Project

Hollystown - Kilmartin SHD

Dublin 15

Report Title

Infrastructure Design Report

Client

Glenveagh Homes Limited

INFRASTRUCTURE

DBFL CONSULTING ENGINEERS

December 2021

Document Control

Job Title: **Hollystown - Kilmartin SHD, Hollystown, Dublin 15**

Job Number: **170182**

Report Title: **Infrastructure Design Report**

Report Reference: **170182-DBFL-XX-XX-RP-C-007**

Author: **Grant Humphrey/ Aneta Smietana**

Approved by: **Brendan Manning**

Date: **December 2021**

Distribution: **Clients Design Team**
DBFL Consulting Engineers (File Copy)

DBFL Consulting Engineers

Dublin Office
Ormond House
Ormond Quay
Dublin 7

Tel 01 4004000
Email info@dbfl.ie
Web www.dbfl.ie

Waterford Office
Suite 8b, The Atrium,
Maritana Gate, Canada Street,
Waterford. X91W028

Tel 051 309500
Email info@dbfl.ie
Web www.dbfl.ie

Cork Office
14 South Mall
Cork
T12 CT91

Tel 021 202 4538
Email info@dbfl.ie
Web www.dbfl.ie

Revision	Issue Date	Description	Prepared	Reviewed	Approved
Draft	26.03.2021	Planning – For Review	GPH	DMW	DMW
	06.04.2021	Stage 2 SHD	GPH	DMW	DMW
Draft	24.11.2021	Stage 3 SHD	ASM	BCM	BCM
Final	15.12.21	Stage 3 SHD	ASM	BCM	BCM

TABLE OF CONTENTS

APPENDICES

Appendix A . **CAPACITY CALCULATIONS OF GOLF COURSE DRAIN**

Appendix B . **ALLOWABLE OUTFLOW Q_{bar} AND ALLOWABLE OUTFLOW CALCULATIONS**

Appendix C . **SURFACE WATER STORAGE CALCULATIONS & MET EIREANN RAINFALL DATA**

Appendix D . **SURFACE WATER SEWER NETWORK CALCULATIONS WITH SIMULATION RESULTS - MICRODRAINAGE**

Appendix E . **FOUL DRAINAGE MICRODRAINAGE CALCULATIONS**

Appendix F . **IRISH WATER CORRESPONDENCE**

Appendix G . **SITE INVESTIGATION**

1.0 INTRODUCTION

1.1 Background

The proposed development relates to at a site of c. 25.3 ha at the townlands of Hollystown, Kilmartin, Hollywoodrath, Cruiserath, Yellow Walls, Powerstown, and Tyrrelstown, Dublin 15, which includes lands in the former Hollystown Golf Course and lands identified under the Kilmartin Local Area Plan 2013 (as extended). The lands are bound by the R121 and Hollywoodrath residential development to the east, the under construction Bellingsmore residential development to the south and north, the former Hollystown Golf Course to the north, Tyrrellstown Educate Together National School, St.Luke's National School and Tyrellstown Community Centre to the west and south and the existing Tyrrellstown Local Centre to the south.

The proposed development will consist of the development of 548 no. residential units, consisting of 147 apartments/duplexes and 401 houses, ranging in height from 2 to 5 storeys and including retail/café unit, 2 no. crèches, 1 no. Montessori, 1 no. community hub, car and bicycle parking, open space, public realm and site infrastructure over a site area of c. 25.3 ha. On lands to the north of the application site (referred to as Hollystown Sites 2 & 3) the proposed development includes for 428 units consisting of 401 no. 2 and 3 storey houses and 27 no. apartments set out in 9 no. 3-storey blocks. On lands to the south of the application site and north of the Tyrellstown Local Centre (referred to as Kilmartin Local Centre) the proposed development includes 120 no. apartment/duplex units in 4 no. blocks ranging in height from 3 to 5 storeys. The local centre includes 2 no. crèches (including 1 standalone 2 storey crèche), 1 no. Montessori, a retail/café unit, and 1 no. community hub. The scheme also proposes a new vehicular access onto the R121 and an extension of the existing partially constructed Link Street which currently serves the Le Chéile Secondary School. A pedestrian / cycle linkage has also been provided from Site 2 &3 to Rathoath Road to the north which is zoned as Open Space. A pedestrian / cycle linkage has also been provided from Site 2 &3 to Rathoath Road to the north which is zoned as Open Space. Refer to Figure 1 below.

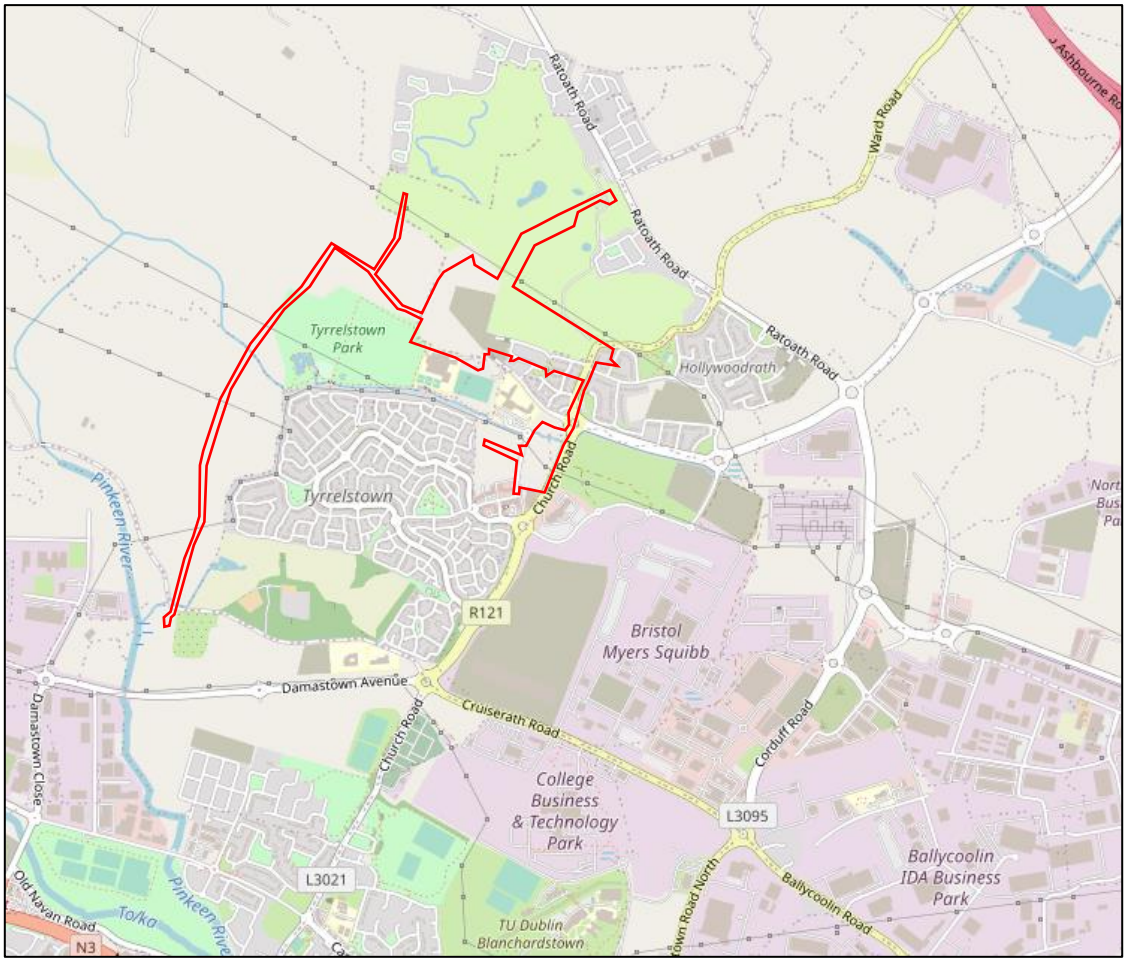


Figure 1: Site Location Plan (Source: EPA Maps)

The subject site is located on an undeveloped greenfield site with limited hardstanding areas that has an approximate site area of c.25.3 hectares. The site which is located within the administrative area of Fingal County Council and is zoned under 'Zoning Objectives RA – Residential Area' which is described within the Fingal Development Plan 2017 - 2023 as to "Provide for new residential communities subject to the provision of the necessary social and physical infrastructure". The lands which form the northern link towards Ratoath Road are zoned OS-Open Space to "Preserve and provide for open space and recreational amenities". The lands which form the proposed Kilmartin Local Centre are zoned LC-Local Centre to "Protect, provide for and/or improve local centre facilities".

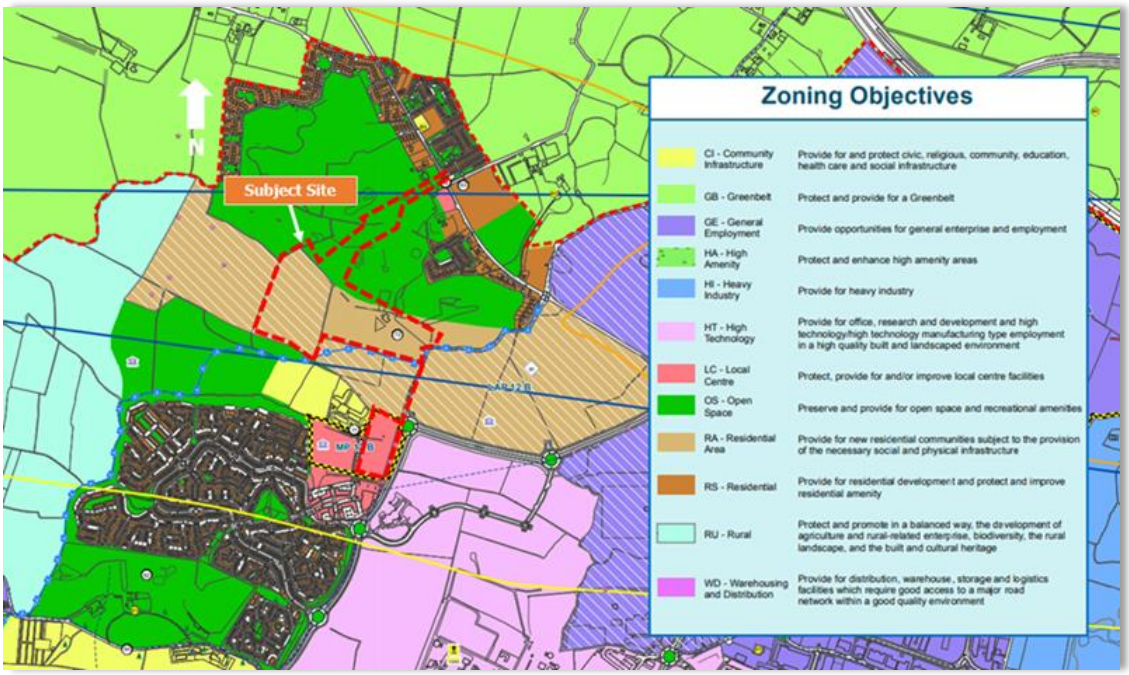


Figure 2: Extract from the Fingal Development Plan 2017-2023 Proposed Development

Site 2&3 part of the development will comprise 428 no. residential units as follows:

- 27 no. 1 bed apartments
- 97 no. 2 bed houses
- 267 no. 3 bed houses
- 37 no. 4 bed houses

Local centre part of the development will comprise 120 no. residential units ranging from 3 to 5 levels high as follows:

- Block A 12 no. units
- Block B 34 no. units
- Block C 44 no. units
- Block D 30 no. units

The development includes 2 no. crèches (including 1 standalone 2 storey crèche), 1 no. Montessori, a retail/café unit, and 1 no. community hub and associated infrastructure including streets, footpaths, cycle paths and water services infrastructure (watermain and below and above ground drainage infrastructure), see Figure 3 below.

Figure 3: Indicative Site Location Plan (Source: ArcGIS)

1.2 Objectives

This report addresses the development's main infrastructure elements, including.

- Access and Roads
- Surface Water Drainage
- Foul Drainage
- Water Supply and Distribution

1.3 Location and Topography and Site Characteristics

Site 2 & 3

Part of the subject site forms the southern part of the grounds of the former Hollystown Golf Club, in the Tyrrelstown area of north west Dublin. The site is circa 5.5km north-west of the M50, and circa 3km west of the N2 and is located to the north of the existing Tyrellstown Local Centre. It is bounded to the north by the former golf glub lands, to the east by Hollywoodrath Road (R121), to the south by "Bellingsmore" Development (constructed by the applicant) and to the west by undeveloped lands.

The site slopes generally in a north-westerly direction. The majority of Site 2 is located within the former golf course lands, which has natural undulations and landscaping features typical of a golf course, including an internal network of open drains and culverts. An open drain forms the boundary between Sites 2 and 3 and continues in a northerly direction where it connects to an open drain along the north eastern and north western boundaries of Site 3. This open drain continues westwards before connecting to the Pinkeen East Stream circa 1200m to the west. There is a dry drain along the western boundary of Site 3.

There are overhead ESB cables traversing the northern portion of the site, with an associated sterilisation zone of 40m (20m either side of the ex 110kV lines).

Local Centre

The site is bound by residential developments to the west and by Tyrrelstown Local Centre, which comprises a mix of retail and commercial units with office and residential above, to the south. To the north is another residential development, Bellingsmore, and north west are several schools while the east of the site is bound by the R121.

The lands are within the jurisdiction of Fingal County Council's Development Plan, 2017-2023. They are zoned 'LC', Local Centre, to 'protect, provide for and/or improve local centre facilities' as well as they are part of the `MP', Masterplan Area, 12.B.

The site is predominantly green-field with a road that connects Tyrrelstown Town Centre and Tyrrelstown Educate Together School currently crossing the site in a north south direction.

There is an existing ditch that meanders from east to west through the local centre site which appears to take road drainage from the R121. The ditch is currently culverted before entering the site from the east and is also culverted under the existing school access roundabout. The ditch flows to the west of the site and connects to field drainage that discharges to the Pinkeen River to the west of the site location as shown in Figure 5 below. It is proposed to culvert an additional section of the ditch to provide a regularised development and the ditch is expected to provide a suitable surface water discharge point for this portion of proposed development.

Overhead ESB cables also traverse this site – 220kV with associated 30m setback zone each side of the centreline of the power line.

A topographical survey of the site is provided as a background to the road layout drawings 170182-DBFL-RD-SP-DR-C-1004 to 170182-DBFL-RD-SP-DR-C-1011.

1.4 Pre-Application Consultation

As part of the pre-application process, FCC Water Services Section prepared two reports on the pre-application submissions for the Hollystown Sites 2 & 3 (An Bord Pleanála Ref. No. ABP-309926-21) and for the Kilmartin Local Centre (An Bord Pleanála Ref. No. ABP-309783-21). We note the responses to the Transportation Section are included in the TTA report

submitted separately as part of this planning application. The Water Services reports identified a number of items to be addressed in the final submission. The following summarises the items raised within the FCC reports and how these have been addressed within the final planning application:

Hollystown Sites 2 & 3 (ABP Ref. No. ABP-309926-21)

a. The general drainage details exclude individual, private water butts. Although the benefits of water butts are limited, it is generally considered good practice to include these in all new developments

As requested, water butt details have been provided for individual dwellings. Refer to DBFL Drawing 170182-DBFL-CS-SP-DR-C-5301 submitted as part of the application

b. There appears to be a larger scope for roadside swales than presently indicated on the layout drawings. Ditto bio-retention and drainage integrated tree-pits.

We have reviewed the scope of swales and provided as have increased to provide as much as allowable along the link streets while taking into account the location of trees in co-ordination with the Landscape Architect. As requested we have also provided a number of tree pits / bio-retention areas throughout the scheme. Refer to DBFL Drawings 170182-DBFL-CS-SP-DR-C-1004 to 1007 and 170182-DBFL-CS-SP-DR-C-1011 submitted as part of the application.

c. Detention basin inlet and outlet structures should be located as far away from each other in order to maximise natural infiltration, filtration, etc. Unsightly and overbearing in/outlet structures should be avoided where possible.

Noted. Inlet and outlet structures have been amended accordingly. Refer to DBFL Drawings 170182-DBFL-CS-SP-DR-C-1004 to 1007 and 170182-DBFL-CS-SP-DR-C-1011 submitted as part of the application.

d. The applicant should note that Stormtech units are generally not Taken-in-Charge. However it is acknowledged that their use may be justified in certain situations. To this extent the applicant is requested to prepare a comparative review of Stormtech v natural drainage stone with regards to each of the four areas where underground attenuation storage is being proposed. Similarly there may be overshadowing benefits associated with using Stormtech elsewhere in

order to provide for more natural detention depressions. This should be investigated and discussed with Parks and Operations.

Generally detention / infiltration basins, swales, tree pits are provided throughout the vast majority of the scheme as agreed with both FCC Water Services and Parks Departments. As noted above there are 4 areas where underground storage has been provided. We have proposed a stone build-up underneath the 2Nr Swales / Basins along the western boundary of Site 3. This is due to the narrow space available here and the fact that we could provide sufficient storage using the stone build-up in this area. In the other 2 areas we have chosen the 2Nr Stormtech Geo-cellular attenuation systems as opposed to natural drainage stone due to the fact that these systems have a much higher porosity than natural stone and, therefore, require significantly less land take. It is our opinion, that the use of stone for underground storage of surface water in these higher volume areas is not a sustainable method of storing surface water, due to the volume of material to be excavated, disposed of and the volume of material to be imported and the maintenance of same. The volume of stone and area of the system required would be over twice as much for the stone build-up as opposed to Stormtech. The maintenance of the Stormtech Geo-Cellular Attenuation Systems is also much simpler than that of natural drainage stone as outline below. Also, If we were to provide basins in these areas, we would end up with very deep unusable open space areas that would need to be fenced off.

In terms of maintenance, 'Stormtech' units are easily inspected and maintained to assure a properly functioning stormwater system. Inspection is through a manhole or inspection port on the 'Isolator Row'. Inspection ports allow inspection from the surface without the need for confined space entry. If sediments are found to have accumulated to a depth of 76mm, cleanout of the 'isolator row' using 'JetVac' maintenance is required. As noted above, underground storage using stone cannot be inspected or easily maintained, i.e., any build-up of silts is not visible and cannot be removed without excavating and removal of the system.

It should also be noted that 'Stormtech' units are Certified, are used industry wide and are routinely taken in charge by Local Authorities. They are designed to provide treatment of water through the removal of contaminants (CIRIA SuDS Manual 2015) and is a recognised SuDS feature. The Isolator row in the 'Stormtech' unit is a first-flush treatment device and the 'Stormtech' unit itself, is a SuDS Infiltration System as defined in the GDSDS.

e. There is a general concern regarding the shape, depth and proximity of basins to footpaths, roads and structures. The applicant is requested to prepare

detailed green/blue drawings and also sections demonstrating the above relationships.

As agreed with FCC Parks and Water Services we have emended the shape of the basins to ensure that the side slopes of the basins are max 1 in 5. As requested, we have also provided a 2m flat area at the top of each basin to allow for grass cutting. Please refer to DBFL Drawings 170182-DBFL-CS-SP-DR-C-1004 to 1007 and 170182-DBFL-CS-SP-DR-C-1011 for plans and DBFL Drawings 170182-DBFL-CS-SP-DR-C-5301 to 5307 for sections which are submitted as part of the planning application.

f. The drainage design does not allow for any storage deduction due to natural infiltration. Although this results in a greater safety margin with regards to storage provision, if may benefit the layout if this is being considered.

To err on the side of caution an infiltration rate of zero has been assumed to ensure no attenuation areas are undersized. Going forward with the scheme additional infiltration tests will be undertaken at attenuation areas prior to construction.

Kilmartin Local Centre (ABP Ref. No. ABP-309783-21)

2. Whilst the surface water drainage strategy is generally acceptable the proposal still incorporates a significant amount of underground attenuation. The use of underground storage should be avoided. The applicant shall consider increasing the capacity of the other SUDS systems elsewhere to reduce further the requirement for underground attenuation.

The Local Centre has been split into 3Nr Catchments, refer to Figure 10 in Section 3.3.2 of this report. Catchment 2 takes up the majority of the subject site and all attenuation is above ground in this location. Green roofs, filter drains, permeable paving, tree pits are also provided here. For Catchment 1 and 3 and element of underground storage is unavoidable. However, we would note that we have maximised the above ground storage throughout the entire subject site, we have provided green roofs for all buildings, we have provided tree pits, permeable paving, petrol interceptors, and flow control devices for all catchments.

3. the applicant is requested to consider the retention of the existing open ditch on the eastern part of the site. There may be an opportunity to better utilise this open ditch for an attenuation feature as well as creating a corridor for bio-diversity and amenity in accordance with the principles of sustainable drainage.

The existing ditch provides an outfall for road drainage from the R121. The ditch is currently culverted before entering the site from the east and is only open for a short distance before

re-entering a culvert under the existing school access roundabout. The ditch then flows to the west of the site and connects to field drainage that discharges to the Pinkeen River to the west of the site. It is proposed to culvert the short section of the open ditch to provide access to Block B and C and provide a regularised development. The existing ditch is unsuitable for attenuation as it is currently taking surface water from upstream which would occupy any attenuation volume. Separate attenuation is provided for the proposed development to mitigate flood risk. We also note that the ditch appears to have been previously diverted as part of previous development works and it noted to have "No Eco Benefit" in Appendix B of the Kilmartin LAP SUDS Strategy.

2.0 ACCESS AND ROADS

2.1 Overall Road and Access Layout

There are three proposed vehicular access points proposed to serve the subject development, as indicated in Figure 4 below. Access Point 1 is provided at the secondary link street connecting site 2 to the R121, and access Point 2 is via an extension of the existing primary link street (referred to as Hollystown Road) into Site 3. The primary link street is continued through Site 3, up to the western boundary, enabling future onward connections to adjacent zoned lands. Access Point 3 is at the new link street extension connecting Local Centre with Hollystown Road.

Figure 4: Proposed Vehicular Access Points

2.2 Road Design

The proposed development's internal streets are designed in accordance with the *'Design Manual for Urban Road and Street (DMURS') and a DMURS Compliance Statement* is included with this pre planning submission.

A *Traffic and Transportation Assessment* and *Mobility Management Plan*, have been prepared by DBFL Consulting Engineers and are included as standalone documents.

3.0 SURFACE WATER DRAINAGE

3.1 Existing Surface Water Arrangement

Site 2 & 3

There is an existing surface water network within Site 2 comprising constructed open drains within the former golf club lands which are piped and culverted locally to facilitate crossing points. There is an existing open drain running in a northerly direction between sites 2 and 3 connecting to the open drain along the northern boundary of Site 3. This open drain continues along the boundary of site 3, as indicated in Figure 5 below, towards the Pinkeen River further west. Refer to Figure 6 below for the location of the Pinkeen East River.

Local Centre

The existing site is predominantly greenfield excluding the existing access road, and the topography of the site generally falls from the south-east corner towards the north-west corner. Currently, the site is drained by a surface water ditch which traverses the site from east to west along its northern boundary before connecting to an existing ditch system, which discharges to the Pinkeen River further west (refer to *Figure 6*).

Surface water runoff from the existing road connecting Tyrrelstown Local Centre and Tyrrelstown Educate Together school is collected via road gullies into the existing 225mm diameter pipe running under the road. The planning documents for the school and the road submitted under FW10A/0137, show the runoff from the road being attenuated within the school area and connected to the existing surface network to the north-west of the proposed development site.

There is an existing 600mm diameter surface water sewer running along the western boundary of the site which outfalls to the North West.

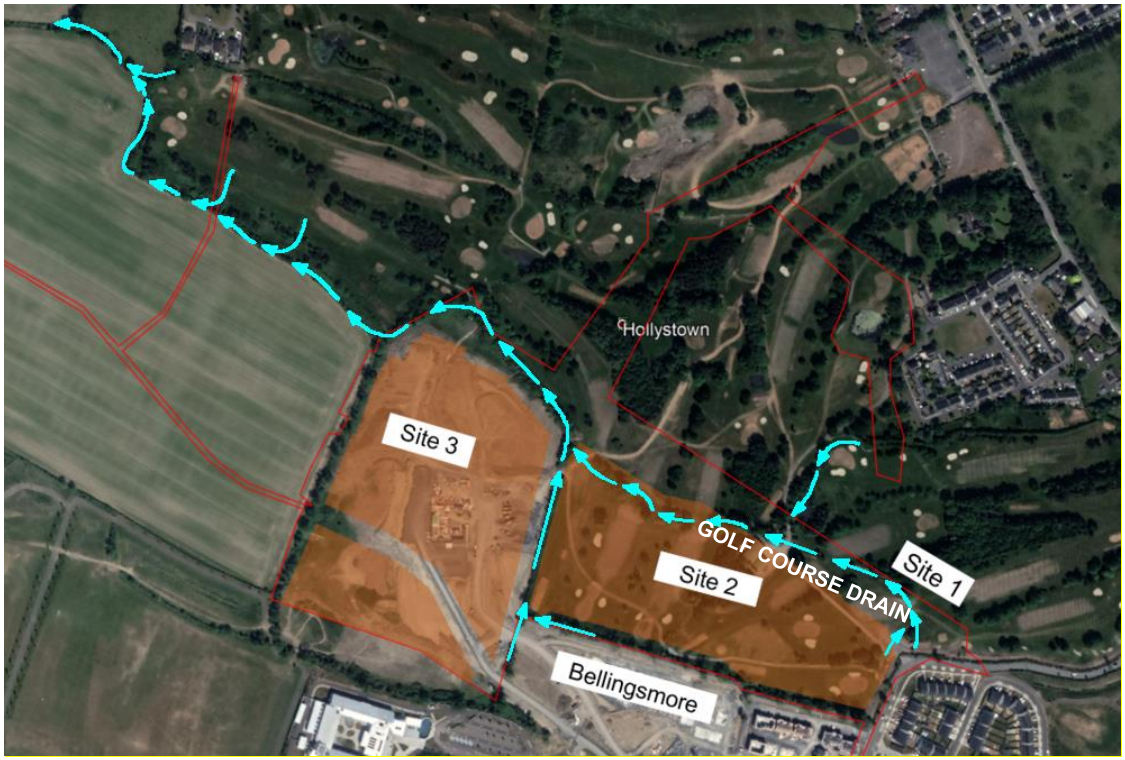


Figure 5: Existing Surface Water Flow Paths

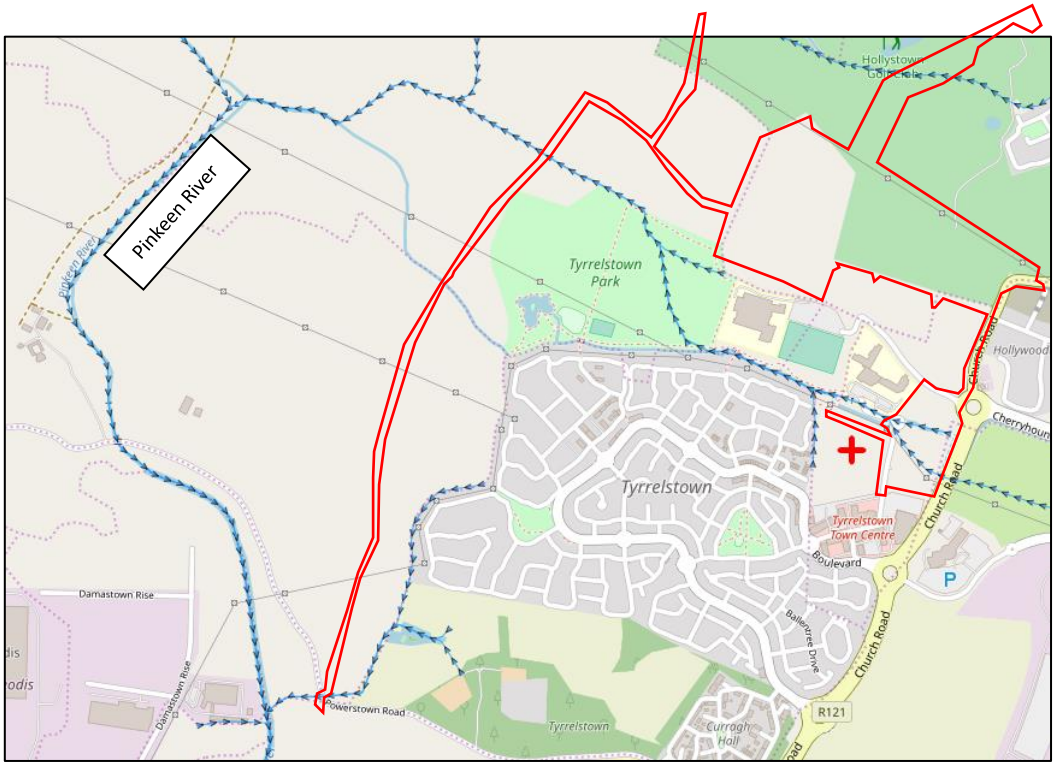


Figure 6: Location of Pinkeen East River (EPA)

Within Site 2, the golf course drain as shown in Figure 7, traverses the site from east to west before connecting to the existing ditch system which forms the boundary between Site 2 and Site 3, which discharges to the Pinkeen River further west (refer to Figure 6). This golf course drain accommodates surface water runoff from the subject site (which will be developed as part

of this application), and some road runoff from a section of Church Road / Hollywoodrath Road, via road gullies at the existing gated entrance. The drain also accommodates attenuated surface water runoff from Hollywood Rath development to the south east, currently under construction under FW14A/0108. The planning documents for Hollywood Rath submitted under FW14A/0108, indicate a maximum attenuated flow rate of 83l/s discharging to the ditch. There is also a small water feature associated with the golf course connecting to the drain, with piped controls which will be maintained.

Figure 7: Existing Golf Course Drain – Site 2

The existing surface water detention basin for Bellingsmore Residential Development to the south is also located within Site 3.

3.2 **Proposed Surface Water Drainage**

3.2.1 General

Site 2&3

To maximise the development potential of Site 2, it is proposed to re-route the existing open channel Golf Course Drain to the north within the ESB sterilisation zone, as indicated on DBFL drawings no. 170182-DBFL-CS-S1-DR-C-1004 to 170182-DBFL-CS-S1-DR-C-1007. Sections of this re-routed drain will be piped and culverted to facilitate crossing points. Refer to Section 3.2.2 for further details.

The existing open drain which forms the boundary between Site 2 and 3 will be maintained with a buffer of circa 10m maintained on both sides.

The existing open drain along the north eastern and north western boundaries of Site 3 will also be maintained with a 10m buffer maintained on the development side.

It is proposed to incorporate the surface water storage requirements for Bellingsmore Residential Development into the scheme design for Site 3, in the form of two interlinked detention basins adjacent to the south east boundary of Site 3. The existing detention basin for Bellingmore will be removed to facilitate this arrangement with the existing storage volume of

circa 810m^3 for a 1% AEP event accommodated in the relocated basins as a minimum. A new surface water outfall will be constructed to the same receiving water (the open drain which forms the north eastern boundary of Site 3).

Local Centre

The existing ditch, existing road and the new road divide the site into three surface water catchments (Figure 10 below) for the purposes of surface water management. It is proposed to discharge attenuated surface water runoff from each catchment to the surface water ditch traversing the site from east to west.

3.2.2 Golf Course Drain within Site 2

The existing golf course drain within Site 2 will be treated in two different ways, (i) intercepted and piped and (ii) re-routed to the north to maximise development potential of the site. These scenarios are outlined below;

(i) **Intercepting Existing Flows and Culverting of the Drain**

Existing pipes outfalling to the golf course drain adjacent to Site 2 development entrance are re-directed via a new surface water pipe (600mm diameter) to the re-routed open drain to the north. This piped section is designed to accommodate the existing discharges to it as outlined in Section 3.1 and an attenuated flow rate of 4.3l/sec from Site 1 (currently under consideration for planning permission with Fingal County Council). The section of the existing open drain which is made redundant following re-directing the pipes will be filled in.

Microdrainage calculations confirming the capacity of the 600mm diameter pipe to accommodate flows are included in **Appendix A**.

(ii) **Re-Routing of the Golf Course Drain**

To optimise the site layout including the public open space, it is proposed to re-route circa 300m of the golf course drain which traverses the site. The re-routed section of the drain would move approximately 60m further north, within the sterilisation zone beneath the overhead ESB power lines.

The re-routed section of the drain will match the existing drain characteristics (to ensure that the existing capacity is maintained) with short, piped sections reinstated to match the existing scenario and to provide crossing points.

The capacity of the existing and the re-routed golf course drain is included in **Appendix A**.

3.2.3 Riparian Corridors

Riparian corridors of 10m are proposed along the existing open drain between Sites 2 and 3 and along the open drains along the northern boundary of Site 3.

3.3 Proposed Surface Water Drainage

3.3.1 General

Attenuated surface water runoff from Site 2 will discharge to the re-routed golf course drain along the northern boundary of Site 2.

Attenuated surface water runoff from Site 3 will discharge to the existing open drain along the northern boundary of Site 3.

Attenuated surface water runoff from Local Centre will discharge to the existing surface water ditch traversing the site from east to west.

3.3.2 Management of Surface Water Runoff

Site 2 & 3

To manage surface water runoff from Site 2, the site will be split into 2 surface water catchments, Catchment “1”and Catchment “2”. Similarly, to manage surface water runoff from Site 3, the site will be split into 5 surface water catchments, Catchments “1” to “5”. Refer to Figures 8 and 9 for proposed surface water catchments.

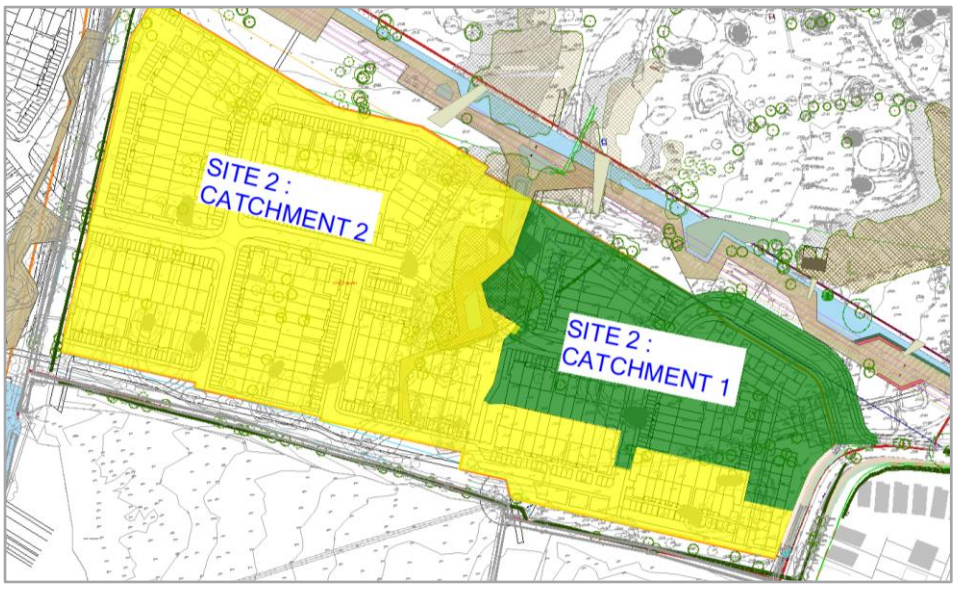


Figure 8: Site 2 Surface Water Catchments

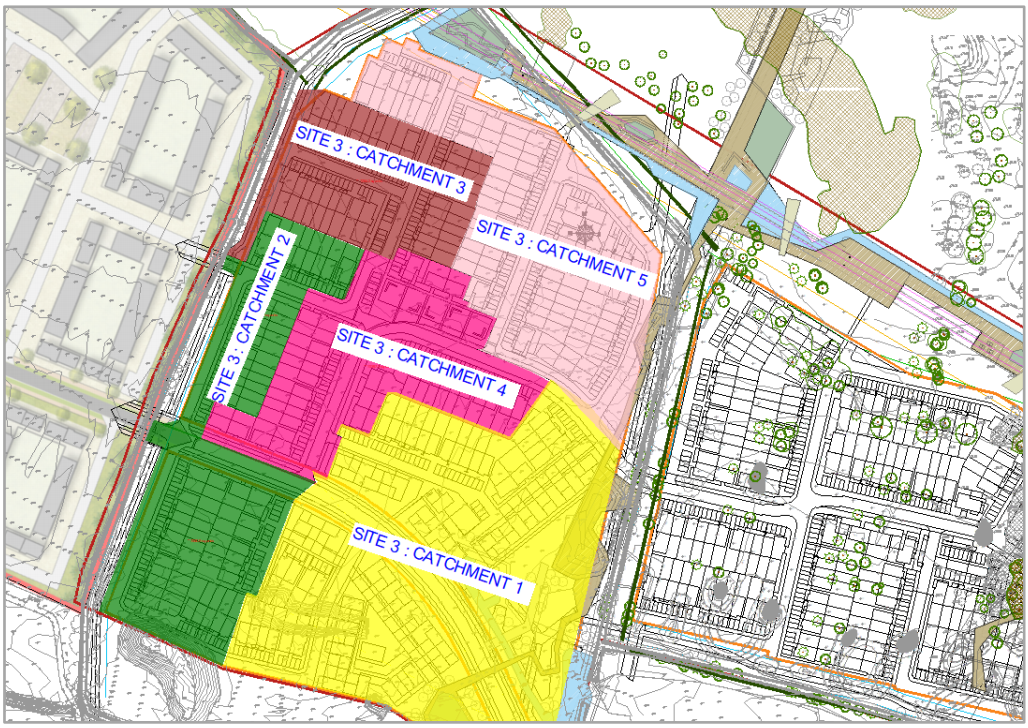


Figure 9: Site 3 Surface Water Catchments

Surface water runoff from Sites 2 and 3 will be attenuated to Qbar "Greenfield Runoff" as required in the GDSDS, with runoff exceeding the allowable outflow stored on site for up to a 1% AEP (Annual Exceedance Probability) event, plus 20% for climate change.

Where possible, detention basins have been shaped to aesthetically fit within the scheme design and incorporated into the landscape design to maximise the usability of open space.

Local Centre

To manage surface water runoff from Local Centre, the site will be split into 3 surface water catchments, Catchment "1" to "3". Catchments "1" to "3". Refer to Figure 10 for proposed surface water catchments.

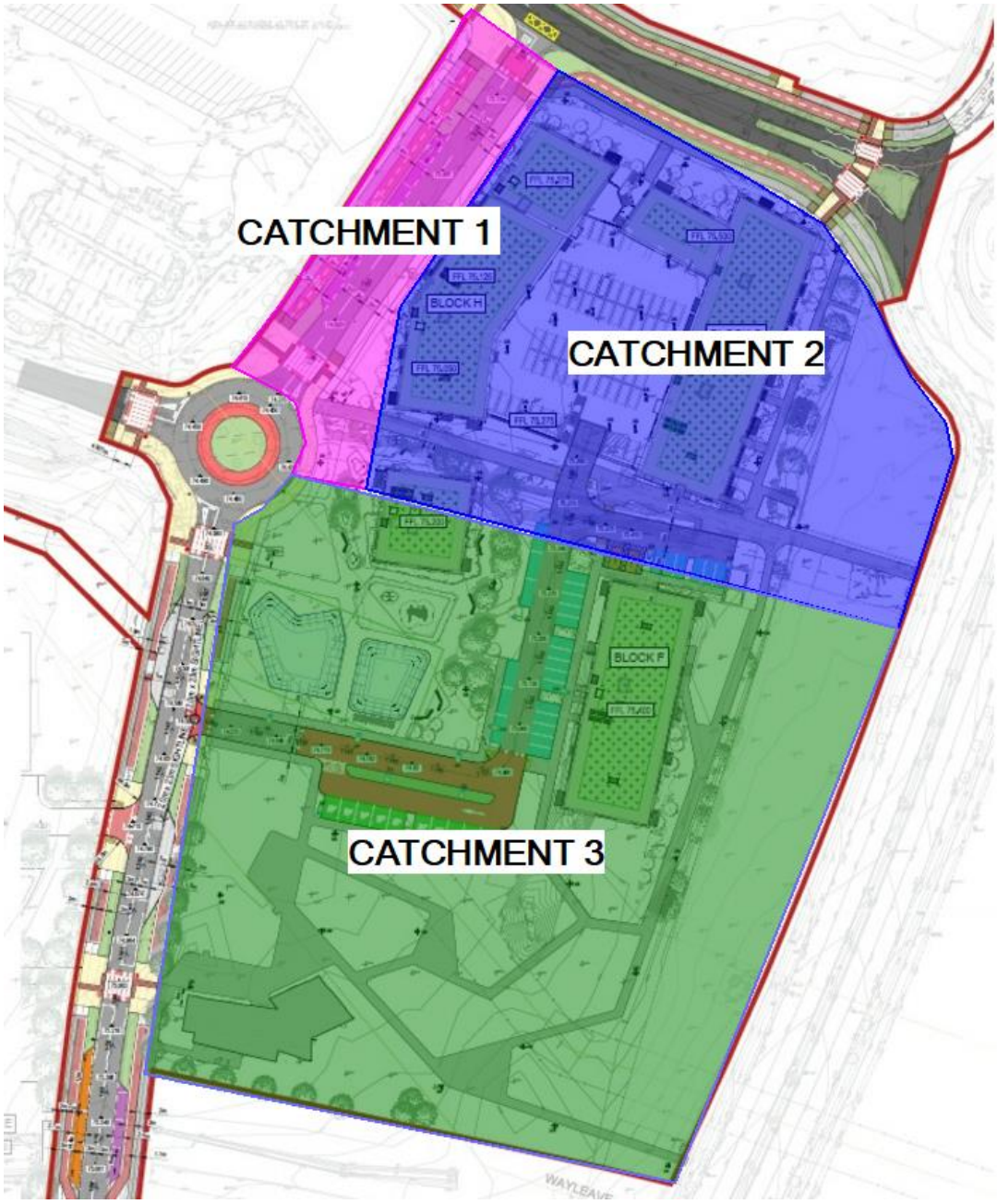


Figure 10: Local Centre Surface Water Catchments

Surface water runoff from Sites 2 and 3 will be attenuated to Qbar "Greenfield Runoff" as required in the GDSDS, with runoff exceeding the allowable outflow stored on site for up to a 1% AEP (Annual Exceedance Probability) event, plus 20% for climate change.

3.3.3 Sustainable Drainage Systems (SuDS)

SuDS features will be integrated into the surface water drainage network for the proposed development, with the objective of controlling the quantity of surface water runoff, managing the quality of runoff to prevent pollution, and creating and sustaining local ecosystems. The four main categories of benefits that can be achieved by SuDS are water *quantity*, *quality*, *amenity*,

and *biodiversity*. SuDS features can take many forms both above and below ground and can include planting and proprietary / manufactured products.

SuDS features deliver high quality drainage while supporting urban areas to cope better with severe rainfall now and in the future. They also counteract some of the impacts on our water cycle caused by increased urbanisation, such as reduced infiltration, which can result in diminished groundwater supplies. They are used in conjunction with traditional drainage systems, and the use of SuDS features are a requirement of the GDSDS (Greater Dublin Strategic drainage Study).

The SuDs features proposed for the development include the following:

- Swales within the link street grass verges;
- Permeable paving within private curtilage parking;
- Bioretention areas;
- Tree Pits;
- Detention basins;
- 'Hydrobrake' flow controls;
- Petrol Interceptors;

The proposed surface water drainage layout for the scheme is detailed in DBFL drawing nos. 170182-DBFL-CS-SP-DR-C-1004 to 170182-DBFL-CS-SP-DR-C-1011.

3.3.4 Surface Water Attenuation

Surface water runoff volumes from the development is attenuated to flowrates equal to the greenfield runoff (Q_{bar}), in accordance with the recommendations of the GDSDS. Surface water run-off from catchment areas will be attenuated using a vortex flow control device (Hydrobrake or equivalent) within the constructed detention basins.

Q_{bar} is calculated using the *Institute of Hydrology* equation, as recommended in the Greater Dublin Strategic Drainage Study (GDSDS), as follows:

$$Q_{bar\ [rural]} = 0.00108\ x\ AREA^{0.89} x\ SAAR^{1.17} x\ Soil^{2.17}$$

$$Q_{bar\ [rural]\ [50ha]} = 0.11 \frac{m^3}{sec} = 110\ l/s\ for\ 50ha = \ 2.2\ l/ha$$

Where:

- $Q_{bar[rural]}$ is the mean catchment annual flow from a 50 ha rural catchment in m^3/s;

- SAAR is the standard average annual rainfall = 823mm**.**

- SOIL is the soil index, with 5 soil types used and SPR values (standard percentage runoff) applied to each soil type.

  The SPR values for the 5 soil types are as follows:

  Soil 1 = 0.1; Soil 2 = 0.3; Soil 3 = 0.37; Soil 4 = 0.47; Soil 5 = 0.53;

  A SPR value of 0.3 (Soil Type 2) is applied for the subject site. Soil type 2 is chosen based on site specific conditions, as confirmed using preliminary site investigations. A copy of the "Ground Investigations Report", (by Ground Investigations Ireland) is included in Appendix G.

The calculated allowable outflow rate of 2.2l/s is applied to each surface water catchment with the storage volume calculated using the Source Control of Microdrainage and modelled in the Network module of Microdrainage. A summary of the surface water catchments and their associated Qbar rate and storage requirements are summarised in Table 1 below:

Refer also to ***Appendix B*** for details of the allowable outflow calculations.

3.3.5 Surface Water Storage

It is proposed to store runoff for a 1% AEP (Annual Exceedance Probability) storm event plus 20% allowance for climate change in detention basins, linear swales and underground Stormtech tanks. The storage requirement has been calculated using the *Source Control* module of *Microdrainage* and modelled using the *Network Module,* taking into consideration the impermeable area of the surface water catchment, design invert levels, ground levels and depth and type of storage system. A summary of the allowable outflow rates and provided storage volumes for each surface water catchment is included in Table 1.

Site 2&3

	Site 2		**Site 3**				
Sub Catchment Name	**2.1**	**2.2**	**3.1**	**3.2**	**3.3**	**3.4**	**3.5**
Area (ha)	1.63	4.24	2.61	1.22	0.73	1.03	1.37
Total (ha)	**5.87**		**6.96**				
Q_{bar} (l/sec)	3.6	9.35	5.7	2.69	1.6	2.28	3.03
Q_{bar} (l/sec/ha)	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Q_{bar} Total (l/s)	**12.95**		**15.3**				
Allowable Outflow (l/s)	3.60	9.35	5.70	[1](4.70 N/A) [2]5.30		2.28	[2]2.00
Allowable Outflow Total (l/s)	**12.95**		**15.3**				
Total Storage Required (m^3)	**433.9**	**1075.9**	**723.3**	**289.5**	**293.6**	**318.6**	**639**
Total Storage Provided (m^3)	**471.43**	**1282.64**	**738.0**	**328.65**	**354.92**	**318.6**	**846.79**
Overground Detention Basin	471.43	1282.64	290.0	107.65	132.92	-	846.79
Underground Structure	X	X	448	221	222	318.6	-
Total Storage Provided (m^3)	**1754.07**		**2586.96**				

Table 1: Surface Water Catchment Summary

[1]The allowable outflow from Surface Water Catchment 3.2 is 4.7l/s which flows into the downstream attenuation structure for Surface Water Catchment 3.3 with the hydrobrake flow control for Catchment 3.3 set at 5.3l/s.

[2]The allowable outflow from Surface Water catchment 3.5 is adjusted to 2l/s instead of 3.03l/s with the additional 1.03l/s applied to Surface Water Catchments 3.2 and 3.3 with the allowable outflow from Catchments 3.2 and 3.3 set at 5.30.

Local Centre

Sub Catchment Name	**1**	**2**	**3**
Area (ha)	0.214	0.710	1.46
Total (ha)		**2.384**	
Qbar (l/sec)	0.5	1.6	3.22
Qbar (l/sec/ha)	2.2	2.2	2.2
Qbar Total (l/s)		**5.32**	
Allowable Outflow (l/s)	2	2	3.22
Allowable Outflow Total (l/s)		**7.22**	
Total Storage Required (m3)	**45.7**	**239.1**	**266.7**
Total Storage Provided (m3)	**57**	**280**	**290.0**
Overground Detention Basin	-	-	290.0
Underground Structure	57	280	-
Total Storage Provided (m3)	**57**	**280**	**266.7**

Refer to **Appendix C** for Microdrainage surface water storage Source Control calculations and Network simulation results.

Detention basins will remain unlined to allow for filtration through the wetted base and sides. However, to ensure adequate provision of attenuated volumes within each detention basin, no allowance for infiltration is assumed in the storage calculations. Detention basin side embankments will be constructed to a minimum side slope of 1:5 (V:H) as requested by Fingal County Council.

3.3.6 Surface Water Storage Bellingsmore Development (FCC Ref FW13A/0088 and PL06F.243395

It is proposed to incorporate the surface water storage requirements for Bellingsmore Residential Development into the scheme design for Site 3, in the form of two interlinked detention basins adjacent to the south east boundary of Site 3. The existing detention basin for Bellingmore will be removed to facilitate this arrangement with the existing storage volume of circa 810m^3 for a 1% AEP event accommodated in the relocated basins as a minimum. A new surface water outfall will be constructed to the same receiving water (the open drain which forms the northern boundary of Site 3).

3.3.7 Treatment Train

SuDS drainage designs collect and treat surface water runoff as close to source as possible. Surface water runoff is managed using a treatment train approach. This ensures that the quantity and quality of surface water runoff are addressed through the techniques of *Pollution Prevention, Source Control, Site Control and Regional Control.*

The treatment train approach divides the drainage elements of the development into sub catchments with different drainage characteristics and land uses, such as a dwelling with permeable paving.

The treatment train approach applied to the proposed development, include in curtilage SuDS comprising permeable paving in driveways and roof runoff discharging to the stone layer under the permeable paving. A typical detail of curtilage areas is shown in Figure 11.

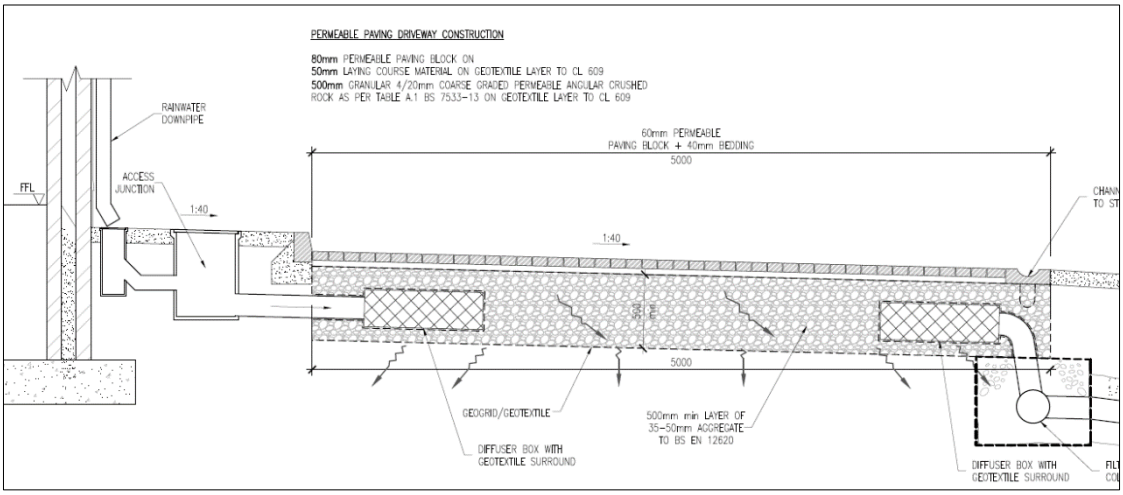


Figure 11: Typical Section through Permeable Paving

Runoff from roads and other hard surfaces such as paths and cycle paths are directed to swales and tree pits where possible. All runoff enters unlined detention basins with hydrobrakes in which attenuated storm volumes are temporarily stored. Restricted baseflow from detention basins through the hydro brakes enter petrol inceptors and grease traps before finally discharging into natural drainage lines.

3.3.8 Interception Storage

To prevent pollutants or sediments discharging into water courses the GDSDS requires *"interception storage"* to be incorporated into the development. The volume of interception required is based on 5mm of rainfall depth from 80% of the runoff from impermeable areas as

defined in the GDSDS. Refer to Table 2 below for details of interception required and interception provided.

The interception volume attributable to each SuDs feature consists of the volume of water that can infiltrate to the ground, what will evaporate into the atmosphere and what can transpire through plants and vegetation. Additionally, there will be some loses of water due to absorption and wetting of stone and soil media.

Site Summary							
Site	**Site 2**		**Site 3**				
Sub Catchment	**2.1**	**2.2**	**3.1**	**3.2**	**3.3**	**3.4**	**3.5**
Impermeable Area (ha)	0.82	2.069	1.287	0.666	0.36	0.553	0.719
Interception Requirements							
Site	**Site 2**		**Site 3**				
Interception Storage Required (m^3) (5mm of 80% Impermeable Area)	32.82	82.76	51.48	26.64	14.48	22.12	28.76
Total Interception Storage Required (m^3)	**115.58**		**143.48**				
Total Interception Storage Required (m^3)	**259.06**						
Interception Provided							
Swales 478.3m x 1.2m	In accordance with Table 24.6 of CIRIA SuDS Manual 2015, the base of the swale can drain up to 25 x the base area of the swale i.e. 14,349m^2 of road area;						
Volume (m^3) Provided in Permeable Paving 790 spaces (300mm Deep with 30% Porosity)	Circa 850m^3 Interception provided in permeable paving is assumed to take itself and the roof area of the property it serves as per Table 2.4 of CIRIA SuDS Manual 2015;						

Table 2: Surface Water Interception Storage

Site Summary			
Site	**Local Centre**		
Sub Catchment	**1**	**2**	**3**
Impermeable Area (ha)	0.139	0.443	0.537
Interception Requirements			
Interception Storage Required (m^3) **(5mm of 80% Impermeable Area)**	5.56	17.72	21.48
Total Interception Storage Required (m^3)	44.76		
Interception Provided			
Volume (m^3) Provided in Permeable Paving 39 spaces **(300mm Deep with 30% Porosity)**	49.05 Interception provided in permeable paving is assumed to take itself and the roof area of the property it serves as per Table 2.4 of CIRIA SuDS Manual 2015;		

Table 3: Surface Water Interception Storage

3.3.9 Treatment Volume

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

- Surface Water Runoff from Roofs – 1 Treatment Stage
- Surface Water Runoff from Roads – 2 Treatment Stages
- Surface Water Runoff from other Paved Areas excluding Roads – 1 Treatment Stage

The treatment volume is based on treatment 15mm of rainfall depth from 80% of the runoff from impermeable areas as defined in the GDSDS. Treatment volumes are summarised in Table 3 below:

	Site 2		**Site 3**				
Sub Catchment	**2.1**	**2.2**	**3.1**	**3.2**	**3.3**	**3.4**	**3.5**
Gross Area (ha)	1.63	4.24	2.61	1.22	0.73	1.03	1.37
Impermeable Area (ha)	0.82	2.069	1.287	0.666	0.36	0.553	0.719

Treatment Volume Required (m^3) (15mm of 80% Impermeable Area)	98.46	248.28	154.44	79.92	43.20	66.36	86.28
Total Volume Required (m^3)	346.74		430.2				

Table 4: Treatment Volume Requirements

Local Centre

Sub Catchment	**1**	**2**	**3**
Gross Area (ha)	0.214	0.71	1.46
Impermeable Area	0.139	0.443	0.537
Treatment Volume Required (m3) (15mm of 80% Impermeable Area)	16.68	53.16	64.44
Total Volume	134.28		

Table 5: Treatment Volume Requirements

While it is not necessary to provide treatment storage as interception storage is provided as indicated in Table 2, treatment volumes will be provided by infiltration of the unlined detention basins, and below ground stone layers.

3.3.10 Compliance with Surface Water Policy

Surface water management for the proposed development is designed to comply with the Greater Dublin Strategic Drainage Study (GDSDS) policies and guidelines and the requirements of Fingal County Council. The guidelines require the following main 4 main criteria to be provided by the development's surface water design.

- Criterion 1: River Water Quality Protection – satisfied by providing interception storage, treatment of run-off within the SUDS features. This is satisfied using permeable paving, swales, tree pits and petrol interceptors.
- Criterion 2: River Regime Protection – satisfied by attenuating run-off with flow control devices prior to discharge to the outfall.

- Criterion 3: Level of Service (flooding) for the site – satisfied by the Site being outside the 1000 year coastal and fluvial flood levels and extents. Pluvial flood risk addressed by development designed to accommodate surface water runoff from a 100-year period storm (1& AEP) plus climate change (20%) as per the recommendations of the GDSDS. Planned flood routing for storms greater than 100-year return period level considered in design and development run-off contained within site.
- Criterion 4: River flood protection – attenuation provided within the SuDS features.

3.4 Surface Water Drainage Design Standards

3.5.1 General

Surface water drainage for the development is designed using the recommendations of the GDSDS, EN752 and BS8301:1985. The parameters applied to the design of the surface water drainage system are included in Table 5:

Drainage Design Parameters	
Return period	2 years
Surcharge Check	1%
Separation between TWL Storage System 1% Storm event	500mm
Minimum time of entry	4 minutes
Pipe Friction (Ks)	0.6 mm
Minimum Velocity	1.0 m/s
Standard Average Annual Rainfall	823mm
M5-60	16.2mm
Ratio r (M5-60/M5-2D)	0.272
Climate Change	20% for rainfall intensities.

Table 5: Drainage Design Parameters

Impermeable areas were calculated for each catchment area by applying the following runoff coefficients as per Table 6 below:

Type of Surface	Runoff Coefficient
Roofs (Traditional)	1.0
Roofs (Suds)	0.6
Roads (Traditional):	1.0
Roads (SuDs)	0.6
Paths (Traditional)	1.0
Permeable Paving (SuDs)	0.5
Public Open Space	0.3
Private Gardens/ hard & soft Landscaping	0.3
Remaining Green Areas	0.3

Table 6: Runoff Coefficients

A breakdown of the impermeable areas contributing to the surface water drainage network is summarised within Table 7. A detailed breakdown for each surface water catchment is included in **Appendix B**.

Catchment Area	Gross Area (ha)	Impermeable Area (ha)	Impermeability Factor
Site 2: 1	1.63	0.82	0.503
Site 2: 2	4.24	2.069	0.488
Site 3: 1	2.61	1.29	0.494
Site 3: 2	1.22	0.67	0.549
Site 3: 3	0.73	0.36	0.493
Site 3: 4	1.03	0.55	0.534
Site 3: 5	1.37	0.72	0.526
Local Centre:1	0.21	0.139	0.648
Local Centre: 2	0.71	0.443	0.623
Local Centre: 3	1.46	0.537	0.368

Table 7: Summary of Impermeable Areas

The surface water drainage network including the surface water storage system has been designed and simulated for a range of storm events (including 1 in 2, 1 in 30 and 1 in 100-year

storm events) using the *Network* module of *Microdrainage*. This is based on the Modified Rational Method. The surface water drainage network is designed in accordance with IS EN 752, BS8301:1985 and the recommendations of the 'Greater Dublin Strategic Drainage Study', (GDSDS). Refer to **Appendix D** for surface water sewer network Microdrainage calculations.

Refer to DBFL drawing numbers 170182-DBFL-CS-SP-DR-C-1004 to 170182-DBFL-CS-SP-DR-C-1011 for the Site Services Layouts.

3.5 Climate Change

Surface water calculations use rainfall values for Hollystown, Dublin 15, provided by Met Eireann. Rainfall intensities were increased by a factor of 20% to take account of climate change, as required by the GDSDS for surface water drainage design included surface water storage design.

Refer to ***Appendix C*** for rainfall data.

3.6 Flood Risk

Refer to the 'Site Specific flood Risk Assessment' (SSFRA) by DBFL Consulting Engineers, which is included as a separate report within the planning application.

The surface water network, attenuation storage and site levels are designed to accommodate a 1% AEP (Annual Exceedance Probability) storm event and includes climate change provision. Floor levels of houses are set above the 1% AEP flood levels by a minimum of 500mm for protection. All footpaths are falling away from houses.

For storms events, exceeding a 1% AEP (Annual Exceedance Probability) storm event, the development has been designed to provide overland flood routes along the various development roads towards green areas, where possible.

4.0 FOUL DRAINAGE

4.1 General

Site 2&3

It is proposed to construct a new foul outfall sewer to the west of the site which is already permitted under FCC Ref FW21A/0042, approximately 3km in length to connect to the existing 750mm diameter foul sewer to the south of Powerstown Road, as indicated in Figure 12 below. This foul outfall is designed to accommodate foul flows from the subject site, the future development the zoned lands to the west of the subject site (within the ownership of Glenveagh Homes), from Bellingsmore Residential Development to the south and from Site 1 to the north east of the subject site which was recently granted planning permission under with Fingal County Council under LA reference FW21A/0042. It is also designed to facilitate a future connection from Hollystown Park Foul Pumping Station which has also been permitted under FCC Ref FW21A/0042. A breakdown of the hydraulic loadings contributing to the foul sewer are included in Table 6.

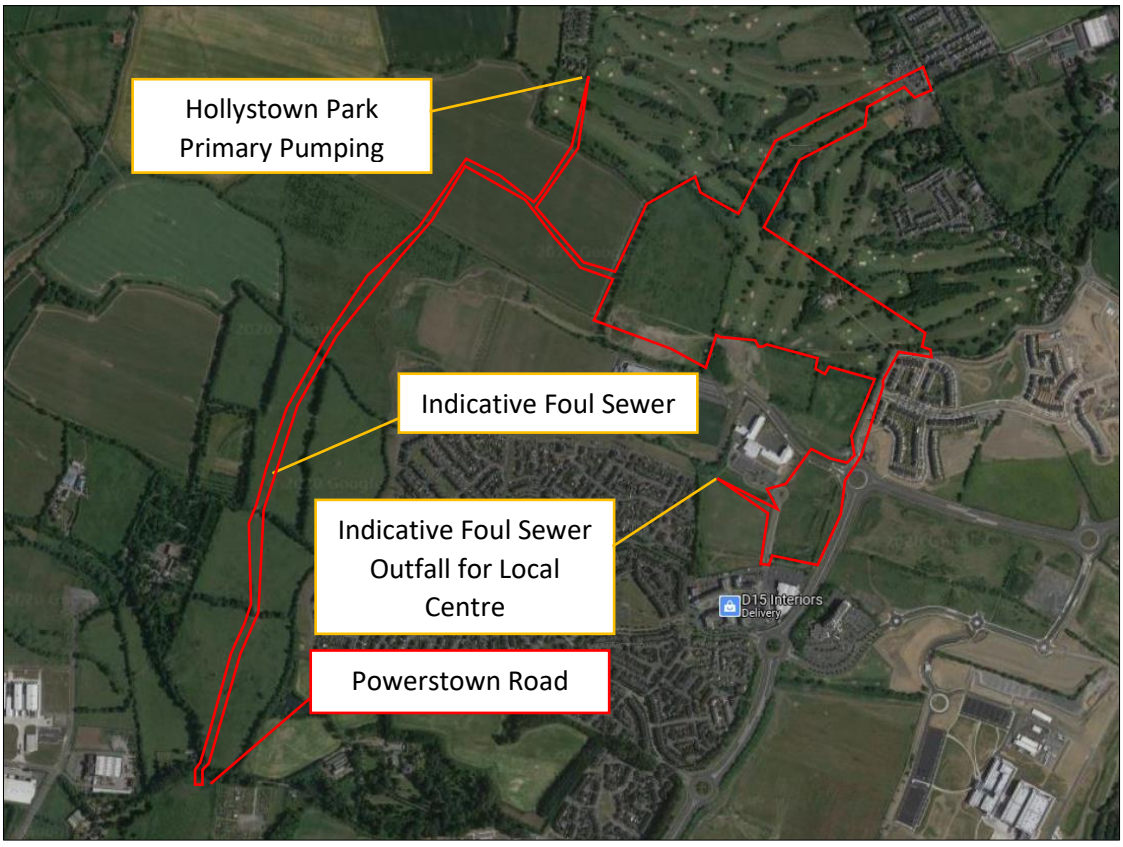


Figure 12: Foul Outfall Location

Local Centre

The proposed foul drainage system for the subject site will connect to the existing 225mm foul sewer, at the west of the subject site.

Apartments will connect to a network of 150mm and 225mm diameter foul drains via individual connections, as per Irish Water Code of Practice for Wastewater Infrastructure

A pre-connection enquiry form for the subject site was issued to Irish Water and a copy of the Confirmation of Feasibility from Irish Water is included in **Appendix F**.

A Statement of Design Acceptance (SODA) has also been received from Irish Water for Site 2, 3 and the Local Centre. A copy of the SODA Letters are included in **Appendix F.**

4.2 Design Calculations

4.2.1 General

Foul sewers have been designed in accordance with the Building Regulations and specifically in accordance with the principles and methods set out in the DOE "Recommendations for Site Development Works for Housing Areas", IS EN752 (2008), BS8301: 1985, IS EN12056: Part 2 (2000) and the recommendations of the *'Greater Dublin Strategic Drainage Study', (GDSDS)* and the Irish Water Connection and Developer Services, "*Code of Practice for Wastewater Connections".*

The following criteria have been applied:

Hydraulic Loading	446l/dwelling/day
Discharge units	14 units per house (BS8301:1985)
Pipe Friction (Ks) (concrete)	1.5mm
Pipe Friction (Ks) (uPVC)	0.15mm
Minimum Diameter	150mm
Minimum Velocity	0.75 m/s (self-cleansing velocity)
Maximum Velocity	*3.0 m/s*.

The foul sewer network has been designed using the *Network* module of *Microdrainage*, using methods from BS8301:1985, the results of which are included in **Appendix E.**

4.2.2 Foul Outfall Sewer

Site 2&3

The foul outfall sewer is designed to accommodate the following foul loading using Irish Water foul sewer demands are summarised in Table 8 below:

Area	No. of Residential Units	Average Daily Demand (l/s)	Foul Water Loading (6 x DWF) (l/s)
Hollystown Park Pumping Station	283	1.46	8.77
Hollystown: Site 1 (currently under consideration for planning permission with Fingal County Council under LA ref: F21A/0042)	69	0.36	2.14
Bellingsmore Residential Development	177	0.91	5.48
Subject: Hollystown Sites 2 & 3	428	2.21	13.26
Total	**957**	**4.94**	**29.64**

Table 8: Foul Sewer Hydraulic Loading

Local Centre

The foul sewer demands are summarised in Table 9 below:

Area	No. of Residential Units	Average Daily Demand (l/s)	Foul Water Loading (6 x DWF) (l/s)
Local Centre - Residential	120	0.6	3.8
Local Centre - Business	Community Hub (154m^2), Caffe/Retail (154.7m^2),	0.04	0.2

	Stand Alone Creche (500m^2), Creche (497.3m^2), Montessori (274.4 m^2)		

Table 9: Foul Sewer Hydraulic Loading

5.0 WATER SUPPLY AND DISTRIBUTION

Site 2&3

The development's water-main distribution system is indicated on drawings 170182-DBFL-WM-SP-DR-C-1004 to 170182-DBFL-WM-SP-DR-C-1011. It is proposed to connect to the existing 300mm diameter watermain on Hollywoodrath Road (R121). The connection to the public water main will include a bulk meter and sluice valves in accordance with the Irish Water's requirements. The water main layout and details are in accordance with Irish Water Connection and Developer Services, 'Code of Practice for Water Infrastructure' and 'Water Infrastructure Standard Details'.

Water demand for the proposed development is summarised in Table 9 below:

Area	No. of Residential Units	Average Daily Demand (l/s)	Average Daily Demand (m^3/day)	Average Day / Peak Week Demand (m^3/day)	Peak Demand (l/s)
Hollystown Sites 2 & 3	428	2.01	173.34	216.68	12.54
Local Centre	124	0.58	50.22	3.63	62.76
Local Centre - Business	Community Hub	0.04	3.47	0.25	4.33

Table 9: Water Demand Summary

A pre-connection enquiry form for the subject site was issued to Irish Water and a copy of the Confirmation of Feasibility from Irish Water is included in **Appendix F.**

A Statement of Design Acceptance (SODA) has also been received from Irish Water for Site 2, 3 and the Local Centre. A copy of the SODA Letters are included in **Appendix F.**

APPENDIX A

CAPACITY OF GOLF COURSE DRAIN

The capacity of the existing "Golf Course Drain", is checked for two scenarios as outlined below:

Scenario (i) – Intercepting and Culverting of Drain adjacent to Entrance

The existing drain adjacent to the entrance to site "2" currently accommodates piped discharges to it from gullies on Church Road (R121) and attenuated surface water runoff from Hollywood Rath development to the east. It is proposed to intercept these existing connections and to redirect them via a 600mm diameter pipe to the golf course drain as indicated on DBFL drawing no. 170182-3009.

This is modelled for various storm events up to a 1%AEP event using Microdrainage. Note, the attenuated runoff rate is 83l/s which is entered as a baseflow.

The impermeable area entered in the calculation is 0.287ha or 2870m^2. This is equivalent to runoff from a 430m length of road circa 6.7m wide.

Calculations are included below and indicate significant available capacity in the pipe even during storm events up to 1 in 100-year return period or 1%AEP.

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	HOLLYSTOWN GOLF CLUB DBFL REF 170182 6000MM CULVERT CHECK	Micro Drainage
Date 13/03/2019 10:23 File CULVERT CHECK.mdx	Designed by DCG Checked by DMW	
Innovyze	Network 2018.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	16.100	Add Flow / Climate Change (%)	10
Ratio R	0.272	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	100	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
SC1.000	52.600	0.260	202.0	0.287	5.00	83.0	0.600	o	600	Pipe/Conduit	
SC1.001	15.100	0.040	377.5	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
SC1.000	46.40	5.51	72.200	0.287	83.0	0.0	11.9	1.71	483.4	131.0
SC1.001	45.76	5.71	71.770	0.287	83.0	0.0	11.9	1.25	352.7	131.0

Simulation Criteria for Storm

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.272
Return Period (years)	2	Profile Type	Summer
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	16.100	Cv (Winter)	0.840

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7	HOLLYSTOWN GOLF CLUB DBFL REF 170182 6000MM CULVERT CHECK	
Date 13/03/2019 10:23 File CULVERT CHECK.mdx	Designed by DCG Checked by DMW	
Innovyze	Network 2018.1	

Synthetic Rainfall Details

Storm Duration (mins) 30

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	HOLLYSTOWN GOLF CLUB DBFL REF 170182 6000MM CULVERT CHECK	Micro Drainage
Date 13/03/2019 10:23 File CULVERT CHECK.mdx	Designed by DCG Checked by DMW	
Innovyze	Network 2018.1	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.272
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	16.100	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	10, 10, 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
SC1.000	S1	15 Winter	100	+10%					72.473
SC1.001	S3	15 Winter	100	+10%					72.182

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
SC1.000	S1	-0.327	0.000	0.42		180.8	OK	
SC1.001	S3	-0.168	0.000	0.81		179.6	OK	

Scenario (ii) Open Channel

Calculations are carried out to demonstrate that the capacity of the drain is increased where the drain is re-routed with characteristics to match the existing arrangement. The average gradient of the existing and the re-routed drains are both 1/285. However, the roughness co-efficient of the re-routed channel is

Assumptions made in capacity calculations as follows:

- The capacity is calculated for an 800mm deep from the bed level of drain. This results in a freeboard between the assumed water level and the top of the bank of various depths between 0.6m – 1.1m across the sections taken.
  Therefore, while the capacity calculations indicate significant capacity, the available capacity is actually larger then that calculated when the freeboard is reduced.

The capacity of the open channel drain is calculated using Manning's Equation as follows:

$$Q = \frac{1}{\Pi} \frac{A^{5/3} S_0^{1/2}}{P^{2/3}}$$

where

Q = discharge (m^3/s)

Π = Manning's Constant (roughness coefficient)

A = cross sectional area (m^2)

P = wetted perimeter (m)

S_0 = bed slope

Manning's equation is relatively accurate and simple and it provides reasonably accurate results for a large range of natural and artificial channels *(Chadwick and Morfett, Hydraulics in Civil Engineering, 1991).*

The value of the roughness coefficient, (Π) determines the frictional resistance of a channel. This value can be estimated from stage and discharge measurements for a known cross section and slope. However, as this information is not available, it is necessary to rely on documented values obtained from similar channels. The values used for the roughness coefficient, Π along the streams were taken from *Wilson, Engineering Hydrology, 4th Edition, 1992*.

Capacity of Existing and Proposed Surface Water Golf course Drain

Open Channel')	Gradient Bed Slope (1/X)	Gradient Bed Slope	Manning's , no., (n) Pipe Rough, ks	Width of Bed, b (m)	Depth of Stream, y (m)	Width from bed to left bank,X1 (m)	Depth from left bank to bed ,Y1 (m)	Width from bed to right bank,X2 (m)	Depth from right bank to bed ,Y2 (m)	Area A (m^2)	Wetted Perimeter P (m)	Capacity, Q (m^3/s)
Existing	285	0.0035	0.045	6.00	0.90	0.00	0.90	0.00	0.90	5.40	7.80	5.567
Proposed	285	0.0035	0.025	6.00	0.9	0.00	0.90	0	0.90	5.40	7.80	10.020

$$Q = \frac{1.A^{\frac{5}{3}}.S_o^{\frac{1}{2}}}{n.P^{\frac{2}{3}}}$$

Q = The capacity of the channel, (m^3/s);
n = Roughness Coefficient, taken as 0.035 for a meandering earth
A = The cross-sectional area of flow normal to direction of flow (m^2)
So = The Bed Slope;
P = The length of the wetted surface normal to the direction of flow (

$$P = b + 2y\sqrt{1 + x^2}$$

Where: b = Bottom width of the channel (m
y = Liquid Depth (m).
x = Width from bed to bank (m).

Table 8.1 Typical values of Manning's *n* for different types of surface

	Conduit type, surface roughness and channel alignment	*n* ($s/m^{1/3}$)
Canals	Earth, straight	0.018–0.025
	Earth, meandering	0.025–0.040
	Rock, straight	0.025–0.045
Lined channels	Perspex	0.009
	Glass	0.009–0.010
	Cement mortar	0.011–0.015
	Concrete	0.012–0.017
	Dressed, jointed stone	0.013–0.020
Rivers	Earth, straight	0.020–0.025
	Earth, poor alignment	0.030–0.050
	Earth, with weeds and poor alignment	0.050–0.150
	Stones 75–150 mm diameter, straight, good condition	0.030–0.040
	Stones 75–150 mm diameter, poor alignment	0.040–0.080
	Stones >150 mm, boulders, steep slope, good condition	0.040–0.070
Floodplain	Short grass	0.025–0.035
	Long grass	0.030–0.050
	Medium to dense brush, in winter	0.045–0.110
Pipes	Cast iron	0.010–0.014
	Concrete	0.011–0.015

APPENDIX B

ALLOWABLE OUTFLOW Q_{bar} CALCULATIONS

TITLE	Job Reference
Development at Hollystown – Site 2 - Catchment 1	170182
SUBJECT	**Calc. Sheet No.**
QBAR Calculation using IOH Report 124 for Sites < 25 km²	1/2

DRAWING NUMBER	Calculations by	Checked by	Date
170182-DBFL-CS-S1-DR-C-1001	GPH	DMW	07.01.2021

Estimation of QBAR from IOH Report 124 for catchments less than 25 km² using the 3 variable equation

[1] $Q_{bar} = 0.00108 * (AREA)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$

[2] Site Area = 1.63 Ha

Site area is less than 50 Ha, calculate Qbar for a 50 Ha Site then pro-rata

AREA = 0.016 km²

SAAR = 823 mm

[3] SOIL = 0.30

Q_{bar} = 0.00004 cumecs/Ha

Q_{bar} = 2.2 l/s/Ha

$Q_{bar\ [rural]}$ = 3.6 l/s

Note to Institute of Hydrology Report No. 124 Eqn

Q_{bar}	The Mean Annual Flood (cumecs)
AREA	Area of the Catchment (km²)
SAAR	Standard Annual Average Rainfall (mm) *NERC Flood Studies Report, 1975*
SOIL	Soil Index Values of Catchment *Winter Rain Acceptance Potential, (Supplementary Report No. 7)*

Soil Classification for Runoff Potential FSR Maps

Soil 1	0	%
Soil 2	100	%
Soil 3	0	%
Soil 4	0	%
Soil 5	0	%

Permissible Outflow from Site using Growth Factor

Qbar growth for permitted outlows from site for given return period (assuming long term storage). (No allowance for standard factorial error)

Flood Return Event	[5] Growth Factor	Permitted Flow (l/s)
1	0.85	3.0
QBAR	1	3.6
10	1.67	6.0
30	2.1	7.5
50	2.33	8.4
100	2.6	9.3
200	2.85	10.2
1000	3.5	12.5

[4] QBar from Site with Factorial Error Allowance

r^2 =	0.847
n =	71
fse =	1.651
Q'_{bar} =	5.92 l/s

(With Allowance for the standard factorial error)

Is longterm storage provided?	Yes

Storm Return Period to be provided for =	100	Years *
QBAR (Growth) =	9.3	Litres/sec
[6] Permissible Outflow from site =	9.3	Litres/sec
[7] Maximum Allowable Outflow from site =	9.3	Litres/sec

(* 30, 50 or 100)

1 hectare = 10,000 m² 1km² - 100 hectares

Notes

1. Based on the Institute of Hydrology Report 124 for small catchments less than 25km².
2. For catchments smaller than 50 hectares in area, flow rates are linearly interpolated for smaller areas.
3. Soil index value (SPR) calculated from Flood Studies Report Vol V Fig I 4.18(1) - The Classification of Soils from Winter Rainfall Acceptance Rate.
4. Fse is the standard factoial error
5. QBAR multiplied by growth factors of 0.85 for 1 year, 2.1 for 30 year, 2.3 for 50 and 2.6 for 100 year return period events, from GDSDS Figure C2.
6. Total Permissible Outflow - QBAR (RURAL) calculated in accordance with GDSDS - Regional Drainage Policies (Volume 2 - Chapter 6), i.e. $QBAR(m3/s)=0.00108x(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$
7. Where Total Permissible Outflow is less than 2.0l/s and not achievable, use 2.0l/s.
8. Rainfall depth for 100 year return period, 6 hour duration with additional 10%for climate change. (Value from Dublin Airport)
9. Interception Volume Vt (m3) = Impermeable Area (ha) x 10mm x 10 (GDSDS, Vol 2, Section 6.3.1.2.1).

TITLE	Job Reference
Development at Hollystown – Site 2 - Catchment 2	170182
SUBJECT	**Calc. Sheet No.**
QBAR Calculation using IOH Report 124 for Sites < 25 km²	2/2

DRAWING NUMBER	Calculations by	Checked by	Date
170182-DBFL-CS-S1-DR-C-1001	GPH	DMW	07.01.2021

Estimation of QBAR from IOH Report 124 for catchments less than 25 km² using the 3 variable equation

[1] $Q_{bar} = 0.00108 * (AREA)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$

[2]Site Area =	4.24	Ha

Site area is less than 50 Ha, calculate Qbar for a 50 Ha Site then pro-rata

AREA =	0.042	km²
SAAR =	823	mm
[3]SOIL =	0.30	
Q_{bar} =	0.00004	cumecs/Ha
Q_{bar} =	2.2	l/s/Ha
$Q_{bar\ [rural]}$ =	9.3	l/s

Note to Institute of Hydrology Report No. 124 Eqn

Q_{bar}	The Mean Annual Flood (cumecs)
AREA	Area of the Catchment (km²)
SAAR	Standard Annual Average Rainfall (mm) *NERC Flood Studies Report, 1975*
SOIL	Soil Index Values of Catchment *Winter Rain Acceptance Potential, (Supplementary Report No. 7)*

Soil Classification for Runoff Potential FSR Maps

Soil 1	0	%
Soil 2	100	%
Soil 3	0	%
Soil 4	0	%
Soil 5	0	%

Permissible Outflow from Site using Growth Factor

Qbar growth for permitted outlows from site for given return period (assuming long term storage). (No allowance for standard factorial error)

Flood Return Event	[5]Growth Factor	Permitted Flow (l/s)
1	0.85	7.9
QBAR	1	9.3
10	1.67	15.6
30	2.1	19.6
50	2.33	21.8
100	2.6	24.3
200	2.85	26.6
1000	3.5	32.7

[4]QBar from Site with Factorial Error Allowance

r^2 =	0.847
n =	71
fse =	1.651
Q'_{bar} =	15.43 l/s

(With Allowance for the standard factorial error)

Is longterm storage provided?	Yes

Storm Return Period to be provided for =	100	Years *
QBAR (Growth) =	24.3	Litres/sec
[6]Permissible Outflow from site =	24.3	Litres/sec
[7]Maximum Allowable Outflow from site =	24.3	Litres/sec

(* 30, 50 or 100)

1 hectare = 10,000 m² 1km² - 100 hectares

Notes

1 Based on the Institute of Hydrology Report 124 for small catchments less than 25km².

2. For catchments smaller than 50 hectares in area, flow rates are linearly interpolated for smaller areas.

3. Soil index value (SPR) calculated from Flood Studies Report Vol V Fig I 4.18(1) - The Classification of Soils from Winter Rainfall Acceptance Rate.

4. Fse is the standard factoial error

5. QBAR multiplied by growth factors of 0.85 for 1 year, 2.1 for 30 year, 2.3 for 50 and 2.6 for 100 year return period events, from GDSDS Figure C2.

6. Total Permissible Outflow - QBAR $_{(RURAL)}$ calculated in accordance with GDSDS - Regional Drainage Policies (Volume 2 - Chapter 6), i.e. $QBAR(m3/s)=0.00108x(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$

7. Where Total Permissible Outflow is less than 2.0l/s and not achievable, use 2.0l/s.

8. Rainfall depth for 100 year return period, 6 hour duration with additional 10%for climate change. (Value from Dublin Airport)

9. Interception Volume Vt (m3) = Impermeable Area (ha) x 10mm x 10 (GDSDS, Vol 2, Section 6.3.1.2.1).

TITLE	Job Reference
Development at Hollystown – Site 3 - Catchment Area 1	170182
SUBJECT	**Calc. Sheet No.**
QBAR Calculation using IOH Report 124 for Sites < 25 km²	1/6

DRAWING NUMBER	Calculations by	Checked by	Date
170182-DBFL-CS-S1-DR-C-1001	GPH	DMW	22.02.2021

Estimation of QBAR from IOH Report 124 for catchments less than 25 km² using the 3 variable equation

[1] $Q_{bar} = 0.00108 * (AREA)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$

[2] Site Area = 2.61 Ha

Site area is less than 50 Ha, calculate Qbar for a 50 Ha Site then pro-rata

AREA = 0.026 km²

SAAR = 823 mm

[3] SOIL = 0.30

Q_{bar} = 0.00004 cumecs/Ha

Q_{bar} = 2.2 l/s/Ha

$Q_{bar\ [rural]}$ = 5.7 l/s

Note to Institute of Hydrology Report No. 124 Eqn

Q_{bar}	The Mean Annual Flood (cumecs)
AREA	Area of the Catchment (km²)
SAAR	Standard Annual Average Rainfall (mm) *NERC Flood Studies Report, 1975*
SOIL	Soil Index Values of Catchment *Winter Rain Acceptance Potential, (Supplementary Report No. 7)*

Soil Classification for Runoff Potential FSR Maps

Soil 1	0	%
Soil 2	100	%
Soil 3	0	%
Soil 4	0	%
Soil 5	0	%

Permissible Outflow from Site using Growth Factor

Qbar growth for permitted outlows from site for given return period (assuming long term storage). (No allowance for standard factorial error)

Flood Return Event	[5] Growth Factor	Permitted Flow (l/s)
1	0.85	4.9
QBAR	1	5.7
10	1.67	9.6
30	2.1	12.1
50	2.33	13.4
100	2.6	14.9
200	2.85	16.4
1000	3.5	20.1

[4] QBar from Site with Factorial Error Allowance

r^2 =	0.847
n =	71
fse =	1.651
Q'_{bar} =	9.49 l/s

(With Allowance for the standard factorial error)

Is longterm storage provided?	Yes

Storm Return Period to be provided for =	100	Years *
QBAR (Growth) =	14.9	Litres/sec
[6] Permissible Outflow from site =	14.9	Litres/sec
[7] Maximum Allowable Outflow from site =	14.9	Litres/sec

(* 30, 50 or 100)

1 hectare = 10,000 m² 1km² - 100 hectares

Notes

1 Based on the Institute of Hydrology Report 124 for small catchments less than 25km².

2. For catchments smaller than 50 hectares in area, flow rates are linearly interpolated for smaller areas.

3. Soil index value (SPR) calculated from Flood Studies Report Vol V Fig I 4.18(1) - The Classification of Soils from Winter Rainfall Acceptance Rate.

4. Fse is the standard factoial error

5. QBAR multiplied by growth factors of 0.85 for 1 year, 2.1 for 30 year, 2.3 for 50 and 2.6 for 100 year return period events, from GDSDS Figure C2.

6. Total Permissible Outflow - QBAR (RURAL) calculated in accordance with GDSDS - Regional Drainage Policies (Volume 2 - Chapter 6), i.e. $QBAR(m3/s)=0.00108x(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$

7. Where Total Permissible Outflow is less than 2.0l/s and not achievable, use 2.0l/s.

8. Rainfall depth for 100 year return period, 6 hour duration with additional 10%for climate change. (Value from Dublin Airport)

9. Interception Volume Vt (m3) = Impermeable Area (ha) x 10mm x 10 (GDSDS, Vol 2, Section 6.3.1.2.1).

TITLE	Job Reference
Development at Hollystown – Site 3 - Catchment Area 2	170182
SUBJECT	**Calc. Sheet No.**
QBAR Calculation using IOH Report 124 for Sites < 25 km²	2/6

DRAWING NUMBER	Calculations by	Checked by	Date
170182-DBFL-CS-S1-DR-C-1001	GPH	DMW	22.02.2021

Estimation of QBAR from IOH Report 124 for catchments less than 25 km² using the 3 variable equation

[1] $Q_{bar} = 0.00108 * (AREA)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$

[2] Site Area = 1.22 Ha

Site area is less than 50 Ha, calculate Qbar for a 50 Ha Site then pro-rata

AREA = 0.012 km²

SAAR = 823 mm

[3] SOIL = 0.30

Q_{bar} = 0.00004 cumecs/Ha

Q_{bar} = 2.2 l/s/Ha

$Q_{bar\ [rural]}$ = 2.7 l/s

Note to Institute of Hydrology Report No. 124 Eqn

Q_{bar}	The Mean Annual Flood (cumecs)
AREA	Area of the Catchment (km²)
SAAR	Standard Annual Average Rainfall (mm) *NERC Flood Studies Report, 1975*
SOIL	Soil Index Values of Catchment *Winter Rain Acceptance Potential, (Supplementary Report No. 7)*

Soil Classification for Runoff Potential FSR Maps

Soil 1	0	%
Soil 2	100	%
Soil 3	0	%
Soil 4	0	%
Soil 5	0	%

Permissible Outflow from Site using Growth Factor

Qbar growth for permitted outlows from site for given return period (assuming long term storage). (No allowance for standard factorial error)

Flood Return Event	[5] Growth Factor	Permitted Flow (l/s)
1	0.85	2.3
QBAR	1	2.7
10	1.67	4.5
30	2.1	5.6
50	2.33	6.3
100	2.6	7.0
200	2.85	7.7
1000	3.5	9.4

[4] QBar from Site with Factorial Error Allowance

r^2 =	0.847
n =	71
fse =	1.651
Q'_{bar} =	4.44 l/s

(With Allowance for the standard factorial error)

Is longterm storage provided?	Yes

Storm Return Period to be provided for =	100	Years *
QBAR (Growth) =	7.0	Litres/sec
[6] Permissible Outflow from site =	7.0	Litres/sec
[7] Maximum Allowable Outflow from site =	7.0	Litres/sec

(* 30, 50 or 100)

1 hectare = 10,000 m² 1km² - 100 hectares

Notes

1 Based on the Institute of Hydrology Report 124 for small catchments less than 25km².

2. For catchments smaller than 50 hectares in area, flow rates are linearly interpolated for smaller areas.

3. Soil index value (SPR) calculated from Flood Studies Report Vol V Fig I 4.18(1) - The Classification of Soils from Winter Rainfall Acceptance Rate.

4. Fse is the standard factoial error

5. QBAR multiplied by growth factors of 0.85 for 1 year, 2.1 for 30 year, 2.3 for 50 and 2.6 for 100 year return period events, from GDSDS Figure C2.

6. Total Permissible Outflow - QBAR (RURAL) calculated in accordance with GDSDS - Regional Drainage Policies (Volume 2 - Chapter 6), i.e. $QBAR(m3/s)=0.00108x(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$

7. Where Total Permissible Outflow is less than 2.0l/s and not achievable, use 2.0l/s.

8. Rainfall depth for 100 year return period, 6 hour duration with additional 10%for climate change. (Value from Dublin Airport)

9. Interception Volume Vt (m3) = Impermeable Area (ha) x 10mm x 10 (GDSDS, Vol 2, Section 6.3.1.2.1).

TITLE	Job Reference
Development at Hollystown – Site 3 - Catchment Area 3	170182
SUBJECT	**Calc. Sheet No.**
QBAR Calculation using IOH Report 124 for Sites < 25 km²	04-Jun

DRAWING NUMBER	Calculations by	Checked by	Date
170182-DBFL-CS-S1-DR-C-1001	GPH	DMW	07.01.2021

Estimation of QBAR from IOH Report 124 for catchments less than 25 km² using the 3 variable equation

[1] $Q_{bar} = 0.00108 * (AREA)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$

[2] Site Area = 0.73 Ha

Site area is less than 50 Ha, calculate Qbar for a 50 Ha Site then pro-rata

AREA = 0.007 km²

SAAR = 823 mm

[3] SOIL = 0.30

Q_{bar} = 0.00004 cumecs/Ha

Q_{bar} = 2.2 l/s/Ha

$Q_{bar\ [rural]}$ = 1.6 l/s

Note to Institute of Hydrology Report No. 124 Eqn

Q_{bar}	The Mean Annual Flood (cumecs)
AREA	Area of the Catchment (km²)
SAAR	Standard Annual Average Rainfall (mm) *NERC Flood Studies Report, 1975*
SOIL	Soil Index Values of Catchment *Winter Rain Acceptance Potential, (Supplementary Report No. 7)*

Soil Classification for Runoff Potential FSR Maps

Soil 1	0	%
Soil 2	100	%
Soil 3	0	%
Soil 4	0	%
Soil 5	0	%

Permissible Outflow from Site using Growth Factor

Qbar growth for permitted outlows from site for given return period (assuming long term storage). (No allowance for standard factorial error)

Flood Return Event	[5] Growth Factor	Permitted Flow (l/s)
1	0.85	1.4
QBAR	1	1.6
10	1.67	2.7
30	2.1	3.4
50	2.33	3.7
100	2.6	4.2
200	2.85	4.6
1000	3.5	5.6

[4] QBar from Site with Factorial Error Allowance

r^2 =	0.847
n =	71
fse =	1.651
Q'_{bar} =	2.64 l/s

(With Allowance for the standard factorial error)

Is longterm storage provided?	Yes

Storm Return Period to be provided for =	100	Years *
QBAR (Growth) =	4.2	Litres/sec
[6] Permissible Outflow from site =	4.2	Litres/sec
[7] Maximum Allowable Outflow from site =	4.2	Litres/sec

(* 30, 50 or 100)

1 hectare = 10,000 m² 1km² - 100 hectares

Notes

1. Based on the Institute of Hydrology Report 124 for small catchments less than 25km².
2. For catchments smaller than 50 hectares in area, flow rates are linearly interpolated for smaller areas.
3. Soil index value (SPR) calculated from Flood Studies Report Vol V Fig I 4.18(1) - The Classification of Soils from Winter Rainfall Acceptance Rate.
4. Fse is the standard factoial error
5. QBAR multiplied by growth factors of 0.85 for 1 year, 2.1 for 30 year, 2.3 for 50 and 2.6 for 100 year return period events, from GDSDS Figure C2.
6. Total Permissible Outflow - QBAR $_{(RURAL)}$ calculated in accordance with GDSDS - Regional Drainage Policies (Volume 2 - Chapter 6), i.e. $QBAR(m3/s)=0.00108x(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$
7. Where Total Permissible Outflow is less than 2.0l/s and not achievable, use 2.0l/s.
8. Rainfall depth for 100 year return period, 6 hour duration with additional 10%for climate change. (Value from Dublin Airport)
9. Interception Volume Vt (m3) = Impermeable Area (ha) x 10mm x 10 (GDSDS, Vol 2, Section 6.3.1.2.1).

TITLE	Job Reference
Development at Hollystown – Site 3 - Catchment Area 4	170182
SUBJECT	**Calc. Sheet No.**
QBAR Calculation using IOH Report 124 for Sites < 25 km²	5/6

DRAWING NUMBER	Calculations by	Checked by	Date
170182-DBFL-CS-S1-DR-C-1001	GPH	DMW	07.01.2021

Estimation of QBAR from IOH Report 124 for catchments less than 25 km² using the 3 variable equation

$^{1}Q_{bar} = 0.00108 * (AREA)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$

^{2}Site Area =	1.03	Ha

Site area is less than 50 Ha, calculate Qbar for a 50 Ha Site then pro-rata

AREA =	0.010	km²
SAAR =	823	mm
^{3}SOIL =	0.30	
Q_{bar} =	0.00004	cumecs/Ha
Q_{bar} =	2.2	l/s/Ha
$Q_{bar\ [rural]}$ =	2.28	l/s

Note to Institute of Hydrology Report No. 124 Eqn

Q_{bar}	The Mean Annual Flood (cumecs)
AREA	Area of the Catchment (km²)
SAAR	Standard Annual Average Rainfall (mm) *NERC Flood Studies Report, 1975*
SOIL	Soil Index Values of Catchment *Winter Rain Acceptance Potential, (Supplementary Report No. 7)*

Soil Classification for Runoff Potential FSR Maps

Soil 1	0	%
Soil 2	100	%
Soil 3	0	%
Soil 4	0	%
Soil 5	0	%

Permissible Outflow from Site using Growth Factor

Qbar growth for permitted outlows from site for given return period (assuming long term storage). (No allowance for standard factorial error)

Flood Return Event	^{5}Growth Factor	Permitted Flow (l/s)
1	0.85	1.9
QBAR	1	2.3
10	1.67	3.8
30	2.1	4.8
50	2.33	5.3
100	2.6	5.9
200	2.85	6.5
1000	3.5	8.0

^{4}QBar from Site with Factorial Error Allowance

r^2 =	0.847
n =	71
fse =	1.651
Q'_{bar} =	3.76 l/s

(With Allowance for the standard factorial error)

Is longterm storage provided?	Yes	
Storm Return Period to be provided for =	100	Years *
QBAR (Growth) =	5.9	Litres/sec
^{6}Permissible Outflow from site =	5.9	Litres/sec
^{7}Maximum Allowable Outflow from site =	5.9	Litres/sec

(* 30, 50 or 100)

1 hectare = 10,000m² 1km² - 100 hectares

Notes

1 Based on the Institute of Hydrology Report 124 for small catchments less than 25km².

2. For catchments smaller than 50 hectares in area, flow rates are linearly interpolated for smaller areas.

3. Soil index value (SPR) calculated from Flood Studies Report Vol V Fig I 4.18(1) - The Classification of Soils from Winter Rainfall Acceptance Rate .

4. Fse is the standard factoial error

5. QBAR multiplied by growth factors of 0.85 for 1 year, 2.1 for 30 year, 2.3 for 50 and 2.6 for 100 year return period events, from GDSDS Figure C2.

6. Total Permissible Outflow - QBAR $_{(RURAL)}$ calculated in accordance with GDSDS - Regional Drainage Policies (Volume 2 - Chapter 6), i.e. $QBAR(m3/s)=0.00108x(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$

7. Where Total Permissible Outflow is less than 2.0l/s and not achievable, use 2.0l/s.

8. Rainfall depth for 100 year return period, 6 hour duration with additional 10%for climate change. (Value from Dublin Airport)

9. Interception Volume Vt (m3) = Impermeable Area (ha) x 10mm x 10 (GDSDS, Vol 2, Section 6.3.12.1).

TITLE	Job Reference
Development at Hollystown – Site 3 - Catchment Area 5	170182
SUBJECT	**Calc. Sheet No.**
QBAR Calculation using IOH Report 124 for Sites < 25 km²	05-May

DRAWING NUMBER	Calculations by	Checked by	Date
170182-DBFL-CS-S1-DR-C-1001	GPH	DMW	22.02.2021

Estimation of QBAR from IOH Report 124 for catchments less than 25 km² using the 3 variable equation

[1] $Q_{bar} = 0.00108 * (AREA)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$

[2] Site Area = 1.37 Ha

Site area is less than 50 Ha, calculate Qbar for a 50 Ha Site then pro-rata

AREA = 0.014 km²

SAAR = 823 mm

[3] SOIL = 0.30

Q_{bar} = 0.00004 cumecs/Ha

Q_{bar} = 2.2 l/s/Ha

$Q_{bar\ [rural]}$ = 3.03 l/s

Note to Institute of Hydrology Report No. 124 Eqn

Q_{bar}	The Mean Annual Flood (cumecs)
AREA	Area of the Catchment (km²)
SAAR	Standard Annual Average Rainfall (mm) *NERC Flood Studies Report, 1975*
SOIL	Soil Index Values of Catchment *Winter Rain Acceptance Potential, (Supplementary Report No. 7)*

Soil Classification for Runoff Potential FSR Maps

Soil 1	0	%
Soil 2	100	%
Soil 3	0	%
Soil 4	0	%
Soil 5	0	%

Permissible Outflow from Site using Growth Factor

Qbar growth for permitted outlows from site for given return period (assuming long term storage). (No allowance for standard factorial error)

Flood Return Event	[5] Growth Factor	Permitted Flow (l/s)
1	0.85	2.6
QBAR	1	3.0
10	1.67	5.1
30	2.1	6.4
50	2.33	7.1
100	2.6	7.9
200	2.85	8.6
1000	3.5	10.6

[4] QBar from Site with Factorial Error Allowance

r^2 =	0.847
n =	71
fse =	1.651
Q'_{bar} =	5.00 l/s

(With Allowance for the standard factorial error)

Is longterm storage provided?	Yes	
Storm Return Period to be provided for =	100	Years *
QBAR (Growth) =	7.9	Litres/sec
[6] Permissible Outflow from site =	7.9	Litres/sec
[7] Maximum Allowable Outflow from site =	7.9	Litres/sec

(* 30, 50 or 100)

1 hectare = 10,000m² 1km² - 100 hectares

Notes

1 Based on the Institute of Hydrology Report 124 for small catchments less than 25km².

2. For catchments smaller than 50 hectares in area, flow rates are linearly interpolated for smaller areas.

3. Soil index value (SPR) calculated from Flood Studies Report Vol V Fig I 4.18(1) - The Classification of Soils from Winter Rainfall Acceptance Rate .

4. Fse is the standard factoial error

5. QBAR multiplied by growth factors of 0.85 for 1 year, 2.1 for 30 year, 2.3 for 50 and 2.6 for 100 year return period events, from GDSDS Figure C2.

6. Total Permissible Outflow - QBAR $_{(RURAL)}$ calculated in accordance with GDSDS - Regional Drainage Policies (Volume 2 - Chapter 6), i.e. $QBAR(m3/s)=0.00108x(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$

7. Where Total Permissible Outflow is less than 2.0l/s and not achievable, use 2.0l/s.

8. Rainfall depth for 100 year return period, 6 hour duration with additional 10% for climate change. (Value from Dublin Airport)

9. Interception Volume Vt (m3) = Impermeable Area (ha) x 10mm x 10 (GDSDS, Vol 2, Section 6.3.12.1).

TITLE	Job Reference
Development at Hollystown - Local Centre - Catchment 1	170182
SUBJECT	**Calc. Sheet No.**
QBAR Calculation using IOH Report 124 for Sites < 25 km²	1

DRAWING NUMBER	Calculations by	Checked by	Date
	ASM	BCM	21.10.2021

Estimation of QBAR from IOH Report 124 for catchments less than 25 km² using the 3 variable equation

$^{1}Q_{bar} = 0.00108 * (AREA)^{0.89} (SAAR)^{1.17} (SOIL)^{2.17}$

^{2}Site Area = 0.214 Ha

Site area is less than 50 Ha, calculate Qbar for a 50 Ha Site then pro-rata

AREA =	0.002	km²
SAAR =	823	mm
^{3}SOIL =	0.30	
Q_{bar} =	0.00004	cumecs/Ha
Q_{bar} =	2.2	l/s/Ha
$Q_{bar\ (rural)}$ =	0.5	l/s

Permissible Outflow from Site using Growth Factor

Qbar growth for permitted outlows from site for given return period (assuming long term storage). (No allowance for standard factorial error)

Flood Return Event	^{5}Growth Factor	Permitted Flow (l/s)
1	0.85	0.4
QBAR	1	0.5
10	1.67	0.8
30	2.1	1.0
50	2.33	1.1
100	2.6	1.2
200	2.85	1.3
1000	3.5	1.6

Note to Institute of Hydrology Report No. 124 Eqn	
Q_{bar}	The Mean Annual Flood (cumecs)
AREA	Area of the Catchment (km²)
SAAR	Standard Annual Average Rainfall (mm) NERC Flood Studies Report, 1975
SOIL	Soil Index Values of Catchment Winter Rain Acceptance Potential (*Supplementary Report No. 7*)

Soil Classification for Run off Potential FSR Maps		
Soil 1	0	%
Soil 2	0	%
Soil 3	100	%
Soil 4	0	%
Soil 5	0	%

^{4}QBar from site with Factorial Error Allowance		
r^2 =	0.847	
n =	71	
fse =	1.651	
Q_{bar} =	0.78	l/s

(With Allowance for the standard factorial error)

Is longterm storage provided?	No

Storm Return Period to be provided for =	30	Years *
QBAR (Growth) =	1.0	Litres/sec
^{6}Permissible Outflow from site =	0.5	Litres/sec
^{7}Maximum Allowable Outflow from site =	2.0	Litres/sec

(* 30, 50 or 100)

1 hectare = 10,000m² 1 km² = 100 hectares

Notes

1. Based on the Institute of Hydrology Report 124 for small catchments less than 25km².
2. For catchments smaller than 50 hectares in area, flow rates are linearly interpolated for smaller areas.
3. Soil index value (SPR) calculated from Flood Studies Report Vol V Fig 14.18(1) - The Classification of Soils from Winter Rainfall Acceptance Rate.
4. Fse is the standard factorial error
5. QBAR multiplied by growth factors of 0.85 for 1 year, 2.1 for 30 years, 2.3 for 50 and 2.6 for 100 year return period events, from GDSDS Figure C2.
6. Total Permissible Outflow - QBAR (rural) calculated in accordance with GDSDS - Regional Drainage Policies (Volume 2 - Chapter 6), i.e. $QBAR(m^3/s) = 0.00108(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$
7. Where Total Permissible Outflow is less than 2.0l/s and is achievable, use 2.0l/s.
8. Rainfall depth for 100 year return period, 6 hour duration with additional 10% for climate change. (Value from Dublin Airport)
9. Interception Volume Vi (m3) = Impermeable Area (ha) x 10mm x 10 (GDSDS, Vol 2, Section 6.3.1.2.1).

TITLE	Job Reference
Development at Hollystown - Local Centre - Catchment 2	170182
SUBJECT	**Calc. Sheet No.**
QBAR Calculation using IOH Report 124 for Sites < 25 km²	1

DRAWING NUMBER	Calculations by	Checked by	Date
	ASM	BCM	21.10.2021

Estimation of QBAR from IOH Report 124 for catchments less than 25 km² using the 3 variable equation

$^{1}Q_{bar} = 0.00108 * (AREA)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$

^{2}Site Area = 0.710 Ha

Site area is less than 50 Ha, calculate Qbar for a 50 Ha Site then pro-rata

AREA =	0.007	km²
SAAR =	823	mm
^{3}SOIL =	0.30	
Q_{bar} =	0.00004	cumecs/Ha
Q_{bar} =	2.2	l/s/Ha
$Q_{bar\ [rural]}$ =	1.6	l/s

Note to Institute of Hydrology Report No. 124 Eqn

Q_{bar}	The Mean Annual Flood (cumecs)
AREA	Area of the Catchment (km²)
SAAR	Standard Annual Average Rainfall (mm)
	NERC Flood Studies Report, 1975
SOIL	Soil Index Values of Catchment
	Winter Rain Acceptance Potential
	(Supplementary Report No. 7)

Soil Classification for Run off Potential FSR Maps

Soil 1	0	%
Soil 2	0	%
Soil 3	100	%
Soil 4	0	%
Soil 5	0	%

^{4}QBar from Site with Factorial Error Allowance

r^2 =	0.847
n =	71
fse =	1.651

Q_{bar} = 2.58 l/s

(With Allowance for the standard factorial error)

Permissible Outflow from Site using Growth Factor

Qbar growth for permitted outlows from site for given return period (assuming long term storage). (No allowance for standard factorial error)

Flood Return Event	^{5}Growth Factor	Permitted Flow (l/s)
1	0.85	1.3
QBAR	1	1.6
10	1.67	2.6
30	2.1	3.3
50	2.33	3.6
100	2.6	4.1
200	2.85	4.5
1000	3.5	5.5

Is longterm storage provided?	No

Storm Return Period to be provided for =	30	Years *
QBAR (Growth) =	3.3	Litres/sec
^{6}Permissible Outflow from site =	1.6	Litres/sec
^{7}Maximum Allowable Outflow from site =	2.0	Litres/sec

(* 30, 50 or 100)

1 hectare = 10,000m² 1km² = 100 hectares

Notes

1. Based on the Institute of Hydrology Report 124 for small catchments less than 25km².
2. For catchments smaller than 50 hectares in area, flow rates are linearly interpolated for smaller areas.
3. Soil Index value (SPR) calculated from Flood Studies Report Vol V Fig 14.18(1) - The Classification of Soils from Winter Rainfall Acceptance Rate.
4. Fse is the standard factorial error
5. QBAR multiplied by growth factors of 0.85 for 1 year, 2.1 for 30 year, 2.3 for 50 and 2.6 for 100 year return period events, from GDSDS Figure C2.
6. Total Permissible Outflow - QBAR (rural) calculated in accordance with GDSDS - Regional Drainage Policies (Volume 2 - Chapter 6), i.e. $QBAR(m^3/s)=0.00108(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$
7. Where Total Permissible Outflow is less than 2.0l/s and not achievable, use 2.0l/s.
8. Rainfall depth for 100 year return period, 6 hour duration with additional 10% for climate change. (Value from Dublin Airport)
9. Interception Volume Vi (m3) = Impermeable Area (ha) x 10mm x 10 (GDSDS, Vol 2, Section 6.3.12.1).

TITLE	Job Reference
Development at Hollystown - Local Centre - Catchment 3	170182
SUBJECT	Calc. Sheet No.
QBAR Calculation using IOH Report 124 for Sites < 25 km²	1

DRAWING NUMBER	Calculations by	Checked by	Date
	ASM	BCM	21.10.2021

Estimation of QBAR from IOH Report 124 for catchments less than 25 km² using the 3 variable equation

[1] $Q_{bar} = 0.00108 * (AREA)^{0.89} (SAAR)^{1.17} (SOIL)^{2.17}$

[2] Site Area = 1.460 Ha

Site area is less than 50 Ha, calculate Qbar for a 50 Ha Site then pro-rata

AREA =	0.015	km²
SAAR =	823	mm
[3] SOIL =	0.30	
Q_{bar} =	0.00004	cumecs/Ha
Q_{bar} =	2.2	l/s/Ha
$Q_{bar\ (rural)}$ =	3.22	l/s

Note to Institute of Hydrology Report No. 124 Eqn

Q_{bar}	The Mean Annual Flood (cumecs)
AREA	Area of the Catchment (km²)
SAAR	Standard Annual Average Rainfall (mm)
	MERC Flood Studies Report, 1975
SOIL	Soil Index Values of Catchment
	Winter Rain Acceptance Potential
	(Supplementary Report No. 7)

Soil Classification for Run off Potential FSR Maps

Soil 1	0	%
Soil 2	0	%
Soil 3	100	%
Soil 4	0	%
Soil 5	0	%

[4] QBar from Site with Factorial Error Allowance

r^2 =	0.847
n =	71
fse =	1.651

Q_{bar} = 5.31 l/s

(With Allowance for the standard factorial error)

Permissible Outflow from Site using Growth Factor

Qbar growth for permitted outlows from site for given return period (assuming long term storage). (No allowance for standard factorial error)

Flood Return Event	[5] Growth Factor	Permitted Flow (l/s)
1	0.85	2.7
QBAR	1	3.2
10	1.67	5.4
30	2.1	6.8
50	2.33	7.5
100	2.6	8.4
200	2.85	9.2
1000	3.5	11.3

Is longterm storage provided?	No

Storm Return Period to be provided for =	30	Years *
QBAR (Growth) =	6.8	Litres/sec
[6] Permissible Outflow from site =	3.2	Litres/sec
[7] Maximum Allowable Outflow from site =	3.2	Litres/sec

(* 30, 50 or 100)

1 hectare = 10,000m² 1km² = 100 hectares

Notes

1. Based on the Institute of Hydrology Report 124 for small catchments less than 25km².
2. For catchments smaller than 50 hectares in area, flow rates are linearly interpolated for smaller areas.
3. Soil Index value (SPR) calculated from Flood Studies Report Vol V Fig 14.18(1) - The Classification of Soils from Winter Rainfall Acceptance Rate.
4. Fse is the standard factorial error
5. QBAR multiplied by growth factors of 0.85 for 1 year, 2.1 for 30 years, 2.3 for 50 and 2.6 for 100 year return period events, from GDSDS Figure C2.
6. Total Permissible Outflow - QBAR (RURAL) calculated in accordance with GDSDS - Regional Drainage Policies (Volume 2 - Chapter 6), i.e. $QBAR(m3/s) = 0.00108(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$
7. Where Total Permissible Outflow is less than 2.0l/s and not achievable, use 2.0l/s.
8. Rainfall depth for 100 year return period, 6 hour duration with additional 10% for climate change. (Value from Dublin Airport)
9. Interception Volume Vi (m3) = Impermeable Area (ha) x 10mm x 10 (GDSDS, Vol 2, Section 6.3.12.1).

TITLE Development at Hollystown – Site 2 - Catchment 1			Job Reference 170182
SUBJECT **Impermeable Area Calculation**			Calc. Sheet No. 1/2
DRAWING NUMBER 170182-DBFL-CS-S1-DR-C-1001	Calculations by GPH	Checked by DMW	Date 07.01.2021

Surface Water Catchment (NEW) Effective Area (ha) = 0.820

SURFACE TYPE	RUNOFF CO-EFFICIENT	GROSS AREA (m^2)	GROSS AREA (ha)	TOTAL IMPERMEABLE AREA (ha)
Roofs (Traditional)	1.00	986.00	0.099	0.099
Roofs (SuDs)	0.60	2237.50	0.224	0.134
Roads (Traditional)	1.00	1558.00	0.156	0.156
Roads and Open Surfaces(SuDs)	0.60	1843.70	0.184	0.111
Permeable Paving (SuDs)	0.50	1578.00	0.158	0.079
Private Gardens/ hard & soft Landscaping	0.30	7417.60	0.742	0.223
Public Open Areas	0.30	0.00	0.000	0.000
Remaining Green Areas	0.30	659.20	0.066	0.020
Total	**0.504**	**16280.00**	**1.63**	**0.820**

TITLE Development at Hollystown – Site 2 - Catchment 2			Job Reference 170182
SUBJECT **Impermeable Area Calculation**			Calc. Sheet No. 2/2
DRAWING NUMBER 170182-DBFL-CS-S1-DR-C-1001	Calculations by GPH	Checked by DMW	Date 07.01.2021

Surface Water Catchment (NEW) Effective Area (ha) = 4.24

SURFACE TYPE	RUNOFF CO-EFFICIENT	GROSS AREA (m^2)	GROSS AREA (ha)	TOTAL IMPERMEABLE AREA (ha)
Roofs (Traditional)	1.00	160.00	0.016	0.016
Roofs (Suds)	0.60	7870.00	0.787	0.472
Roads (Traditional)	1.00	4490.00	0.449	0.449
Roads (SuDs)	0.60	1790.00	0.179	0.107
Paths (Traditional)	1.00	0.00	0.000	0.000
Permeable Paving (SuDs)	0.50	9020.00	0.902	0.451
Private Gardens/ hard & soft Landscaping	0.30	13535.00	1.354	0.406
Public Open Areas	0.30	510.00	0.051	0.015
Remaining Green Areas	0.30	5071.60	0.507	0.152
Total	**0.487**	**42446.60**	**4.24**	**2.069**

TITLE	Job Reference
Development at Hollystown – Site 3 - Catchment Area 1	170182
SUBJECT	**Calc. Sheet No.**
Impermeable Area Calculation	1/6

DRAWING NUMBER	Calculations by	Checked by	Date
170182-DBFL-CS-S1-DR-C-1001	GPH	DMW	22.02.2021

Surface Water Catchment (NEW) Effective Area (ha) = 2.61

SURFACE TYPE	RUNOFF CO-EFFICIENT	GROSS AREA (m^2)	GROSS AREA (ha)	TOTAL IMPERMEABLE AREA (ha)
Roofs (Traditional)	1.00	2806.40	0.281	0.281
Roofs (Suds)	0.60	1487.94	0.149	0.089
Roads (Traditional)	1.00	1905.50	0.191	0.191
Roads (SuDs)	0.60	1982.00	0.198	0.119
Paths (Traditional)	1.00	0.00	0.000	0.000
Permeable Paving (SuDs)	0.50	3476.00	0.348	0.174
Public Open Space	0.30	2250.00	0.225	0.068
Private Gardens/ hard & soft Landscaping	0.30	3376.00	0.338	0.101
Remaining Green Areas	0.30	8819.26	0.882	0.265
Total	**0.493**	**26103.10**	**2.61**	**1.287**

TITLE	Job Reference
Development at Hollystown – Site 3 - Catchment Area 2	170182
SUBJECT	**Calc. Sheet No.**
Impermeable Area Calculation	2/6

DRAWING NUMBER	Calculations by	Checked by	Date
170182-DBFL-CS-S1-DR-C-1001	GPH	DMW	22.02.2021

Surface Water Catchment (NEW) Effective Area (ha) = 1.22

SURFACE TYPE	RUNOFF CO-EFFICIENT	GROSS AREA (m^2)	GROSS AREA (ha)	TOTAL IMPERMEABLE AREA (ha)
Roofs (Traditional)	1.00	0.00	0.000	0.000
Roofs (Suds)	0.60	2479.13	0.248	0.149
Roads (Traditional)	1.00	2254.00	0.225	0.225
Roads (SuDs)	0.60	1058.00	0.106	0.063
Paths (Traditional)	1.00	0.00	0.000	0.000
Permeable Paving (SuDs)	0.50	1824.00	0.182	0.091
Private Gardens/ hard & soft Landscaping	0.30	3165.00	0.317	0.095
Open Space	0.30	1419.87	0.142	0.043
Total	**0.546**	**12200.00**	**1.22**	**0.666**

TITLE	Job Reference
Development at Hollystown – Site 3 - Catchment Area 3	170182
SUBJECT	**Calc. Sheet No.**
Impermeable Area Calculation	4/6

DRAWING NUMBER	Calculations by	Checked by	Date
170182-DBFL-CS-S1-DR-C-1001	GPH	DMW	22.02.2021

Surface Water Catchment (NEW) Effective Area (ha) = 0.36

SURFACE TYPE	RUNOFF CO-EFFICIENT	GROSS AREA (m^2)	GROSS AREA (ha)	TOTAL IMPERMEABLE AREA (ha)
Roofs (Traditional)	1.00	0.00	0.000	0.000
Roofs (Suds)	0.60	1652.82	0.165	0.099
Roads (Traditional)	1.00	732.00	0.073	0.073
Roads (SuDs)	0.60	675.40	0.068	0.041
Paths (Traditional)	1.00	0.00	0.000	0.000
Permeable Paving (SuDs)	0.50	1142.00	0.114	0.057
Private Gardens/ hard & soft Landscaping	0.30	2119.00	0.212	0.064
Remaining Green Areas	0.30	942.78	0.094	0.028
Total	**0.498**	**7264.00**	**0.73**	**0.362**

TITLE	Job Reference
Development at Hollystown – Site 3 - Catchment Area 4	170182
SUBJECT	**Calc. Sheet No.**
Impermeable Area Calculation	4/5

DRAWING NUMBER	Calculations by	Checked by	Date
170182-DBFL-CS-S1-DR-C-1001	GPH	DMW	22.02.2021

Surface Water Catchment (NEW) Effective Area (ha) = 1.03

SURFACE TYPE	RUNOFF CO-EFFICIENT	GROSS AREA (m^2)	GROSS AREA (ha)	TOTAL IMPERMEABLE AREA (ha)
Roofs (Traditional)	1.00	0.00	0.000	0.000
Roofs (Suds)	0.60	1707.91	0.171	0.102
Roads (Traditional)	1.00	1381.00	0.138	0.138
Roads (SuDs)	0.60	2456.40	0.246	0.147
Paths (Traditional)	1.00	0.00	0.000	0.000
Permeable Paving (SuDs)	0.50	1054.90	0.105	0.053
Private Gardens/ hard & soft Landscaping	0.30	2143.00	0.214	0.064
Open Space	0.30	1603.59	0.160	0.048
Total	**0.535**	**10346.80**	**1.03**	**0.553**

TITLE		Job Reference	
Development at Hollystown – Site 3 - Catchment Area 5		170182	
SUBJECT		Calc. Sheet No.	
Impermeable Area Calculation		6/6	
DRAWING NUMBER	Calculations by	Checked by	Date
170182-DBFL-CS-S1-DR-C-1001	GPH	DMW	07.01.2021

Surface Water Catchment (NEW) Effective Area (ha) = 1.37

SURFACE TYPE	RUNOFF CO-EFFICIENT	GROSS AREA (m^2)	GROSS AREA (ha)	TOTAL IMPERMEABLE AREA (ha)
Roofs (Traditional)	1.00	0.00	0.000	0.000
Roofs (Suds)	0.60	2809.00	0.281	0.169
Roads (Traditional)	1.00	2015.50	0.202	0.202
Roads (SuDs)	0.60	1089.00	0.109	0.065
Paths (Traditional)	1.00	0.00	0.000	0.000
Permeable Paving (SuDs)	0.50	2394.00	0.239	0.120
Private Gardens/ hard & soft Landscaping	0.30	4323.50	0.432	0.130
Open Space	0.30	1116.00	0.112	0.033
Total	**0.523**	**13747.00**	**1.37**	**0.718**

TITLE		Job Reference	
Development at Hollystown – Local Centre - Catchment Area 1		170182	
SUBJECT		Calc. Sheet No.	
Impermeable Area Calculation		1/6	
DRAWING NUMBER	Calculations by	Checked by	Date
170182-DBFL-CS-S1-DR-C-1001	ASM	BCM	22.10.2021

Surface Water Catchment (NEW) Effective Area (ha) = 0.214

SURFACE TYPE	RUNOFF CO-EFFICIENT	GROSS AREA (m^2)	GROSS AREA (ha)	TOTAL IMPERMEABLE AREA (ha)
Roads (Traditional)	1.00	220.30	0.022	0.022
Roads (SuDs)	0.60	379.50	0.038	0.023
Paths (Traditional)	1.00	393.00	0.039	0.039
Paths (SuDs)	0.60	332.60	0.033	0.020
Green Areas	0.30	667.90	0.067	0.020
Parking Space (Impermeable)	1.00	146.70	0.015	0.015
Total	**0.648**	**2140.00**	**0.21**	**0.139**

TITLE
Development at Hollystown – Local Centre - Catchment Area 2

Job Reference
170182

SUBJECT
Impermeable Area Calculation

Calc. Sheet No.
1/6

DRAWING NUMBER	Calculations by	Checked by	Date
170182-DBFL-CS-S1-DR-C-1001	ASM	BCM	21.10.2021

Surface Water Catchment (NEW) Effective Area (ha) = 0.71

SURFACE TYPE	RUNOFF CO-EFFICIENT	GROSS AREA (m^2)	GROSS AREA (ha)	TOTAL IMPERMEABLE AREA (ha)
Roofs (Traditional)	1.00	1472.00	0.147	0.147
Roofs (Suds)	0.60	1472.00	0.147	0.088
Roads (Traditional)	1.00	0.00	0.000	0.000
Roads (SuDs)	0.60	0.00	0.000	0.000
Paths (Traditional)	1.00	405.00	0.041	0.041
Landscaped Podium Slab	0.70	1350.00	0.135	0.095
Permeable Paving (SuDs)	0.50	0.00	0.000	0.000
Public Open Space	0.30	2402.00	0.240	0.072
Private Gardens/ hard & soft Landscaping	0.30	0.00	0.000	0.000
Remaining Green Areas	0.30	0.00	0.000	0.000
Total	**0.623**	**7101.00**	**0.71**	**0.443**

TITLE
Development at Hollystown – Local Centre - Catchment Area 3

Job Reference
170182

SUBJECT
Impermeable Area Calculation

Calc. Sheet No.
1/6

DRAWING NUMBER	Calculations by	Checked by	Date
170182-DBFL-CS-S1-DR-C-1001	ASM	BCM	21.10.2021

Surface Water Catchment (NEW) Effective Area (ha) = 1.46

SURFACE TYPE	RUNOFF CO-EFFICIENT	GROSS AREA (m^2)	GROSS AREA (ha)	TOTAL IMPERMEABLE AREA (ha)
Roofs (Traditional)	1.00	860.00	0.086	0.086
Roofs (Suds)	0.60	525.00	0.053	0.032
Roads (Traditional)	1.00	1410.00	0.141	0.141
Roads (SuDs)	0.60	0.00	0.000	0.000
Paths (Traditional)	1.00	0.00	0.000	0.000
Permeable Paving (SuDs)	0.50	480.00	0.048	0.024
Public Open Space	0.30	5662.50	0.566	0.170
Remaining green area	0.15	5662.50	0.566	0.085
Total	**0.368**	**14600.00**	**1.46**	**0.537**

APPENDIX C

MET EIREANN RAINFALL DATA

ATTENUATION STORAGE SUMMARY

SURFACE WATER STORAGE CALCULATIONS (SOURCE CONTROL)

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 307691, Northing: 242789,

DURATION	Interval 6months	1year	Years 2	3	4	5	10	20	30	50	75	100	150	200	250	500
5 mins	2.6	3.6	4.2	5.0	5.6	6.0	7.4	9.0	10.1	11.6	12.9	13.9	15.5	16.7	17.7	N/A
10 mins	3.6	5.1	5.9	7.0	7.8	8.4	10.4	12.6	14.1	16.1	18.0	19.4	21.6	23.2	24.6	N/A
15 mins	4.3	6.0	6.9	8.2	9.2	9.9	12.2	14.8	16.6	19.0	21.1	22.8	25.4	27.3	29.0	N/A
30 mins	5.6	7.8	8.9	10.6	11.7	12.6	15.5	18.6	20.7	23.6	26.2	28.2	31.2	33.6	35.5	N/A
1 hours	7.5	10.2	11.6	13.7	15.1	16.1	19.6	23.5	26.0	29.4	32.5	34.8	38.4	41.2	43.5	N/A
2 hours	9.9	13.2	15.0	17.6	19.3	20.6	24.8	29.5	32.5	36.7	40.3	43.1	47.3	50.6	53.2	N/A
3 hours	11.6	15.5	17.5	20.4	22.3	23.8	28.5	33.7	37.1	41.7	45.7	48.8	53.4	57.0	59.9	N/A
4 hours	13.0	17.3	19.5	22.7	24.8	26.4	31.5	37.1	40.7	45.7	50.0	53.3	58.2	62.0	65.2	N/A
6 hours	15.3	20.2	22.7	26.3	28.6	30.4	36.2	42.4	46.4	51.9	56.7	60.3	65.8	70.0	73.4	N/A
9 hours	18.1	23.6	26.4	30.5	33.1	35.1	41.6	48.5	52.9	59.0	64.3	68.3	74.3	78.9	82.6	N/A
12 hours	20.3	26.3	29.4	33.8	36.7	38.9	45.9	53.4	58.1	64.6	70.3	74.5	81.0	85.9	89.8	N/A
18 hours	23.9	30.7	34.2	39.2	42.5	44.9	52.7	61.0	66.3	73.5	79.7	84.4	91.4	96.8	101.1	N/A
24 hours	26.8	34.3	38.1	43.5	47.1	49.7	58.1	67.1	72.8	80.5	87.1	92.2	99.7	105.4	110.0	125.7
2 days	33.3	41.9	46.2	52.3	56.2	59.2	68.4	78.1	84.2	92.5	99.5	104.9	112.8	118.8	123.6	139.9
3 days	38.6	48.1	52.7	59.4	63.6	66.8	76.7	87.1	93.6	102.3	109.8	115.3	123.7	129.9	135.0	151.9
4 days	43.2	53.4	58.5	65.5	70.0	73.4	83.9	94.9	101.7	110.9	118.7	124.5	133.2	139.7	144.9	162.5
6 days	51.4	62.8	68.4	76.3	81.3	85.0	96.5	108.5	115.9	125.8	134.2	140.5	149.8	156.7	162.3	181.0
8 days	58.6	71.1	77.2	85.7	91.1	95.2	107.5	120.4	128.3	138.9	147.8	154.4	164.2	171.5	177.4	197.0
10 days	65.2	78.7	85.2	94.3	100.1	104.4	117.5	131.1	139.5	150.6	160.0	167.0	177.3	184.9	191.1	211.6
12 days	71.3	85.7	92.7	102.3	108.4	113.0	126.8	141.1	149.9	161.5	171.3	178.6	189.3	197.3	203.7	225.0
16 days	82.8	98.8	106.4	117.0	123.7	128.7	143.8	159.3	168.8	181.4	192.0	199.8	211.3	219.8	226.7	249.4
20 days	93.4	110.8	119.1	130.6	137.8	143.1	159.4	176.0	186.1	199.6	210.8	219.1	231.3	240.3	247.6	271.5
25 days	105.9	124.9	133.9	146.3	154.1	159.9	177.4	195.3	206.1	220.5	232.4	241.3	254.3	263.9	271.6	296.9

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

Attenuation Structure Summary	
Site	2
Catchment Area	1
Type of Overground Structure	Unlined Detention Basin
Average Water Depth of Overground Structure (mm)	902
Overground Structure Base Area (m^2)	740.5
Base slope (1V:XH)	5
Overground Volume Provided (m^3)	471.43
Total Volume	471.43
Outflow Control	Hydro brake
Q_{bar} (l/sec)	3.6
Allowable Outflow (l/sec)	3.6
Outlet	Site 2: Golf Course Drain (Section 3.22)

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	Hollystown Site 2 : 1	
Date 04/10/2021 14:11 File Site 2 Catchment 1.SRCX	Designed by GPH Checked by DW	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 1112 minutes.

	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60	min Summer	71.433	0.533	0.0	3.6	3.6	220.8	O K
120	min Summer	71.530	0.630	0.0	3.6	3.6	272.2	O K
180	min Summer	71.583	0.683	0.0	3.6	3.6	301.6	O K
240	min Summer	71.618	0.718	0.0	3.6	3.6	321.7	O K
360	min Summer	71.661	0.761	0.0	3.6	3.6	346.7	O K
480	min Summer	71.684	0.784	0.0	3.6	3.6	360.6	O K
600	min Summer	71.697	0.797	0.0	3.6	3.6	368.2	O K
720	min Summer	71.702	0.802	0.0	3.6	3.6	371.5	O K
960	min Summer	71.700	0.800	0.0	3.6	3.6	370.5	O K
1440	min Summer	71.692	0.792	0.0	3.6	3.6	365.6	O K
2160	min Summer	71.679	0.779	0.0	3.6	3.6	357.6	O K
2880	min Summer	71.662	0.762	0.0	3.6	3.6	347.3	O K
60	min Winter	71.482	0.582	0.0	3.6	3.6	246.3	O K
120	min Winter	71.588	0.688	0.0	3.6	3.6	304.5	O K
180	min Winter	71.647	0.747	0.0	3.6	3.6	338.5	O K
240	min Winter	71.687	0.787	0.0	3.6	3.6	362.1	O K
360	min Winter	71.736	0.836	0.0	3.6	3.6	392.8	O K
480	min Winter	71.765	0.865	0.0	3.6	3.6	411.2	O K
600	min Winter	71.783	0.883	0.0	3.6	3.6	422.5	O K
720	min Winter	71.793	0.893	0.0	3.6	3.6	429.2	O K

	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60	min Summer	38.241	0.0	235.0	88
120	min Summer	24.215	0.0	297.8	146
180	min Summer	18.375	0.0	338.9	206
240	min Summer	15.079	0.0	370.8	264
360	min Summer	11.378	0.0	419.7	382
480	min Summer	9.305	0.0	457.8	500
600	min Summer	7.956	0.0	489.1	618
720	min Summer	6.998	0.0	516.3	736
960	min Summer	5.713	0.0	562.0	934
1440	min Summer	4.292	0.0	552.7	1170
2160	min Summer	3.222	0.0	713.1	1572
2880	min Summer	2.626	0.0	775.4	1984
60	min Winter	38.241	0.0	260.2	86
120	min Winter	24.215	0.0	329.5	144
180	min Winter	18.375	0.0	375.1	202
240	min Winter	15.079	0.0	410.5	260
360	min Winter	11.378	0.0	464.6	376
480	min Winter	9.305	0.0	506.6	490
600	min Winter	7.956	0.0	541.3	604
720	min Winter	6.998	0.0	569.3	718

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7	Hollystown Site 2 : 1	
Date 04/10/2021 14:11 File Site 2 Catchment 1.SRCX	Designed by GPH Checked by DW	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	71.800	0.900	0.0	3.6	3.6	433.9	O K
1440 min Winter	71.788	0.888	0.0	3.6	3.6	425.6	O K
2160 min Winter	71.766	0.866	0.0	3.6	3.6	411.5	O K
2880 min Winter	71.738	0.838	0.0	3.6	3.6	394.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	5.713	0.0	566.8	938
1440 min Winter	4.292	0.0	557.4	1336
2160 min Winter	3.222	0.0	789.3	1672
2880 min Winter	2.626	0.0	858.1	2148

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	Hollystown Site 2 : 1	
Date 04/10/2021 14:11 File Site 2 Catchment 1.SRCX	Designed by GPH Checked by DW	
Innovyze	Source Control 2018.1.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.830
M5-60 (mm)	16.200	Shortest Storm (mins)	60
Ratio R	0.272	Longest Storm (mins)	2880
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.820

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	15	0.000	15	30	0.820

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7	Hollystown Site 2 : 1	
Date 04/10/2021 14:11 File Site 2 Catchment 1.SRCX	Designed by GPH Checked by DW	
Innovyze	Source Control 2018.1.1	

Model Details

Storage is Online Cover Level (m) 72.300

Infiltration Basin Structure

Invert Level (m) 70.900 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	328.0	0.902	655.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0089-3600-1100-3600
Design Head (m)	1.100
Design Flow (l/s)	3.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	89
Invert Level (m)	70.750
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	3.6
Flush-Flo™	0.330	3.6
Kick-Flo®	0.683	2.9
Mean Flow over Head Range	-	3.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.7	1.200	3.7	3.000	5.7	7.000	8.6
0.200	3.4	1.400	4.0	3.500	6.2	7.500	8.9
0.300	3.6	1.600	4.3	4.000	6.6	8.000	9.1
0.400	3.6	1.800	4.5	4.500	6.9	8.500	9.4
0.500	3.5	2.000	4.8	5.000	7.3	9.000	9.7
0.600	3.3	2.200	5.0	5.500	7.6	9.500	9.9
0.800	3.1	2.400	5.2	6.000	8.0		
1.000	3.4	2.600	5.4	6.500	8.3		

Attenuation Structure Summary	
Site	2
Catchment Area	2
Type of Overground Structure	Unlined Detention Basin
Average Water Depth of Overground Structure (mm)	1092
Overground Structure Base Area (m^2)	661.2
Base slope (1V:XH)	5
Overground Volume Provided (m^3)	1282.64
Total Volume	1282.64
Outflow Control	Hydro brake
Q_{bar} (l/sec)	9.35
Allowable Outflow (l/sec)	9.35
Outlet	Site 2: Golf Course Drain (Section 3.22)

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	Hollystown Site 2 : 1	
Date 04/10/2021 14:12 File Site 2 Catchment 2.SRCX	Designed by GPH Checked by DW	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 1066 minutes.

	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60	min Summer	70.446	0.659	0.0	9.4	9.4	558.0	O K
120	min Summer	70.564	0.777	0.0	9.4	9.4	685.9	O K
180	min Summer	70.627	0.840	0.0	9.4	9.4	758.4	O K
240	min Summer	70.668	0.881	0.0	9.4	9.4	807.6	O K
360	min Summer	70.718	0.931	0.0	9.4	9.4	867.6	O K
480	min Summer	70.744	0.957	0.0	9.4	9.4	899.8	O K
600	min Summer	70.756	0.969	0.0	9.4	9.4	915.8	O K
720	min Summer	70.761	0.974	0.0	9.4	9.4	921.2	O K
960	min Summer	70.756	0.969	0.0	9.4	9.4	915.1	O K
1440	min Summer	70.746	0.959	0.0	9.4	9.4	903.3	O K
2160	min Summer	70.729	0.942	0.0	9.4	9.4	882.2	O K
2880	min Summer	70.707	0.920	0.0	9.4	9.4	854.1	O K
60	min Winter	70.506	0.719	0.0	9.4	9.4	622.3	O K
120	min Winter	70.634	0.847	0.0	9.4	9.4	767.3	O K
180	min Winter	70.705	0.918	0.0	9.4	9.4	851.7	O K
240	min Winter	70.752	0.965	0.0	9.4	9.4	909.9	O K
360	min Winter	70.810	1.023	0.0	9.4	9.4	984.3	O K
480	min Winter	70.843	1.056	0.0	9.4	9.4	1028.0	O K
600	min Winter	70.862	1.075	0.0	9.4	9.4	1054.0	O K
720	min Winter	70.873	1.086	0.0	9.4	9.4	1068.5	O K

	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60	min Summer	38.241	0.0	592.5	78
120	min Summer	24.215	0.0	751.1	138
180	min Summer	18.375	0.0	855.2	196
240	min Summer	15.079	0.0	935.1	256
360	min Summer	11.378	0.0	1059.2	374
480	min Summer	9.305	0.0	1154.2	494
600	min Summer	7.956	0.0	1233.7	612
720	min Summer	6.998	0.0	1302.3	730
960	min Summer	5.713	0.0	1418.6	908
1440	min Summer	4.292	0.0	1447.4	1152
2160	min Summer	3.222	0.0	1798.5	1548
2880	min Summer	2.626	0.0	1956.4	1972
60	min Winter	38.241	0.0	656.0	78
120	min Winter	24.215	0.0	831.3	136
180	min Winter	18.375	0.0	946.7	194
240	min Winter	15.079	0.0	1035.4	252
360	min Winter	11.378	0.0	1172.0	368
480	min Winter	9.305	0.0	1277.7	482
600	min Winter	7.956	0.0	1366.2	596
720	min Winter	6.998	0.0	1441.5	710

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7	Hollystown Site 2 : 1	
Date 04/10/2021 14:12 File Site 2 Catchment 2.SRCX	Designed by GPH Checked by DW	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
960 min Winter	70.879	1.092	0.0	9.4	9.4	1075.9	O K
1440 min Winter	70.858	1.071	0.0	9.4	9.4	1047.5	O K
2160 min Winter	70.833	1.046	0.0	9.4	9.4	1014.6	O K
2880 min Winter	70.796	1.009	0.0	9.4	9.4	966.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
960 min Winter	5.713	0.0	1486.9	928
1440 min Winter	4.292	0.0	1461.8	1300
2160 min Winter	3.222	0.0	1992.6	1656
2880 min Winter	2.626	0.0	2163.9	2120

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	Hollystown Site 2 : 1	
Date 04/10/2021 14:12 File Site 2 Catchment 2.SRCX	Designed by GPH Checked by DW	
Innovyze	Source Control 2018.1.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.200	Shortest Storm (mins)	60
Ratio R	0.272	Longest Storm (mins)	2880
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 2.069

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	10	0.000	10	20	2.069

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7	Hollystown Site 2 : 1	
Date 04/10/2021 14:12 File Site 2 Catchment 2.SRCX	Designed by GPH Checked by DW	
Innovyze	Source Control 2018.1.1	

Model Details

Storage is Online Cover Level (m) 71.750

Infiltration Basin Structure

Invert Level (m) 69.787 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	660.0	1.000	1284.0	1.900	2091.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0136-9400-1400-9400
Design Head (m)	1.400
Design Flow (l/s)	9.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	136
Invert Level (m)	69.552
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	9.4
Flush-Flo™	0.410	9.4
Kick-Flo®	0.876	7.5
Mean Flow over Head Range	-	8.2

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.9	1.200	8.7	3.000	13.5	7.000	20.2
0.200	8.6	1.400	9.4	3.500	14.5	7.500	20.9
0.300	9.2	1.600	10.0	4.000	15.4	8.000	21.5
0.400	9.4	1.800	10.6	4.500	16.3	8.500	22.2
0.500	9.3	2.000	11.1	5.000	17.2	9.000	22.8
0.600	9.2	2.200	11.6	5.500	18.0	9.500	23.4
0.800	8.3	2.400	12.1	6.000	18.7		
1.000	8.0	2.600	12.6	6.500	19.5		

Attenuation Structure Summary	
Site	3
Catchment Area	1
Type of Overground Structure	Unlined Detention Basin
Average Water Depth of Overground Structure (mm)	322
Overground Structure Base Area (m^2)	845.2
Base slope (1V:XH)	5
Overground Volume Provided (m^3)	290.0
Type of Underground Structure	Stormtech SC-310 Chamber Subsurface Attenuation Tank
Underground Volume Provided (m^3)	448
Total Volume provided (m^3)	738
Outflow Control	Hydro brake
Q_{bar} (l/sec)	5.7
Allowable Outflow (l/sec)	5.7
Outlet	Riparian Corridor: Site 3 (Section 3.2.3)

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:14 File S3C1.SRCX	Designed by ASM Checked by BM	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

	Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60	min Summer	70.225	0.554	5.7	353.4	O K
120	min Summer	70.356	0.685	5.7	437.1	O K
180	min Summer	70.711	1.040	5.7	487.6	O K
240	min Summer	70.758	1.087	5.7	522.8	O K
360	min Summer	70.817	1.146	5.7	568.3	O K
480	min Summer	70.852	1.181	5.7	596.1	O K
600	min Summer	70.874	1.203	5.7	613.6	O K
720	min Summer	70.887	1.216	5.7	624.1	O K
960	min Summer	70.898	1.227	5.7	633.0	O K
1440	min Summer	70.903	1.232	5.7	637.2	O K
2160	min Summer	70.893	1.222	5.7	628.7	O K
2880	min Summer	70.872	1.201	5.7	612.0	O K
60	min Winter	70.286	0.615	5.7	392.6	O K
120	min Winter	70.711	1.040	5.7	487.4	O K
180	min Winter	70.786	1.115	5.7	543.8	O K
240	min Winter	70.837	1.166	5.7	583.7	O K
360	min Winter	70.903	1.232	5.7	636.8	O K
480	min Winter	70.943	1.272	5.7	670.3	O K
600	min Winter	70.970	1.299	5.7	692.6	O K
720	min Winter	70.987	1.316	5.7	707.4	O K
960	min Winter	71.005	1.334	5.7	722.8	O K

	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60	min Summer	38.241	0.0	364.0	68
120	min Summer	24.215	0.0	461.2	128
180	min Summer	18.375	0.0	524.8	186
240	min Summer	15.079	0.0	573.8	246
360	min Summer	11.378	0.0	648.2	364
480	min Summer	9.305	0.0	705.0	484
600	min Summer	7.956	0.0	750.8	602
720	min Summer	6.998	0.0	788.5	722
960	min Summer	5.713	0.0	841.6	898
1440	min Summer	4.292	0.0	842.6	1142
2160	min Summer	3.222	0.0	1114.7	1536
2880	min Summer	2.626	0.0	1210.2	1960
60	min Winter	38.241	0.0	403.0	68
120	min Winter	24.215	0.0	510.3	126
180	min Winter	18.375	0.0	580.4	184
240	min Winter	15.079	0.0	634.3	242
360	min Winter	11.378	0.0	715.7	358
480	min Winter	9.305	0.0	776.7	474
600	min Winter	7.956	0.0	824.0	588
720	min Winter	6.998	0.0	858.9	700
960	min Winter	5.713	0.0	882.3	920

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:14 File S3C1.SRCX	Designed by ASM Checked by BM	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
1440 min Winter	71.006	1.335	5.7	723.3	O K
2160 min Winter	70.990	1.319	5.7	709.7	O K
2880 min Winter	70.957	1.286	5.7	682.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
1440 min Winter	4.292	0.0	857.5	1296
2160 min Winter	3.222	0.0	1233.3	1648
2880 min Winter	2.626	0.0	1338.5	2112

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:14 File S3C1.SRCX	Designed by ASM Checked by BM	
Innovyze	Source Control 2018.1.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.830
M5-60 (mm)	16.200	Shortest Storm (mins)	60
Ratio R	0.272	Longest Storm (mins)	2880
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 1.287

Time (mins) From:	To:	Area (ha)
0	10	1.287

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:14 File S3C1.SRCX	Designed by ASM Checked by BM	
Innovyze	Source Control 2018.1.1	

Model Details

Storage is Online Cover Level (m) 71.400

Tank or Pond Structure

Invert Level (m) 69.671

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	638.0	0.706	1.0	1.037	740.0
0.705	638.0	0.900	1.0	1.359	870.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0107-5700-1360-5700
Design Head (m)	1.360
Design Flow (l/s)	5.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	107
Invert Level (m)	69.670
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.360	5.7
Flush-Flo™	0.401	5.7
Kick-Flo®	0.838	4.5
Mean Flow over Head Range	-	5.0

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.4	3.000	8.3	7.000	12.3
0.200	5.3	1.400	5.8	3.500	8.9	7.500	12.7
0.300	5.6	1.600	6.1	4.000	9.5	8.000	13.1
0.400	5.7	1.800	6.5	4.500	10.0	8.500	13.5
0.500	5.7	2.000	6.8	5.000	10.5	9.000	13.9
0.600	5.5	2.200	7.1	5.500	11.0	9.500	14.3
0.800	4.8	2.400	7.4	6.000	11.5		
1.000	4.9	2.600	7.7	6.500	11.9		

Attenuation Structure Summary	
Site	3
Catchment Area	2
Type of Overground Structure	Swale
Average Swale Water Depth (mm)	350
Overground Swale Base Area (m^2)	63.1
Base slope (1V:XH)	5
Captured Swale Volume (m^3)	107.65
Type of Underground Structure	Stone Trench Underflow
Trench Stone Layer Base Area (m^2)	693
Vol Stone Layer	554
Pororisty (%)	40
Volume Voids (m^3)	221
Underflow Trench Captured Volume (m^3)	221
Total Volume Provided (m^3)	328.65
Outflow Control	Hydro brake
Q_{bar} (l/sec)	2.7
Allowable Outflow (l/sec)	4.7
Outlet	Attenuation Structure Site 3: Catchment 3

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7		Micro Drainage
Date 04/10/2021 14:18 File S3C2 27.08.21.SRCX	Designed by ASM Checked by BCM	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 521 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	69.357	0.357	0.0	4.8	4.8	99.3	O K
30 min Summer	69.491	0.491	0.0	4.8	4.8	136.5	O K
60 min Summer	69.624	0.624	0.0	4.8	4.8	173.6	O K
120 min Summer	69.757	0.757	0.0	4.8	4.8	210.5	O K
180 min Summer	70.022	1.022	0.0	4.8	4.8	229.3	O K
240 min Summer	70.102	1.102	0.0	4.8	4.8	239.7	Flood Risk
360 min Summer	70.152	1.152	0.0	4.8	4.8	248.8	Flood Risk
480 min Summer	70.158	1.158	0.0	4.8	4.8	250.1	Flood Risk
600 min Summer	70.155	1.155	0.0	4.8	4.8	249.4	Flood Risk
720 min Summer	70.147	1.147	0.0	4.8	4.8	247.9	Flood Risk
960 min Summer	70.129	1.129	0.0	4.8	4.8	244.3	Flood Risk
1440 min Summer	70.078	1.078	0.0	4.8	4.8	236.1	Flood Risk
2160 min Summer	69.797	0.797	0.0	4.8	4.8	221.6	O K
2880 min Summer	69.713	0.713	0.0	4.8	4.8	198.1	O K
4320 min Summer	69.545	0.545	0.0	4.8	4.8	151.6	O K
5760 min Summer	69.408	0.408	0.0	4.8	4.8	113.3	O K
7200 min Summer	69.299	0.299	0.0	4.8	4.8	83.2	O K
8640 min Summer	69.219	0.219	0.0	4.7	4.7	60.8	O K
10080 min Summer	69.159	0.159	0.0	4.6	4.6	44.2	O K
15 min Winter	69.398	0.398	0.0	4.8	4.8	110.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	84.453	0.0	105.3	24
30 min Summer	58.623	0.0	146.2	38
60 min Summer	38.241	0.0	190.8	68
120 min Summer	24.215	0.0	241.7	126
180 min Summer	18.375	0.0	275.3	184
240 min Summer	15.079	0.0	301.1	244
360 min Summer	11.378	0.0	340.7	362
480 min Summer	9.305	0.0	371.8	452
600 min Summer	7.956	0.0	397.2	510
720 min Summer	6.998	0.0	419.5	574
960 min Summer	5.713	0.0	456.4	706
1440 min Summer	4.292	0.0	514.6	986
2160 min Summer	3.222	0.0	579.4	1432
2880 min Summer	2.626	0.0	629.2	1824
4320 min Summer	1.966	0.0	706.9	2592
5760 min Summer	1.600	0.0	767.1	3288
7200 min Summer	1.363	0.0	816.7	3968
8640 min Summer	1.195	0.0	859.6	4672
10080 min Summer	1.070	0.0	897.6	5352
15 min Winter	84.453	0.0	116.5	24

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7		Micro Drainage
Date 04/10/2021 14:18 File S3C2 27.08.21.SRCX	Designed by ASM Checked by BCM	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	69.548	0.548	0.0	4.8	4.8	152.3	O K
60 min Winter	69.700	0.700	0.0	4.8	4.8	194.6	O K
120 min Winter	70.081	1.081	0.0	4.8	4.8	236.6	Flood Risk
180 min Winter	70.193	1.193	0.0	4.8	4.8	258.2	Flood Risk
240 min Winter	70.243	1.243	0.0	4.8	4.8	271.6	Flood Risk
360 min Winter	70.285	1.285	0.0	4.8	4.8	285.2	Flood Risk
480 min Winter	70.297	1.297	0.0	4.8	4.8	289.5	Flood Risk
600 min Winter	70.296	1.296	0.0	4.8	4.8	289.1	Flood Risk
720 min Winter	70.287	1.287	0.0	4.8	4.8	286.0	Flood Risk
960 min Winter	70.271	1.271	0.0	4.8	4.8	280.5	Flood Risk
1440 min Winter	70.220	1.220	0.0	4.8	4.8	265.3	Flood Risk
2160 min Winter	70.093	1.093	0.0	4.8	4.8	238.4	Flood Risk
2880 min Winter	69.738	0.738	0.0	4.8	4.8	205.3	O K
4320 min Winter	69.465	0.465	0.0	4.8	4.8	129.2	O K
5760 min Winter	69.276	0.276	0.0	4.8	4.8	76.8	O K
7200 min Winter	69.157	0.157	0.0	4.6	4.6	43.7	O K
8640 min Winter	69.086	0.086	0.0	4.3	4.3	23.8	O K
10080 min Winter	69.042	0.042	0.0	4.0	4.0	11.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	58.623	0.0	161.9	38
60 min Winter	38.241	0.0	211.4	66
120 min Winter	24.215	0.0	267.5	124
180 min Winter	18.375	0.0	304.6	182
240 min Winter	15.079	0.0	333.3	238
360 min Winter	11.378	0.0	377.2	352
480 min Winter	9.305	0.0	411.6	462
600 min Winter	7.956	0.0	439.7	566
720 min Winter	6.998	0.0	464.2	646
960 min Winter	5.713	0.0	505.3	748
1440 min Winter	4.292	0.0	569.2	1060
2160 min Winter	3.222	0.0	641.2	1520
2880 min Winter	2.626	0.0	696.9	1996
4320 min Winter	1.966	0.0	782.6	2724
5760 min Winter	1.600	0.0	848.6	3400
7200 min Winter	1.363	0.0	903.8	4040
8640 min Winter	1.195	0.0	951.5	4672
10080 min Winter	1.070	0.0	993.5	5344

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7		
Date 04/10/2021 14:18 File S3C2 27.08.21.SRCX	Designed by ASM Checked by BCM	
Innovyze	Source Control 2018.1.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.200	Shortest Storm (mins)	15
Ratio R	0.272	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.666

Time (mins) From:	To:	Area (ha)
0	10	0.666

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7		Micro Drainage
Date 04/10/2021 14:18 File S3C2 27.08.21.SRCX	Designed by ASM Checked by BCM	
Innovyze	Source Control 2018.1.1	

Model Details

Storage is Online Cover Level (m) 70.350

Infiltration Basin Structure

Invert Level (m) 69.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	278.0	0.801	0.0	0.950	60.5	1.350	748.0
0.800	278.0	0.900	0.0	1.300	366.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0098-4800-1400-4800
Design Head (m)	1.400
Design Flow (l/s)	4.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level (m)	68.900
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	4.8
Flush-Flo™	0.416	4.8
Kick-Flo®	0.855	3.8
Mean Flow over Head Range	-	4.2

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	1.200	4.5	3.000	6.9	7.000	10.2
0.200	4.4	1.400	4.8	3.500	7.4	7.500	10.6
0.300	4.7	1.600	5.1	4.000	7.8	8.000	10.9
0.400	4.8	1.800	5.4	4.500	8.3	8.500	11.2
0.500	4.8	2.000	5.7	5.000	8.7	9.000	11.5
0.600	4.7	2.200	5.9	5.500	9.1	9.500	11.8
0.800	4.1	2.400	6.2	6.000	9.5		
1.000	4.1	2.600	6.4	6.500	9.9		

Attenuation Structure Summary	
Site	3
Catchment Area	3
Type of Overground Structure	Swale
Average Swale Water Depth (mm)	395
Overground Swale Base Area (m²)	66.5
Base slope (1V:XH)	5
Captured Swale Volume (m³)	132.92
Type of Underground Structure	Stone Trench Underflow
Trench Stone Layer Base Area (m²)	654
Vol Stone Layer	555.9
Pororisty (%)	40
Volume Voids (m³)	222
Underflow Trench Captured Volume (m³)	222
Total Volume Provided (m³)	354.92
Outflow Control	Hydro brake
Q_{bar} (l/sec)	2.7
Allowable Outflow (l/sec)	5.3 $\Sigma Q_{bar\ (Site\ 3)}$ = 15.3l/sec
Outlet	Riparian Corridor: Site 3 (Section 3.2.3)

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7		Micro Drainage
Date 04/10/2021 14:20	Designed by SmietanaA	
File S3C3 cascade 27.08.CASX	Checked by	
Innovyze	Source Control 2018.1.1	

Cascade Summary of Results for S3C3.SRCX

Upstream Structures	Outflow To	Overflow To
S3C2 27.08.21.SRCX	(None)	(None)

Half Drain Time : 469 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	68.542	0.237	0.0	5.0	5.0	61.6	O K
30 min Summer	68.628	0.323	0.0	5.2	5.2	84.0	O K
60 min Summer	68.722	0.417	0.0	5.3	5.3	108.3	O K
120 min Summer	68.822	0.517	0.0	5.3	5.3	134.5	O K
180 min Summer	68.890	0.585	0.0	5.3	5.3	152.0	O K
240 min Summer	68.944	0.639	0.0	5.3	5.3	166.1	O K
360 min Summer	69.024	0.719	0.0	5.3	5.3	187.1	O K
480 min Summer	69.086	0.781	0.0	5.3	5.3	203.0	O K
600 min Summer	69.144	0.839	0.0	5.3	5.3	218.1	O K
720 min Summer	69.336	1.031	0.0	5.3	5.3	225.8	O K
960 min Summer	69.429	1.124	0.0	5.3	5.3	236.1	O K
1440 min Summer	69.446	1.141	0.0	5.3	5.3	238.5	O K
2160 min Summer	69.490	1.185	0.0	5.3	5.3	245.7	O K
2880 min Summer	69.567	1.262	0.0	5.3	5.3	261.8	O K
4320 min Summer	69.579	1.274	0.0	5.3	5.3	264.8	O K
5760 min Summer	69.551	1.246	0.0	5.3	5.3	258.1	O K
7200 min Summer	69.476	1.171	0.0	5.3	5.3	243.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	84.453	0.0	161.6	35
30 min Summer	58.623	0.0	224.1	50
60 min Summer	38.241	0.0	293.9	80
120 min Summer	24.215	0.0	372.4	138
180 min Summer	18.375	0.0	424.0	198
240 min Summer	15.079	0.0	463.8	258
360 min Summer	11.378	0.0	524.7	378
480 min Summer	9.305	0.0	572.0	500
600 min Summer	7.956	0.0	610.6	1422
720 min Summer	6.998	0.0	644.3	738
960 min Summer	5.713	0.0	699.9	976
1440 min Summer	4.292	0.0	772.3	1454
2160 min Summer	3.222	0.0	892.4	2176
2880 min Summer	2.626	0.0	969.4	2872
4320 min Summer	1.966	0.0	1088.7	3420
5760 min Summer	1.600	0.0	1181.6	4048
7200 min Summer	1.363	0.0	1258.1	4736

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7		
Date 04/10/2021 14:20 File S3C3 cascade 27.08.CASX	Designed by SmietanaA Checked by	
Innovyze	Source Control 2018.1.1	

Cascade Summary of Results for S3C3.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	69.145	0.840	0.0	5.3	5.3	218.5	O K
10080 min Summer	68.992	0.687	0.0	5.3	5.3	178.6	O K
15 min Winter	68.565	0.260	0.0	5.1	5.1	67.5	O K
30 min Winter	68.659	0.354	0.0	5.3	5.3	92.1	O K
60 min Winter	68.761	0.456	0.0	5.3	5.3	118.4	O K
120 min Winter	68.877	0.572	0.0	5.3	5.3	148.6	O K
180 min Winter	68.956	0.651	0.0	5.3	5.3	169.2	O K
240 min Winter	69.017	0.712	0.0	5.3	5.3	185.1	O K
360 min Winter	69.117	0.812	0.0	5.3	5.3	211.1	O K
480 min Winter	69.375	1.070	0.0	5.3	5.3	229.5	O K
600 min Winter	69.472	1.167	0.0	5.3	5.3	242.7	O K
720 min Winter	69.525	1.220	0.0	5.3	5.3	252.6	O K
960 min Winter	69.583	1.278	0.0	5.3	5.3	266.0	O K
1440 min Winter	69.623	1.318	0.0	5.3	5.3	276.8	O K
2160 min Winter	69.599	1.294	0.0	5.3	5.3	269.9	O K
2880 min Winter	69.634	1.329	0.0	5.3	5.3	280.2	O K
4320 min Winter	69.676	1.371	0.0	5.3	5.3	293.6	O K
5760 min Winter	69.615	1.310	0.0	5.3	5.3	274.5	O K
7200 min Winter	69.407	1.102	0.0	5.3	5.3	233.2	O K
8640 min Winter	68.925	0.620	0.0	5.3	5.3	161.3	O K
10080 min Winter	68.741	0.436	0.0	5.3	5.3	113.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.195	0.0	1324.4	5456
10080 min Summer	1.070	0.0	1383.0	6056
15 min Winter	84.453	0.0	178.8	35
30 min Winter	58.623	0.0	248.0	49
60 min Winter	38.241	0.0	325.5	78
120 min Winter	24.215	0.0	412.1	136
180 min Winter	18.375	0.0	469.2	196
240 min Winter	15.079	0.0	513.3	256
360 min Winter	11.378	0.0	580.3	510
480 min Winter	9.305	0.0	632.4	550
600 min Winter	7.956	0.0	675.3	614
720 min Winter	6.998	0.0	712.1	732
960 min Winter	5.713	0.0	771.8	964
1440 min Winter	4.292	0.0	808.5	1414
2160 min Winter	3.222	0.0	987.7	2088
2880 min Winter	2.626	0.0	1073.4	2836
4320 min Winter	1.966	0.0	1204.9	3480
5760 min Winter	1.600	0.0	1307.4	4152
7200 min Winter	1.363	0.0	1392.3	4848
8640 min Winter	1.195	0.0	1465.8	5400
10080 min Winter	1.070	0.0	1530.6	5912

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7		
Date 04/10/2021 14:20 File S3C3 cascade 27.08.CASX	Designed by SmietanaA Checked by	
Innovyze	Source Control 2018.1.1	

Cascade Rainfall Details for S3C3.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.830
M5-60 (mm)	16.200	Shortest Storm (mins)	15
Ratio R	0.272	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.360

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	10	0.000	10	20	0.360

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7		Micro Drainage
Date 04/10/2021 14:20 File S3C3 cascade 27.08.CASX	Designed by SmietanaA Checked by	
Innovyze	Source Control 2018.1.1	

Cascade Model Details for S3C3.SRCX

Storage is Online Cover Level (m) 70.400

Infiltration Basin Structure

Invert Level (m) 68.305 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	260.0	0.851	0.0	1.000	70.0	2.045	691.0
0.850	260.0	0.900	0.0	1.395	367.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0103-5300-1400-5300
Design Head (m)	1.400
Design Flow (l/s)	5.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	103
Invert Level (m)	68.300
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	5.3
Flush-Flo™	0.419	5.3
Kick-Flo®	0.860	4.2
Mean Flow over Head Range	-	4.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.4	1.200	4.9	3.000	7.6	7.000	11.3
0.200	4.8	1.400	5.3	3.500	8.1	7.500	11.7
0.300	5.2	1.600	5.6	4.000	8.7	8.000	12.1
0.400	5.3	1.800	6.0	4.500	9.2	8.500	12.4
0.500	5.3	2.000	6.3	5.000	9.6	9.000	12.8
0.600	5.2	2.200	6.5	5.500	10.1	9.500	13.1
0.800	4.6	2.400	6.8	6.000	10.5		
1.000	4.5	2.600	7.1	6.500	10.9		

Attenuation Structure Summary	
Site	3
Catchment Area	4
Type of Underground Structure	Stormtech SC-740 Chamber Subsurface Attenuation Tank
Tank Base Dimensions (l x b) (m)	55.4 x 9.0
No of Chambers	325
Underground Tank Volume Provided (m^3)	318.6
Outflow Control	Hydro brake
Q_{bar} (l/sec)	2.3
Allowable Outflow (l/sec)	2.3
Outlet	Riparian Corridor: Site 3 (Section 3.2.3)

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:21 File S3C4 - Tank.SRCX	Designed by ASM Checked by BCM	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	69.330	0.286	2.2	86.0	O K
30 min Summer	69.438	0.394	2.2	118.5	O K
60 min Summer	69.551	0.507	2.2	152.6	O K
120 min Summer	69.672	0.628	2.2	189.1	O K
180 min Summer	69.746	0.702	2.2	211.2	O K
240 min Summer	69.797	0.753	2.2	226.6	O K
360 min Summer	69.864	0.820	2.2	246.9	O K
480 min Summer	69.906	0.862	2.2	259.5	O K
600 min Summer	69.933	0.889	2.2	267.6	O K
720 min Summer	69.950	0.906	2.2	272.8	O K
960 min Summer	69.966	0.922	2.2	277.6	O K
1440 min Summer	69.973	0.929	2.2	279.7	O K
2160 min Summer	69.964	0.920	2.2	277.0	O K
2880 min Summer	69.945	0.901	2.2	271.2	O K
15 min Winter	69.360	0.316	2.2	95.3	O K
30 min Winter	69.481	0.437	2.2	131.4	O K
60 min Winter	69.607	0.563	2.2	169.4	O K
120 min Winter	69.744	0.700	2.2	210.6	O K
180 min Winter	69.825	0.781	2.2	235.2	O K
240 min Winter	69.883	0.839	2.2	252.7	O K
360 min Winter	69.961	0.917	2.2	276.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	84.453	0.0	84.2	19
30 min Summer	58.623	0.0	117.0	34
60 min Summer	38.241	0.0	156.9	64
120 min Summer	24.215	0.0	198.7	124
180 min Summer	18.375	0.0	226.0	182
240 min Summer	15.079	0.0	247.1	242
360 min Summer	11.378	0.0	278.9	362
480 min Summer	9.305	0.0	302.8	482
600 min Summer	7.956	0.0	321.4	602
720 min Summer	6.998	0.0	334.7	720
960 min Summer	5.713	0.0	341.4	952
1440 min Summer	4.292	0.0	330.0	1162
2160 min Summer	3.222	0.0	479.2	1576
2880 min Summer	2.626	0.0	520.2	1988
15 min Winter	84.453	0.0	93.3	19
30 min Winter	58.623	0.0	129.3	33
60 min Winter	38.241	0.0	173.7	62
120 min Winter	24.215	0.0	219.8	122
180 min Winter	18.375	0.0	249.9	180
240 min Winter	15.079	0.0	273.0	238
360 min Winter	11.378	0.0	307.4	356

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:21 File S3C4 - Tank.SRCX	Designed by ASM Checked by BCM	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
480 min Winter	70.012	0.968	2.2	291.3	O K
600 min Winter	70.046	1.002	2.2	301.5	O K
720 min Winter	70.069	1.025	2.3	308.5	O K
960 min Winter	70.095	1.051	2.3	316.3	O K
1440 min Winter	70.103	1.059	2.3	318.6	O K
2160 min Winter	70.087	1.043	2.3	314.0	O K
2880 min Winter	70.056	1.012	2.2	304.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
480 min Winter	9.305	0.0	331.7	472
600 min Winter	7.956	0.0	346.2	586
720 min Winter	6.998	0.0	349.8	700
960 min Winter	5.713	0.0	347.2	922
1440 min Winter	4.292	0.0	336.9	1328
2160 min Winter	3.222	0.0	530.2	1664
2880 min Winter	2.626	0.0	575.2	2132

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:21 File S3C4 - Tank.SRCX	Designed by ASM Checked by BCM	
Innovyze	Source Control 2018.1.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.200	Shortest Storm (mins)	15
Ratio R	0.272	Longest Storm (mins)	2880
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.553

Time (mins) From:	To:	Area (ha)
0	4	0.553

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:21 File S3C4 - Tank.SRCX	Designed by ASM Checked by BCM	
Innovyze	Source Control 2018.1.1	

Model Details

Storage is Online Cover Level (m) 70.700

Tank or Pond Structure

Invert Level (m) 69.044

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	301.0	1.060	301.0	1.070	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0071-2300-1060-2300
Design Head (m)	1.060
Design Flow (l/s)	2.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	71
Invert Level (m)	69.044
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.060	2.3
Flush-Flo™	0.314	2.2
Kick-Flo®	0.636	1.8
Mean Flow over Head Range	-	2.0

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.8	1.200	2.4	3.000	3.7	7.000	5.5
0.200	2.2	1.400	2.6	3.500	4.0	7.500	5.7
0.300	2.2	1.600	2.8	4.000	4.2	8.000	5.9
0.400	2.2	1.800	2.9	4.500	4.5	8.500	6.0
0.500	2.1	2.000	3.1	5.000	4.7	9.000	6.2
0.600	1.9	2.200	3.2	5.500	4.9	9.500	6.4
0.800	2.0	2.400	3.3	6.000	5.1		
1.000	2.2	2.600	3.5	6.500	5.3		

Attenuation Structure Summary	
Site	3
Catchment Area	5
Type of Overground Structure	Unlined Detention Basin
Average Water Depth of Overground Structure (mm)	880
Overground Structure Base Area (m^2)	602.1
Base slope (1V:XH)	5
Overground Volume (m^3)	849.79
Total Provided Volume	849.79
Outflow Control	Hydro brake
Q_{bar} (l/sec)	3.03
Allowable Outflow (l/sec)	2.0 ΣQ_{bar} (Site 3, Catchment 3.1,3.2,3.5 and Bellingmore) = 42.3l/sec
Outlet	Riparian Corridor: Site 3 (Section 3.2.3)

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:26 File S3C5 27.08.21.SRCX	Designed by ASM Checked by BCM	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 80 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	68.745	0.275	0.0	41.7	41.7	89.1	O K
30 min Summer	68.809	0.339	0.0	42.2	42.2	115.7	O K
60 min Summer	68.852	0.382	0.0	42.3	42.3	134.7	O K
120 min Summer	68.888	0.418	0.0	42.3	42.3	151.2	O K
180 min Summer	68.923	0.453	0.0	42.3	42.3	168.1	O K
240 min Summer	69.010	0.540	0.0	42.3	42.3	213.6	O K
360 min Summer	69.120	0.650	0.0	42.3	42.3	278.2	O K
480 min Summer	69.176	0.706	0.0	42.3	42.3	314.4	O K
600 min Summer	69.200	0.730	0.0	42.3	42.3	330.4	O K
720 min Summer	69.231	0.761	0.0	42.3	42.3	351.6	O K
960 min Summer	69.262	0.792	0.0	42.3	42.3	373.5	O K
1440 min Summer	69.255	0.785	0.0	42.3	42.3	368.3	O K
2160 min Summer	68.806	0.336	0.0	42.2	42.2	114.2	O K
2880 min Summer	68.714	0.244	0.0	41.1	41.1	77.5	O K
4320 min Summer	68.696	0.226	0.0	40.7	40.7	70.5	O K
5760 min Summer	68.694	0.224	0.0	40.3	40.3	69.8	O K
7200 min Summer	68.693	0.223	0.0	40.2	40.2	69.4	O K
8640 min Summer	68.692	0.222	0.0	40.0	40.0	69.2	O K
10080 min Summer	68.691	0.221	0.0	39.9	39.9	69.0	O K
15 min Winter	68.770	0.300	0.0	42.0	42.0	99.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	84.453	0.0	2251.0	29
30 min Summer	58.623	0.0	2295.2	41
60 min Summer	38.241	0.0	2987.0	60
120 min Summer	24.215	0.0	3042.0	98
180 min Summer	18.375	0.0	3078.1	192
240 min Summer	15.079	0.0	3106.1	252
360 min Summer	11.378	0.0	3149.0	372
480 min Summer	9.305	0.0	3182.2	492
600 min Summer	7.956	0.0	3209.8	618
720 min Summer	6.998	0.0	3233.6	738
960 min Summer	5.713	0.0	3273.7	898
1440 min Summer	4.292	0.0	3336.2	916
2160 min Summer	3.222	0.0	3421.7	916
2880 min Summer	2.626	0.0	3475.7	896
4320 min Summer	1.966	0.0	3559.3	856
5760 min Summer	1.600	0.0	3625.2	856
7200 min Summer	1.363	0.0	3679.0	856
8640 min Summer	1.195	0.0	3725.4	856
10080 min Summer	1.070	0.0	3766.4	856
15 min Winter	84.453	0.0	2263.1	30

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:26 File S3C5 27.08.21.SRCX	Designed by ASM Checked by BCM	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	68.842	0.372	0.0	42.3	42.3	130.0	O K
60 min Winter	68.885	0.415	0.0	42.3	42.3	150.1	O K
120 min Winter	68.917	0.447	0.0	42.3	42.3	165.2	O K
180 min Winter	68.966	0.496	0.0	42.3	42.3	190.2	O K
240 min Winter	69.052	0.582	0.0	42.3	42.3	237.3	O K
360 min Winter	69.166	0.696	0.0	42.3	42.3	307.6	O K
480 min Winter	69.213	0.743	0.0	42.3	42.3	339.0	O K
600 min Winter	69.236	0.766	0.0	42.3	42.3	355.3	O K
720 min Winter	69.266	0.796	0.0	42.3	42.3	376.6	O K
960 min Winter	69.298	0.828	0.0	42.3	42.3	399.8	O K
1440 min Winter	69.265	0.795	0.0	42.3	42.3	375.7	O K
2160 min Winter	68.880	0.410	0.0	42.3	42.3	147.7	O K
2880 min Winter	68.739	0.269	0.0	41.6	41.6	87.1	O K
4320 min Winter	68.698	0.228	0.0	40.7	40.7	71.3	O K
5760 min Winter	68.695	0.225	0.0	40.6	40.6	70.3	O K
7200 min Winter	68.694	0.224	0.0	40.4	40.4	69.9	O K
8640 min Winter	68.693	0.223	0.0	40.2	40.2	69.6	O K
10080 min Winter	68.693	0.223	0.0	40.2	40.2	69.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	58.623	0.0	2312.1	42
60 min Winter	38.241	0.0	3009.0	64
120 min Winter	24.215	0.0	3069.8	106
180 min Winter	18.375	0.0	3109.8	190
240 min Winter	15.079	0.0	3140.8	250
360 min Winter	11.378	0.0	3188.2	366
480 min Winter	9.305	0.0	3225.0	478
600 min Winter	7.956	0.0	3255.6	604
720 min Winter	6.998	0.0	3281.9	724
960 min Winter	5.713	0.0	3326.3	898
1440 min Winter	4.292	0.0	3395.5	926
2160 min Winter	3.222	0.0	3488.4	920
2880 min Winter	2.626	0.0	3548.2	900
4320 min Winter	1.966	0.0	3640.7	868
5760 min Winter	1.600	0.0	3713.6	848
7200 min Winter	1.363	0.0	3773.0	856
8640 min Winter	1.195	0.0	3824.4	856
10080 min Winter	1.070	0.0	3869.9	856

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:26 File S3C5 27.08.21.SRCX	Designed by ASM Checked by BCM	
Innovyze	Source Control 2018.1.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.830
M5-60 (mm)	16.200	Shortest Storm (mins)	15
Ratio R	0.272	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.719

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	10	0.000	10	20	0.719

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:26 File S3C5 27.08.21.SRCX	Designed by ASM Checked by BCM	
Innovyze	Source Control 2018.1.1	

Model Details

Storage is Online Cover Level (m) 70.500

Infiltration Basin Structure

Invert Level (m) 68.470 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	260.0	0.880	787.0	2.005	1450.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0275-4230-0900-4230
Design Head (m)	0.900
Design Flow (l/s)	42.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	275
Invert Level (m)	68.430
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	42.3
Flush-Flo™	0.411	42.3
Kick-Flo®	0.713	37.8
Mean Flow over Head Range	-	33.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.7	1.200	48.6	3.000	75.7	7.000	114.4
0.200	28.3	1.400	52.3	3.500	81.6	7.500	118.3
0.300	41.4	1.600	55.8	4.000	87.1	8.000	122.1
0.400	42.3	1.800	59.1	4.500	92.2	8.500	125.8
0.500	41.9	2.000	62.2	5.000	97.1	9.000	129.3
0.600	40.7	2.200	65.1	5.500	101.7	9.500	131.9
0.800	40.0	2.400	67.9	6.000	106.1		
1.000	44.5	2.600	70.6	6.500	110.3		

Attenuation Structure Summary	
Site	Local Centre
Catchment Area	1
Type of Underground Structure	Stormtech SC-740 Chamber Subsurface Attenuation Tank
No of Chambers	22
Underground Volume Provided (m^3)	57
Volume Required (m^3)	45.7
Total Volume provided (m^3)	57
Outflow Control	Hydro brake
Q_{bar} (l/sec)	0.5
Allowable Outflow (l/sec)	2
Outlet	750mm diameter pipe

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7		Micro Drainage
Date 25/02/2021 File Catchment 1 (New Road)....	Designed by BCU Checked by NCG	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 223 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	73.433	0.439	0.0	1.8	1.8	20.2	O K
30 min Summer	73.589	0.595	0.0	1.8	1.8	27.3	O K
60 min Summer	73.723	0.729	0.0	1.8	1.8	33.5	O K
120 min Summer	73.817	0.823	0.0	1.8	1.8	37.9	O K
180 min Summer	73.834	0.840	0.0	1.9	1.9	38.7	O K
240 min Summer	73.833	0.839	0.0	1.9	1.9	38.6	O K
360 min Summer	73.824	0.830	0.0	1.8	1.8	38.2	O K
480 min Summer	73.810	0.816	0.0	1.8	1.8	37.5	O K
600 min Summer	73.792	0.798	0.0	1.8	1.8	36.7	O K
720 min Summer	73.771	0.777	0.0	1.8	1.8	35.7	O K
960 min Summer	73.725	0.731	0.0	1.8	1.8	33.6	O K
1440 min Summer	73.624	0.630	0.0	1.8	1.8	29.0	O K
2160 min Summer	73.443	0.449	0.0	1.8	1.8	20.7	O K
2880 min Summer	73.281	0.287	0.0	1.8	1.8	13.2	O K
4320 min Summer	73.105	0.111	0.0	1.8	1.8	5.1	O K
5760 min Summer	73.028	0.034	0.0	1.7	1.7	1.6	O K
7200 min Summer	72.994	0.000	0.0	1.5	1.5	0.0	O K
8640 min Summer	72.994	0.000	0.0	1.3	1.3	0.0	O K
10080 min Summer	72.994	0.000	0.0	1.2	1.2	0.0	O K
15 min Winter	73.492	0.498	0.0	1.8	1.8	22.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	84.666	0.0	22.0	18
30 min Summer	58.697	0.0	30.6	33
60 min Summer	38.241	0.0	39.9	62
120 min Summer	24.187	0.0	50.3	120
180 min Summer	18.342	0.0	57.4	172
240 min Summer	15.045	0.0	62.8	202
360 min Summer	11.345	0.0	70.9	266
480 min Summer	9.273	0.0	77.3	336
600 min Summer	7.926	0.0	82.6	406
720 min Summer	6.970	0.0	87.2	476
960 min Summer	5.688	0.0	94.9	616
1440 min Summer	4.270	0.0	106.7	894
2160 min Summer	3.203	0.0	120.1	1280
2880 min Summer	2.610	0.0	130.7	1616
4320 min Summer	1.953	0.0	146.5	2288
5760 min Summer	1.588	0.0	159.0	2944
7200 min Summer	1.353	0.0	169.2	3656
8640 min Summer	1.186	0.0	178.1	0
10080 min Summer	1.061	0.0	185.9	0
15 min Winter	84.666	0.0	24.7	18

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7		Micro Drainage
Date 25/02/2021 File Catchment 1 (New Road).....	Designed by BCU Checked by NCG	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	73.668	0.674	0.0	1.8	1.8	31.0	O K
60 min Winter	73.828	0.834	0.0	1.8	1.8	38.3	O K
120 min Winter	73.949	0.955	0.0	2.0	2.0	44.0	O K
180 min Winter	73.985	0.991	0.0	2.0	2.0	45.6	O K
240 min Winter	73.987	0.993	0.0	2.0	2.0	45.7	O K
360 min Winter	73.967	0.973	0.0	2.0	2.0	44.8	O K
480 min Winter	73.941	0.947	0.0	1.9	1.9	43.6	O K
600 min Winter	73.910	0.916	0.0	1.9	1.9	42.1	O K
720 min Winter	73.873	0.879	0.0	1.9	1.9	40.5	O K
960 min Winter	73.794	0.800	0.0	1.8	1.8	36.8	O K
1440 min Winter	73.628	0.634	0.0	1.8	1.8	29.2	O K
2160 min Winter	73.321	0.327	0.0	1.8	1.8	15.0	O K
2880 min Winter	73.135	0.141	0.0	1.8	1.8	6.5	O K
4320 min Winter	73.002	0.008	0.0	1.6	1.6	0.4	O K
5760 min Winter	72.994	0.000	0.0	1.3	1.3	0.0	O K
7200 min Winter	72.994	0.000	0.0	1.1	1.1	0.0	O K
8640 min Winter	72.994	0.000	0.0	1.0	1.0	0.0	O K
10080 min Winter	72.994	0.000	0.0	0.9	0.9	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	58.697	0.0	34.3	32
60 min Winter	38.241	0.0	44.7	62
120 min Winter	24.187	0.0	56.4	118
180 min Winter	18.342	0.0	64.2	174
240 min Winter	15.045	0.0	70.2	224
360 min Winter	11.345	0.0	79.5	282
480 min Winter	9.273	0.0	86.7	360
600 min Winter	7.926	0.0	92.6	438
720 min Winter	6.970	0.0	97.7	514
960 min Winter	5.688	0.0	106.3	664
1440 min Winter	4.270	0.0	119.7	964
2160 min Winter	3.203	0.0	134.7	1320
2880 min Winter	2.610	0.0	146.2	1620
4320 min Winter	1.953	0.0	164.1	2248
5760 min Winter	1.588	0.0	178.0	0
7200 min Winter	1.353	0.0	189.5	0
8640 min Winter	1.186	0.0	199.4	0
10080 min Winter	1.061	0.0	208.2	0

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7		
Date 25/02/2021 File Catchment 1 (New Road)....	Designed by BCU Checked by NCG	
Innovyze	Source Control 2018.1.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.200	Shortest Storm (mins)	15
Ratio R	0.274	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.139

Time (mins) From:	To:	Area (ha)
0	4	0.139

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7		
Date 25/02/2021 File Catchment 1 (New Road).....	Designed by BCU Checked by NCG	
Innovyze	Source Control 2018.1.1	

Model Details

Storage is Online Cover Level (m) 74.450

Cellular Storage Structure

Invert Level (m) 72.994 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	46.0	0.0	1.300	0.0	0.0
0.100	46.0	0.0	1.400	0.0	0.0
0.200	46.0	0.0	1.500	0.0	0.0
0.300	46.0	0.0	1.600	0.0	0.0
0.400	46.0	0.0	1.700	0.0	0.0
0.500	46.0	0.0	1.800	0.0	0.0
0.600	46.0	0.0	1.900	0.0	0.0
0.700	46.0	0.0	2.000	0.0	0.0
0.800	46.0	0.0	2.100	0.0	0.0
0.900	46.0	0.0	2.200	0.0	0.0
1.000	46.0	0.0	2.300	0.0	0.0
1.100	0.0	0.0	2.400	0.0	0.0
1.200	0.0	0.0	2.500	0.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0066-2000-1100-2000
Design Head (m)	1.100
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	66
Invert Level (m)	72.898
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	2.0
Flush-Flo™	0.289	1.8
Kick-Flo®	0.584	1.5
Mean Flow over Head Range	-	1.7

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

DBFL Consulting Engineers		Page 5
Ormond House Upper Ormond Quay Dublin 7		
Date 25/02/2021 File Catchment 1 (New Road)....	Designed by BCU Checked by NCG	
Innovyze	Source Control 2018.1.1	

Hydro-Brake® Optimum Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	1.200	2.1	3.000	3.2	7.000	4.7
0.200	1.8	1.400	2.2	3.500	3.4	7.500	4.9
0.300	1.8	1.600	2.4	4.000	3.6	8.000	5.0
0.400	1.8	1.800	2.5	4.500	3.8	8.500	5.1
0.500	1.7	2.000	2.6	5.000	4.0	9.000	5.3
0.600	1.5	2.200	2.7	5.500	4.2	9.500	5.4
0.800	1.7	2.400	2.9	6.000	4.4		
1.000	1.9	2.600	3.0	6.500	4.5		

Attenuation Structure Summary	
Site	Local Centre
Catchment Area	2
Type of Underground Structure	Concrete tank
Tank Base Dimensions (l x b) (m)	20.0 x 17.5
Depth (mm)	800
Underground Volume Provided (m^3)	280
Volume Required (m^3)	239.1
Total Volume provided (m^3)	280
Outflow Control	Hydro brake
Q_{bar} (l/sec)	1.6
Allowable Outflow (l/sec)	2
Outlet	750mm diameter pipe

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7		Micro Drainage
Date 25/02/2021 File Catchment 2 (Undeground...	Designed by BCU Checked by NCG	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 1034 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	73.872	0.222	0.0	2.0	2.0	67.6	O K
30 min Summer	73.955	0.305	0.0	2.0	2.0	93.2	O K
60 min Summer	74.042	0.392	0.0	2.0	2.0	119.6	O K
120 min Summer	74.133	0.483	0.0	2.0	2.0	147.2	O K
180 min Summer	74.186	0.536	0.0	2.0	2.0	163.5	O K
240 min Summer	74.222	0.572	0.0	2.0	2.0	174.6	O K
360 min Summer	74.268	0.618	0.0	2.0	2.0	188.4	O K
480 min Summer	74.293	0.643	0.0	2.0	2.0	196.3	O K
600 min Summer	74.308	0.658	0.0	2.0	2.0	200.7	O K
720 min Summer	74.316	0.666	0.0	2.0	2.0	203.0	O K
960 min Summer	74.317	0.667	0.0	2.0	2.0	203.6	O K
1440 min Summer	74.310	0.660	0.0	2.0	2.0	201.3	O K
2160 min Summer	74.293	0.643	0.0	2.0	2.0	196.1	O K
2880 min Summer	74.272	0.622	0.0	2.0	2.0	189.8	O K
4320 min Summer	74.223	0.573	0.0	2.0	2.0	174.8	O K
5760 min Summer	74.165	0.515	0.0	2.0	2.0	157.0	O K
7200 min Summer	74.093	0.443	0.0	2.0	2.0	135.2	O K
8640 min Summer	74.031	0.381	0.0	2.0	2.0	116.2	O K
10080 min Summer	73.976	0.326	0.0	2.0	2.0	99.4	O K
15 min Winter	73.899	0.249	0.0	2.0	2.0	76.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	84.666	0.0	70.2	26
30 min Summer	58.697	0.0	97.4	41
60 min Summer	38.241	0.0	126.9	70
120 min Summer	24.187	0.0	160.6	130
180 min Summer	18.342	0.0	182.7	188
240 min Summer	15.045	0.0	199.8	248
360 min Summer	11.345	0.0	226.0	366
480 min Summer	9.273	0.0	246.3	484
600 min Summer	7.926	0.0	263.2	602
720 min Summer	6.970	0.0	277.8	722
960 min Summer	5.688	0.0	302.2	916
1440 min Summer	4.270	0.0	304.1	1152
2160 min Summer	3.203	0.0	383.1	1556
2880 min Summer	2.610	0.0	416.1	1968
4320 min Summer	1.953	0.0	467.0	2812
5760 min Summer	1.588	0.0	506.5	3640
7200 min Summer	1.353	0.0	539.1	4400
8640 min Summer	1.186	0.0	567.3	5112
10080 min Summer	1.061	0.0	592.3	5848
15 min Winter	84.666	0.0	78.6	26

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7		Micro Drainage
Date 25/02/2021 File Catchment 2 (Undeground...	Designed by BCU Checked by NCG	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	73.994	0.344	0.0	2.0	2.0	105.0	O K
60 min Winter	74.093	0.443	0.0	2.0	2.0	135.0	O K
120 min Winter	74.198	0.548	0.0	2.0	2.0	167.0	O K
180 min Winter	74.259	0.609	0.0	2.0	2.0	185.7	O K
240 min Winter	74.301	0.651	0.0	2.0	2.0	198.7	O K
360 min Winter	74.357	0.707	0.0	2.0	2.0	215.5	O K
480 min Winter	74.390	0.740	0.0	2.0	2.0	225.7	O K
600 min Winter	74.411	0.761	0.0	2.0	2.0	232.1	O K
720 min Winter	74.424	0.774	0.0	2.0	2.0	236.0	O K
960 min Winter	74.434	0.784	0.0	2.0	2.0	239.1	O K
1440 min Winter	74.423	0.773	0.0	2.0	2.0	235.9	O K
2160 min Winter	74.398	0.748	0.0	2.0	2.0	228.3	O K
2880 min Winter	74.364	0.714	0.0	2.0	2.0	217.7	O K
4320 min Winter	74.284	0.634	0.0	2.0	2.0	193.3	O K
5760 min Winter	74.191	0.541	0.0	2.0	2.0	165.0	O K
7200 min Winter	74.073	0.423	0.0	2.0	2.0	128.9	O K
8640 min Winter	73.976	0.326	0.0	2.0	2.0	99.6	O K
10080 min Winter	73.898	0.248	0.0	2.0	2.0	75.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	58.697	0.0	109.1	40
60 min Winter	38.241	0.0	142.2	70
120 min Winter	24.187	0.0	179.8	128
180 min Winter	18.342	0.0	204.7	184
240 min Winter	15.045	0.0	223.8	242
360 min Winter	11.345	0.0	253.2	358
480 min Winter	9.273	0.0	275.9	474
600 min Winter	7.926	0.0	294.8	588
720 min Winter	6.970	0.0	311.1	700
960 min Winter	5.688	0.0	315.2	922
1440 min Winter	4.270	0.0	307.6	1310
2160 min Winter	3.203	0.0	428.9	1652
2880 min Winter	2.610	0.0	465.9	2132
4320 min Winter	1.953	0.0	523.0	3036
5760 min Winter	1.588	0.0	567.1	3976
7200 min Winter	1.353	0.0	603.8	4688
8640 min Winter	1.186	0.0	635.4	5368
10080 min Winter	1.061	0.0	663.3	6056

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7		
Date 25/02/2021 File Catchment 2 (Undeground...	Designed by BCU Checked by NCG	
Innovyze	Source Control 2018.1.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.200	Shortest Storm (mins)	15
Ratio R	0.274	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.443

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.163	4	8	0.140	8	12	0.140

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7		Micro Drainage
Date 25/02/2021 File Catchment 2 (Undeground...	Designed by BCU Checked by NCG	
Innovyze	Source Control 2018.1.1	

Model Details

Storage is Online Cover Level (m) 75.200

Cellular Storage Structure

Invert Level (m) 73.650 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	305.0	0.0	1.300	0.0	0.0
0.100	305.0	0.0	1.400	0.0	0.0
0.200	305.0	0.0	1.500	0.0	0.0
0.300	305.0	0.0	1.600	0.0	0.0
0.400	305.0	0.0	1.700	0.0	0.0
0.500	305.0	0.0	1.800	0.0	0.0
0.600	305.0	0.0	1.900	0.0	0.0
0.700	305.0	0.0	2.000	0.0	0.0
0.800	305.0	0.0	2.100	0.0	0.0
0.900	0.0	0.0	2.200	0.0	0.0
1.000	0.0	0.0	2.300	0.0	0.0
1.100	0.0	0.0	2.400	0.0	0.0
1.200	0.0	0.0	2.500	0.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0069-2000-0900-2000
Design Head (m)	0.900
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	69
Invert Level (m)	73.586
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	2.0
Flush-Flo™	0.278	2.0
Kick-Flo®	0.568	1.6
Mean Flow over Head Range	-	1.8

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

DBFL Consulting Engineers		Page 5
Ormond House Upper Ormond Quay Dublin 7		Micro Drainage
Date 25/02/2021 File Catchment 2 (Undeground...	Designed by BCU Checked by NCG	
Innovyze	Source Control 2018.1.1	

Hydro-Brake® Optimum Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.7	1.200	2.3	3.000	3.5	7.000	5.2
0.200	2.0	1.400	2.4	3.500	3.7	7.500	5.3
0.300	2.0	1.600	2.6	4.000	4.0	8.000	5.5
0.400	1.9	1.800	2.7	4.500	4.2	8.500	5.7
0.500	1.8	2.000	2.9	5.000	4.4	9.000	5.8
0.600	1.7	2.200	3.0	5.500	4.6	9.500	6.0
0.800	1.9	2.400	3.1	6.000	4.8		
1.000	2.1	2.600	3.2	6.500	5.0		

Attenuation Structure Summary	
Site	Local Centre
Catchment Area	3
Type of Overground Structure	Unlined Detention Basin
Average Water Depth of Overground Structure (mm)	900
Overground Structure Base Area (m^2)	197
Base slope (1V:XH)	5
Volume required (m^3)	266.7
Total Provided Volume	xxx
Outflow Control	Hydro brake
Q_{bar} (l/sec)	3.3
Allowable Outflow (l/sec)	3.3
Outlet	750mm diameter pipe

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7		Micro Drainage
Date 25/02/2021 File Catchment 3 (Park).srcx	Designed by BCU Checked by NCG	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 705 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	73.564	0.340	0.0	3.3	3.3	81.8	O K
30 min Summer	73.673	0.449	0.0	3.3	3.3	112.8	O K
60 min Summer	73.777	0.553	0.0	3.3	3.3	144.4	O K
120 min Summer	73.879	0.655	0.0	3.3	3.3	177.1	O K
180 min Summer	73.932	0.708	0.0	3.3	3.3	195.1	O K
240 min Summer	73.966	0.742	0.0	3.3	3.3	206.8	O K
360 min Summer	74.002	0.778	0.0	3.3	3.3	220.1	O K
480 min Summer	74.019	0.795	0.0	3.3	3.3	226.3	O K
600 min Summer	74.025	0.801	0.0	3.3	3.3	228.4	O K
720 min Summer	74.027	0.803	0.0	3.3	3.3	229.1	O K
960 min Summer	74.025	0.801	0.0	3.3	3.3	228.6	O K
1440 min Summer	74.014	0.790	0.0	3.3	3.3	224.2	O K
2160 min Summer	73.986	0.762	0.0	3.3	3.3	214.0	O K
2880 min Summer	73.951	0.727	0.0	3.3	3.3	201.7	O K
4320 min Summer	73.867	0.643	0.0	3.3	3.3	173.2	O K
5760 min Summer	73.759	0.535	0.0	3.3	3.3	138.5	O K
7200 min Summer	73.666	0.442	0.0	3.3	3.3	110.5	O K
8640 min Summer	73.587	0.363	0.0	3.3	3.3	87.9	O K
10080 min Summer	73.521	0.297	0.0	3.3	3.3	70.2	O K
15 min Winter	73.601	0.377	0.0	3.3	3.3	92.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	84.666	0.0	83.9	26
30 min Summer	58.697	0.0	116.5	40
60 min Summer	38.241	0.0	153.3	70
120 min Summer	24.187	0.0	194.0	128
180 min Summer	18.342	0.0	220.7	186
240 min Summer	15.045	0.0	241.4	246
360 min Summer	11.345	0.0	273.1	364
480 min Summer	9.273	0.0	297.6	482
600 min Summer	7.926	0.0	317.9	586
720 min Summer	6.970	0.0	335.3	636
960 min Summer	5.688	0.0	364.6	766
1440 min Summer	4.270	0.0	409.3	1030
2160 min Summer	3.203	0.0	463.9	1452
2880 min Summer	2.610	0.0	503.9	1872
4320 min Summer	1.953	0.0	565.3	2692
5760 min Summer	1.588	0.0	613.8	3416
7200 min Summer	1.353	0.0	653.4	4112
8640 min Summer	1.186	0.0	687.4	4840
10080 min Summer	1.061	0.0	717.3	5456
15 min Winter	84.666	0.0	94.0	26

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7		Micro Drainage
Date 25/02/2021 File Catchment 3 (Park).srcx	Designed by BCU Checked by NCG	
Innovyze	Source Control 2018.1.1	

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	73.721	0.497	0.0	3.3	3.3	126.9	O K
60 min Winter	73.836	0.612	0.0	3.3	3.3	163.1	O K
120 min Winter	73.947	0.723	0.0	3.3	3.3	200.3	O K
180 min Winter	74.006	0.782	0.0	3.3	3.3	221.2	O K
240 min Winter	74.043	0.819	0.0	3.3	3.3	235.2	O K
360 min Winter	74.086	0.862	0.0	3.3	3.3	252.1	O K
480 min Winter	74.108	0.884	0.0	3.3	3.3	260.9	O K
600 min Winter	74.119	0.895	0.0	3.3	3.3	265.2	O K
720 min Winter	74.122	0.898	0.0	3.3	3.3	266.7	O K
960 min Winter	74.118	0.894	0.0	3.3	3.3	264.7	O K
1440 min Winter	74.101	0.877	0.0	3.3	3.3	258.1	O K
2160 min Winter	74.058	0.834	0.0	3.3	3.3	241.2	O K
2880 min Winter	74.004	0.780	0.0	3.3	3.3	220.6	O K
4320 min Winter	73.868	0.644	0.0	3.3	3.3	173.6	O K
5760 min Winter	73.690	0.466	0.0	3.3	3.3	117.7	O K
7200 min Winter	73.554	0.330	0.0	3.3	3.3	79.1	O K
8640 min Winter	73.456	0.232	0.0	3.3	3.3	53.5	O K
10080 min Winter	73.391	0.167	0.0	3.1	3.1	38.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	58.697	0.0	130.6	40
60 min Winter	38.241	0.0	171.8	68
120 min Winter	24.167	0.0	217.3	126
180 min Winter	18.342	0.0	247.3	184
240 min Winter	15.045	0.0	270.4	240
360 min Winter	11.345	0.0	305.8	356
480 min Winter	9.273	0.0	333.2	468
600 min Winter	7.926	0.0	355.9	580
720 min Winter	6.970	0.0	375.4	686
960 min Winter	5.688	0.0	408.0	872
1440 min Winter	4.270	0.0	456.2	1102
2160 min Winter	3.203	0.0	519.6	1568
2880 min Winter	2.610	0.0	564.4	2024
4320 min Winter	1.953	0.0	633.1	2940
5760 min Winter	1.588	0.0	687.5	3584
7200 min Winter	1.353	0.0	731.9	4256
8640 min Winter	1.186	0.0	770.0	4848
10080 min Winter	1.061	0.0	803.5	5448

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7		
Date 25/02/2021 File Catchment 3 (Park).srcx	Designed by BCU Checked by NCG	
Innovyze	Source Control 2018.1.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.200	Shortest Storm (mins)	15
Ratio R	0.274	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.537

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.200	4	8	0.167	8	12	0.170

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7		
Date 25/02/2021 File Catchment 3 (Park).srcx	Designed by BCU Checked by NCG	
Innovyze	Source Control 2018.1.1	

Model Details

Storage is Online Cover Level (m) 74.900

Cellular Storage Structure

Invert Level (m) 73.224 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	220.0	0.0	1.300	0.0	0.0
0.100	230.0	0.0	1.400	0.0	0.0
0.200	237.0	0.0	1.500	0.0	0.0
0.300	265.0	0.0	1.600	0.0	0.0
0.400	285.0	0.0	1.700	0.0	0.0
0.500	305.0	0.0	1.800	0.0	0.0
0.600	320.0	0.0	1.900	0.0	0.0
0.700	342.0	0.0	2.000	0.0	0.0
0.800	375.0	0.0	2.100	0.0	0.0
0.900	410.0	0.0	2.200	0.0	0.0
1.000	0.0	0.0	2.300	0.0	0.0
1.100	0.0	0.0	2.400	0.0	0.0
1.200	0.0	0.0	2.500	0.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0086-3300-1000-3300
Design Head (m)	1.000
Design Flow (l/s)	3.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	86
Invert Level (m)	73.224
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.3
Flush-Flo™	0.296	3.3
Kick-Flo®	0.624	2.7
Mean Flow over Head Range	-	2.9

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

DBFL Consulting Engineers		Page 5
Ormond House Upper Ormond Quay Dublin 7		
Date 25/02/2021 File Catchment 3 (Park).srcx	Designed by BCU Checked by NCG	
Innovyze	Source Control 2018.1.1	

Hydro-Brake® Optimum Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.6	1.200	3.6	3.000	5.5	7.000	8.2
0.200	3.2	1.400	3.9	3.500	5.9	7.500	8.5
0.300	3.3	1.600	4.1	4.000	6.3	8.000	8.7
0.400	3.2	1.800	4.3	4.500	6.6	8.500	9.0
0.500	3.1	2.000	4.5	5.000	7.0	9.000	9.2
0.600	2.8	2.200	4.8	5.500	7.3	9.500	9.5
0.800	3.0	2.400	4.9	6.000	7.6		
1.000	3.3	2.600	5.1	6.500	7.9		

APPENDIX D

SURFACE WATER NETWORK CALCULATIONS

Site 2: Catchment Area 1

Surface Water Network

Impermeability Factor (%): 50.3

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	Hollystown	Micro Drainage
Date 04/10/2021 14:50 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Site 2 : Catchment 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	PIMP (%)	75
M5-60 (mm)	16.200	Add Flow / Climate Change (%)	20
Ratio R	0.272	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	100	Maximum Backdrop Height (m)	1.200
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Site 2 : Catchment 1

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.470	4-8	0.777	8-12	0.097

Total Area Contributing (ha) = 1.343

Total Pipe Volume (m³) = 50.635

Network Design Table for Site 2 : Catchment 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	27.209	0.160	170.1	0.134	4.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	14.423	0.085	169.7	0.051	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	55.370	0.326	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	14.721	0.087	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	37.401	0.115	325.2	0.059	0.00	0.0	0.600	o	375	Pipe/Conduit	
2.000	54.735	0.771	71.0	0.019	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.47	4.45	72.380	0.134	0.0	0.0	4.9	1.00	39.7	29.2
1.001	49.54	4.69	72.220	0.185	0.0	0.0	6.6	1.00	39.8	39.6
1.002	46.36	5.62	72.135	0.185	0.0	0.0	6.6	1.00	39.8	39.6
1.003	45.59	5.86	71.809	0.185	0.0	0.0	6.6	1.00	39.8	39.6
1.004	43.78	6.49	71.572	0.243	0.0	0.0	7.7	1.00	110.4	46.1
2.000	49.95	4.59	72.775	0.019	0.0	0.0	0.7	1.55	61.8	4.1

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:50 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Site 2 : Catchment 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
3.000	11.146	0.066	168.9	0.062	4.00	0.0	0.600	o	225	Pipe/Conduit	
3.001	10.322	0.205	50.4	0.021	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	10.577	0.062	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.002	56.111	0.335	167.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	7.743	0.028	276.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
4.000	48.923	0.321	152.4	0.071	4.00	0.0	0.600	o	225	Pipe/Conduit	
1.006	50.921	0.127	401.0	0.143	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.007	10.649	0.027	400.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
5.000	56.598	0.231	245.0	0.047	4.00	0.0	0.600	o	300	Pipe/Conduit	
5.001	4.475	0.018	245.0	0.008	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.008	46.455	0.116	400.5	0.128	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.009	14.849	0.037	400.0	0.055	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.010	12.672	0.032	396.0	0.055	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.011	19.466	0.039	499.1	0.158	0.00	0.0	0.600	o	525	Pipe/Conduit	
1.012	5.924	0.012	493.7	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.000	51.55	4.19	72.275	0.062	0.0	0.0	2.3	1.00	39.9	13.9
3.001	51.17	4.28	72.209	0.083	0.0	0.0	3.1	1.85	73.5	18.5
2.001	49.29	4.76	72.004	0.102	0.0	0.0	3.6	1.00	39.8	21.8
2.002	46.12	5.69	71.942	0.102	0.0	0.0	3.6	1.01	40.1	21.8
1.005	43.46	6.60	71.457	0.345	0.0	0.0	10.8	1.08	119.8	65.0
4.000	49.25	4.77	71.900	0.071	0.0	0.0	2.5	1.06	42.0	15.2
1.006	41.33	7.45	71.354	0.559	0.0	0.0	16.7	1.01	160.5	100.1
1.007	40.91	7.62	71.227	0.559	0.0	0.0	16.7	1.01	160.7	100.1
5.000	48.63	4.94	71.557	0.047	0.0	0.0	1.6	1.00	70.7	9.8
5.001	48.36	5.02	71.326	0.054	0.0	0.0	1.9	1.00	70.7	11.3
1.008	39.23	8.39	71.200	0.740	0.0	0.0	21.0	1.01	160.6	125.8
1.009	38.72	8.63	71.084	0.795	0.0	0.0	22.2	1.01	160.7	133.4
1.010	38.31	8.84	71.047	0.850	0.0	0.0	23.5	1.02	161.5	141.1
1.011	37.68	9.17	70.940	1.007	0.0	0.0	27.4	1.00	215.6	164.5
1.012	37.50	9.27	70.901	1.007	0.0	0.0	27.4	1.00	216.8	164.5

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:50 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Site 2 : Catchment 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.013	5.000	0.001	5000.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.013	37.10	9.48	70.889	1.007	0.0	0.0	27.4	0.39	170.5	164.5

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:50 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Manhole Schedules for Site 2 : Catchment 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SA11	73.838	1.458	Open Manhole	1200	1.000	72.380	225				
SA10	73.556	1.336	Open Manhole	1200	1.001	72.220	225	1.000	72.220	225	
SA9-1	73.429	1.294	Open Manhole	1200	1.002	72.135	225	1.001	72.135	225	
SA9	72.933	1.124	Open Manhole	1200	1.003	71.809	225	1.002	71.809	225	
SA8	72.904	1.332	Open Manhole	1350	1.004	71.572	375	1.003	71.722	225	
SA7-5	74.200	1.425	Open Manhole	1200	2.000	72.775	225				
SA7-4	73.785	1.510	Open Manhole	1200	3.000	72.275	225				
SA7-3	73.771	1.562	Open Manhole	1200	3.001	72.209	225	3.000	72.209	225	
SA7-2	73.664	1.660	Open Manhole	1200	2.001	72.004	225	2.000	72.004	225	
								3.001	72.004	225	
SA7-1	73.584	1.642	Open Manhole	1200	2.002	71.942	225	2.001	71.942	225	
SA7	73.201	1.744	Open Manhole	1350	1.005	71.457	375	1.004	71.457	375	
								2.002	71.607	225	
SA6-1	73.954	2.054	Open Manhole	1200	4.000	71.900	225				
SA6	73.247	1.893	Open Manhole	1350	1.006	71.354	450	1.005	71.429	375	
								4.000	71.579	225	
SA5	73.130	1.903	Open Manhole	1350	1.007	71.227	450	1.006	71.227	450	
SA4-2	72.607	1.050	Open Manhole	1200	5.000	71.557	300				
SA4-1	73.015	1.689	Open Manhole	1200	5.001	71.326	300	5.000	71.326	300	
SA4	73.011	1.811	Open Manhole	1350	1.008	71.200	450	1.007	71.200	450	
								5.001	71.308	300	
SA3	72.434	1.350	Open Manhole	1350	1.009	71.084	450	1.008	71.084	450	
SA2	72.000	0.953	Open Manhole	1350	1.010	71.047	450	1.009	71.047	450	
SA1	72.000	1.060	Open Manhole	1500	1.011	70.940	525	1.010	71.015	450	
SA0	72.000	1.099	Open Manhole	1500	1.012	70.901	525	1.011	70.901	525	
BASIN	72.000	1.111	Open Manhole	1800	1.013	70.889	750	1.012	70.889	525	
SA00	72.400	1.512	Open Manhole	300		OUTFALL		1.013	70.888	750	

DBFL Consulting Engineers		Page 5
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:50 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

PIPELINE SCHEDULES for Site 2 : Catchment 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	SA11	73.838	72.380	1.233	Open Manhole	1200
1.001	o	225	SA10	73.556	72.220	1.111	Open Manhole	1200
1.002	o	225	SA9-1	73.429	72.135	1.069	Open Manhole	1200
1.003	o	225	SA9	72.933	71.809	0.899	Open Manhole	1200
1.004	o	375	SA8	72.904	71.572	0.957	Open Manhole	1350
2.000	o	225	SA7-5	74.200	72.775	1.200	Open Manhole	1200
3.000	o	225	SA7-4	73.785	72.275	1.285	Open Manhole	1200
3.001	o	225	SA7-3	73.771	72.209	1.337	Open Manhole	1200
2.001	o	225	SA7-2	73.664	72.004	1.435	Open Manhole	1200
2.002	o	225	SA7-1	73.584	71.942	1.417	Open Manhole	1200
1.005	o	375	SA7	73.201	71.457	1.369	Open Manhole	1350
4.000	o	225	SA6-1	73.954	71.900	1.829	Open Manhole	1200
1.006	o	450	SA6	73.247	71.354	1.443	Open Manhole	1350
1.007	o	450	SA5	73.130	71.227	1.453	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	27.209	170.1	SA10	73.556	72.220	1.111	Open Manhole	1200
1.001	14.423	169.7	SA9-1	73.429	72.135	1.069	Open Manhole	1200
1.002	55.370	170.0	SA9	72.933	71.809	0.898	Open Manhole	1200
1.003	14.721	170.0	SA8	72.904	71.722	0.957	Open Manhole	1350
1.004	37.401	325.2	SA7	73.201	71.457	1.369	Open Manhole	1350
2.000	54.735	71.0	SA7-2	73.664	72.004	1.435	Open Manhole	1200
3.000	11.146	168.9	SA7-3	73.771	72.209	1.337	Open Manhole	1200
3.001	10.322	50.4	SA7-2	73.664	72.004	1.435	Open Manhole	1200
2.001	10.577	170.0	SA7-1	73.584	71.942	1.417	Open Manhole	1200
2.002	56.111	167.5	SA7	73.201	71.607	1.369	Open Manhole	1350
1.005	7.743	276.5	SA6	73.247	71.429	1.443	Open Manhole	1350
4.000	48.923	152.4	SA6	73.247	71.579	1.443	Open Manhole	1350
1.006	50.921	401.0	SA5	73.130	71.227	1.453	Open Manhole	1350
1.007	10.649	400.0	SA4	73.011	71.200	1.360	Open Manhole	1350

DBFL Consulting Engineers		Page 6
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:50 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

PIPELINE SCHEDULES for Site 2 : Catchment 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.000	o	300	SA4-2	72.607	71.557	0.750	Open Manhole	1200
5.001	o	300	SA4-1	73.015	71.326	1.389	Open Manhole	1200
1.008	o	450	SA4	73.011	71.200	1.361	Open Manhole	1350
1.009	o	450	SA3	72.434	71.084	0.900	Open Manhole	1350
1.010	o	450	SA2	72.000	71.047	0.503	Open Manhole	1350
1.011	o	525	SA1	72.000	70.940	0.535	Open Manhole	1500
1.012	o	525	SA0	72.000	70.901	0.574	Open Manhole	1500
1.013	o	750	BASIN	72.000	70.889	0.511	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.000	56.598	245.0	SA4-1	73.015	71.326	1.389	Open Manhole	1200
5.001	4.475	245.0	SA4	73.011	71.308	1.403	Open Manhole	1350
1.008	46.455	400.5	SA3	72.434	71.084	0.900	Open Manhole	1350
1.009	14.849	400.0	SA2	72.000	71.047	0.503	Open Manhole	1350
1.010	12.672	396.0	SA1	72.000	71.015	0.535	Open Manhole	1500
1.011	19.466	499.1	SA0	72.000	70.901	0.574	Open Manhole	1500
1.012	5.924	493.7	BASIN	72.000	70.889	0.586	Open Manhole	1800
1.013	5.000	5000.0	SA00	72.400	70.888	0.912	Open Manhole	300

DBFL Consulting Engineers		Page 7
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:50 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Area Summary for Site 2 : Catchment 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	75	0.178	0.134	0.134
1.001	-	-	75	0.068	0.051	0.051
1.002	-	-	75	0.000	0.000	0.000
1.003	-	-	75	0.000	0.000	0.000
1.004	-	-	75	0.078	0.059	0.059
2.000	-	-	75	0.025	0.019	0.019
3.000	-	-	75	0.083	0.062	0.062
3.001	-	-	75	0.028	0.021	0.021
2.001	-	-	75	0.000	0.000	0.000
2.002	-	-	75	0.000	0.000	0.000
1.005	-	-	75	0.000	0.000	0.000
4.000	-	-	75	0.095	0.071	0.071
1.006	-	-	75	0.190	0.143	0.143
1.007	-	-	75	0.000	0.000	0.000
5.000	-	-	75	0.062	0.047	0.047
5.001	-	-	75	0.010	0.008	0.008
1.008	-	-	75	0.170	0.128	0.128
1.009	-	-	75	0.073	0.055	0.055
1.010	-	-	75	0.073	0.055	0.055
1.011	-	-	75	0.210	0.158	0.158
1.012	-	-	75	0.000	0.000	0.000
1.013	-	-	75	0.000	0.000	0.000
				Total	Total	Total
				1.343	1.007	1.007

Free Flowing Outfall Details for Site 2 : Catchment 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.013	SA00	72.400	70.888	0.000	300	0

Simulation Criteria for Site 2 : Catchment 1

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

DBFL Consulting Engineers		Page 8
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:50 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	2	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.200	Storm Duration (mins)	30
Ratio R	0.272		

DBFL Consulting Engineers		Page 9
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:50 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Online Controls for Site 2 : Catchment 1

Hydro-Brake® Optimum Manhole: BASIN, DS/PN: 1.013, Volume (m³): 3.8

Unit Reference	MD-SHE-0091-3600-0920-3600
Design Head (m)	0.920
Design Flow (l/s)	3.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	91
Invert Level (m)	70.889
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.920	3.6
Flush-Flo™	0.271	3.6
Kick-Flo®	0.584	2.9
Mean Flow over Head Range	-	3.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.9	1.200	4.1	3.000	6.2	7.000	9.3
0.200	3.5	1.400	4.4	3.500	6.7	7.500	9.6
0.300	3.6	1.600	4.6	4.000	7.1	8.000	9.9
0.400	3.5	1.800	4.9	4.500	7.6	8.500	10.2
0.500	3.3	2.000	5.2	5.000	7.9	9.000	10.5
0.600	3.0	2.200	5.4	5.500	8.3	9.500	10.8
0.800	3.4	2.400	5.6	6.000	8.7		
1.000	3.7	2.600	5.8	6.500	9.0		

Site 2: Catchment Area 2

Surface Water Network

Impermeability Factor (%): 48.8

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	Hollystown	Micro Drainage
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Site 2 : Catchment 2

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	PIMP (%)	75
M5-60 (mm)	16.200	Add Flow / Climate Change (%)	0
Ratio R	0.272	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	100	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Site 2 : Catchment 2 at outfall SC0 (pipe 8.004)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.276	4-8	0.129

Total Area Contributing (ha) = 0.405

Total Pipe Volume (m³) = 7.638

Time Area Diagram at outfall SB0 (pipe 9.012)

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.442	4-8	1.982	8-12	0.354

Total Area Contributing (ha) = 3.778

Total Pipe Volume (m³) = 96.965

Network Design Table for Site 2 : Catchment 2

\# - Indicates pipe length does not match coordinates

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design

Network Results Table

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Site 2 : Catchment 2

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
8.000	23.825	0.140	170.2	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
8.001	3.568	0.021	170.0	0.034	0.00	0.0	0.600	o	225	Pipe/Conduit	
8.002	74.292	0.437	170.0	0.071	0.00	0.0	0.600	o	225	Pipe/Conduit	
8.003	45.862	0.187	245.0	0.199	0.00	0.0	0.600	o	300	Pipe/Conduit	
8.004	5.000	0.028	178.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
9.000	64.495	0.379	170.2	0.170	4.00	0.0	0.600	o	225	Pipe/Conduit	
9.001	9.761	0.030	325.0	0.257	0.00	0.0	0.600	o	375	Pipe/Conduit	
9.002	68.244	0.210	325.0	0.083	0.00	0.0	0.600	o	375	Pipe/Conduit	
9.003	12.502	0.050	248.2	0.173	0.00	0.0	0.600	o	375	Pipe/Conduit	
10.000	38.147	0.224	170.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
9.004	69.912	0.218	320.7	0.029	0.00	0.0	0.600	o	375	Pipe/Conduit	
9.005	5.278	0.016	329.9	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
9.006	79.040	1.228	64.4	0.173	0.00	0.0	0.600	o	375	Pipe/Conduit	
11.000	18.720	0.122	153.4	0.108	4.00	0.0	0.600	o	225	Pipe/Conduit	
9.007	72.924	0.336	217.3	0.099	0.00	0.0	0.600	o	450	Pipe/Conduit	
12.000	64.602	0.380	170.0	0.031	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
8.000	50.69	4.40	70.720	0.000	0.0	0.0	0.0	1.00	39.7	0.0
8.001	50.46	4.46	70.580	0.034	0.0	0.0	0.0	1.00	39.8	6.1
8.002	46.11	5.70	70.559	0.105	0.0	0.0	0.0	1.00	39.8	17.5
8.003	43.86	6.46	70.047	0.304	0.0	0.0	0.0	1.00	70.7	48.1
8.004	43.66	6.53	69.860	0.304	0.0	0.0	0.0	1.17	82.9	48.1
9.000	48.16	5.08	72.975	0.170	0.0	0.0	0.0	1.00	39.7	29.5
9.001	47.60	5.24	72.446	0.427	0.0	0.0	0.0	1.00	110.4	73.4
9.002	44.09	6.38	72.416	0.509	0.0	0.0	0.0	1.00	110.4	81.1
9.003	43.59	6.56	72.206	0.682	0.0	0.0	0.0	1.15	126.5	107.3
10.000	49.76	4.64	72.530	0.000	0.0	0.0	0.0	1.00	39.8	0.0
9.004	40.70	7.72	72.156	0.710	0.0	0.0	0.0	1.01	111.1	107.3
9.005	40.49	7.80	71.938	0.710	0.0	0.0	0.0	0.99	109.6	107.3
9.006	39.23	8.39	71.922	0.883	0.0	0.0	0.0	2.26	249.8	125.0
11.000	51.10	4.30	70.966	0.108	0.0	0.0	0.0	1.05	41.9	19.9
9.007	37.49	9.27	70.619	1.090	0.0	0.0	0.0	1.38	218.7	147.5
12.000	48.16	5.08	71.630	0.031	0.0	0.0	0.0	1.00	39.8	5.3

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Site 2 : Catchment 2

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
12.001	66.614	0.272	245.0	0.308	0.00	0.0	0.600	o	300	Pipe/Conduit	
12.002	8.468	0.035	245.0	0.236	0.00	0.0	0.600	o	375	Pipe/Conduit	
13.000	42.552	0.372	114.4	0.169	4.00	0.0	0.600	o	225	Pipe/Conduit	
13.001	12.398	0.073	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
12.003	5.381	0.054	99.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
9.008	56.403	0.113	500.0	0.202	0.00	0.0	0.600	o	600	Pipe/Conduit	
9.009	18.059	0.060	301.0	0.184	0.00	0.0	0.600	o	600	Pipe/Conduit	
14.000	51.877	0.305	170.1	0.100	4.00	0.0	0.600	o	225	Pipe/Conduit	
14.001	33.040	0.135	245.0	0.161	0.00	0.0	0.600	o	300	Pipe/Conduit	
14.002	80.547	0.329	245.0	0.137	0.00	0.0	0.600	o	300	Pipe/Conduit	
14.003	6.600	0.020	325.0	0.124	0.00	0.0	0.600	o	375	Pipe/Conduit	
9.010	7.540#	0.015	502.7	0.094	0.00	0.0	0.600	o	675	Pipe/Conduit	
9.011	5.000#	0.008	600.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
9.012	12.988	0.026	499.5	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
12.001	44.63	6.19	71.175	0.338	0.0	0.0	0.0	1.00	70.7	54.5
12.002	44.28	6.31	70.828	0.575	0.0	0.0	0.0	1.15	127.4	91.9
13.000	49.98	4.58	71.007	0.169	0.0	0.0	0.0	1.22	48.6	30.5
13.001	49.20	4.79	70.635	0.169	0.0	0.0	0.0	1.00	39.8	30.5
12.003	44.14	6.36	70.412	0.743	0.0	0.0	0.0	1.82	200.5	118.5
9.008	35.95	10.14	70.133	2.035	0.0	0.0	0.0	1.08	306.0	264.2
9.009	35.60	10.35	70.020	2.219	0.0	0.0	0.0	1.40	395.4	285.2
14.000	48.91	4.86	71.124	0.100	0.0	0.0	0.0	1.00	39.7	17.6
14.001	47.01	5.42	70.744	0.261	0.0	0.0	0.0	1.00	70.7	44.3
14.002	43.05	6.76	70.609	0.398	0.0	0.0	0.0	1.00	70.7	61.8
14.003	42.76	6.87	70.205	0.521	0.0	0.0	0.0	1.00	110.4	80.5
9.010	35.42	10.46	69.885	2.834	0.0	0.0	0.0	1.16	415.9	362.4
9.011	35.30	10.54	69.795	2.834	0.0	0.0	0.0	1.14	501.5	362.4
9.012	35.03	10.71	69.787	2.834	0.0	0.0	0.0	1.25	550.1	362.4

DBFL Consulting Engineers		Page 5
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Manhole Schedules for Site 2 : Catchment 2

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SC4	72.007	1.287	Open Manhole	1200	8.000	70.720	225				
SC3	72.260	1.680	Open Manhole	1200	8.001	70.580	225	8.000	70.580	225	
SC2	72.310	1.751	Open Manhole	1200	8.002	70.559	225	8.001	70.559	225	
SC1	71.485	1.438	Open Manhole	1200	8.003	70.047	300	8.002	70.122	225	
BASIN1	71.400	1.540	Open Manhole	1200	8.004	69.860	300	8.003	69.860	300	
SC0	70.911	1.079	Open Manhole	1200		OUTFALL		8.004	69.832	300	
SB11	74.385	1.410	Open Manhole	1200	9.000	72.975	225				
SB10	74.096	1.650	Open Manhole	1350	9.001	72.446	375	9.000	72.596	225	
SB9	73.909	1.493	Open Manhole	1350	9.002	72.416	375	9.001	72.416	375	
SB8	73.405	1.199	Open Manhole	1350	9.003	72.206	375	9.002	72.206	375	
SB8-1	73.259	0.729	Open Manhole	1200	10.000	72.530	225				
SB7	73.491	1.336	Open Manhole	1350	9.004	72.156	375	9.003	72.156	375	
								10.000	72.306	225	
SB6	73.576	1.638	Open Manhole	1350	9.005	71.938	375	9.004	71.938	375	
SB5	73.615	1.693	Open Manhole	1350	9.006	71.922	375	9.005	71.922	375	
SB4-1	72.391	1.425	Open Manhole	1200	11.000	70.966	225				
SB4	72.542	1.923	Open Manhole	1350	9.007	70.619	450	9.006	70.694	375	
								11.000	70.844	225	
SB3-6	73.055	1.425	Open Manhole	1200	12.000	71.630	225				
SB3-5	73.033	1.858	Open Manhole	1200	12.001	71.175	300	12.000	71.250	225	
SB3-4	72.345	1.517	Open Manhole	1350	12.002	70.828	375	12.001	70.903	300	
SB3-3	72.432	1.425	Open Manhole	1200	13.000	71.007	225				
SB3-2	72.254	1.619	Open Manhole	1200	13.001	70.635	225	13.000	70.635	225	
SB3-1	72.307	1.895	Open Manhole	1350	12.003	70.412	375	12.002	70.794	375	381
								13.001	70.562	225	
SB3	72.247	2.114	Open Manhole	1500	9.008	70.133	600	9.007	70.283	450	
								12.003	70.358	375	
SB2	71.426	1.406	Open Manhole	1500	9.009	70.020	600	9.008	70.020	600	
SB1-5	72.442	1.318	Open Manhole	1200	14.000	71.124	225				
SB1-4	72.058	1.314	Open Manhole	1200	14.001	70.744	300	14.000	70.819	225	
SB1-3	72.030	1.421	Open Manhole	1200	14.002	70.609	300	14.001	70.609	300	
SB1-2	71.362	1.156	Open Manhole	1350	14.003	70.205	375	14.002	70.280	300	
SB1	71.282	1.397	Open Manhole	1500	9.010	69.885	675	9.009	69.960	600	
								14.003	70.185	375	
SB0	71.409	1.614	Open Manhole	1800	9.011	69.795	750	9.010	69.870	675	
BASIN	71.400	1.613	Open Manhole	1800	9.012	69.787	750	9.011	69.787	750	
SB0	71.000	1.239	Open Manhole	1500		OUTFALL		9.012	69.761	750	

DBFL Consulting Engineers		Page 6
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

PIPELINE SCHEDULES for Site 2 : Catchment 2

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
8.000	o	225	SC4	72.007	70.720	1.062	Open Manhole	1200
8.001	o	225	SC3	72.260	70.580	1.455	Open Manhole	1200
8.002	o	225	SC2	72.310	70.559	1.526	Open Manhole	1200
8.003	o	300	SC1	71.485	70.047	1.138	Open Manhole	1200
8.004	o	300	BASIN1	71.400	69.860	1.240	Open Manhole	1200
9.000	o	225	SB11	74.385	72.975	1.185	Open Manhole	1200
9.001	o	375	SB10	74.096	72.446	1.275	Open Manhole	1350
9.002	o	375	SB9	73.909	72.416	1.118	Open Manhole	1350
9.003	o	375	SB8	73.405	72.206	0.824	Open Manhole	1350
10.000	o	225	SB8-1	73.259	72.530	0.504	Open Manhole	1200
9.004	o	375	SB7	73.491	72.156	0.961	Open Manhole	1350
9.005	o	375	SB6	73.576	71.938	1.263	Open Manhole	1350
9.006	o	375	SB5	73.615	71.922	1.318	Open Manhole	1350
11.000	o	225	SB4-1	72.391	70.966	1.200	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
8.000	23.825	170.2	SC3	72.260	70.580	1.455	Open Manhole	1200
8.001	3.568	170.0	SC2	72.310	70.559	1.526	Open Manhole	1200
8.002	74.292	170.0	SC1	71.485	70.122	1.138	Open Manhole	1200
8.003	45.862	245.0	BASIN1	71.400	69.860	1.240	Open Manhole	1200
8.004	5.000	178.6	SC0	70.911	69.832	0.779	Open Manhole	1200
9.000	64.495	170.2	SB10	74.096	72.596	1.275	Open Manhole	1350
9.001	9.761	325.0	SB9	73.909	72.416	1.118	Open Manhole	1350
9.002	68.244	325.0	SB8	73.405	72.206	0.824	Open Manhole	1350
9.003	12.502	248.2	SB7	73.491	72.156	0.961	Open Manhole	1350
10.000	38.147	170.0	SB7	73.491	72.306	0.961	Open Manhole	1350
9.004	69.912	320.7	SB6	73.576	71.938	1.263	Open Manhole	1350
9.005	5.278	329.9	SB5	73.615	71.922	1.318	Open Manhole	1350
9.006	79.040	64.4	SB4	72.542	70.694	1.473	Open Manhole	1350
11.000	18.720	153.4	SB4	72.542	70.844	1.473	Open Manhole	1350

DBFL Consulting Engineers		Page 7
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

PIPELINE SCHEDULES for Site 2 : Catchment 2

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
9.007	o	450	SB4	72.542	70.619	1.473	Open Manhole	1350
12.000	o	225	SB3-6	73.055	71.630	1.200	Open Manhole	1200
12.001	o	300	SB3-5	73.033	71.175	1.558	Open Manhole	1200
12.002	o	375	SB3-4	72.345	70.828	1.142	Open Manhole	1350
13.000	o	225	SB3-3	72.432	71.007	1.200	Open Manhole	1200
13.001	o	225	SB3-2	72.254	70.635	1.394	Open Manhole	1200
12.003	o	375	SB3-1	72.307	70.412	1.520	Open Manhole	1350
9.008	o	600	SB3	72.247	70.133	1.514	Open Manhole	1500
9.009	o	600	SB2	71.426	70.020	0.806	Open Manhole	1500
14.000	o	225	SB1-5	72.442	71.124	1.093	Open Manhole	1200
14.001	o	300	SB1-4	72.058	70.744	1.014	Open Manhole	1200
14.002	o	300	SB1-3	72.030	70.609	1.121	Open Manhole	1200
14.003	o	375	SB1-2	71.362	70.205	0.781	Open Manhole	1350
9.010	o	675	SB1	71.282	69.885	0.722	Open Manhole	1500
9.011	o	750	SB0	71.409	69.795	0.864	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
9.007	72.924	217.3	SB3	72.247	70.283	1.514	Open Manhole	1500
12.000	64.602	170.0	SB3-5	73.033	71.250	1.558	Open Manhole	1200
12.001	66.614	245.0	SB3-4	72.345	70.903	1.142	Open Manhole	1350
12.002	8.468	245.0	SB3-1	72.307	70.794	1.138	Open Manhole	1350
13.000	42.552	114.4	SB3-2	72.254	70.635	1.394	Open Manhole	1200
13.001	12.398	170.0	SB3-1	72.307	70.562	1.520	Open Manhole	1350
12.003	5.381	99.6	SB3	72.247	70.358	1.514	Open Manhole	1500
9.008	56.403	500.0	SB2	71.426	70.020	0.806	Open Manhole	1500
9.009	18.059	301.0	SB1	71.282	69.960	0.722	Open Manhole	1500
14.000	51.877	170.1	SB1-4	72.058	70.819	1.014	Open Manhole	1200
14.001	33.040	245.0	SB1-3	72.030	70.609	1.121	Open Manhole	1200
14.002	80.547	245.0	SB1-2	71.362	70.280	0.781	Open Manhole	1350
14.003	6.600	325.0	SB1	71.282	70.185	0.722	Open Manhole	1500
9.010	7.540#	502.7	SB0	71.409	69.870	0.864	Open Manhole	1800
9.011	5.000#	600.0	BASIN	71.400	69.787	0.863	Open Manhole	1800

DBFL Consulting Engineers		Page 8
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

PIPELINE SCHEDULES for Site 2 : Catchment 2

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
9.012	o	750	BASIN	71.400	69.787	0.863	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
9.012	12.988	499.5	SB0	71.000	69.761	0.489	Open Manhole	1500

DBFL Consulting Engineers		Page 9
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Area Summary for Site 2 : Catchment 2

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
8.000	-	-	75	0.000	0.000	0.000
8.001	-	-	75	0.045	0.034	0.034
8.002	-	-	75	0.095	0.071	0.071
8.003	-	-	75	0.265	0.199	0.199
8.004	-	-	75	0.000	0.000	0.000
9.000	-	-	75	0.226	0.170	0.170
9.001	-	-	75	0.343	0.257	0.257
9.002	-	-	75	0.110	0.083	0.083
9.003	-	-	75	0.230	0.173	0.173
10.000	-	-	75	0.000	0.000	0.000
9.004	-	-	75	0.038	0.029	0.029
9.005	-	-	75	0.000	0.000	0.000
9.006	-	-	75	0.230	0.173	0.173
11.000	-	-	75	0.144	0.108	0.108
9.007	-	-	75	0.132	0.099	0.099
12.000	-	-	75	0.041	0.031	0.031
12.001	-	-	75	0.410	0.308	0.308
12.002	-	-	75	0.315	0.236	0.236
13.000	-	-	75	0.225	0.169	0.169
13.001	-	-	75	0.000	0.000	0.000
12.003	-	-	75	0.000	0.000	0.000
9.008	-	-	75	0.269	0.202	0.202
9.009	-	-	75	0.245	0.184	0.184
14.000	-	-	75	0.133	0.100	0.100
14.001	-	-	75	0.215	0.161	0.161
14.002	-	-	75	0.182	0.137	0.137
14.003	-	-	75	0.165	0.124	0.124
9.010	-	-	75	0.125	0.094	0.094
9.011	-	-	75	0.000	0.000	0.000
9.012	-	-	75	0.000	0.000	0.000
				Total	Total	Total
				4.183	3.137	3.137

Free Flowing Outfall Details for Site 2 : Catchment 2

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
8.004	SC0	70.911	69.832	69.503	1200	0

Free Flowing Outfall Details for Site 2 : Catchment 2

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
9.012	SB0	71.000	69.761	71.500	1500	0

DBFL Consulting Engineers		Page 10
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Simulation Criteria for Site 2 : Catchment 2

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	2	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.200	Storm Duration (mins)	30
Ratio R	0.272		

DBFL Consulting Engineers		Page 11
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Online Controls for Site 2 : Catchment 2

Hydro-Brake® Optimum Manhole: BASIN1, DS/PN: 8.004, Volume (m³): 4.9

Unit Reference	MD-SHE-0142-9400-1000-9400
Design Head (m)	1.000
Design Flow (l/s)	9.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	142
Invert Level (m)	69.860
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	9.4
Flush-Flo™	0.302	9.4
Kick-Flo®	0.672	7.8
Mean Flow over Head Range	-	8.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.1	1.200	10.2	3.000	15.8	7.000	23.7
0.200	9.1	1.400	11.0	3.500	17.0	7.500	24.5
0.300	9.4	1.600	11.7	4.000	18.1	8.000	25.3
0.400	9.3	1.800	12.4	4.500	19.2	8.500	26.1
0.500	9.0	2.000	13.0	5.000	20.2	9.000	26.8
0.600	8.6	2.200	13.6	5.500	21.1	9.500	27.5
0.800	8.5	2.400	14.2	6.000	22.0		
1.000	9.4	2.600	14.8	6.500	22.9		

Hydro-Brake® Optimum Manhole: BASIN, DS/PN: 9.012, Volume (m³): 5.5

Unit Reference	MD-SHE-0140-9300-1050-9300
Design Head (m)	1.050
Design Flow (l/s)	9.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	140
Invert Level (m)	69.787
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

DBFL Consulting Engineers		Page 12
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Hydro-Brake® Optimum Manhole: BASIN, DS/PN: 9.012, Volume (m³): 5.5

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.050	9.3
Flush-Flo™	0.317	9.3
Kick-Flo®	0.698	7.7
Mean Flow over Head Range	-	8.0

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.1	1.200	9.9	3.000	15.3	7.000	22.9
0.200	9.0	1.400	10.6	3.500	16.4	7.500	23.7
0.300	9.3	1.600	11.3	4.000	17.5	8.000	24.4
0.400	9.2	1.800	12.0	4.500	18.5	8.500	25.2
0.500	9.0	2.000	12.6	5.000	19.5	9.000	25.9
0.600	8.6	2.200	13.2	5.500	20.4	9.500	26.6
0.800	8.2	2.400	13.7	6.000	21.3		
1.000	9.1	2.600	14.3	6.500	22.1		

Site 3: Catchment Area 1

Surface Water Network

Impermeability Factor (%): 49.4

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Site 3 : Catchment 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	PIMP (%)	75
M5-60 (mm)	16.200	Add Flow / Climate Change (%)	0
Ratio R	0.272	Minimum Backdrop Height (m)	0.300
Maximum Rainfall (mm/hr)	100	Maximum Backdrop Height (m)	3.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Site 3 : Catchment 1

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.788	4-8	0.932

Total Area Contributing (ha) = 1.720

Total Pipe Volume (m³) = 55.885

Network Design Table for Site 3 : Catchment 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
5.000	71.705	0.293	245.0	0.000	4.00	0.0	0.600	o	300	Pipe/Conduit	
5.001	12.000	0.037	324.3	0.113	0.00	0.0	0.600	o	375	Pipe/Conduit	
6.000	42.433	0.250	169.7	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
5.002	20.386	0.063	323.6	0.011	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
5.000	47.75	5.20	70.560	0.000	0.0	0.0	0.0	1.00	70.7	0.0
5.001	47.07	5.39	70.192	0.113	0.0	0.0	0.0	1.00	110.5	19.1
6.000	49.50	4.71	70.555	0.000	0.0	0.0	0.0	1.00	39.8	0.0
5.002	45.99	5.73	70.155	0.124	0.0	0.0	0.0	1.00	110.6	20.5

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Site 3 : Catchment 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
7.000	14.901	0.088	169.3	0.056	4.00	0.0	0.600	o	225	Pipe/Conduit	
5.003	26.151	0.064	408.6	0.152	0.00	0.0	0.600	o	450	Pipe/Conduit	
5.004	26.651	0.054	493.5	0.234	0.00	0.0	0.600	o	525	Pipe/Conduit	
8.000	18.583	0.109	170.5	0.184	4.00	0.0	0.600	o	225	Pipe/Conduit	
8.001	24.565	0.100	245.7	0.127	0.00	0.0	0.600	o	300	Pipe/Conduit	
9.000	23.975	0.141	170.0	0.068	4.00	0.0	0.600	o	225	Pipe/Conduit	
9.001	51.663	0.211	244.8	0.049	0.00	0.0	0.600	o	300	Pipe/Conduit	
9.002	2.681	0.011	243.7	0.062	0.00	0.0	0.600	o	300	Pipe/Conduit	
10.000	27.243	0.160	170.3	0.032	4.00	0.0	0.600	o	225	Pipe/Conduit	
8.002	25.507	0.078	327.0	0.034	0.00	0.0	0.600	o	375	Pipe/Conduit	
8.003	13.203	0.032	412.6	0.129	0.00	0.0	0.600	o	450	Pipe/Conduit	
8.004	49.333	0.120	411.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
5.005	30.181	0.052	585.0	0.024	0.00	0.0	0.600	o	600	Pipe/Conduit	
11.000	15.161	0.097	156.2	0.017	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
7.000	51.30	4.25	70.330	0.056	0.0	0.0	0.0	1.00	39.8	10.4
5.003	44.68	6.17	70.017	0.332	0.0	0.0	0.0	1.00	159.0	53.6
5.004	43.44	6.61	69.878	0.566	0.0	0.0	0.0	1.00	216.8	88.8
8.000	51.04	4.31	70.475	0.184	0.0	0.0	0.0	1.00	39.7	33.9
8.001	49.45	4.72	70.291	0.311	0.0	0.0	0.0	1.00	70.6	55.4
9.000	50.68	4.40	70.629	0.068	0.0	0.0	0.0	1.00	39.8	12.4
9.001	47.52	5.26	70.413	0.116	0.0	0.0	0.0	1.00	70.7	19.9
9.002	47.37	5.31	70.202	0.178	0.0	0.0	0.0	1.00	70.9	30.4
10.000	50.47	4.45	70.426	0.032	0.0	0.0	0.0	1.00	39.7	5.9
8.002	45.99	5.73	70.116	0.554	0.0	0.0	0.0	1.00	110.1	92.1
8.003	45.32	5.95	69.963	0.683	0.0	0.0	0.0	0.99	158.2	111.8
8.004	43.00	6.78	69.931	0.683	0.0	0.0	0.0	1.00	158.5	111.8
5.005	41.72	7.28	69.749	1.274	0.0	0.0	0.0	1.00	282.6	191.9
11.000	51.32	4.24	70.267	0.017	0.0	0.0	0.0	1.04	41.5	3.1

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Site 3 : Catchment 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
5.006	15.111	0.026	581.2	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
5.007	1.792	0.001	1792.4	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
5.006	41.12	7.53	69.697	1.290	0.0	0.0	0.0	1.00	283.6	191.9
5.007	52.11	4.05	69.671	0.000	5.7	0.0	0.0	0.57	160.0	5.7

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Manhole Schedules for Site 3 : Catchment 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SD6	71.610	1.050	Open Manhole	1200	5.000	70.560	300				
SD5	71.720	1.528	Open Manhole	1350	5.001	70.192	375	5.000	70.267	300	
SD4-1	71.604	1.049	Open Manhole	1200	6.000	70.555	225				
SD4	71.500	1.345	Open Manhole	1350	5.002	70.155	375	5.001	70.155	375	
								6.000	70.305	225	
SD3-1	71.780	1.450	Open Manhole	1200	7.000	70.330	225				
SD3	71.350	1.333	Open Manhole	1350	5.003	70.017	450	5.002	70.092	375	
								7.000	70.242	225	
SD2	71.315	1.437	Open Manhole	1500	5.004	69.878	525	5.003	69.953	450	
SD1-10	71.450	0.975	Open Manhole	1200	8.000	70.475	225				
SD1-9	71.460	1.169	Open Manhole	1200	8.001	70.291	300	8.000	70.366	225	
SD1-8	71.960	1.331	Open Manhole	1200	9.000	70.629	225				
SD1-6	71.814	1.401	Open Manhole	1200	9.001	70.413	300	9.000	70.488	225	
SD1-5	71.560	1.358	Open Manhole	1200	9.002	70.202	300	9.001	70.202	300	
SD1-4	71.450	1.024	Open Manhole	1200	10.000	70.426	225				
SD1-3	71.610	1.494	Open Manhole	1350	8.002	70.116	375	8.001	70.191	300	
								9.002	70.191	300	
								10.000	70.266	225	
SD1-2	71.158	1.195	Open Manhole	1350	8.003	69.963	450	8.002	70.038	375	75
SD1-1	71.124	1.193	Open Manhole	1350	8.004	69.931	450	8.003	69.931	450	
SD1	71.350	1.601	Open Manhole	1500	5.005	69.749	600	5.004	69.824	525	
								8.004	69.811	450	
SD0-1	71.403	1.136	Open Manhole	1200	11.000	70.267	225				
SD0	71.550	1.853	Open Manhole	1500	5.006	69.697	600	5.005	69.697	600	
								11.000	70.170	225	98
BASIN	71.200	1.529	Open Manhole	1500	5.007	69.671	600	5.006	69.671	600	
SD00	71.300	1.630	Open Manhole	300		OUTFALL		5.007	69.670	600	

DBFL Consulting Engineers		Page 5
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

PIPELINE SCHEDULES for Site 3 : Catchment 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.000	o	300	SD6	71.610	70.560	0.750	Open Manhole	1200
5.001	o	375	SD5	71.720	70.192	1.153	Open Manhole	1350
6.000	o	225	SD4-1	71.604	70.555	0.824	Open Manhole	1200
5.002	o	375	SD4	71.500	70.155	0.970	Open Manhole	1350
7.000	o	225	SD3-1	71.780	70.330	1.225	Open Manhole	1200
5.003	o	450	SD3	71.350	70.017	0.883	Open Manhole	1350
5.004	o	525	SD2	71.315	69.878	0.912	Open Manhole	1500
8.000	o	225	SD1-10	71.450	70.475	0.750	Open Manhole	1200
8.001	o	300	SD1-9	71.460	70.291	0.794	Open Manhole	1200
9.000	o	225	SD1-8	71.960	70.629	1.106	Open Manhole	1200
9.001	o	300	SD1-6	71.814	70.413	1.101	Open Manhole	1200
9.002	o	300	SD1-5	71.560	70.202	1.058	Open Manhole	1200
10.000	o	225	SD1-4	71.450	70.426	0.799	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.000	71.705	245.0	SD5	71.720	70.267	1.153	Open Manhole	1350
5.001	12.000	324.3	SD4	71.500	70.155	0.970	Open Manhole	1350
6.000	42.433	169.7	SD4	71.500	70.305	0.970	Open Manhole	1350
5.002	20.386	323.6	SD3	71.350	70.092	0.883	Open Manhole	1350
7.000	14.901	169.3	SD3	71.350	70.242	0.883	Open Manhole	1350
5.003	26.151	408.6	SD2	71.315	69.953	0.912	Open Manhole	1500
5.004	26.651	493.5	SD1	71.350	69.824	1.001	Open Manhole	1500
8.000	18.583	170.5	SD1-9	71.460	70.366	0.869	Open Manhole	1200
8.001	24.565	245.7	SD1-3	71.610	70.191	1.044	Open Manhole	1350
9.000	23.975	170.0	SD1-6	71.814	70.488	1.101	Open Manhole	1200
9.001	51.663	244.8	SD1-5	71.560	70.202	1.058	Open Manhole	1200
9.002	2.681	243.7	SD1-3	71.610	70.191	1.119	Open Manhole	1350
10.000	27.243	170.3	SD1-3	71.610	70.266	1.119	Open Manhole	1350

DBFL Consulting Engineers		Page 6
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

PIPELINE SCHEDULES for Site 3 : Catchment 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
8.002	o	375	SD1-3	71.610	70.116	1.044	Open Manhole	1350
8.003	o	450	SD1-2	71.158	69.963	0.745	Open Manhole	1350
8.004	o	450	SD1-1	71.124	69.931	0.743	Open Manhole	1350
5.005	o	600	SD1	71.350	69.749	1.001	Open Manhole	1500
11.000	o	225	SD0-1	71.403	70.267	0.911	Open Manhole	1200
5.006	o	600	SD0	71.550	69.697	1.253	Open Manhole	1500
5.007	o	600	BASIN	71.200	69.671	0.854	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
8.002	25.507	327.0	SD1-2	71.158	70.038	0.670	Open Manhole	1350
8.003	13.203	412.6	SD1-1	71.124	69.931	0.743	Open Manhole	1350
8.004	49.333	411.1	SD1	71.350	69.811	1.089	Open Manhole	1500
5.005	30.161	585.0	SD0	71.550	69.697	1.253	Open Manhole	1500
11.000	15.161	156.2	SD0	71.550	70.170	1.155	Open Manhole	1500
5.006	15.111	581.2	BASIN	71.200	69.671	0.929	Open Manhole	1500
5.007	1.792	1792.4	SD00	71.300	69.670	0.955	Open Manhole	300

DBFL Consulting Engineers		Page 7
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Area Summary for Site 3 : Catchment 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
5.000	-	-	75	0.000	0.000	0.000
5.001	-	-	75	0.150	0.113	0.113
6.000	-	-	75	0.000	0.000	0.000
5.002	-	-	75	0.015	0.011	0.011
7.000	-	-	75	0.075	0.056	0.056
5.003	-	-	75	0.203	0.152	0.152
5.004	-	-	75	0.312	0.234	0.234
8.000	-	-	75	0.245	0.184	0.184
8.001	-	-	75	0.169	0.127	0.127
9.000	-	-	75	0.090	0.068	0.068
9.001	-	-	75	0.065	0.049	0.049
9.002	-	-	75	0.082	0.062	0.062
10.000	-	-	75	0.043	0.032	0.032
8.002	-	-	75	0.045	0.034	0.034
8.003	-	-	75	0.172	0.129	0.129
8.004	-	-	75	0.000	0.000	0.000
5.005	-	-	75	0.032	0.024	0.024
11.000	-	-	75	0.022	0.017	0.017
5.006	-	-	75	0.000	0.000	0.000
5.007	-	-	75	0.000	0.000	0.000
				Total	Total	Total
				1.720	1.290	1.290

Free Flowing Outfall Details for Site 3 : Catchment 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
5.007	SD00	71.300	69.670	0.000	300	0

Simulation Criteria for Site 3 : Catchment 1

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Region	Scotland and Ireland
Return Period (years)	2	M5-60 (mm)	16.200

DBFL Consulting Engineers		Page 8
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Synthetic Rainfall Details

Ratio R	0.272	Cv (Winter)	0.840
Profile Type	Winter	Storm Duration (mins)	30
Cv (Summer)	0.750		

DBFL Consulting Engineers		Page 9
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:53 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Online Controls for Site 3 : Catchment 1

Hydro-Brake® Optimum Manhole: BASIN, DS/PN: 5.007, Volume (m³): 6.6

Unit Reference	MD-SHE-0106-5700-1400-5700
Design Head (m)	1.400
Design Flow (l/s)	5.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	106
Invert Level (m)	69.671
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	5.7
Flush-Flo™	0.417	5.7
Kick-Flo®	0.861	4.5
Mean Flow over Head Range	-	5.0

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.3	3.000	8.1	7.000	12.2
0.200	5.2	1.400	5.7	3.500	8.8	7.500	12.6
0.300	5.6	1.600	6.1	4.000	9.3	8.000	13.0
0.400	5.7	1.800	6.4	4.500	9.9	8.500	13.4
0.500	5.7	2.000	6.7	5.000	10.4	9.000	13.7
0.600	5.5	2.200	7.0	5.500	10.9	9.500	14.1
0.800	4.9	2.400	7.3	6.000	11.3		
1.000	4.9	2.600	7.6	6.500	11.8		

Site 3: Catchment Area 2

Surface Water Network

Impermeability Factor (%): 54.9

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	Hollystown	Micro Drainage
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Site 3 : Catchment 2

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	PIMP (%)	57
M5-60 (mm)	16.200	Add Flow / Climate Change (%)	20
Ratio R	0.272	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Site 3 : Catchment 2

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.297	4-8	0.806	8-12	0.066

Total Area Contributing (ha) = 1.169

Total Pipe Volume (m³) = 39.771

Network Design Table for Site 3 : Catchment 2

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
2.000	45.708	0.269	169.9	0.029	4.00	0.0	0.600		o	225	Pipe/Conduit	
2.001	15.000	0.067	223.9	0.103	0.00	0.0	0.600		o	300	Pipe/Conduit	
3.000	50.294	0.296	169.9	0.058	4.00	0.0	0.600		o	225	Pipe/Conduit	
3.001	32.593	0.133	245.1	0.029	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.000	49.29	4.76	69.555	0.029	0.0	0.0	1.0	1.00	39.8	6.1
2.001	48.42	5.00	69.211	0.132	0.0	0.0	4.6	1.05	74.0	27.6
3.000	49.01	4.84	70.189	0.058	0.0	0.0	2.0	1.00	39.8	12.2
3.001	47.12	5.38	69.818	0.087	0.0	0.0	2.9	1.00	70.7	17.7

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Site 3 : Catchment 2

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Aut Desi
3.002	6.440	0.026	247.7	0.070	0.00	0.0	0.600		o	300	Pipe/Conduit	
3.003	90.950	0.280	324.8	0.080	0.00	0.0	0.600		o	375	Pipe/Conduit	
4.000	54.809	0.322	170.0	0.032	4.00	0.0	0.600		o	225	Pipe/Conduit	
4.001	65.426	0.331	197.7	0.105	0.00	0.0	0.600		o	300	Pipe/Conduit	
3.004	77.234	0.235	328.7	0.085	0.00	0.0	0.600		o	375	Pipe/Conduit	
2.002	22.023	0.055	400.4	0.076	0.00	0.0	0.600		o	525	Pipe/Conduit	
2.003	5.000	0.001	5000.0	0.000	0.00	0.0		0.045	o	675	Pipe/Conduit	
2.004	5.000	0.025	200.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.002	46.77	5.49	69.685	0.156	0.0	0.0	5.3	0.99	70.3	31.6
3.003	42.41	7.01	69.584	0.237	0.0	0.0	7.2	1.00	110.4	43.5
4.000	48.74	4.91	70.100	0.032	0.0	0.0	1.1	1.00	39.8	6.7
4.001	45.50	5.89	69.713	0.137	0.0	0.0	4.5	1.11	78.8	27.0
3.004	39.41	8.30	69.304	0.458	0.0	0.0	13.0	0.99	109.8	78.3
2.002	38.73	8.63	69.069	0.666	0.0	0.0	18.6	1.11	241.0	111.8
2.003	37.07	9.50	69.000	0.666	0.0	0.0	18.6	0.10	34.3«	111.8
2.004	36.91	9.59	68.900	0.666	0.0	0.0	18.6	0.92	36.6«	111.8

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Manhole Schedules for Site 3 : Catchment 2

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SE2	70.700	1.145	Open Manhole	1200	2.000	69.555	225				
SE1	71.150	1.939	Open Manhole	1200	2.001	69.211	300	2.000	69.286	225	
SE0-7	71.250	1.061	Open Manhole	1200	3.000	70.189	225				
SE0-6	71.187	1.369	Open Manhole	1200	3.001	69.818	300	3.000	69.893	225	
SE0-5	70.840	1.155	Open Manhole	1200	3.002	69.685	300	3.001	69.685	300	
SE0-4	70.820	1.236	Open Manhole	1350	3.003	69.584	375	3.002	69.659	300	
SE0-3	71.600	1.500	Open Manhole	1200	4.000	70.100	225				
SE0-2	71.600	1.887	Open Manhole	1200	4.001	69.713	300	4.000	69.778	225	
SE0-1	70.940	1.636	Open Manhole	1350	3.004	69.304	375	3.003	69.304	375	
								4.001	69.382	300	3
SE0	71.230	2.161	Open Manhole	1500	2.002	69.069	525	2.001	69.144	300	
								3.004	69.069	375	
BASIN	71.230	2.230	Open Manhole	1500	2.003	69.000	675	2.002	69.014	525	
OUTFLOW	71.230	2.330	Open Manhole	1500	2.004	68.900	225	2.003	68.999	675	549
BASIN	71.230	2.355	Open Manhole	1900		OUTFALL		2.004	68.875	225	

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

PIPELINE SCHEDULES for Site 3 : Catchment 2

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
2.000	o	225	SE2	70.700	69.555	0.920	Open Manhole	1200
2.001	o	300	SE1	71.150	69.211	1.639	Open Manhole	1200
3.000	o	225	SE0-7	71.250	70.189	0.836	Open Manhole	1200
3.001	o	300	SE0-6	71.187	69.818	1.069	Open Manhole	1200
3.002	o	300	SE0-5	70.840	69.685	0.855	Open Manhole	1200
3.003	o	375	SE0-4	70.820	69.584	0.861	Open Manhole	1350
4.000	o	225	SE0-3	71.600	70.100	1.275	Open Manhole	1200
4.001	o	300	SE0-2	71.600	69.713	1.587	Open Manhole	1200
3.004	o	375	SE0-1	70.940	69.304	1.261	Open Manhole	1350
2.002	o	525	SE0	71.230	69.069	1.636	Open Manhole	1500
2.003	o	675	BASIN	71.230	69.000	1.555	Open Manhole	1500
2.004	o	225	OUTFLOW	71.230	68.900	2.105	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
2.000	45.708	169.9	SE1	71.150	69.286	1.639	Open Manhole	1200
2.001	15.000	223.9	SE0	71.230	69.144	1.786	Open Manhole	1500
3.000	50.294	169.9	SE0-6	71.187	69.893	1.069	Open Manhole	1200
3.001	32.593	245.1	SE0-5	70.840	69.685	0.855	Open Manhole	1200
3.002	6.440	247.7	SE0-4	70.820	69.659	0.861	Open Manhole	1350
3.003	90.950	324.8	SE0-1	70.940	69.304	1.261	Open Manhole	1350
4.000	54.809	170.0	SE0-2	71.600	69.778	1.597	Open Manhole	1200
4.001	65.426	197.7	SE0-1	70.940	69.382	1.258	Open Manhole	1350
3.004	77.234	328.7	SE0	71.230	69.069	1.786	Open Manhole	1500
2.002	22.023	400.4	BASIN	71.230	69.014	1.691	Open Manhole	1500
2.003	5.000	5000.0	OUTFLOW	71.230	68.999	1.556	Open Manhole	1500
2.004	5.000	200.0	BASIN	71.230	68.875	2.130	Open Manhole	1900

DBFL Consulting Engineers		Page 5
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Area Summary for Site 3 : Catchment 2

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
2.000	-	-	57	0.050	0.029	0.029
2.001	-	-	57	0.181	0.103	0.103
3.000	-	-	57	0.101	0.058	0.058
3.001	-	-	57	0.051	0.029	0.029
3.002	-	-	57	0.122	0.070	0.070
3.003	-	-	57	0.141	0.080	0.080
4.000	-	-	57	0.056	0.032	0.032
4.001	-	-	57	0.184	0.105	0.105
3.004	-	-	57	0.149	0.085	0.085
2.002	-	-	57	0.134	0.076	0.076
2.003	-	-	57	0.000	0.000	0.000
2.004	-	-	57	0.000	0.000	0.000
				Total	Total	Total
				1.169	0.666	0.666

Free Flowing Outfall Details for Site 3 : Catchment 2

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
2.004	BASIN	71.230	68.875	0.000	1900	0

Simulation Criteria for Site 3 : Catchment 2

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model		FSR	Profile Type Winter
Return Period (years)		2	Cv (Summer) 0.750
Region	Scotland and Ireland		Cv (Winter) 0.840
M5-60 (mm)		16.200	Storm Duration (mins) 30
Ratio R		0.272	

DBFL Consulting Engineers		Page 6
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Online Controls for Site 3 : Catchment 2

Hydro-Brake® Optimum Manhole: BASIN, DS/PN: 2.003, Volume (m³): 8.4

Unit Reference	MD-SHE-0099-4800-1300-4800
Design Head (m)	1.300
Design Flow (l/s)	4.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	99
Invert Level (m)	69.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	4.8
Flush-Flo™	0.388	4.8
Kick-Flo®	0.799	3.8
Mean Flow over Head Range	-	4.2

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	4.6	3.000	7.1	7.000	10.6
0.200	4.4	1.400	5.0	3.500	7.6	7.500	10.9
0.300	4.7	1.600	5.3	4.000	8.1	8.000	11.3
0.400	4.8	1.800	5.6	4.500	8.6	8.500	11.6
0.500	4.7	2.000	5.9	5.000	9.0	9.000	11.9
0.600	4.6	2.200	6.1	5.500	9.4	9.500	12.2
0.800	3.8	2.400	6.4	6.000	9.8		
1.000	4.2	2.600	6.6	6.500	10.2		

Site 3: Catchment Area 3

Surface Water Network

Impermeability Factor (%): 49.3

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:55 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Site 3 : Catchment 3

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	PIMP (%)	50
M5-60 (mm)	16.200	Add Flow / Climate Change (%)	20
Ratio R	0.272	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Site 3 : Catchment 3

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.382	4-8	0.338

Total Area Contributing (ha) = 0.720

Total Pipe Volume (m³) = 16.654

Network Design Table for Site 3 : Catchment 3

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	30.562	0.180	169.8	0.040	4.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	30.328	0.178	170.4	0.045	4.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	34.642	0.107	323.8	0.145	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.002	32.112	0.099	324.4	0.036	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.51	68.914	0.040	0.0	0.0	1.4	1.00	39.8	8.7
2.000	50.00	4.51	69.375	0.045	0.0	0.0	1.6	1.00	39.7	9.7
1.001	48.13	5.09	68.659	0.230	0.0	0.0	8.0	1.00	110.6	48.0
1.002	46.34	5.62	68.552	0.266	0.0	0.0	8.9	1.00	110.5	53.3

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:55 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Site 3 : Catchment 3

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
3.000	38.885	0.229	170.0	0.087	4.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	20.993	0.065	323.0	0.008	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.004	14.320	0.044	325.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.005	5.000	0.001	5000.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.000	49.72	4.65	68.900	0.087	0.0	0.0	3.1	1.00	39.8	18.6
1.003	45.27	5.97	68.453	0.360	0.0	0.0	11.8	1.00	110.7	70.6
1.004	44.57	6.21	68.388	0.360	0.0	0.0	11.8	1.00	110.3	70.6
1.005	50.00	4.25	68.305	0.000	5.3	0.0	0.9	0.33	94.6	5.3

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:55 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Manhole Schedules for Site 3 : Catchment 3

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SF5	70.350	1.436	Open Manhole	1200	1.000	68.914	225				
SF4	70.350	0.975	Open Manhole	1200	2.000	69.375	225				
SF3	70.100	1.441	Open Manhole	1350	1.001	68.659	375	1.000	68.734	225	
								2.000	69.197	225	388
SF2	69.970	1.418	Open Manhole	1350	1.002	68.552	375	1.001	68.552	375	
SF1-1	70.510	1.610	Open Manhole	1200	3.000	68.900	225				
SF1	70.296	1.843	Open Manhole	1350	1.003	68.453	375	1.002	68.453	375	
								3.000	68.671	225	68
SF0	70.300	1.912	Open Manhole	1350	1.004	68.388	375	1.003	68.388	375	
BASIN	70.300	1.995	Open Manhole	1500	1.005	68.305	600	1.004	68.344	375	
BASIN	69.480	1.176	Open Manhole	1900		OUTFALL		1.005	68.304	600	

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:55 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

PIPELINE SCHEDULES for Site 3 : Catchment 3

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	SF5	70.350	68.914	1.211	Open Manhole	1200
2.000	o	225	SF4	70.350	69.375	0.750	Open Manhole	1200
1.001	o	375	SF3	70.100	68.659	1.066	Open Manhole	1350
1.002	o	375	SF2	69.970	68.552	1.043	Open Manhole	1350
3.000	o	225	SF1-1	70.510	68.900	1.385	Open Manhole	1200
1.003	o	375	SF1	70.296	68.453	1.468	Open Manhole	1350
1.004	o	375	SF0	70.300	68.388	1.537	Open Manhole	1350
1.005	o	600	BASIN	70.300	68.305	1.395	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	30.562	169.8	SF3	70.100	68.734	1.141	Open Manhole	1350
2.000	30.328	170.4	SF3	70.100	69.197	0.678	Open Manhole	1350
1.001	34.642	323.8	SF2	69.970	68.552	1.043	Open Manhole	1350
1.002	32.112	324.4	SF1	70.296	68.453	1.468	Open Manhole	1350
3.000	38.885	170.0	SF1	70.296	68.671	1.400	Open Manhole	1350
1.003	20.993	323.0	SF0	70.300	68.388	1.537	Open Manhole	1350
1.004	14.320	325.5	BASIN	70.300	68.344	1.581	Open Manhole	1500
1.005	5.000	5000.0	BASIN	69.480	68.304	0.576	Open Manhole	1900

DBFL Consulting Engineers		Page 5
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:55 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Area Summary for Site 3 : Catchment 3

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	50	0.080	0.040	0.040
2.000	-	-	50	0.090	0.045	0.045
1.001	-	-	50	0.290	0.145	0.145
1.002	-	-	50	0.071	0.036	0.036
3.000	-	-	50	0.173	0.087	0.087
1.003	-	-	50	0.016	0.008	0.008
1.004	-	-	50	0.000	0.000	0.000
1.005	-	-	50	0.000	0.000	0.000
				Total	Total	Total
				0.720	0.360	0.360

Free Flowing Outfall Details for Site 3 : Catchment 3

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005	BASIN	69.480	68.304	0.000	1900	0

Simulation Criteria for Site 3 : Catchment 3

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	2	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.200	Storm Duration (mins)	30
Ratio R	0.272		

DBFL Consulting Engineers		Page 6
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:55 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Online Controls for Site 3 : Catchment 3

Hydro-Brake® Optimum Manhole: BASIN, DS/PN: 1.005, Volume (m³): 4.9

Unit Reference	MD-SHE-0103-5300-1400-5300
Design Head (m)	1.400
Design Flow (l/s)	5.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	103
Invert Level (m)	68.305
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	5.3
Flush-Flo™	0.419	5.3
Kick-Flo®	0.860	4.2
Mean Flow over Head Range	-	4.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.4	1.200	4.9	3.000	7.6	7.000	11.3
0.200	4.8	1.400	5.3	3.500	8.1	7.500	11.7
0.300	5.2	1.600	5.6	4.000	8.7	8.000	12.1
0.400	5.3	1.800	6.0	4.500	9.2	8.500	12.4
0.500	5.3	2.000	6.3	5.000	9.6	9.000	12.8
0.600	5.2	2.200	6.5	5.500	10.1	9.500	13.1
0.800	4.6	2.400	6.8	6.000	10.5		
1.000	4.5	2.600	7.1	6.500	10.9		

Site 3: Catchment Area 4

Surface Water Network

Impermeability Factor (%): 53.4

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Site 3 : Catchment 4

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	PIMP (%)	75
M5-60 (mm)	16.200	Add Flow / Climate Change (%)	20
Ratio R	0.272	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	100	Maximum Backdrop Height (m)	2.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.000
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Site 3 : Catchment 4 at outfall (pipe 2.004)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.524	4-8	0.149

Total Area Contributing (ha) = 0.673

Total Pipe Volume (m³) = 13.596

Time Area Diagram at outfall (pipe 4.002)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.054	4-8	0.006

Total Area Contributing (ha) = 0.060

Total Pipe Volume (m³) = 1.887

Network Design Table for Site 3 : Catchment 4

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.000	42.344	0.374	113.2	0.068	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.000	50.00	4.57	69.815	0.068	0.0	0.0	2.4	1.23	48.8	14.6

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Site 3 : Catchment 4

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.001	16.204	0.066	245.5	0.151	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.002	14.408	0.044	327.5	0.069	0.00	0.0	0.600	o	375	Pipe/Conduit	
3.000	23.292	0.137	170.0	0.041	4.00	0.0	0.600	o	225	Pipe/Conduit	
3.001	18.787	0.078	240.9	0.038	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.002	70.501	0.287	245.6	0.065	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.003	8.639	0.062	139.3	0.074	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.004	3.546	0.009	394.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
4.000	8.192	0.048	170.7	0.012	4.00	0.0	0.600	o	225	Pipe/Conduit	
5.000	14.100	0.083	169.9	0.030	4.00	0.0	0.600	o	225	Pipe/Conduit	
4.001	10.414	0.043	242.2	0.003	0.00	0.0	0.600	o	300	Pipe/Conduit	
4.002	3.742	0.016	240.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.001	48.98	4.85	69.366	0.218	0.0	0.0	7.7	1.00	70.6	46.3
2.002	48.12	5.09	69.225	0.287	0.0	0.0	10.0	1.00	110.0	59.9
3.000	50.73	4.39	69.911	0.041	0.0	0.0	1.5	1.00	39.8	9.1
3.001	49.53	4.70	69.699	0.079	0.0	0.0	2.8	1.01	71.3	16.9
3.002	45.55	5.88	69.621	0.143	0.0	0.0	4.7	1.00	70.6	28.3
2.003	45.30	5.96	69.106	0.505	0.0	0.0	16.5	1.72	273.6	99.1
2.004	45.13	6.02	69.044	0.505	0.0	0.0	16.5	1.02	161.9	99.1
4.000	51.76	4.14	69.210	0.012	0.0	0.0	0.4	1.00	39.7	2.7
5.000	51.35	4.23	69.245	0.030	0.0	0.0	1.1	1.00	39.8	6.7
4.001	50.65	4.41	69.087	0.045	0.0	0.0	1.6	1.01	71.1	9.9
4.002	50.41	4.47	69.044	0.045	0.0	0.0	1.6	1.01	71.4	9.9

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Manhole Schedules for Site 3 : Catchment 4

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SG3	71.540	1.725	Open Manhole	1200	2.000	69.815	225				
SG2	71.012	1.646	Open Manhole	1200	2.001	69.366	300	2.000	69.441	225	
SG1	70.560	1.335	Open Manhole	1350	2.002	69.225	375	2.001	69.300	300	
SG0-4	71.397	1.486	Open Manhole	1200	3.000	69.911	225				
SG0-2	71.290	1.591	Open Manhole	1200	3.001	69.699	300	3.000	69.774	225	
SG0-1	71.460	1.839	Open Manhole	1200	3.002	69.621	300	3.001	69.621	300	
SG0	71.400	2.294	Open Manhole	1350	2.003	69.106	450	2.002	69.181	375	
								3.002	69.334	300	78
TANK	70.600	1.556	Open Manhole	300	2.004	69.044	450	2.003	69.044	450	
	70.600	1.565	Open Manhole	0		OUTFALL		2.004	69.035	450	
SG0-1-3	70.620	1.410	Open Manhole	1200	4.000	69.210	225				
SG0-1-2	70.780	1.535	Open Manhole	1200	5.000	69.245	225				
SG0-1-1	70.800	1.713	Open Manhole	1200	4.001	69.087	300	4.000	69.162	225	
								5.000	69.162	225	75
TANK	70.600	1.556	Open Manhole	300	4.002	69.044	300	4.001	69.044	300	
	70.600	1.572	Open Manhole	0		OUTFALL		4.002	69.028	300	

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

PIPELINE SCHEDULES for Site 3 : Catchment 4

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
2.000	o	225	SG3	71.540	69.815	1.500	Open Manhole	1200
2.001	o	300	SG2	71.012	69.366	1.346	Open Manhole	1200
2.002	o	375	SG1	70.560	69.225	0.960	Open Manhole	1350
3.000	o	225	SG0-4	71.397	69.911	1.261	Open Manhole	1200
3.001	o	300	SG0-2	71.290	69.699	1.291	Open Manhole	1200
3.002	o	300	SG0-1	71.460	69.621	1.539	Open Manhole	1200
2.003	o	450	SG0	71.400	69.106	1.844	Open Manhole	1350
2.004	o	450	TANK	70.600	69.044	1.106	Open Manhole	300
4.000	o	225	SG0-1-3	70.620	69.210	1.185	Open Manhole	1200
5.000	o	225	SG0-1-2	70.780	69.245	1.235	Open Manhole	1200
4.001	o	300	SG0-1-1	70.800	69.087	1.413	Open Manhole	1200
4.002	o	300	TANK	70.600	69.044	1.256	Open Manhole	300

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
2.000	42.344	113.2	SG2	71.012	69.441	1.346	Open Manhole	1200
2.001	16.204	245.5	SG1	70.560	69.300	0.960	Open Manhole	1350
2.002	14.408	327.5	SG0	71.400	69.181	1.844	Open Manhole	1350
3.000	23.292	170.0	SG0-2	71.290	69.774	1.291	Open Manhole	1200
3.001	18.787	240.9	SG0-1	71.460	69.621	1.539	Open Manhole	1200
3.002	70.501	245.6	SG0	71.400	69.334	1.766	Open Manhole	1350
2.003	8.639	139.3	TANK	70.600	69.044	1.106	Open Manhole	300
2.004	3.546	394.0		70.600	69.035	1.115	Open Manhole	0
4.000	8.192	170.7	SG0-1-1	70.800	69.162	1.413	Open Manhole	1200
5.000	14.100	169.9	SG0-1-1	70.800	69.162	1.338	Open Manhole	1200
4.001	10.414	242.2	TANK	70.600	69.044	1.256	Open Manhole	300
4.002	3.742	240.1		70.600	69.028	1.272	Open Manhole	0

DBFL Consulting Engineers		Page 5
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Area Summary for Site 3 : Catchment 4

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
2.000	-	-	75	0.090	0.068	0.068
2.001	-	-	75	0.201	0.151	0.151
2.002	-	-	75	0.092	0.069	0.069
3.000	-	-	75	0.055	0.041	0.041
3.001	-	-	75	0.050	0.038	0.038
3.002	-	-	75	0.086	0.065	0.065
2.003	-	-	75	0.099	0.074	0.074
2.004	-	-	75	0.000	0.000	0.000
4.000	-	-	75	0.016	0.012	0.012
5.000	-	-	75	0.040	0.030	0.030
4.001	-	-	75	0.004	0.003	0.003
4.002	-	-	75	0.000	0.000	0.000
				Total	Total	Total
				0.733	0.550	0.550

Free Flowing Outfall Details for Site 3 : Catchment 4

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
2.004		70.600	69.035	0.000	0	0

Free Flowing Outfall Details for Site 3 : Catchment 4

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
4.002		70.600	69.028	0.000	0	0

Simulation Criteria for Site 3 : Catchment 4

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Region	Scotland and Ireland
Return Period (years)	2	M5-60 (mm)	16.200

DBFL Consulting Engineers		Page 6
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Synthetic Rainfall Details

Ratio R	0.272	Cv (Winter)	0.840
Profile Type	Winter	Storm Duration (mins)	30
Cv (Summer)	0.750		

DBFL Consulting Engineers		Page 7
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Online Controls for Site 3 : Catchment 4

Hydro-Brake® Optimum Manhole: TANK, DS/PN: 2.004, Volume (m³): 1.4

Unit Reference	MD-SHE-0072-2300-1000-2300
Design Head (m)	1.000
Design Flow (l/s)	2.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	72
Invert Level (m)	69.044
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.3
Flush-Flo™	0.307	2.3
Kick-Flo®	0.625	1.9
Mean Flow over Head Range	-	2.0

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.9	1.200	2.5	3.000	3.8	7.000	5.7
0.200	2.2	1.400	2.7	3.500	4.1	7.500	5.9
0.300	2.3	1.600	2.9	4.000	4.4	8.000	6.0
0.400	2.3	1.800	3.0	4.500	4.6	8.500	6.2
0.500	2.2	2.000	3.2	5.000	4.8	9.000	6.4
0.600	2.0	2.200	3.3	5.500	5.1	9.500	6.6
0.800	2.1	2.400	3.4	6.000	5.3		
1.000	2.3	2.600	3.6	6.500	5.5		

Hydro-Brake® Optimum Manhole: TANK, DS/PN: 4.002, Volume (m³): 0.8

Unit Reference	MD-SHE-0072-2300-1000-2300
Design Head (m)	1.000
Design Flow (l/s)	2.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	72
Invert Level (m)	69.044
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

DBFL Consulting Engineers		Page 8
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Hydro-Brake® Optimum Manhole: TANK, DS/PN: 4.002, Volume (m³): 0.8

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.3
Flush-Flo™	0.307	2.3
Kick-Flo®	0.625	1.9
Mean Flow over Head Range	-	2.0

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.9	1.200	2.5	3.000	3.8	7.000	5.7
0.200	2.2	1.400	2.7	3.500	4.1	7.500	5.9
0.300	2.3	1.600	2.9	4.000	4.4	8.000	6.0
0.400	2.3	1.800	3.0	4.500	4.6	8.500	6.2
0.500	2.2	2.000	3.2	5.000	4.8	9.000	6.4
0.600	2.0	2.200	3.3	5.500	5.1	9.500	6.6
0.800	2.1	2.400	3.4	6.000	5.3		
1.000	2.3	2.600	3.6	6.500	5.5		

Site 3: Catchment Area 5

Surface Water Network

Impermeability Factor (%): 52.6

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Site 3 : Catchment 5

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	PIMP (%)	75
M5-60 (mm)	16.200	Add Flow / Climate Change (%)	20
Ratio R	0.272	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	100	Maximum Backdrop Height (m)	2.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Site 3 : Catchment 5

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.441	4-8	0.523

Total Area Contributing (ha) = 0.964

Total Pipe Volume (m³) = 75.928

Network Design Table for Site 3 : Catchment 5

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.000	24.576	0.376	65.4	0.106	4.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	30.342	0.124	244.7	0.064	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.002	46.590	0.190	245.2	0.074	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.003	19.073	0.078	244.5	0.057	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	14.598	0.058	251.7	0.000	4.00	5.7	0.600	o	300	Pipe/Conduit	
3.001	43.305	0.173	250.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.000	51.27	4.25	69.640	0.106	0.0	0.0	3.9	1.62	64.4	23.5
2.001	49.30	4.76	69.189	0.170	0.0	0.0	6.0	1.00	70.7	36.2
2.002	46.62	5.54	69.065	0.243	0.0	0.0	8.2	1.00	70.7	49.1
2.003	45.62	5.85	68.875	0.300	0.0	0.0	9.9	1.00	70.8	59.3
3.000	51.30	4.25	69.670	0.000	5.7	0.0	1.1	0.99	69.7	6.8
3.001	48.51	4.98	69.612	0.000	5.7	0.0	1.1	0.99	70.0	6.8

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Site 3 : Catchment 5

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
3.002	21.200	0.085	250.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.003	39.758	0.098	405.0	0.000	0.00	32.3	0.600	o	450	Pipe/Conduit	
3.004	40.569	0.100	405.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.005	25.558	0.063	405.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.006	21.499	0.053	405.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.007	22.864	0.056	405.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.008	22.366	0.056	400.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.009	5.911	0.058	101.9	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.010	91.209	0.222	410.9	0.132	0.00	2.3	0.600	o	450	Pipe/Conduit	
2.004	21.924	0.046	481.7	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.005	45.302	0.111	408.1	0.074	0.00	0.0	0.600	o	450	Pipe/Conduit	
4.000	22.859	0.093	245.0	0.056	4.00	0.0	0.600	o	300	Pipe/Conduit	
4.001	50.786	0.207	245.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
4.002	8.876	0.048	184.9	0.099	0.00	0.0	0.600	o	300	Pipe/Conduit	
4.003	21.423	0.088	242.6	0.021	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.006	5.281	0.020	264.0	0.041	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.007	5.000	0.001	5000.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.002	47.28	5.33	69.439	0.000	5.7	0.0	1.1	0.99	70.0	6.8
3.003	45.20	5.99	69.354	0.000	38.0	0.0	7.6	1.00	159.7	45.6
3.004	43.30	6.67	69.256	0.000	38.0	0.0	7.6	1.00	159.7	45.6
3.005	42.20	7.09	69.156	0.000	38.0	0.0	7.6	1.00	159.7	45.6
3.006	41.32	7.45	69.093	0.000	38.0	0.0	7.6	1.00	159.7	45.6
3.007	40.44	7.83	69.039	0.000	38.0	0.0	7.6	1.00	159.7	45.6
3.008	39.63	8.20	68.983	0.000	38.0	0.0	7.6	1.01	160.7	45.6
3.009	39.53	8.24	68.927	0.000	38.0	0.0	7.6	2.01	320.3	45.6
3.010	36.59	9.77	68.869	0.132	40.3	0.0	11.5	1.00	158.5	69.3
2.004	35.91	10.17	68.647	0.432	40.3	0.0	19.3	0.92	146.3	115.6
2.005	34.70	10.92	68.601	0.506	40.3	0.0	20.7	1.00	159.1	124.4
4.000	50.76	4.38	69.050	0.056	0.0	0.0	2.1	1.00	70.7	12.4
4.001	47.64	5.23	68.957	0.056	0.0	0.0	2.1	1.00	70.7	12.4
4.002	47.20	5.36	68.749	0.155	0.0	0.0	5.3	1.15	81.5	31.8
4.003	46.06	5.71	68.701	0.176	0.0	0.0	5.9	1.00	71.0	35.2
2.006	34.59	10.99	68.490	0.723	40.3	0.0	26.1	1.25	198.2	156.7
2.007	51.08	4.30	68.470	0.000	42.3	0.0	7.1	0.28	44.2	42.3

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Manhole Schedules for Site 3 : Catchment 5

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SH6	71.140	1.500	Open Manhole	1200	2.000	69.640	225				
SH5	70.950	1.761	Open Manhole	1200	2.001	69.189	300	2.000	69.264	225	
SH4	70.780	1.715	Open Manhole	1200	2.002	69.065	300	2.001	69.065	300	
SH3	70.435	1.560	Open Manhole	1200	2.003	68.875	300	2.002	68.875	300	
S3-C1-12	71.054	1.384	Open Manhole	1200	3.000	69.670	300				
S3-C1-11	71.394	1.782	Open Manhole	1200	3.001	69.612	300	3.000	69.612	300	
S3-C1-10	71.393	1.955	Open Manhole	1200	3.002	69.439	300	3.001	69.439	300	
S3-C1-9	71.288	1.934	Open Manhole	1350	3.003	69.354	450	3.002	69.354	300	
S3-C1-8	71.480	2.224	Open Manhole	1350	3.004	69.256	450	3.003	69.256	450	
S3-C1-7	71.698	2.542	Open Manhole	1350	3.005	69.156	450	3.004	69.156	450	
S3-C1-6	71.149	2.056	Open Manhole	1350	3.006	69.093	450	3.005	69.093	450	
S3-C1-5	71.242	2.202	Open Manhole	1350	3.007	69.039	450	3.006	69.039	450	
S3-C1-4	71.066	2.083	Open Manhole	1350	3.008	68.983	450	3.007	68.983	450	
S3-C1-3	71.046	2.119	Open Manhole	1350	3.009	68.927	450	3.008	68.927	450	
SH2-1	70.850	1.981	Open Manhole	1350	3.010	68.869	450	3.009	68.869	450	
SH2	70.081	1.434	Open Manhole	1350	2.004	68.647	450	2.003	68.797	300	
								3.010	68.647	450	
SH1	70.240	1.639	Open Manhole	1350	2.005	68.601	450	2.004	68.601	450	
SH0-4	70.467	1.417	Open Manhole	1200	4.000	69.050	300				
SH0-3	70.620	1.663	Open Manhole	1200	4.001	68.957	300	4.000	68.957	300	
SH0-2	70.510	1.761	Open Manhole	1200	4.002	68.749	300	4.001	68.749	300	
SH0-1	70.450	1.749	Open Manhole	1200	4.003	68.701	300	4.002	68.701	300	
SH0	69.372	0.882	Open Manhole	1350	2.006	68.490	450	2.005	68.490	450	
								4.003	68.613	300	
BASIN	70.240	1.770	Open Manhole	1350	2.007	68.470	450	2.006	68.470	450	
	70.280	1.811	Open Manhole	0		OUTFALL		2.007	68.469	450	

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

PIPELINE SCHEDULES for Site 3 : Catchment 5

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
2.000	o	225	SH6	71.140	69.640	1.275	Open Manhole	1200
2.001	o	300	SH5	70.950	69.189	1.461	Open Manhole	1200
2.002	o	300	SH4	70.780	69.065	1.415	Open Manhole	1200
2.003	o	300	SH3	70.435	68.875	1.260	Open Manhole	1200
3.000	o	300	S3-C1-12	71.054	69.670	1.084	Open Manhole	1200
3.001	o	300	S3-C1-11	71.394	69.612	1.482	Open Manhole	1200
3.002	o	300	S3-C1-10	71.393	69.439	1.655	Open Manhole	1200
3.003	o	450	S3-C1-9	71.288	69.354	1.484	Open Manhole	1350
3.004	o	450	S3-C1-8	71.480	69.256	1.774	Open Manhole	1350
3.005	o	450	S3-C1-7	71.698	69.156	2.092	Open Manhole	1350
3.006	o	450	S3-C1-6	71.149	69.093	1.606	Open Manhole	1350
3.007	o	450	S3-C1-5	71.242	69.039	1.752	Open Manhole	1350
3.008	o	450	S3-C1-4	71.066	68.983	1.633	Open Manhole	1350
3.009	o	450	S3-C1-3	71.046	68.927	1.669	Open Manhole	1350
3.010	o	450	SH2-1	70.850	68.869	1.531	Open Manhole	1350
2.004	o	450	SH2	70.081	68.647	0.984	Open Manhole	1350
2.005	o	450	SH1	70.240	68.601	1.189	Open Manhole	1350
4.000	o	300	SH0-4	70.467	69.050	1.117	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
2.000	24.576	65.4	SH5	70.950	69.264	1.461	Open Manhole	1200
2.001	30.342	244.7	SH4	70.780	69.065	1.415	Open Manhole	1200
2.002	46.590	245.2	SH3	70.435	68.875	1.260	Open Manhole	1200
2.003	19.073	244.5	SH2	70.081	68.797	0.984	Open Manhole	1350
3.000	14.598	251.7	S3-C1-11	71.394	69.612	1.482	Open Manhole	1200
3.001	43.305	250.0	S3-C1-10	71.393	69.439	1.655	Open Manhole	1200
3.002	21.200	250.0	S3-C1-9	71.288	69.354	1.634	Open Manhole	1350
3.003	39.758	405.0	S3-C1-8	71.480	69.256	1.774	Open Manhole	1350
3.004	40.569	405.0	S3-C1-7	71.698	69.156	2.092	Open Manhole	1350
3.005	25.558	405.0	S3-C1-6	71.149	69.093	1.606	Open Manhole	1350
3.006	21.499	405.0	S3-C1-5	71.242	69.039	1.752	Open Manhole	1350
3.007	22.864	405.0	S3-C1-4	71.066	68.983	1.633	Open Manhole	1350
3.008	22.366	400.0	S3-C1-3	71.046	68.927	1.669	Open Manhole	1350
3.009	5.911	101.9	SH2-1	70.850	68.869	1.531	Open Manhole	1350
3.010	91.209	410.9	SH2	70.081	68.647	0.984	Open Manhole	1350
2.004	21.924	481.7	SH1	70.240	68.601	1.189	Open Manhole	1350
2.005	45.302	408.1	SH0	69.372	68.490	0.432	Open Manhole	1350
4.000	22.859	245.0	SH0-3	70.620	68.957	1.363	Open Manhole	1200

DBFL Consulting Engineers		Page 5
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

PIPELINE SCHEDULES for Site 3 : Catchment 5

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
4.001	o	300	SH0-3	70.620	68.957	1.363	Open Manhole	1200
4.002	o	300	SH0-2	70.510	68.749	1.461	Open Manhole	1200
4.003	o	300	SH0-1	70.450	68.701	1.449	Open Manhole	1200
2.006	o	450	SH0	69.372	68.490	0.432	Open Manhole	1350
2.007	o	450	BASIN	70.240	68.470	1.320	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
4.001	50.786	245.0	SH0-2	70.510	68.749	1.461	Open Manhole	1200
4.002	8.876	184.9	SH0-1	70.450	68.701	1.449	Open Manhole	1200
4.003	21.423	242.6	SH0	69.372	68.613	0.460	Open Manhole	1350
2.006	5.281	264.0	BASIN	70.240	68.470	1.320	Open Manhole	1350
2.007	5.000	5000.0		70.280	68.469	1.361	Open Manhole	0

DBFL Consulting Engineers		Page 6
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Area Summary for Site 3 : Catchment 5

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
2.000	-	-	75	0.141	0.106	0.106
2.001	-	-	75	0.085	0.064	0.064
2.002	-	-	75	0.098	0.074	0.074
2.003	-	-	75	0.076	0.057	0.057
3.000	-	-	75	0.000	0.000	0.000
3.001	-	-	75	0.000	0.000	0.000
3.002	-	-	75	0.000	0.000	0.000
3.003	-	-	75	0.000	0.000	0.000
3.004	-	-	75	0.000	0.000	0.000
3.005	-	-	75	0.000	0.000	0.000
3.006	-	-	75	0.000	0.000	0.000
3.007	-	-	75	0.000	0.000	0.000
3.008	-	-	75	0.000	0.000	0.000
3.009	-	-	75	0.000	0.000	0.000
3.010	-	-	75	0.176	0.132	0.132
2.004	-	-	75	0.000	0.000	0.000
2.005	-	-	75	0.098	0.074	0.074
4.000	-	-	75	0.075	0.056	0.056
4.001	-	-	75	0.000	0.000	0.000
4.002	-	-	75	0.132	0.099	0.099
4.003	-	-	75	0.028	0.021	0.021
2.006	-	-	75	0.055	0.041	0.041
2.007	-	-	75	0.000	0.000	0.000
				Total	Total	Total
				0.964	0.723	0.723

Free Flowing Outfall Details for Site 3 : Catchment 5

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
2.007		70.280	68.469	0.000	0	0

Simulation Criteria for Site 3 : Catchment 5

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

DBFL Consulting Engineers		Page 7
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	2	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.200	Storm Duration (mins)	30
Ratio R	0.272		

DBFL Consulting Engineers		Page 8
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 04/10/2021 14:54 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Online Controls for Site 3 : Catchment 5

Hydro-Brake® Optimum Manhole: BASIN, DS/PN: 2.007, Volume (m³): 3.2

Unit Reference	MD-SHE-0275-4230-0880-4230
Design Head (m)	0.880
Design Flow (l/s)	42.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	275
Invert Level (m)	68.470
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.880	42.3
Flush-Flo™	0.410	42.2
Kick-Flo®	0.701	37.9
Mean Flow over Head Range	-	33.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.7	1.200	49.1	3.000	76.5	7.000	115.6
0.200	28.4	1.400	52.9	3.500	82.4	7.500	119.5
0.300	41.4	1.600	56.4	4.000	88.0	8.000	123.4
0.400	42.2	1.800	59.7	4.500	93.2	8.500	127.1
0.500	41.8	2.000	62.8	5.000	98.1	9.000	129.7
0.600	40.6	2.200	65.8	5.500	102.7	9.500	133.3
0.800	40.4	2.400	68.6	6.000	107.2		
1.000	45.0	2.600	71.3	6.500	111.5		

Local Centre: Catchment Area 1,2 and 3

Surface Water Network

Impermeability Factor (%): 46.9

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	Hollystown Local Centre	
Date 21/10/2021 File Local Centre.mdx	Designed by ASM Checked by BCM	
Innovyze	Network 2018.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SW 2

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	16.200	Add Flow / Climate Change (%)	20
Ratio R	0.274	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	100	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for SW 2

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	18.184	0.176	103.3	0.443	4.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	8.017	0.011	750.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
2.000	27.175	0.160	170.0	0.009	4.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	55.421	0.226	245.0	0.200	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.002	49.935	0.296	168.7	0.178	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	38.315	0.225	170.3	0.108	4.00	0.0	0.600	o	225	Pipe/Conduit	
2.003	15.750	0.048	325.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
2.004	40.617	0.125	325.0	0.042	0.00	0.0	0.600	o	375	Pipe/Conduit	
2.005	28.697	0.089	324.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	51.71	4.20	73.586	0.443	0.0	0.0	12.4	1.55	109.3	74.5
1.001	51.17	4.33	72.960	0.443	0.0	0.0	12.4	1.01	448.0	74.5
2.000	50.67	4.45	74.104	0.009	0.0	0.0	0.2	1.00	39.8	1.5
2.001	47.31	5.38	73.869	0.209	0.0	0.0	5.4	1.00	70.7	32.1
2.002	45.14	6.07	73.643	0.387	0.0	0.0	9.5	1.21	85.4	56.8
3.000	49.94	4.64	73.647	0.108	0.0	0.0	2.9	1.00	39.7	17.5
2.003	44.38	6.33	73.272	0.495	0.0	0.0	11.9	1.00	110.4	71.4
2.004	42.55	7.01	73.224	0.537	0.0	0.0	12.4	1.00	110.4	74.3
2.005	41.37	7.48	73.099	0.537	0.0	0.0	12.4	1.00	110.6	74.3

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7	Hollystown Local Centre	
Date 21/10/2021 File Local Centre.mdx	Designed by ASM Checked by BCM	
Innovyze	Network 2018.1.1	

Network Design Table for SW 2

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.002	31.032	0.041	756.9	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
1.003	32.331	0.043	750.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
4.000	12.700	0.075	169.3	0.113	4.00	0.0	0.600	o	225	Pipe/Conduit	
4.001	47.544	0.280	169.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.002	28.133	0.147	191.4	0.026	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.003	2.962	0.018	164.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.004	12.447	0.005	2489.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.004	17.286	0.022	785.7	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.002	40.20	8.00	72.949	0.980	0.0	0.0	21.3	1.01	445.9	128.0
1.003	39.06	8.53	72.908	0.980	0.0	0.0	21.3	1.01	448.0	128.0
4.000	51.65	4.21	73.588	0.113	0.0	0.0	3.2	1.00	39.8	19.0
4.001	48.60	5.00	73.513	0.113	0.0	0.0	3.2	1.00	39.8	19.0
4.002	46.90	5.50	73.233	0.139	0.0	0.0	3.5	0.94	37.4	21.2
4.003	46.74	5.55	73.086	0.139	0.0	0.0	3.5	1.02	40.4	21.2
4.004	44.67	6.23	72.994	0.139	0.0	0.0	3.5	0.31	21.6	21.2
1.004	38.47	8.82	72.862	1.119	0.0	0.0	23.3	0.99	437.5	139.9

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	Hollystown Local Centre	
Date 21/10/2021 File Local Centre.mdx	Designed by ASM Checked by BCM	
Innovyze	Network 2018.1.1	

Manhole Schedules for SW 2

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SB5	75.200	1.614	Open Manhole	1200	1.000	73.586	300				
SB4	75.200	2.240	Open Manhole	1800	1.001	72.960	750	1.000	73.410	300	
SB3-6	75.079	0.975	Open Manhole	1200	2.000	74.104	225				
SB3-5	75.340	1.471	Open Manhole	1200	2.001	73.869	300	2.000	73.944	225	
SB3-4	74.990	1.347	Open Manhole	1200	2.002	73.643	300	2.001	73.643	300	
SB3-3-1	74.950	1.303	Open Manhole	1200	3.000	73.647	225				
SB3-3	74.650	1.378	Open Manhole	1350	2.003	73.272	375	2.002	73.347	300	
								3.000	73.422	225	
SB3-2	74.700	1.476	Open Manhole	1350	2.004	73.224	375	2.003	73.224	375	
SB3-1	74.910	1.811	Open Manhole	1350	2.005	73.099	375	2.004	73.099	375	
SB3	75.000	2.051	Open Manhole	1800	1.002	72.949	750	1.001	72.949	750	
								2.005	73.010	375	
SB2	74.725	1.817	Open Manhole	1800	1.003	72.908	750	1.002	72.908	750	
SB1-5	75.209	1.621	Open Manhole	1200	4.000	73.588	225				
SB1-4	75.100	1.587	Open Manhole	1200	4.001	73.513	225	4.000	73.513	225	
SB1-3	75.750	2.517	Open Manhole	1200	4.002	73.233	225	4.001	73.233	225	
SB1-2	75.650	2.564	Open Manhole	1200	4.003	73.086	225	4.002	73.086	225	
SB1-1	74.547	1.553	Open Manhole	1200	4.004	72.994	300	4.003	73.068	225	
SB1	74.450	1.588	Open Manhole	1800	1.004	72.862	750	1.003	72.865	750	3
								4.004	72.989	300	
	74.000	1.160	Open Manhole	0		OUTFALL		1.004	72.840	750	

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7	Hollystown Local Centre	
Date 21/10/2021 File Local Centre.mdx	Designed by ASM Checked by BCM	
Innovyze	Network 2018.1.1	

PIPELINE SCHEDULES for SW 2

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	SB5	75.200	73.586	1.314	Open Manhole	1200
1.001	o	750	SB4	75.200	72.960	1.490	Open Manhole	1800
2.000	o	225	SB3-6	75.079	74.104	0.750	Open Manhole	1200
2.001	o	300	SB3-5	75.340	73.869	1.171	Open Manhole	1200
2.002	o	300	SB3-4	74.990	73.643	1.047	Open Manhole	1200
3.000	o	225	SB3-3-1	74.950	73.647	1.078	Open Manhole	1200
2.003	o	375	SB3-3	74.650	73.272	1.003	Open Manhole	1350
2.004	o	375	SB3-2	74.700	73.224	1.101	Open Manhole	1350
2.005	o	375	SB3-1	74.910	73.099	1.436	Open Manhole	1350
1.002	o	750	SB3	75.000	72.949	1.301	Open Manhole	1800
1.003	o	750	SB2	74.725	72.908	1.067	Open Manhole	1800
4.000	o	225	SB1-5	75.209	73.588	1.396	Open Manhole	1200
4.001	o	225	SB1-4	75.100	73.513	1.362	Open Manhole	1200
4.002	o	225	SB1-3	75.750	73.233	2.292	Open Manhole	1200
4.003	o	225	SB1-2	75.650	73.086	2.339	Open Manhole	1200
4.004	o	300	SB1-1	74.547	72.994	1.253	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	18.184	103.3	SB4	75.200	73.410	1.490	Open Manhole	1800
1.001	8.017	750.0	SB3	75.000	72.949	1.301	Open Manhole	1800
2.000	27.175	170.0	SB3-5	75.340	73.944	1.171	Open Manhole	1200
2.001	55.421	245.0	SB3-4	74.990	73.643	1.047	Open Manhole	1200
2.002	49.935	168.7	SB3-3	74.650	73.347	1.003	Open Manhole	1350
3.000	38.315	170.3	SB3-3	74.650	73.422	1.003	Open Manhole	1350
2.003	15.750	325.0	SB3-2	74.700	73.224	1.101	Open Manhole	1350
2.004	40.617	325.0	SB3-1	74.910	73.099	1.436	Open Manhole	1350
2.005	28.697	324.1	SB3	75.000	73.010	1.615	Open Manhole	1800
1.002	31.032	756.9	SB2	74.725	72.908	1.067	Open Manhole	1800
1.003	32.331	750.0	SB1	74.450	72.865	0.835	Open Manhole	1800
4.000	12.700	169.3	SB1-4	75.100	73.513	1.362	Open Manhole	1200
4.001	47.544	169.8	SB1-3	75.750	73.233	2.292	Open Manhole	1200
4.002	28.133	191.4	SB1-2	75.650	73.086	2.339	Open Manhole	1200
4.003	2.962	164.5	SB1-1	74.547	73.068	1.254	Open Manhole	1200
4.004	12.447	2489.4	SB1	74.450	72.989	1.161	Open Manhole	1800

DBFL Consulting Engineers		Page 5
Ormond House Upper Ormond Quay Dublin 7	Hollystown Local Centre	
Date 21/10/2021 File Local Centre.mdx	Designed by ASM Checked by BCM	
Innovyze	Network 2018.1.1	

PIPELINE SCHEDULES for SW 2

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.004	o	750	SB1	74.450	72.862	0.838	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.004	17.286	785.7		74.000	72.840	0.410	Open Manhole	0

Simulation Criteria for SW 2

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	2880
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	24

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.200	Storm Duration (mins)	1440
Ratio R	0.274		

DBFL Consulting Engineers		Page 6
Ormond House Upper Ormond Quay Dublin 7	Hollystown Local Centre	
Date 21/10/2021 File Local Centre.mdx	Designed by ASM Checked by BCM	
Innovyze	Network 2018.1.1	

Online Controls for SW 2

Hydro-Brake® Optimum Manhole: SB4, DS/PN: 1.001, Volume (m³): 6.9

Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	72.960
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0
Flush-Flo™	0.296	1.9
Kick-Flo®	0.599	1.6
Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		

Hydro-Brake® Optimum Manhole: SB3-2, DS/PN: 2.004, Volume (m³): 3.7

Unit Reference	MD-SHE-0086-3300-1000-3300
Design Head (m)	1.000
Design Flow (l/s)	3.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	86
Invert Level (m)	73.224
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

DBFL Consulting Engineers		Page 7
Ormond House Upper Ormond Quay Dublin 7	Hollystown Local Centre	
Date 21/10/2021 File Local Centre.mdx	Designed by ASM Checked by BCM	
Innovyze	Network 2018.1.1	

Hydro-Brake® Optimum Manhole: SB3-2, DS/PN: 2.004, Volume (m³): 3.7

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.3
Flush-Flo™	0.296	3.3
Kick-Flo®	0.624	2.7
Mean Flow over Head Range	-	2.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.6	1.200	3.6	3.000	5.5	7.000	8.2
0.200	3.2	1.400	3.9	3.500	5.9	7.500	8.5
0.300	3.3	1.600	4.1	4.000	6.3	8.000	8.7
0.400	3.2	1.800	4.3	4.500	6.6	8.500	9.0
0.500	3.1	2.000	4.5	5.000	7.0	9.000	9.2
0.600	2.8	2.200	4.8	5.500	7.3	9.500	9.5
0.800	3.0	2.400	4.9	6.000	7.6		
1.000	3.3	2.600	5.1	6.500	7.9		

Hydro-Brake® Optimum Manhole: SB1-1, DS/PN: 4.004, Volume (m³): 1.8

Unit Reference	MD-SHE-0067-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	72.994
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.0
Flush-Flo™	0.296	1.9
Kick-Flo®	0.599	1.6
Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.6	0.300	1.9	0.500	1.8	0.800	1.8
0.200	1.9	0.400	1.9	0.600	1.6	1.000	2.0

DBFL Consulting Engineers		Page 9
Ormond House Upper Ormond Quay Dublin 7	Hollystown Local Centre	
Date 21/10/2021 File Local Centre.mdx	Designed by ASM Checked by BCM	
Innovyze	Network 2018.1.1	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.274
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	16.200	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 5, 30, 100
Climate Change (%)	20, 20, 20, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	SB5	15 Winter	100	+20%	30/15 Summer			
1.001	SB4	2160 Winter	100	+20%	100/1440 Winter			
2.000	SB3-6	15 Winter	100	+20%	100/15 Summer			
2.001	SB3-5	15 Winter	100	+20%	30/15 Summer			
2.002	SB3-4	15 Winter	100	+20%	30/15 Summer			
3.000	SB3-3-1	720 Winter	100	+20%	30/360 Winter			
2.003	SB3-3	720 Winter	100	+20%	5/180 Winter			
2.004	SB3-2	720 Winter	100	+20%	5/120 Winter			
2.005	SB3-1	600 Summer	1	+20%				
1.002	SB3	4320 Summer	100	+20%				
1.003	SB2	1440 Summer	100	+20%				
4.000	SB1-5	15 Winter	100	+20%	100/15 Summer			
4.001	SB1-4	15 Winter	100	+20%	100/15 Summer			
4.002	SB1-3	15 Winter	100	+20%	30/15 Summer			
4.003	SB1-2	360 Winter	100	+20%	30/15 Summer			
4.004	SB1-1	360 Winter	100	+20%	30/60 Winter			
1.004	SB1	1440 Summer	100	+20%				

DBFL Consulting Engineers		Page 10
Ormond House Upper Ormond Quay Dublin 7	Hollystown Local Centre	
Date 21/10/2021 File Local Centre.mdx	Designed by ASM Checked by BCM	
Innovyze	Network 2018.1.1	

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SB5	74.325	0.439	0.000	1.84		173.2	SURCHARGED	
1.001	SB4	73.724	0.014	0.000	0.01		1.9	SURCHARGED	
2.000	SB3-6	74.656	0.327	0.000	0.16		5.9	SURCHARGED	
2.001	SB3-5	74.651	0.482	0.000	0.97		64.8	SURCHARGED	
2.002	SB3-4	74.425	0.482	0.000	1.48		119.0	SURCHARGED	
3.000	SB3-3-1	74.116	0.244	0.000	0.11		4.2	SURCHARGED	
2.003	SB3-3	74.114	0.467	0.000	0.21		18.7	SURCHARGED	
2.004	SB3-2	74.112	0.514	0.000	0.03		3.3	SURCHARGED	
2.005	SB3-1	73.143	-0.330	0.000	0.03		3.3	OK	
1.002	SB3	73.031	-0.668	0.000	0.02		5.2	OK	
1.003	SB2	72.992	-0.666	0.000	0.02		5.2	OK	
4.000	SB1-5	73.988	0.175	0.000	1.23		42.3	SURCHARGED	
4.001	SB1-4	73.894	0.156	0.000	1.03		39.1	SURCHARGED	
4.002	SB1-3	73.615	0.157	0.000	1.26		43.8	SURCHARGED	
4.003	SB1-2	73.546	0.235	0.000	0.32		8.7	SURCHARGED	
4.004	SB1-1	73.545	0.251	0.000	0.08		1.9	SURCHARGED	
1.004	SB1	72.959	-0.653	0.000	0.04		7.1	OK	

APPENDIX E

FOUL DRAINAGE MICRODRAINAGE CALCULATIONS

Site 2 & 3

Foul Network

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 05/10/2021 08:57 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

FOUL SEWERAGE DESIGN

Design Criteria for Foul Network

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00
Industrial Peak Flow Factor	0.00
Calculation Method	BS 8301
Frequency Factor	0.00
Domestic (l/s/ha)	0.00
Domestic Peak Flow Factor	6.00
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	0.75
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul Network

- Indicates pipe length does not match coordinates

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	24.726	0.412	60.0	0.000	966.0	0.0	1.500	o	150	Pipe/Conduit	
F1.001	13.266	0.221	60.0	0.000	28.0	0.0	1.500	o	150	Pipe/Conduit	
F1.002	52.392	1.191	44.0	0.000	56.0	0.0	1.500	o	150	Pipe/Conduit	
F1.003	10.279	0.060	171.3	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
F1.004	13.800	0.070	196.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
F2.000	38.808	0.647	60.0	0.000	28.0	0.0	1.500	o	150	Pipe/Conduit	
F2.001	9.288	0.155	59.9	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	72.350	0.000	0.0	966.0	0.0	66	1.07	1.13	20.0	7.9
F1.001	71.938	0.000	0.0	994.0	0.0	66	1.07	1.13	20.0	8.0
F1.002	71.690	0.000	0.0	1050.0	0.0	61	1.21	1.32	23.4	8.2
F1.003	70.490	0.000	0.0	1050.0	0.0	92	0.72	0.67	11.8	8.2
F1.004	70.430	0.000	0.0	1050.0	0.0	97	0.68	0.62	11.0	8.2
F2.000	71.247	0.000	0.0	28.0	0.0	39	0.81	1.13	20.0	3.0
F2.001	70.600	0.000	0.0	28.0	0.0	39	0.81	1.13	20.0	3.0

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 05/10/2021 08:57 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Foul Network

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.005	28.980	0.151	192.0	0.000	56.0	0.0	1.500	o	225	Pipe/Conduit	
F3.000	44.034	1.101	40.0	0.000	70.0	0.0	0.150	o	150	Pipe/Conduit	
F1.006	9.552	0.053	180.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F4.000	36.344	1.211	30.0	0.000	112.0	0.0	0.150	o	150	Pipe/Conduit	
F1.007	60.743	0.351	173.0	0.000	140.0	0.0	1.500	o	225	Pipe/Conduit	
F5.000	12.000	0.200	60.0	0.000	14.0	0.0	0.150	o	150	Pipe/Conduit	
F5.001	51.006	0.850	60.0	0.000	70.0	0.0	0.150	o	150	Pipe/Conduit	
F1.008	67.224	0.336	200.0	0.000	140.0	0.0	1.500	o	225	Pipe/Conduit	
F6.000	56.798	0.947	60.0	0.000	70.0	0.0	0.150	o	150	Pipe/Conduit	
F1.009	7.533	0.038	198.2	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F1.010	22.234	0.111	200.3	0.000	70.0	0.0	1.500	o	225	Pipe/Conduit	
F7.000	62.522	1.042	60.0	0.000	126.0	0.0	0.150	o	150	Pipe/Conduit	
F7.001	64.448	0.537	120.0	0.000	112.0	0.0	0.150	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.005	70.360	0.000	0.0	1134.0	0.0	78	0.69	0.83	32.9	8.5
F3.000	72.000	0.000	0.0	70.0	0.0	33	1.25	1.89	33.4	3.6
F1.006	70.209	0.000	0.0	1204.0	0.0	78	0.72	0.85	34.0	8.8
F4.000	72.150	0.000	0.0	112.0	0.0	32	1.43	2.19	38.6	4.0
F1.007	70.156	0.000	0.0	1456.0	0.0	81	0.75	0.87	34.7	9.6
F5.000	70.930	0.000	0.0	14.0	0.0	31	0.97	1.53	27.1	2.6
F5.001	70.730	0.000	0.0	84.0	0.0	38	1.09	1.53	27.1	3.8
F1.008	69.805	0.000	0.0	1680.0	0.0	88	0.72	0.81	32.2	10.3
F6.000	70.635	0.000	0.0	70.0	0.0	37	1.08	1.53	27.1	3.6
F1.009	69.469	0.000	0.0	1750.0	0.0	88	0.73	0.81	32.4	10.5
F1.010	69.431	0.000	0.0	1820.0	0.0	89	0.73	0.81	32.2	10.8
F7.000	72.600	0.000	0.0	126.0	0.0	39	1.12	1.53	27.1	4.1
F7.001	71.483	0.000	0.0	238.0	0.0	45	0.87	1.39	55.3	4.9

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 05/10/2021 08:57 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Foul Network

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F7.002	9.781	0.065	150.5	0.000	14.0	0.0	0.150	o	225	Pipe/Conduit	
F7.003	68.358	0.456	149.9	0.000	112.0	0.0	0.150	o	225	Pipe/Conduit	
F7.004	7.741	0.052	148.9	0.000	0.0	0.0	0.150	o	225	Pipe/Conduit	
F8.000	33.444	0.557	60.0	0.000	70.0	0.0	0.150	o	150	Pipe/Conduit	
F7.005	76.141	0.452	168.5	0.000	98.0	0.0	0.150	o	225	Pipe/Conduit	
F7.006	5.426	0.037	146.6	0.000	0.0	0.0	0.150	o	225	Pipe/Conduit	
F7.007	82.227	0.489	168.2	0.000	182.0	0.0	0.150	o	225	Pipe/Conduit	
F1.011	53.585	0.268	199.9	0.000	238.0	0.0	1.500	o	225	Pipe/Conduit	
F1.012	14.317	0.072	198.8	0.000	14.0	0.0	1.500	o	225	Pipe/Conduit	
F9.000	56.985	0.950	60.0	0.000	126.0	0.0	0.150	o	150	Pipe/Conduit	
F9.001	24.412	0.144	169.5	0.000	42.0	0.0	0.150	o	225	Pipe/Conduit	
F9.002	10.263	0.060	171.1	0.000	56.0	0.0	0.150	o	225	Pipe/Conduit	
F9.003	51.662	0.371	139.3	0.000	168.0	0.0	0.150	o	225	Pipe/Conduit	
F9.004	9.839	0.072	136.7	0.000	0.0	0.0	0.150	o	225	Pipe/Conduit	
F1.013	78.499	0.334	235.0	0.000	182.0	0.0	1.500	o	300	Pipe/Conduit	
F1.014	78.639	0.336	234.0	0.000	126.0	0.0	1.500	o	300	Pipe/Conduit	
F1.015	51.063	0.216	236.4	0.000	0.0	0.0	1.500	o	300	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F7.002	70.946	0.000	0.0	252.0	0.0	48	0.80	1.24	49.2	5.0
F7.003	70.881	0.000	0.0	364.0	0.0	51	0.83	1.24	49.3	5.5
F7.004	70.425	0.000	0.0	364.0	0.0	51	0.83	1.24	49.4	5.5
F8.000	71.749	0.000	0.0	70.0	0.0	37	1.08	1.53	27.1	3.6
F7.005	70.373	0.000	0.0	532.0	0.0	56	0.82	1.17	46.4	6.3
F7.006	69.921	0.000	0.0	532.0	0.0	54	0.87	1.25	49.8	6.3
F7.007	69.884	0.000	0.0	714.0	0.0	59	0.85	1.17	46.4	7.0
F1.011	69.320	0.000	0.0	2772.0	0.0	102	0.78	0.81	32.2	13.7
F1.012	69.052	0.000	0.0	2786.0	0.0	103	0.78	0.81	32.3	13.7
F9.000	70.750	0.000	0.0	126.0	0.0	39	1.12	1.53	27.1	4.1
F9.001	69.725	0.000	0.0	168.0	0.0	47	0.74	1.16	46.2	4.4
F9.002	69.581	0.000	0.0	224.0	0.0	49	0.76	1.16	46.0	4.8
F9.003	69.521	0.000	0.0	392.0	0.0	50	0.86	1.29	51.2	5.7
F9.004	69.150	0.000	0.0	392.0	0.0	50	0.86	1.30	51.7	5.7
F1.013	68.905	0.000	0.0	3360.0	0.0	101	0.75	0.90	63.8	15.5
F1.014	68.571	0.000	0.0	3486.0	0.0	102	0.75	0.90	64.0	15.9
F1.015	68.235	0.000	0.0	3486.0	0.0	102	0.75	0.90	63.6	15.9

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 05/10/2021 08:57 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Foul Network

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.016	34.966	0.134	260.9	0.000	0.0	0.0	0.150	o	300	Pipe/Conduit	
F10.000	62.503	0.368	169.8	0.000	2478.0	0.0	1.500	o	225	Pipe/Conduit	
F1.017	64.674	0.203	318.6	0.000	0.0	0.0	1.500	o	300	Pipe/Conduit	
F1.018	12.606	0.037	340.7	0.000	0.0	0.0	1.500	o	300	Pipe/Conduit	
F11.000	24.367	0.406	60.0	0.000	28.0	0.0	0.150	o	150	Pipe/Conduit	
F12.000	8.310	0.139	59.8	0.000	14.0	0.0	0.150	o	150	Pipe/Conduit	
F11.001	47.555	0.793	60.0	0.000	42.0	0.0	0.150	o	150	Pipe/Conduit	
F11.002	6.447	0.107	60.3	0.000	0.0	0.0	0.150	o	150	Pipe/Conduit	
F13.000	18.472	0.308	60.0	0.000	70.0	0.0	0.150	o	150	Pipe/Conduit	
F13.001	22.221	0.370	60.1	0.000	14.0	0.0	0.150	o	150	Pipe/Conduit	
F14.000	26.738	0.446	60.0	0.000	42.0	0.0	0.150	o	150	Pipe/Conduit	
F11.003	24.829	0.166	149.6	0.000	28.0	0.0	0.150	o	150	Pipe/Conduit	
F1.019	40.392	0.118	342.3	0.000	0.0	0.0	1.500	o	300	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.016	68.019	0.000	0.0	3486.0	0.0	91	0.88	1.12	79.0	15.9
F10.000	70.294	0.000	0.0	2478.0	0.0	94	0.81	0.88	35.0	12.8
F1.017	67.885	0.000	0.0	5964.0	0.0	136	0.74	0.77	54.8	23.1
F1.018	67.682	0.000	0.0	5964.0	0.0	139	0.72	0.75	52.9	23.1
F11.000	70.369	0.000	0.0	28.0	0.0	33	1.02	1.53	27.1	3.0
F12.000	70.102	0.000	0.0	14.0	0.0	31	0.97	1.54	27.1	2.6
F11.001	69.963	0.000	0.0	84.0	0.0	38	1.09	1.53	27.1	3.8
F11.002	69.170	0.000	0.0	84.0	0.0	38	1.09	1.53	27.0	3.8
F13.000	69.989	0.000	0.0	70.0	0.0	37	1.08	1.53	27.1	3.6
F13.001	69.681	0.000	0.0	84.0	0.0	38	1.09	1.53	27.1	3.8
F14.000	69.996	0.000	0.0	42.0	0.0	35	1.04	1.53	27.1	3.3
F11.003	69.063	0.000	0.0	238.0	0.0	55	0.83	0.96	16.9	4.9
F1.019	67.644	0.000	0.0	6202.0	0.0	141	0.73	0.75	52.8	23.7

DBFL Consulting Engineers		Page 5
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 05/10/2021 08:57 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Foul Network

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F15.000	59.563	0.993	60.0	0.000	112.0	0.0	0.150	o	150	Pipe/Conduit	
F16.000	43.973	0.733	60.0	0.000	84.0	0.0	0.150	o	150	Pipe/Conduit	
F17.000	15.771	0.263	60.0	0.000	28.0	0.0	0.150	o	150	Pipe/Conduit	
F18.000	15.457	0.258	59.9	0.000	28.0	0.0	0.150	o	150	Pipe/Conduit	
F17.001	23.941	0.399	60.0	0.000	14.0	0.0	0.150	o	150	Pipe/Conduit	
F16.001	11.737	0.078	150.5	0.000	0.0	0.0	0.150	o	150	Pipe/Conduit	
F16.002	89.982	0.529	170.1	0.000	196.0	0.0	0.150	o	225	Pipe/Conduit	
F19.000	45.200	0.753	60.0	0.000	84.0	0.0	0.150	o	150	Pipe/Conduit	
F19.001	21.824	0.363	60.1	0.000	42.0	0.0	0.150	o	150	Pipe/Conduit	
F19.002	51.830	0.341	152.0	0.000	70.0	0.0	0.150	o	225	Pipe/Conduit	
F20.000	49.069	0.491	99.9	0.000	168.0	0.0	0.150	o	225	Pipe/Conduit	
F19.003	6.822	0.040	170.6	0.000	0.0	0.0	0.150	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F15.000	70.205	0.000	0.0	112.0	0.0	39	1.11	1.53	27.1	4.0
F16.000	70.421	0.000	0.0	84.0	0.0	38	1.09	1.53	27.1	3.8
F17.000	69.994	0.000	0.0	28.0	0.0	33	1.02	1.53	27.1	3.0
F18.000	69.989	0.000	0.0	28.0	0.0	33	1.02	1.53	27.1	3.0
F17.001	69.731	0.000	0.0	70.0	0.0	37	1.08	1.53	27.1	3.6
F16.001	69.332	0.000	0.0	154.0	0.0	52	0.80	0.95	16.8	4.4
F16.002	69.179	0.000	0.0	350.0	0.0	52	0.79	1.16	46.2	5.5
F19.000	70.500	0.000	0.0	84.0	0.0	38	1.09	1.53	27.1	3.8
F19.001	69.747	0.000	0.0	126.0	0.0	39	1.12	1.53	27.1	4.1
F19.002	69.309	0.000	0.0	196.0	0.0	46	0.78	1.23	48.9	4.6
F20.000	70.750	0.000	0.0	168.0	0.0	41	0.90	1.53	60.7	4.4
F19.003	68.968	0.000	0.0	364.0	0.0	52	0.79	1.16	46.1	5.5

DBFL Consulting Engineers		Page 6
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 05/10/2021 08:57 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Foul Network

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F21.000	24.464	0.408	60.0	0.000	28.0	0.0	0.150	o	150	Pipe/Conduit	
F19.004	10.441	0.061	170.0	0.000	0.0	0.0	0.150	o	225	Pipe/Conduit	
F19.005	40.472	0.202	200.4	0.000	14.0	0.0	0.150	o	225	Pipe/Conduit	
F22.000	34.794	0.570	61.0	0.000	84.0	0.0	0.150	o	150	Pipe/Conduit	
F22.001	23.179	0.386	60.0	0.000	14.0	0.0	0.150	o	150	Pipe/Conduit	
F19.006	13.182	0.066	199.7	0.000	42.0	0.0	0.150	o	225	Pipe/Conduit	
F19.007	17.592	0.088	199.9	0.000	28.0	0.0	0.150	o	225	Pipe/Conduit	
F19.008	32.539	0.163	199.6	0.000	98.0	0.0	0.150	o	225	Pipe/Conduit	
F23.000	32.214	0.571	56.4	0.000	70.0	0.0	0.150	o	150	Pipe/Conduit	
F23.001	20.952	0.262	80.0	0.000	14.0	0.0	0.150	o	150	Pipe/Conduit	
F24.000	6.734	0.114	59.1	0.000	28.0	0.0	0.150	o	150	Pipe/Conduit	
F23.002	46.891	0.313	149.8	0.000	168.0	0.0	0.150	o	150	Pipe/Conduit	
F23.003	56.429	0.282	200.1	0.000	196.0	0.0	0.150	o	225	Pipe/Conduit	
F19.009	43.403	0.217	200.0	0.000	126.0	0.0	0.150	o	225	Pipe/Conduit	
F19.010	12.418	0.062	200.3	0.000	0.0	0.0	0.150	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F21.000	70.260	0.000	0.0	28.0	0.0	33	1.02	1.53	27.1	3.0
F19.004	68.928	0.000	0.0	392.0	0.0	53	0.80	1.16	46.2	5.7
F19.005	68.867	0.000	0.0	406.0	0.0	56	0.75	1.07	42.4	5.7
F22.000	69.696	0.000	0.0	84.0	0.0	38	1.08	1.52	26.9	3.8
F22.001	69.126	0.000	0.0	98.0	0.0	38	1.10	1.53	27.1	3.9
F19.006	68.665	0.000	0.0	546.0	0.0	58	0.77	1.07	42.5	6.3
F19.007	68.599	0.000	0.0	574.0	0.0	59	0.78	1.07	42.5	6.5
F19.008	68.511	0.000	0.0	672.0	0.0	61	0.79	1.07	42.5	6.9
F23.000	70.015	0.000	0.0	70.0	0.0	36	1.10	1.58	28.0	3.6
F23.001	69.444	0.000	0.0	84.0	0.0	41	0.98	1.32	23.4	3.8
F24.000	69.132	0.000	0.0	28.0	0.0	33	1.02	1.55	27.3	3.0
F23.002	69.018	0.000	0.0	280.0	0.0	56	0.84	0.96	16.9	5.1
F23.003	68.630	0.000	0.0	476.0	0.0	57	0.76	1.07	42.4	6.0
F19.009	68.348	0.000	0.0	1274.0	0.0	70	0.85	1.07	42.4	9.0
F19.010	68.131	0.000	0.0	1274.0	0.0	70	0.85	1.07	42.4	9.0

DBFL Consulting Engineers		Page 7
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 05/10/2021 08:57 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Foul Network

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F19.011	16.793	0.084	199.9	0.000	28.0	0.0	0.150	o	225	Pipe/Conduit	
F19.012	48.242	0.241	200.2	0.000	140.0	0.0	0.150	o	225	Pipe/Conduit	
F16.003	28.389	0.142	199.9	0.000	28.0	0.0	0.150	o	225	Pipe/Conduit	
F1.020	59.972#	0.193	310.7	0.000	98.0	0.0	1.500	o	375	Pipe/Conduit	
F25.000	24.883	0.415	60.0	0.000	70.0	0.0	0.150	o	150	Pipe/Conduit	
F25.001	9.816	0.164	59.9	0.000	0.0	0.0	0.150	o	150	Pipe/Conduit	
F26.000	26.663	0.406	65.7	0.000	28.0	0.0	0.150	o	150	Pipe/Conduit	
F25.002	59.635	0.398	149.8	0.000	112.0	0.0	0.150	o	150	Pipe/Conduit	
F27.000	53.603	0.357	150.1	0.000	196.0	0.0	0.150	o	150	Pipe/Conduit	
F25.003	31.116	0.249	125.0	0.000	98.0	0.0	0.150	o	225	Pipe/Conduit	
F25.004	12.693	0.094	135.0	0.000	42.0	0.0	0.150	o	225	Pipe/Conduit	
F25.005	24.542	0.175	140.2	0.000	42.0	0.0	0.150	o	225	Pipe/Conduit	
F25.006	57.032	0.393	145.1	0.000	112.0	0.0	0.150	o	225	Pipe/Conduit	
F28.000	15.707	0.262	60.0	0.000	28.0	0.0	0.150	o	150	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F19.011	68.069	0.000	0.0	1302.0	0.0	70	0.86	1.07	42.5	9.1
F19.012	67.985	0.000	0.0	1442.0	0.0	72	0.87	1.07	42.4	9.5
F16.003	67.744	0.000	0.0	1820.0	0.0	77	0.90	1.07	42.5	10.8
F1.020	67.452	0.000	0.0	8232.0	0.0	136	0.78	0.91	100.2	28.4
F25.000	69.914	0.000	0.0	70.0	0.0	37	1.08	1.53	27.1	3.6
F25.001	69.499	0.000	0.0	70.0	0.0	37	1.08	1.54	27.1	3.6
F26.000	69.741	0.000	0.0	28.0	0.0	34	0.98	1.46	25.9	3.0
F25.002	69.335	0.000	0.0	210.0	0.0	54	0.82	0.96	16.9	4.7
F27.000	69.294	0.000	0.0	196.0	0.0	54	0.82	0.95	16.9	4.6
F25.003	68.862	0.000	0.0	504.0	0.0	51	0.91	1.36	54.1	6.2
F25.004	68.613	0.000	0.0	546.0	0.0	53	0.90	1.31	52.0	6.3
F25.005	68.519	0.000	0.0	588.0	0.0	54	0.89	1.28	51.0	6.5
F25.006	68.344	0.000	0.0	700.0	0.0	56	0.90	1.26	50.1	7.0
F28.000	69.870	0.000	0.0	28.0	0.0	33	1.02	1.53	27.1	3.0

DBFL Consulting Engineers		Page 8
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 05/10/2021 08:57 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Network Design Table for Foul Network

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F28.001	69.448	1.157	60.0	0.000	42.0	0.0	0.150	o	150	Pipe/Conduit	
F28.002	20.069	0.334	60.1	0.000	14.0	0.0	0.150	o	150	Pipe/Conduit	
F28.003	5.384	0.090	59.8	0.000	0.0	0.0	0.150	o	150	Pipe/Conduit	
F25.007	92.167	0.542	170.0	0.000	140.0	0.0	0.150	o	225	Pipe/Conduit	
F29.000	49.684	0.824	60.3	0.000	56.0	0.0	1.500	o	150	Pipe/Conduit	
F29.001	27.028	0.181	149.3	0.000	84.0	0.0	0.150	o	150	Pipe/Conduit	
F29.002	7.216	0.036	200.4	0.000	140.0	0.0	0.150	o	225	Pipe/Conduit	
F29.003	90.774	0.534	170.0	0.000	0.0	0.0	0.150	o	225	Pipe/Conduit	
F1.021	23.363	0.064	365.0	0.000	0.0	0.0	1.500	o	375	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F28.001	69.608	0.000	0.0	70.0	0.0	37	1.08	1.53	27.1	3.6
F28.002	68.451	0.000	0.0	84.0	0.0	38	1.09	1.53	27.1	3.8
F28.003	68.117	0.000	0.0	84.0	0.0	38	1.09	1.54	27.1	3.8
F25.007	67.951	0.000	0.0	924.0	0.0	62	0.87	1.16	46.2	7.8
F29.000	69.825	0.000	0.0	56.0	0.0	42	0.84	1.13	20.0	3.5
F29.001	69.001	0.000	0.0	140.0	0.0	51	0.80	0.96	16.9	4.3
F29.002	68.745	0.000	0.0	280.0	0.0	52	0.73	1.07	42.4	5.1
F29.003	68.709	0.000	0.0	280.0	0.0	50	0.77	1.16	46.2	5.1
F1.021	67.259	0.000	0.0	9436.0	0.0	150	0.76	0.84	92.4	31.0

DBFL Consulting Engineers		Page 9
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 05/10/2021 08:57 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Manhole Schedules for Foul Network

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdr (mm)
FF148	73.843	1.493	Open Manhole	1200	F1.000	72.350	150				
FF147	73.565	1.627	Open Manhole	1200	F1.001	71.938	150	F1.000	71.938	150	
FF146	73.454	1.764	Open Manhole	1200	F1.002	71.690	150	F1.001	71.717	150	
FF145A	72.992	2.502	Open Manhole	1200	F1.003	70.490	150	F1.002	70.499	150	
FF145	72.889	2.459	Open Manhole	1200	F1.004	70.430	150	F1.003	70.430	150	
FF144-2	72.400	1.153	Open Manhole	1200	F2.000	71.247	150				
FF144-1	73.000	2.400	Open Manhole	1200	F2.001	70.600	150	F2.000	70.600	150	
FF144	72.958	2.599	Open Manhole	1200	F1.005	70.360	225	F1.004	70.360	150	
								F2.001	70.445	150	
FF143A-1	73.429	1.429	Open Manhole	1200	F3.000	72.000	150				
FF143A	73.186	2.977	Open Manhole	1200	F1.006	70.209	225	F1.005	70.209	225	
								F3.000	70.899	150	6
FF143-1	73.584	1.434	Open Manhole	1200	F4.000	72.150	150				
FF143	73.240	3.084	Open Manhole	1200	F1.007	70.156	225	F1.006	70.156	225	
								F4.000	70.939	150	7
FF142-2	71.176	0.246	Open Manhole	1200	F5.000	70.930	150				
FF142-1	72.404	1.674	Open Manhole	1200	F5.001	70.730	150	F5.000	70.730	150	
FF142	73.019	3.214	Open Manhole	1200	F1.008	69.805	225	F1.007	69.805	225	
								F5.001	69.880	150	
FF141A-1	72.072	1.437	Open Manhole	1200	F6.000	70.635	150				
FF141A	72.537	3.068	Open Manhole	1200	F1.009	69.469	225	F1.008	69.469	225	
								F6.000	69.688	150	1
FF141	72.432	3.001	Open Manhole	1200	F1.010	69.431	225	F1.009	69.431	225	
FF140A-9	73.743	1.143	Open Manhole	1200	F7.000	72.600	150				
FF140A-8	74.370	2.887	Open Manhole	1200	F7.001	71.483	225	F7.000	71.558	150	
FF140A-7	74.180	3.234	Open Manhole	1200	F7.002	70.946	225	F7.001	70.946	225	
FF140A-6	74.060	3.179	Open Manhole	1200	F7.003	70.881	225	F7.002	70.881	225	
FF140A-5	73.401	2.976	Open Manhole	1200	F7.004	70.425	225	F7.003	70.425	225	
FF140A-4	73.437	1.688	Open Manhole	1200	F8.000	71.749	150				
FF140A-3	73.468	3.095	Open Manhole	1200	F7.005	70.373	225	F7.004	70.373	225	
								F8.000	71.192	150	7
FF140A-2	73.580	3.659	Open Manhole	1200	F7.006	69.921	225	F7.005	69.921	225	
FF140A-1	73.594	3.710	Open Manhole	1200	F7.007	69.884	225	F7.006	69.884	225	
FF140A	72.561	3.241	Open Manhole	1200	F1.011	69.320	225	F1.010	69.320	225	
								F7.007	69.395	225	
FF140	72.342	3.290	Open Manhole	1200	F1.012	69.052	225	F1.011	69.052	225	
FF139-5	72.001	1.251	Open Manhole	1200	F9.000	70.750	150				
FF139-4	71.485	1.760	Open Manhole	1200	F9.001	69.725	225	F9.000	69.800	150	

DBFL Consulting Engineers		Page 10
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 05/10/2021 08:57 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Manhole Schedules for Foul Network

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Bac
FF139-3	71.332	1.751	Open Manhole	1200	F9.002	69.581	225	F9.001	69.581	225	
FF139-2	71.411	1.890	Open Manhole	1200	F9.003	69.521	225	F9.002	69.521	225	
FF139-1	72.154	3.004	Open Manhole	1200	F9.004	69.150	225	F9.003	69.150	225	
FF139	72.331	3.426	Open Manhole	1200	F1.013	68.905	300	F1.012	68.980	225	
								F9.004	69.078	225	
FF138	73.032	4.461	Open Manhole	1200	F1.014	68.571	300	F1.013	68.571	300	
FF137	72.648	4.413	Open Manhole	1200	F1.015	68.235	300	F1.014	68.235	300	
FF136	71.267	3.248	Open Manhole	1200	F1.016	68.019	300	F1.015	68.019	300	
FF135-1	71.719	1.425	Open Manhole	1200	F10.000	70.294	225				
FF135	71.723	3.838	Open Manhole	1200	F1.017	67.885	300	F1.016	67.885	300	
								F10.000	69.926	225	
FF134	71.389	3.707	Open Manhole	1200	F1.018	67.682	300	F1.017	67.682	300	
FF133A-8	71.869	1.500	Open Manhole	1200	F11.000	70.369	150				
FF133A-7	71.806	1.704	Open Manhole	1200	F12.000	70.102	150				
FF133A-6	71.810	1.847	Open Manhole	1200	F11.001	69.963	150	F11.000	69.963	150	
								F12.000	69.963	150	
FF133A-5	71.522	2.352	Open Manhole	1200	F11.002	69.170	150	F11.001	69.170	150	
FF133A-4	71.639	1.650	Open Manhole	1200	F13.000	69.989	150				
FF133A-3	71.556	1.875	Open Manhole	1200	F13.001	69.681	150	F13.000	69.681	150	
FF133A-2	71.346	1.350	Open Manhole	1200	F14.000	69.996	150				
FF133A-1	71.580	2.517	Open Manhole	1200	F11.003	69.063	150	F11.002	69.063	150	
								F13.001	69.311	150	
								F14.000	69.550	150	
FF133A	71.317	3.673	Open Manhole	1200	F1.019	67.644	300	F1.018	67.645	300	
								F11.003	68.897	150	
FF133-27	71.555	1.350	Open Manhole	1200	F15.000	70.205	150				
FF133-26	71.633	1.212	Open Manhole	1200	F16.000	70.421	150				
FF133-25	71.399	1.405	Open Manhole	1200	F17.000	69.994	150				
FF133-24	71.387	1.398	Open Manhole	1200	F18.000	69.989	150				
FF133-23	71.323	1.592	Open Manhole	1200	F17.001	69.731	150	F17.000	69.731	150	
								F18.000	69.731	150	
FF133-22	71.502	2.170	Open Manhole	1200	F16.001	69.332	150	F16.000	69.688	150	
								F17.001	69.332	150	
FF133-21	71.830	2.651	Open Manhole	1200	F16.002	69.179	225	F16.001	69.254	150	
FF133-20	71.300	0.800	Open Manhole	1200	F19.000	70.500	150				
FF133-19	71.493	1.746	Open Manhole	1200	F19.001	69.747	150	F19.000	69.747	150	
FF133-18A	71.632	2.323	Open Manhole	1200	F19.002	69.309	225	F19.001	69.384	150	
FF133-18	72.200	1.450	Open Manhole	1200	F20.000	70.750	225				

DBFL Consulting Engineers		Page 11
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 05/10/2021 08:57 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Manhole Schedules for Foul Network

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Ba
FF133-17	72.306	3.338	Open Manhole	1200	F19.003	68.968	225	F19.002	68.968	225	
								F20.000	70.259	225	
FF133-16	71.988	1.728	Open Manhole	1200	F21.000	70.260	150				
FF133-15	72.216	3.288	Open Manhole	1200	F19.004	68.928	225	F19.003	68.928	225	
								F21.000	69.852	150	
FF133-14	72.011	3.145	Open Manhole	1200	F19.005	68.867	225	F19.004	68.867	225	
FF133-13	70.930	1.234	Open Manhole	1200	F22.000	69.696	150				
FF133-12	71.130	2.004	Open Manhole	1200	F22.001	69.126	150	F22.000	69.126	150	
FF133-11	71.150	2.485	Open Manhole	1200	F19.006	68.665	225	F19.005	68.665	225	
								F22.001	68.740	150	
FF133-10	71.269	2.670	Open Manhole	1200	F19.007	68.599	225	F19.006	68.599	225	
FF133-9	71.231	2.720	Open Manhole	1200	F19.008	68.511	225	F19.007	68.511	225	
FF133-8	70.915	0.900	Open Manhole	1200	F23.000	70.015	150				
FF133-7	70.285	0.841	Open Manhole	1200	F23.001	69.444	150	F23.000	69.444	150	
FF133-6-1	70.138	1.006	Open Manhole	1200	F24.000	69.132	150				
FF133-6	70.085	1.067	Open Manhole	1200	F23.002	69.018	150	F23.001	69.132	150	
								F24.000	69.018	150	
FF133-5	70.558	1.928	Open Manhole	1200	F23.003	68.630	225	F23.002	68.705	150	
FF133-4	70.982	2.634	Open Manhole	1200	F19.009	68.348	225	F19.008	68.348	225	
								F23.003	68.348	225	
FF133-3	70.691	2.560	Open Manhole	1200	F19.010	68.131	225	F19.009	68.131	225	
FF133-2A	70.610	2.541	Open Manhole	1200	F19.011	68.069	225	F19.010	68.069	225	
FF133-2	70.752	2.767	Open Manhole	1200	F19.012	67.985	225	F19.011	67.985	225	
FF133-1	71.495	3.751	Open Manhole	1200	F16.003	67.744	225	F16.002	68.650	225	
								F19.012	67.744	225	
FF133	71.584	4.132	Open Manhole	1350	F1.020	67.452	375	F1.019	67.526	300	
								F15.000	69.212	150	
								F16.003	67.602	225	
FF131A-17	70.660	0.746	Open Manhole	1200	F25.000	69.914	150				
FF132A-16	70.491	0.992	Open Manhole	1200	F25.001	69.499	150	F25.000	69.499	150	
FF132-15-1	70.400	0.659	Open Manhole	1200	F26.000	69.741	150				
FF131A-15	70.442	1.107	Open Manhole	1200	F25.002	69.335	150	F25.001	69.335	150	
								F26.000	69.335	150	
FF131A-14	70.029	0.735	Open Manhole	1200	F27.000	69.294	150				
FF131A-13	70.083	1.221	Open Manhole	1200	F25.003	68.862	225	F25.002	68.937	150	
								F27.000	68.937	150	
FF131A-12	70.349	1.736	Open Manhole	1200	F25.004	68.613	225	F25.003	68.613	225	
FF131A-11	70.528	2.009	Open Manhole	1200	F25.005	68.519	225	F25.004	68.519	225	

DBFL Consulting Engineers		Page 12
Ormond House Upper Ormond Quay Dublin 7	Hollystown	
Date 05/10/2021 08:57 File Network Site 2 and 3 20...	Designed by Grant Humphrey Checked by Deirdre Walsh	
Innovyze	Network 2018.1.1	

Manhole Schedules for Foul Network

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Bac
FF131A-10	70.744	2.400	Open Manhole	1200	F25.006	68.344	225	F25.005	68.344	225	
FF131A-9	70.550	0.680	Open Manhole	1200	F28.000	69.870	150				
FF131A-8	70.500	0.892	Open Manhole	1200	F28.001	69.608	150	F28.000	69.608	150	
FF131A-7	70.404	1.953	Open Manhole	1200	F28.002	68.451	150	F28.001	68.451	150	
FF131A-6	71.152	3.035	Open Manhole	1200	F28.003	68.117	150	F28.002	68.117	150	
FF131A-5	71.099	3.148	Open Manhole	1200	F25.007	67.951	225	F25.006	67.951	225	
								F28.003	68.027	150	
FF131A-4	71.230	1.405	Open Manhole	1200	F29.000	69.825	150				
FF131A-3	71.127	2.126	Open Manhole	1200	F29.001	69.001	150	F29.000	69.001	150	
FF131A-2	70.829	2.084	Open Manhole	1200	F29.002	68.745	225	F29.001	68.820	150	
FF131A-1	70.777	2.068	Open Manhole	1200	F29.003	68.709	225	F29.002	68.709	225	
FF131A	70.945	3.686	Open Manhole	1350	F1.021	67.259	375	F1.020	67.259	375	
								F25.007	67.409	225	
								F29.003	68.175	225	
FF131	70.432	3.237	Open Manhole	300		OUTFALL		F1.021	67.195	375	

Local Centre

Foul Network

DBFL Consulting Engineers		Page 1
Ormond House Upper Ormond Quay Dublin 7	Hollystown Local Centre	
Date 21/10/2021 File Local Centre.mdx	Designed by ASM Checked by BCM	
Innovyze	Network 2018.1.1	

FOUL SEWERAGE DESIGN

Design Criteria for FS 3

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00
Industrial Peak Flow Factor	0.00
Calculation Method	BS 8301
Frequency Factor	0.20
Domestic (l/s/ha)	0.00
Domestic Peak Flow Factor	6.00
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	2.000
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	0.75
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for FS 3

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	29.577	0.228	129.7	0.000	658.0	0.0	1.500	o	225	Pipe/Conduit	
1.001	31.130	0.239	130.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
1.002	9.584	0.130	74.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
2.000	30.063	0.231	130.1	0.000	700.0	0.0	1.500	o	225	Pipe/Conduit	
2.001	23.677	0.366	64.7	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
1.003	31.440	0.187	168.1	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
1.004	51.451	0.274	188.0	0.000	462.0	0.0	1.500	o	225	Pipe/Conduit	
1.005	59.542	0.317	188.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	74.200	0.000	0.0	658.0	0.0	63	0.75	1.01	40.0	6.8
1.001	73.972	0.000	0.0	658.0	0.0	63	0.75	1.01	40.0	6.8
1.002	73.733	0.000	0.0	658.0	0.0	54	0.92	1.34	53.1	6.8
2.000	74.200	0.000	0.0	700.0	0.0	64	0.75	1.01	40.0	7.0
2.001	73.969	0.000	0.0	700.0	0.0	53	0.97	1.43	56.8	7.0
1.003	72.847	0.000	0.0	1358.0	0.0	79	0.75	0.88	35.2	9.3
1.004	72.660	0.000	0.0	1820.0	0.0	88	0.75	0.84	33.2	10.8
1.005	72.386	0.000	0.0	1820.0	0.0	88	0.75	0.84	33.2	10.8

DBFL Consulting Engineers		Page 2
Ormond House Upper Ormond Quay Dublin 7	Hollystown Local Centre	
Date 21/10/2021 File Local Centre.mdx	Designed by ASM Checked by BCM	
Innovyze	Network 2018.1.1	

Network Design Table for FS 3

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
3.000	35.769	0.596	60.0	0.000	14.0	0.0	1.500	o	150	Pipe/Conduit	
1.006	58.023	0.309	188.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
1.007	67.837	0.361	188.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
1.008	60.223	0.320	188.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.000	73.650	0.000	0.0	14.0	0.0	36	0.77	1.13	20.0	2.6
1.006	72.070	0.000	0.0	1834.0	0.0	88	0.75	0.84	33.2	10.8
1.007	71.761	0.000	0.0	1834.0	0.0	88	0.75	0.84	33.2	10.8
1.008	71.400	0.000	0.0	1834.0	0.0	88	0.75	0.84	33.2	10.8

DBFL Consulting Engineers		Page 3
Ormond House Upper Ormond Quay Dublin 7	Hollystown Local Centre	
Date 21/10/2021 File Local Centre.mdx	Designed by ASM Checked by BCM	
Innovyze	Network 2018.1.1	

Manhole Schedules for FS 3

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
FC9	75.200	1.000	Open Manhole	1200	1.000	74.200	225				
FC8	75.200	1.228	Open Manhole	1200	1.001	73.972	225	1.000	73.972	225	
FC7	75.200	1.467	Open Manhole	1200	1.002	73.733	225	1.001	73.733	225	
FC6-2	75.200	1.000	Open Manhole	1200	2.000	74.200	225				
FC6-1	75.200	1.231	Open Manhole	1200	2.001	73.969	225	2.000	73.969	225	
FC6	75.200	2.353	Open Manhole	1200	1.003	72.847	225	1.002	73.603	225	756
								2.001	73.603	225	756
FC5	75.340	2.680	Open Manhole	1200	1.004	72.660	225	1.003	72.660	225	
FC4	75.062	2.676	Open Manhole	1200	1.005	72.386	225	1.004	72.386	225	
FC3-1	74.950	1.300	Open Manhole	1200	3.000	73.650	150				
FC3	74.586	2.516	Open Manhole	1200	1.006	72.070	225	1.005	72.070	225	
								3.000	73.054	150	909
FC2	74.263	2.502	Open Manhole	1200	1.007	71.761	225	1.006	71.761	225	
FC1	73.352	1.952	Open Manhole	1200	1.008	71.400	225	1.007	71.400	225	
	0.000		Open Manhole	0		OUTFALL		1.008	71.080	225	

DBFL Consulting Engineers		Page 4
Ormond House Upper Ormond Quay Dublin 7	Hollystown Local Centre	
Date 21/10/2021 File Local Centre.mdx	Designed by ASM Checked by BCM	
Innovyze	Network 2018.1.1	

PIPELINE SCHEDULES for FS_3

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	FC9	75.200	74.200	0.775	Open Manhole	1200
1.001	o	225	FC8	75.200	73.972	1.003	Open Manhole	1200
1.002	o	225	FC7	75.200	73.733	1.242	Open Manhole	1200
2.000	o	225	FC6-2	75.200	74.200	0.775	Open Manhole	1200
2.001	o	225	FC6-1	75.200	73.969	1.006	Open Manhole	1200
1.003	o	225	FC6	75.200	72.847	2.128	Open Manhole	1200
1.004	o	225	FC5	75.340	72.660	2.455	Open Manhole	1200
1.005	o	225	FC4	75.062	72.386	2.451	Open Manhole	1200
3.000	o	150	FC3-1	74.950	73.650	1.150	Open Manhole	1200
1.006	o	225	FC3	74.586	72.070	2.291	Open Manhole	1200
1.007	o	225	FC2	74.263	71.761	2.277	Open Manhole	1200
1.008	o	225	FC1	73.352	71.400	1.727	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	29.577	129.7	FC8	75.200	73.972	1.003	Open Manhole	1200
1.001	31.130	130.0	FC7	75.200	73.733	1.242	Open Manhole	1200
1.002	9.584	74.0	FC6	75.200	73.603	1.372	Open Manhole	1200
2.000	30.063	130.1	FC6-1	75.200	73.969	1.006	Open Manhole	1200
2.001	23.677	64.7	FC6	75.200	73.603	1.372	Open Manhole	1200
1.003	31.440	168.1	FC5	75.340	72.660	2.455	Open Manhole	1200
1.004	51.451	188.0	FC4	75.062	72.386	2.451	Open Manhole	1200
1.005	59.542	188.0	FC3	74.586	72.070	2.291	Open Manhole	1200
3.000	35.769	60.0	FC3	74.586	73.054	1.382	Open Manhole	1200
1.006	58.023	188.0	FC2	74.263	71.761	2.277	Open Manhole	1200
1.007	67.837	188.0	FC1	73.352	71.400	1.727	Open Manhole	1200
1.008	60.223	188.0		0.000	71.080		Open Manhole	0

Free Flowing Outfall Details for FS_3

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.008		0.000	71.080	71.080	0	0

APPENDIX F

IRISH WATER CORRESPONDENCE

Site 2&3 Confirmation of Feasibility

Aneta Smietana

Ormond House
Upper Ormond Quay
Dublin 7
D07W704

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

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

www.water.ie

15 January 2021

Re: CDS20003676 pre-connection enquiry - Subject to contract | Contract denied
Connection for Multi/Mixed Use Development of 591 units at Lands at Hollystown, Dublin 15, Co. Dublin

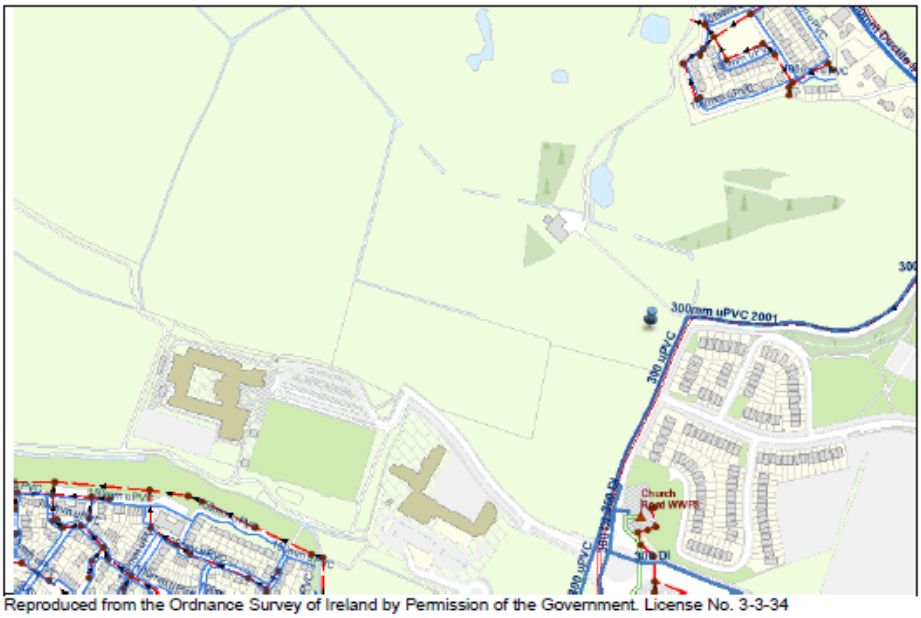
Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Lands at Hollystown, Dublin 15, Co. Dublin (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	OUTCOME OF PRE-CONNECTION ENQUIRY THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	A new 200mm ID connection pipe, with installed bulk meter and associated telemetry system, should be connected to the existing 300mm uPVC main. 

Wastewater Connection	Completion of 9C Duplication Project is required prior the connection. The Project is currently at construction phase and is scheduled to be completed by Irish Water in Q3/2022 (this may be subject to change)
The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.	

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



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

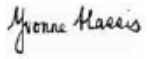
Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish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

General Notes:

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

If you have any further questions, please contact Marina Byrne from the design team via email mzbyrne@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

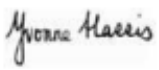
Head of Customer Operations

General Notes:

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

If you have any further questions, please contact Marina Byrne from the design team via email mzbyrne@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations

Local Centre Confirmation of Feasibility

Brendan Curran

Ormond House
Ormond Quay Upper
Dublin 7
Co. Dublin
D07N5YH

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

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

www.water.ie

19 November 2020

Re: CDS20003562 pre-connection enquiry - Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 301 units at Town Centre Development, Tyrellstown, Dublin 15, Co. Dublin

Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Town Centre Development, Tyrellstown, Dublin 15, Co. Dublin (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	OUTCOME OF PRE-CONNECTION ENQUIRY THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	The proposed development indicates that Irish Water 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 infrastructure 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 Development. A wayleave in favour of Irish Water will be required over the infrastructure that is not located within the Public Space.
Wastewater Connection	Completion of 9C Duplication Project is required prior the connection. The Project is currently at construction phase and is scheduled to be completed by Irish Water in Q3/2022 (this may be subject to change)

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

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

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

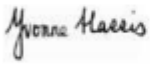
Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish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

General Notes:

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

If you have any further questions, please contact Marina Byrne from the design team via email mzbyrne@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations

Site 2&3 Statement of Design Acceptance

Aneta Smietana
DBFL Consulting
Ormond House
Upper Ormond Quay
Dublin 7 D07W704

15 December 2021

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

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

www.water.ie

Re: Design Submission for Lands at Hollystown, Dublin 15, Co. Dublin (the "Development")
(the "Design Submission") / Connection Reference No: CDS20003676

Dear Aneta Smietana,

Many thanks for your recent Design Submission.

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

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

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

If you have any further questions, please contact your Irish Water representative:
Name: Dario Alvarez
Email: dalvarez@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

- 170182-DBFL-CS-SP-DR-C-1004 Site 2 Site Services Sheet 1
- 170182-DBFL-CS-SP-DR-C-1005 Site 2 Site Services Sheet 2
- 170182-DBFL-CS-SP-DR-C-1006 Site 3 Site Services Sheet 1
- 170182-DBFL-CS-SP-DR-C-1007 Site 3 Site Services Sheet 2
- 170182-DBFL-FW-SP-DR-C-3001 Longitudinal Sections Through Foul Sewer Sheet 1
- 170182-DBFL-FW-SP-DR-C-3002 Longitudinal Sections Through Foul Sewer Sheet 2
- 170182-DBFL-FW-SP-DR-C-3003 Longitudinal Sections Through Foul Sewer Sheet 3
- 170182-DBFL-FW-SP-DR-C-3004 Longitudinal Sections Through Foul Sewer Sheet 4
- 170182-DBFL-FW-SP-DR-C-3005 Longitudinal Sections Through Foul Sewer Sheet 5
- 170182-DBFL-FW-SP-DR-C-3006 Longitudinal Sections Through Foul Sewer Sheet 6
- 170182-DBFL-FW-SP-DR-C-3007 Longitudinal Sections Through Foul Sewer Sheet 7
- 170182-DBFL-WM-SP-DR-C-1004 Site 2 Proposed Watermain Layout Sheet 1
- 170182-DBFL-WM-SP-DR-C-1005 Site 2 Proposed Watermain Layout Sheet 2
- 170182-DBFL-WM-SP-DR-C-1006 Site 2 Proposed Watermain Layout Sheet 1
- 170182-DBFL-WM-SP-DR-C-1007 Site 2 Proposed Watermain Layout Sheet 2

Standard Details/Code of Practice Exemption: N/A

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

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

Local Centre - Statement of Design Acceptance

Brendan Curran
Ormond House
Ormond Quay Upper
Dublin 7,
Co. Dublin
D07N5YH

15 December 2021

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

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

www.water.ie

Re: Design Submission for Town Centre Development, Tyrellstown, Dublin 15, Co. Dublin (the "Development") – East Section of the Development.
(the "Design Submission") / Connection Reference No: CDS20003562

Dear Brendan Curran,

Many thanks for your recent Design Submission.

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

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

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

If you have any further questions, please contact your Irish Water representative:
Name: Dario Alvarez
Email: dalvarez@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

- 170182-DBFL-WM-SP-DR-C-1011 Local Centre Proposed Watermain Layout
- 170182-DBFL-CS-SP-DR-C-1011 Local Centre Proposed Site Services
- 170182-DBFL-FW-SP-DR-C-3007 Longitudinal Sections Through Foul Sewer Sheet 7

Standard Details/Code of Practice Exemption:

While Irish Water notes that the wastewater services infrastructure in Block C and Block B area will remain private and not be vested, we have the following comments:

- *It is recommended that the foul sewer should be 3m distance from the building*

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

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

APPENDIX G

SITE INVESTIGATION

GROUND INVESTIGATIONS IRELAND

Ground Investigations Ireland Ltd.,
Catherinestown House,
Hazelhatch Road,
Newcastle, Co Dublin.
Tel: 01 601 5175 / 5176 | Fax: 01 601 5173
Email: info@gii.ie | Web: gii.ie

Ground Investigations Ireland

Development at Hollystown Golf Club

Ground Investigation Report

DOCUMENT CONTROL SHEET

Project Title	Development at Hollystown Golf Club
Engineer	DBFL
Project No	7929-07-18
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Final	S Mclaughlin	F McNamara	F McNamara	Dublin	29 August 2018

GROUND INVESTIGATIONS IRELAND

Ground Investigations Ireland Ltd.,
Catherinestown House,
Hazelhatch Road,
Newcastle, Co Dublin.
Tel: 01 601 5175 / 5176 | Fax: 01 601 5173
Email: info@gii.ie | Web: gii.ie

CONTENTS

APPENDICES

1.0 Preamble

On the instructions of DBFL Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd. in July 2018 at the site of the proposed development at Hollystown Golf Club, Hollystown, Co. Dublin.

2.0 Overview

2.1. Background

It is proposed to construct a new residential development with associated services and car parking at the proposed site. The site is currently an active golf course and is situated in Hollystown, North Dublin. The proposed construction is envisaged to consist of conventional foundations and pavement make up with some local excavations for services and plant.

2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Carry out 4 No. Trial Pit to a maximum depth of 2.00m BGL
- Carry out 4 No. Soakaway to determine a soil infiltration value to BRE digest 365
- Report with recommendations

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.
The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.1. Trial Pits

The trial pits were excavated using a 3.5T tracked excavator at the location shown in the exploratory hole location plan in Appendix 1. The location was checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pit was sampled, logged and photographed by a

Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 with associated photographs in Appendix 3 of this Report.

3.2. Soakaway Testing

The soakaway testing was carried out the trial pit at the location shown in the exploratory hole location plan in Appendix 1. The pit was carefully excavated and filled with water to assess the infiltration characteristics of the proposed site. The pit was allowed to drain and the drop in water level was recorded over time as required by BRE Digest 365. The pit was logged prior to completing the soakaway test and was backfilled with arising's upon completion. The soakaway test result is provided in Appendix 4 of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and are generally comprised;

- Topsoil
- Made Ground
- Cohesive Deposits

TOPSOIL: Topsoil was encountered in all the exploratory holes and was present to a maximum depth of 0.15m BGL.

MADE GROUND: Made Ground deposits were encountered in SA03 beneath the Topsoil and was present to a depth of 0.30m BGL. These deposits were described generally as *brown slightly sandy slightly gravelly Clay with occasional cobbles and contained occasional fragments of plastic.*

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Topsoil and Made Ground and were described typically as *grey or brown slightly sandy slightly gravelly CLAY with occasional cobbles* .The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. The strength of the cohesive deposits typically increased with depth and was firm or firm to stiff below 1.5m BGL in the majority of the exploratory holes. These deposits had occasional, some or many cobble content where noted on the exploratory hole logs.

5.0 Recommendations & Conclusions

5.1. General

The recommendations given and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes. Limited information has been provided at the ground investigation stage and any designs based on the recommendations or conclusions should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory hole logs.

5.2. Soakaway Design

Infiltration rates of 1.980 x 10^{-5} and 1.955 x 10^{-5} m/s respectively were calculated for the soakaway locations SA02 and SA03. At the locations of SA01 and SA04 the water level dropped too slowly to allow calculation of 'f' the soil infiltration rate. These locations are therefore not recommended as suitable for soakaway design and construction.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

APPENDIX 1 - Site Location Plan

LEGEND

SOAKAWAY TEST

TRIAL PIT

TEST TYPE	TEST NUMBERING RANGE	NO. OF TESTS
Soakaways	SA01 - SA04	4
Trial Pit	TP01 - TP03	3

LOCATION: HOLLYSTOWN GOLF COURSE, CO. DUBLIN

SCALE: NTS

DBFL REF: 170182

APPENDIX 2 – Trial Pitting Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Development at Hollystown Golf Club			**Trial Pit Number** SA01
Machine : 3.5T Excavator **Method** : Trial Pit	**Dimensions** 2.10m X 0.50m X 1.70m	**Ground Level (mOD)**	**Client** DBFL	**Job Number** 7929-07-18
	Location	**Dates** 01/08/2018	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
					(0.50) 0.60	Stiff brown slightly sandy slightly gravelly CLAY with rare sub-angular to sub-rounded cobbles of limestone and granite. Gravel is sub-angular to sub-rounded fine to coarse limestone and granite.		
					(0.90) 1.50	Stiff greyish brown slightly sandy gravelly CLAY with rare sub-angular to sub-rounded cobbles of limestone and granite. Gravel is sub-angular to sub-rounded fine to coarse limestone and granite. Trial pit completed at scheduled depth. Complete at 1.50m		

Plan

Remarks

No Groundwater encountered.
Trial pit stable.
Soakaway completed in trial pit.
Trial pit backfilled on completion on of soakaway test.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	7929-07-18.SA01

Ground Investigations Ireland Ltd www.gii.ie				Site Development at Hollystown Golf Club	Trial Pit Number SA02
Machine : 3.5T Excavator Method : Trial Pit	Dimensions 2.10m X 0.50m X 1.70m		Ground Level (mOD)	Client DBFL	Job Number 7929-07-18
	Location		Dates 01/08/2018	Project Contractor Ground Investigations Ireland	Sheet 1/1

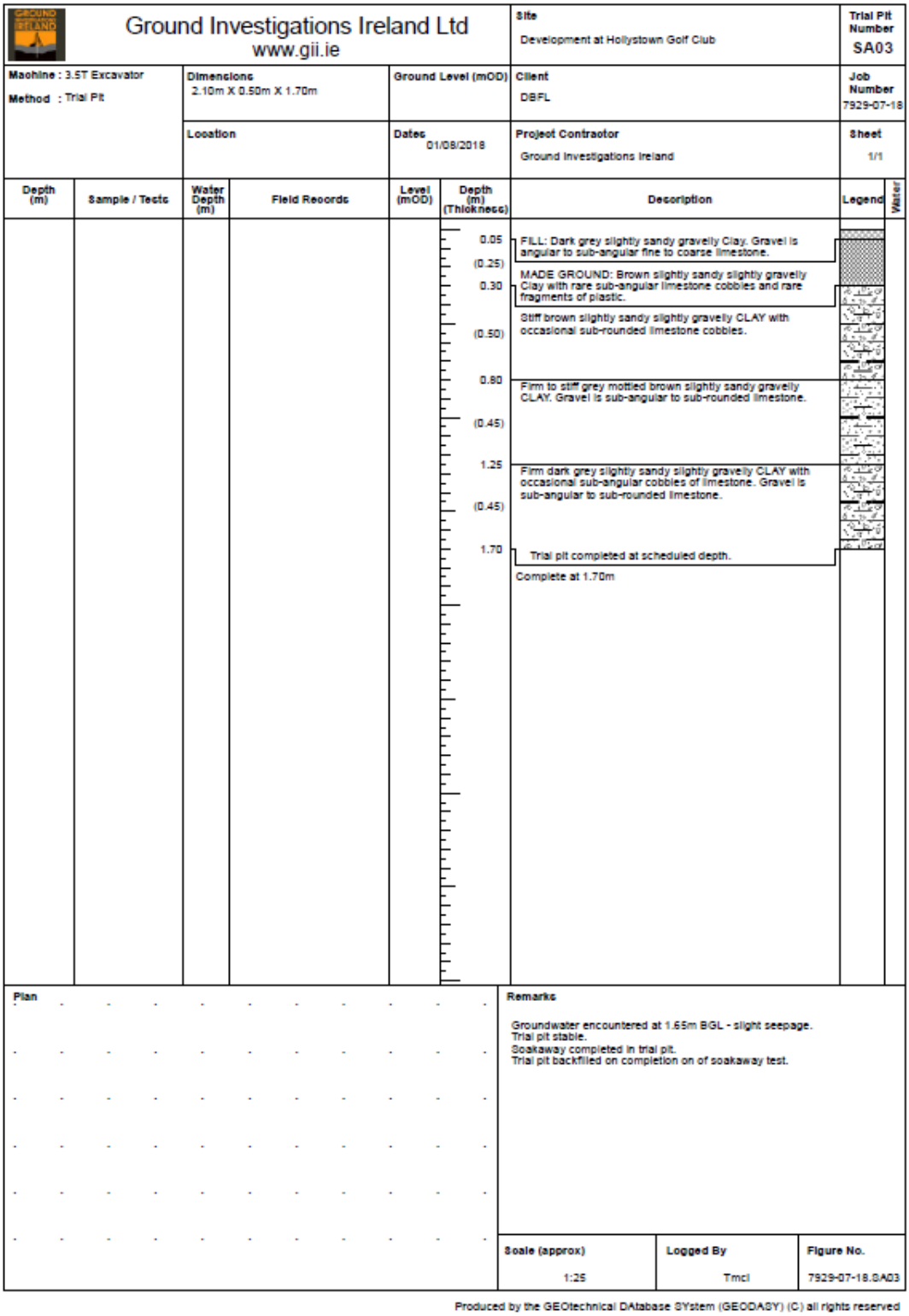
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	Brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
					(0.20) 0.30	Firm brown slightly sandy gravelly CLAY with rare sub-angular cobbles of limestone. Gravel is angular to sub-angular fine to coarse limestone.		
					(0.90)	Firm greyish brown slightly sandy gravelly CLAY with occasional sub-angular cobbles of limestone. Gravel is sub-angular fine to coarse limestone.		
					1.20	Firm to stiff dark brown sandy gravelly CLAY with occasional sub-rounded boulders of limestone. Gravel is sub-angular to sub-rounded fine to coarse limestone.		
					(0.50)			
					1.70	Trial pit completed at scheduled depth.		
						Complete at 1.70m		

Plan

Remarks

No Groundwater encountered.
Trial pit stable.
Soakaway completed in trial pit.
Trial pit backfilled on completion on of soakaway test.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	7929-07-18.SA02



Ground Investigations Ireland Ltd
www.gii.ie

Site: Development at Hollystown Golf Club			Trial Pit Number: SA03
Machine : 3.5T Excavator Method : Trial Pit	Dimensions: 2.10m X 0.50m X 1.70m	Ground Level (mOD):	Client: DBFL Job Number: 7929-07-18
	Location:	Dates: 01/08/2018	Project Contractor: Ground Investigations Ireland Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.05	FILL: Dark grey slightly sandy gravelly Clay. Gravel is angular to sub-angular fine to coarse limestone.		
					(0.25)			
					0.30	MADE GROUND: Brown slightly sandy slightly gravelly Clay with rare sub-angular limestone cobbles and rare fragments of plastic.		
					(0.50)	Stiff brown slightly sandy slightly gravelly CLAY with occasional sub-rounded limestone cobbles.		
					0.80	Firm to stiff grey mottled brown slightly sandy gravelly CLAY. Gravel is sub-angular to sub-rounded limestone.		
					(0.45)			
					1.25	Firm dark grey slightly sandy slightly gravelly CLAY with occasional sub-angular cobbles of limestone. Gravel is sub-angular to sub-rounded limestone.		
					(0.45)			
					1.70	Trial pit completed at scheduled depth.		
						Complete at 1.70m		

Plan

Remarks

Groundwater encountered at 1.65m BGL - slight seepage.
Trial pit stable.
Soakaway completed in trial pit.
Trial pit backfilled on completion on of soakaway test.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	7929-07-18.GA03

Ground Investigations Ireland Ltd
www.gii.ie

Site Development at Hollystown Golf Club			**Trial Pit Number** SA04
Machine : 3.5T Excavator **Method :** Trial Pit	**Dimensions** 2.30m X 0.50m X 1.60m	**Ground Level (mOD)**	**Client** DBFL	**Job Number** 7929-07-18
	Location	**Dates** 01/08/2018	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15) 0.15	Dark brown slightly sandy slightly gravelly TOPSOIL with grass rootlets.		
					(0.35) 0.50	Firm to stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is sub-angular to sub-rounded fine to coarse limestone.		
					(0.40) 0.90	Firm to stiff brown slightly sandy gravelly CLAY with occasional angular to sub-angular cobbles of limestone. Gravel is sub-angular to sub-rounded fine to coarse limestone.		
					(0.70) 1.60	Firm grey mottled brown slightly sandy slightly gravelly CLAY with rare cobbles of sub-rounded limestone. Gravel is sub-angular to sub-rounded fine to coarse limestone. Trial pit completed at scheduled depth. Complete at 1.60m		

Plan

Remarks

No Groundwater encountered.
Trial pit stable.
Soakaway completed in trial pit.
Trial pit backfilled on completion on of soakaway test.

Scale (approx)	Logged By	Figure No.
1:25	Tmcl	7929-07-18.SA04

APPENDIX 3 – Trial Pitting Photographs

Hollystown Golf Course – Trial Pit Photographs

SAO1

SA02

SA03

SA04

APPENDIX 4 – Soakaway Testing Results

Hollystown golf course | Ground Investigations Ireland | Soakaway Test Report

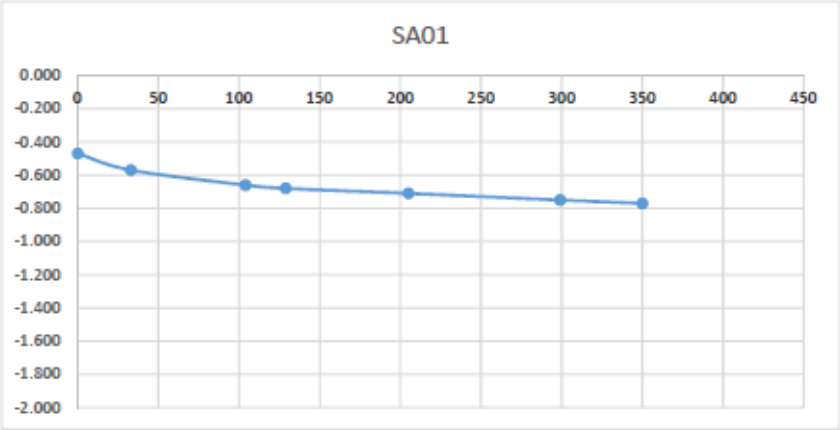
SA01

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.10m x 0.50m 1.50m (L x W x D)

Date	Time	Water level (m bgl)
02/08/2018	0	-0.470
02/08/2018	33	-0.570
02/08/2018	104	-0.660
02/08/2018	129	-0.680
02/08/2018	205	-0.710
02/08/2018	299	-0.750
02/08/2018	350	-0.770

*Soakaway failed - Pit backfilled

Start depth	Depth of Pit	Diff	75% full	25%full
0.47	1.500	1.030	0.7275	1.2425



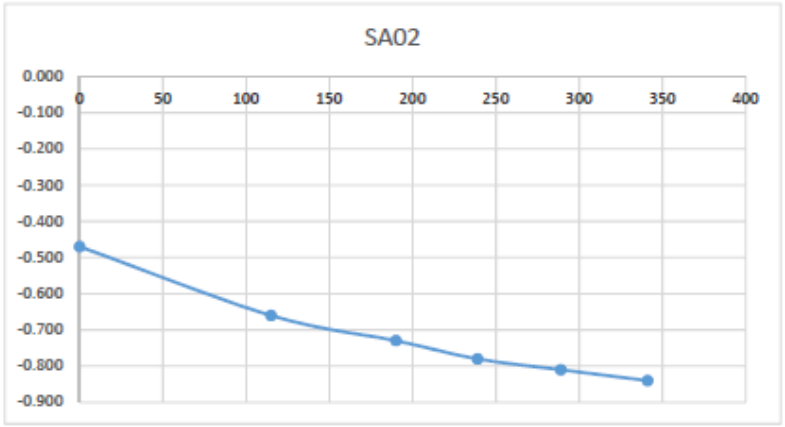
Hollystown Gold Course | Ground Investigations Ireland | Soakaway Test Report

SA02

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.30m x 0.50m x 1.70m (L x W x D)

Date	Time	Water level (m bgl)
02/08/2018	0	-0.470
02/08/2018	115	-0.660
02/08/2018	190	-0.730
02/08/2018	239	-0.780
02/08/2018	289	-0.810
02/08/2018	341	-0.840

Start depth	Depth of Pit		Diff	75% full	25%full
0.47	1.700		1.230	0.7775	1.3925
Length of pit (m)	Width of pit (m)			75-25Ht (m)	Vp75-25 (m3)
2.300	0.500			0.615	0.71
Tp75-25 (from graph) (s)		77750		50% Eff Depth	ap50 (m2)
				0.615	4.594
f =	1.980E-06	m/s			

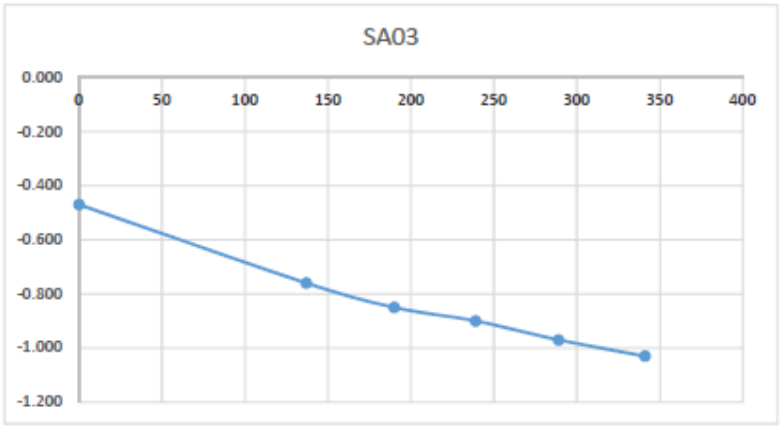


SA03

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.10m x 0.50m x 1.70m (L x W x D)

Date	Time	Water level (m bgl)
02/08/2018	0	-0.470
02/08/2018	137	-0.760
02/08/2018	190	-0.850
02/08/2018	239	-0.900
02/08/2018	289	-0.970
02/08/2018	341	-1.030

Start depth	Depth of Pit		Diff	75% full	25%full
0.47	1.700		1.230	0.7775	1.3925
Length of pit (m)	Width of pit (m)			75-25Ht (m)	Vp75-25 (m3)
2.100	0.500			0.615	0.65
Tp75-25 (from graph) (s)		77750		50% Eff Depth	ap50 (m2)
				0.615	4.248
f =	1.955E-06	m/s			



Hollystown Golf Course | Ground Investigations Ireland | Soakaway Test Report

SA04

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.30m x 0.50m 1.50m (L x W x D)

Date	Time	Water level (m bgl)
02/08/2018	0	-0.330
02/08/2018	60	-0.410
02/08/2018	88	-0.410
02/08/2018	171	-0.420
02/08/2018	205	-0.430
02/08/2018	247	-0.440

*Soakaway failed - Pit backfilled

Start depth	Depth of Pit	Diff	75% full	25%full
0.33	1.600	1.270	0.6475	1.2825