DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

RESIDENTIAL DEVELOPMENT AT LEHENAGHMORE, CORK

INFRASTRUCTURE REPORT

DATE *04/06/2025*

REVISION *2*

JOB NO. 6476

Joyce House, Barrack Square, Ballincollig, Co. Cork
T 021 4871781 F 021 4874157 info@dosa.ie www.dosa.ie

DOCUMENT CONTROL

PROJECT NAME: RESIDENTIAL DEVELOPMENT AT LEHENAGHMORE, CORK

PROJECT NUMBER: 6476

REVISION	DATE	FILE NAME: RESIDENTIAL DEVELOPMENT AT LEHENAGHMORE, CORK			
0	09.04.2025	DESCRIPTION: Infrastructure Report			
			PREPARED	CHECKED	APPROVED
		INITIAL	SO'D	SO'D	SO'D
		DATE	09.04.2025	09.04.2025	09.04.2025
1	04.06.2025	FILE NAME: Infrastructure Report			
		DESCRIPTION: Infrastructure Report			
			PREPARED	CHECKED	APPROVED
		INITIAL	SO'D	CO'S	SO'D
		DATE	04.06.2025	04.06.2025	04.06.2025
2	24.06.2025	FILE NAME: Infrastructure Report			
		DESCRIPTION: Infrastructure Report			
			PREPARED	CHECKED	APPROVED
		INITIAL	SO'D	SO'D	SO'D
		DATE	24.06.2025	24.06.2025	24.06.2025
#	Insert Date	FILE NAME: Infrastructure Report			
		DESCRIPTION:			
			PREPARED	CHECKED	APPROVED
		INITIAL	#	#	#
		DATE	Insert Date	Insert Date	Insert Date
#	Insert Date	FILE NAME: Infrastructure Report			
		DESCRIPTION:			
			PREPARED	CHECKED	APPROVED
		INITIAL	#	#	#
		DATE	Insert Date	Insert Date	Insert Date

Contents

1 Introduction

Denis O'Sullivan & Associates have been engaged as Consulting Engineers for the proposed residential development at Lehenaghmore, Cork

The proposed development consists of the construction of *155 residential units and a 42 child creche* within the vacant green field site at Lehenaghmore, Cork. The overall development consists of. 3 bed semi-detached, 4 bed semi-detached, townhouses, Ground floor and Duplex units, Apartment-Blocks *and a creche*.

1.1 Objectives

Denis O'Sullivan & Associates carried out a number of site investigations and their findings have been incorporated to deal with solutions to:

- Surface Water Drainage Network
- Foul Drainage Network
- Water Supply

The Confirmation of Feasibility as issued by Irish Water is included in Appendix A of this Report.

1.2 Proposed Development

The proposed development consists of the construction of 155 residential units *and a 42 child creche* within the vacant green field site at Lehenaghmore Cork.

The site is located in the townland of Lehenaghmore, Cork and is in close proximity to the N27 and Cork Airport, as shown in Figure 1 - 1 below.

Access to the site will be from the existing Pouladuff Road.

Figure 1-1 Site Location

2 *Surface Water System*

In order to reduce the effects of the surface runoff on potential flooding, a Stormwater Management Plan will be applied to surface water discharging into sewers and adjacent watercourses. The Stormwater Management Plan can be applied to control the rate of runoff from new development and takes into consideration of the various SUDS elements and techniques available. The maximum permitted surface water outflow from the new development is to be restricted to that of the existing Greenfield site.

Control of runoff by attenuation methods requires a hydraulic control to restrict the magnitude of flows passing downstream, together with an upstream storage capacity to contain the volume of runoff held back by the hydraulic control. The flows are proposed to be attenuated in the surface water system by adopting a flood storage attenuation tank along with a restricted outlet as the control devise. The storage volume required has been designed using the computer aided design package Windes 10.4

3 *Surface Water Management*

3.1 *Surface Water Design*

The storm water system for the development will involve Sud measures and a network of underground pipelines and manholes discharging to the storm sewer within granted P8. HP .22.11 development. The attenuation system, which will be fitted with flow control devices to ensure no increase in peak flows and an oil interceptor to remove any traces of oil washed off road surfaces.

Surface water discharge rates from the proposed surface water drainage network will be controlled by a vortex flow control device (Hydrobrake or equivalent) and associated attenuation tank. Surface water discharge will also pass via a bypass fuel/oil separator (sized in accordance with permitted discharge from the site).

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

3.2 *Review of SUDS Techniques*

3.3 *SuDS Appraisal*

The SUDS selection process used for this site is in accordance with SUDS selection flow chart, Volume 3, Section 6.5, Figure 48 of the GDSDS. The characteristics of the site are utilised to select the various SUDS techniques that would be applicable.

The following methodologies are being implemented as part of a SuDS treatment train approach:

- Permeable Pavement - utilised within car parking areas
- Underground Attenuation -below the open space area
- Flow control device (e.g. hydrobrake) - installed at the outfall manhole of each catchment

- Petrol Interceptor - installed downstream of each flow control device manhole.
- Filtration trenches and Basins
- Tree pits
- Rain gardens

In reviewing the design of the storm water drainage system, all options under the SUDS guidance policies referred to in the Greater Dublin Drainage Strategy were reviewed. A preliminary feasibility of the applicable SUDS Techniques was carried out using the facility on the website of Irishsuds.ie (Guidance and Tools). The preliminary analysis indicated that the following techniques were possibly suitable Ponds, Basins, Permeable Paving, filtration drains, Soakaways, Swales and Rainwater Harvesting. Each proposal was examined and evaluated on its merits / suitability under site specific constraints for use in the proposed development site. Our design approach summary is as follows:

3.3.1 Infiltration Basins

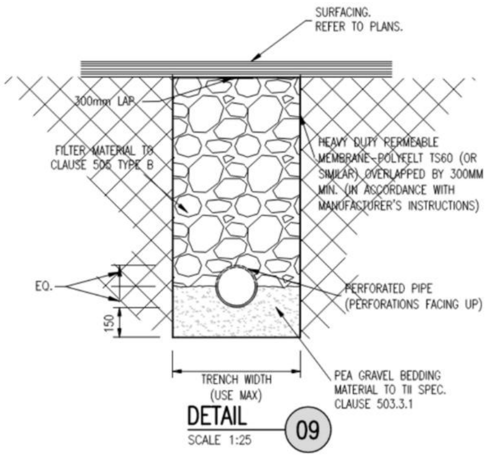
Infiltration basins are vegetated depressions designed to store runoff on the surface and infiltrate it gradually into the ground. They are dry except in periods of heavy rainfall. The site slopes downwards in a south to north direction with a gradient in the region of 1:20. The most suitable location of such a technique would be on a relatively flat plain none. Infiltration basins reduce the volume of runoff from impermeable areas.

3.3.2 Permeable Paving (Exfiltration Method)

Permeable pavement will be used throughout the site, in car parking spaces. Permeable paving will not be used in the public domain. Permeable paving reduces the overall impermeable area of the hard-standing area, which will reduce the impact of the discharge and improve the quality of the effluent from the proposed development. Permeable pavement will be provided in the car parking areas. The permeable paving is provided for the purposes of improving the quality of the surface water runoff. No reduction in the rate of run-off as a result of the permeable paving provision is allowed for in the surface water calculations which assumes the system is in a saturated state.

3.3.3 Filter Drain

Numerous filter drains are proposed along the site. Filter drains are trenches filled with permeable material and a perforated collection pipe at the invert with an optional permeable 'sandy' topsoil at surface. These can treat, convey and attenuate runoff at source, and can infiltrate to the ground where the subgrade is suitable. These systems will allow some form of storage for small rainfall events and can result in water evaporation and adsorption in small quantities, therefore there will be less run-off from these areas in small rainfall events thus mimicking the natural response for this catchment. These will be located along the proposed green area and will allow groundwater to recharge to its natural state.



TYPICAL FILTER DRAIN DETAIL

Figure 3

.3– Typical Filter Drain Detail

3.3.4 Tree Pits

It is proposed where possible to utilise tree pits throughout the site. Trees can be planted within a range of infiltration SuDS components to improve their performance, as root growth and decomposition increase soil infiltration capacity. Alternatively, they can be used as standalone within soil-filled tree pits, tree planters or structural soils, collecting and storing runoff and providing treatment via filtration and phytoremediation. Tree pits and planters will be designed to collect and attenuate runoff by providing additional storage within the underlying structure. The soils around trees can also be used to filter out pollutants from runoff directly. Tree pits are proposed to be in green space areas to treat and control runoff, while at the same time providing amenity value to adjacent pedestrian, and residential zones. It is also proposed, where possible to fit tree pits along the estate road to drain and treat surface water runoff from the road network. This will allow for treatment of first flush and low flows while high flows will discharge into the surface water network during extreme rainfall events. Rainwater gullies will still be provided downstream of any tree pit to drain runoff during an extreme rainfall event.

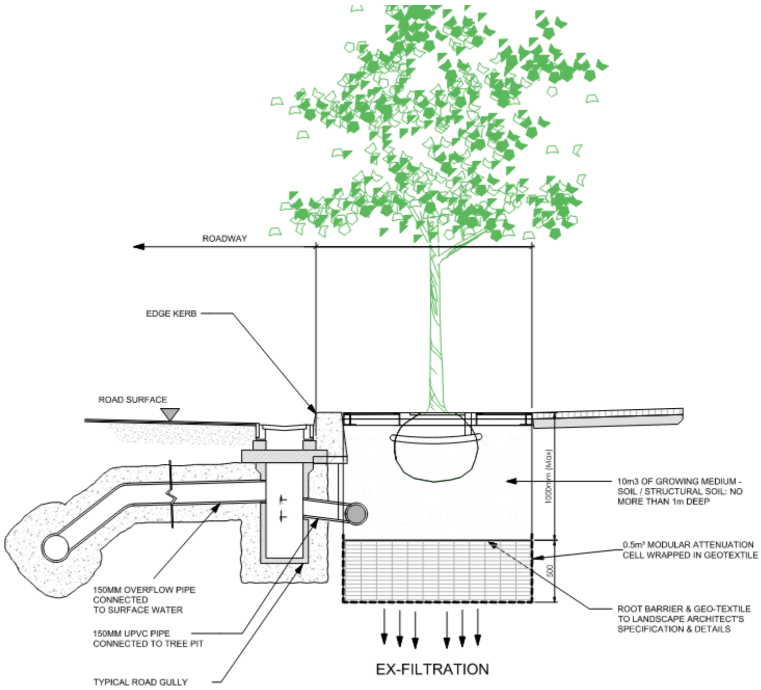


Figure 2.4– Tree Pit Detail

3.3.5 Rain Gardens/Bioretention Tree Pit

Rain Gardens/Bioretention Tree pits are small, planted areas with stormwater controls that collect and treat stormwater runoff. Shallow landscaped basins make use of soils and vegetation to remove pollutants. This treated runoff shall be collected in these basins and form part of a wider SuDS approach for the areas adjacent the Main Distributor Road within the development.

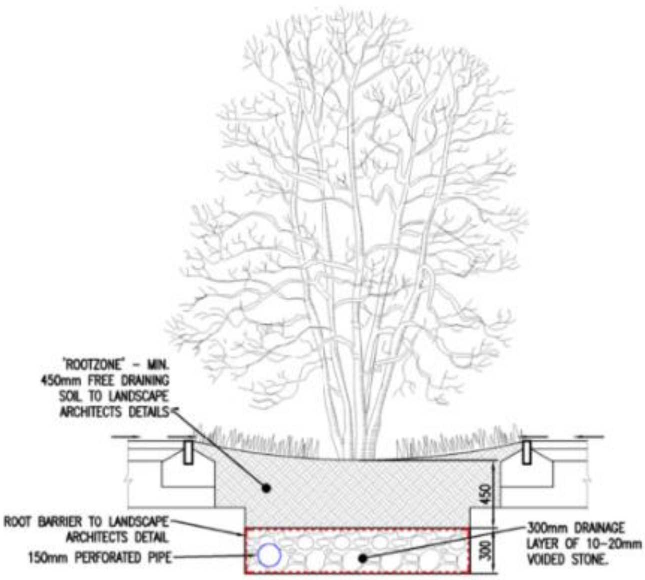


Figure 2.5– Typical Raingarden/Bioretention Tree Pit Arrangement

The proposed raingardens are included on the SuDS drawings. It is proposed to include them along the main access road and along green areas within the development. Theoretically the installation of these Raingarden/Bioretention tree pits in public areas contribute to a possible volumetric reduction in required attenuation in the overall development , however they have been omitted from providing any reduction in these attenuated volume requirements.

3.3.6 Green / blue roof

It is proposed install Green / blue roof on the apartment block flat roof Green/Blue and Sedum roofs involve covering a roof of a building with vegetation laid over a drainage & storage layer and a waterproofing membrane. They are designed to intercept and store rainwater and therefore, reduce surface water runoff. They are suited to the flat type of roof being proposed for the proposed apartment buildings. Sedum roofs have ecological and aesthetic benefits and remove pollutants from rainwater.

3.3.7 Underground Attenuation

The system attenuates surface water to restrict the outflow to the equivalent of an agricultural runoff. This ensures the development will not give rise to any impact downstream of the site.

3.3.8 Flow Control Device

It is proposed to provide a hydrobrake, or similar approved, at the outfall of the surface water catchment to restrict the outflow of water from the subject site. The hydro-brakes will be fitted with a pull cord bypass and a penstock valve installed on the inlet to the manhole for maintenance purposes.

3.3.9 Petrol Interceptor

It is proposed to provide a petrol interceptor upstream of the attenuation tanks to ensure that any remaining hydro-carbons or pollutants within the runoff from trafficked areas are treated prior to outfall to the existing storm sewer. It is proposed to provide a Conder Bypass Separator Type or similar approved.

In conclusion the water quality from this catchment should be of a high quality due to the above-mentioned measures, which are applied in a treatment train to treat the water before discharge at a restricted rate to the local network.

The above measures ensure a suitable management train is provided.

3.3.10 Management Train

The management train commences with source control through the provision of permeable paving within the car parking area. This employment of source control will aid to reduce the peak runoff rate, placing less stress on the facilities downstream.

The second stage of the management train, site control, is provided by the introduction of the hydrocarbon interceptors, which provide a degree of treatment before discharging to the attenuation system.

The underground attenuation offers a third stage of treatment, regional control, by slowing the storm water discharge down, promoting infiltration and removing additional silts which may remain in the storm water.

4 Maintenance Regime for SuDS Devices

The SuDS features proposed above for the site will require the following maintenance: It should be noted that as part of the as-builts and taking in charge process, documentation in relation to Operation and maintenance etc will be provided. The proposed SuDS strategy has been developed to try and strike a balance between efficient and robust operation and the minimising of frequent and on-going maintenance requirements. The maintenance of all SuDS features shall remain the responsibility of the developer until such time as any proposed taking in charge has been completed.

4.1.1 Underground attenuation systems

Inspection of the system should be conducted monthly for the first 3 months and then annually to ensure the system is working correctly. Debris should be removed monthly from the catchment surface where it may cause risk to the performance of the underground attenuation system. As required sediment from pre-treatment (catch pit) manholes prior to the attenuation system should be removed to ensure on going performance of the system. The inside of the tank should be surveyed every 5 years or as required if performance is reduced with any sediment build up removed if necessary.

The locations of all the tanks have readily accessible areas adjacent. Off road parking for maintenance vehicles and crew can be provided. In terms Of Operation and Maintenance the use of Reinforced concrete tanks is robust and maintenance free. The typical arrangement is the following train

- A Petrol interceptor which is accessible only via an on-grade heavy duty manhole cover.
- An inlet manhole to the tank will have a sump incorporated to trap silt so as to reduce the need to access the tank.
- The SuDS train is followed by a reinforced concrete attenuation tank. This is accessed via a number of heavy-duty manholes covers and fall arrest gates (anticipated requirement to enter is extremely low). In the unlikely event of entry being necessary only trained personnel in confined spaces will be permitted in any tank and this will be detailed and highlighted in any handover/maintenance files at taking in charge stage. There are no moving parts or plant associated with these tanks.
- The outflow will be controlled by a hydro brake located in an outlet manhole abutting the tank. This will be a vortex arrangement and separate access to that of the tank itself.

4.1.2 Tree Pits

Maintenance of trees will be greatest in the first few years, which will include regular inspection of tree condition including inlets and outlets, removal of invasive vegetation and possibly irrigation during long dry periods. As any handover process (taking in charge) is medium to long term it is anticipated that the Tree Pit regime will be well established and operational with little maintenance required.

4.1.3 *Filter Drains*

Inspection of the system should be conducted monthly on the inlet / outlet pipework and any control systems for blockages. Inspection of pre-treatment systems including should be conducted every 6 months for catch pits manholes prior to the filter drain with removal of silt or other build-ups. Removal of silt build-up may be required more frequent. Annual cleaning of roof runoff gutters etc should be part of the maintenance of the drainage system to ensure debris is removed prior to entering the network. Perforated pipework should be cleared of blockage if required.

4.1.4 *Hydro brake Manhole:*

Normally little maintenance is required as there are no moving parts within a hydro brake, however, after installation, hydro brakes should be inspected to ensure the hydro brake orifice is not blocked monthly for three months and thereafter at six monthly intervals and hosed down if required. Remove rubbish or debris from hydro brake if present. Hydro-Brake Flow Controls are fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur. The hydro brake will be located in a manhole separate to the tanks. As a result, any access will be similar to entering a standard manhole.

4.1.5 *Petrol Interceptor:*

Systems should be visually inspected for every rainfall event for 30 days after installation and the amount of sediment measured to give the operator an idea of the expected rate of deposition. Systems should then be inspected every 6 months to verify the appropriate level of maintenance. Floating debris and solids should be removed, and the sump cleaned with a conventional sump vacuum cleaner. Filter media should be replaced, and sediments, oils and grease should be removed where required.

4.1.6 *Green Roof Maintenance*

With the right conditions, green roofs are self-regulating but a minimum of two inspections per year should be conducted.

A typical maintenance programme includes:

1) Roof Evaluation - a comprehensive review of your green roof to determine what remedial work, if any, needs to be done.
2) Removal of Unwanted Items - Over time a green roof can become congested with leaves, debris, and other unwanted vegetation, which can be removed as part of the service.
3) Inspection - of roof outlets and removal of any encroaching vegetation to enable water to flow freely through rainwater pipes.
4) Application of fertiliser - To help restore your green roof to its best, an organic slow-release granular fertiliser if required will encourage growth.

Green Roofs are only proposed in private curtilage. As a result, it is maintenance will be the responsibility of a management company and not that of the council. Safe working procedures in relation to the maintenance of these roofs post construction will be detailed in Risk Assessments and associated method statements and included in any as-built package and hand over documentation at taking in charge stage.

4.2 *Permeable paving*

The permeable paving has a design life equivalent to standard block paving. The surface blocks require routine maintenance. There are four levels of cleaning that can be carried out on a paved area:

1. General dirt should be removed by regular dry brushing.
2. Where the paving has become dull, showing a loss of colour, a wet wash with a stiff bristle brush and garden hose can be adequate.
3. For more stubborn areas a power washer can be used, taking care not to remove the jointing materials (sand or mortar). The washer should be on a medium pressure setting or lower, and should not be aimed directly at the paving surface, but at an angle of 30° approximately.

Cleaning detergents can be used; however, some detergents are acidic and overuse can damage some paving products. It is advisable to follow the manufacturer's instructions and rinse the areas fully. The resulting runoff should be carefully channelled to either drainage points or containers from where it can be safely disposed.

Replace any washed-out jointing sand with new dried sand once the paving has dried.

4.3 *Surface Water Drainage Network*

The surface water drainage network for the proposed development will be modelled using the Microdrainage software application. The surface water pipe lengths, slopes, contributing impermeable areas, upstream invert levels, upstream cover levels and pipe diameters will be entered into the model using the drawings supplied.

The global variables required for the model were the M5-60 and Rainfall Ratio. These two factors may be read from maps contained in the Wallingford procedure. They enable the program to calculate the intensity, duration and frequency characteristics of storms.

M5-60 is the rainfall depth based on a 60-minute storm of 5 years return period. Ratio R is the ratio of the 60-minute storm to the 2-day storm for the 5-year return period events. These values are as follows:

- M5-60 = 18.80mm
- Ratio R = 0.250

Microdrainage generates design storms using the principles set out in the Flood Studies Report (NERC 1975).

A summer rainfall profile was used for the design of the pipework and a winter rainfall profile was used for the design of the storm water attenuation tank to give the critical design. A summer profile gives higher rainfall intensities and results in higher runoff rates and is used to determine the required capacity of the pipework. A winter rainfall profile gives a flatter more sustained profile and results in higher runoff volumes and is used to determine the attenuation/storage requirements.

The surface water drainage network will be assessed for compliance with maximum and minimum velocities, pipe length etc. The network will be designed to ensure velocities in the network and pipe gradients will not exceed the maximum velocity of 4.0m/s. The minimum velocity allowed will be 0.75m/s.

The design of the drainage network was assessed using events with a range of different durations to determine the critical event for each return period analysed as follows:

- 1 in 2-year return period events were used to ensure that the system did not surcharge;
- 1 in 100 year return period events were used to ensure that flooding did not occur.

4.4 Design Criteria

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

- Return period for pipe work design 2 years
- Return period for attenuation design 100 years
- Soil Type 2
- Allowable Outflow 8.8 l/sec
- Time of entry 5 minutes
- M5 – 60 18.80 mm
- Ratio "r" 0.25
- Pipe Friction (Ks) 0.6 mm
- Minimum Velocity (based on pipe flowing full) 1.0 m/s
- Rainfall Runoff from Roads and Footpaths 100%
- Rainfall Runoff from Roofs 80%
- Rainfall Runoff from Driveways 80%
- Rainfall Runoff from Green Areas 20%
- Rainfall Depth Factored for Climate Change (as per GDSDS) 20%

(in accordance with GDSDS Volume 2, Chapter 6, Table 6.2 – see below)

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

Table 6.2 Climate Change Factors to be Applied to Drainage Design

The global variables required for the model were the M5-60 and Rainfall Ratio. These two factors may be read from maps contained in the Wallingford procedure. They enable the program to calculate the intensity, duration and frequency characteristics of storms.

M5-60 is the rainfall depth based on a 60-minute storm of 5 years return period. Ratio R is the ratio of the 60-minute storm to the 2-day storm for the 5-year return period events. These values are as follows:

4.5 Stormwater Attenuation Strategy

4.5.1 Pre-Development Conditions

The area of this proposed development is 5.34 hectares (ha). For this development, the permissible outflow is calculated using the estimation method contained in the Institute of Hydrology Report No. 124: Flood estimation for small catchments.

$$QBAR = 0.00108 \times (AREA)^{0.89} \times (SAAR)^{1.17} \times (SOIL)^{2.17}$$

QBAR = The Mean Annual Peak Flow (Permissible outflow in m3.sec

AREA = Area of the Catchment (site) in km^2

SAAR = Standard Annual Average Rainfall

SOIL = Soil index

As the development is smaller than 50 ha, the analysis for determining the permissible outflow uses 50 ha in the formula and linearly interpolates the flow rate value based on the ratio of the development to 50 ha. This is a statistical based method within the MicroDrainage Software utilizing the Regional Flood Frequency by Catchment Characteristics to give the Index Flood (QBAR)

The Mean Annual Peak Flow (permissible outflow) was calculated for the particular design development areas.

The allowable runoff estimation method utilises IH 124 and the Soil Index value taken from the MicroDrainage Design Package mapping system gives a Soil Index of 0.3

4.5.2 Post-Development Conditions

The area of this proposed development is approximately 5.34 (ha). The stormwater management plan adopted for the particular development involves using an attenuation tank located in the south-eastern/eastern side of the site.

All surface water runoff arising from the paved development will be drained away from the site. The attenuation tank is designed for a 100-year storm event. The maximum discharge from the attenuation tank will be limited to calculated permissible runoff (QBAR) for the site.

Based on the proposed development design there will be a change in the land surface. Therefore, due to this proposed change a corresponding increase in the peak rate of surface runoff from the site will arise during times of high rainfall.

Contributing Area	Permissible Outflow (l/sec)
Catchment Area	8.8 l/sec

The flood peak runoff rates from the post-development grassy permeable area (Q_p grass) and the post-development impervious area (Q_p imp.) using the Rational Method (100% impermeability of hard surfaces) are calculated using Windes 10.4. The Sources Control Module of the MicroDrainage Software was used to design the attenuation tank capacities. This module also provides the critical storm duration for the attenuation tank during the design process.

It should be noted that climate change has been accounted for in the design. As per volume 5 of the GDSDS a factor of 10% has been incorporated into the design.

The allowable runoff utilising IH 124 of 8.8 l/second combined from the Catchment Areas for the proposed development equates to 176 l/second/hectare.

4.6 Attenuation Tank

4.6.1 Volume of Attenuation Tank

The capacity of the attenuation tank will be designed to cater for the capacity required for a 1 in 100 year ARI event. This capacity is summarised as follows:

Tank No.	Capacity (m^3)	Restricted Outlet (l/sec)
1	300	8.8 l/sec
2	200	8.8 l/sec
3	120	8.8 l/sec

4.7 Hydrocarbon Treatment

A petrol interceptor is a trap used to filter out hydrocarbon pollutants from rainwater runoff. It is used in construction to prevent fuel contamination of streams carrying away the runoff.

Petrol interceptors work on the premise that some hydrocarbons such as petroleum and diesel float on the top of water. The contaminated water enters the interceptor typically after flowing off roads or hardstanding areas before being deposited into the first tank inside the interceptor.

The first tank builds up a layer of the hydrocarbon as well as other scum. Typically, petrol interceptors have 3 separate tanks each connected with a dip pipe, as more liquid enters the interceptor the water enters into the second tank leaving the majority of the hydrocarbon behind as it cannot enter the dip pipe, whose opening into the second tank is below the surface.

However, some of the contaminants may by chance enter the second tank. This second tank will not build up as much of the hydrocarbon on its surface. As before, the water is pushed into the third tank and more water enters the second.

The third tank should be practically clear of any hydrocarbon floating on its surface. As a precaution, the outlet pipe is also a dip pipe. When the water leaves the third tank via the outlet pipe it should be contaminant free.

The hard-surfaced area that will be draining to each interceptor is approximately 2700m². 3 number interceptors with a catchment capacity of 2780m² will be provided.

A summary of the proposed interceptor is as per the Table 2.4 below.

Table 2.4 – Petrol Interceptor Details

Catchment Reference	Petrol Interceptor Make & Model	Oil Storage Capacity (l)
Catchment Area		
2780	NSFA050	400 litres
2780	NSFA050	400 litres
2780	NSFA050	400 litres

4.8 Silt Control

The proposed petrol interceptors from Conder Environmental also include a silt storage capacity in addition to the oil storage capacity that allow silt to be collected in the interceptor prior to discharge to the proposed attenuation tanks. This silt build-up can then be removed from the tanks. The amount of silt storage from the proposed petrol interceptor is outlined in Table 2.5 below.

Table 2.5 – Petrol Interceptor Silt Storage Details

Catchment Reference	Petrol Interceptor Make & Model	Silt Storage Capacity (l)
Catchment Area	NSFA050	5000 litres

5 *Summary of Results*

The storm water network was built and analysed using the MicroDrainage Software application and were assessed for a 1 in 2-year storm & 1 in 100-year storm. A summary of the results is shown in Tables 5.1 below

The global variables, pipeline and manhole schedules for both the surface water network and foul network were printed. These show the basic pipe details such as pipe length, diameter, roughness coefficient, upstream invert, velocity, etc.

Table 5.1 Summary of Surcharge and Flooding

Attenuation Tank Reference	Storm Event	Results
Attenuation Tank	1 in 2 years	No surcharge of the stormwater network
	1 in 100 years	No surcharge of the stormwater network

The stormwater system is designed to ensure no surcharge occurs during a 1 in 2-year return period event. The surcharging that occurs in the pipes highlighted in the summary of the design sheets are the pipes that have been replaced with tanks and Hydrobrake. For the purposes of design this is acceptable.

No flooding was predicted to occur for the 1 in 100-year return period event. Surcharging and flood risk occurred for a number of critical storm events but this is allowed and does not compromise the network.

Table 5.2 Outlet Control Summary

Attenuation Tank Reference	Hydrobrake Reference	Limiting Discharge (l/s)	Design Head (m)	Hydrobrake Diameter (mm)
Attenuation Tank 1	MD4	8.8 l/sec	1	127
Attenuation Tank 2	MD4	8.8 l/sec	1	127
Attenuation Tank 3	MD4	8.8 l/sec	1	127

Table 5.3: Storage Tank Summary

Tank No.	Storage Type	Capacity (m^3)	Invert Level (m)	Maximum Storage Level (m)
Attenuation Tank1	Concrete	300	95	96.30

Attenuation Tank2	Concrete	200	85.6	87.60
Attenuation Tank3	Concrete	120	82.570	83.70

6 *Foul Sewer System*

6.1 *Foul Sewer Design*

A Pre-Connection Enquiry was submitted to Irish Water. The Irish Water Reference Number for this enquiry is CDS24006240. The response to this Enquiry issued on the 1st November 2024 confirmed that connection to the network was feasible but upgrades to the infrastructure is required. It is proposed to connect to the foul sewer network within granted P8. HP .22.11 development.

The foul sewer has been designed using the System 1 and Simulation Modules of the Micro-drainage package. The foul network design addresses present day design issues and can view velocities at Full Bore, Proportional Depth and 1/3 flow.

A model of the proposed foul drainage network was built using the micro-drainage software applications. The model was analysed and amended until the results met with the design criteria specified.

The layout of the proposed Foul network is shown on the Proposed drainage Layout Plan 6476-0020

The network has been designed to achieve self-cleansing velocities at 1/3 flow whilst maintaining minimum gradients. Design summary sheets are contained in Appendix F.

6.1.1 *Development Breakdown*

<u>155 No. Units</u>

Section 3.6 of The Irish Water Code of Practice Wastewater Infrastructure states that, gravity sewers shall be designed to carry a minimum wastewater volume of 6 times the dry weather flow (6DWF) which is to be taken as 446 litres per dwelling

Assume creche equates to 5 units with 155 units.

Loading = (160units) (446) / (24) (60) (60 = 0.825 litres/second

6DWF = 4.95 litres/second

The layout of the proposed Foul network is shown on the Proposed drainage Layout Plan 6476-0020

The foul waste within the development will be collected via an internal gravity network and will discharge to the existing public foul sewer on Main Street.

All works will be in accordance with Irish Water specifications and requirements.

All works will be in accordance with Irish Water Code of Practice for Wastewater Supply & the Wastewater Infrastructure Standard Details Document Number IW-CDS-5030-01.

7 Water Supply

As with the drainage network, a Pre-Connection Enquiry was submitted to Irish Water under Reference No. CDS24006240. This confirmed that connection to the network was feasible.

It is proposed to provide a 100mm internal diameter HDPE connection to tie into the granted P8. HP.22.11 development adjacent to this development. Internally within the development it is proposed to have a series of 100mm Ø branches and loops with associated hydrants, valves and metering requirements.

Water distribution supply to each building will be sized to cater for the requirements of those particular uses. Metered connections will be made to the main in accordance with Irish Water specifications and details.

The layout of the proposed watermain network is shown on the Proposed Watermain Layout Plan 6476-0030.

All works will be in accordance with Irish Water Code of Practice for Water Supply & the Water Infrastructure Standard Details Document Number: IW-CDS-5020-01.

8 Conclusion

The overall strategy achieves the objectives set out and SUDS measures will be implemented within the development. SUDS measures will consist of Tree pits, Filtration Basin and trenches, rainwater harvesting and concrete attenuation tanks.

Appendix A – Irish Water COF

CONFIRMATION OF FEASIBILITY

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

Uisce Éireann
PO Box 448
South City Delivery Office
Cork City

www.water.ie

Stephen O'Donoghue
DOSA Consulting Engineers
Joyce House, Barrack Square, Ballincollig
Co. Cork P31KP84

1 November 2024

Our Ref: CDS24006240 Pre-Connection Enquiry
Lehenaghmore, Togher, Co., Cork

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 154 unit(s) at Lehenaghmore, Togher, Co., Cork, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection**
  - Feasible Subject to upgrades
  - In order to accommodate this proposed development, Upsizing of the existing 4” AC main to 150mm ID will be required for a length of Approximately 180 meters towards chestnut drive.
    The Arterial routeway through the development known as "Glenmore Heights" shall provide for a Internal spine main of 150mm ID to feed/service this development. A Pump Station in the development known as "Glenmore Heights" shall also make provision for this proposed development. The proposed Connection to the Networks may be through 3rd party infrastructure (the development known as "Glenmore Heights) and all relevant Quality Assurances, Wayleaves, Easements, Confirmation of capacity and Permissions would need to be obtained by the Developer.

- **Wastewater Connection**
  - Feasible Subject to upgrades
  - In order to accommodate this proposed development, Network Upgrades of circa 260 meters will be required. This figure includes and is Contingent on CDS2400056201 (the development known as "Glenmore Heights) works being completed. The proposed Connection to the Networks may be through 3rd party infrastructure (the development known as "Glenmore Heights) and all relevant Quality Assurances, Wayleaves, Easements, Confirmation of capacity and Permissions would need to be obtained by the Developer.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

Where can you find more information?

- **Section A -** What is important to know?
- **Section B -** Details of Uisce Éireann's Network(s)

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Uisce Éireann's network(s). This is not a connection offer and capacity in Uisce Éireann's network(s) may only be secured by entering into a connection agreement with Uisce Éireann.

For any further information, visit **www.water.ie/connections**, **email newconnections@water.ie** or contact 1800 278 278**.**

Yours sincerely,

Dermot Phelan
Connections Delivery Manager

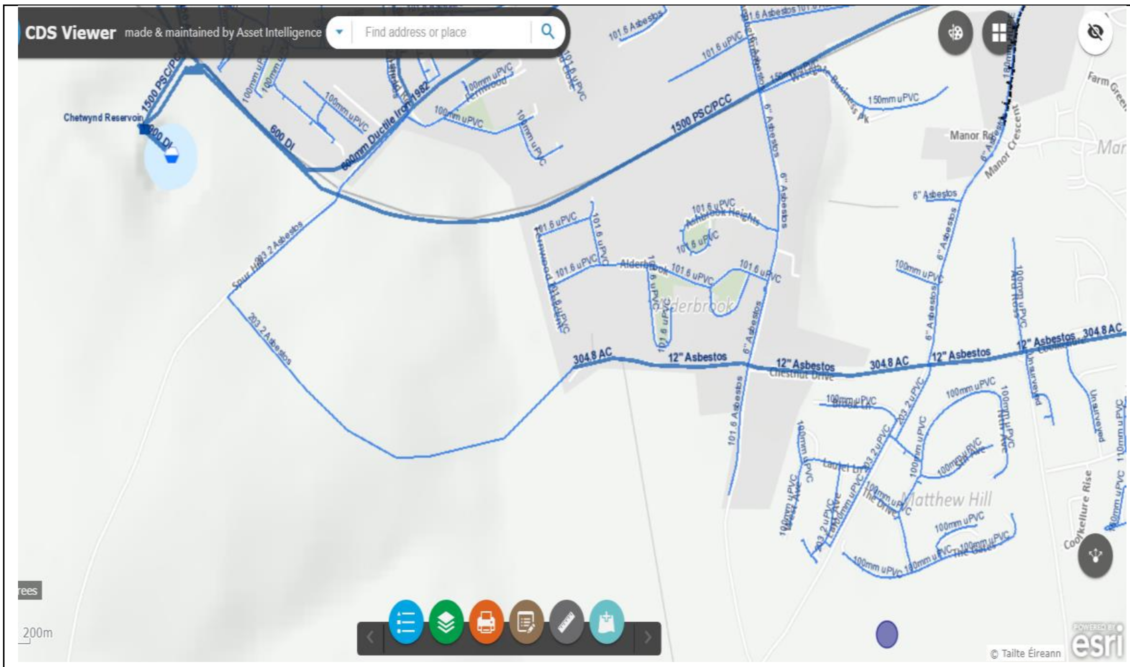
Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • **What to do?** - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Uisce Éireann's network(s)?	• Requests for maps showing Uisce Éireann's network(s) can be submitted to: datarequests@water.ie

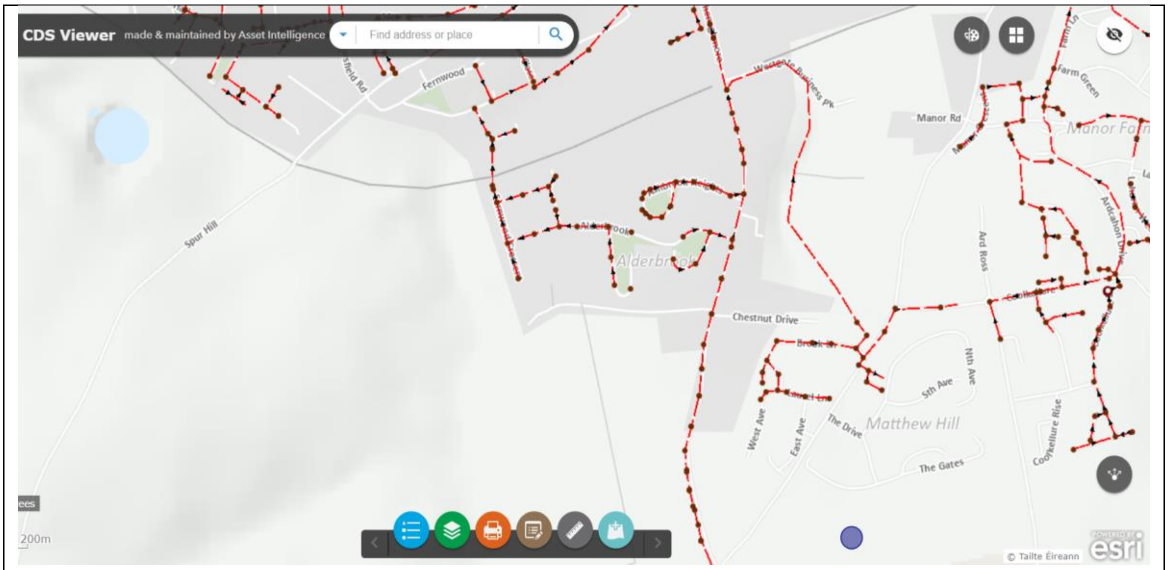
What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

Section B – Details of Uisce Éireann's Network(s)

The map included below outlines the current Uisce Éireann infrastructure adjacent the Development: To access Uisce Éireann Maps email datarequests@water.ie



DW.



WW.

Note: The information provided on the included maps as to the position of Uisce Éireann's underground network(s) is provided as a general guide only. The information is based on the best available information provided by each Local Authority in Ireland to Uisce Éireann.

Whilst every care has been taken in respect of the information on Uisce Éireann's network(s), Uisce Éireann assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Uisce Éireann's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Uisce Éireann's underground network(s) is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

Appendix B – Allowable Runoff QBAR Values

IH 124 Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	2.000	Urban	0.000
SAAR (mm)	1103	Region Number	Ireland South

Results	**l/s**
QBAR Rural	8.8
QBAR Urban	8.8
Q100 years	16.3
Q1 year	7.5
Q2 years	8.5
Q5 years	10.5
Q10 years	11.9
Q20 years	13.3
Q25 years	13.7
Q30 years	14.1
Q50 years	15.0
Q100 years	16.3
Q200 years	17.6
Q250 years	n/a
Q1000 years	n/a

WARNING: Irish growth curves are not defined above 200 years.

Warning: It is unusual to use the IH124 method with an area < 50ha. The Interim Code of Practice recommends that the IH124 method is applied with 50ha and the resulting discharge is linearly interpolated for the required area. The ICP SUDS tab will do this automatically.

Appendix C – 1 in 2 Year Design Sheets

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	100	Add Flow / Climate Change (%)	10
M5-60 (mm)	18.800	Minimum Backdrop Height (m)	0.200
Ratio R	0.250	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.592	4-8	1.266	8-12	0.171

Total Area Contributing (ha) = 2.029

Total Pipe Volume (m³) = 64.446

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
S1.000	48.000	0.240	200.0	0.120	5.00	0.0	0.600	o	225
S1.001	48.000	0.240	200.0	0.086	0.00	0.0	0.600	o	225
S1.002	14.600	0.073	200.0	0.004	0.00	0.0	0.600	o	225
S1.003	23.500	0.118	199.2	0.170	0.00	0.0	0.600	o	300
S1.004	3.000	0.015	200.0	0.000	0.00	0.0	0.600	o	300
S1.005	40.000	0.200	200.0	0.000	0.00	0.0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.87	97.000	0.120	0.0	0.0	1.6	0.92	36.6	17.9
S1.001	50.00	6.74	96.760	0.206	0.0	0.0	2.8	0.92	36.6	30.7
S1.002	50.00	7.00	96.520	0.210	0.0	0.0	2.8	0.92	36.6	31.3
S1.003	50.00	7.35	96.447	0.380	0.0	0.0	5.1	1.11	78.5	56.6
S1.004	50.00	7.40	96.329	0.380	0.0	0.0	5.1	1.11	78.3	56.6
S1.005	50.00	8.00	96.314	0.380	0.0	0.0	5.1	1.11	78.3	56.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
S1.006	3.000	0.015	200.0	0.000	0.00	0.0	0.600	o	225
S1.007	89.000	2.171	41.0	0.200	0.00	0.0	0.600	o	225
S1.008	28.500	0.150	190.0	0.010	0.00	0.0	0.600	o	300
S1.009	73.000	0.880	83.0	0.190	0.00	0.0	0.600	o	300
S1.010	28.500	1.425	20.0	0.015	0.00	0.0	0.600	o	300
S1.011	52.300	1.046	50.0	0.110	0.00	0.0	0.600	o	300
S1.012	54.000	2.700	20.0	0.130	0.00	0.0	0.600	o	300
S1.013	5.000	0.385	13.0	0.030	0.00	0.0	0.600	o	300
S1.014	16.000	1.231	13.0	0.000	0.00	0.0	0.600	o	300
S1.015	16.000	1.231	13.0	0.000	0.00	0.0	0.600	o	300
S1.016	14.000	3.384	4.1	0.000	0.00	0.0	0.600	o	300
S2.000	47.200	0.236	200.0	0.121	5.00	0.0	0.600	o	225
S2.001	47.000	2.350	20.0	0.120	0.00	0.0	0.600	o	225
S2.002	18.500	1.423	13.0	0.090	0.00	0.0	0.600	o	225
S2.003	64.500	0.387	166.7	0.160	0.00	0.0	0.600	o	300
S2.004	4.000	0.024	166.7	0.090	0.00	0.0	0.600	o	375
S2.005	40.000	2.000	20.0	0.000	0.00	0.0	0.600	o	375
S2.006	4.000	0.020	200.0	0.000	0.00	0.0	0.600	o	225
S2.007	22.000	0.110	200.0	0.050	0.00	0.0	0.600	o	225

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.006	50.00	5.05	95.000	0.000	8.8	0.0	0.8	0.92	36.6	8.8
S1.007	50.00	5.78	94.985	0.200	8.8	0.0	3.6	2.05	81.5	39.5
S1.008	50.00	6.20	92.814	0.210	8.8	0.0	3.7	1.14	80.4	41.0
S1.009	50.00	6.90	92.664	0.400	8.8	0.0	6.3	1.73	122.1	69.3
S1.010	50.00	7.03	91.784	0.415	8.8	0.0	6.5	3.53	249.6	71.5
S1.011	50.00	7.43	90.359	0.525	8.8	0.0	8.0	2.23	157.5	87.9
S1.012	50.00	7.68	89.313	0.655	8.8	0.0	9.7	3.53	249.6	107.2
S1.013	50.00	7.70	86.613	0.685	8.8	0.0	10.2	4.39	310.0	111.7
S1.014	50.00	7.76	86.228	0.685	8.8	0.0	10.2	4.38	309.9	111.7
S1.015	50.00	7.82	84.997	0.685	8.8	0.0	10.2	4.38	309.9	111.7
S1.016	50.00	7.85	83.766	0.685	8.8	0.0	10.2	7.78	550.0	111.7
S2.000	50.00	5.85	92.000	0.121	0.0	0.0	1.6	0.92	36.6	18.0
S2.001	50.00	6.12	91.764	0.241	0.0	0.0	3.3	2.94	116.9	35.9
S2.002	50.00	6.21	89.414	0.331	0.0	0.0	4.5	3.65	145.1	49.3
S2.003	50.00	7.09	87.991	0.491	0.0	0.0	6.6	1.22	85.9	73.1
S2.004	50.00	7.14	87.604	0.581	0.0	0.0	7.9	1.40	154.7	86.5
S2.005	50.00	7.30	87.580	0.581	0.0	0.0	7.9	4.07	449.2	86.5
S2.006	50.00	5.07	85.580	0.000	8.8	0.0	0.8	0.92	36.6	8.8
S2.007	50.00	5.47	85.560	0.050	8.8	0.0	1.6	0.92	36.6	17.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
S2.008	55.000	1.222	45.0	0.120	0.00	0.0	0.600	o	225
S2.009	55.000	0.330	166.7	0.120	0.00	0.0	0.600	o	300
S2.010	12.500	0.198	63.1	0.070	0.00	0.0	0.600	o	300
S2.011	26.000	0.130	200.0	0.000	0.00	0.0	0.600	o	300
S2.012	10.000	0.050	200.0	0.000	0.00	0.0	0.600	o	300
S2.013	42.000	2.100	20.0	0.023	0.00	0.0	0.600	o	300
S3.000	33.000	0.229	144.1	0.000	5.00	0.0	0.600	o	225
S2.014	12.000	0.061	196.7	0.000	0.00	0.0	0.600	o	300
S1.017	15.000	0.075	200.0	0.000	0.00	0.0	0.600	o	375
S1.018	1.000	0.002	401.4	0.000	0.00	0.0	0.600	o	450

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.008	50.00	5.94	85.450	0.170	8.8	0.0	3.2	1.96	77.7	35.0
S2.009	50.00	6.69	84.228	0.290	8.8	0.0	4.8	1.22	85.9	52.9
S2.010	50.00	6.80	83.898	0.360	8.8	0.0	5.8	1.98	140.1	63.3
S2.011	50.00	7.19	83.700	0.360	8.8	0.0	5.8	1.11	78.3	63.3
S2.012	50.00	5.15	82.570	0.000	8.8	0.0	0.8	1.11	78.3	8.8
S2.013	50.00	5.35	82.520	0.023	8.8	0.0	1.2	3.53	249.6	13.1
S3.000	50.00	5.51	80.800	0.000	0.0	0.0	0.0	1.09	43.2	0.0
S2.014	50.00	5.68	80.420	0.023	8.8	0.0	1.2	1.12	79.0	13.1
S1.017	50.00	8.05	80.359	0.708	17.6	0.0	11.3	1.28	141.1	124.8
S1.018	50.00	8.06	80.284	0.708	17.6	0.0	11.3	1.01	160.4	124.8

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SSW01	98.500	1.500	1050	S1.000	97.000	225				
SSW02	99.000	2.240	1200	S1.001	96.760	225	S1.000	96.760	225	
SSW03	99.650	3.130	1200	S1.002	96.520	225	S1.001	96.520	225	
SSW04	100.300	3.853	1200	S1.003	96.447	300	S1.002	96.447	225	
SSW05	100.750	4.421	1200	S1.004	96.329	300	S1.003	96.329	300	
SSW006	100.950	4.636	1200	S1.005	96.314	300	S1.004	96.314	300	
SSW007	99.450	4.450	1200	S1.006	95.000	225	S1.005	96.114	300	1189
SSw008	99.750	4.765	1200	S1.007	94.985	225	S1.006	94.985	225	
SSW009	95.250	2.436	1200	S1.008	92.814	300	S1.007	92.814	225	
SSW010	94.100	1.436	1050	S1.009	92.664	300	S1.008	92.664	300	
SSW011	93.350	1.566	1050	S1.010	91.784	300	S1.009	91.784	300	
SSW012	92.400	2.041	1200	S1.011	90.359	300	S1.010	90.359	300	
SSW013	91.250	1.937	1200	S1.012	89.313	300	S1.011	89.313	300	
SSW014	90.000	3.387	1200	S1.013	86.613	300	S1.012	86.613	300	
SSw015	89.600	3.372	1200	S1.014	86.228	300	S1.013	86.228	300	
SSW016	89.200	4.203	1200	S1.015	84.997	300	S1.014	84.997	300	
SSw017	86.000	2.234	1200	S1.016	83.766	300	S1.015	83.766	300	
SSW020	93.500	1.500	1050	S2.000	92.000	225				
SSw021	93.200	1.436	1050	S2.001	91.764	225	S2.000	91.764	225	
SSW022	91.000	1.586	1050	S2.002	89.414	225	S2.001	89.414	225	
SSw023	89.700	1.709	1050	S2.003	87.991	300	S2.002	87.991	225	
SSW024	89.200	1.596	1350	S2.004	87.604	375	S2.003	87.604	300	
SSw025	89.200	1.620	1350	S2.005	87.580	375	S2.004	87.580	375	
SSW026	88.400	2.820	1350	S2.006	85.580	225	S2.005	85.580	375	
SSw027	88.100	2.540	1200	S2.007	85.560	225	S2.006	85.560	225	
SSW028	87.600	2.150	1200	S2.008	85.450	225	S2.007	85.450	225	
SSw029	85.700	1.472	1050	S2.009	84.228	300	S2.008	84.228	225	
SSw030	85.350	1.452	1050	S2.010	83.898	300	S2.009	83.898	300	
SSw031	85.300	1.600	1050	S2.011	83.700	300	S2.010	83.700	300	
SSW032	85.300	2.730	1200	S2.012	82.570	300	S2.011	83.570	300	1000
SSw033	85.150	2.630	1200	S2.013	82.520	300	S2.012	82.520	300	
SSw034	82.000	1.200	1050	S3.000	80.800	225				
SSw035	84.550	4.130	1200	S2.014	80.420	300	S2.013	80.420	300	
							S3.000	80.571	225	76
SSW036	86.000	5.641	1350	S1.017	80.359	375	S1.016	80.382	300	
							S2.014	80.359	300	
SExisting	84.900	4.616	1350	S1.018	80.284	450	S1.017	80.284	375	
SExisting	84.900	4.618	225		OUTFALL		S1.018	80.282	450	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.000	o	225	SSW01	98.500	97.000	1.275	1050
S1.001	o	225	SSW02	99.000	96.760	2.015	1200
S1.002	o	225	SSW03	99.650	96.520	2.905	1200
S1.003	o	300	SSW04	100.300	96.447	3.553	1200
S1.004	o	300	SSW05	100.750	96.329	4.121	1200
S1.005	o	300	SSW006	100.950	96.314	4.336	1200
S1.006	o	225	SSW007	99.450	95.000	4.225	1200
S1.007	o	225	SSw008	99.750	94.985	4.540	1200
S1.008	o	300	SSW009	95.250	92.814	2.136	1200
S1.009	o	300	SSW010	94.100	92.664	1.136	1050
S1.010	o	300	SSW011	93.350	91.784	1.266	1050
S1.011	o	300	SSW012	92.400	90.359	1.741	1200
S1.012	o	300	SSW013	91.250	89.313	1.637	1200
S1.013	o	300	SSW014	90.000	86.613	3.087	1200
S1.014	o	300	SSw015	89.600	86.228	3.072	1200
S1.015	o	300	SSW016	89.200	84.997	3.903	1200
S1.016	o	300	SSw017	86.000	83.766	1.934	1200
S2.000	o	225	SSW020	93.500	92.000	1.275	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.000	48.000	200.0	SSW02	99.000	96.760	2.015	1200
S1.001	48.000	200.0	SSW03	99.650	96.520	2.905	1200
S1.002	14.600	200.0	SSW04	100.300	96.447	3.628	1200
S1.003	23.500	199.2	SSW05	100.750	96.329	4.121	1200
S1.004	3.000	200.0	SSW006	100.950	96.314	4.336	1200
S1.005	40.000	200.0	SSW007	99.450	96.114	3.036	1200
S1.006	3.000	200.0	SSw008	99.750	94.985	4.540	1200
S1.007	89.000	41.0	SSW009	95.250	92.814	2.211	1200
S1.008	28.500	190.0	SSW010	94.100	92.664	1.136	1050
S1.009	73.000	83.0	SSW011	93.350	91.784	1.266	1050
S1.010	28.500	20.0	SSW012	92.400	90.359	1.741	1200
S1.011	52.300	50.0	SSW013	91.250	89.313	1.637	1200
S1.012	54.000	20.0	SSW014	90.000	86.613	3.087	1200
S1.013	5.000	13.0	SSw015	89.600	86.228	3.072	1200
S1.014	16.000	13.0	SSW016	89.200	84.997	3.903	1200
S1.015	16.000	13.0	SSw017	86.000	83.766	1.934	1200
S1.016	14.000	4.1	SSW036	86.000	80.382	5.318	1350
S2.000	47.200	200.0	SSw021	93.200	91.764	1.211	1050

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S2.001	o	225	SSw021	93.200	91.764	1.211	1050
S2.002	o	225	SSW022	91.000	89.414	1.361	1050
S2.003	o	300	SSw023	89.700	87.991	1.409	1050
S2.004	o	375	SSW024	89.200	87.604	1.221	1350
S2.005	o	375	SSw025	89.200	87.580	1.245	1350
S2.006	o	225	SSW026	88.400	85.580	2.595	1350
S2.007	o	225	SSw027	88.100	85.560	2.315	1200
S2.008	o	225	SSW028	87.600	85.450	1.925	1200
S2.009	o	300	SSw029	85.700	84.228	1.172	1050
S2.010	o	300	SSw030	85.350	83.898	1.152	1050
S2.011	o	300	SSw031	85.300	83.700	1.300	1050
S2.012	o	300	SSW032	85.300	82.570	2.430	1200
S2.013	o	300	SSw033	85.150	82.520	2.330	1200
S3.000	o	225	SSw034	82.000	80.800	0.975	1050
S2.014	o	300	SSw035	84.550	80.420	3.830	1200
S1.017	o	375	SSW036	86.000	80.359	5.266	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S2.001	47.000	20.0	SSW022	91.000	89.414	1.361	1050
S2.002	18.500	13.0	SSw023	89.700	87.991	1.484	1050
S2.003	64.500	166.7	SSW024	89.200	87.604	1.296	1350
S2.004	4.000	166.7	SSw025	89.200	87.580	1.245	1350
S2.005	40.000	20.0	SSW026	88.400	85.580	2.445	1350
S2.006	4.000	200.0	SSw027	88.100	85.560	2.315	1200
S2.007	22.000	200.0	SSW028	87.600	85.450	1.925	1200
S2.008	55.000	45.0	SSw029	85.700	84.228	1.247	1050
S2.009	55.000	166.7	SSw030	85.350	83.898	1.152	1050
S2.010	12.500	63.1	SSw031	85.300	83.700	1.300	1050
S2.011	26.000	200.0	SSW032	85.300	83.570	1.430	1200
S2.012	10.000	200.0	SSw033	85.150	82.520	2.330	1200
S2.013	42.000	20.0	SSw035	84.550	80.420	3.830	1200
S3.000	33.000	144.1	SSw035	84.550	80.571	3.754	1200
S2.014	12.000	196.7	SSW036	86.000	80.359	5.341	1350
S1.017	15.000	200.0	SExisting	84.900	80.284	4.241	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.018	o	450	SExisting	84.900	80.284	4.166	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.018	1.000	401.4	SExisting	84.900	80.282	4.168	225

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.018	SExisting	84.900	80.282	0.000	225	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
PIMP (% impervious)	100	Additional Flow - % of Total Flow	10.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Run Time (mins)	60
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	3	Number of Time/Area Diagrams	0
Number of Offline Controls	0		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	18.800	Storm Duration (mins)	30
Ratio R	0.250		

Online Controls for Storm

Hydro-Brake® Manhole: SSW007, DS/PN: S1.006, Volume (m³): 7.8

Design Head (m)	1.000	Diameter (mm)	124
Design Flow (l/s)	8.8	Invert Level (m)	95.000
Hydro-Brake® Type	Md6 SW Only		

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	4.0	1.200	9.6	3.000	15.2	7.000	23.2
0.200	7.8	1.400	10.4	3.500	16.4	7.500	24.0
0.300	8.1	1.600	11.1	4.000	17.5	8.000	24.8
0.400	7.8	1.800	11.8	4.500	18.6	8.500	25.6
0.500	7.5	2.000	12.4	5.000	19.6	9.000	26.3
0.600	7.5	2.200	13.0	5.500	20.6	9.500	27.0
0.800	8.1	2.400	13.6	6.000	21.5		
1.000	8.8	2.600	14.1	6.500	22.4		

Hydro-Brake® Manhole: SSW026, DS/PN: S2.006, Volume (m³): 8.3

Design Head (m)	1.000	Hydro-Brake® Type	Md4	Invert Level (m)	85.580
Design Flow (l/s)	8.8	Diameter (mm)	107		

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	3.2	1.200	9.8	3.000	15.5	7.000	23.6
0.200	7.3	1.400	10.6	3.500	16.7	7.500	24.4
0.300	6.8	1.600	11.3	4.000	17.8	8.000	25.2
0.400	6.2	1.800	12.0	4.500	18.9	8.500	26.0
0.500	6.4	2.000	12.6	5.000	19.9	9.000	26.8
0.600	6.9	2.200	13.2	5.500	20.9	9.500	27.5
0.800	8.0	2.400	13.8	6.000	21.9		
1.000	8.9	2.600	14.4	6.500	22.7		

Hydro-Brake® Manhole: SSW032, DS/PN: S2.012, Volume (m³): 4.8

Design Head (m)	1.000	Hydro-Brake® Type	Md4	Invert Level (m)	82.570
Design Flow (l/s)	8.8	Diameter (mm)	107		

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	3.2	1.200	9.8	3.000	15.5	7.000	23.6
0.200	7.3	1.400	10.6	3.500	16.7	7.500	24.4
0.300	6.8	1.600	11.3	4.000	17.8	8.000	25.2
0.400	6.2	1.800	12.0	4.500	18.9	8.500	26.0
0.500	6.4	2.000	12.6	5.000	19.9	9.000	26.8
0.600	6.9	2.200	13.2	5.500	20.9	9.500	27.5
0.800	8.0	2.400	13.8	6.000	21.9		
1.000	8.9	2.600	14.4	6.500	22.7		

Storage Structures for Storm

Tank or Pond Manhole: SSW007, DS/PN: S1.006

Invert Level (m) 96.181

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	300.0	1.000	300.0

Tank or Pond Manhole: SSW026, DS/PN: S2.006

Invert Level (m) 85.580

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	200.0	1.500	200.0

Tank or Pond Manhole: SSW032, DS/PN: S2.012

Invert Level (m) 82.570

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	130.0	1.000	130.0

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

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2
Climate Change (%) 0

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	2	0%					
S1.001	15 Winter	2	0%					
S1.002	15 Winter	2	0%					
S1.003	15 Winter	2	0%					
S1.004	15 Winter	2	0%					
S1.005	15 Winter	2	0%					
S1.006	60 Winter	2	0%	2/15 Summer				
S1.007	15 Winter	2	0%					
S1.008	15 Winter	2	0%					
S1.009	15 Winter	2	0%					
S1.010	15 Winter	2	0%					
S1.011	15 Winter	2	0%					
S1.012	15 Winter	2	0%					
S1.013	15 Winter	2	0%					
S1.014	15 Winter	2	0%					
S1.015	15 Winter	2	0%					
S1.016	15 Winter	2	0%					
S2.000	15 Winter	2	0%					
S2.001	15 Winter	2	0%					
S2.002	15 Winter	2	0%					
S2.003	15 Winter	2	0%					
S2.004	15 Winter	2	0%					
S2.005	15 Winter	2	0%					
S2.006	360 Winter	2	0%	2/60 Summer				
S2.007	120 Summer	2	0%					
S2.008	15 Winter	2	0%					
S2.009	15 Winter	2	0%					
S2.010	15 Winter	2	0%					
S2.011	15 Winter	2	0%					
S2.012	960 Winter	2	0%	2/60 Summer				
S2.013	60 Summer	2	0%					
S3.000	120 Winter	2	0%					
S2.014	15 Winter	2	0%					
S1.017	15 Winter	2	0%					
S1.018	15 Winter	2	0%					

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	SSW01	97.122	-0.103	0.000	0.54	0.0	19.1	OK
S1.001	SSW02	96.924	-0.061	0.000	0.85	0.0	29.7	OK
S1.002	SSW03	96.699	-0.046	0.000	0.93	0.0	30.0	OK
S1.003	SSW04	96.637	-0.110	0.000	0.71	0.0	49.5	OK
S1.004	SSW05	96.564	-0.065	0.000	0.97	0.0	49.6	OK
S1.005	SSW006	96.496	-0.118	0.000	0.68	0.0	49.2	OK
S1.006	SSW007	96.265	1.040	0.000	0.36	0.0	9.7	SURCHARGED
S1.007	SSw008	95.094	-0.116	0.000	0.46	0.0	36.7	OK
S1.008	SSW009	92.968	-0.146	0.000	0.52	0.0	37.6	OK
S1.009	SSW010	92.822	-0.142	0.000	0.53	0.0	62.2	OK
S1.010	SSW011	91.893	-0.191	0.000	0.28	0.0	64.1	OK
S1.011	SSW012	90.514	-0.145	0.000	0.52	0.0	77.5	OK
S1.012	SSW013	89.445	-0.169	0.000	0.40	0.0	93.4	OK
S1.013	SSW014	86.786	-0.128	0.000	0.62	0.0	96.9	OK
S1.014	SSw015	86.355	-0.174	0.000	0.37	0.0	96.5	OK
S1.015	SSW016	85.123	-0.174	0.000	0.37	0.0	96.7	OK
S1.016	SSw017	83.860	-0.207	0.000	0.21	0.0	97.0	OK
S2.000	SSW020	92.123	-0.102	0.000	0.55	0.0	19.3	OK
S2.001	SSw021	91.852	-0.137	0.000	0.32	0.0	35.8	OK
S2.002	SSW022	89.509	-0.130	0.000	0.37	0.0	48.1	OK
S2.003	SSw023	88.205	-0.086	0.000	0.83	0.0	68.0	OK
S2.004	SSW024	87.882	-0.097	0.000	0.90	0.0	78.8	OK
S2.005	SSw025	87.692	-0.263	0.000	0.19	0.0	78.4	OK
S2.006	SSW026	86.038	0.233	0.000	0.29	0.0	7.3	SURCHARGED
S2.007	SSw027	85.647	-0.138	0.000	0.30	0.0	9.9	OK
S2.008	SSW028	85.537	-0.138	0.000	0.31	0.0	23.5	OK
S2.009	SSw029	84.377	-0.151	0.000	0.48	0.0	39.0	OK
S2.010	SSw030	84.036	-0.162	0.000	0.43	0.0	48.2	OK
S2.011	SSw031	83.883	-0.117	0.000	0.69	0.0	48.1	OK
S2.012	SSW032	83.402	0.532	0.000	0.13	0.0	8.1	SURCHARGED
S2.013	SSw033	82.559	-0.261	0.000	0.04	0.0	9.1	OK
S3.000	SSw034	80.800	-0.225	0.000	0.00	0.0	0.0	OK
S2.014	SSw035	80.653	-0.067	0.000	0.13	0.0	8.2	OK
S1.017	SSW036	80.648	-0.086	0.000	0.95	0.0	101.7	OK
S1.018	SExisting	80.581	-0.153	0.000	0.76	0.0	101.8	OK

Appendix D – 1 in 100 Year Design Sheets

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	100	Add Flow / Climate Change (%)	10
M5-60 (mm)	18.800	Minimum Backdrop Height (m)	0.200
Ratio R	0.250	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.592	4-8	1.266	8-12	0.171

Total Area Contributing (ha) = 2.029

Total Pipe Volume (m³) = 64.446

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
S1.000	48.000	0.240	200.0	0.120	5.00	0.0	0.600	o	225
S1.001	48.000	0.240	200.0	0.086	0.00	0.0	0.600	o	225
S1.002	14.600	0.073	200.0	0.004	0.00	0.0	0.600	o	225
S1.003	23.500	0.118	199.2	0.170	0.00	0.0	0.600	o	300
S1.004	3.000	0.015	200.0	0.000	0.00	0.0	0.600	o	300
S1.005	40.000	0.200	200.0	0.000	0.00	0.0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.87	97.000	0.120	0.0	0.0	1.6	0.92	36.6	17.9
S1.001	50.00	6.74	96.760	0.206	0.0	0.0	2.8	0.92	36.6	30.7
S1.002	50.00	7.00	96.520	0.210	0.0	0.0	2.8	0.92	36.6	31.3
S1.003	50.00	7.35	96.447	0.380	0.0	0.0	5.1	1.11	78.5	56.6
S1.004	50.00	7.40	96.329	0.380	0.0	0.0	5.1	1.11	78.3	56.6
S1.005	50.00	8.00	96.314	0.380	0.0	0.0	5.1	1.11	78.3	56.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
S1.006	3.000	0.015	200.0	0.000	0.00	0.0	0.600	o	225
S1.007	89.000	2.171	41.0	0.200	0.00	0.0	0.600	o	225
S1.008	28.500	0.150	190.0	0.010	0.00	0.0	0.600	o	300
S1.009	73.000	0.880	83.0	0.190	0.00	0.0	0.600	o	300
S1.010	28.500	1.425	20.0	0.015	0.00	0.0	0.600	o	300
S1.011	52.300	1.046	50.0	0.110	0.00	0.0	0.600	o	300
S1.012	54.000	2.700	20.0	0.130	0.00	0.0	0.600	o	300
S1.013	5.000	0.385	13.0	0.030	0.00	0.0	0.600	o	300
S1.014	16.000	1.231	13.0	0.000	0.00	0.0	0.600	o	300
S1.015	16.000	1.231	13.0	0.000	0.00	0.0	0.600	o	300
S1.016	14.000	3.384	4.1	0.000	0.00	0.0	0.600	o	300
S2.000	47.200	0.236	200.0	0.121	5.00	0.0	0.600	o	225
S2.001	47.000	2.350	20.0	0.120	0.00	0.0	0.600	o	225
S2.002	18.500	1.423	13.0	0.090	0.00	0.0	0.600	o	225
S2.003	64.500	0.387	166.7	0.160	0.00	0.0	0.600	o	300
S2.004	4.000	0.024	166.7	0.090	0.00	0.0	0.600	o	375
S2.005	40.000	2.000	20.0	0.000	0.00	0.0	0.600	o	375
S2.006	4.000	0.020	200.0	0.000	0.00	0.0	0.600	o	225
S2.007	22.000	0.110	200.0	0.050	0.00	0.0	0.600	o	225

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.006	50.00	5.05	95.000	0.000	8.8	0.0	0.8	0.92	36.6	8.8
S1.007	50.00	5.78	94.985	0.200	8.8	0.0	3.6	2.05	81.5	39.5
S1.008	50.00	6.20	92.814	0.210	8.8	0.0	3.7	1.14	80.4	41.0
S1.009	50.00	6.90	92.664	0.400	8.8	0.0	6.3	1.73	122.1	69.3
S1.010	50.00	7.03	91.784	0.415	8.8	0.0	6.5	3.53	249.6	71.5
S1.011	50.00	7.43	90.359	0.525	8.8	0.0	8.0	2.23	157.5	87.9
S1.012	50.00	7.68	89.313	0.655	8.8	0.0	9.7	3.53	249.6	107.2
S1.013	50.00	7.70	86.613	0.685	8.8	0.0	10.2	4.39	310.0	111.7
S1.014	50.00	7.76	86.228	0.685	8.8	0.0	10.2	4.38	309.9	111.7
S1.015	50.00	7.82	84.997	0.685	8.8	0.0	10.2	4.38	309.9	111.7
S1.016	50.00	7.85	83.766	0.685	8.8	0.0	10.2	7.78	550.0	111.7
S2.000	50.00	5.85	92.000	0.121	0.0	0.0	1.6	0.92	36.6	18.0
S2.001	50.00	6.12	91.764	0.241	0.0	0.0	3.3	2.94	116.9	35.9
S2.002	50.00	6.21	89.414	0.331	0.0	0.0	4.5	3.65	145.1	49.3
S2.003	50.00	7.09	87.991	0.491	0.0	0.0	6.6	1.22	85.9	73.1
S2.004	50.00	7.14	87.604	0.581	0.0	0.0	7.9	1.40	154.7	86.5
S2.005	50.00	7.30	87.580	0.581	0.0	0.0	7.9	4.07	449.2	86.5
S2.006	50.00	5.07	85.580	0.000	8.8	0.0	0.8	0.92	36.6	8.8
S2.007	50.00	5.47	85.560	0.050	8.8	0.0	1.6	0.92	36.6	17.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
S2.008	55.000	1.222	45.0	0.120	0.00	0.0	0.600	o	225
S2.009	55.000	0.330	166.7	0.120	0.00	0.0	0.600	o	300
S2.010	12.500	0.198	63.1	0.070	0.00	0.0	0.600	o	300
S2.011	26.000	0.130	200.0	0.000	0.00	0.0	0.600	o	300
S2.012	10.000	0.050	200.0	0.000	0.00	0.0	0.600	o	300
S2.013	42.000	2.100	20.0	0.023	0.00	0.0	0.600	o	300
S3.000	33.000	0.229	144.1	0.000	5.00	0.0	0.600	o	225
S2.014	12.000	0.061	196.7	0.000	0.00	0.0	0.600	o	300
S1.017	15.000	0.075	200.0	0.000	0.00	0.0	0.600	o	375
S1.018	1.000	0.002	401.4	0.000	0.00	0.0	0.600	o	450

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.008	50.00	5.94	85.450	0.170	8.8	0.0	3.2	1.96	77.7	35.0
S2.009	50.00	6.69	84.228	0.290	8.8	0.0	4.8	1.22	85.9	52.9
S2.010	50.00	6.80	83.898	0.360	8.8	0.0	5.8	1.98	140.1	63.3
S2.011	50.00	7.19	83.700	0.360	8.8	0.0	5.8	1.11	78.3	63.3
S2.012	50.00	5.15	82.570	0.000	8.8	0.0	0.8	1.11	78.3	8.8
S2.013	50.00	5.35	82.520	0.023	8.8	0.0	1.2	3.53	249.6	13.1
S3.000	50.00	5.51	80.800	0.000	0.0	0.0	0.0	1.09	43.2	0.0
S2.014	50.00	5.68	80.420	0.023	8.8	0.0	1.2	1.12	79.0	13.1
S1.017	50.00	8.05	80.359	0.708	17.6	0.0	11.3	1.28	141.1	124.8
S1.018	50.00	8.06	80.284	0.708	17.6	0.0	11.3	1.01	160.4	124.8

Denis O'Sullivan & Associates

Unit 5, Joyce House
Barrack Square
Ballincollig, Co. Cork

Date 24/06/2025 11:09 | Designed By SODonoghue
File STORM SEWER 2024.MDX | Checked By
Micro Drainage | Network W.12.4

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SSW01	98.500	1.500	1050	S1.000	97.000	225				
SSW02	99.000	2.240	1200	S1.001	96.760	225	S1.000	96.760	225	
SSW03	99.650	3.130	1200	S1.002	96.520	225	S1.001	96.520	225	
SSW04	100.300	3.853	1200	S1.003	96.447	300	S1.002	96.447	225	
SSW05	100.750	4.421	1200	S1.004	96.329	300	S1.003	96.329	300	
SSW006	100.950	4.636	1200	S1.005	96.314	300	S1.004	96.314	300	
SSW007	99.450	4.450	1200	S1.006	95.000	225	S1.005	96.114	300	1189
SSw008	99.750	4.765	1200	S1.007	94.985	225	S1.006	94.985	225	
SSW009	95.250	2.436	1200	S1.008	92.814	300	S1.007	92.814	225	
SSW010	94.100	1.436	1050	S1.009	92.664	300	S1.008	92.664	300	
SSW011	93.350	1.566	1050	S1.010	91.784	300	S1.009	91.784	300	
SSW012	92.400	2.041	1200	S1.011	90.359	300	S1.010	90.359	300	
SSW013	91.250	1.937	1200	S1.012	89.313	300	S1.011	89.313	300	
SSW014	90.000	3.387	1200	S1.013	86.613	300	S1.012	86.613	300	
SSw015	89.600	3.372	1200	S1.014	86.228	300	S1.013	86.228	300	
SSW016	89.200	4.203	1200	S1.015	84.997	300	S1.014	84.997	300	
SSw017	86.000	2.234	1200	S1.016	83.766	300	S1.015	83.766	300	
SSW020	93.500	1.500	1050	S2.000	92.000	225				
SSw021	93.200	1.436	1050	S2.001	91.764	225	S2.000	91.764	225	
SSW022	91.000	1.586	1050	S2.002	89.414	225	S2.001	89.414	225	
SSw023	89.700	1.709	1050	S2.003	87.991	300	S2.002	87.991	225	
SSW024	89.200	1.596	1350	S2.004	87.604	375	S2.003	87.604	300	
SSw025	89.200	1.620	1350	S2.005	87.580	375	S2.004	87.580	375	
SSW026	88.400	2.820	1350	S2.006	85.580	225	S2.005	85.580	375	
SSw027	88.100	2.540	1200	S2.007	85.560	225	S2.006	85.560	225	
SSW028	87.600	2.150	1200	S2.008	85.450	225	S2.007	85.450	225	
SSw029	85.700	1.472	1050	S2.009	84.228	300	S2.008	84.228	225	
SSw030	85.350	1.452	1050	S2.010	83.898	300	S2.009	83.898	300	
SSw031	85.300	1.600	1050	S2.011	83.700	300	S2.010	83.700	300	
SSW032	85.300	2.730	1200	S2.012	82.570	300	S2.011	83.570	300	1000
SSw033	85.150	2.630	1200	S2.013	82.520	300	S2.012	82.520	300	
SSw034	82.000	1.200	1050	S3.000	80.800	225				
SSw035	84.550	4.130	1200	S2.014	80.420	300	S2.013	80.420	300	
							S3.000	80.571	225	76
SSW036	86.000	5.641	1350	S1.017	80.359	375	S1.016	80.382	300	
							S2.014	80.359	300	
SExisting	84.900	4.616	1350	S1.018	80.284	450	S1.017	80.284	375	
SExisting	84.900	4.618	225		OUTFALL		S1.018	80.282	450	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.000	o	225	SSW01	98.500	97.000	1.275	1050
S1.001	o	225	SSW02	99.000	96.760	2.015	1200
S1.002	o	225	SSW03	99.650	96.520	2.905	1200
S1.003	o	300	SSW04	100.300	96.447	3.553	1200
S1.004	o	300	SSW05	100.750	96.329	4.121	1200
S1.005	o	300	SSW006	100.950	96.314	4.336	1200
S1.006	o	225	SSW007	99.450	95.000	4.225	1200
S1.007	o	225	SSw008	99.750	94.985	4.540	1200
S1.008	o	300	SSW009	95.250	92.814	2.136	1200
S1.009	o	300	SSW010	94.100	92.664	1.136	1050
S1.010	o	300	SSW011	93.350	91.784	1.266	1050
S1.011	o	300	SSW012	92.400	90.359	1.741	1200
S1.012	o	300	SSW013	91.250	89.313	1.637	1200
S1.013	o	300	SSW014	90.000	86.613	3.087	1200
S1.014	o	300	SSw015	89.600	86.228	3.072	1200
S1.015	o	300	SSW016	89.200	84.997	3.903	1200
S1.016	o	300	SSw017	86.000	83.766	1.934	1200
S2.000	o	225	SSW020	93.500	92.000	1.275	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.000	48.000	200.0	SSW02	99.000	96.760	2.015	1200
S1.001	48.000	200.0	SSW03	99.650	96.520	2.905	1200
S1.002	14.600	200.0	SSW04	100.300	96.447	3.628	1200
S1.003	23.500	199.2	SSW05	100.750	96.329	4.121	1200
S1.004	3.000	200.0	SSW006	100.950	96.314	4.336	1200
S1.005	40.000	200.0	SSW007	99.450	96.114	3.036	1200
S1.006	3.000	200.0	SSw008	99.750	94.985	4.540	1200
S1.007	89.000	41.0	SSW009	95.250	92.814	2.211	1200
S1.008	28.500	190.0	SSW010	94.100	92.664	1.136	1050
S1.009	73.000	83.0	SSW011	93.350	91.784	1.266	1050
S1.010	28.500	20.0	SSW012	92.400	90.359	1.741	1200
S1.011	52.300	50.0	SSW013	91.250	89.313	1.637	1200
S1.012	54.000	20.0	SSW014	90.000	86.613	3.087	1200
S1.013	5.000	13.0	SSw015	89.600	86.228	3.072	1200
S1.014	16.000	13.0	SSW016	89.200	84.997	3.903	1200
S1.015	16.000	13.0	SSw017	86.000	83.766	1.934	1200
S1.016	14.000	4.1	SSW036	86.000	80.382	5.318	1350
S2.000	47.200	200.0	SSw021	93.200	91.764	1.211	1050

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S2.001	o	225	SSw021	93.200	91.764	1.211	1050
S2.002	o	225	SSW022	91.000	89.414	1.361	1050
S2.003	o	300	SSw023	89.700	87.991	1.409	1050
S2.004	o	375	SSW024	89.200	87.604	1.221	1350
S2.005	o	375	SSw025	89.200	87.580	1.245	1350
S2.006	o	225	SSW026	88.400	85.580	2.595	1350
S2.007	o	225	SSw027	88.100	85.560	2.315	1200
S2.008	o	225	SSW028	87.600	85.450	1.925	1200
S2.009	o	300	SSw029	85.700	84.228	1.172	1050
S2.010	o	300	SSw030	85.350	83.898	1.152	1050
S2.011	o	300	SSw031	85.300	83.700	1.300	1050
S2.012	o	300	SSW032	85.300	82.570	2.430	1200
S2.013	o	300	SSw033	85.150	82.520	2.330	1200
S3.000	o	225	SSw034	82.000	80.800	0.975	1050
S2.014	o	300	SSw035	84.550	80.420	3.830	1200
S1.017	o	375	SSW036	86.000	80.359	5.266	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S2.001	47.000	20.0	SSW022	91.000	89.414	1.361	1050
S2.002	18.500	13.0	SSw023	89.700	87.991	1.484	1050
S2.003	64.500	166.7	SSW024	89.200	87.604	1.296	1350
S2.004	4.000	166.7	SSw025	89.200	87.580	1.245	1350
S2.005	40.000	20.0	SSW026	88.400	85.580	2.445	1350
S2.006	4.000	200.0	SSw027	88.100	85.560	2.315	1200
S2.007	22.000	200.0	SSW028	87.600	85.450	1.925	1200
S2.008	55.000	45.0	SSw029	85.700	84.228	1.247	1050
S2.009	55.000	166.7	SSw030	85.350	83.898	1.152	1050
S2.010	12.500	63.1	SSw031	85.300	83.700	1.300	1050
S2.011	26.000	200.0	SSW032	85.300	83.570	1.430	1200
S2.012	10.000	200.0	SSw033	85.150	82.520	2.330	1200
S2.013	42.000	20.0	SSw035	84.550	80.420	3.830	1200
S3.000	33.000	144.1	SSw035	84.550	80.571	3.754	1200
S2.014	12.000	196.7	SSW036	86.000	80.359	5.341	1350
S1.017	15.000	200.0	SExisting	84.900	80.284	4.241	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.018	o	450	SExisting	84.900	80.284	4.166	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH DIAM., L*W (mm)
S1.018	1.000	401.4	SExisting	84.900	80.282	4.168	225

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.018	SExisting	84.900	80.282	0.000	225	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
PIMP (% impervious)	100	Additional Flow - % of Total Flow	10.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Run Time (mins)	60
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	3	Number of Time/Area Diagrams	0
Number of Offline Controls	0		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	18.800	Storm Duration (mins)	30
Ratio R	0.250		

Online Controls for Storm

Hydro-Brake® Manhole: SSW007, DS/PN: S1.006, Volume (m³): 7.8

Design Head (m) 1.000 Diameter (mm) 124
Design Flow (l/s) 8.8 Invert Level (m) 95.000
Hydro-Brake® Type Md6 SW Only

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	4.0	1.200	9.6	3.000	15.2	7.000	23.2
0.200	7.8	1.400	10.4	3.500	16.4	7.500	24.0
0.300	8.1	1.600	11.1	4.000	17.5	8.000	24.8
0.400	7.8	1.800	11.8	4.500	18.6	8.500	25.6
0.500	7.5	2.000	12.4	5.000	19.6	9.000	26.3
0.600	7.5	2.200	13.0	5.500	20.6	9.500	27.0
0.800	8.1	2.400	13.6	6.000	21.5		
1.000	8.8	2.600	14.1	6.500	22.4		

Hydro-Brake® Manhole: SSW026, DS/PN: S2.006, Volume (m³): 8.3

Design Head (m) 1.000 Hydro-Brake® Type Md4 Invert Level (m) 85.580
Design Flow (l/s) 8.8 Diameter (mm) 107

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	3.2	1.200	9.8	3.000	15.5	7.000	23.6
0.200	7.3	1.400	10.6	3.500	16.7	7.500	24.4
0.300	6.8	1.600	11.3	4.000	17.8	8.000	25.2
0.400	6.2	1.800	12.0	4.500	18.9	8.500	26.0
0.500	6.4	2.000	12.6	5.000	19.9	9.000	26.8
0.600	6.9	2.200	13.2	5.500	20.9	9.500	27.5
0.800	8.0	2.400	13.8	6.000	21.9		
1.000	8.9	2.600	14.4	6.500	22.7		

Hydro-Brake® Manhole: SSW032, DS/PN: S2.012, Volume (m³): 4.8

Design Head (m) 1.000 Hydro-Brake® Type Md4 Invert Level (m) 82.570
Design Flow (l/s) 8.8 Diameter (mm) 107

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	3.2	1.200	9.8	3.000	15.5	7.000	23.6
0.200	7.3	1.400	10.6	3.500	16.7	7.500	24.4
0.300	6.8	1.600	11.3	4.000	17.8	8.000	25.2
0.400	6.2	1.800	12.0	4.500	18.9	8.500	26.0
0.500	6.4	2.000	12.6	5.000	19.9	9.000	26.8
0.600	6.9	2.200	13.2	5.500	20.9	9.500	27.5
0.800	8.0	2.400	13.8	6.000	21.9		
1.000	8.9	2.600	14.4	6.500	22.7		

Storage Structures for Storm

Tank or Pond Manhole: SSW007, DS/PN: S1.006

Invert Level (m) 96.181

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	300.0	1.000	300.0

Tank or Pond Manhole: SSW026, DS/PN: S2.006

Invert Level (m) 85.580

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	200.0	1.500	200.0

Tank or Pond Manhole: SSW032, DS/PN: S2.012

Invert Level (m) 82.570

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	130.0	1.000	130.0

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

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

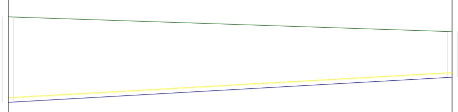
Profile(s) Summer and Winter
Duration(s) (mins) 30, 60, 120, 240, 360, 480, 960, 1440, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 100
Climate Change (%) 0

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	30 Summer	100	0%	100/30 Summer				
S1.001	30 Summer	100	0%	100/30 Summer				
S1.002	30 Summer	100	0%	100/30 Summer				
S1.003	30 Summer	100	0%	100/30 Summer				
S1.004	30 Summer	100	0%	100/30 Summer				
S1.005	30 Summer	100	0%	100/30 Summer				
S1.006	120 Winter	100	0%	100/30 Summer				
S1.007	30 Summer	100	0%	100/30 Summer				
S1.008	30 Summer	100	0%	100/30 Summer				
S1.009	30 Summer	100	0%	100/30 Summer				
S1.010	30 Summer	100	0%					
S1.011	30 Summer	100	0%	100/30 Summer				
S1.012	30 Summer	100	0%					
S1.013	30 Summer	100	0%	100/30 Summer				
S1.014	30 Summer	100	0%					
S1.015	30 Summer	100	0%					
S1.016	30 Summer	100	0%					
S2.000	30 Summer	100	0%	100/30 Summer				
S2.001	30 Summer	100	0%					
S2.002	30 Summer	100	0%	100/30 Summer				
S2.003	30 Summer	100	0%	100/30 Summer				
S2.004	30 Summer	100	0%	100/30 Summer				
S2.005	30 Summer	100	0%					
S2.006	480 Winter	100	0%	100/30 Summer				
S2.007	30 Summer	100	0%					
S2.008	30 Summer	100	0%	100/30 Summer				
S2.009	30 Summer	100	0%	100/30 Summer				
S2.010	30 Summer	100	0%	100/30 Summer				
S2.011	30 Summer	100	0%	100/30 Summer				
S2.012	960 Winter	100	0%	100/30 Summer				
S2.013	30 Summer	100	0%					
S3.000	30 Summer	100	0%	100/30 Summer				
S2.014	30 Summer	100	0%	100/30 Summer				
S1.017	30 Summer	100	0%	100/30 Summer				
S1.018	30 Summer	100	0%	100/30 Summer				

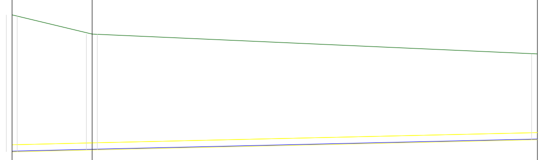
Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	SSW01	98.242	1.017	0.000	0.98	0.0	34.2	FLOOD RISK
S1.001	SSW02	98.003	1.018	0.000	1.55	0.0	54.3	SURCHARGED
S1.002	SSW03	97.408	0.663	0.000	1.77	0.0	56.8	SURCHARGED
S1.003	SSW04	97.208	0.461	0.000	1.46	0.0	101.8	SURCHARGED
S1.004	SSW05	96.952	0.323	0.000	1.98	0.0	101.5	SURCHARGED
S1.005	SSW006	96.787	0.173	0.000	1.38	0.0	100.4	SURCHARGED
S1.006	SSW007	96.493	1.268	0.000	0.39	0.0	10.5	SURCHARGED
S1.007	SSw008	95.601	0.391	0.000	0.99	0.0	78.4	SURCHARGED
S1.008	SSW009	93.487	0.373	0.000	1.13	0.0	82.4	SURCHARGED
S1.009	SSW010	93.319	0.355	0.000	1.16	0.0	136.2	SURCHARGED
S1.010	SSW011	91.957	-0.127	0.000	0.62	0.0	140.3	OK
S1.011	SSW012	90.997	0.338	0.000	1.15	0.0	170.4	SURCHARGED
S1.012	SSW013	89.536	-0.077	0.000	0.89	0.0	209.2	OK
S1.013	SSW014	87.286	0.373	0.000	1.41	0.0	219.2	SURCHARGED
S1.014	SSw015	86.439	-0.090	0.000	0.84	0.0	219.1	OK
S1.015	SSW016	85.207	-0.090	0.000	0.84	0.0	218.7	OK
S1.016	SSw017	83.913	-0.154	0.000	0.48	0.0	218.1	OK
S2.000	SSW020	92.345	0.120	0.000	1.21	0.0	42.3	SURCHARGED
S2.001	SSw021	91.913	-0.076	0.000	0.76	0.0	84.7	OK
S2.002	SSW022	90.514	0.875	0.000	0.83	0.0	107.7	SURCHARGED
S2.003	SSw023	89.543	1.252	0.000	1.87	0.0	152.9	FLOOD RISK
S2.004	SSW024	88.145	0.166	0.000	2.02	0.0	176.4	SURCHARGED
S2.005	SSw025	87.753	-0.202	0.000	0.43	0.0	176.2	OK
S2.006	SSW026	86.737	0.932	0.000	0.37	0.0	9.3	SURCHARGED
S2.007	SSw027	85.727	-0.058	0.000	0.63	0.0	21.0	OK
S2.008	SSW028	85.683	0.008	0.000	0.84	0.0	62.7	SURCHARGED
S2.009	SSw029	84.872	0.344	0.000	1.21	0.0	98.5	SURCHARGED
S2.010	SSw030	84.420	0.222	0.000	1.02	0.0	114.2	SURCHARGED
S2.011	SSw031	84.204	0.204	0.000	1.63	0.0	114.6	SURCHARGED
S2.012	SSW032	84.176	1.306	0.000	0.18	0.0	11.3	SURCHARGED
S2.013	SSw033	82.571	-0.249	0.000	0.07	0.0	15.8	OK
S3.000	SSw034	81.240	0.215	0.000	0.04	0.0	1.7	SURCHARGED
S2.014	SSw035	81.241	0.521	0.000	0.41	0.0	25.1	SURCHARGED
S1.017	SSW036	81.231	0.497	0.000	2.16	0.0	231.4	SURCHARGED
S1.018	SExisting	80.878	0.144	0.000	1.74	0.0	231.5	SURCHARGED

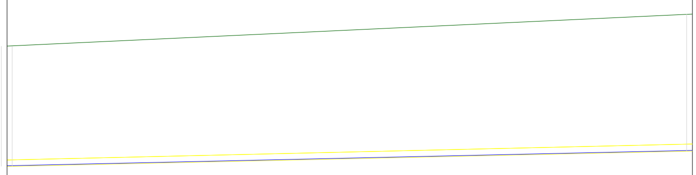
Appendix E – Foul Sewer Design Sheets

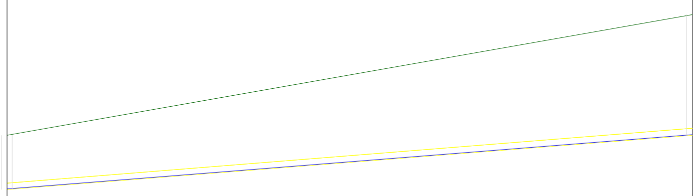


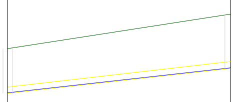
MH Name	FFS02		FFS01
Hor Scale 850 Ver Scale 250 Datum (m) 92.000			
PN		F1.000	
Dia (mm)		150	
Slope (1:X)		60.0	
Cover Level (m)	99.000		98.500
Invert Level (m)	96.167		97.000
Length (m)		50.000	



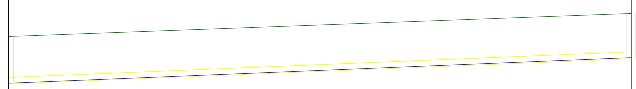
MH Name	FFS04			FFS02
Hor Scale 850 Ver Scale 250 Datum (m) 92.000				
PN			F1.001	
Dia (mm)			225	
Slope (1:X)			150.2	
Cover Level (m)	100.300	99.650		99.000
Invert Level (m)	95.774	95.834	95.834	96.167
Length (m)			50.000	

MH Name	FFS05		FFS04
Hor Scale 850 Ver Scale 250 Datum (m) 92.000			
PN		F1.003	
Dia (mm)		225	
Slope (1:X)		150.1	
Cover Level (m)	99.250		100.300
Invert Level (m)	95.261		95.774
Length (m)		77.000	

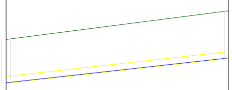
MH Name	FFS06		FFS05
Hor Scale 850 Ver Scale 250 Datum (m) 91.000			
PN		F1.004	
Dia (mm)		225	
Slope (1:X)		42.5	
Cover Level (m)	95.250		99.250
Invert Level (m)	93.449		95.261
Length (m)		77.000	

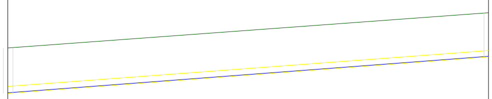


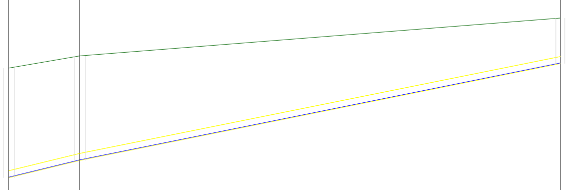
MH Name	FFS07	FFS06
Hor Scale 850 Ver Scale 250 Datum (m) 88.000		
PN	F1.005	
Dia (mm)	225	
Slope (1:X)	30.0	
Cover Level (m)	94.100	95.250
Invert Level (m)	92.616	93.449
Length (m)	25.000	



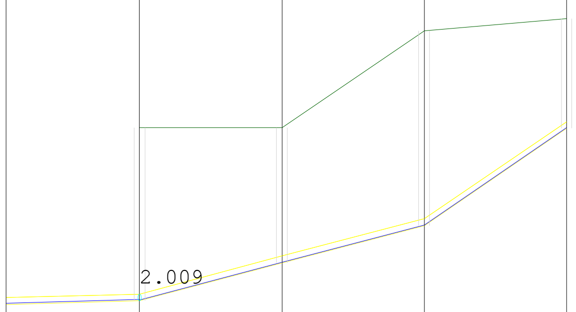
MH Name	FFS08	FFS07
Hor Scale 850 Ver Scale 250 Datum (m) 87.000		
PN	F1.006	
Dia (mm)	225	
Slope (1:X)	83.0	
Cover Level (m)	93.350	94.100
Invert Level (m)	91.773	92.616
Length (m)	70.000	

MH Name	FFS09	FFS08	
Hor Scale 850 Ver Scale 250 Datum (m)86.000			
PN		F1.007	
Dia (mm)		225	
Slope (1:X)		30.0	
Cover Level (m)	92.400	93.350	
Invert Level (m)		90.940 91.773	
Length (m)		25.000	

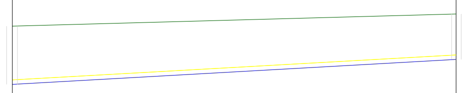
MH Name	FFS010	FFS09	
Hor Scale 850 Ver Scale 250 Datum (m)85.000			
PN		F1.008	
Dia (mm)		225	
Slope (1:X)		45.0	
Cover Level (m)	91.250	92.400	
Invert Level (m)		89.740 90.940	
Length (m)		54.000	

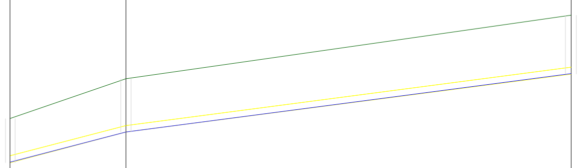


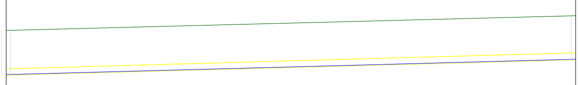
MH Name	FFS012		FFS010	
Hor Scale 850 Ver Scale 250 Datum (m) 83.000				
PN			F1.009	
Dia (mm)			225	
Slope (1:X)			16.9	
Cover Level (m)	89.600	90.000	91.250	
Invert Level (m)		85.979 / 86.550	86.550 / 89.740	
Length (m)			54.000	

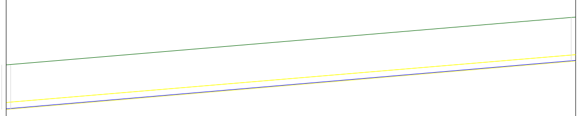


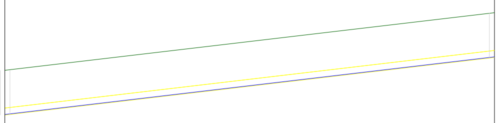
MH Name	F	FFS31	FFS014	FFS013	FFS012	
Hor Scale 850 Ver Scale 250 Datum (m) 79.000						
PN		F1.014	F1.013	F1.012	F1.011	
Dia (mm)		225	225	225	225	
Slope (1:X)		125.0	12.8	13.0	5.0	
Cover Level (m)	0.000	86.000	86.000	89.200	89.600	
Invert Level (m)		80.164 / 80.284	80.284 / 81.538	81.538 / 82.769	82.769 / 85.979	
Length (m)		15.000	16.000	16.000	16.000	

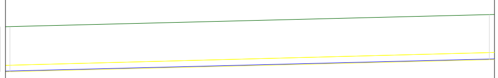
MH Name	FFS021		FFS020
Hor Scale 850 Ver Scale 250 Datum (m) 87.000			
PN		F2.000	
Dia (mm)		150	
Slope (1:X)		60.0	
Cover Level (m)	93.100		93.500
Invert Level (m)	91.167		92.000
Length (m)		50.000	

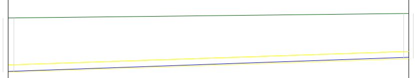
MH Name	FFS023		FFS022		FFS021
Hor Scale 850 Ver Scale 250 Datum (m) 85.000					
PN		F2.002		F2.001	
Dia (mm)		225		225	
Slope (1:X)		13.0		26.0	
Cover Level (m)	89.700		91.000		93.100
Invert Level (m)	88.244		89.244 / 89.244		91.167
Length (m)		13.000		50.000	

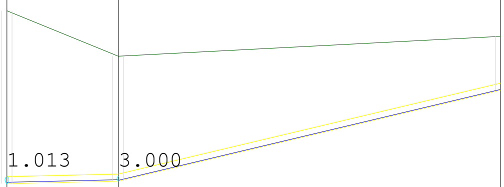
MH Name	FFS024		FFS023	
Hor Scale 850 Ver Scale 250 Datum (m) 83.000				
PN		F2.003		
Dia (mm)		225		
Slope (1:X)		123.1		
Cover Level (m)	89.200		89.700	
Invert Level (m)	87.724		88.244	
Length (m)		64.000		

MH Name	FFS025		FFS024	
Hor Scale 850 Ver Scale 250 Datum (m) 82.000				
PN		F2.004		
Dia (mm)		225		
Slope (1:X)		40.0		
Cover Level (m)	87.600		89.200	
Invert Level (m)	86.124		87.724	
Length (m)		64.000		

MH Name	FFS026		FFS025	
Hor Scale 850 Ver Scale 250 Datum (m) 80.000				
PN		F2.005		
Dia (mm)		225		
Slope (1:X)		29.0		
Cover Level (m)	85.700		87.600	
Invert Level (m)	84.227		86.124	
Length (m)		55.000		

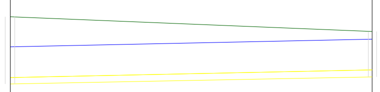
MH Name	FFS027		FFS026	
Hor Scale 850 Ver Scale 250 Datum (m) 79.000				
PN		F2.006		
Dia (mm)		225		
Slope (1:X)		135.1		
Cover Level (m)	85.300		85.700	
Invert Level (m)	83.820		84.227	
Length (m)		55.000		

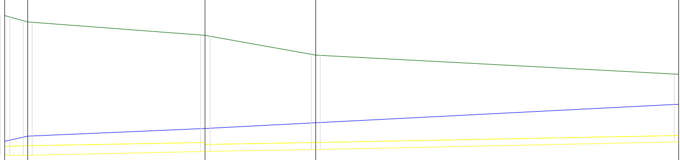
MH Name	FFS028	FFS027	
Hor Scale 850 Ver Scale 250 Datum (m) 79.000			
PN		F2.007	
Dia (mm)		225	
Slope (1:X)		100.0	
Cover Level (m)	85.150	85.300	
Invert Level (m)	83.370	83.820	
Length (m)		45.000	

MH Name	FFS31	FFS030	FFS028	
Hor Scale 850 Ver Scale 250 Datum (m) 77.000				
PN		F2.009	F2.008	
Dia (mm)		225	225	
Slope (1:X)		150.0	14.3	
Cover Level (m)	86.000	84.500	85.150	
Invert Level (m)	80.284	80.367 / 80.367	83.370	
Length (m)		12.500	43.000	

MH Name	FFS030	FFS029	
Hor Scale 850 Ver Scale 250 Datum (m)77.000			
PN	F3.000		
Dia (mm)	150		
Slope (1:X)	60.0		
Cover Level (m)	84.500	82.000	
Invert Level (m)	80.367	80.800	
Length (m)	26.000		

Appendix F – Storm Water Longitudinal Sections

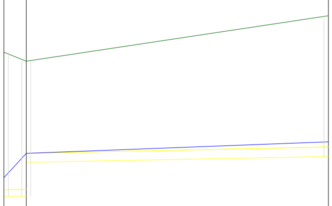
MH Name	SSW02	SSW01	
Hor Scale 1000 Ver Scale 250 Datum (m) 92.000			
PN		S1.000	
Dia (mm)		225	
Slope (1:X)		200.0	
Cover Level (m)	99.000	98.500	
Invert Level (m)		96.760 97.000	
Length (m)		48.000	

MH Name	SSW006		SSW04	SSW03	SSW02	
Hor Scale 1000 Ver Scale 250 Datum (m) 93.000						
PN			S1.003	S1.002	S1.001	
Dia (mm)			300	225	225	
Slope (1:X)			199.2	200.0	200.0	
Cover Level (m)	100.950		100.300	99.650	99.000	
Invert Level (m)			96.329 96.447	96.447 96.520	96.520 96.760	
Length (m)			23.500	14.600	48.000	

Hor Scale 1000

Ver Scale 250

Datum (m) 92.000

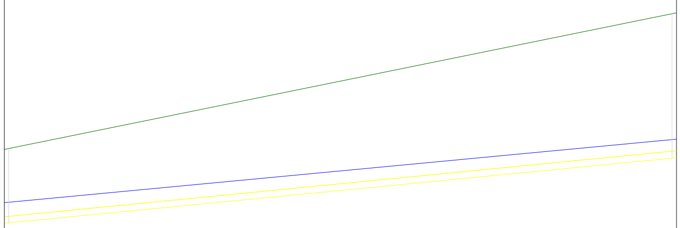


MH Name	SSw008		SSW006
PN		S1.005	
Dia (mm)		300	
Slope (1:X)		200.0	
Cover Level (m)	99.750		100.950
Invert Level (m)	96.114		96.314
Length (m)		40.000	

Hor Scale 1000

Ver Scale 250

Datum (m) 91.000



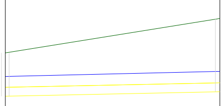
MH Name	SSW009		SSw008
PN		S1.007	
Dia (mm)		225	
Slope (1:X)		41.0	
Cover Level (m)	95.250		99.750
Invert Level (m)	92.814		94.985
Length (m)		89.000	

MH Name	SSW010	SSW009	

Hor Scale 1000

Ver Scale 250

Datum (m) 88.000



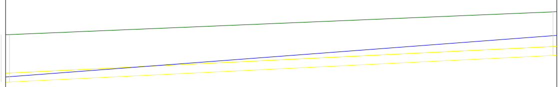
PN		S1.008	
Dia (mm)		300	
Slope (1:X)		190.0	
Cover Level (m)	94.100	95.250	
Invert Level (m)	92.664	92.814	
Length (m)		28.500	

MH Name	SSW011	SSW010	

Hor Scale 1000

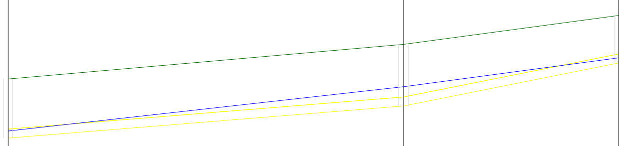
Ver Scale 250

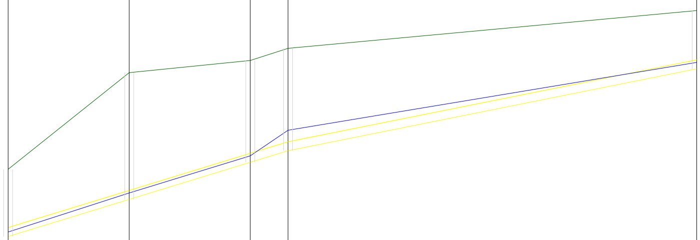
Datum (m) 87.000



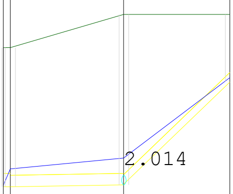
PN		S1.009	
Dia (mm)		300	
Slope (1:X)		83.0	
Cover Level (m)	93.350	94.100	
Invert Level (m)	91.784	92.664	
Length (m)		73.000	

Denis O'Sullivan & Associates		Page 4
Unit 5, Joyce House Barrack Square Ballincollig, Co. Cork		Micro Drainage
Date 27/06/2024 12:49 File STORM SEWER 2024.MDX	Designed By SODonoghue Checked By	
Micro Drainage	Network W.12.4	

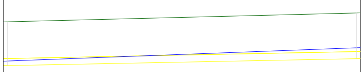
MH Name	SSW013		SSW012		SSW011
Hor Scale 1000 Ver Scale 250 Datum (m) 86.000					
PN		S1.011		S1.010	
Dia (mm)		300		300	
Slope (1:X)		50.0		20.0	
Cover Level (m)	91.250		92.400		93.350
Invert Level (m)	89.313		90.359 90.359		91.784
Length (m)		52.300		28.500	

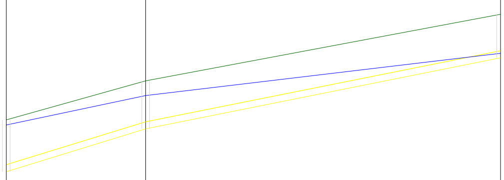
MH Name	SSw017		SSW016		SSw015			SSW013
Hor Scale 1000 Ver Scale 250 Datum (m) 82.000								
PN		S1.015		S1.014			S1.012	
Dia (mm)		300		300			300	
Slope (1:X)		13.0		13.0			20.0	
Cover Level (m)	86.000		89.200		89.600	90.000		91.250
Invert Level (m)	83.766		84.997 84.997		86.228	86.613 86.613		89.313
Length (m)		16.000		16.000			54.000	

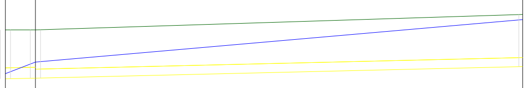
MH Name	SExisting		SSW036		SSw017
Hor Scale 1000 Ver Scale 250 Datum (m) 77.000					
PN		S1.017		S1.016	
Dia (mm)		375		300	
Slope (1:X)		200.0		4.1	
Cover Level (m)	84.900		86.000		86.000
Invert Level (m)		80.284	80.359	80.382	83.766
Length (m)		15.000		14.000	

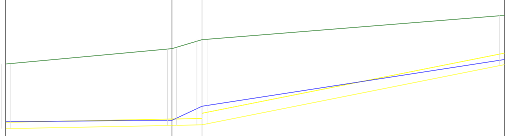


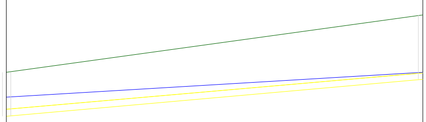
MH Name	SSw021		SSW020
Hor Scale 1000 Ver Scale 250 Datum (m) 87.000			
PN		S2.000	
Dia (mm)		225	
Slope (1:X)		200.0	
Cover Level (m)	93.200		93.500
Invert Level (m)	91.764		92.000
Length (m)		47.200	

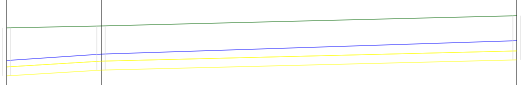


MH Name	SSw023	SSW022	SSw021	
Hor Scale 1000 Ver Scale 250 Datum (m)85.000				
PN		S2.002	S2.001	
Dia (mm)		225	225	
Slope (1:X)		13.0	20.0	
Cover Level (m)	89.700	91.000	93.200	
Invert Level (m)		87.991 89.414	89.414 91.764	
Length (m)		18.500	47.000	

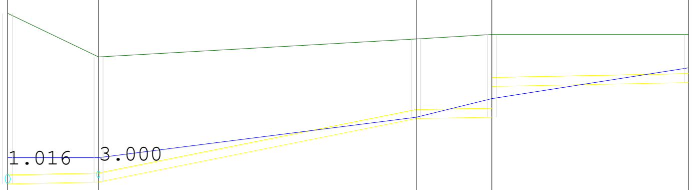
MH Name	SSw025		SSw023	
Hor Scale 1000 Ver Scale 250 Datum (m)83.000				
PN			S2.003	
Dia (mm)			300	
Slope (1:X)			166.7	
Cover Level (m)	89.200	89.200	89.700	
Invert Level (m)		87.604	87.604 87.991	
Length (m)			64.500	

MH Name	SSW028	SSw027		SSw025	
Hor Scale 1000 Ver Scale 250 Datum (m) 82.000					
PN		S2.007		S2.005	
Dia (mm)		225		375	
Slope (1:X)		200.0		20.0	
Cover Level (m)	87.600	88.100	88.400	89.200	
Invert Level (m)		85.450 85.560	85.580	85.580 87.580	
Length (m)		22.000		40.000	

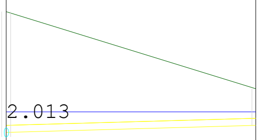
MH Name	SSw029	SSW028	
Hor Scale 1000 Ver Scale 250 Datum (m) 80.000			
PN		S2.008	
Dia (mm)		225	
Slope (1:X)		45.0	
Cover Level (m)	85.700	87.600	
Invert Level (m)		84.228 85.450	
Length (m)		55.000	



MH Name	SSw031	SSw030	SSw029	
Hor Scale 1000 Ver Scale 250 Datum (m) 79.000				
PN		S2.010	S2.009	
Dia (mm)		300	300	
Slope (1:X)		63.1	166.7	
Cover Level (m)	85.300	85.350	85.700	
Invert Level (m)		83.700 83.898	83.898 84.228	
Length (m)		12.500	55.000	



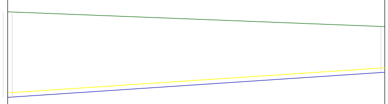
MH Name	SSW036		SSw033		SSw031	
Hor Scale 1000 Ver Scale 250 Datum (m) 77.000						
PN			S2.013		S2.011	
Dia (mm)			300		300	
Slope (1:X)			20.0		200.0	
Cover Level (m)	86.000	84.550	85.150	85.300	85.300	
Invert Level (m)		80.359 80.420	80.420 82.520	82.520 82.570	83.570 83.700	
Length (m)			42.000		26.000	

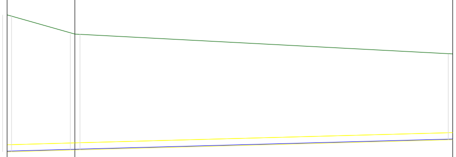


MH Name	SSw035	SSw034	
Hor Scale 1000 Ver Scale 250 Datum (m)77.000			
PN		S3.000	
Dia (mm)		225	
Slope (1:X)		144.1	
Cover Level (m)	84.550	82.000	
Invert Level (m)		80.571 80.800	
Length (m)		33.000	

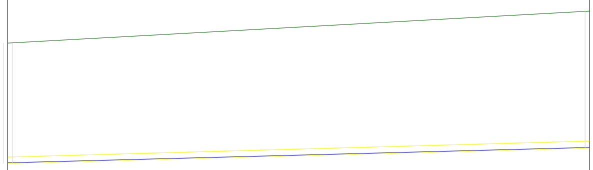
Appendix G – Foul Sewer Longitudinal Sections

Denis O'Sullivan & Associates		Page 1
Unit 5, Joyce House Barrack Square Ballincollig, Co. Cork		
Date 27/06/2024 12:50 File FOUL SEWER 2024 ...	Designed By SODonoghue Checked By	
Micro Drainage	Network W.12.4	

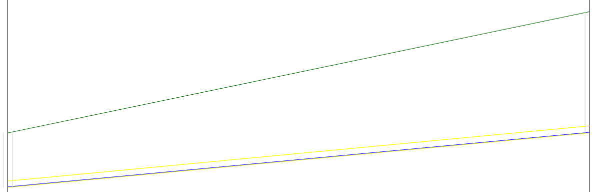
MH Name	FFS02		FFS01
Hor Scale 1000 Ver Scale 250 Datum (m) 92.000			
PN		F1.000	
Dia (mm)		150	
Slope (1:X)		60.0	
Cover Level (m)	99.000		98.500
Invert Level (m)		96.167	97.000
Length (m)		50.000	

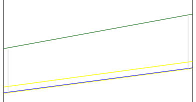
MH Name	FFS04			FFS02
Hor Scale 1000 Ver Scale 250 Datum (m) 92.000				
PN			F1.001	
Dia (mm)			225	
Slope (1:X)			150.2	
Cover Level (m)	100.300	99.650		99.000
Invert Level (m)		95.774 95.834	95.834	96.167
Length (m)			50.000	

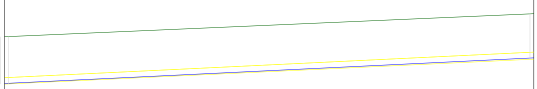
MH Name	FFS05		FFS04
Hor Scale 1000 Ver Scale 250 Datum (m) 92.000			
PN		F1.003	
Dia (mm)		225	
Slope (1:X)		150.1	
Cover Level (m)	99.250		100.300
Invert Level (m)	95.261		95.774
Length (m)		77.000	

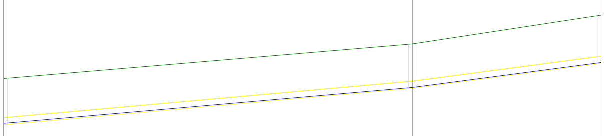


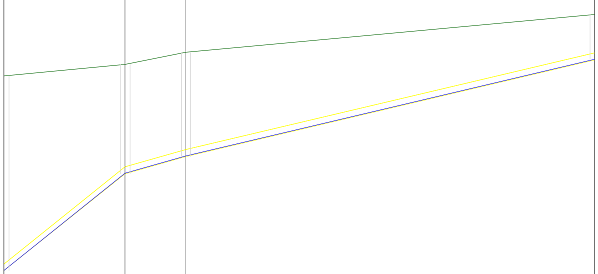
MH Name	FFS06		FFS05
Hor Scale 1000 Ver Scale 250 Datum (m) 91.000			
PN		F1.004	
Dia (mm)		225	
Slope (1:X)		42.5	
Cover Level (m)	95.250		99.250
Invert Level (m)	93.449		95.261
Length (m)		77.000	



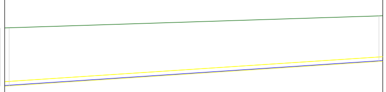
MH Name	FFS07	FFS06	
Hor Scale 1000 Ver Scale 250 Datum (m) 88.000			
PN		F1.005	
Dia (mm)		225	
Slope (1:X)		30.0	
Cover Level (m)	94.100	95.250	
Invert Level (m)		92.616 / 93.449	
Length (m)		25.000	

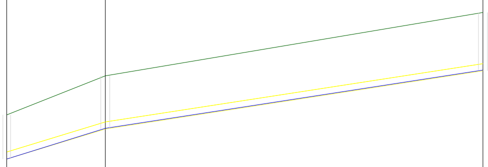
MH Name	FFS08	FFS07	
Hor Scale 1000 Ver Scale 250 Datum (m) 87.000			
PN		F1.006	
Dia (mm)		225	
Slope (1:X)		83.0	
Cover Level (m)	93.350	94.100	
Invert Level (m)		91.773 / 92.616	
Length (m)		70.000	

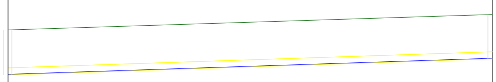
MH Name	FFS010	FFS09	FFS08	
Hor Scale 1000 Ver Scale 250 Datum (m) 86.000				
PN		F1.008	F1.007	
Dia (mm)		225	225	
Slope (1:X)		45.0	30.0	
Cover Level (m)	91.250	92.400	93.350	
Invert Level (m)		89.740 / 90.940	90.940 / 91.773	
Length (m)		54.000	25.000	

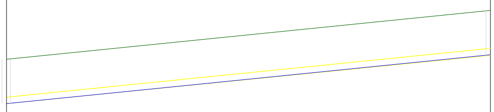
MH Name	FFS013	FFS012		FFS010	
Hor Scale 1000 Ver Scale 250 Datum (m) 81.000					
PN		F1.011		F1.009	
Dia (mm)		225		225	
Slope (1:X)		5.0		16.9	
Cover Level (m)	89.200	89.600	90.000	91.250	
Invert Level (m)		82.769 / 85.979	85.979 / 86.550	86.550 / 89.740	
Length (m)		16.000		54.000	

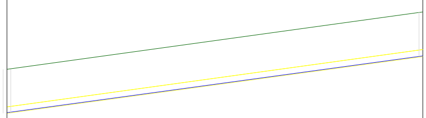
MH Name	F	FFS31	FFS014	FFS013
Hor Scale 1000 Ver Scale 250 Datum (m) 79.000				
PN		F1.014	F1.013	F1.012
Dia (mm)		225	225	225
Slope (1:X)		125.0	12.8	13.0
Cover Level (m)	0.000	86.000	86.000	89.200
Invert Level (m)		80.164 80.284	80.284 81.538	81.538 82.769
Length (m)		15.000	16.000	16.000

MH Name	FFS021	FFS020
Hor Scale 1000 Ver Scale 250 Datum (m) 87.000		
PN		F2.000
Dia (mm)		150
Slope (1:X)		60.0
Cover Level (m)	93.100	93.500
Invert Level (m)		91.167 92.000
Length (m)		50.000

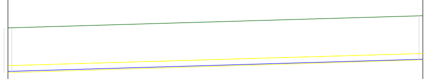
MH Name	FFS023	FFS022	FFS021	
Hor Scale 1000 Ver Scale 250 Datum (m)85.000				
PN		F2.002	F2.001	
Dia (mm)		225	225	
Slope (1:X)		13.0	26.0	
Cover Level (m)	89.700	91.000	93.100	
Invert Level (m)		88.244 89.244	89.244 91.167	
Length (m)		13.000	50.000	

MH Name	FFS024	FFS023	
Hor Scale 1000 Ver Scale 250 Datum (m)83.000			
PN		F2.003	
Dia (mm)		225	
Slope (1:X)		123.1	
Cover Level (m)	89.200	89.700	
Invert Level (m)		87.724 88.244	
Length (m)		64.000	

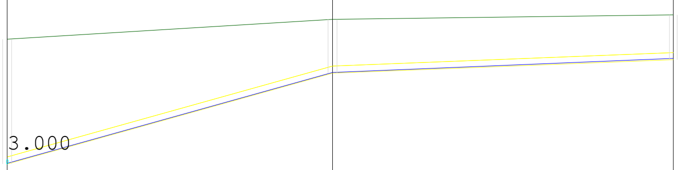
MH Name	FFS025		FFS024
Hor Scale 1000 Ver Scale 250 Datum (m) 82.000			
PN		F2.004	
Dia (mm)		225	
Slope (1:X)		40.0	
Cover Level (m)	87.600		89.200
Invert Level (m)	86.124		87.724
Length (m)		64.000	

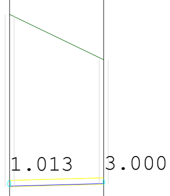
MH Name	FFS026		FFS025
Hor Scale 1000 Ver Scale 250 Datum (m) 80.000			
PN		F2.005	
Dia (mm)		225	
Slope (1:X)		29.0	
Cover Level (m)	85.700		87.600
Invert Level (m)	84.227		86.124
Length (m)		55.000	

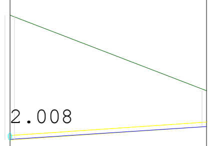
MH Name	FFS027		FFS026
Hor Scale 1000 Ver Scale 250 Datum (m) 79.000			
PN		F2.006	
Dia (mm)		225	
Slope (1:X)		135.1	
Cover Level (m)	85.300		85.700
Invert Level (m)	83.820		84.227
Length (m)		55.000	



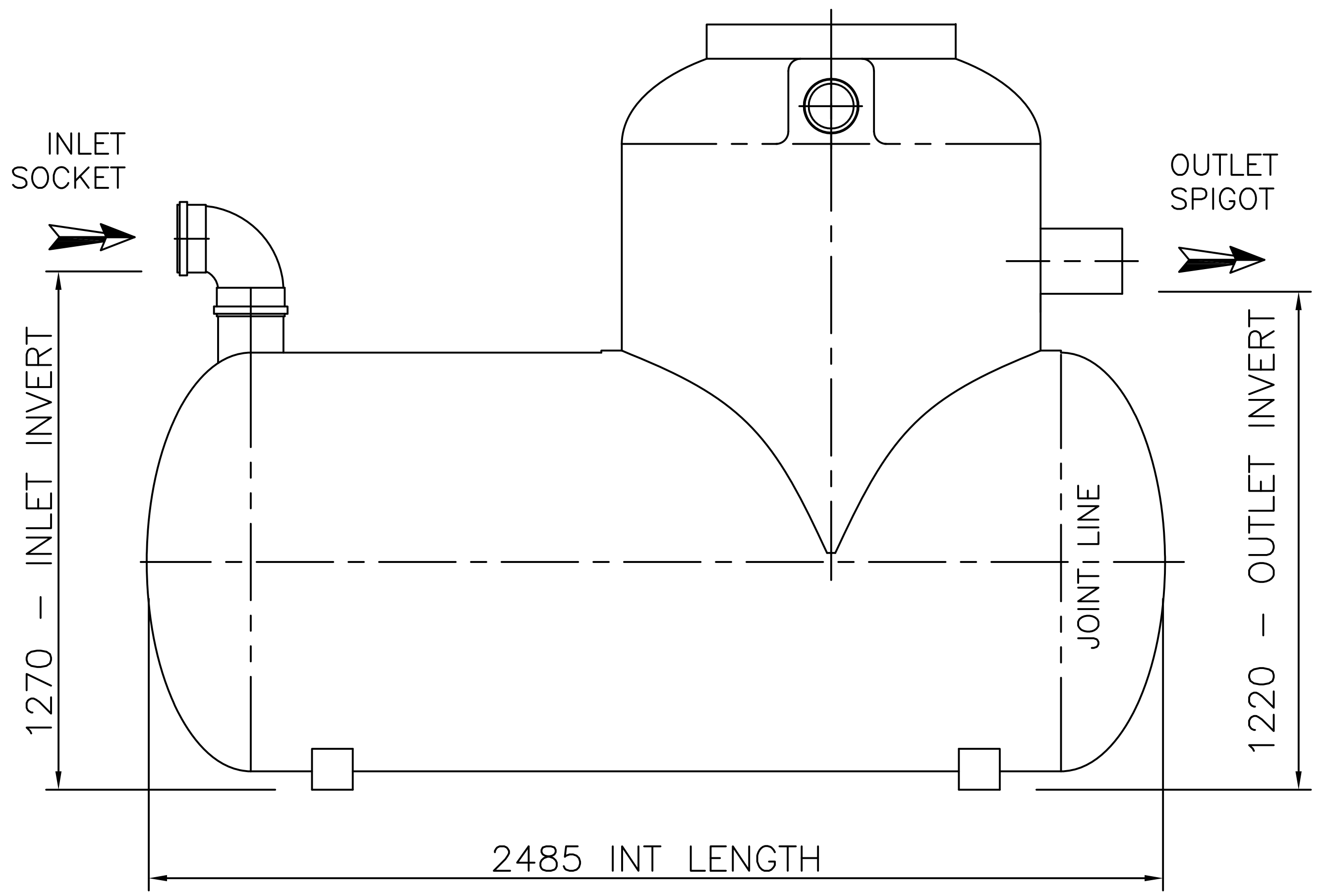
MH Name	FFS030		FFS028		FFS027
Hor Scale 1000 Ver Scale 250 Datum (m) 77.000					
PN		F2.008		F2.007	
Dia (mm)		225		225	
Slope (1:X)		14.3		100.0	
Cover Level (m)	84.500		85.150		85.300
Invert Level (m)	80.367		83.370 / 83.370		83.820
Length (m)		43.000		45.000	

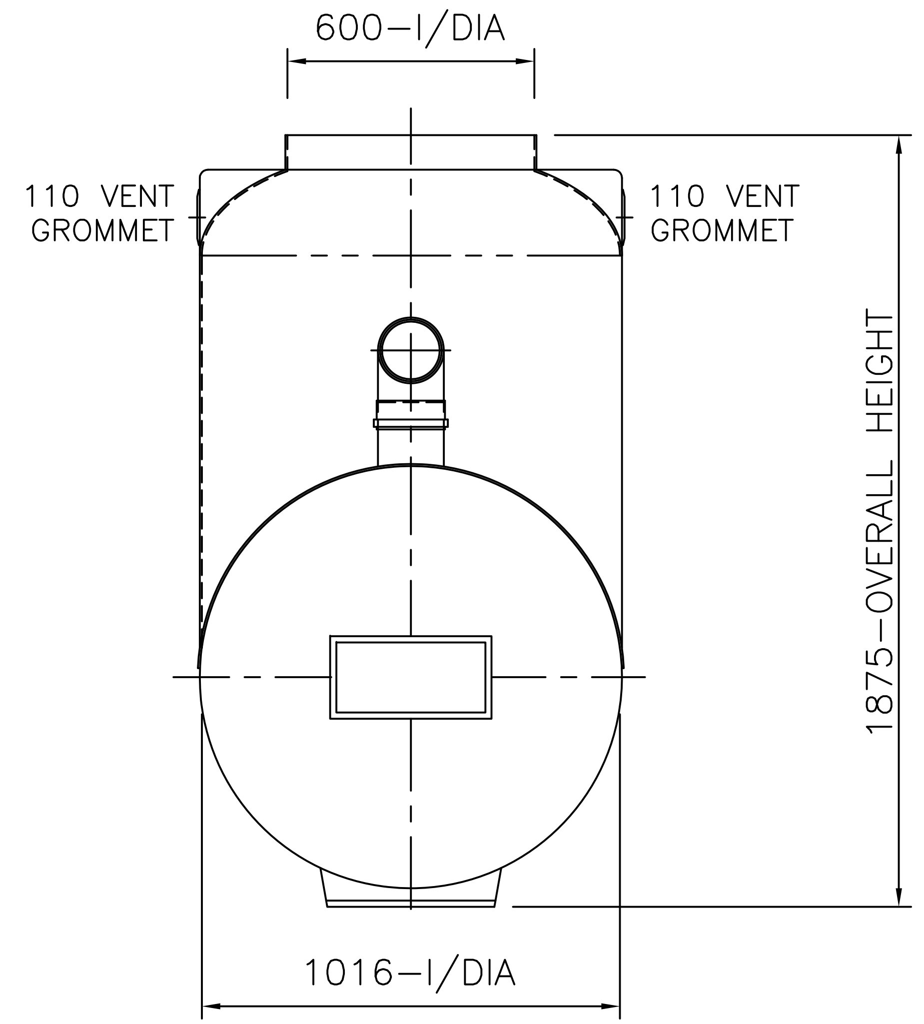


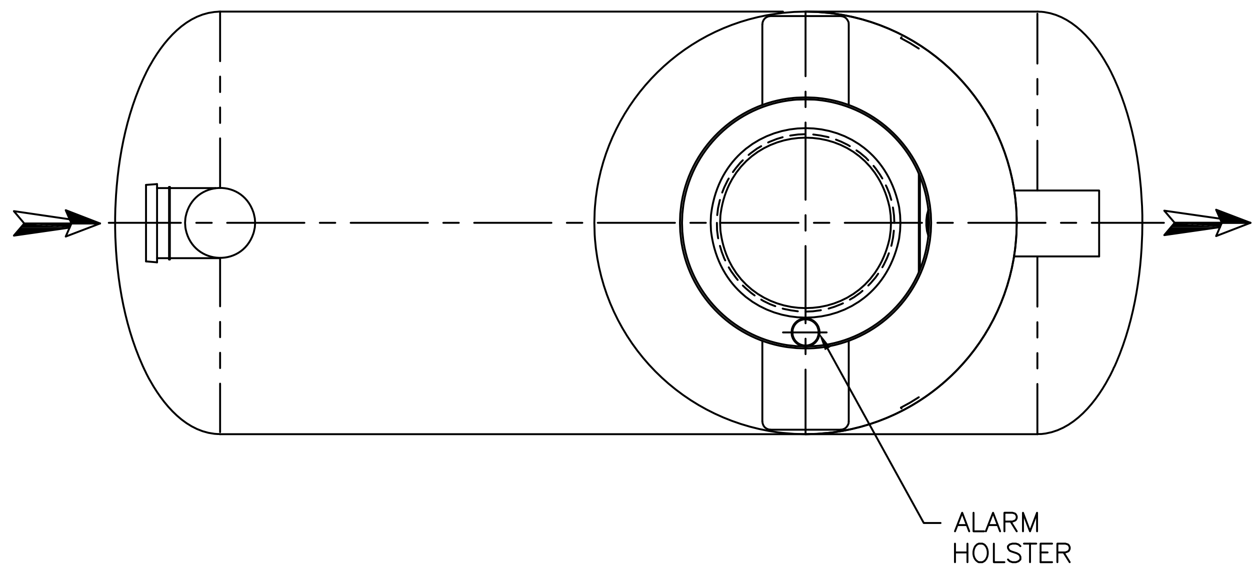
MH Name	FFS31	FFS030	
Hor Scale 1000 Ver Scale 250 Datum (m) 77.000			
PN	F2.009		
Dia (mm)	225		
Slope (1:X)	150.0		
Cover Level (m)	86.000	84.500	
Invert Level (m)	80.284	80.367	
Length (m)	12.500		

MH Name	FFS030	FFS029	
Hor Scale 1000 Ver Scale 250 Datum (m) 77.000			
PN	F3.000		
Dia (mm)	150		
Slope (1:X)	60.0		
Cover Level (m)	84.500	82.000	
Invert Level (m)	80.367	80.800	
Length (m)	26.000		

Appendix H - Petrol Interceptor Details







IMPORTANT NOTE

DUE TO THE COMPACT DESIGN AND EASE OF INSTALLATION, CONDER SEPARATORS ARE NOW SUPPLIED AS STANDARD WITH AN IN LINE CONFIGURATION.

PIPE SIZE VARIANTS

100, 150, 225 PVC

300, 375 GRP

NOTES:

1. PRODUCT INFORMATION

The Conder range of light liquid separators is produced from high grade GRP. Inlets are provided as sockets and outlets as spigots, Connections may be made by steel-banded flexible couplings, nitrile seal joints, rope-seal and mortar or any other appropriate jointing method.

Ventilation specifications should be in accordance with Local Authority requirements. Vent pipework from multiple chambers must never be manifolded below ground level.

2. PERFORMANCE CHARACTERISTICS

Separators are based on the requirements stated in European Standard EN858-1 and Environment Agency guideline PPG3, in particular:-

a. The nominal size has been established from performance tests where the residual oil at the outlet is less than 5mg/l for class 1 separators and less than 100mg/l for class 2 separators.

3. MAINTENANCE AND USE

It is important to recognise that light liquid separators require regular maintenance. The period between maintenance operations can vary depending on the location and use of the separator, therefore routine inspections shall be undertaken at least every six months and a log maintained of inspection date, depth of oil, depth of silt and any cleaning that is undertaken.

A Conder Alarm should be fitted to every separator to give automatic warning that the light liquid capacity has been reached.

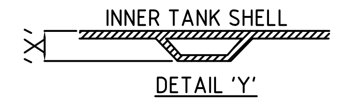
Access to the separator should be kept clear and not used for storage.

4. PRODUCT DEVELOPMENT

In line with our policy of constant improvement and development, we reserve the right to change specification without prior notice.

IMPORTANT INVERT LEVEL NOTE (RIBBED TANKS ONLY!):

The inlet and outlet Invert Level(IL) shown on this drawing is to internals of the shell unless otherwise stated.
For Invert level to the outside of the shell ribs, see the conversion below:
Ø1.0m, 1.2m, 1.5m, 1.8m, 2.5m IL+50mm ('X')
Ø3.0m,4.0m IL+75mm ('X')



TANKS SUPPLIED WITH LOOSE SHAFTS DO NOT COME SUPPLIED WITH A FIXING KIT.
THIS IS THE RESPONSIBILITY OF THE SITE CONTRACTOR.

PREMIER TECH AQUA

1ST ANGLE PROJECTION

TITLE: CNSB10S/21/SALES BYPASS SEPARATOR

REV.	DATE	BY	CHKD.	APPD.	DESCRIPTION
6	19.09.11	RU	DG	RU	VENT BOXES AND GROMMETS ADDED

DRAWN BY	CHKD.	APPD.	SCALE	DRAWING No.	REVISION
RU	PB	RP	NTS	CNSB10S/21 SALES	6
DATE 23.03.09	DATE 23.03.09	DATE 23.03.09			

A3 — DO NOT SCALE. IF IN DOUBT ASK. ALL DIMENSIONS IN MM

GENERAL TOLERANCES (unless noted otherwise)				
GRP	LINEAR	± 5mm	ANGLE	±0.5°
FABRICATED		± 2mm		±0.2°
MACHINED		± 0.5mm		±0.1°

Conder® OIL/WATER SEPARATORS

THE PARTNER OF CHOICE

PREMIER TECH AQUA

40 years OF PASSION

The Conder Range of Oil Separators are for installation on surface water drainage systems and are designed to prevent hydrocarbons (e.g. diesel, petrol, engine oil) from mixing with surface water and entering our drainage systems.

Pollution prevention is a critical part of sustainable drainage systems and statutory regulations are in force to control the discharge of hydrocarbons, with severe penalties imposed for non-compliance.

Compliance

The Conder Range of Oil Separators fully conform to both the Environment Agency's latest PPG guidelines and European standard BSEN-858-1-2 and are proven to effectively separate oil and water. Under test, the Conder Bypass performed to less than 1 mg/L and in doing so guarantees minimal environmental impact and ensures public safety.

Classes of Separators

There are two classes of separators which are defined by performance.

Class 1	Class 2*
Class 1 Separators are designed to achieve a concentration of less than 5 mg/L of oil under standard test conditions. These conditions are required for discharges to surface water drains and the water environment.	Class 2 Separators are designed to achieve a concentration of less than 100 mg/L oil under standard test conditions and are suitable for dealing with discharges where a lower quality requirement applies, such as discharges to the foul sewer.

*Class 2 available in forecourt separators only.

Selecting the Right Separator

Premier Tech Aqua offers a full range of Separators for varying use and application:

- Bypass Separator
- Full Retention Separator
- Forecourt Separator
- Wash Down and Silt Separators

If you're unsure of what type of Conder Oil Separator you require, please use the chart below to help you identify the most suitable product for your project.

The guidance given is for the use of separators in surface water drainage systems that discharge to rivers and soakways.

Is there a risk of oil contaminating the drainage from the site?

YES	YES	YES	YES	NO
Risk of infrequent light contamination and potential for small spills only e.g. car park.	Risk of regular contamination of surface water run off with oil and/or risk of larger spills e.g. vehicle maintenance area, goods vehicle parking or vehicle manoeuvring.	Risk of regular Drainage will also contain dissolved oils, detergents or degreasers such as vehicle wash water and trade effluents e.g. industrial sites.	Fuel oils are delivered to and dispensed on site e.g. retail fuel forecourts.	Very low risk of oil contamination e.g. roofwater.
YES				YES
Source control SUDS must be considered and incorporated where suitable.				Separator not required.
IF NOT SUITABLE	YES	YES	YES	
By-pass separator with alarm required. Class 1 if discharge to surface water. Class 2 if discharge to foul sewer.	Full retention separator with alarm required. Class 1 if discharge to surface water. Class 2 if discharge to foul sewer.	Trade effluents must be directed to the foul sewer. It may need to pass through a separator before discharge to sewer to remove.	Full retention forecourt separator with alarm required. Class 1 if discharge to surface water. Class 2 if discharge to foul sewer.	Clean water should not be passed through the separator unless the size of the unit is increased accordingly.

The use of SUDS should be considered at all sites and they should be incorporated where suitable. SUDS can be used to polish the effluent from these separators before it enters the environment.

Source control SUDS should be considered where possible.

Separator Alarms

All oil separators are required by legislation to be fitted with an oil level alarm system with recommendations that the alarm is installed, tested, commissioned and regularly serviced by a qualified technician.

The alarm indicates when the separator is in need of immediate maintenance in order for it to continue to work effectively. Premier Tech Aqua can offer a full technical and service package for a variety of alarm options.

The Conder Range of Bypass Separators

The Conder Range of Bypass Separators are used to fully treat all flows generated by rainfall rates of up to 6.5 mm/hr. Bypass Separators are used when it is considered an acceptable risk not to provide full treatment for high flows, for example where only small spillages occur and the risk of spillage is small.

Typical Applications

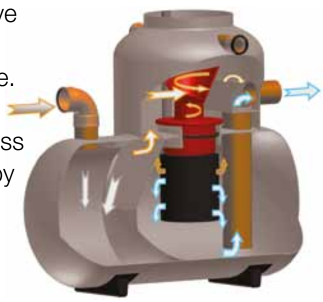
- Car parks
- Roadways and major trunk roads
- Light industrial and goods yards

Features and Benefits

- Innovative design
- Compact and easy to handle/install
- Fully compliant to the Environment Agency's PPG3 guidelines
- Low product and install costs
- Full BSI certification
- Exceeds industry standards
- Easy to service
- Fully tested and verified with a range from CNSB 3 to CNSB 1000 (Class 1)

Performance

Conder Bypass Separators have been designed to treat all flow up to the designed nominal size. Any flow in excess of the nominal size is allowed to bypass the separation chamber, thereby keeping the separated and trapped oil safe.



How it Works

Step 1

During the early part of a rain storm, which is a time of high oil contamination, all of the contaminated water flow passes through the sediment collection chamber and enters the separation chamber through a patented oil skimming and filter device.

Step 2

All of the oil then proceeds to the separation chamber where it is separated to the Class 1 standard of 5 mg/L and safely trapped.

Step 3

As the rainstorm builds up to its maximum and the level of oil contamination reduces significantly, the nominal size flow continues to pass through the separation chamber and any excess flow of virtually clean water is allowed to bypass directly to the outlet.

Specifications

Larger models up to CNSB 1000 are available.

Area Drained (m^2)	Tank Code including Silt	Length including Silt (mm)	Silt Capacity (L)	Oil Storage Capacity (L)	Diameter (mm)	Height (mm)	Base to Inlet Invert (mm)	Base to Outlet Invert (mm)	Access (mm)
1667	CNSB3s/21	1400	300	45	1026	2200	1730	1680	750
2500	CNSB4.5s/21	1785	450	67.5	1026	1875	1270	1220	600
3333	CNSB6s/21	1975	600	90	1026	1875	1270	1220	600
4444	CNSB8s/21	2165	800	120	1026	1875	1270	1220	600
5555	CNSB10s/21	2485	1000	150	1026	1875	1270	1220	600
8333	CNSB15s/21	2670	1500	225	1210	2150	1450	1400	600
11111	CNSB20s/21	3115	2000	300	1210	2150	1450	1400	600
13889	CNSB25s/21	3555	2500	375	1210	2150	1450	1400	600
16667	CNSB30s/21	3470	3000	450	1510	2690	1770	1720	750
22222	CNSB40s/21	4040	4000	600	1510	2690	1770	1720	750
27778	CNSB50s/21	4655	5000	750	1510	2690	1770	1720	750
33333	CNSB60s/21	4415	6000	900	1880	3300	2025	1975	2 x 600
44444	CNSB80s/21	5225	8000	1200	1880	3300	2025	1975	2 x 600
55556	CNSB100s/21	6010	10,000	1500	1880	3300	2025	1975	2 x 600

Note: It is a requirement of PPG3 that you have a silt capacity either in your tank or in an upstream catch pit.

The Conder Range of Full Retention Separators

The Conder Range of Full Retention Separators are designed to treat the full flow that can be delivered by a drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 65 mm/hr. Full Retention Separators are used where there is a risk of regular contamination with oil and a foreseeable risk of significant spillages.

Typical Applications

- Sites with a high-risk of oil contamination
- Fuel storage depots
- Refuelling facilities
- Petrol forecourts
- Vehicle maintenance areas/workshops
- Where discharge is to a sensitive environment

Features and Benefits

- All surface water is treated
- Automatic closure device (ACD) fitted as standard

Performance

All Conder Full Retention Separators have an automatic closure device (ACD) fitted as standard. This is compulsory for all PPG3 compliant Full Retention Separators and prevents accumulated pollutants flowing through the unit when maximum storage level is reached.

How it Works

Step 1

Contaminated water enters the separator where the liquid is retained for a sufficient period to ensure that the lighter than water pollutants (such as oil, petrol) separate and rise to the surface of the water.

Step 2

The decontaminated water then passes through the coalescing filter before it is safely discharged from the separator, with the remaining pollutants being retained in the separator.

Step 3

Retained pollutants must be emptied from the separator once the level of oil is reached, or the oil level alarm is activated. This waste should be removed from the separator under the terms of The Waste Management Code of Practice.

Specifications

Larger models available upon request.

Area Drained (m²)	Tank code Incl. Silt	Length including Silt (mm)	Slit Capacity (L)	Oil Storage Capacity	Diameter (mm)	Height (mm)	Base to Inlet Invert (mm)	Base to Outlet Invert (mm)
222	CNS4s/11	2319	400	40	1026	1655	1295	1245
333	CNS6s/11	3414	600	60	1026	1655	1295	1245
444	CNS8s/11	3197	800	80	1210	1855	1480	1430
556	CNS10s/11	3957	1000	100	1210	1855	1480	1430
833	CNS15s/11	3870	1500	150	1510	2180	1780	1730
1111	CNS20s/11	5060	2000	200	1510	2180	1780	1730
1667	CNS30s/11	5369	3000	300	1880	2560	2030	1980
2222	CNS40s/11	7059	4000	400	1880	2560	2030	1980
2778	CNS50s/11	4080	5000	500	2600	3315	2730	2680
3333	CNS60s/11	4805	6000	600	2600	3315	2730	2680
3889	CNS70s/11	5529	7000	700	2600	3315	2730	2680
4444	CNS80s/11	6254	8000	800	2600	3315	2730	2680
5556	CNS100s/11	6751	10,000	1,000	2600	3315	2730	2680

Note: It is a requirement of PPG3 that you have a silt capacity either in your tank or in an upstream catch pit.

Conder Range of Forecourt Separators

Conder Forecourt Separators have been designed for specific use in petrol filling stations and other similar applications. The size of this separator has been specifically increased in order to retain the possible loss of the contents from one compartment of a road tanker, which could be up to 7,600 litres.

Forecourt separators are an essential infrastructure requirement for all forecourts so as to ensure compliance with both health and safety and environmental legislation.

Typical Applications

- Petrol forecourts
- Refuelling facilities
- Fuel storage depot

Features and Benefits

- All surface water is treated
- Available in Class 1 and Class 2
- Automatic Closure Device (ACD) fitted as standard
- Includes 2000L silt capacity

Performance

All Conder Forecourt Separators have an automatic closure device (ACD) fitted as standard. This is compulsory for all PPG3 compliant Full Retention Separators and prevents accumulated pollutants flowing through the unit when maximum storage level is reached.

How it Works

Step 1

Contaminated water enters the separator where the liquid is retained for a sufficient period to ensure that the lighter than water pollutants (such as oil, petrol) separate and rise to the surface of the water.

Step 2

The decontaminated water then passes through the coalescing filter before it is safely discharged from the separator, with the remaining pollutants being retained in the separator.

Step 3

Retained pollutants must be emptied from the separator once the level of oil is reached, or the oil level alarm is activated. This waste should be removed from the separator under the terms of The Waste Management Code of Practice.

Specifications

Tank Code	Volume (L)	Length (mm)	Diameter (mm)	Height (mm)	Base to Inlet (mm)	Base to Outlet (mm)	Access (mm)
ANO/11*	10,000	4,250	1,800	2,100	1,600	1,550	750
ANT/12**	10,000	4,250	1,800	2,100	1,600	1,550	750
LNO/11***	10,000	4,250	1,800	2,100	1,600	1,550	750

*Class 1 Forecourt Separator suitable for discharging to surface water drains

**Class 2 Forecourt Separator suitable for discharging to foul drains only

***Class 1 Forecourt Separator suitable for installation in granular materials

Conder Range of Washdown and Silt Separators

Conder Washdown and Silt Separators are for use in areas such as car washes, pressure wash facilities or other cleaning facilities and must be discharged to the foul water drainage system in accordance with PPG13.

Typical Applications

- Car wash facilities
- Tool hire depots
- Pressure washer facilities

Features and Benefits

- Available in 1,2 and 3 stage options
- Efficient silt and hydrocarbon removal

Performance

The Environment Agency's PPG13 requires that discharge from pressure washers must discharge to a foul drainage system. Where there is no foul drainage available, the effluent must be contained within a sealed drainage system or catchpit for disposal by a licenced waste contractor.

Silt build-up is the primary concern with washdown facilities and so the Conder range of washdown and silt separators are used to remove the silt and will allow some separation of hydrocarbons.

Detergents that are used in wash down areas will break down and disperse hydrocarbons (hindering the separation process). Therefore, it is important to remember the main function of wash down separators is to remove silt.

How it Works

Step 1

Contaminated wash down water enters the unit where the heavier solids, silts and settle to the bottom of the tank.

Step 2

The lighter liquids, hydrocarbons, will rise to the surface and be retained within the tank.

Step 3

Treated water will exit the separator via the dipped outlet.

Specifications

Although it is recognised that single stage separators give the most efficient separation, 2 and 3 chamber Conder Washdown and Silt Separators are available on request.

Tank Code	Capacity (L)	Silt Storage	Diameter (mm)	Length (mm)	Access Diameter (mm)	Base to Inlet Invert (mm)	Base to Outlet Invert (mm)
CWS2/12	2,000	1,000	1,000	2,713	600	1,290	1,240
CWS3/12	3,000	1,500	1,200	2,853	600	1,475	1,425
CWS4/12	4,000	2,000	1,200	3,737	600	1,475	1,425
CWS6/12	6,000	3,000	1,500	3,636	600	1,775	1,725
CWS8/12	8,000	4,000	1,800	3,443	600	2,030	1,980
CWS10/12	10,000	5,000	1,800	4,250	600	2,030	1,980

FST Silt Trap

Large quantities of silt can be associated with washdown areas. The Conder FST silt trap is ideal for easy removal of silt either manually or by a waste disposal contractor.

The FST range of silt traps are available with varying grades of covers from B125 up to E600 to allow installation in all types of vehicle or plant washdown facilities.

Conder Range of Alarm Systems

All separators must be fitted with an alarm in order to provide visual and audible warning when the level of oil reaches 90% of its storage volume, as required by The Environment Agency's PPG3.

The alarm system will then be triggered to indicate that the separator is in need of immediate emptying, in order to continue effective operation.

Features and Benefits

- Option for installation at a remote supervisory point
- Audible and visual
- Eliminates unnecessary waste management visits
- Easy installation
- Audible, visual and text message alert alarm systems available

Mains Powered System

Mains powered alarm systems are best suited to new build situations or sites where installation of the necessary cabling and ducting is straight forward and economical. The probe located in the separator will, when surrounded by floating hydrocarbons, activate an alarm condition on the remote panel to advise that the unit requires emptying.

Solar Powered System (Flashing Beacon)

This option requires no mains power supply or any significant cabling or ducting, making it extremely economical for large sites and retro fitting alarms to existing oil separators. A High Intensity Beacon will flash when a problem is detected.

Solar GSM Alarm

The Solar GSM Alarm sends a status report on your separator to a mobile phone number of your choice. The status of the GSM Alarm can also be tested at any time by simply sending a pre-recorded text message via your directed mobile phone, for additional peace of mind.

Peripherals

Coalescing Filters

The Conder Coalescing Filter is designed to separate residual oil in already separated oil/water and ensures a discharge quality of less than 5 mg/L of oil in water.

Features and Benefits

- Handle for easy removal and cleaning
- Flashing beacons (with option of siren kit)
- Kiosks
- Probe brackets
- Bas 1000 intrinsically safe junction box
- High level probe
- Silt level probe
- Oil level probe

Servicing

The Environmental Agency's PPG3 guidelines stipulate that every 6 months, and in accordance with manufacturer's instructions, experienced personnel should carry out maintenance to both the separator and alarm.

Premier Tech Aqua and our service partners can offer a full technical and service package including separator and alarm installation, commissioning, oil and silt removal and route service contracts.

PREMIER TECH AQUA
2 Whitehouse Way, South West Industrial Estate, Peterlee, Co Durham, SR8 2RA UNITED KINGDOM.
+44 (0) 8702 640004 | ptauk-sales@premiertech.com | PREMIERTECHAQUA.CO.UK

Appendix J – Hydrobrake Details

Hydro-Brake® Flow Control

Modelling Guide

Unit Selection Design Guide

Overview

Hydro-Brake® Flow Controls restrict the flow in surface/storm water or foul/combined sewer systems by inducing a vortex flow pattern in the water passing through the device, having the effect of increasing back-pressure.

Their 'hydrodynamic' rather than 'physical restriction' based operation provides flow regulation whilst maintaining larger clearances than most other types of flow control, making them less susceptible to blockage. Their unique "S"-shaped head-flow characteristic also enables them to pass greater flows at lower heads, which can enable more efficient use of upstream storage facilities.

This document provides guidance relating to the selection and use of Hydro-Brake® Flow Controls for use in surface/storm water and foul/combined sewer systems.

The information provided here is intended for the purposes of general guidance only - individual application requirements may differ. If in doubt, or to enquire about new product additions, please contact HRD Technologies Ltd.

STH Range of Hydro-Brake® Flow Controls

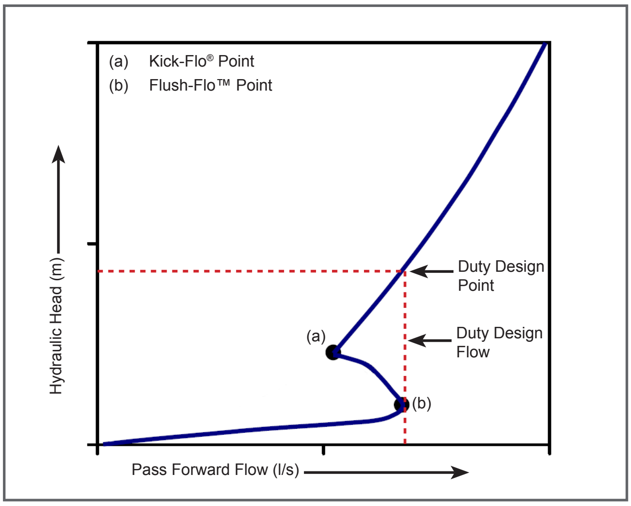
APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4599

See back cover for details.

Hydraulic Characteristics and Specification

Hydro-Brake® Flow Controls should be selected such that the duty/design flow is not exceeded at any point on the head-flow curve, see illustration right. If this is not achievable using the initially selected unit, it may be appropriate to select an alternative option (see selection guidance overleaf).

While the primary aim of a flow control is to provide a particular flow rate at a given upstream head (giving a design/duty point), it is important to note that secondary opportunities, such as potential for optimised storage use, derive from consideration of the full hydraulic characteristic. It is therefore important to ensure that the same flow control, or one confirmed to provide equivalent hydraulic performance, is implemented in any final installation.



Typical Hydro-Brake® Head Versus Flow Characteristics

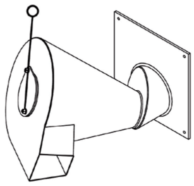
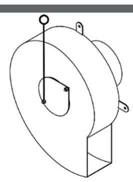
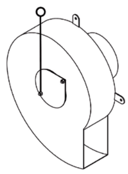
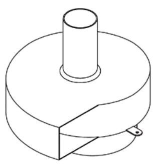
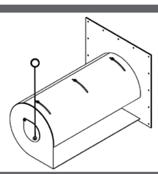
To ensure correct implementation a multiple design-point specification, defining the main hydraulic features of the selected flow control, can be provided by HRD Technologies Ltd. This should include at least the following information:

- outlet size and model of Hydro-Brake® Flow Control
- definition of the duty/design point (head and flow)
- definition of the Flush-Flo™ point (head and flow)
- definition of the Kick-Flo® point (head and flow)

To ensure that a drainage system performs as designed, it is strongly recommended that this information is reproduced on any technical specifications.

Hydro-Brake® Flow Control Models Supported in Micro Drainage

The Table below provides a summary of the Hydro-Brake® Flow Control models currently supported by the Micro Drainage programs, including details of unit styles, applications and design/installation considerations. Advice regarding unit selection is provided in subsequent sections.

Win*Des*® Reference Code	Style / Typical Shape	Application	Design / Installation Notes
Md1 Md2 Md4 Md14	**Conical** 	Foul / combined and surface / storm water.	With the exception of the Md14, conical units require benching into the intake (the Md14 has a piped intake). They generally require larger manholes than equivalent sump-type units.
Md5 Md6 Md7 Md12	**Sump-Type** 	Surface / storm water only.	Sump-type units require the provision of a sump to accommodate the flow control. As this will always be full of water, sump-type units are unsuitable for use in foul / combined systems.
Md13	**Sump-Type** BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE No 08/4599 STH Range of Hydro-Brake® Flow Controls 	Surface / storm water only.	The Md13 (STH) unit will always have an outlet size in excess of 75 mm and can always be fitted to a 225 mm diameter outlet pipe or larger.
Md8 Md9 Md11	**Vertical Discharge** 	Foul / combined and surface / storm water.	Vertical discharge units require a chamber design to accommodate the vertically directed outlet. They do not have S-shaped head / discharge curves and are for special applications only - please refer to HRD Technologies Ltd for advice.
Md10	**Tubular** 	Foul / combined and surface / storm water.	Tubular units require benching into the intake. They do not have S-shaped head / discharge curves and are for special applications only - please refer to HRD Technologies Ltd for advice.

Note: For system modelling using other software packages, HRD Technologies Ltd can provide individual unit head / flow characteristics in an appropriate format.

General Advice

Selection of the most appropriate Hydro-Brake® Flow Control for a particular application depends on a number of considerations, including the type of sewer system, the hydraulic characteristic of the device, device clearances and overall physical dimensions. The Micro Drainage programs provide outputs for hydraulic characteristic and outlet size.

The table opposite provides general selection guidance taking into account the considerations of type of sewer system, device clearances and overall physical dimensions. This should be considered along with other information provided here and in conjunction with the advice contained within the software design program that is being used.

The Table should be followed from the top, using the left hand column for surface/storm water applications and the right hand column for foul/combined applications. The 'general comments' provided are relevant to both applications.

HRD Technologies Ltd offer a free design service and can assist with unit selection.

General Guidance on Unit Selection

Surface / Storm Water Applications	Foul / Combined Applications
1) Select sump-type Md13 (STH) initially. This is a British Board of Agrément (BBA) approved product that is currently only available in certain sizes – if a size is not available for the specified duty/ design point go to 2) otherwise use Md13 (STH). The Md13 (STH) has a minimum outlet size in excess of 75 mm and can always be fitted to a 225 mm diameter outlet pipe (or greater).	1) Select conical-type Md4 (CX) initially provided the required outlet >150 mm. If the required manhole/ chamber size is too large go to 2) otherwise use Md4 (CX).
2) Select sump-type Md6 (SXH) initially provided the required outlet >75 mm (please seek advice if outlet <75 mm). If required outlet >200 mm go to 3) otherwise use Md6 (SXH).	2) Select conical-type Md2 (CH) provided the required outlet >150 mm. If the required manhole/chamber size is too large go to 3) otherwise use Md2 (CH).
3) Select sump-type Md5 (SH) or Md12 (SMXH) provided the required outlet >75 mm (please seek advice if outlet <75 mm). If required outlet >250 mm (Md5 - SH) or >300 mm (Md12 - SMXH) go to 4) otherwise use Md5 (SH) /Md12 (SMXH).	3) Select conical-type Md1 (C) provided the required outlet >429 mm. If the required manhole/chamber size is too large go to 4) otherwise use Md1 (C).
4) Select conical-type Md4 (CX) provided the required outlet >100 mm. This unit does not require a sump arrangement but requires benching into the intake. If the required manhole/ chamber size is too large go to 5), otherwise use Md4 (CX).	4) Vertical discharge units Md8 (SV), Md9 (SMV) and Md11 (SXV) can be considered if their outlets are >150 mm. Their physical dimensions should be considered - the Md9 (SMV) is typically used when the diameter of the Md8 (SV) and Md11 (SXV) >200 to 250 mm. If none of these units are suitable go to 5).
5) Select conical-type Md2 (CH) unit provided the required outlet >100 mm. This unit does not require a sump arrangement but requires benching into the intake. If the required manhole/ chamber size is too large go to 6), otherwise use Md2 (CH).	5) Select tubular-type Md10 (TH) provided the required outlet >333 mm. This is sometimes the only option that will meet a certain head/discharge relationship (eg. low head, low flow situations). It should only be used when there is no other alternative.
6) Select conical-type Md1 (C) provided the required outlet >285 mm. This unit does not require a sump arrangement but requires benching into the intake. If the required manhole/chamber size is too large go to 7), otherwise use Md1 (C).	For design assistance for any Hydro-Brake® Flow Control please call: **01-4013964** or **e-mail: enquiries@hrdtec.com**
7) Select sump-type Md7 (SMH) provided the required outlet >75 mm. If the required outlet >300 mm then go to 8), otherwise use Md7 (SMH).	
8) Vertical discharge units Md8 (SV), Md9 (SMV) and Md11 (SXV) can be considered provided the required outlet >75 mm. Their physical dimensions should be considered - the Md9 (SMV) is typically used when the diameter of the Md8 (SV) and Md11 (SXV) >200 to 250 mm. If none of these units are suitable go to 9).	
9) Select tubular-type Md10 (TH) provided the required outlet >222 mm. This is sometimes the only option that will meet a certain head/discharge relationship (eg. low head, low flow situations). It should only be used when there is no other alternative.	

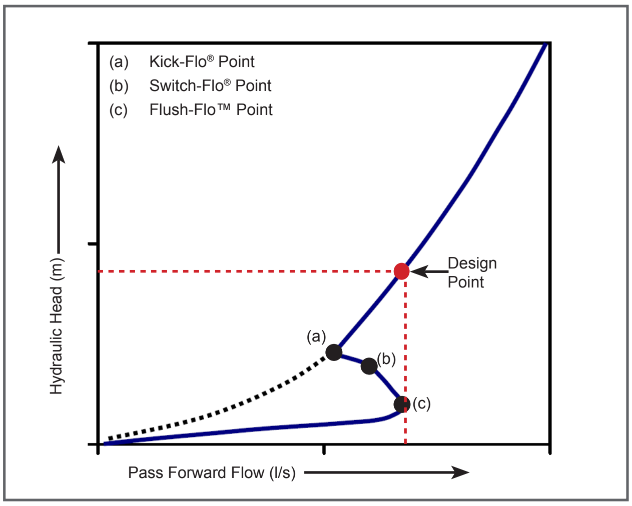
General Comments: The minimum sizes quoted for Hydro-Brake® Flow Controls represent sizes based on experience as offering significant reduction in risk of blockage and hence maintenance and derive from general practice in flow control selection in the UK and Ireland. Sizes below the minimum recommended can be specified though it should be recognised these might incur increased risks of blockage and associated maintenance. Sizes above the maximum recommended can also be specified though may require oversized manholes/chambers. For the larger units, refer to HRD Technologies Ltd for advice.

The information provided here is intended for the purposes of general guidance only - individual application requirements may differ. **If in doubt, please contact HRD Technologies Ltd.**

STH Type Hydro-Brake® Flow Control with BBA Approval

Now included in Win*Des*® W.12.6!

The new STH type Hydro-Brake® Flow Control range has a unique head / discharge performance curve which introduces a very important feature - the Switch-Flo® Point. This point illustrates the unique performance feature of the STH range which can lead to further savings in upstream storage, whilst also enabling increased inlet / outlet size to further reduce the risk of blockage.



Typical STH Head Versus Flow Characteristics

Kick-Flo® (a) - the point at which the vortex has initiated and at which the curve begins to return back to follow the orifice curve and reach the same design point or desired head / flow condition.

NEW Switch-Flo® (b) - marks the transition between the Kick-Flo® and Flush-Flo™, from vortex initiation to stabilisation. This point adds a new layer of resolution to the Hydro-Brake® curve that has implications to upstream storage savings.

Flush-Flo™ (c) - the point at which the vortex begins to initiate and have a throttling effect. This point on the Hydro-Brake® curve is usually much nearer to the maximum design flow (Design Point), than other vortex flow controls leading to more water passing through the unit during the earlier stages of a storm, thus reducing the amount of water that needs to be stored upstream.

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4599
STH Range of Hydro-Brake® Flow Controls

The STH Hydro-Brake® Flow Control is the only vortex flow control available today that has been given the prestigious BBA Approval Certificate. The BBA assessment procedure entails rigorous assessment of production and manufacturing standards, and confirms that the hydraulic performance of the Hydro-Brake® Flow Control matches the data given to designers by HRD Technologies with their head / discharge curves.

A worked example showing the steps to model a Hydro-Brake® Flow Control and associated Stormcell® Storage System within Micro Drainage Win*Des*® is available on our website:

www.hrdtec.com

Take a Look at Our New Stormwater Web Resource

Engineering Nature's Way™

www.engineeringnaturesway.co.uk

Engineering Nature's Way is a brand new resource for people working with Sustainable Drainage and flood management in the UK.

The site provides an opportunity to share news, opinion, information and best practice for people working in local and central Government; developers, consulting engineers and contractors. Do you have something to share? We would be delighted to receive your contributions.

turning water around ...®

This information is for guidance only and not intended to form part of a contract. HRD Technologies Ltd pursues a policy of continual development and reserves the right to amend specifications without prior notice. Equipment is patented in countries throughout the world.

HRD Technologies Ltd
HRD Technologies Ltd • Tootenhill House • Rathcoole • Co. Dublin • Ireland
Tel: +353 (0) 1 4013964 • Fax: +353 (0) 1 4013978 • www.hrdtec.com
HRD Technologies Ltd is a subsidiary of Hydro International plc

UKAS QUALITY MANAGEMENT 001 ISO9001

