PROPOSED PART 8 RESIDENTIAL DEVELOPMENT
COOLAGHKNOCK GLEBE, KILDARE.

ENGINEERING REPORT

KILDARE COUNTY COUNCIL

May 2024

Project No: 23006

Contents Amendment Record

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Title: **Proposed Part 8 Residential Development – Coolaghknock Glebe, Kildare Engineering Report / Kildare County Council**

Project Number: **23006**

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Revision Record

Issue No.	**Date**	**Description**	**Remark**	**Prepared**	**Checked**	**Approved**
0	13/09/2023	Information	P1	PB	ND	ND
0	23/01/2024	Pre-Planning	P1	PB	ND	ND
1	28/02/2024	Pre-Planning	P1	PB	DW	DW
2	14/03/2024	Pre-Planning	P1	PB	DW	DW
3	08/04/2024	Pre-Planning	P1	PB	DW	DW
4	17/05/2024	Planning	P3	DW	KA	DW

CONTENTS

Page No.

1 INTRODUCTION

1.1 Introduction

This report is prepared on behalf of the NDFA and Kildare County Council to accompany a Part 8 proposal for the residential development on a site with access off Connagh Road, south of Melitta Road in the townland of Coolaghknock Glebe, Kildare, Co. Kildare.

The proposed development includes:

i. 131 no. residential units including 89 no. houses and 42 no. own door apartment / duplex units to be delivered on a phased basis, comprising 42 no. one bed units; 36 no. two bed units; 45 no. three bed units; and 8 no. four bed units; with renewable energy design measures (which may be provided externally) for each housing unit;
ii. Rear garden sheds serving the residential units;
iii. 1 no. crèche facility of 325sqm with potential for community use until such time as crèche becomes viable;
iv. Landscaping works including provision of (a) open space and kick about areas; (b) natural play features; (c) new pedestrian and cycle connections; and (d) attenuation pond;
v. Associated site and infrastructural works, including provision for (a) 2 no. ESB substations and switchrooms; (b) car and bicycle parking; (d) public lighting; (e) bin storage; (f) temporary construction signage; (g) estate signage; and (h) varied site boundary treatment comprising walls and fencing; and
vi. all associated site development works.

The purpose of this document is to describe the engineering proposals associated with the new development. These proposals are indicated on the drawings prepared by Malone O'Regan which accompany the planning submission. Where reference is made to drawings and drawing numbers within this report, these should be taken as meaning those drawings produced by Malone O'Regan unless specifically stated otherwise.

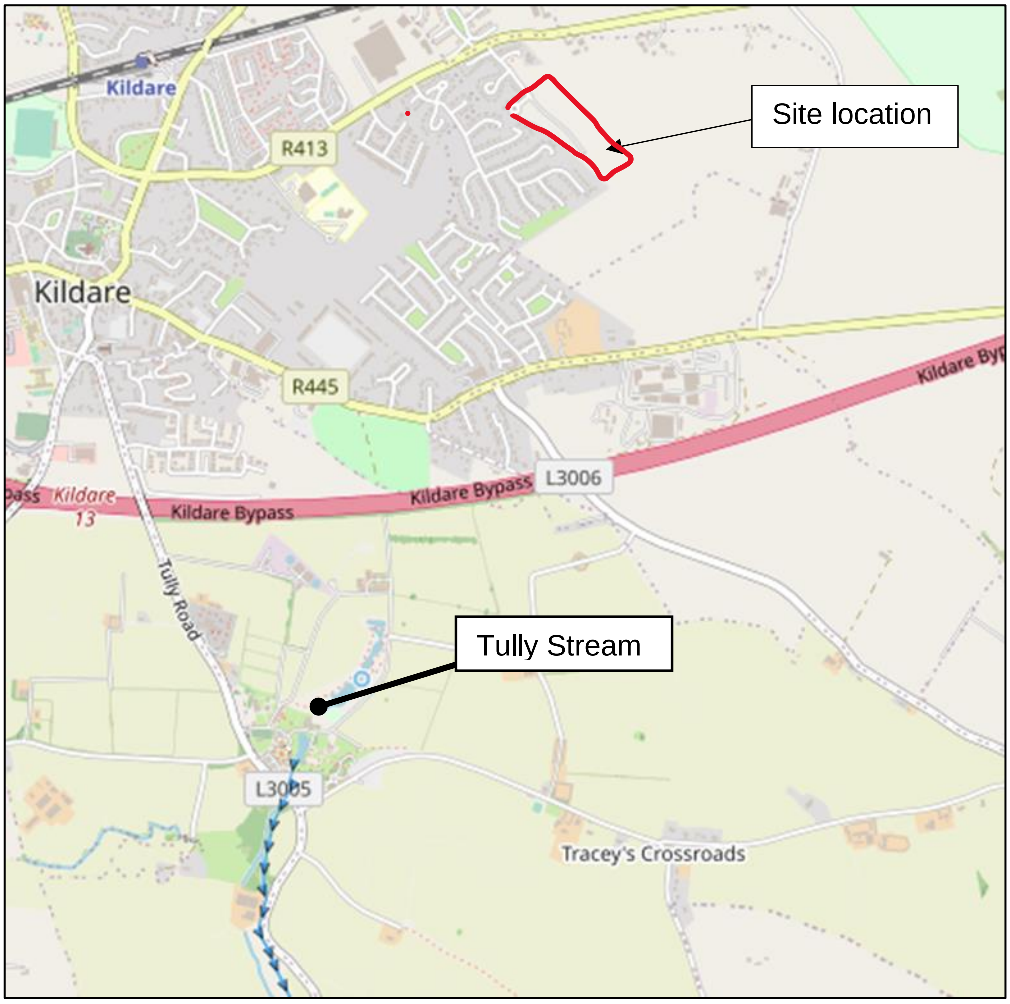


Figure 1.1 – Site location

1.2 Site Description

The location of the proposed development is illustrated in Figure 1.1 above. The site is situated on the outskirts of Kildare town, approximately 1km to the east of the town centre. The new residential development is located beside existing housing estates Curragh Plains and Coolaghknock Drive to the west of the site. The site is accessed via Connagh Road which serves an existing housing development to the northwest and connects with R413 Melitta Road. The site is bound to the south by undeveloped greenfield sites. The R445 Dublin Road is located 650m to the south.

The lands to the east of the site remain largely undeveloped, greenfield sites with some isolated housing leading 0.75km to the Curragh Racecourse lands. Some of these lands are used for agricultural purposes and stables.

Refer to the latest site layout in Figure 1.2 below.

Figure 1.2 – Site Plan

2 SURFACE WATER DRAINAGE DESIGN

2.1 Introduction

This chapter follows the guidelines set out in Greater Dublin Strategic Drainage Study (GDSDS) and the CIRIA 2015 SuDS Manual.

The aim of any SuDS strategy is to ensure that a new development does not negatively affect surrounding watercourse systems, existing surface water networks and groundwater systems. This SuDS strategy will achieve these aims by using a variety of SuDS measures within the site. These measures include water interception, treatment, infiltration and attenuation.

The SuDS strategy will be developed with the following steps:

1. The existing greenfield run-off of the development site will be calculated and used as the minimum benchmark for the SuDS design. This run-off calculation is based on the drained area of the new development. The post development run-off will not exceed the greenfield run-off.
2. A set of SuDS measures will be chosen based on their applicability and usage for the site.
3. A "FLOW" model will be created to analyse the rainfall on the site and the effectiveness of the proposed SuDS measures.
4. If effective, these SuDS measures will be incorporated into the proposed design.

Table 2.1 outlines the parameters adopted in the design of the surface water drainage infrastructure.

Parameter Description	Assigned Value
Surface Water Drainage Pipework Design Return Period	2 years (Ref IS EN 752 Table 2 for 'Domestic')
Attenuation Design Return Period	100 years
Allowance for climate change	20% (Ref. OPW Flood Risk Management Climate Change Sectoral Adaptation Plan, High-End Future Scenario)
M5-60	15mm (Met Eireann data)
M5-2D	53.6mm (Met Eireann data)
Ratio, r	0.28
Time of Entry	4 min
Pipe roughness, Ks	0.6mm (Ref. GDSDS Volume 2, Table 6.4)
Minimum velocity	1.0 m/s (Ref. GDSDS Volume 2, Table 6.4)

Table 2.1 Surface Water Design Parameters

2.2 Existing Services

The Melitta Road R413 is located 0.4km to the north of the site, connecting to the M7 motorway to the southeast of the site. Existing surface water drains run from Melitta Road down into surface water storage tanks located in the centre of the site in a 525mm concrete pipe. These underground drains carry surface water runoff from other catchments for storage and infiltration on the site. This infiltration storage area will be maintained and will not be amended as part of the new development. The new drainage system for the development will be completely separate from the existing system on the site.

2.3 Proposed Services

The proposed surface water drainage system is designed to comply with the 'Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Technical Document – Volume 2, New Developments, 2005' and the 'Greater Dublin Regional Code of Practice for Drainage Works, V6.0 2005'. CIRIA Design Manuals C753, C697 and C609 have also been used to design the surface water drainage system within the site.

The proposed surface water drainage layout for the development is indicated on Malone O'Regan drawings SHB5-CGK-DR-MOR-CS-P3-130, 150 and 151. Surface water runoff from new internal road surfaces, footpaths, other areas of hardstanding and the roofs of buildings will be collected within a gravity drainage network and directed towards an infiltration basin. The infiltration basin has been sized to cater for a 1 in 100-year storm event.

Rainwater collecting in the infiltration basin will be allowed to percolate directly into the underlying soil. Extensive site investigations including a number of 'soakaway' tests have been undertaken on the site to establish that water will be able to percolate into the underlying ground. Further information is provided in Section 2.4.

A number of sustainable drainage systems (SuDS) are proposed in order to minimise the volume and rate of runoff into the infiltration basin. Further details on these SuDS measures are provided in Section 2.5.

All surface water drainage will be designed and installed in accordance with the Greater Dublin Regional Code of Practice for Drainage Works.

The runoff coefficients used in the calculations are as outlined in the table 2.2 below.

Type of Areas	CV
Landscaping (Grass / Soft)	0.2
Permeable Paving	0.5
Impermeable Surface (Incl. tree pits)	0.9
Standard Roof (Impermeable)	0.95

Table 2.2: Runoff Coefficients

Calculations for the surface water drainage network are provided in Appendix B.

2.4 Soil Infiltration Rate

In October 2023, Causeway Geotech Ltd. completed a comprehensive programme of site investigations for the site. These investigations showed that ground conditions were consistent generally across the site. Generally, topsoil varying in depth from 100 to 500mm over made ground. This made ground consists of sandy gravelly clay fill or sandy clayey gravel fill with varying fragments of plastic extending to a depth of 0.3-1.3m. Fluvioglacial deposits consisting of loose to medium dense sands and gravels were encountered across the site becoming denser with depth. Some layers of soft to firm sandy gravelly clay or silt were present becoming stiffer with depth.

3 no. infiltration tests were conducted across the site at locations IT01 to IT03 as indicated in Figure 2.1. The results of these tests varied with IT01 test not yielding any infiltration rate, but the other two tests indicated good percolation with values of 0.03m/hr for IT02 and 0.04m/hr for IT03. The report prepared by Causeway Geotech Ltd. concludes that the site may be suitable for an infiltration drainage system. 4 no. additional soakaway tests SA01 to SA04 were therefore conducted on the site and the results may be seen in Appendix E. The results of these tests varied with SA02 test not yielding any infiltration rate. The other three tests gave values of 0.36m/hr for SA01, 0.21m/hr for SA03 and 0.11m/hr for SA04. Thus, the additional testing confirms the suitability of the site for infiltration drainage measures.

Based on these results, the infiltration basin has been sized assuming a soil infiltration rate of 0.02m/hr.

Figure 2.1 – Soakaway Test Locations (Source: Causeway Geotech site investigation report No. 24-0213)

For the infiltration basin to function effectively it is important that it will not be impacted by groundwater levels. A number of groundwater monitoring wells were installed on the site and groundwater levels were checked across several months. The results of all site investigations including these monitoring wells were assessed by an expert Hydrogeologist. Refer to the letter report titled 'Expert hydro-geotechnical opinion, Coolaghknock Glebe, Kildare, Co. Kildare' prepared by Firth Consultants which is provided under separate cover. The base of the infiltration pond is proposed ta +96.13m and the report from Firth Consultants concludes that the *"groundwater level in the gravels in the vicinity of the infiltration basin is unlikely to exceed 92 m OD Malin. As such, the thickness of unsaturated zone below the base of the basin is considered to be at least 4m (96.13 m OD – 92 m OD), and well above the minimum requirement of 1m."*

The extensive site investigations conducted on the site and the report prepared by Firth Consulting confirm the suitability of an infiltration basin in this location for the disposal of surface water runoff.

2.5 Contributing Catchment

In order to size the infiltration basin, it is necessary to calculate the volume of rainwater runoff which will flow towards the basin during storm events.

A breakdown of the impermeable areas contributing to the surface water drainage network in each catchment with applied runoff coefficients is provided in Table 2.3 below.

Total Area sq.m	Type of Surface	Area sq.m	Run-off Coefficient	Equivalent Impermeable	Urban Creep Allowance	Oberall Impermeable
42312	Roof	6567.0	0.95	6238.7	6862.5	21521.2
	Permeable Paving inc. areas from hardstanding	10087.3	0.50	5043.7	5548.0	
ha	Landscaped Areas inc. areas from hardstanding	21156.4	0.20	4231.3	4654.4	**ha**
4.23						2.2
	Hardstanding	4501.3	0.90	4051.2	4456.3	

Table 2.3 Breakdown of Impermeable Areas for Proposed Development

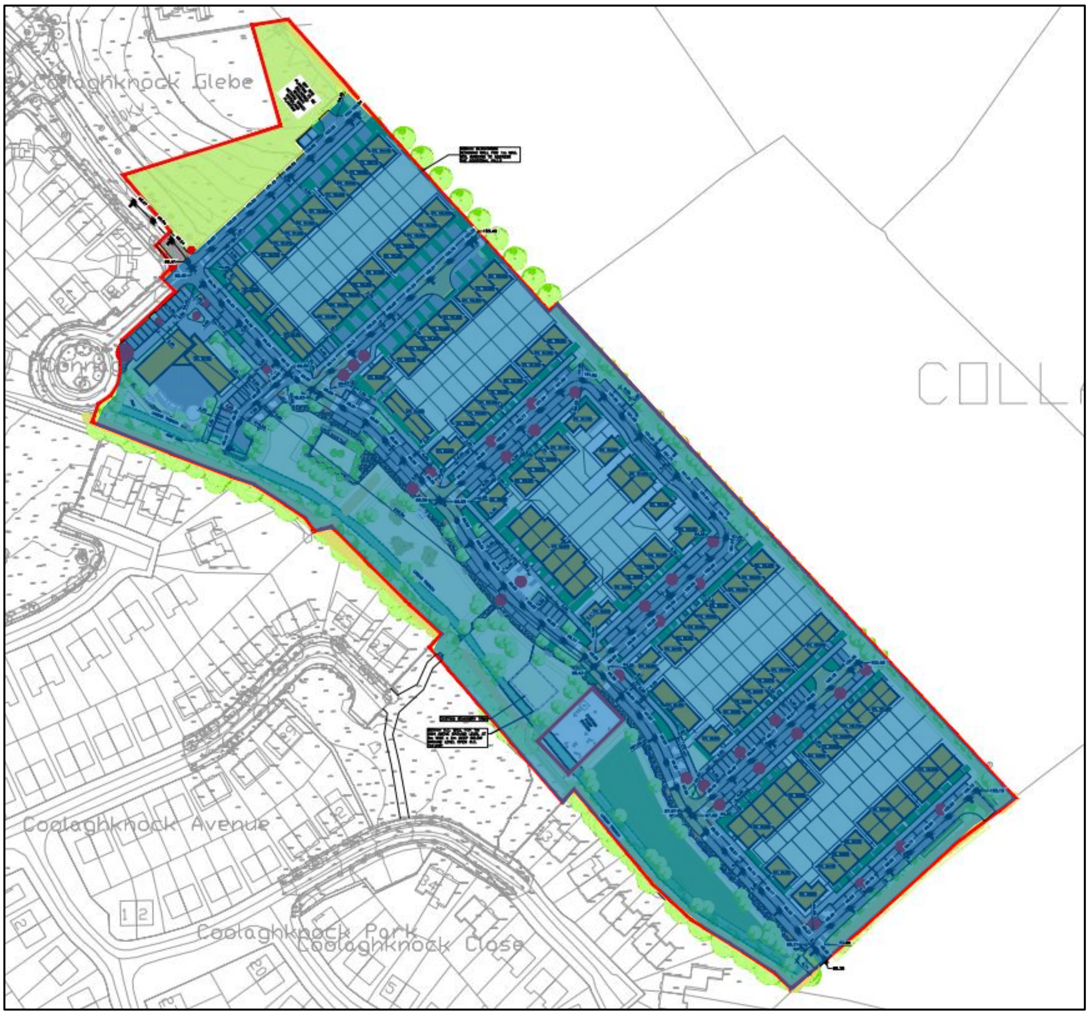


Figure 2.2 – Surface Water Drainage Catchment Area

2.6 Sustainable Drainage Systems (SuDS)

The proposed development will be designed in accordance with the principles of Sustainable Drainage Systems (SuDS) as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS) and will significantly reduce run-off rates and improve storm water quality discharging to the public storm water system. The GDSDS addresses the issue of sustainability by requiring designs to comply with a set of drainage criteria which aim to minimize the impact of urbanization by replicating the run-off characteristics of the greenfield site. The criteria provide a consistent approach to addressing the increase in both rate and volume of run-off, as well as ensuring the environment is protected from any pollution from roads and buildings. These drainage design criteria are as follows:

- Criterion 1 – River Water Quality Protection
- Criterion 2 – River Regime Protection
- Criterion 3 – Flood Risk Assessment
- Criterion 4 – River Flood Protection

The requirements of SuDS are typically addressed by provision of the following:

- Interception storage
- Treatment storage (commonly addressed in interception storage)
- Attenuation storage
- Long term storage (not applicable if growth factors are not applied to Qbar when designing attenuation storage)

2.6.1 Compliance with the principles of the CIRIA C753 SuDS Manual

The C753 SuDS Manual explains that the primary function of SuDS measures is to protect watercourses from any impact due to the new development. However, SuDS can also improve the quality of life in a new development and urban spaces by making them more vibrant, visually attractive, sustainable and more resilient to change. This document explains the wider social context of SuDS and how SuDS can deliver high quality drainage while supporting urban areas to cope better with sever rainfall both in present and future.

There are four main categories of benefits that can be achieved by SuDS:
1. Water Quantity (mitigate flood risk & protect natural water cycle)
2. Water Quality (manage the quality of the runoff to prevent pollution)
3. Amenity (create and sustain better places for people)
4. Biodiversity (create and sustain better places for nature)

Table 2.4 below includes a list of all current SuDS measures which would typically be considered when designing a new residential development such as that which is now proposed. This table also outlines the rationale behind the selection of SuDS measures and why other measures would not be appropriate.

The runoff generated from the catchment will be attenuated in storage structures within and below ground. The proposed attenuation systems are explained in section 2.5. A wide range of SuDS measures are proposed across the site to maximise interception and treatment.

SUDS Measure	Measure Adopted	Rationale for Selecting / Not Selecting Measure
Bioretention Swales *Shallow landscaped depressions that serve to reduce runoff rates / volumes as well as providing interception storage, treatment of runoff and encouraging biodiversity*	Yes	Bioretention swales are proposed in areas beside roads and green spaces within the site.
Tree pits *Attenuate surface water runoff by utilising voids within the root zone*	Yes	Tree pits have been specified in suitable areas beside the development roads and car parking.
Green Roofs *Vegetated roofs used to reduce the rate and volume of runoff as well as encouraging biodiversity*	No	It is not proposed to provide green roofs for roofs above housing and duplex buildings due to the roof pitch.
Blue Roofs *Provide attenuation storage, reducing requirement for storage elsewhere on site*	No	It is not proposed to provide green roofs for roofs above housing and duplex buildings due to the roof pitch.
Green Living Walls *Planted walls which improve air quality and encourage biodiversity*	No	Green walls are not considered appropriate given the proposed residential building use.
Rain Gardens *Localised depressions in the ground that collect runoff from roofs and allow infiltration, reducing runoff rates and volumes*	Yes	The proposed residential development aims to provide rain gardens, particularly in rear gardens of the housing units.
Rainwater harvesting *Runoff captured from roofs is reused for non-potable purposes, thereby reducing overall runoff volume.*	Yes	In the case of the proposed residential development, it is considered viable to gather the water for grey water use; refer to M&E details.
Permeable paving *Allows runoff to percolate into the subsoil, reducing overall runoff volume*	Yes	Permeable paving is proposed within the development in driveways and car parking spaces.
Porous asphalt *Allows runoff to percolate into the subsoil, reducing overall runoff volume*	No	Porous asphalt is not considered suitable for use in roads within the development as it does not comply with the Local Authority roads standards.
Integrated Constructed Wetlands (ICWs) *System of shallow ponds, planted to treat water, removing nutrients and harmful impurities*	No	ICWs are not considered appropriate due to the priority of infiltration on the site over above ground water storage systems.
Dry Ponds *Depressed area of site for water infiltration, planted to treat water, removing harmful impurities and provide attenuation*	Yes	Surface water runoff including the overflow from the various SuDS measures described above will be directed towards an infiltration basin. The suitability of the ground for infiltration has been confirmed (refer to Section 2.4)

Table 2.4 Proposed SuDS Features

Further details of the principal SuDS features proposed for this development are provided in the following sections.

2.6.2 Bioretention Swales

It is proposed to provide a number of discrete, shallow landscaped areas, adjacent to the access roads in the site. Runoff from the roads will be directed towards these bioretention swales and will be able to run directly into them via short cut-out sections within the road kerbs. Refer to the details on drawing SHB5-CGK-DR-MOR-CS-P3-130, 150 and 151. These features will provide a level of storage to attenuate the runoff flows and also permit settlement of coarse silts. As described in Section 2.3 above, the permeability of the underlying soils varies across the site. However, it is anticipated that runoff from minor rainfall events will be able to percolate directly into the soil. An overflow from the swales will be provided. This will take the form of a manhole with an open-grated access cover. During larger storm events, the water in the bioretention areas will be able to overflow through the grated access cover and will then drain towards the attenuation system.

The bioretention swales will be planted in order to promote settlement of silt particles. Runoff will also be treated through the adsorption of particles by vegetation or by soil, and by biological activity. Swales can reduce the runoff rates and volumes of surface water. They are very effective in delivering interception and treatment storage.

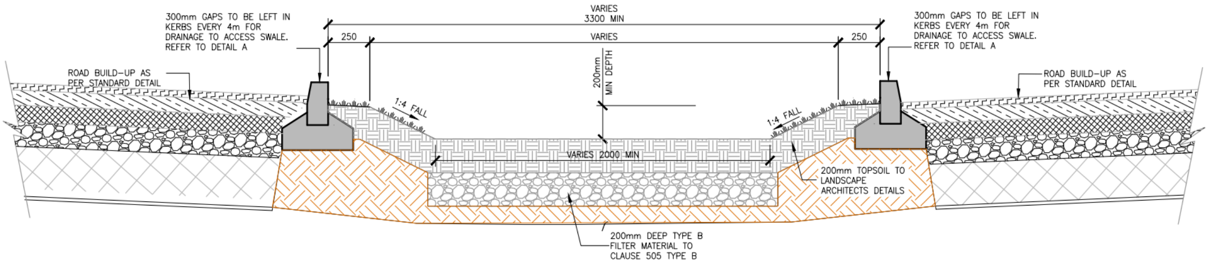


Figure 2.3 – Bio-Retention Area Detail

2.6.3 Tree Pit

It is proposed to provide a number of tree pits adjacent to car parking and footpaths within the development. Runoff from the roads and footpaths will be directed towards these tree pits. Refer to the details on drawing SHB5-CGK-DR-MOR-CS-P3-130, 150 and 151. These features will provide a level of storage to attenuate the runoff flows. It is anticipated that runoff from minor rainfall events will be able to percolate directly into the soil. An overflow from the tree pits will be provided. During larger storm events, the water in the bioretention areas will be able to overflow and drain towards the attenuation system.

The bioretention areas will be planted in order to promote biodiversity. Runoff will also be treated through the adsorption of particles by vegetation or by soil, and by biological activity. Tree pits can reduce the runoff rates and volumes of surface water although the area contributing is small. They are effective in delivering interception and treatment storage.

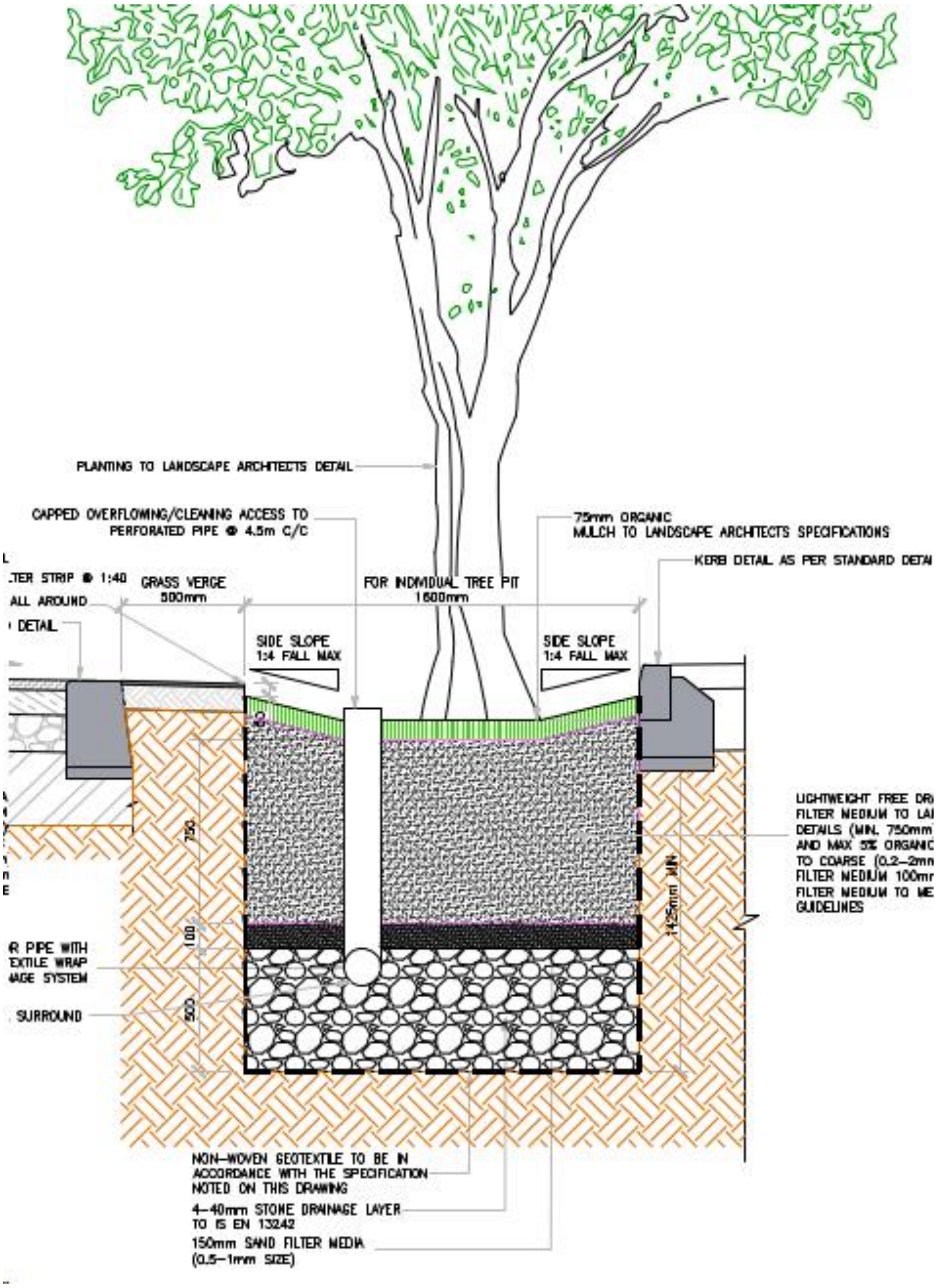


Figure 2.4 – Tree Pit

2.6.4 Rain Garden / Bioretention Area

It is proposed to provide a number of discrete, shallow landscaped areas in the private curtilage strips in front gardens of the housing units. They are also provided in grass verge locations throughout the development. Runoff from the roofs will be directed towards these bioretention gardens. Refer to the details on drawing SHB5-CGK-DR-MOR-CS-P3-130, 150 and 151. These features will provide a level of storage to attenuate the runoff flows. It is anticipated that runoff from minor rainfall events will be able to percolate directly into the soil. An overflow from the rain gardens will be provided. During larger storm events, the water in the bioretention areas will be able to overflow and drain towards the attenuation system.

The bioretention areas will be planted in order to promote biodiversity. Runoff will also be treated through the adsorption of particles by vegetation or by soil, and by biological activity. Rain gardens can reduce the runoff rates and volumes of surface water. They are very effective in delivering interception and treatment storage.

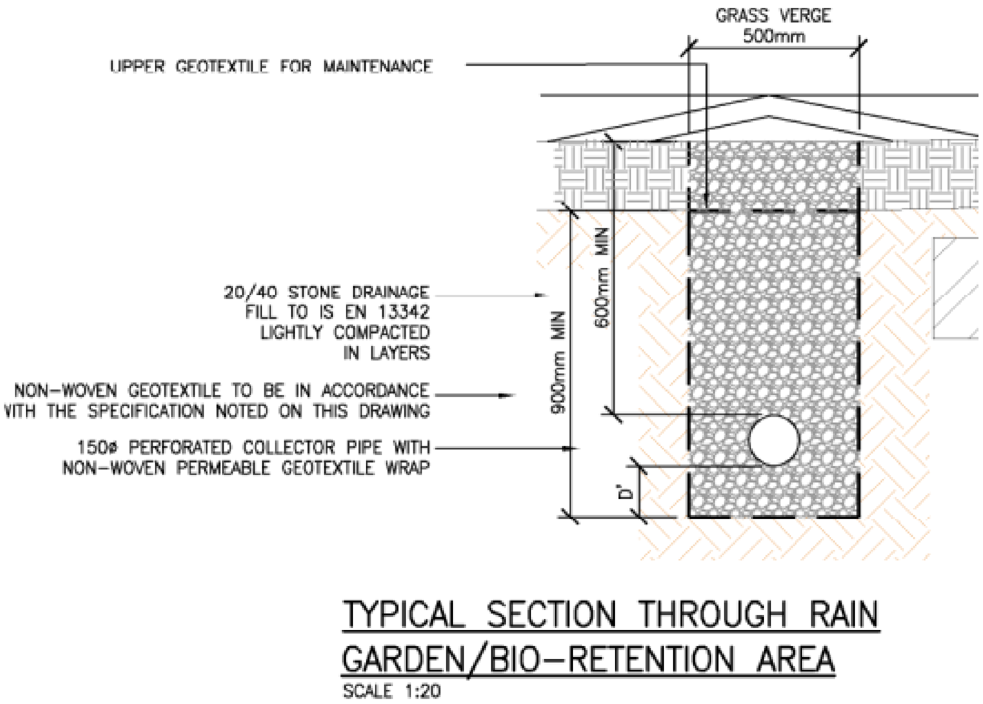


Figure 2.5 – Rain Garden

2.6.5 Permeable Paving

It is proposed to use permeable paving to surface the courtyard area to the creche, parking spaces and driveways in the development. It is anticipated that most of the rainwater will be able to percolate through the permeable paving and infiltrate into the underlying soils. However, it is proposed to provide a number of overflow outlets within the permeable paving build-up which will ensure the parking area is not flooded during severe rainfall events. The outlet from the permeable paving areas will be raised 100mm above formation level to provide interception storage within the stone sub-base; this gives 30mm interception storage @ 30% voids in the gravel.

These permeable surfaces, together with their associated substructures, are an efficient means of managing surface water runoff close to source – intercepting runoff, reducing the volume and frequency of runoff, and providing treatment medium. Refer to the Malone O'Regan SuDS detail drawing no. SHB5-CGK-DR-MOR-CS-P3-130, 150 and 151 for typical permeable paving details.

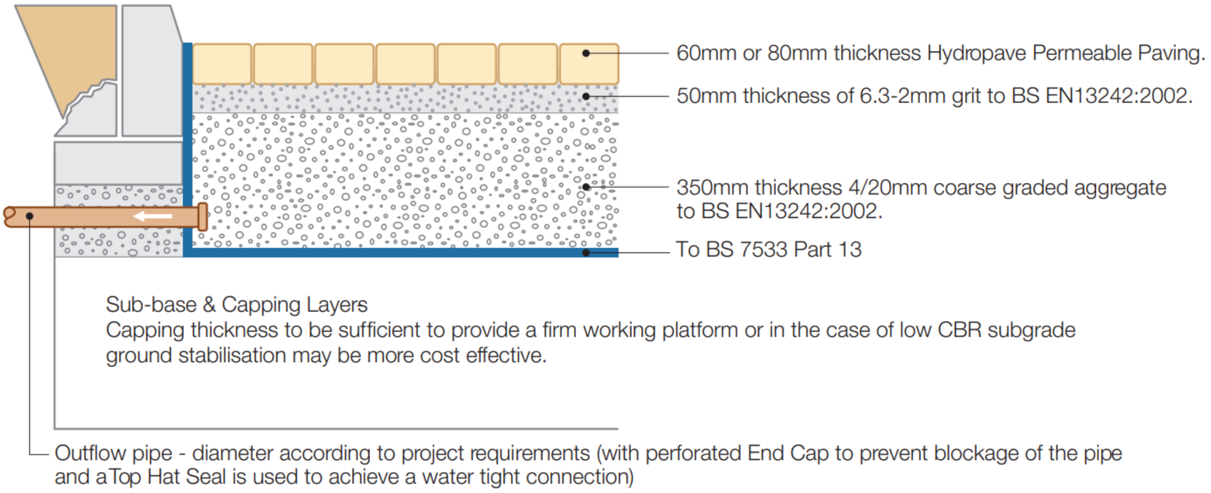


Figure 2.6 – Typical Section Through Permeable Paving in Parking Spaces

2.7 Dry Ponds

It is proposed to provide an infiltration basin in the southern area of the site. Runoff from the roofs, footpaths and roads will be directed towards this basin via other SuDS drainage methods in the surface water drainage scheme. Refer to the details on drawing SHB5-CGK-DR-MOR-CS-P3-130, 150 and 151. These features will provide a level of storage to attenuate the runoff flows and also permit settlement of coarse silts. As described in Section 2.4 above, the ground is considered suitable for infiltration measures. The infiltration basin has been sized using Causeway Flow drainage software to ensure that it has adequate capacity to store runoff from storm events up to and including the 1 in 100-year (plus 20% climate change) storm. Water levels in the basin will rise during storm events up to a maximum level of 97.649 for the 1 in 100-year (plus 20% climate change) storm event. Finished floor levels within the development have been set so they are at least 500mm above this level.

The infiltration basin will be planted in order to promote settlement of silt particles and treatment of runoff through the absorption of particles by vegetation or by soil and biological activity.

Figure 2.7 – Infiltration Basin

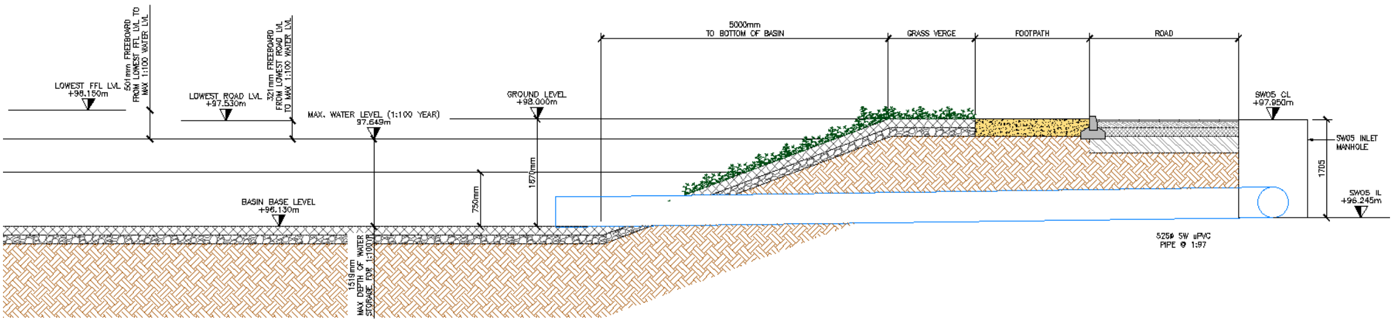


Figure 2.8 – Infiltration Basin Section

2.8 Interception Storage

On new developments, interception storage calculations are normally provided to demonstrate that adequate SuDS measures have been introduced to prevent pollutants or sediments discharging into watercourses. In this instance, it is not proposed to discharge surface water to a receivinbg public drain or watercourse.

Interception storage to remove sediment from surface water runoff will be provided throughout the development within the various SuDS measures described above and shown on drawing SHB5-CGK-DR-MOR-CS-P3-150. Ultimately, any water that overflows from these SuDS measures will flow to the infiltration basin which will trap any remaining pollutants and sediment.

These SuDS measures will ensure that runoff water can infiltrate to the ground, evaporate into the atmosphere and dissipate through transpiration in plants and vegetation.

2.9 GDSDS Criterion Compliance

2.9.1 Criterion 1 River Water Quality Protection

Run-off from natural greenfield areas contributes very little pollution and sediment to rivers and for most rainfall events direct run-off from greenfield sites to rivers does not take place as rainfall percolates into the ground. By contrast, urban run-off, when drained by pipe systems, results in run-off from virtually every rainfall event with high levels of pollution, particularly in the first phase of run-off, with little rainfall percolating to the ground. To prevent this happening, Criterion 1 requires that interception storage and/or treatment storage is provided, thereby replicating the run-off characteristics of the pre-development greenfield site.

2.9.2 Criterion 3 Site Flooding

The GDSDS requires that no flooding should occur on site for storms up to and including the 1 in 30-year event. The pipe network and the attenuation storage volumes should, therefore, be checked for such storms to ensure that no site flooding occurs although partial surcharging of the system is allowed if it does not threaten to flood.

For the 1 in 100-year event, the pipe network can fully surcharge and cause site flooding, but the top water level due to any such flooding must be at least 500mm below any vulnerable internal floor levels, and the flood waters should be contained within the site.

Surface water drains have been sized to ensure the following:

- The system does not surcharge for a 2-year storm event
- The system surcharges but does not flood for a 30-year event.
- The system surcharges but does not flood for a 100-year event.

Detailed modelling of the surface water sewer network has been carried out using Causeway Flow software to confirm the above criteria are adequately met. The outputs are appended to this report.

2.9.3 Criterion 2 & 4 River Regime & Flood Protection

These criteria are deemed satisfied due to the fact there is not proposed discharge to a receiving watercourse. Instead, all surface water will percolate to ground through the various SuDS measures proposed throughout the site and the single infiltration basin in that the southern end of the site.

2.10 Enhanced Biodiversity

A infiltration basin will be included as part of the proposed development. Biodiversity has been carefully considered when determining both the location and the detailed design of this area. The proposed infiltration basin offers the opportunity to create a wetland habitat for plants and animals which will encourage biodiversity on the site.

2.11 SuDS CIRIA Pillars of Design

2.11.1 Water Quantity

The “Water Quantity” design objective is to ensure that the surface water runoff from a developed site does not have a detrimental impact on people, property or the environment, it is important to control:

- How fast the runoff is discharged from the site (ie the peak runoff rate) and
- How much runoff is discharged from the site (ie the runoff volume)

As noted above, it is not proposed to discharge surface water runoff to a receiving watercourse. Instead, water will percolate to ground through the various SuDS measures proposed throughout the site and the single infiltration basin in that the southern end of the site.

2.11.2 Water Quality

The “Water Quality” design objective seeks to ensure the surface water runoff from the site does not compromise the groundwater or surrounding water courses relating to the site.

As noted in Section 2.8, a number of SuDS measures have been introduced to prevent pollutants or sediments discharging into watercourses.

2.11.3 Amenity

The “Amenity” design objective aims to deliver attractive, pleasant, useful and above all liveable urban environments. SuDS measures should be designed to replicate the existing natural environment and blend in with the urban development.

MOR have worked closely with the landscaping architect throughout the SuDS strategy design process to ensure that the measures which have been suggested and incorporated have a high sense of public use. Throughout the site, there are swales, bio-retention areas, tree pits and an infiltration basin.

2.11.4 Biodiversity

The encouragement of biodiverse environments within urban environments is incredibly important. The SuDS measures must not only replicate the pre-development surface water runoff systems and treatment for rainfall, but they should also aim to replicate the existing habitats from the pre- development stage.

By incorporating large landscaped areas throughout the site and the bio- retention areas, biodiversity on site is promoted. In addition, a large number of mature hedgerows have been retained on site.

2.11.5 SuDS Conclusion

This section of the report has discussed the various SuDS measures which can be applied to the site and then selected the applicable systems, based on the site layout. A wide range of measures have been employed.

Finally, the chosen SuDS measures have been analysed for various rainfall scenarios to ensure that all the SuDS design criteria are met. These measures will be effective in treating rainfall on the site to meet GDSDS and CIRIA.

2.12 Maintenance and Management Plan

Refer to appendix D for details of maintenance requirements for individual SuDS drainage measures on the site.

2.13 Potential Future Expansion

No future expansion has been considered for the proposed drainage networks for the development.

According to Kildare Town Local Area Plan 2023-2029 a new surface water drainage corridor route is to be allowed for on the development site, see Figure 2.9 below. This corridor will allow surface water to be conveyed towards potential nature-based management areas (NBMAs), for example ponds, infiltration systems and bioretention areas. These represent opportunities to build additional surface water attenuation capacity into the catchment.

Malone O’Regan drawing no. SHB5-CGK-DR-MOR-CS-P3-702 indicates how this corridor can be accommodated within the proposed site layout. An extract from this drawing is provided in Figure 2.10 below for reference.

The overflow from this future surface water corridor can be routed to the southern end of the site and directed towards the southwest drainage plans for sub-catchment 03.

In order to cater for the intervening period, prior to this surface water drainage corridor being provided, the proposed layout has been designed with a number of low-lying areas along the southwestern boundary of the site. These areas which are denoted as Flood Storage A, B, C and D on drawing SHB5-CGK-DR-MOR-CS-P3-702 ensure that the site has adequate capacity to cater for pluvial flood events, storing rainwater on site and ensuring that there is no increase of water being displaced onto adjoining lands. Refer to further commentary in Section 6 of the *‘Desktop Flood Risk Assessment Report’* which has been prepared by Malone O’Regan and is provided under separate cover.

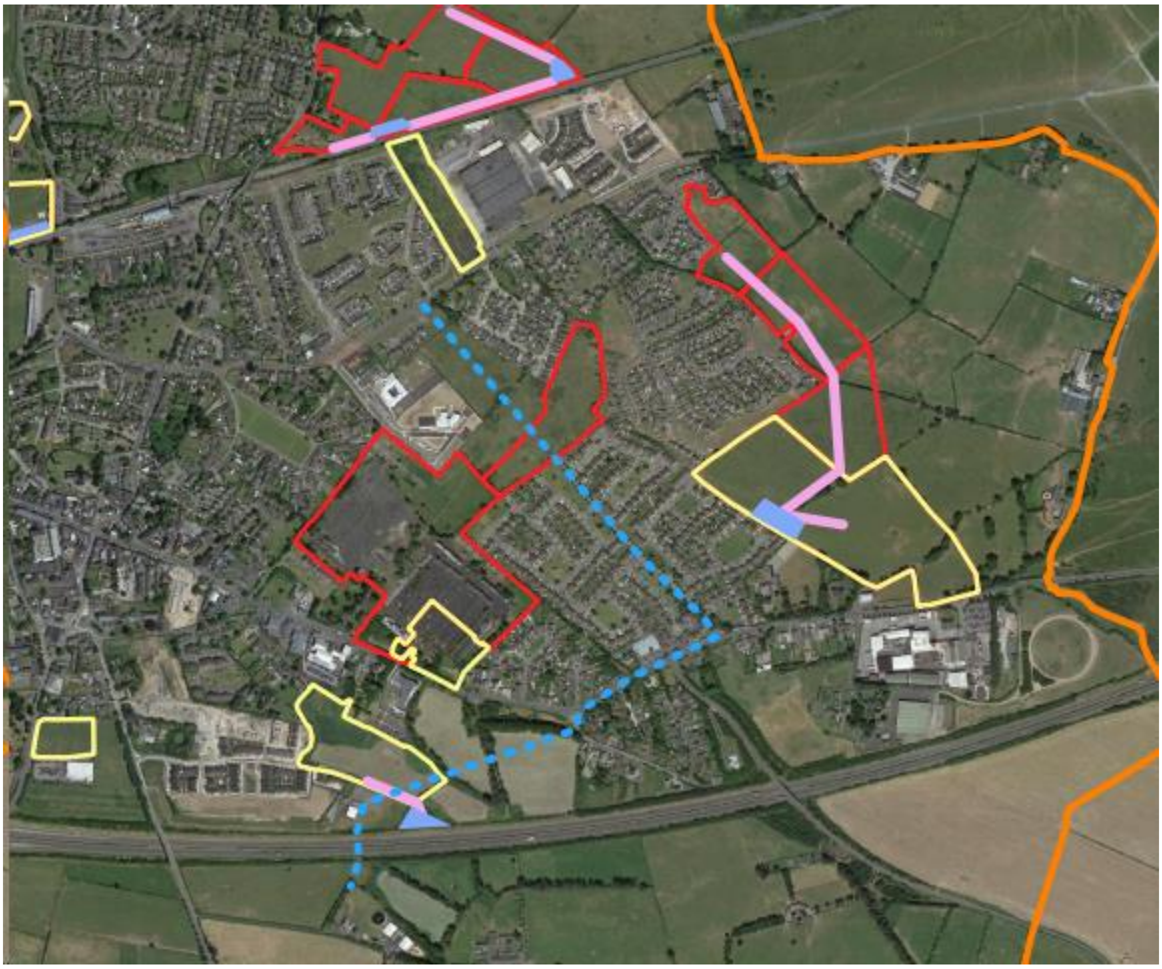


Figure 2.9 SW Drainage Corridor (Source – Kildare Town Surface Water Study Stage 2 - Surface Water Management Proposals Appendix A)

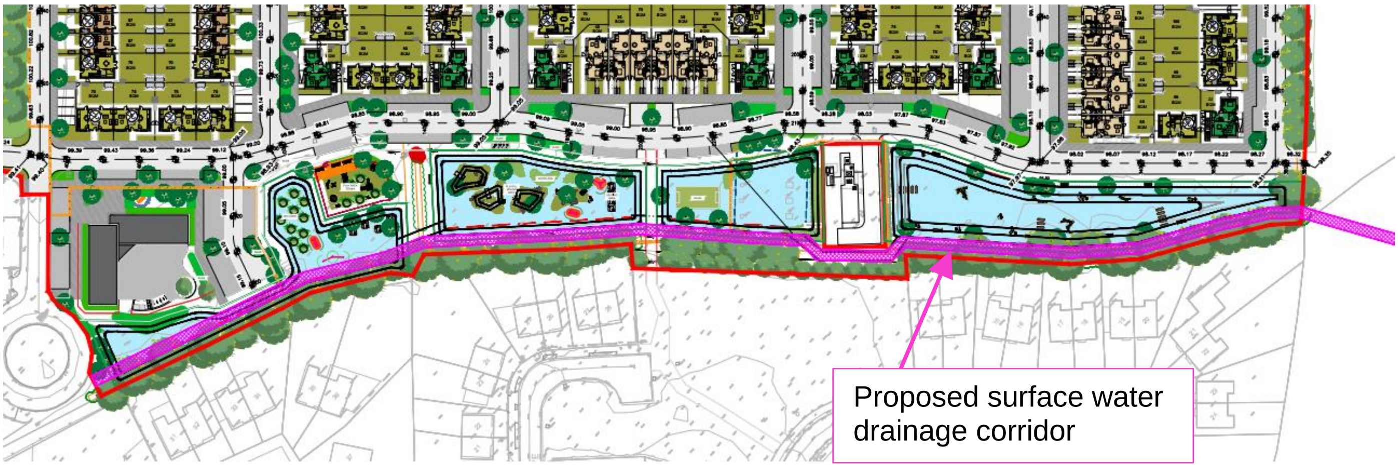


Figure 2.10 Proposed Indicative Route for Future SW Drainage Corridor (extract from drawing SHB5-CGK-DR-MOR-CS-P3-702)

3 FOUL WATER DRAINAGE DESIGN

3.1 General

The foul water drainage infrastructure has been designed in accordance with Irish Water Technical Standard for Wastewater Gravity Sewers (Document Number: IW-TEC-800-01) and the Irish Water Code of Practice for Wastewater Infrastructure (Document Number: IW-CDS-5030-03).

On 1st November 2023, a Pre-Connection Enquiry Form was submitted to Irish Water in respect of this development. Irish Water provided a Confirmation of Feasibility letter which confirms that, subject to upgrades, the proposed connection to the public sewer network can be facilitated. The letter further notes that in order to accommodate the proposed connection upgrade of the Coolaghknock Glebe pumping station is required. At connection application stage the upgrade requirements will be reviewed and a quotation provided.

A Copy of the Irish Water Confirmation of Feasibility Letter is provided in Appendix A.

Table 3.1 outlines the parameters adopted in the design of the foul water drainage infrastructure.

Parameter Description	**Assigned Value**
Hydraulic Loading (Foul associated with domestic dwellings)	150 litres / person / day
Pipe Friction	1.5 mm
Minimum Velocity	0.7 m/s
Maximum Velocity	3.0 m/s
Peaking Factor (for domestic foul flows)	6.0

Table 3.1 Foul Water Design Parameters

Hydraulic loading for the foul drainage i.e., domestic foul flows from toilets, sinks etc. have been calculated in accordance with the Irish Water Code of Practice for Wastewater Infrastructure which gives a flow rate of 150 litres per person per day.

Calculations for the foul and process water pipe networks are provided in Appendix C.

3.2 Existing Services

The Melitta Road R413 is located 400m to the north of the site, connecting to the M7 motorway to the southeast of the site. Existing foul water drains run from Melitta Road down Connagh Road in a 225mm uPVC pipe into a foul water pumping station located in the centre of the site. Due to the relative levels of the existing drainage and the proposed site levels, it is possible to achieve a gravity connection to the existing foul pumping station installed.

3.3 Proposed Services

The proposed foul water drainage system is designed to comply with the ‘Greater Dublin Strategic Drainage Study (GDSDS) Regional Drainage Policies Technical Document – Volume

2, New Developments, 2005' and the 'Greater Dublin Regional Code of Practice for Drainage Works, V6.0 2005'.

The proposed foul water drainage layout for the development is indicated on Malone O'Regan drawings SHB5-CGK-DR-MOR-CS-P3-130. Foul water from new housing units will be collected within a gravity drainage network and directed towards the pumping station.

Uisce Eireann noted that upgrade works will be required to the existing pumping station located on the site. The exact details of the upgrade works required will be outlined at connection application stage.

3.4 Potential Future Expansion

No future expansion has been considered for the proposed drainage networks for the development.

Upgrade works are required for the pumping station located on the site – the details for these works shall be outlined by Uisce Eireann at connection application time.

4 WATER SUPPLY

4.1 General

The Proposed Development will use mains water.

The proposed water supply infrastructure has been designed in accordance with the Irish Water Code of Practice for Water Infrastructure (Document Number: IW-CDS-5020-03).

On 1st November 2023, a Pre-Connection Enquiry Form was submitted to Irish Water in respect of this development. Irish Water provided a Confirmation of Feasibility (CoF) letter which confirms that, subject to a valid connection agreement being put in place, the proposed connection to the public water supply network can be facilitated without infrastructure upgrades.

A Copy of the Irish Water Confirmation of Feasibility Letter is provided in Appendix A.

4.2 Existing & Proposed Services

A 100mm diameter watermain is located under the footpath in Coolaghknock Avenue and Park to the west of the proposed development. A 150mm diameter watermain is located under the footpath in Coolaghknock Glebe to the north and west of the proposed development.

The watermain in Coolaghknock Avenue and Park is at a higher level than the subject site. Thus, it is proposed to use provide a potable water supply to the development off the existing main in Coolaghknock Glebe estate.

The proposed watermain layout is indicated on drawing SHB5-CGK-DR-MOR-CS-P3-140 which accompanies this planning application.

4.3 Water Demand Calculations

Average and peak water demand rates have been calculated as follows, in accordance with the Irish Water Code of Practice for Water Infrastructure:

Domestic Water Demand

Total no. residents = 523

Irish Water Code of Practice for Water Infrastructure gives flow rate for Domestic Dwellings' as 150 litres per person per day.

Total Daily Water Demand = 523 people x 150 litres per day per person
= 78,450 litres/day

Average Hour Demand = 78,450 litres/day / (24hr x 60min x 60sec)
= 0.91 litres/sec

The average day, peak week demand is taken as 1.25 times the average daily domestic demand.

Average Day / Peak Week Demand = 0.91 litres/sec x 1.25
= 1.13 litres/sec

The above figures were provided to Irish Water within the Pre-Connection Enquiry Form dated 1st November 2023. Irish Water's response to the Pre-Connection Enquiry, outlined in their Confirmation of Feasibility Letter, is therefore based on these figures.

APPENDIX A – IRISH WATER CONFIRMATION OF FEASIBILITY

CONFIRMATION OF FEASIBILITY

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

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

Kezia Adanza

Malone O'Regan
2B Richview Office Park
Clonskeagh
Dublin 14
D14XT57

20 December 2023

Our Ref: CDS23008160 Pre-Connection Enquiry
Site at, Coolaghknock Glebe, Kildare Town, Kildare

Dear Applicant/Agent,

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

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 168 unit(s) at Site at, Coolaghknock Glebe, Kildare Town, Kildare, (the **Development)**.

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

- **Water Connection** - Feasible without infrastructure upgrade by Irish Water
- **Wastewater Connection** - Feasible Subject to upgrades

- In order to accommodate the proposed connection, upgrade of Collaghknock Glabe Pumping Station may be required. At a connection application stage, the upgrade requirement will be reviewed, and you will be provided with a quote for these works.
- The proposed Development indicates that Uisce Éireann assets are present on the site. The Developer has to demonstrate that proposed structures and works will not inhibit access for maintenance or endanger structural or functional integrity of the assets during and after the works. Drawings (showing clearance distances, changing to ground levels) and Method Statements should be included in the Detailed Design of the

Stiúrthóirí / Directors: Tony Keohane (Cathaoirleach / Chairman), Niall Gleeson (POF / CEO), Christopher Banks, Fred Barry, Gerard Britchfield, Liz Joyce, Patricia King, Eileen Maher, Cathy Mannion, Michael Walsh.
Oifig Chláraithe / Registered Office: Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86 / Colvill House, 24-26 Talbot Street, Dublin, Ireland D01NP86
Is cuideachta ghníomhaíochta ainmnithe atá faoi theorainn scaireanna é Uisce Éireann / Uisce Éireann is a design activity company, limited by shares. Cláraithe in Éirinn Uimh.: 530363 / Registered in Ireland No.: 530363.

Development. A wayleave in favour of Uisce Éireann will be required over the assets that are not located within the Public Space. For design submissions and queries related to diversion/build near or over, please contact UÉ Diversion Team via email address diversions@water.ie

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

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

Where can you find more information?

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

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

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

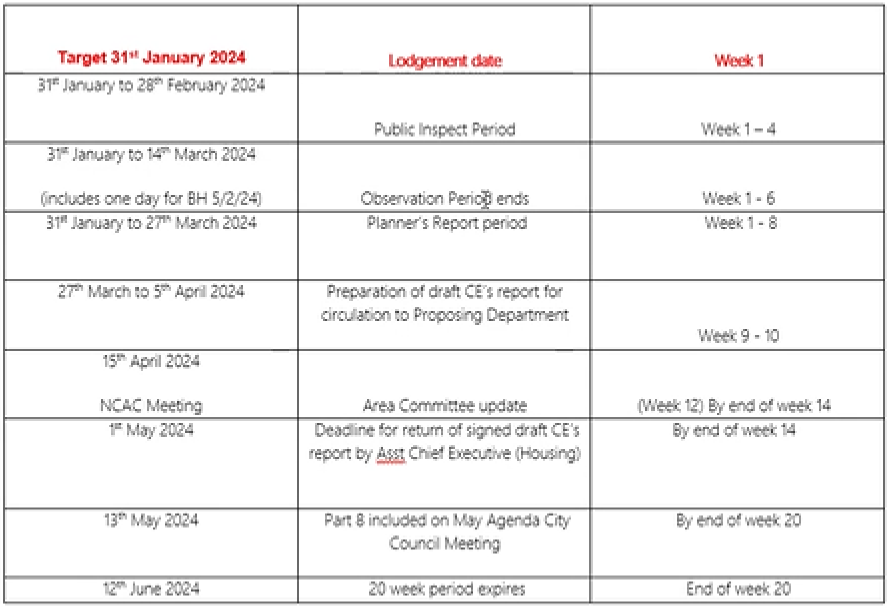
Yours sincerely,

Dermot Phelan
Connections Delivery Manager

Section A - What is important to know?

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

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



Target 31st January 2024	Lodgement date	Week 1
31st January to 28th February 2024	Public Inspect Period	Week 1 – 4
31st January to 14th March 2024 (includes one day for BH 5/2/24)	Observation Period ends	Week 1 - 6
31st January to 27th March 2024	Planner's Report period	Week 1 - 8
27th March to 5th April 2024	Preparation of draft CE's report for circulation to Proposing Department	Week 9 - 10
15th April 2024 NCAC Meeting	Area Committee update	(Week 12) By end of week 14
1st May 2024	Deadline for return of signed draft CE's report by Asst Chief Executive (Housing)	By end of week 14
13th May 2024	Part 8 included on May Agenda City Council Meeting	By end of week 20
12th June 2024	20 week period expires	End of week 20

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

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

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

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

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

APPENDIX B – SURFACE WATER PIPE NETWORK CALCULATIONS

Drainage Design Report

Flow+

v10.8

Network	Storm Network
Filename	2024-05-16 Flow.pfd
Username	Kezia Adanza (kadanza@morce.ie)
Last analysed	17/05/2024 14:36:40
Report produced on	17/05/2024 15:32:12

Causeway Sales

Tel:	+44(0) 1628 552000
Fax:	+44(0) 1628 552001
Email:	marketing@causeway.com
Web:	www.causeway.com

Technical support web portal:

http://support.causeway.com

Rainfall Methodology	FSR
Return Period (years)	2
Additional Flow (%)	0
FSR Region	Scotland and Ireland
M5-60 (mm)	15.000
Ratio-R	0.280
CV	0.750
Time of Entry (mins)	4.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	0.90
Connection Type	Level Inverts
Minimum Backdrop Height (m)	0.500
Preferred Cover Depth (m)	1.100
Include Intermediate Ground	Yes
Enforce best practice design rules	Yes

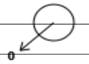
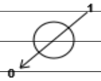
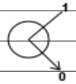
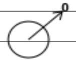
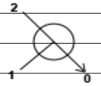
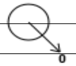
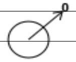
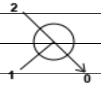
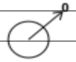
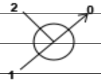
	Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Width (mm)	Sump (m)	Easting (m)	Northing (m)	Depth (m)	Notes
✓	SW43	0.050	4.00		103.820	Manhole	Adoptable	1200			674116.178	713002.357	1.325	
✓	SW42	0.050	4.00		101.120	Manhole	Adoptable	1200			674083.151	712971.792	1.325	
✓	SW41	0.050	4.00		99.400	Manhole	Adoptable	1200			674056.685	712947.297	1.550	
✓	SW40	0.050	4.00		99.400	Manhole	Adoptable	1200			674032.846	712911.228	1.325	
✓	SW39	0.050	4.00		99.400	Manhole	Adoptable	1200			674063.629	712939.804	1.601	
✓	SW38	0.050	4.00		99.430	Manhole	Adoptable	1200			674065.139	712927.154	1.325	
✓	SW37	0.050	4.00		99.100	Manhole	Adoptable	1200			674067.208	712897.339	1.400	
✓	SW36	0.050	4.00		99.220	Manhole	Adoptable	1200			674080.998	712910.102	1.614	
✓	SW35	0.050	4.00		99.100	Manhole	Adoptable	1200			674075.366	712890.190	1.550	
✓	SW34	0.050	4.00		99.000	Manhole	Adoptable	1200			674088.325	712902.185	1.550	
✓	SW33	0.050	4.00		99.050	Manhole	Adoptable	1200			674093.795	712907.247	1.625	
✓	SW32	0.050	4.00		103.330	Manhole	Adoptable	1200			674158.225	712955.712	1.400	
✓	SW31	0.050	4.00		100.930	Manhole	Adoptable	1200			674128.872	712928.538	1.400	
✓	SW30	0.050	4.00		98.930	Manhole	Adoptable	1200			674099.519	712901.365	1.625	
✓	SW29	0.050	4.00		98.840	Manhole	Adoptable	1200			674112.706	712895.887	1.625	
✓	SW28	0.050	4.00		98.840	Manhole	Adoptable	1200			674116.974	712893.316	1.650	
✓	SW27	0.050	4.00		99.020	Manhole	Adoptable	1200			674143.952	712864.215	2.028	
✓	SW26	0.050	4.00		101.820	Manhole	Adoptable	1200			674201.271	712909.018	1.325	
✓	SW25	0.050	4.00		100.770	Manhole	Adoptable	1200			674177.435	712886.926	1.325	
✓	SW24	0.050	4.00		99.050	Manhole	Adoptable	1500			674148.098	712859.735	2.089	
✓	SW23	0.050	4.00		99.070	Manhole	Adoptable	1500			674152.795	712854.959	2.142	
✓	SW22	0.050	4.00		99.050	Manhole	Adoptable	1500			674160.252	712842.784	2.193	
✓	SW21	0.050	4.00		98.850	Manhole	Adoptable	1500			674183.943	712815.802	2.173	
✓	SW20	0.050	4.00		98.675	Manhole	Adoptable	1500			674198.663	712806.283	2.086	
✓	SW19	0.050	4.00		101.900	Manhole	Adoptable	1200			674217.732	712890.872	1.325	
✓	SW18	0.050	4.00		101.240	Manhole	Adoptable	1200			674257.806	712847.571	1.325	
✓	SW17	0.050	4.00		99.550	Manhole	Adoptable	1200			674228.458	712820.393	1.325	
✓	SW16	0.050	4.00		98.430	Manhole	Adoptable	1500			674206.231	712799.838	1.891	
✓	SW15	0.050	4.00		98.280	Manhole	Adoptable	1500			674210.816	712794.884	1.775	
✓	SW14	0.050	4.00		97.950	Manhole	Adoptable	1500			674226.270	712778.234	1.625	
✓	SW13	0.050	4.00		100.130	Manhole	Adoptable	1200			674346.157	712751.527	1.400	
✓	SW12	0.050	4.00		99.520	Manhole	Adoptable	1350			674319.008	712726.388	1.550	
✓	SW11	0.050	4.00		98.310	Manhole	Adoptable	1350			674286.379	712696.148	1.550	
✓	SW10	0.050	4.00		98.270	Manhole	Adoptable	1350			674281.468	712701.447	1.546	
✓	SW09	0.050	4.00		100.380	Manhole	Adoptable	1200			674301.991	712799.242	1.325	
✓	SW08	0.050	4.00		99.200	Manhole	Adoptable	1200			674274.842	712774.103	1.325	

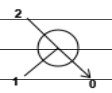
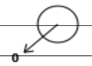
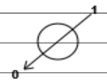
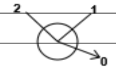
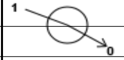
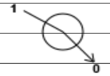
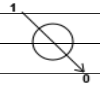
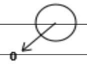
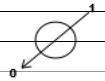
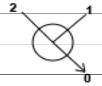
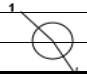
✓	SW07	0.050	4.00		97.980	Manhole	Adoptable	1350			674242.184	712743.835	1.550	
✓	SW06	0.050	4.00		97.920	Manhole	Adoptable	1350			674237.835	712753.472	1.543	
✓	SW05				97.950	Manhole	Adoptable	1500			674233.168	712763.814	1.705	
✓	IN				98.000	Manhole	Adoptable	1500			674222.899	712759.444	1.870	

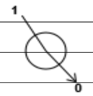
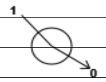
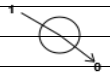
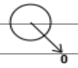
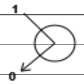
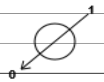
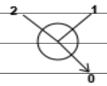
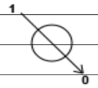
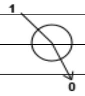
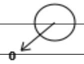
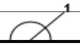
	Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)	Con Offset (m)	Min DS IL (m)	Lateral Area (ha)	Lateral Ins Point (%)	Lateral T of E (mins)
?	1.000	SW43	SW42	45.000	0.600	Colebrook-White	102.495	99.795	2.700	16.7	225	Circular	4.23	48.3					
?	1.001	SW42	SW41	36.062	0.600	Colebrook-White	99.795	97.850	1.945	18.5	225	Circular	4.43	47.5					
✓	1.002	SW41	SW39	10.216	0.600	Colebrook-White	97.850	97.799	0.051	200.3	450	Circular	4.55	47.1					
✓	2.000	SW40	SW39	42.002	0.600	Colebrook-White	98.075	97.799	0.276	152.2	225	Circular	4.66	46.7					
✓	1.003	SW39	SW33	44.384	0.600	Colebrook-White	97.799	97.425	0.374	118.7	450	Circular	5.06	45.3					
✓	3.000	SW38	SW36	23.287	0.600	Colebrook-White	98.105	97.606	0.499	46.7	225	Circular	4.20	48.4					
✓	4.000	SW37	SW36	18.790	0.600	Colebrook-White	97.700	97.606	0.094	200.0	300	Circular	4.28	48.1					
?	3.001	SW36	SW34	10.787	0.600	Colebrook-White	97.606	97.552	0.054	200.0	450	Circular	4.41	47.6					
✓	5.000	SW35	SW34	17.658	0.600	Colebrook-White	97.550	97.450	0.100	176.6	450	Circular	4.19	48.5					
?	3.002	SW34	SW33	7.453	0.600	Colebrook-White	97.450	97.425	0.025	298.1	525	Circular	4.50	47.3					
✓	1.004	SW33	SW30	8.207	0.600	Colebrook-White	97.425	97.305	0.120	68.4	525	Circular	5.11	45.1					
?	6.000	SW32	SW31	40.000	0.600	Colebrook-White	101.930	99.530	2.400	16.7	300	Circular	4.17	48.5					
?	6.001	SW31	SW30	40.000	0.600	Colebrook-White	99.530	97.305	2.225	18.0	300	Circular	4.35	47.8					
✓	1.005	SW30	SW29	14.280	0.600	Colebrook-White	97.305	97.215	0.090	158.7	525	Circular	5.24	44.7					
✓	1.006	SW29	SW28	4.983	0.600	Colebrook-White	97.215	97.190	0.025	199.3	525	Circular	5.30	44.5					
✓	1.007	SW28	SW27	39.682	0.600	Colebrook-White	97.190	96.992	0.198	200.0	525	Circular	5.71	43.3					
✓	1.008	SW27	SW24	6.104	0.600	Colebrook-White	96.992	96.961	0.031	200.0	525	Circular	5.78	43.1					
✓	7.000	SW26	SW25	32.499	0.600	Colebrook-White	100.495	99.445	1.050	31.0	225	Circular	4.23	48.3					
✓	7.001	SW25	SW24	40.000	0.600	Colebrook-White	99.445	97.725	1.720	23.3	225	Circular	4.47	47.4					
✓	1.009	SW24	SW23	6.699	0.600	Colebrook-White	96.961	96.928	0.033	200.0	525	Circular	5.85	42.9					
✓	1.010	SW23	SW22	14.277	0.600	Colebrook-White	96.928	96.857	0.071	200.0	525	Circular	6.00	42.4					
✓	1.011	SW22	SW21	35.907	0.600	Colebrook-White	96.857	96.677	0.180	200.0	525	Circular	6.38	41.4					
✓	1.012	SW21	SW20	17.530	0.600	Colebrook-White	96.677	96.589	0.088	200.0	525	Circular	6.56	40.9					
✓	1.013	SW20	SW16	9.940	0.600	Colebrook-White	96.589	96.539	0.050	200.0	525	Circular	6.67	40.6					
✓	8.000	SW19	SW18	58.999	0.600	Colebrook-White	100.575	99.915	0.660	89.4	225	Circular	4.71	46.5					
✓	8.001	SW18	SW17	39.999	0.600	Colebrook-White	99.915	98.225	1.690	23.7	225	Circular	4.96	45.7					
✓	8.002	SW17	SW16	30.275	0.600	Colebrook-White	98.225	97.105	1.120	27.0	225	Circular	5.16	45.0					
✓	1.014	SW16	SW15	6.750	0.600	Colebrook-White	96.539	96.505	0.034	200.0	525	Circular	6.74	40.5					
✓	1.015	SW15	SW14	22.717	0.600	Colebrook-White	96.505	96.325	0.180	126.2	525	Circular	6.93	40.0					
✓	1.016	SW14	SW05	15.985	0.600	Colebrook-White	96.325	96.245	0.080	199.8	525	Circular	7.10	39.6					
✓	9.000	SW13	SW12	37.001	0.600	Colebrook-White	98.730	97.970	0.760	48.7	300	Circular	4.27	48.1					
?	9.001	SW12	SW11	44.487	0.600	Colebrook-White	97.970	96.760	1.210	36.8	450	Circular	4.49	47.3					
?	9.002	SW11	SW10	7.225	0.600	Colebrook-White	96.760	96.724	0.036	200.0	450	Circular	4.58	47.0					
?	9.003	SW10	SW07	57.793	0.600	Colebrook-White	96.724	96.430	0.294	196.6	450	Circular	5.24	44.7					
✓	10.000	SW09	SW08	37.001	0.600	Colebrook-White	99.055	97.875	1.180	31.4	225	Circular	4.26	48.2					
✓	10.001	SW08	SW07	44.527	0.600	Colebrook-White	97.875	96.430	1.445	30.8	225	Circular	4.58	47.0					
?	9.004	SW07	SW06	10.573	0.600	Colebrook-White	96.430	96.377	0.053	200.0	450	Circular	5.37	44.3					
?	9.005	SW06	SW05	11.346	0.600	Colebrook-White	96.377	96.320	0.057	199.1	450	Circular	5.50	43.9					
✓	1.017	SW05	IN	11.160	0.600	Colebrook-White	96.245	96.130	0.115	97.0	525	Circular	7.18	39.4					

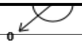
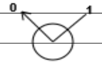
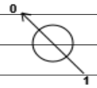
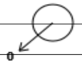
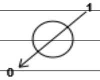
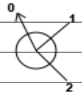
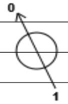
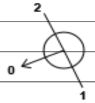
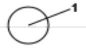
	Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)	Notes
?	1.000	SW43	SW42	3.220	128.0	6.5	1.100	1.100	1.100	1.100	0.050	0.0	35	1.718	Velocity is more than 3 m/s
?	1.001	SW42	SW41	3.053	121.4	12.9	1.100	1.325	1.100	1.325	0.100	0.0	49	1.993	Velocity is more than 3 m/s
✓	1.002	SW41	SW39	1.433	227.8	19.2	1.100	1.151	1.100	1.151	0.150	0.0	87	0.884	
✓	2.000	SW40	SW39	1.057	42.0	6.3	1.100	1.376	1.100	1.376	0.050	0.0	58	0.763	Fall increased to remove backdrop
✓	1.003	SW39	SW33	1.865	296.6	30.7	1.151	1.175	1.151	1.175	0.250	0.0	97	1.224	Fall increased to remove backdrop
✓	3.000	SW38	SW36	1.919	76.3	6.6	1.100	1.389	1.100	1.389	0.050	0.0	44	1.184	Fall increased to remove backdrop
✓	4.000	SW37	SW36	1.108	78.3	6.5	1.100	1.314	1.100	1.314	0.050	0.0	58	0.679	
?	3.001	SW36	SW34	1.434	228.0	19.4	1.164	0.998	0.998	1.164	0.150	0.0	87	0.885	Downstream Depth is less than the specified minimum
✓	5.000	SW35	SW34	1.527	242.8	6.6	1.100	1.100	1.100	1.100	0.050	0.0	51	0.677	
?	3.002	SW34	SW33	1.292	279.6	32.0	1.025	1.100	1.025	1.100	0.250	0.0	119	0.870	Upstream Depth is less than the specified minimum
✓	1.004	SW33	SW30	2.711	586.8	67.3	1.100	1.100	1.100	1.100	0.550	0.0	119	1.831	
?	6.000	SW32	SW31	3.869	273.5	6.6	1.100	1.100	1.100	1.100	0.050	0.0	32	1.651	Velocity is more than 3 m/s
?	6.001	SW31	SW30	3.725	263.3	13.0	1.100	1.325	1.100	1.325	0.100	0.0	45	1.961	Fall increased to remove backdrop | Velocity is more than 3 m/s
✓	1.005	SW30	SW29	1.775	384.3	84.8	1.100	1.100	1.100	1.100	0.700	0.0	166	1.437	
✓	1.006	SW29	SW28	1.583	342.6	90.6	1.100	1.125	1.100	1.125	0.750	0.0	183	1.345	
✓	1.007	SW28	SW27	1.580	342.0	93.8	1.125	1.503	1.125	1.503	0.800	0.0	187	1.355	
✓	1.008	SW27	SW24	1.580	342.0	99.2	1.503	1.564	1.503	1.564	0.850	0.0	193	1.377	
✓	7.000	SW26	SW25	2.360	93.8	6.5	1.100	1.100	1.100	1.100	0.050	0.0	40	1.369	
✓	7.001	SW25	SW24	2.724	108.3	12.8	1.100	1.100	1.100	1.100	0.100	0.0	52	1.851	
✓	1.009	SW24	SW23	1.580	342.0	116.2	1.564	1.617	1.564	1.617	1.000	0.0	210	1.435	
✓	1.010	SW23	SW22	1.580	342.0	120.7	1.617	1.668	1.617	1.668	1.050	0.0	215	1.449	
✓	1.011	SW22	SW21	1.580	342.0	123.4	1.668	1.648	1.648	1.668	1.100	0.0	218	1.457	
✓	1.012	SW21	SW20	1.580	342.0	127.5	1.648	1.561	1.561	1.648	1.150	0.0	221	1.468	
✓	1.013	SW20	SW16	1.580	342.0	132.2	1.561	1.366	1.366	1.561	1.200	0.0	226	1.482	
✓	8.000	SW19	SW18	1.383	55.0	6.3	1.100	1.100	1.100	1.100	0.050	0.0	51	0.929	
✓	8.001	SW18	SW17	2.700	107.4	12.4	1.100	1.100	1.100	1.100	0.100	0.0	51	1.817	
✓	8.002	SW17	SW16	2.526	100.4	18.3	1.100	1.100	1.100	1.100	0.150	0.0	65	1.930	
✓	1.014	SW16	SW15	1.580	342.0	153.5	1.366	1.250	1.250	1.366	1.400	0.0	246	1.539	
✓	1.015	SW15	SW14	1.992	431.3	157.1	1.250	1.100	1.100	1.250	1.450	0.0	219	1.842	
✓	1.016	SW14	SW05	1.581	342.2	160.9	1.100	1.180	1.100	1.180	1.500	0.0	253	1.557	
✓	9.000	SW13	SW12	2.258	159.6	6.5	1.100	1.250	1.100	1.250	0.050	0.0	41	1.119	
?	9.001	SW12	SW11	3.361	534.5	12.8	1.100	1.100	1.100	1.100	0.100	0.0	47	1.433	Velocity is more than 3 m/s
?	9.002	SW11	SW10	1.434	228.0	19.1	1.100	1.096	1.096	1.100	0.150	0.0	87	0.885	Downstream Depth is less than the specified minimum
?	9.003	SW10	SW07	1.446	230.0	24.2	1.096	1.100	1.096	1.100	0.200	0.0	98	0.953	Upstream Depth is less than the specified minimum
✓	10.000	SW09	SW08	2.344	93.2	6.5	1.100	1.100	1.100	1.100	0.050	0.0	40	1.361	
✓	10.001	SW08	SW07	2.365	94.0	12.7	1.100	1.325	1.100	1.325	0.100	0.0	56	1.667	Fall increased to remove backdrop
?	9.004	SW07	SW06	1.434	228.0	42.0	1.100	1.093	1.093	1.100	0.350	0.0	130	1.102	Downstream Depth is less than the specified minimum
?	9.005	SW06	SW05	1.437	228.6	47.6	1.093	1.180	1.093	1.180	0.400	0.0	138	1.144	Upstream Depth is less than the specified minimum
✓	1.017	SW05	IN	2.274	492.2	202.8	1.180	1.345	1.180	1.345	1.900	0.0	235	2.169	

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)	US Node	Dia (mm)	Width (mm)	Sump (m)	Node Type	MH Type	DS Node	Dia (mm)	Width (mm)	Sump (m)	Node Type	MH Type
1.000	45.000	16.7	225	Circular	103.820	102.495	1.100	101.120	99.795	1.100	SW43	1200			Manhole	Adoptable	SW42	1200			Manhole	Adoptable
1.001	36.062	18.5	225	Circular	101.120	99.795	1.100	99.400	97.850	1.325	SW42	1200			Manhole	Adoptable	SW41	1200			Manhole	Adoptable
1.002	10.216	200.3	450	Circular	99.400	97.850	1.100	99.400	97.799	1.151	SW41	1200			Manhole	Adoptable	SW39	1200			Manhole	Adoptable
2.000	42.002	152.2	225	Circular	99.400	98.075	1.100	99.400	97.799	1.376	SW40	1200			Manhole	Adoptable	SW39	1200			Manhole	Adoptable
1.003	44.384	118.7	450	Circular	99.400	97.799	1.151	99.050	97.425	1.175	SW39	1200			Manhole	Adoptable	SW33	1200			Manhole	Adoptable
3.000	23.287	46.7	225	Circular	99.430	98.105	1.100	99.220	97.606	1.389	SW38	1200			Manhole	Adoptable	SW36	1200			Manhole	Adoptable
4.000	18.790	200.0	300	Circular	99.100	97.700	1.100	99.220	97.606	1.314	SW37	1200			Manhole	Adoptable	SW36	1200			Manhole	Adoptable
3.001	10.787	200.0	450	Circular	99.220	97.606	1.164	99.000	97.552	0.998	SW36	1200			Manhole	Adoptable	SW34	1200			Manhole	Adoptable
5.000	17.658	176.6	450	Circular	99.100	97.550	1.100	99.000	97.450	1.100	SW35	1200			Manhole	Adoptable	SW34	1200			Manhole	Adoptable
3.002	7.453	298.1	525	Circular	99.000	97.450	1.025	99.050	97.425	1.100	SW34	1200			Manhole	Adoptable	SW33	1200			Manhole	Adoptable
1.004	8.207	68.4	525	Circular	99.050	97.425	1.100	98.930	97.305	1.100	SW33	1200			Manhole	Adoptable	SW30	1200			Manhole	Adoptable
6.000	40.000	16.7	300	Circular	103.330	101.930	1.100	100.930	99.530	1.100	SW32	1200			Manhole	Adoptable	SW31	1200			Manhole	Adoptable
6.001	40.000	18.0	300	Circular	100.930	99.530	1.100	98.930	97.305	1.325	SW31	1200			Manhole	Adoptable	SW30	1200			Manhole	Adoptable
1.005	14.280	158.7	525	Circular	98.930	97.305	1.100	98.840	97.215	1.100	SW30	1200			Manhole	Adoptable	SW29	1200			Manhole	Adoptable
1.006	4.983	199.3	525	Circular	98.840	97.215	1.100	98.840	97.190	1.125	SW29	1200			Manhole	Adoptable	SW28	1200			Manhole	Adoptable
1.007	39.682	200.0	525	Circular	98.840	97.190	1.125	99.020	96.992	1.503	SW28	1200			Manhole	Adoptable	SW27	1200			Manhole	Adoptable
1.008	6.104	200.0	525	Circular	99.020	96.992	1.503	99.050	96.961	1.564	SW27	1200			Manhole	Adoptable	SW24	1500			Manhole	Adoptable
7.000	32.499	31.0	225	Circular	101.820	100.495	1.100	100.770	99.445	1.100	SW26	1200			Manhole	Adoptable	SW25	1200			Manhole	Adoptable
7.001	40.000	23.3	225	Circular	100.770	99.445	1.100	99.050	97.725	1.100	SW25	1200			Manhole	Adoptable	SW24	1500			Manhole	Adoptable
1.009	6.699	200.0	525	Circular	99.050	96.961	1.564	99.070	96.928	1.617	SW24	1500			Manhole	Adoptable	SW23	1500			Manhole	Adoptable
1.010	14.277	200.0	525	Circular	99.070	96.928	1.617	99.050	96.857	1.668	SW23	1500			Manhole	Adoptable	SW22	1500			Manhole	Adoptable
1.011	35.907	200.0	525	Circular	99.050	96.857	1.668	98.850	96.677	1.648	SW22	1500			Manhole	Adoptable	SW21	1500			Manhole	Adoptable
1.012	17.530	200.0	525	Circular	98.850	96.677	1.648	98.675	96.589	1.561	SW21	1500			Manhole	Adoptable	SW20	1500			Manhole	Adoptable
1.013	9.940	200.0	525	Circular	98.675	96.589	1.561	98.430	96.539	1.366	SW20	1500			Manhole	Adoptable	SW16	1500			Manhole	Adoptable
8.000	58.999	89.4	225	Circular	101.900	100.575	1.100	101.240	99.915	1.100	SW19	1200			Manhole	Adoptable	SW18	1200			Manhole	Adoptable
8.001	39.999	23.7	225	Circular	101.240	99.915	1.100	99.550	98.225	1.100	SW18	1200			Manhole	Adoptable	SW17	1200			Manhole	Adoptable
8.002	30.275	27.0	225	Circular	99.550	98.225	1.100	98.430	97.105	1.100	SW17	1200			Manhole	Adoptable	SW16	1500			Manhole	Adoptable
1.014	6.750	200.0	525	Circular	98.430	96.539	1.366	98.280	96.505	1.250	SW16	1500			Manhole	Adoptable	SW15	1500			Manhole	Adoptable
1.015	22.717	126.2	525	Circular	98.280	96.505	1.250	97.950	96.325	1.100	SW15	1500			Manhole	Adoptable	SW14	1500			Manhole	Adoptable
1.016	15.985	199.8	525	Circular	97.950	96.325	1.100	97.950	96.245	1.180	SW14	1500			Manhole	Adoptable	SW05	1500			Manhole	Adoptable
9.000	37.001	48.7	300	Circular	100.130	98.730	1.100	99.520	97.970	1.250	SW13	1200			Manhole	Adoptable	SW12	1350			Manhole	Adoptable
9.001	44.487	36.8	450	Circular	99.520	97.970	1.100	98.310	96.760	1.100	SW12	1350			Manhole	Adoptable	SW11	1350			Manhole	Adoptable
9.002	7.225	200.0	450	Circular	98.310	96.760	1.100	98.270	96.724	1.096	SW11	1350			Manhole	Adoptable	SW10	1350			Manhole	Adoptable
9.003	57.793	196.6	450	Circular	98.270	96.724	1.096	97.980	96.430	1.100	SW10	1350			Manhole	Adoptable	SW07	1350			Manhole	Adoptable
10.000	37.001	31.4	225	Circular	100.380	99.055	1.100	99.200	97.875	1.100	SW09	1200			Manhole	Adoptable	SW08	1200			Manhole	Adoptable
10.001	44.527	30.8	225	Circular	99.200	97.875	1.100	97.980	96.430	1.325	SW08	1200			Manhole	Adoptable	SW07	1350			Manhole	Adoptable
9.004	10.573	200.0	450	Circular	97.980	96.430	1.100	97.920	96.377	1.093	SW07	1350			Manhole	Adoptable	SW06	1350			Manhole	Adoptable
9.005	11.346	199.1	450	Circular	97.920	96.377	1.093	97.950	96.320	1.180	SW06	1350			Manhole	Adoptable	SW05	1500			Manhole	Adoptable
1.017	11.160	97.0	525	Circular	97.950	96.245	1.180	98.000	96.130	1.345	SW05	1500			Manhole	Adoptable	IN	1500			Manhole	Adoptable

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Sump (m)	Node Type	MH Type	Connections		Link	IL (m)	Dia (mm)	Link Type
SW43	674116.178	713002.357	103.820	1.325	1200			Manhole	Adoptable						
											0	1.000	102.495	225	Circular
SW42	674083.151	712971.792	101.120	1.325	1200			Manhole	Adoptable		1	1.000	99.795	225	Circular
											0	1.001	99.795	225	Circular
SW41	674056.685	712947.297	99.400	1.550	1200			Manhole	Adoptable		1	1.001	97.850	225	Circular
											0	1.002	97.850	450	Circular
SW40	674032.846	712911.228	99.400	1.325	1200			Manhole	Adoptable						
											0	2.000	98.075	225	Circular
SW39	674063.629	712939.804	99.400	1.601	1200			Manhole	Adoptable		1	2.000	97.799	225	Circular
											2	1.002	97.799	450	Circular
											0	1.003	97.799	450	Circular
SW38	674065.139	712927.154	99.430	1.325	1200			Manhole	Adoptable						
											0	3.000	98.105	225	Circular
SW37	674067.208	712897.339	99.100	1.400	1200			Manhole	Adoptable						
											0	4.000	97.700	300	Circular
SW36	674080.998	712910.102	99.220	1.614	1200			Manhole	Adoptable		1	4.000	97.606	300	Circular
											2	3.000	97.606	225	Circular
											0	3.001	97.606	450	Circular
SW35	674075.366	712890.190	99.100	1.550	1200			Manhole	Adoptable						
											0	5.000	97.550	450	Circular
SW34	674088.325	712902.185	99.000	1.550	1200			Manhole	Adoptable		1	5.000	97.450	450	Circular
											2	3.001	97.552	450	Circular
											0	3.002	97.450	525	Circular

SW33	674093.795	712907.247	99.050	1.625	1200			Manhole	Adoptable		1	3.002	97.425	525	Circular
											2	1.003	97.425	450	Circular
											0	1.004	97.425	525	Circular
SW32	674158.225	712955.712	103.330	1.400	1200			Manhole	Adoptable						
											0	6.000	101.930	300	Circular
SW31	674128.872	712928.538	100.930	1.400	1200			Manhole	Adoptable		1	6.000	99.530	300	Circular
											0	6.001	99.530	300	Circular
SW30	674099.519	712901.365	98.930	1.625	1200			Manhole	Adoptable		1	6.001	97.305	300	Circular
											2	1.004	97.305	525	Circular
											0	1.005	97.305	525	Circular
SW29	674112.706	712895.887	98.840	1.625	1200			Manhole	Adoptable		1	1.005	97.215	525	Circular
											0	1.006	97.215	525	Circular
SW28	674116.974	712893.316	98.840	1.650	1200			Manhole	Adoptable		1	1.006	97.190	525	Circular
											0	1.007	97.190	525	Circular
SW27	674143.952	712864.215	99.020	2.028	1200			Manhole	Adoptable		1	1.007	96.992	525	Circular
											0	1.008	96.992	525	Circular
SW26	674201.271	712909.018	101.820	1.325	1200			Manhole	Adoptable						
											0	7.000	100.495	225	Circular
SW25	674177.435	712886.926	100.770	1.325	1200			Manhole	Adoptable		1	7.000	99.445	225	Circular
											0	7.001	99.445	225	Circular
SW24	674148.098	712859.735	99.050	2.089	1500			Manhole	Adoptable		1	7.001	97.725	225	Circular
											2	1.008	96.961	525	Circular
											0	1.009	96.961	525	Circular
SW23	674152.795	712854.959	99.070	2.142	1500			Manhole	Adoptable		1	1.009	96.928	525	Circular

											0	1.010	96.928	525	Circular
SW22	674160.252	712842.784	99.050	2.193	1500			Manhole	Adoptable		1	1.010	96.857	525	Circular
											0	1.011	96.857	525	Circular
SW21	674183.943	712815.802	98.850	2.173	1500			Manhole	Adoptable		1	1.011	96.677	525	Circular
											0	1.012	96.677	525	Circular
SW20	674198.663	712806.283	98.675	2.086	1500			Manhole	Adoptable		1	1.012	96.589	525	Circular
											0	1.013	96.589	525	Circular
SW19	674217.732	712890.872	101.900	1.325	1200			Manhole	Adoptable						
											0	8.000	100.575	225	Circular
SW18	674257.806	712847.571	101.240	1.325	1200			Manhole	Adoptable		1	8.000	99.915	225	Circular
											0	8.001	99.915	225	Circular
SW17	674228.458	712820.393	99.550	1.325	1200			Manhole	Adoptable		1	8.001	98.225	225	Circular
											0	8.002	98.225	225	Circular
SW16	674206.231	712799.838	98.430	1.891	1500			Manhole	Adoptable		1	8.002	97.105	225	Circular
											2	1.013	96.539	525	Circular
											0	1.014	96.539	525	Circular
SW15	674210.816	712794.884	98.280	1.775	1500			Manhole	Adoptable		1	1.014	96.505	525	Circular
											0	1.015	96.505	525	Circular
SW14	674226.270	712778.234	97.950	1.625	1500			Manhole	Adoptable		1	1.015	96.325	525	Circular
											0	1.016	96.325	525	Circular
SW13	674346.157	712751.527	100.130	1.400	1200			Manhole	Adoptable						
											0	9.000	98.730	300	Circular
SW12	674319.008	712726.388	99.520	1.550	1350			Manhole	Adoptable		1	9.000	97.970	300	Circular

															
											0	9.001	97.970	450	Circular
SW11	674286.379	712696.148	98.310	1.550	1350			Manhole	Adoptable		1	9.001	96.760	450	Circular
											0	9.002	96.760	450	Circular
SW10	674281.468	712701.447	98.270	1.546	1350			Manhole	Adoptable		1	9.002	96.724	450	Circular
											0	9.003	96.724	450	Circular
SW09	674301.991	712799.242	100.380	1.325	1200			Manhole	Adoptable						
											0	10.000	99.055	225	Circular
SW08	674274.842	712774.103	99.200	1.325	1200			Manhole	Adoptable		1	10.000	97.875	225	Circular
											0	10.001	97.875	225	Circular
SW07	674242.184	712743.835	97.980	1.550	1350			Manhole	Adoptable		1	10.001	96.430	225	Circular
											2	9.003	96.430	450	Circular
											0	9.004	96.430	450	Circular
SW06	674237.835	712753.472	97.920	1.543	1350			Manhole	Adoptable		1	9.004	96.377	450	Circular
											0	9.005	96.377	450	Circular
SW05	674233.168	712763.814	97.950	1.705	1500			Manhole	Adoptable		1	9.005	96.320	450	Circular
											2	1.016	96.245	525	Circular
											0	1.017	96.245	525	Circular
IN	674222.899	712759.444	98.000	1.870	1500			Manhole	Adoptable		1	1.017	96.130	525	Circular

Rainfall Methodology	FSR		**Return Period (years)**	**Climate Change (CC %)**	**Additional Area (A %)**	**Additional Flow (Q %)**
FSR Region	Scotland and Ireland		2	20	0	0
M5-60 (mm)	15.000		30	20	0	0
Ratio-R	0.280		100	20	0	0
Summer CV	0.750					
Winter CV	0.840					
Analysis Speed	Normal					
Skip Steady State	No					
Drain Down Time (mins)	240					
Additional Storage (m³/ha)	20.0					
Storm Durations (mins)	15					
	30					
	60					
	120					
	180					
	240					
	360					
	480					
	600					
	720					
	960					
	1440					
	2160					
	2880					
Check Discharge Rate(s)	No					
Check Discharge Volume	No					
100 year 360 minute (m³)						

Depth/Area/Inf Area									
Node	**Base Inf Coefficient (m/hr)**	**Side Inf Coefficient (m/hr)**	**Safety Factor**	**Porosity**	**Invert Level (m)**	**Time to half empty (mins)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
IN	0.02000	0.02000	2.0	1.00	96.130		0.000	631.0	0.0
							0.750	1155.5	0.0
							1.870	1675.2	0.0

<u>**Default Values**</u>			<u>**Overrides**</u>					
Entry Loss (manhole)	0.250		**Link**	**Entry Loss**	**Exit Loss**		**Node**	**Flood Risk (m)**
Exit Loss (manhole)	0.250							
Entry Loss (junction)	0.000							
Exit Loss (junction)	0.000							
Apply Recommended Losses	No							
Flood Risk (m)	0.300							

Node Size	Yes
Node Losses	Yes
Link Size	Yes
Minimum Diameter (mm)	150
Link Length	Yes
Maximum Length (m)	100.000
Coordinates	Yes
Accuracy (m)	1.000
Crossings	Yes
Cover Depth	Yes
Minimum Cover Depth (m)	
Maximum Cover Depth (m)	3.000
Backdrops	Yes
Minimum Backdrop Height (m)	
Maximum Backdrop Height (m)	1.500
Full Bore Velocity	Yes
Minimum Full Bore Velocity (m/s)	
Maximum Full Bore Velocity (m/s)	3.000
Proportional Velocity	Yes
Return Period (years)	
Minimum Proportional Velocity (m/s)	0.750
Maximum Proportional Velocity (m/s)	3.000
Surcharged Depth	Yes
Return Period (years)	
Maximum Surcharged Depth (m)	0.100
Flooding	Yes
Return Period (years)	30
Time to Half Empty	No
Return Period (years)	
Discharge Rates	Yes
Discharge Volume	Yes
100 year 360 minute (m^3)	

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year +20% CC 15 minute summer	117.259	33.180
2 year +20% CC 15 minute winter	82.287	33.180
2 year +20% CC 30 minute summer	79.817	22.586
2 year +20% CC 30 minute winter	56.012	22.586
2 year +20% CC 60 minute summer	56.533	14.940
2 year +20% CC 60 minute winter	37.559	14.940
2 year +20% CC 120 minute summer	36.744	9.710
2 year +20% CC 120 minute winter	24.412	9.710
2 year +20% CC 180 minute summer	29.050	7.476
2 year +20% CC 180 minute winter	18.883	7.476
2 year +20% CC 240 minute summer	23.433	6.193
2 year +20% CC 240 minute winter	15.569	6.193
2 year +20% CC 360 minute summer	18.572	4.779
2 year +20% CC 360 minute winter	12.072	4.779
2 year +20% CC 480 minute summer	15.037	3.974
2 year +20% CC 480 minute winter	9.990	3.974
2 year +20% CC 600 minute summer	12.569	3.438
2 year +20% CC 600 minute winter	8.588	3.438
2 year +20% CC 720 minute summer	11.395	3.054
2 year +20% CC 720 minute winter	7.658	3.054
2 year +20% CC 960 minute summer	9.622	2.534
2 year +20% CC 960 minute winter	6.374	2.534
2 year +20% CC 1440 minute summer	7.269	1.948
2 year +20% CC 1440 minute winter	4.885	1.948
2 year +20% CC 2160 minute summer	5.417	1.497
2 year +20% CC 2160 minute winter	3.732	1.497
2 year +20% CC 2880 minute summer	4.623	1.239
2 year +20% CC 2880 minute winter	3.107	1.239
30 year +20% CC 15 minute summer	214.539	60.707
30 year +20% CC 15 minute winter	150.554	60.707

30 year +20% CC 30 minute summer	147.431	41.718
30 year +20% CC 30 minute winter	103.461	41.718
30 year +20% CC 60 minute summer	103.377	27.319
30 year +20% CC 60 minute winter	68.681	27.319
30 year +20% CC 120 minute summer	65.765	17.380
30 year +20% CC 120 minute winter	43.693	17.380
30 year +20% CC 180 minute summer	51.476	13.246
30 year +20% CC 180 minute winter	33.461	13.246
30 year +20% CC 240 minute summer	41.235	10.897
30 year +20% CC 240 minute winter	27.395	10.897
30 year +20% CC 360 minute summer	32.111	8.263
30 year +20% CC 360 minute winter	20.873	8.263
30 year +20% CC 480 minute summer	25.659	6.781
30 year +20% CC 480 minute winter	17.047	6.781
30 year +20% CC 600 minute summer	21.256	5.814
30 year +20% CC 600 minute winter	14.523	5.814
30 year +20% CC 720 minute summer	19.125	5.126
30 year +20% CC 720 minute winter	12.853	5.126
30 year +20% CC 960 minute summer	15.949	4.200
30 year +20% CC 960 minute winter	10.565	4.200
30 year +20% CC 1440 minute summer	11.827	3.170
30 year +20% CC 1440 minute winter	7.949	3.170
30 year +20% CC 2160 minute summer	8.655	2.392
30 year +20% CC 2160 minute winter	5.964	2.392
30 year +20% CC 2880 minute summer	7.307	1.958
30 year +20% CC 2880 minute winter	4.911	1.958
100 year +20% CC 15 minute summer	277.378	78.488
100 year +20% CC 15 minute winter	194.651	78.488
100 year +20% CC 30 minute summer	192.192	54.384
100 year +20% CC 30 minute winter	134.871	54.384
100 year +20% CC 60 minute summer	134.639	35.581
100 year +20% CC 60 minute winter	89.451	35.581
100 year +20% CC 120 minute summer	85.051	22.477

100 year +20% CC 120 minute winter	56.506	22.477
100 year +20% CC 180 minute summer	66.221	17.041
100 year +20% CC 180 minute winter	43.045	17.041
100 year +20% CC 240 minute summer	52.812	13.957
100 year +20% CC 240 minute winter	35.087	13.957
100 year +20% CC 360 minute summer	40.870	10.517
100 year +20% CC 360 minute winter	26.566	10.517
100 year +20% CC 480 minute summer	32.500	8.589
100 year +20% CC 480 minute winter	21.592	8.589
100 year +20% CC 600 minute summer	26.818	7.335
100 year +20% CC 600 minute winter	18.324	7.335
100 year +20% CC 720 minute summer	24.051	6.446
100 year +20% CC 720 minute winter	16.164	6.446
100 year +20% CC 960 minute summer	19.953	5.254
100 year +20% CC 960 minute winter	13.217	5.254
100 year +20% CC 1440 minute summer	14.686	3.936
100 year +20% CC 1440 minute winter	9.870	3.936
100 year +20% CC 2160 minute summer	10.668	2.948
100 year +20% CC 2160 minute winter	7.351	2.948
100 year +20% CC 2880 minute summer	8.957	2.401
100 year +20% CC 2880 minute winter	6.020	2.401

Results for 2 year +20% CC Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status	Link Event (Outflow)	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)	Note
15 minute winter	SW43	10	102.533	0.038	8.0	0.0718	0.0000	OK	15 minute winter	1.000	SW42	8.0	1.355	0.062	0.2679		
15 minute winter	SW42	10	99.850	0.055	16.0	0.1036	0.0000	OK	15 minute winter	1.001	SW41	16.0	1.237	0.131	0.4725		
15 minute winter	SW41	10	97.958	0.108	24.0	0.1910	0.0000	OK	15 minute winter	1.002	SW39	23.8	0.816	0.104	0.2979		
15 minute winter	SW40	10	98.141	0.066	8.0	0.1240	0.0000	OK	15 minute winter	2.000	SW39	7.9	0.563	0.189	0.5993		
15 minute winter	SW39	10	97.907	0.108	39.7	0.1902	0.0000	OK	15 minute winter	1.003	SW33	38.8	0.928	0.131	1.8751		
15 minute winter	SW38	10	98.154	0.049	8.0	0.0924	0.0000	OK	15 minute winter	3.000	SW36	8.0	0.678	0.105	0.2841		
15 minute winter	SW37	10	97.764	0.064	8.0	0.1182	0.0000	OK	15 minute winter	4.000	SW36	8.0	0.495	0.102	0.3081		
15 minute winter	SW36	10	97.710	0.104	24.0	0.1830	0.0000	OK	15 minute winter	3.001	SW34	23.9	0.904	0.105	0.2847		
15 minute winter	SW35	10	97.612	0.062	8.0	0.1106	0.0000	OK	15 minute winter	5.000	SW34	7.7	0.285	0.032	0.5732		
15 minute winter	SW34	10	97.613	0.163	38.6	0.2893	0.0000	OK	15 minute summer	3.002	SW33	38.0	0.668	0.136	0.4368		
15 minute winter	SW33	11	97.596	0.171	84.7	0.2990	0.0000	OK	15 minute winter	1.004	SW30	84.2	1.122	0.143	0.6173		
15 minute winter	SW32	10	101.965	0.035	8.0	0.0648	0.0000	OK	15 minute winter	6.000	SW31	8.0	1.320	0.029	0.2451		
15 minute winter	SW31	10	99.580	0.050	16.0	0.0919	0.0000	OK	15 minute winter	6.001	SW30	16.0	0.636	0.061	1.2887		
15 minute winter	SW30	11	97.532	0.227	107.3	0.3963	0.0000	OK	15 minute winter	1.005	SW29	107.0	1.114	0.278	1.3714		
15 minute winter	SW29	11	97.468	0.253	113.8	0.4410	0.0000	OK	15 minute winter	1.006	SW28	114.4	1.195	0.334	0.4772		
15 minute winter	SW28	11	97.416	0.226	121.2	0.3925	0.0000	OK	15 minute winter	1.007	SW27	122.3	1.093	0.358	4.4360		
15 minute winter	SW27	12	97.308	0.316	129.1	0.5130	0.0000	OK	15 minute winter	1.008	SW24	128.5	0.957	0.376	0.8352		
15 minute winter	SW26	10	100.539	0.044	8.0	0.0835	0.0000	OK	15 minute winter	7.000	SW25	8.0	1.174	0.085	0.2242		
15 minute winter	SW25	10	99.504	0.059	16.0	0.1114	0.0000	OK	15 minute winter	7.001	SW24	15.9	1.940	0.147	0.3277		
15 minute winter	SW24	12	97.281	0.320	150.1	0.7194	0.0000	OK	15 minute winter	1.009	SW23	149.3	1.157	0.436	0.9097		
15 minute winter	SW23	12	97.240	0.312	156.1	0.6967	0.0000	OK	15 minute summer	1.010	SW22	154.4	1.327	0.451	1.8997		
15 minute summer	SW22	12	97.182	0.325	161.0	0.7223	0.0000	OK	15 minute winter	1.011	SW21	169.4	1.217	0.495	6.1138		
15 minute winter	SW21	11	97.159	0.482	174.4	1.0729	0.0000	OK	15 minute winter	1.012	SW20	176.6	1.068	0.516	3.7127		
15 minute winter	SW20	11	97.144	0.555	179.9	1.2471	0.0000	SURCHARGED	15 minute winter	1.013	SW16	192.7	1.106	0.563	2.1474		No issue with pipe capacity. Surcharge reflects standing water level in infiltration basin.
15 minute summer	SW19	10	100.633	0.058	8.0	0.1097	0.0000	OK	15 minute winter	8.000	SW18	8.0	0.983	0.145	0.4785		
15 minute winter	SW18	10	99.973	0.058	16.0	0.1096	0.0000	OK	15 minute winter	8.001	SW17	15.8	1.595	0.147	0.3976		
15 minute winter	SW17	10	98.301	0.076	23.8	0.1433	0.0000	OK	15 minute winter	8.002	SW16	23.4	2.032	0.233	0.3487		
15 minute winter	SW16	11	97.120	0.581	210.1	1.3335	0.0000	SURCHARGED	15 minute winter	1.014	SW15	219.7	1.344	0.642	1.4582		No issue with pipe capacity. Surcharge reflects standing water level in infiltration basin.
2880 minute winter	SW15	2820	97.114	0.609	11.4	1.4197	0.0000	SURCHARGED	15 minute winter	1.015	SW14	240.0	1.331	0.556	4.9076		No issue with pipe capacity. Surcharge reflects standing water level in infiltration basin.
2880 minute winter	SW14	2820	97.117	0.792	11.7	1.8867	0.0000	SURCHARGED	15 minute winter	1.016	SW05	252.3	1.328	0.737	3.4533		No issue with pipe capacity. Surcharge reflects standing water level in infiltration basin.
15 minute winter	SW13	10	98.775	0.045	8.0	0.0837	0.0000	OK	15 minute winter	9.000	SW12	8.0	1.068	0.050	0.2773		
15 minute winter	SW12	10	98.023	0.053	16.0	0.1096	0.0000	OK	15 minute winter	9.001	SW11	15.9	0.826	0.030	2.3107		
2880 minute winter	SW11	2820	97.114	0.354	1.2	0.7345	0.0000	OK	15 minute summer	9.002	SW10	37.4	0.777	0.164	0.7531		
2880 minute winter	SW10	2820	97.114	0.390	1.9	0.8097	0.0000	OK	15 minute summer	9.003	SW07	72.7	0.616	0.316	7.6681		
15 minute winter	SW09	10	99.099	0.044	8.0	0.0837	0.0000	OK	15 minute winter	10.000	SW08	8.0	1.115	0.086	0.2679		
15 minute winter	SW08	10	97.937	0.062	16.0	0.1177	0.0000	OK	15 minute winter	10.001	SW07	15.9	0.803	0.169	1.0848		
2880 minute winter	SW07	2820	97.114	0.684	3.6	1.4198	0.0000	SURCHARGED	15 minute winter	9.004	SW06	116.7	0.822	0.512	1.6752		No issue with pipe capacity. Surcharge reflects standing water level in infiltration basin.
2880 minute winter	SW06	2820	97.115	0.738	4.4	1.5335	0.0000	SURCHARGED	15 minute winter	9.005	SW05	125.1	0.850	0.548	1.7977		No issue with pipe capacity. Surcharge reflects standing water level in infiltration basin.
2880 minute winter	SW05	2940	97.112	0.867	14.4	1.5328	0.0000	SURCHARGED	15 minute winter	1.017	IN	383.8	3.353	0.780	1.3175		No issue with pipe capacity. Surcharge reflects standing water level in infiltration basin.
2880 minute winter	IN	3060	97.112	0.982	14.7	952.0988	0.0000	OK	15 minute summer	Infiltration		0.0					

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link Event (Outflow)	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW43	10	102.546	0.051	14.6	0.0964	0.0000	OK	15 minute summer	1.000	SW42	14.6	1.612	0.114	0.4114	
15 minute winter	SW42	10	99.870	0.075	29.2	0.1411	0.0000	OK	15 minute winter	1.001	SW41	29.2	1.466	0.240	0.7175	
15 minute winter	SW41	10	98.001	0.151	43.8	0.2677	0.0000	OK	15 minute winter	1.002	SW39	43.6	0.947	0.191	0.4702	
15 minute winter	SW40	10	98.166	0.091	14.6	0.1707	0.0000	OK	15 minute winter	2.000	SW39	14.5	0.681	0.346	0.8969	
15 minute winter	SW39	10	97.947	0.148	72.7	0.2607	0.0000	OK	15 minute winter	1.003	SW33	71.9	1.034	0.243	4.3705	
15 minute summer	SW38	10	98.171	0.066	14.6	0.1252	0.0000	OK	15 minute summer	3.000	SW36	14.6	0.809	0.191	0.5380	
15 minute winter	SW37	12	97.950	0.250	14.6	0.4618	0.0000	OK	15 minute winter	4.000	SW36	17.3	0.584	0.221	1.2516	
15 minute winter	SW36	12	97.931	0.325	43.8	0.5693	0.0000	OK	15 minute winter	3.001	SW34	68.1	1.037	0.299	1.4405	
15 minute winter	SW35	12	97.916	0.366	14.6	0.6491	0.0000	OK	15 minute summer	5.000	SW34	-41.9	-0.386	-0.173	2.3119	
15 minute winter	SW34	12	97.937	0.487	90.3	0.8658	0.0000	OK	15 minute winter	3.002	SW33	74.3	0.686	0.266	1.5813	
15 minute winter	SW33	12	97.942	0.517	154.3	0.9025	0.0000	OK	15 minute winter	1.004	SW30	150.3	1.164	0.256	1.7697	
15 minute summer	SW32	10	101.977	0.047	14.6	0.0864	0.0000	OK	15 minute summer	6.000	SW31	14.6	1.577	0.053	0.3740	
15 minute winter	SW31	10	99.597	0.067	29.2	0.1236	0.0000	OK	15 minute winter	6.001	SW30	29.2	0.700	0.111	1.6425	
15 minute winter	SW30	12	97.911	0.606	194.1	1.0588	0.0000	SURCHARGED	15 minute summer	1.005	SW29	188.1	1.198	0.489	3.0830	
15 minute winter	SW29	12	97.875	0.660	189.2	1.1519	0.0000	SURCHARGED	15 minute winter	1.006	SW28	199.1	1.265	0.581	1.0765	
15 minute winter	SW28	12	97.852	0.662	203.3	1.1506	0.0000	SURCHARGED	15 minute winter	1.007	SW27	221.8	1.144	0.649	8.5726	
15 minute winter	SW27	11	97.793	0.801	226.0	1.3015	0.0000	SURCHARGED	15 minute winter	1.008	SW24	231.9	1.074	0.678	1.3187	
15 minute summer	SW26	10	100.555	0.060	14.6	0.1127	0.0000	OK	15 minute summer	7.000	SW25	14.6	1.385	0.156	0.3471	
15 minute winter	SW25	10	99.526	0.081	29.2	0.1535	0.0000	OK	15 minute winter	7.001	SW24	29.1	2.291	0.269	0.5083	
15 minute winter	SW24	11	97.786	0.825	246.8	1.8526	0.0000	SURCHARGED	15 minute winter	1.009	SW23	250.5	1.228	0.732	1.4472	
15 minute winter	SW23	11	97.774	0.846	254.7	1.8897	0.0000	SURCHARGED	15 minute winter	1.010	SW22	258.5	1.276	0.756	3.0843	
15 minute winter	SW22	11	97.756	0.899	262.7	1.9993	0.0000	SURCHARGED	15 minute winter	1.011	SW21	267.0	1.282	0.781	7.7571	
15 minute winter	SW21	11	97.656	0.979	271.2	2.1803	0.0000	SURCHARGED	15 minute winter	1.012	SW20	275.0	1.282	0.804	3.7871	
15 minute winter	SW20	11	97.598	1.009	279.2	2.2675	0.0000	SURCHARGED	15 minute winter	1.013	SW16	282.3	1.327	0.825	2.1474	
15 minute summer	SW19	10	100.655	0.080	14.6	0.1505	0.0000	OK	15 minute summer	8.000	SW18	14.6	1.163	0.265	0.7411	
15 minute winter	SW18	10	99.995	0.080	29.2	0.1501	0.0000	OK	15 minute winter	8.001	SW17	29.0	1.926	0.270	0.6042	
15 minute summer	SW17	10	98.328	0.103	43.6	0.1940	0.0000	OK	15 minute summer	8.002	SW16	43.4	2.289	0.433	0.8696	
15 minute winter	SW16	11	97.554	1.015	312.3	2.3311	0.0000	SURCHARGED	15 minute winter	1.014	SW15	320.8	1.519	0.938	1.4582	
15 minute winter	SW15	11	97.490	0.985	326.9	2.2965	0.0000	SURCHARGED	15 minute winter	1.015	SW14	336.6	1.595	0.780	4.9076	
2880 minute winter	SW14	2820	97.491	1.166	17.3	2.7786	0.0000	SURCHARGED	15 minute winter	1.016	SW05	349.2	1.689	1.020	3.4533	
15 minute winter	SW13	10	98.791	0.061	14.6	0.1123	0.0000	OK	15 minute winter	9.000	SW12	14.6	1.284	0.091	0.4215	
15 minute winter	SW12	10	98.040	0.070	29.2	0.1463	0.0000	OK	15 minute winter	9.001	SW11	29.1	0.923	0.054	3.8757	
2880 minute winter	SW11	2820	97.486	0.726	1.8	1.5080	0.0000	SURCHARGED	15 minute summer	9.002	SW10	68.9	0.828	0.302	1.1448	
2880 minute winter	SW10	2820	97.486	0.762	3.7	1.5838	0.0000	SURCHARGED	15 minute summer	9.003	SW07	103.9	0.760	0.452	9.1569	
15 minute summer	SW09	10	99.115	0.060	14.6	0.1131	0.0000	OK	15 minute winter	10.000	SW08	14.6	1.320	0.157	0.4127	
15 minute winter	SW08	10	97.961	0.086	29.2	0.1613	0.0000	OK	15 minute winter	10.001	SW07	29.1	0.933	0.310	1.1935	
2880 minute winter	SW07	2820	97.485	1.055	4.8	2.1916	0.0000	SURCHARGED	15 minute summer	9.004	SW06	150.0	0.947	0.658	1.6752	
2880 minute winter	SW06	2820	97.494	1.117	6.4	2.3218	0.0000	SURCHARGED	15 minute summer	9.005	SW05	160.1	1.010	0.700	1.7977	
2880 minute winter	SW05	3000	97.472	1.227	22.0	2.1688	0.0000	SURCHARGED	15 minute winter	1.017	IN	519.0	3.447	1.055	1.5214	
2880 minute winter	IN	2880	97.472	1.342	25.4	1437.8140	0.0000	OK	15 minute summer	Infiltration		0.0				

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.39%																
Node Event	**US Node**	**Peak (mins)**	**Level (m)**	**Depth (m)**	**Inflow (l/s)**	**Node Vol (m³)**	**Flood (m³)**	**Status**	**Link Event (Outflow)**	**Link**	**DS Node**	**Outflow (l/s)**	**Velocity (m/s)**	**Flow/Cap**	**Link Vol (m³)**	**Discharge Vol (m³)**
15 minute winter	SW43	10	102.553	0.058	18.9	0.1098	0.0000	OK	15 minute winter	1.000	SW42	18.9	1.732	0.148	0.4953	
15 minute winter	SW42	10	99.881	0.086	37.8	0.1618	0.0000	OK	15 minute winter	1.001	SW41	37.8	1.584	0.311	0.9481	
15 minute winter	SW41	12	98.386	0.536	56.7	0.9518	0.0000	SURCHARGED	15 minute winter	1.002	SW39	56.5	1.001	0.248	1.6187	
15 minute winter	SW40	12	98.491	0.416	18.9	0.7845	0.0000	SURCHARGED	15 minute winter	2.000	SW39	27.7	0.741	0.660	1.6705	
15 minute winter	SW39	12	98.382	0.583	94.2	1.0229	0.0000	SURCHARGED	15 minute summer	1.003	SW33	98.2	1.090	0.331	6.9664	
15 minute winter	SW38	12	98.487	0.382	18.9	0.7197	0.0000	SURCHARGED	15 minute winter	3.000	SW36	18.9	0.840	0.248	0.9261	
15 minute winter	SW37	12	98.364	0.664	73.3	1.2250	0.0000	SURCHARGED	15 minute winter	4.000	SW36	-54.4	-0.780	-0.695	1.3232	
15 minute winter	SW36	12	98.385	0.779	61.9	1.3635	0.0000	SURCHARGED	15 minute summer	3.001	SW34	57.3	0.998	0.251	1.7091	
15 minute winter	SW35	12	98.343	0.793	18.9	1.4075	0.0000	SURCHARGED	15 minute summer	5.000	SW34	-74.0	-0.506	-0.305	2.7978	
15 minute winter	SW34	12	98.365	0.915	84.7	1.6245	0.0000	SURCHARGED	15 minute summer	3.002	SW33	93.7	0.717	0.335	1.6101	
15 minute winter	SW33	12	98.352	0.927	179.3	1.6186	0.0000	SURCHARGED	15 minute winter	1.004	SW30	187.5	1.158	0.320	1.7730	
15 minute winter	SW32	10	101.983	0.053	18.9	0.0980	0.0000	OK	15 minute winter	6.000	SW31	18.9	1.699	0.069	0.4494	
15 minute winter	SW31	10	99.606	0.076	37.8	0.1407	0.0000	OK	15 minute winter	6.001	SW30	37.8	0.744	0.144	1.6899	
15 minute winter	SW30	12	98.321	1.016	220.6	1.7746	0.0000	SURCHARGED	15 minute winter	1.005	SW29	218.1	1.172	0.568	3.0849	
15 minute winter	SW29	12	98.290	1.075	228.6	1.8773	0.0000	SURCHARGED	15 minute winter	1.006	SW28	227.3	1.260	0.663	1.0765	
15 minute winter	SW28	12	98.267	1.077	231.2	1.8710	0.0000	SURCHARGED	15 minute summer	1.007	SW27	242.5	1.168	0.709	8.5726	
15 minute winter	SW27	12	98.187	1.195	240.4	1.9403	0.0000	SURCHARGED	15 minute summer	1.008	SW24	249.0	1.153	0.728	1.3187	
15 minute winter	SW26	10	100.563	0.068	18.9	0.1286	0.0000	OK	15 minute winter	7.000	SW25	18.9	1.502	0.201	0.4103	
15 minute summer	SW25	10	99.537	0.092	37.8	0.1731	0.0000	OK	15 minute summer	7.001	SW24	38.2	2.392	0.353	1.0693	
15 minute winter	SW24	12	98.152	1.191	258.9	2.6739	0.0000	SURCHARGED	15 minute winter	1.009	SW23	272.4	1.261	0.797	1.4472	
15 minute winter	SW23	11	98.120	1.192	280.3	2.6634	0.0000	SURCHARGED	15 minute winter	1.010	SW22	287.6	1.367	0.841	3.0843	
15 minute winter	SW22	11	98.065	1.208	295.5	2.6865	0.0000	SURCHARGED	15 minute winter	1.011	SW21	303.3	1.404	0.887	7.7571	
15 minute winter	SW21	11	97.941	1.264	311.2	2.8155	0.0000	SURCHARGED	15 minute winter	1.012	SW20	317.8	1.471	0.929	3.7871	
15 minute winter	SW20	11	97.847	1.258	325.7	2.8272	0.0000	SURCHARGED	15 minute winter	1.013	SW16	332.2	1.538	0.971	2.1474	
15 minute summer	SW19	10	100.667	0.092	18.9	0.1735	0.0000	OK	15 minute summer	8.000	SW18	18.9	1.245	0.344	0.8965	
15 minute winter	SW18	10	100.007	0.092	37.8	0.1726	0.0000	OK	15 minute winter	8.001	SW17	37.7	2.024	0.351	0.8081	
15 minute winter	SW17	10	98.362	0.137	56.6	0.2580	0.0000	OK	15 minute winter	8.002	SW16	53.6	2.309	0.534	0.9844	
15 minute winter	SW16	10	97.802	1.263	370.5	2.8998	0.0000	SURCHARGED	15 minute winter	1.014	SW15	381.4	1.766	1.115	1.4582	
15 minute winter	SW15	10	97.747	1.242	389.3	2.8945	0.0000	SURCHARGED	15 minute winter	1.015	SW14	395.6	1.831	0.917	4.9076	
2880 minute winter	SW14	3120	97.649	1.324	20.1	3.1552	0.0000	SURCHARGED	15 minute winter	1.016	SW05	414.7	1.920	1.212	3.4533	
15 minute winter	SW13	10	98.799	0.069	18.9	0.1276	0.0000	OK	15 minute winter	9.000	SW12	18.9	1.386	0.118	0.5051	
15 minute winter	SW12	10	98.050	0.080	37.8	0.1661	0.0000	OK	15 minute winter	9.001	SW11	37.7	0.909	0.071	3.9465	
2880 minute winter	SW11	2880	97.649	0.889	4.9	1.8474	0.0000	SURCHARGED	15 minute winter	9.002	SW10	80.7	0.830	0.354	1.1448	
2880 minute winter	SW10	2880	97.649	0.925	6.1	1.9225	0.0000	SURCHARGED	15 minute summer	9.003	SW07	108.0	0.736	0.469	9.1569	
15 minute winter	SW09	10	99.123	0.068	18.9	0.1291	0.0000	OK	15 minute winter	10.000	SW08	18.9	1.416	0.203	0.5339	
15 minute winter	SW08	10	97.982	0.107	37.8	0.2024	0.0000	OK	15 minute winter	10.001	SW07	36.6	1.123	0.390	1.3012	
2880 minute winter	SW07	3060	97.649	1.219	7.8	2.5318	0.0000	SURCHARGED	15 minute winter	9.004	SW06	173.1	1.092	0.759	1.6752	
2880 minute winter	SW06	3120	97.649	1.272	8.4	2.6444	0.0000	FLOOD RISK	15 minute winter	9.005	SW05	196.3	1.239	0.859	1.7977	
2880 minute winter	SW05	3060	97.649	1.404	25.4	2.4810	0.0000	SURCHARGED	15 minute winter	1.017	IN	605.9	3.990	1.231	1.7499	
2880 minute winter	IN	2940	97.649	1.519	31.2	1697.7390	0.0000	OK	15 minute summer	Infiltration		0.0				

Results for 2 year +20% CC 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 99.94%																
Node Event	**US Node**	**Peak (mins)**	**Level (m)**	**Depth (m)**	**Inflow (l/s)**	**Node Vol (m³)**	**Flood (m³)**	**Status**	**Link Event**	**Link**	**DS Node**	**Outflow (l/s)**	**Velocity (m/s)**	**Flow/Cap**	**Link Vol (m³)**	**Discharge Vol (m³)**
15 minute summer	SW43	10	102.533	0.038	8.0	0.0718	0.0000	OK	15 minute summer	1.000	SW42	8.0	1.357	0.062	0.2679	
15 minute summer	SW42	10	99.850	0.055	16.0	0.1036	0.0000	OK	15 minute summer	1.001	SW41	16.0	1.238	0.131	0.4719	
15 minute summer	SW41	10	97.957	0.107	23.9	0.1907	0.0000	OK	15 minute summer	1.002	SW39	23.7	0.817	0.104	0.2968	
15 minute summer	SW40	10	98.141	0.066	8.0	0.1239	0.0000	OK	15 minute summer	2.000	SW39	7.9	0.565	0.189	0.5973	
15 minute summer	SW39	10	97.907	0.108	39.7	0.1896	0.0000	OK	15 minute summer	1.003	SW33	38.6	0.927	0.130	1.8649	
15 minute summer	SW38	10	98.154	0.049	8.0	0.0924	0.0000	OK	15 minute summer	3.000	SW36	8.0	0.681	0.105	0.2840	
15 minute summer	SW37	10	97.764	0.064	8.0	0.1182	0.0000	OK	15 minute summer	4.000	SW36	8.0	0.496	0.102	0.3080	
15 minute summer	SW36	10	97.710	0.104	24.0	0.1829	0.0000	OK	15 minute summer	3.001	SW34	23.8	0.904	0.104	0.2845	
15 minute summer	SW35	11	97.612	0.062	8.0	0.1098	0.0000	OK	15 minute summer	5.000	SW34	7.6	0.295	0.031	0.5678	
15 minute summer	SW34	10	97.612	0.162	38.5	0.2882	0.0000	OK	15 minute summer	3.002	SW33	38.0	0.668	0.136	0.4368	
15 minute summer	SW33	10	97.595	0.170	84.6	0.2971	0.0000	OK	15 minute summer	1.004	SW30	83.3	1.120	0.142	0.6118	
15 minute summer	SW32	10	101.965	0.035	8.0	0.0648	0.0000	OK	15 minute summer	6.000	SW31	8.0	1.322	0.029	0.2450	
15 minute summer	SW31	10	99.580	0.050	16.0	0.0919	0.0000	OK	15 minute summer	6.001	SW30	16.0	0.605	0.061	1.2787	
15 minute summer	SW30	11	97.530	0.225	106.6	0.3937	0.0000	OK	15 minute summer	1.005	SW29	106.0	1.112	0.276	1.3612	
15 minute summer	SW29	11	97.466	0.251	112.6	0.4388	0.0000	OK	15 minute summer	1.006	SW28	113.5	1.192	0.331	0.4743	
15 minute summer	SW28	11	97.415	0.225	120.1	0.3908	0.0000	OK	15 minute summer	1.007	SW27	121.5	1.095	0.355	4.4028	
15 minute summer	SW27	11	97.304	0.312	128.1	0.5063	0.0000	OK	15 minute summer	1.008	SW24	127.0	0.954	0.371	0.8122	
15 minute summer	SW26	10	100.539	0.044	8.0	0.0835	0.0000	OK	15 minute summer	7.000	SW25	8.0	1.178	0.085	0.2240	
15 minute summer	SW25	10	99.504	0.059	16.0	0.1114	0.0000	OK	15 minute summer	7.001	SW24	15.9	1.939	0.146	0.3273	
15 minute summer	SW24	11	97.271	0.310	148.1	0.6957	0.0000	OK	15 minute summer	1.009	SW23	147.9	1.166	0.432	0.8556	
15 minute summer	SW23	12	97.225	0.297	154.5	0.6630	0.0000	OK	15 minute summer	1.010	SW22	154.4	1.327	0.451	1.8997	
15 minute summer	SW22	12	97.182	0.325	161.0	0.7223	0.0000	OK	15 minute summer	1.011	SW21	157.1	1.241	0.459	5.9568	
15 minute summer	SW21	11	97.125	0.448	163.7	0.9966	0.0000	OK	15 minute summer	1.012	SW20	168.4	1.042	0.492	3.5763	
15 minute summer	SW20	11	97.087	0.498	172.4	1.1198	0.0000	OK	15 minute summer	1.013	SW16	181.5	1.080	0.531	2.1263	
15 minute summer	SW19	10	100.633	0.058	8.0	0.1097	0.0000	OK	15 minute summer	8.000	SW18	8.0	0.983	0.145	0.4780	
15 minute summer	SW18	10	99.973	0.058	16.0	0.1094	0.0000	OK	15 minute summer	8.001	SW17	15.7	1.596	0.147	0.3962	
15 minute summer	SW17	10	98.301	0.076	23.7	0.1428	0.0000	OK	15 minute summer	8.002	SW16	23.2	2.028	0.231	0.3471	
15 minute summer	SW16	11	97.066	0.527	196.9	1.2110	0.0000	SURCHARGED	15 minute summer	1.014	SW15	205.1	1.311	0.600	1.4576	
15 minute summer	SW15	11	97.034	0.529	207.5	1.2321	0.0000	SURCHARGED	15 minute summer	1.015	SW14	221.7	1.276	0.514	4.9067	
15 minute summer	SW14	11	96.982	0.657	224.1	1.5659	0.0000	SURCHARGED	15 minute summer	1.016	SW05	232.1	1.259	0.678	3.4533	
15 minute summer	SW13	10	98.775	0.045	8.0	0.0837	0.0000	OK	15 minute summer	9.000	SW12	8.0	1.068	0.050	0.2772	
15 minute summer	SW12	10	98.023	0.053	16.0	0.1095	0.0000	OK	15 minute summer	9.001	SW11	15.9	0.833	0.030	2.4340	
15 minute summer	SW11	12	97.035	0.275	51.2	0.5715	0.0000	OK	15 minute summer	9.002	SW10	37.4	0.777	0.164	0.7531	
15 minute summer	SW10	12	97.012	0.288	44.6	0.5975	0.0000	OK	15 minute summer	9.003	SW07	72.7	0.616	0.316	7.6681	
15 minute summer	SW09	10	99.099	0.044	8.0	0.0837	0.0000	OK	15 minute summer	10.000	SW08	8.0	1.118	0.086	0.2678	
15 minute summer	SW08	10	97.937	0.062	16.0	0.1176	0.0000	OK	15 minute summer	10.001	SW07	15.9	0.779	0.169	1.0847	
15 minute summer	SW07	11	96.969	0.539	81.8	1.1195	0.0000	SURCHARGED	15 minute summer	9.004	SW06	108.8	0.832	0.477	1.6752	
15 minute summer	SW06	11	96.963	0.586	111.2	1.2182	0.0000	SURCHARGED	15 minute summer	9.005	SW05	115.8	0.890	0.507	1.7977	
15 minute summer	SW05	11	96.955	0.710	347.9	1.2546	0.0000	SURCHARGED	15 minute summer	1.017	IN	355.7	3.302	0.723	1.2910	
15 minute summer	IN	255	96.300	0.170	355.7	117.5630	0.0000	OK	15 minute summer	Infiltration		0.0				

Results for 2 year +20% CC 15 minute winter. 255 minute analysis at 1 minute timestep. Mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status	Link Event	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute winter	SW43	10	102.533	0.038	8.0	0.0718	0.0000	OK	15 minute winter	1.000	SW42	8.0	1.355	0.062	0.2679	
15 minute winter	SW42	10	99.850	0.055	16.0	0.1036	0.0000	OK	15 minute winter	1.001	SW41	16.0	1.237	0.131	0.4725	
15 minute winter	SW41	10	97.958	0.108	24.0	0.1910	0.0000	OK	15 minute winter	1.002	SW39	23.8	0.816	0.104	0.2979	
15 minute winter	SW40	10	98.141	0.066	8.0	0.1240	0.0000	OK	15 minute winter	2.000	SW39	7.9	0.563	0.189	0.5993	
15 minute winter	SW39	10	97.907	0.108	39.7	0.1902	0.0000	OK	15 minute winter	1.003	SW33	38.8	0.928	0.131	1.8751	
15 minute winter	SW38	10	98.154	0.049	8.0	0.0924	0.0000	OK	15 minute winter	3.000	SW36	8.0	0.678	0.105	0.2841	
15 minute winter	SW37	10	97.764	0.064	8.0	0.1182	0.0000	OK	15 minute winter	4.000	SW36	8.0	0.495	0.102	0.3081	
15 minute winter	SW36	10	97.710	0.104	24.0	0.1830	0.0000	OK	15 minute winter	3.001	SW34	23.9	0.904	0.105	0.2847	
15 minute winter	SW35	10	97.612	0.062	8.0	0.1106	0.0000	OK	15 minute winter	5.000	SW34	7.7	0.285	0.032	0.5732	
15 minute winter	SW34	10	97.613	0.163	38.6	0.2893	0.0000	OK	15 minute winter	3.002	SW33	37.9	0.662	0.136	0.4398	
15 minute winter	SW33	11	97.596	0.171	84.7	0.2990	0.0000	OK	15 minute winter	1.004	SW30	84.2	1.122	0.143	0.6173	
15 minute winter	SW32	10	101.965	0.035	8.0	0.0648	0.0000	OK	15 minute winter	6.000	SW31	8.0	1.320	0.029	0.2451	
15 minute winter	SW31	10	99.580	0.050	16.0	0.0919	0.0000	OK	15 minute winter	6.001	SW30	16.0	0.636	0.061	1.2887	
15 minute winter	SW30	11	97.532	0.227	107.3	0.3963	0.0000	OK	15 minute winter	1.005	SW29	107.0	1.114	0.278	1.3714	
15 minute winter	SW29	11	97.468	0.253	113.8	0.4410	0.0000	OK	15 minute winter	1.006	SW28	114.4	1.195	0.334	0.4772	
15 minute winter	SW28	11	97.416	0.226	121.2	0.3925	0.0000	OK	15 minute winter	1.007	SW27	122.3	1.093	0.358	4.4360	
15 minute winter	SW27	12	97.308	0.316	129.1	0.5130	0.0000	OK	15 minute winter	1.008	SW24	128.5	0.957	0.376	0.8352	
15 minute winter	SW26	10	100.539	0.044	8.0	0.0835	0.0000	OK	15 minute winter	7.000	SW25	8.0	1.174	0.085	0.2242	
15 minute winter	SW25	10	99.504	0.059	16.0	0.1114	0.0000	OK	15 minute winter	7.001	SW24	15.9	1.940	0.147	0.3277	
15 minute winter	SW24	12	97.281	0.320	150.1	0.7194	0.0000	OK	15 minute winter	1.009	SW23	149.3	1.157	0.436	0.9097	
15 minute winter	SW23	12	97.240	0.312	156.1	0.6967	0.0000	OK	15 minute winter	1.010	SW22	152.7	1.272	0.446	1.9459	
15 minute winter	SW22	12	97.179	0.322	159.5	0.7164	0.0000	OK	15 minute winter	1.011	SW21	169.4	1.217	0.495	6.1138	
15 minute winter	SW21	11	97.159	0.482	174.4	1.0729	0.0000	OK	15 minute winter	1.012	SW20	176.6	1.068	0.516	3.7127	
15 minute winter	SW20	11	97.144	0.555	179.9	1.2471	0.0000	SURCHARGED	15 minute winter	1.013	SW16	192.7	1.106	0.563	2.1474	
15 minute winter	SW19	10	100.633	0.058	8.0	0.1097	0.0000	OK	15 minute winter	8.000	SW18	8.0	0.983	0.145	0.4785	
15 minute winter	SW18	10	99.973	0.058	16.0	0.1096	0.0000	OK	15 minute winter	8.001	SW17	15.8	1.595	0.147	0.3976	
15 minute winter	SW17	10	98.301	0.076	23.8	0.1433	0.0000	OK	15 minute winter	8.002	SW16	23.4	2.032	0.233	0.3487	
15 minute winter	SW16	11	97.120	0.581	210.1	1.3335	0.0000	SURCHARGED	15 minute winter	1.014	SW15	219.7	1.344	0.642	1.4582	
15 minute winter	SW15	11	97.092	0.587	223.0	1.3690	0.0000	SURCHARGED	15 minute winter	1.015	SW14	240.0	1.331	0.556	4.9076	
15 minute winter	SW14	11	97.023	0.698	243.3	1.6643	0.0000	SURCHARGED	15 minute winter	1.016	SW05	252.3	1.328	0.737	3.4533	
15 minute winter	SW13	10	98.775	0.045	8.0	0.0837	0.0000	OK	15 minute winter	9.000	SW12	8.0	1.068	0.050	0.2773	
15 minute winter	SW12	10	98.023	0.053	16.0	0.1096	0.0000	OK	15 minute winter	9.001	SW11	15.9	0.826	0.030	2.3107	
15 minute winter	SW11	12	97.021	0.261	23.9	0.5426	0.0000	OK	15 minute winter	9.002	SW10	31.9	0.773	0.140	0.7425	
15 minute winter	SW10	12	97.019	0.295	46.4	0.6129	0.0000	OK	15 minute winter	9.003	SW07	72.2	0.654	0.314	7.7603	
15 minute winter	SW09	10	99.099	0.044	8.0	0.0837	0.0000	OK	15 minute winter	10.000	SW08	8.0	1.115	0.086	0.2679	
15 minute winter	SW08	10	97.937	0.062	16.0	0.1177	0.0000	OK	15 minute winter	10.001	SW07	15.9	0.803	0.169	1.0848	
15 minute winter	SW07	11	96.962	0.532	84.0	1.1044	0.0000	SURCHARGED	15 minute winter	9.004	SW06	116.7	0.822	0.512	1.6752	
15 minute winter	SW06	11	96.964	0.587	120.0	1.2197	0.0000	SURCHARGED	15 minute winter	9.005	SW05	125.1	0.850	0.548	1.7977	
15 minute winter	SW05	11	96.954	0.709	377.5	1.2527	0.0000	SURCHARGED	15 minute winter	1.017	IN	383.8	3.353	0.780	1.3175	
15 minute winter	IN	252	96.318	0.188	383.8	131.1797	0.0000	OK	15 minute winter	Infiltration		0.0				

Results for 2 year +20% CC 30 minute summer. 270 minute analysis at 1 minute timestep. Mass balance: 99.98%																
Node Event	**US Node**	**Peak (mins)**	**Level (m)**	**Depth (m)**	**Inflow (l/s)**	**Node Vol (m³)**	**Flood (m³)**	**Status**	**Link Event**	**Link**	**DS Node**	**Outflow (l/s)**	**Velocity (m/s)**	**Flow/Cap**	**Link Vol (m³)**	**Discharge Vol (m³)**
30 minute summer	SW43	17	102.531	0.036	7.2	0.0678	0.0000	OK	30 minute summer	1.000	SW42	7.1	1.315	0.055	0.2454	
30 minute summer	SW42	17	99.847	0.052	14.3	0.0972	0.0000	OK	30 minute summer	1.001	SW41	14.0	1.199	0.116	0.4302	
30 minute summer	SW41	18	97.950	0.100	21.2	0.1780	0.0000	OK	30 minute summer	1.002	SW39	21.0	0.790	0.092	0.2726	
30 minute summer	SW40	17	98.137	0.062	7.2	0.1160	0.0000	OK	30 minute summer	2.000	SW39	7.0	0.543	0.166	0.5535	
30 minute summer	SW39	18	97.902	0.103	34.8	0.1801	0.0000	OK	30 minute summer	1.003	SW33	34.9	0.901	0.118	1.7363	
30 minute summer	SW38	17	98.151	0.046	7.2	0.0872	0.0000	OK	30 minute summer	3.000	SW36	7.1	0.653	0.093	0.2597	
30 minute summer	SW37	17	97.760	0.060	7.2	0.1113	0.0000	OK	30 minute summer	4.000	SW36	7.1	0.480	0.090	0.2807	
30 minute summer	SW36	18	97.703	0.097	21.4	0.1706	0.0000	OK	30 minute summer	3.001	SW34	21.0	0.876	0.092	0.2589	
30 minute summer	SW35	18	97.602	0.052	7.2	0.0930	0.0000	OK	30 minute summer	5.000	SW34	7.1	0.277	0.029	0.5121	
30 minute summer	SW34	18	97.604	0.154	35.0	0.2729	0.0000	OK	30 minute summer	3.002	SW33	34.7	0.650	0.124	0.4056	
30 minute summer	SW33	18	97.586	0.161	76.3	0.2820	0.0000	OK	30 minute summer	1.004	SW30	76.4	1.106	0.130	0.5682	
30 minute summer	SW32	17	101.963	0.033	7.2	0.0614	0.0000	OK	30 minute summer	6.000	SW31	7.1	1.278	0.026	0.2246	
30 minute summer	SW31	17	99.577	0.047	14.3	0.0864	0.0000	OK	30 minute summer	6.001	SW30	14.0	0.531	0.053	1.2090	
30 minute summer	SW30	18	97.518	0.213	97.0	0.3720	0.0000	OK	30 minute summer	1.005	SW29	96.6	1.095	0.251	1.2601	
30 minute summer	SW29	18	97.452	0.237	103.4	0.4129	0.0000	OK	30 minute summer	1.006	SW28	102.8	1.173	0.300	0.4376	
30 minute summer	SW28	18	97.401	0.211	109.6	0.3672	0.0000	OK	30 minute summer	1.007	SW27	108.6	1.076	0.318	4.0148	
30 minute summer	SW27	19	97.283	0.291	115.4	0.4734	0.0000	OK	30 minute summer	1.008	SW24	115.5	0.940	0.338	0.7500	
30 minute summer	SW26	17	100.537	0.042	7.2	0.0788	0.0000	OK	30 minute summer	7.000	SW25	7.1	1.134	0.076	0.2047	
30 minute summer	SW25	18	99.500	0.055	14.3	0.1041	0.0000	OK	30 minute summer	7.001	SW24	13.9	1.872	0.129	0.2981	
30 minute summer	SW24	19	97.252	0.291	133.3	0.6530	0.0000	OK	30 minute summer	1.009	SW23	134.0	1.137	0.392	0.7896	
30 minute summer	SW23	19	97.200	0.272	139.5	0.6083	0.0000	OK	30 minute summer	1.010	SW22	140.4	1.275	0.410	1.5713	
30 minute summer	SW22	19	97.118	0.261	145.9	0.5799	0.0000	OK	30 minute summer	1.011	SW21	146.7	1.253	0.429	4.2020	
30 minute summer	SW21	19	96.976	0.299	152.2	0.6659	0.0000	OK	30 minute summer	1.012	SW20	150.6	1.132	0.440	2.3352	
30 minute summer	SW20	19	96.912	0.323	156.1	0.7262	0.0000	OK	30 minute summer	1.013	SW16	154.8	1.133	0.453	1.3801	
30 minute summer	SW19	17	100.630	0.054	7.2	0.1028	0.0000	OK	30 minute summer	8.000	SW18	7.0	0.946	0.127	0.4349	
30 minute summer	SW18	18	99.970	0.055	14.2	0.1029	0.0000	OK	30 minute summer	8.001	SW17	13.9	1.539	0.130	0.3640	
30 minute summer	SW17	18	98.296	0.071	20.9	0.1345	0.0000	OK	30 minute summer	8.002	SW16	20.9	1.974	0.208	0.3204	
30 minute summer	SW16	19	96.860	0.321	179.4	0.7367	0.0000	OK	30 minute summer	1.014	SW15	178.7	1.400	0.522	0.8646	
30 minute summer	SW15	19	96.787	0.282	184.2	0.6565	0.0000	OK	30 minute summer	1.015	SW14	183.1	1.417	0.425	2.9876	
30 minute summer	SW14	19	96.659	0.334	188.6	0.7968	0.0000	OK	30 minute summer	1.016	SW05	189.9	1.418	0.555	2.2705	
30 minute summer	SW13	17	98.773	0.043	7.2	0.0790	0.0000	OK	30 minute summer	9.000	SW12	7.1	1.034	0.044	0.2543	
30 minute summer	SW12	18	98.020	0.050	14.3	0.1030	0.0000	OK	30 minute summer	9.001	SW11	13.9	0.800	0.026	0.8179	
30 minute summer	SW11	18	96.863	0.103	21.1	0.2142	0.0000	OK	30 minute summer	9.002	SW10	20.8	0.762	0.091	0.1976	
30 minute summer	SW10	18	96.827	0.103	27.6	0.2145	0.0000	OK	30 minute summer	9.003	SW07	27.4	0.673	0.119	2.3821	
30 minute summer	SW09	17	99.097	0.042	7.2	0.0790	0.0000	OK	30 minute summer	10.000	SW08	7.1	1.080	0.076	0.2449	
30 minute summer	SW08	17	97.933	0.058	14.3	0.1100	0.0000	OK	30 minute summer	10.001	SW07	13.9	0.713	0.148	0.9004	
30 minute summer	SW07	14	96.618	0.188	48.1	0.3900	0.0000	OK	30 minute summer	9.004	SW06	46.5	0.754	0.204	0.7624	
30 minute summer	SW06	14	96.607	0.230	53.3	0.4788	0.0000	OK	30 minute summer	9.005	SW05	52.5	0.710	0.230	1.0421	
30 minute summer	SW05	13	96.597	0.352	240.1	0.6216	0.0000	OK	30 minute summer	1.017	IN	242.3	3.056	0.492	0.9215	
30 minute summer	IN	270	96.353	0.223	242.3	158.5743	0.0000	OK	30 minute summer	Infiltration		0.0				

Results for 2 year +20% CC 30 minute winter. 270 minute analysis at 1 minute timestep. Mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link Event	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	SW43	17	102.529	0.034	6.3	0.0637	0.0000	OK	30 minute winter	1.000	SW42	6.2	1.264	0.049	0.2245	
30 minute winter	SW42	17	99.843	0.048	12.5	0.0914	0.0000	OK	30 minute winter	1.001	SW41	12.4	1.155	0.102	0.3954	
30 minute winter	SW41	18	97.944	0.094	18.7	0.1669	0.0000	OK	30 minute winter	1.002	SW39	18.6	0.763	0.082	0.2496	
30 minute winter	SW40	17	98.133	0.058	6.3	0.1092	0.0000	OK	30 minute winter	2.000	SW39	6.2	0.518	0.147	0.5110	
30 minute winter	SW39	18	97.896	0.097	30.9	0.1697	0.0000	OK	30 minute winter	1.003	SW33	30.9	0.877	0.104	1.5815	
30 minute winter	SW38	17	98.148	0.043	6.3	0.0818	0.0000	OK	30 minute winter	3.000	SW36	6.3	0.626	0.082	0.2386	
30 minute winter	SW37	17	97.757	0.057	6.3	0.1046	0.0000	OK	30 minute winter	4.000	SW36	6.2	0.462	0.080	0.2573	
30 minute winter	SW36	18	97.698	0.092	18.8	0.1603	0.0000	OK	30 minute winter	3.001	SW34	18.6	0.847	0.082	0.2373	
30 minute winter	SW35	17	97.599	0.049	6.3	0.0874	0.0000	OK	30 minute winter	5.000	SW34	6.2	0.260	0.026	0.4636	
30 minute winter	SW34	18	97.593	0.143	31.0	0.2541	0.0000	OK	30 minute winter	3.002	SW33	30.9	0.633	0.111	0.3671	
30 minute winter	SW33	18	97.575	0.150	67.9	0.2625	0.0000	OK	30 minute winter	1.004	SW30	67.9	1.086	0.116	0.5145	
30 minute winter	SW32	17	101.961	0.031	6.3	0.0577	0.0000	OK	30 minute winter	6.000	SW31	6.3	1.227	0.023	0.2057	
30 minute winter	SW31	17	99.574	0.044	12.6	0.0814	0.0000	OK	30 minute winter	6.001	SW30	12.4	0.553	0.047	1.1138	
30 minute winter	SW30	18	97.503	0.198	86.3	0.3456	0.0000	OK	30 minute winter	1.005	SW29	86.1	1.075	0.224	1.1439	
30 minute winter	SW29	18	97.435	0.220	92.1	0.3843	0.0000	OK	30 minute winter	1.006	SW28	91.9	1.152	0.268	0.3980	
30 minute winter	SW28	18	97.387	0.197	98.0	0.3422	0.0000	OK	30 minute winter	1.007	SW27	97.5	1.053	0.285	3.6892	
30 minute winter	SW27	19	97.264	0.272	103.6	0.4416	0.0000	OK	30 minute winter	1.008	SW24	103.8	0.918	0.303	0.6897	
30 minute winter	SW26	17	100.534	0.039	6.3	0.0741	0.0000	OK	30 minute winter	7.000	SW25	6.3	1.089	0.067	0.1874	
30 minute winter	SW25	18	99.497	0.052	12.5	0.0979	0.0000	OK	30 minute winter	7.001	SW24	12.4	1.809	0.114	0.2737	
30 minute winter	SW24	19	97.233	0.272	120.9	0.6119	0.0000	OK	30 minute winter	1.009	SW23	121.2	1.115	0.354	0.7281	
30 minute winter	SW23	19	97.184	0.256	126.7	0.5709	0.0000	OK	30 minute winter	1.010	SW22	127.1	1.252	0.372	1.4494	
30 minute winter	SW22	19	97.102	0.245	132.6	0.5448	0.0000	OK	30 minute winter	1.011	SW21	132.9	1.231	0.389	3.8774	
30 minute winter	SW21	19	96.957	0.280	138.4	0.6240	0.0000	OK	30 minute winter	1.012	SW20	137.6	1.115	0.402	2.1657	
30 minute winter	SW20	19	96.894	0.305	143.1	0.6845	0.0000	OK	30 minute winter	1.013	SW16	142.4	1.109	0.416	1.2888	
30 minute winter	SW19	17	100.626	0.051	6.3	0.0965	0.0000	OK	30 minute winter	8.000	SW18	6.2	0.914	0.113	0.3996	
30 minute winter	SW18	18	99.966	0.051	12.5	0.0969	0.0000	OK	30 minute winter	8.001	SW17	12.4	1.489	0.115	0.3338	
30 minute winter	SW17	18	98.292	0.067	18.5	0.1262	0.0000	OK	30 minute winter	8.002	SW16	18.5	1.911	0.185	0.2938	
30 minute winter	SW16	19	96.843	0.304	165.7	0.6974	0.0000	OK	30 minute winter	1.014	SW15	165.3	1.382	0.483	0.8093	
30 minute winter	SW15	19	96.772	0.267	170.8	0.6228	0.0000	OK	30 minute winter	1.015	SW14	170.3	1.411	0.395	2.7756	
30 minute winter	SW14	14	96.674	0.349	175.8	0.8327	0.0000	OK	30 minute winter	1.016	SW05	176.8	1.412	0.517	2.6793	
30 minute winter	SW13	17	98.770	0.040	6.3	0.0744	0.0000	OK	30 minute winter	9.000	SW12	6.2	0.991	0.039	0.2332	
30 minute winter	SW12	18	98.017	0.047	12.5	0.0973	0.0000	OK	30 minute winter	9.001	SW11	12.4	0.769	0.023	0.7489	
30 minute winter	SW11	18	96.857	0.097	18.6	0.2011	0.0000	OK	30 minute winter	9.002	SW10	18.5	0.737	0.081	0.1815	
30 minute winter	SW10	18	96.822	0.098	24.6	0.2027	0.0000	OK	30 minute winter	9.003	SW07	24.5	0.653	0.107	3.0523	
30 minute winter	SW09	17	99.094	0.039	6.3	0.0743	0.0000	OK	30 minute winter	10.000	SW08	6.2	1.037	0.067	0.2244	
30 minute winter	SW08	17	97.930	0.055	12.5	0.1036	0.0000	OK	30 minute winter	10.001	SW07	12.4	0.703	0.131	1.0236	
30 minute winter	SW07	14	96.674	0.244	43.0	0.5075	0.0000	OK	30 minute winter	9.004	SW06	49.4	0.785	0.217	1.0402	
30 minute winter	SW06	14	96.669	0.292	55.5	0.6072	0.0000	OK	30 minute winter	9.005	SW05	60.4	0.725	0.264	1.3459	
30 minute winter	SW05	13	96.661	0.416	224.6	0.7348	0.0000	OK	30 minute winter	1.017	IN	225.7	2.982	0.459	1.0340	
30 minute winter	IN	266	96.379	0.249	225.7	178.9271	0.0000	OK	30 minute winter	Infiltration		0.0				

Results for 2 year +20% CC 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 99.97%																
Node Event	**US Node**	**Peak (mins)**	**Level (m)**	**Depth (m)**	**Inflow (l/s)**	**Node Vol (m³)**	**Flood (m³)**	**Status**	**Link Event**	**Link**	**DS Node**	**Outflow (l/s)**	**Velocity (m/s)**	**Flow/Cap**	**Link Vol (m³)**	**Discharge Vol (m³)**
60 minute summer	SW43	32	102.527	0.032	5.5	0.0596	0.0000	OK	60 minute summer	1.000	SW42	5.4	1.214	0.043	0.2038	
60 minute summer	SW42	32	99.840	0.045	10.9	0.0853	0.0000	OK	60 minute summer	1.001	SW41	10.8	1.112	0.089	0.3583	
60 minute summer	SW41	33	97.937	0.087	16.3	0.1550	0.0000	OK	60 minute summer	1.002	SW39	16.2	0.736	0.071	0.2254	
60 minute summer	SW40	32	98.129	0.054	5.5	0.1018	0.0000	OK	60 minute summer	2.000	SW39	5.4	0.497	0.128	0.4653	
60 minute summer	SW39	33	97.889	0.090	26.9	0.1584	0.0000	OK	60 minute summer	1.003	SW33	26.9	0.853	0.091	1.4157	
60 minute summer	SW38	32	98.146	0.041	5.5	0.0766	0.0000	OK	60 minute summer	3.000	SW36	5.5	0.602	0.071	0.2166	
60 minute summer	SW37	32	97.753	0.053	5.5	0.0979	0.0000	OK	60 minute summer	4.000	SW36	5.4	0.444	0.069	0.2330	
60 minute summer	SW36	33	97.691	0.085	16.4	0.1493	0.0000	OK	60 minute summer	3.001	SW34	16.2	0.814	0.071	0.2148	
60 minute summer	SW35	32	97.596	0.046	5.5	0.0817	0.0000	OK	60 minute summer	5.000	SW34	5.4	0.255	0.022	0.4128	
60 minute summer	SW34	33	97.581	0.131	27.0	0.2330	0.0000	OK	60 minute summer	3.002	SW33	26.9	0.625	0.096	0.3254	
60 minute summer	SW33	33	97.563	0.138	59.1	0.2412	0.0000	OK	60 minute summer	1.004	SW30	59.0	1.063	0.101	0.4570	
60 minute summer	SW32	32	101.959	0.029	5.5	0.0541	0.0000	OK	60 minute summer	6.000	SW31	5.5	1.178	0.020	0.1868	
60 minute summer	SW31	32	99.571	0.041	11.0	0.0762	0.0000	OK	60 minute summer	6.001	SW30	10.8	0.475	0.041	1.0068	
60 minute summer	SW30	33	97.486	0.181	75.0	0.3167	0.0000	OK	60 minute summer	1.005	SW29	74.7	1.048	0.194	1.0190	
60 minute summer	SW29	33	97.417	0.202	80.0	0.3530	0.0000	OK	60 minute summer	1.006	SW28	79.7	1.120	0.233	0.3556	
60 minute summer	SW28	33	97.371	0.181	85.0	0.3152	0.0000	OK	60 minute summer	1.007	SW27	84.9	1.028	0.248	3.2861	
60 minute summer	SW27	34	97.240	0.248	89.8	0.4020	0.0000	OK	60 minute summer	1.008	SW24	90.2	0.898	0.264	0.6130	
60 minute summer	SW26	32	100.532	0.037	5.5	0.0692	0.0000	OK	60 minute summer	7.000	SW25	5.4	1.048	0.058	0.1697	
60 minute summer	SW25	33	99.493	0.048	10.9	0.0913	0.0000	OK	60 minute summer	7.001	SW24	10.8	1.740	0.099	0.2479	
60 minute summer	SW24	34	97.210	0.249	105.1	0.5590	0.0000	OK	60 minute summer	1.009	SW23	105.4	1.088	0.308	0.6487	
60 minute summer	SW23	34	97.162	0.234	110.2	0.5223	0.0000	OK	60 minute summer	1.010	SW22	110.4	1.220	0.323	1.2924	
60 minute summer	SW22	34	97.082	0.225	115.2	0.4993	0.0000	OK	60 minute summer	1.011	SW21	115.4	1.206	0.337	3.4354	
60 minute summer	SW21	34	96.931	0.254	120.2	0.5646	0.0000	OK	60 minute summer	1.012	SW20	119.3	1.097	0.349	1.9113	
60 minute summer	SW20	34	96.865	0.276	124.1	0.6196	0.0000	OK	60 minute summer	1.013	SW16	123.8	1.086	0.362	1.1413	
60 minute summer	SW19	32	100.623	0.048	5.5	0.0900	0.0000	OK	60 minute summer	8.000	SW18	5.4	0.878	0.098	0.3620	
60 minute summer	SW18	33	99.963	0.048	10.9	0.0904	0.0000	OK	60 minute summer	8.001	SW17	10.8	1.434	0.100	0.3018	
60 minute summer	SW17	33	98.287	0.062	16.1	0.1173	0.0000	OK	60 minute summer	8.002	SW16	16.1	1.839	0.161	0.2657	
60 minute summer	SW16	34	96.815	0.276	143.7	0.6328	0.0000	OK	60 minute summer	1.014	SW15	143.3	1.352	0.419	0.7175	
60 minute summer	SW15	34	96.748	0.243	148.1	0.5669	0.0000	OK	60 minute summer	1.015	SW14	147.6	1.386	0.342	2.4337	
60 minute summer	SW14	34	96.604	0.279	152.4	0.6644	0.0000	OK	60 minute summer	1.016	SW05	153.0	1.379	0.447	1.7857	
60 minute summer	SW13	32	98.768	0.038	5.5	0.0696	0.0000	OK	60 minute summer	9.000	SW12	5.4	0.951	0.034	0.2120	
60 minute summer	SW12	33	98.014	0.044	10.9	0.0911	0.0000	OK	60 minute summer	9.001	SW11	10.8	0.743	0.020	0.6743	
60 minute summer	SW11	33	96.850	0.090	16.2	0.1865	0.0000	OK	60 minute summer	9.002	SW10	16.1	0.712	0.071	0.1637	
60 minute summer	SW10	33	96.815	0.091	21.4	0.1892	0.0000	OK	60 minute summer	9.003	SW07	21.3	0.665	0.093	1.8725	
60 minute summer	SW09	32	99.092	0.037	5.5	0.0694	0.0000	OK	60 minute summer	10.000	SW08	5.4	0.998	0.058	0.2034	
60 minute summer	SW08	33	97.926	0.051	10.9	0.0966	0.0000	OK	60 minute summer	10.001	SW07	10.8	0.705	0.114	0.7278	
60 minute summer	SW07	34	96.570	0.140	37.4	0.2911	0.0000	OK	60 minute summer	9.004	SW06	36.5	0.814	0.160	0.4769	
60 minute summer	SW06	34	96.532	0.155	41.6	0.3214	0.0000	OK	60 minute summer	9.005	SW05	41.4	0.817	0.181	0.6232	
60 minute summer	SW05	34	96.506	0.261	193.0	0.4607	0.0000	OK	60 minute summer	1.017	IN	193.5	2.667	0.393	1.0215	
60 minute summer	IN	296	96.416	0.286	193.5	209.4269	0.0000	OK	60 minute summer	Infiltration		0.0				

Results for 2 year +20% CC 60 minute winter. 300 minute analysis at 1 minute timestep. Mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link Event	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	SW43	33	102.523	0.028	4.3	0.0532	0.0000	OK	60 minute winter	1.000	SW42	4.3	1.129	0.034	0.1732	
60 minute winter	SW42	33	99.835	0.040	8.6	0.0763	0.0000	OK	60 minute winter	1.001	SW41	8.6	1.040	0.071	0.3053	
60 minute winter	SW41	33	97.927	0.077	12.9	0.1376	0.0000	OK	60 minute winter	1.002	SW39	12.9	0.691	0.057	0.1910	
60 minute winter	SW40	33	98.123	0.048	4.3	0.0910	0.0000	OK	60 minute winter	2.000	SW39	4.3	0.459	0.102	0.3996	
60 minute winter	SW39	33	97.880	0.081	21.5	0.1418	0.0000	OK	60 minute winter	1.003	SW33	21.5	0.820	0.072	1.1718	
60 minute winter	SW38	33	98.141	0.036	4.3	0.0682	0.0000	OK	60 minute winter	3.000	SW36	4.3	0.561	0.056	0.1848	
60 minute winter	SW37	33	97.747	0.047	4.3	0.0873	0.0000	OK	60 minute winter	4.000	SW36	4.3	0.414	0.055	0.1981	
60 minute winter	SW36	33	97.682	0.076	12.9	0.1330	0.0000	OK	60 minute winter	3.001	SW34	12.9	0.764	0.057	0.1822	
60 minute winter	SW35	33	97.591	0.041	4.3	0.0732	0.0000	OK	60 minute winter	5.000	SW34	4.3	0.240	0.018	0.3411	
60 minute winter	SW34	33	97.564	0.114	21.5	0.2022	0.0000	OK	60 minute winter	3.002	SW33	21.5	0.606	0.077	0.2651	
60 minute winter	SW33	33	97.544	0.119	47.2	0.2081	0.0000	OK	60 minute winter	1.004	SW30	47.1	1.032	0.080	0.3764	
60 minute winter	SW32	33	101.956	0.026	4.3	0.0484	0.0000	OK	60 minute winter	6.000	SW31	4.3	1.094	0.016	0.1588	
60 minute winter	SW31	33	99.567	0.037	8.6	0.0683	0.0000	OK	60 minute winter	6.001	SW30	8.6	0.471	0.033	0.8560	
60 minute winter	SW30	33	97.464	0.159	60.0	0.2772	0.0000	OK	60 minute winter	1.005	SW29	59.9	1.006	0.156	0.8514	
60 minute winter	SW29	33	97.393	0.178	64.2	0.3102	0.0000	OK	60 minute winter	1.006	SW28	64.1	1.071	0.187	0.2988	
60 minute winter	SW28	33	97.350	0.160	68.4	0.2783	0.0000	OK	60 minute winter	1.007	SW27	68.4	0.988	0.200	2.7561	
60 minute winter	SW27	34	97.207	0.215	72.5	0.3498	0.0000	OK	60 minute winter	1.008	SW24	72.6	0.864	0.212	0.5131	
60 minute winter	SW26	33	100.528	0.033	4.3	0.0617	0.0000	OK	60 minute winter	7.000	SW25	4.3	0.975	0.046	0.1443	
60 minute winter	SW25	33	99.488	0.043	8.6	0.0816	0.0000	OK	60 minute winter	7.001	SW24	8.6	1.628	0.079	0.2112	
60 minute winter	SW24	34	97.179	0.218	85.1	0.4898	0.0000	OK	60 minute winter	1.009	SW23	85.2	1.045	0.249	0.5463	
60 minute winter	SW23	34	97.134	0.206	89.3	0.4594	0.0000	OK	60 minute winter	1.010	SW22	89.4	1.169	0.261	1.0919	
60 minute winter	SW22	34	97.055	0.198	93.5	0.4408	0.0000	OK	60 minute winter	1.011	SW21	93.6	1.162	0.274	2.8928	
60 minute winter	SW21	34	96.899	0.222	97.7	0.4933	0.0000	OK	60 minute winter	1.012	SW20	97.4	1.063	0.285	1.6081	
60 minute winter	SW20	34	96.831	0.242	101.5	0.5428	0.0000	OK	60 minute winter	1.013	SW16	101.6	1.045	0.297	0.9667	
60 minute winter	SW19	33	100.618	0.043	4.3	0.0803	0.0000	OK	60 minute winter	8.000	SW18	4.3	0.821	0.078	0.3088	
60 minute winter	SW18	33	99.958	0.043	8.6	0.0810	0.0000	OK	60 minute winter	8.001	SW17	8.6	1.345	0.080	0.2567	
60 minute winter	SW17	33	98.280	0.055	12.9	0.1044	0.0000	OK	60 minute winter	8.002	SW16	12.9	1.727	0.128	0.2258	
60 minute winter	SW16	34	96.782	0.243	118.2	0.5573	0.0000	OK	60 minute winter	1.014	SW15	118.1	1.307	0.345	0.6102	
60 minute winter	SW15	34	96.720	0.215	122.2	0.5015	0.0000	OK	60 minute winter	1.015	SW14	122.2	1.336	0.283	2.0786	
60 minute winter	SW14	35	96.572	0.247	126.2	0.5887	0.0000	OK	60 minute winter	1.016	SW05	126.3	1.316	0.369	1.5352	
60 minute winter	SW13	33	98.764	0.034	4.3	0.0624	0.0000	OK	60 minute winter	9.000	SW12	4.3	0.879	0.027	0.1811	
60 minute winter	SW12	33	98.010	0.039	8.6	0.0820	0.0000	OK	60 minute winter	9.001	SW11	8.6	0.697	0.016	0.5693	
60 minute winter	SW11	33	96.840	0.080	12.9	0.1654	0.0000	OK	60 minute winter	9.002	SW10	12.9	0.669	0.056	0.1390	
60 minute winter	SW10	33	96.806	0.082	17.2	0.1699	0.0000	OK	60 minute winter	9.003	SW07	17.1	0.630	0.074	1.5842	
60 minute winter	SW09	33	99.088	0.033	4.3	0.0619	0.0000	OK	60 minute winter	10.000	SW08	4.3	0.928	0.046	0.1730	
60 minute winter	SW08	33	97.921	0.046	8.6	0.0864	0.0000	OK	60 minute winter	10.001	SW07	8.6	0.641	0.091	0.6246	
60 minute winter	SW07	34	96.554	0.124	30.0	0.2566	0.0000	OK	60 minute winter	9.004	SW06	29.8	0.795	0.130	0.3960	
60 minute winter	SW06	15	96.519	0.142	33.9	0.2953	0.0000	OK	60 minute winter	9.005	SW05	33.9	0.790	0.148	0.6273	
60 minute winter	SW05	15	96.519	0.274	159.8	0.4846	0.0000	OK	60 minute winter	1.017	IN	159.8	2.451	0.325	1.2027	
60 minute winter	IN	297	96.446	0.316	159.8	234.5691	0.0000	OK	60 minute winter	Infiltration		0.0				

Adoptable						
Max Width (mm)	**Diameter (mm)**	**Width (mm)**		**Max Depth (m)**	**Diameter (mm)**	**Width (mm)**
374	1200			1.500	1050	
499	1350			99.999	1200	
749	1500					
900	1800					
>900	Link+900 mm					

Circular			
Shape	Circular		**Dia (mm)**
Barrels	1		100
Height (mm)			150
Width (mm)			
Side Slope (1:X)			
Auto Increment (mm)	75		
Preferred Cover (m)			
Steep Slope (1:X)			
Follow Ground	No		
Velocity	Default		
ks (mm) / n			
uPVC			
Shape	Circular		**Dia (mm)**
Barrels	1		225
Height (mm)			
Width (mm)			
Side Slope (1:X)			
Auto Increment (mm)	75		
Preferred Cover (m)			
Steep Slope (1:X)			
Follow Ground	No		
Velocity	Colebrook-White		
ks (mm) / n	0.150		

APPENDIX C – FOUL WATER PIPE NETWORK CALCULATIONS

Drainage Design Report

Flow+

v10.8

Network	Foul Network
Filename	2024-05-16 Flow.pfd
Username	Kezia Adanza (kadanza@morce.ie)

Report produced on	17/05/2024 15:32:40

Causeway Sales

Tel:	+44(0) 1628 552000
Fax:	+44(0) 1628 552001
Email:	marketing@causeway.com
Web:	www.causeway.com

Technical support web portal:

http://support.causeway.com

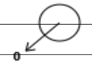
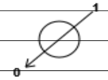
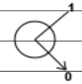
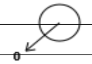
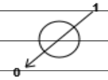
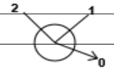
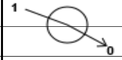
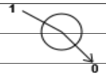
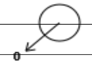
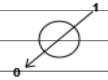
Frequency of use (kDU)	0.50
Flow per dwelling per day (l/day)	446
Domestic Flow (l/s/ha)	0.0
Industrial Flow (l/s/ha)	0.0
Additional Flow (%)	10
Minimum Velocity (m/s)	0.75
Connection Type	Level Inverts
Minimum Backdrop Height (m)	0.500
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	Yes

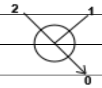
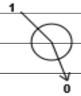
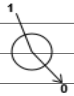
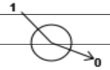
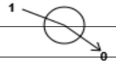
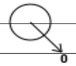
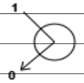
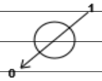
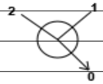
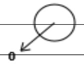
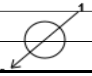
	Name	Area (ha)	Dwellings	Units	Add Inflow (l/s)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)	Notes
✓	FW28					103.820	Manhole	Adoptable	1200		674115.666	713000.249	2.495	
✓	FW27		6			101.720	Manhole	Adoptable	1200		674089.979	712976.476	1.795	
✓	FW26		4			99.400	Manhole	Adoptable	1200		674058.382	712947.230	1.415	
✓	FW25					103.330	Manhole	Adoptable	1200		674158.143	712957.271	2.395	
✓	FW24		14			100.930	Manhole	Adoptable	1200		674128.787	712930.102	1.695	
✓	FW23		10			98.930	Manhole	Adoptable	1200		674099.434	712902.928	2.135	
✓	FW22		1			98.810	Manhole	Adoptable	1200		674112.621	712897.451	2.095	
✓	FW21		3			98.830	Manhole	Adoptable	1200		674118.717	712893.790	2.151	
✓	FW20					101.820	Manhole	Adoptable	1200		674201.386	712910.870	1.455	
✓	FW19		8			100.770	Manhole	Adoptable	1200		674179.011	712890.143	1.475	
✓	FW18		7			99.050	Manhole	Adoptable	1200		674148.207	712861.592	2.589	
✓	FW17					99.060	Manhole	Adoptable	1200		674160.379	712848.303	2.689	
✓	FW16					99.050	Manhole	Adoptable	1200		674162.557	712842.344	2.711	
✓	FW15		4			98.850	Manhole	Adoptable	1200		674183.943	712817.819	2.674	
✓	FW14		2			98.850	Manhole	Adoptable	1200		674188.763	712815.794	2.700	
✓	FW13					101.900	Manhole	Adoptable	1200		674218.073	712888.736	1.425	
✓	FW12		5			101.240	Manhole	Adoptable	1200		674256.111	712847.637	1.698	
✓	FW11		7			100.050	Manhole	Adoptable	1200		674234.092	712827.260	1.835	
✓	FW10		8			98.430	Manhole	Adoptable	1200		674206.745	712801.949	2.658	
✓	FW09					100.130	Manhole	Adoptable	1200		674346.079	712753.083	1.415	
✓	FW08		6			99.520	Manhole	Adoptable	1200		674314.524	712723.872	1.522	
✓	FW07		4			98.310	Manhole	Adoptable	1200		674286.785	712698.199	1.745	
✓	FW06					100.380	Manhole	Adoptable	1200		674301.913	712800.797	1.415	
✓	FW05		15			99.170	Manhole	Adoptable	1200		674270.358	712771.586	1.375	
✓	FW04		8			97.970	Manhole	Adoptable	1200		674242.957	712746.226	2.334	
✓	FW03					97.830	Manhole	Adoptable	1200		674231.781	712770.908	2.329	
✓	FW02		2			97.870	Manhole	Adoptable	1200		674226.133	712780.651	2.425	
✓	FW01					98.030	Manhole	Adoptable	1200		674217.428	712790.406	2.973	
✓	EXFW MH					97.530	Manhole	Adoptable	1200		674212.373	712785.937	2.507	

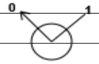
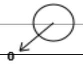
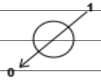
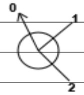
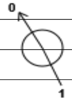
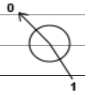
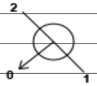
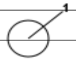
	Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	Con Offset (m)	Min DS IL (m)
✓	1.000	FW28	FW27	35.000	1.500	Colebrook-White	101.325	99.925	1.400	25.0	225	Circular		
?	1.001	FW27	FW26	43.055	1.500	Colebrook-White	99.925	97.985	1.940	22.2	225	Circular		
?	1.002	FW26	FW23	60.398	1.500	Colebrook-White	97.985	96.795	1.190	50.8	225	Circular		
✓	2.000	FW25	FW24	39.999	1.500	Colebrook-White	100.935	99.235	1.700	23.5	225	Circular		
?	2.001	FW24	FW23	40.000	1.500	Colebrook-White	99.235	97.495	1.740	23.0	225	Circular		
?	1.003	FW23	FW22	14.279	1.500	Colebrook-White	96.795	96.715	0.080	179.0	225	Circular		
?	1.004	FW22	FW21	7.111	1.500	Colebrook-White	96.715	96.679	0.036	200.0	225	Circular		
?	1.005	FW21	FW18	43.662	1.500	Colebrook-White	96.679	96.461	0.218	200.0	225	Circular		
✓	3.000	FW20	FW19	30.500	1.500	Colebrook-White	100.365	99.295	1.070	28.5	225	Circular		
?	3.001	FW19	FW18	42.001	1.500	Colebrook-White	99.295	97.386	1.909	22.0	225	Circular		
?	1.006	FW18	FW17	18.021	1.500	Colebrook-White	96.461	96.371	0.090	200.0	225	Circular		
?	1.007	FW17	FW16	6.345	1.500	Colebrook-White	96.371	96.339	0.032	200.0	225	Circular		
?	1.008	FW16	FW15	32.540	1.500	Colebrook-White	96.339	96.176	0.163	200.0	225	Circular		
?	1.009	FW15	FW14	5.228	1.500	Colebrook-White	96.176	96.150	0.026	200.0	225	Circular		
?	1.010	FW14	FW10	22.694	1.500	Colebrook-White	96.150	95.772	0.378	60.0	225	Circular		
✓	4.000	FW13	FW12	56.000	1.500	Colebrook-White	100.475	99.542	0.933	60.0	225	Circular		
?	4.001	FW12	FW11	30.001	1.500	Colebrook-White	99.542	98.215	1.327	22.6	225	Circular		
?	4.002	FW11	FW10	37.263	1.500	Colebrook-White	98.215	96.595	1.620	23.0	225	Circular		
?	1.011	FW10	FW01	15.728	1.500	Colebrook-White	95.772	95.057	0.715	22.0	225	Circular		
?	5.000	FW09	FW08	43.000	1.500	Colebrook-White	98.715	97.998	0.717	60.0	225	Circular		
?	5.001	FW08	FW07	37.796	1.500	Colebrook-White	97.998	96.565	1.433	26.4	225	Circular		
?	5.002	FW07	FW04	65.019	1.500	Colebrook-White	96.565	95.636	0.929	70.0	225	Circular		
?	6.000	FW06	FW05	43.000	1.500	Colebrook-White	98.965	97.795	1.170	36.8	225	Circular		
?	6.001	FW05	FW04	37.336	1.500	Colebrook-White	97.795	96.235	1.560	23.9	225	Circular		
?	5.003	FW04	FW03	27.094	1.500	Colebrook-White	95.636	95.501	0.135	200.0	225	Circular		
?	5.004	FW03	FW02	11.262	1.500	Colebrook-White	95.501	95.445	0.056	200.0	225	Circular		
?	5.005	FW02	FW01	13.074	1.500	Colebrook-White	95.445	95.380	0.065	200.0	225	Circular		
?	1.012	FW01	EXFW MH	6.747	1.500	Colebrook-White	95.057	95.023	0.034	200.0	225	Circular		

	Name	US Node	DS Node	Pro Vel @ 1/3 Q (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)	Notes
✓	1.000	FW28	FW27	0.000	2.301	91.5	0.0	2.270	1.570	1.570	2.270	0.000	0	0.0	0.0	0	0.000	
?	1.001	FW27	FW26	0.161	2.442	97.1	0.0	1.570	1.190	1.190	1.570	0.000	6	0.0	0.0	4	0.266	Proportional Velocity @ 1/3 Flow is less than the specified minimum | Downstream Depth is less than the specified minimum
?	1.002	FW26	FW23	0.141	1.613	64.1	0.1	1.190	1.910	1.190	1.910	0.000	10	0.0	0.0	6	0.234	Proportional Velocity @ 1/3 Flow is less than the specified minimum | Upstream Depth is less than the specified minimum
✓	2.000	FW25	FW24	0.000	2.372	94.3	0.0	2.170	1.470	1.470	2.170	0.000	0	0.0	0.0	0	0.000	
?	2.001	FW24	FW23	0.212	2.399	95.4	0.1	1.470	1.210	1.210	1.470	0.000	14	0.0	0.0	6	0.351	Proportional Velocity @ 1/3 Flow is less than the specified minimum
?	1.003	FW23	FW22	0.151	0.856	34.1	0.2	1.910	1.870	1.870	1.910	0.000	34	0.0	0.0	13	0.225	Proportional Velocity @ 1/3 Flow is less than the specified minimum
?	1.004	FW22	FW21	0.155	0.810	32.2	0.2	1.870	1.926	1.870	1.926	0.000	35	0.0	0.0	13	0.213	Proportional Velocity @ 1/3 Flow is less than the specified minimum
?	1.005	FW21	FW18	0.155	0.810	32.2	0.2	1.926	2.364	1.926	2.364	0.000	38	0.0	0.0	14	0.223	Proportional Velocity @ 1/3 Flow is less than the specified minimum
✓	3.000	FW20	FW19	0.000	2.154	85.7	0.0	1.230	1.250	1.230	1.250	0.000	0	0.0	0.0	0	0.000	
?	3.001	FW19	FW18	0.162	2.453	97.5	0.0	1.250	1.439	1.250	1.439	0.000	8	0.0	0.0	4	0.267	Proportional Velocity @ 1/3 Flow is less than the specified minimum
?	1.006	FW18	FW17	0.168	0.810	32.2	0.3	2.364	2.464	2.364	2.464	0.000	53	0.0	0.0	15	0.243	Proportional Velocity @ 1/3 Flow is less than the specified minimum | Downstream Depth is more than twice the specified minimum
?	1.007	FW17	FW16	0.168	0.810	32.2	0.3	2.464	2.486	2.464	2.486	0.000	53	0.0	0.0	15	0.243	Proportional Velocity @ 1/3 Flow is less than the specified minimum | Upstream Depth is more than twice the specified minimum | Downstream Depth is more than twice the specified minimum
?	1.008	FW16	FW15	0.168	0.810	32.2	0.3	2.486	2.449	2.449	2.486	0.000	53	0.0	0.0	15	0.243	Proportional Velocity @ 1/3 Flow is less than the specified minimum | Upstream Depth is more than twice the specified minimum | Downstream Depth is more than twice the specified minimum
?	1.009	FW15	FW14	0.179	0.810	32.2	0.3	2.449	2.475	2.449	2.475	0.000	57	0.0	0.0	16	0.253	Proportional Velocity @ 1/3 Flow is less than the specified minimum | Upstream Depth is more than twice the specified minimum | Downstream Depth is more than twice the specified minimum
?	1.010	FW14	FW10	0.265	1.483	59.0	0.3	2.475	2.433	2.433	2.475	0.000	59	0.0	0.0	13	0.392	Proportional Velocity @ 1/3 Flow is less than the specified minimum | Upstream Depth is more than twice the specified minimum | Downstream Depth is more than twice the specified minimum
✓	4.000	FW13	FW12	0.000	1.483	59.0	0.0	1.200	1.473	1.200	1.473	0.000	0	0.0	0.0	0	0.000	
?	4.001	FW12	FW11	0.160	2.420	96.2	0.0	1.473	1.610	1.473	1.610	0.000	5	0.0	0.0	3	0.214	Proportional Velocity @ 1/3 Flow is less than the specified minimum
?	4.002	FW11	FW10	0.212	2.399	95.4	0.1	1.610	1.610	1.610	1.610	0.000	12	0.0	0.0	5	0.307	Proportional Velocity @ 1/3 Flow is less than the specified minimum
?	1.011	FW10	FW01	0.400	2.453	97.5	0.4	2.433	2.748	2.433	2.748	0.000	79	0.0	0.0	11	0.585	Proportional Velocity @ 1/3 Flow is less than the specified minimum | Upstream Depth is more than twice the specified minimum | Downstream Depth is more than twice the specified minimum
?	5.000	FW09	FW08	0.000	1.483	59.0	0.0	1.190	1.297	1.190	1.297	0.000	0	0.0	0.0	0	0.000	Upstream Depth is less than the specified minimum
?	5.001	FW08	FW07	0.147	2.240	89.1	0.0	1.297	1.520	1.297	1.520	0.000	6	0.0	0.0	4	0.244	Proportional Velocity @ 1/3 Flow is less than the specified minimum
?	5.002	FW07	FW04	0.148	1.373	54.6	0.1	1.520	2.109	1.520	2.109	0.000	10	0.0	0.0	6	0.199	Proportional Velocity @ 1/3 Flow is less than the specified minimum
?	6.000	FW06	FW05	0.000	1.897	75.4	0.0	1.190	1.150	1.150	1.190	0.000	0	0.0	0.0	0	0.000	Upstream Depth is less than the specified minimum | Downstream Depth is less than the specified minimum
?	6.001	FW05	FW04	0.208	2.351	93.5	0.1	1.150	1.510	1.150	1.510	0.000	15	0.0	0.0	6	0.343	Proportional Velocity @ 1/3 Flow is less than the specified minimum | Upstream Depth is less than the specified minimum
?	5.003	FW04	FW03	0.143	0.810	32.2	0.2	2.109	2.104	2.104	2.109	0.000	33	0.0	0.0	13	0.213	Proportional Velocity @ 1/3 Flow is less than the specified minimum
?	5.004	FW03	FW02	0.143	0.810	32.2	0.2	2.104	2.200	2.104	2.200	0.000	33	0.0	0.0	13	0.213	Proportional Velocity @ 1/3 Flow is less than the specified minimum
?	5.005	FW02	FW01	0.155	0.810	32.2	0.2	2.200	2.425	2.200	2.425	0.000	35	0.0	0.0	13	0.213	Proportional Velocity @ 1/3 Flow is less than the specified minimum | Downstream Depth is more than twice the specified minimum
?	1.012	FW01	EXFW MH	0.223	0.810	32.2	0.6	2.748	2.282	2.282	2.748	0.000	114	0.0	0.0	22	0.316	Proportional Velocity @ 1/3 Flow is less than the specified minimum | Upstream Depth is more than twice the specified minimum

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)	US Node	Dia (mm)	Width (mm)	Sump (m)	Node Type	MH Type	DS Node	Dia (mm)	Width (mm)	Sump (m)	Node Type	MH Type
1.000	35.000	25.0	225	Circular	103.820	101.325	2.270	101.720	99.925	1.570	FW28	1200			Manhole	Adoptable	FW27	1200			Manhole	Adoptable
1.001	43.055	22.2	225	Circular	101.720	99.925	1.570	99.400	97.985	1.190	FW27	1200			Manhole	Adoptable	FW26	1200			Manhole	Adoptable
1.002	60.398	50.8	225	Circular	99.400	97.985	1.190	98.930	96.795	1.910	FW26	1200			Manhole	Adoptable	FW23	1200			Manhole	Adoptable
2.000	39.999	23.5	225	Circular	103.330	100.935	2.170	100.930	99.235	1.470	FW25	1200			Manhole	Adoptable	FW24	1200			Manhole	Adoptable
2.001	40.000	23.0	225	Circular	100.930	99.235	1.470	98.930	97.495	1.210	FW24	1200			Manhole	Adoptable	FW23	1200			Manhole	Adoptable
1.003	14.279	179.0	225	Circular	98.930	96.795	1.910	98.810	96.715	1.870	FW23	1200			Manhole	Adoptable	FW22	1200			Manhole	Adoptable
1.004	7.111	200.0	225	Circular	98.810	96.715	1.870	98.830	96.679	1.926	FW22	1200			Manhole	Adoptable	FW21	1200			Manhole	Adoptable
1.005	43.662	200.0	225	Circular	98.830	96.679	1.926	99.050	96.461	2.364	FW21	1200			Manhole	Adoptable	FW18	1200			Manhole	Adoptable
3.000	30.500	28.5	225	Circular	101.820	100.365	1.230	100.770	99.295	1.250	FW20	1200			Manhole	Adoptable	FW19	1200			Manhole	Adoptable
3.001	42.001	22.0	225	Circular	100.770	99.295	1.250	99.050	97.386	1.439	FW19	1200			Manhole	Adoptable	FW18	1200			Manhole	Adoptable
1.006	18.021	200.0	225	Circular	99.050	96.461	2.364	99.060	96.371	2.464	FW18	1200			Manhole	Adoptable	FW17	1200			Manhole	Adoptable
1.007	6.345	200.0	225	Circular	99.060	96.371	2.464	99.050	96.339	2.486	FW17	1200			Manhole	Adoptable	FW16	1200			Manhole	Adoptable
1.008	32.540	200.0	225	Circular	99.050	96.339	2.486	98.850	96.176	2.449	FW16	1200			Manhole	Adoptable	FW15	1200			Manhole	Adoptable
1.009	5.228	200.0	225	Circular	98.850	96.176	2.449	98.850	96.150	2.475	FW15	1200			Manhole	Adoptable	FW14	1200			Manhole	Adoptable
1.010	22.694	60.0	225	Circular	98.850	96.150	2.475	98.430	95.772	2.433	FW14	1200			Manhole	Adoptable	FW10	1200			Manhole	Adoptable
4.000	56.000	60.0	225	Circular	101.900	100.475	1.200	101.240	99.542	1.473	FW13	1200			Manhole	Adoptable	FW12	1200			Manhole	Adoptable
4.001	30.001	22.6	225	Circular	101.240	99.542	1.473	100.050	98.215	1.610	FW12	1200			Manhole	Adoptable	FW11	1200			Manhole	Adoptable
4.002	37.263	23.0	225	Circular	100.050	98.215	1.610	98.430	96.595	1.610	FW11	1200			Manhole	Adoptable	FW10	1200			Manhole	Adoptable
1.011	15.728	22.0	225	Circular	98.430	95.772	2.433	98.030	95.057	2.748	FW10	1200			Manhole	Adoptable	FW01	1200			Manhole	Adoptable
5.000	43.000	60.0	225	Circular	100.130	98.715	1.190	99.520	97.998	1.297	FW09	1200			Manhole	Adoptable	FW08	1200			Manhole	Adoptable
5.001	37.796	26.4	225	Circular	99.520	97.998	1.297	98.310	96.565	1.520	FW08	1200			Manhole	Adoptable	FW07	1200			Manhole	Adoptable
5.002	65.019	70.0	225	Circular	98.310	96.565	1.520	97.970	95.636	2.109	FW07	1200			Manhole	Adoptable	FW04	1200			Manhole	Adoptable
6.000	43.000	36.8	225	Circular	100.380	98.965	1.190	99.170	97.795	1.150	FW06	1200			Manhole	Adoptable	FW05	1200			Manhole	Adoptable
6.001	37.336	23.9	225	Circular	99.170	97.795	1.150	97.970	96.235	1.510	FW05	1200			Manhole	Adoptable	FW04	1200			Manhole	Adoptable
5.003	27.094	200.0	225	Circular	97.970	95.636	2.109	97.830	95.501	2.104	FW04	1200			Manhole	Adoptable	FW03	1200			Manhole	Adoptable
5.004	11.262	200.0	225	Circular	97.830	95.501	2.104	97.870	95.445	2.200	FW03	1200			Manhole	Adoptable	FW02	1200			Manhole	Adoptable
5.005	13.074	200.0	225	Circular	97.870	95.445	2.200	98.030	95.380	2.425	FW02	1200			Manhole	Adoptable	FW01	1200			Manhole	Adoptable
1.012	6.747	200.0	225	Circular	98.030	95.057	2.748	97.530	95.023	2.282	FW01	1200			Manhole	Adoptable	EXFW MH	1200			Manhole	Adoptable

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Sump (m)	Node Type	MH Type	Connections		Link	IL (m)	Dia (mm)	Link Type
FW28	674115.666	713000.249	103.820	2.495	1200			Manhole	Adoptable						
											0	1.000	101.325	225	Circular
FW27	674089.979	712976.476	101.720	1.795	1200			Manhole	Adoptable		1	1.000	99.925	225	Circular
											0	1.001	99.925	225	Circular
FW26	674058.382	712947.230	99.400	1.415	1200			Manhole	Adoptable		1	1.001	97.985	225	Circular
											0	1.002	97.985	225	Circular
FW25	674158.143	712957.271	103.330	2.395	1200			Manhole	Adoptable						
											0	2.000	100.935	225	Circular
FW24	674128.787	712930.102	100.930	1.695	1200			Manhole	Adoptable		1	2.000	99.235	225	Circular
											0	2.001	99.235	225	Circular
FW23	674099.434	712902.928	98.930	2.135	1200			Manhole	Adoptable		1	2.001	97.495	225	Circular
											2	1.002	96.795	225	Circular
											0	1.003	96.795	225	Circular
FW22	674112.621	712897.451	98.810	2.095	1200			Manhole	Adoptable		1	1.003	96.715	225	Circular
											0	1.004	96.715	225	Circular
FW21	674118.717	712893.790	98.830	2.151	1200			Manhole	Adoptable		1	1.004	96.679	225	Circular
											0	1.005	96.679	225	Circular
FW20	674201.386	712910.870	101.820	1.455	1200			Manhole	Adoptable						
											0	3.000	100.365	225	Circular
FW19	674179.011	712890.143	100.770	1.475	1200			Manhole	Adoptable		1	3.000	99.295	225	Circular
											0	3.001	99.295	225	Circular

FW18	674148.207	712861.592	99.050	2.589	1200			Manhole	Adoptable		1	3.001	97.386	225	Circular
											2	1.005	96.461	225	Circular
											0	1.006	96.461	225	Circular
FW17	674160.379	712848.303	99.060	2.689	1200			Manhole	Adoptable		1	1.006	96.371	225	Circular
											0	1.007	96.371	225	Circular
FW16	674162.557	712842.344	99.050	2.711	1200			Manhole	Adoptable		1	1.007	96.339	225	Circular
											0	1.008	96.339	225	Circular
FW15	674183.943	712817.819	98.850	2.674	1200			Manhole	Adoptable		1	1.008	96.176	225	Circular
											0	1.009	96.176	225	Circular
FW14	674188.763	712815.794	98.850	2.700	1200			Manhole	Adoptable		1	1.009	96.150	225	Circular
											0	1.010	96.150	225	Circular
FW13	674218.073	712888.736	101.900	1.425	1200			Manhole	Adoptable						
											0	4.000	100.475	225	Circular
FW12	674256.111	712847.637	101.240	1.698	1200			Manhole	Adoptable		1	4.000	99.542	225	Circular
											0	4.001	99.542	225	Circular
FW11	674234.092	712827.260	100.050	1.835	1200			Manhole	Adoptable		1	4.001	98.215	225	Circular
											0	4.002	98.215	225	Circular
FW10	674206.745	712801.949	98.430	2.658	1200			Manhole	Adoptable		1	4.002	96.595	225	Circular
											2	1.010	95.772	225	Circular
											0	1.011	95.772	225	Circular
FW09	674346.079	712753.083	100.130	1.415	1200			Manhole	Adoptable						
											0	5.000	98.715	225	Circular
FW08	674314.524	712723.872	99.520	1.522	1200			Manhole	Adoptable		1	5.000	97.998	225	Circular

											0	5.001	97.998	225	Circular
FW07	674286.785	712698.199	98.310	1.745	1200			Manhole	Adoptable		1	5.001	96.565	225	Circular
											0	5.002	96.565	225	Circular
FW06	674301.913	712800.797	100.380	1.415	1200			Manhole	Adoptable						
											0	6.000	98.965	225	Circular
FW05	674270.358	712771.586	99.170	1.375	1200			Manhole	Adoptable		1	6.000	97.795	225	Circular
											0	6.001	97.795	225	Circular
FW04	674242.957	712746.226	97.970	2.334	1200			Manhole	Adoptable		1	6.001	96.235	225	Circular
											2	5.002	95.636	225	Circular
											0	5.003	95.636	225	Circular
FW03	674231.781	712770.908	97.830	2.329	1200			Manhole	Adoptable		1	5.003	95.501	225	Circular
											0	5.004	95.501	225	Circular
FW02	674226.133	712780.651	97.870	2.425	1200			Manhole	Adoptable		1	5.004	95.445	225	Circular
											0	5.005	95.445	225	Circular
FW01	674217.428	712790.406	98.030	2.973	1200			Manhole	Adoptable		1	5.005	95.380	225	Circular
											2	1.011	95.057	225	Circular
											0	1.012	95.057	225	Circular
EXFW MH	674212.373	712785.937	97.530	2.507	1200			Manhole	Adoptable		1	1.012	95.023	225	Circular

APPENDIX D – MAINTENANCE AND MANAGEMENT PLAN

Maintenance and Management Plan

Project	NDFA Social Housing Bundles 4 & 5	Analysed by	Kezia Adanza
Job no.	23006	Date	November 2023

SuDS Component	**Maintenance Responsibility**	**Maintenance Schedule**	**Required Action**	**Typical Frequency**
Permeable Paving	Homeowners on private curtilage PPP management company for 25 years then Kildare County Council for public realm areas	Regular Maintenance	Brushing (Standard cosmetic sweep over whole surface)	Once a year or reduced frequency as required
		Occasional Maintenance	Removal of weeds or management using glyphosate or other suitable weed killer.	As required – once a year on less frequently used pavements
		Remedial Action	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing materials.	As required
			Remediate any landscaping which has been raised within the level of the paving.	As required
			Rehabilitation of surface and upper sub-structure by remedial sweeping.	Every 10 to 15 years or as required (if performance is reduced due to significant flooding)
		Monitoring	Initial Inspection	Monthly for three months after installation
			Inspect for evidence of poor operation and/ or weed growth – if required, take remedial action,	Every 3 months, 48 hours after large storms in first six months
			Inspect slit accumulation rates and establish appropriate brushing frequencies.	Annually
			Monitor inspection chambers	Annually

Maintenance and Management Plan

MALONE O'REGAN

Project	NDFA Social Housing Bundles 4 & 5	Analysed by	Kezia Adanza
Job no.	23006	Date	November 2023

SuDS Component	Maintenance Responsibility	Maintenance Schedule	Required Action	Typical Frequency
Bioretention Areas - Swales / Tree Pits / Rain Gardens	PPP management company for 25 years then Kildare County Council for public realm areas	Regular Inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain to determine if maintenance is necessary.	Quarterly
			Check operation of underdrains by inspection of flows after rain.	Annually
			Assess plants for disease infection, poor growth, invasive species etc. and replace as necessary.	Quarterly
			Inspect inlets and outlets for blockage.	Quarterly
		Regular Maintenance	Remove litter, surface debris and weeds.	Quarterly (or more frequently for tidiness or aesthetic reasons)
			Replace any plants to maintain plant density.	Quarterly to bi-annually
			Remove sediment, litter and debris build-up from around inlets.	As required
		Occasional Maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required.	As required
			Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch.	As required
		Remedial Actions	Remove and replace filter medium and vegetation.	As required but likely to be > 20 years

SuDS Component	Maintenance Responsibility	Maintenance Schedule	Required Action	Typical Frequency
Pond	PPP management company for 25 years then Kildare County Council	Regular Inspections	Inspect surfaces for silting, record water levels of the facility and assess actual versus predicted levels, determine if modifications are necessary.	Quarterly for first year, then every 6 months thereafter
			Check operation of underdrains by inspection of flows after rain.	Annually
			Inspect inlets and outlets for blockage.	Quarterly
		Regular Maintenance	Remove sediment, litter and debris build-up from around inlets/outlets.	As required

APPENDIX E – ADDITIONAL SOAKAWAY TEST REPORT

APPENDIX H

SOAKAWAY PIT LOGS AND TEST RESULTS

CAUSEWAY GEOTECH

Project No. 23-0881F	**Project Name:** NDFA Social Housing Lot 3 - Coolaghknock Glebe		**Trial Pit ID** **IT01**
Coordinates 674115.39 E 712905.52 N	**Client:** NDFA		
	Client's Representative: Malone O'Regan Consulting Engineers		Sheet 1 of 1 Scale: 1:25
Elevation 99.55 mOD	**Date:** 17/10/2023	**Logger:** RS	FINAL

Method:
Soakaway Pit

Plant:
8t Tracked Excavator

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			99.25	0.30	▨	Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is rounded fine to coarse.	
			98.95	0.60	▨	Firm light brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is rounded fine to coarse.	
			98.05	1.50	▨	Soft brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is rounded fine to coarse.	
						End of trial pit at 1.50m	

0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 1.50
Width: 0.45
Length: 1.30

Remarks:
No groundwater encountered.

Stability:
Stable

Termination Reason
Terminated at scheduled depth.

Last Updated
20/12/2023

AGS

Soakaway Infiltration Test

Project No.: 23-0881F
Site: NDFA Social Housing Lot 3 - Coolaghknock Glebe
Test Location: IT01
Test Date: 17 October 2023

Analysis using method as described in BRE Digest 365 and CIRIA Report C697-The SUDS Manual

	width (m)	length (m)
test pit top dimensions	0.45	1.30
test pit base dimensions	0.30	0.60

test pit depth (m) 1.50

depth to groundwater before adding water (m) = Dry

Time (mins)	Depth to water surface (m)	Head of water in pit (m)
0	0.11	1.39
1	0.11	1.39
1	0.11	1.39
2	0.12	1.38
4	0.13	1.38
6	0.13	1.37
8	0.14	1.37
10	0.14	1.36
15	0.16	1.35
20	0.17	1.34
25	0.18	1.33
30	0.19	1.32
45	0.21	1.30
60	0.23	1.28
90	0.26	1.25
120	0.29	1.22
330	0.42	1.09

RESULTS (FROM GRAPH BELOW)

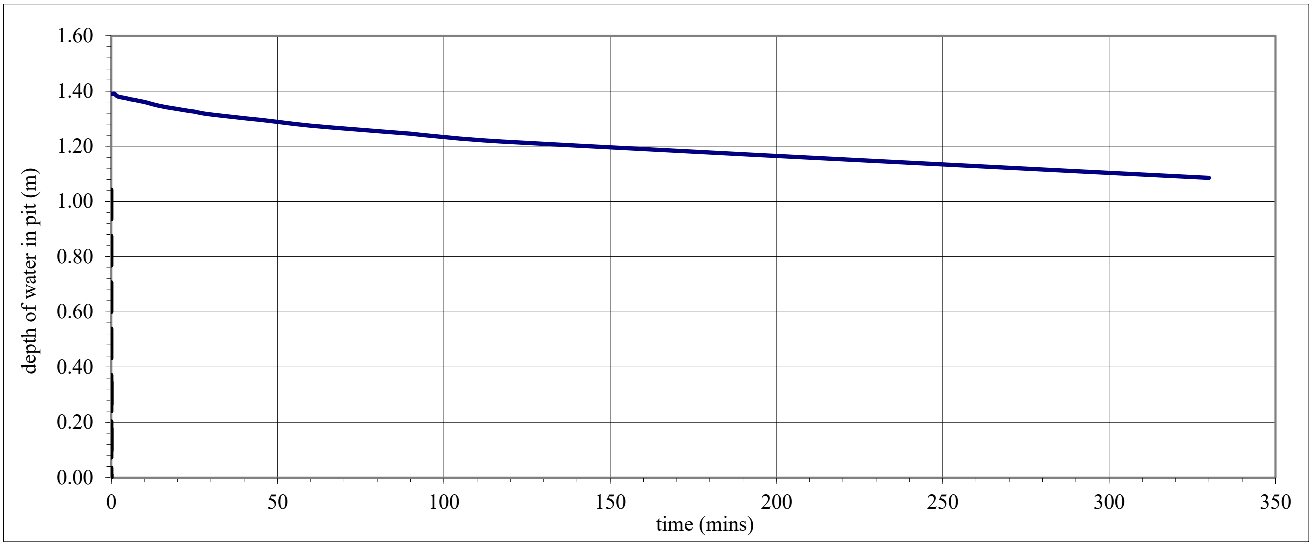
Test start
75% head of water at 1.04 m
depth to water surface (target) 0.46 m
time to reach target depth not reached

Test end
25% head of water at 0.35 m
depth to water surface (target) 1.15 m
time to reach target depth not reached

infiltration rate (q) is very low

TARGET DEPTHS AND CALCULATED VALUES

time (mins)	depth to water surface (m)	head of water in pit (m)	time elapsed (mins)	volume of water lost (m^3)	Area of walls and base at 50% drop (m^2)	q (m/min)	q (m/h)
	0.46	1.04	N/A				
	1.15	0.35					



CAUSEWAY GEOTECH

Project No. 23-0881F	**Project Name:** NDFA Social Housing Lot 3 - Coolaghknock Glebe		**Trial Pit ID** **IT02**
Coordinates 674227.20 E 712842.87 N	**Client:** NDFA		
Method: Soakaway Pit	**Client's Representative:** Malone O'Regan Consulting Engineers		Sheet 1 of 1 Scale: 1:25
Plant: 8t Tracked Excavator	**Elevation** 101.03 mOD	**Date:** 17/10/2023	**Logger:** RS
			FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
			99.98	1.05	▨	Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is rounded fine to coarse.	
			99.53	1.50	▨	Grey gravelly silty fine to coarse SAND with low cobble content. Gravel is rounded fine to coarse. Cobbles are rounded.	
						End of trial pit at 1.50m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 1.50
Width: 0.40
Length: 1.40

Remarks:
No groundwater encountered.

Stability:
Stable

Termination Reason
Terminated at scheduled depth.

Last Updated
20/12/2023

AGS

Soakaway Infiltration Test

Project No.: 23-0881F
Site: NDFA Social Housing Lot 3 - Coolaghknock Glebe
Test Location: IT02
Test Date: 17 October 2023

Analysis using method as described in BRE Digest 365 and CIRIA Report C697-The SUDS Manual

	width (m)	length (m)
test pit top dimensions	0.30	1.50
test pit base dimensions	0.30	1.00

test pit depth (m) 1.50

depth to groundwater before adding water (m) = Dry

Time (mins)	Depth to water surface (m)	Head of water in pit (m)
0	0.56	0.94
1	0.56	0.94
1	0.56	0.94
2	0.58	0.92
4	0.61	0.89
6	0.64	0.86
8	0.66	0.85
10	0.67	0.83
15	0.71	0.80
20	0.72	0.78
25	0.75	0.75
30	0.77	0.73
45	0.83	0.68
60	0.89	0.62
120	1.10	0.40
180	1.23	0.27
240	1.29	0.21
300	1.31	0.19

RESULTS (FROM GRAPH BELOW)

Test start

75% head of water at 0.71 m
depth to water surface (target) 0.80 m
time to reach target depth 36.5 mins

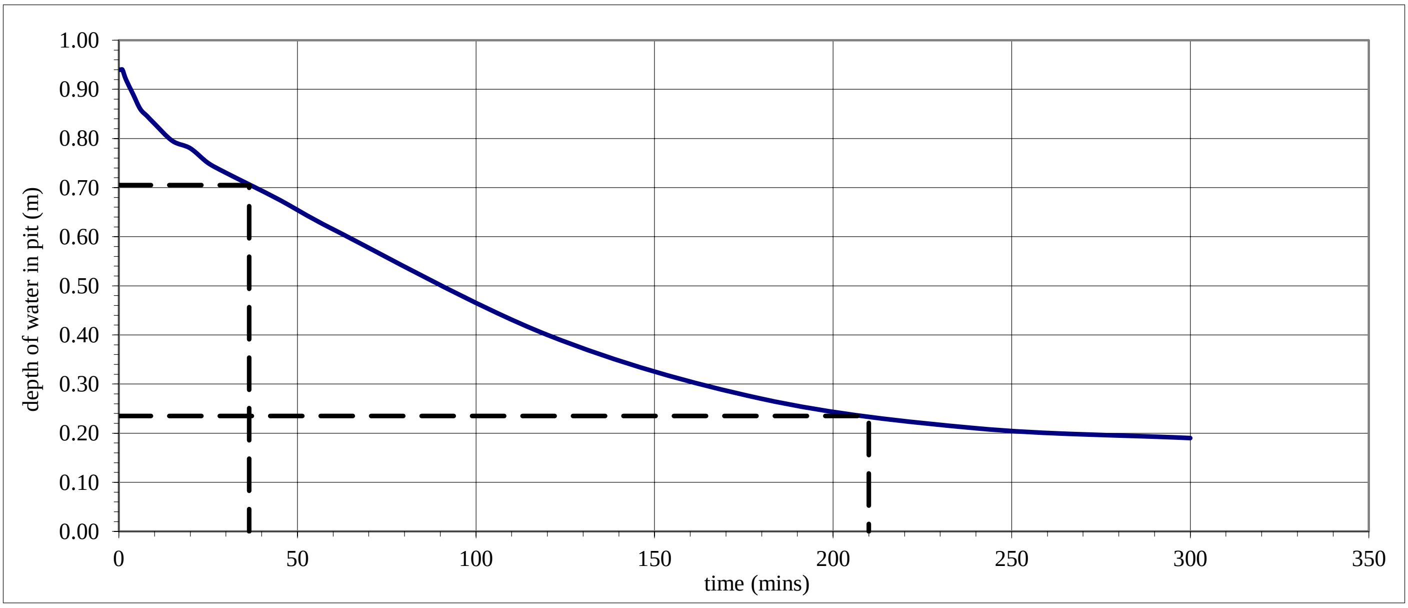
Test end

25% head of water at 0.24 m
depth to water surface (target) 1.27 m
time to reach target depth 210.0 mins

test infiltration rate (q) = 0.03 m/h

TARGET DEPTHS AND CALCULATED VALUES

time (mins)	depth to water surface (m)	head of water in pit (m)	time elapsed (mins)	volume of water lost (m^3)	Area of walls and base at 50% drop (m^2)	q (m/min)	q (m/h)
36.5	0.80	0.71	173.5	0.16	1.61	5.8E-04	0.035
210	1.27	0.24					



CAUSEWAY
GEOTECH

Project No. 23-0881F	**Project Name:** NDFA Social Housing Lot 3 - Coolaghknock Glebe		**Trial Pit ID** **IT03**
Coordinates 674307.47 E 712757.77 N	**Client:** NDFA		
Method: Soakaway Pit	**Client's Representative:** Malone O'Regan Consulting Engineers		Sheet 1 of 1 Scale: 1:25
Plant: 8t Tracked Excavator **Elevation** 99.61 mOD	**Date:** 17/10/2023	**Logger:** RS	FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
					▨	Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is rounded fine to coarse.	
			99.31	0.30	▨	Grey slightly gravelly slightly silty fine to coarse SAND. Gravel is rounded fine to coarse.	
			98.11	1.50		End of trial pit at 1.50m	

0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5

Water Strikes		
Struck at (m)	Remarks	

Depth: 1.50
Width: 0.40
Length: 1.40

Remarks:
No groundwater encountered.

Stability:
Moderately stable

Termination Reason
Terminated at scheduled depth.

Last Updated
20/12/2023

AGS

Soakaway Infiltration Test

Project No.: 23-0881F
Site: NDFA Social Housing Lot 3 - Coolaghknock Glebe
Test Location: IT03
Test Date: 17 October 2023

Analysis using method as described in BRE Digest 365 and CIRIA Report C697-The SUDS Manual

	width (m)	length (m)
test pit top dimensions	0.40	1.40
test pit base dimensions	0.30	1.06
test pit depth (m)	1.50	

depth to groundwater before adding water (m) = Dry

Time (mins)	Depth to water surface (m)	Head of water in pit (m)
0	0.21	1.29
1	0.23	1.28
1	0.24	1.26
2	0.26	1.25
4	0.30	1.20
6	0.33	1.17
8	0.36	1.14
10	0.39	1.12
15	0.44	1.06
30	0.57	0.93
60	0.71	0.79
90	0.84	0.66
180	1.15	0.35
210	1.23	0.27

RESULTS (FROM GRAPH BELOW)

Test start

75% head of water at	0.97 m
depth to water surface (target)	0.53 m
time to reach target depth	25.0 mins

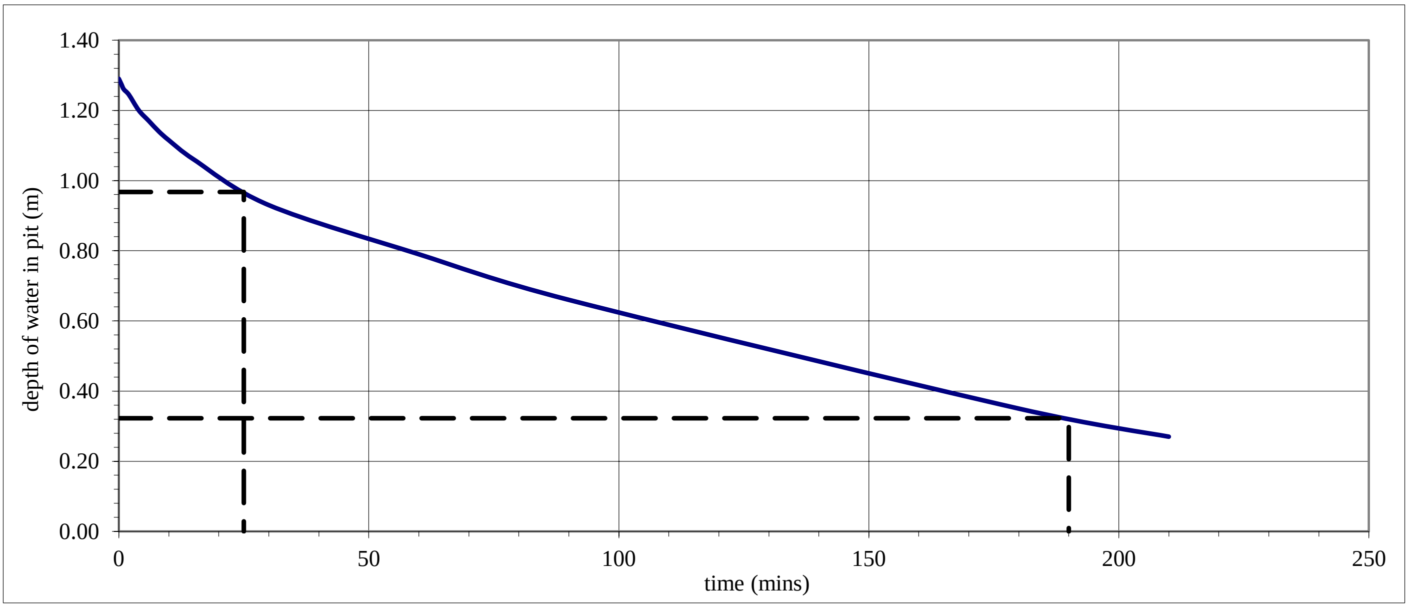
Test end

25% head of water at	0.32 m
depth to water surface (target)	1.18 m
time to reach target depth	190.0 mins

test infiltration rate (q) = 0.04 m/h

TARGET DEPTHS AND CALCULATED VALUES

time (mins)	depth to water surface (m)	head of water in pit (m)	time elapsed (mins)	volume of water lost (m^3)	Area of walls and base at 50% drop (m^2)	q (m/min)	q (m/h)
25	0.53	0.97	165	0.27	2.22	7.3E-04	0.044
190	1.18	0.32					



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Clonskeagh
Dublin 14
D14 XT57

Project:	**24-0213**
Site:	**Coolaghknock Glebe Soakaway Testing**
Report Date:	**20th February 2024**
Prepared by:	**Rachel White** B.A. (Mod.) Geoscience

Introduction

At the request of the Malone O'Regan Consulting Engineers, ground investigation works were carried out on the 19th and 20th February 2024 to facilitate the design and construction of a proposed residential development. The works consisted of four soakaway tests.

The exploratory hole location plan in Appendix A shows the locations of the soakaway pits excavated.

Soakaway tests

Four soakaway tests (SA01- SA04) were carried out in accordance with BRE Digest 365 - Soakaways (BRE, 2016). The pits were excavated using a 3t tracked excavator fitted with a 600mm wide bucket, to depths of 1.50m.

The stability of the trial pit walls was noted on completion.

The results are summarized in Table 1 below:

Table 1 Summary of soakaway tests

GI Ref	Depth (m)	Strata	Infiltration Rate (m/hr)	Comments
SA01	1.50	MADE GROUND: GRAVEL	0.36	
SA02	1.50	SILT	n/a	Water level did not drop sufficiently in 3 hours to derive a result
SA03	1.50	SAND	0.21	
SA04	1.50	SILT	0.11	

Appendix B presents the soakaway pit logs followed by the results and analysis of the infiltration test with photographs of the pits and arising provided in Appendix C.

REFERENCES

BS 1377: 1990: Methods of test for soils for civil engineering purposes. British Standards Institution.

BS 5930: 2015+A1:2020: Code of practice for ground investigations. British Standards Institution.

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. British Standards Institution.

BS EN ISO 14688-1: 2002: Geotechnical investigation and testing - Identification and classification of soil - Part 1 Identification and description. British Standards Institution.

Building Research Establishment (2007), BRE Digest 365: Soakaways.

APPENDIX A

SITE AND EXPLORATORY HOLE LOCATION PLANS

Legend Key

Project No.	24-0213
Client	NDFA
Client's Rep	Malone O'Regan Consulting Engineers

Site Location Plan

Coolaghknock Glebe Soakaway Testing

CAUSEWAY GEOTECH

Last Revision	20/02/2024
Scale	1:10000

Legend Key

🟥 Locations By Type - TP

Project No.	24-0213
Client	NDFA
Client's Rep	Malone O'Regan Consulting Engineers

Exploratory Hole Location Plan

Coolaghknock Glebe Soakaway Testing

CAUSEWAY GEOTECH

Last Revision	20/02/2024
Scale	1:2000

APPENDIX B

SOAKAWAY TEST LOGS AND RESULTS

Project No. 24-0213	**Project Name:** Coolaghknock Glebe Soakaway Testing		**Trial Pit ID** **SA01**
Coordinates 674053.01 E 712984.41 N	**Client:** NDFA		
Method: Soakaway Testing	**Client's Representative:** Malone O'Regan Consulting Engineers		Sheet 1 of 1 Scale: 1:25
Plant: 3t Tracked Excavator	**Elevation** 103.50 mOD	**Date:** 19/02/2024	**Logger:** RW
			FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
					▨	TOPSOIL	
			103.30	0.20	▨	MADE GROUND: Soft brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse.	
			103.10	0.40	▨	MADE GROUND: Greyish brown very sandy very clayey subangular fine to coarse GRAVEL with low cobble content and fragments of concrete, wires, red brick, rope, plastic, ceramics and timber. Sand is fine to coarse. Cobbles are subangular.	
			102.00	1.50		End of trial pit at 1.50m	

Water Strikes	
Struck at (m)	Remarks

Depth: 1.50
Width: 0.60
Length: 2.10

Remarks:
Concrete encountered at western edge of pit at 0.50mbgl.
No groundwater encountered.

Stability:
Stable

Termination Reason
Terminated at scheduled depth.

Last Updated
20/02/2024

Soakaway Infiltration Test

Project No.: 24-0213
Site: Clloaghknock Glebe Soakaway Testing
Test Location: SA01
Test Date: 19 February 2024

Analysis using method as described in BRE Digest 365 and CIRIA Report C697-The SUDS Manual

	width (m)	length (m)
test pit top dimensions	0.60	2.10
test pit base dimensions	0.60	1.50

test pit depth (m) 1.50

depth to groundwater before adding water (m) = Dry

Time (mins)	Depth to water surface (m)	Head of water in pit (m)
0	0.72	0.78
1	0.76	0.74
2	0.80	0.70
3	0.86	0.64
4	0.89	0.61
5	0.92	0.58
6	0.93	0.57
8	0.97	0.53
10	1.01	0.49
15	1.09	0.41
20	1.15	0.35
25	1.19	0.31
30	1.30	0.20
45	1.50	0.00

RESULTS (FROM GRAPH BELOW)

Test start

75% head of water at	0.59 m
depth to water surface (target)	0.92 m
time to reach target depth	5.0 mins

Test end

25% head of water at	0.20 m
depth to water surface (target)	1.31 m
time to reach target depth	30.0 mins

test infiltration rate (q) = 0.36 m/h

TARGET DEPTHS AND CALCULATED VALUES

time (mins)	depth to water surface (m)	head of water in pit (m)	time elapsed (mins)	volume of water lost (m^3)	Area of walls and base at 50% drop (m^2)	q (m/min)	q (m/h)
5	0.92	0.59	25	0.39	2.61	5.9E-03	0.356
30	1.31	0.20					

CAUSEWAY GEOTECH

Project No. 24-0213	**Project Name:** Coolaghknock Glebe Soakaway Testing		**Trial Pit ID** **SA02**
Coordinates 674140.23 E 712959.27 N	**Client:** NDFA		
Method: Soakaway Testing	**Client's Representative:** Malone O'Regan Consulting Engineers		Sheet 1 of 1 Scale: 1:25
Plant: 3t Tracked Excavator	**Elevation** 101.97 mOD	**Date:** 19/02/2024	**Logger:** RW
			FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
					▨	TOPSOIL	
			101.77	0.20	▨	MADE GROUND: Brownish grey sandy silty subangular fine to coarse GRAVEL with low cobble content and fragments of brick, ceramics and timber. Sand is fine to coarse. Cobbles are subangular.	
			101.37	0.60	▨	MADE GROUND: Reddish brown sandy very silty subrounded fine to coarse GRAVEL with fragments of red brick. Sand is fine to coarse.	
			101.27	0.70	▨	Reddish brown sandy very silty subrounded fine to coarse GRAVEL. Sand is fine to coarse.	
			100.97	1.00	▨	Soft reddish brown slightly gravelly sandy SILT. Sand is fine to coarse. Gravel is rounded fine to coarse.	
			100.47	1.50		End of trial pit at 1.50m	

0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 1.50
Width: 0.60
Length: 2.00

Remarks:
No groundwater encountered.

Stability:
Stable

Termination Reason
Terminated at scheduled depth.

Last Updated
20/02/2024

AGS

Soakaway Infiltration Test

Project No.: 24-0213
Site: Coolaghknock Glebe Soakaway Testing
Test Location: SA02
Test Date: 19 February 2024

Analysis using method as described in BRE Digest 365 and CIRIA Report C697-The SUDS Manual

	width (m)	length (m)
test pit top dimensions	0.60	2.00
test pit base dimensions	0.60	1.80
test pit depth (m)	1.50	

depth to groundwater before adding water (m) = Dry

Time (mins)	Depth to water surface (m)	Head of water in pit (m)
0	0.68	0.82
1	0.69	0.81
2	0.69	0.81
3	0.70	0.80
4	0.71	0.79
5	0.72	0.78
6	0.73	0.78
8	0.75	0.75
10	0.77	0.73
15	0.79	0.71
20	0.81	0.69
30	0.87	0.63
60	1.00	0.50
90	1.10	0.40
120	1.20	0.30
150	1.25	0.25
180	1.25	0.25

RESULTS (FROM GRAPH BELOW)

Test start

75% head of water at	0.62 m
depth to water surface (target)	0.89 m
time to reach target depth	33.0 mins

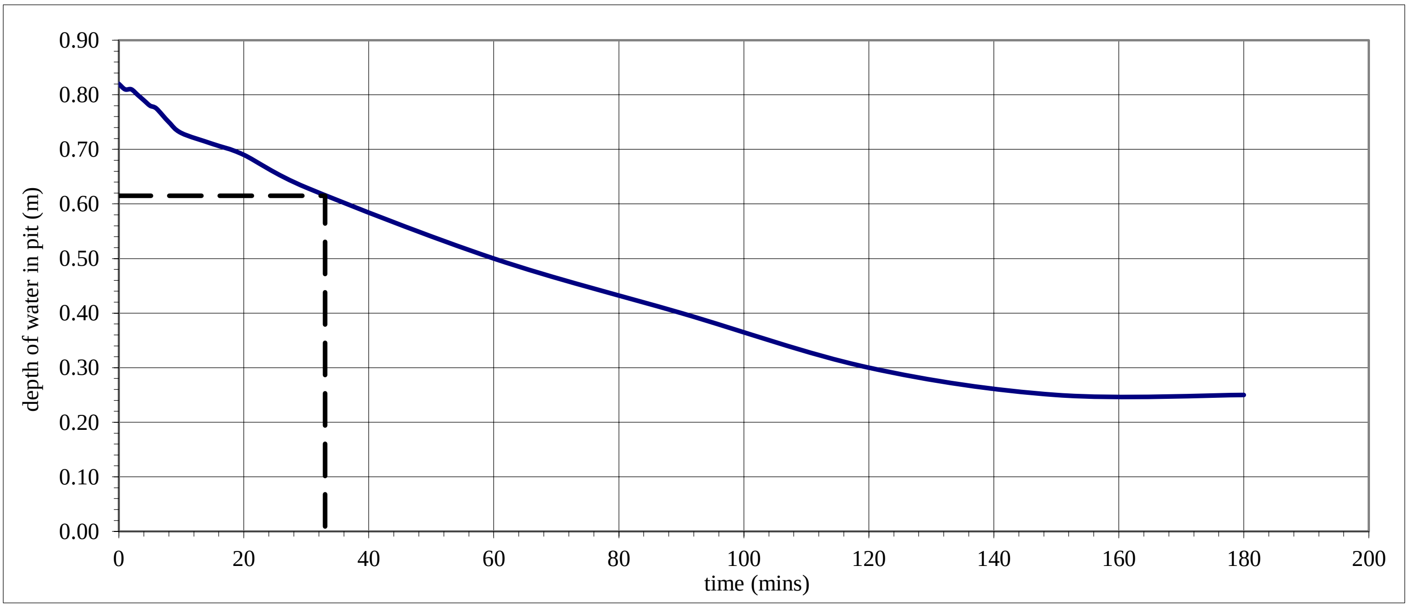
Test end

25% head of water at	0.21 m
depth to water surface (target)	1.30 m
time to reach target depth	not reached

infiltration rate (q) is very low

TARGET DEPTHS AND CALCULATED VALUES

time (mins)	depth to water surface (m)	head of water in pit (m)	time elapsed (mins)	volume of water lost (m^3)	Area of walls and base at 50% drop (m^2)	q (m/min)	q (m/h)
33	0.89	0.62	N/A				



CAUSEWAY GEOTECH

Project No. 24-0213	**Project Name:** Coolaghknock Glebe Soakaway Testing		**Trial Pit ID** **SA03**
Coordinates 674156.24 E 712882.92 N	**Client:** NDFA		
Method: Soakaway Testing	**Client's Representative:** Malone O'Regan Consulting Engineers		Sheet 1 of 1 Scale: 1:25
Plant: 3t Tracked Excavator	**Elevation** 101.95 mOD	**Date:** 19/02/2024	**Logger:** RW
			FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
					▨	TOPSOIL	
			101.85	0.10	▩	MADE GROUND: Brown very gravelly very clayey fine to coarse SAND. Gravel is subrounded fine to coarse.	
			101.05	0.90	░	Greyish brown very gravelly fine to coarse SAND. Gravel is rounded fine to coarse.	
			100.45	1.50		End of trial pit at 1.50m	

0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 1.50
Width: 0.60
Length: 2.10

Remarks:
No groundwater encountered.

Stability:
Moderately Stable

Termination Reason
Terminated at scheduled depth.

Last Updated
20/02/2024

AGS

Soakaway Infiltration Test

Project No.: 24-0213
Site: Coolaghknock Glebe Soakway Testing
Test Location: SA03
Test Date: 19 February 2024

	width (m)	length (m)
test pit top dimensions	0.60	2.10
test pit base dimensions	0.60	1.90
test pit depth (m)	1.50	

Analysis using method as described in BRE Digest 365 and CIRIA Report C697-The SUDS Manual

depth to groundwater before adding water (m) = Dry

Time (mins)	Depth to water surface (m)	Head of water in pit (m)
0	0.69	0.81
1	0.70	0.80
2	0.72	0.78
3	0.74	0.76
4	0.76	0.74
5	0.78	0.72
6	0.80	0.70
8	0.82	0.68
10	0.84	0.66
15	0.88	0.62
20	0.92	0.58
30	1.00	0.50
60	1.30	0.20
90	1.46	0.04

RESULTS (FROM GRAPH BELOW)

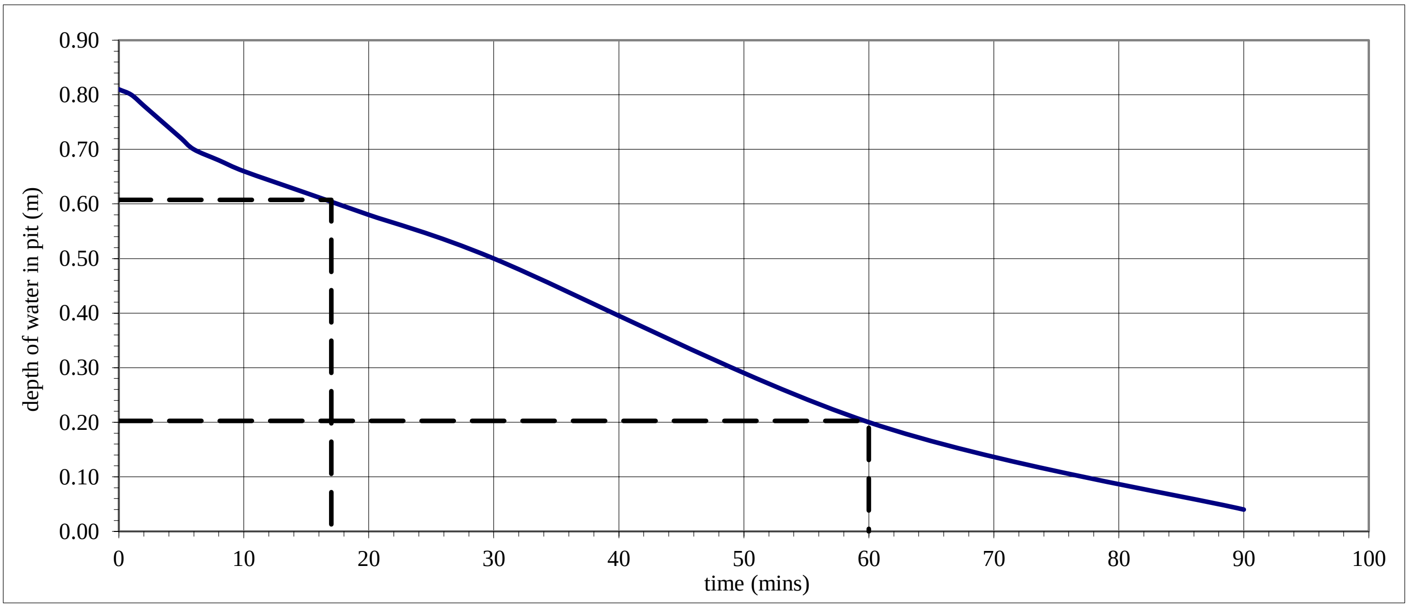
Test start
75% head of water at 0.61 m
depth to water surface (target) 0.89 m
time to reach target depth 17.0 mins

Test end
25% head of water at 0.20 m
depth to water surface (target) 1.30 m
time to reach target depth 60.0 mins

test infiltration rate (q) = 0.21 m/h

TARGET DEPTHS AND CALCULATED VALUES

time (mins)	depth to water surface (m)	head of water in pit (m)	time elapsed (mins)	volume of water lost (m^3)	Area of walls and base at 50% drop (m^2)	q (m/min)	q (m/h)
17	0.89	0.61	43	0.47	3.19	3.5E-03	0.208
60	1.30	0.20					



CAUSEWAY GEOTECH

Project No. 24-0213	**Project Name:** Coolaghknock Glebe Soakaway Testing		**Trial Pit ID** **SA04**
Coordinates 674252.24 E 712770.34 N	**Client:** NDFA		
Method: Soakaway Testing	**Client's Representative:** Malone O'Regan Consulting Engineers		Sheet 1 of 1 Scale: 1:25
Plant: 3t Tracked Excavator	**Elevation** 97.43 mOD	**Date:** 20/02/2024	**Logger:** RW
			FINAL

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m)	Legend	Description	Water
					▨	TOPSOIL	
			97.23	0.20	▩	MADE GROUND: Soft brown slightly sandy gravelly CLAY with low cobble and boulder content and fragments of concrete, red brick and cloth. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subangular. Boulders are subangular up to 1200mm.	
			96.93	0.50	░	Brown sandy very clayey subrounded fine to coarse GRAVEL. Sand is fine to coarse.	
			96.53	0.90	✕	Soft brown slightly gravelly sandy SILT. Sand is fine to coarse. Gravel is subrounded fine to medium.	
			95.93	1.50		End of trial pit at 1.50m	

0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5

Water Strikes	
Struck at (m)	Remarks

Depth: 1.50
Width: 0.60
Length: 2.10

Remarks:
No groundwater encountered.

Stability:
Unstable

Termination Reason
Terminated at scheduled depth.

Last Updated
20/02/2024

AGS

Soakaway Infiltration Test

Project No.: 23-0213

Site: Coolaghknock Glebe Soakaway Testing

Test Location: SA04

Test Date: 20 February 2024

Analysis using method as described in BRE Digest 365 and CIRIA Report C697-The SUDS Manual

	width (m)	length (m)
test pit top dimensions	0.60	2.10
test pit base dimensions	0.60	1.90
test pit depth (m)	1.50	

depth to groundwater before adding water (m) = Dry

Time (mins)	Depth to water surface (m)	Head of water in pit (m)
0	0.66	0.84
1	0.69	0.81
2	0.70	0.80
3	0.72	0.78
4	0.73	0.77
5	0.74	0.76
6	0.76	0.74
8	0.78	0.72
10	0.80	0.70
15	0.85	0.65
20	0.89	0.61
25	0.93	0.57
45	1.05	0.45
60	1.10	0.40
90	1.21	0.29
120	1.40	0.10
150	1.45	0.05

RESULTS (FROM GRAPH BELOW)

Test start

75% head of water at 0.63 m

depth to water surface (target) 0.87 m

time to reach target depth 17.0 mins

Test end

25% head of water at 0.21 m

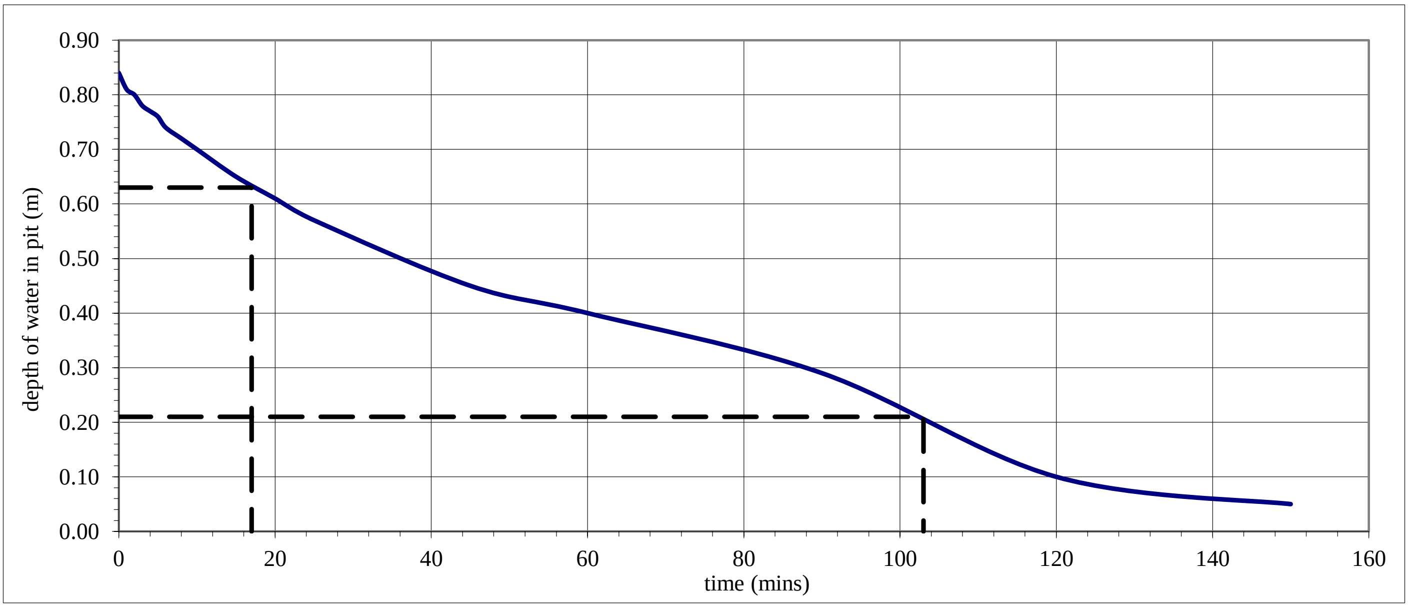
depth to water surface (target) 1.29 m

time to reach target depth 103.0 mins

test infiltration rate (q) = 0.11 m/h

TARGET DEPTHS AND CALCULATED VALUES

time (mins)	depth to water surface (m)	head of water in pit (m)	time elapsed (mins)	volume of water lost (m^3)	Area of walls and base at 50% drop (m^2)	q (m/min)	q (m/h)
17	0.87	0.63	86	0.49	3.27	1.8E-03	0.105
103	1.29	0.21					



APPENDIX C

PIT PHOTOGRAPHS


CAUSEWAY GEOTECH
Project Name
Coolaghknock Glebe
Project Number
24-0213
Date
19.02.24
EH Number
SA01
(m) 0.1 0.2 0.3 0.4 0.5

SA01


CAUSEWAY GEOTECH
Project Name
Coolaghknock Glebe
Date
19.02.24
Project Number
24-02
EH Number
SA01
(m) 0.1 0.2 0.3 0.4

SA01

SA01

SA01

SA01


CAUSEWAY GEOTECH
Project Name
Coolaghknock Glebe
Project Number
24-0213
EH Number
SA01
Date
19.02.24
(m) 0.1 0.2 0.3 0.4 0.5

SA01

SA01


CAUSEWAY GEOTECH
Project Name
Coolaghknock Glebe
Project Number
24-0213
Date
19.02.24
EH Number
SA02
(m) 0.1 0.2 0.3 0.4 0.5

SA02


CAUSEWAY GEOTECH
Project Name
Coolaghknock Glebe
Project Number
24-0213
EH Number
SA02
Date
19.02.24
(m)
0.1
0.2
0.3
0.4
0.5

SA02

SA02

SA02

SA02


CAUSEWAY GEOTECH
Project Name
Coolaghknock Glebe
Project Number
24-0213
Date
19.02.24
EH Number
SA02
(m)
0.1
0.2
0.3
0.4
0.5

SA02

SA02


CAUSEWAY GEOTECH
Project Name
Coolaghknock Glebe
Project Number
24-0213
Date
19.02.24
EH Number
SA03
(m) 0.1 0.2 0.3 0.4 0.5

SA03


CAUSEWAY GEOTECH
Project Name
Coolaghknock Glebe
Project Number
24-0213
EH Number
SA03
Date
19.02.24
(m)
0.1
0.2
0.3
0.4
0.5
U36-4

SA03

SA03

SA03

SA03


CAUSEWAY
GEOTECH
Project Name
Coolaghknock Glebe
Project Number
24-0213
EH Number
SA03
Date
19.02.24
(m)
0.1
0.2
0.3
0.4
0.5

SA03

SA03


CAUSEWAY GEOTECH
Project Name
Coolaghknock Glebe
Project Number
24-0213
Date
19.02.24
EH Number
SA04
(m) 0.1 0.2 0.3 0.4 0.5

SA04


CAUSEWAY GEOTECH
Project Name
Coolaghknock Glebe
Project Number
24-0213
TR Number
SA04
Date
19.02.24
U36-4

SA04

SA04

SA04

SA04

SA04


CAUSEWAY GEOTECH
Project Name
Coolaghknock Glebe
Project Number
24-0213
Date
19.02.24
EH Number
SA04
(m) 0.1 0.2 0.3 0.4 0.5

SA04

SA04