.259	3.741	14.415	11.032	2.933		1350
4.000	SMH54	12.879	11.425	1.154	13.906	11.035	2.571		1200
4.001	SMH55	13.906	11.035	2.571	14.415	10.802	3.313		1200
1.007	SMH56	14.415	10.800	3.165	13.602	10.644	2.508		1350
1.008	SMH57	13.602	10.574	2.503	12.059	10.254	1.280		1500
5.000	SMH58	10.871	9.450	1.121	11.464	9.163	2.001		1200
5.001	SMH59	11.464	9.160	2.079	12.059	8.821	3.013		1200
1.009	SMH60	12.059	8.800	2.734	11.273	8.509	2.239		1500
1.010	SMH61	11.273	8.500	2.248	10.474	8.293	1.656		1500
6.000	SMH62	9.948	8.603	1.120	10.161	8.290	1.646		1200

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
7.000	29.27	0.293	99.9	0.036	4.00	1	0.600	o	225
6.001	31.05	0.207	150.0	0.036	0.00	1	0.600	o	300
6.002	43.89	0.148	296.6	0.170	0.00	1	0.600	o	300
8.000	56.19	0.273	205.8	0.130	4.00	1	0.600	o	225
1.011	21.28	0.142	149.9	0.100	0.00	1	0.600	o	525
9.000	9.65	0.062	155.6	0.015	4.00	1	0.600	o	225
1.012	42.56	0.170	250.4	0.060	0.00	1	0.600	o	525

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
7.000	SMH63	10.252	8.902	1.125	10.161	8.609	1.327		1200
6.001	SMH64	10.161	8.250	1.611	10.109	8.043	1.766		1200
6.002	SMH65	10.109	8.040	1.769	10.474	7.892	2.282		1200
8.000	SMH66	9.905	8.494	1.186	10.474	8.221	2.028		1200
1.011	SMH67	10.474	7.850	2.099	9.910	7.708	1.677		1500
9.000	SMH68	8.326	7.500	0.601	9.910	7.438	2.247		1200
1.012	SMH69	9.910	7.437	1.948	8.092	7.267	0.300		1500

Summary of Results

Return Period (years)	30	Analysis Time Step	Unknown
Storm Duration (mins)	360	DTS Status	ON
Profile Type	Summer	DVD Status	OFF
Margin for Flood Risk warning (mm)	300	Inertia Status	OFF

PN	Water Lev. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	16.049	-0.176	0.000	0.11	0.0	9.5	O K
1.001	14.693	-0.149	0.000	0.25	0.0	14.6	O K
2.000	14.292	-0.174	0.000	0.12	0.0	4.4	O K
1.002	14.225	-0.133	0.000	0.36	0.0	28.5	O K
1.003	12.427	-0.164	0.000	0.42	0.0	31.7	O K
1.004	12.153	-0.238	0.000	0.29	0.0	44.3	O K
3.000	13.905	-0.245	0.000	0.08	0.0	6.3	O K
3.001	13.586	-0.234	0.000	0.11	0.0	9.2	O K
1.005	11.654	-0.300	0.000	0.25	0.0	56.9	O K
1.006	11.415	-0.294	0.000	0.26	0.0	60.4	O K
4.000	11.484	-0.241	0.000	0.09	0.0	8.9	O K
4.001	11.099	-0.236	0.000	0.10	0.0	10.0	O K
1.007	10.981	-0.269	0.000	0.34	0.0	74.8	O K
1.008	10.747	-0.352	0.000	0.24	0.0	85.9	O K
5.000	9.496	-0.254	0.000	0.06	0.0	5.7	O K
5.001	9.231	-0.154	0.000	0.22	0.0	10.8	O K
1.009	8.992	-0.333	0.000	0.29	0.0	100.2	O K
1.010	8.709	-0.316	0.000	0.34	0.0	111.5	O K
6.000	8.657	-0.171	0.000	0.13	0.0	6.3	O K
7.000	8.933	-0.194	0.000	0.05	0.0	2.3	O K
6.001	8.439	-0.111	0.000	0.13	0.0	10.9	O K
6.002	8.436	0.096	0.000	0.36	0.0	21.6	SURCH'ED
8.000	8.568	-0.151	0.000	0.24	0.0	8.2	O K
1.011	8.443	0.068	0.000	0.51	0.0	147.1	SURCH'ED
9.000	8.392	0.667	65.548	0.84	0.0	28.9	FLOOD
1.012	8.509	0.547	0.000	0.55	0.0	147.9	SURCH'ED

Rainfall Hyetograph

Region	FSR - Scotland & Ireland	Profile Type	Summer
Return Period (yrs)	30	Storm Duration (mins)	360
M5-60 (mm)	16.500		
Ratio R	0.300		

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
6	2.37	78	3.42	150	12.94	222	10.63	294	3.26
12	2.42	84	3.59	156	15.19	228	8.98	300	3.14
18	2.48	90	3.77	162	17.62	234	7.55	306	3.02
24	2.56	96	4.00	168	20.77	240	6.44	312	2.89
30	2.61	102	4.25	174	23.98	246	5.70	318	2.79
36	2.67	108	4.59	180	27.64	252	5.08	324	2.73
42	2.73	114	5.08	186	27.64	258	4.59	330	2.67
48	2.79	120	5.70	192	23.98	264	4.25	336	2.61
54	2.89	126	6.44	198	20.77	270	4.00	342	2.56
60	3.02	132	7.55	204	17.62	276	3.77	348	2.48
66	3.14	138	8.98	210	15.19	282	3.59	354	2.42
72	3.26	144	10.63	216	12.94	288	3.42	360	2.37

Appendix E -8

Surface Water Network 2 Simulation 1 in 100Yr
Infiltration Basin/Pond Source Control 1 in 100 Yr (Winter 360)

Global Variables

Region	FSR - Scotland & Ireland
Return Period (yrs)	100
M5-60 (mm)	16.500
Ratio R	0.300
Volumetric Runoff Coef	0.750
Profile Type	Summer
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	360
Hot Start (mins)	0
Hot Start Level (mm)	0
Manhole Headloss Coefficient	0.500
MADD Factor * 10m³/ha Storage	3.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	10
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of On-Line Controls	0

Starting Storm file name

F:\17-03 Kingsbridge Consultancy Ltd Blackrock\Services (May 2019)\Storm Drainage\19-05-20 Storm Drainage Network 2.sws

Surcharged Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.012	27	8.092	7.267	1500	0

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
0	0.000	0.000	56	7.131	-0.473	112	7.315	-0.473	168	7.781	-0.011
2	7.000	-0.473	58	7.137	-0.473	114	7.325	-0.467	170	7.805	0.013
4	7.000	-0.473	60	7.143	-0.473	116	7.336	-0.456	172	7.828	0.036
6	7.001	-0.473	62	7.149	-0.473	118	7.347	-0.445	174	7.852	0.060
8	7.002	-0.473	64	7.154	-0.473	120	7.358	-0.434	176	7.876	0.084
10	7.003	-0.473	66	7.160	-0.473	122	7.370	-0.422	178	7.900	0.108
12	7.006	-0.473	68	7.165	-0.473	124	7.382	-0.410	180	7.923	0.131
14	7.009	-0.473	70	7.171	-0.473	126	7.395	-0.397	182	7.947	0.155
16	7.012	-0.473	72	7.176	-0.473	128	7.408	-0.384	184	7.971	0.179
18	7.017	-0.473	74	7.182	-0.473	130	7.422	-0.370	186	7.994	0.202
20	7.021	-0.473	76	7.188	-0.473	132	7.436	-0.356	188	8.017	0.225
22	7.026	-0.473	78	7.193	-0.473	134	7.451	-0.341	190	8.039	0.247
24	7.032	-0.473	80	7.199	-0.473	136	7.467	-0.325	192	8.061	0.269
26	7.038	-0.473	82	7.205	-0.473	138	7.482	-0.310	194	8.082	0.290
28	7.043	-0.473	84	7.210	-0.473	140	7.499	-0.293	196	8.103	0.311
30	7.049	-0.473	86	7.216	-0.473	142	7.516	-0.276	198	8.123	0.331
32	7.055	-0.473	88	7.223	-0.473	144	7.533	-0.259	200	8.143	0.351
34	7.062	-0.473	90	7.229	-0.473	146	7.551	-0.241	202	8.162	0.370
36	7.068	-0.473	92	7.235	-0.473	148	7.569	-0.223	204	8.180	0.388
38	7.074	-0.473	94	7.242	-0.473	150	7.588	-0.204	206	8.198	0.406
40	7.081	-0.473	96	7.249	-0.473	152	7.608	-0.184	208	8.215	0.423
42	7.087	-0.473	98	7.256	-0.473	154	7.628	-0.164	210	8.232	0.440
44	7.094	-0.473	100	7.263	-0.473	156	7.648	-0.144	212	8.248	0.456
46	7.100	-0.473	102	7.271	-0.473	158	7.669	-0.123	214	8.263	0.471
48	7.107	-0.473	104	7.279	-0.473	160	7.691	-0.101	216	8.277	0.485
50	7.113	-0.473	106	7.288	-0.473	162	7.713	-0.079	218	8.291	0.499
52	7.119	-0.473	108	7.297	-0.473	164	7.735	-0.057	220	8.305	0.513
54	7.125	-0.473	110	7.306	-0.473	166	7.758	-0.034	222	8.317	0.525

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
224	8.329	0.537	354	8.431	0.639	484	8.143	0.351	614	7.829	0.037
226	8.340	0.548	356	8.429	0.637	486	8.138	0.346	616	7.824	0.032
228	8.351	0.559	358	8.425	0.633	488	8.134	0.342	618	7.818	0.026
230	8.361	0.569	360	8.422	0.630	490	8.130	0.338	620	7.813	0.021
232	8.371	0.579	362	8.418	0.626	492	8.125	0.333	622	7.807	0.015
234	8.380	0.588	364	8.414	0.622	494	8.121	0.329	624	7.802	0.010
236	8.388	0.596	366	8.409	0.617	496	8.116	0.324	626	7.796	0.004
238	8.396	0.604	368	8.404	0.612	498	8.112	0.320	628	7.790	-0.002
240	8.403	0.611	370	8.400	0.608	500	8.107	0.315	630	7.785	-0.007
242	8.410	0.618	372	8.395	0.603	502	8.103	0.311	632	7.779	-0.013
244	8.417	0.625	374	8.390	0.598	504	8.098	0.306	634	7.773	-0.019
246	8.423	0.631	376	8.385	0.593	506	8.094	0.302	636	7.767	-0.025
248	8.428	0.636	378	8.381	0.589	508	8.089	0.297	638	7.762	-0.030
250	8.433	0.641	380	8.376	0.584	510	8.085	0.293	640	7.756	-0.036
252	8.438	0.646	382	8.371	0.579	512	8.080	0.288	642	7.750	-0.042
254	8.442	0.650	384	8.366	0.574	514	8.075	0.283	644	7.744	-0.048
256	8.446	0.654	386	8.361	0.569	516	8.071	0.279	646	7.738	-0.054
258	8.449	0.657	388	8.357	0.565	518	8.066	0.274	648	7.732	-0.060
260	8.452	0.660	390	8.352	0.560	520	8.062	0.270	650	7.726	-0.066
262	8.455	0.663	392	8.347	0.555	522	8.057	0.265	652	7.720	-0.072
264	8.457	0.665	394	8.343	0.551	524	8.053	0.261	654	7.714	-0.078
266	8.459	0.667	396	8.338	0.546	526	8.048	0.256	656	7.708	-0.084
268	8.461	0.669	398	8.333	0.541	528	8.043	0.251	658	7.702	-0.090
270	8.462	0.670	400	8.329	0.537	530	8.039	0.247	660	7.696	-0.096
272	8.463	0.671	402	8.324	0.532	532	8.034	0.242	662	7.690	-0.102
274	8.464	0.672	404	8.319	0.527	534	8.029	0.237	664	7.684	-0.108
276	8.465	0.673	406	8.315	0.523	536	8.025	0.233	666	7.678	-0.114
278	8.466	0.674	408	8.310	0.518	538	8.020	0.228	668	7.671	-0.121
280	8.466	0.674	410	8.306	0.514	540	8.015	0.223	670	7.665	-0.127
282	8.466	0.674	412	8.301	0.509	542	8.011	0.219	672	7.659	-0.133
284	8.466	0.674	414	8.297	0.505	544	8.006	0.214	674	7.652	-0.140
286	8.466	0.674	416	8.292	0.500	546	8.001	0.209	676	7.646	-0.146
288	8.466	0.674	418	8.288	0.496	548	7.997	0.205	678	7.640	-0.152
290	8.465	0.673	420	8.283	0.491	550	7.992	0.200	680	7.633	-0.159
292	8.465	0.673	422	8.279	0.487	552	7.987	0.195	682	7.627	-0.165
294	8.464	0.672	424	8.274	0.482	554	7.982	0.190	684	7.620	-0.172
296	8.464	0.672	426	8.270	0.478	556	7.978	0.186	686	7.614	-0.178
298	8.463	0.671	428	8.265	0.473	558	7.973	0.181	688	7.607	-0.185
300	8.462	0.670	430	8.261	0.469	560	7.968	0.176	690	7.600	-0.192
302	8.461	0.669	432	8.257	0.465	562	7.963	0.171	692	7.594	-0.198
304	8.461	0.669	434	8.252	0.460	564	7.958	0.166	694	7.587	-0.205
306	8.460	0.668	436	8.248	0.456	566	7.953	0.161	696	7.580	-0.212
308	8.459	0.667	438	8.243	0.451	568	7.948	0.156	698	7.574	-0.218
310	8.458	0.666	440	8.239	0.447	570	7.943	0.151	700	7.567	-0.225
312	8.457	0.665	442	8.235	0.443	572	7.938	0.146	702	7.560	-0.232
314	8.456	0.664	444	8.230	0.438	574	7.933	0.141	704	7.554	-0.238
316	8.455	0.663	446	8.226	0.434	576	7.928	0.136	706	7.547	-0.245
318	8.455	0.663	448	8.222	0.430	578	7.923	0.131	708	7.540	-0.252
320	8.454	0.662	450	8.217	0.425	580	7.918	0.126	710	7.534	-0.258
322	8.453	0.661	452	8.213	0.421	582	7.913	0.121	712	7.527	-0.265
324	8.452	0.660	454	8.209	0.417	584	7.908	0.116	714	7.520	-0.272
326	8.451	0.659	456	8.204	0.412	586	7.903	0.111	716	7.514	-0.278
328	8.450	0.658	458	8.200	0.408	588	7.898	0.106	718	7.507	-0.285
330	8.449	0.657	460	8.196	0.404	590	7.893	0.101	720	7.500	-0.292
332	8.448	0.656	462	8.191	0.399	592	7.888	0.096	722	7.494	-0.298
334	8.447	0.655	464	8.187	0.395	594	7.883	0.091	724	7.487	-0.305
336	8.446	0.654	466	8.183	0.391	596	7.877	0.085	726	7.480	-0.312
338	8.445	0.653	468	8.178	0.386	598	7.872	0.080	728	7.474	-0.318
340	8.444	0.652	470	8.174	0.382	600	7.867	0.075	730	7.467	-0.325
342	8.443	0.651	472	8.169	0.377	602	7.861	0.069	732	7.461	-0.331
344	8.441	0.649	474	8.165	0.373	604	7.856	0.064	734	7.455	-0.337
346	8.440	0.648	476	8.161	0.369	606	7.851	0.059	736	7.448	-0.344
348	8.438	0.646	478	8.156	0.364	608	7.845	0.053	738	7.442	-0.350
350	8.436	0.644	480	8.152	0.360	610	7.840	0.048	740	7.436	-0.356
352	8.434	0.642	482	8.147	0.355	612	7.835	0.043	742	7.430	-0.362

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
744	7.423	-0.369	874	7.170	-0.473	1004	7.069	-0.473	1134	7.017	-0.473
746	7.417	-0.375	876	7.168	-0.473	1006	7.068	-0.473	1136	7.017	-0.473
748	7.411	-0.381	878	7.165	-0.473	1008	7.067	-0.473	1138	7.016	-0.473
750	7.405	-0.387	880	7.163	-0.473	1010	7.065	-0.473	1140	7.016	-0.473
752	7.399	-0.393	882	7.161	-0.473	1012	7.064	-0.473	1142	7.015	-0.473
754	7.393	-0.399	884	7.159	-0.473	1014	7.063	-0.473	1144	7.015	-0.473
756	7.388	-0.404	886	7.157	-0.473	1016	7.062	-0.473	1146	7.015	-0.473
758	7.382	-0.410	888	7.155	-0.473	1018	7.061	-0.473	1148	7.014	-0.473
760	7.376	-0.416	890	7.153	-0.473	1020	7.060	-0.473	1150	7.014	-0.473
762	7.371	-0.421	892	7.151	-0.473	1022	7.058	-0.473	1152	7.014	-0.473
764	7.365	-0.427	894	7.149	-0.473	1024	7.057	-0.473	1154	7.013	-0.473
766	7.360	-0.432	896	7.147	-0.473	1026	7.056	-0.473	1156	7.013	-0.473
768	7.355	-0.437	898	7.145	-0.473	1028	7.055	-0.473	1158	7.013	-0.473
770	7.349	-0.443	900	7.143	-0.473	1030	7.054	-0.473	1160	7.013	-0.473
772	7.344	-0.448	902	7.141	-0.473	1032	7.053	-0.473	1162	7.012	-0.473
774	7.339	-0.453	904	7.139	-0.473	1034	7.052	-0.473	1164	7.012	-0.473
776	7.334	-0.458	906	7.138	-0.473	1036	7.050	-0.473	1166	7.012	-0.473
778	7.329	-0.463	908	7.136	-0.473	1038	7.049	-0.473	1168	7.012	-0.473
780	7.325	-0.467	910	7.134	-0.473	1040	7.048	-0.473	1170	7.011	-0.473
782	7.320	-0.472	912	7.132	-0.473	1042	7.047	-0.473	1172	7.011	-0.473
784	7.315	-0.473	914	7.130	-0.473	1044	7.046	-0.473	1174	7.011	-0.473
786	7.311	-0.473	916	7.129	-0.473	1046	7.045	-0.473	1176	7.011	-0.473
788	7.306	-0.473	918	7.127	-0.473	1048	7.044	-0.473	1178	7.010	-0.473
790	7.302	-0.473	920	7.125	-0.473	1050	7.043	-0.473	1180	7.010	-0.473
792	7.297	-0.473	922	7.124	-0.473	1052	7.042	-0.473	1182	7.010	-0.473
794	7.293	-0.473	924	7.122	-0.473	1054	7.041	-0.473	1184	7.010	-0.473
796	7.289	-0.473	926	7.121	-0.473	1056	7.040	-0.473	1186	7.009	-0.473
798	7.285	-0.473	928	7.119	-0.473	1058	7.039	-0.473	1188	7.009	-0.473
800	7.281	-0.473	930	7.117	-0.473	1060	7.039	-0.473	1190	7.009	-0.473
802	7.277	-0.473	932	7.116	-0.473	1062	7.038	-0.473	1192	7.009	-0.473
804	7.273	-0.473	934	7.114	-0.473	1064	7.037	-0.473	1194	7.009	-0.473
806	7.269	-0.473	936	7.113	-0.473	1066	7.036	-0.473	1196	7.008	-0.473
808	7.265	-0.473	938	7.111	-0.473	1068	7.035	-0.473	1198	7.008	-0.473
810	7.261	-0.473	940	7.110	-0.473	1070	7.035	-0.473	1200	7.008	-0.473
812	7.258	-0.473	942	7.108	-0.473	1072	7.034	-0.473	1202	7.008	-0.473
814	7.254	-0.473	944	7.107	-0.473	1074	7.033	-0.473	1204	7.008	-0.473
816	7.251	-0.473	946	7.106	-0.473	1076	7.032	-0.473	1206	7.008	-0.473
818	7.247	-0.473	948	7.104	-0.473	1078	7.032	-0.473	1208	7.007	-0.473
820	7.244	-0.473	950	7.103	-0.473	1080	7.031	-0.473	1210	7.007	-0.473
822	7.240	-0.473	952	7.102	-0.473	1082	7.030	-0.473	1212	7.007	-0.473
824	7.237	-0.473	954	7.100	-0.473	1084	7.030	-0.473	1214	7.007	-0.473
826	7.234	-0.473	956	7.099	-0.473	1086	7.029	-0.473	1216	7.007	-0.473
828	7.230	-0.473	958	7.098	-0.473	1088	7.028	-0.473	1218	7.007	-0.473
830	7.227	-0.473	960	7.096	-0.473	1090	7.028	-0.473	1220	7.006	-0.473
832	7.224	-0.473	962	7.095	-0.473	1092	7.027	-0.473	1222	7.006	-0.473
834	7.221	-0.473	964	7.094	-0.473	1094	7.026	-0.473	1224	7.006	-0.473
836	7.218	-0.473	966	7.092	-0.473	1096	7.026	-0.473	1226	7.006	-0.473
838	7.215	-0.473	968	7.091	-0.473	1098	7.025	-0.473	1228	7.006	-0.473
840	7.212	-0.473	970	7.090	-0.473	1100	7.025	-0.473	1230	7.006	-0.473
842	7.210	-0.473	972	7.089	-0.473	1102	7.024	-0.473	1232	7.006	-0.473
844	7.207	-0.473	974	7.087	-0.473	1104	7.024	-0.473	1234	7.006	-0.473
846	7.204	-0.473	976	7.086	-0.473	1106	7.023	-0.473	1236	7.005	-0.473
848	7.202	-0.473	978	7.085	-0.473	1108	7.023	-0.473	1238	7.005	-0.473
850	7.199	-0.473	980	7.084	-0.473	1110	7.022	-0.473	1240	7.005	-0.473
852	7.196	-0.473	982	7.082	-0.473	1112	7.022	-0.473	1242	7.005	-0.473
854	7.194	-0.473	984	7.081	-0.473	1114	7.021	-0.473	1244	7.005	-0.473
856	7.191	-0.473	986	7.080	-0.473	1116	7.021	-0.473	1246	7.005	-0.473
858	7.189	-0.473	988	7.079	-0.473	1118	7.020	-0.473	1248	7.005	-0.473
860	7.186	-0.473	990	7.077	-0.473	1120	7.020	-0.473	1250	7.005	-0.473
862	7.184	-0.473	992	7.076	-0.473	1122	7.019	-0.473	1252	7.004	-0.473
864	7.181	-0.473	994	7.075	-0.473	1124	7.019	-0.473	1254	7.004	-0.473
866	7.179	-0.473	996	7.074	-0.473	1126	7.018	-0.473	1256	7.004	-0.473
868	7.177	-0.473	998	7.073	-0.473	1128	7.018	-0.473	1258	7.004	-0.473
870	7.174	-0.473	1000	7.071	-0.473	1130	7.018	-0.473	1260	7.004	-0.473
872	7.172	-0.473	1002	7.070	-0.473	1132	7.017	-0.473	1262	7.004	-0.473

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
1264	7.004	-0.473	1394	7.001	-0.473	1524	7.000	-0.473	1654	7.000	-0.473
1266	7.004	-0.473	1396	7.001	-0.473	1526	7.000	-0.473	1656	7.000	-0.473
1268	7.004	-0.473	1398	7.001	-0.473	1528	7.000	-0.473	1658	7.000	-0.473
1270	7.004	-0.473	1400	7.001	-0.473	1530	7.000	-0.473	1660	7.000	-0.473
1272	7.004	-0.473	1402	7.001	-0.473	1532	7.000	-0.473	1662	7.000	-0.473
1274	7.004	-0.473	1404	7.001	-0.473	1534	7.000	-0.473	1664	7.000	-0.473
1276	7.003	-0.473	1406	7.001	-0.473	1536	7.000	-0.473	1666	7.000	-0.473
1278	7.003	-0.473	1408	7.001	-0.473	1538	7.000	-0.473	1668	7.000	-0.473
1280	7.003	-0.473	1410	7.001	-0.473	1540	7.000	-0.473	1670	7.000	-0.473
1282	7.003	-0.473	1412	7.001	-0.473	1542	7.000	-0.473	1672	7.000	-0.473
1284	7.003	-0.473	1414	7.001	-0.473	1544	7.000	-0.473	1674	7.000	-0.473
1286	7.003	-0.473	1416	7.001	-0.473	1546	7.000	-0.473	1676	7.000	-0.473
1288	7.003	-0.473	1418	7.001	-0.473	1548	7.000	-0.473	1678	7.000	-0.473
1290	7.003	-0.473	1420	7.001	-0.473	1550	7.000	-0.473	1680	7.000	-0.473
1292	7.003	-0.473	1422	7.001	-0.473	1552	7.000	-0.473	1682	7.000	-0.473
1294	7.003	-0.473	1424	7.001	-0.473	1554	7.000	-0.473	1684	7.000	-0.473
1296	7.003	-0.473	1426	7.001	-0.473	1556	7.000	-0.473	1686	7.000	-0.473
1298	7.003	-0.473	1428	7.001	-0.473	1558	7.000	-0.473	1688	7.000	-0.473
1300	7.003	-0.473	1430	7.001	-0.473	1560	7.000	-0.473	1690	7.000	-0.473
1302	7.003	-0.473	1432	7.001	-0.473	1562	7.000	-0.473	1692	7.000	-0.473
1304	7.003	-0.473	1434	7.001	-0.473	1564	7.000	-0.473	1694	7.000	-0.473
1306	7.002	-0.473	1436	7.001	-0.473	1566	7.000	-0.473	1696	7.000	-0.473
1308	7.002	-0.473	1438	7.001	-0.473	1568	7.000	-0.473	1698	7.000	-0.473
1310	7.002	-0.473	1440	7.001	-0.473	1570	7.000	-0.473	1700	7.000	-0.473
1312	7.002	-0.473	1442	7.001	-0.473	1572	7.000	-0.473	1702	7.000	-0.473
1314	7.002	-0.473	1444	7.001	-0.473	1574	7.000	-0.473	1704	7.000	-0.473
1316	7.002	-0.473	1446	7.000	-0.473	1576	7.000	-0.473	1706	7.000	-0.473
1318	7.002	-0.473	1448	7.000	-0.473	1578	7.000	-0.473	1708	7.000	-0.473
1320	7.002	-0.473	1450	7.000	-0.473	1580	7.000	-0.473	1710	7.000	-0.473
1322	7.002	-0.473	1452	7.000	-0.473	1582	7.000	-0.473	1712	7.000	-0.473
1324	7.002	-0.473	1454	7.000	-0.473	1584	7.000	-0.473	1714	7.000	-0.473
1326	7.002	-0.473	1456	7.000	-0.473	1586	7.000	-0.473	1716	7.000	-0.473
1328	7.002	-0.473	1458	7.000	-0.473	1588	7.000	-0.473	1718	7.000	-0.473
1330	7.002	-0.473	1460	7.000	-0.473	1590	7.000	-0.473	1720	7.000	-0.473
1332	7.002	-0.473	1462	7.000	-0.473	1592	7.000	-0.473	1722	7.000	-0.473
1334	7.002	-0.473	1464	7.000	-0.473	1594	7.000	-0.473	1724	7.000	-0.473
1336	7.002	-0.473	1466	7.000	-0.473	1596	7.000	-0.473	1726	7.000	-0.473
1338	7.002	-0.473	1468	7.000	-0.473	1598	7.000	-0.473	1728	7.000	-0.473
1340	7.002	-0.473	1470	7.000	-0.473	1600	7.000	-0.473	1730	7.000	-0.473
1342	7.002	-0.473	1472	7.000	-0.473	1602	7.000	-0.473	1732	7.000	-0.473
1344	7.002	-0.473	1474	7.000	-0.473	1604	7.000	-0.473	1734	7.000	-0.473
1346	7.002	-0.473	1476	7.000	-0.473	1606	7.000	-0.473	1736	7.000	-0.473
1348	7.002	-0.473	1478	7.000	-0.473	1608	7.000	-0.473	1738	7.000	-0.473
1350	7.001	-0.473	1480	7.000	-0.473	1610	7.000	-0.473	1740	7.000	-0.473
1352	7.001	-0.473	1482	7.000	-0.473	1612	7.000	-0.473	1742	7.000	-0.473
1354	7.001	-0.473	1484	7.000	-0.473	1614	7.000	-0.473	1744	7.000	-0.473
1356	7.001	-0.473	1486	7.000	-0.473	1616	7.000	-0.473	1746	7.000	-0.473
1358	7.001	-0.473	1488	7.000	-0.473	1618	7.000	-0.473	1748	7.000	-0.473
1360	7.001	-0.473	1490	7.000	-0.473	1620	7.000	-0.473	1750	7.000	-0.473
1362	7.001	-0.473	1492	7.000	-0.473	1622	7.000	-0.473	1752	7.000	-0.473
1364	7.001	-0.473	1494	7.000	-0.473	1624	7.000	-0.473	1754	7.000	-0.473
1366	7.001	-0.473	1496	7.000	-0.473	1626	7.000	-0.473	1756	7.000	-0.473
1368	7.001	-0.473	1498	7.000	-0.473	1628	7.000	-0.473	1758	7.000	-0.473
1370	7.001	-0.473	1500	7.000	-0.473	1630	7.000	-0.473	1760	7.000	-0.473
1372	7.001	-0.473	1502	7.000	-0.473	1632	7.000	-0.473	1762	7.000	-0.473
1374	7.001	-0.473	1504	7.000	-0.473	1634	7.000	-0.473	1764	7.000	-0.473
1376	7.001	-0.473	1506	7.000	-0.473	1636	7.000	-0.473	1766	7.000	-0.473
1378	7.001	-0.473	1508	7.000	-0.473	1638	7.000	-0.473	1768	7.000	-0.473
1380	7.001	-0.473	1510	7.000	-0.473	1640	7.000	-0.473	1770	7.000	-0.473
1382	7.001	-0.473	1512	7.000	-0.473	1642	7.000	-0.473	1772	7.000	-0.473
1384	7.001	-0.473	1514	7.000	-0.473	1644	7.000	-0.473	1774	7.000	-0.473
1386	7.001	-0.473	1516	7.000	-0.473	1646	7.000	-0.473	1776	7.000	-0.473
1388	7.001	-0.473	1518	7.000	-0.473	1648	7.000	-0.473	1778	7.000	-0.473
1390	7.001	-0.473	1520	7.000	-0.473	1650	7.000	-0.473	1780	7.000	-0.473
1392	7.001	-0.473	1522	7.000	-0.473	1652	7.000	-0.473	1782	7.000	-0.473

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
1784	7.000	-0.473	1914	7.000	-0.473	2044	7.000	-0.473	2174	7.000	-0.473
1786	7.000	-0.473	1916	7.000	-0.473	2046	7.000	-0.473	2176	7.000	-0.473
1788	7.000	-0.473	1918	7.000	-0.473	2048	7.000	-0.473	2178	7.000	-0.473
1790	7.000	-0.473	1920	7.000	-0.473	2050	7.000	-0.473	2180	7.000	-0.473
1792	7.000	-0.473	1922	7.000	-0.473	2052	7.000	-0.473	2182	7.000	-0.473
1794	7.000	-0.473	1924	7.000	-0.473	2054	7.000	-0.473	2184	7.000	-0.473
1796	7.000	-0.473	1926	7.000	-0.473	2056	7.000	-0.473	2186	7.000	-0.473
1798	7.000	-0.473	1928	7.000	-0.473	2058	7.000	-0.473	2188	7.000	-0.473
1800	7.000	-0.473	1930	7.000	-0.473	2060	7.000	-0.473	2190	7.000	-0.473
1802	7.000	-0.473	1932	7.000	-0.473	2062	7.000	-0.473	2192	7.000	-0.473
1804	7.000	-0.473	1934	7.000	-0.473	2064	7.000	-0.473	2194	7.000	-0.473
1806	7.000	-0.473	1936	7.000	-0.473	2066	7.000	-0.473	2196	7.000	-0.473
1808	7.000	-0.473	1938	7.000	-0.473	2068	7.000	-0.473	2198	7.000	-0.473
1810	7.000	-0.473	1940	7.000	-0.473	2070	7.000	-0.473	2200	7.000	-0.473
1812	7.000	-0.473	1942	7.000	-0.473	2072	7.000	-0.473	2202	7.000	-0.473
1814	7.000	-0.473	1944	7.000	-0.473	2074	7.000	-0.473	2204	7.000	-0.473
1816	7.000	-0.473	1946	7.000	-0.473	2076	7.000	-0.473	2206	7.000	-0.473
1818	7.000	-0.473	1948	7.000	-0.473	2078	7.000	-0.473	2208	7.000	-0.473
1820	7.000	-0.473	1950	7.000	-0.473	2080	7.000	-0.473	2210	7.000	-0.473
1822	7.000	-0.473	1952	7.000	-0.473	2082	7.000	-0.473	2212	7.000	-0.473
1824	7.000	-0.473	1954	7.000	-0.473	2084	7.000	-0.473	2214	7.000	-0.473
1826	7.000	-0.473	1956	7.000	-0.473	2086	7.000	-0.473	2216	7.000	-0.473
1828	7.000	-0.473	1958	7.000	-0.473	2088	7.000	-0.473	2218	7.000	-0.473
1830	7.000	-0.473	1960	7.000	-0.473	2090	7.000	-0.473	2220	7.000	-0.473
1832	7.000	-0.473	1962	7.000	-0.473	2092	7.000	-0.473	2222	7.000	-0.473
1834	7.000	-0.473	1964	7.000	-0.473	2094	7.000	-0.473	2224	7.000	-0.473
1836	7.000	-0.473	1966	7.000	-0.473	2096	7.000	-0.473	2226	7.000	-0.473
1838	7.000	-0.473	1968	7.000	-0.473	2098	7.000	-0.473	2228	7.000	-0.473
1840	7.000	-0.473	1970	7.000	-0.473	2100	7.000	-0.473	2230	7.000	-0.473
1842	7.000	-0.473	1972	7.000	-0.473	2102	7.000	-0.473	2232	7.000	-0.473
1844	7.000	-0.473	1974	7.000	-0.473	2104	7.000	-0.473	2234	7.000	-0.473
1846	7.000	-0.473	1976	7.000	-0.473	2106	7.000	-0.473	2236	7.000	-0.473
1848	7.000	-0.473	1978	7.000	-0.473	2108	7.000	-0.473	2238	7.000	-0.473
1850	7.000	-0.473	1980	7.000	-0.473	2110	7.000	-0.473	2240	7.000	-0.473
1852	7.000	-0.473	1982	7.000	-0.473	2112	7.000	-0.473	2242	7.000	-0.473
1854	7.000	-0.473	1984	7.000	-0.473	2114	7.000	-0.473	2244	7.000	-0.473
1856	7.000	-0.473	1986	7.000	-0.473	2116	7.000	-0.473	2246	7.000	-0.473
1858	7.000	-0.473	1988	7.000	-0.473	2118	7.000	-0.473	2248	7.000	-0.473
1860	7.000	-0.473	1990	7.000	-0.473	2120	7.000	-0.473	2250	7.000	-0.473
1862	7.000	-0.473	1992	7.000	-0.473	2122	7.000	-0.473	2252	7.000	-0.473
1864	7.000	-0.473	1994	7.000	-0.473	2124	7.000	-0.473	2254	7.000	-0.473
1866	7.000	-0.473	1996	7.000	-0.473	2126	7.000	-0.473	2256	7.000	-0.473
1868	7.000	-0.473	1998	7.000	-0.473	2128	7.000	-0.473	2258	7.000	-0.473
1870	7.000	-0.473	2000	7.000	-0.473	2130	7.000	-0.473	2260	7.000	-0.473
1872	7.000	-0.473	2002	7.000	-0.473	2132	7.000	-0.473	2262	7.000	-0.473
1874	7.000	-0.473	2004	7.000	-0.473	2134	7.000	-0.473	2264	7.000	-0.473
1876	7.000	-0.473	2006	7.000	-0.473	2136	7.000	-0.473	2266	7.000	-0.473
1878	7.000	-0.473	2008	7.000	-0.473	2138	7.000	-0.473	2268	7.000	-0.473
1880	7.000	-0.473	2010	7.000	-0.473	2140	7.000	-0.473	2270	7.000	-0.473
1882	7.000	-0.473	2012	7.000	-0.473	2142	7.000	-0.473	2272	7.000	-0.473
1884	7.000	-0.473	2014	7.000	-0.473	2144	7.000	-0.473	2274	7.000	-0.473
1886	7.000	-0.473	2016	7.000	-0.473	2146	7.000	-0.473	2276	7.000	-0.473
1888	7.000	-0.473	2018	7.000	-0.473	2148	7.000	-0.473	2278	7.000	-0.473
1890	7.000	-0.473	2020	7.000	-0.473	2150	7.000	-0.473	2280	7.000	-0.473
1892	7.000	-0.473	2022	7.000	-0.473	2152	7.000	-0.473	2282	7.000	-0.473
1894	7.000	-0.473	2024	7.000	-0.473	2154	7.000	-0.473	2284	7.000	-0.473
1896	7.000	-0.473	2026	7.000	-0.473	2156	7.000	-0.473	2286	7.000	-0.473
1898	7.000	-0.473	2028	7.000	-0.473	2158	7.000	-0.473	2288	7.000	-0.473
1900	7.000	-0.473	2030	7.000	-0.473	2160	7.000	-0.473	2290	7.000	-0.473
1902	7.000	-0.473	2032	7.000	-0.473	2162	7.000	-0.473	2292	7.000	-0.473
1904	7.000	-0.473	2034	7.000	-0.473	2164	7.000	-0.473	2294	7.000	-0.473
1906	7.000	-0.473	2036	7.000	-0.473	2166	7.000	-0.473	2296	7.000	-0.473
1908	7.000	-0.473	2038	7.000	-0.473	2168	7.000	-0.473	2298	7.000	-0.473
1910	7.000	-0.473	2040	7.000	-0.473	2170	7.000	-0.473	2300	7.000	-0.473
1912	7.000	-0.473	2042	7.000	-0.473	2172	7.000	-0.473	2302	7.000	-0.473

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
2304	7.000	-0.473	2434	7.000	-0.473	2564	7.000	-0.473	2694	7.000	-0.473
2306	7.000	-0.473	2436	7.000	-0.473	2566	7.000	-0.473	2696	7.000	-0.473
2308	7.000	-0.473	2438	7.000	-0.473	2568	7.000	-0.473	2698	7.000	-0.473
2310	7.000	-0.473	2440	7.000	-0.473	2570	7.000	-0.473	2700	7.000	-0.473
2312	7.000	-0.473	2442	7.000	-0.473	2572	7.000	-0.473	2702	7.000	-0.473
2314	7.000	-0.473	2444	7.000	-0.473	2574	7.000	-0.473	2704	7.000	-0.473
2316	7.000	-0.473	2446	7.000	-0.473	2576	7.000	-0.473	2706	7.000	-0.473
2318	7.000	-0.473	2448	7.000	-0.473	2578	7.000	-0.473	2708	7.000	-0.473
2320	7.000	-0.473	2450	7.000	-0.473	2580	7.000	-0.473	2710	7.000	-0.473
2322	7.000	-0.473	2452	7.000	-0.473	2582	7.000	-0.473	2712	7.000	-0.473
2324	7.000	-0.473	2454	7.000	-0.473	2584	7.000	-0.473	2714	7.000	-0.473
2326	7.000	-0.473	2456	7.000	-0.473	2586	7.000	-0.473	2716	7.000	-0.473
2328	7.000	-0.473	2458	7.000	-0.473	2588	7.000	-0.473	2718	7.000	-0.473
2330	7.000	-0.473	2460	7.000	-0.473	2590	7.000	-0.473	2720	7.000	-0.473
2332	7.000	-0.473	2462	7.000	-0.473	2592	7.000	-0.473	2722	7.000	-0.473
2334	7.000	-0.473	2464	7.000	-0.473	2594	7.000	-0.473	2724	7.000	-0.473
2336	7.000	-0.473	2466	7.000	-0.473	2596	7.000	-0.473	2726	7.000	-0.473
2338	7.000	-0.473	2468	7.000	-0.473	2598	7.000	-0.473	2728	7.000	-0.473
2340	7.000	-0.473	2470	7.000	-0.473	2600	7.000	-0.473	2730	7.000	-0.473
2342	7.000	-0.473	2472	7.000	-0.473	2602	7.000	-0.473	2732	7.000	-0.473
2344	7.000	-0.473	2474	7.000	-0.473	2604	7.000	-0.473	2734	7.000	-0.473
2346	7.000	-0.473	2476	7.000	-0.473	2606	7.000	-0.473	2736	7.000	-0.473
2348	7.000	-0.473	2478	7.000	-0.473	2608	7.000	-0.473	2738	7.000	-0.473
2350	7.000	-0.473	2480	7.000	-0.473	2610	7.000	-0.473	2740	7.000	-0.473
2352	7.000	-0.473	2482	7.000	-0.473	2612	7.000	-0.473	2742	7.000	-0.473
2354	7.000	-0.473	2484	7.000	-0.473	2614	7.000	-0.473	2744	7.000	-0.473
2356	7.000	-0.473	2486	7.000	-0.473	2616	7.000	-0.473	2746	7.000	-0.473
2358	7.000	-0.473	2488	7.000	-0.473	2618	7.000	-0.473	2748	7.000	-0.473
2360	7.000	-0.473	2490	7.000	-0.473	2620	7.000	-0.473	2750	7.000	-0.473
2362	7.000	-0.473	2492	7.000	-0.473	2622	7.000	-0.473	2752	7.000	-0.473
2364	7.000	-0.473	2494	7.000	-0.473	2624	7.000	-0.473	2754	7.000	-0.473
2366	7.000	-0.473	2496	7.000	-0.473	2626	7.000	-0.473	2756	7.000	-0.473
2368	7.000	-0.473	2498	7.000	-0.473	2628	7.000	-0.473	2758	7.000	-0.473
2370	7.000	-0.473	2500	7.000	-0.473	2630	7.000	-0.473	2760	7.000	-0.473
2372	7.000	-0.473	2502	7.000	-0.473	2632	7.000	-0.473	2762	7.000	-0.473
2374	7.000	-0.473	2504	7.000	-0.473	2634	7.000	-0.473	2764	7.000	-0.473
2376	7.000	-0.473	2506	7.000	-0.473	2636	7.000	-0.473	2766	7.000	-0.473
2378	7.000	-0.473	2508	7.000	-0.473	2638	7.000	-0.473	2768	7.000	-0.473
2380	7.000	-0.473	2510	7.000	-0.473	2640	7.000	-0.473	2770	7.000	-0.473
2382	7.000	-0.473	2512	7.000	-0.473	2642	7.000	-0.473	2772	7.000	-0.473
2384	7.000	-0.473	2514	7.000	-0.473	2644	7.000	-0.473	2774	7.000	-0.473
2386	7.000	-0.473	2516	7.000	-0.473	2646	7.000	-0.473	2776	7.000	-0.473
2388	7.000	-0.473	2518	7.000	-0.473	2648	7.000	-0.473	2778	7.000	-0.473
2390	7.000	-0.473	2520	7.000	-0.473	2650	7.000	-0.473	2780	7.000	-0.473
2392	7.000	-0.473	2522	7.000	-0.473	2652	7.000	-0.473	2782	7.000	-0.473
2394	7.000	-0.473	2524	7.000	-0.473	2654	7.000	-0.473	2784	7.000	-0.473
2396	7.000	-0.473	2526	7.000	-0.473	2656	7.000	-0.473	2786	7.000	-0.473
2398	7.000	-0.473	2528	7.000	-0.473	2658	7.000	-0.473	2788	7.000	-0.473
2400	7.000	-0.473	2530	7.000	-0.473	2660	7.000	-0.473	2790	7.000	-0.473
2402	7.000	-0.473	2532	7.000	-0.473	2662	7.000	-0.473	2792	7.000	-0.473
2404	7.000	-0.473	2534	7.000	-0.473	2664	7.000	-0.473	2794	7.000	-0.473
2406	7.000	-0.473	2536	7.000	-0.473	2666	7.000	-0.473	2796	7.000	-0.473
2408	7.000	-0.473	2538	7.000	-0.473	2668	7.000	-0.473	2798	7.000	-0.473
2410	7.000	-0.473	2540	7.000	-0.473	2670	7.000	-0.473	2800	7.000	-0.473
2412	7.000	-0.473	2542	7.000	-0.473	2672	7.000	-0.473	2802	7.000	-0.473
2414	7.000	-0.473	2544	7.000	-0.473	2674	7.000	-0.473	2804	7.000	-0.473
2416	7.000	-0.473	2546	7.000	-0.473	2676	7.000	-0.473	2806	7.000	-0.473
2418	7.000	-0.473	2548	7.000	-0.473	2678	7.000	-0.473	2808	7.000	-0.473
2420	7.000	-0.473	2550	7.000	-0.473	2680	7.000	-0.473	2810	7.000	-0.473
2422	7.000	-0.473	2552	7.000	-0.473	2682	7.000	-0.473	2812	7.000	-0.473
2424	7.000	-0.473	2554	7.000	-0.473	2684	7.000	-0.473	2814	7.000	-0.473
2426	7.000	-0.473	2556	7.000	-0.473	2686	7.000	-0.473	2816	7.000	-0.473
2428	7.000	-0.473	2558	7.000	-0.473	2688	7.000	-0.473	2818	7.000	-0.473
2430	7.000	-0.473	2560	7.000	-0.473	2690	7.000	-0.473	2820	7.000	-0.473
2432	7.000	-0.473	2562	7.000	-0.473	2692	7.000	-0.473	2822	7.000	-0.473

Surcharged Outfalls

Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)	Time (mins)	Level (m)	Depth (m)
2824	7.000	-0.473	2840	7.000	-0.473	2856	7.000	-0.473	2872	7.000	-0.473
2826	7.000	-0.473	2842	7.000	-0.473	2858	7.000	-0.473	2874	7.000	-0.473
2828	7.000	-0.473	2844	7.000	-0.473	2860	7.000	-0.473	2876	7.000	-0.473
2830	7.000	-0.473	2846	7.000	-0.473	2862	7.000	-0.473	2878	7.000	-0.473
2832	7.000	-0.473	2848	7.000	-0.473	2864	7.000	-0.473	2880	7.000	-0.473
2834	7.000	-0.473	2850	7.000	-0.473	2866	7.000	-0.473	2882	0.000	0.000
2836	7.000	-0.473	2852	7.000	-0.473	2868	7.000	-0.473			
2838	7.000	-0.473	2854	7.000	-0.473	2870	7.000	-0.473			

Network Details

* - Indicates pipe has been modified outside of WinDes's Storm/Foul & Schedules

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
1.000	42.66	1.383	30.8	0.150	4.00	1	0.600	o	225
1.001	33.85	0.484	69.9	0.080	0.00	1	0.600	o	225
2.000	16.42	0.108	152.0	0.070	4.00	1	0.600	o	225
1.002	70.40	1.767	39.8	0.150	0.00	1	0.600	o	225
1.003	37.43	0.200	187.1	0.050	0.00	1	0.600	o	300
1.004	65.49	0.437	149.9	0.200	0.00	1	0.600	o	375
3.000	53.67	0.329	163.1	0.100	4.00	1	0.600	o	300
3.001	38.87	0.259	150.1	0.045	0.00	1	0.600	o	300
1.005	36.74	0.245	150.0	0.054	0.00	1	0.600	o	450
1.006	34.01	0.227	149.8	0.054	0.00	1	0.600	o	450
4.000	38.99	0.390	100.0	0.140	4.00	1	0.600	o	300
4.001	23.29	0.233	100.0	0.018	0.00	1	0.600	o	300
1.007	23.42	0.156	150.1	0.070	0.00	1	0.600	o	450
1.008	44.76	0.320	139.9	0.175	0.00	1	0.600	o	525
5.000	28.69	0.287	100.0	0.090	4.00	1	0.600	o	300
5.001	33.89	0.339	100.0	0.080	0.00	1	0.600	o	225
1.009	43.61	0.291	149.9	0.060	0.00	1	0.600	o	525
1.010	30.99	0.207	149.7	0.180	0.00	1	0.600	o	525
6.000	31.34	0.313	100.1	0.100	4.00	1	0.600	o	225

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
1.000	SMH49	17.278	16.000	1.053	16.185	14.617	1.343		1200
1.001	SMH48	16.185	14.617	1.343	15.825	14.133	1.467		1200
2.000	SMH44	15.647	14.241	1.181	15.825	14.133	1.467		1200
1.002	SMH45	15.825	14.133	1.467	13.731	12.366	1.140		1200
1.003	SMH46	13.731	12.291	1.140	15.613	12.091	3.222		1200
1.004	SMH47	15.613	12.016	3.222	16.567	11.579	4.613		1200
3.000	SMH50	18.318	13.850	4.168	17.397	13.521	3.576		1200
3.001	SMH51	17.397	13.520	3.577	16.567	13.261	3.006		1200
1.005	SMH52	16.567	11.504	4.613	15.450	11.259	3.741		1350
1.006	SMH53	15.450	11.259	3.741	14.415	11.032	2.933		1350
4.000	SMH54	12.879	11.425	1.154	13.906	11.035	2.571		1200
4.001	SMH55	13.906	11.035	2.571	14.415	10.802	3.313		1200
1.007	SMH56	14.415	10.800	3.165	13.602	10.644	2.508		1350
1.008	SMH57	13.602	10.574	2.503	12.059	10.254	1.280		1500
5.000	SMH58	10.871	9.450	1.121	11.464	9.163	2.001		1200
5.001	SMH59	11.464	9.160	2.079	12.059	8.821	3.013		1200
1.009	SMH60	12.059	8.800	2.734	11.273	8.509	2.239		1500
1.010	SMH61	11.273	8.500	2.248	10.474	8.293	1.656		1500
6.000	SMH62	9.948	8.603	1.120	10.161	8.290	1.646		1200

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
7.000	29.27	0.293	99.9	0.036	4.00	1	0.600	o	225
6.001	31.05	0.207	150.0	0.036	0.00	1	0.600	o	300
6.002	43.89	0.148	296.6	0.170	0.00	1	0.600	o	300
8.000	56.19	0.273	205.8	0.130	4.00	1	0.600	o	225
1.011	21.28	0.142	149.9	0.100	0.00	1	0.600	o	525
9.000	9.65	0.062	155.6	0.015	4.00	1	0.600	o	225
1.012	42.56	0.170	250.4	0.060	0.00	1	0.600	o	525

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
7.000	SMH63	10.252	8.902	1.125	10.161	8.609	1.327		1200
6.001	SMH64	10.161	8.250	1.611	10.109	8.043	1.766		1200
6.002	SMH65	10.109	8.040	1.769	10.474	7.892	2.282		1200
8.000	SMH66	9.905	8.494	1.186	10.474	8.221	2.028		1200
1.011	SMH67	10.474	7.850	2.099	9.910	7.708	1.677		1500
9.000	SMH68	8.326	7.500	0.601	9.910	7.438	2.247		1200
1.012	SMH69	9.910	7.437	1.948	8.092	7.267	0.300		1500

Summary of Results

Return Period (years)	100	Analysis Time Step	Fine
Storm Duration (mins)	360	DTS Status	ON
Profile Type	Summer	DVD Status	OFF
Margin for Flood Risk warning (mm)	300	Inertia Status	OFF

PN	Water Lev. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	16.055	-0.170	0.000	0.13	0.0	12.1	O K
1.001	14.703	-0.139	0.000	0.32	0.0	18.5	O K
2.000	14.299	-0.167	0.000	0.15	0.0	5.6	O K
1.002	14.239	-0.119	0.000	0.45	0.0	36.2	O K
1.003	12.447	-0.144	0.000	0.54	0.0	40.2	O K
1.004	12.173	-0.218	0.000	0.37	0.0	56.2	O K
3.000	13.913	-0.237	0.000	0.10	0.0	8.0	O K
3.001	13.594	-0.226	0.000	0.14	0.0	11.7	O K
1.005	11.675	-0.279	0.000	0.31	0.0	72.2	O K
1.006	11.437	-0.272	0.000	0.33	0.0	76.6	O K
4.000	11.491	-0.234	0.000	0.11	0.0	11.2	O K
4.001	11.106	-0.229	0.000	0.13	0.0	12.7	O K
1.007	11.007	-0.243	0.000	0.43	0.0	94.9	O K
1.008	10.771	-0.328	0.000	0.30	0.0	108.8	O K
5.000	9.503	-0.247	0.000	0.07	0.0	7.2	O K
5.001	9.241	-0.144	0.000	0.28	0.0	13.7	O K
1.009	9.019	-0.306	0.000	0.37	0.0	127.0	O K
1.010	8.739	-0.286	0.000	0.42	0.0	141.3	O K
6.000	8.664	-0.164	0.000	0.17	0.0	8.0	O K
7.000	8.937	-0.190	0.000	0.06	0.0	2.9	O K
6.001	8.451	-0.099	0.000	0.17	0.0	13.8	O K
6.002	8.447	0.107	0.000	0.46	0.0	27.4	SURCH'ED
8.000	8.578	-0.141	0.000	0.30	0.0	10.4	O K
1.011	8.441	0.066	0.000	0.65	0.0	186.6	SURCH'ED
9.000	8.370	0.645	44.392	-0.77	0.0	-26.5	FLOOD
1.012	8.432	0.470	0.000	0.70	0.0	188.3	SURCH'ED

Rainfall Hyetograph

Region	FSR - Scotland & Ireland	Profile Type	Summer
Return Period (yrs)	100	Storm Duration (mins)	360
M5-60 (mm)	16.500		
Ratio R	0.300		

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
6	3.00	78	4.34	150	16.42	222	13.49	294	4.13
12	3.08	84	4.56	156	19.27	228	11.40	300	3.98
18	3.15	90	4.78	162	22.35	234	9.58	306	3.84
24	3.24	96	5.08	168	26.35	240	8.17	312	3.67
30	3.32	102	5.39	174	30.43	246	7.23	318	3.54
36	3.39	108	5.82	180	35.06	252	6.45	324	3.47
42	3.47	114	6.45	186	35.06	258	5.82	330	3.39
48	3.54	120	7.23	192	30.43	264	5.39	336	3.32
54	3.67	126	8.17	198	26.35	270	5.08	342	3.24
60	3.84	132	9.58	204	22.35	276	4.78	348	3.15
66	3.98	138	11.40	210	19.27	282	4.56	354	3.08
72	4.13	144	13.49	216	16.42	288	4.34	360	3.00

Appendix F

Foul Sewer Hydraulic Load Calculation

CLIENT: Kingsbridge Consultancy Ltd	**DATE:**	17/05/2019	finn DESIGN PARTNERSHIP
PROJECT NAME: Proposed Residential Development @ Haggardstown, Blackrock, Dundalk, Co Louth.	**CALCULATION SHEET:**	1 OF 1	
CALCULATION: Wastewater Hydraulic Load Calculation	**PROJECT REFERENCE:**	1704	

Foul Drainage

Housing Units	500	no.
Creche	1	no.
Dry Weather Flow (DWF-Dwelling) per person[1]	150	lts/person/day
Dry Weather Flow (DWF-Creche) per person[7]	60	lts/person/day
Average Occupancy Rate per dwelling[2]	3	
Creche Occupancy	120	People
Total Site Occupancy	1620	People
Total Discharge from Site	232,200	lts
Peak Flow Discharge[3]	6	
Post Development Average Discharge	2.69	lts/sec
Post Development Peak Discharge[4]	16.13	lts/sec

Foul Sewer Organic

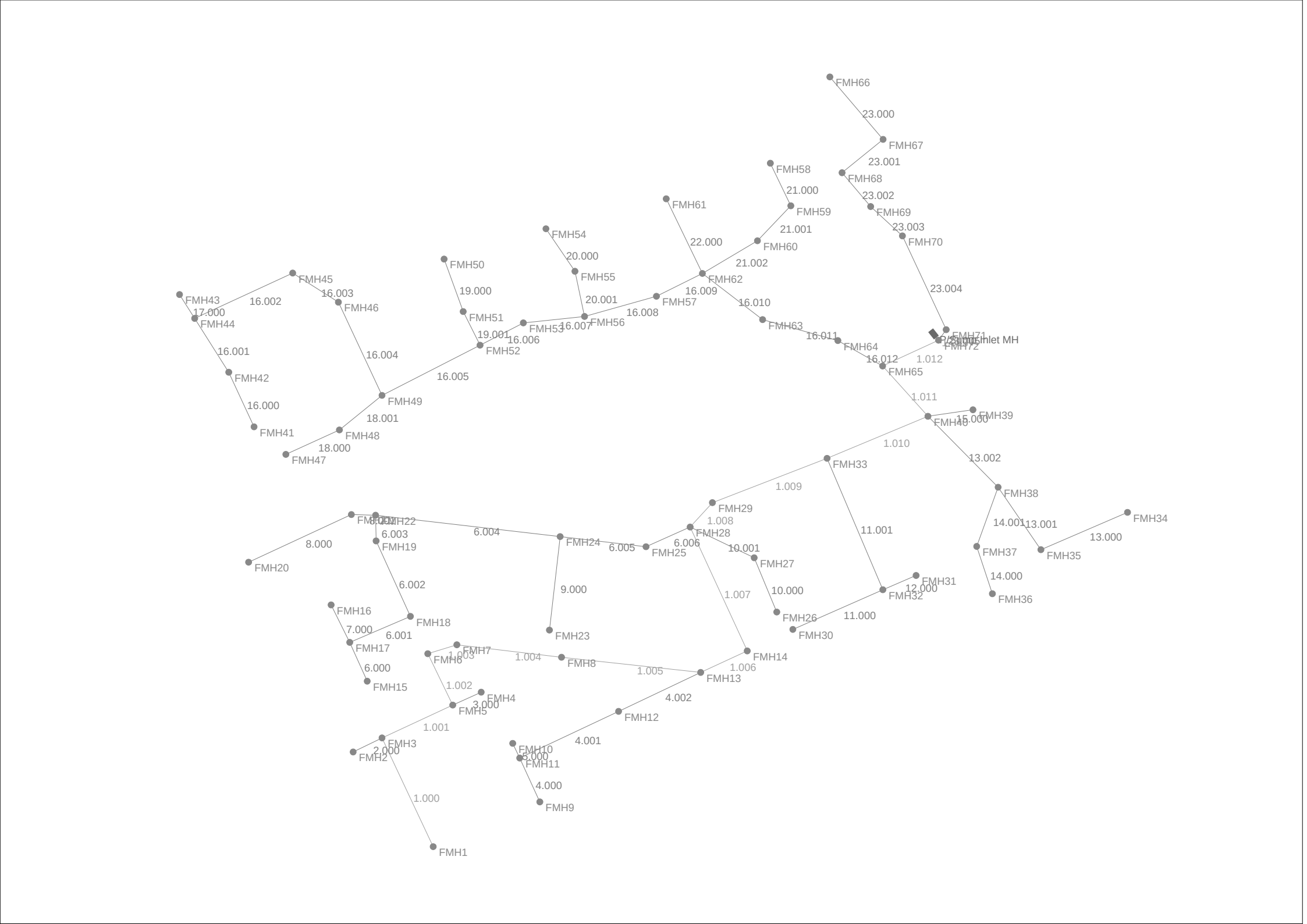
	Average Concentration[5]	Maximum Concentration[6]		Average Concentration	Maximum Concentration	
BOD (mg/l)	168	422	BOD total (Kg/day) for site	47	117	
SS (mg/l)	163	435	SS total (Kg/day) for site	45	121	
N (mg/l)	40.6	78.6	N total (Kg/day) for site	11	22	
P (mg/l)	7.1	15.5	P (Kg/day) for site	2	4.3	

Notes:

1. Dry Weather Flow (DWF) is 200 litres/person/day from the - Irish Water Code of Practice
2. Occupancy ratio of 3 persons per dwelling from Irish Water Code of Practice
3. The Peak Flow factor is taken as 6 times Dry Weather Flow
4. The peak discharge is equal to the Average Discharge multiplied by the peak flow factor, expressed in litres/second.
5. The average concentrations of wastewater parameters taken from EPA "Wastewater Treatment Manuals, Treatment Systems or Small Communities, Business, Leisure Centres and Hotels".
6. 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,
7. Dry Weather Flow (DWF) for creche taken from EPA "Wastewater Treatment Manuals, Treatment Systems for Small Communities, Business, Leisure Centres and Hotels".

Appendix G

Foul Sewer Network Calculations


FMH66
23.000
FMH67
23.001
FMH68
23.002
FMH69
23.003
FMH70
23.004
FMH58
21.000
FMH59
21.001
FMH60
21.002
FMH61
22.000
FMH62
16.009
16.010
FMH63
16.011
FMH64
16.012
FMH65
1.012
1.011
FMH39
15.000
FMH40
1.010
13.002
FMH38
14.001
13.001
FMH34
13.000
FMH35
FMH37
14.000
FMH36
FMH33
1.009
11.001
FMH31
12.000
FMH32
11.000
FMH30
FMH29
1.008
10.001
FMH27
10.000
FMH26
1.007
FMH28
6.006
6.005
FMH25
6.004
FMH24
9.000
FMH23
6.003
FMH19
8.000
FMH20
6.002
FMH16
7.000
6.001
FMH18
FMH17
6.000
FMH15
1.003
FMH7
1.004
FMH8
1.005
FMH14
1.006
FMH13
4.002
FMH12
4.001
FMH10
5.000
FMH11
4.000
FMH9
1.002
FMH4
3.000
FMH5
1.001
FMH3
2.000
FMH2
1.000
FMH1
FMH54
20.000
FMH55
20.001
FMH56
16.008
FMH57
16.007
FMH53
19.001
16.006
FMH52
16.005
FMH50
19.000
FMH51
FMH45
16.003
FMH46
16.004
FMH43
16.002
17.000
FMH44
16.001
FMH42
16.000
FMH41
FMH49
18.001
FMH48
18.000
FMH47

FOUL SEWERAGE DESIGN

Global Variables

Pipe Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.PIP
Manhole Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.MHS

Industrial Flow (l/s/ha)	0.00
Industrial Peak Flow Factor	0.00
Flow Per Person (l/per/day)	150.00
Persons per House	3.00
Domestic (l/s/ha)	0.00
Domestic Peak Flow Factor	6.00
O'flow Setting (*Foul only)	0
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Cover Depth for Optimisation (m)	1.200
Min Vel for Auto Design Only (m/s)	0.80
Min Slope for Optimisation (1:X)	200
Minimum Outfall Invert (m)	5.585
Ground Level at Outfall (m)	8.723
Outfall Manhole Name	P/Sump Inlet MH
Outfall Manhole Dia/Length (mm)	3000
Outfall Manhole Width (mm)	3000

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Hse	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	75.83	2.053	36.9	0.000	6	0.0	1.500	o	150
2.000	20.21	0.322	62.8	0.000	2	0.0	1.500	o	150
1.001	49.21	0.394	124.9	0.000	7	0.0	1.500	o	150
3.000	19.79	0.198	99.9	0.000	2	0.0	1.500	o	150
1.002	36.03	0.288	125.1	0.000	0	0.0	1.500	o	150
1.003	19.19	0.154	124.6	0.000	2	0.0	1.500	o	150
1.004	66.48	1.469	45.3	0.000	8	0.0	1.500	o	225
1.005	88.43	2.010	44.0	0.000	8	0.0	1.500	o	225

Network Results Table

PN	US/IL (m)	E.Area (ha)	E.DWF (l/s)	E.Hse	Infil. (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	21.753	0.000	0.0	6	0.0	9	0.40	1.44	25.5	0.2
2.000	20.000	0.000	0.0	2	0.0	7	0.23	1.11	19.6	0.1
1.001	19.650	0.000	0.0	15	0.0	19	0.36	0.78	13.8	0.5
3.000	19.878	0.000	0.0	2	0.0	7	0.20	0.88	15.5	0.1
1.002	19.256	0.000	0.0	17	0.0	20	0.37	0.78	13.8	0.5
1.003	18.968	0.000	0.0	19	0.0	21	0.38	0.78	13.9	0.6
1.004	18.739	0.000	0.0	27	0.0	18	0.57	1.71	67.9	0.8
1.005	17.270	0.000	0.0	35	0.0	20	0.63	1.73	68.9	1.1

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Hse	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
4.000	30.47	0.595	51.2	0.000	4	0.0	1.500	o	150
5.000	10.26	0.103	99.6	0.000	2	0.0	1.500	o	150
4.001	68.98	2.299	30.0	0.000	6	0.0	1.500	o	150
4.002	57.39	1.730	33.2	0.000	9	0.0	1.500	o	150
1.006	32.36	1.085	29.8	0.000	4	0.0	1.500	o	225
1.007	86.09	1.186	72.6	0.000	9	0.0	1.500	o	225
6.000	26.89	0.738	36.4	0.000	2	0.0	1.500	o	150
7.000	26.45	0.265	99.8	0.000	3	0.0	1.500	o	150
6.001	41.71	0.278	150.0	0.000	7	0.0	1.500	o	150
6.002	52.32	0.349	149.9	0.000	3	0.0	1.500	o	150
6.003	16.16	0.082	197.1	0.000	0	0.0	1.500	o	150
8.000	71.46	0.715	99.9	0.000	9	0.0	1.500	o	150
8.001	15.25	0.152	100.3	0.000	32	0.0	1.500	o	150
6.004	117.31	0.782	150.0	0.000	76	0.0	1.500	o	225
9.000	59.47	1.831	32.5	0.000	8	0.0	1.500	o	150
6.005	54.54	0.610	89.4	0.000	36	0.0	1.500	o	225
6.006	30.53	0.872	35.0	0.000	0	0.0	1.500	o	225

Network Results Table

PN	US/IL (m)	E.Area (ha)	E.DWF (l/s)	E.Hse	Infil. (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
4.000	20.295	0.000	0.0	4	0.0	9	0.31	1.23	21.7	0.1
5.000	19.803	0.000	0.0	2	0.0	7	0.20	0.88	15.5	0.1
4.001	19.400	0.000	0.0	12	0.0	12	0.54	1.60	28.3	0.4
4.002	17.101	0.000	0.0	21	0.0	16	0.63	1.52	26.9	0.7
1.006	15.260	0.000	0.0	60	0.0	23	0.85	2.11	83.7	1.9
1.007	14.175	0.000	0.0	69	0.0	31	0.65	1.35	53.6	2.2
6.000	17.800	0.000	0.0	2	0.0	6	0.28	1.45	25.7	0.1
7.000	16.550	0.000	0.0	3	0.0	9	0.23	0.88	15.5	0.1
6.001	16.280	0.000	0.0	12	0.0	18	0.31	0.71	12.6	0.4
6.002	15.990	0.000	0.0	15	0.0	20	0.33	0.71	12.6	0.5
6.003	15.600	0.000	0.0	15	0.0	21	0.30	0.62	11.0	0.5
8.000	17.000	0.000	0.0	9	0.0	14	0.33	0.88	15.5	0.3
8.001	16.200	0.000	0.0	41	0.0	29	0.52	0.87	15.5	1.3
6.004	15.500	0.000	0.0	132	0.0	51	0.62	0.94	37.2	4.1
9.000	17.469	0.000	0.0	8	0.0	11	0.46	1.54	27.2	0.3
6.005	14.706	0.000	0.0	176	0.0	51	0.81	1.21	48.3	5.5
6.006	14.000	0.000	0.0	176	0.0	41	1.12	1.94	77.3	5.5

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Hse	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
10.000	37.13	0.820	45.3	0.000	6	0.0	1.500	o	150
10.001	44.83	0.675	66.4	0.000	0	0.0	1.500	o	150
1.008	20.84	0.161	129.4	0.000	0	0.0	1.500	o	225
1.009	77.63	1.223	63.5	0.000	6	0.0	1.500	o	225
11.000	62.12	0.605	102.7	0.000	7	0.0	1.500	o	150
12.000	22.83	0.231	98.8	0.000	3	0.0	1.500	o	150
11.001	90.06	2.407	37.4	0.000	13	0.0	1.500	o	150
1.010	68.98	2.110	32.7	0.000	4	0.0	1.500	o	225
13.000	59.54	0.397	150.0	0.000	5	0.0	1.500	o	150
13.001	47.84	0.319	150.0	0.000	0	0.0	1.500	o	150
14.000	31.40	1.191	26.4	0.000	3	0.0	1.500	o	150
14.001	39.73	1.221	32.5	0.000	4	0.0	1.500	o	150
13.002	62.93	0.420	149.8	0.000	4	0.0	1.500	o	150
15.000	28.69	0.438	65.5	0.000	10	0.0	1.500	o	150
1.011	42.79	0.236	181.3	0.000	0	0.0	1.500	o	225
16.000	37.96	1.000	38.0	0.000	7	0.0	1.500	o	150

Network Results Table

PN	US/IL (m)	E.Area (ha)	E.DWF (l/s)	E.Hse	Infil. (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
10.000	13.622	0.000	0.0	6	0.0	10	0.37	1.30	23.0	0.2
10.001	12.802	0.000	0.0	6	0.0	11	0.33	1.08	19.0	0.2
1.008	12.127	0.000	0.0	251	0.0	68	0.78	1.01	40.1	7.8
1.009	11.966	0.000	0.0	257	0.0	57	1.02	1.44	57.3	8.0
11.000	13.862	0.000	0.0	7	0.0	13	0.30	0.86	15.3	0.2
12.000	13.381	0.000	0.0	3	0.0	9	0.23	0.88	15.6	0.1
11.001	13.150	0.000	0.0	23	0.0	18	0.62	1.44	25.4	0.7
1.010	10.743	0.000	0.0	284	0.0	51	1.33	2.01	80.0	8.9
13.000	7.800	0.000	0.0	5	0.0	12	0.23	0.71	12.6	0.2
13.001	7.402	0.000	0.0	5	0.0	12	0.23	0.71	12.6	0.2
14.000	12.286	0.000	0.0	3	0.0	6	0.36	1.71	30.2	0.1
14.001	11.095	0.000	0.0	7	0.0	10	0.44	1.54	27.2	0.2
13.002	7.082	0.000	0.0	16	0.0	21	0.34	0.71	12.6	0.5
15.000	9.250	0.000	0.0	10	0.0	14	0.39	1.08	19.1	0.3
1.011	6.652	0.000	0.0	310	0.0	82	0.73	0.85	33.9	9.7
16.000	16.000	0.000	0.0	7	0.0	10	0.42	1.42	25.2	0.2

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Hse	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
16.001	40.22	0.891	45.1	0.000	6	0.0	1.500	o	150
17.000	17.86	0.151	118.3	0.000	3	0.0	1.500	o	150
16.002	68.16	1.682	40.5	0.000	8	0.0	1.500	o	225
16.003	34.22	0.228	150.1	0.000	1	0.0	1.500	o	225
16.004	64.94	0.433	150.0	0.000	11	0.0	1.500	o	225
18.000	37.14	0.743	50.0	0.000	2	0.0	1.500	o	150
18.001	34.61	0.692	50.0	0.000	2	0.0	1.500	o	150
16.005	69.53	0.463	150.2	0.000	3	0.0	1.500	o	225
19.000	35.25	0.235	150.0	0.000	10	0.0	1.500	o	150
19.001	23.68	0.158	149.9	0.000	1	0.0	1.500	o	150
16.006	30.76	0.505	60.9	0.000	0	0.0	1.500	o	225
16.007	38.82	0.279	139.1	0.000	3	0.0	1.500	o	225
20.000	32.60	0.326	100.0	0.000	4	0.0	1.500	o	150
20.001	29.08	0.291	99.9	0.000	3	0.0	1.500	o	150
16.008	47.19	0.314	150.3	0.000	35	0.0	1.500	o	225
16.009	32.34	0.216	149.7	0.000	34	0.0	1.500	o	225
21.000	29.77	0.298	99.9	0.000	3	0.0	1.500	o	150
21.001	30.50	0.305	100.0	0.000	1	0.0	1.500	o	150
21.002	40.44	0.300	134.8	0.000	34	0.0	1.500	o	225

Network Results Table

PN	US/IL (m)	E.Area (ha)	E.DWF (l/s)	E.Hse	Infil. (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
16.001	15.000	0.000	0.0	13	0.0	14	0.48	1.31	23.1	0.4
17.000	14.260	0.000	0.0	3	0.0	9	0.21	0.80	14.2	0.1
16.002	14.109	0.000	0.0	24	0.0	17	0.57	1.81	71.8	0.8
16.003	12.427	0.000	0.0	25	0.0	23	0.37	0.94	37.2	0.8
16.004	12.190	0.000	0.0	36	0.0	27	0.41	0.94	37.2	1.1
18.000	16.700	0.000	0.0	2	0.0	6	0.25	1.24	21.9	0.1
18.001	15.950	0.000	0.0	4	0.0	8	0.32	1.24	21.9	0.1
16.005	11.750	0.000	0.0	43	0.0	29	0.44	0.94	37.2	1.3
19.000	11.570	0.000	0.0	10	0.0	17	0.29	0.71	12.6	0.3
19.001	11.335	0.000	0.0	11	0.0	17	0.30	0.71	12.6	0.3
16.006	11.170	0.000	0.0	54	0.0	26	0.64	1.47	58.5	1.7
16.007	10.604	0.000	0.0	57	0.0	33	0.49	0.97	38.7	1.8
20.000	9.644	0.000	0.0	4	0.0	10	0.25	0.88	15.5	0.1
20.001	9.300	0.000	0.0	7	0.0	13	0.30	0.88	15.5	0.2
16.008	9.000	0.000	0.0	99	0.0	44	0.56	0.94	37.2	3.1
16.009	8.670	0.000	0.0	133	0.0	51	0.62	0.94	37.3	4.2
21.000	8.710	0.000	0.0	3	0.0	9	0.23	0.88	15.5	0.1
21.001	8.400	0.000	0.0	4	0.0	10	0.25	0.88	15.5	0.1
21.002	8.000	0.000	0.0	38	0.0	27	0.44	0.99	39.3	1.2

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Hse	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
22.000	52.29	0.516	101.3	0.000	8	0.0	1.500	o	150
16.010	47.92	0.322	148.8	0.000	0	0.0	1.500	o	225
16.011	49.35	0.329	150.0	0.000	0	0.0	1.500	o	225
16.012	32.44	0.214	151.6	0.000	0	0.0	1.500	o	225
1.012	38.80	0.259	149.8	0.000	0	0.0	1.500	o	225
23.000	51.86	0.346	149.9	0.000	12	0.0	1.500	o	150
23.001	33.39	0.223	149.7	0.000	7	0.0	1.500	o	150
23.002	28.02	0.187	149.8	0.000	0	0.0	1.500	o	150
23.003	27.27	0.182	149.8	0.000	0	0.0	1.500	o	150
23.004	65.30	0.435	150.1	0.000	0	0.0	1.500	o	150
23.005	8.30	0.080	103.8	0.000	0	0.0	1.500	o	150
1.013	5.08	0.034	149.4	0.000	0	0.0	1.500	o	225

Network Results Table

PN	US/IL (m)	E.Area (ha)	E.DWF (l/s)	E.Hse	Infil. (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
22.000	8.586	0.000	0.0	8	0.0	14	0.31	0.87	15.4	0.3
16.010	7.682	0.000	0.0	179	0.0	59	0.68	0.94	37.4	5.6
16.011	7.360	0.000	0.0	179	0.0	59	0.67	0.94	37.2	5.6
16.012	7.031	0.000	0.0	179	0.0	59	0.67	0.93	37.1	5.6
1.012	6.416	0.000	0.0	489	0.0	100	0.89	0.94	37.2	15.3
23.000	6.800	0.000	0.0	12	0.0	18	0.31	0.71	12.6	0.4
23.001	6.454	0.000	0.0	19	0.0	22	0.36	0.71	12.6	0.6
23.002	6.200	0.000	0.0	19	0.0	22	0.36	0.71	12.6	0.6
23.003	6.010	0.000	0.0	19	0.0	22	0.36	0.71	12.6	0.6
23.004	5.772	0.000	0.0	19	0.0	22	0.36	0.71	12.6	0.6
23.005	5.330	0.000	0.0	19	0.0	21	0.41	0.86	15.2	0.6
1.013	5.244	0.000	0.0	508	0.0	103	0.90	0.94	37.3	15.9

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	o	150	FMH1	22.975	21.753	1.072	1200
2.000	o	150	FMH2	21.233	20.000	1.083	1200
1.001	o	150	FMH3	20.973	19.650	1.173	1200
3.000	o	150	FMH4	21.223	19.878	1.195	1200
1.002	o	150	FMH5	20.969	19.256	1.563	1200
1.003	o	150	FMH6	20.524	18.968	1.406	1200
1.004	o	225	FMH7	20.274	18.739	1.310	1200
1.005	o	225	FMH8	18.922	17.270	1.427	1200
4.000	o	150	FMH9	21.626	20.295	1.181	1200
5.000	o	150	FMH10	21.152	19.803	1.199	1200
4.001	o	150	FMH11	21.008	19.400	1.458	1200
4.002	o	150	FMH12	18.669	17.101	1.418	1200
1.006	o	225	FMH13	16.721	15.260	1.236	1200
1.007	o	225	FMH14	15.615	14.175	1.215	1200
6.000	o	150	FMH15	19.127	17.800	1.177	1200
7.000	o	150	FMH16	17.688	16.550	0.988	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	75.83	36.9	FMH3	20.973	19.700	1.123	1200
2.000	20.21	62.8	FMH3	20.973	19.678	1.145	1200
1.001	49.21	124.9	FMH5	20.969	19.256	1.563	1200
3.000	19.79	99.9	FMH5	20.969	19.680	1.139	1200
1.002	36.03	125.1	FMH6	20.524	18.968	1.406	1200
1.003	19.19	124.6	FMH7	20.274	18.814	1.310	1200
1.004	66.48	45.3	FMH8	18.922	17.270	1.427	1200
1.005	88.43	44.0	FMH13	16.721	15.260	1.236	1200
4.000	30.47	51.2	FMH11	21.008	19.700	1.158	1200
5.000	10.26	99.6	FMH11	21.008	19.700	1.158	1200
4.001	68.98	30.0	FMH12	18.669	17.101	1.418	1200
4.002	57.39	33.2	FMH13	16.721	15.371	1.200	1200
1.006	32.36	29.8	FMH14	15.615	14.175	1.215	1200
1.007	86.09	72.6	FMH28	14.406	12.989	1.192	1200
6.000	26.89	36.4	FMH17	18.389	17.062	1.177	1200
7.000	26.45	99.8	FMH17	18.389	16.285	1.954	1200

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
6.001	o	150	FMH17	18.389	16.280	1.959	1200
6.002	o	150	FMH18	20.228	15.990	4.088	1200
6.003	o	150	FMH19	19.628	15.600	3.878	1200
8.000	o	150	FMH20	18.295	17.000	1.145	1200
8.001	o	150	FMH21	19.602	16.200	3.252	1200
6.004	o	225	FMH22	19.593	15.500	3.868	1200
9.000	o	150	FMH23	18.710	17.469	1.091	1200
6.005	o	225	FMH24	17.464	14.706	2.533	1200
6.006	o	225	FMH25	15.514	14.000	1.289	1200
10.000	o	150	FMH26	14.854	13.622	1.082	1200
10.001	o	150	FMH27	13.672	12.802	0.720	1200
1.008	o	225	FMH28	14.406	12.127	2.054	1200
1.009	o	225	FMH29	13.910	11.966	1.719	1200
11.000	o	150	FMH30	15.203	13.862	1.191	1200
12.000	o	150	FMH31	14.722	13.381	1.191	1200
11.001	o	150	FMH32	15.009	13.150	1.709	1200
1.010	o	225	FMH33	12.208	10.743	1.240	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
6.001	41.71	150.0	FMH18	20.228	16.002	4.076	1200
6.002	52.32	149.9	FMH19	19.628	15.641	3.837	1200
6.003	16.16	197.1	FMH22	19.593	15.518	3.925	1200
8.000	71.46	99.9	FMH21	19.602	16.285	3.167	1200
8.001	15.25	100.3	FMH22	19.593	16.048	3.395	1200
6.004	117.31	150.0	FMH24	17.464	14.718	2.521	1200
9.000	59.47	32.5	FMH24	17.464	15.638	1.676	1200
6.005	54.54	89.4	FMH25	15.514	14.096	1.193	1200
6.006	30.53	35.0	FMH28	14.406	13.128	1.053	1200
10.000	37.13	45.3	FMH27	13.672	12.802	0.720	1200
10.001	44.83	66.4	FMH28	14.406	12.127	2.129	1200
1.008	20.84	129.4	FMH29	13.910	11.966	1.719	1200
1.009	77.63	63.5	FMH33	12.208	10.743	1.240	1200
11.000	62.12	102.7	FMH32	15.009	13.257	1.602	1200
12.000	22.83	98.8	FMH32	15.009	13.150	1.709	1200
11.001	90.06	37.4	FMH33	12.208	10.743	1.315	1200
1.010	68.98	32.7	FMH40	10.172	8.633	1.314	1200

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
13.000	o	150	FMH34	7.761	7.800	-0.189	1200
13.001	o	150	FMH35	11.616	7.402	4.064	1200
14.000	o	150	FMH36	14.323	12.286	1.887	1200
14.001	o	150	FMH37	13.147	11.095	1.902	1200
13.002	o	150	FMH38	11.827	7.082	4.595	1200
15.000	o	150	FMH39	10.450	9.250	1.050	1200
1.011	o	225	FMH40	10.172	6.652	3.295	1200
16.000	o	150	FMH41	17.382	16.000	1.232	1200
16.001	o	150	FMH42	16.273	15.000	1.123	1200
17.000	o	150	FMH43	15.642	14.260	1.232	1200
16.002	o	225	FMH44	15.841	14.109	1.507	1200
16.003	o	225	FMH45	13.734	12.427	1.082	1200
16.004	o	225	FMH46	15.601	12.190	3.186	1200
18.000	o	150	FMH47	18.009	16.700	1.159	1200
18.001	o	150	FMH48	17.380	15.950	1.280	1200
16.005	o	225	FMH49	16.595	11.750	4.620	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
13.000	59.54	150.0	FMH35	11.616	7.403	4.063	1200
13.001	47.84	150.0	FMH38	11.827	7.083	4.594	1200
14.000	31.40	26.4	FMH37	13.147	11.095	1.902	1200
14.001	39.73	32.5	FMH38	11.827	9.874	1.803	1200
13.002	62.93	149.8	FMH40	10.172	6.662	3.360	1200
15.000	28.69	65.5	FMH40	10.172	8.812	1.210	1200
1.011	42.79	181.3	FMH65	9.570	6.416	2.929	1200
16.000	37.96	38.0	FMH42	16.273	15.000	1.123	1200
16.001	40.22	45.1	FMH44	15.841	14.109	1.582	1200
17.000	17.86	118.3	FMH44	15.841	14.109	1.582	1200
16.002	68.16	40.5	FMH45	13.734	12.427	1.082	1200
16.003	34.22	150.1	FMH46	15.601	12.199	3.177	1200
16.004	64.94	150.0	FMH49	16.595	11.757	4.613	1200
18.000	37.14	50.0	FMH48	17.380	15.957	1.273	1200
18.001	34.61	50.0	FMH49	16.595	15.258	1.187	1200
16.005	69.53	150.2	FMH52	14.541	11.287	3.029	1200

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
19.000	o	150	FMH50	12.932	11.570	1.212	1200
19.001	o	150	FMH51	13.846	11.335	2.361	1200
16.006	o	225	FMH52	14.541	11.170	3.146	1200
16.007	o	225	FMH53	13.486	10.604	2.657	1200
20.000	o	150	FMH54	10.840	9.644	1.046	1200
20.001	o	150	FMH55	11.499	9.300	2.049	1200
16.008	o	225	FMH56	12.181	9.000	2.956	1200
16.009	o	225	FMH57	11.263	8.670	2.368	1200
21.000	o	150	FMH58	9.936	8.710	1.076	1200
21.001	o	150	FMH59	10.153	8.400	1.603	1200
21.002	o	225	FMH60	10.084	8.000	1.859	1200
22.000	o	150	FMH61	9.934	8.586	1.198	1200
16.010	o	225	FMH62	10.383	7.682	2.476	1200
16.011	o	225	FMH63	9.190	7.360	1.605	1200
16.012	o	225	FMH64	9.270	7.031	2.014	1200
1.012	o	225	FMH65	9.570	6.416	2.929	1200
23.000	o	150	FMH66	7.696	6.800	0.746	1200
23.001	o	150	FMH67	9.050	6.454	2.446	1200
23.002	o	150	FMH68	9.823	6.200	3.473	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
19.000	35.25	150.0	FMH51	13.846	11.335	2.361	1200
19.001	23.68	149.9	FMH52	14.541	11.177	3.214	1200
16.006	30.76	60.9	FMH53	13.486	10.665	2.596	1200
16.007	38.82	139.1	FMH56	12.181	10.325	1.631	1200
20.000	32.60	100.0	FMH55	11.499	9.318	2.031	1200
20.001	29.08	99.9	FMH56	12.181	9.009	3.022	1200
16.008	47.19	150.3	FMH57	11.263	8.686	2.352	1200
16.009	32.34	149.7	FMH62	10.383	8.454	1.704	1200
21.000	29.77	99.9	FMH59	10.153	8.412	1.591	1200
21.001	30.50	100.0	FMH60	10.084	8.095	1.839	1200
21.002	40.44	134.8	FMH62	10.383	7.700	2.458	1200
22.000	52.29	101.3	FMH62	10.383	8.070	2.163	1200
16.010	47.92	148.8	FMH63	9.190	7.360	1.605	1200
16.011	49.35	150.0	FMH64	9.270	7.031	2.014	1200
16.012	32.44	151.6	FMH65	9.570	6.817	2.528	1200
1.012	38.80	149.8	FMH72	8.773	6.157	2.391	1200
23.000	51.86	149.9	FMH67	9.050	6.454	2.446	1200
23.001	33.39	149.7	FMH68	9.823	6.231	3.442	1200
23.002	28.02	149.8	FMH69	9.175	6.013	3.012	1200

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
23.003	o	150	FMH69	9.175	6.010	3.015	1200
23.004	o	150	FMH70	8.589	5.772	2.667	1200
23.005	o	150	FMH71	8.749	5.330	3.269	1200
1.013	o	225	FMH72	8.773	5.244	3.304	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
23.003	27.27	149.8	FMH70	8.589	5.828	2.611	1200
23.004	65.30	150.1	FMH71	8.749	5.337	3.262	1200
23.005	8.30	103.8	FMH72	8.773	5.250	3.373	1200
1.013	5.08	149.4	P/Sump Inlet MH	8.723	5.210	3.288	3000 x 3000

MANHOLE SCHEDULES

M/Hole Number	Cover Level (m)	M/Hole Depth (m)	M/Hole Diam.,L*W (mm)	Pipes Out PN	Pipes Out IL.(m)	Pipes Out D (mm)	Pipes In PN	Pipes In IL.(m)	Pipes In D (mm)
FMH1	22.975	1.222	1200	1.000	21.753	150			
FMH2	21.233	1.233	1200	2.000	20.000	150			
FMH3	20.973	1.323	1200	1.001	19.650	150	1.000	19.700	150
							2.000	19.678	150
FMH4	21.223	1.345	1200	3.000	19.878	150			
FMH5	20.969	1.713	1200	1.002	19.256	150	1.001	19.256	150
							3.000	19.680	150
FMH6	20.524	1.556	1200	1.003	18.968	150	1.002	18.968	150
FMH7	20.274	1.535	1200	1.004	18.739	225	1.003	18.814	150
FMH8	18.922	1.652	1200	1.005	17.270	225	1.004	17.270	225
FMH9	21.626	1.331	1200	4.000	20.295	150			
FMH10	21.152	1.349	1200	5.000	19.803	150			
FMH11	21.008	1.608	1200	4.001	19.400	150	4.000	19.700	150
							5.000	19.700	150
FMH12	18.669	1.568	1200	4.002	17.101	150	4.001	17.101	150
FMH13	16.721	1.461	1200	1.006	15.260	225	1.005	15.260	225
							4.002	15.371	150
FMH14	15.615	1.440	1200	1.007	14.175	225	1.006	14.175	225
FMH15	19.127	1.327	1200	6.000	17.800	150			
FMH16	17.688	1.138	1200	7.000	16.550	150			
FMH17	18.389	2.109	1200	6.001	16.280	150	6.000	17.062	150
							7.000	16.285	150
FMH18	20.228	4.238	1200	6.002	15.990	150	6.001	16.002	150
FMH19	19.628	4.028	1200	6.003	15.600	150	6.002	15.641	150
FMH20	18.295	1.295	1200	8.000	17.000	150			
FMH21	19.602	3.402	1200	8.001	16.200	150	8.000	16.285	150
FMH22	19.593	4.093	1200	6.004	15.500	225	6.003	15.518	150
							8.001	16.048	150
FMH23	18.710	1.241	1200	9.000	17.469	150			
FMH24	17.464	2.758	1200	6.005	14.706	225	6.004	14.718	225
							9.000	15.638	150
FMH25	15.514	1.514	1200	6.006	14.000	225	6.005	14.096	225
FMH26	14.854	1.232	1200	10.000	13.622	150			
FMH27	13.672	0.870	1200	10.001	12.802	150	10.000	12.802	150
FMH28	14.406	2.279	1200	1.008	12.127	225	1.007	12.989	225
							6.006	13.128	225

MANHOLE SCHEDULES

M/Hole Number	Cover Level (m)	M/Hole Depth (m)	M/Hole Diam.,L*W (mm)	Pipes Out PN	Pipes Out IL.(m)	Pipes Out D (mm)	Pipes In PN	Pipes In IL.(m)	Pipes In D (mm)
							10.001	12.127	150
FMH29	13.910	1.944	1200	1.009	11.966	225	1.008	11.966	225
FMH30	15.203	1.341	1200	11.000	13.862	150			
FMH31	14.722	1.341	1200	12.000	13.381	150			
FMH32	15.009	1.859	1200	11.001	13.150	150	11.000	13.257	150
							12.000	13.150	150
FMH33	12.208	1.465	1200	1.010	10.743	225	1.009	10.743	225
							11.001	10.743	150
FMH34	7.761	-0.039	1200	13.000	7.800	150			
FMH35	11.616	4.214	1200	13.001	7.402	150	13.000	7.403	150
FMH36	14.323	2.037	1200	14.000	12.286	150			
FMH37	13.147	2.052	1200	14.001	11.095	150	14.000	11.095	150
FMH38	11.827	4.745	1200	13.002	7.082	150	13.001	7.083	150
							14.001	9.874	150
FMH39	10.450	1.200	1200	15.000	9.250	150			
FMH40	10.172	3.520	1200	1.011	6.652	225	1.010	8.633	225
							13.002	6.662	150
							15.000	8.812	150
FMH41	17.382	1.382	1200	16.000	16.000	150			
FMH42	16.273	1.273	1200	16.001	15.000	150	16.000	15.000	150
FMH43	15.642	1.382	1200	17.000	14.260	150			
FMH44	15.841	1.732	1200	16.002	14.109	225	16.001	14.109	150
							17.000	14.109	150
FMH45	13.734	1.307	1200	16.003	12.427	225	16.002	12.427	225
FMH46	15.601	3.411	1200	16.004	12.190	225	16.003	12.199	225
FMH47	18.009	1.309	1200	18.000	16.700	150			
FMH48	17.380	1.430	1200	18.001	15.950	150	18.000	15.957	150
FMH49	16.595	4.845	1200	16.005	11.750	225	16.004	11.757	225
							18.001	15.258	150
FMH50	12.932	1.362	1200	19.000	11.570	150			
FMH51	13.846	2.511	1200	19.001	11.335	150	19.000	11.335	150
FMH52	14.541	3.371	1200	16.006	11.170	225	16.005	11.287	225
							19.001	11.177	150
FMH53	13.486	2.882	1200	16.007	10.604	225	16.006	10.665	225
FMH54	10.840	1.196	1200	20.000	9.644	150			
FMH55	11.499	2.199	1200	20.001	9.300	150	20.000	9.318	150

MANHOLE SCHEDULES

M/Hole Number	Cover Level (m)	M/Hole Depth (m)	M/Hole Diam.,L*W (mm)	Pipes Out PN	Pipes Out IL.(m)	Pipes Out D (mm)	Pipes In PN	Pipes In IL.(m)	Pipes In D (mm)
FMH56	12.181	3.181	1200	16.008	9.000	225	16.007	10.325	225
							20.001	9.009	150
FMH57	11.263	2.593	1200	16.009	8.670	225	16.008	8.686	225
FMH58	9.936	1.226	1200	21.000	8.710	150			
FMH59	10.153	1.753	1200	21.001	8.400	150	21.000	8.412	150
FMH60	10.084	2.084	1200	21.002	8.000	225	21.001	8.095	150
FMH61	9.934	1.348	1200	22.000	8.586	150			
FMH62	10.383	2.701	1200	16.010	7.682	225	16.009	8.454	225
							21.002	7.700	225
							22.000	8.070	150
FMH63	9.190	1.830	1200	16.011	7.360	225	16.010	7.360	225
FMH64	9.270	2.239	1200	16.012	7.031	225	16.011	7.031	225
FMH65	9.570	3.154	1200	1.012	6.416	225	1.011	6.416	225
							16.012	6.817	225
FMH66	7.696	0.896	1200	23.000	6.800	150			
FMH67	9.050	2.596	1200	23.001	6.454	150	23.000	6.454	150
FMH68	9.823	3.623	1200	23.002	6.200	150	23.001	6.231	150
FMH69	9.175	3.165	1200	23.003	6.010	150	23.002	6.013	150
FMH70	8.589	2.817	1200	23.004	5.772	150	23.003	5.828	150
FMH71	8.749	3.419	1200	23.005	5.330	150	23.004	5.337	150
FMH72	8.773	3.529	1200	1.013	5.244	225	1.012	6.157	225
							23.005	5.250	150
P/Sump Inlet MH	8.723	3.513	3000 x 3000		OUTFALL		1.013	5.210	225

Appendix H

Pumping Station & Rising Main Design

TABLE OF CONTENTS

1 PROJECT INFO

The scope of the project covers installation of pump sump (PS) to accommodate flow from approximately 500 residential properties. To provide safety measures in case of emergency an installation of a storage tank with 12 hours capacity is predicted. The new pump sump will be designed for the capacity of 232.50 m^3.

Designed flow for the new pump sump is calculated as follow:

1.1 DATA PROVIDED FOR DESIGN

- MAXIMUM DAILY FLOW FROM KINGSBRIDGE CONSULTANCY LTD (Q_{D1MAX}) – 232.50 m^3
- RAISING MAIN LENGTH – 1473 m
- GROUND LEVEL AT THE pump sump – 8.8 m
- GROUND LEVEL AT THE DISCHARGE POINT – 13.30 m
- RISING MAIN UNDERGROUND DEPTH (INVERT LEVEL) – MIN 2.40 m – 1.25 m
- NUMBER OF PROPERTIES ON KINGSBRIDGE CONSULTANCY LTD AREA – 400
- MAXIMUM DAILY FLOW PER HOSE/PROPERTY – 447 liters per day
- REQUIRED STORAGE TIME – 12 hours

1.2 LIST OF RELEVANT DRAWINGS:

Refer to Engineering Drawings

Drwg No 1703-Eng-120-Foul Sewer Pumping Station & Details.
Drwg No 1703-Eng-125-Overall Site Foul Drainage Layout.
Drwg No 1703-Eng-126 Rising Main Layout & Longitudinal Section.

2 DESIGN PROPOSAL

2.1 DESCRIPTION

Proposed design consists of two parts:

2.2 Pumping station equipped with valve chamber and storage tank.

Pump sump will be equipped with pumps and all necessary auxiliary equipment to provide control and meet health and safety requirements.

2.3 Emergency Tank

New storage tank will be installed next to PUMP sump and it will be connected at high and low level. It is recommended to equip storage tank with tipping bucket to prevent septic conditions occurring.

As an option it is recommended to consider installation on inlet screen as nature of waste water from residential properties tends to cause problems with pumps operation.

It is recommended to consider installation of three pumps instead of two. Third pump would be a small pump that could cope with small flows until new properties are commissioned. This solution would allow for savings on energy and maintenance.
It is also possible to install a small pump that can be replaced once the new developments are connected to the sump.

2.4 PUMP CALCULATIONS AND SELECTION

2.5 PUMP FLOW

Pump size is determined based on **maximum hourly flow** into the sump from all three sources. To calculate maximum hourly flow, a **MAXIMUM DAY PEAKING FACTOR** is used. Taking into account that premises connected to the new sump have residential character with high water usage peaks during the early morning and evening time, a high peaking factor value of **3** is estimated.

- [PF_{dMAX}]MAXIMUM DAY PEAKING FACTOR = **3**
- [Q_{hMAX}] MAXIMUM HOURLY FLOW FROM KINGSBRIDGE CONSULTANCY LTD LANDS IS CALCULATED AS FOLLOWS:
  MAXIMUM DAILY FLOW IN m3/ 24 x **MAXIMUM DAY PEAKING FACTOR**

$$Q_{hMAX} = (232.50/24) \times 3 = 6.60 \times 3 = 29.06 m^3/h$$

To include a safety factor **TOTAL MAXIMUM HOURLY FLOW Q_{ThMAX}** is increased by 10%.

- [SF] SAFETY FACTOR – 1.1

$$Q_{ThMAXSF} = Q_{ThMAX} \times 1.1 = 29.06 \times 1.1 = 31.97 [m^3/h]$$

2.5.1 SEPTICITY CALCULATIONS

To avoid septic conditions in raising main sewage retention time must be kept between 4 to 8 hours max. To achieve that, the volume of the raising main needs to be adjusted by choosing the right diameter.
Planned raising main is 150 mm diameter and 1473 meters long.
Daily minimum flow through the raising main equals 162.75 m^3 (estimated at 70% of daily max flow). **Retention time** is chosen at maximum **4 hours**, which means that the volume of the raising main should be turned over minimum 6 times a day.

<table>
<tr><td rowspan="11">$D_{RM\ MAX}$</td><td colspan="5">RISING MAIN PIPE MAX DIAMETER THAT GUARANTEE SUFFICIENT NUMBER OF FULL VOLUME TURN OVERS</td><td>m</td></tr>
<tr><td colspan="6">$D_{RM\ MAX} = \sqrt{\frac{V_{RM\ MAX} \cdot 4}{L_{RM} \cdot \pi}} = \sqrt{\frac{27.13 \cdot 4}{1473 \cdot \pi}} = 0.153\ [m] = \mathbf{153.0}\ [\boldsymbol{mm}] > \mathbf{125}$</td></tr>
<tr><td>L_{RM}</td><td colspan="3">RISING MAIN PIPE LENGTH</td><td>1463</td><td>m</td></tr>
<tr><td rowspan="10">$V_{RM\ MAX}$</td><td colspan="4">MINIMUM REQUIRED VOLUME PUMPED TROUGH THE RAISING MAIN PER ONE TURN OVER</td><td>m^3</td></tr>
<tr><td colspan="5">$V_{RM\ MAX} = \frac{Q_{D\ MIN}[m^3]}{RM_{TO}[\frac{times}{d}]} = \frac{162.75}{6} = 27.13\ [m^3]$</td></tr>
<tr><td rowspan="4">$Q_{D\ MIN}$</td><td colspan="3">MINIMUM DAILY FLOW</td><td>m^3/d</td></tr>
<tr><td colspan="4">$Q_{D\ MIN} = 70\ \%\ of\ Q_{D\ MAX} = 70\%\ of\ 232.50 = 162.75\ [m^3/d]$</td></tr>
<tr><td rowspan="2">$Q_{D\ MAX}$</td><td colspan="2">MAXIMUM DAILY FLOW</td><td>m^3/d</td></tr>
<tr><td colspan="3">$Q_{D\ MAX} = Q_{D1MAX} = 232.50[m^3/d]$</td></tr>
<tr><td rowspan="4">RM_{TO}</td><td colspan="3">FREQUENCY OF FULL VOLUME OF THE RISING MAIN TURN OVER PER DAY</td><td>TIMES PER DAY</td></tr>
<tr><td colspan="4">$RM_{TO} = \frac{24\ [h]}{RT[h]} = \frac{24}{4} = 6\ TIMES\ A\ DAY$</td></tr>
<tr><td>RT</td><td colspan="2">RETENTION TIME</td><td>4</td><td>h</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td rowspan="4">TO_D</td><td colspan="5">NUMBER OF RAISING MAIN TURN OVERS PER DAY</td><td>times/d</td></tr>
<tr><td colspan="6">$TO_D = \frac{Q_{D\ MIN}[m^3]}{V_{RM\ FULL}\ [m^3]} = \frac{162.75}{15.30} = 10.63 - 0\ [times\ per\ day]$</td></tr>
<tr><td rowspan="2">$V_{RM\ FULL}$</td><td colspan="4">VOLUME OF FULL LENGTH OF RISING MAIN</td><td>m^3</td></tr>
<tr><td colspan="5">$V_{RM\ FULL} = \frac{\pi \cdot D^2[m]}{4} \cdot L_{RM}[m] = \frac{\pi \cdot 0.115^2}{4} \cdot 1473 = 15.30[m^3]$</td></tr>
</table>

Proposed rising main is less than the calculated size which means it provides a sufficient number of full volumes turn overs of the raising main. Full volume of the raising main will be turned over a minimum of 10 times a day. Septic conditions will not occur in rising main.

2.5.2 PUMP SELECTION

Pump selection will be based on head and flow calculations, but number of site specific requirements will be taken into consideration to ensure fault free operation.

2.5.2.1 PUMP REQUIREMENTS

1. SUFFICIENT HEAD PRESSURE
2. SUFFICIENT FLOW
3. SUBMERSIBLE MODEL
4. GUIDE RAILS FOR EASY REMOVAL
5. IMPELLOR ANTI CLOGGING IMPELLER – 70-100 mm
6. DRY RUN/OVERHEAT PROTECTION
7. VSD OPERATION
8. 3 PHASE 50 Hz
9. QUICK POWER CABLE CONNECTORS

2.5.2.2 HEAD LOSSES

$$H = H_S + H_L + H_A = 11.60 + 13.21 + 1.32 = \mathbf{26.13\ m}$$

H – TOTAL HEAD LOSS
H_S – STATIC HEAD LOSS
H_L – LINEAR HEAD LOSS
H_A – LOCAL HEAD LOSS

2.5.2.3 STATIC HEAD LOSSES CALCULATIONS

$$H_S = GL_{SUMP} - LWL = 8.70 - 3.00 = \mathbf{5.70\ m}$$

H_S – STATIC HEAD LOSS IN PUMP SUMP
GL_{SUMP} – GROUND LEVEL AT THE SUMP – 8.70 m
LWL – LOW LEVEL IN THE SUMP – 3.00 m

Pump cut out level will be min 800 mm from the bottom of the sump for motor cooling and vortex prevention.

Static **head loss in the pump sump** equals **5.70 m**.

It is assumed that in worst case scenario raising mains has 1.50 mm cover (invert level). Invert level of rising main at the sump is 7.20 m and ground level at the discharge is 13.30 m. The difference in these levels adds **6.10 m of static head loss on the raising main**.
Refer to Drawings included in appendix A

Therefore, total Static Head Loss is 5.50 m + 6.10 m = 11.60 m

2.5.2.3.1 LINEAR HEAD LOSSES CALCULATIONS

<table>
<tr><td rowspan="11">H_L</td><td colspan="5">LINEAR HEAD LOSSES – DARCY WEISBACH</td><td>m</td></tr>
<tr><td colspan="6">$H_L = \lambda \cdot \frac{L_{RM}[m]}{D[m]} \cdot \frac{v^2\left[\frac{m}{s}\right]}{2g} = 0.034300 \cdot \frac{1473}{0.131} \cdot \frac{0.82^2}{2 \cdot 9.81} = 13.21\ [m]$</td></tr>
<tr><td>L_{RM}</td><td colspan="3">RISING MAIN PIPE LENGTH</td><td>1473</td><td>m</td></tr>
<tr><td>D</td><td colspan="3">INSIDE PIPE DIAMETER - HDPE SDR 11 DN 125 mm, WALL THICKNESS 4.9 mm</td><td>0.115</td><td>m</td></tr>
<tr><td rowspan="9">λ</td><td colspan="4">FRICTION LOSS FACTOR</td><td>m^3</td></tr>
<tr><td colspan="5">WALDEN EQUATION
$\frac{1}{\lambda} = -2\log\left(\frac{6.1}{Re^{0.915}} + \frac{\varepsilon}{3.73}\right) =$
$\lambda = \left(-2\log\left(\frac{6.1}{Re^{0.915}} + \frac{\varepsilon}{3.73}\right)\right)^{-2} =$
$= \left(-2\log\left(\frac{6.1}{83500^{0.915}} + \frac{0.0013}{3.73}\right)\right)^{-2} = 0.034300\ [-]$</td></tr>
<tr><td rowspan="4">Re</td><td colspan="3">REYNOLDS NUMBER</td><td>-</td></tr>
<tr><td colspan="4">$Re = \frac{\rho \cdot v \cdot D}{\mu} = \frac{v \cdot D}{\nu} = \frac{0.82 \cdot 0.115}{1.31 \cdot 10^{-6}} = 83500[-]$</td></tr>
<tr><td>v</td><td colspan="2">FLOW VELOCITY</td><td>m/s</td></tr>
<tr><td colspan="4">$v = \frac{\frac{4Q_{ThMAXSF}\left[\frac{m^3}{h}\right]}{3600}}{\pi \cdot D^2\ [m]} = \frac{4 \cdot \frac{30.62}{3600}}{\pi \cdot 0.115^2} = 0.82[^m/_s]$
FLOW VELOCITY SHOULD BE IN A RANGE OF 0.8 -2.0 m/s. VELOCITY BELOW 0.8 IS NOT SUFFICIENT FOR PIPE SELF CLEANING EFFECT. VELOCITIES HIGHER THAN 2.0 WILL CAUSE HIGH LINEAR HEAD LOSSES AND CAN DAMAGE PIPE.</td></tr>
<tr><td>ν</td><td colspan="2">KINEMATIC VISCOSITY OF THE WATER AT 10 °C</td><td>$1.31 \cdot 10^{-6}$</td><td>m^2/s</td></tr>
<tr><td rowspan="3">ε</td><td colspan="3">RELATIVE ROUGHNESS</td><td>-</td></tr>
<tr><td colspan="4">$\varepsilon = \frac{k\ [m]}{D[m]} = \frac{0.00015}{0.115} = 0.0013\ [-]$</td></tr>
<tr><td rowspan="2">k</td><td rowspan="2">PIPE ROUGHNESS DEPENDS ON TYPE OF USED PIPE</td><td>0.15</td><td>mm</td></tr>
<tr><td>0.00015</td><td>m</td></tr>
</table>

Therefore, total Linear Head Loss is = 13.21m

2.5.2.3.2 LOCAL HEAD LOSSES CALCULATIONS

Local head (H_A) losses are estimated as 10% of friction head losses.

$$H_A = H_L \cdot 0.1 = 13.21 \cdot 0.1 = 1.321m$$

2.5.3 PROPOSED PUMP MODEL

Based on above calculations pump model shown below is recommended:

Xylem (Flygt) NP 3127 SH 3~ Adaptive 246.

Patented self-cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

DUTY POINT
- Fluid: Water
- Flow:42.0 m³/h
- Head:30 m
- Fluid temperature:4 °C

- Motor: 3~400V/50Hz
- Rated power: 8.5 kW
- Speed: 3000 rpm
- Motor design: 3127 SH 3

Final details of pump selection to be confirmed later.

2.6 PUMP SUMP AND STORAGE TANK CALCULATIONS AND SELECTION

2.6.1 MINIMUM SUMP VOLUME DUE TO PUMP OPERATION CYCLE

Due to the mechanical stress from the temperature rise in the motor, pumps have a limited number of starts per hour. Depending on type and size of the pump it can work in a on/off cycle with the frequency of 10 starts per hour for large pumps (bigger than 7 kW) and up to 30 for small pumps.
Maximum number of starts determines minimum working volume of the sump that can be calculated with equation below:

<table>
<tr><td rowspan="6">V_{WPS}</td><td colspan="4">MINIMUM WORKING PUMP SUMP VOLUME</td><td>m^3</td></tr>
<tr><td colspan="5">$V_{WPS} = \frac{T_C \cdot Q_{ThMAX}[min]}{4} = \frac{6 \cdot 0.51}{4} = 0.765\ [m^3]$</td></tr>
<tr><td rowspan="4">T_C</td><td colspan="3">CYCLE TIME</td><td>minutes</td></tr>
<tr><td colspan="4">$T_C = \frac{60\ [min]}{S_{hPU}} = \frac{60}{10} = 6\ [min]$</td></tr>
<tr><td>S_{hPU}</td><td>PUMP STARTS PER HOUR (MAXIMUM STARTS OF THE PUMP PER HOUR IS SPECIFIED BY PUMP MANUFACTURER – USUALLY MAX 10)</td><td>10</td><td>-</td></tr>
</table>

2.6.2 PUMP SUM DIMENSIONS

- LENGTH = 3.0 m
- WIDTH = 3 m
- DEPTH = 3.25 m
- VOLUME = 28.8 m^3

2.6.3 PUMP SUMP OPERATIONAL VOLUME

On the assumption that gravity inlet pipe to the pump sump is not situated deeper than 2.2 meter underground, an operational level of 2.35 meter in a pump sump for calculations will be used.

- PUMP SUMP LENGTH = 3.0 m
- PUMP SUMP WIDTH = 3.0 m
- PUMP SUMP OPERATIONAL DEPTH = 2.35 m
- $V_{O\,PS}$ – SUMP OPERATIONAL VOLUME = 21.15 m^3

2.6.4 STORAGE TANK SIZE

Storage tank is designed for 12 hours retention time. Taking into account depth of the pump sump and size of the available parcel a rectangular shape tank was selected.
Storage tank will be 4.45 deep but to avoid surging of gravity foul only 2 meters will be used as a working volume.

V_{WPS}	**STORAGE TANK VOLUME**			m^3
	$V_{ST12h} = \frac{Q_{D1\,MAX}[m^3] - V_{O\,PS}}{2} = \frac{232.50 - 28.80}{2} = 101.85\ [m^3]$			
	$Q_{D1\,MAX}$	MAXIMUM DAILY FLOW FROM KINGSBRIDGE CONSULTANCY LTD	232.50	m^3
	T_R	RETENTION TIME	12	h
STORAGE TANK DIMENSION				
H_{ST}	**STORAGE TANK DEPTH**		**5.50**	m
$H_{ST\,W}$	STORAGE TANK WORKING DEPTH		2.0	m
A_{ST}	STORAGE TANK FOOTPRINT			m^2
	$A_{ST} = \frac{V_{sT12h}[m^3]}{H_{ST\,W}[m]} = \frac{101.85}{2.0} = 50.93\ [m^3]$			
L_{ST}	**STORAGE TANK LENGTH FOR SQUARE FOOTPRINT**			m
	$L_{ST} = \sqrt{A_{ST}} = \sqrt{50.93} = 7.13 \approx \mathbf{7.00}\ [m]$			
W_{ST}	CALCULATED STORAGE TANK WIDTH		7.00	m
L_{ST}	CALCULATED STORAGE TANK LENGTH		7.00	m
V_B	APPROX. ADDITIONAL VOLUME TO ALLOW FOR BENCHING		12	m^3
W_{ST}	**SELECTED STORAGE TANK WIDTH**		7.00	m
L_{ST}	**SELECTED STORAGE TANK LENGTH**		8.70	m

2.7 PUMP SUMP EQUIPMENT

2.7.1 PUMP SUMP

2.7.1.1 SPECIFIC MINIMUM REQUIREMENTS FOR MEDIUM TYPE 3 PUMPING STATION

Pump sump flow (11.61 m/s) is bigger than 1 m/s so under Irish Water Code of Practice for waste Water Infrastructure is qualified as Type 3 pump sump.

1. Pump station is to have a minimum of two submersible pumps;
2. Pumps to be provided on a duty/standby control arrangement or if more than two pumps required, the arrangement to be duty/assist/standby;
3. Plate to be provided near top of wet well chamber to allow nomination of the pumps (e.g. Pump No 1, Pump No 2, etc.);
4. Electrical and control equipment to be located in a vandal resistant kiosk or structure situated adjacent to but offset from the pumping station, complete with a meter for each pump, hours run meter for each pump, socket to accept a power supply from a portable standby generator, etc.;
5. Emergency Wastewater storage capacity or emergency overflow facilities to be provided in pumping station and equipped with appropriate septicity and odour mitigation provisions;
6. Access for operation and maintenance vehicles to be provided;
7. Welfare facilities to be provided for plant operatives for Type 3 Pump Station, including a small wash-hand basin within a separate kiosk or within the kiosk/structure for the plant control equipment subject to health and safety risk assessment;
8. Security fencing and access gates to be provided
9. A dedicated, metered, power supply to be provided to the pump station serving only the pump station equipment and associated plant;
10. Telemetry outstation to be provided for data reporting to Irish Water central facility;
11. Alert system and call out emergency response to be provided in the event of plant breakdown or malfunction;
12. Flow metering facilities to be provided on the Rising Main as appropriate;
13. Odour control equipment to be provided where there is a risk of odour nuisance arising;
14. Lifting equipment to be provided for the removal of equipment;
15. Safety equipment to be provided for controlled and planned safe access to the wet well, including gas monitors, tripod and lifting harness, etc.;
16. Pump stations wet well and valve chamber to be provided with pipework, to allow emptying of the Rising Main and wet well by a vacuum tanker

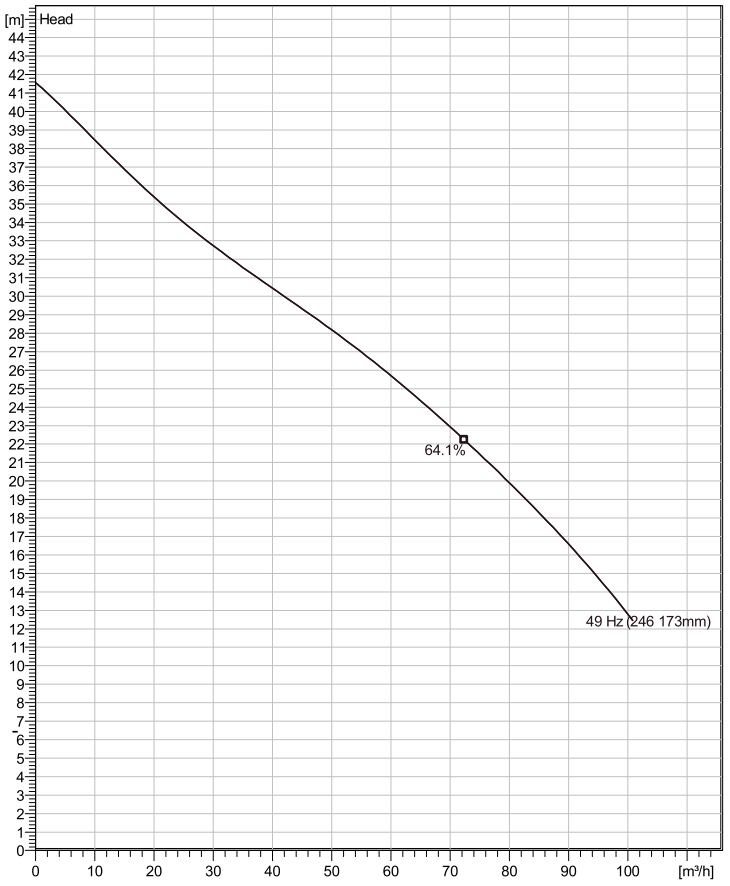
2.8 WET WELL

The wet-well of the pumping station can be of rectangular or circular plan section with a minimum 3000 mm square plan area. The shape of the wet well shall be such that solid matter does not accumulate in dead spots within the well. The shape of the wet well and location of the inlet Sewer arrangement should ensure satisfactory flow conditions to the pump unit to avoid the formation of damaging vortices. This is best achieved by installing the incoming Sewer on the centerline between the submersible pump units at a depth between 0.15m and 1.15 m above the pump highest cut in level. An inlet baffle may be provided for the Sewer inlet to prevent excessive aeration of the Wastewater or the interference with ultrasonic beams used for level sensing. There shall be a minimum capacity between the start and stop level controls to give a maximum of 10 starts per hour.
The depth of the wet well shall be suitable to accommodate the incoming Gravity Sewer, the pumping plant, the minimum pumping storage between cut-in and cut-out, etc.

Appendix A Pump Specification

NP 3127 SH 3~ Adaptive 246

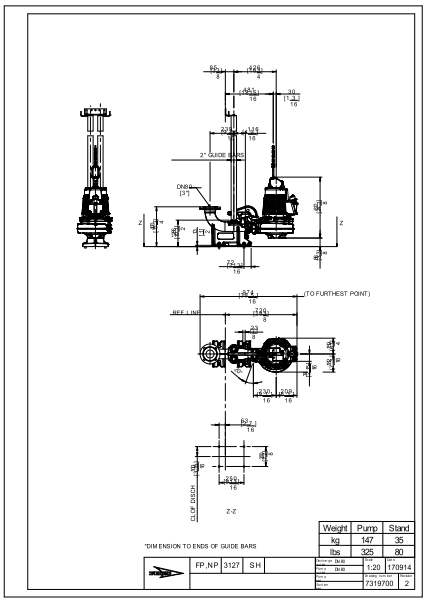
Technical specification



Water, pure *Curve ISO*

Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

Impeller material	Grey cast iron
Discharge Flange Diameter	80 mm
Suction Flange Diameter	90 mm
Impeller diameter	173 mm
Number of blades	2

Motor

Motor #	N3127.901 21-11-2AS-W IE3 8.5KW
Stator variant	1
Frequency	50 Hz
Rated voltage	400 V
Number of poles	2
Phases	3~
Rated power	8.5 kW
Rated current	15 A
Starting current	116 A
Rated speed	3000 rpm
Power factor	
1/1 Load	0.88
3/4 Load	0.87
1/2 Load	0.81
Pump efficiency	
1/1 Load	90.6 %
3/4 Load	91.0 %
1/2 Load	89.6 %

IE3 Rating is based on Y connection

Configuration

Project	Project ID	Created by	Created on	Last update
			8/24/2018	

NP 3127 SH 3~ Adaptive 246

Performance curve

Pump

Discharge Flange Diameter	80 mm
Suction Flange Diameter	90 mm
Impeller diameter	173 mm
Number of blades	2

Motor

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Power factor	
1/1 Load	0.88
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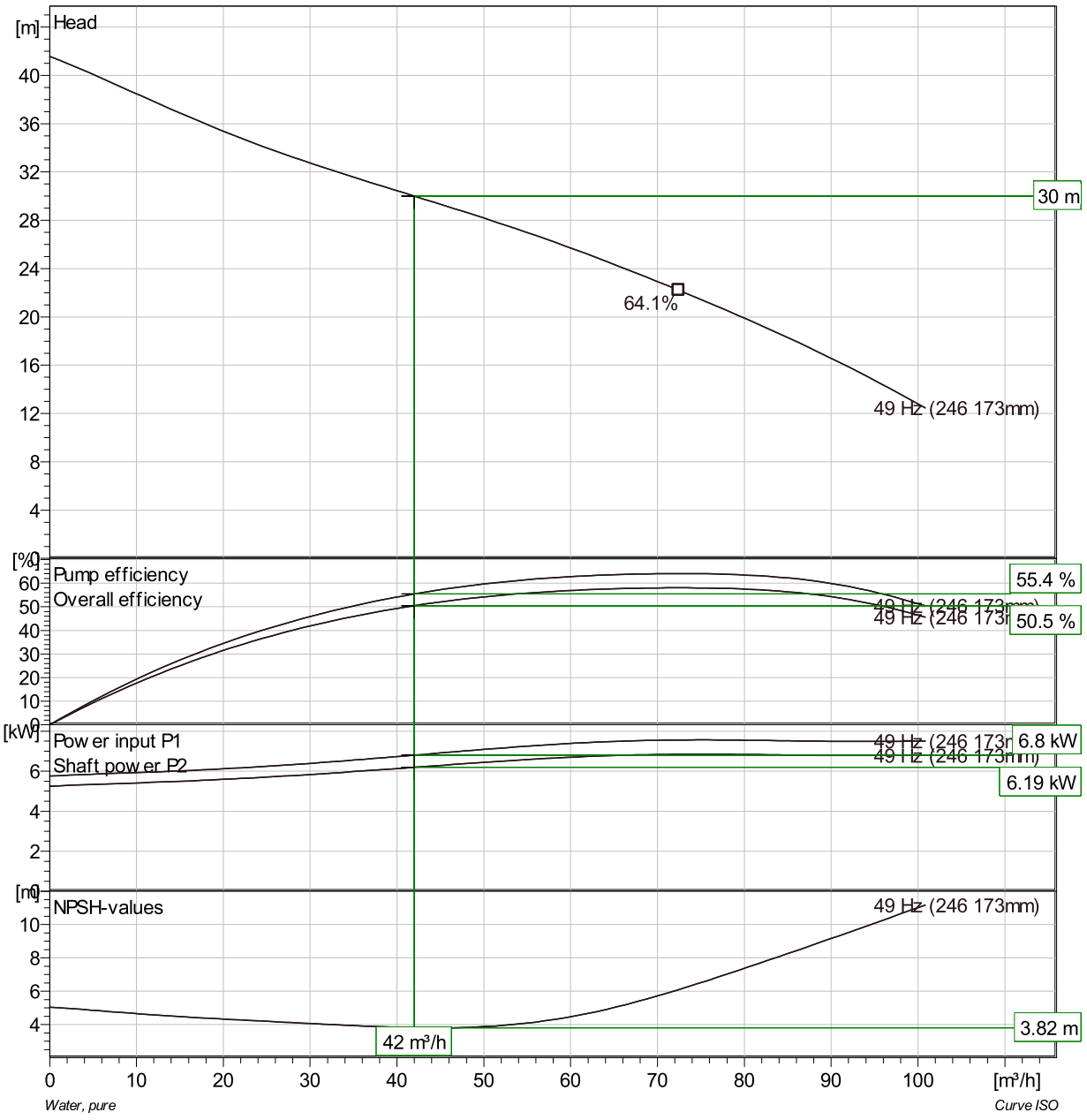
Pump efficiency	
1/1 Load	90.6 %
3/4 Load	91.0 %
1/2 Load	89.6 %

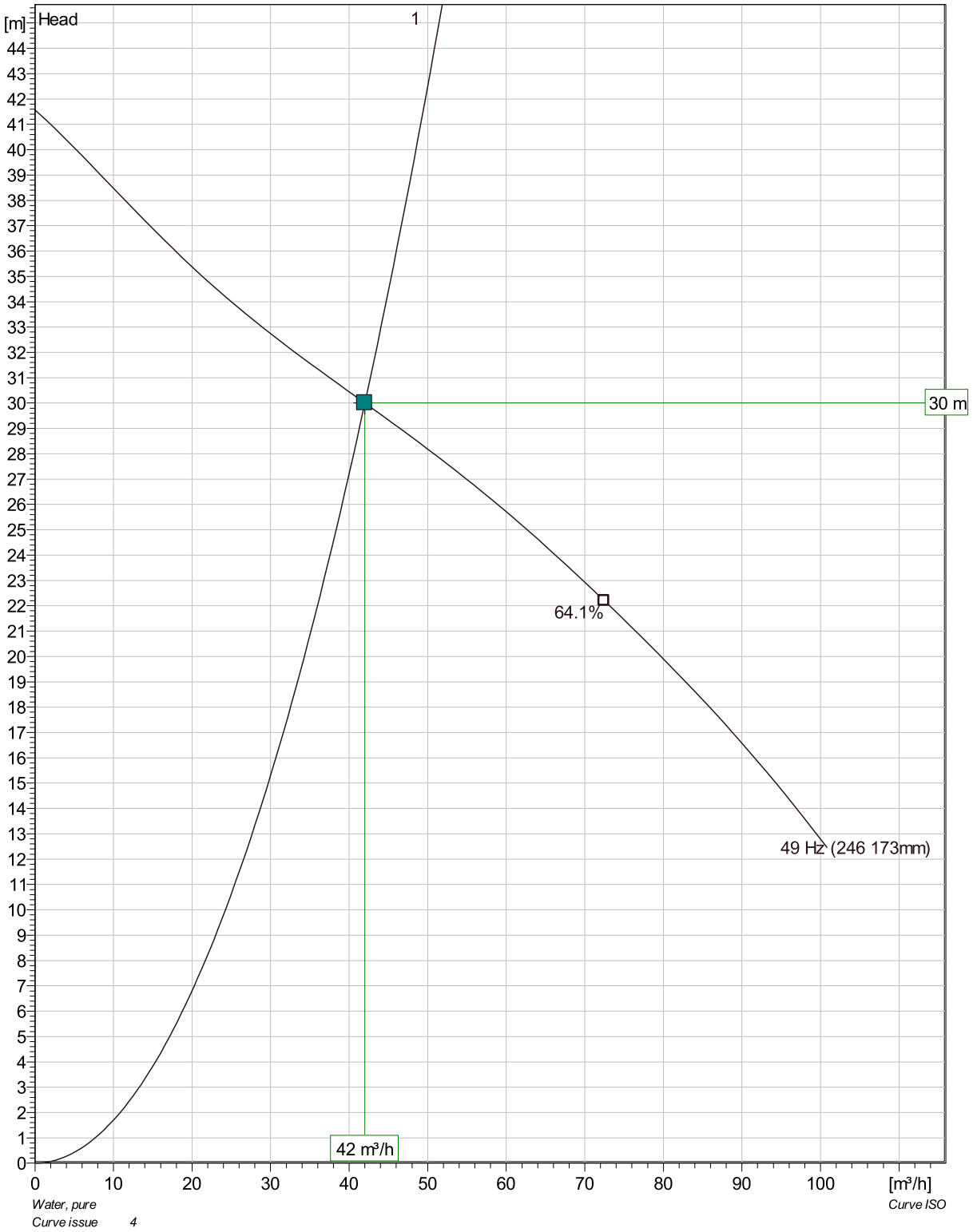


Duty point		Guarantee
Flow	Head	
42 m³/h	30 m	No

Project	Project ID	Created by	Created on	Last update
			8/24/2018	

NP 3127 SH 3~ Adaptive 246

Duty Analysis

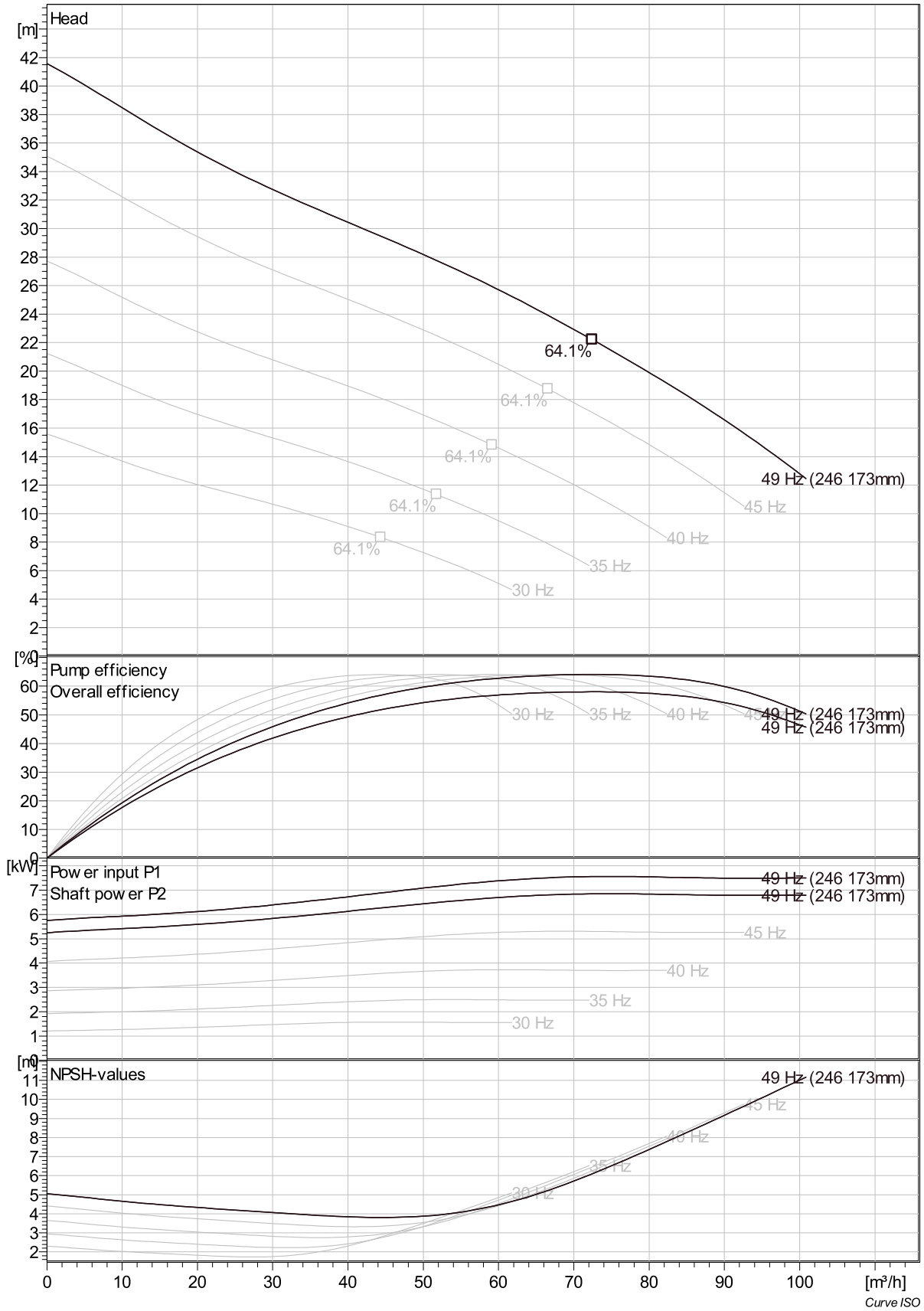


	Individual pump			Total					
Pumps running /System	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	42 m³/h	30 m	6.19 kW	42 m³/h	30 m	6.19 kW	55.4 %	0.162 kWh/m³	3.82 m

Project	Project ID	Created by	Created on	Last update
			8/24/2018	

NP 3127 SH 3~ Adaptive 246

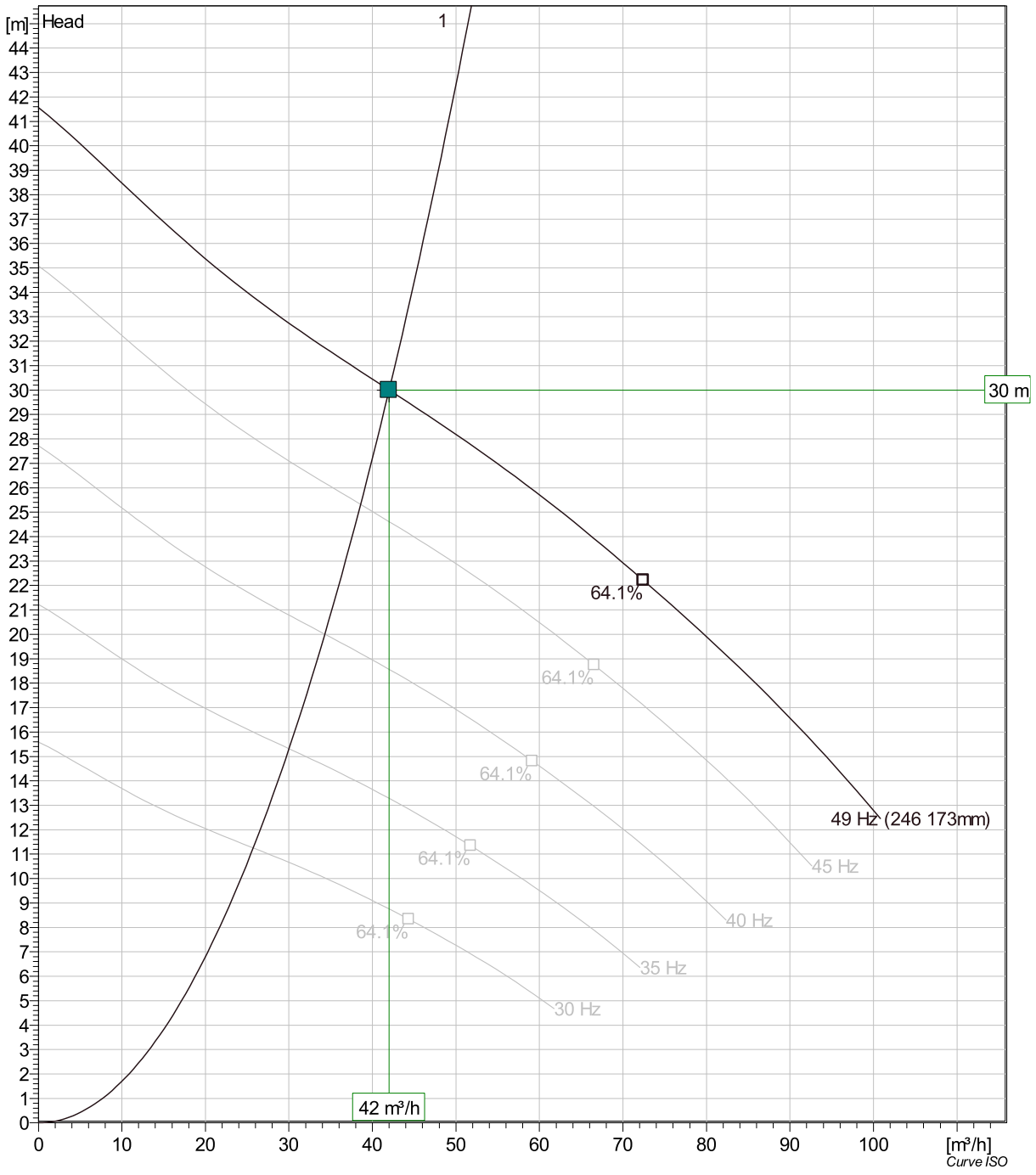
VFD Curve



Project	Project ID	Created by	Created on	Last update
			8/24/2018	

NP 3127 SH 3~ Adaptive 246

VFD Analysis

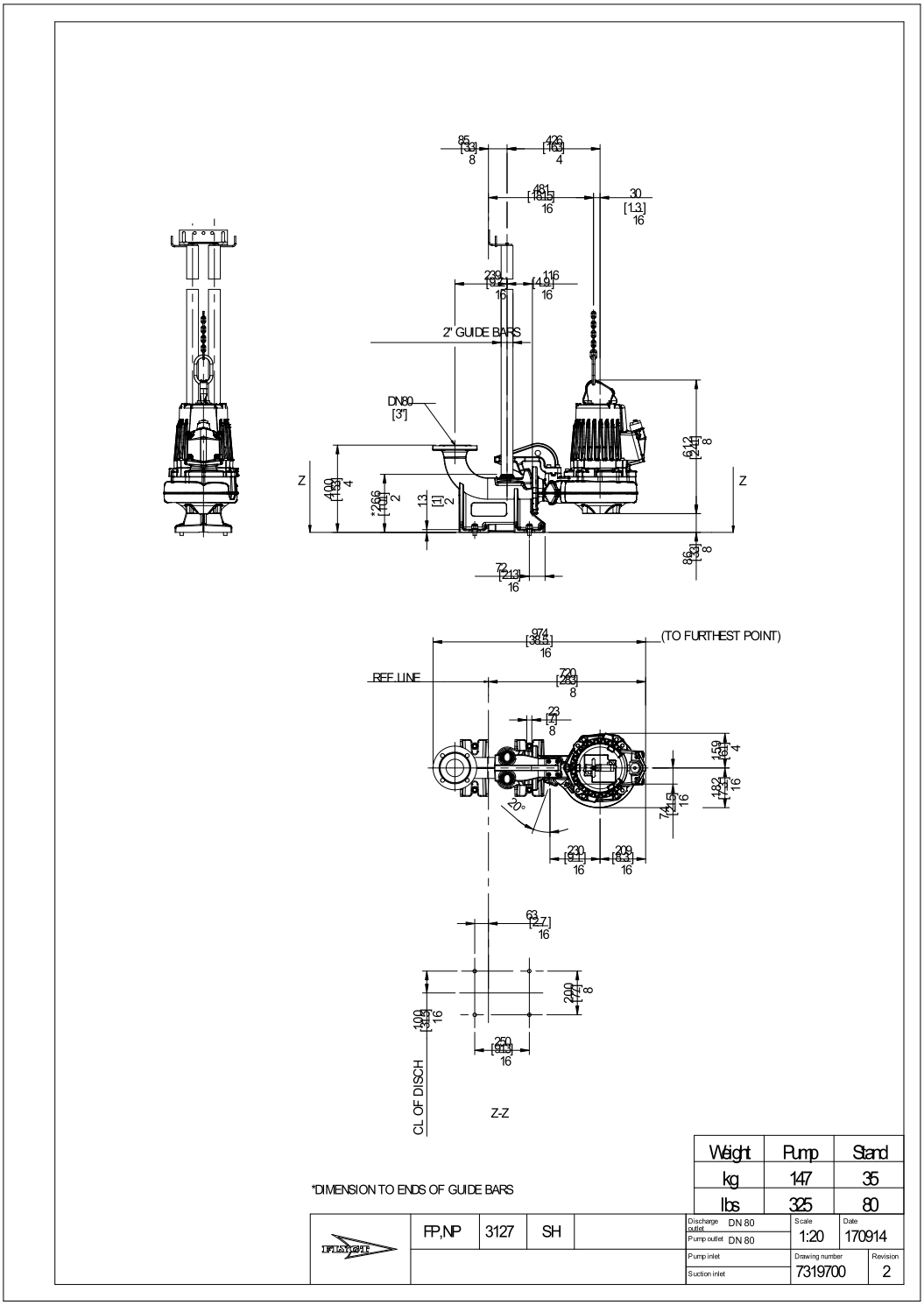


Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	49 Hz	42 m³/h	30 m	6.19 kW	42 m³/h	30 m	6.19 kW	55.4 %	0.162 kWh/m³	3.82 m
1	45 Hz	38.6 m³/h	25.3 m	4.8 kW	38.6 m³/h	25.3 m	4.8 kW	55.4 %	0.137 kWh/m³	3.33 m
1	40 Hz	34.3 m³/h	20 m	3.37 kW	34.3 m³/h	20 m	3.37 kW	55.4 %	0.113 kWh/m³	2.76 m
1	35 Hz	30 m³/h	15.3 m	2.26 kW	30 m³/h	15.3 m	2.26 kW	55.4 %	0.0905 kWh/m³	2.23 m
1	30 Hz	25.7 m³/h	11.3 m	1.42 kW	25.7 m³/h	11.3 m	1.42 kW	55.4 %	0.0705 kWh/m³	1.74 m

Project	Project ID	Created by	Created on	Last update
			8/24/2018	

NP 3127 SH 3~ Adaptive 246

Dimensional drawing



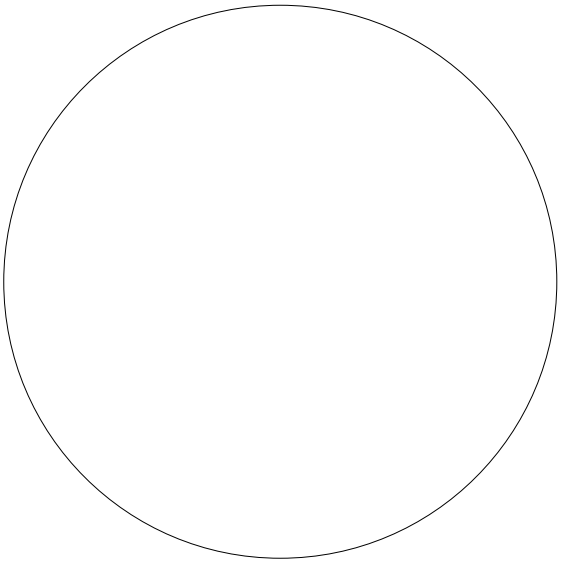
Project	Project ID	Created by	Created on	Last update
			8/24/2018	

NP 3127 SH 3~ Adaptive 246

Life cycle costs (LCC)

Total lifetime	15	Inflation rate (rate of price increases)	2 %
Annual operating time	5600	Interest rate (for investment)	3 %
Energy cost per kWh	0.00 EUR		
Power input P1			

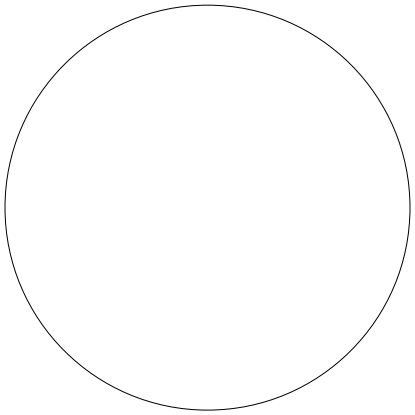
Total costs



0.00
EUR

0%	**0.00 EUR**	Energy
0%	**0.00 EUR**	Investment costs
0%	**0.00 EUR**	Installation & commissioning
0%	**0.00 EUR**	Operating cost
0%	**0.00 EUR**	Maintenance & repair
0%	**0.00 EUR**	Downtime
0%	**0.00 EUR**	Environmental
0%	**0.00 EUR**	Decommissioning

First year costs



0.00
EUR

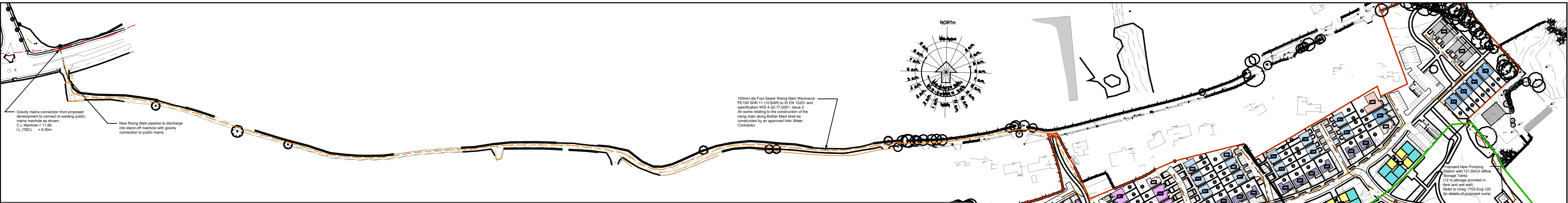
0%	**0.00 EUR**	Energy (1st year)
0%	**0.00 EUR**	Investment costs (1st year)
0%	**0.00 EUR**	Installation & commissioning (1st year)
0%	**0.00 EUR**	Operating cost (1st year)
0%	**0.00 EUR**	Maintenance & repair (1st year)
0%	**0.00 EUR**	Downtime (1st year)
0%	**0.00 EUR**	Environmental (1st year)
0%	**0.00 EUR**	Decommissioning (1st year)

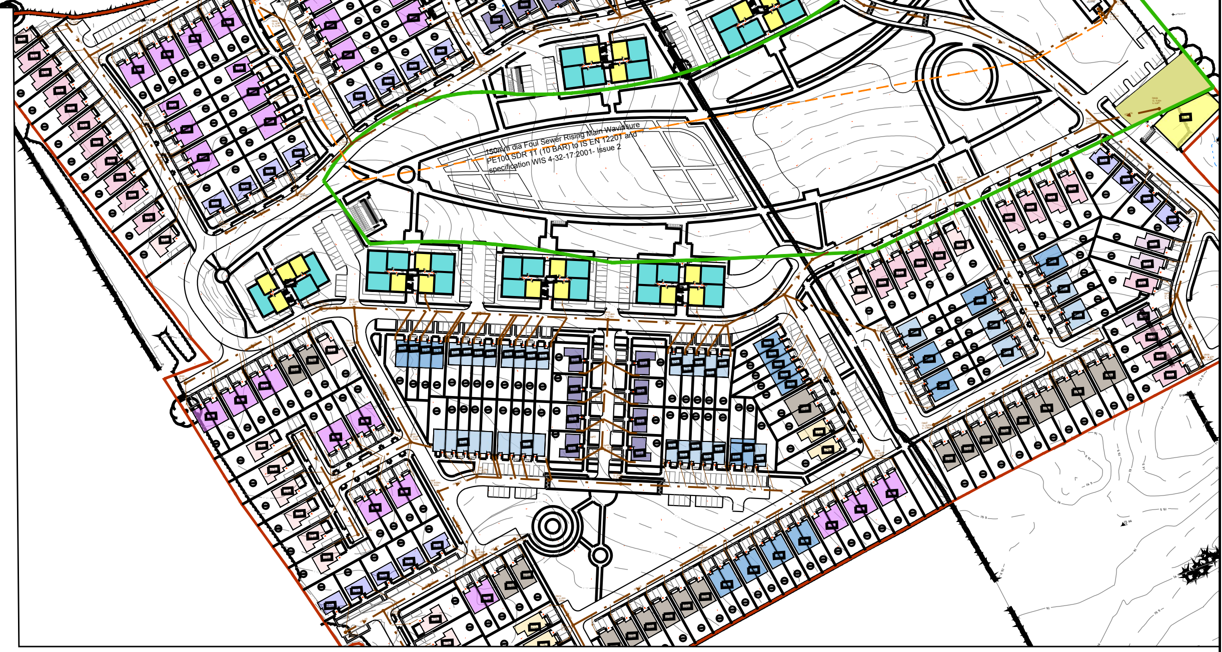
Disclaimer: The calculations and the results are based on user input values and general assumptions and provide only estimated costs for the input data. Xyleminc can therefore not guarantee that the estimated savings will actually occur.

Project	Project ID	Created by	Created on	Last update
			8/24/2018	

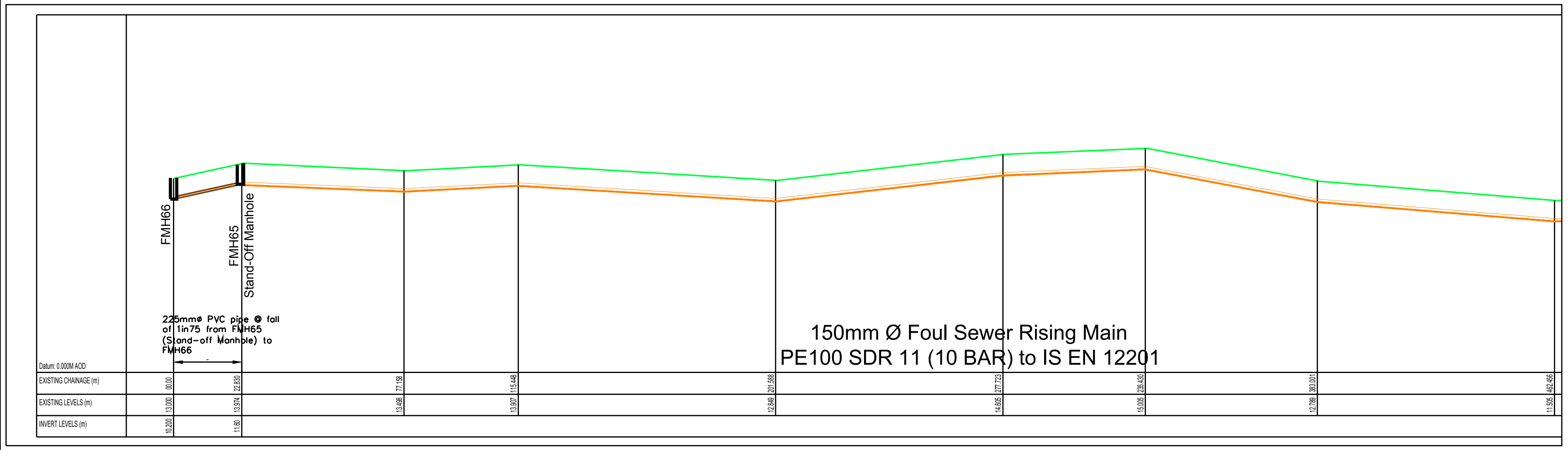
Appendix J

Foul Sewer Works Outside Site Boundary

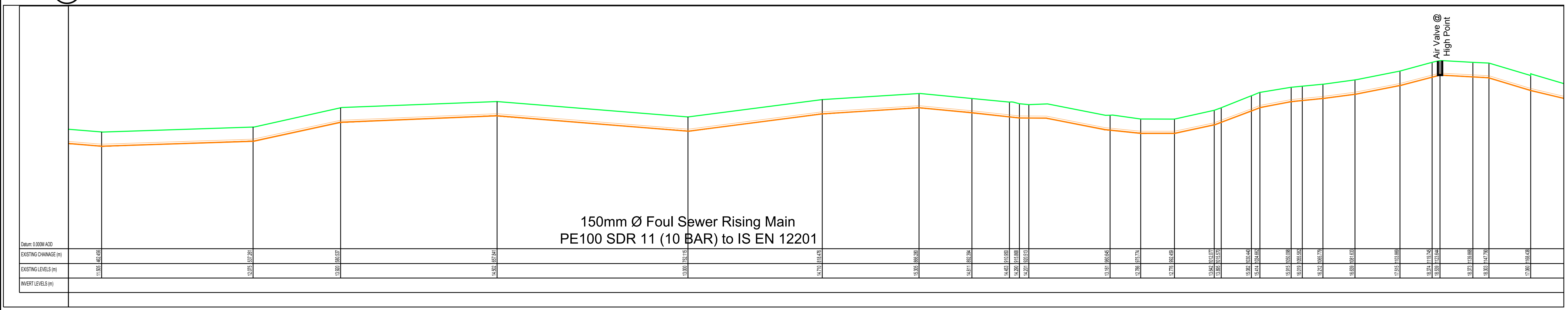




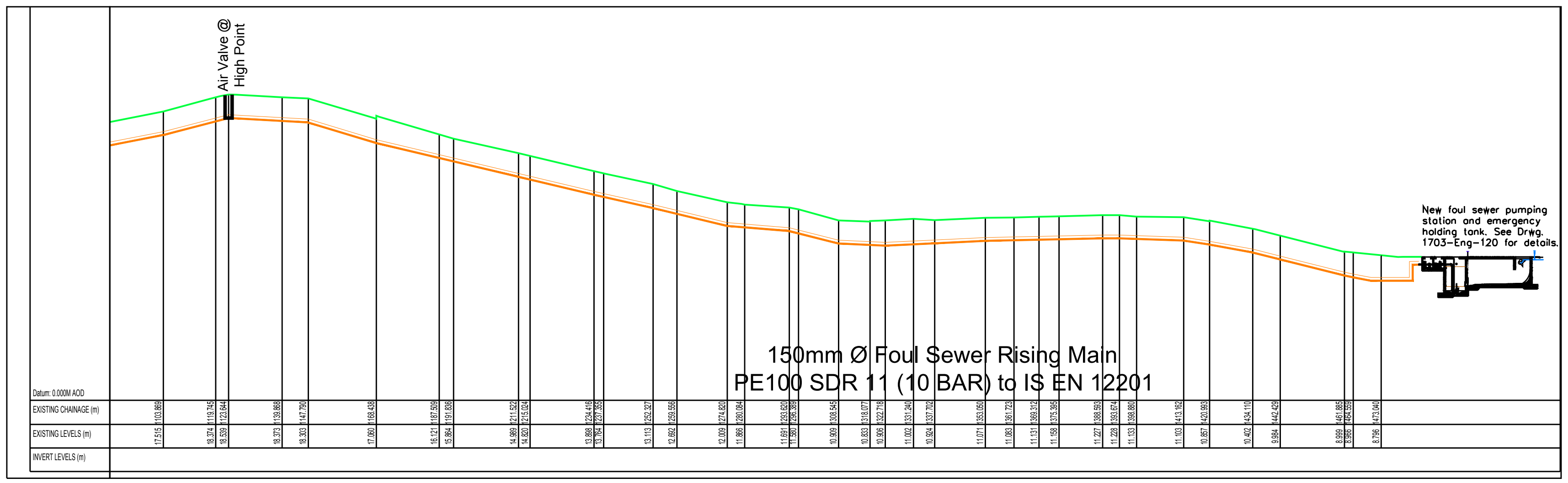
01 / 125 Foul Sewer Rising Main Layout
SCALE 1:1250



02 / 125 Part Longitudinal Section
SCALE 1:750



03 / 125 Part Longitudinal Section
SCALE 1:750



04 / 125 Part Longitudinal Section
SCALE 1:750

REV. NO.	DESCRIPTION	DATE	INITIALS
A	Issued for Planning	May 2019	T. Finn

finn DESIGN PARTNERSHIP
CREATIVE ● INNOVATIVE

Blakestown, Ardee, Co. Louth, Ireland
t 041 6857200 f 041 6857201 e info@finn.ie w www.finn.ie

DRAWING. NO:	126
REV. NO:	A
TITLE:	Foul Drainage Rising Main Layout
PROJECT:	Residential Development @ Haggardstown, Blackrock, Co Louth
CLIENT:	Kingsbridge Consultancy Ltd, 1st Floor, Block 1, Quayside Business Park, Mill Street, Dundalk, Co. Louth;
SCALE:	As Shown @ A1
DRAWN:	PC
DATE:	August 2018
CHECKED:	-
STATUS:	Planning Permission
JOB NO:	1703

ENG

NOTES
1. Copyright Reserved 2003 ©
2. Work to figured dimensions only. Do not scale drawing.
3. The contractor is responsible for checking all levels and dimensions on site and shall refer all discrepancies to the Architect
4. Where appropriate, for details of r.c. structure, or mechanical and electrical details, see Engineers drawings
5. Proprietary items shall be fixed in strict accordance with manufacturers instructions.
6. Sizes of proprietary items shall be checked with manufacturer.
7. The contractor shall be responsible for the coordination of structure, finishes and services.

● CIVIL - STRUCTURAL ENGINEERING ● PROJECT MANAGEMENT

Appendix K

Potable Water Demand Calculation

CLIENT: Kingsbridge Consultancy Ltd	**DATE:**	20/04/2018
PROJECT NAME: Proposed Residential Development @ Haggardstown, Blackrock, Dundalk, Co Louth.	**CALCULATION SHEET:**	1 OF 1
CALCULATION: Water Supply Requirements	**PROJECT REFERENCE:**	1704

finn DESIGN PARTNERSHIP

Potable Water Supply

Housing Units	500	no.
Creche	1	no.
Daily Demand per Person (Dwelling)	150	lts/person/day
Daily Demand per Person (Creche)[7]	60	lts/person/day
Average Occupancy Ratio per dwelling[1]	3	
Occupancy of Creche	120	People
Total Site Occupancy	1620	Persons
Average Daily Demand	232,200	lts
Average Daily Demand in Peak Week[2]	290,250	lts
Normal Length of Day[3]	24	hrs
Peak Factor[4]	5	
Post Development Peak Water Demand[5]	16.80	l/sec
Post Development Average Water Demand	2.7	l/sec
Normal Water Demand[6]	2.6	

Notes:

1. Occupancy ratio of 2.7 persons per dwelling from Irish Water Pre-Connection Enquiry Form (PCEF Rev 2)
2. Average Day in Peak Week is 1.25 times the average daily demand.
3. Assumed normal demand is the total daily demand during the normal length of day.
4. Peak Factor for pipe sizing from Irish Water Pre-Connection Enquiry Form.
5. Peak Factor multiplied by Average Day in Peak Week flow
6. Normal demand is the total daily demand during the normal length of day.
7. Daily Demand for creche taken from EPA "Wastewater Treatment Manuals, Treatment Systems for Small Communities,

Appendix L

Irish Water Pre-Connection Enquiry

Pre-connection enquiry form

Large industrial and commercial developments, mixed use developments, housing developments, business developments.

This form is to be filled out by applicants enquiring about the feasibility of a water and/or wastewater connection to Irish Water infrastructure. If completing this form by hand, please use BLOCK CAPITALS and black ink.

Please refer to the **Guide to completing the pre-connection enquiry form** on page 12 of this document when completing the form.

Section A | Applicant details

1 **WPRN number (where available):**

2 **Applicant details:**

Registered company name (if applicable): Kingsbridge Consultancy Ltd

Trading name (if applicable): N/A

Company registration number (if applicable): 518906

If you are not a registered company/business, please provide the applicant's name:

Contact name: Mr Adam Simpson

Postal address: c/o McAleer & Rushe

17-19 Dungannon Rd Co Tyrone

BT80 8TL

Eircode: N/A

Telephone: 00442826763741

Mobile:

Email: tristan.treacy@mcaleer.co

3 **Agent details (if applicable):**

Contact name: Tony Finn

Company name (if applicable): Finn Design Ptnrs

Postal address: Blakestown Ardee

Co Louth

Eircode: A92VX97

Telephone: 041 6857200

Email: info@finn.ie

4 **Please indicate whether it is the applicant or agent who should receive future correspondence in relation to the enquiry:**

Applicant ☐ Agent ☑

Section B | Site details

5 **Site address:** Haggardstown Blackrock
Dundalk Co Louth

6 **Irish Grid co-ordinates of site:** E(X) 706847 N(Y) 804278

Eg. co-ordinates of GPO, O'Connell St., Dublin: E(X) 315,878 N(Y) 234,619

7 **Local Authority:**

Local Authority that granted planning permission (if applicable):

Louth Co Council

8 **Has full planning permission been granted?** Yes ☐ No ☑

If 'Yes', please provide the current or previous planning reference number:

Pre-Connection

9 **Previous use of this site (if applicable):** Agricultural

10 **Date that previous development was last occupied (if applicable):** --/--/----

11 **Are there poor ground conditions on site?** Yes ☐ No ☑

If 'Yes', please include site investigation report and a detailed site-specific report on the approach being taken to deal with ground conditions specifically with regard to pipe support and trenching.

12 **Are there potential contaminated land issues?** Yes ☐ No ☑

If 'Yes', please include a detailed site-specific report on the approach being taken to deal with contaminated land and the measures being taken to mitigate the impact on infrastructure.

13 **Is the development compliant with the local area development plan?** Yes ☑ No ☐

Section C | Water connection and demand details

14 **Is there an existing connection to public water mains at the site?** Yes ☐ No ☑

15 **Is this enquiry for an additional connection to the one already installed?** Yes ☐ No ☑

16 **Is this enquiry to increase the size of an existing water connection?** Yes ☐ No ☑

17 **Is this enquiry for a new water connection?** Yes ☑ No ☐

18 **Approximate date water connection is required:** 1 / 10 / 2019

19 **Please indicate pre-development water demand (if applicable):**

Pre-development peak hour water demand	N/A	**l/s**
Pre-development average hour water demand	N/A	**l/s**

Pre-development refers to brownfield sites only. Please include calculations on the attached sheet provided.

20 **Please indicate the domestic water demand (housing developments only):**

Post-development peak hour water demand	6.93	**l/s**
Post-development average hour water demand	2.77	**l/s**

Please include calculations on the attached sheet provided.

21 **Please indicate the business water demand (shops, offices, schools, hotels, restaurants, etc.):**

Post-development peak hour water demand	N/A	**l/s**
Post-development average hour water demand	N/A	**l/s**

Please include calculations on the attached sheet provided. Where there will be a daily/weekly/seasonal variation in the water demand profile, please provide all such details.

22 **Please indicate the industrial water demand (industry-specific water requirements):**

Post-development peak hour water demand	N/A	**l/s**
Post-development average hour water demand	N/A	**l/s**

Please include calculations on the attached sheet provided. Where there will be a daily/weekly/seasonal variation in the water demand profile, please provide all such details.

23 **What is the existing ground level at the property boundary at connection point (if known) above Malin Head Ordnance Datum?**

4.40 m

24 **What is the highest finished floor level of the proposed development above Malin Head Ordnance Datum?**

25.60 m

25 **Is on-site water storage being provided?** Yes ☐ No ☑

Please include calculations on the attached sheet provided.

26 **Are there fire flow requirements?** Yes ☑ No ☐

Additional fire flow requirements over and above those identified in Q20, Q21 and Q22 above	20 Hydrants @ 8lts/Hyd	l/s

Please include calculations on the attached sheet provided, and include confirmation of requirements from the Fire Authority.

27 **Do you propose to supplement your potable water supply from other sources?** Yes ☐ No ☑

If 'Yes', please indicate how you propose to supplement your potable water supply from other sources (see **Guide to completing the application form** on page 12 of this document for further details):

Section D | Wastewater connection and discharge details

28 **Is there an existing connection to a public sewer at the site?** Yes ☐ No ☑

29 **Is this enquiry for an additional connection to one already installed?** Yes ☐ No ☑

30 **Is this enquiry to increase the size of an existing connection?** Yes ☐ No ☑

31 **Is this enquiry for a new wastewater connection?** Yes ☑ No ☐

32 **Approximate date that wastewater connection is required:** 1 / 10 / 2019

33 **Please indicate pre-development wastewater discharge (if applicable):**

Pre-development peak discharge	N/A	l/s
Pre-development average discharge	N/A	l/s

Pre-development refers to brownfield sites only. Please include calculations on the attached sheet provided.

34 **Please indicate the domestic wastewater hydraulic load (housing developments only):**

Post-development peak discharge	6.93	l/s
Post-development average discharge	2.77	l/s

Please include calculations on the attached sheet provided.

35 **Please indicate the commercial wastewater hydraulic load (shops, offices, schools, hotels, restaurants, etc.):**

Post-development peak discharge	N/A	l/s
Post-development average discharge	N/A	l/s

Please include calculations on the attached sheet provided.

36 Please indicate the industrial wastewater hydraulic load (industry-specific discharge requirements):

Post-development peak discharge	N/A	**l/s**
Post-development average discharge	N/A	**l/s**

Please include calculations on the attached sheet provided.

37 Wastewater organic load:

Characteristic	Max concentration (mg/l)	Average concentration (mg/l)	Maximum daily load (kg/day)
Biochemical oxygen demand (BOD)			
Chemical oxygen demand (COD)			
Suspended solids (SS)	Domestic Loadings		
Total nitrogen (N)			
Total phosphorus (P)			
Other			

Temperature range	
pH range	

38 Storm water run-off will only be accepted from brownfield sites that already have a storm/surface water connection to a combined sewer. In the case of such brownfield sites, please indicate if the development intends discharging surface water to the combined wastewater collection system:

Yes ☐ No ☑

If 'Yes', please give reason for discharge and comment on adequacy of SUDS/attenuation measures proposed.

39 Do you propose to pump the wastewater? Yes ☑ No ☐

If 'Yes', please include justification for your pumped solution with this application.

40 What is the existing ground level at the property boundary at connection point (if known) above Malin Head Ordnance Datum?

4 . 4 0 m

41 What is the lowest finished floor level on site above Malin Head Ordnance Datum? 8 . 1 0 m

Section E | Development details

42 Please outline the domestic and/or industry/business use proposed:

Property type	Total number of units for this application
Domestic	500 # Residential Units and Associated Creche Facility
Office	
Residential care home	
Hotel	
Factory	
School	
Institution	
Retail unit	
Industrial unit	
Other (please specify)	

43 Approximate start date of proposed development: 1 _ / 1 0 / 2 0 1 9

44 Is the development multi-phased? Yes ☑ No ☐

If 'Yes', application must include a master-plan identifying the development phases and the current phase number.

If 'Yes', please provide details of variations in water demand volumes and wastewater discharge loads due to phasing requirements.

Section F | Supporting documentation

Please provide the following additional information:

> Site location map: A site location map to a scale of 1:1000, which clearly identifies the land or structure to which the enquiry relates. The map shall include the following details:

a) The scale shall be clearly indicated on the map.

b) The boundaries shall be delineated in red.

c) The site co-ordinates shall be marked on the site location map.

> Details of planning and development exemptions (if applicable).

> Calculations (calculation sheets provided below).

> Site layout map to a scale of 1:500 showing layout of proposed development, water network and wastewater network layouts, additional water/wastewater infrastructure if proposed, connection points to Irish Water infrastructure (if known).

> Any other information that might help Irish Water assess this pre-connection enquiry.

Section G | Declaration

I/We hereby make this application to Irish Water for a water and/or wastewater connection as detailed on this form.

I/We understand that any alterations made to this application must be declared to Irish Water.

The details that I/we have given with this application are accurate.

I/We have enclosed all the necessary supporting documentation.

Signature: Tony Finn Date: 19/10/2015

Your full name (in BLOCK CAPITALS):

TONY FINN

Irish Water will carry out a formal assessment based on the information provided on this form.
Any future connection offer made by Irish Water will be based on the information that has been provided here.

Please submit the completed form to **newconnections@water.ie** or alternatively, post to:

Irish Water
PO Box 860
South City Delivery Office
Cork City

For office use only:

Input customer number:

Calculations

Water demand

Water consumption for 500 # residential units & associated creche facility

Residential

Consumption/person/day = 150 lts
Average occupancy/dwelling = 5
Consumption/dwelling/day = 450

Calculation

500 units × 450 = 225,000 lts or 225 m^3

Over 24 hr period = 225,000 ÷ (24×60×60)
= 2.6 lts/sec

Creche

Consumption/person/day = 60 lts
Occupancy of creche = 120 persons
Consumption of creche/day = 7,200 lts or 7.2 m^3

Over 12 hr period = 7,200 ÷ (12×60×60)
= 0.17 lts/sec

∴ Total consumption = 2.6 + .17
= 2.77 lts/sec

Peak demand equates to area 2.5 times average demand

= 2.77 × 2.5
= 6.925 lts/sec

On-site storage

N/A

Fire flow requirements

Say circa 20 hydrants required to serve overall development @ max demand of 8 lts/sec/hydrant

With all hydrants operating @ max flow & at the same time (unlikely)

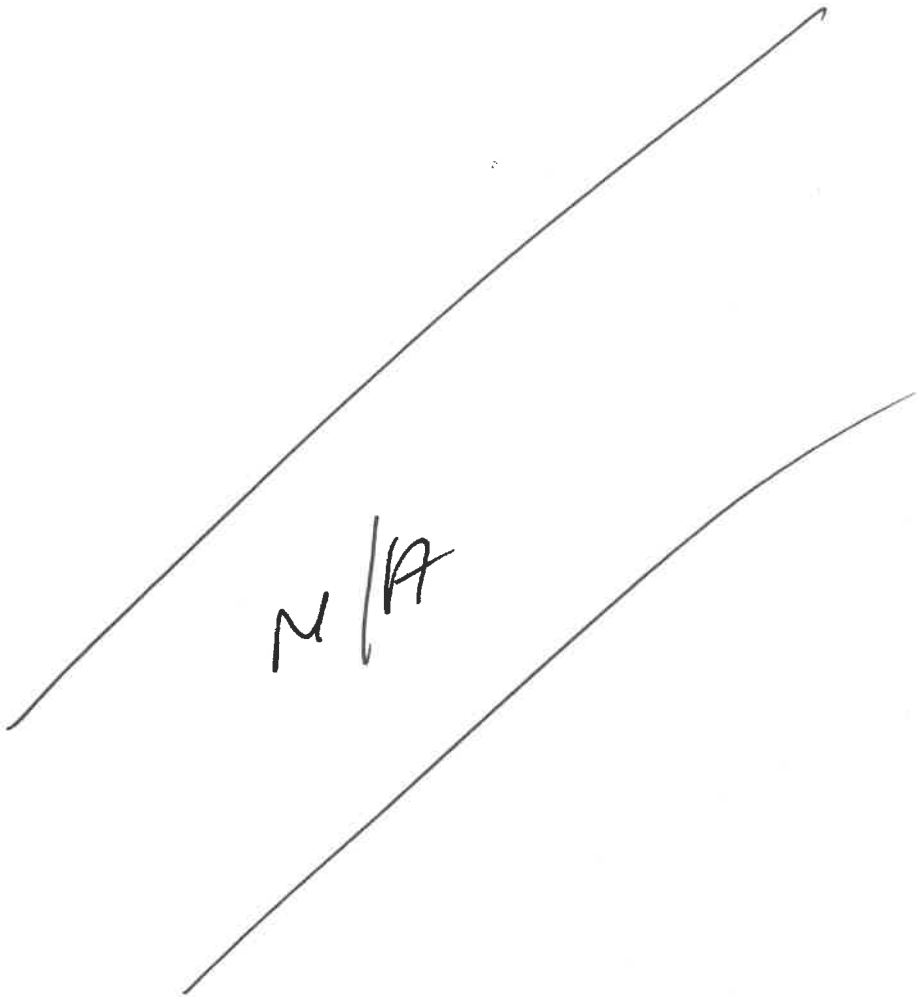
= 8 x 20

= 160 lts/sec

Foul water discharge from the development will correspond (approx) to water supply requirements

∴ Average flow = 2.77 lts/sec

Peak flow = 6.925 lts/sec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Appendix M

Irish Water Letter of Response to Pre-Connection Enquiry

Tony Finn
Finn Design Ptnrs
Blakestown,
Ardee,
Co Louth.
A92VX97

Letter Ref: CDSCOF6

Uisce Eireann
Bosca OP 860
Oifig Sheachadta
na Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 860
South City
Delivery Office
Cork City

www.water.ie

18/02/2019

Dear Sir/Madam,

Re: 3121963370 pre-connection enquiry – Subject to contract | Contract denied
Water and wastewater connections for a 500 unit residential development at Haggardstown, Blackrock, Dundalk, Co. Louth.

Irish Water has reviewed your pre-connection enquiry in relation to water and wastewater connections at **Haggardstown, Blackrock, Dundalk, Co. Louth.** (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on the capacity currently available as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place and the conditions listed below, your proposed connection to the Irish Water network can be facilitated.

Strategic Housing Development
Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. Therefore:

A. In advance of submitting your full application to An Bord Pleanala for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services.
B. You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed and appropriate connection fee paid at a later date.

Water: To connect this development to Irish Water's water network significant upgrades are required, these include but are not limited to the construction of approx. 1.2km of 200mm watermain this will include a DMA meter, PRV and telemetry.

Waterwater: To connect this development to Irish Water's wastewater network sigificanr upgrades are required, these include but are not limited to the construction of approx. 1km of 225mm foul gravity sewer in which Irish Water may need to upsize.

In addition, upgrade/improvement works at Coes Road WWPS will be required to facilitate connection. An assessment of the capacity of Coes

Road WWPS is currently being carried out by the DAP consultant in relation to the Blackrock LRNP connection. This assessment will also confirm if upgrade/improvement works are required to faciltiate this development. This may be subject to change.

A connection agreement can be applied for by completing the connection application form available 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 Energy Regulation.

Should you wish to have any of the above progressed by Irish Water or if you have any further questions, please contact Pat O' Neill from the design team on 018925250 or email patoneil@water.ie For further information, visit **www.water.ie/connections**

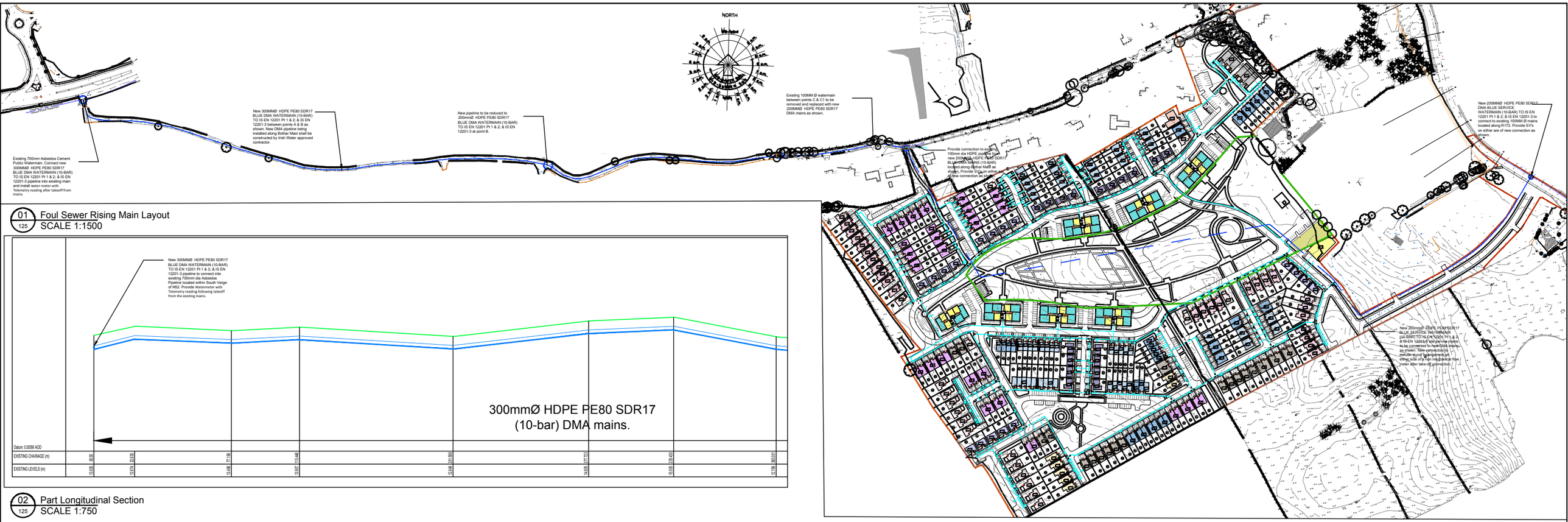
Yours sincerely,

Maria O'Dwyer

Connections and Developer Services

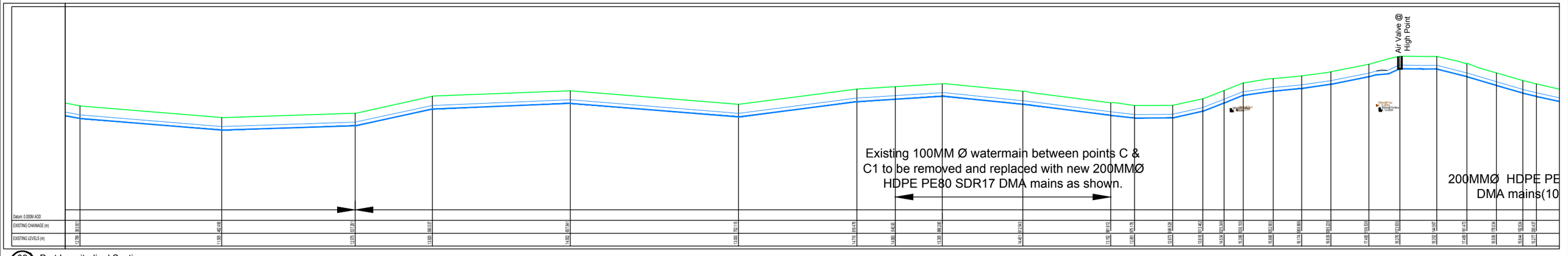
Appendix N

Potable Water Works Outside Site Boundary

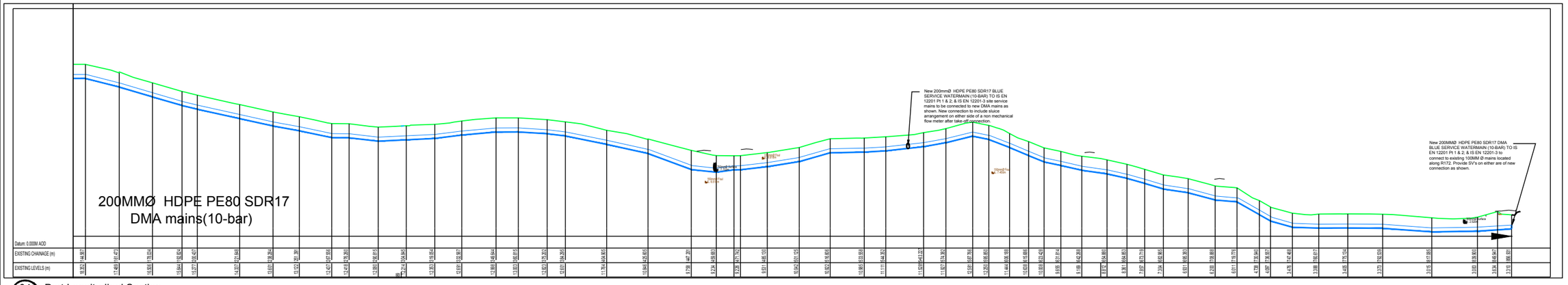


01 125 Foul Sewer Rising Main Layout
SCALE 1:1500

02 125 Part Longitudinal Section
SCALE 1:750



03 125 Part Longitudinal Section
SCALE 1:750



04 125 Part Longitudinal Section
SCALE 1:750

REV. NO.	DESCRIPTION	DATE	INITIALS
B	Issued for Planning	May 2019	T. Finn
A	Issued to Irish Water for Statement of Acceptance	26th April 2019	T. Finn

finn DESIGN PARTNERSHIP
CREATIVE ● INNOVATIVE
Blakestown, Ardee, Co. Louth, Ireland
t 041 6857200 f 041 6857201 e info@finn.ie w www.finn.ie

DRAWING NO. 136 REV. NO. B

ENG

TITLE: Public Watermain New DMA

PROJECT: Residential Development @ Haggardstown, Blackrock, Co Louth

CLIENT: Kingsbridge Consultancy Ltd 1st Floor, Block 1, Quayside Business Park, Mill Street, Dundalk, Co. Louth.

SCALE: 1:1500 & 1:750 @ A1 DRAWN: PC

DATE: November 2018 CHECKED: -

STATUS: Planning Permission

JOB NO: 1703

CIVIL ● STRUCTURAL ENGINEERING ● PROJECT MANAGEMENT

Appendix O

Irish Water Statement of Design Acceptance for Foul Drainage & Potable Water

Tony Finn,
Finn Design Partnership,
Blakestown,
Ardee,
Co. Louth

20 May 2019

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

Re: Design Submission for Strategic Housing Development at Haggardstown, Blackrock, Dundalk, Co. Louth (the "Development") (the "Design Submission") / 1604905118.

Dear Tony,

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: Marina Byrne
Phone: 01 8925991
Email: mzbyrne@water.ie

Yours sincerely,

Maria O'Dwyer

Connections and Developer Services

Appendix A

Document Title & Revision

- 1703-121-A Foul Drainage Layout Zone 1
- 1703-122-A Foul Drainage Layout Zone 2
- 1703-123-A Foul Drainage Layout Zone 3
- 1703-124-A Foul Drainage Layout Zone 4
- 1703-125-A Overall Site Foul Drainage Layout
- 1703-127-A Foul Drainage Longitudinal Sections
- 1703-128-A Foul Drainage Longitudinal Sections
- 1703-129-A Foul Drainage Longitudinal Sections
- 1703-130-A Watermain Layout Main Entrance
- 1703-131-A Watermain Layout Zone 1
- 1703-132-A Watermain Layout Zone 2
- 1703-133-A Watermain Layout Zone 3
- 1703-134-A Watermain Layout Zone 4
- 1703-137-A Watermain Details (Sheet 1 of 3)
- 1703-138-A Watermain Details (Sheet 2 of 3)
- 1703-139-A Watermain Details (Sheet 3 of 3)

- 1703-143-A Foul Drainage Details (Sheet 1 of 3)
- 1703-144-A Foul Drainage Details (Sheet 2 of 3)
- 1703-145-A Foul Drainage Details (Sheet 3 of 3)

Standard Details/Code of Practice Exemption: N/A

*For further information, visit **www.water.ie/connections***

Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Irish Water will not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.