walsh design group
The Mall, Maryborough Woods,
Douglas, Co. Cork, T12 K8YT.
Tel: 021 4774940 | www.wdg.ie

NSAI QUALITY ISO 9001:2015 NSAI Certified

Project: Proposed Residential Development, Coolcarron, Fermoy, Co. Cork

Project No: 19074

Document Title: Civil Engineering Report

Document No: 19074-ER-01

Date: January 2021

Date	Revision	Status	Originator	Checked	Approved
January 21	A	P	IR	MW	
March 22	B	P	IR	MW	

Table of Contents

Table of Contents i
1.0 Introduction 2
1.1. Site Description 4
1.2. Flooding 5
2.0 Street Design 8
2.1. Design Guidelines 8
2.2. Street Hierarchy 8
2.3. Shared surfaces and Surface Materials 9
2.4. Street Gradients 9
2.5. Corner Radii 9
2.6. Pedestrian Crossings 10
2.7. Pavement Construction 11
2.8. On-site parking 11
2.9. Private Driveways 11
2.10. Site Cut and Fill 11
2.11. Electricity & Gas Services 11
3.0 Surface Water Drainage 14
3.1. Surface Water Design and Simulation Criteria 14
3.2. SUDs 15
3.2.1. Allowable Discharge 15
3.2.2. Attenuation 16
3.2.3. Hydrocarbon Interceptors 18
3.2.4. Road Gullies 18
4.0 Wastewater Drainage 20
4.1. Wastewater Design Criteria 20
5.0 Water Supply 22
Appendix A ..... A
Appendix B ..... B
Appendix C C
Appendix D ..... D

1.0 Introduction

Walsh design group (WDG) were appointed by Cumnor Construction Ltd. to produce a Civil Engineering Report as part of a planning application for the proposed residential development at Coolcarron, Fermoy, Co. Cork. The proposed development consists of 336 dwelling units consisting of 250 houses, 86 duplex apartments and 1 crèche and all associated site development works. This report is particularly concerned with the following engineering services:

- Road design,
- Wastewater Drainage,
- Surface Water Drainage,
- Water Supply.

This report should be read in conjunction with the following accompanying drawings and documents submitted with the planning application:

- 19074-ER-02 Street Lighting Report,
- 19074-ER-03 Preliminary Construction and Environmental Management Plan (CEMP),
- 19074-ER-04 Preliminary Construction & Demolition Waste Management Plan (CDWMP),
- 19074-P-001-1 Site Layout & Levels (Sheet 1 of 2),
- 19074-P-001-2 Site Layout & Levels (Sheet 2 of 2),
- 19074-P-002-1 Site Layout – Drainage (Sheet 1 of 3),
- 19074-P-002-2 Site Layout – Drainage (Sheet 2 of 3),
- 19074-P-002-3 Site Layout - Drainage (Sheet 3 of 3),
- 19074-P-003-1 Site Layout – Water Main (Sheet 1 of 2),
- 19074-P-003-2 Site Layout – Water Main (Sheet 2 of 2),
- 19074-P-004-1 Site Layout – Street Lighting (Sheet 1 of 2),
- 19074-P-004-2 Site Layout – Street Lighting (Sheet 2 of 2),
- 19074-P-301-1 Road Longitudinal Sections (Sheet 1 of 2),
- 19074-P-301-2 Road Longitudinal Sections (Sheet 2 of 2),
- 19074-P-302-1 Wastewater Network Longitudinal Sections (Sheet 1 of 5),
- 19074-P-302-2 Wastewater Network Longitudinal Sections (Sheet 2 of 5),
- 19074-P-302-3 Wastewater Network Longitudinal Sections (Sheet 3 of 5),
- 19074-P-302-4 Wastewater Network Longitudinal Sections (Sheet 4 of 5),
- 19074-P-302-5 Wastewater Network Longitudinal Sections (Sheet 5 of 5),
- 19074-P-303-1 Surface Water Longitudinal Sections (Sheet 1 of 5),
- 19074-P-303-2 Surface Water Longitudinal Sections (Sheet 2 of 5),
- 19074-P-303-3 Surface Water Longitudinal Sections (Sheet 3 of 5),
- 19074-P-303-4 Surface Water Longitudinal Sections (Sheet 4 of 5),
- 19074-P-303-5 Surface Water Longitudinal Sections (Sheet 5 of 5),
- 19074-P-304 Surface Water Outfall – North – Longitudinal Section,
- 19074-P-500 Surface Water Drainage Typical Details,

- 19074-P-501 Irish Water Standard Details – Wastewater,
- 19074-P-502 Irish Water Standard Details – Water Main (Sheet 1 of 2),
- 19074-P-503 Irish Water Standard Details – Water Main (Sheet 2 of 2),
- 19074-P-504 Site Details – Typical,
- 19074-P-505 Irish Water Standard Details – Wastewater Rising Mains.

1.1. Site Description

This site is 11.56ha in total area and is currently laid out as agricultural pasture land. It is located just South of Fermoy town on the eastern side of the R639 Fermoy to Rathcormac road, see Figure 1. The site generally slopes gently downwards from west to east and there is an existing open drainage channel along the eastern boundary. Where the proposed entrance road to the development meets the R639 the ground level is 57.57m but within the site the high point is 56.99m in the southwest corner and this falls to a low point of 51.11m in the northeast corner (all levels are to Malin Head datum).

Figure 1: Satellite image showing Site Location and application boundary (Google Earth)

The southern boundary of the site is shared with agricultural land. The western boundary is shared with private dwellings at the southern end and an ESB facility and commercial properties at the northern end. An existing lay-by and weigh station is situated adjacent to the proposed development entrance, beside the R639. The northern boundary is shared with the St. Coleman's sports ground and the eastern boundary is shared with land, beyond the drainage channel that is currently forested.

1.2. Flooding

A desktop study of the flood history at the site was carried out. There are no records of any flooding in this area of Fermoy in the OPW's floodinfo.ie database of maps and the development lies outside all flood zones shown in the Local Area Plan for the Fermoy Municipal District.

An extract from the floodinfo.ie map is shown in Figure 2 shows the extent of flooding in Fermoy Town. The floodinfo.ie map system allows layers of flood information to be overlaid on the map to show the projected extents of the different types of flooding and the areas affected. In the extract below all layers are turned on as follows:

- CFRAM River Flood Extents – Present Day (Low medium and high probability),
- CFRAM Coastal Flood Extents – Present Day (Low, medium and high probability),
- National Indicative Fluvial Mapping – Present Day (River low and medium probability),
- Geological Survey Ireland (GSI) Groundwater Flooding Probability maps (Low, medium and high probability).

The projected flood extents are localised in the lower lying areas Fermoy Town near the river and do not extend southwards to the proposed site which is on higher ground.

The past flood events layer is also shown in the map, indicated with the hazard signs. These events are in Fermoy Town and there is no indication that there has been a flood event in the Coolcarron area.

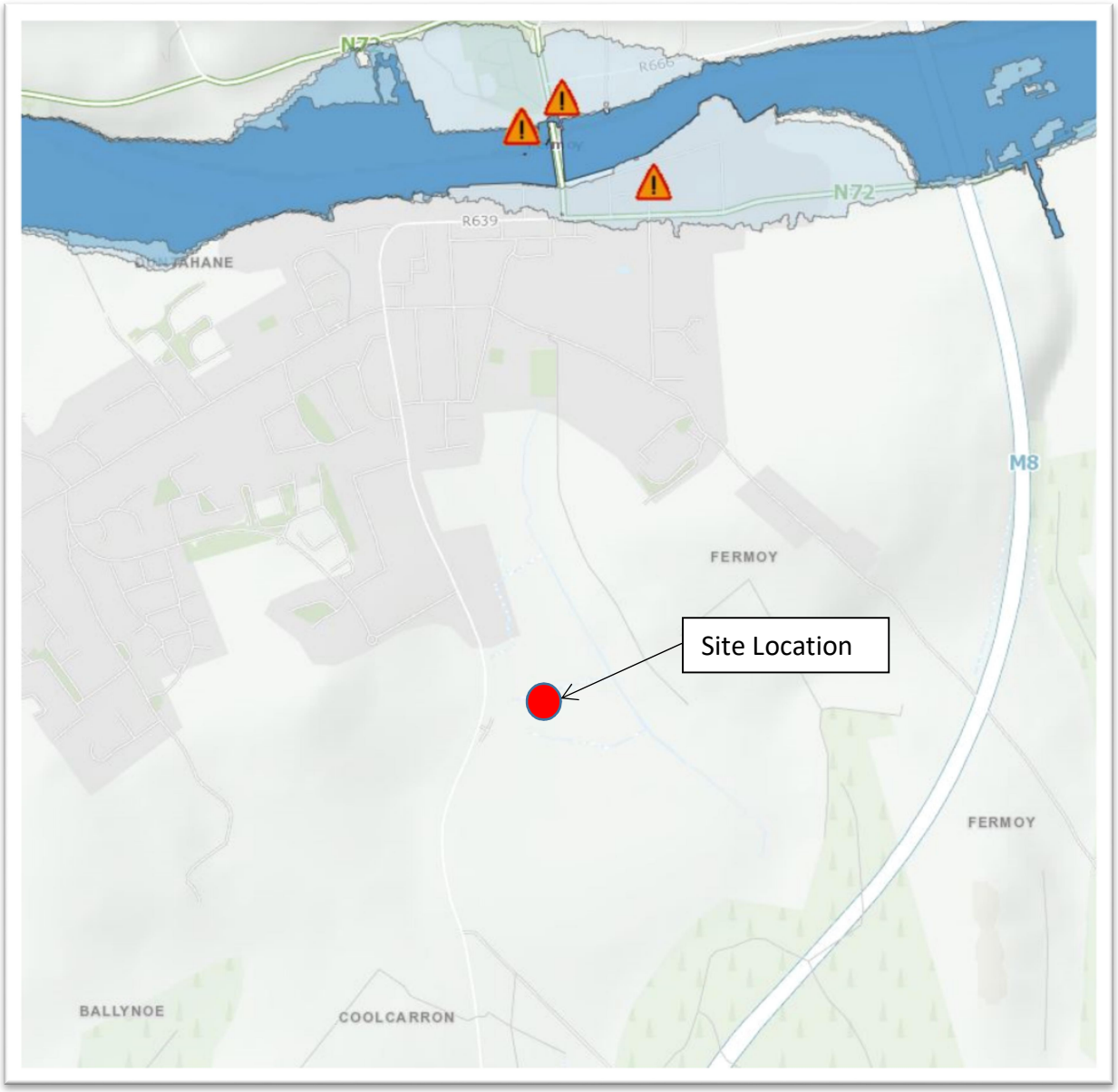


Figure 2: Floodinfo.ie map of Coolcarron and Fermoy

2.0 Street Design

The layout of the proposed streets and how they connect with the R639 Fermoy to Rathcormac Road is shown on WDG drawings no. 19074-P-001-1 and no. 19074-P-001-2 and the MHL drawings of the junction with the R639. Longitudinal sections through the roads are shown on WDG drawings no. 19074-P-301-1 and 19074-P-301-2.

2.1. Design Guidelines

The proposed streets within the estate have been designed in substantial compliance with the following:

- Design Manual for Urban Roads and Streets (DMURS) - Dept. of Environment and Dept. of Transport Tourism and Sport-2019
- Recommendations for Site Development Works for housing areas – DOE 1998

2.2. Street Hierarchy

There are no *Link* streets or 'through roads' proposed in the development. All of the proposed streets would be considered local streets in the DMURS hierarchy shown in Table 1. Local streets are described as streets that provide access within communities and to *Arterial* and *Link* streets. The R639 could be described as a Link road as it links the towns of Fermoy and Rathcormac as well as being the link from the M8 Arterial motorway to the south side of Fermoy.

DMURS Description	Roads Act/NRA DMRB	Traffic Management Guidelines	National Cycle Manual
Arterial	National	Primary Distributor Roads	Distributor
Link	Regional (see note 1)	District Distributor Local Collector (see Notes 1 and 2)	Local Collector
Local	Local	Access	Access

Notes

Note 1: Larger Regional/District Distributors may fall into the category of *Arterial* where they are the main links between major centres (i.e. towns) or have an orbital function.

Note 2: Local Distributors may fall into the category of *Local* street where they are relatively short in length and simply link a neighbourhood to the broader street network.

Table 1: DMURS Table 3.1 - Terminology used in DMURS compared with other publications

Road 1 is the spine road through the development and has a width of 6.0m. This street may be considered as a local distributor as per Note 2 of DMURS Table 3.1, see Table 1 above. The other proposed streets within the development are predominantly 5.3m wide and are served by at last one 2.0m wide footpath. 4.8m wide streets with shared surfaces are used

in some cul-de-sacs and in front of the crèche where there is an allocated set-down area and allocated parking. The intention is to introduce self-regulation in these particular locations with narrow streets and on-street parking providing a passive means of traffic calming. These carriageway widths are in keeping with those recommended in DMURS Figure 4.55. All of the estate streets will have a sign posted speed limit of 30km/h.

A colour scheme for the centre lines of the streets along with a hatch pattern for the shared surfaces was added to WDG drawings no. 19074-P-001-1 and 001-2 to illustrate the road hierarchy.

2.3. Shared surfaces and Surface Materials

DMURS encourages the use of raised and shared surfaces which promote integration between pedestrians, cyclists and drivers. This has been shown to be effective where pedestrian activities are high and vehicle movements are mainly due to lower level access requirements and circulatory purposes. DMURS recommends that, where design speeds of 30km/h are desired, periodic changes in the colour and/or texture of the street surfaces should be employed. In this development, shared surfaces are introduced through raised junctions, raised street sections and the use of material changes in the street surface treatments. Shared surfaces, raised junctions and raised tables for traffic calming will be finished in Duracolour Beige Stone Mastic Asphalt (SMA) to differentiate these features from the normal street surfaces.

The proposed locations and extent of these features are shown on WDG drawings no. 19074-P-001-1 and no. 19074-P-001-2.

2.4. Street Gradients

In accordance with DMURS guidelines, streets have been limited to gradients of 5% or less. All proposed streets shall have a cross fall of 2.5%. Vertical alignment has been carefully considered to minimise the amount of cut and fill on site.

For details of the road configuration at the entrance to the development from the R639 please refer to the MHL documents submitted with this application.

2.5. Corner Radii

According to DMURS section 4.3.3, reducing corner radii will significantly improve pedestrian and cyclist safety at junctions by lowering the speed at which vehicles can pass through corners and increasing the inter-visibility between users. At tighter corner radii vehicle and cyclist speeds are more compatible. The majority of the larger junctions between local streets within the proposed development have corner radii of between 3.0m and 4.5m and the junctions with the narrower 4.8m wide streets have minimum junction radii of 2.0m. This is considered to be acceptable in residential developments where design speeds are low and movements of larger vehicles are infrequent. Autodesk Vehicle Tracking Software 2019 has been used to verify that fire tenders and refuse vehicles can negotiate the junctions and bends in the estate streets.

2.6. Pedestrian Crossings

Pedestrian crossings will be placed throughout the development on streets which have footpaths on both sides and at junctions, see WDG drawings no. 19074-P-001-1 and no. 19074-P-001-2. The proposed pedestrian crossings are uncontrolled crossing points. Each crossing point shall be constructed using dished kerbs in accordance with Diagram 13.1 of the Traffic Management Guidelines 2013, see Figure 3.

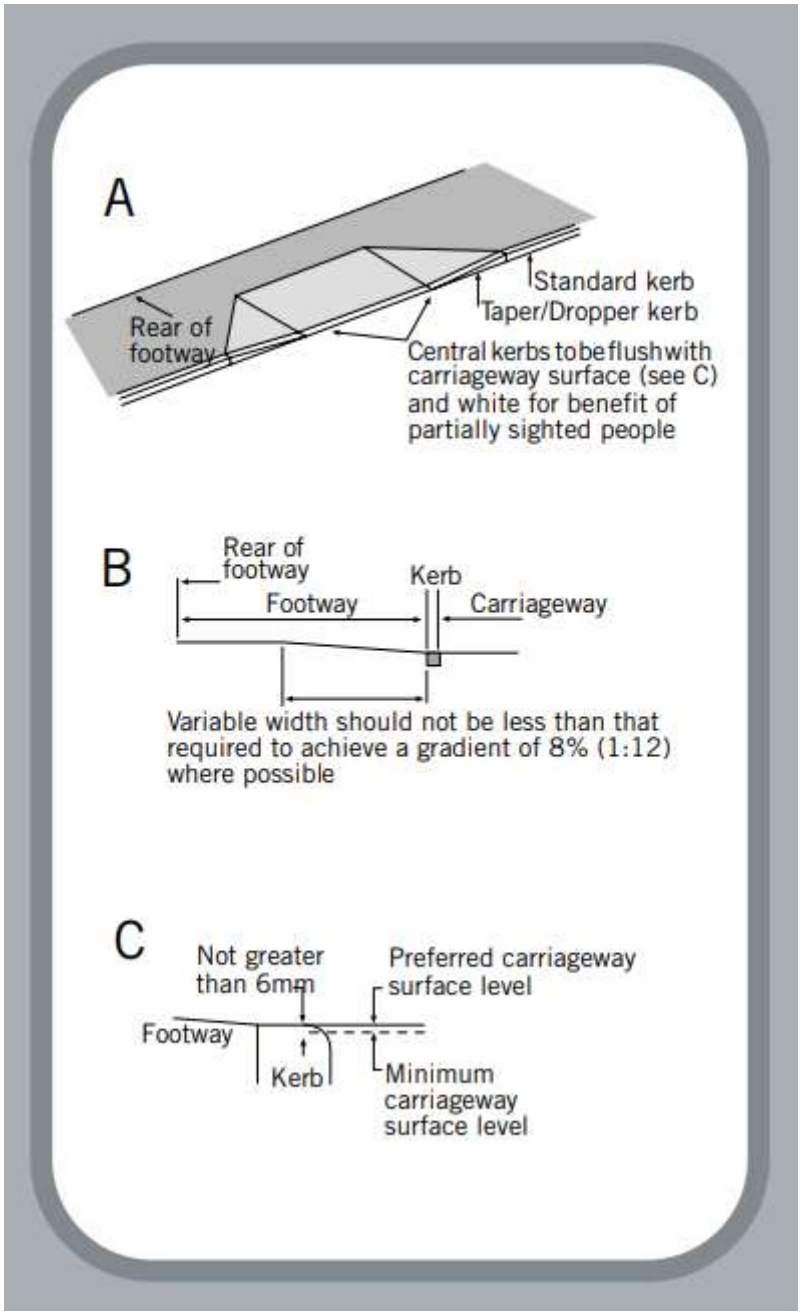


Figure 3: Diagram 13.1 Dished Crossing - Traffic Management Guidelines; DOT, 2013

Buff coloured tactile paving in accordance with Table 13.1 of the Traffic Management Guidelines shall be set in the footpath at each crossing point.

2.7. Pavement Construction

Street and footpath construction shall be in accordance with Cork County Council requirements. The road build-up, as shown in drawing no.19074-P-504 assumes a minimum design CBR for the existing ground. The main contractor will be obliged to carry out testing to establish the actual CBR prior to commencement of any street construction.

2.8. On-site parking

Permeable paving is proposed for all car parking spaces in the public areas of the development i.e. every parking space that is not within the curtilage of a private dwelling. The permeable paving will allow surface water to soak into the subsoil and ground water rather than leaving the site via the sewer network which is preferable in terms of SUDS.
See the GCA Architect's Design Submission for detail on parking allocation.

2.9. Private Driveways

Each private dwelling plot with car parking included will have a driveway designed to provide two parking spaces. Driveway slopes will be in compliance with Technical Guidance Document M of the Building Regulations. Footpaths across driveway entrances will be dished and incorporate dropped kerbs.

2.10. Site Cut and Fill

For details on the site cut and fill please read the Construction and Demolition Waste Management Plan (CDWMP) that accompanies the application as a standalone document.

2.11. Electricity & Gas Services

ESB networks were contacted regarding power lines running in the vicinity and through the site. There are no buried cables running through the site but there are several medium voltage 10kV/20kV overhead lines and one high voltage 38kV overhead line indicated on the original map (No. 20190912-020_A3) provided by the ESB in Appendix D.

It is proposed to underground the 38kV cables that are currently overhead from the southern boundary to the ESB distribution facility to the west of the site. A form NW1 was submitted to the ESB requesting the diversion and subsequently, the diversion route as shown on drawings no. 19074-P-001-1 and 19074-P-001-2 was agreed. The works proposed include the construction of a new Type F lattice steel mast near the southern boundary at which the overhead cables coming from the South will be diverted underground. From the lattice mast new ducting will be laid in the ESB's trefoil 5-way duct formation along the route shown in the drawings. This duct trench is 600mm wide and shall have a 4.0m wide wayleave for access which is centred on the trench.

Appendix D to this report includes the ESB's letter agreeing to the requested changes to their distribution network. Also included is the ESB map showing the proposed new underground route for the 38kV cables through the development (Map No. 5959-C) and the structures proposed at each end of the undergrounded cables.

Should An Bord Pleanála be mindful to grant panning permission for the development, a separate diversion agreement shall be entered into with ESB networks to have the 10kV/20kV overhead lines rerouted to suit the proposed layout. These works are less complex than those on the 38kV line and do not involve large structures.

Gas Networks Ireland was contacted regarding the gas supply services in the vicinity of the proposed development site. The map supplied in Appendix D to this document shows the extent of services in the area. A gas supply line runs under the R639 outside the proposed entrance but other than that there are no other gas mains present near the site and a diversion of gas services will not be required.

3.0 Surface Water Drainage

The proposed storm sewer collection system consists of a 100 mm diameter pipe collection network around each house in accordance with TGD part H discharging to 225mm diameter uPVC sewer pipes or larger under the estate streets. The surface water network layout is shown in drawings no. 19074-P-002-1, 19074-P-002-2 and 19074-P-002-3 and the typical details for the surface water infrastructure are shown on drawing no. 19074-P-500.

The surface water networks have been designed using the MicroDrainage design software and the Wallingford procedure for the design and analysis of urban drainage. The overall drainage system has been designed in 6 separate networks (numbered 2-7) due to the topography of the site and the proposed street layout. All networks are designed to discharge an attenuated flow of surface water into the existing open drainage channels in the site which in turn, eventually discharge to the River Blackwater in Fermoy.

The main drainage channel which forms the eastern boundary of the site has a very gentle fall from south to north and continues north past the St. Coleman's sports ground. Before the channel reaches College Road it is currently channelled under an astro-turf playing pitch owned by the Loreto Convent in an old stone culvert. It is proposed to partially divert the flow in the drainage channel, before the stone culvert, into a new 750mm diameter pipe flowing westward across the northern end of the St. Coleman's sports ground to Devlin Street where it will connect to an existing manhole and the 900mm diameter surface water sewer downstream, see WDG drawings no. 19074-P-002-3 and 19074-P-304.It is envisaged that the new 750mm dia. pipe will carry almost all of the water westward, however, two 100mm dia. openings shall be constructed in the head wall to ensure that the old stone culvert remains active with a low flow.

3.1. Surface Water Design and Simulation Criteria

The storm networks design criteria included:

- maximum rainfall of 50 mm/hr,
- maximum time of concentration of 30 minutes,
- minimum cover of 1.2m to pipes under streets,
- M5-60 of 17.0mm,
- R Ratio of 0.2

The storm networks were tested by simulating both summer and winter storms with durations of between 15 minutes and 24 hours and return periods of 1, 30 and 100 years with the following criteria:

- Summer volumetric runoff coefficient of 0.75,
- Winter volumetric runoff coefficient of 0.84,
- Areal runoff factor of 1.0,
- Additional flow for climate change of 20%,
- Madd Factor of 2.

The surface water sewer networks have been modelled and each individual pipe run has been designed such that no flooding will occur to individual elements during any storm up

to and including 24 hour 100 year return period, summer and winter storms. In all storm simulations an additional flow of 20% was added to account for future climate change.

(See detailed design in Appendix A to this document).

3.2. SUDs

3.2.1. Allowable Discharge

In accordance with the recommendations of sustainable urban drainage systems (SUDS) the allowable stormwater discharge from the surface water network was calculated by means of the QBAR equation for small rural catchments (< 25 km2) as indicated in the institute of Hydrology, UK Report No. 124. QBAR is calculated using the following formula:
QBAR = (0.00108 [AREA]0.89 [SAAR]1.17 [SOIL]2.17)

Where,

QBAR (m^3/sec)	=	Annual peak flow
AREA (km^2)	=	Catchment area
SAAR (mm)	=	Standard annual average rainfall
SOIL	=	Index with values between 0.15 and 0.50

The variables for the sewer Network 2 which outfalls at manhole S85 are as follows:

AREA The catchment area of the estate that will have its runoff attenuated is 2.0412ha = 0.020412km^2,

SAAR The standard average rainfall for the site for the period from 1941 to 1970 was obtained from Met Eireann and is approximately 1166 mm/year,

SOIL This index was obtained using the UKSUDS greenfield runoff map which places the site in an area of Type 4 soil with an SPR of 0.3.

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

QBAR	=	(0.020412 [0.5]0.89 [1166]1.17 [0.3]2.17)
	=	0.165.54 m^3/sec
	=	165.54 l/sec

By linear interpolation => QBAR Actual = 6.76 l/sec.

Using the same approach for the remaining networks the results were as follows:

- Network 3 catchement area is 1.148ha and QBAR is 3.80 l/sec,
- Network 4 catchement area is 1.249ha and QBAR is 4.14 l/sec,
- Network 5 catchement area is 3.443ha and QBAR is 11.4 l/sec,

- Network 6 catchement area is 2.4741ha and QBAR is 8.18 l/sec,
- Network 7 catchement area is 0.922ha and QBAR is 3.05 l/sec.

3.2.2. Attenuation

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

To limit the outfall from the networks to the greenfield runoff rate in storm simulations Aqua Brakes were placed in manholes just upstream of the outfalls limiting the outflows from each network to the QBAR figures listed in the previous section. These vortex flow control devises are specifically designed for the required flows, have no moving parts and are powered by water flow alone. The devices are designed to minimise risk of blockage but are also equipped with a bypass door that can be manually opened in case of blockage. The Manholes concerned will also be fitted with a head wall and an overflow pipe, in accordance with the manufacturer's recommendations, to prevent flooding. The top level of the overflow pipe will be set slightly below the cover level of the adjacent attenuation tank.

During storm simulations on the network the choking of the flow using Aqua Brakes resulted in flooding upstream of the flow control in each network. To eliminate flood risk in the system, attenuation tanks were chosen for temporary storage of surface water runoff. The proposed attenuation tanks will consist of ESS Eco-cell, cellular water storage modules (or similar approved) measuring 690mm x 410mm x 450mm high, arranged to form tanks as shown on drawings no. 19074-P-002-1 and 19074-P-002-2 and details drawing no. 19074-P-504. The modules are moulded polypropylene and have an internal void ratio in excess of 95%.

The proposed attenuation tanks have been sized so that no flooding will occur in any rainfall event up to and including the 24 hour 100 year event with a further allowance of 20% for future climate change.

- Network 2 Tank – 41.2m x 18.0m x 1.1m deep = 816m^3,
- Network 3 Tank – 25.0m x 9.0m x 1.0m deep = 225m^3,
- Network 4 Tank - 16.5m x 16.5m x 1.0m deep = 272m^3,
- Network 5 Tank - 26.5m x 26.5m x 1.4m deep = 984m^3,
- Network 6 Tank - 16.0m x 30.0m x 1.2m deep = 576m^3,
- Network 7 Tank - 9.0m x 17.8m x 1.3m deep = 208m^3.

The modules will be wrapped with Tuflex impermeable geomembrane (or similar approved) with lapped, heat welded joints. To protect the waterproof geomembrane during backfilling the top and sides are to be lined with a Geotex 300 PP needle punched, non-woven geotextile with lapped joints. Vent pipes and water pipes will be connected to the tank using heavy duty pipe collars heat welded to the Tuflex impermeable geomembrane and with stainless steel strangle bands for fastening around the pipe. A 100mm thick layer of thick

coarse sand or class 6H selected granular material will surround the geotextile on the top and sides of the tank to provide further protection.

The cellular storage modules will be laid on a flat, level and smooth base of selected, compacted granular material. A vent pipe from the top of the tank will allow the release of air during tank filling and allow air to be drawn into the tank as the water level falls. The vent box, protecting the top of the vent pipe, will consist of a Stanton heavy duty ductile iron double triangular surface box (or similar approved) with a vented cover, 300mm x 300mm clear opening and a minimum of 100mm frame depth on a mortar bed.

The minimum recommended soil cover over Eco-cell modules is 500mm in a green area and 650mm in a trafficked area. It is proposed to locate these tanks under green areas with a soil cover in excess of 500mm. During construction, measures will be taken to prevent vehicles passing over or near the tanks. A CBR of between 3% and 5% has been assumed at sub-base level. CBR testing will be carried out by the contractor prior to installation.

Infiltration
The Eco-cell tanks can equally be constructed to allow infiltration of the attenuated surface water directly into the surrounding earth by replacing the impermeable membrane surrounding the modules with a proprietary permeable geotextile. This would reduce the quantity of runoff discharging to the drainage channels and further add to the SUDS in the development. The use of a permeable membrane would be subject to detailed ground investigations over time to determine the infiltration rate of the soil at each location and the depth to the water table at different times of the year. Should site conditions allow, the use of these infiltration tanks would be recommended.

Permeable Paving
Permeable paving is proposed for all car parking spaces in the public areas of the development i.e. every parking space that is not within the curtilage of a private dwelling, should the results of infiltration rate testing allow. The permeable paving will allow surface water to soak into the subsoil and ground water rather than leaving the site via the sewer network which is preferable in terms of SUDS. See the GCA Architect's Design Submission for detail on parking allocation.

Tree Pits & Filter Drains
Infiltration tree pits, constructed in accordance with CIRIA SuDS Manual Chapter 19, are proposed throughout the green areas of the site, particularly adjacent to the estate streets where a small proportion of the surface water from the hard road and footpath surfaces can be channelled towards the tree base and percolate to ground water.

Filter drains are linear drains consisting of a shallow trench filled with permeable aggregate material and sometimes with perforated pipe in the base to assist drainage. It is proposed to construct these drains, in accordance with the guidance in the CIRIA SuDS Manual Chapter 16, parallel with the road and footpath edges to collect a small proportion of the rainwater runoff and allow it to percolate to the ground water.

Water Butts

It is proposed to install a 300 litre water butt to the rear of each dwelling that has a rear garden. The water butt shall be designed to collect water from the downpipes with a bypass system so that they do not overtop and flood the yard/garden. A tap on the water butt will allow the water to be used for gardening or car washing etc. using harvested rainwater and reducing demand on the local authority water supply.

3.2.3. Hydrocarbon Interceptors

It is proposed to install hydrocarbon bypass interceptors in each of the surface water network just upstream of the final Aqua brakes and attenuation tanks. The interceptors shall be sized as follows:

- Network 2 – The peak flow rate is 102 l/s. A Klargester NSBE015 (or similar approved) interceptor is designed to treat a peak flow rate of 150 l/s,
- Network 3 – The peak flow rate is 39 l/s. A Klargester NSP004 (or similar approved) interceptor is designed to treat a peak flow rate of 45 l/s,
- Network 4 – The peak flow rate is 44 l/s. A Klargester NSBP004 (or similar approved) interceptor is designed to treat a peak flow rate of 45 l/s,
- Network 5 – The peak flow rate is 133 l/s. A Klargester NSBE015 (or similar approved) interceptor is designed to treat a peak flow rate of 150 l/s,
- Network 6 – The peak flow rate is 90 l/s. A Klargester NSBE010 (or similar approved) interceptor is designed to treat a peak flow rate of 100 l/s,
- Network 7 – The peak flow rate is 40 l/s. A Klargester NSBP004 (or similar approved) interceptor is designed to treat a peak flow rate of 45 l/s.

Bypass separators are considered adequate in residential developments where the risk of a large spillage and heavy rainfall occurring at the same time is low.

3.2.4. Road Gullies

Gullies are positioned throughout the proposed roads for the collection of surface water from footpaths, roads, driveways, parking bays and other impervious areas for discharge into the drainage system. The minimum rate of gully provision recommended in; 'Recommendations for Site Development Works for Housing Areas' is one per 200m^2 of hard surface.

The 'Site 3D' software application was used to set out the roads and drainage for the development. This software positions gullies according to road area, gradient and curvature. Low points are picked up by the software and gullies are doubled at the low point of sag curves to prevent ponding. Gullies are also positioned at the bottom of all ramps to the raised junctions where surface water will collect. Drawing no. 19087-P-002 shows the proposed position of all gullies.

All gullies in the roadways will be precast concrete complying with the requirements of BS 5911: Part 230. The outlet from the gullies will be 150mm diameter pipe set a minimum of 375mm off the floor of the chamber. This allows for debris and silt that falls through the grating to settle below the invert of the outlet pipe. The silt in gullies must be regularly

cleaned out as part of the silt management and maintenance schedule in the operational phase of the housing development.

The class of gully grating required will be D400 as per the manhole covers. Gully gratings in roads will be set with the direction of the openings at right angles to the direction of traffic.

4.0 Wastewater Drainage

The layout of the proposed wastewater drainage network for the development is shown on drawings no. 19074-P-002-1 and no. 19074-P-002-2 and the typical details for the wastewater infrastructure are shown on drawing no. 19074-P-501. The network is a conventional piped, gravity sewer flowing to a wastewater pumping station in the East of the site from where it is proposed to pump the wastewater, via rising main, to the public wastewater sewer in the R639.

All sewers within the curtilage of individual houses have been designed and are to be installed in accordance with TGD Part H (2010) and will consist of 100 mm diameter uPVC Sewers from individual houses laid to falls of min 1:60 to connect to a 225mm uPVC sewer to be laid under the estate street. Inspection chambers will be constructed within 1m of the boundary of each private property in accordance with Irish Water Standard Details. All foul sewers have been designed in compliance with Irish Water's Code of Practice for Waste Water Infrastructure – A Design and Construction Guide for Developers (Revision 2) July 2020. All construction details within the public realm will be in accordance with Irish Water, Wastewater Infrastructure Standard Details (Revision 4), July 2020.

A pre-connection enquiry was submitted to Irish Water to assess the feasibility of providing a connection to the site. See Appendix C to this document for the pre-connection enquiry form and calculations. At that time the proposed development involved 374 dwelling units and a crèche. Irish Water subsequently issued a confirmation of feasibility which noted that the capacity of the Fermoy wastewater treatment plant (WWTP) would need to be upgraded to accommodate the proposed development. Following this, Michael Walsh of Walsh Design Group consulted with Tadhg Coffey and Brian O'Mahony of Irish Water, and it was established that the upgrades required to the WWTP were relatively minor, could be carried out by Irish Water and should not hold up the planning application.

After the tri-partite meeting, a detailed design of the wastewater networks was submitted to Irish Water for design approval. Irish Water has since issued a statement of design acceptance for the wastewater infrastructure layout and details. See Appendix C to this report for Irish the Irish Water correspondence and Michael Walsh's memo regarding his consultation with Irish Water.

The proposed development of 336 dwellings and 1 crèche will ultimately discharge to the Irish Water infrastructure. As such, a connection agreement will be required with Irish Water and it is anticipated that the current design team will liaise closely with Irish Water prior to making a connection agreement application.

4.1. Wastewater Design Criteria

For the purposes of clarity the wastewater sewer system has been designed using the following parameters, as required in Irish Water document IW-CDS-5030-03 Section 3.6:

- Flow per person: 150 L/day
- Average persons per household: 2.7 persons
- Unit consumption allowance (infiltration) 10%

- Minimum velocity for pipe running full: 0.75 m/sec
- Peak flow: 4.5 DWF

The detailed hydraulic design parameters and calculations for the wastewater network are included in Appendix B to this document.

A domestic peak flow factor of 4.5 has been applied to the wastewater network. The number of dwellings that will discharge to the sewer via the proposed network is 336. Using Irish Water's figure of 2.7 average persons per household, this amounts to a population of 908. Section 2.2.5 of Appendix B of Irish Water document IW-CDS-5030-03 states that, where the population served is between 751 and 1000 a peaking factor of 4.5 should be used. For populations up to 750 a peaking factor of 6 should be used.

5.0 Water Supply

It is proposed that a connection to the existing Irish Water infrastructure will be made in the R639 road. The watermain layout is shown on WDG drawing no. 19074-P-003-1 and no. 19074-P-003-2 and the water main typical details are shown on drawings 19074-P-502 and 19074-P-503.

A pre-connection enquiry was submitted to Irish Water to assess the feasibility of providing a connection to the site. Irish Water subsequently issued a confirmation of feasibility which noted that the connection to the existing water supply infrastructure was feasible without upgrade by Irish Water. See Appendix C to this document for the pre-connection enquiry form and Confirmation of Feasibility. After the tri-partite meeting a detailed design of the watermain network was submitted to Irish Water for design approval and Irish Water issued a statement of design acceptance which is included in Appendix C to this report.

Private properties will each have a separate service connection, fitted with an Irish Water approved boundary box immediately outside the boundary. Fire hydrants are placed so that no domestic property within the development is more than 46m from a hydrant. All potable water infrastructure will be constructed in accordance with the following Irish Water documents:

- IW-CDS-5020-03 Code of Practice for Water Infrastructure – Connections and Developer Services, July 2020 (Revision 2)
- IW-CDS-5020-01 Water Infrastructure Standard Details - Connections and Developer Services, July 2020 (Revision 4).

Appendix A

Surface Water Sewer Networks Design

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 2

Pipe Sizes Storm Manhole Sizes IW-MH

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	0
Ratio R	0.200	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	2.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Surface Network 2

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.578	4-8	0.675	8-12	0.002

Total Area Contributing (ha) = 1.255

Total Pipe Volume (m^3) = 34.178

Network Design Table for Surface Network 2

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	27.726	0.584	47.4	0.065	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	53.059	0.769	69.0	0.131	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	29.699	1.061	28.0	0.053	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	30.774	0.511	60.2	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	
3.000	45.172	0.283	159.6	0.329	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	64.470	0.607	106.2	0.147	0.00	0.0	0.600	o	375	Pipe/Conduit	
4.000	51.092	0.306	167.0	0.129	5.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	34.90	5.24	54.195	0.065	0.0	0.0	0.0	1.90	75.7	6.1
1.001	33.73	5.80	53.610	0.196	0.0	0.0	0.0	1.58	62.7	17.9
2.000	34.99	5.20	53.902	0.053	0.0	0.0	0.0	2.48	98.7	5.0
1.002	33.14	6.11	52.841	0.263	0.0	0.0	0.0	1.69	67.1	23.6
3.000	34.13	5.61	52.613	0.329	0.0	0.0	0.0	1.24	87.8	30.4
1.003	32.07	6.72	52.330	0.738	0.0	0.0	0.0	1.76	194.1	64.1
4.000	33.93	5.70	52.029	0.129	0.0	0.0	0.0	1.21	85.8	11.8

©1982-2018 Innovyze

Network Design Table for Surface Network 2

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.004	21.258	0.133	159.8	0.049	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.005	19.453	0.078	250.0	0.126	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.006	31.141	0.125	250.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
5.000	24.815	0.149	166.7	0.060	5.00	0.0	0.600	o	225	Pipe/Conduit	
5.001	6.403	0.126	50.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.007	28.367	0.113	251.0	0.061	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.008	5.958	0.024	250.0	0.092	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.004	31.66	6.97	51.723	0.916	0.0	0.0	0.0	1.43	158.0	78.5
1.005	31.20	7.25	51.590	1.041	0.0	0.0	0.0	1.14	126.1	88.0
1.006	30.52	7.71	51.512	1.041	0.0	0.0	0.0	1.14	126.1	88.0
5.000	34.54	5.41	51.662	0.060	0.0	0.0	0.0	1.01	40.1	5.7
5.001	34.42	5.47	51.513	0.060	0.0	0.0	0.0	1.84	73.1	5.7
1.007	29.99	8.07	51.387	1.163	0.0	0.0	0.0	1.28	203.3	94.5
1.008	29.88	8.15	51.274	1.255	0.0	0.0	0.0	1.28	203.8	101.6

©1982-2018 Innovyze

Manhole Schedules for Surface Network 2

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S72	55.620	1.425	Open Manhole	1200	1.000	54.195	225				
S73	55.035	1.425	Open Manhole	1200	1.001	53.610	225	1.000	53.610	225	
S86	55.327	1.425	Open Manhole	1200	2.000	53.902	225				
S74	54.266	1.425	Open Manhole	900 x 675	1.002	52.841	225	1.001	52.841	225	
								2.000	52.841	225	
S75	54.038	1.425	Open Manhole	1200	3.000	52.613	300				
S76	53.905	1.575	Open Manhole	1200	1.003	52.330	375	1.002	52.330	225	
								3.000	52.330	300	
S77	53.393	1.364	Open Manhole	1200	4.000	52.029	300				
S78	53.206	1.483	Open Manhole	1350	1.004	51.723	375	1.003	51.723	375	
								4.000	51.723	300	
S79	52.963	1.373	Open Manhole	900 x 825	1.005	51.590	375	1.004	51.590	375	
S80	52.887	1.375	Open Manhole	900 x 825	1.006	51.512	375	1.005	51.512	375	
S81	52.709	1.047	Open Manhole	900 x 675	5.000	51.662	225				
S82	52.738	1.225	Open Manhole	900 x 675	5.001	51.513	225	5.000	51.513	225	
S83	52.782	1.395	Open Manhole	900 x 825	1.007	51.387	450	1.006	51.388	375	
								5.001	51.387	225	
S84	52.684	1.410	Open Manhole	900 x 825	1.008	51.274	450	1.007	51.274	450	
S85	52.700	1.450	Open Manhole	1350		OUTFALL		1.008	51.250	450	

©1982-2018 Innovyze

PIPELINE SCHEDULES for Surface Network 2

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	S72	55.620	54.195	1.200	Open Manhole	1200
1.001	o	225	S73	55.035	53.610	1.200	Open Manhole	1200
2.000	o	225	S86	55.327	53.902	1.200	Open Manhole	1200
1.002	o	225	S74	54.266	52.841	1.200	Open Manhole	900 x 675
3.000	o	300	S75	54.038	52.613	1.125	Open Manhole	1200
1.003	o	375	S76	53.905	52.330	1.200	Open Manhole	1200
4.000	o	300	S77	53.393	52.029	1.064	Open Manhole	1200
1.004	o	375	S78	53.206	51.723	1.108	Open Manhole	1350
1.005	o	375	S79	52.963	51.590	0.998	Open Manhole	900 x 825
1.006	o	375	S80	52.887	51.512	1.000	Open Manhole	900 x 825
5.000	o	225	S81	52.709	51.662	0.822	Open Manhole	900 x 675
5.001	o	225	S82	52.738	51.513	1.000	Open Manhole	900 x 675
1.007	o	450	S83	52.782	51.387	0.945	Open Manhole	900 x 825
1.008	o	450	S84	52.684	51.274	0.960	Open Manhole	900 x 825

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	27.726	47.4	S73	55.035	53.610	1.200	Open Manhole	1200
1.001	53.059	69.0	S74	54.266	52.841	1.200	Open Manhole	900 x 675
2.000	29.699	28.0	S74	54.266	52.841	1.200	Open Manhole	900 x 675
1.002	30.774	60.2	S76	53.905	52.330	1.350	Open Manhole	1200
3.000	45.172	159.6	S76	53.905	52.330	1.275	Open Manhole	1200
1.003	64.470	106.2	S78	53.206	51.723	1.108	Open Manhole	1350
4.000	51.092	167.0	S78	53.206	51.723	1.183	Open Manhole	1350
1.004	21.258	159.8	S79	52.963	51.590	0.998	Open Manhole	900 x 825
1.005	19.453	250.0	S80	52.887	51.512	1.000	Open Manhole	900 x 825
1.006	31.141	250.0	S83	52.782	51.388	1.019	Open Manhole	900 x 825
5.000	24.815	166.7	S82	52.738	51.513	1.000	Open Manhole	900 x 675
5.001	6.403	50.8	S83	52.782	51.387	1.170	Open Manhole	900 x 825
1.007	28.367	251.0	S84	52.684	51.274	0.960	Open Manhole	900 x 825
1.008	5.958	250.0	S85	52.700	51.250	1.000	Open Manhole	1350

Free Flowing Outfall Details for Surface Network 2

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.008	S85	52.700	51.250	51.250	1350	0

©1982-2018 Innovyze

Simulation Criteria for Surface Network 2

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.000	Storm Duration (mins)	30
Ratio R	0.200		

©1982-2018 Innovyze

Online Controls for Surface Network 2

Hydro-Brake® Optimum Manhole: S84, DS/PN: 1.008, Volume (m³): 5.4

Unit Reference	MD-SHE-0129-6800-0488-6800
Design Head (m)	0.488
Design Flow (l/s)	6.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	129
Invert Level (m)	51.274
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.488	6.8	Kick-Flo®	0.374	6.0
Flush-Flo™	0.198	6.8	Mean Flow over Head Range	-	5.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.6	0.800	8.6	2.000	13.2	4.000	18.4	7.000	24.1
0.200	6.8	1.000	9.5	2.200	13.8	4.500	19.5	7.500	25.0
0.300	6.6	1.200	10.4	2.400	14.4	5.000	20.4	8.000	25.8
0.400	6.2	1.400	11.2	2.600	15.0	5.500	21.4	8.500	26.6
0.500	6.9	1.600	11.9	3.000	16.0	6.000	22.3	9.000	27.4
0.600	7.5	1.800	12.6	3.500	17.3	6.500	23.2	9.500	28.1

©1982-2018 Innovyze

Storage Structures for Surface Network 2

Tank or Pond Manhole: S84, DS/PN: 1.008

Invert Level (m) 51.274

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	740.0	0.600	740.0	1.200	0.0	1.800	0.0	2.400	0.0
0.100	740.0	0.700	740.0	1.300	0.0	1.900	0.0	2.500	0.0
0.200	740.0	0.800	740.0	1.400	0.0	2.000	0.0		
0.300	740.0	0.900	740.0	1.500	0.0	2.100	0.0		
0.400	740.0	1.000	740.0	1.600	0.0	2.200	0.0		
0.500	740.0	1.100	740.0	1.700	0.0	2.300	0.0		

©1982-2018 Innovyze

Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 2

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.000 Cv (Summer) 0.750
Region Scotland and Ireland Ratio R 0.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 5.0 DVD Status ON
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S72	15 Winter	100	+20%	100/15 Winter				54.547	0.127	0.000
1.001	S73	15 Winter	100	+20%	30/15 Winter				54.509	0.674	0.000
2.000	S86	15 Winter	100	+20%	100/15 Winter				54.153	0.026	0.000
1.002	S74	15 Winter	100	+20%	30/15 Summer				54.122	1.056	0.000
3.000	S75	15 Winter	100	+20%	30/15 Summer				53.976	1.063	0.000
1.003	S76	30 Winter	100	+20%	30/15 Summer				53.698	0.993	0.000
4.000	S77	30 Winter	100	+20%	30/15 Summer				53.287	0.958	0.000
1.004	S78	30 Winter	100	+20%	30/15 Summer				53.190	1.092	0.000
1.005	S79	30 Winter	100	+20%	30/15 Summer				52.875	0.910	0.000
1.006	S80	1440 Winter	100	+20%	30/15 Summer				52.513	0.626	0.000
5.000	S81	1440 Winter	100	+20%	30/15 Winter				52.510	0.622	0.000
5.001	S82	1440 Winter	100	+20%	30/15 Summer				52.507	0.769	0.000
1.007	S83	1440 Winter	100	+20%	30/15 Summer				52.510	0.673	0.000
1.008	S84	1440 Winter	100	+20%	30/120 Summer				52.507	0.782	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S72	0.33		23.3	SURCHARGED	
1.001	S73	0.92		55.5	SURCHARGED	
2.000	S86	0.21		19.1	SURCHARGED	
1.002	S74	0.97		60.9	SURCHARGED	
3.000	S75	0.99		81.5	SURCHARGED	
1.003	S76	0.91		165.9	SURCHARGED	
4.000	S77	0.37		30.1	SURCHARGED	
1.004	S78	1.54		205.8	SURCHARGED	
1.005	S79	2.21		232.3	SURCHARGED	
1.006	S80	0.29		32.9	SURCHARGED	
5.000	S81	0.05		1.9	SURCHARGED	
5.001	S82	0.04		1.8	SURCHARGED	
1.007	S83	0.21		36.7	SURCHARGED	
1.008	S84	0.08		10.3	SURCHARGED	

©1982-2018 Innovyze

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 3

Pipe Sizes Storm Manhole Sizes IW-MH

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	0
Ratio R	0.200	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	2.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Surface Network 3

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.235	4-8	0.224

Total Area Contributing (ha) = 0.459

Total Pipe Volume (m^3) = 13.684

Network Design Table for Surface Network 3

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	57.975	0.348	166.7	0.122	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	42.465	0.443	95.8	0.121	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	15.283	0.092	166.7	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	5.796	0.035	166.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	61.491	0.369	166.6	0.104	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	68.907	0.429	160.6	0.098	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	4.165	0.025	166.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	33.43	5.96	52.004	0.122	0.0	0.0	0.0	1.01	40.1	11.0
2.000	34.29	5.53	52.099	0.121	0.0	0.0	0.0	1.34	53.1	11.3
1.001	32.96	6.21	51.656	0.257	0.0	0.0	0.0	1.01	40.1	22.9
1.002	32.78	6.30	51.564	0.257	0.0	0.0	0.0	1.01	40.1	22.9
1.003	31.36	7.15	51.530	0.361	0.0	0.0	0.0	1.22	85.9	30.7
3.000	33.13	6.12	51.590	0.098	0.0	0.0	0.0	1.03	40.9	8.8
1.004	31.27	7.21	51.161	0.459	0.0	0.0	0.0	1.22	85.9	38.9

©1982-2018 Innovyze

Network Design Table for Surface Network 3

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
4.000	26.383	0.234	112.8	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	5.971	0.036	166.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.000	34.65	5.36	51.370	0.000	0.0	0.0	0.0	1.23	48.9	0.0
1.005	31.15	7.29	51.136	0.459	0.0	0.0	0.0	1.21	85.9	38.9

©1982-2018 Innovyze

Manhole Schedules for Surface Network 3

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S62	53.334	1.330	Open Manhole	1200	1.000	52.004	225				
S63	53.430	1.330	Open Manhole	1200	2.000	52.099	225				
S64	53.265	1.609	Open Manhole	1200	1.001	51.656	225	1.000	51.656	225	
								2.000	51.656	225	
S65	53.136	1.571	Open Manhole	1200	1.002	51.564	225	1.001	51.564	225	
S66	53.093	1.563	Open Manhole	1200	1.003	51.530	300	1.002	51.530	225	
S67	52.695	1.105	Open Manhole	900 x 675	3.000	51.590	225				
S68	52.693	1.533	Open Manhole	1200	1.004	51.161	300	1.003	51.161	300	
								3.000	51.161	225	
S69	52.700	1.330	Open Manhole	900 x 675	4.000	51.370	225				
S70	52.700	1.564	Open Manhole	1200	1.005	51.136	300	1.004	51.136	300	
								4.000	51.136	225	
S71	52.700	1.600	Open Manhole	1200		OUTFALL		1.005	51.100	300	

©1982-2018 Innovyze

PIPELINE SCHEDULES for Surface Network 3

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	S62	53.334	52.004	1.105	Open Manhole	1200
2.000	o	225	S63	53.430	52.099	1.105	Open Manhole	1200
1.001	o	225	S64	53.265	51.656	1.384	Open Manhole	1200
1.002	o	225	S65	53.136	51.564	1.346	Open Manhole	1200
1.003	o	300	S66	53.093	51.530	1.263	Open Manhole	1200
3.000	o	225	S67	52.695	51.590	0.880	Open Manhole	900 x 675
1.004	o	300	S68	52.693	51.161	1.233	Open Manhole	1200
4.000	o	225	S69	52.700	51.370	1.105	Open Manhole	900 x 675
1.005	o	300	S70	52.700	51.136	1.264	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	57.975	166.7	S64	53.265	51.656	1.384	Open Manhole	1200
2.000	42.465	95.8	S64	53.265	51.656	1.384	Open Manhole	1200
1.001	15.283	166.7	S65	53.136	51.564	1.346	Open Manhole	1200
1.002	5.796	166.7	S66	53.093	51.530	1.338	Open Manhole	1200
1.003	61.491	166.6	S68	52.693	51.161	1.233	Open Manhole	1200
3.000	68.907	160.6	S68	52.693	51.161	1.307	Open Manhole	1200
1.004	4.165	166.6	S70	52.700	51.136	1.264	Open Manhole	1200
4.000	26.383	112.8	S70	52.700	51.136	1.339	Open Manhole	1200
1.005	5.971	166.7	S71	52.700	51.100	1.300	Open Manhole	1200

Free Flowing Outfall Details for Surface Network 3

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005	S71	52.700	51.100	0.000	1200	0

Simulation Criteria for Surface Network 3

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

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

Synthetic Rainfall Details

©1982-2018 Innovyze

Simulation Criteria for Surface Network 3

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.000	Storm Duration (mins)	30
Ratio R	0.200		

©1982-2018 Innovyze

Online Controls for Surface Network 3

Hydro-Brake® Optimum Manhole: S70, DS/PN: 1.005, Volume (m³): 3.0

Unit Reference	MD-SHE-0096-3800-0747-3800
Design Head (m)	0.747
Design Flow (l/s)	3.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	96
Invert Level (m)	51.136
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.747	3.8	Kick-Flo®	0.495	3.1
Flush-Flo™	0.222	3.8	Mean Flow over Head Range	-	3.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.1	0.800	3.9	2.000	6.0	4.000	8.3	7.000	10.9
0.200	3.8	1.000	4.3	2.200	6.3	4.500	8.8	7.500	11.2
0.300	3.7	1.200	4.7	2.400	6.5	5.000	9.2	8.000	11.6
0.400	3.6	1.400	5.1	2.600	6.8	5.500	9.7	8.500	11.9
0.500	3.2	1.600	5.4	3.000	7.3	6.000	10.1	9.000	12.3
0.600	3.4	1.800	5.7	3.500	7.8	6.500	10.5	9.500	12.6

©1982-2018 Innovyze

Storage Structures for Surface Network 3

Tank or Pond Manhole: S70, DS/PN: 1.005

Invert Level (m) 51.136

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	225.0	1.200	0.0	2.400	0.0	3.600	0.0	4.800	0.0
0.200	225.0	1.400	0.0	2.600	0.0	3.800	0.0	5.000	0.0
0.400	225.0	1.600	0.0	2.800	0.0	4.000	0.0		
0.600	225.0	1.800	0.0	3.000	0.0	4.200	0.0		
0.800	225.0	2.000	0.0	3.200	0.0	4.400	0.0		
1.000	225.0	2.200	0.0	3.400	0.0	4.600	0.0		

©1982-2018 Innovyze

Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 3

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	17.000
Region	Scotland and Ireland	Ratio R	0.200
Cv (Summer)	0.750		
Cv (Winter)	0.840		

Margin for Flood Risk Warning (mm) 5.0 DVD Status ON
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S62	15 Winter	100	+20%	30/15 Summer				52.830	0.601	0.000
2.000	S63	15 Winter	100	+20%	30/15 Winter				52.770	0.446	0.000
1.001	S64	15 Winter	100	+20%	30/15 Summer				52.591	0.710	0.000
1.002	S65	960 Winter	100	+20%	30/15 Summer				52.445	0.655	0.000
1.003	S66	960 Winter	100	+20%	30/15 Winter				52.442	0.613	0.000
3.000	S67	960 Winter	100	+20%	30/240 Winter				52.419	0.604	0.000
1.004	S68	960 Winter	100	+20%	1/480 Winter				52.450	0.990	0.000
4.000	S69	960 Winter	100	+20%	30/120 Summer				52.452	0.857	0.000
1.005	S70	960 Winter	100	+20%	1/360 Winter				52.452	1.016	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S62	0.81		31.3	SURCHARGED	
2.000	S63	0.70		35.2	SURCHARGED	
1.001	S64	1.86		65.8	SURCHARGED	
1.002	S65	0.34		10.2	SURCHARGED	
1.003	S66	0.18		14.4	SURCHARGED	
3.000	S67	0.10		3.9	SURCHARGED	
1.004	S68	0.33		17.9	SURCHARGED	
4.000	S69	0.00		0.0	SURCHARGED	
1.005	S70	0.08		4.8	SURCHARGED	

©1982-2018 Innovyze

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 4

Pipe Sizes Storm Manhole Sizes IW-MH

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	0
Ratio R	0.200	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	2.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Network Design Table for Surface Network 4

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	28.255	0.518	54.6	0.018	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	13.332	0.080	166.7	0.044	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	23.498	0.141	166.7	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
3.000	38.186	0.747	51.1	0.086	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	66.149	0.397	166.6	0.146	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	6.232	0.037	168.4	0.016	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.004	68.812	0.447	153.8	0.165	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	9.465	0.063	150.7	0.009	0.00	0.0	0.600	o	300	Pipe/Conduit	
4.000	66.092	0.523	126.5	0.016	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.006	5.298	0.037	141.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	34.85	5.27	53.290	0.018	0.0	0.0	0.0	1.77	70.6	1.7
2.000	34.95	5.22	52.852	0.044	0.0	0.0	0.0	1.01	40.1	4.2
1.001	34.03	5.65	52.773	0.097	0.0	0.0	0.0	1.01	40.1	8.9
3.000	34.67	5.35	53.633	0.086	0.0	0.0	0.0	1.83	72.9	8.1
1.002	32.33	6.56	52.632	0.329	0.0	0.0	0.0	1.22	85.9	28.8
1.003	32.19	6.65	52.235	0.345	0.0	0.0	0.0	1.21	85.4	30.0
1.004	30.74	7.55	52.198	0.509	0.0	0.0	0.0	1.27	89.4	42.4
1.005	30.56	7.68	51.750	0.518	0.0	0.0	0.0	1.28	90.4	42.9
4.000	33.44	5.95	52.210	0.016	0.0	0.0	0.0	1.16	46.2	1.4
1.006	30.46	7.74	51.687	0.534	0.0	0.0	0.0	1.32	93.2	44.1

©1982-2018 Innovyze

Manhole Schedules for Surface Network 4

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S51	54.600	1.310	Open Manhole	900 x 675	1.000	53.290	225				
S52	54.162	1.310	Open Manhole	1200	2.000	52.852	225				
S53	54.146	1.374	Open Manhole	1200	1.001	52.773	225	1.000	52.773	225	
								2.000	52.773	225	
S54	54.943	1.310	Open Manhole	1200	3.000	53.633	225				
S55	54.196	1.564	Open Manhole	1200	1.002	52.632	300	1.001	52.632	225	
								3.000	52.886	225	180
S56	53.990	1.755	Open Manhole	1200	1.003	52.235	300	1.002	52.235	300	
S57	53.900	1.703	Open Manhole	1350	1.004	52.198	300	1.003	52.198	300	
S58	53.517	1.767	Open Manhole	1350	1.005	51.750	300	1.004	51.750	300	
S59	54.039	1.829	Open Manhole	1200	4.000	52.210	225				
S60	53.520	1.833	Open Manhole	1350	1.006	51.687	300	1.005	51.687	300	
								4.000	51.687	225	
S61	53.400	1.750	Open Manhole	1350		OUTFALL		1.006	51.650	300	

©1982-2018 Innovyze

PIPELINE SCHEDULES for Surface Network 4

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	S51	54.600	53.290	1.085	Open Manhole	900 x 675
2.000	o	225	S52	54.162	52.852	1.085	Open Manhole	1200
1.001	o	225	S53	54.146	52.773	1.149	Open Manhole	1200
3.000	o	225	S54	54.943	53.633	1.085	Open Manhole	1200
1.002	o	300	S55	54.196	52.632	1.264	Open Manhole	1200
1.003	o	300	S56	53.990	52.235	1.455	Open Manhole	1200
1.004	o	300	S57	53.900	52.198	1.403	Open Manhole	1350
1.005	o	300	S58	53.517	51.750	1.467	Open Manhole	1350
4.000	o	225	S59	54.039	52.210	1.604	Open Manhole	1200
1.006	o	300	S60	53.520	51.687	1.533	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	28.255	54.6	S53	54.146	52.773	1.149	Open Manhole	1200
2.000	13.332	166.7	S53	54.146	52.773	1.149	Open Manhole	1200
1.001	23.498	166.7	S55	54.196	52.632	1.339	Open Manhole	1200
3.000	38.186	51.1	S55	54.196	52.886	1.085	Open Manhole	1200
1.002	66.149	166.6	S56	53.990	52.235	1.455	Open Manhole	1200
1.003	6.232	168.4	S57	53.900	52.198	1.403	Open Manhole	1350
1.004	68.812	153.8	S58	53.517	51.750	1.467	Open Manhole	1350
1.005	9.465	150.7	S60	53.520	51.687	1.533	Open Manhole	1350
4.000	66.092	126.5	S60	53.520	51.687	1.608	Open Manhole	1350
1.006	5.298	141.9	S61	53.400	51.650	1.450	Open Manhole	1350

Free Flowing Outfall Details for Surface Network 4

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006	S61	53.400	51.650	0.000	1350	0

©1982-2018 Innovyze

Simulation Criteria for Surface Network 4

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.000	Storm Duration (mins)	30
Ratio R	0.200		

©1982-2018 Innovyze

Online Controls for Surface Network 4

Hydro-Brake® Optimum Manhole: S60, DS/PN: 1.006, Volume (m³): 5.8

Unit Reference	MD-SHE-0100-4100-0744-4100
Design Head (m)	0.744
Design Flow (l/s)	4.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	100
Invert Level (m)	51.687
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.744	4.1	Kick-Flo®	0.496	3.4
Flush-Flo™	0.222	4.1	Mean Flow over Head Range	-	3.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	0.800	4.2	2.000	6.5	4.000	9.0	7.000	11.8
0.200	4.1	1.000	4.7	2.200	6.8	4.500	9.5	7.500	12.1
0.300	4.0	1.200	5.1	2.400	7.1	5.000	10.0	8.000	12.5
0.400	3.9	1.400	5.5	2.600	7.3	5.500	10.5	8.500	12.9
0.500	3.4	1.600	5.8	3.000	7.9	6.000	10.9	9.000	13.3
0.600	3.7	1.800	6.2	3.500	8.5	6.500	11.3	9.500	13.6

©1982-2018 Innovyze

Storage Structures for Surface Network 4

Tank or Pond Manhole: S60, DS/PN: 1.006

Invert Level (m) 51.687

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	270.0	1.200	0.0	2.400	0.0	3.600	0.0	4.800	0.0
0.200	270.0	1.400	0.0	2.600	0.0	3.800	0.0	5.000	0.0
0.400	270.0	1.600	0.0	2.800	0.0	4.000	0.0		
0.600	270.0	1.800	0.0	3.000	0.0	4.200	0.0		
0.800	270.0	2.000	0.0	3.200	0.0	4.400	0.0		
1.000	270.0	2.200	0.0	3.400	0.0	4.600	0.0		

©1982-2018 Innovyze

Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.000 Cv (Summer) 0.750
Region Scotland and Ireland Ratio R 0.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 5.0 DVD Status ON
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S51	15 Winter	100	+20%	100/15 Summer				53.690	0.174	0.000
2.000	S52	15 Winter	100	+20%	30/15 Summer				53.699	0.622	0.000
1.001	S53	15 Winter	100	+20%	30/15 Summer				53.678	0.681	0.000
3.000	S54	15 Winter	100	+20%					53.739	-0.119	0.000
1.002	S55	15 Winter	100	+20%	30/15 Summer				53.600	0.668	0.000
1.003	S56	1440 Winter	100	+20%	30/15 Summer				53.236	0.701	0.000
1.004	S57	1440 Winter	100	+20%	30/15 Summer				53.234	0.736	0.000
1.005	S58	1440 Winter	100	+20%	30/15 Summer				53.224	1.174	0.000
4.000	S59	1440 Winter	100	+20%	30/360 Winter				53.221	0.786	0.000
1.006	S60	1440 Winter	100	+20%	1/240 Winter				53.221	1.233	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S51	0.09		5.7	SURCHARGED	
2.000	S52	0.36		12.4	SURCHARGED	
1.001	S53	0.78		28.6	SURCHARGED	
3.000	S54	0.44		30.5	OK	
1.002	S55	0.97		79.7	SURCHARGED	
1.003	S56	0.18		11.0	SURCHARGED	
1.004	S57	0.19		16.2	SURCHARGED	
1.005	S58	0.26		16.0	SURCHARGED	
4.000	S59	0.01		0.5	SURCHARGED	
1.006	S60	0.09		5.7	SURCHARGED	

©1982-2018 Innovyze

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 5

Pipe Sizes Storm Manhole Sizes IW-MH

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	0
Ratio R	0.200	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	2.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Surface Network 5

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.592	4-8	1.107	8-12	0.023

Total Area Contributing (ha) = 1.721

Total Pipe Volume (m^3) = 67.438

Network Design Table for Surface Network 5

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	31.445	1.457	21.6	0.051	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	47.845	1.911	25.0	0.049	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	45.352	0.422	107.5	0.049	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.003	7.981	0.033	241.8	0.010	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.004	88.663	0.369	240.3	0.302	0.00	0.0	0.600	o	375	Pipe/Conduit	
2.000	19.878	0.119	167.0	0.020	5.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	12.975	0.292	44.4	0.037	5.00	0.0	0.600	o	300	Pipe/Conduit	
2.001	67.290	0.404	166.7	0.181	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	35.02	5.19	56.108	0.051	0.0	0.0	0.0	2.83	112.5	4.8
1.001	34.37	5.49	54.651	0.099	0.0	0.0	0.0	2.63	104.4	9.3
1.002	33.50	5.92	52.740	0.148	0.0	0.0	0.0	1.75	193.0	13.5
1.003	33.27	6.04	52.318	0.158	0.0	0.0	0.0	1.16	128.2	14.3
1.004	31.12	7.31	52.285	0.460	0.0	0.0	0.0	1.16	128.6	38.8
2.000	34.83	5.27	52.964	0.020	0.0	0.0	0.0	1.21	85.8	1.8
3.000	35.23	5.09	53.137	0.037	0.0	0.0	0.0	2.37	167.2	3.6
2.001	32.98	6.20	52.845	0.238	0.0	0.0	0.0	1.21	85.9	21.2

©1982-2018 Innovyze

Network Design Table for Surface Network 5

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
4.000	16.341	0.103	158.7	0.026	5.00	0.0	0.600	o	300	Pipe/Conduit	
2.002	69.888	0.526	132.9	0.143	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.005	21.263	0.092	230.6	0.019	0.00	0.0	0.600	o	375	Pipe/Conduit	
5.000	12.116	0.105	114.9	0.015	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.006	65.602	0.262	250.0	0.139	0.00	0.0	0.600	o	375	Pipe/Conduit	
6.000	56.675	0.340	166.7	0.207	5.00	0.0	0.600	o	300	Pipe/Conduit	
6.001	59.576	0.357	166.7	0.099	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.007	51.127	0.368	138.8	0.144	0.00	0.0	0.600	o	375	Pipe/Conduit	
7.000	52.157	0.313	166.7	0.034	5.00	0.0	0.600	o	225	Pipe/Conduit	
7.001	86.312	0.518	166.7	0.173	0.00	0.0	0.600	o	225	Pipe/Conduit	
7.002	32.754	0.196	166.7	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	
7.003	7.576	0.045	168.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.008	8.589	0.025	350.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.000	34.95	5.22	52.545	0.026	0.0	0.0	0.0	1.25	88.1	2.4
2.002	31.70	6.94	52.441	0.406	0.0	0.0	0.0	1.57	173.4	34.9
1.005	30.67	7.60	51.915	0.885	0.0	0.0	0.0	1.19	131.3	73.5
5.000	35.07	5.17	52.276	0.015	0.0	0.0	0.0	1.22	48.5	1.4
1.006	29.33	8.56	51.823	1.038	0.0	0.0	0.0	1.14	126.1	82.5
6.000	33.78	5.78	52.040	0.207	0.0	0.0	0.0	1.21	85.9	18.9
6.001	32.28	6.59	51.700	0.305	0.0	0.0	0.0	1.21	85.9	26.7
1.007	28.62	9.12	51.343	1.488	0.0	0.0	0.0	1.54	169.6	115.4
7.000	33.61	5.86	52.046	0.034	0.0	0.0	0.0	1.01	40.1	3.1
7.001	31.15	7.29	51.734	0.208	0.0	0.0	0.0	1.01	40.1	17.5
7.002	30.34	7.83	51.216	0.233	0.0	0.0	0.0	1.01	40.1	19.1
7.003	30.19	7.93	51.020	0.233	0.0	0.0	0.0	1.21	85.5	19.1
1.008	28.46	9.25	50.974	1.721	0.0	0.0	0.0	1.08	171.9	132.7

©1982-2018 Innovyze

Manhole Schedules for Surface Network 5

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S29	57.514	1.405	Open Manhole	1200	1.000	56.108	225				
S30	56.056	1.405	Open Manhole	1200	1.001	54.651	225	1.000	54.651	225	
S31	54.220	1.480	Open Manhole	1200	1.002	52.740	375	1.001	52.740	225	
S32	53.798	1.480	Open Manhole	1200	1.003	52.318	375	1.002	52.318	375	
S33	53.792	1.507	Open Manhole	1200	1.004	52.285	375	1.003	52.285	375	
S34	54.369	1.405	Open Manhole	1200	2.000	52.964	300				
S35	54.543	1.406	Open Manhole	1200	3.000	53.137	300				
S36	54.427	1.582	Open Manhole	1200	2.001	52.845	300	2.000	52.845	300	
								3.000	52.845	300	
S37	53.950	1.405	Open Manhole	1200	4.000	52.545	300				
S38	53.943	1.502	Open Manhole	1200	2.002	52.441	375	2.001	52.441	300	
								4.000	52.442	300	
S39	53.956	2.041	Open Manhole	1200	1.005	51.915	375	1.004	51.916	375	
								2.002	51.915	375	
S40	53.682	1.405	Open Manhole	1200	5.000	52.276	225				
S41	53.726	1.903	Open Manhole	1200	1.006	51.823	375	1.005	51.823	375	
								5.000	52.171	225	197
S42	53.445	1.405	Open Manhole	1200	6.000	52.040	300				
S43	53.320	1.620	Open Manhole	1200	6.001	51.700	300	6.000	51.700	300	
S44	53.266	1.924	Open Manhole	1350	1.007	51.343	375	1.006	51.561	375	218
								6.001	51.343	300	
S45	53.452	1.405	Open Manhole	1200	7.000	52.046	225				
S46	53.293	1.560	Open Manhole	1200	7.001	51.734	225	7.000	51.734	225	
S47	52.948	1.732	Open Manhole	1200	7.002	51.216	225	7.001	51.216	225	
S48	52.792	1.772	Open Manhole	1200	7.003	51.020	300	7.002	51.020	225	
S49	52.811	1.837	Open Manhole	1240 x 900	1.008	50.974	450	1.007	50.974	375	
								7.003	50.975	300	
S50	52.733	1.783	Open Manhole	1240 x 900		OUTFALL		1.008	50.950	450	

©1982-2018 Innovyze

PIPELINE SCHEDULES for Surface Network 5

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	S29	57.514	56.108	1.180	Open Manhole	1200
1.001	o	225	S30	56.056	54.651	1.180	Open Manhole	1200
1.002	o	375	S31	54.220	52.740	1.105	Open Manhole	1200
1.003	o	375	S32	53.798	52.318	1.105	Open Manhole	1200
1.004	o	375	S33	53.792	52.285	1.132	Open Manhole	1200
2.000	o	300	S34	54.369	52.964	1.105	Open Manhole	1200
3.000	o	300	S35	54.543	53.137	1.106	Open Manhole	1200
2.001	o	300	S36	54.427	52.845	1.282	Open Manhole	1200
4.000	o	300	S37	53.950	52.545	1.105	Open Manhole	1200
2.002	o	375	S38	53.943	52.441	1.127	Open Manhole	1200
1.005	o	375	S39	53.956	51.915	1.666	Open Manhole	1200
5.000	o	225	S40	53.682	52.276	1.180	Open Manhole	1200
1.006	o	375	S41	53.726	51.823	1.528	Open Manhole	1200
6.000	o	300	S42	53.445	52.040	1.105	Open Manhole	1200
6.001	o	300	S43	53.320	51.700	1.320	Open Manhole	1200
1.007	o	375	S44	53.266	51.343	1.549	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	31.445	21.6	S30	56.056	54.651	1.180	Open Manhole	1200
1.001	47.845	25.0	S31	54.220	52.740	1.255	Open Manhole	1200
1.002	45.352	107.5	S32	53.798	52.318	1.105	Open Manhole	1200
1.003	7.981	241.8	S33	53.792	52.285	1.132	Open Manhole	1200
1.004	88.663	240.3	S39	53.956	51.916	1.666	Open Manhole	1200
2.000	19.878	167.0	S36	54.427	52.845	1.282	Open Manhole	1200
3.000	12.975	44.4	S36	54.427	52.845	1.282	Open Manhole	1200
2.001	67.290	166.7	S38	53.943	52.441	1.202	Open Manhole	1200
4.000	16.341	158.7	S38	53.943	52.442	1.201	Open Manhole	1200
2.002	69.888	132.9	S39	53.956	51.915	1.666	Open Manhole	1200
1.005	21.263	230.6	S41	53.726	51.823	1.528	Open Manhole	1200
5.000	12.116	114.9	S41	53.726	52.171	1.330	Open Manhole	1200
1.006	65.602	250.0	S44	53.266	51.561	1.331	Open Manhole	1350
6.000	56.675	166.7	S43	53.320	51.700	1.320	Open Manhole	1200
6.001	59.576	166.7	S44	53.266	51.343	1.624	Open Manhole	1350
1.007	51.127	138.8	S49	52.811	50.974	1.462	Open Manhole	1240 x 900

©1982-2018 Innovyze

PIPELINE SCHEDULES for Surface Network 5

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
7.000	o	225	S45	53.452	52.046	1.180	Open Manhole	1200
7.001	o	225	S46	53.293	51.734	1.335	Open Manhole	1200
7.002	o	225	S47	52.948	51.216	1.507	Open Manhole	1200
7.003	o	300	S48	52.792	51.020	1.472	Open Manhole	1200
1.008	o	450	S49	52.811	50.974	1.387	Open Manhole	1240 x 900

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
7.000	52.157	166.7	S46	53.293	51.734	1.335	Open Manhole	1200
7.001	86.312	166.7	S47	52.948	51.216	1.507	Open Manhole	1200
7.002	32.754	166.7	S48	52.792	51.020	1.547	Open Manhole	1200
7.003	7.576	168.4	S49	52.811	50.975	1.537	Open Manhole	1240 x 900
1.008	8.589	350.0	S50	52.733	50.950	1.333	Open Manhole	1240 x 900

Free Flowing Outfall Details for Surface Network 5

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.008	S50	52.733	50.950	50.950	1240	900

Simulation Criteria for Surface Network 5

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

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

Synthetic Rainfall Details

Rainfall Model		FSR	Profile Type Summer
Return Period (years)		1	Cv (Summer) 0.750
Region	Scotland and Ireland		Cv (Winter) 0.840
M5-60 (mm)	17.000	Storm Duration (mins)	30
Ratio R	0.200		

©1982-2018 Innovyze

Online Controls for Surface Network 5

Hydro-Brake® Optimum Manhole: S49, DS/PN: 1.008, Volume (m³): 8.0

Unit Reference	MD-SHE-0158-1140-0744-1140
Design Head (m)	0.744
Design Flow (l/s)	11.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	158
Invert Level (m)	50.974
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.744	11.4	Kick-Flo®	0.545	9.8
Flush-Flo™	0.261	11.4	Mean Flow over Head Range	-	9.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.7	0.800	11.8	2.000	18.2	4.000	25.4	7.000	33.3
0.200	11.3	1.000	13.1	2.200	19.1	4.500	26.9	7.500	34.2
0.300	11.4	1.200	14.3	2.400	19.9	5.000	28.3	8.000	35.4
0.400	11.1	1.400	15.4	2.600	20.7	5.500	29.6	8.500	36.4
0.500	10.5	1.600	16.4	3.000	22.1	6.000	30.9	9.000	37.5
0.600	10.3	1.800	17.3	3.500	23.8	6.500	32.1	9.500	38.6

©1982-2018 Innovyze

Storage Structures for Surface Network 5

Tank or Pond Manhole: S49, DS/PN: 1.008

Invert Level (m) 50.975

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	700.0	1.200	700.0	2.400	0.0	3.600	0.0	4.800	0.0
0.200	700.0	1.400	700.0	2.600	0.0	3.800	0.0	5.000	0.0
0.400	700.0	1.600	0.0	2.800	0.0	4.000	0.0		
0.600	700.0	1.800	0.0	3.000	0.0	4.200	0.0		
0.800	700.0	2.000	0.0	3.200	0.0	4.400	0.0		
1.000	700.0	2.200	0.0	3.400	0.0	4.600	0.0		

©1982-2018 Innovyze

Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 5

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.000 Cv (Summer) 0.750
Region Scotland and Ireland Ratio R 0.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 5.0 DVD Status ON
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S29	15 Winter	100	+20%					56.171	-0.162	0.000
1.001	S30	15 Winter	100	+20%					54.746	-0.130	0.000
1.002	S31	30 Winter	100	+20%	100/15 Summer				53.865	0.750	0.000
1.003	S32	30 Winter	100	+20%	30/15 Summer				53.783	1.091	0.000
1.004	S33	30 Winter	100	+20%	30/15 Summer				53.753	1.093	0.000
2.000	S34	30 Winter	100	+20%	100/15 Summer				53.802	0.538	0.000
3.000	S35	30 Winter	100	+20%	100/15 Winter				53.805	0.368	0.000
2.001	S36	30 Winter	100	+20%	100/15 Summer				53.799	0.654	0.000
4.000	S37	30 Winter	100	+20%	30/15 Winter				53.687	0.842	0.000
2.002	S38	30 Winter	100	+20%	30/15 Winter				53.682	0.866	0.000
1.005	S39	30 Winter	100	+20%	30/15 Summer				53.545	1.255	0.000
5.000	S40	30 Winter	100	+20%	30/15 Summer				53.334	0.833	0.000
1.006	S41	30 Winter	100	+20%	30/15 Summer				53.331	1.133	0.000
6.000	S42	30 Winter	100	+20%	30/15 Winter				52.977	0.637	0.000
6.001	S43	30 Winter	100	+20%	30/15 Summer				52.853	0.853	0.000
1.007	S44	30 Winter	100	+20%	30/15 Summer				52.601	0.883	0.000
7.000	S45	15 Winter	100	+20%	100/15 Summer				52.751	0.480	0.000
7.001	S46	15 Winter	100	+20%	30/15 Summer				52.723	0.765	0.000
7.002	S47	1440 Winter	100	+20%	1/480 Winter				52.535	1.094	0.000
7.003	S48	1440 Winter	100	+20%	1/180 Winter				52.529	1.210	0.000
1.008	S49	1440 Winter	100	+20%	1/360 Winter				52.528	1.104	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S29	0.17		18.2	OK	
1.001	S30	0.37		36.6	OK	
1.002	S31	0.24		42.2	SURCHARGED	
1.003	S32	0.38		33.8	SURCHARGED	
1.004	S33	0.76		93.7	SURCHARGED	
2.000	S34	0.08		5.9	SURCHARGED	
3.000	S35	0.09		11.5	SURCHARGED	
2.001	S36	0.83		67.9	SURCHARGED	

©1982-2018 Innovyze

Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 5

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
4.000	S37	0.09		7.1	SURCHARGED	
2.002	S38	0.58		95.2	SURCHARGED	
1.005	S39	1.53		169.6	SURCHARGED	
5.000	S40	0.13		5.3	SURCHARGED	
1.006	S41	1.66		196.5	SURCHARGED	
6.000	S42	0.66		53.6	SURCHARGED	
6.001	S43	0.86		69.9	SURCHARGED	
1.007	S44	1.84		290.0	SURCHARGED	
7.000	S45	0.30		11.6	SURCHARGED	
7.001	S46	1.37		53.5	SURCHARGED	
7.002	S47	0.18		6.9	SURCHARGED	
7.003	S48	0.11		6.8	SURCHARGED	
1.008	S49	0.15		16.0	SURCHARGED	

©1982-2018 Innovyze

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 6

Pipe Sizes Storm Manhole Sizes IW-MH

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	0
Ratio R	0.200	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	2.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Surface Network 6

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.522	4-8	0.585	8-12	0.014

Total Area Contributing (ha) = 1.122

Total Pipe Volume (m^3) = 34.981

Network Design Table for Surface Network 6

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	43.387	0.260	166.7	0.162	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	10.444	0.063	166.7	0.008	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	57.998	0.348	166.7	0.092	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	48.764	0.292	166.7	0.134	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.004	65.148	0.392	166.2	0.019	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	20.287	0.122	166.7	0.038	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	67.026	0.402	166.7	0.126	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.002	60.280	0.362	166.5	0.118	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	58.466	0.376	155.5	0.138	5.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	33.90	5.72	52.356	0.162	0.0	0.0	0.0	1.01	40.1	14.8
1.001	33.56	5.89	52.096	0.169	0.0	0.0	0.0	1.01	40.1	15.4
1.002	32.12	6.68	52.033	0.261	0.0	0.0	0.0	1.22	85.9	22.7
1.003	31.04	7.35	51.685	0.395	0.0	0.0	0.0	1.21	85.9	33.2
1.004	29.75	8.25	51.393	0.414	0.0	0.0	0.0	1.22	86.0	33.3
2.000	34.70	5.33	51.936	0.038	0.0	0.0	0.0	1.01	40.1	3.6
2.001	32.54	6.44	51.814	0.164	0.0	0.0	0.0	1.01	40.1	14.5
2.002	31.18	7.27	51.412	0.282	0.0	0.0	0.0	1.22	85.9	23.8
3.000	33.79	5.77	51.950	0.138	0.0	0.0	0.0	1.26	88.9	12.6

©1982-2018 Innovyze

Network Design Table for Surface Network 6

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
4.000	27.592	0.165	166.7	0.065	5.00	0.0	0.600	o	225	Pipe/Conduit	
4.001	5.557	0.034	162.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
3.001	73.898	0.524	141.0	0.200	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.003	12.515	0.050	250.0	0.023	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	12.649	0.051	250.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.000	34.44	5.46	51.774	0.065	0.0	0.0	0.0	1.01	40.1	6.0
4.001	34.25	5.55	51.608	0.065	0.0	0.0	0.0	1.02	40.6	6.0
3.001	32.09	6.71	51.574	0.403	0.0	0.0	0.0	1.32	93.5	35.0
2.003	30.85	7.48	51.050	0.708	0.0	0.0	0.0	0.99	70.0	59.1
1.005	29.50	8.43	51.000	1.122	0.0	0.0	0.0	1.14	126.1	89.6

©1982-2018 Innovyze

Manhole Schedules for Surface Network 6

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S14	53.636	1.280	Open Manhole	1200	1.000	52.356	225				
S15	53.449	1.353	Open Manhole	1200	1.001	52.096	225	1.000	52.096	225	
S16	53.407	1.374	Open Manhole	1200	1.002	52.033	300	1.001	52.033	225	
S17	53.513	1.828	Open Manhole	1200	1.003	51.685	300	1.002	51.685	300	
S18	53.209	1.816	Open Manhole	1200	1.004	51.393	300	1.003	51.393	300	
S19	53.043	1.107	Open Manhole	900 x 675	2.000	51.936	225				
S20	53.093	1.279	Open Manhole	1200	2.001	51.814	225	2.000	51.814	225	
S21	52.587	1.175	Open Manhole	900 x 675	2.002	51.412	300	2.001	51.412	225	
S22	53.231	1.281	Open Manhole	1200	3.000	51.950	300				
S23	53.030	1.256	Open Manhole	1200	4.000	51.774	225				
S24	52.863	1.255	Open Manhole	900 x 675	4.001	51.608	225	4.000	51.608	225	
S25	52.821	1.247	Open Manhole	900 x 675	3.001	51.574	300	3.000	51.574	300	
								4.001	51.574	225	
S26	52.577	1.527	Open Manhole	1200	2.003	51.050	300	2.002	51.050	300	
								3.001	51.050	300	
S27	52.480	1.480	Open Manhole	1350	1.005	51.000	375	1.004	51.001	300	
								2.003	51.000	300	
S28	52.500	1.551	Open Manhole	1350		OUTFALL		1.005	50.949	375	

©1982-2018 Innovyze

PIPELINE SCHEDULES for Surface Network 6

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	S14	53.636	52.356	1.055	Open Manhole	1200
1.001	o	225	S15	53.449	52.096	1.128	Open Manhole	1200
1.002	o	300	S16	53.407	52.033	1.074	Open Manhole	1200
1.003	o	300	S17	53.513	51.685	1.528	Open Manhole	1200
1.004	o	300	S18	53.209	51.393	1.516	Open Manhole	1200
2.000	o	225	S19	53.043	51.936	0.882	Open Manhole	900 x 675
2.001	o	225	S20	53.093	51.814	1.054	Open Manhole	1200
2.002	o	300	S21	52.587	51.412	0.875	Open Manhole	900 x 675
3.000	o	300	S22	53.231	51.950	0.981	Open Manhole	1200
4.000	o	225	S23	53.030	51.774	1.031	Open Manhole	1200
4.001	o	225	S24	52.863	51.608	1.030	Open Manhole	900 x 675
3.001	o	300	S25	52.821	51.574	0.947	Open Manhole	900 x 675
2.003	o	300	S26	52.577	51.050	1.227	Open Manhole	1200
1.005	o	375	S27	52.480	51.000	1.105	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	43.387	166.7	S15	53.449	52.096	1.128	Open Manhole	1200
1.001	10.444	166.7	S16	53.407	52.033	1.149	Open Manhole	1200
1.002	57.998	166.7	S17	53.513	51.685	1.528	Open Manhole	1200
1.003	48.764	166.7	S18	53.209	51.393	1.516	Open Manhole	1200
1.004	65.148	166.2	S27	52.480	51.001	1.179	Open Manhole	1350
2.000	20.287	166.7	S20	53.093	51.814	1.054	Open Manhole	1200
2.001	67.026	166.7	S21	52.587	51.412	0.950	Open Manhole	900 x 675
2.002	60.280	166.5	S26	52.577	51.050	1.227	Open Manhole	1200
3.000	58.466	155.5	S25	52.821	51.574	0.947	Open Manhole	900 x 675
4.000	27.592	166.7	S24	52.863	51.608	1.030	Open Manhole	900 x 675
4.001	5.557	162.9	S25	52.821	51.574	1.022	Open Manhole	900 x 675
3.001	73.898	141.0	S26	52.577	51.050	1.227	Open Manhole	1200
2.003	12.515	250.0	S27	52.480	51.000	1.180	Open Manhole	1350
1.005	12.649	250.0	S28	52.500	50.949	1.176	Open Manhole	1350

Free Flowing Outfall Details for Surface Network 6

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005	S28	52.500	50.949	0.000	1350	0

©1982-2018 Innovyze

Simulation Criteria for Surface Network 6

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.000	Storm Duration (mins)	30
Ratio R	0.200		

©1982-2018 Innovyze

Online Controls for Surface Network 6

Hydro-Brake® Optimum Manhole: S27, DS/PN: 1.005, Volume (m³): 7.4

Unit Reference	MD-SHE-0138-8200-0617-8200
Design Head (m)	0.617
Design Flow (l/s)	8.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	138
Invert Level (m)	51.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.617	8.2	Kick-Flo®	0.456	7.1
Flush-Flo™	0.221	8.2	Mean Flow over Head Range	-	6.8

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.0	0.800	9.3	2.000	14.3	4.000	19.9	7.000	26.0
0.200	8.2	1.000	10.3	2.200	14.9	4.500	21.0	7.500	26.9
0.300	8.1	1.200	11.2	2.400	15.6	5.000	22.1	8.000	27.8
0.400	7.7	1.400	12.1	2.600	16.2	5.500	23.2	8.500	28.6
0.500	7.4	1.600	12.8	3.000	17.3	6.000	24.2	9.000	29.5
0.600	8.1	1.800	13.6	3.500	18.7	6.500	25.0	9.500	30.3

©1982-2018 Innovyze

Storage Structures for Surface Network 6

Tank or Pond Manhole: S27, DS/PN: 1.005

Invert Level (m) 51.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	480.0	1.200	480.0	2.400	0.0	3.600	0.0	4.800	0.0
0.200	480.0	1.400	0.0	2.600	0.0	3.800	0.0	5.000	0.0
0.400	480.0	1.600	0.0	2.800	0.0	4.000	0.0		
0.600	480.0	1.800	0.0	3.000	0.0	4.200	0.0		
0.800	480.0	2.000	0.0	3.200	0.0	4.400	0.0		
1.000	480.0	2.200	0.0	3.400	0.0	4.600	0.0		

©1982-2018 Innovyze

Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 6

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.000 Cv (Summer) 0.750
Region Scotland and Ireland Ratio R 0.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 5.0 DVD Status ON
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S14	15 Winter	100	+20%	30/15 Summer				53.011	0.430	0.000
1.001	S15	15 Winter	100	+20%	30/15 Summer				52.639	0.318	0.000
1.002	S16	15 Winter	100	+20%	100/15 Summer				52.514	0.180	0.000
1.003	S17	960 Winter	100	+20%	30/15 Summer				52.368	0.383	0.000
1.004	S18	960 Winter	100	+20%	30/15 Winter				52.362	0.669	0.000
2.000	S19	15 Winter	100	+20%	30/15 Winter				52.600	0.440	0.000
2.001	S20	15 Winter	100	+20%	30/15 Summer				52.579	0.540	0.000
2.002	S21	960 Winter	100	+20%	30/15 Summer				52.366	0.654	0.000
3.000	S22	15 Winter	100	+20%	100/15 Summer				52.566	0.316	0.000
4.000	S23	15 Winter	100	+20%	30/15 Summer				52.517	0.518	0.000
4.001	S24	30 Summer	100	+20%	30/15 Summer				52.476	0.643	0.000
3.001	S25	30 Summer	100	+20%	30/15 Summer				52.462	0.588	0.000
2.003	S26	960 Winter	100	+20%	1/15 Summer				52.361	1.011	0.000
1.005	S27	960 Winter	100	+20%	1/360 Winter				52.354	0.980	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S14	1.25		47.7	SURCHARGED	
1.001	S15	1.44		48.5	SURCHARGED	
1.002	S16	0.84		68.9	SURCHARGED	
1.003	S17	0.20		16.5	SURCHARGED	
1.004	S18	0.20		16.5	SURCHARGED	
2.000	S19	0.32		11.7	SURCHARGED	
2.001	S20	1.15		44.9	SURCHARGED	
2.002	S21	0.14		11.1	SURCHARGED	
3.000	S22	0.46		39.1	SURCHARGED	
4.000	S23	0.47		17.5	SURCHARGED	
4.001	S24	0.61		18.3	SURCHARGED	
3.001	S25	1.12		100.8	SURCHARGED	
2.003	S26	0.48		27.4	SURCHARGED	
1.005	S27	0.12		11.9	SURCHARGED	

©1982-2018 Innovyze

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 7

Pipe Sizes Storm Manhole Sizes IW-MH

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	0
Ratio R	0.200	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	2.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Surface Network 7

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.264	4-8	0.194

Total Area Contributing (ha) = 0.458

Total Pipe Volume (m^3) = 8.872

Network Design Table for Surface Network 7

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	18.130	0.109	166.7	0.063	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	3.990	0.024	166.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	10.610	0.071	150.1	0.009	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	21.431	0.129	166.7	0.052	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	29.344	0.176	166.7	0.045	0.00	0.0	0.600	o	225	Pipe/Conduit	
3.000	37.823	0.240	157.8	0.109	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	22.473	0.135	166.7	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	34.78	5.30	51.536	0.063	0.0	0.0	0.0	1.01	40.1	6.0
1.001	34.63	5.37	51.427	0.063	0.0	0.0	0.0	1.01	40.1	6.0
1.002	34.28	5.53	51.403	0.072	0.0	0.0	0.0	1.06	42.3	6.7
2.000	34.66	5.35	51.461	0.052	0.0	0.0	0.0	1.01	40.1	4.9
1.003	33.31	6.02	51.332	0.169	0.0	0.0	0.0	1.01	40.1	15.3
3.000	34.13	5.61	51.396	0.109	0.0	0.0	0.0	1.04	41.3	10.1
1.004	32.64	6.39	51.156	0.291	0.0	0.0	0.0	1.01	40.1	25.8

©1982-2018 Innovyze

Network Design Table for Surface Network 7

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
4.000	50.707	0.327	155.3	0.112	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	9.520	0.057	166.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.006	19.112	0.115	166.7	0.054	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.000	33.72	5.81	51.348	0.112	0.0	0.0	0.0	1.05	41.6	10.2
1.005	32.36	6.54	51.022	0.403	0.0	0.0	0.0	1.01	40.1	35.3
1.006	31.83	6.86	50.965	0.458	0.0	0.0	0.0	1.01	40.1	39.4

©1982-2018 Innovyze

Manhole Schedules for Surface Network 7

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S3	52.859	1.323	Open Manhole	1200	1.000	51.536	225				
S4	52.743	1.316	Open Manhole	900 x 675	1.001	51.427	225	1.000	51.427	225	
S5	52.719	1.316	Open Manhole	900 x 675	1.002	51.403	225	1.001	51.403	225	
S6	52.759	1.298	Open Manhole	1200	2.000	51.461	225				
S7	52.707	1.374	Open Manhole	900 x 675	1.003	51.332	225	1.002	51.332	225	
								2.000	51.332	225	
S8	52.649	1.252	Open Manhole	900 x 675	3.000	51.396	225				
S9	52.636	1.479	Open Manhole	1200	1.004	51.156	225	1.003	51.156	225	
								3.000	51.156	225	
S10	52.586	1.237	Open Manhole	900 x 675	4.000	51.348	225				
S11	52.650	1.628	Open Manhole	1200	1.005	51.022	225	1.004	51.022	225	
								4.000	51.022	225	
S12	52.600	1.635	Open Manhole	1200	1.006	50.965	225	1.005	50.965	225	
S13	52.600	1.750	Open Manhole	1200		OUTFALL		1.006	50.850	225	

©1982-2018 Innovyze

PIPELINE SCHEDULES for Surface Network 7

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	S3	52.859	51.536	1.098	Open Manhole	1200
1.001	o	225	S4	52.743	51.427	1.091	Open Manhole	900 x 675
1.002	o	225	S5	52.719	51.403	1.091	Open Manhole	900 x 675
2.000	o	225	S6	52.759	51.461	1.073	Open Manhole	1200
1.003	o	225	S7	52.707	51.332	1.149	Open Manhole	900 x 675
3.000	o	225	S8	52.649	51.396	1.027	Open Manhole	900 x 675
1.004	o	225	S9	52.636	51.156	1.254	Open Manhole	1200
4.000	o	225	S10	52.586	51.348	1.012	Open Manhole	900 x 675
1.005	o	225	S11	52.650	51.022	1.403	Open Manhole	1200
1.006	o	225	S12	52.600	50.965	1.410	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	18.130	166.7	S4	52.743	51.427	1.091	Open Manhole	900 x 675
1.001	3.990	166.7	S5	52.719	51.403	1.091	Open Manhole	900 x 675
1.002	10.610	150.1	S7	52.707	51.332	1.149	Open Manhole	900 x 675
2.000	21.431	166.7	S7	52.707	51.332	1.149	Open Manhole	900 x 675
1.003	29.344	166.7	S9	52.636	51.156	1.254	Open Manhole	1200
3.000	37.823	157.8	S9	52.636	51.156	1.254	Open Manhole	1200
1.004	22.473	166.7	S11	52.650	51.022	1.403	Open Manhole	1200
4.000	50.707	155.3	S11	52.650	51.022	1.403	Open Manhole	1200
1.005	9.520	166.7	S12	52.600	50.965	1.410	Open Manhole	1200
1.006	19.112	166.7	S13	52.600	50.850	1.525	Open Manhole	1200

Free Flowing Outfall Details for Surface Network 7

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006	S13	52.600	50.850	0.000	1200	0

©1982-2018 Innovyze

Simulation Criteria for Surface Network 7

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.000	Storm Duration (mins)	30
Ratio R	0.200		

©1982-2018 Innovyze

Online Controls for Surface Network 7

Hydro-Brake® Optimum Manhole: S12, DS/PN: 1.006, Volume (m³): 2.2

Unit Reference	MD-SHE-0093-3100-0282-3100
Design Head (m)	0.282
Design Flow (l/s)	3.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	93
Invert Level (m)	50.965
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.282	3.1	Kick-Flo®	0.228	2.8
Flush-Flo™	0.133	3.1	Mean Flow over Head Range	-	2.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.0	0.800	5.0	2.000	7.7	4.000	10.7	7.000	14.2
0.200	3.0	1.000	5.6	2.200	8.1	4.500	11.4	7.500	14.8
0.300	3.2	1.200	6.1	2.400	8.4	5.000	12.0	8.000	15.2
0.400	3.6	1.400	6.5	2.600	8.7	5.500	12.6	8.500	15.7
0.500	4.0	1.600	6.9	3.000	9.3	6.000	13.2	9.000	16.2
0.600	4.4	1.800	7.3	3.500	10.0	6.500	13.7	9.500	16.6

©1982-2018 Innovyze

Storage Structures for Surface Network 7

Tank or Pond Manhole: S12, DS/PN: 1.006

Invert Level (m) 50.965

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	160.0	0.600	160.0	1.200	160.0	1.800	0.0	2.400	0.0
0.100	160.0	0.700	160.0	1.300	160.0	1.900	0.0	2.500	0.0
0.200	160.0	0.800	160.0	1.400	0.0	2.000	0.0		
0.300	160.0	0.900	160.0	1.500	0.0	2.100	0.0		
0.400	160.0	1.000	160.0	1.600	0.0	2.200	0.0		
0.500	160.0	1.100	160.0	1.700	0.0	2.300	0.0		

©1982-2018 Innovyze

Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 7

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.000 Cv (Summer) 0.750
Region Scotland and Ireland Ratio R 0.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 5.0 DVD Status ON
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	S3	30 Winter	100	+20%	30/15 Summer				52.412	0.651	0.000	0.40
1.001	S4	30 Winter	100	+20%	30/15 Summer				52.383	0.731	0.000	0.52
1.002	S5	30 Winter	100	+20%	30/15 Summer				52.374	0.746	0.000	0.46
2.000	S6	30 Winter	100	+20%	30/15 Summer				52.377	0.691	0.000	0.32
1.003	S7	30 Winter	100	+20%	30/15 Summer				52.351	0.794	0.000	0.97
3.000	S8	720 Winter	100	+20%	30/15 Summer				52.309	0.688	0.000	0.13
1.004	S9	720 Winter	100	+20%	1/240 Winter				52.305	0.923	0.000	0.37
4.000	S10	720 Winter	100	+20%	30/15 Summer				52.301	0.727	0.000	0.13
1.005	S11	720 Winter	100	+20%	1/15 Summer				52.295	1.048	0.000	0.57
1.006	S12	720 Winter	100	+20%	1/60 Summer				52.287	1.098	0.000	0.18

PN	US/MH Name	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S3		14.5	SURCHARGED	
1.001	S4		14.3	SURCHARGED	
1.002	S5		16.3	SURCHARGED	
2.000	S6		11.6	SURCHARGED	
1.003	S7		36.5	SURCHARGED	
3.000	S8		5.2	SURCHARGED	
1.004	S9		13.6	SURCHARGED	
4.000	S10		5.4	SURCHARGED	
1.005	S11		18.8	SURCHARGED	
1.006	S12		6.3	SURCHARGED	

©1982-2018 Innovyze

Appendix B

Wastewater Sewer Networks Design

FOUL SEWERAGE DESIGN

Design Criteria for Foul Network 1

Pipe Sizes Foul Manhole Sizes IW-MH

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	10
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.500
Flow Per Person (l/per/day)	150.00	Maximum Backdrop Height (m)	2.500
Persons per House	2.70	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	4.50	Min Slope for Optimisation (1:X)	200

Designed with Level Inverts

Network Design Table for Foul Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	32.473	0.678	47.9	0.000	4	0.0	1.500	o	150	Pipe/Conduit	
1.001	41.970	0.811	51.8	0.000	5	0.0	1.500	o	150	Pipe/Conduit	
2.000	28.726	0.479	60.0	0.000	3	0.0	1.500	o	150	Pipe/Conduit	
3.000	15.805	0.263	60.1	0.000	3	0.0	1.500	o	150	Pipe/Conduit	
2.001	27.434	0.457	60.0	0.000	2	0.0	1.500	o	150	Pipe/Conduit	
1.002	60.807	0.304	200.0	0.000	8	0.0	1.500	o	225	Pipe/Conduit	
1.003	8.774	0.044	199.4	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
1.004	70.203	0.351	200.0	0.000	8	0.0	1.500	o	225	Pipe/Conduit	
1.005	6.252	0.031	201.7	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
1.006	18.619	0.093	200.2	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
4.000	51.580	1.032	50.0	0.000	11	0.0	1.500	o	150	Pipe/Conduit	
5.000	25.454	1.005	25.3	0.000	3	0.0	1.500	o	150	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	54.106	0.000	0.0	4	0.0	7	0.29	1.27	22.4	0.1
1.001	53.428	0.000	0.0	9	0.0	11	0.37	1.22	21.6	0.2
2.000	53.050	0.000	0.0	3	0.0	7	0.24	1.13	20.0	0.1
3.000	52.617	0.000	0.0	3	0.0	7	0.24	1.13	20.0	0.1
2.001	52.354	0.000	0.0	8	0.0	11	0.34	1.13	20.0	0.2
1.002	51.897	0.000	0.0	25	0.1	21	0.30	0.81	32.2	0.6
1.003	51.593	0.000	0.0	25	0.1	21	0.31	0.81	32.3	0.6
1.004	51.549	0.000	0.0	33	0.1	24	0.33	0.81	32.2	0.8
1.005	51.198	0.000	0.0	33	0.1	24	0.33	0.81	32.1	0.8
1.006	51.167	0.000	0.0	33	0.1	24	0.33	0.81	32.2	0.8
4.000	53.406	0.000	0.0	11	0.0	12	0.40	1.24	21.9	0.3
5.000	53.684	0.000	0.0	3	0.0	6	0.33	1.75	30.8	0.1

©1982-2018 Innovyze

Network Design Table for Foul Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
4.001	23.164	0.154	150.4	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
4.002	4.946	0.033	149.9	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
4.003	42.227	0.211	200.1	0.000	17	0.0	1.500	o	225	Pipe/Conduit	
4.004	49.146	0.246	199.8	0.000	7	0.0	1.500	o	225	Pipe/Conduit	
1.007	69.466	0.347	200.2	0.000	6	0.0	1.500	o	225	Pipe/Conduit	
6.000	91.540	0.610	150.1	0.000	15	0.0	1.500	o	150	Pipe/Conduit	
1.008	16.957	0.085	199.5	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
1.009	3.316	0.017	195.1	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
1.010	42.844	0.214	200.2	0.000	5	0.0	1.500	o	225	Pipe/Conduit	
7.000	76.319	0.847	90.1	0.000	10	0.0	1.500	o	150	Pipe/Conduit	
7.001	23.237	0.155	149.9	0.000	4	0.0	1.500	o	150	Pipe/Conduit	
7.002	23.652	0.158	149.7	0.000	3	0.0	1.500	o	150	Pipe/Conduit	
8.000	29.743	0.496	60.0	0.000	4	0.0	1.500	o	150	Pipe/Conduit	
7.003	7.215	0.036	200.4	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
7.004	35.287	0.176	200.5	0.000	4	0.0	1.500	o	225	Pipe/Conduit	
7.005	67.191	0.336	200.0	0.000	4	0.0	1.500	o	225	Pipe/Conduit	
7.006	3.427	0.017	201.6	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
7.007	14.135	0.071	199.1	0.000	1	0.0	1.500	o	225	Pipe/Conduit	
1.011	30.832	0.154	200.2	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
9.000	48.343	0.806	60.0	0.000	1	0.0	1.500	o	150	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.001	52.374	0.000	0.0	14	0.0	17	0.30	0.71	12.6	0.3
4.002	51.950	0.000	0.0	14	0.0	17	0.30	0.71	12.6	0.3
4.003	51.917	0.000	0.0	31	0.1	23	0.33	0.81	32.2	0.7
4.004	51.706	0.000	0.0	38	0.1	26	0.35	0.81	32.2	0.9
1.007	51.074	0.000	0.0	77	0.2	36	0.43	0.81	32.2	1.8
6.000	51.550	0.000	0.0	15	0.0	17	0.30	0.71	12.6	0.3
1.008	50.727	0.000	0.0	92	0.2	39	0.46	0.81	32.3	2.1
1.009	50.642	0.000	0.0	92	0.2	39	0.46	0.82	32.6	2.1
1.010	50.625	0.000	0.0	97	0.2	40	0.46	0.81	32.2	2.3
7.000	52.268	0.000	0.0	10	0.0	13	0.32	0.92	16.3	0.2
7.001	51.421	0.000	0.0	14	0.0	17	0.30	0.71	12.6	0.3
7.002	51.266	0.000	0.0	17	0.0	18	0.32	0.71	12.6	0.4
8.000	51.148	0.000	0.0	4	0.0	8	0.27	1.13	20.0	0.1
7.003	50.652	0.000	0.0	21	0.0	20	0.29	0.81	32.2	0.5
7.004	50.616	0.000	0.0	25	0.1	21	0.30	0.81	32.2	0.6
7.005	50.440	0.000	0.0	29	0.1	23	0.32	0.81	32.2	0.7
7.006	50.104	0.000	0.0	29	0.1	23	0.32	0.81	32.1	0.7
7.007	50.087	0.000	0.0	30	0.1	23	0.32	0.81	32.3	0.7
1.011	50.016	0.000	0.0	127	0.3	46	0.50	0.81	32.2	2.9
9.000	51.900	0.000	0.0	1	0.0	4	0.17	1.13	20.0	0.0

©1982-2018 Innovyze

Network Design Table for Foul Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.012	82.981	0.415	200.0	0.000	9	0.0	1.500	o	225	Pipe/Conduit	
1.013	38.521	0.193	199.6	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
10.000	75.479	1.258	60.0	0.000	7	0.0	1.500	o	150	Pipe/Conduit	
11.000	20.287	0.790	25.7	0.000	3	0.0	1.500	o	150	Pipe/Conduit	
10.001	45.839	0.306	149.8	0.000	8	0.0	1.500	o	150	Pipe/Conduit	
12.000	16.572	0.696	23.8	0.000	2	0.0	1.500	o	150	Pipe/Conduit	
10.002	24.945	0.125	199.6	0.000	5	0.0	1.500	o	225	Pipe/Conduit	
13.000	87.152	0.581	150.0	0.000	17	0.0	1.500	o	150	Pipe/Conduit	
10.003	20.791	0.104	199.9	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
10.004	65.189	0.326	200.0	0.000	6	0.0	1.500	o	225	Pipe/Conduit	
14.000	52.998	0.353	150.1	0.000	13	0.0	1.500	o	150	Pipe/Conduit	
14.001	58.497	0.390	150.0	0.000	6	0.0	1.500	o	150	Pipe/Conduit	
10.005	44.390	0.222	200.0	0.000	14	0.0	1.500	o	225	Pipe/Conduit	
1.014	6.095	0.030	203.2	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
1.015	42.065	0.210	200.3	0.000	4	0.0	1.500	o	225	Pipe/Conduit	
1.016	19.383	0.097	199.8	0.000	4	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.012	49.862	0.000	0.0	137	0.3	48	0.51	0.81	32.2	3.2
1.013	49.447	0.000	0.0	137	0.3	48	0.52	0.81	32.2	3.2
10.000	52.968	0.000	0.0	7	0.0	10	0.32	1.13	20.0	0.2
11.000	52.500	0.000	0.0	3	0.0	6	0.33	1.73	30.6	0.1
10.001	51.710	0.000	0.0	18	0.0	19	0.32	0.71	12.6	0.4
12.000	52.100	0.000	0.0	2	0.0	5	0.29	1.80	31.8	0.0
10.002	51.404	0.000	0.0	25	0.1	21	0.31	0.81	32.2	0.6
13.000	52.212	0.000	0.0	17	0.0	18	0.32	0.71	12.6	0.4
10.003	51.279	0.000	0.0	42	0.1	27	0.36	0.81	32.2	1.0
10.004	51.175	0.000	0.0	48	0.1	29	0.37	0.81	32.2	1.1
14.000	51.893	0.000	0.0	13	0.0	16	0.29	0.71	12.6	0.3
14.001	51.540	0.000	0.0	19	0.0	19	0.33	0.71	12.6	0.4
10.005	50.849	0.000	0.0	81	0.2	37	0.44	0.81	32.2	1.9
1.014	49.254	0.000	0.0	218	0.5	61	0.59	0.80	32.0	5.1
1.015	49.224	0.000	0.0	222	0.5	61	0.59	0.81	32.2	5.2
1.016	49.014	0.000	0.0	226	0.5	61	0.60	0.81	32.2	5.2

©1982-2018 Innovyze

Network Design Table for Foul Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
15.000	21.249	0.354	60.0	0.000	8	0.0	1.500	o	150	Pipe/Conduit	
15.001	7.259	0.121	60.0	0.000	4	0.0	1.500	o	150	Pipe/Conduit	
15.002	13.242	0.088	150.5	0.000	2	0.0	1.500	o	150	Pipe/Conduit	
16.000	25.750	0.455	56.6	0.000	4	0.0	1.500	o	150	Pipe/Conduit	
15.003	29.045	0.145	200.3	0.000	2	0.0	1.500	o	225	Pipe/Conduit	
17.000	43.313	0.435	99.6	0.000	18	0.0	1.500	o	150	Pipe/Conduit	
15.004	12.897	0.064	201.5	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
15.005	6.189	0.031	199.6	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
15.006	49.144	0.246	199.8	0.000	5	0.0	1.500	o	225	Pipe/Conduit	
18.000	62.730	1.046	60.0	0.000	8	0.0	1.500	o	150	Pipe/Conduit	
15.007	65.148	0.326	199.8	0.000	6	0.0	1.500	o	225	Pipe/Conduit	
19.000	21.195	0.430	49.3	0.000	4	0.0	1.500	o	150	Pipe/Conduit	
19.001	9.075	0.104	87.3	0.000	1	0.0	1.500	o	150	Pipe/Conduit	
20.000	24.858	0.414	60.0	0.000	3	0.0	1.500	o	150	Pipe/Conduit	
19.002	74.204	0.371	200.0	0.000	12	0.0	1.500	o	225	Pipe/Conduit	
15.008	12.196	0.061	199.9	0.000	1	0.0	1.500	o	225	Pipe/Conduit	
15.009	64.742	0.324	199.8	0.000	2	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
15.000	51.323	0.000	0.0	8	0.0	11	0.34	1.13	20.0	0.2
15.001	50.969	0.000	0.0	12	0.0	13	0.39	1.13	20.0	0.3
15.002	50.848	0.000	0.0	14	0.0	17	0.30	0.71	12.6	0.3
16.000	51.215	0.000	0.0	4	0.0	8	0.28	1.17	20.6	0.1
15.003	50.760	0.000	0.0	20	0.0	19	0.28	0.81	32.2	0.5
17.000	51.050	0.000	0.0	18	0.0	17	0.37	0.88	15.5	0.4
15.004	50.615	0.000	0.0	38	0.1	26	0.35	0.81	32.1	0.9
15.005	50.551	0.000	0.0	38	0.1	26	0.35	0.81	32.2	0.9
15.006	50.520	0.000	0.0	43	0.1	27	0.36	0.81	32.2	1.0
18.000	51.112	0.000	0.0	8	0.0	11	0.34	1.13	20.0	0.2
15.007	50.066	0.000	0.0	57	0.1	31	0.39	0.81	32.2	1.3
19.000	51.182	0.000	0.0	4	0.0	7	0.29	1.25	22.1	0.1
19.001	50.752	0.000	0.0	5	0.0	9	0.26	0.94	16.6	0.1
20.000	51.392	0.000	0.0	3	0.0	7	0.24	1.13	20.0	0.1
19.002	50.648	0.000	0.0	20	0.0	19	0.28	0.81	32.2	0.5
15.008	49.740	0.000	0.0	78	0.2	36	0.43	0.81	32.2	1.8
15.009	49.679	0.000	0.0	80	0.2	37	0.44	0.81	32.2	1.9

©1982-2018 Innovyze

Network Design Table for Foul Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
21.000	42.272	0.282	149.9	0.000	16	0.0	1.500	o	150	Pipe/Conduit	
21.001	6.258	0.042	149.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
21.002	17.938	0.120	149.5	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
22.000	35.829	0.597	60.0	0.000	4	0.0	1.500	o	150	Pipe/Conduit	
21.003	86.018	0.430	200.0	0.000	10	0.0	1.500	o	225	Pipe/Conduit	
1.017	11.789	0.059	199.8	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
21.000	52.081	0.000	0.0	16	0.0	18	0.31	0.71	12.6	0.4
21.001	51.799	0.000	0.0	16	0.0	18	0.31	0.72	12.7	0.4
21.002	51.757	0.000	0.0	16	0.0	18	0.31	0.72	12.6	0.4
22.000	51.405	0.000	0.0	4	0.0	8	0.27	1.13	20.0	0.1
21.003	50.808	0.000	0.0	30	0.1	23	0.32	0.81	32.2	0.7
1.017	48.917	0.000	0.0	336	0.7	75	0.67	0.81	32.2	7.8

©1982-2018 Innovyze

Manhole Schedules for Foul Network 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
F1	55.656	1.550	Open Manhole	1200	1.000	54.106	150				
F2	55.018	1.590	Open Manhole	1200	1.001	53.428	150	1.000	53.428	150	
F3	54.600	1.550	Open Manhole	1200	2.000	53.050	150				
F4	54.167	1.550	Open Manhole	1200	3.000	52.617	150				
F5	54.148	1.794	Open Manhole	1200	2.001	52.354	150	2.000	52.571	150	217
								3.000	52.354	150	
F6	54.243	2.346	Open Manhole	1200	1.002	51.897	225	1.001	52.617	150	645
								2.001	51.897	150	
F7	53.980	2.387	Open Manhole	1200	1.003	51.593	225	1.002	51.593	225	
F8	53.897	2.348	Open Manhole	1200	1.004	51.549	225	1.003	51.549	225	
F9	53.518	2.320	Open Manhole	1200	1.005	51.198	225	1.004	51.198	225	
F10	53.486	2.319	Open Manhole	1200	1.006	51.167	225	1.005	51.167	225	
F11	54.993	1.587	Open Manhole	1200	4.000	53.406	150				
F12	55.234	1.550	Open Manhole	1200	5.000	53.684	150				
F13	54.229	1.855	Open Manhole	1200	4.001	52.374	150	4.000	52.374	150	
								5.000	52.679	150	305
F14	53.973	2.023	Open Manhole	1200	4.002	51.950	150	4.001	52.220	150	270
F15	53.994	2.077	Open Manhole	1200	4.003	51.917	225	4.002	51.917	150	
F16	54.042	2.336	Open Manhole	1200	4.004	51.706	225	4.003	51.706	225	
F17	53.496	2.422	Open Manhole	1200	1.007	51.074	225	1.006	51.074	225	
								4.004	51.460	225	386
F18	53.149	1.599	Open Manhole	1200	6.000	51.550	150				
F19	53.363	2.636	Open Manhole	1200	1.008	50.727	225	1.007	50.727	225	
								6.000	50.940	150	138
F20	53.141	2.499	Open Manhole	1200	1.009	50.642	225	1.008	50.642	225	
F21	53.109	2.484	Open Manhole	1200	1.010	50.625	225	1.009	50.625	225	
F22	53.818	1.550	Open Manhole	1200	7.000	52.268	150				
F23	52.971	1.550	Open Manhole	1200	7.001	51.421	150	7.000	51.421	150	
F24	52.880	1.614	Open Manhole	1200	7.002	51.266	150	7.001	51.266	150	
F25	52.698	1.550	Open Manhole	1200	8.000	51.148	150				
F26	52.874	2.222	Open Manhole	1200	7.003	50.652	225	7.002	51.108	150	381
								8.000	50.652	150	
F27	52.806	2.190	Open Manhole	1200	7.004	50.616	225	7.003	50.616	225	
F28	52.702	2.262	Open Manhole	1200	7.005	50.440	225	7.004	50.440	225	
F29	52.740	2.636	Open Manhole	1200	7.006	50.104	225	7.005	50.104	225	
F30	52.743	2.656	Open Manhole	1200	7.007	50.087	225	7.006	50.087	225	
F31	52.765	2.749	Open Manhole	1200	1.011	50.016	225	1.010	50.411	225	395
								7.007	50.016	225	
F32	53.450	1.550	Open Manhole	1200	9.000	51.900	150				
F33	53.372	3.510	Open Manhole	1200	1.012	49.862	225	1.011	49.862	225	
								9.000	51.094	150	1157
F34	52.961	3.514	Open Manhole	1200	1.013	49.447	225	1.012	49.447	225	
F35	54.518	1.550	Open Manhole	1200	10.000	52.968	150				
F36	54.050	1.550	Open Manhole	1200	11.000	52.500	150				
F37	53.874	2.164	Open Manhole	1200	10.001	51.710	150	10.000	51.710	150	
								11.000	51.710	150	

©1982-2018 Innovyze

Manhole Schedules for Foul Network 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
F38	53.750	1.650	Open Manhole	1200	12.000	52.100	150				
F39	53.879	2.475	Open Manhole	1200	10.002	51.404	225	10.001	51.404	150	
								12.000	51.404	150	
F40	53.762	1.550	Open Manhole	1200	13.000	52.212	150				
F41	53.961	2.682	Open Manhole	1200	10.003	51.279	225	10.002	51.279	225	
								13.000	51.631	150	277
F42	53.883	2.708	Open Manhole	1200	10.004	51.175	225	10.003	51.175	225	
F43	53.443	1.550	Open Manhole	1200	14.000	51.893	150				
F44	53.324	1.784	Open Manhole	1200	14.001	51.540	150	14.000	51.540	150	
F45	53.323	2.474	Open Manhole	1200	10.005	50.849	225	10.004	50.849	225	
								14.001	51.150	150	226
F46	52.922	3.668	Open Manhole	1200	1.014	49.254	225	1.013	49.254	225	
								10.005	50.627	225	1373
F47	53.000	3.776	Open Manhole	1200	1.015	49.224	225	1.014	49.224	225	
F48	53.250	4.236	Open Manhole	1200	1.016	49.014	225	1.015	49.014	225	
F49	52.873	1.550	Open Manhole	1200	15.000	51.323	150				
F50	52.739	1.770	Open Manhole	1200	15.001	50.969	150	15.000	50.969	150	
F51	52.702	1.854	Open Manhole	1200	15.002	50.848	150	15.001	50.848	150	
F52	52.765	1.550	Open Manhole	1200	16.000	51.215	150				
F53	52.699	1.939	Open Manhole	1200	15.003	50.760	225	15.002	50.760	150	
								16.000	50.760	150	
F54	52.652	1.602	Open Manhole	1200	17.000	51.050	150				
F55	52.700	2.085	Open Manhole	1200	15.004	50.615	225	15.003	50.615	225	
								17.000	50.615	150	
F56	52.604	2.053	Open Manhole	1200	15.005	50.551	225	15.004	50.551	225	
F57	52.598	2.078	Open Manhole	1200	15.006	50.520	225	15.005	50.520	225	
F58	52.662	1.550	Open Manhole	1200	18.000	51.112	150				
F59	52.664	2.598	Open Manhole	1200	15.007	50.066	225	15.006	50.274	225	208
								18.000	50.066	150	
F60	52.732	1.550	Open Manhole	1200	19.000	51.182	150				
F61	52.857	2.105	Open Manhole	1200	19.001	50.752	150	19.000	50.752	150	
F62	52.942	1.550	Open Manhole	1200	20.000	51.392	150				
F63	52.903	2.255	Open Manhole	1200	19.002	50.648	225	19.001	50.648	150	
								20.000	50.978	150	255
F64	52.584	2.844	Open Manhole	1200	15.008	49.740	225	15.007	49.740	225	
								19.002	50.277	225	537
F65	52.494	2.815	Open Manhole	1200	15.009	49.679	225	15.008	49.679	225	
F66	53.631	1.550	Open Manhole	1200	21.000	52.081	150				
F67	53.450	1.651	Open Manhole	1200	21.001	51.799	150	21.000	51.799	150	
F68	53.431	1.674	Open Manhole	1200	21.002	51.757	150	21.001	51.757	150	
F69	52.955	1.550	Open Manhole	1200	22.000	51.405	150				
F71	53.299	2.491	Open Manhole	1200	21.003	50.808	225	21.002	51.637	150	754
								22.000	50.808	150	
F72	53.226	4.309	Open Manhole	1200	1.017	48.917	225	1.016	48.917	225	
								15.009	49.355	225	438
								21.003	50.378	225	1461

©1982-2018 Innovyze

Manhole Schedules for Foul Network 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
F73	53.200	4.342	Open Manhole	1200		OUTFALL		1.017	48.858	225	

©1982-2018 Innovyze

PIPELINE SCHEDULES for Foul Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	F1	55.656	54.106	1.400	Open Manhole	1200
1.001	o	150	F2	55.018	53.428	1.440	Open Manhole	1200
2.000	o	150	F3	54.600	53.050	1.400	Open Manhole	1200
3.000	o	150	F4	54.167	52.617	1.400	Open Manhole	1200
2.001	o	150	F5	54.148	52.354	1.644	Open Manhole	1200
1.002	o	225	F6	54.243	51.897	2.121	Open Manhole	1200
1.003	o	225	F7	53.980	51.593	2.162	Open Manhole	1200
1.004	o	225	F8	53.897	51.549	2.123	Open Manhole	1200
1.005	o	225	F9	53.518	51.198	2.095	Open Manhole	1200
1.006	o	225	F10	53.486	51.167	2.094	Open Manhole	1200
4.000	o	150	F11	54.993	53.406	1.437	Open Manhole	1200
5.000	o	150	F12	55.234	53.684	1.400	Open Manhole	1200
4.001	o	150	F13	54.229	52.374	1.705	Open Manhole	1200
4.002	o	150	F14	53.973	51.950	1.873	Open Manhole	1200
4.003	o	225	F15	53.994	51.917	1.852	Open Manhole	1200
4.004	o	225	F16	54.042	51.706	2.111	Open Manhole	1200
1.007	o	225	F17	53.496	51.074	2.197	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	32.473	47.9	F2	55.018	53.428	1.440	Open Manhole	1200
1.001	41.970	51.8	F6	54.243	52.617	1.476	Open Manhole	1200
2.000	28.726	60.0	F5	54.148	52.571	1.427	Open Manhole	1200
3.000	15.805	60.1	F5	54.148	52.354	1.644	Open Manhole	1200
2.001	27.434	60.0	F6	54.243	51.897	2.196	Open Manhole	1200
1.002	60.807	200.0	F7	53.980	51.593	2.162	Open Manhole	1200
1.003	8.774	199.4	F8	53.897	51.549	2.123	Open Manhole	1200
1.004	70.203	200.0	F9	53.518	51.198	2.095	Open Manhole	1200
1.005	6.252	201.7	F10	53.486	51.167	2.094	Open Manhole	1200
1.006	18.619	200.2	F17	53.496	51.074	2.197	Open Manhole	1200
4.000	51.580	50.0	F13	54.229	52.374	1.705	Open Manhole	1200
5.000	25.454	25.3	F13	54.229	52.679	1.400	Open Manhole	1200
4.001	23.164	150.4	F14	53.973	52.220	1.603	Open Manhole	1200
4.002	4.946	149.9	F15	53.994	51.917	1.927	Open Manhole	1200
4.003	42.227	200.1	F16	54.042	51.706	2.111	Open Manhole	1200
4.004	49.146	199.8	F17	53.496	51.460	1.811	Open Manhole	1200
1.007	69.466	200.2	F19	53.363	50.727	2.411	Open Manhole	1200

©1982-2018 Innovyze

PIPELINE SCHEDULES for Foul Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
6.000	o	150	F18	53.149	51.550	1.449	Open Manhole	1200
1.008	o	225	F19	53.363	50.727	2.411	Open Manhole	1200
1.009	o	225	F20	53.141	50.642	2.274	Open Manhole	1200
1.010	o	225	F21	53.109	50.625	2.259	Open Manhole	1200
7.000	o	150	F22	53.818	52.268	1.400	Open Manhole	1200
7.001	o	150	F23	52.971	51.421	1.400	Open Manhole	1200
7.002	o	150	F24	52.880	51.266	1.464	Open Manhole	1200
8.000	o	150	F25	52.698	51.148	1.400	Open Manhole	1200
7.003	o	225	F26	52.874	50.652	1.997	Open Manhole	1200
7.004	o	225	F27	52.806	50.616	1.965	Open Manhole	1200
7.005	o	225	F28	52.702	50.440	2.037	Open Manhole	1200
7.006	o	225	F29	52.740	50.104	2.411	Open Manhole	1200
7.007	o	225	F30	52.743	50.087	2.431	Open Manhole	1200
1.011	o	225	F31	52.765	50.016	2.524	Open Manhole	1200
9.000	o	150	F32	53.450	51.900	1.400	Open Manhole	1200
1.012	o	225	F33	53.372	49.862	3.285	Open Manhole	1200
1.013	o	225	F34	52.961	49.447	3.289	Open Manhole	1200
10.000	o	150	F35	54.518	52.968	1.400	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
6.000	91.540	150.1	F19	53.363	50.940	2.273	Open Manhole	1200
1.008	16.957	199.5	F20	53.141	50.642	2.274	Open Manhole	1200
1.009	3.316	195.1	F21	53.109	50.625	2.259	Open Manhole	1200
1.010	42.844	200.2	F31	52.765	50.411	2.129	Open Manhole	1200
7.000	76.319	90.1	F23	52.971	51.421	1.400	Open Manhole	1200
7.001	23.237	149.9	F24	52.880	51.266	1.464	Open Manhole	1200
7.002	23.652	149.7	F26	52.874	51.108	1.616	Open Manhole	1200
8.000	29.743	60.0	F26	52.874	50.652	2.072	Open Manhole	1200
7.003	7.215	200.4	F27	52.806	50.616	1.965	Open Manhole	1200
7.004	35.287	200.5	F28	52.702	50.440	2.037	Open Manhole	1200
7.005	67.191	200.0	F29	52.740	50.104	2.411	Open Manhole	1200
7.006	3.427	201.6	F30	52.743	50.087	2.431	Open Manhole	1200
7.007	14.135	199.1	F31	52.765	50.016	2.524	Open Manhole	1200
1.011	30.832	200.2	F33	53.372	49.862	3.285	Open Manhole	1200
9.000	48.343	60.0	F33	53.372	51.094	2.128	Open Manhole	1200
1.012	82.981	200.0	F34	52.961	49.447	3.289	Open Manhole	1200
1.013	38.521	199.6	F46	52.922	49.254	3.443	Open Manhole	1200
10.000	75.479	60.0	F37	53.874	51.710	2.014	Open Manhole	1200

©1982-2018 Innovyze

PIPELINE SCHEDULES for Foul Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
11.000	o	150	F36	54.050	52.500	1.400	Open Manhole	1200
10.001	o	150	F37	53.874	51.710	2.014	Open Manhole	1200
12.000	o	150	F38	53.750	52.100	1.500	Open Manhole	1200
10.002	o	225	F39	53.879	51.404	2.250	Open Manhole	1200
13.000	o	150	F40	53.762	52.212	1.400	Open Manhole	1200
10.003	o	225	F41	53.961	51.279	2.457	Open Manhole	1200
10.004	o	225	F42	53.883	51.175	2.483	Open Manhole	1200
14.000	o	150	F43	53.443	51.893	1.400	Open Manhole	1200
14.001	o	150	F44	53.324	51.540	1.634	Open Manhole	1200
10.005	o	225	F45	53.323	50.849	2.249	Open Manhole	1200
1.014	o	225	F46	52.922	49.254	3.443	Open Manhole	1200
1.015	o	225	F47	53.000	49.224	3.551	Open Manhole	1200
1.016	o	225	F48	53.250	49.014	4.011	Open Manhole	1200
15.000	o	150	F49	52.873	51.323	1.400	Open Manhole	1200
15.001	o	150	F50	52.739	50.969	1.620	Open Manhole	1200
15.002	o	150	F51	52.702	50.848	1.704	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
11.000	20.287	25.7	F37	53.874	51.710	2.014	Open Manhole	1200
10.001	45.839	149.8	F39	53.879	51.404	2.325	Open Manhole	1200
12.000	16.572	23.8	F39	53.879	51.404	2.325	Open Manhole	1200
10.002	24.945	199.6	F41	53.961	51.279	2.457	Open Manhole	1200
13.000	87.152	150.0	F41	53.961	51.631	2.180	Open Manhole	1200
10.003	20.791	199.9	F42	53.883	51.175	2.483	Open Manhole	1200
10.004	65.189	200.0	F45	53.323	50.849	2.249	Open Manhole	1200
14.000	52.998	150.1	F44	53.324	51.540	1.634	Open Manhole	1200
14.001	58.497	150.0	F45	53.323	51.150	2.023	Open Manhole	1200
10.005	44.390	200.0	F46	52.922	50.627	2.070	Open Manhole	1200
1.014	6.095	203.2	F47	53.000	49.224	3.551	Open Manhole	1200
1.015	42.065	200.3	F48	53.250	49.014	4.011	Open Manhole	1200
1.016	19.383	199.8	F72	53.226	48.917	4.084	Open Manhole	1200
15.000	21.249	60.0	F50	52.739	50.969	1.620	Open Manhole	1200
15.001	7.259	60.0	F51	52.702	50.848	1.704	Open Manhole	1200
15.002	13.242	150.5	F53	52.699	50.760	1.789	Open Manhole	1200

©1982-2018 Innovyze

PIPELINE SCHEDULES for Foul Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
16.000	o	150	F52	52.765	51.215	1.400	Open Manhole	1200
15.003	o	225	F53	52.699	50.760	1.714	Open Manhole	1200
17.000	o	150	F54	52.652	51.050	1.452	Open Manhole	1200
15.004	o	225	F55	52.700	50.615	1.860	Open Manhole	1200
15.005	o	225	F56	52.604	50.551	1.828	Open Manhole	1200
15.006	o	225	F57	52.598	50.520	1.853	Open Manhole	1200
18.000	o	150	F58	52.662	51.112	1.400	Open Manhole	1200
15.007	o	225	F59	52.664	50.066	2.373	Open Manhole	1200
19.000	o	150	F60	52.732	51.182	1.400	Open Manhole	1200
19.001	o	150	F61	52.857	50.752	1.955	Open Manhole	1200
20.000	o	150	F62	52.942	51.392	1.400	Open Manhole	1200
19.002	o	225	F63	52.903	50.648	2.030	Open Manhole	1200
15.008	o	225	F64	52.584	49.740	2.619	Open Manhole	1200
15.009	o	225	F65	52.494	49.679	2.590	Open Manhole	1200
21.000	o	150	F66	53.631	52.081	1.400	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
16.000	25.750	56.6	F53	52.699	50.760	1.789	Open Manhole	1200
15.003	29.045	200.3	F55	52.700	50.615	1.860	Open Manhole	1200
17.000	43.313	99.6	F55	52.700	50.615	1.935	Open Manhole	1200
15.004	12.897	201.5	F56	52.604	50.551	1.828	Open Manhole	1200
15.005	6.189	199.6	F57	52.598	50.520	1.853	Open Manhole	1200
15.006	49.144	199.8	F59	52.664	50.274	2.165	Open Manhole	1200
18.000	62.730	60.0	F59	52.664	50.066	2.448	Open Manhole	1200
15.007	65.148	199.8	F64	52.584	49.740	2.619	Open Manhole	1200
19.000	21.195	49.3	F61	52.857	50.752	1.955	Open Manhole	1200
19.001	9.075	87.3	F63	52.903	50.648	2.105	Open Manhole	1200
20.000	24.858	60.0	F63	52.903	50.978	1.775	Open Manhole	1200
19.002	74.204	200.0	F64	52.584	50.277	2.082	Open Manhole	1200
15.008	12.196	199.9	F65	52.494	49.679	2.590	Open Manhole	1200
15.009	64.742	199.8	F72	53.226	49.355	3.646	Open Manhole	1200
21.000	42.272	149.9	F67	53.450	51.799	1.501	Open Manhole	1200

©1982-2018 Innovyze

PIPELINE SCHEDULES for Foul Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
21.001	o	150	F67	53.450	51.799	1.501	Open Manhole	1200
21.002	o	150	F68	53.431	51.757	1.524	Open Manhole	1200
22.000	o	150	F69	52.955	51.405	1.400	Open Manhole	1200
21.003	o	225	F71	53.299	50.808	2.266	Open Manhole	1200
1.017	o	225	F72	53.226	48.917	4.084	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
21.001	6.258	149.0	F68	53.431	51.757	1.524	Open Manhole	1200
21.002	17.938	149.5	F71	53.299	51.637	1.512	Open Manhole	1200
22.000	35.829	60.0	F71	53.299	50.808	2.341	Open Manhole	1200
21.003	86.018	200.0	F72	53.226	50.378	2.623	Open Manhole	1200
1.017	11.789	199.8	F73	53.200	48.858	4.117	Open Manhole	1200

Free Flowing Outfall Details for Foul Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.017	F73	53.200	48.858	0.000	1200	0

©1982-2018 Innovyze

Appendix C

Irish Water Documents:

- Pre-connection enquiry,
- Irish Water Confirmation of Feasibility,
- MW Memo re. Irish Water consultations,
- Irish Water Statement of design acceptance.

Pre-connection enquiry form

Business developments, mixed use developments, housing developments

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

Please refer to the **Guide to completing the pre-connection enquiry form** on page 13 of this document when completing the form.

*** Denotes mandatory/ required field. Please note, if mandatory fields are not completed the application will be returned.**

Section A | Applicant details

1 *Applicant details:

Registered company name (if applicable): Cumnor Construction Ltd.

Trading name (if applicable):

Company registration number (if applicable): IE0304466

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

*Contact name:

*Postal address: Stoneview, Blarney, Co. Cork

*Eircode:

*Telephone: 0214381104

Mobile:

*Email: cumnor@cumnor.ie

2 Agent details (if applicable):

Contact name: Ian Reilly

Company name (if applicable): Walsh Design Group

Postal address: The Mall, Maryborough Woods, Douglas, Cork

Eircode: T12K8YT

Telephone: 0214774940

Email: ian@wdg.ie

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

Applicant [ ] Agent [X]

Section B | Site details

4 ***Site address:** Coolcarron, Fermoy,
Co. Cork

5 ***Irish Grid co-ordinates of site:** Eastings (X) 182179 Northings (Y) 97396

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

6 ***Local Authority:**

Local Authority that granted planning permission (if applicable):

Cork County Council

7 ***Has full planning permission been granted?** Yes [ ] No [X]

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

Section C | Development details

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

Property type	Number of units	Property type	Number of units	Property type	Number of units
House	374	Apartments		Agricultural	
Office		School		Retail unit	
Residential care home		Institution		Industrial unit	
Hotel		Factory		Other	1
Other (please specify type)	Creche				

9 *Approximate start date of proposed development: 0 4 / 0 8 / 2 0 2 0

10 *Is the development multi-phased? Yes [X] No [ ]

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

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

11 *Please indicate the type of connection required by ticking the appropriate box below:

Water [ ] Please go to Section D

Wastewater [ ] Please go to Section E

Both [X] Please complete both Sections D and E

See Notes page attached for breakdown of the 8no. proposed development phases

Section D | Water connection and demand details

12 ***Is there an existing connection to public water mains at the site?** Yes [ ] No [X]

12.1 If yes, is this enquiry for an additional connection to one already installed? Yes [ ] No [ ]

12.2 If yes, is this enquiry to increase the size of an existing connection? Yes [ ] No [ ]

13 **Approximate date water connection is required:** 01 / 09 / 2020

14 ***What diameter of water connection is required to service the development?** 200 mm

15 ***Is more than one connection required to the public infrastructure to service this development?** Yes [ ] No [X]

If 'Yes', how many? [ ]

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

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

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

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

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

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

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

57.40 m

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

55.85 m

20 **Is on-site water storage being provided?** Yes [ ] No [X]

Please include calculations on the attached sheet provided.

21 **Are there fire flow requirements?** Yes [X] No [ ]

Additional fire flow requirements over and above those identified in Q16-17	8	**l/s**

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

22 **Do you propose to supplement your potable water supply from other sources?** Yes [ ] No [X]

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

Section E | Wastewater connection and discharge details

23 ***Is there an existing connection to a public sewer at the site?** Yes [ ] No [X]

23.1 If yes, is this enquiry for an additional connection to the one already installed? Yes [ ] No [ ]

23.2 If yes, is this enquiry to increase the size of an existing connection? Yes [ ] No [ ]

24 ***Approximate date that wastewater connection is required:** 02 / 11 / 2020

25 ***What diameter of wastewater connection is required to service the development?** 225 mm

26 ***Is more than one connection required to the public infrastructure to service this development?** Yes [ ] No [X]

If 'Yes', how many? [ ]

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

Post-development peak discharge		**l/s**
Post-development average discharge	0.035	**l/s**

Please include calculations on the attached sheet provided.

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

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

Please include calculations on the attached sheet provided.

29 Wastewater organic load:

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

Temperature range	
pH range	

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

Yes [ ] No [X]

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

31 *Do you propose to pump the wastewater? Yes [X] No [ ]

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

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

Exact connection point of rising main to IW sewer is to be agreed with IW

[ ] m

33 What is the lowest finished floor level on site above Malin Head Ordnance Datum? [5][2].[2][5] m

34 What is the proposed invert level of the pipe exiting the property to the public road?

The pipe exiting the property to the public road will be a rising main. Ground level at this point is 57.40m

[ ] m

Section F | Supporting documentation

Please provide the following additional information (all mandatory):

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

i. The scale shall be clearly indicated on the map.

ii. The boundaries shall be delineated in red.

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

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

> Calculations (calculation sheets provided below). [X]

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

> Conceptual design of the connection asset from the proposed development to the existing Irish Water infrastructure, including service conflicts, gradients, pipe sizes and invert levels. [X]

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

Section G | Declaration

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

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

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

I/We have enclosed all the necessary supporting documentation.

Any personal data you provide will be stored and processed by Irish Water and may be transferred to third parties for the purposes of the water and/or wastewater connection process. I hereby give consent to Irish Water to store and process my personal data and to transfer my personal data to third parties, if required, for the purposes of the connection process.

If you wish to revoke consent at any time or wish to see Irish Water's full Data Protection Notice, please see **https://www.water.ie/privacy-notice/**

Signature: [ ] Date: 0 3 / 0 1 / 2 0 2 0

Your full name (in BLOCK CAPITALS):

I A N R E I L L Y

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

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

Irish Water
PO Box 860
South City Delivery Office
Cork City

Please note that if you are sending us your application form and any associated documentation by email, the maximum file size that we can receive in any one email is 35MB.

Please note, if mandatory fields are not completed the application will be returned.

Irish Water is subject to the provisions of the Freedom of Information Act 2014 ("FOIA") and the codes of practice issued under FOIA as may be amended, updated or replaced from time to time. The FOIA enables members of the public to obtain access to records held by public bodies subject to certain exemptions such as where the requested records may not be released, for example to protect another individual's privacy rights or to protect commercially sensitive information. Please clearly label any document or part thereof which contains commercially sensitive information. Irish Water accepts no responsibility for any loss or damage arising as a result of its processing of freedom of information requests.

Calculations

Water demand

On-site storage

Fire flow requirements

Local Authority Guidelines advise that flow rates required should be taken from the Water UK: 'National Guidelines Document on the Provision of water for Fire Fighting'.
In Appendix 6, Section 1 advises that, for a housing development as proposed, the water supply should be capable of delivering a minimum of 8 l/sec through any single hydrant.

Creche

Ref: Code of Practice for Wastewater Infrastructure - Connections and Developer Services - IW-CDS-5030-03 - December 2017 (Revision 1)

Appendix D - Wastewater Flow Rates for Design

School - Non-residential without a canteen = 50 litres/person/day
51 children & 10 Staff

61 x 50 = 3050 litres/day = 0.035 litres/sec average discharge

A conventional gravity sewer network is proposed within the development which will fall to a pumping station at the location shown in WDG drawing no. 19047-P-002. This pumping station will be a Type 3 pumping station designed in accordance with Irish Water specifications. The ground level at the pumping station will be 52.00m and the invert level of the incoming pipe from the gravity network will be approximately 47.90m.

It is proposed to pump the wastewater from the development's pumping station, via rising main, to the existing Irish Water infrastructure under the main R639 Road to the Northwest of the development site. The exact location of the connection point is to be agreed with Irish Water. The ground level on the R639 at the proposed development entrance is 57.40m.

Notes

PROPOSED PHASING (374 Dwellings & 1 Creche)

Phase 1 - 53no. Houses
Phase 2 - 65no. Houses
Phase 3 - 27no. Houses & 1no. Creche
Phase 4 - 52no. Houses
Phase 5 - 33no. Apartments
Phase 6 - 39no. Apartments & 13no. Houses
Phase 7 - 24no. Apartments & 13no. Houses
Phase 8 - 41no. Apartments & 14no. Houses

Ian Reilly

The Mall
Maryborough Woods
Douglas
Cork
T12K8YT

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

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

www.water.ie

18 January 2021

Re: CDS20000034 pre-connection enquiry - Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 375 unit(s) at Coolcarron, Fermoy, Co. Cork

Dear Sir/Madam,

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

SERVICE	**OUTCOME OF PRE-CONNECTION ENQUIRY** **THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.**
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	Connection can be made to the 150mm watermain at the entrance to the site
Wastewater Connection	In order to accommodate the proposed connection at the Premises, upgrade works are required to increase the capacity of Fermoy wastewater treatment plant. Irish Water does not currently have any plans to carry out the works required to provide the necessary upgrade and capacity. Should you wish to have such upgrade works progressed, Irish Water will require you to provide a contribution of a relevant portion of the costs for the required upgrades, please contact Irish Water to discuss this further.

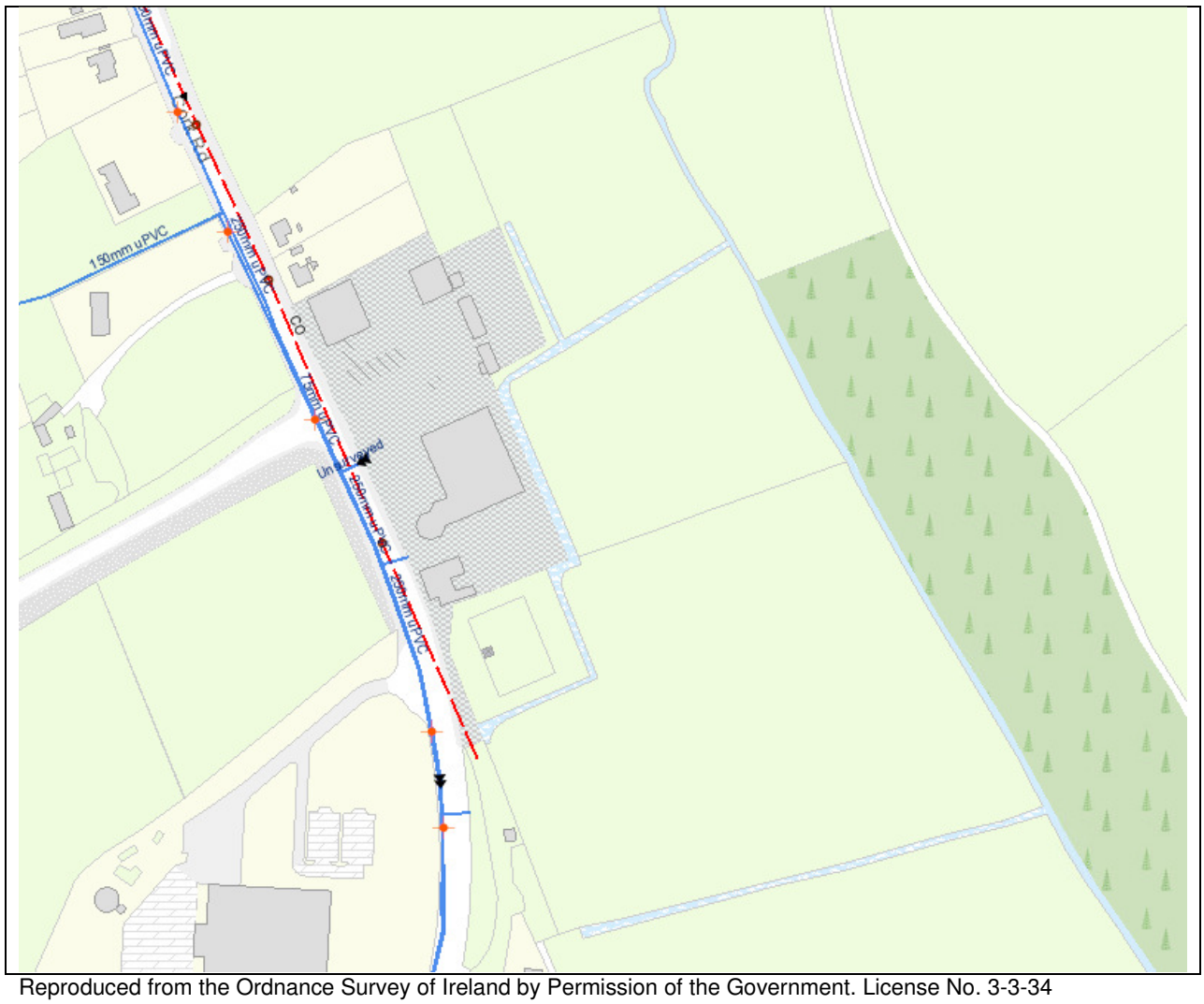
Stiúrthóirí / Directors: Cathal Marley (Chairman), Niall Gleeson, Eamon Gallen, Yvonne Harris, Brendan Murphy, Maria O'Dwyer
Oifig Chláraithe / Registered Office: Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86 / Colvill House, 24-26 Talbot Street, Dublin 1, D01 NP86
Is cuideachta ghníomhaíochta ainmnithe atá faoi theorainn scaireanna é Uisce Éireann / Irish Water is a designated activity company, limited by shares.
Uimhir Chláraithe in Éirinn / Registered in Ireland No.: 530363

IW-HP-BUS

REV012

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

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



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

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

Strategic Housing Development

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

A. In advance of submitting your full application to An Bord Pleanala for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services. Please submit your design to CDSDesignQA@water.ie

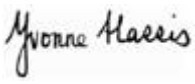
B. In advance of submitting this development to An Bord Pleanala for full assessment, the Developer is required to have entered into a Project Works Services Agreement to deliver infrastructure upgrades to facilitate the connection of the development to Irish Water infrastructure.

General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**
2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.
3) The feedback provided is subject to a Connection Agreement/contract being signed at a later date.
4) A Connection Agreement will be required to commencing the connection works associated with the enquiry this can be applied for at https://www.water.ie/connections/get-connected/
5) A Connection Agreement cannot be issued until all statutory approvals are successfully in place.
6) Irish Water Connection Policy/ Charges can be found at https://www.water.ie/connections/information/connection-charges/
7) Please note the Confirmation of Feasibility does not extend to your fire flow requirements.
8) Irish Water is not responsible for the management or disposal of storm water or ground waters. You are advised to contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges
9) To access Irish Water Maps email datarequests@water.ie
10) All works to the Irish Water infrastructure, including works in the Public Space, shall have to be carried out by Irish Water.

If you have any further questions, please contact Brian O'Mahony from the design team on 022 52205 or email bomahony@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations

Head Office
The Mall
Maryborough Woods
Douglas
Cork, T12 K8YT
(021) 477 4940
www.wdg.ie
reception@wdg.ie

Dublin Office
Unit 111, Q House
76 Furze Road
Sandyford
Dublin 18, D18 PF29
(01) 524 0191
www.wdg.ie
reception@wdg.ie

Memo

Date: 3rd March 2022

Project No: WDG 19074

Project Description: SHD Planning Application Coolcarron Fermoy Co. Cork

Throughout 2020 and 2021 I had been in regular contact with Brian O'Mahony and Tadhg Coffey to discuss the perceived capacity Issues with the WWTP at Fermoy. A Teams meeting was held to discuss the Capacity issues on 14th January 2021. Following this meeting Brian O' Mahony wrote to the writer explaining that the Fermoy WWTP was constructed with a capacity of 22,000PE but was currently operating with a design capacity of 11,000 PE. He advised that the existing plant had an available capacity of 975 PE which equated to circa 357 houses. However, he advised that there was another permitted development for 100 houses in Fermoy and accordingly there was only capacity for 257 houses from our development. It was suggested that in order to construct the full planned development it would be necessary for the developer to enter into a Public Works Service Agreement (PWSA) with Irish water for the expansion of the existing WWTP facilities at Fermoy. MW wrote to Tadhg Coffey and Brian O' Mahony on 12th October asking whether IW would be in apposition to issue Statement of Design Acceptance and subsequent Connection Agreement for circa 300 units if the developer proceeded with an application for this reduced number of units.

Following this query Tadgh Coffey of Irish Water phoned the writer in December 2021 and advised that IW had by then completed a revised study of available capacity and were now satisfied that they would be in a position to provide capacity for the full planned development of 336 units plus Creche. He advised that IW were satisfied at that time that the necessary capacity could be made available following modest upgrades which could be carried out by Irish Water from their own resources and that A PWSA would not now be required. It was agreed that it was appropriate for WDG to apply for a Statement of Design Acceptance for the full development. This application was lodged on 6th January 2022 and the statement of Design Acceptance for the full development was issued on 18th February 2022.

Michael Walsh BE CENG MIEI

On Behalf of Walsh Design Group

Reg. No: 476845. Walsh Design Group is a registered trading name of Browne Asset Solutions Ltd
Registered Office: The Mall, Maryborough Woods, Douglas, Co. Cork. T12 K8YT
Directors: Michael Walsh, Jamie Wallace, Patrick Beckett

QUALITY ISO 9001:2015 NSAI Certified

Ian Reilly
Walsh Design Group, The Mall
Maryborough Woods
Douglas
Cork T12K8YT

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

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

www.water.ie

18 February 2022

Re: Design Submission for Coolcarron, Fermoy, Co. Cork (the "Development") (the "Design Submission") / Connection Reference No: CDS20000034

Dear Ian Reilly,

Many thanks for your recent Design Submission.

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

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

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

If you have any further questions, please contact your Irish Water representative:
Name: Adrian Roberts
Email: adrian.roberts@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

- **19074-P-002-1 REV: C**
- **19074-P-002-2 REV: C**
- **19074-P-002-3 REV: B**
- **19074-P-003-1 REV: D**
- **19074-P-003-2 REV: D**
- **19074-P-302-1 REV: C**
- **19074-P-302-2 REV: C**
- **19074-P-302-3 REV: C**
- **19074-P-302-4 REV: C**
- **19074-P-302-5 REV: B**
- **19074-P-501 REV: A**
- **19074-P-502 REV: A**
- **19074-P-503 REV: A**
- **19074-P-505 REV: A**
- **19074-P-900 REV: A**

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

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

Stiúrthóirí / Directors: Cathal Marley (Chairman), Niall Gleeson, Eamon Gallen, Yvonne Harris, Brendan Murphy, Dawn O'Driscoll, Maria O'Dwyer
Oifig Chláraithe / Registered Office: Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86 / Colvill House, 24-26 Talbot Street, Dublin 1 D01 NP86
Is cuideachta ghníomhaíochta ainmnithe atá faoi theorainn scaireanna é Uisce Éireann / Irish Water is a designated activity company, limited by shares.
Uimhir Chláraithe in Éirinn / Registered in Ireland No.: 530363

Appendix D

ESB Networks – Original Underground Services map,
ESB Networks – Diversion Map,
ESB Networks – Letter of Agreement,
ESB Networks – Drawing - Typical Structures for 38kV lines,
ESB Networks – Drawing – Sealing Ends

Gas Networks Ireland - Underground Services map.

ESB Networks

TITLE: 20190912-020_A3

COLOUR CODE:

- BLACK - 38KV & HIGHER VOLTAGE OVERHEAD LINES
- GREEN - MV(10KV/20KV) OVERHEAD LINES
- BLUE - LV (400V/230V) OVERHEAD LINES
- CYAN - 38KV & HIGHER VOLTAGE UNDERGROUND CABLE ROUTES
- RED - MV/LV (10KV/20KV/400V/230V) UNDERGROUND CABLE ROUTES

DATE: 12-Sep-2019

** SCALE: 1:2500

** SCALE WHEN PRINTED ON AN A3 PAGE
XY COORDINATES DISPLAYED IN IRISH GRID COORDINATE SYSTEM

Maps reproduced by permission: Ordnance Survey Ireland Licence No. EN0023715-19, Copyright Ordnance Survey Ireland Government of Ireland

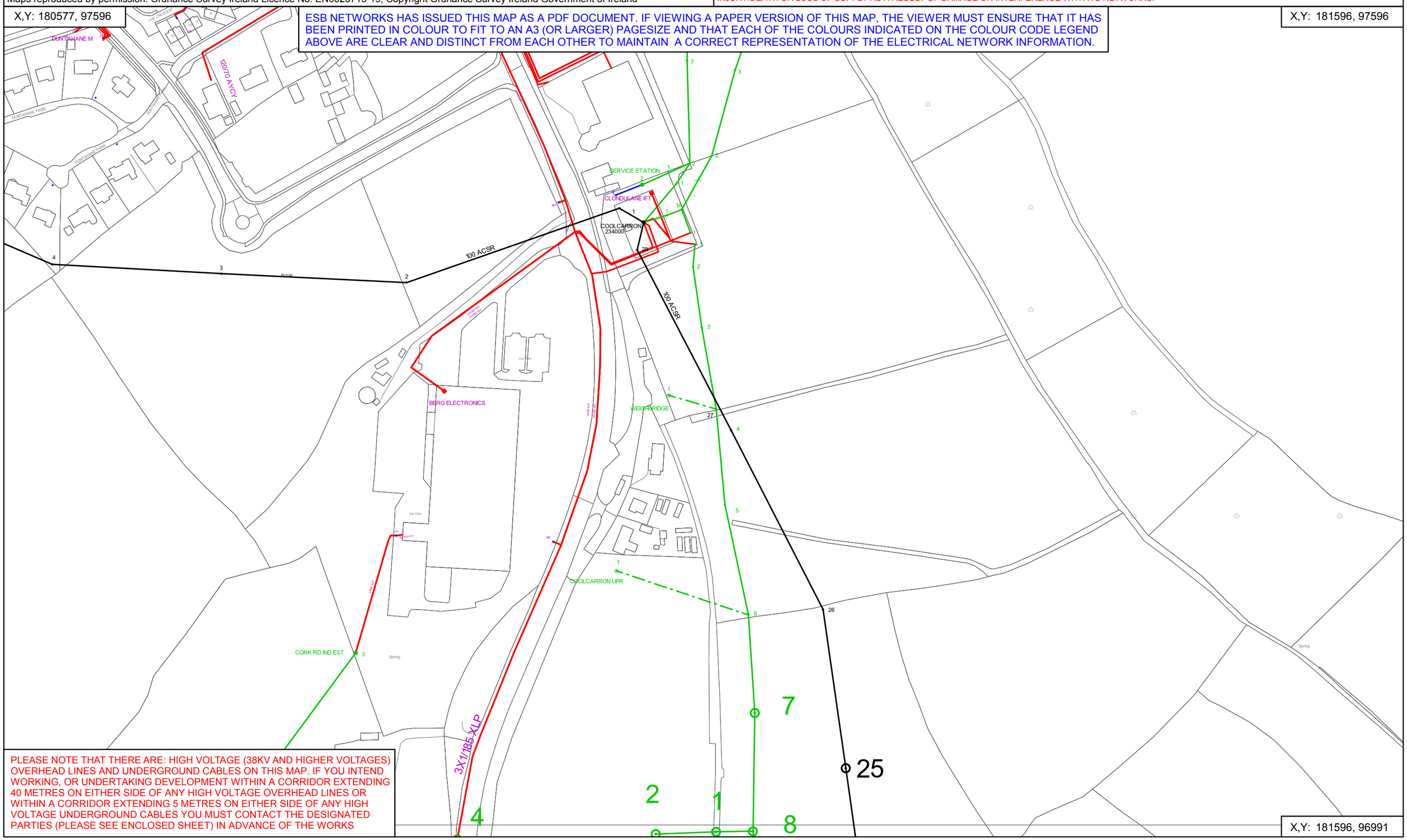
WARNING

THIS MAP INDICATES THE APPROXIMATE LOCATION OF ESB TRANSMISSION (400KV, 220KV, 110KV, 38KV) AND DISTRIBUTION (20KV, 10KV, 230V/400V) UNDERGROUND CABLES AND OVERHEAD LINES IN THE GENERAL AREA OF THE PROPOSED WORKS. ESB NETWORKS TAKES NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THE MAP. IT IS THE USER'S RESPONSIBILITY TO INDEPENDENTLY VERIFY THE INFORMATION AND THE LOCATION OF UNDERGROUND CABLES AND OVERHEAD LINES. LOW VOLTAGE (230V/400V) SERVICE CABLES (E.G. HOUSE SERVICES, FACTORY/SHOP SERVICES, PUBLIC LIGHTING LAMP SERVICES, ETC) ARE NOT INCLUDED BUT THEIR PRESENCE SHOULD BE ANTICIPATED. THE DEPTHS OF UNDERGROUND CABLES MUST NEVER BE ASSUMED. ADDITIONAL MORE DETAILED INFORMATION IS AVAILABLE FOR HIGH VOLTAGE TRANSMISSION UNDERGROUND CABLES (38KV, 110KV, 220KV, 400KV) FROM THE LOCAL ESB NETWORKS TRANSMISSION REPRESENTATIVE - SEE ATTACHED LIST FOR CONTACT DETAILS OR CALL 1850 372 757. NO WORK SHOULD BE CARRIED OUT IN THE VICINITY OF 38KV OR HIGHER VOLTAGE UNDERGROUND CABLES WITHOUT PRIOR CONSULTATION WITH ESB NETWORKS. BEFORE ANY MECHANICAL EXCAVATION IS UNDERTAKEN, THE ACTUAL LOCATION OF ALL UNDERGROUND ELECTRICITY CABLES MUST BE ESTABLISHED AND VERIFIED ON THE SITE USING: (A) UP-TO-DATE MAP RECORDS; (B) CABLE LOCATER EQUIPMENT OPERATED IN BOTH POWER AND RADIO MODES; (C) CAREFUL HAND DIGGING OF TRIAL HOLES USING 'SAFE DIGGING PRACTICE'. REFER ALSO TO 'HSA CODE OF PRACTICE FOR AVOIDING DANGER FROM UNDERGROUND SERVICES'. ESB TAKES NO RESPONSIBILITY FOR AND SHALL BEAR NO LIABILITY, HOWSOEVER ARISING, IN RELATION TO ANY DAMAGE, INJURY/DEATH OR LOSS OF SUPPLY AS A RESULT OF DAMAGE OR INTERFERENCE WITH ITS NETWORKS.

X,Y: 180577, 97596

ESB NETWORKS HAS ISSUED THIS MAP AS A PDF DOCUMENT. IF VIEWING A PAPER VERSION OF THIS MAP, THE VIEWER MUST ENSURE THAT IT HAS BEEN PRINTED IN COLOUR TO FIT TO AN A3 (OR LARGER) PAGESIZE AND THAT EACH OF THE COLOURS INDICATED ON THE COLOUR CODE LEGEND ABOVE ARE CLEAR AND DISTINCT FROM EACH OTHER TO MAINTAIN A CORRECT REPRESENTATION OF THE ELECTRICAL NETWORK INFORMATION.

X,Y: 181596, 97596



PLEASE NOTE THAT THERE ARE: HIGH VOLTAGE (38KV AND HIGHER VOLTAGES) OVERHEAD LINES AND UNDERGROUND CABLES ON THIS MAP. IF YOU INTEND WORKING, OR UNDERTAKING DEVELOPMENT WITHIN A CORRIDOR EXTENDING 40 METRES ON EITHER SIDE OF ANY HIGH VOLTAGE OVERHEAD LINES OR WITHIN A CORRIDOR EXTENDING 5 METRES ON EITHER SIDE OF ANY HIGH VOLTAGE UNDERGROUND CABLES YOU MUST CONTACT THE DESIGNATED PARTIES (PLEASE SEE ENCLOSED SHEET) IN ADVANCE OF THE WORKS

X,Y: 181596, 96991

X,Y: 181463 , 97525

PROPOSED 38kV CABLE SEALING ENDS

TYPE "F"

100 ACSR

100 ACSR

PROPOSED 38kV UNDERGROUND CABLE ROUTE

Car Park

PROPOSED RETIRMENT OF
OVERHEAD CONDUCTORS & MAST & POLES

TYPE "B"

Car Park

PROPOSED REALIGNMENT OF 13.60 METRES OF OVERHEAD CONDUCTORS
TO PROPOSED TYPE "F" STEEL 12 METRE MAST STRUCTURE

TYPE "C"

Spring

X,Y: 180851 , 97098

NOTE: STRUCTURE SYMBOLS ARE NOT TO SCALE

LEGEND

- Existing 38kV MV overhead lines
- New underground cable route
- New type "F" 12m steel mast structure
- New 38kV cable sealing ends
- Realignment of overhead conductors
- Retirement of overhead conductors
- Retirement of type "F" steel mast structure
- Retirement of type "B" & "C" portal sets

Note :To be read with attached
1.Drawing number PG567-D020-213-001-001
2.Drawing number PG406-D038-010-001-001

ESB Networks

SCALE: 1:1500 @ A3

MAP NUMBER: 5959-C

TOWNLAND: Coolcarron

COUNTY: Cork

PROJECT NAME:PROPOSED BARRYMORE-COOLCARRON 38kV LINE DIVERSION

Maps reproduced by permission:
Ordnance Survey Ireland Licence No. EN0092320
Copyright Ordnance Survey Ireland Government of Ireland

NETWORKS

esbnetworks.ie

Wilton, Corcaigh, Éire
Fón 1850 372 757

Wilton, Cork, Ireland
Phone 1850 372 757

21 February 2022

Mr. Ian Reilly
Walsh Design Group'
The Mall,
Maryborough woods,
Douglas,
Cork.
T12 K8YT

Your Ref: Proposed residential development at Coolcarron, Fermoy , Co. Cork
Our Ref: Proposed line diversion on Barrymore-Coolcarron 38Kv line

WITHOUT PREJUDICE

Dear Ian,

Thank you for your application for an alteration to our network at the above location. Based upon drawing numbers 19074-P-001-1 and 19074-P-001-2,19074-P-305 provided by you to Electricity Supply Board Networks, (ESBN) will agree to carry out the requested changes to the distribution network (see attached map and 38Kv outline of typical structures of lattice steel mast Type "F" drawing number PG567-D020-213-001-001 and 38kV cable sealing ends Drawing number PG406-D038-010-001-001) subject to acceptance of Terms and conditions.

I have discussed with Mr. Ian Reilly the safety issues arising from the proximity of the 38kV overhead electricity line to the proposed development.

ESBN has no problem in altering the overhead line to facilitate the construction of the development and Mr. Ian Reilly has agreed to cooperate fully with the ESB to achieve this.

The ESB does not have an issue with work commencing on the site prior to the 38kV line being altered once the precautions outlined in the safety literature and agreed by Mr. Ian Reilly and myself are implemented.

I will be working closely with Mr. Ian Reilly and his contractor on an ongoing basis.

If you require further information or if I can be of assistance in any way regarding this matter, please do not hesitate in contacting me.

Yours sincerely,

Pat Harrington

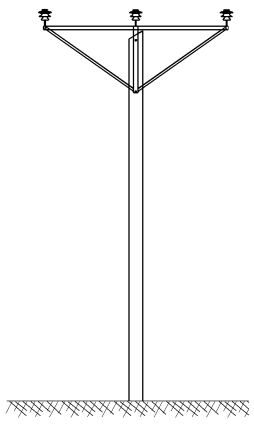
Pat Harrington
Engineering Officer
Network Projects South
ESB
Sarsfield Road
Wilton
Cork
Phone: 021-4844205

Type "A" Single Pole Intermediate Structure

Single wood pole with 4m steel crossarm holding conductors horizontally 2m apart.

Pole lengths from 12m to 16m incl. buried depth 2.3m.

Maximum conductor height overground 14.1m.



Type "B" Portal Suspension & Portal Strain Structures

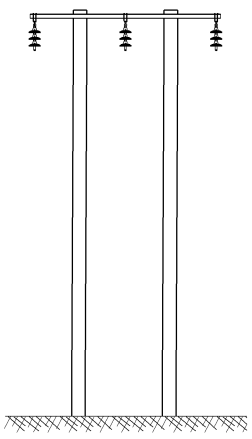
Two wood poles, 2m apart with a 4m steel crossarm holding conductors horizontally 2m apart.

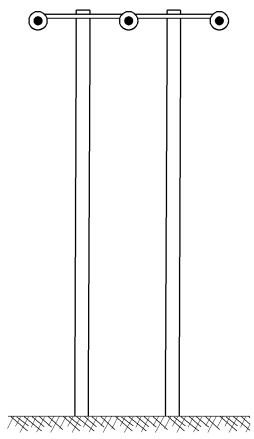
Insulator chain may be vertical or horizontal.

Pole lengths from 12m to 20m incl. buried depth 2.3m.

Maximum conductor height overground 17.2m.

Poles can also be 3m apart with a 6m steel crossarm holding conductors horizontally 3m apart.





Type "C" Light Angle Suspension & Light Angle Strain Structures

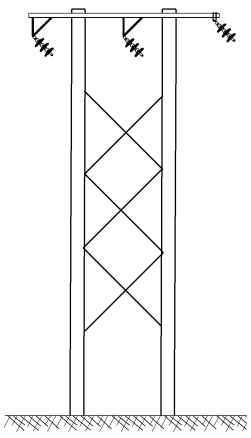
Two wood poles, 2m apart with a 4m steel crossarm holding conductors horizontally 2m apart.

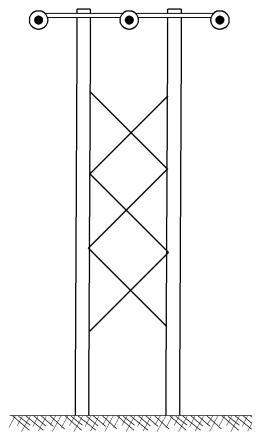
Insulator chain may be in suspension or horizontal.

Pole lengths from 12m to 16m incl. buried depth 2.3m.

Maximum conductor height overground 13.2m.

Line can deviate by 20deg. with up to 3 sets of cross bracings.





Type "D" Heavy Angle Portal Structure

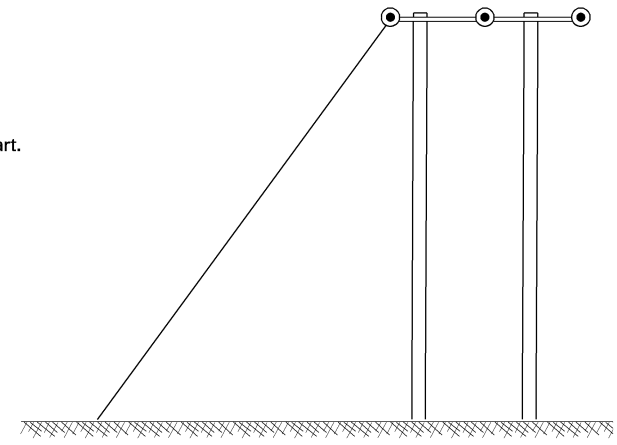
Two wood poles, 2.5m apart with a 4m steel crossarm holding conductors horizontally 2m apart.

Insulator chain is horizontal.

Pole lengths from 12m to 16m incl. buried depth 2.3m.

Maximum conductor height overground 13.6m.

Line can deviate by 60deg. with two staywires extending from the crossarm at 45deg.



Type "E" Three-Pole Structure

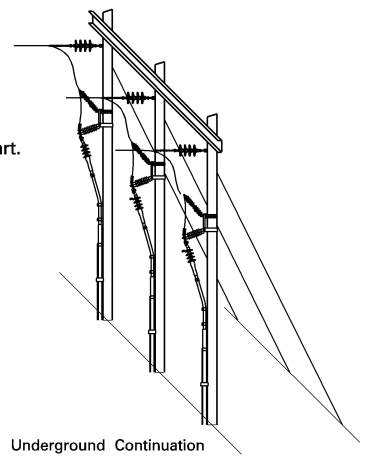
Three wood poles, 2m apart with a 4m steel crossarm holding conductors horizontally 2m apart.

Insulator chain is horizontal.

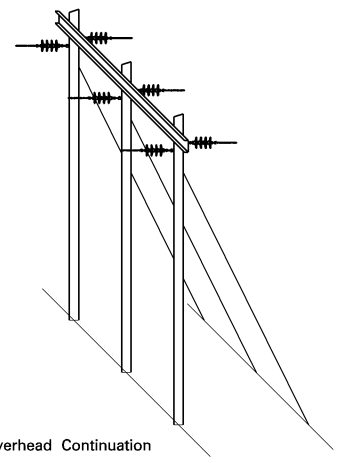
Pole lengths from 12m to 16m incl. buried depth 2.3m.

Maximum conductor height overground 13.4m

Three staywires, (one on each pole) extend from pole tops at 45deg.



Underground Continuation



Overhead Continuation

Type "F" Lattice steel mast Structure.

Base buried depth 2.3m. in concrete.

Maximum conductor height overground 9, 12 or 15m.

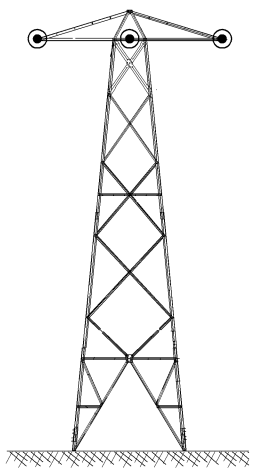
Corresponding base footprint 2.4, 2.8, or 3.2m.

Mast apex can be up to 1m over conductor height depending on manufacture.

4m crossarm with horizontal Insulator chain holding conductors 2m apart

Bracing shown may change depending on manufacture.

Can be used as an End mast to terminate a line, or used as an Angle mast to allow up to a 60deg. deviation in the line.



FOR SCALED 1:100 DRAWINGS,
SEE Shts 002-007

Copyright ESB International Ltd All rights reserved. No part of this work may be modified or reproduced or copied in any form or by any means - graphic, electronic or mechanical, including photocopying, recording, taping or information-and-retrieval system, or used for any purpose other than its designated purpose, without the written permission of ESB International Ltd.

Drawn EBL	Produced E.Lawlor	Verified J.Eustace	Approved P.Ennis
Client Ref	TC205748	No. of Shts 10	Size A3
Drawing Number	PG567-D020-213-001-001	SHEET	REV

Approved date 29/08/08

Scale N/A

Production Unit High Voltage Engineering

Drawing Title
38kV LINES /PLANNING APPLICATION
OUTLINE OF TYPICAL STRUCTURES
SINGLE PHASE RACOON & MULBERRY CONDUCTORS

Client

Project GENERIC LINES DOCUMENTS

Contract N/A

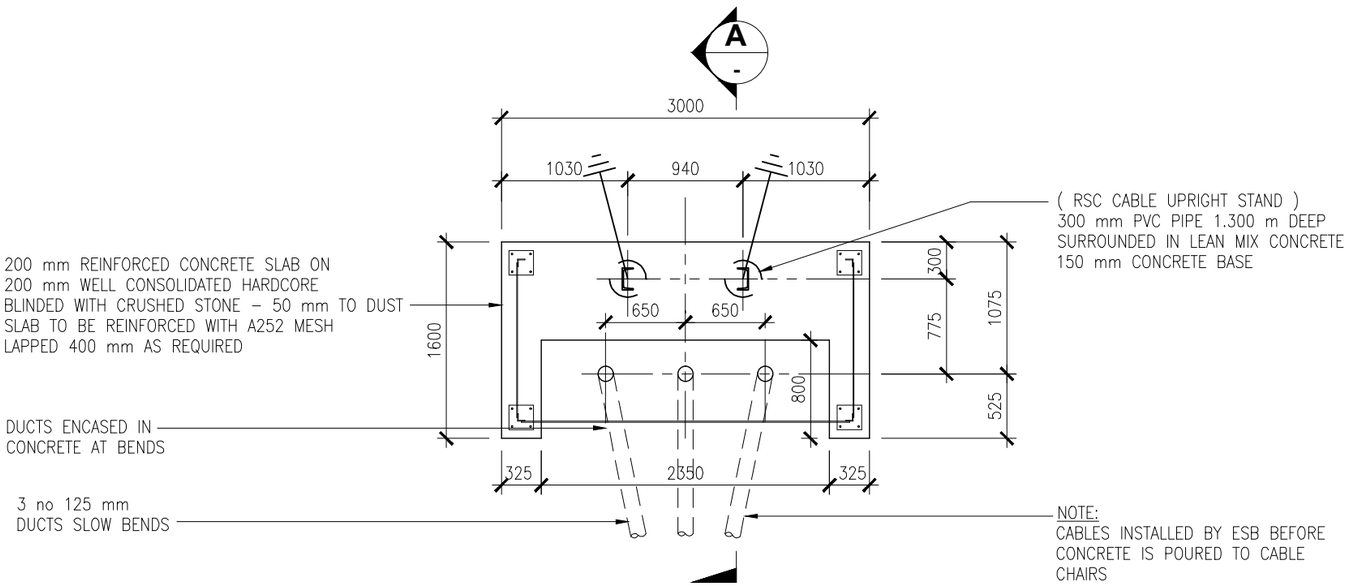
ESB International
ESBI Engineering & Facility Management Ltd
Stephen Court, 18-21 St Stephen's Green, Dublin 2 Ireland
Telephone + 353-1-703 8000 Fax + 353-1-661-5359
www.esbi.ie
Registered Office as above
Registered in Ireland No. 155249

Rev	Revision Description
1	STRUCTURE TYPE "E" ADDED
0	IMPORTED FROM ESB NETWORKS AT REV 0

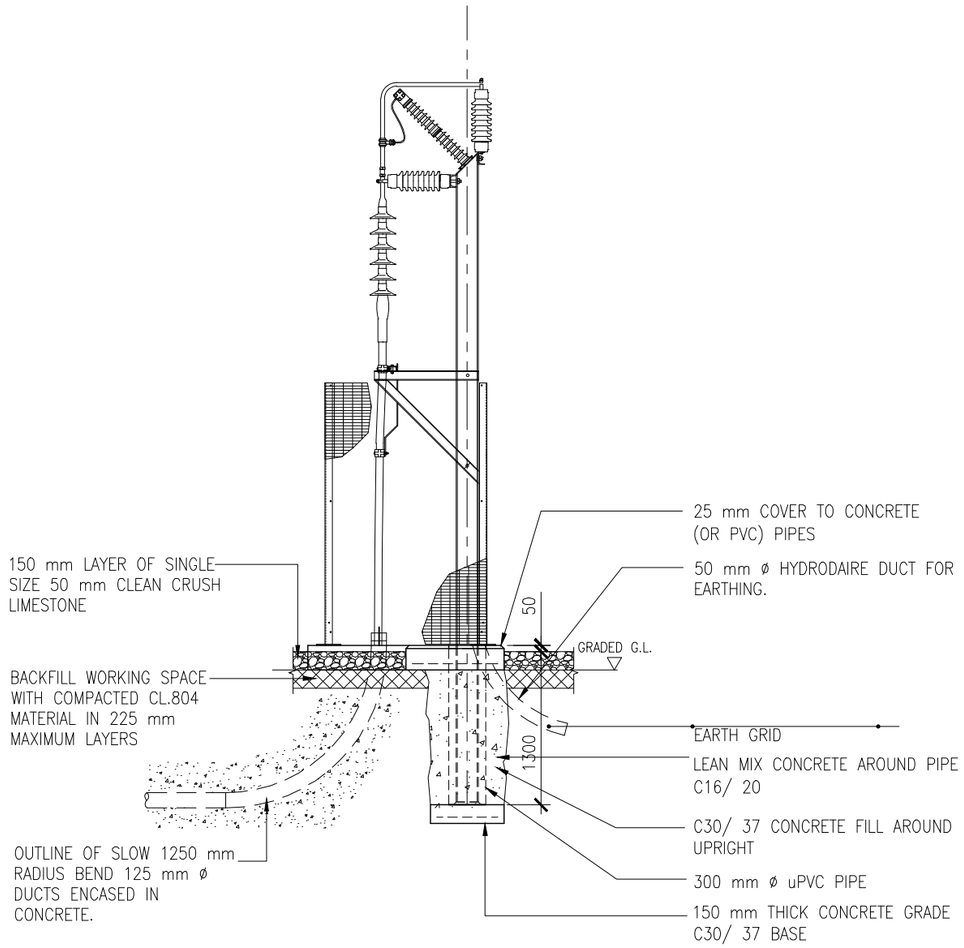
Purpose of issue - Preliminary unless indicated
Tender ☐ Client Approval ☑ Construction ☐ As-built ☐ Revised ☐

A3 CAD

Business Form No. BF-DRG-005-007-002



PLAN OF PLINTH
SCALE 1:50



SECTION A-
SCALE 1:50

NOT FOR CONSTRUCTION USE, DESIGN RECORD ONLY. CONSULT WITH STANDARD SUBSTATION DESIGN TEAM FOR LATEST DESIGN REQUIREMENTS.

REFER TO SITE SPECIFIC DUCTING LAYOUT FOR DUCT ROUTES

Rev.	Date	Revision description	Drn.	Prod.	Ver. C	Ver. E	App
1	FEB'18	ISSUED FOR TENDER	MK				
0	AUG'13	ISSUED FOR TENDER	ROT	MP	JD	AB	CT

Purpose of issue - Preliminary unless indicated

Tender [X] Client approval [ ] Construction [ ] As-built [ ] Revised [ ]

ESB INTERNATIONAL

One Dublin Airport Central,
Dublin Airport, Cloghran, Co. Dublin

Tel: 353 1 703 8000 Email: marketing@esbi.ie
Web: www.esbinternational.ie

ESB International is a trading name of
ESBI Engineering & Facility Management Ltd.

Registered Office: as above
Registered in Ireland No. 155249

Client ESB NETWORKS

Project 38 kV & MV Standard Civil Drawings

Contract

Drawing title
38 kV & MV STANDARD CIVIL DRAWINGS
38 kV CABLE SEALING ENDS (3 PHASE)

BASE TYPE PU2

Production unit Civil Building and Environmental

COPYRIGHT © ESBI ENGINEERING & FACILITY MANAGEMENT LIMITED.
All rights reserved. No part of this work may be modified or reproduced or copied in any form or by any means - graphic, electronic or mechanical, including photocopying, recording, taping or information-and-retrieval system, or used for any purpose other than its designated purpose, without the written permission of ESBI Engineering & Facility Management Ltd.

DRAWN	PRODUCED	VERIFIED 1	VERIFIED 2	APPROVED	APPD DATE
Mark.Kenny	K.Ward	R.Lenihan	B.Perry	C.Twomey	13/02/2018

Client ref.	No. of sheets	Size	Scale
STD.07	1	A3	As Shown

Drawing number PG406-D038-010-001-001 **Sheet** **Rev**

BF-DRG-013-004-001

d:\bc-workspace\srv_ipm\m-virtapp172s,d-high voltage\drawings\pg406 generic substation engineering docs\038 – 38 kv & mv standard civil drawings\pg406-d038-010-001-001.dwg

This is not an official figure

Important Safety Notice:

Damage to gas pipelines can result in serious injury or death. Gas network information is provided as a general guide. The exact location and depth of medium or low pressure distribution gas pipes must be verified on site by carrying out necessary investigations, including, for example, hand digging trial holes along the route of the pipe.
Service pipes are not generally shown but their presence should always be anticipated.

High pressure transmission pipelines are shown in red. If a transmission pipeline is identified within 10m of any intended excavations then work must not proceed before GNI has been consulted. The true location and depth of a transmission pipeline must be verified on site by a representative of GNI. Contact can be made through 1850 427 747.

All work in the vicinity of the gas network must be completed in accordance with the current edition of the Health & Safety Authority publication, Code of Practice For Avoiding Danger From Underground Services which is available from the Health and Safety Authority (1890 289 389) or can be downloaded at www.hsa.ie.

Legal Notice:

Gas Networks Ireland (GNI) and its affiliates, accept no responsibility for the accuracy of any information contained in this document including data concerning location and technical designation of the gas distribution and transmission network (the Information). The Information should not be relied on for accurate distance or depth of cover measurements.

Any representations and warranties, express or implied, are excluded to the fullest extent permitted by law. No liability shall be accepted for any loss or damage including, without limitation, direct, indirect or consequential loss, arising out of or in connection with the use or re-use of the Information.

- Aurora Telecom Fibre Optic Cable
- Aurora Telecom Duct
- Aurora Telecom Sub-duct
- Aurora Telecom Inserted Gas Pipe

Contact Aurora Telecom on 1850-427-399 or (01)203-0120.

- Transmission Pipe (High Pressure)
- Transmission Pipe (Construction Issue)
- Distribution Pipe (Medium Pressure)
- Distribution Pipe (Low Pressure)
- Service Pipe (Medium Pressure)
- Service Pipe (Low Pressure)
- Strategic Pipe (Medium Pressure)
- Strategic Pipe (Low Pressure)
- Inserted Pipe (Medium Pressure)
- Inserted Pipe (Low Pressure)
- Distribution Pipe (Abandoned)

.C=?	Cover (depth in meters)		Pressure Monitor
CP	CP Test Point		Protection (Sleeve)
	End Cap		Protection (Slabbing)
	Hot Tap		Reducer
	Installation		Service Terminator
	Valve		Tee
	Mains Verification **		Transition

** Please contact GNI on 1850-427747 for specific information.

Design Department - CORK

Gas Networks Ireland

GAS NETWORK INFORMATION

Issue: Walsh Design Group

Location: Coolcarron Fermoy Co Cork

Plot Date:	Contact:
11/09/2019	I Reilly
Plotted by:	Scale:
KOC	1:1000

REPRODUCED FROM THE ORDNANCE SURVEY BY PERMISSION OF THE GOVERNMENT. LICENCE No. 3-3-34