# Residential Development, Sandford Road, Dublin 6

**Report Title** 

**Infrastructure Design Report** 

Client

Sandford Living Limited





August 2021

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# **1.0 INTRODUCTION**

## 1.1 Background

DBFL have been instructed to prepare an Infrastructure Design Report to accompany a planning application for a proposed development at Milltown Park, Sandford Road, Dublin 6.

The proposed development ("the site") comprises of 671 residential dwelling (604 No. Build to Rent and 67 No. Build to Sell) on a c. 4.26 ha site (developable area). The development also includes a creche with outdoor play area and communal internal amenities and facilities (co-working space, lounges, libraries and multi-purpose hall).

# 1.2 **Objectives**

This report provides information regarding the existing site and addresses the infrastructural demands of the proposed development including the following:

- Site Access and Road Layout
- Surface Water Drainage
- Flood Risk
- Foul Drainage
- Water Supply

## 1.3 Location

The subject site is located at the corner of Sandford Road and Milltown Road (refer to Figure 1.1 below). The site is currently occupied by institutional buildings comprising Milltown Park House with 5 No. extensions attached to the original structure, two of which are to be retained within the proposed development (The Chapel and Tabor House).

Sandford Road is located along the site's north-eastern boundary and Milltown Road is located along the site's south-eastern boundary.

Existing residential development is located to the north-west and west of the site while lands in the ownership of the Jesuit Order are located to the south-west and south of the site.

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Figure 1.1: Site Location Plan (Site Boundary Indicative Only)

## 1.4 **Topography and Site Characteristics**

The site generally falls from south to north at a gradient of approx. 1:45. Surface gradients become flatter (approx. 1:100) on approach to the existing site access off Sandford Road.

Existing topographical survey of the site is shown in the background of the Proposed Road Layout Plan and the Proposed Site Services Layout Plan (refer to DBFL's Drawings 190226-DBFL-RD-SP-DR-C-1001 and 190226-DBFL-CS-SP-DR-C-1001).

Existing surface gradients across the site have been a key factor in the design of road levels, finished floor levels, the surface water drainage network and the foul drainage network.

Existing trees and vegetation are located along the site's western, eastern and northern boundaries. These trees and vegetation have also been considered in the design of the surface water drainage network and foul drainage network.

## 1.5 Ground Conditions

Ground Investigations Ireland carried out site investigations between January and June 2020.

The site is generally overlain by a 0.2m to 0.4 m thick topsoil layer. An asphalt layer was observed at some locations (existing access road / carpark) and is typically 100mm thick.

Made ground deposits were encountered under topsoil/surfacing at some locations at depths between 0.5 and 1.0m BGL. These deposits were described generally as brown slightly sandy, slightly gravelly CLAY with occasional cobbles or grey sandy angular Gravel. In some locations the made ground contained occasional fragments of brick.

The site is generally underlain by cohesive deposits comprising of slightly sandy / slightly gravelly CLAY with occasional cobbles overlying a stiff or very stiff dark grey/black slightly sandy slightly gravelly CLAY with occasional cobbles. The strength of the cohesive deposits typically increases with depth. Granular deposits were encountered in BH16 within the cohesive deposits and were typically grey brown slightly clayey sandy sub angular sub rounded fine to coarse GRAVEL with occasional cobbles.

The rotary core boreholes recovered weak to strong grey/dark grey fines to medium grained LIMESTONE with calcite veining. Residual weather mudstone also found in some locations. Depths to rock varies from 9.0m to 18.45m BGL.

At the time of the initial site investigations, groundwater was observed at 4 of 16 borehole locations at depths typically ranging from 2.5m to 3.0m BGL. Standpipes were installed at 7 no. boreholes locations to determine the equilibrium groundwater level over time. Ground water measurements taken in June 2020 and October 2020 indicated ground water depths of 1.0m to 7.5m BGL.

Soakaway testing was carried out at three locations (in the vicinity of the proposed attenuation facility). Infiltration was not observed at any of the test locations; therefore, infiltration has not been allowed for in surface water design and calculations for the proposed development. Infiltration test results are included in Appendix F of this report.

## 1.6 **Proposed Development**

As noted in Section 1.1, the proposed development comprises of 672 residential dwellings a creche and communal internal amenities. Refer to O'Mahony Pike Architects' Schedule of Accommodation and Site Layout Plan for further detail.

The proposed development will also include the following associated engineering infrastructure:

- Provision of surface water drainage, foul drainage and water supply infrastructure and connections.
- Construction of a surface water outfall which exits the site along its south-eastern boundary, continues along Milltown Road, through the junction of Milltown Road / Sandford Road prior to discharging to the existing public surface water drainage network in Eglinton Road. The surface water outfall extends approximately 300m from the developable site boundary to the outfall location.
- Provision of a new vehicle access off Milltown Road (primary vehicle access to the proposed development facilitating access to the basement carpark, the forecourt area adjacent to Tabor House and the duplex units along the western boundary). This new site access shall be a priority junction and also serves pedestrians and cyclists.
- Retain existing entrance on Sandford Road (facilitates pedestrian and cycle access as well as limited vehicle access to the area adjacent to Block A1). Improvements to pedestrian facilities adjacent to the entrance off Sandford Road are also proposed.
- Provision of additional a access point for pedestrians and cyclists adjacent to the junction of Sandford Road / Milltown Road.

# 2.0 ACCESS AND ROADS

#### 2.1 Vehicular Site Access

#### Vehicular Access – Milltown Road

The primary access point for vehicles is off Milltown Road facilitating access to the basement carpark, the forecourt area adjacent to Tabor House and the duplex units along the western boundary. This access point also serves pedestrians and cyclists.

This proposed site access shall operate as a priority junction with associated signage and line marking in accordance with the Department of Transport's Traffic Signs Manual.

A Toucan Crossing is also proposed in vicinity of the Milltown Road access to improve facilities for vulnerable road users.

Milltown Road has a posted speed limit of 50km/hour. The site entrance complies with minimum visibility splays as required by DMURS (Y Distance = 49m, X Distance = 2.4m).

Refer to Drawing No. 190226-DBFL-RD-SP-DR-C-1001 for the proposed site access layout at Milltown Road.

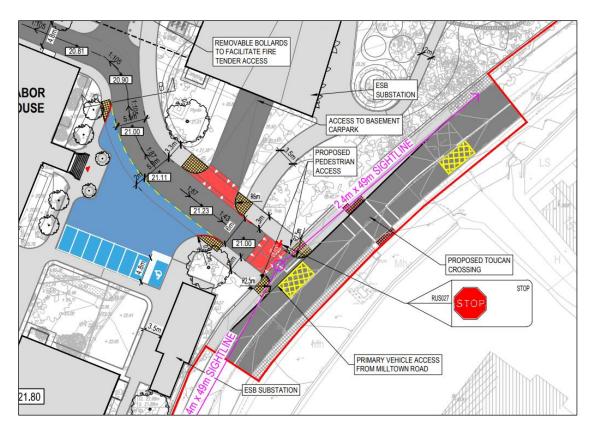


Figure 2.1: Site Access off Milltown Road

#### Vehicular Access – Sandford Road

A secondary access point for vehicles is located at the existing entrance from Sandford Road which facilitates access to the area adjacent to Block A (for deliveries, taxi pick up / drop off and disabled parking) as well as fire tender access to the northern end of the site.

This access point also serves pedestrians and cyclists. As such, improvements to pedestrian facilities at the Sandford Road / Belmont Avenue junction are proposed (upgrading of the existing pedestrian crossing on Sandford Road, amendments to line marking at the junction, improved tactile paving and reduction of corner radii).

There is no vehicular access from Sandford Road to the basement carpark, the forecourt area adjacent to Tabor House and the duplex units along the western boundary (which are all served exclusively from Milltown Road).

Refer to Drawing No. 190226-DBFL-RD-SP-DR-C-1001 for the proposed site access layout at Milltown Road.

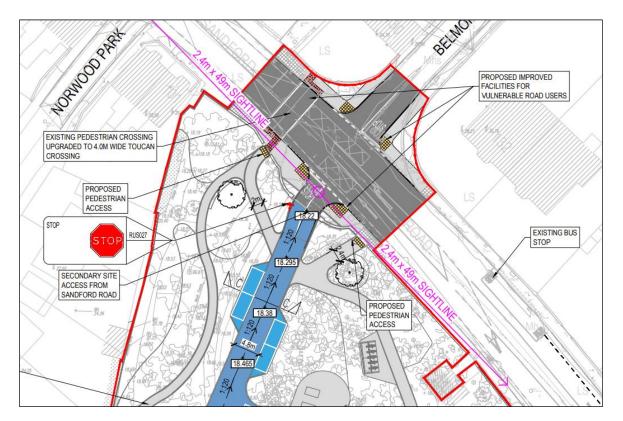


Figure 2.1: Site Access off Milltown Road

#### 2.2 Pedestrian and Cycle Access

With reference to DBFL Drawing 190226-DBFL-RD-SP-DR-C-1001 (Roads Layout), the site layout facilitates high levels of cycle and pedestrian connectivity as noted below:

- As noted above in Section 2.1, pedestrian and cycle access is proposed at the Milltown Road and Sandford Road entrances.
- An additional access point for pedestrians and cyclists is proposed adjacent to the junction of Sandford Road / Milltown Road (adjacent to the north-east corner of the site).
- The site layout also facilitates potential future pedestrian connectivity to the Jesuit lands south-west of the site.
- A Toucan Crossing is proposed in vicinity of the Milltown Road access to improve facilities for vulnerable road users.
- Improved facilities for vulnerable road users are also proposed at the Sandford Road access (at present there is a single push button pedestrian crossing at Sandford Road which is to be upgraded to a Toucan Crossing).
- The scheme proposals for the subject site will ensure pedestrians are given priority within the internal site layout arranged to ensure pedestrian desire lines are accommodated within the development.

The proposed pedestrian and cycle access points as described above are shown on Drawing 190226-DBFL-RD-SP-DR-C-1001.

## 2.3 Street Layout Design

DMURS Street Design guidelines have been incorporated into the site's street layout and are detailed further in DBFL's DMURS Design Statement (Technical Note, 190226-TN-001).

## 2.4 Vehicle Tracking

The proposed site layout has been tracked (using AutoTrack software) to demonstrate that large vehicles such as fire tender, refuse vehicles and ESB trucks can access and circulate around the site (refer to Drawings 190226-DBFL-RD-SP-DR-C-1002 to 190226-DBFL-RD-SP-DR-C-1007).

# 2.5 **Pavement Design Standards**

Pavement design at site access points from Milltown Road and Sandford Road and local streets within the development are to be designed in accordance with the Design Manual for Urban Roads and Streets (DMURS) and Local Authority requirements.

Actual CBR (California Bearing Ratio) values and ground conditions are to be confirmed by site specific investigations prior to road construction.

# 2.6 Traffic & Transportation

A separate Traffic and Transportation Assessment has been prepared as part of this planning application (refer to DBFL Report No. 190226-rep-005).

# 3.0 SURFACE WATER DRAINAGE

## 3.1 **Existing Surface Water Drainage Infrastructure**

As noted in Section 1.4, Topography and Site Characteristics, the site generally falls from south to north at a gradient of approx. 1:45 with surface gradients becoming flatter on approach to the existing site access off Sandford Road.

An existing 225mm diameter surface water drain is located approximately 80m from the eastern corner of the site on Eglington Road. Refer to Figure 3.1 below and Irish Water's Network Plan as included in Appendix A of this report.

Existing surface water drains on site discharge to the existing combined sewer network along Sandford Road and Milltown Road rather than the existing surface water drain in Eglinton Road / Dodder River.

It is proposed to discharge attenuated flows from the site to the existing drainage network on Eglington Road (approximately 200m from the Sandford Road / Eglinton Road junction where the public line increases to a 300mm diameter pipe).

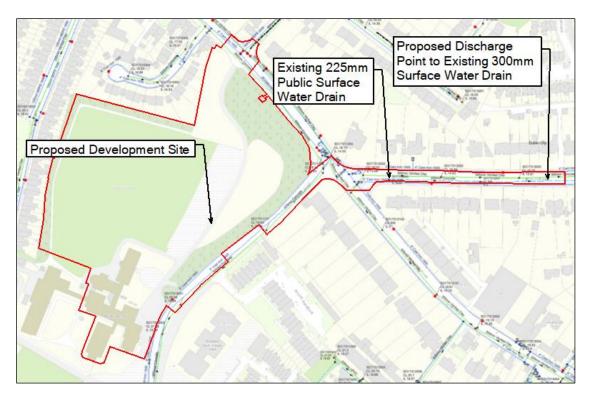


Figure 3.1: Extract from Irish Water's Network Plan (Site Boundary Indicative Only)

#### 3.2 Basis of Design

#### 3.2.1 General Description of Surface Water Design

The public surface water network on Eglington Road (as described above in Section 3.1) will provide a suitable surface water discharge point for the proposed development. However, in order to achieve the required drainage invert levels on site, approximately 160m of the existing drainage network along Eglington Road will need to be replaced with a 300mm pipe running at a flatter gradient. The total length of the surface water outfall from the point it crosses the developable site boundary at Milltown Road to the discharge point on Eglinton Road is approximately 300m.

Detailed topographic and GPR surveys were carried out along the proposed outfall route (Milltown Road, through the junction of Milltown Road / Sandford Road and Eglinton Road) to assess feasibility with regard to the location of existing services. The interaction between existing services and the alignment / level of the outfall route is shown on DBFL Drawing 190226-DBFL-CS-SP-DR-C-1003. The development's surface water outfall has been designed based on a self -cleansing velocity of 1.0 m/sec (300mm diameter @ min. gradient of 1/252).

The proposed surface water drainage network for the site is shown on Drawings 190226-DBFL-CS-SP-DR-C-1001.

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

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

Surface water runoff from **apartment roofs** will be captured by green roof (sedum blanket or equivalent) prior to being routed to the piped surface water drainage network.

Surface water runoff from the **roofs of duplex units located along the western boundary will be routed to the proposed surface water pipe network via porous aggregates beneath permeable paved driveways** (providing an additional element of attenuation).

A drainage reservoir (drainage board) is to be provided on the podium slab over basement (for green areas and paved areas).

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Surface water runoff from the majority of site's internal street network will be directed to the proposed pipe network via tree pits or other SUDS features (with overflows to conventional road gullies). Part of the site's internal street network (adjacent to Block E) drains via 3 no. bio-retention areas.

Surface water runoff from in curtilage parking spaces associated with duplex units located along the western boundary will be captured by permeable paving.

In limited instances, surface water runoff from paved areas will be directed to the proposed pipe network via conventional road gullies.

Any incidental surface water runoff generated from the basement carpark would drain through a separate system beneath the basement slab (out falling to the proposed foul drainage network via a petrol interceptor).

## 3.2.2 Compliance with Surface Water Policy

The site's surface water management infrastructure has been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS).

The GDSDS (Vol. 2, Chapter 6.3.4) requires that the following design criteria are applied to all sites:

• Criterion 1:

River Water Quality Protection – Satisfied by providing interception storage and treatment of surface water run-off by SUDS features such as permeable paving of driveways, green roofs, tree pits, bioretention areas, underground attenuation tanks and full retention fuel / oil separators at surface water discharge points.

• Criterion 2:

River Regime Protection – Satisfied by attenuating surface water run-off in association with flow control devices prior to discharge off site at greenfield runoff rate. Site critical duration storm used to assess attenuation volume.

• Criterion 3:

Level of Service (Flooding) for the Site – Satisfied by reviewing available flood hazard information (e.g. Eastern CFRAM Study) relating to the site's proximity to fluvial flood plains (up to 1 in 100-year flood event).

Also refer to DBFL Report No. 162085-rep-004 (Site Specific Flood Risk Assessment).

• Criterion 4:

River Flood Protection – Satisfied by attenuating surface water discharge to greenfield runoff rates, addressing pluvial flood risk associated with the 1 in 100 year storm and avoiding development in flood plains.

#### 3.2.3 Design Standards

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

#### Design Criteria:

•	Return period for pipe work design	5 years
•	Return period for attenuation design	100 years
•	Allowable Outflow	2.0 l/sec/ha
•	Time of entry	4 minutes
•	M5 - 60 (based on site specific rainfall data)	17.3 mm
•	Ratio "r" (based on site specific rainfall data)	0.280
•	Pipe Friction (Ks)	0.6 mm
•	Minimum Velocity (based on pipe flowing full)	1.0 m/s
•	Rainfall Depth Factored for Climate Change	20%

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

#### Table 6.2 Climate Change Factors to be Applied to Drainage Design

Refer to Appendix B for Attenuation Design Calculations and Appendix C for Surface Water Network Design Calculations which have been carried out using Microdrainage WinDes analysis software.

# 3.2.4 SuDS

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

- Green Roof The proposed build-up will be an extensive type with 100mm minimum construction depth and sedum planting.
- Roof Areas Draining Via SuDS Duplex units located along the site's western boundary drain via porous aggregates beneath permeable paved driveways (providing an additional element of attenuation).
- Green Areas Over Podium –Soft landscaped podium areas will have typical soil depths of up to 300mm to facilitate grassed areas, plants, shrubs and trees i.e. similar to a deep intensive green roof build up.
- Permeable Paving Over Podium Free draining material within the build-up and will reduce the flow rate from these areas.
- Surface water runoff from the site's internal street network will be directed to the proposed pipe network via tree pits or other SUDS features like swales or bioretention areas with overflows to conventional road gullies.
- Surface water runoff from in curtilage parking spaces (duplex units located along the site's western boundary) captured by permeable paving.
- Soft Landscaped/Grassed Areas Slows runoff at source.
- Attenuation of the 30 and 100 year return period storms within Stormtech Attenuation Chambers or equivalent
- Installation of a vortex flow control device (Hydrobrake or equivalent), limiting surface water discharge from the site to 2.0 l/sec/ha
- Surface water discharge will also pass via a Class 1 full retention fuel / oil separator (sized in accordance with permitted discharge from the site)

## 3.2.5 Proposed Runoff Coefficients and Factored Impermeable Areas

#### Proposed Runoff Coefficients

Noted below are the proposed reduction factors for the proposed development.

• Green Roof – 30% Reduction Factor

The proposed build up will be an extensive type with 100mm minimum construction depth and sedum planting. The soil build-up will partially absorb some of the initial run-off and once saturated will reduce flow rates through green roof medium to the outlets and final attenuation storage location.

• Duplex Roof Draining via SuDs – 20% Reduction Factor

Reduction of velocity as the aggregate/filter material used in the SuDS feature (permeable paving) slows run-off at source and ultimately reduces the peak inflow for attenuation calculations.

• Roads Draining via SuDs – 20% Reduction Factor

Typically, road gullies discharge to tree pits (with high level overflow to the piped surface water network). Also takes account of run-off stored within the micro and macro texture of the surfacing (i.e. runoff not collected by piped network).

• In Curtilage Parking Spaces, Permeable Paving – 30% reduction Factor

Reduction of velocity as the aggregate/filter material used in the SuDS feature (permeable paving) slows the run-off at source ultimately reduce the peak inflow for attenuation calculations.

• Green Areas Over Podium – 50% Reduction Factor

Soft landscaped podium areas will have typical soil depths of up to 300mm to facilitate grassed areas, plants, shrubs and trees i.e. similar to a deep intensive green roof build up.

• Permeable Paving Over Podium – 20% Reduction Factor

Permeable paving on the podium will have a free draining material within the build-up and will reduce the flow rate from these areas. A reduction in velocity will also occur as the aggregate used will slow the run-off at source. • Soft Landscaped/Grassed Areas – 90% Reduction Factor

Grassed/ landscaped areas slows the run-off at source ultimately reducing the peak inflow for attenuation calculation.

• Impermeable Areas (footpaths and hard stand areas) – 5% Reduction Factor

A 5% reduction of the surface area is applied to take account of run-off not collected and stored within the micro and macro texture of the surfacing.

Factored Impermeable Areas

	Runoff Coefficients	Gross Areas m <sup>2</sup>	Factored Areas m <sup>2</sup>
Green Roof	0.70	8,018	5,613
Roof Draining via SuDS	0.80	1,389	1,111
Roads/Footpaths draining to tree pits with Overflow to Gullies	0.80	4,677	3,742
Green Areas on Podium	0.50	2,669	1,334
Permeable Areas on Podium	0.80	1,427	1,142
Permeable Paving	0.70	1,089	763
Landscaped Area	0.10	21,265	2,127
Impermeable areas	0.95	2,066	1,963
Total (m²)		42,600	17,795
Total (ha)		4.26	1.8

Table 3.1 Proposed Runoff Coefficients and Factored Impermeable Areas.

## 3.2.6 Attenuation Calculation

Attenuation volumes have been calculated based on an allowable outflow / greenfield runoff rate of 2.00 l/sec/ha. This results in a permitted discharge from the site of 8.52 l/sec.

Run-off from the proposed development will be controlled / attenuated using vortex type flow control devices (Hydrobrake or equivalent).

Due to the topography and site layout, it is proposed that the site be divided in to 5 no. catchments each containing an attenuated storage system.

The resultant storage system types, discharge limits and storage volumes for each catchment are detailed in Table 3.2.

Catchment / Attenuation Area	Draining/ cascading to	Catchment Area (Total)	Impermeable Catchment Area (Total)	Allowable Outflow (Max.)	Storage Volume Required (100 Yr.)	Storage Volume Provided (100 Yr.)
		ha	ha	l/sec	m <sup>3</sup>	m <sup>3</sup>
1	Cascading to Catchment 2	0.80	0.36	2	238.5	261.6
2	Cascading to Catchment 3	0.79	0.51	4.7	285.6	327.4
3	Cascading to Catchment 5	0.48	0.146	4.7	201.6	209.2
4	Cascading to Catchment 5	1.18	0.548	2.6	364.6	377.9
5	Draining to Eglington Rd.	1.00	0.219	8.5	182.5	229.2
TOTAL		4.26	1.8		1272.8	1405.3

Table 3.2 – Surface Water Attenuation Storage and Discharge Limits

The locations of the proposed attenuation systems are shown on Drawing 190226-DBFL-CS-SP-DR-C-1001. Refer to Appendix B for Attenuation Calculations (attenuation volumes have been carried out using Microdrainage analysis software). 190226-Rep-002

#### 3.2.7 Interception Volume

The GDSDS (Vol. 2, Table 6.3) requires interception storage to be incorporated into surface water drainage design in order to limit discharge of sediment and pollutants into the downstream surface water drainage network and receiving water courses.

This interception storage is designed to capture surface water run-off from rainfall depths of 5mm (and up to 10mm if possible).

The SuDS features included in the development (refer to Section 3.2.4) will provide the necessary interception volume required by the GDSDS (i.e. green roofs, permeable paving, tree pits, bioretention areas, landscaped areas, stone backfill associated with attenuation tank).

# 3.3 Flood Risk

A separate Site-Specific Flood Risk Assessment has been prepared as part of this planning application (refer to DBFL Report No. 190226-rep-003).

This flood risk assessment has been undertaken by reviewing information from the Office of Public Works (OPW) National Flood Hazard Mapping (www.floodmaps.ie) and the Eastern CFRAM Study and has been carried out in accordance with the OPW's Guidelines for Planning Authorities – The Planning System and Flood Risk Management (November 2009).

## 3.4 Surface Water Quality Impact

Run-off rates from the site are controlled by flow control devices.

Surface water management proposals for the development also incorporate the following impact reduction measures;

- Surface water network designed in accordance with GDSDS requirements.
- Incorporates SUDS features e.g. green roofs, drainage reservoir (drainage board) on the podium slab over basement, permeable paving in parking areas at the front of duplex units (i.e. treatment / filtration provided within the stone reservoir beneath permeable paved driveways) and tree pits with overflow to conventional road gullies.
- Surface water attenuation (i.e. treatment / filtration provided within the granular surround of the Stormtech Chambers) in conjunction with a final Class 1 fuel / oil separator prior to discharge to the downstream surface water network.

#### 4.0 FOUL DRAINAGE

#### 4.1 Existing Drainage Infrastructure

An existing 600mm diameter combined sewer is located adjacent to the site's north-eastern boundary (Sandford Road). An existing 375mm diameter combined sewer is also located adjacent to the site's south-eastern boundary (Milltown Road) which outfalls to the 600mm diameter combined sewer on Sandford Road. Refer to Figure 4.1 and Irish Water's Network Plan as included in Appendix A of this report.

An existing private foul drainage network is located within the site (typically 150mm diameter) which outfalls to the combined sewer on the Sandford Road via a combined connection with the private surface water drainage network.

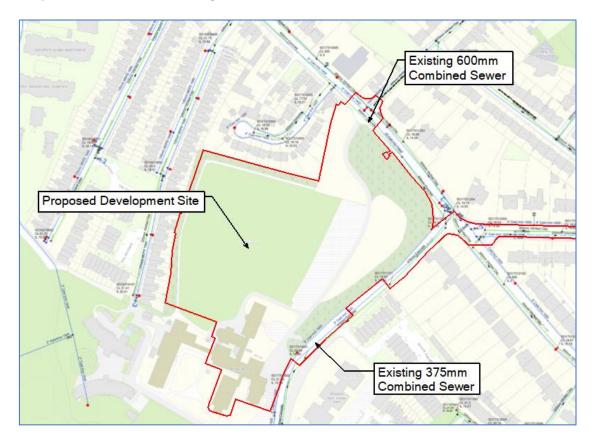


Figure 4.1: Extract from Irish Water's Network Plan (Site Boundary Indicative Only)

# 4.2 **Design Strategy**

As noted in Section 4.1 above, an existing combined sewer network is located in Sandford Road and Milltown Road.

Two foul drainage discharge points are proposed for the site (in the vicinity of the proposed access off Milltown Road and the existing access of Sandford Road). This facilitates a gravity drainage solution for the site. Refer to Drawing 190226-DBFL-CS-SP-DR-C-1001 for the proposed foul drainage layout.

The proposed foul drainage network within the site comprises of a series of 225mm diameter pipes. Duplex units (located along the western boundary) will be serviced by individual 100mm diameter connections.

We note that a Statement of Design Acceptance has been received from Irish Water for the proposed foul drainage layout (refer to Appendix D).

## 4.3 **Pre-Connection Feedback from Irish Water**

Pre-connection enquiry feedback has been received from Irish Water (included in Appendix D). Irish Water have advised as follows:

 "Based upon the details that you have provided with your pre-connection enquiry and on the capacity currently available in the network(s), as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place, your proposed connection to the Irish water network(s) can be facilitated".

DBFL have engaged with Irish Water regarding feasibility of providing a foul drainage connection for the proposed development (refer to e-mail trail from March 2020 to June 2020 as included in Appendix D of this report).

With reference to Section 3.1 above, it is proposed to discharge surface water flows from the proposed development to existing surface water drainage infrastructure on Eglington Road. On this basis, Irish Water have advised that discharge of foul drainage flows to existing combined sewers adjacent to the site is feasible:

 "if you were to connect to the storm sewer and divert any existing hardstanding to this storm sewer it would offset any impact from the foul connection. In this scenario, given the development will be delivering a net reduction in flows we could allow the connection without surveys and modelling", Irish Water e-mail dated 30<sup>th</sup> March 2020

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 "The connection of the developments ww flows to the combined sewer is feasible once the surface water flows are discharged to the storm sewer", Irish Water e-mail dated 6<sup>th</sup> May 2020.

Irish Water also issued a letter to ABP dated 4<sup>th</sup> September 2020 which confirmed their earlier issue of a Confirmation of Feasibility letter and a Statement of Design Acceptance dated 19<sup>th</sup> January 2021 (as included in Appendix D of this report).

# 4.4 **Design Calculations**

The foul drainage network for the proposed development has been designed in accordance with the following guidelines: (Add Dates of Publication)

- Irish Water Code of Practice for Wastewater Infrastructure (July 2020)
- Department of the Environment's Building Regulations "Technical Guidance Document Part H Drainage and Waste Water Disposal" (2016)
- BS EN 752: 2008 Drain and Sewer Systems Outside Buildings
- IS EN 12056: Part 2 (2000) Gravity Drainage Systems Inside Buildings

Foul drainage network calculations for the proposed development have been carried out using Microdrainage WinDes analysis software (refer to Appendix E).

#### **Design Criteria:**

Demand	446 l/dwelling/day
Discharge units	14 units per house (as BS8301)
Pipe Friction (Ks)	1.5 mm
Minimum Velocity	0.75 m/s (self-cleansing velocity)
Maximum Velocity	3.0 m/s (1:18 maximum pipe gradient)
Frequency Factor	0.5 for domestic use

# 4.5 Foul Drainage – Environmental Impact

#### **Residential**

Waste Water Discharge Calculation (as outlined in Irish Water's Pre-Connection Enquiry Application Form)

Dry Weather Flow	446 l/dwelling /day
No. of Dwellings	671
Post Development Average Discharge (DWF)	3.46 l/sec
Post Development Peak Discharge (6 x DWF)	20.8 l/sec
Daily Foul Discharge Volume (600l per dwelling)	299,266 l

#### Communal Internal Amenities (Within Residential Blocks, Tabor House and Chapel)

Waste Water Discharge Calculation (as outlined in Irish Water's Pre-Connection Enquiry Application Form)

Assumed occupancy (persons)	50
Flow Rate / Person / Day (litres)	50
(Based on IW Flow Rate for Design	
non-residential school with canteen)	
Post Development Average Discharge	0.1 l/sec
(based on 8 hour occupancy)	
Post Development Peak Discharge	0.6 l/sec
(6 X DWF)	
Daily Foul Discharge Volume (50l per person)	2,500 l/Day

#### **Residential and Communal Internal Amenities**

Post Development Peak Discharge	21.4 l/sec
---------------------------------	------------

## 5.0 WATER SUPPLY

#### 5.1 Existing Public Water Mains

Existing public water supply infrastructure (9" Cast Iron Water Main) is located along the site's northern-eastern boundary (Sandford Road) and south-eastern boundary (Milltown Road) as identified in Figure 5.1 and Irish Water's Network Plan as included in Appendix A of this report.

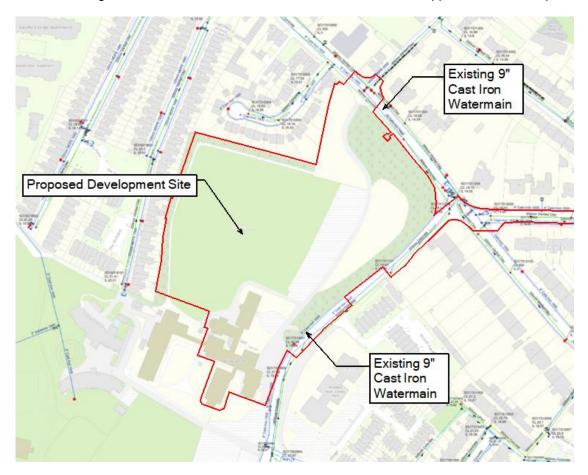


Figure 5.1: Extract from Irish Water's Network Plan (Site Boundary Indicative Only)

## 5.2 **Pre-Connection Feedback from Irish Water**

Pre-connection enquiry feedback has been received from Irish Water (included in Appendix D). Irish Water have advised as follows:

 "Based upon the details that you have provided with your pre-connection enquiry and on the capacity currently available in the network(s), as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place, your proposed connection to the Irish water network(s) can be facilitated".

#### 5.3 **Proposed Water Main Layout**

The site's proposed water main layout is shown on Drawing 190226-DBFL-WM-SP-DR-C-1001. It is proposed to take 2 No. 200mm diameter connections off the existing 9" water mains located along Sandford Road and Milltown Road. These connections will link within the site.

Bulk flow meters and sluice valves will be installed at connection points to the public water main in accordance with the Irish Water Code of Practice and Standard Details.

Duplex units (located along the western boundary) will have their own connections (25mm O.D. PE pipe) to distribution water mains via service connections and boundary boxes. Individual connections are to be installed in accordance with Irish Water Standard Detail STD-W-03.

## 5.4 Hydrants

The proposed water main layout is arranged such that all buildings are a maximum of 46.0m from a hydrant in accordance with the Department of the Environment's Building Regulations "Technical Guidance Document Part B Fire Safety".

Hydrants shall comply with the requirements of BS 750:2012 and shall be installed in accordance with Irish Water's Code of Practice and Standard Details.

#### 5.5 Materials

Proposed water mains and connections to duplex units are to be PE100 SDR17.

## 5.6 Water Demand

#### **Residential**

Water Demand has been calculated in accordance with the guidelines outlined in Irish Water's Pre-Connection Enquiry Application Form:

•	No. of Housing Units	671
•	Average Occupancy Ration (Persons Per Dwelling)	2.7
•	Per-Capita Consumption (I/person/day)	150
•	Average Domestic Daily Demand (I/sec)	3.15
•	Post Development Average Hour Water Demand (I/sec)	3.94
	(1.25 x Average Domestic Daily Demand)	
•	Post Development Peak Hour Water Demand (I/sec)	19.7
	(5.0 x Post Development Average Hour Water Demand)	

#### Communal Internal Amenities (Within Residential Blocks, Tabor House and Chapel)

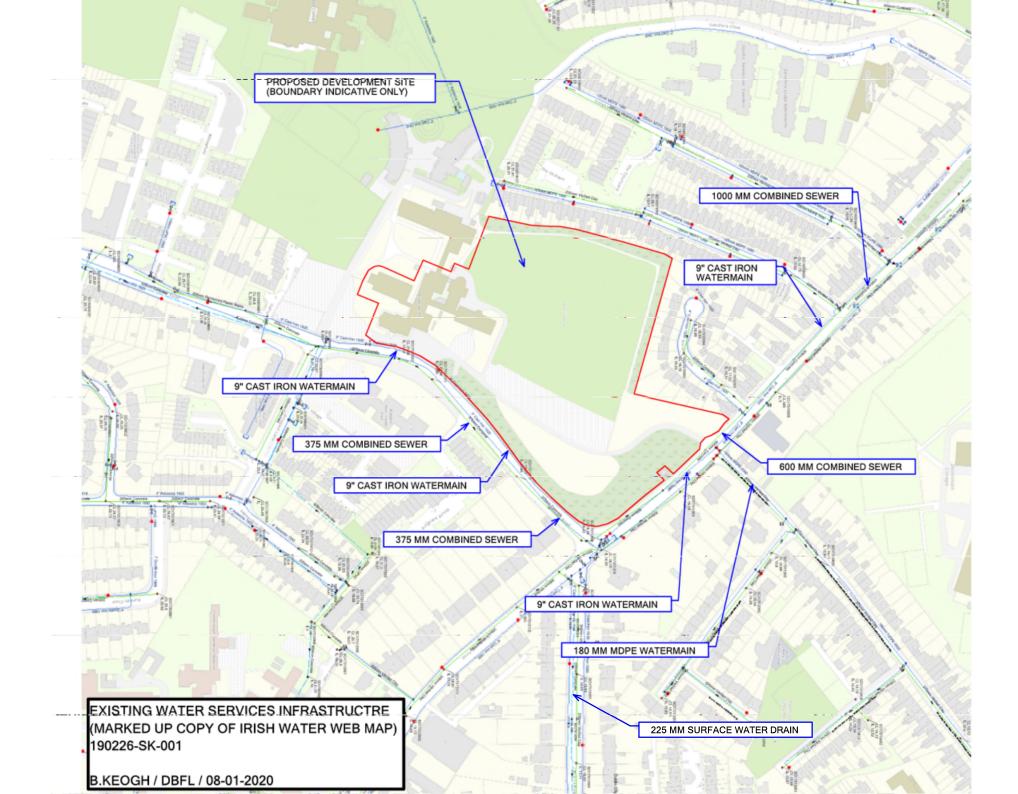
Water Demand has been calculated in accordance with the guidelines outlined in Irish Water's Pre-Connection Enquiry Application Form:

•	Assumed occupancy (persons)	50
•	Per-Capita Consumption (I/person/day)	50
	(Based on IW Flow Rate for Design	
	non-residential school with canteen)	
•	Average Domestic Daily Demand (I/sec)	0.1
	(based on 8 hour occupancy)	
•	Post Development Average Hour Water Demand (I/sec)	0.13
	(1.25 x Average Domestic Daily Demand)	
•	Post Development Peak Hour Water Demand (I/sec)	0.7
	(5.0 x Post Development Average Hour Water Demand)	

#### **Residential and Communal Internal Amenities**

20.4 l/sec Post Development Peak Hour Water Demand

# **APPENDIX A – IRISH WATER NETWORK PLANS**



190226-Rep-002

# **APPENDIX B – ATTENUATION CALCULATION**

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<u>Casca</u>	<u>de Summar</u>	y of R			190220 2021.S		e Contro	l Catc	<u>hment 1</u>
			<u> </u>			NUN			_
_	tream ctures			Out	flow To			Overi	low To
	(None) 1903	226 Sour	ce Con	trol C	atchmen	t 2 09.08	.2021.SRC	Х	(None)
		Н	alf Dr	ain Ti	me : 178	3 minutes	5.		
	Storm	Max	Max		lax	Max	Max	Max	Status
	Event		-				E Outflow		
		(m)	(m)	(1	/s)	(1/s)	(1/s)	(m³)	
15	min Summer	17.109	0.267		0.0	1.1	1.1	60.9	O K
	min Summer				0.0	1.1		83.5	
	min Summer				0.0	1.1		106.8	
	min Summer				0.0	1.1		132.2	
	min Summer				0.0	1.1		147.5	
	min Summer				0.0	1.1		158.5	
	min Summer				0.0	1.1		173.6	
	min Summer min Summer				0.0	1.1		183.5	
	min Summer					1.2		190.5	
	min Summer min Summer				0.0	1.2		195.5 201.6	
	min Summer				0.0	1.2		201.6	
	min Summer				0.0	1.2		205.8	
	min Summer				0.0	1.2		203.6	
	min Summer				0.0	1.2		196.7	
5760	min Summer	17.668	0.826		0.0	1.2	1.2	188.4	O K
7200	min Summer	17.630	0.788		0.0	1.1	1.1	179.6	0 K
		Storm Event		Rain		Dischar Volume	ge Time-P		
		Event	(1	nm/hr)	(m <sup>3</sup> )	(m <sup>3</sup> )	mins	\$ <b>)</b>	
	15	min Sur	nmer 9	91.546	0.0	58	. 8	27	
		min Sur		53.018	0.0			42	
	60	min Sur	nmer 4	40.649	0.0	108	.2	72	
	120	min Sur	nmer 2	25.571	0.0	135	.6	132	
	180	min Sur	nmer 3	L9.343	0.0	152	.9	190	
	240	min Sur	nmer 1	L5.831	0.0	164		250	
		min Sur		L1.908	0.0			370	
		min Sur		9.717	0.0			490	
		min Sur		8.295	0.0			610	
		min Sur		7.287	0.0			728	
		min Sur		5.938	0.0			968	
		min Sur		4.449	0.0			322	
		min Sur		3.330	0.0			696	
		min Sur		2.709	0.0			084	
		min Sur min Sur		2.022	0.0			940 752	
		ILL ILL JUL	uuu C L	1.042	0.0	420	.J J	192	
		min Sur	nmer	1.397	0.0	452	.0 4	616	

DBFL Consulting Engineers		Page 2
Ormond House		
Upper Ormond Quay		
Dublin 7		Micro
Date 23/08/2021 17:47	Designed by dalye	Drainage
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Innovyze	Source Control 2020.1	

## Cascade Summary of Results for 190226 Source Control Catchment 1 09.08.2021.SRCX

Storm Event	Ma Lev (n	vel Depth	Max Infiltration (1/s)	Max Control (l/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
8640 min Sı	ummer 17.	591 0.749	0.0	1.1	1.1	170.7	ОК
10080 min Sı	ummer 17.	552 0.710	0.0	1.1	1.1	161.9	ΟK
15 min Wi	inter 17.	142 0.300	0.0	1.1	1.1	68.3	ΟK
30 min Wi	inter 17.	253 0.411	0.0	1.1	1.1	93.7	ΟK
60 min Wi	inter 17.	368 0.526	0.0	1.1	1.1	119.9	ΟK
120 min Wi	inter 17.	494 0.652	0.0	1.1	1.1	148.6	ΟK
180 min Wi	inter 17.	570 0.728	0.0	1.1	1.1	166.1	ΟK
240 min Wi	inter 17.	626 0.784	0.0	1.1	1.1	178.7	ОК
360 min Wi	inter 17.	703 0.861	0.0	1.2	1.2	196.3	ОК
480 min Wi	inter 17.	755 0.913	0.0	1.2	1.2	208.2	ОК
600 min Wi	inter 17.	793 0.951	0.0	1.2	1.2	216.7	ОК
720 min Wi	inter 17.	820 0.978	0.0	1.3	1.3	223.1	ОК
960 min Wi	inter 17.	857 1.015	0.0	1.3	1.3	231.5	ОК
1440 min Wi	inter 17.	888 1.046	0.0	1.3	1.3	238.5	ОК
2160 min Wi	inter 17.	885 1.043	0.0	1.3	1.3	237.9	ОК
2880 min Wi	inter 17.	874 1.032	0.0	1.3	1.3	235.2	ОК
4320 min Wi	inter 17.	825 0.983	0.0	1.3	1.3	224.1	ΟK
5760 min Wi	inter 17.	765 0.923	0.0	1.2	1.2	210.4	ОК
7200 min Wi	inter 17.	703 0.861	0.0	1.2	1.2	196.2	ΟK
8640 min Wi	inter 17.	640 0.798	0.0	1.1	1.1	181.9	ΟK

	Stor Even		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
8640	min	Summer	1.224	0.0	475.0	5448	
10080	min	Summer	1.094	0.0	494.9	6256	
15	min	Winter	91.546	0.0	65.7	27	
30	min	Winter	63.018	0.0	86.5	41	
60	min	Winter	40.649	0.0	121.1	70	
120	min	Winter	25.571	0.0	151.2	130	
180	min	Winter	19.343	0.0	168.5	188	
240	min	Winter	15.831	0.0	176.4	248	
360	min	Winter	11.908	0.0	178.5	364	
480	min	Winter	9.717	0.0	178.7	480	
600	min	Winter	8.295	0.0	179.0	596	
720	min	Winter	7.287	0.0	179.5	710	
960	min	Winter	5.938	0.0	181.7	940	
1440	min	Winter	4.449	0.0	185.6	1378	
2160	min	Winter	3.330	0.0	355.2	1764	
2880	min	Winter	2.709	0.0	357.6	2224	
4320	min	Winter	2.022	0.0	339.1	3160	
5760	min	Winter	1.642	0.0	476.3	4048	
7200	min	Winter	1.397	0.0	506.2	4976	
8640	min	Winter	1.224	0.0	531.8	5872	
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Storm	Max 1	Max	Max	Max	Max	Max	Status
Event				Control S			
			1/s)	(l/s)	(l/s)	(m³)	
10080 min Winter	17 578 0	736	0.0	1 1	1.1	167 9	0 K
10000 min wincer	11.570 0	. / 50	0.0	1.1	1.1	107.9	0 K
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	Storm Event	Rain	Flooded	l Discharge Volume	Time-Pe (mins)		
	Lvent	(1111)	(m <sup>3</sup> )		(mins)		
10080	min Winte	er 1.09	4 0.0	553.3	67	52	

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Cascade Painfall Details	for 190226 Source Control Catchment 1	
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Rainfall Model	FSR Winter Storms Yes	
Return Period (years)	100 Cv (Summer) 0.750	
Region Scot. M5-60 (mm)	Land and Ireland Cv (Winter) 0.840 17.300 Shortest Storm (mins) 15	
Ratio R	0.280 Longest Storm (mins) 10080	
Summer Storms	Yes Climate Change % +20	
_		
<u> </u>	ime Area Diagram	
Tc	tal Area (ha) 0.360	
Time (mins) Area	Time (mins) Area Time (mins) Area	
	From: To: (ha) From: To: (ha)	
0 4 0.000	4 8 0.074 8 12 0.286	
0 4 0.000	4 8 0.074 8 12 0.286	
<u> </u>	ime Area Diagram	
То	tal Area (ha) 0.000	
	Time (mins) Area	
	From: To: (ha)	
	0 4 0.000	
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Cascade Model Details for 19022	<u>6 Source Cc</u>	ntrol	Catchment	1 09.08.2	2021.SRCX
Storage is On	nline Cover L	evel (m	) 19.100		
Cellula	ar Storage :	Struct	ure		
Inve	rt Level (m)	16.842	2 Safety Fact	or 2.0	
Infiltration Coefficient Infiltration Coefficient				ty 0.95	
Depth (m) Area (m²) Inf. Ar	ea (m²) Depth	1 (m) A:	rea (m²) Inf.	Area (m²)	
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<u>Hydro-Brake@</u>	) Optimum O	utflow	Control		
	t Reference M	D-SHE-0	053-2000-2733		
	gn Head (m)			2.733	
Design	Flow (l/s) Flush-Flo™		Cala	2.0 lated	
		Minimis	e upstream st		
1	Application	.1111111110	-	irface	
	p Available			Yes	
Dia	ameter (mm)			53	
	t Level (m)		1	6.842	
Minimum Outlet Pipe Dia				75	
Suggested Manhole Dia	ameter (mm)			1200	
Control Po	oints He	ad (m)	Flow (l/s)		
Design Point (C					
	Flush-Flo™	0.226	1.1		
Mean Flow over	Kick-Flo® Head Bange	0.470	0.9 1.4		
Mean FIOW OVEL	neau range		1.4		
The hydrological calculations have b			-		-
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Hydro-Brake Optimum® be utilised the invalidated	en these stor	age rou	ting calculat	ions will	be
Depth (m) Flow (1/s) Depth (m) Flo					
0.100 1.0 1.200		8.000	2.1	7.000	3.1
0.200 1.1 1.400		8.500	2.2	7.500	3.2
0.300 1.1 1.600 0.400 1.0 1.800		.000	2.4 2.5	8.000 8.500	3.3 3.4
0.400 1.0 1.800 0.500 0.9 2.000		5.000 5.000	2.5	8.500 9.000	3.4 3.5
0.600 1.0 2.200		5.500	2.8	9.500	3.6
0.800 1.1 2.400		5.000	2.9		
1.000 1.3 2.600	1.9	5.500	3.0		
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	Half	Drain Ti	lme : 56	7 minutes.					
Storm	Max Ma	x M	lax	Max	Max	Max	Status		
Event	Level Dep	th Infil	tration	Control $\boldsymbol{\Sigma}$	Outflow	Volume			
	(m) (m	ı) (1	/s)	(l/s)	(l/s)	(m³)			
15 min Summer	16.843 0.3	00	0.0	4.2	4.2	85.1	ОК		
30 min Summer	16.952 0.4	09	0.0	4.2	4.2	116.1	O K		
60 min Summer	17.060 0.5	17	0.0	4.2	4.2	147.0	O K		
120 min Summer	17.173 0.6	30	0.0	4.2	4.2	178.9	O K		
180 min Summer	17.238 0.6	95	0.0	4.2	4.2	197.4	O K		
240 min Summer	17.282 0.7	39	0.0	4.2	4.2	209.9	ΟK		
360 min Summer	17.340 0.7	97	0.0	4.2	4.2	226.3	O K		
480 min Summer	17.376 0.8	33	0.0	4.2	4.2	236.6	O K		
600 min Summer			0.0	4.2	4.2		O K		
720 min Summer			0.0	4.2	4.2		0 K		
960 min Summer			0.0	4.2	4.2		ΟK		
1440 min Summer			0.0	4.2	4.2		ΟK		
2160 min Summer			0.0	4.2	4.2		0 K		
2880 min Summer			0.0	4.2	4.2		ОК		
4320 min Summer			0.0	4.2		182.8	ОК		
5760 min Summer 7200 min Summer			0.0	4.2 4.2	4.2	153.7 128.6	ОК ОК		
	10.000 0.1		0.0			120.0	0 11		
	Storm	Rain	Flooder	d Discharge	Timo-D	k			
	Event	(mm/hr)		5	(mins				
15	min Summer	91.546	0.0	0 141.2	2	19			
	min Summer		0.0			33			
	min Summer					64			
120	min Summer		0.0			22			
180	min Summer	19.343	0.0	368.7	1 1	82			
0.4.0	min Summor	15 931	0 1	n 2003		212		1	

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5760 min Summer 1.642 0.0 1027.2 7200 min Summer 1.397 0.0 1091.8

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240 min Summer 15.831

360 min Summer 11.908

720 min Summer 7.287

960 min Summer 5.938

480 min Summer

600 min Summer

1440 min Summer

2160 min Summer

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4320 min Summer

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# Cascade Summary of Results for 190226 Source Control Catchment 2 09.08.2021.SRCX

	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
8640	min Summer	16.924	0.381	0.0	4.2	4.2	108.1	ΟK
10080	min Summer	16.866	0.323	0.0	4.2	4.2	91.8	0 K
15	min Winter	16.879	0.336	0.0	4.2	4.2	95.5	0 K
30	min Winter	17.002	0.459	0.0	4.2	4.2	130.5	ΟK
60	min Winter	17.126	0.583	0.0	4.2	4.2	165.5	ΟK
120	min Winter	17.256	0.713	0.0	4.2	4.2	202.4	ΟK
180	min Winter	17.333	0.790	0.0	4.2	4.2	224.5	ΟK
240	min Winter	17.389	0.846	0.0	4.2	4.2	240.2	ОК
360	min Winter	17.459	0.916	0.0	4.2	4.2	260.2	ОК
480	min Winter	17.500	0.957	0.0	4.2	4.2	271.9	ОК
600	min Winter	17.525	0.982	0.0	4.2	4.2	278.9	ΟK
720	min Winter	17.539	0.996	0.0	4.2	4.2	283.0	ΟK
960	min Winter	17.548	1.005	0.0	4.2	4.2	285.6	ОК
1440	min Winter	17.528	0.985	0.0	4.2	4.2	279.7	ОК
2160	min Winter	17.478	0.935	0.0	4.2	4.2	265.7	ΟK
2880	min Winter	17.405	0.862	0.0	4.2	4.2	244.9	ΟK
4320	min Winter	17.199	0.656	0.0	4.2	4.2	186.4	ΟK
5760	min Winter	17.035	0.492	0.0	4.2	4.2	139.7	ΟK
7200	min Winter	16.909	0.366	0.0	4.2	4.2	104.1	ΟK
8640	min Winter	16.822	0.279	0.0	4.1	4.1	79.2	ΟK

	Stor Even		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
8640	min	Summer	1.224	0.0	1147.2	4840	
10080	min	Summer	1.094	0.0	1195.1	5544	
15	min	Winter	91.546	0.0	157.9	19	
30	min	Winter	63.018	0.0	210.7	33	
60	min	Winter	40.649	0.0	291.9	62	
120	min	Winter	25.571	0.0	364.4	120	
180	min	Winter	19.343	0.0	407.5	180	
240	min	Winter	15.831	0.0	434.8	238	
360	min	Winter	11.908	0.0	470.6	354	
480	min	Winter	9.717	0.0	497.8	470	
600	min	Winter	8.295	0.0	520.6	584	
720	min	Winter	7.287	0.0	540.7	694	
960	min	Winter	5.938	0.0	575.3	914	
1440	min	Winter	4.449	0.0	607.1	1194	
2160	min	Winter	3.330	0.0	858.9	1644	
2880	min	Winter	2.709	0.0	900.6	2132	
4320	min	Winter	2.022	0.0	950.1	2896	
5760	min	Winter	1.642	0.0	1150.4	3632	
7200	min	Winter	1.397	0.0	1222.7	4320	
8640	min	Winter	1.224	0.0	1284.3	4928	
		<b>a</b> 1	L982-20	20 7222			
		0	1902-20	20 Inno	vyze		

DBFL Consulting Engineers		Page 3
Ormond House		
Upper Ormond Quay		
Dublin 7		Micro
Date 23/08/2021 17:49	Designed by dalye	
File Cascade all.casx	Checked by	Diamage
Innovyze	Source Control 2020.1	
Cascade Summary of Results	for 190226 Source Control Catchm	ent 2
	0.08.2021.SRCX	

Storm Event		-	Max Infiltration (l/s)		Σ Outflow		Status
10080 min Winter	16.764	0.221	0.0	4.0	4.0	62.7	O K

	Storm Event		Flooded Volume (m <sup>3</sup> )	Discharge Volume (m³)	Time-Peak (mins)
10080	min Winter	1.094	0.0	1336.1	5544

DBFL Consulting Engineers		Page 4
Ormond House		
Upper Ormond Quay		
Dublin 7		Micro
Date 23/08/2021 17:49	Designed by dalye	Drainage
File Cascade all.casx	Checked by	Digitige
Innovyze	Source Control 2020.1	

#### Cascade Rainfall Details for 190226 Source Control Catchment 2 09.08.2021.SRCX

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)		17.300	Shortest Storm (mins)	15
Ratio R		0.280	Longest Storm (mins)	10080
Summer Storms		Yes	Climate Change %	+20

<u> Time Area Diagram</u>

Total Area (ha) 0.510

Time	(mins)	Area
From:	To:	(ha)
0	4	0.510

ne Cover Storage Level (m) ase (m/hr) ide (m/hr)	Dy Dontrol Level (n <u>Struct</u> 16.54 0.0000 0.0000 th (m) A	2020.1 <u>Catchment</u> n) 18.600 <u>cure</u> 3 Safety Fa 0 Poro	ctor 2.0 sity 0.95	
hecked b ource Co Source C ne Cover Storage Level (m) ase (m/hr) ide (m/hr) (m <sup>2</sup> ) Dept 299.0	Dy Dontrol Level (n <u>Struct</u> 16.54 0.0000 0.0000 th (m) A	2020.1 <u>Catchment</u> n) 18.600 <u>cure</u> 3 Safety Fa 0 Poro 0	ctor 2.0 sity 0.95	Drainago 8.2021.src
hecked b ource Co Source C ne Cover Storage Level (m) ase (m/hr) ide (m/hr) (m <sup>2</sup> ) Dept 299.0	Dy Dontrol Level (n <u>Struct</u> 16.54 0.0000 0.0000 th (m) A	2020.1 <u>Catchment</u> n) 18.600 <u>cure</u> 3 Safety Fa 0 Poro 0	ctor 2.0 sity 0.95	Drainago 8.2021.src
hecked b ource Co Source C ne Cover Storage Level (m) ase (m/hr) ide (m/hr) (m <sup>2</sup> ) Dept 299.0	Dy Dontrol Level (n <u>Struct</u> 16.54 0.0000 0.0000 th (m) A	2020.1 <u>Catchment</u> n) 18.600 <u>cure</u> 3 Safety Fa 0 Poro 0	ctor 2.0 sity 0.95	Drainago 8.2021.src
hecked b ource Co Source C ne Cover Storage Level (m) ase (m/hr) ide (m/hr) (m <sup>2</sup> ) Dept 299.0	Dy Dontrol Level (n <u>Struct</u> 16.54 0.0000 0.0000 th (m) A	2020.1 <u>Catchment</u> n) 18.600 <u>cure</u> 3 Safety Fa 0 Poro 0	ctor 2.0 sity 0.95	8.2021.SRC
Ource Co Source C ne Cover Storage Level (m) ase (m/hr) ide (m/hr) (m <sup>2</sup> ) Dept 299.0	Control Control Level (n Struct 16.54 0.0000 0.0000 th (m) A	Catchment n) 18.600 cure 3 Safety Fa 0 Poro 0	ctor 2.0 sity 0.95	
Source C ne Cover Storage Level (m) ase (m/hr) de (m/hr) (m <sup>2</sup> ) Dept 299.0	Control Level (n Struct 16.54 0.0000 0.0000 th (m) A	Catchment n) 18.600 cure 3 Safety Fa 0 Poro 0	ctor 2.0 sity 0.95	
Storage Level (m) ase (m/hr) ide (m/hr) (m <sup>2</sup> ) Dept	Struct 16.54 0.0000 0.0000 th (m) A	<u>sure</u> 3 Safety Fa 0 Poro 0	sity 0.95	
Level (m) ase (m/hr) ide (m/hr) (m <sup>2</sup> ) Dept	16.54 0.0000 0.0000 <b>th (m) A</b>	3 Safety Fa 0 Poro 0	sity 0.95	
ase (m/hr) ide (m/hr) (m <sup>2</sup> ) Dept 299.0	0.0000 0.0000 th (m) A	0 Poro 0	sity 0.95	
299.0		area (m²) Ir	nf. Area (	(m²)
	1 675			. ,
	1.070	0.0	29	99.0
)ptimum (	Dutflow	<u>Control</u>		
eference 1	MD-SHE-(	0093-4700-16	675-4700	
Head (m)			1.675	
	Min in i			
-	MITUTI	se upstream	-	
. ,			16.543	
ter (mm)			150	
ter (mm)			1200	
ts H	lead (m)	Flow (l/s)		
culated)	1.675	4.7		
ısh-Flo™	0.409	4.2		
ick-Flo®				
ad Range	-	3.9		
ould anot	her type	e of control	l device c	other than a
(1/s) Dept	th (m) F	'low (l/s)  I	Depth (m)	Flow (l/s)
4.0	3.000	6.2	7.000	9.2
4.3	3.500	6.6		9.5
				9.8
				10.1 10.4
				10.4
5.6	6.000	8.6	2.000	±0.0
5.8	6.500	8.9		
-2020 In	novyze			
	eference Head (m) ow (1/s) ush-Flo™ bjective lication vailable ter (mm) ter (mm) te	eference MD-SHE-( Head (m) ow (1/s) ush-Flo™ bjective Minimis lication vailable ter (mm) ter	Head (m)       ow (1/s)         ush-Flo™       Cai         bjective       Minimise upstream         lication       vailable         ter (mm)       evel (m)         ter (mm)       ter (mm)         ts       Head (m) Flow (1/s)         culated)       1.675       4.7         sh-Flo™       0.409       4.2         ck-Flo®       0.829       3.4         ad Range       -       3.9         n based on the Head/Discharge       ould another type of control         these storage routing calcul       1         4.0       3.000       6.2         4.3       3.500       6.6         4.6       4.000       7.1         4.9       4.500       7.5         5.1       5.000       7.8         5.3       5.500       8.2         5.6       6.000       8.6	eference MD-SHE-0093-4700-1675-4700         Head (m)       1.675         ow (1/s)       4.7         ush-Flo <sup>TM</sup> Calculated         bjective Minimise upstream storage       Surface         vailable       Yes         ter (mm)       93         evel (m)       16.543         ter (mm)       150         ter (mm)       1200         ts       Head (m) Flow (1/s)         ck-Flo <sup>TM</sup> 0.409       4.2         .ck-Flo©       0.829       3.4         ad Range       -       3.9         n based on the Head/Discharge relation       7.000         4.0       3.000       6.2         4.3       3.500       6.6         4.6       4.000       7.1         4.9       4.500       7.5         5.1       5.000       7.8         5.3       5.500       8.2         5.8       6.500       8.9

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Ormond House		
Upper Ormond Quay		
Dublin 7		Micro
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Innovyze	Source Control 2020.1	I

Cascade Summary of Results for 190226 Source Control Catchment 3
09.08.2021.SRCX

#### Upstream Structures

## Outflow To

Overfl

190226 Source Control Catchment 2 09.08.2021.SRCX 190226 Source Control Catchment 5 09.08.2021.SRCX 190226 Source Control Catchment 1 09.08.2021.SRCX

Half Drain Time : 403 minutes.

	Stor Even		Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
15	min	Summer	16.248	0.171	0.0	3.7	3.7	29.5	ОК
30	min	Summer	16.302	0.225	0.0	4.0	4.0	38.9	ОК
60	min	Summer	16.356	0.279	0.0	4.1	4.1	48.2	ОК
120	min	Summer	16.416	0.339	0.0	4.2	4.2	58.6	ОК
180	min	Summer	16.461	0.384	0.0	4.2	4.2	66.4	ОК
240	min	Summer	16.493	0.416	0.0	4.2	4.2	71.9	ОК
360	min	Summer	16.535	0.458	0.0	4.2	4.2	79.3	ΟK
480	min	Summer	16.560	0.483	0.0	4.2	4.2	83.4	ОК
600	min	Summer	16.577	0.500	0.0	4.2	4.2	86.5	ОК
720	min	Summer	16.591	0.514	0.0	4.2	4.2	88.9	ОК
960	min	Summer	16.614	0.537	0.0	4.2	4.2	92.8	ОК
1440	min	Summer	16.642	0.565	0.0	4.2	4.2	97.7	ОК
2160	min	Summer	16.691	0.614	0.0	4.2	4.2	106.2	ОК
2880	min	Summer	16.949	0.872	0.0	4.2	4.2	150.8	ОК
4320	min	Summer	17.079	1.002	0.0	4.2	4.2	173.3	ОК
5760	min	Summer	17.052	0.975	0.0	4.2	4.2	168.6	O K

	Stor Ever		Rain (mm/hr)		Discharge Volume (m³)		
15	min	Summer	91.546	0.0	162.6	231	
30	min	Summer	63.018	0.0	220.1	317	
60	min	Summer	40.649	0.0	303.4	416	
120	min	Summer	25.571	0.0	379.8	124	
180	min	Summer	19.343	0.0	427.7	184	
240	min	Summer	15.831	0.0	461.6	242	
360	min	Summer	11.908	0.0	505.5	362	
480	min	Summer	9.717	0.0	536.2	480	
600	min	Summer	8.295	0.0	561.4	600	
720	min	Summer	7.287	0.0	583.1	702	
960	min	Summer	5.938	0.0	619.9	828	
1440	min	Summer	4.449	0.0	642.2	1084	
2160	min	Summer	3.330	0.0	901.5	2816	
2880	min	Summer	2.709	0.0	961.3	3400	
4320	min	Summer	2.022	0.0	1015.1	4088	
5760	min	Summer	1.642	0.0	1199.0	4672	
			1000 00	20 Trans			
		C	1982-20	20 Innc	ovyze		

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Ormond House		
Upper Ormond Quay		
Dublin 7		Micro
Date 23/08/2021 17:50	Designed by dalye	Drainage
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# Cascade Summary of Results for 190226 Source Control Catchment 3 09.08.2021.SRCX

	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
7200	min Summe:	16.993	0.916	0.0	4.2	4.2	158.3	ΟK
8640	min Summer	16.873	0.796	0.0	4.2	4.2	137.6	ΟK
10080	min Summer	16.746	0.669	0.0	4.2	4.2	115.7	ΟK
15	min Winter	16.265	0.188	0.0	3.8	3.8	32.6	ΟK
30	min Winter	16.324	0.247	0.0	4.1	4.1	42.7	ΟK
60	min Winter	16.380	0.303	0.0	4.2	4.2	52.4	ΟK
120	min Winter	16.452	0.375	0.0	4.2	4.2	64.8	ΟK
180	min Winte	16.499	0.422	0.0	4.2	4.2	72.9	ΟK
240	min Winte	16.531	0.454	0.0	4.2	4.2	78.5	ΟK
360	min Winte	16.581	0.504	0.0	4.2	4.2	87.1	ΟK
480	min Winte	16.619	0.542	0.0	4.2	4.2	93.8	ΟK
600	min Winter	16.651	0.574	0.0	4.2	4.2	99.2	ΟK
720	min Winte	16.677	0.600	0.0	4.2	4.2	103.8	ΟK
960	min Winte	16.719	0.642	0.0	4.2	4.2	111.0	ΟK
1440	min Winte	16.774	0.697	0.0	4.2	4.2	120.6	ΟK
2160	min Winte	16.869	0.792	0.0	4.2	4.2	136.9	ΟK
2880	min Winter	17.025	0.948	0.0	4.2	4.2	163.9	ΟK
4320	min Winte	17.243	1.166	0.0	4.2	4.2	201.6	ОК
5760	min Winte	17.198	1.121	0.0	4.2	4.2	193.8	ΟK
7200	min Winter	17.099	1.022	0.0	4.2	4.2	176.6	0 K

	Stor Even		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
7200	min	Summer	1.397	0.0	1274.4	5304	
8640	min	Summer	1.224	0.0	1338.8	5936	
10080	min	Summer	1.094	0.0	1394.2	6432	
15	min	Winter	91.546	0.0	181.7	256	
30	min	Winter	63.018	0.0	242.1	355	
60	min	Winter	40.649	0.0	339.3	468	
120	min	Winter	25.571	0.0	422.9	122	
180	min	Winter	19.343	0.0	472.1	180	
240	min	Winter	15.831	0.0	504.3	238	
360	min	Winter	11.908	0.0	549.7	356	
480	min	Winter	9.717	0.0	584.7	472	
600	min	Winter	8.295	0.0	614.0	590	
720	min	Winter	7.287	0.0	639.4	708	
960	min	Winter	5.938	0.0	664.5	942	
1440	min	Winter	4.449	0.0	631.0	1412	
2160	min	Winter	3.330	0.0	999.1	3368	
2880	min	Winter	2.709	0.0	1051.5	3800	
4320	min	Winter	2.022	0.0	1119.7	4252	
5760	min	Winter	1.642	0.0	1342.9	4816	
7200	min	Winter	1.397	0.0	1427.2	5456	
		©	L982-20	20 Inno	vyze		

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Dublin 7		Micro
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Innovyze	Source Control 2020.1	1

Cascade Summary of Results for 190226 Source Control Catchment 3
09.08.2021.SRCX

Storm Event	Max Level (m)	-	Max Infiltration (l/s)			Max Volume (m³)	Status
8640 min Winter	16.856	0.779	0.0	4.2	4.2	134.7	ОК
10080 min Winter	16.620	0.543	0.0	4.2	4.2	93.8	ОК

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.224	0.0	1498.7	6120
10080 min Winter	1.094	0.0	1558.1	6448

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Ormond House		
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Innovyze	Source Control 2020.1	

# Cascade Rainfall Details for 190226 Source Control Catchment 3 09.08.2021.SRCX

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)		17.300	Shortest Storm (mins)	15
Ratio R		0.280	Longest Storm (mins)	10080
Summer Storms		Yes	Climate Change %	+20

<u> Time Area Diagram</u>

Total Area (ha) 0.146

Time	(mins)	Area
From:	To:	(ha)
0	4	0.146

DBFL Consulting Enginee:	rs				P	age 5
Ormond House						2
Upper Ormond Quay						
Dublin 7						Micro
Date 23/08/2021 17:50		Designed	l by dal	ye		Drainage
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<u>Cascade Model Details f</u>	or 190226	Source	Control	Catchment	3 09.08.	2021.SRC>
Sto	rage is On	line Cover	Level (m	) 18.283		
	<u>Cellula</u>	r Storage	e Struct	ure		
Infiltration Co Infiltration Co	pefficient	Base (m/hr	c) 0.00000		tor 2.0 ity 0.95	
Depth (m) Area (m	2) Inf. Are	a (m²) Deg	oth (m) A	rea (m²) Ini	E. Area (m²	<sup>•</sup> )
0.000 182 1.670 182	.0 .0	182.0 182.0	1.675	0.0	182.	0
Hydi	ro-Brake®	Optimum	Outflow	Control		
	Unit	Reference	MD-SHE-0	093-4700-16	75-4700	
	-	n Head (m)			1.675	
	-	Flow (l/s)			4.7	
		Flush-Flo™			culated	
		pplication		e upstream s	Surface	
		Available			Yes	
	-	meter (mm)			93	
	Invert	Level (m)			16.077	
Minimum Outle Suggested M	-				150 1200	
	Control Po	ints	Head (m)	Flow (l/s)		
Desig	n Point (Ca	lculated)	1.675	4.7		
-		'lush-Flo™		4.2		
		Kick-Flo®	0.829			
Mean	Flow over H	lead Range	-	3.9		
The hydrological calculat: Hydro-Brake® Optimum as sp Hydro-Brake Optimum® be ut invalidated	pecified.	Should ano	ther type	of control	device oth	ner than a
Depth (m) Flow (l/s) Dept	th (m) Flow		oth (m) F	low (l/s) De	epth (m) Fl	Low (l/s)
0.100 2.9	1.200	4.0	3.000	6.2	7.000	9.2
0.200 3.9 0.300 4.2	1.400	4.3	3.500	6.6	7.500	9.5
0.300 4.2 0.400 4.2	1.600 1.800	4.6	4.000 4.500	7.1	8.000 8.500	9.8 10.1
0.500 4.2	2.000	5.1	5.000	7.8	9.000	10.1
0.600 4.1	2.200	5.3	5.500	8.2	9.500	10.4
0.800 3.6	2.400	5.6	6.000	8.6		
1.000 3.7	2.600	5.8	6.500	8.9		
		2-2020 I				

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'ile Casca	de all.cas	X	Ch	necked by				Diamay
Innovyze			So	ource Con	trol 202	20.1		<b>I</b>
Casca	ade Summar	y of Res				Control	Catcl	nment 4
			<u>09.0</u>	8.2021.SI	<u>RCX</u>			
IIm			0	utflow To			Orromf	low To
-	stream suctures		01	ICITOM 10			Overi	10 10
	(None) 1902	226 Source	e Control	Catchment	5 09.08.	2021.SRCX	I	(None)
		Hal	f Drain ?	Time : 176	1 minutes			
	Storm	Max I	Max	Max	Max	Max	Max	Status
	Event			Max iltration				JLALUS
			-	(1/s)	(1/s)	(1/s)	(m <sup>3</sup> )	
1 -	min Commerci	10 626 0	271	0.0	1 0	1 0	02.0	0 V
	5 min Summer ) min Summer			0.0	1.8		92.8 127.1	ок ок
	) min Summer			0.0	1.8		162.3	0 K
	) min Summer			0.0	1.8		201.0	ОК
180	) min Summer	19.022 0	.657	0.0	1.8	1.8	224.6	ОК
240	) min Summer	19.071 0	.706	0.0	1.8	1.8	241.5	O K
360	) min Summer	19.139 0	.774	0.0	1.8	1.8	264.7	O K
480	) min Summer	19.184 0	.819	0.0	1.8	1.8	280.1	O K
600	) min Summer	19.216 0	.851	0.0	1.8	1.8	290.9	O K
	) min Summer			0.0	1.8		298.7	O K
	) min Summer			0.0	1.8		308.3	O K
	) min Summer			0.0	1.8		314.5	0 K
	) min Summer			0.0	1.8		314.9	ОК
	) min Summer			0.0	1.8	- • •	311.4	ОК
	) min Summer ) min Summer			0.0	1.8 1.8		300.5	ок ок
	) min Summer			0.0	1.8		273.4	0 K
		Storm	Rain	Flooded	Discharge	e Time-Pe	ak	
		Storm Event	Rain (mm/hr		Discharge Volume	e Time-Pe (mins)		
					-			
	15	Event	(mm/hr	r) Volume (m³)	Volume (m <sup>3</sup> )	(mins)	)	
		Event min Summe	(mm/hr er 91.54	r) Volume (m <sup>3</sup> ) 46 0.0	Volume (m <sup>3</sup> ) 88.	<b>(mins)</b>	19	
	30	Event min Summe min Summe	(mm/hr er 91.54 er 63.01	r) Volume (m <sup>3</sup> ) 46 0.0 18 0.0	Volume (m <sup>3</sup> ) 88. 120.	<b>(mins)</b> 5 3	19 34	
	30 60	Event min Summe	(mm/hr er 91.54 er 63.01 er 40.64	r) Volume (m <sup>3</sup> ) 46 0.0 18 0.0 49 0.0	Volume (m <sup>3</sup> ) 88. 120. 164.	(mins) 5 3 2	19	
	30 60 120	Event min Summe min Summe	(mm/hr er 91.54 er 63.01 er 40.64 er 25.57	r) Volume (m <sup>3</sup> ) 46 0.0 18 0.0 49 0.0 71 0.0	Volume (m <sup>3</sup> ) 88. 120. 164. 206.	(mins) 5 3 2 0 1	19 34 64	
	30 60 120 180	Event min Summe min Summe min Summe min Summe	(mm/hr er 91.54 er 63.01 er 40.64 er 25.57 er 19.34	Volume (m <sup>3</sup> )           46         0.0           18         0.0           49         0.0           71         0.0           43         0.0	Volume (m <sup>3</sup> ) 88. 120. 164. 206. 232.	(mins) 5 3 2 0 1 5 1	19 34 64 24	
	30 60 120 180 240	Event min Summe min Summe min Summe min Summe	(mm/hr er 91.54 er 63.01 er 40.64 er 25.57 er 19.34 er 15.83	Volume (m <sup>3</sup> )           46         0.0           18         0.0           49         0.0           71         0.0           43         0.0           31         0.0	Volume (m <sup>3</sup> ) 88. 120. 164. 206. 232. 251.	(mins) 5 3 2 0 1 5 1 6 2	19 34 64 24 84	
	30 60 120 180 240 360	Event min Summe min Summe min Summe min Summe min Summe	(mm/hr er 91.54 er 63.01 er 40.64 er 25.57 er 19.34 er 15.83 er 11.90	Volume (m <sup>3</sup> )           46         0.0           18         0.0           49         0.0           71         0.0           43         0.0           31         0.0           08         0.0	Volume (m <sup>3</sup> ) 88. 120. 164. 206. 232. 251. 273.	(mins) 5 3 2 0 1 5 1 6 2 2 2 3	19 34 64 24 84 42	
	30 60 120 180 240 360 480	Event min Summe min Summe min Summe min Summe min Summe min Summe	(mm/hr er 91.54 er 63.01 er 40.64 er 25.57 er 19.34 er 15.83 er 11.90 er 9.71	Volume (m³)           46         0.0           18         0.0           49         0.0           71         0.0           43         0.0           31         0.0           08         0.0           17         0.0	Volume (m <sup>3</sup> ) 88. 120. 164. 206. 232. 251. 273. 276.	(mins) 5 3 2 0 1 5 1 6 2 2 3 4 4	19 34 64 24 84 42 62	
	30 60 120 180 240 360 480 600 720	Event min Summe min Summe min Summe min Summe min Summe min Summe min Summe min Summe	(mm/hz er 91.54 er 63.01 er 40.64 er 25.57 er 19.34 er 15.83 er 11.90 er 9.71 er 8.29 er 7.28	Volume (m³)           46         0.0           18         0.0           49         0.0           71         0.0           43         0.0           31         0.0           08         0.0           07         0.0           08         0.0           095         0.0           037         0.0	Volume (m <sup>3</sup> ) 88. 120. 164. 206. 232. 251. 273. 276. 275. 272.	(mins) 5 2 0 1 5 1 6 2 2 3 4 4 0 6 9 7	19 34 64 24 84 42 62 82 02 22	
	30 60 120 180 240 360 480 600 720 960	Event min Summe min Summe min Summe min Summe min Summe min Summe min Summe min Summe min Summe min Summe	(mm/hz er 91.54 er 63.01 er 40.64 er 25.57 er 19.34 er 15.83 er 11.90 er 9.71 er 8.29 er 7.28 er 5.93	Volume (m³)           46         0.0           18         0.0           49         0.0           71         0.0           43         0.0           31         0.0           08         0.0           17         0.0           95         0.0           87         0.0           38         0.0	Volume (m <sup>3</sup> ) 88. 120. 164. 206. 232. 251. 273. 276. 275. 272. 268.	(mins) 5 2 0 1 5 1 6 2 2 3 4 4 0 6 9 7 7 9	19 34 64 24 84 42 62 82 02 22 60	
	30 60 120 180 240 360 480 600 720 960 1440	Event min Summe min Summe	(mm/hz er 91.54 er 63.01 er 40.64 er 25.57 er 19.34 er 15.83 er 11.90 er 9.71 er 8.29 er 7.28 er 5.93 er 4.44	Volume (m³)           46         0.0           18         0.0           49         0.0           71         0.0           43         0.0           31         0.0           08         0.0           17         0.0           95         0.0           87         0.0           38         0.0           49         0.0	Volume (m <sup>3</sup> ) 88. 120. 164. 206. 232. 251. 273. 276. 275. 272. 268. 262.	(mins) 5 3 2 0 1 5 1 6 2 2 3 4 4 0 6 9 7 7 9 7 9 6 13	19 34 64 24 84 42 62 82 02 22 60 68	
	30 60 120 180 240 360 480 600 720 960 1440 2160	Event min Summe min Summe	(mm/hz er 91.54 er 63.01 er 40.64 er 25.57 er 19.34 er 15.83 er 11.90 er 9.71 er 8.29 er 7.28 er 7.28 er 5.93 er 4.44 er 3.33	Volume (m³)           46         0.0           18         0.0           49         0.0           71         0.0           43         0.0           31         0.0           08         0.0           17         0.0           95         0.0           87         0.0           38         0.0           39         0.0           30         0.0	Volume (m <sup>3</sup> ) 88. 120. 164. 206. 232. 251. 273. 276. 275. 272. 268. 262. 487.	(mins) 5 3 2 0 1 5 1 6 2 2 3 4 4 0 6 9 7 7 9 6 1 3 3 17	19 34 64 24 84 42 62 82 02 22 60 68 08	
	30 60 120 240 360 480 600 720 960 1440 2160 2880	Event min Summe min Summe	(mm/hz er 91.54 er 63.01 er 40.64 er 25.57 er 19.34 er 15.83 er 11.90 er 9.71 er 8.29 er 7.28 er 5.93 er 4.44 er 3.33 er 2.70	Volume (m³)           46         0.0           18         0.0           49         0.0           71         0.0           43         0.0           31         0.0           08         0.0           17         0.0           95         0.0           87         0.0           38         0.0           49         0.0           30         0.0           30         0.0	Volume (m <sup>3</sup> ) 88. 120. 164. 206. 232. 251. 273. 276. 275. 272. 268. 262. 487. 519.	(mins) 5 3 2 0 1 5 1 6 2 2 3 4 4 0 6 9 7 7 9 6 1 3 3 1 7 7 21	19 34 64 24 84 42 62 82 02 22 60 68 08 04	
	30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320	Event min Summe min Summe	(mm/hr er 91.54 er 63.01 er 40.64 er 25.57 er 19.34 er 15.83 er 11.90 er 9.71 er 8.29 er 7.28 er 7.28 er 5.93 er 4.44 er 3.33 er 2.70 er 2.02	Volume (m³)           46         0.0           18         0.0           49         0.0           71         0.0           43         0.0           31         0.0           08         0.0           17         0.0           95         0.0           87         0.0           38         0.0           30         0.0           00         0.0           22         0.0	Volume (m <sup>3</sup> ) 88. 120. 164. 206. 232. 251. 273. 276. 275. 272. 268. 262. 487. 519.	(mins) 5 3 2 0 1 5 1 6 2 2 3 4 4 0 6 9 7 7 9 6 1 3 3 1 7 7 2 1 7 2 9	19 34 64 24 84 42 62 82 02 22 60 68 08 04 40	
	30 60 120 180 240 360 480 600 720 960 1440 2160 2880 4320 5760	Event min Summe min Summe	(mm/hr er 91.54 er 63.01 er 40.64 er 25.57 er 19.34 er 15.83 er 11.90 er 9.71 er 8.29 er 7.28 er 7.28 er 5.93 er 4.44 er 3.33 er 2.70 er 2.02 er 1.64	Volume (m³)           46         0.0           18         0.0           49         0.0           71         0.0           43         0.0           31         0.0           08         0.0           17         0.0           95         0.0           87         0.0           38         0.0           30         0.0           02         0.0           49         0.0	Volume (m <sup>3</sup> ) 88. 120. 164. 206. 232. 251. 273. 276. 275. 272. 268. 262. 487. 519. 490.	(mins) 5 3 2 0 1 5 1 6 2 2 3 4 4 0 6 9 7 7 9 6 1 3 3 1 7 7 2 9 8 3 8	19 34 64 24 84 42 62 82 02 22 60 68 08 04	

DBFL Consulting Engineers		Page 2
Ormond House		
Upper Ormond Quay		
Dublin 7		Micro
Date 23/08/2021 17:50	Designed by dalye	Drainage
File Cascade all.casx	Checked by	Diamaye
Innovyze	Source Control 2020.1	

# Cascade Summary of Results for 190226 Source Control Catchment 4 09.08.2021.SRCX

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
	min Sum min Sum				0.0	1.8	1.8 1.8	259.1 244.5	ОК
	min Win				0.0	1.8	1.8	104.0	ΟK
30	min Win	ter	18.782	0.417	0.0	1.8	1.8	142.6	ΟK
60	min Win	ter	18.898	0.533	0.0	1.8	1.8	182.3	ΟK
120	min Win	ter	19.026	0.661	0.0	1.8	1.8	226.1	O K
180	min Win	ter	19.104	0.739	0.0	1.8	1.8	252.9	ΟK
240	min Win	ter	19.161	0.796	0.0	1.8	1.8	272.1	O K
360	min Win	ter	19.239	0.874	0.0	1.8	1.8	299.0	ОК
480	min Win	ter	19.293	0.928	0.0	1.8	1.8	317.3	ΟK
600	min Win	ter	19.331	0.966	0.0	1.8	1.8	330.5	ΟK
720	min Win	ter	19.360	0.995	0.0	1.8	1.8	340.3	ОК
960	min Win	ter	19.398	1.033	0.0	1.9	1.9	353.4	ОК
1440	min Win	ter	19.431	1.066	0.0	1.9	1.9	364.6	ΟK
2160	min Win	ter	19.428	1.063	0.0	1.9	1.9	363.5	ОК
2880	min Win	ter	19.415	1.050	0.0	1.9	1.9	359.2	ОК
4320	min Win	ter	19.365	1.000	0.0	1.8	1.8	342.0	ОК
5760	min Win	ter	19.302	0.937	0.0	1.8	1.8	320.5	O K
7200	min Win	ter	19.235	0.870	0.0	1.8	1.8	297.7	O K
8640	min Win	ter	19.168	0.803	0.0	1.8	1.8	274.6	ΟK

	Stor Even		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
8640	min	Summer	1.224	0.0	722.4	5448	
10080	min	Summer	1.094	0.0	752.6	6256	
15	min	Winter	91.546	0.0	99.0	19	
30	min	Winter	63.018	0.0	132.5	33	
60	min	Winter	40.649	0.0	183.8	64	
120	min	Winter	25.571	0.0	229.8	122	
180	min	Winter	19.343	0.0	257.5	180	
240	min	Winter	15.831	0.0	273.6	240	
360	min	Winter	11.908	0.0	279.7	358	
480	min	Winter	9.717	0.0	278.6	474	
600	min	Winter	8.295	0.0	277.1	590	
720	min	Winter	7.287	0.0	275.8	706	
960	min	Winter	5.938	0.0	274.4	932	
1440	min	Winter	4.449	0.0	276.7	1370	
2160	min	Winter	3.330	0.0	540.4	1820	
2880	min	Winter	2.709	0.0	548.0	2220	
4320	min	Winter	2.022	0.0	513.4	3156	
5760	min	Winter	1.642	0.0	724.4	4096	
7200	min	Winter	1.397	0.0	769.9	4976	
8640	min	Winter	1.224	0.0	808.7	5880	
		©1	1982-20	20 Inno	vyze		

DBFL Consulting Engi	neers						Page 3
Ormond House							
Upper Ormond Quay							
Dublin 7							Micro
Date 23/08/2021 17:5	0	Desi	gned by	v dalye			– Micro Drainage
File Cascade all.cas	X	Chec	ked by				Diamage
Innovyze		Sour	ce Cont	rol 2020	.1		<u>I</u>
<u>Cascade Summar</u>	<u>y of Resul</u>		<u>190226</u> 2021.SR		Control	Catch	nment <u>4</u>
Storm	Max Max	ĸ M	lax	Max	Max	Max	Status
Event	Level Dept						
	(m) (m)	) (1	./s)	(1/s)	(l/s)	(m³)	
10080 min Winter	19.099 0.73	34	0.0	1.8	1.8	251.2	0 К
	Storm	Rain	Flooded	Discharge	Time-Pe	ak	
	Event	(mm/hr)	Volume (m³)	Volume (m³)	(mins)	)	
10080	) min Winter	1.094	0.0	841.8	67	60	

DBFL Consulting Engineers		Page 4
Ormond House		
Upper Ormond Quay		
Dublin 7		Micco
Date 23/08/2021 17:50	Designed by dalye	Drainage
File Cascade all.casx	Checked by	Digitight
Innovyze	Source Control 2020.1	

#### Cascade Rainfall Details for 190226 Source Control Catchment 4 09.08.2021.SRCX

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)		17.300	Shortest Storm (mins)	15
Ratio R		0.280	Longest Storm (mins)	10080
Summer Storms		Yes	Climate Change %	+20

<u>Time Area Diagram</u>

Total Area (ha) 0.548

Time	(mins)	Area
From:	To:	(ha)
0	4	0.548

DBFL Consulting Eng	gineers				Pa	age 5
Ormond House						
Upper Ormond Quay						
Dublin 7						Airco
Date 23/08/2021 17:	· 50	Designed	by dal			/icro
File Cascade all.ca		-		уC		)rainage
	15X	Checked		2020 1		
Innovyze		Source C	ontrol .	2020.1		
Cascade Model Deta	ils for 19022	6 Source	Control	Catchment	4 09.08.	2021.SRCX
	Storage is On	nline Cover	Level (m	) 21.000		
	<u>Cellula</u>	ar Storage	e Struct	ure		
	Inve tion Coefficient tion Coefficient	Base (m/hr	.) 0.00000		cor 2.0 ty 0.95	
Depth (m) Ar	ea (m²) Inf. Ar	ea (m²) Dej	oth (m) A	rea (m²) Inf	. Area (m²	)
0.000 1.670	360.0 360.0	360.0 360.0	1.675	0.0	360.	0
	<u>Hydro-Brake@</u>	) Optimum	Outflow	Control		
			MD-SHE-0	064-2600-211	0-2600	
		gn Head (m)			2.110	
	Design	Flow (l/s) Flush-Flo™		Cala	2.6	
				e upstream s	ulated	
	1	Application		-	urface	
	Sum	p Available			Yes	
		ameter (mm)			64	
Minimum	Invert Outlet Pipe Dia	t Level (m)			18.365 100	
	sted Manhole Dia				1200	
	Control Po	oints	Head (m)	Flow (l/s)		
	Design Point (C	alculated)	2.110	2.6		
		Flush-Flo™	0.283	1.8		
	Mana Diana ana	Kick-Flo®				
	Mean Flow over	Head Range	-	1.9		
The hydrological cal Hydro-Brake® Optimum Hydro-Brake Optimum® invalidated	as specified.	Should and	ther type	of control	device oth	er than a
Depth (m) Flow (l/s	) Depth (m) Flo	w (l/s) Dej	oth (m) F	low (l/s) De	pth (m) Fl	ow (l/s)
0.100 1.		2.0	3.000	3.1	7.000	4.5
0.200 1.		2.1	3.500	3.3	7.500	4.7
0.300 1. 0.400 1.		2.3	4.000 4.500	3.5 3.7	8.000 8.500	4.8 5.0
0.400 1.		2.4	4.500	3.9	8.500 9.000	5.U 5.1
0.600 1.		2.6	5.500	4.0	9.500	5.2
0.800 1.		2.8	6.000	4.2		
1.000 1.	8 2.600	2.9	6.500	4.4		
	©19	82-2020 I	nnovyze			

ineers						Page 1	
51	Des	ianed h	v dalve			_Micro	
		-				Drainage	
				0.1			
<u>ry of Res</u>				Control	Catc	<u>hment 5</u>	
	<u>09.08</u> .	2021.SI	<u>RCX</u>				
Upst	ream		о	utflow To	Overf	low To	
Struc	tures						
				(None)		(None)	
Hal	f Drain Ti	.me : 229	minutes.				
May N	lav M	av	May	Max	Max	Status	
(m) (	(m) (1	/s)	(1/s)	(1/s)	(m³)		
: 15.813 0.	197	0.0	5.8	5.8	37.4	O K	
		0.0	6.3				
			6.7				
		0.0	6.7	6.7	117.2	ΟK	
: 16.264 0.	648	0.0	6.7	6.7	123.2	O K	
		0.0	6.7	6.7	127.9	O K	
		0.0	6.7				
		0.0	6.7				
Storm	Bain	Flooded	Discharge	. Mime-Dec	1-		
			-		IK		
	(,,	(m <sup>3</sup> )	(m <sup>3</sup> )	(			
5 min Summe	r 91.546	0.0	283.3	3 1	9		
) min Summe	r 63.018	0.0		7 3	34		
		0.0					
		0.0					
		0.0					
		0.0					
) min Summe	r 7.287	0.0	984.4	4 72	22		
0 min Summe		0.0			52		
	r 4.449	0.0	1005.3				
0 min Summe					50		
0 min Summe	r 3.330	0.0	1580.2				
	er 3.330 er 2.709	0.0 0.0 0.0	1683.2	2 216	50		
0 min Summe 0 min Summe	er 3.330 er 2.709	0.0	1683.2	2 216	50		
	Upst Struc Control Ca Control Ca Control Ca Control Ca Ial Max M Level De (m) ( 15.813 0. 15.826 0. 15.962 0. 16.045 0. 16.096 0. 16.135 0. 16.135 0. 16.233 0. 16.233 0. 16.264 0. 16.239 0. 16.326 0. 16.326 0. 16.326 0. 16.339 0. 16.326 0. 16.339 0. 16.292 0. Storm Event 5 min Summe 0 min Summe	51       Des:         sx       Check         Sour         ry of Results for         09.08.         Upstream         Structures         Control Catchment 3         Control Catchment 1         Control Catchment 3         Control Catchment 1         Control Catchment 1	51       Designed b         sx       Checked by         Source Con         ry of Results for 190226         09.08.2021.SI         Upstream         Structures         Control Catchment 3 09.08.20         Control Catchment 2 09.08.20         Control Catchment 2 09.08.20         Control Catchment 4 09.08.20         Control Catchment 4 09.08.20         Control Catchment 1 09.08.20         Control Catchment 2 09.08.20         Control Catchment 3 Max         Max Max Max         Level Depth Infiltration 0         Control Catchment 7         Control Catchment 6 0.0         Control Catchment 6 0.0         Control Catchment 6 0.0 <t< td=""><td>51         Designed by dalye           sx         Checked by           Source Control 202           ry of Results for 190226 Source           09.08.2021.SRCX           Upstream         O           Structures           Control Catchment 3 09.08.2021.SRCX           Control Catchment 1 09.08.2021.SRCX           Control Catchment 4 09.08.2021.SRCX           Max Max Max Max           Levent Max           Max Max Max Max           Levent Max           Max Max Max Max           Level Depth Infiltration Control E           (m) (m) (1/s)         (1/s)           Control Catchment 7           Colspan= 0.0           Control Catchment 7           Colspan= 0.0</td><td>51         Designed by dalye           sx         Checked by           Source Control 2020.1           ry of Results for 190226 Source Control 09.08.2021.SRCX           Outflow To Structures           Outflow To Structures           Control Catchment 3 09.08.2021.SRCX Control Catchment 1 09.08.2021.SRCX Control Catchment 4 09.08.2021.SRCX           Control Catchment 4 09.08.2021.SRCX           Max         Max           Max         Max</td><td>51         Designed by dalye Checked by           sx         Checked by           Source Control 2020.1           ry of Results for 190226 Source Control Catc 09.08.2021.SRCX           Outflow To Overf Structures           Outflow To Overf Structures           Outflow To Overf Structures           Control Catchment 3 09.08.2021.SRCX Control Catchment 1 09.08.2021.SRCX           Control Catchment 4 09.08.2021.SRCX           Control Catchment 5 00.5.8           Storm Max Max Max Max Max Max           Level Depth Infiltration Control E Outflow Volume (m)           15.813 0.197         0.0         6.7         6.7         91.3           Catched bischarge Time-Peak           <th (mins)<<="" (mm="" colspane:="" hr)="" td="" volume=""></th></td></t<>	51         Designed by dalye           sx         Checked by           Source Control 202           ry of Results for 190226 Source           09.08.2021.SRCX           Upstream         O           Structures           Control Catchment 3 09.08.2021.SRCX           Control Catchment 1 09.08.2021.SRCX           Control Catchment 4 09.08.2021.SRCX           Max Max Max Max           Levent Max           Max Max Max Max           Levent Max           Max Max Max Max           Level Depth Infiltration Control E           (m) (m) (1/s)         (1/s)           Control Catchment 7           Colspan= 0.0           Control Catchment 7           Colspan= 0.0	51         Designed by dalye           sx         Checked by           Source Control 2020.1           ry of Results for 190226 Source Control 09.08.2021.SRCX           Outflow To Structures           Outflow To Structures           Control Catchment 3 09.08.2021.SRCX Control Catchment 1 09.08.2021.SRCX Control Catchment 4 09.08.2021.SRCX           Control Catchment 4 09.08.2021.SRCX           Max         Max           Max         Max	51         Designed by dalye Checked by           sx         Checked by           Source Control 2020.1           ry of Results for 190226 Source Control Catc 09.08.2021.SRCX           Outflow To Overf Structures           Outflow To Overf Structures           Outflow To Overf Structures           Control Catchment 3 09.08.2021.SRCX Control Catchment 1 09.08.2021.SRCX           Control Catchment 4 09.08.2021.SRCX           Control Catchment 5 00.5.8           Storm Max Max Max Max Max Max           Level Depth Infiltration Control E Outflow Volume (m)           15.813 0.197         0.0         6.7         6.7         91.3           Catched bischarge Time-Peak <th (mins)<<="" (mm="" colspane:="" hr)="" td="" volume=""></th>	

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Ormond House		
Upper Ormond Quay		
Dublin 7		Micro
Date 23/08/2021 17:51	Designed by dalye	Drainage
File Cascade all.casx	Checked by	Diamage
Innovyze	Source Control 2020.1	

# Cascade Summary of Results for 190226 Source Control Catchment 5 09.08.2021.SRCX

Storm Event			Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
			16.248		0.0	6.7	6.7	120.0	0 K
7200	min S	Summer	16.206	0.590	0.0	6.7	6.7	112.2	ОК
8640	min S	Summer	16.170	0.554	0.0	6.7	6.7	105.2	ОК
10080	min S	Summer	16.138	0.522	0.0	6.7	6.7	99.2	ΟK
15	min W	linter	15.837	0.221	0.0	6.0	6.0	41.9	ОК
30	min W	linter	15.919	0.303	0.0	6.4	6.4	57.5	ОК
60	min W	linter	16.003	0.387	0.0	6.6	6.6	73.6	ΟK
120	min W	linter	16.096	0.480	0.0	6.7	6.7	91.2	ОК
180	min W	linter	16.156	0.540	0.0	6.7	6.7	102.6	ОК
240	min W	linter	16.201	0.585	0.0	6.7	6.7	111.1	ОК
360	min W	linter	16.267	0.651	0.0	6.7	6.7	123.8	ОК
480	min W	linter	16.317	0.701	0.0	6.7	6.7	133.2	ОК
600	min W	linter	16.356	0.740	0.0	6.7	6.7	140.6	ОК
720	min W	linter	16.389	0.773	0.0	6.7	6.7	146.8	ОК
960	min W	linter	16.440	0.824	0.0	6.7	6.7	156.6	ОК
1440	min W	linter	16.512	0.896	0.0	6.7	6.7	170.3	ОК
2160	min W	linter	16.576	0.960	0.0	6.7	6.7	182.5	ОК
2880	min W	linter	16.502	0.886	0.0	6.7	6.7	168.3	ΟK
4320	min W	linter	16.352	0.736	0.0	6.7	6.7	139.8	ΟK
5760	min W	linter	16.276	0.660	0.0	6.7	6.7	125.5	O K

	Storm Event		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
5760	min	Summer	1.642	0.0	2103.7	3584	
7200	min	Summer	1.397	0.0	2235.8	4328	
8640	min	Summer	1.224	0.0	2348.7	5104	
10080	min	Summer	1.094	0.0	2445.7	5848	
15	min	Winter	91.546	0.0	316.7	19	
30	min	Winter	63.018	0.0	422.0	33	
60	min	Winter	40.649	0.0	594.4	62	
120	min	Winter	25.571	0.0	740.8	122	
180	min	Winter	19.343	0.0	827.2	180	
240	min	Winter	15.831	0.0	882.0	240	
360	min	Winter	11.908	0.0	946.0	358	
480	min	Winter	9.717	0.0	991.1	476	
600	min	Winter	8.295	0.0	1028.2	594	
720	min	Winter	7.287	0.0	1054.3	714	
960	min	Winter	5.938	0.0	1038.5	952	
1440	min	Winter	4.449	0.0	967.4	1430	
2160	min	Winter	3.330	0.0	1750.3	2796	
2880	min	Winter	2.709	0.0	1823.8	2768	
4320	min	Winter	2.022	0.0	1881.7	2924	
5760	min	Winter	1.642	0.0	2356.0	3688	
		©1	L982-20	20 Inno	vyze		

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Ormond House		
Upper Ormond Quay		
Dublin 7		Micro
Date 23/08/2021 17:51	Designed by dalye	Drainage
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Innovyze	Source Control 2020.1	

Cascade Summary of Results for 190226 Source Control Catchment 5
09.08.2021.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)			Max Volume (m³)	Status
7200 min Winter	16.219	0.603	0.0	6.7	6.7	114.7	ОК
8640 min Winter	16.173	0.557	0.0	6.7	6.7	105.9	ОК
10080 min Winter	16.131	0.515	0.0	6.7	6.7	97.8	ΟK

Storm	Rain	Flooded	Discharge	Time-Peak	
Event	(mm/hr)	Volume	Volume	(mins)	
		(m³)	(m³)		
7200 min Winter	1.397	0.0	2503.8	4528	
8640 min Winter	1.224	0.0	2629.1	5368	
10080 min Winter	1.094	0.0	2733.3	6248	

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Ormond House		
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Innovyze	Source Control 2020.1	

#### Cascade Rainfall Details for 190226 Source Control Catchment 5 09.08.2021.SRCX

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)		17.300	Shortest Storm (mins)	15
Ratio R		0.280	Longest Storm (mins)	10080
Summer Storms		Yes	Climate Change %	+20

<u> Time Area Diagram</u>

Total Area (ha) 0.219

Time	(mins)	Area
From:	To:	(ha)
0	4	0.219

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Ormond House					Г	
Upper Ormond Quay						
Dublin 7						Airco
Date 23/08/2021 17	:51	Designed	d by dal	ye		Micro
File Cascade all.c	asx	Checked		2		Drainage
Innovyze			Control 2	2020.1		
1						
Cascade Model Deta	ails for 19022	6 Source	Control	Catchment	5 09.08.	2021.SRCX
	Storage is Or	nline Cover	Level (m	) 18.100		
	<u>Cellula</u>	ar Storag	e Struct	ure		
Infiltra	Inve tion Coefficient			5 Safety Fact Poros:	tor 2.0 ity 0.95	
Infiltra	tion Coefficient	Side (m/h:	r) 0.00000	)		
Depth (m) A	rea (m²) Inf. Ar	ea (m²) De	pth (m) A:	rea (m²) Inf	. Area (m²	)
0.000 1.670	200.0 200.0	200.0 200.0	1.671	0.0	200.	0
	<u>Hydro-Brake@</u>	) Optimum	Outflow	Control		
	Unit	Reference	MD-SHE-0	111-8500-274	9-8500	
		gn Head (m)			2.749	
	Design	Flow (1/s)			8.5	
		Flush-Flo™		Calc e upstream s	ulated	
	2	Application		-	urface	
		o Available			Yes	
	Dia	ameter (mm)			111	
		t Level (m)			15.616	
	n Outlet Pipe Dia ested Manhole Dia				150 1200	
	Control Po	oints	Head (m)	Flow (l/s)		
	Design Point (C	alculated)	2.749	8.5		
		Flush-Flo™		6.7		
		Kick-Flo®				
	Mean Flow over	Head Range	-	6.6		
The hydrological ca Hydro-Brake® Optimum Hydro-Brake Optimum invalidated	m as specified.	Should and	ther type	of control	device oth	er than a
Depth (m) Flow (1/:	s) Depth (m) Flo	w (1/s) De	pth (m) F	low (l/s) De	pth (m) Fl	low (1/s)
0.100 3	.9 1.200	5.8	3.000	8.8	7.000	13.2
	.9 1.400	6.2	3.500	9.5	7.500	13.7
	.4 1.600	6.6	4.000	10.1	8.000	14.1
	.6 1.800 .7 2.000	7.0 7.3	4.500	10.7 11.3	8.500 9.000	14.5 14.9
	.7 2.000	7.6	5.000 5.500	11.3	9.000 9.500	14.9 15.3
	.3 2.400	8.0	6.000	12.3	2.000	±0.0
	.3 2.600	8.3	6.500	12.8		
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190226-Rep-002

**APPENDIX C – SURFACE WATER DRAINAGE CALCULATIONS** 

DBFL Consulting Engineers		Page 1
Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION 1 in 5 YEAR STORM EVENT	
Dublin 7	– Micro	
Date 23/08/2021 18:02	Designed by dalye	
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Drainage
Innovyze	Network 2020.1	
STORM SEWER DES	SIGN by the Modified Rational Method	
<u>Design Cri</u>	teria for Surface Water Network	
Pipe Size	es STANDARD Manhole Sizes STANDARD	
Ratio R 0.280 Maximum Rainfall (mm/hr) 50 Add F Maximum Time of Concentration (mins) 30 Min	Foul Sewage (l/s/ha) 0.000 Maximum Backdrop Hei Volumetric Runoff Coeff. 0.750 Min Design Depth for Optimisat PIMP (%) 100 Min Vel for Auto Design onl Clow / Climate Change (%) 20 Min Slope for Optimisatic imum Backdrop Height (m) 0.200 Designed with Level Soffits	ion (m) 1.200 y (m/s) 1.00
Network Desig	gn Table for Surface Water Network	
« - :	Indicates pipe capacity < flow	
PN Length Fall Slope I.Area (m) (m) (1:X) (ha)	T.E. Base k HYD DIA Section Type Auto (mins) Flow (l/s) (mm) SECT (mm) Design	
	<u>Network Results Table</u>	
PN Rain T.C. US/ILΣ (mm/hr) (mins) (m)	I.Area Σ Base Foul Add Flow Vel Cap Flow (ha) Flow (l/s) (l/s) (l/s) (m/s) (l/s) (l/s)	
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Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION 1 in 5 YEAR STORM EVENT	
Dublin 7		Micro
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File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Drainage
Innovyze	Network 2020.1	

PN	Length	Fall	Slope	I.Area	T.E.	Ba	ase	k	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)	(mins)	Flow	(l/s)	(mm)	SECT	(mm)		Design
S1.000	45.534	0.569	80.0	0.159	4.00		0.0	0.600	0	225	Pipe/Conduit	ð
S1.001	37.539	1.104	34.0	0.109	0.00		0.0	0.600	0	225	Pipe/Conduit	Ť
S1.002	56.453	0.896	63.0	0.066	0.00		0.0	0.600	0	225	Pipe/Conduit	ĕ
S1.003	26.659	0.089	299.5	0.024	0.00		0.0	0.600	0	300	Pipe/Conduit	ď
S1.004	13.463	0.299	45.0	0.010	0.00		0.0	0.600	0	300	Pipe/Conduit	Ū,
S2.000	3.468	0.035	99.1	0.219	4.00		0.0	0.600	0	300	Pipe/Conduit	٠
S3.000	16.441	0.149	110.0	0.068	4.00		0.0	0.600	0	225	Pipe/Conduit	ð

#### <u>Network Results Table</u>

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (1/s)	Vel (m/s)	Cap (1/s)	Flow (l/s)	
S1.000 S1.001 S1.002 S1.003	50.00 50.00 50.00 50.00	4.80 5.37	<b>19.575</b> 19.006 17.902 16.931	0.159 0.268 0.334 0.358	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0	4.3 7.3 9.0 9.7	1.46 2.25 1.65 0.90	58.2 89.5 65.6 63.8	25.8 43.5 54.3 58.2	
S1.004 S2.000	50.00 50.00		16.842 16.708	0.368 0.219	0.0	0.0	10.0 5.9		166.1 111.7	59.8 35.6	
S3.000	50.00	4.22	16.908	0.068	0.0	0.0	1.8	1.25	49.5	11.0	

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Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION	
Dublin 7	1 in 5 YEAR STORM EVENT	Micro
Date 23/08/2021 18:02	Designed by dalye	inite o
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Drainage
Innovyze	Network 2020.1	I

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)		Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.001	16.571	0.055	301.3	0.000	0.00	0.0	0.600	0	300	Pipe/Conduit	ď
S4.000	10.520	0.062	169.7	0.210	4.00	0.0	0.600	0	300	Pipe/Conduit	ð
	22.944 31.083			0.014 0.080	0.00		0.600 0.600	0		Pipe/Conduit Pipe/Conduit	<b>⊕</b> ♂
S5.000	28.375	0.465	61.0	0.032	4.00	0.0	0.600	0	225	Pipe/Conduit	ð
S1.007	9.494	0.047	202.0	0.000	0.00	0.0	0.600	0	450	Pipe/Conduit	0

#### <u>Network Results Table</u>

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)			Add Flow (l/s)	Vel (m/s)	Cap (1/s)	Flow (l/s)			
S2.001	50.00	4.53	16.673	0.287	0.0	0.0	7.8	0.90	63.7	46.6			
S4.000	50.00	4.15	16.680	0.210	0.0	0.0	5.7	1.20	85.1	34.1			
S1.005 S1.006	50.00 50.00		16.543 16.342	0.879 0.959	0.0	0.0	23.8 26.0		148.0 171.9				
S5.000	50.00	4.28	16.944	0.032	0.0	0.0	0.9	1.68	66.7	5.2			
S1.007	50.00	6.83	16.254	0.991	0.0	0.0	26.8	1.43	226.9	161.0			
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Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION 1 in 5 YEAR STORM EVENT	
Dublin 7		Micro
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File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Drainage
Innovyze	Network 2020.1	I

PN	Length	Fall	Slope	I.Area	T.E.	Ba	ase	k	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)	(mins)	Flow	(l/s)	(mm)	SECT	(mm)		Design
S1.008	29.925	0.130	230.2	0.014	0.00		0.0	0.600	0	450	Pipe/Conduit	ď
S1.009	10.755	0.035	307.3	0.012	0.00		0.0	0.600	0	450	Pipe/Conduit	ě
S1.010	25.432	0.102	249.3	0.015	0.00		0.0	0.600	0	450	Pipe/Conduit	ď
S1.011	45.007	0.183	245.9	0.050	0.00		0.0	0.600	0	450	Pipe/Conduit	ă 🖌
S1.012	12.339	0.037	333.5	0.008	0.00		0.0	0.600	0	450	Pipe/Conduit	-
S6.000	6.457	0.099	65.2	0.035	4.00		0.0	0.600	0	225	Pipe/Conduit	ð
S6.001	10.656	0.155	68.7	0.001	0.00		0.0	0.600	0	225	Pipe/Conduit	
S6.002	15.711	0.225	69.9	0.001	0.00		0.0	0.600	0	225	Pipe/Conduit	Ŭ,

### <u>Network Results Table</u>

(11	mm/hr)	(mins)	(m)	(ha)	Flow (l/s)	(l/s)	(1/s)	(m/s)	(1/s)	(1/s)	
S1.008	50.00	7.20	16.207	1.005	0.0	0.0	27.2	1.34	212.4	163.3	
S1.009	50.00	7.36	16.077	1.017	0.0	0.0	27.5	1.15	183.6	165.3	
S1.010	50.00	7.69	16.042	1.032	0.0	0.0	27.9	1.28	204.0	167.7	
S1.011	50.00	8.27	15.940	1.082	0.0	0.0	29.3	1.29	205.5	175.8	
S1.012	50.00	8.46	15.757	1.090	0.0	0.0	29.5	1.11	176.2«	177.1	Upstream of hydrobrake and
S6.000	50.00	4.07	19.575	0.035	0.0	0.0	0.9	1.62	64.5	5.7	attenuation
S6.001	50.00	4.18	19.476	0.036	0.0	0.0	1.0	1.58	62.8	5.8	
S6.002	50.00	4.35	19.321	0.037	0.0	0.0	1.0	1.57	62.3	6.0	

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Ormond House		
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Dublin 7	1 in 5 YEAR STORM EVENT	Micro
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PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)		Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
s7.000	41.999	0.677	62.0	0.034	4.00	0.0	0.600	0	225	Pipe/Conduit	ð
s6.003	33.244	0.277	120.0	0.005	0.00	0.0	0.600	0	225	Pipe/Conduit	ď
s8.000 s8.001	26.970 4.205		100.0 62.0	0.090 0.000	4.00 0.00		0.600	0		Pipe/Conduit Pipe/Conduit	<del>d</del>
S6.004	22.515	0.113	199.2	0.041	0.00	0.0	0.600	0	300	Pipe/Conduit	ď
S9.000	32.583	0.543	60.0	0.035	4.00	0.0	0.600	0	225	Pipe/Conduit	ð

#### <u>Network Results Table</u>

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)		Σ Base Flow (l/s)				Cap (1/s)	Flow (l/s)			
S7.000	50.00	4.42	19.775	0.034	0.0	0.0	0.9	1.66	66.1	5.5			
S6.003	50.00	4.89	19.096	0.076	0.0	0.0	2.1	1.19	47.4	12.3			
S8.000 S8.001	50.00 50.00		<b>19.575</b> 19.305	0.090 0.090	0.0	0.0	2.4 2.4	1.31 1.66		14.6 14.6			
S6.004	50.00	5.22	18.744	0.207	0.0	0.0	5.6	1.11	78.5	33.6			
\$9.000	50.00	4.32	19.475	0.035	0.0	0.0	0.9	1.69	67.3	5.7			
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Innovyze	Network 2020.1	

PN	Length	Fall	Slope	I.Area	T.E.	Base		k	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)	(mins)	Flow (1	/s)	(mm)	SECT	(mm)		Design
S6.005	22.917	0.082	279.5	0.047	0.00	1	0.0	0.600	0	375	Pipe/Conduit	<b>.</b>
S6.006	16.601	0.055	301.9	0.036	0.00		0.0	0.600	0	375	Pipe/Conduit	ĕ
S6.007	16.165	0.054	300.0	0.034	0.00		0.0	0.600	0	375	Pipe/Conduit	ð
S10.000	21.651	0.492	44.0	0.021	4.00		0.0	0.600	0	225	Pipe/Conduit	<del>3</del>
S10.001	20.030	0.250	80.0	0.023	0.00		0.0	0.600	0	225	Pipe/Conduit	ď
S10.002	23.954	0.260	92.0	0.009	0.00		0.0	0.600	0	225	Pipe/Conduit	- T
S10.003	50.972	0.631	80.8	0.031	0.00		0.0	0.600	0	225	Pipe/Conduit	ě

#### <u>Network Results Table</u>

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (1/s)	Add Flow (1/s)	Vel (m/s)	Cap (1/s)	Flow (1/s)	
S6.005 S6.006 S6.007	50.00 50.00 50.00	5.84	18.556 18.474 18.419	0.289 0.325 0.359	0.0 0.0 0.0	0.0 0.0 0.0	7.8 8.8 9.7	1.04	119.2 114.6 115.0	47.0 52.8 58.3	
S10.000 S10.001 S10.002 S10.003	50.00 50.00 50.00 50.00	4.41 4.70	20.475 19.983 19.733 19.472	0.021 0.044 0.053 0.084	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.6 1.2 1.4 2.3	1.98 1.46 1.36 1.46	78.6 58.2 54.2 57.9	3.4 7.1 8.6 13.6	

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Dublin 7	1 in 5 YEAR STORM EVENT	Micro
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Innovyze	Network 2020.1	I

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Bas Flow		k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S11.000	27.528	0.376	73.2	0.086	4.00		0.0	0.600	0	225	Pipe/Conduit	<del>0</del>
S10.004	31.220	0.156	200.1	0.008	0.00		0.0	0.600	0	375	Pipe/Conduit	ð
S6.009 S6.010 S6.011	11.371 21.052 52.584 17.288	0.070 0.939 0.288	300.7 56.0 60.0	0.017 0.020 0.055 0.023	0.00 0.00 0.00 0.00		0.0	0.600 0.600 0.600 0.600	0 0 0	<mark>375</mark> 375 375	Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit	5 0 5 5
S6.012	18.044	0.323	55.9	0.010	0.00		0.0	0.600	0	375	Pipe/Conduit	0

#### <u>Network Results Table</u>

(mm/hr) (mi	ins) (m)		Σ Base Low (l/s)		Add Flow (1/s)	Vel (m/s)	Cap (1/s)	Flow (l/s)
S11.000 50.00 4	4.30 19.475	0.086	0.0	0.0	2.3	1.53	60.8	14.0
S10.004 50.00 5	5.69 18.521	0.178	0.0	0.0	4.8	1.28	141.1	28.9
\$6.009       \$0.00       \$6         \$6.010       \$0.00       \$6         \$6.011       \$0.00       \$6	6.29 18.365 6.63 18.327 6.99 18.257 7.11 17.318 7.23 17.030	0.554 0.574 0.629 0.652 0.662	0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0	15.0 15.5 17.0 17.7 17.9	1.04 2.43 2.34	112.9 114.8 267.9 258.7 268.1	105.9

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Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION 1 in 5 YEAR STORM EVENT	
Dublin 7		Micro
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PN	Length	Fall	Slope	I.Area	T.E.	Ba	ase	k	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)	(mins)	Flow	(l/s)	(mm)	SECT	(mm)		Design
S1.013	12.708	0.104	122.2	0.000	0.00		0.0	0.600	0	450	Pipe/Conduit	_
S1.014	6.243	0.027	231.2	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	ě
S1.015	25.474	0.136	188.0	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	ě
S1.016	29.555	0.130	227.3	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	ě
S1.017	29.961	0.119	251.8	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	Ā
S1.018	19.883	0.079	251.7	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	Ā
S1.019	24.828	0.099	250.8	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	ă
S1.020	35.005	0.140	250.0	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	ă
S1.021	36.565	0.146	250.4	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	ă
S1.022	38.440	0.156	246.4	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	ē

#### <u>Network Results Table</u>

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)		Add Flow (l/s)	Vel (m/s)	Cap (1/s)	Flow (l/s)	
S1.013	50.00	8.57	15.720	1.752	0.0	0.0	47.4	1.84	292.3	284.7	Reduced fLow
S1.014	50.00	8.67	15.616	1.752	0.0	0.0	47.4	1.03	72.8«	284.7	
S1.015	50.00	9.04	15.589	1.752	0.0	0.0	47.4	1.14	80.8«	284.7	Following
S1.016	49.95	9.52	15.454	1.752	0.0	0.0	47.4	1.04	73.4«	284.7	Hydrobrake
S1.017	48.74	10.02	15.324	1.752	0.0	0.0	47.4	0.99	69.7«	284.7	
S1.018	47.98	10.36	15.205	1.752	0.0	0.0	47.4	0.99	69.7«	284.7	MaxQ 8.5 l/s
S1.019	47.07	10.78	15.126	1.752	0.0	0.0	47.4	0.99	69.9«	284.7	
S1.020	45.86	11.37	14.150	1.752	0.0	0.0	47.4	0.99	70.0«	284.7	
S1.021	44.68	11.98	14.010	1.752	0.0	0.0	47.4	0.99	69.9«	284.7	
S1.022	43.52	12.63	13.863	1.752	0.0	0.0	47.4	1.00	70.5«	284.7	

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Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION	
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<u>Network Desi</u>	<u>gn Table for Surface Water Network</u>	

PN	Length (m)		Slope (1:X)		T.E. (mins)				HYD SECT		Section	Туре	Auto Design
S1.02	3 85.511	0.339	252.2	0.000	0.00		0.0	0.600	0	300	Pipe/Cor	nduit	•
				Ne	twork	Resu	lts T	<u>able</u>					
,	DN Da	in 7			T Area	5	Baso	Foul	Add 1	Flow	Vel C	<b>an</b> 1	Flow

PN	Rain	T.C.	US/IL	Σ I.Area	Σ Base	Foul	Add Flow	Vel	Cap	Flow	
	(mm/hr)	(mins)	(m)	(ha)	Flow (l/s)	(l/s)	(l/s)	(m/s)	(l/s)	(l/s)	
S1.023	41.17	14.07	13.707	1.752	0.0	0.0	47.4	0.99	69.7«	284.7	

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MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S25	20.994	1.419	Open Manhole	1200	s1.000	19.575	225				
S24	20.740	1.734	Open Manhole	1200	S1.001	19.006	225	S1.000	19.006	225	
S23	19.378	1.476	Open Manhole	1200	S1.002	17.902	225	S1.001	17.902	225	
S22	19.100	2.169	Open Manhole	1200	s1.003	16.931	300	S1.002	17.006	225	
S21	19.100	2.258	Open Manhole	1200	S1.004	16.842	300	S1.003	16.842	300	
S20-1-1	18.796	2.088	Open Manhole	1200	s2.000	16.708	300				
S20-2	18.685	1.777	Open Manhole	1200	s3.000	16.908	225				
S20-1	18.717	2.044	Open Manhole	1200	s2.001	16.673	300	s2.000	16.673	300	
								S3.000	16.759	225	11
S9	18.880	2.200	Open Manhole	1200	S4.000	16.680	300				
S20	18.839	2.296	Open Manhole	1350	S1.005	16.543	375	S1.004	16.543	300	
								S2.001	16.618	300	
								S4.000	16.618	300	
S19	18.747	2.405	Open Manhole	1350	S1.006	16.342	450	S1.005	16.417	375	
S18-1	18.238	1.294	Open Manhole	1200	s5.000	16.944	225				
S18	18.498	2.245	Open Manhole	1350	S1.007	16.254	450	S1.006	16.253	450	
								s5.000	16.479	225	
S17	18.414	2.207	Open Manhole	1350	S1.008	16.207	450	S1.007	16.207	450	
S16	18.270	2.193	Open Manhole	1350	S1.009	16.077	450	S1.008	16.077	450	

#### Manhole Schedules for Surface Water Network

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Innovyze	Network 2020.1	<u> </u>

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S15	18.094	2.052	Open Manhole	1350	S1.010	16.042	450	s1.009	16.042	450	
S14	18.244	2.304	Open Manhole	1350	S1.011	15.940	450	S1.010	15.940	450	
S13	18.602	2.845	Open Manhole	1350	S1.012	15.757	450	S1.011	15.757	450	
S12-13	20.908	1.333	Open Manhole	1200	S6.000	19.575	225				
S12-12	20.947	1.471	Open Manhole	1200	S6.001	19.476	225	S6.000	19.476	225	
S12-11	21.560	2.239	Open Manhole	1200	S6.002	19.321	225	S6.001	19.321	225	
S12-10-1	21.338	1.563	Open Manhole	1200	s7.000	19.775	225				
S12-10	21.125	2.029	Open Manhole	1200	S6.003	19.096	225	S6.002	19.096	225	
								S7.000	19.098	225	2
S23	20.994	1.419	Open Manhole	1200	S8.000	19.575	225				
S12-9-1	20.712	1.407	Open Manhole	1200	S8.001	19.305	225	S8.000	19.305	225	
S12-9	20.679	1.935	Open Manhole	1200	S6.004	18.744	300	S6.003	18.819	225	
								S8.001	19.237	225	418
S12-8-1	20.900	1.425	Open Manhole	1200	S9.000	19.475	225				
S12-8	20.690	2.134	Open Manhole	1350	S6.005	18.556	375	S6.004	18.631	300	
								S9.000	18.932	225	226
S12-7	20.876	2.402	Open Manhole	1350	S6.006	18.474	375	S6.005	18.474	375	
S12-6	21.020	2.601	Open Manhole	1350	S6.007	18.419	375	S6.006	18.419	375	
S12-5-5	22.029	1.554	Open Manhole	1200	S10.000	20.475	225				

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MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S12-5-4	21.800	1.817	Open Manhole	1200	S10.001	19.983	225	S10.000	19.983	225	
S12-5-3	22.077	2.344	Open Manhole	1200	S10.002	19.733	225	S10.001	19.733	225	
S12-5-2	22.250	2.778	Open Manhole	1200	S10.003	19.472	225	S10.002	19.472	225	
12-5-1-1	21.237	1.762	Open Manhole	1200	S11.000	19.475	225				
S12-5-1	21.782	3.261	Open Manhole	1350	S10.004	18.521	375	S10.003	18.841	225	170
								S11.000	19.099	225	428
S12-5	21.200	2.835	Open Manhole	1350	S6.008	18.365	375	S6.007	18.365	375	
								S10.004	18.365	375	
S12-4	20.935	2.608	Open Manhole	1350	S6.009	18.327	375	S6.008	18.328	375	1
S12-3	20.589	2.332	Open Manhole	1350	S6.010	18.257	375	S6.009	18.257	375	
S12-2	19.050	1.732	Open Manhole	1350	S6.011	17.318	375	S6.010	17.318	375	
S12-1	18.987	1.957	Open Manhole	1350	S6.012	17.030	375	S6.011	17.030	375	
S12	18.649	2.929	Open Manhole	1350	S1.013	15.720	450	S1.012	15.720	450	
								S6.012	16.707	375	912
S11	18.610	2.994	Open Manhole	1350	S1.014	15.616	300	S1.013	15.616	450	
			Open Manhole	1200	S1.015	15.589	300	S1.014	15.589	300	
			Open Manhole	1200	S1.016	15.454	300	S1.015	15.454	300	
			Open Manhole	1200	S1.017	15.324	300	S1.016	15.324	300	
S7	18.520	3.315	Open Manhole	1200	S1.018	15.205	300	S1.017	15.205	300	

#### Manhole Schedules for Surface Water Network

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				Manho	ole Sched	ules f	or Surfac	<u>ce Water</u>	Netwo	<u>rk</u>		
MH Name	MH CL (m)	MH Depth (m)	Conr	MH nection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S6	18.314	3.188	Open	Manhole	1200	S1.019	15.126	300	S1.018	15.126	300	
S5	18.333	4.183	Open	Manhole	1200	S1.020	14.150	300	S1.019	15.027	300	877
S4	17.620	3.610	Open	Manhole	1200	S1.021	14.010	300	S1.020	14.010	300	
S3	17.151	3.288	Open	Manhole	1200	S1.022	13.863	300	S1.021	13.864	300	1
S2	16.667	2.960	Open	Manhole	1200	S1.023	13.707	300	S1.022	13.707	300	
S	15.660	2.292	Open	Manhole	0		OUTFALL		S1.023	13.368	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)		Layout (North)
S25	716876.126	731222.283	716876.126	731222.283	Required	6
S24	716887.061	731266.484	716887.061	731266.484	Required	4
S23	716900.259	731301.627	716900.259	731301.627	Required	-
						<u> </u>
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SURFACE WATER DRAINAGE CALCULATION	
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MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	-
S22	716953.133	731281.848	716953.133	731281.848	Required	-0_
S21	716977.747	731271.608	716977.747	731271.608	Required	·
S20-1-1	717000.380	731257.076	717000.380	731257.076	Required	-
S20-2	717015.030	731270.557	717015.030	731270.557	Required	
S20-1	717002.982	731259.369	717002.982	731259.369	Required	Ser
SS	716984.191	731263.171	716984.191	731263.171	Required	· /
S20	716991.197	731271.018	716991.197	731271.018	Required	
S19	717005.797	731288.719	717005.797	731288.719	Required	J.
		@1982	-2020 Innov	W70		~
		01902	2020 111100			

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MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S18-1	717026.680	731344.231	717026.680	731344.231	Required	•
S18	717014.752	731318.484	717014.752	731318.484	Required	1
S17	717023.639	731315.144	717023.639	731315.144	Required	
S16	717043.112	731292.421	717043.112	731292.421	Required	
S15	717053.473	731295.304	717053.473	731295.304	Required	
S14	717069.800	731275.806	717069.800	731275.806	Required	
S13	717035.882	731246.222	717035.882	731246.222	Required	
S12-13	716893.572	731132.840	716893.572	731132.840	Required	
		©1982	-2020 Innov	yze		

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MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S12-12	2 716887.540	731135.143	716887.540	731135.143	Required	\
S12-11	716882.573	731144.571	716882.573	731144.571	Required	
S12-10-1	716849.313	731175.124	716849.313	731175.124	Required	
S12-10	716888.193	731159.242	716888.193	731159.242	Required	-
S23	716872.532	731203.849	716872.532	731203.849	Required	
S12-9-1	716897.335	731193.258	716897.335	731193.258	Required	-
S12-9	716900.246	731190.224	716900.246	731190.224	Required	
S12-8-1	716908.845	731151.687	716908.845	731151.687	Required	1
		©1982	-2020 Innov	yze		

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MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S12-8	716921.150	731181.858	716921.150	731181.858	Required	-
S12-7	716942.608	731173.814	716942.608	731173.814	Required	-
S12-6	716946.662	731157.716	716946.662	731157.716	Required	
S12-5-5	716894.758	731106.699	716894.758	731106.699	Required	
S12-5-4	716915.025	731099.083	716915.025	731099.083	Required	-
S12-5-3	716907.813	731080.396	716907.813	731080.396	Required	
s12-5-2	716930.106	731071.630	716930.106	731071.630	Required	
S12-5-1-1	716922.727	731129.624	716922.727	731129.624	Required	
		-1.0.0				
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MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S12-5-1	716948.233	731119.269	716948.233	731119.269	Required	4
S12-5	716959.784	731148.274	716959.784	731148.274	Required	5
S12-4	716970.743	731151.303	716970.743	731151.303	Required	
S12-3	716986.207	731165.588	716986.207	731165.588	Required	
S12-2	717003.968	731215.082	717003.968	731215.082	Required	· •
S12-1	717019.726	731222.192	717019.726	731222.192	Required	
S12	717033.217	731234.174	717033.217	731234.174	Required	X
S11	717041.734	731224.743	717041.734	731224.743	Required	
		01000				
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MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)		Layout (North)			
S10	717047.619	731222.660	717047.619	731222.660	Required				
S9	717065.548	731204.563	717065.548	731204.563	Required	$\checkmark$			
S8	717085.867	731226.026	717085.867	731226.026	Required	6			
S7	717105.562	731248.604	717105.562	731248.604	Required				
S6	717122.095	731259.649	717122.095	731259.649	Required				
\$5	717140.120	731242.576	717140.120	731242.576	Required				
S4	717175.116	731243.364	717175.116	731243.364	-	•			
\$3	717211.680	731243.249	717211.680	731243.249	Required	•			
		©1982	-2020 Innov	yze					

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Innovyze			Net	work 2020.1				
	MH Name	Manhole Easting (m)	Manhole Northing (m)		Intersection Northing (m)	Manhole Access		
	S2	717250.120	731243.155	5 717250.120	731243.155	Required		
	S	717335.630	731242.904	l		No Entry	•	
			©1983	2-2020 Innov	yze			

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Innovyze	Network 2020.1	!			

## <u>Upstream Manhole</u>

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	0	225	S25	20.994	19.575	1.194	Open Manhole	1200
S1.001	0	225	S24	20.740	19.006	1.509	Open Manhole	1200
S1.002	0	225	S23	19.378	17.902	1.251	Open Manhole	1200
S1.003	0	300	S22	19.100	16.931	1.869	Open Manhole	1200
S1.004	0	300	S21	19.100	16.842	1.958	Open Manhole	1200
S2.000	0	300	S20-1-1	18.796	16.708	1.788	Open Manhole	1200
s3.000	0	225	s20-2	18.685	16.908	1.552	Open Manhole	1200

#### <u>Downstream Manhole</u>

PI	N	Length (m)	Slope (1:X)		C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)	
S1.(	000	45.534	80.0	S24	20.740	19.006	1.509	Open Manhole	1200	
S1.0	001	37.539	34.0	S23	19.378	17.902	1.251	Open Manhole	1200	
S1.0	002	56.453	63.0	S22	19.100	17.006	1.869	Open Manhole	1200	
S1.0	003	26.659	299.5	S21	19.100	16.842	1.958	Open Manhole	1200	
S1.0	004	13.463	45.0	S20	18.839	16.543	1.996	Open Manhole	1350	
S2.0	000	3.468	99.1	s20-1	18.717	16.673	1.744	Open Manhole	1200	
S3.(	000	16.441	110.0	S20-1	18.717	16.759	1.733	Open Manhole	1200	
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Ormond House Upper Ormond Quay				SUR	SURFACE WATER DRAINAGE CALCULATION						
Dublin 7					5 YEAR S						
Date 23/08/2021 18:02			Desi	.gned by	/ dalve			— Micro			
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-											
	<u>P</u>	IPELIN	NE SC	CHEDULES	S for S	urface	Water Netwo	rk			
				Upsi	tream M	anhole					
PN	-	Diam (mm) 1		C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)			
						. ,					
S2.001	0	300 S	20-1	18.717	16.673	1.744	Open Manhole	1200			
S4.000	0	300	S9	18.880	16.680	1.900	Open Manhole	1200			
S1.005	0	375	S20	18.839	16.543	1.921	Open Manhole	1350			
S1.006	0	450	S19	18.747	16.342	1.955	Open Manhole	1350			
\$5.000	0	225 S	18-1	18.238	16.944	1.069	Open Manhole	1200			
				Downs	stream 1	Manhole	<u>.</u>				
PN	-	-		C.Level		-		MH DIAM., L*W			
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)			
S2.001	16.571	301.3	S20	18.839	16.618	1.921	Open Manhole	e 1350			
S4.000	10.520	169.7	S20	18.839	16.618	1.921	Open Manhole	1350			
S1.005	22.944	182.0	S19	18.747	16.417	1.955	Open Manhole	1350			
S1.006	31.083	350.0	S18	18.498	16.253	1.795	Open Manhole	1350			
S5.000	28.375	61.0	S18	18.498	16.479	1.794	Open Manhole	e 1350			
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Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION 1 in 5 YEAR STORM EVENT	
Dublin 7		Micro
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Innovyze	Network 2020.1	

## <u>Upstream Manhole</u>

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
	Dect	(	Manie	(m)	(111)	(111)	connection	(mail)
S1.007	0	450	S18	18.498	16.254	1.794	Open Manhole	1350
S1.008	0	450	S17	18.414	16.207	1.757	Open Manhole	1350
S1.009	0	450	S16	18.270	16.077	1.743	Open Manhole	1350
S1.010	0	450	S15	18.094	16.042	1.602	Open Manhole	1350
S1.011	0	450	S14	18.244	15.940	1.854	Open Manhole	1350
S1.012	0	450	S13	18.602	15.757	2.395	Open Manhole	1350
S6.000	0	225	S12-13	20.908	19.575	1.108	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)
S1.007	9.494	202.0	S17	18.414	16.207	1.757	Open Manhole	1350
S1.008	29.925	230.2	S16	18.270	16.077	1.743	Open Manhole	1350
S1.009	10.755	307.3	S15	18.094	16.042	1.602	Open Manhole	1350
S1.010	25.432	249.3	S14	18.244	15.940	1.854	Open Manhole	1350
S1.011	45.007	245.9	S13	18.602	15.757	2.395	Open Manhole	1350
S1.012	12.339	333.5	S12	18.649	15.720	2.479	Open Manhole	1350
S6.000	6.457	65.2	S12-12	20.947	19.476	1.246	Open Manhole	1200
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Innovyze	Network 2020.1			

## <u>Upstream Manhole</u>

PN Hyd Diam MH C.Level I.Level D.Depth Mi Sect (mm) Name (m) (m) (m) Connec	
S6.001 o 225 S12-12 20.947 19.476 1.246 Open Ma	Manhole 1200
S6.002 o 225 S12-11 21.560 19.321 2.014 Open Ma	Manhole 1200
S7.000 o 225 S12-10-1 21.338 19.775 1.338 Open Ma	Manhole 1200
S6.003 o 225 S12-10 21.125 19.096 1.804 Open Ma	Manhole 1200
S8.000 o 225 S23 20.994 19.575 1.194 Open Ma	Manhole 1200
S8.001 o 225 S12-9-1 20.712 19.305 1.182 Open Ma	Manhole 1200

## Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
S6.00	1 10.656	68.7	S12-11	21.560	19.321	2.014	Open Manhole	1200
S6.00	2 15.711	69.9	S12-10	21.125	19.096	1.804	Open Manhole	1200
S7.00	0 41.999	62.0	S12-10	21.125	19.098	1.802	Open Manhole	1200
S6.00	3 33.244	120.0	S12-9	20.679	18.819	1.635	Open Manhole	1200
S8.00	0 26.970	100.0	S12-9-1	20.712	19.305	1.182	Open Manhole	1200
S8.00	1 4.205	62.0	S12-9	20.679	19.237	1.217	Open Manhole	1200
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## <u>Upstream Manhole</u>

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
S6.004	0	300	S12-9	20.679	18.744	1.635	Open Manhole	1200
S9.000	0	225	S12-8-1	20.900	19.475	1.200	Open Manhole	1200
S6.005	0	<mark>375</mark>	S12-8	20.690	18.556	2.027	Open Manhole	1350
S6.006	0	375	S12-7	20.876	18.474		Open Manhole	1350
S6.007	0	375	S12-6	21.020	18.419		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)
S6.004	22.515	199.2	S12-8	20.690	18.631	1.759	Open Manhole	1350
S9.000	32.583	60.0	S12-8	20.690	18.932	1.533	Open Manhole	1350
S6.006	16.601	301.9	S12-6	20.876 21.020 21.200	18.419	2.226	Open Manhole Open Manhole Open Manhole	1350 1350 1350

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## <u>Upstream Manhole</u>

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
s10.000	0	225	S12-5-5	22.029	20.475	1.329	Open Manhole	1200
S10.001	0	225	S12-5-4	21.800	19.983	1.592	Open Manhole	1200
S10.002	0	225	S12-5-3	22.077	19.733	2.119	Open Manhole	1200
S10.003	0	225	S12-5-2	22.250	19.472	2.553	Open Manhole	1200
S11.000	0	225	S12-5-1-1	21.237	19.475	1.537	Open Manhole	1200
S10.004	0	375	S12-5-1	21.782	18.521	2.886	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)
S10.000	21.651	44.0	S12-5-4	21.800	19.983	1.592	Open Manhole	1200
S10.001	20.030	80.0	S12-5-3	22.077	19.733	2.119	Open Manhole	1200
S10.002	23.954	92.0	S12-5-2	22.250	19.472	2.553	Open Manhole	1200
S10.003	50.972	80.8	S12-5-1	21.782	18.841	2.716	Open Manhole	1350
S11.000	27.528	73.2	S12-5-1	21.782	19.099	2.458	Open Manhole	1350
S10.004	31.220	200.1	S12-5	21.200	18.365	2.460	Open Manhole	1350

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## <u>Upstream Manhole</u>

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
S6.008	0	375	S12-5	21.200	18.365	2.460	Open Manhole	1350
S6.009	0	375	S12-4	20.935	18.327	2.233	Open Manhole	1350
S6.010	0	375	S12-3	20.589	18.257	1.957	Open Manhole	1350
S6.011	0	375	S12-2	19.050	17.318	1.357	Open Manhole	1350
S6.012	0	375	S12-1	18.987	17.030	1.582	Open Manhole	1350
S1.013	0	450	S12	18.649	15.720	2.479	Open Manhole	1350
S1.014	0	300	S11	18.610	15.616	2.694	Open Manhole	1350
S1.015	0	300	S10	18.709	15.589	2.820	Open Manhole	1200

## Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
S6.008	11.371	311.0	S12-4	20.935	18.328	2.232	Open Manhole	1350
S6.009	21.052	300.7	s12-3	20.589	18.257	1.957	Open Manhole	1350
S6.010	52.584	56.0	s12-2	19.050	17.318	1.357	Open Manhole	1350
S6.011	17.288	60.0	S12-1	18.987	17.030	1.582	Open Manhole	1350
S6.012	18.044	55.9	S12	18.649	16.707	1.567	Open Manhole	1350
s1.013	12.708	122.2	S11	18.610	15.616	2.544	Open Manhole	1350
S1.014	6.243	231.2	S10	18.709	15.589	2.820	Open Manhole	1200
S1.015	25.474	188.0	S9	19.024	15.454	3.271	Open Manhole	1200
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Ormond House		
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Dublin 7	1 in 5 YEAR STORM EVENT	Micro
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## <u>Upstream Manhole</u>

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
S1.016	0	300	59	19.024	15,454	3 270	Open Manhole	1200
S1.010 S1.017	0	300	59 58	19.024	15.324		Open Manhole	1200
S1.017	0	300	30 S7	18.520	15.205		Open Manhole	1200
S1.010 S1.019	0	300	S6	18.314	15.126		Open Manhole	1200
S1.020	0	300	S5	18.333	14.150		Open Manhole	1200
S1.020	0	300	S4	17.620	14.010		Open Manhole	1200
S1.022	0	300	S3	17.151	13.863		Open Manhole	1200
S1.023	0	300	S2	16.667	13.707		Open Manhole	1200

## Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
S1.016	29.555	227.3	S8	18.716	15.324	3.092	Open Manhole	1200
S1.017	29.961	251.8	S7	18.520	15.205	3.015	Open Manhole	1200
S1.018	19.883	251.7	S6	18.314	15.126	2.888	Open Manhole	1200
S1.019	24.828	250.8	S5	18.333	15.027	3.006	Open Manhole	1200
S1.020	35.005	250.0	S4	17.620	14.010	3.310	Open Manhole	1200
S1.021	36.565	250.4	S3	17.151	13.864	2.987	Open Manhole	1200
S1.022	38.440	246.4	S2	16.667	13.707	2.660	Open Manhole	1200
S1.023	85.511	252.2	S	15.660	13.368	1.992	Open Manhole	0

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Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION	
Dublin 7	1 in 5 YEAR STORM EVENT	Micro
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#### Free Flowing Outfall Details for Surface Water Network

Outfall Outfall C. Level I. Level Min D,L W Pipe Number Name (m) (m) I. Level (mm) (mm)

(m)

S1.023 S 15.660 13.368 0.000 0 0

#### Simulation Criteria for Surface Water Network

Volumetric Runoff Coeff 0.750Manhole Headloss Coeff (Global)0.500Inlet Coefficient 0.800Areal Reduction Factor 1.000Foul Sewage per hectare (l/s)0.000 Flow per Person per Day (l/per/day)0.000Hot Start (mins)0 Additional Flow - % of Total Flow 20.000Run Time (mins)60Hot Start Level (mm)0MADD Factor \* 10m³/ha Storage2.000Output Interval (mins)1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 5 Number of Storage Structures 5 Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model		FSR	M5-60 (m	mm) 1	L7.300		Cv (\$	Summer)	0.750
Return Period (years)		5	Ratic	эR	0.280		Cv (V	Vinter)	0.840
Region	Scotland and $% \left( {{{\left( {{{\left( {{{\left( {{{\left( {{{c}}} \right)}} \right.}$	Ireland	Profile Ty	ype S	Summer	Storm	Duration	(mins)	30

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Drmond House								
Jpper Ormond Quay		SURFACE WA			ATION			
Dublin 7		1 in 5 YEAR S	IORM EVEN	1				Micro
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File 190226 - Drainage Design 23.08.2	2021.MDX	Checked by						Drainage
Innovyze		Network 202	20.1					
	Online Contr	rols for Sur	face Wate	r Networl	-			
	OIIIIIe COIICI	<u>.015 101 5u1</u>	Iace Wale	I NELWOII	<u>&gt;</u>			
Hydro-Brake	e® Optimum Man	hole: S21,	DS/PN: S1	.004, Vol	ume (m³):	4.4		
- <u>-</u>	<u>-</u>	·						
	e MD-SHE-0053-20				mp Availabl			
Design Head (m		2.733			iameter (mm	,		
Design Flow (1/s		2.0			rt Level (m	,		
Flush-Flo		Calculated		-				
Applicatio:	e Minimise upst n	Surface	Suggested	Mannole D.	Lameter (mm	) 1200		
Appricacio.		buildee						
Control Points	Head (m)	Flow (l/s)	Control	Points	Head (m)	Flow (1/	s)	
Design Point (Calcul	lated) 2.733	2.0		Kick-Fl	o® 0.470	0	.9	
Flush	h-Flo™ 0.226	1.1   Me	an Flow ove	er Head Ran	ge –	1	.4	
The hydrological calculations have been ba	and on the Haad	Diachargo ro	ationabin d	for the live	no Brokom (	ntimum aa	appaified	Chould
another type of control device other than		-	-	-		-	-	
Depth (m) Flow (1/s) Depth (m) Flow	(1/s) Depth (m)	Flow (l/s) De	pth (m) Flo	ow (l/s) De	pth (m) Flo	w (l/s)  I	Depth (m)	Flow (l/s)
0.100 1.0 0.600	1.0 1.600	1.6	2.600	1.9	5.000	2.6	7.500	3.2
0.200 1.1 0.800	1.1 1.800	1.6	3.000	2.1	5.500	2.8	8.000	3.3
	1.3 2.000	1.7	3.500	2.2	6.000	2.9	8.500	3.4
0.300 1.1 1.000						1		
0.300 1.1 1.000 0.400 1.0 1.200	1.4 2.200	1.8	4.000	2.4	6.500	3.0	9.000	3.5

Ormond House Upper Ormond Quay Dublin 7												
ublin 7					WATER DR R STORM E'	AINAGE CAL	CULATION	1				
				TITSTEAP							Mi	
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nnovyze				Network 2	2020.1							
	_				,				_			
	<u>Hydrc</u>	<u>-Brake® Op</u>	otimum Mar	nhole: S20,	, DS/PN:	S1.005, N	Volume (	m³): 5	.9			
	Unit R	eference MD-	-SHE-0093-4	700-1675-470	0		Sump Ava	ilable	Yes			
	Design	Head (m)		1.67	5		Diamete	r (mm)	93			
	Design Fl	ow (l/s)		4.	7	II	nvert Lev	el (m) 1	16.543			
		ush-Flo™				Outlet Pipe			150			
		2	inimise ups	tream storag		sted Manhole	e Diamete	r (mm)	1200			
	App	lication		Surfac	e							
	~ · · ·	Points						d (m) F	low (1,	/s)		
	Control	Points	Head (m)	Flow (l/s)	Cont	rol Points	пеа	u (m) r	104 (1)			
					Cont			0.829		3.4		
	Design Point		) 1.675	4.7			-Flo®		:			
	Design Point	(Calculated Flush-Flo	) 1.675 ™ 0.409	4.7 4.2	Mean Flow	Kick over Head 1	-Flo® Range	0.829		3.4 3.9		
The hydrological calcu	Design Point	(Calculated Flush-Flo <sup>3</sup> been based	) 1.675 ™ 0.409 on the Head	4.7 4.2	Mean Flow relationsh	Kick over Head 1 ip for the	-Flo® Range Hydro-Bra	0.829 - ke® Opt	imum as	3.4 3.9 s specifi		
The hydrological calcu	Design Point	(Calculated Flush-Flo <sup>3</sup> been based	) 1.675 ™ 0.409 on the Head	4.7 4.2	Mean Flow relationsh	Kick over Head 1 ip for the	-Flo® Range Hydro-Bra	0.829 - ke® Opt	imum as	3.4 3.9 s specifi		
The hydrological calcu	Design Point alations have ol device othe	(Calculated Flush-Flo been based er than a Hy	) 1.675 ™ 0.409 on the Heac dro-Brake C	4.7 4.2 d/Discharge n Optimum® be u	Mean Flow relationsh utilised t	Kick over Head 1 ip for the hen these s	-Flo® Range Hydro-Bra storage rc	0.829 - ke® Opt uting c	imum as alculat	3.4 3.9 s specifi tions wil	l be i	nvalidate
The hydrological calcu another type of contro Depth (m) Flow (1,	Design Point alations have ol device othe	(Calculated Flush-Flo been based er than a Hy Flow (1/s)	) 1.675 ™ 0.409 on the Head dro-Brake ( Depth (m)	4.7 4.2 d/Discharge n Dptimum® be u Flow (1/s)	Mean Flow relationsh utilised t	Kick over Head 1 ip for the hen these s	-Flo® Range Hydro-Bra torage rc <b>Depth (m</b>	0.829 - ke® Opt uting c ) Flow	imum as alculat	3.4 3.9 s specifi tions wil	l be i ) <b>Flow</b>	nvalidate
The hydrological calcu another type of contro <b>Depth (m) Flow (1,</b> 0.100 2	Design Point alations have ol device othe /s) Depth (m)	(Calculated Flush-Flo <sup>o</sup> been based er than a Hy Flow (1/s) 0 4.1	) 1.675 ™ 0.409 on the Head dro-Brake C Depth (m) 1.600	4.7 4.2 d/Discharge n Dptimum® be u Flow (1/s) 4.6	Mean Flow relationsh utilised t <b>Depth (m)</b>	Kick over Head I ip for the hen these s Flow (1/s) 5.8	-Flo® Range Hydro-Bra torage rc Depth (m 5.00	0.829 - ke® Opt uting c ) Flow 0	imum as alculat ( <b>1/s)</b>	3.4 3.9 s specifi tions wil Depth (m, 7.500 8.000	l be i ) <b>Flow</b> )	nvalidate (1/s)
The hydrological calcu another type of contro Depth (m) Flow (1, 0.100 2 0.200 3 0.300 4	Design Point alations have ol device other /s) Depth (m) 2.9 0.600 3.9 0.800 4.2 1.000	(Calculated Flush-Flo been based er than a Hy Flow (1/s) 0 4.1 0 3.6 0 3.7	) 1.675 ™ 0.409 on the Head dro-Brake C Depth (m) 1.600 1.800 2.000	4.7 4.2 d/Discharge n Dptimum® be u Flow (1/s) 4.6 4.9 5.1	Mean Flow relationsh utilised t Depth (m) 2.600 3.000 3.500	Kick over Head I ip for the hen these s Flow (1/s) 5.8 6.2 6.6	-Flo® Range Hydro-Bra storage ro Depth (m 5.00 5.50 6.00	0.829 - ke® Opt uting c ) Flow 0 0 0	imum as alculat ( <b>1/s)</b> 7.8 8.2 8.6	3.4 3.9 s specifi tions wil Depth (m, 7.500 8.000 8.500	l be i ) <b>Flow</b> ) )	nvalidate ( <b>1/s)</b> 9.5 9.8 10.1
The hydrological calcu another type of contro <b>Depth (m) Flow (1</b> / 0.100 2 0.200 3 0.300 4 0.400 4	Design Point alations have ol device other /s) Depth (m) 2.9 0.600 3.9 0.800 4.2 1.000 4.2 1.200	(Calculated Flush-Flo been based er than a Hy Flow (1/s) 4.1 3.6 3.7 4.0	) 1.675 ™ 0.409 on the Head dro-Brake C Depth (m) 1.600 1.800 2.000 2.200	4.7 4.2 d/Discharge n Dptimum® be u Flow (1/s) 4.6 4.9 5.1 5.3	Mean Flow relationsh utilised t Depth (m) 2.600 3.000 3.500 4.000	Kick over Head I ip for the hen these s Flow (1/s) 5.8 6.2 6.6 7.1	-Flo® Range Hydro-Bra storage ro <b>Depth (m</b> 5.00 5.50 6.00 6.50	0.829 - ke® Opt uting c ) Flow 0 0 0 0	imum as alculat (1/s) 7.8 8.2 8.6 8.9	3.4 3.9 s specifi tions wil <b>Depth (m</b> ) 7.500 8.000 8.500 9.000	l be i ) <b>Flow</b> ) ) ) )	nvalidate (1/s) 9.5 9.8 10.1 10.4
The hydrological calcu another type of contro <b>Depth (m) Flow (1</b> , 0.100 2 0.200 3 0.300 4 0.400 4	Design Point alations have ol device other /s) Depth (m) 2.9 0.600 3.9 0.800 4.2 1.000	(Calculated Flush-Flo been based er than a Hy Flow (1/s) 4.1 3.6 3.7 4.0	) 1.675 ™ 0.409 on the Head dro-Brake C Depth (m) 1.600 1.800 2.000 2.200	4.7 4.2 d/Discharge n Dptimum® be u Flow (1/s) 4.6 4.9 5.1 5.3	Mean Flow relationsh utilised t Depth (m) 2.600 3.000 3.500	Kick over Head I ip for the hen these s Flow (1/s) 5.8 6.2 6.6 7.1	-Flo® Range Hydro-Bra storage ro <b>Depth (m</b> 5.00 5.50 6.00 6.50	0.829 - ke® Opt uting c ) Flow 0 0 0 0	imum as alculat ( <b>1/s)</b> 7.8 8.2 8.6	3.4 3.9 s specifi tions wil Depth (m, 7.500 8.000 8.500	l be i ) <b>Flow</b> ) ) ) )	nvalidate ( <b>1/s)</b> 9.5 9.8 10.1
The hydrological calcu another type of contro <b>Depth (m) Flow (1</b> , 0.100 2 0.200 3 0.300 4 0.400 4	Design Point alations have of device other (s) Depth (m) 2.9 0.600 3.9 0.800 4.2 1.000 4.2 1.200 4.2 1.400	(Calculated Flush-Flo <sup>o</sup> been based er than a Hy Flow (1/s) ) 4.1 ) 3.6 ) 3.7 ) 4.0 ) 4.3	) 1.675 ™ 0.409 on the Head dro-Brake C Depth (m) 1.600 1.800 2.000 2.200 2.400	4.7 4.2 d/Discharge n Dptimum® be u Flow (1/s) 4.6 4.9 5.1 5.3	Mean Flow relationsh utilised t Depth (m) 2.600 3.000 3.500 4.000 4.500	Kick over Head 1 ip for the hen these s Flow (1/s) 5.8 6.2 6.6 7.1 7.5	-Flo® Range Hydro-Bra torage ro <b>Depth (m</b> 5.00 5.50 6.00 6.50 7.00	0.829 - ke® Opt uting c ) Flow 0 0 0 0 0 0	imum as alculat (1/s) 7.8 8.2 8.6 8.9 9.2	3.4 3.9 s specifi tions wil <b>Depth (m</b> ) 7.500 8.000 8.500 9.000	l be i ) <b>Flow</b> ) ) ) )	nvalidate (1/s) 9.5 9.8 10.1 10.4
The hydrological calcu another type of contro <b>Depth (m) Flow (1</b> , 0.100 2 0.200 3 0.300 4 0.400 4	Design Point alations have ol device other (s) Depth (m) 2.9 0.600 3.9 0.800 4.2 1.200 4.2 1.200 4.2 1.400 Hydrc	(Calculated Flush-Flo been based er than a Hy Flow (1/s) () 4.1 () 3.6 () 3.7 () 4.0 () 4.3 () 4.3 () 4.3	) 1.675 ■ 0.409 on the Head dro-Brake C Depth (m) 1.600 1.800 2.000 2.200 2.400 Dtimum Mar	4.7 4.2 d/Discharge p Dptimum® be u Flow (1/s) 4.6 4.9 5.1 5.3 5.6	Mean Flow relationsh utilised t Depth (m) 2.600 3.000 3.500 4.000 4.500 , DS/PN:	Kick over Head 1 ip for the hen these s Flow (1/s) 5.8 6.2 6.6 7.1 7.5 S1.009, N	-Flo® Range Hydro-Bra torage ro <b>Depth (m</b> 5.00 5.50 6.00 6.50 7.00	0.829 - ke® Opt uting c ) Flow 0 0 0 0 0 0	imum a: alculat ( <b>1/s</b> ) 7.8 8.2 8.6 8.9 9.2 9.2	3.4 3.9 s specifi tions wil <b>Depth (m</b> ) 7.500 8.000 8.500 9.000	l be i ) <b>Flow</b> ) ) ) )	nvalidate (1/s) 9.5 9.8 10.1 10.4
The hydrological calcu another type of contro <b>Depth (m) Flow (1</b> / 0.100 2 0.200 3 0.300 4 0.400 4	Design Point alations have ol device other (s) Depth (m) 2.9 0.600 3.9 0.800 4.2 1.200 4.2 1.200 4.2 1.400 <u>Hydrc</u> Unit	(Calculated Flush-Flo been based er than a Hy Flow (1/s) () 4.1 () 3.6 () 3.7 () 4.0 () 4.3 () 4.3 () 4.3	) 1.675 ■ 0.409 on the Head dro-Brake C Depth (m) 1.600 1.800 2.000 2.200 2.400 Dtimum Mar	4.7 4.2 d/Discharge p Dptimum® be u Flow (1/s) 4.6 4.9 5.1 5.3 5.6 nhole: S16	Mean Flow relationsh utilised t Depth (m) 2.600 3.000 3.500 4.000 4.500 , DS/PN: 700 Flush	Kick over Head 1 ip for the hen these s Flow (1/s) 5.8 6.2 6.6 7.1 7.5 S1.009, N	-Flo® Range Hydro-Bra storage ro <b>Depth (m</b> 5.00 5.50 6.00 6.50 7.00 Volume (	0.829 - ke® Opt uting c ) Flow 0 0 0 0 0 0 0 0 0 0 0 0 0	imum as alculat (1/s) 7.8 8.2 8.6 8.9 9.2 9.2	3.4 3.9 s specifi tions wil <b>Depth (m</b> ) 7.500 8.000 8.500 9.000	l be i ) <b>Flow</b> ) ) ) )	nvalidate (1/s) 9.5 9.8 10.1 10.4

	Engineers	3							Pag	je 32
Ormond House										
Upper Ormond Qua	У				ATER DRAINA		LATION			
Dublin 7				TINDTEAR		1				Micco
Date 23/08/2021	18:02			Designed k	ov dalve					MICro
File 190226 - Dr	ainage De	esign 23.08.20	21.MDX	Checked by						Drainage
Innovyze			-	Network 20						
1										
		<u>Hydro-Brake®</u>	Optimum Mar	nhole: S16,	DS/PN: S1	.009, Vol	ume (m³):	7.7		
		-		Yes Minimum	-					
			neter (mm) Level (m) 16.	55	ted Manhole 1	Diameter (n	nm) 1200			
		Invert	Tever (III) 10.	077						
		Control Points	Head (m)	Flow (l/s)	Control	Points	Head (m)	Flow (1/	's)	
	Desig	n Point (Calcula	ted) 1.670	4.7		Kick-Fl	o® 0.825	5 3	3.4	
	5	Flush-		4.3 M	1ean Flow ove	r Head Ran	qe -	. 3	3.9	
another type of c Depth (m) Flo			-	-				-		
		- <u>F</u> (, -= (			epth (m) Flo	ow (l/s) De	epth (m) Fl	ow (1/s)	Depth (m)	Flow (l/s)
0.100	2.9									
0.100	2.9	0.600	4.1 1.600 3.5 1.800	4.6	2.600 3.000	5.8 6.2	5.000 5.500	ow (1/s) 1 7.9 8.2	<b>Depth (m)</b> 7.500 8.000	<b>Flow (1/s)</b> 9.5 9.8
	- • •	0.600 0.800	4.1 1.600	4.6 4.9	2.600	5.8	5.000	7.9	7.500	9.5
0.200	3.9	0.600 0.800 1.000	4.1 1.600 3.5 1.800	4.6 4.9 5.1	2.600 3.000	5.8	5.000 5.500	7.9 8.2	7.500	9.5 9.8
0.200	3.9 4.2	0.600 0.800 1.000 1.200	4.11.6003.51.8003.72.000	4.6 4.9 5.1	2.600 3.000 3.500	5.8 6.2 6.6	5.000 5.500 6.000	7.9 8.2 8.6	7.500 8.000 8.500	9.5 9.8 10.1
0.200 0.300 0.400	3.9 4.2 4.3 4.2	0.600 0.800 1.000 1.200	4.1       1.600         3.5       1.800         3.7       2.000         4.0       2.200         4.3       2.400	4.6 4.9 5.1 5.3 5.6	2.600 3.000 3.500 4.000 4.500	5.8 6.2 6.6 7.1 7.5	5.000 5.500 6.000 6.500 7.000	7.9 8.2 8.6 8.9 9.2	7.500 8.000 8.500 9.000	9.5 9.8 10.1 10.4
0.200 0.300 0.400	3.9 4.2 4.3 4.2	0.600 0.800 1.000 1.200 1.400 <u>Hydro-Brake</u> ®	4.1       1.600         3.5       1.800         3.7       2.000         4.0       2.200         4.3       2.400         Optimum Mank	4.6 4.9 5.1 5.3 5.6	2.600 3.000 3.500 4.000 4.500 , DS/PN: S	5.8 6.2 6.6 7.1 7.5	5.000 5.500 6.000 6.500 7.000	7.9 8.2 8.6 8.9 9.2 : 9.0	7.500 8.000 8.500 9.000	9.5 9.8 10.1 10.4
0.200 0.300 0.400	3.9 4.2 4.3 4.2	0.600 0.800 1.000 1.200 1.400 Hydro-Brake® Unit Reference	4.1       1.600         3.5       1.800         3.7       2.000         4.0       2.200         4.3       2.400         Optimum Mank	4.6 4.9 5.1 5.3 5.6 nole: S12-5	2.600 3.000 3.500 4.000 4.500 , DS/PN: S	5.8 6.2 6.6 7.1 7.5 6.008, Vc	5.000 5.500 6.000 6.500 7.000 Plume (m <sup>3</sup> ) mp Availabl	7.9 8.2 8.6 8.9 9.2 : <u>9.0</u> e Yes	7.500 8.000 8.500 9.000	9.5 9.8 10.1 10.4
0.200 0.300 0.400	3.9 4.2 4.3 4.2	0.600 0.800 1.000 1.200 1.400 <u>Hydro-Brake®</u> Unit Reference Design Head (m)	4.1       1.600         3.5       1.800         3.7       2.000         4.0       2.200         4.3       2.400         Optimum Mank	4.6 4.9 5.1 5.3 5.6 nole: S12-5 600-2110-2600 2.110	2.600 3.000 3.500 4.000 4.500 , DS/PN: S	5.8 6.2 6.6 7.1 7.5 6.008, Vc	5.000 5.500 6.000 6.500 7.000 Plume (m <sup>3</sup> ) mp Availabl iameter (mm	7.9 8.2 8.6 8.9 9.2 : <u>9.0</u> e Yes .) 64	7.500 8.000 8.500 9.000	9.5 9.8 10.1 10.4
0.200 0.300 0.400	3.9 4.2 4.3 4.2	0.600 0.800 1.000 1.200 1.400 <u>Hydro-Brake®</u> Unit Reference Design Head (m) sign Flow (1/s)	4.1       1.600         3.5       1.800         3.7       2.000         4.0       2.200         4.3       2.400         Optimum Mank	4.6 4.9 5.1 5.3 5.6 00-2110-2600 2.110 2.6	2.600 3.000 3.500 4.000 4.500 , DS/PN: S	5.8 6.2 6.6 7.1 7.5 6.008, VC Su D Inve	5.000 5.500 6.000 6.500 7.000 Dlume (m <sup>3</sup> ) mp Availabl iameter (mm rt Level (m	7.9 8.2 8.6 8.9 9.2 : 9.0 e Yes 0 64 0 18.365	7.500 8.000 8.500 9.000	9.5 9.8 10.1 10.4
0.200 0.300 0.400	3.9 4.2 4.3 4.2	0.600 0.800 1.000 1.200 1.400 <u>Hydro-Brake®</u> Unit Reference Design Head (m) sign Flow (1/s) Flush-Flo™	4.1 1.600 3.5 1.800 3.7 2.000 4.0 2.200 4.3 2.400 Optimum Manh MD-SHE-0064-2	4.6 4.9 5.1 5.3 5.6 00-2110-2600 2.110 2.6 Calculated	2.600 3.000 3.500 4.000 4.500 , DS/PN: S	5.8 6.2 6.6 7.1 7.5 6.008, VC Su D Inve let Pipe D	5.000 5.500 6.000 6.500 7.000 Dlume (m <sup>3</sup> ) mp Availabl iameter (mm rt Level (m iameter (mm	7.9 8.2 8.6 8.9 9.2 : 9.0 e Yes .) 64 .) 18.365 .) 100	7.500 8.000 8.500 9.000	9.5 9.8 10.1 10.4
0.200 0.300 0.400	3.9 4.2 4.3 4.2	0.600 0.800 1.000 1.200 1.400 <u>Hydro-Brake®</u> Unit Reference Design Head (m) sign Flow (1/s) Flush-Flo™	4.1       1.600         3.5       1.800         3.7       2.000         4.0       2.200         4.3       2.400         Optimum Mank	4.6 4.9 5.1 5.3 5.6 00-2110-2600 2.110 2.6 Calculated	2.600 3.000 3.500 4.000 4.500 , DS/PN: S	5.8 6.2 6.6 7.1 7.5 6.008, VC Su D Inve let Pipe D	5.000 5.500 6.000 6.500 7.000 Dlume (m <sup>3</sup> ) mp Availabl iameter (mm rt Level (m	7.9 8.2 8.6 8.9 9.2 : 9.0 e Yes .) 64 .) 18.365 .) 100	7.500 8.000 8.500 9.000	9.5 9.8 10.1 10.4
0.200 0.300 0.400	3.9 4.2 4.3 4.2	0.600 0.800 1.000 1.200 1.400 Unit Reference Design Head (m) sign Flow (1/s) Flush-Flo™ Objective	4.1 1.600 3.5 1.800 3.7 2.000 4.0 2.200 4.3 2.400 Optimum Manh MD-SHE-0064-2	4.6 4.9 5.1 5.3 5.6 nole: S12-5 600-2110-2600 2.110 2.6 Calculated tream storage	2.600 3.000 3.500 4.000 4.500 , DS/PN: S	5.8 6.2 6.6 7.1 7.5 6.008, VC Su D Inve let Pipe D	5.000 5.500 6.000 6.500 7.000 Dlume (m <sup>3</sup> ) mp Availabl iameter (mm rt Level (m iameter (mm	7.9 8.2 8.6 8.9 9.2 : 9.0 e Yes .) 64 .) 18.365 .) 100	7.500 8.000 8.500 9.000	9.5 9.8 10.1 10.4
0.200 0.300 0.400	3.9 4.2 4.3 4.2	0.600 0.800 1.000 1.200 1.400 Unit Reference Design Head (m) sign Flow (1/s) Flush-Flo™ Objective	4.1 1.600 3.5 1.800 3.7 2.000 4.0 2.200 4.3 2.400 Optimum Manh MD-SHE-0064-2 Minimise ups	4.6 4.9 5.1 5.3 5.6 nole: S12-5 600-2110-2600 2.110 2.6 Calculated tream storage	2.600 3.000 3.500 4.000 4.500 , DS/PN: S	5.8 6.2 6.6 7.1 7.5 6.008, VC Su D Inve let Pipe D	5.000 5.500 6.000 6.500 7.000 Dlume (m <sup>3</sup> ) mp Availabl iameter (mm rt Level (m iameter (mm	7.9 8.2 8.6 8.9 9.2 : 9.0 e Yes .) 64 .) 18.365 .) 100	7.500 8.000 8.500 9.000	9.5 9.8 10.1 10.4

	Engineers	5								Pa	ge 33
Drmond House					SURFACE		AGE CALCULA				
Jpper Ormond Qua	У					R STORM EVEN					
Dublin 7							··				Micro
Date 23/08/2021 2	18:02				Designed	by dalye					Drainage
File 190226 - Dra	ainage De	esign 2	3.08.2021.1	MDX	Checked 1	ру					Diamage
Innovyze					Network	2020.1					
		<u>Hydro-1</u>	Brake® Opti	imum Manh	ole: S12-	5, DS/PN: S	6.008, Vol	ume (m³)	<u>9.0</u>		
		Control	Points	Head (m)	Flow (l/s)	Control	Points	Head (m)	Flow (1/	s)	
	Desia	n Point	(Calculated)	2.110	2.6		Kick-Flo®	0.577	1	. 4	
	Desig	II FOILIC	Flush-Flo™			Mean Flow ov	er Head Range			.9	
another type of co Depth (m) Flo											
0.100	1.5	0.600	1.5	1.600	2.3	2.600	2.9	5.000	3.9	7.500	4.7
0.200	1.7	0.800		1.800	2.4	3.000	3.1	5.500	4.0	8.000	4.8
										0 500	5.0
0.300	1.8	1.000	1.8	2.000	2.5	3.500	3.3	6.000	4.2	8.500	5.0
0.300 0.400	1.7	1.200	2.0	2.200	2.6	4.000	3.5	6.500	4.4	9.000	5.1
0.300			2.0								5.1
0.300 0.400	1.7	1.200 1.400	2.0 2.1	2.200 2.400	2.6 2.8	4.000 4.500	3.5	6.500 7.000	4.4 4.5	9.000	5.1
0.300 0.400	1.7	1.200 1.400 <u>Hydro</u>	2.0 2.1	2.200 2.400 timum Mar	2.6 2.8 hole: S11	4.000 4.500 , DS/PN: S1	3.5 3.7	6.500 7.000	4.4 4.5 6.1	9.000	5.1
0.300 0.400	1.7 1.6	1.200 1.400 <u>Hydro</u> Unit Re Design F	2.0 2.1 -Brake® Opt eference MD-S Head (m)	2.200 2.400 timum Mar	2.6 2.8 hhole: S11 500-2749-850 2.74	4.000 4.500 , DS/PN: S1 0 9	3.5 3.7 014, Volu: 	6.500 7.000 me (m <sup>3</sup> ): Available	4.4 4.5 6.1 Yes 111	9.000	5.1
0.300 0.400	1.7 1.6	1.200 1.400 <u>Hydro</u> Unit Re Design Flo	2.0 2.1 -Brake® Opt eference MD-S Head (m) pw (1/s)	2.200 2.400 timum Mar	2.6 2.8 hhole: S11 500-2749-850 2.74 8	4.000 4.500 , DS/PN: S1 0 9 5	3.5 3.7 014, Volus Sump Dia Invert	6.500 7.000 me (m <sup>3</sup> ): Available meter (mm) : Level (m)	4.4 4.5 6.1 e Yes 111 15.616	9.000	5.1
0.300 0.400	1.7 1.6	1.200 1.400 <u>Hydro</u> Unit Re Design Flo Sign Flo	2.0 2.1 -Brake® Opt eference MD-S Head (m) ow (1/s) ush-Flo™	2.200 2.400 timum Mar SHE-0111-85	2.6 2.8 hole: S11 500-2749-850 2.74 8 Calculate	4.000 4.500 , DS/PN: S1 0 9 5 5 cd Minimum Ou	3.5 3.7 014, Volu: Sump Dia Invert tlet Pipe Dia	6.500 7.000 me (m <sup>3</sup> ): • Available meter (mm) • Level (m) meter (mm)	4.4 4.5 6.1 • Yes 111 15.616 150	9.000	5.1
0.300 0.400	1.7 1.6	1.200 1.400 <u>Hydro</u> Unit Re Design Flo Sign Flo Ok	2.0 2.1 -Brake® Opt eference MD-S Head (m) pw (1/s)	2.200 2.400 timum Mar SHE-0111-85	2.6 2.8 hole: S11 500-2749-850 2.74 8 Calculate	4.000 4.500 , DS/PN: S1 0 9 5 5 d Minimum Ou re Suggester	3.5 3.7 014, Volus Sump Dia Invert	6.500 7.000 me (m <sup>3</sup> ): • Available meter (mm) • Level (m) meter (mm)	4.4 4.5 6.1 • Yes 111 15.616 150	9.000	5.1
0.300 0.400	1.7 1.6	1.200 1.400 <u>Hydro</u> Unit Re Design Flo Sign Flo Ok	2.0 2.1 -Brake® Opt eference MD-S Head (m) pw (1/s) ush-Flo™ ojective Mir Lication	2.200 2.400 timum Mar SHE-0111-85 nimise upst	2.6 2.8 hole: S11 500-2749-850 2.74 8 Calculate tream storage	4.000 4.500 , DS/PN: S1 0 9 5 5 6 Minimum Ou re Suggester re	3.5 3.7 014, Volu: Sump Dia Invert tlet Pipe Dia	6.500 7.000 me (m <sup>3</sup> ): Available meter (mm) Level (m) meter (mm)	4.4 4.5 6.1 • Yes 111 15.616 150	9.000 9.500	5.1
0.300 0.400	1.7 1.6	1.200 1.400 Unit Re Design Flo Sign Flo Ok Appl Control	2.0 2.1 -Brake® Opt eference MD-S Head (m) pw (1/s) ush-Flo™ ojective Mir Lication	2.200 2.400 timum Mar SHE-0111-85 nimise upst Head (m)	2.6 2.8 hole: S11 500-2749-850 2.74 8 Calculate tream storage Surface	4.000 4.500 , DS/PN: S1 0 9 5 5 6 Minimum Ou re Suggester re	3.5 3.7 014, Volu: Sump Dia Invert tlet Pipe Dia d Manhole Dia	6.500 7.000 me (m <sup>3</sup> ): • Available meter (mm) • Level (m) meter (mm) Head (m)	4.4 4.5 6.1 • Yes 111 15.616 150 1200 Flow (1/	9.000 9.500	5.1
0.300 0.400	1.7 1.6	1.200 1.400 Unit Re Design Flo Sign Flo Ok Appl Control	2.0 2.1 -Brake® Opt eference MD-S Head (m) ow (1/s) 1sh-Flo™ ojective Mir Lication Points	2.200 2.400 timum Mar SHE-0111-85 nimise upst Head (m) 2.749	2.6 2.8 hole: S11 500-2749-850 2.74 8 Calculate tream storag Surfac Flow (1/s) 8.5	4.000 4.500 , DS/PN: S1 0 9 5 5 d Minimum Ou re Suggester re Control	3.5 3.7 Sump Dia Invert tlet Pipe Dia d Manhole Dia	6.500 7.000 me (m <sup>3</sup> ): • Available meter (mm) • Level (m) meter (mm) Head (m) • 0.999	4.4 4.5 6.1 • Yes 111 15.616 150 1200 Flow (1/	9.000 9.500	5.1

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## Hydro-Brake® Optimum Manhole: S11, DS/PN: S1.014, Volume (m<sup>3</sup>): 6.1

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)										
0.100	3.9	0.600	6.6	1.600	6.6	2.600	8.3	5.000	11.3	7.500	13.7
0.200	5.9	0.800	6.3		7.0		8.8	5.500	11.8		14.1
0.300	6.4	1.000	5.3	2.000	7.3	3.500	9.5	6.000	12.3	8.500	14.5
0.400	6.6	1.200	5.8	2.200	7.6	4.000	10.1	6.500	12.8	9.000	14.9
0.500	6.7	1.400	6.2	2.400	8.0	4.500	10.7	7.000	13.2	9.500	15.3

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## Summary of Results for 30 minute 5 year Summer (Surface Water Network)

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)		Flow / Cap.	Overflow (1/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	
S1.000	S25	19.700	-0.100	0.000	0.58			32.1	OK	
S1.001	S24	19.131	-0.100	0.000	0.60			50.5	OK	
S1.002	S23	18.082	-0.045	0.000	0.96			60.5	OK	Attenuation Tank
S1.003	S22	17.239	0.008	0.000	1.09			62.8	SURCHARGED 🗧	
S1.004	S21	17.029	-0.113	0.000	0.01			0.7	OK	
S2.000	S20-1-1	16.982	-0.026	0.000	0.70			43.0	OK	
S3.000	S20-2	17.000	-0.133	0.000	0.32			13.9	OK	
S2.001	S20-1	16.968	-0.005	0.000	1.00			54.1	OK	
S4.000	S9	16.956	-0.024	0.000	0.68			42.1	OK	Attenuation Tank
S1.005	S20	16.955	0.037	0.000	0.03			4.2	SURCHARGED ←	
S1.006	S19	16.449	-0.343	0.000	0.12			17.3	OK	
\$5.000	S18-1	16.993	-0.176	0.000	0.11			6.5	OK	
S1.007	S18	16.370	-0.334	0.000	0.15			23.6	OK	
S1.008	S17	16.319	-0.338	0.000	0.14			25.9	OK	
S1.009	S16	16.216	-0.311	0.000	0.02			2.3	OK	
S1.010	S15	16.148	-0.344	0.000	0.02			3.0	OK	
S1.011	S14	16.148	-0.242	0.000	0.05			9.4	OK	
S1.012	S13	16.147	-0.060	0.000	0.04			5.3	OK	
S6.000	S12-13	19.636	-0.164	0.000	0.16			7.2	OK	
S6.001	S12-12	19.532	-0.169	0.000	0.14			7.3	OK	
S6.002	S12-11	19.376	-0.170	0.000	0.14			7.5	OK	
S7.000	S12-10-1	19.825	-0.175	0.000	0.11			6.9	OK	
			©1	982-202	0 Innc	ovyze				

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# Summary of Results for 30 minute 5 year Summer (Surface Water Network)

	US/MH	Water Level	Surcharged Depth	Flooded Volume	Flow /	Overflow	Half Drain Time	Pipe Flow		
PN	Name	(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	Status	
S6.003	S12-10	19.187	-0.134	0.000	0.34			15.1	OK	
S8.000	S23	19.672	-0.128	0.000	0.38			18.2	OK	
S8.001	S12-9-1	19.419	-0.111	0.000	0.50			18.4	OK	
S6.004	S12-9	18.908	-0.136	0.000	0.57			39.6	OK	
S9.000	S12-8-1	19.526	-0.174	0.000	0.11			7.1	OK	
S6.005	S12-8	18.768	-0.163	0.000	0.53			53.6	OK	
S6.006	S12-7	18.729	-0.120	0.000	0.62			57.7	OK	
S6.007	S12-6	18.727	-0.068	0.000	0.65			60.6	OK	
S10.000	S12-5-5	20.511	-0.189	0.000	0.06			4.3	OK	
S10.001	S12-5-4	20.042	-0.166	0.000	0.15			8.1	OK	
S10.002	S12-5-3	19.800	-0.158	0.000	0.19			9.7	OK	
S10.003	S12-5-2	19.551	-0.146	0.000	0.27			14.8	OK	
S11.000	s12-5-1-1	19.562	-0.138	0.000	0.31			17.5	OK	
S10.004	S12-5-1	18.725	-0.171	0.000	0.26			32.6	OK	
S6.008	S12-5	18.725	-0.015	0.000	0.02			1.8	OK	
S6.009	S12-4	18.383	-0.319	0.000	0.05			5.1	OK	
S6.010	S12-3	18.315	-0.317	0.000	0.06			14.1	OK	
S6.011	S12-2	17.392	-0.301	0.000	0.09			17.9	OK	
S6.012	S12-1	17.105	-0.300	0.000	0.09			19.6	OK	
S1.013	S12	16.146	-0.024	0.000	0.10			18.6	OK	Attenuation Tank
S1.014	S11	16.144	0.228	0.000	0.13		22	6.7	SURCHARGED ←	
S1.015	S10	15.650	-0.239	0.000	0.09			6.7	OK	
S1.016	S9	15.517	-0.237	0.000	0.10			6.7	OK	
S1.017	S8	15.389	-0.235	0.000	0.11			6.7	OK	
S1.018	S7	15.271	-0.234	0.000	0.11			6.7	OK	
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## Summary of Results for 30 minute 5 year Summer (Surface Water Network)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (1/s)	Half Drain Time (mins)	Flow	Status
S1.019	S6	15.191	-0.235	0.000	0.11			6.7	OK
S1.020	S5	14.214	-0.236	0.000	0.10			6.7	OK
S1.021	S4	14.074	-0.236	0.000	0.10			6.7	OK
S1.022	S3	13.927	-0.236	0.000	0.10			6.7	OK
S1.023	S2	13.770	-0.237	0.000	0.10			6.7	OK

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STORM SEWER DES	SIGN by the Modified Rational Method	
<u>Design Crit</u>	teria for Surface Water Network	
Pipe Size	s STANDARD Manhole Sizes STANDARD	
Ratio R 0.280 Maximum Rainfall (mm/hr) 50 Add F Maximum Time of Concentration (mins) 30 Min:	Foul Sewage (l/s/ha) 0.000 Maximum Backdrop Hei Volumetric Runoff Coeff. 0.750 Min Design Depth for Optimisat PIMP (%) 100 Min Vel for Auto Design onl low / Climate Change (%) 20 Min Slope for Optimisatio imum Backdrop Height (m) 0.200 esigned with Level Soffits	ion (m) 1.200 y (m/s) 1.00
Network Desig	n Table for Surface Water Network	
« - I	Indicates pipe capacity < flow	
PN Length Fall Slope I.Area (m) (m) (1:X) (ha)		
<u>1</u>	Network Results Table	
	I.Area E Base Foul Add Flow Vel Cap Flow (ha) Flow (l/s) (l/s) (l/s) (m/s) (l/s) (l/s)	
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PN	Length	Fall	Slope	I.Area	T.E.	Ba	ase	k	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)	(mins)	Flow	(l/s)	(mm)	SECT	(mm)		Design
S1.000	45.534	0.569	80.0	0.159	4.00		0.0	0.600	0	225	Pipe/Conduit	ð
S1.001	37.539	1.104	34.0	0.109	0.00		0.0	0.600	0	225	Pipe/Conduit	Ť
S1.002	56.453	0.896	63.0	0.066	0.00		0.0	0.600	0	225	Pipe/Conduit	ĕ
S1.003	26.659	0.089	299.5	0.024	0.00		0.0	0.600	0	300	Pipe/Conduit	ď
S1.004	13.463	0.299	45.0	0.010	0.00		0.0	0.600	0	300	Pipe/Conduit	Ū,
S2.000	3.468	0.035	99.1	0.219	4.00		0.0	0.600	0	300	Pipe/Conduit	٠
S3.000	16.441	0.149	110.0	0.068	4.00		0.0	0.600	0	225	Pipe/Conduit	ð

## <u>Network Results Table</u>

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 (1/s)	Flow (l/s)	
S1.000 S1.001 S1.002 S1.003 S1.004	50.00 50.00 50.00 50.00 50.00	4.80 5.37 5.86	<b>19.575</b> 19.006 17.902 16.931 16.842	0.159 0.268 0.334 0.358 0.368	0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0	4.3 7.3 9.0 9.7 10.0	1.46 2.25 1.65 0.90 2.35	58.2 89.5 65.6 63.8 166.1	25.8 43.5 54.3 58.2 59.8	
s2.000 s3.000	50.00 50.00		16.708 16.908	0.219	0.0	0.0	5.9 1.8	1.58 1.25	111.7 49.5	35.6 11.0	

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PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Ba Flow		k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.001	16.571	0.055	301.3	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	ď
S4.000	10.520	0.062	169.7	0.210	4.00		0.0	0.600	0	300	Pipe/Conduit	ð
	22.944 31.083			0.014 0.080	0.00			0.600	0		Pipe/Conduit Pipe/Conduit	<b>⊕</b> ♂
S5.000	28.375	0.465	61.0	0.032	4.00		0.0	0.600	0	225	Pipe/Conduit	ð
S1.007	9.494	0.047	202.0	0.000	0.00		0.0	0.600	0	450	Pipe/Conduit	•

## <u>Network Results Table</u>

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)			Vel (m/s)	Cap (1/s)	Flow (l/s)		
S2.001	50.00	4.53	16.673	0.287	0.0	0.0	7.8	0.90	63.7	46.6		
S4.000	50.00	4.15	16.680	0.210	0.0	0.0	5.7	1.20	85.1	34.1		
S1.005 S1.006	50.00 50.00		16.543 16.342	0.879 0.959	0.0	0.0	23.8 26.0		148.0 171.9			
s5.000	50.00	4.28	16.944	0.032	0.0	0.0	0.9	1.68	66.7	5.2		
S1.007	50.00	6.83	16.254	0.991	0.0	0.0	26.8	1.43	226.9	161.0		
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PN	Length	Fall	Slope	I.Area	T.E.	Ba	ase	k	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)	(mins)	Flow	(l/s)	(mm)	SECT	(mm)		Design
S1.008	29.925	0.130	230.2	0.014	0.00		0.0	0.600	0	450	Pipe/Conduit	ď
S1.009	10.755	0.035	307.3	0.012	0.00		0.0	0.600	0	450	Pipe/Conduit	
S1.010	25.432	0.102	249.3	0.015	0.00		0.0	0.600	0	450	Pipe/Conduit	ĕ
S1.011	45.007	0.183	245.9	0.050	0.00		0.0	0.600	0	450	Pipe/Conduit	
S1.012	12.339	0.037	333.5	0.008	0.00		0.0	0.600	0	450	Pipe/Conduit	
S6.000	6.457	0.099	65.2	0.035	4.00		0.0	0.600	0	225	Pipe/Conduit	ð
S6.001	10.656	0.155	68.7	0.001	0.00		0.0	0.600	0	225	Pipe/Conduit	
S6.002	15.711	0.225	69.9	0.001	0.00		0.0	0.600	0	225	Pipe/Conduit	ð

## <u>Network Results Table</u>

PN	Rain	T.C.	US/IL	Σ I.Area	Σ Base	Foul	Add Flow	Vel	Cap	Flow
	(mm/hr)	(mins)	(m)	(ha)	Flow (l/s)	(1/s)	(1/s)	(m/s)	(1/s)	(l/s)
S1.008	50.00	7.20	16.207	1.005	0.0	0.0	27.2	1.34	212.4	163.3
S1.009	50.00	7.36	16.077	1.017	0.0	0.0	27.5	1.15	183.6	165.3
S1.010	50.00	7.69	16.042	1.032	0.0	0.0	27.9	1.28	204.0	167.7
S1.011	50.00	8.27	15.940	1.082	0.0	0.0	29.3	1.29	205.5	175.8
S1.012	50.00	8.46	15.757	1.090	0.0	0.0	29.5	1.11	176.2«	177.1
S6.000	50.00	4.07	19.575	0.035	0.0	0.0	0.9	1.62	64.5	5.7
S6.001	50.00	4.18	19.476	0.036	0.0	0.0	1.0	1.58	62.8	5.8
S6.002	50.00	4.35	19.321	0.037	0.0	0.0	1.0	1.57	62.3	6.0

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PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)		Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
s7.000	41.999	0.677	62.0	0.034	4.00	0.0	0.600	0	225	Pipe/Conduit	ð
S6.003	33.244	0.277	120.0	0.005	0.00	0.0	0.600	0	225	Pipe/Conduit	ď
S8.000 S8.001	26.970 4.205		100.0 62.0	0.090 0.000	4.00 0.00		0.600 0.600	0		Pipe/Conduit Pipe/Conduit	<del>0</del> 5
S6.004	22.515	0.113	199.2	0.041	0.00	0.0	0.600	0	300	Pipe/Conduit	ď
S9.000	32.583	0.543	60.0	0.035	4.00	0.0	0.600	0	225	Pipe/Conduit	ð

## <u>Network Results Table</u>

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)				Cap (1/s)	Flow (1/s)		
S7.000	50.00	4.42	19.775	0.034	0.0	0.0	0.9	1.66	66.1	5.5		
S6.003	50.00	4.89	19.096	0.076	0.0	0.0	2.1	1.19	47.4	12.3		
S8.000 S8.001	50.00 50.00		<b>19.575</b> 19.305	0.090 0.090	0.0	0.0	2.4 2.4	1.31 1.66	52.0 66.2	14.6 14.6		
S6.004	50.00	5.22	18.744	0.207	0.0	0.0	5.6	1.11	78.5	33.6		
S9.000	50.00	4.32	19.475	0.035	0.0	0.0	0.9	1.69	67.3	5.7		
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PN	Length	Fall	Slope	I.Area	T.E.	Base	k	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)	(mins)	Flow (l/s)	(mm)	SECT	(mm)		Design
S6.005	22.917	0.082	279.5	0.047	0.00	0.0	0.600	0	375	Pipe/Conduit	<b>ď</b>
S6.006	16.601	0.055	301.9	0.036	0.00	0.0	0.600	0	375	Pipe/Conduit	ð
S6.007	16.165	0.054	300.0	0.034	0.00	0.0	0.600	0	375	Pipe/Conduit	ð
S10.000	21.651	0.492	44.0	0.021	4.00	0.0	0.600	0	225	Pipe/Conduit	<del>3</del>
S10.001	20.030	0.250	80.0	0.023	0.00	0.0	0.600	0	225	Pipe/Conduit	- The second sec
S10.002	23.954	0.260	92.0	0.009	0.00	0.0	0.600	0	225	Pipe/Conduit	- T
S10.003	50.972	0.631	80.8	0.031	0.00	0.0	0.600	0	225	Pipe/Conduit	

## <u>Network Results Table</u>

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (1/s)	Vel (m/s)	Cap (1/s)	Flow (1/s)	
S6.005 S6.006	50.00		18.556	0.289	0.0	0.0	7.8		119.2 114.6	47.0	
s6.007	50.00		18.419	0.359	0.0	0.0	9.7		115.0	58.3	
S10.000 S10.001 S10.002 S10.003	50.00 50.00 50.00 50.00	4.41 4.70	20.475 19.983 19.733 19.472	0.021 0.044 0.053 0.084	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.6 1.2 1.4 2.3	1.98 1.46 1.36 1.46	78.6 58.2 54.2 57.9	3.4 7.1 8.6 13.6	

DBFL Consulting Engineers		Page 7
Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION	
Dublin 7	1 in 30 YEAR STORM EVENT	Micro
Date 23/08/2021 18:00	Designed by dalye	
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Drainage
Innovyze	Network 2020.1	I

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Bas Flow		k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S11.000	27.528	0.376	73.2	0.086	4.00		0.0	0.600	0	225	Pipe/Conduit	<del>0</del>
S10.004	31.220	0.156	200.1	0.008	0.00		0.0	0.600	0	375	Pipe/Conduit	ð
S6.009 S6.010 S6.011	11.371 21.052 52.584 17.288	0.070 0.939 0.288	300.7 56.0 60.0	0.017 0.020 0.055 0.023	0.00 0.00 0.00 0.00		0.0	0.600 0.600 0.600 0.600	0 0 0	<mark>375</mark> 375 375	Pipe/Conduit Pipe/Conduit Pipe/Conduit Pipe/Conduit	5 0 5 5
S6.012	18.044	0.323	55.9	0.010	0.00		0.0	0.600	0	375	Pipe/Conduit	0

## <u>Network Results Table</u>

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)		Add Flow (1/s)	Vel (m/s)	Cap (1/s)	Flow (1/s)
S11.000	50.00	4.30	19.475	0.086	0.0	0.0	2.3	1.53	60.8	14.0
S10.004	50.00	5.69	18.521	0.178	0.0	0.0	4.8	1.28	141.1	28.9
\$6.008 \$6.009 \$6.010 \$6.011 \$6.012	50.00 50.00 50.00 50.00 50.00	6.63 6.99 7.11	18.365 18.327 18.257 17.318 17.030	0.554 0.574 0.629 0.652 0.662	0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0	15.0 15.5 17.0 17.7 17.9	1.04 2.43 2.34	112.9 114.8 267.9 258.7 268.1	105.9

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Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION 1 in 30 YEAR STORM EVENT	
Dublin 7		_ Micro
Date 23/08/2021 18:00	Designed by dalye	Drainage
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Diamaye
Innovyze	Network 2020.1	

PN	Length	Fall	Slope	I.Area	T.E.	Ba	ase	k	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)	(mins)	Flow	(l/s)	(mm)	SECT	(mm)		Design
S1.013	12.708	0.104	122.2	0.000	0.00		0.0	0.600	0	450	Pipe/Conduit	<b>A</b>
S1.014	6.243	0.027	231.2	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	ă
S1.015	25.474	0.136	188.0	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	ě
S1.016	29.555	0.130	227.3	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	Ā
S1.017	29.961	0.119	251.8	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	Ā
S1.018	19.883	0.079	251.7	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	Ä
S1.019	24.828	0.099	250.8	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	Ā
S1.020	35.005	0.140	250.0	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	Ä
S1.021	36.565	0.146	250.4	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	Ä
S1.022	38.440	0.156	246.4	0.000	0.00		0.0	0.600	0	300	Pipe/Conduit	ě

## <u>Network Results Table</u>

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)		Add Flow (1/s)	Vel (m/s)	Cap (1/s)	Flow (l/s)	
S1.013	50.00	8.57	15.720	1.752	0.0	0.0	47.4	1.84	292.3	284.7	Reduced flow
S1.014	50.00	8.67	15.616	1.752	0.0	0.0	47.4	1.03	72.8«	284.7	Following
S1.015	50.00	9.04	15.589	1.752	0.0	0.0	47.4	1.14	80.8«	284.7	, , , , , , , , , , , , , , , , , , ,
S1.016	50.00	9.52	15.454	1.752	0.0	0.0	47.4	1.04	73.4«	284.7	Hydrobrake
S1.017	50.00	10.02	15.324	1.752	0.0	0.0	47.4	0.99	69.7«	284.7	
S1.018	50.00	10.36	15.205	1.752	0.0	0.0	47.4	0.99	69.7«	284.7	MaxQ 8.5 l/s
S1.019	50.00	10.78	15.126	1.752	0.0	0.0	47.4	0.99	69.9«	284.7	
S1.020	50.00	11.37	14.150	1.752	0.0	0.0	47.4	0.99	70.0«	284.7	
S1.021	50.00	11.98	14.010	1.752	0.0	0.0	47.4	0.99	69.9«	284.7	
S1.022	50.00	12.63	13.863	1.752	0.0	0.0	47.4	1.00	70.5«	284.7	

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Ormond House		
Upper Ormond Quay		
Dublin 7	1 in 30 YEAR STORM EVENT	Micro
Date 23/08/2021 18:00	Designed by dalye	
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Drainage
Innovyze	Network 2020.1	
<u>Network Design</u> PN Length Fall Slope I.Area (m) (m) (1:X) (ha)	Table for Surface Water Network T.E. Base k HYD DIA Section Type Auto (mins) Flow (1/s) (mm) SECT (mm) Design	
s1.023 85.511 0.339 252.2 0.000	0.00 0.0 0.600 o 300 Pipe/Conduit 🔒	

<u>Network Results Table</u>

PN	Rain	T.C.	US/IL	Σ I.Area	Σ Base	Foul	Add Flow	Vel	Cap	Flow	
	(mm/hr)	(mins)	(m)	(ha)	Flow (l/s)	(1/s)	(l/s)	(m/s)	(l/s)	(l/s)	
S1.023	50.00	14.07	13.707	1.752	0.0	0.0	47.4	0.99	69.7«	284.7	

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Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION	
Dublin 7	1 in 30 YEAR STORM EVENT	Micro
Date 23/08/2021 18:00	Designed by dalye	
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Drainage
Innovyze	Network 2020.1	

#### Free Flowing Outfall Details for Surface Water Network

OutfallOutfall C. Level I. LevelMinD,LWPipe NumberName(m)(m)I. Level (mm)(mm)

(m)

S1.023 S 15.660 13.368 0.000 0 0

#### Simulation Criteria for Surface Water Network

Volumetric Runoff Coeff 0.750Manhole Headloss Coeff (Global)0.500Inlet Coefficient 0.800Areal Reduction Factor 1.000Foul Sewage per hectare (l/s)0.000 Flow per Person per Day (l/per/day)0.000Hot Start (mins)0 Additional Flow - % of Total Flow 20.000Run Time (mins)60Hot Start Level (mm)0MADD Factor \* 10m³/ha Storage2.000Output Interval (mins)1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 5 Number of Storage Structures 5 Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model		FSR	M5-60 (mm	) 17.300		Cv (S	Summer)	0.750
Return Period (years)		30	Ratio	R 0.280		Cv (V	Vinter)	0.840
Region	Scotland and	Ireland	Profile Typ	e Summer	Storm	Duration	(mins)	30

DBFL Consulting Engineers							Pa	ge 30
Ormond House								
Jpper Ormond Quay		SURFACE W			LATION			
Dublin 7		1 in 30 YEAR	STORM EVE	ENT				Micro
Date 23/08/2021 18:00		Designed by	y dalye					
7ile 190226 - Drainage Design 23.08.2	2021.MDX	Checked by	_					Drainage
Innovyze		Network 202	20.1					
	Online Contr	cols for Sur	face Wate	er Network	:			
	01111110 001101		1400 1400		-			
<u>Hydro-Brake</u>	® Optimum Manl	hole: S21,	DS/PN: S1	.004, Vol	ume (m³)	: 4.4		
	e MD-SHE-0053-20				np Availab			
Design Head (m		2.733			Lameter (r			
Design Flow (1/s		2.0				(m) 16.842		
Flush-Flo	e Minimise upst	Calculated		let Pipe Di Manhole Di				
Applicatio	-	Surface	suggested	i Mannole Di	Lalleter (I	un) 1200		
Appricació		Burrace						
Control Points	Head (m)	Flow (l/s)	Control	Points	Head (1	n) Flow (1	/s)	
Design Point (Calcul	lated) 2.733	2.0		Kick-Flo	D® 0.4	70	0.9	
	n-Flo™ 0.226	1.1 Me	an Flow ove	r Head Rang	je	-	1.4	
The hydrological calculations have been ba	and on the Head	(Diachargo rol	ationchin d	For the Urd	ro Brakon	Ontimum	a anagifia	d Chould
another type of control device other than		2	-	-		-	-	
					5	5		
Depth (m) Flow (1/s) Depth (m) Flow	(1/s) Depth (m) 1	Flow (l/s) De	pth (m) Flo	ow (l/s) De	pth (m) F	low (l/s)	Depth (m)	Flow (l/s)
0.100 1.0 0.600	1.0 1.600	1.6	2.600	1.9	5.000	2.6	7.500	3.2
0.200 1.1 0.800	1.1 1.800	1.6	3.000	2.1	5.500	2.8	8.000	3.3
0.300 1.1 1.000	1.3 2.000	1.7	3.500	2.2	6.000	2.9	8.500	3.4
0.300 1.1 1.000	1						1	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1.4 2.200 1.5 2.400	1.8	4.000 4.500	2.4	6.500 7.000	3.0	9.000	

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ould validate
arruated
1/s)
9.5
9.8
10.1
10.4
10.6
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Drmond House											
Upper Ormond Quay					SURFACE WATER DRAINAGE CALCULATION						
Dublin 7					1 IN 30 YEAF	R STORM EVE	=N I				Micco
Date 23/08/2021	18:00				Designed k	oy dalye					Micro
File 190226 - Dr.	ainage De	esign 23.08	8.2021.M	1DX	Checked by						Drainage
Innovyze					Network 20	)20.1					
		_	_								
		<u>Hydro-Bra</u>	ake® Opt	imum Man	hole: S16,	DS/PN: S1	L.009, Vol	ume (m³	): 7.7		
			Sump Avai	lable	Yes Minimum (	Outlet Pipe	Diameter (	nm) 150			
			Diameter			ted Manhole					
		In	vert Leve	el (m) 16.	077						
		Control Poir	nts	Head (m)	Flow (l/s)	Control	l Points	Head (	m) Flow (]	/s)	
	Desia	n Point (Cal	lculated)	1.670	4.7		Kick-Fl	.o® 0.8	25	3.4	
			lush-Flo™		4.3 M	íean Flow ov	er Head Rar	ae	_	3.9	
The hydrological		ns have been	n based or	n the Head	/ /Discharge re	elationship	for the Hyd	dro-Brake@			
The hydrological another type of c <b>Depth (m) Flo</b>	control dev	ns have been ice other th	n based or nan a Hydi	n the Head ro-Brake O	/Discharge re ptimum® be ut	elationship tilised ther	for the Hyd h these sto:	dro-Brake@ rage routi	ng calcula	tions will	be invalidat
another type of c Depth (m) Flo	control dev	ns have been ice other th epth (m) Flo	n based or nan a Hydr ow (l/s)	n the Head ro-Brake O Depth (m)	/Discharge re ptimum® be ut Flow (l/s)  D	elationship tilised then Depth (m) Fl	for the Hyd these sto: .ow (1/s) D	dro-Brake@ rage routi <b>epth (m)</b> 1	ng calcula	Depth (m)	be invalidat
another type of c	control dev	ns have been ice other th	n based or nan a Hydi	n the Head ro-Brake O	/Discharge re ptimum® be ut	elationship tilised ther	for the Hyd h these sto:	dro-Brake@ rage routi	ng calcula	Depth (m)	be invalidat Flow (l/s) 9.5
another type of c Depth (m) Flo 0.100	control dev ow (1/s) De 2.9	ns have been ice other th <b>epth (m) Flc</b> 0.600	n based or nan a Hydr <b>ow (l/s)   1</b> 4.1	n the Head ro-Brake O Depth (m) 1.600	/Discharge reptimum® be ut Flow (1/s) D 4.6	elationship tilised ther Depth (m) Fl 2.600	for the Hyd these sto: .ow (1/s) Do 5.8	dro-Brake@ rage routi epth (m) 1 5.000	ng calcula Flow (l/s) 7.9	Depth (m) 7.500 8.000	be invalidat Flow (1/s) 9.5 9.8
another type of c Depth (m) Flo 0.100 0.200	control dev ow (1/s) De 2.9 3.9	ns have been ice other th <b>epth (m) Flc</b> 0.600 0.800	n based or nan a Hydr <b>ow (l/s)   1</b> 4.1 3.5	n the Head ro-Brake O <b>Depth (m)</b> 1.600 1.800	/Discharge reptimum® be ut Flow (1/s) D 4.6 4.9	elationship tilised ther Depth (m) Fl 2.600 3.000	for the Hydra these stor .cow (1/s) Data 5.8 6.2	dro-Brake@ rage routi epth (m) 1 5.000 5.500	ng calcula Flow (l/s) 7.9 8.2	Depth (m) 7.500 8.000 8.500	be invalidat Flow (1/s) 9.5 9.8 10.1
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300	control dev cow (1/s) Da 2.9 3.9 4.2	ns have been ice other th <b>epth (m) Flc</b> 0.600 0.800 1.000	h based or han a Hydr bw (1/s)   4.1 3.5 3.7	n the Head ro-Brake O Depth (m) 1.600 1.800 2.000	/Discharge re ptimum® be ut Flow (1/s) D 4.6 4.9 5.1	elationship tilised ther 2.600 3.000 3.500	for the Hydra these stor .cow (1/s) Data 5.8 6.2 6.6	dro-Brake@ rage routi apth (m) 1 5.000 5.500 6.000	ng calcula Flow (1/s) 7.9 8.2 8.6	Depth (m) 7.500 8.000 8.500 9.000	be invalidat <b>Flow (1/s)</b> 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev cow (1/s) De 2.9 3.9 4.2 4.3 4.2 4.3 4.2	ns have been ice other th epth (m) Flc 0.600 0.800 1.000 1.200 1.400	h based or han a Hydr <b>bw (1/s)   1</b> 4.1 3.5 3.7 4.0 4.3	n the Head ro-Brake O Depth (m) 1.600 1.800 2.000 2.200 2.400	/Discharge reptimum® be ut Flow (1/s) D 4.6 4.9 5.1 5.3	elationship tilised then 2.600 3.000 3.500 4.000 4.500	for the Hydra these stor .cow (1/s) Data 5.8 6.2 6.6 7.1 7.5	dro-Brake@ rage routi spth (m) 1 5.000 5.500 6.000 6.500 7.000	ng calcula Flow (1/s) 7.9 8.2 8.6 8.9 9.2	Depth (m) 7.500 8.000 8.500 9.000	be invalidat <b>Flow (1/s)</b> 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev cow (1/s) De 2.9 3.9 4.2 4.3 4.2 4.3 4.2	ns have been ice other th epth (m) Flc 0.600 0.800 1.000 1.200 1.400 Hydro-Brał	h based or han a Hydr <b>ow (l/s)   1</b> 4.1 3.5 3.7 4.0 4.3 ke® Opti	n the Head ro-Brake O Depth (m) 1.600 1.800 2.000 2.200 2.400 .mum Manh	/Discharge reptimum® be ut Flow (1/s) D 4.6 4.9 5.1 5.3 5.6 ole: S12-5	elationship tilised then 2.600 3.000 3.500 4.000 4.500 , DS/PN: S	for the Hydra these store .ow (1/s) D 5.8 6.2 6.6 7.1 7.5 	dro-Brake@ rage routi epth (m) 1 5.000 5.500 6.000 6.500 7.000 olume (m	ng calcula Flow (1/s) 7.9 8.2 8.6 8.9 9.2 3): 9.0	Depth (m) 7.500 8.000 8.500 9.000 9.500	be invalidat <b>Flow (1/s)</b> 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev ow (1/s) De 2.9 3.9 4.2 4.3 4.2	ns have been ice other th epth (m) Flc 0.600 0.800 1.000 1.200 1.400 Hydro-Brał	h based or han a Hydr <b>ow (l/s)   1</b> 4.1 3.5 3.7 4.0 4.3 ke® Opti ence MD-S	n the Head ro-Brake O Depth (m) 1.600 1.800 2.000 2.200 2.400 .mum Manh	/Discharge reptimum® be ut Flow (1/s) D 4.6 4.9 5.1 5.3 5.6	elationship tilised then 2.600 3.000 3.500 4.000 4.500 , DS/PN: S	for the Hydra these store .cow (1/s) D 5.8 6.2 6.6 7.1 7.5 56.008, Vo	dro-Brake@ rage routi spth (m) 1 5.000 5.500 6.000 6.500 7.000	ng calcula Flow (1/s) 7.9 8.2 8.6 8.9 9.2 3): 9.0 ble Yes	Depth (m) 7.500 8.000 8.500 9.000 9.500	be invalidat <b>Flow (1/s)</b> 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev ow (1/s) De 2.9 3.9 4.2 4.3 4.2	ns have been ice other th epth (m) Flc 0.600 0.800 1.000 1.200 1.400 <u>Hydro-Bra</u> Unit Refere	h based or han a Hydr ow (l/s)   1 4.1 3.5 3.7 4.0 4.3 ke® Opti ence MD-S (m)	n the Head ro-Brake O Depth (m) 1.600 1.800 2.000 2.200 2.400 .mum Manh	/Discharge reptimum® be ut Flow (1/s) D 4.6 4.9 5.1 5.3 5.6 001e: S12-5 500-2110-2600	elationship tilised then 2.600 3.000 3.500 4.000 4.500 , DS/PN: S	for the Hydra these store .cow (1/s) Da 5.8 6.2 6.6 7.1 7.5 56.008, Vo	dro-Brake@ rage routi epth (m) 1 5.000 5.500 6.000 6.500 7.000 olume (m mp Availa viameter (	ng calcula Flow (1/s) 7.9 8.2 8.6 8.9 9.2 3): 9.0 ble Yes	Depth (m) 7.500 8.000 8.500 9.000 9.500	be invalidat <b>Flow (1/s)</b> 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev ow (1/s) De 2.9 3.9 4.2 4.3 4.2	ns have been ice other th epth (m) Flc 0.600 0.800 1.000 1.200 1.400 <u>Hydro-Bra</u> Unit Refere Design Head	h based or han a Hydr ow (l/s)   1 4.1 3.5 3.7 4.0 4.3 ke® Opti ence MD-S (m) 1/s)	n the Head ro-Brake O Depth (m) 1.600 1.800 2.000 2.200 2.400 .mum Manh	/Discharge reptimum® be ut Flow (1/s) D 4.6 4.9 5.1 5.3 5.6 001e: S12-5 500-2110-2600 2.110 2.6	elationship tilised then 2.600 3.000 3.500 4.000 4.500 , DS/PN: S	for the Hydra these store .ow (1/s) D 5.8 6.2 6.6 7.1 7.5 56.008, Vo Sur Investigation	dro-Brake@ rage routi epth (m) 1 5.000 5.500 6.000 6.500 7.000 Dlume (m mp Availa Jiameter ( rt Level	ng calcula Flow (1/s) 7.9 8.2 8.6 8.9 9.2 3): 9.0 ble Yes mm) 64 (m) 18.365	Depth (m) 7.500 8.000 8.500 9.000 9.500	be invalidat <b>Flow (1/s)</b> 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev ow (1/s) De 2.9 3.9 4.2 4.3 4.2	ns have been ice other th epth (m) Flc 0.600 0.800 1.000 1.200 1.400 Hydro-Brał Unit Refere Design Head sign Flow (1 Flush-H Object	n based or han a Hydr ow (l/s)   1 4.1 3.5 3.7 4.0 4.3   ke® Opti ence MD-S (m) 1/s) Flo™ tive Min	n the Head ro-Brake O Depth (m) 1.600 1.800 2.000 2.200 2.400 .mum Manh HE-0064-26	/Discharge reptimum® be ut Flow (1/s) D 4.6 4.9 5.1 5.3 5.6 00-2110-2600 2.110 2.6 Calculated cream storage	elationship tilised then 2.600 3.000 3.500 4.000 4.500 , DS/PN: S	for the Hydra these store .ow (1/s) D 5.8 6.2 6.6 7.1 7.5 56.008, Vo Sur Investigation	dro-Brake@ rage routi epth (m) 1 5.000 5.500 6.000 6.500 7.000 Dlume (m mp Availa Diameter ( rt Level Diameter (	ng calcula Flow (1/s) 7.9 8.2 8.6 8.9 9.2 3): 9.0 ble Yes mm) 64 (m) 18.365 mm) 100	Depth (m) 7.500 8.000 8.500 9.000 9.500	be invalidat <b>Flow (1/s)</b> 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev ow (1/s) De 2.9 3.9 4.2 4.3 4.2	ns have been ice other th epth (m) Flc 0.600 0.800 1.000 1.200 1.400 Hydro-Brał Unit Refere Design Head sign Flow (1 Flush-F	n based or han a Hydr ow (l/s)   1 4.1 3.5 3.7 4.0 4.3   ke® Opti ence MD-S (m) 1/s) Flo™ tive Min	n the Head ro-Brake O Depth (m) 1.600 1.800 2.000 2.200 2.400 .mum Manh HE-0064-26	/Discharge reptimum® be ut Flow (1/s) D 4.6 4.9 5.1 5.3 5.6 001e: S12-5 500-2110-2600 2.110 2.6 Calculated	elationship tilised then 2.600 3.000 3.500 4.000 4.500 , DS/PN: S	for the Hydra these store .ow (1/s) Data 5.8 6.2 6.6 7.1 7.5 56.008, Volume Structure Investigned	dro-Brake@ rage routi epth (m) 1 5.000 5.500 6.000 6.500 7.000 Dlume (m mp Availa Diameter ( rt Level Diameter (	ng calcula Flow (1/s) 7.9 8.2 8.6 8.9 9.2 3): 9.0 ble Yes mm) 64 (m) 18.365 mm) 100	Depth (m) 7.500 8.000 8.500 9.000 9.500	be invalidat <b>Flow (1/s)</b> 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev ow (1/s) De 2.9 3.9 4.2 4.3 4.2	ns have been ice other th epth (m) Flc 0.600 0.800 1.000 1.200 1.400 Hydro-Brał Unit Refere Design Head sign Flow (1 Flush-H Object	n based or han a Hydr ow (l/s)   1 4.1 3.5 3.7 4.0 4.3   ke® Opti ence MD-S (m) 1/s) Flo™ tive Min	n the Head ro-Brake O Depth (m) 1.600 1.800 2.000 2.200 2.400 .mum Manh HE-0064-26	/Discharge reptimum® be ut Flow (1/s) D 4.6 4.9 5.1 5.3 5.6 00-2110-2600 2.110 2.6 Calculated cream storage	elationship tilised then 2.600 3.000 3.500 4.000 4.500 , DS/PN: S	for the Hydra these store .ow (1/s) Data 5.8 6.2 6.6 7.1 7.5 56.008, Volume Structure Investigned	dro-Brake@ rage routi epth (m) 1 5.000 5.500 6.000 6.500 7.000 Dlume (m mp Availa Diameter ( rt Level Diameter (	ng calcula Flow (1/s) 7.9 8.2 8.6 8.9 9.2 3): 9.0 ble Yes mm) 64 (m) 18.365 mm) 100	Depth (m) 7.500 8.000 8.500 9.000 9.500	be invalidat <b>Flow (1/s)</b> 9.5 9.8 10.1 10.4

	Engineers	5								Pa	ge 33
Ormond House								TION			
Upper Ormond Qua	У				SURFACE						
Dublin 7							Micro				
Date 23/08/2021	18:00				Designed						
File 190226 - Dr.	ainage De	esign 2	3.08.2021.1	MDX	Checked k	ру					Drainage
Innovyze					Network 2	2020.1					
		<u>Hydro-</u>	<u>Brake® Opt</u> :	imum Manh	ole: S12-	5, DS/PN: S	6.008, Vol	ume (m³)	<u>9.0</u>		
		Control	Points	Head (m)	Flow (l/s)	Control	Points	Head (m)	Flow (1/	/s)	
	Desia	n Point	(Calculated)	2.110	2.6		Kick-Flo®	0.577	1	.4	
	20019		Flush-Flo™			Mean Flow ove				1.9	
The hydrological another type of c											
Depth (m) Flo	ow (1/s) De	epth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m) Fl	ow (l/s) Dep	th (m) Flo	w (1/s)	Depth (m)	Flow (l/s)
0.100	1.5	0.600	1.5	1.600	2.3	2.600	2.9	5.000	3.9	7.500	4.7
0.200	1.7	0.800		1.800	2.4	3.000	3.1	5.500	4.0	8.000	
0.300	1.8	1.000		2.000		3.500	3.3	6.000	4.2	8.500	
				2 200			2 5 1		4.4	9.000	5.1
0.400	1.7	1.200		2.200	2.6	4.000	3.5	6.500			F 0
	1.7 1.6	1.200 1.400		2.200	2.6	4.000 4.500	3.7	6.500 7.000	4.5	9.500	5.2
0.400		1.400	2.1	2.400	2.8		3.7	7.000	4.5		5.2
0.400		1.400 <u>Hydro</u>	2.1	2.400 timum Man	2.8	4.500 , DS/PN: S1	3.7	7.000	4.5		5.2
0.400	1.6	1.400 <u>Hydro</u>	2.1	2.400 timum Man	2.8	4.500 , DS/PN: S1	3.7   .014, Volui Sump	7.000 me (m³):	4.5 <u>6.1</u> e Yes		5.2
0.400	1.6	1.400 <u>Hydro</u> Unit Re Design Flo	2.1 -Brake® Opt eference MD-S Head (m) bw (1/s)	2.400 timum Man	2.8 hole: S11 500-2749-850 2.74 8.	4.500 , DS/PN: S1 00 19 5	3.7 014, Volui Sump Dia Invert	7.000 <u>me (m<sup>3</sup>):</u> Available meter (mm) Level (m)	4.5 6.1 Yes 111 15.616		5.2
0.400	1.6	1.400 <u>Hydro</u> Unit Re Design Flo Flu	2.1 -Brake® Opt eference MD-S Head (m) pw (1/s) ush-Flo™	2.400 <u>timum Man</u> SHE-0111-85	2.8 hole: S11 500-2749-850 2.74 8. Calculate	4.500 , DS/PN: S1 00 19 5 20 30 4.500 5 5 20 4.500 5 5 20 5 20 20 20 20 20 20 20 20 20 20	3.7 014, Volum Sump Dia Invert tlet Pipe Dia	7.000 me (m <sup>3</sup> ): Available meter (mm) Level (m) meter (mm)	4.5 6.1 Yes 111 15.616 150		5.2
0.400	1.6	1.400 <u>Hydro</u> Unit Re Design Flo Sign Flo Ok	2.1 -Brake® Opt eference MD-S Head (m) bw (1/s) ush-Flo™ bjective Min	2.400 <u>timum Man</u> SHE-0111-85	2.8 hole: S11 500-2749-850 2.74 8. Calculate cream storag	4.500 <u>, DS/PN: S1</u> 00 5 5 5 5 6 Minimum Out ge Suggested	3.7 014, Volui Sump Dia Invert	7.000 me (m <sup>3</sup> ): Available meter (mm) Level (m) meter (mm)	4.5 6.1 Yes 111 15.616 150		5.2
0.400	1.6	1.400 <u>Hydro</u> Unit Re Design Flo Sign Flo Ok	2.1 -Brake® Opt eference MD-S Head (m) pw (1/s) ush-Flo™	2.400 <u>timum Man</u> SHE-0111-85 nimise upst	2.8 hole: S11 500-2749-850 2.74 8. Calculate tream storag Surfac	4.500 <u>, DS/PN: S1</u> 00 5 5 5 5 6 Minimum Out ge Suggested	3.7 014, Volum Sump Dia Invert tlet Pipe Dia	7.000 me (m <sup>3</sup> ): Available meter (mm) Level (m) meter (mm)	4.5 6.1 Yes 111 15.616 150 1200	9.500	5.2
0.400	1.6	1.400 <u>Hydro</u> Unit Re Design Flo Sign Flo Ok	2.1 -Brake® Opt eference MD-S Head (m) pw (1/s) ush-Flo™ ojective Min lication	2.400 <u>timum Man</u> SHE-0111-85 nimise upst	2.8 hole: S11 500-2749-850 2.74 8. Calculate cream storag	4.500 , DS/PN: S1 00 95 55 56 Minimum Out 96 Suggested 96 97 98 99 99 90 90 99 90 90 90 90 90	3.7 014, Volum Sump Dia Invert tlet Pipe Dia	7.000 me (m <sup>3</sup> ): Available meter (mm) Level (m) meter (mm)	4.5 6.1 Yes 111 15.616 150 1200	9.500	5.2
0.400	1.6	1.400 <u>Hydro</u> Unit Re Design Flo Sign Flo Ok Appl Control	2.1 -Brake® Opt eference MD-S Head (m) pw (1/s) ush-Flo™ ojective Min lication	2.400 timum Man SHE-0111-85 nimise upst <b>Head (m)</b>	2.8 hole: S11 500-2749-850 2.74 8. Calculate tream storag Surfac	4.500 , DS/PN: S1 00 95 55 56 Minimum Out 96 Suggested 96 97 98 99 99 90 90 99 90 90 90 90 90	3.7 014, Volum Sump Dia Invert tlet Pipe Dia d Manhole Dia	7.000 <u>me (m<sup>3</sup>):</u> Available meter (mm) Level (m) meter (mm) Head (m)	4.5 6.1 Yes 111 15.616 150 1200 Flow (1/	9.500	5.2
0.400	1.6	1.400 <u>Hydro</u> Unit Re Design Flo Sign Flo Ok Appl Control	2.1 -Brake® Opt eference MD-S Head (m) bw (1/s) ush-Flo™ ojective Min lication Points	2.400 timum Man SHE-0111-85 nimise upst <b>Head (m)</b> 2.749	2.8 hole: S11 500-2749-850 2.74 8. Calculate tream storag Surfac Flow (1/s) 8.5	4.500 , DS/PN: S1 00 95 55 56 Minimum Out 96 Suggested 96 97 98 99 99 90 90 99 90 90 90 90 90	3.7 .014, Volum Sump Dia Invert tlet Pipe Dia d Manhole Dia . Points Kick-Flo®	7.000 <u>me (m<sup>3</sup>):</u> Available meter (mm) Level (m) meter (mm) <b>Head (m)</b> 0.999	4.5 6.1 Yes 111 15.616 150 1200 Flow (1/	9.500 ′s)	5.2

DBFL Consulting Engineers		Page 34
Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION	
Dublin 7		Micro
Date 23/08/2021 18:00	Designed by dalye	Drainage
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Diamaye
Innovyze	Network 2020.1	

## Hydro-Brake® Optimum Manhole: S11, DS/PN: S1.014, Volume (m<sup>3</sup>): 6.1

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)										
0.100	3.9	0.600	6.6	1.600	6.6	2.600	8.3	5.000	11.3	7.500	13.7
0.200	5.9	0.800	6.3	1.800	7.0	3.000	8.8	5.500	11.8	8.000	14.1
0.300	6.4	1.000	5.3	2.000	7.3	3.500	9.5	6.000	12.3	8.500	14.5
0.400	6.6	1.200	5.8	2.200	7.6	4.000	10.1	6.500	12.8	9.000	14.9
0.500	6.7	1.400	6.2	2.400	8.0	4.500	10.7	7.000	13.2	9.500	15.3

OBFL Consulting Engine	ers										Page 35
Drmond House											
Jpper Ormond Quay								E CALCULA	TION		
Dublin 7					1 in 30 YE	EARSIO	RM EVENT				Micco
Date 23/08/2021 18:00					Designe	— Micro					
File 190226 - Drainage	Design	23.08	.2021.1		Checked	_	-				Drainage
Innovyze					Network	-	1				
- 4 -											
	Summai	ry of R	esults	for 30 m	inute 3	0 year	Summer	(Surface	Water	Network)	
		-				-					
	Má	argin fo	f Flood	Risk Warnir	ng (mm) 3	300.0 DI	'S Status	ON Inertia	a Statu	s OFF	
				Analysis Ti	mestep	Fine DV	D Status (	OFF			
	WAR	NING: Ha	lf Drai	n Time has	not been	calcula	ted as the	e structure	e is to	o full.	
					_, , ,						
				Surcharged				Half Drain	-		
		TTC /MIT	T 0110 1	Donth	1701	F1 /	Orromflore	Time	E1		
	PN	US/MH Name	Level (m)	Depth (m)		•	Overflow (1/s)	Time (mins)	Flow (1/s)	Status	
	PN	Name	(m)	(m)	Volume (m³)	Flow / Cap.	Overflow (1/s)	Time (mins)	Flow (1/s)	Status	
	S1.000	Name S25	(m) 19.776	(m) -0.024	(m³) 0.000	<b>Cap</b> .		-	<b>(1/s)</b> 46.7	OK	Upstream of
	S1.000 S1.001	Name	(m) 19.776 19.467	(m) -0.024 0.236	(m³) 0.000 0.000	Cap. 0.84 0.80		-	(1/s) 46.7 68.1	OK SURCHARGED 🛩	Catchment 1
	S1.000 S1.001 S1.002	Name	(m) 19.776 19.467 18.794	(m) -0.024 0.236 0.667	(m <sup>3</sup> ) 0.000 0.000 0.000	Cap. 0.84 0.80 1.27		-	(1/s) 46.7 68.1 80.5	OK SURCHARGED -	
	S1.000 S1.001 S1.002 S1.003	Name	(m) 19.776 19.467 18.794 17.326	(m) -0.024 0.236 0.667 0.095	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48		-	(1/s) 46.7 68.1 80.5 85.0	OK SURCHARGED & SURCHARGED SURCHARGED &	Catchment 1
	S1.000 S1.001 S1.002 S1.003 S1.004	Name \$25 \$24 \$23 \$22 \$21	(m) 19.776 19.467 18.794 17.326 17.121	(m) -0.024 0.236 0.667 0.095 -0.021	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48 0.00		-	(1/s) 46.7 68.1 80.5 85.0 0.6	OK SURCHARGED SURCHARGED SURCHARGED OK	Catchment 1 Hydrobrake
	S1.000 S1.001 S1.002 S1.003 S1.004 S2.000	Name	(m) 19.776 19.467 18.794 17.326 17.121 17.129	(m) -0.024 0.236 0.667 0.095 -0.021 0.121	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48 0.00 1.04		-	(1/s) 46.7 68.1 80.5 85.0 0.6 64.0	OK SURCHARGED SURCHARGED OK SURCHARGED	Catchment 1 Hydrobrake
	<pre>\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000</pre>	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2	(m) 19.776 19.467 18.794 17.326 17.121 17.129 17.102	(m) -0.024 0.236 0.667 0.095 -0.021 0.121 -0.031	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48 0.00 1.04 0.45		-	(1/s) 46.7 68.1 80.5 85.0 0.6 64.0 19.8	OK SURCHARGED SURCHARGED SURCHARGED OK SURCHARGED OK	Catchment 1 Hydrobrake Attenuation Tank
	S1.000 S1.001 S1.002 S1.003 S1.004 S2.000 S3.000 S2.001	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1	(m) 19.776 19.467 18.794 17.326 17.121 17.129 17.102 17.066	(m) -0.024 0.236 0.667 0.095 -0.021 0.121 -0.031 0.093	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48 0.00 1.04 0.45 1.54		-	(1/s) 46.7 68.1 80.5 85.0 0.6 64.0 19.8 83.2	OK SURCHARGED SURCHARGED SURCHARGED OK SURCHARGED OK	Catchment 1 Hydrobrake
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000 \$2.001 \$4.000	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9	(m) 19.776 19.467 18.794 17.326 17.121 17.129 17.102 17.066 17.057	(m) -0.024 0.236 0.667 0.095 -0.021 0.121 -0.031 0.093 0.077	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48 0.00 1.04 0.45 1.54 0.99		-	(1/s) 46.7 68.1 80.5 85.0 0.6 64.0 19.8 83.2 61.6	OK SURCHARGED SURCHARGED OK SURCHARGED OK SURCHARGED SURCHARGED	Catchment 1 Hydrobrake Attenuation Tank
	S1.000 S1.001 S1.002 S1.003 S1.004 S2.000 S3.000 S2.001	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20	(m) 19.776 19.467 18.794 17.326 17.121 17.129 17.102 17.066 17.057 17.055	(m) -0.024 0.236 0.667 0.095 -0.021 0.121 -0.031 0.093 0.077 0.137	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48 0.00 1.04 0.45 1.54 0.99 0.03		-	(1/s) 46.7 68.1 80.5 85.0 0.6 64.0 19.8 83.2 61.6	OK SURCHARGED SURCHARGED SURCHARGED OK SURCHARGED OK	Catchment 1 Hydrobrake Attenuation Tank Attenuation Tank
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000 \$2.001 \$4.000 \$1.005 \$1.006	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20 \$19	(m) 19.776 19.467 18.794 17.326 17.121 17.129 17.102 17.066 17.057 17.055 16.482	(m) -0.024 0.236 0.667 0.095 -0.021 0.121 -0.031 0.093 0.077 0.137 -0.310	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48 0.00 1.04 0.45 1.54 0.99 0.03 0.19		-	<pre>(1/s) 46.7 68.1 80.5 85.0 0.6 64.0 19.8 83.2 61.6 4.2 28.1</pre>	OK SURCHARGED SURCHARGED OK SURCHARGED OK SURCHARGED SURCHARGED SURCHARGED OK	Catchment 1 Hydrobrake Attenuation Tank Attenuation Tank Upstream of Catchment 2
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000 \$2.001 \$4.000 \$1.005	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20 \$19	(m) 19.776 19.467 18.794 17.326 17.121 17.129 17.102 17.066 17.057 17.055	(m) -0.024 0.236 0.667 0.095 -0.021 0.121 -0.031 0.093 0.077 0.137	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48 0.00 1.04 0.45 1.54 0.99 0.03 0.19 0.16		-	<pre>(1/s) 46.7 68.1 80.5 85.0 0.6 64.0 19.8 83.2 61.6 4.2 28.1 9.7</pre>	OK SURCHARGED SURCHARGED OK SURCHARGED OK SURCHARGED SURCHARGED	Catchment 1 Hydrobrake Attenuation Tank Attenuation Tank
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000 \$2.001 \$4.000 \$1.005 \$1.006	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20 \$19 \$18-1	(m) 19.776 19.467 18.794 17.326 17.121 17.129 17.102 17.066 17.057 17.055 16.482	(m) -0.024 0.236 0.667 0.095 -0.021 0.121 -0.031 0.093 0.077 0.137 -0.310	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48 0.00 1.04 0.45 1.54 0.99 0.03 0.19 0.16 0.24		-	<pre>(1/s) 46.7 68.1 80.5 85.0 0.6 64.0 19.8 83.2 61.6 4.2 28.1</pre>	OK SURCHARGED SURCHARGED OK SURCHARGED OK SURCHARGED SURCHARGED SURCHARGED OK	Catchment 1 Hydrobrake Attenuation Tank Attenuation Tank Upstream of Catchment 2
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000 \$2.001 \$4.000 \$1.005 \$1.006 \$5.000	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20 \$19 \$18-1 \$18	(m) 19.776 19.467 18.794 17.326 17.121 17.129 17.102 17.066 17.057 17.055 16.482 17.004	(m) -0.024 0.236 0.667 0.095 -0.021 0.121 -0.031 0.093 0.077 0.137 -0.310 -0.165	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48 0.00 1.04 0.45 1.54 0.99 0.03 0.19 0.16		-	<pre>(1/s) 46.7 68.1 80.5 85.0 0.6 64.0 19.8 83.2 61.6 4.2 28.1 9.7</pre>	OK SURCHARGED SURCHARGED OK SURCHARGED OK SURCHARGED SURCHARGED SURCHARGED OK OK OK	Catchment 1 Hydrobrake Attenuation Tank Attenuation Tank Upstream of Catchment 2
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000 \$2.001 \$4.000 \$1.005 \$1.006 \$5.000 \$1.007	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20 \$19 \$18-1 \$18 \$17	(m) 19.776 19.467 18.794 17.326 17.121 17.129 17.102 17.066 17.057 17.055 16.482 17.004 16.403	(m) -0.024 0.236 0.667 0.095 -0.021 0.121 -0.031 0.093 0.077 0.137 -0.310 -0.165 -0.301	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48 0.00 1.04 0.45 1.54 0.99 0.03 0.19 0.16 0.24		-	<pre>(1/s) 46.7 68.1 80.5 85.0 0.6 64.0 19.8 83.2 61.6 4.2 28.1 9.7 37.7</pre>	OK SURCHARGED SURCHARGED OK SURCHARGED OK SURCHARGED SURCHARGED SURCHARGED OK OK OK	Catchment 1 Hydrobrake Attenuation Tank Attenuation Tank Upstream of Catchment 2
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000 \$2.001 \$4.000 \$1.005 \$1.006 \$5.000 \$1.007 \$1.008	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20 \$19 \$18-1 \$18 \$17 \$16	(m) 19.776 19.467 18.794 17.326 17.121 17.129 17.102 17.066 17.057 17.055 16.482 17.004 16.403 16.352	(m) -0.024 0.236 0.667 0.095 -0.021 0.121 -0.031 0.093 0.077 0.137 -0.310 -0.165 -0.301 -0.305	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48 0.00 1.04 0.45 1.54 0.99 0.03 0.19 0.16 0.24 0.22		-	<pre>(1/s) 46.7 68.1 80.5 85.0 0.6 64.0 19.8 83.2 61.6 4.2 28.1 9.7 37.7 41.1</pre>	OK SURCHARGED SURCHARGED OK SURCHARGED OK SURCHARGED SURCHARGED SURCHARGED OK OK OK OK	Catchment 1 Hydrobrake Attenuation Tank Attenuation Tank Upstream of Catchment 2
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000 \$2.001 \$4.000 \$1.005 \$1.006 \$5.000 \$1.007 \$1.008 \$1.009	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20 \$19 \$18-1 \$18 \$17 \$16 \$15	(m) 19.776 19.467 18.794 17.326 17.121 17.129 17.102 17.005 17.055 16.482 17.004 16.403 16.352 16.260 16.192	(m) -0.024 0.236 0.667 0.095 -0.021 0.121 -0.031 0.093 0.077 0.137 -0.310 -0.165 -0.301 -0.305 -0.267 -0.300	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48 0.00 1.04 0.45 1.54 0.99 0.03 0.19 0.16 0.24 0.22 0.02		-	<pre>(1/s) 46.7 68.1 80.5 85.0 0.6 64.0 19.8 83.2 61.6 4.2 28.1 9.7 37.7 41.1 2.2</pre>	OK SURCHARGED SURCHARGED OK SURCHARGED OK SURCHARGED SURCHARGED SURCHARGED OK OK OK OK OK	Catchment 1 Hydrobrake Attenuation Tank Attenuation Tank Upstream of Catchment 2
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000 \$2.001 \$4.000 \$1.005 \$1.006 \$5.000 \$1.007 \$1.008 \$1.009 \$1.010 \$1.011	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20 \$19 \$18-1 \$18 \$17 \$16 \$15 \$14	(m) 19.776 19.467 18.794 17.326 17.121 17.129 17.102 17.005 17.055 16.482 17.004 16.403 16.352 16.260 16.192 16.191	(m) -0.024 0.236 0.667 0.095 -0.021 0.121 -0.031 0.093 0.077 0.137 -0.310 -0.165 -0.301 -0.305 -0.267 -0.300 -0.199	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48 0.00 1.04 0.45 1.54 0.99 0.03 0.19 0.16 0.24 0.22 0.02 0.02 0.07		-	<pre>(1/s) 46.7 68.1 80.5 85.0 0.6 64.0 19.8 83.2 61.6 4.2 28.1 9.7 37.7 41.1 2.2 4.0 13.3</pre>	OK SURCHARGED SURCHARGED OK SURCHARGED OK SURCHARGED SURCHARGED SURCHARGED OK OK OK OK OK OK	Catchment 1 Hydrobrake Attenuation Tank Attenuation Tank Upstream of Catchment 2
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000 \$2.001 \$4.000 \$1.005 \$1.006 \$5.000 \$1.007 \$1.008 \$1.009 \$1.010 \$1.011 \$1.012	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20 \$19 \$18-1 \$18 \$17 \$16 \$15 \$14	(m) 19.776 19.467 18.794 17.326 17.121 17.129 17.102 17.005 16.482 17.004 16.403 16.352 16.260 16.192 16.191 16.190	(m) -0.024 0.236 0.667 0.095 -0.021 0.121 -0.031 0.093 0.077 0.137 -0.310 -0.165 -0.301 -0.305 -0.267 -0.300	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.84 0.80 1.27 1.48 0.00 1.04 0.45 1.54 0.99 0.03 0.19 0.16 0.24 0.22 0.02 0.02		-	<pre>(1/s) 46.7 68.1 80.5 85.0 0.6 64.0 19.8 83.2 61.6 4.2 28.1 9.7 37.7 41.1 2.2 4.0</pre>	OK SURCHARGED SURCHARGED OK SURCHARGED OK SURCHARGED SURCHARGED SURCHARGED OK OK OK OK OK	Catchment 1 Hydrobrake Attenuation Tank Attenuation Tank Upstream of Catchment 2

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Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION	
Dublin 7	1 in 30 YEAR STORM EVENT	Micro
Date 23/08/2021 18:00	Designed by dalye	
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Drainage
Innovyze	Network 2020.1	

# Summary of Results for 30 minute 30 year Summer (Surface Water Network)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)		Flow / Cap.	Overflow (1/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	
					-	(_/ 0/	(			
S6.001	S12-12		-0.155	0.000	0.21			10.9	OK	
S6.002	S12-11		-0.155	0.000	0.21			11.3	OK	
S7.000	S12-10-1		-0.164	0.000	0.16			10.2	OK	
S6.003	S12-10		-0.110	0.000	0.51			22.9	OK	
S8.000	S23	19.698	-0.102	0.000	0.56			27.0	OK	
S8.001	S12-9-1	19.452	-0.078	0.000	0.75			27.4	OK	
S6.004	S12-9	18.965	-0.079	0.000	0.88			60.9	OK	
S9.000	S12-8-1	19.537	-0.163	0.000	0.17			10.6	OK	
S6.005	S12-8	18.857	-0.074	0.000	0.80			81.2	OK	
S6.006	S12-7	18.819	-0.031	0.000	0.93			87.2	OK	Upstream of
S6.007	S12-6	18.814	0.020	0.000	1.00			93.1	SURCHARGED	Catchment 4
S10.000	S12-5-5	20.520	-0.180	0.000	0.09			6.4	OK	Hydrobrake
S10.001	S12-5-4	20.060	-0.148	0.000	0.25			13.4	OK	. If all out all o
S10.002	S12-5-3	19.821	-0.136	0.000	0.32			16.1	OK	
S10.003	S12-5-2	19.580	-0.117	0.000	0.46			25.5	OK	
S11.000	S12-5-1-1	19.584	-0.116	0.000	0.46			26.0	OK	
S10.004	S12-5-1	18.813	-0.083	0.000	0.42			53.0	OK	Attenuation
S6.008	S12-5	18.813	0.073	0.000	0.02			1.8	SURCHARGED	
S6.009	S12-4	18.400	-0.302	0.000	0.08			7.8	OK	
S6.010	S12-3	18.336	-0.296	0.000	0.10			24.2	OK	
S6.011	S12-2	17.415	-0.278	0.000	0.15			31.2	OK	
S6.012	S12-1	17.129	-0.276	0.000	0.15			34.3	OK	Linetreem of
S1.013	S12	16.189	0.019	0.000	0.24			43.3	SURCHARGED	Upstream of
S1.014	S11	16.187	0.271	0.000	0.13			6.7	SURCHARGED	Catchment 5
S1.015	S10	15.650	-0.239	0.000	0.09			6.7	OK	Hydrobrake
			©19	82-2020	) Inno	1170				

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Innovyze	Network 2020.1	L

# Summary of Results for 30 minute 30 year Summer (Surface Water Network)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)		Flow / Cap.	Overflow (1/s)	Half Drain Time (mins)	Flow	Status
S1.016	S9	15.517	-0.237	0.000	0.10			6.7	OK
S1.017	S8	15.389	-0.235	0.000	0.11			6.7	OK
S1.018	s7	15.271	-0.234	0.000	0.11			6.7	OK
S1.019	S6	15.191	-0.235	0.000	0.11			6.7	OK
S1.020	S5	14.214	-0.236	0.000	0.10			6.7	OK
S1.021	S4	14.074	-0.236	0.000	0.10			6.7	OK
S1.022	s3	13.927	-0.236	0.000	0.10			6.7	OK
S1.023	s2	13.770	-0.237	0.000	0.10			6.7	OK

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Jpper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION 1 in 100 YEAR STORM EVENT	
Dublin 7		Micro
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File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Dialitacje
Innovyze	Network 2020.1	
STORM SEWER D	ESIGN by the Modified Rational Method	
<u>Design Cr</u>	riteria for Surface Water Network	
Pipe Si	zes STANDARD Manhole Sizes STANDARD	
Return Period (years) 100 M5-60 (mm) 17.300 Ratio R 0.280 Maximum Rainfall (mm/hr) 50 Add	Volumetric Runoff Coeff. 0.750 Min Design Depth for PIMP (%) 100 Min Vel for Auto D	ckdrop Height (m) 1.500 Optimisation (m) 1.200 Design only (m/s) 1.00 Detimisation (1:X) 500
Network Des	ign Table for Surface Water Network	
« -	- Indicates pipe capacity < flow	
PN Length Fall Slope I.Are (m) (m) (1:X) (ha)		
	<u>Network Results Table</u>	
PN Rain T.C. US/IL (mm/hr) (mins) (m)	Σ I.Area Σ Base Foul Add Flow Vel Cap Flow (ha) Flow (l/s) (l/s) (l/s) (m/s) (l/s) (l/s)	

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PN	Length	Fall	Slope	I.Area	T.E.	Base	k	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)	(mins)	Flow (1/s	s) (mm	) SECT	(mm)		Design
S1.000	45.534	0.569	80.0	0.159	4.00	0	0 0.60	0 0	225	Pipe/Conduit	<del>0</del>
S1.001	37.539	1.104	34.0	0.109	0.00	0	0 0.60	0 0		Pipe/Conduit	
S1.002	56.453	0.896	63.0	0.066	0.00	0	0 0.60	0 0	225	Pipe/Conduit	ð
S1.003	26.659	0.089	299.5	0.024	0.00	0	0 0.60	0 0	300	Pipe/Conduit	Ť
S1.004	13.463	0.299	45.0	0.010	0.00	0	0 0.60	0 0	300	Pipe/Conduit	Ť
S2.000	3.468	0.035	99.1	0.219	4.00	0 .	0 0.60	0 0	300	Pipe/Conduit	•
S3.000	16.441	0.149	110.0	0.068	4.00	0	0 0.60	0 0	225	Pipe/Conduit	<del>0</del>

# <u>Network Results Table</u>

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)		Add Flow (1/s)	Vel (m/s)	Cap (1/s)	Flow (1/s)	
S1.000 S1.001 S1.002 S1.003 S1.004	50.00 50.00 50.00 50.00 50.00	4.80 5.37 5.86	<b>19.575</b> 19.006 17.902 16.931 16.842	0.159 0.268 0.334 0.358 0.368	0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0	4.3 7.3 9.0 9.7 10.0	1.46 2.25 1.65 0.90 2.35	58.2 89.5 65.6 63.8 166.1	25.8 43.5 54.3 58.2 59.8	
s2.000 s3.000	50.00 50.00		16.708 16.908	0.219 0.068	0.0	0.0	5.9 1.8	1.58 1.25	111.7 49.5	35.6 11.0	

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Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION	
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PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)		Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.001	16.571	0.055	301.3	0.000	0.00	0.0	0.600	0	300	Pipe/Conduit	ď
S4.000	10.520	0.062	169.7	0.210	4.00	0.0	0.600	0	300	Pipe/Conduit	ð
	22.944 31.083	0.126 0.089		0.014 0.080	0.00		0.600 0.600	0		Pipe/Conduit Pipe/Conduit	<b>⊕</b> ♂
S5.000	28.375	0.465	61.0	0.032	4.00	0.0	0.600	0	225	Pipe/Conduit	ð
S1.007	9.494	0.047	202.0	0.000	0.00	0.0	0.600	0	450	Pipe/Conduit	0

#### <u>Network Results Table</u>

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)		Add Flow (1/s)	Vel (m/s)	Cap (1/s)	Flow (l/s)		
S2.001	50.00	4.53	16.673	0.287	0.0	0.0	7.8	0.90	63.7	46.6		
S4.000	50.00	4.15	16.680	0.210	0.0	0.0	5.7	1.20	85.1	34.1		
S1.005 S1.006	50.00 50.00		<b>16.543</b> 16.342	0.879 0.959	0.0	0.0	23.8 26.0		148.0 171.9			
S5.000	50.00	4.28	16.944	0.032	0.0	0.0	0.9	1.68	66.7	5.2		
S1.007	50.00	6.83	16.254	0.991	0.0	0.0	26.8	1.43	226.9	161.0		
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PN	Length	Fall	Slope	I.Area	T.E.	Ba	ase	k	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)	(mins)	Flow	(l/s)	(mm)	SECT	(mm)		Design
S1.008	29.925	0.130	230.2	0.014	0.00		0.0	0.600	0	450	Pipe/Conduit	6
S1.009	10.755	0.035	307.3	0.012	0.00		0.0	0.600	0	450	Pipe/Conduit	
S1.010	25.432	0.102	249.3	0.015	0.00		0.0	0.600	0	450	Pipe/Conduit	
S1.011	45.007	0.183	245.9	0.050	0.00		0.0	0.600	0	450	Pipe/Conduit	
S1.012	12.339	0.037	333.5	0.008	0.00		0.0	0.600	0	450	Pipe/Conduit	
S6.000	6.457	0.099	65.2	0.035	4.00		0.0	0.600	0	225	Pipe/Conduit	ð
S6.001	10.656	0.155	68.7	0.001	0.00		0.0	0.600	0	225	Pipe/Conduit	
S6.002	15.711	0.225	69.9	0.001	0.00		0.0	0.600	0	225	Pipe/Conduit	

# <u>Network Results Table</u>

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)		Add Flow (1/s)	Vel (m/s)	Cap (1/s)	Flow (l/s)	
s1.008	50.00	7.20	16.207	1.005	0.0	0.0	27.2	1.34	212.4	163.3	
s1.009	50.00	7.36	16.077	1.017	0.0	0.0	27.5	1.15	183.6	165.3	
s1.010	50.00	7.69	16.042	1.032	0.0	0.0	27.9	1.28	204.0	167.7	
s1.011	50.00	8.27	15.940	1.082	0.0	0.0	29.3	1.29	205.5	175.8	Upstream of
S1.012	50.00	8.46	15.757	1.090	0.0	0.0	29.5	1.11	176.2«	177.1	hydrobrake and
s6.000	50.00	4.07	19.575	0.035	0.0	0.0	0.9	1.62	64.5	5.7	attenuation
s6.001	50.00	4.18	19.476	0.036	0.0	0.0	1.0	1.58	62.8	5.8	
s6.002	50.00	4.35	19.321	0.037	0.0	0.0	1.0	1.57	62.3	6.0	

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PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)		Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
s7.000	41.999	0.677	62.0	0.034	4.00	0.0	0.600	0	225	Pipe/Conduit	ð
s6.003	33.244	0.277	120.0	0.005	0.00	0.0	0.600	0	225	Pipe/Conduit	ď
s8.000 s8.001	26.970 4.205		100.0 62.0	0.090 0.000	4.00 0.00		0.600	0		Pipe/Conduit Pipe/Conduit	<del>d</del>
S6.004	22.515	0.113	199.2	0.041	0.00	0.0	0.600	0	300	Pipe/Conduit	ď
S9.000	32.583	0.543	60.0	0.035	4.00	0.0	0.600	0	225	Pipe/Conduit	ð

#### <u>Network Results Table</u>

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)				Cap (1/s)	Flow (1/s)		
S7.000	50.00	4.42	19.775	0.034	0.0	0.0	0.9	1.66	66.1	5.5		
S6.003	50.00	4.89	19.096	0.076	0.0	0.0	2.1	1.19	47.4	12.3		
S8.000 S8.001	50.00 50.00		<b>19.575</b> 19.305	0.090 0.090	0.0	0.0	2.4 2.4	1.31 1.66	52.0 66.2	14.6 14.6		
S6.004	50.00	5.22	18.744	0.207	0.0	0.0	5.6	1.11	78.5	33.6		
S9.000	50.00	4.32	19.475	0.035	0.0	0.0	0.9	1.69	67.3	5.7		
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Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION	
Dublin 7	1 in 100 YEAR STORM EVENT	Micro
Date 23/08/2021 17:58	Designed by dalye	
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Drainage
Innovyze	Network 2020.1	

PN	Length	Fall	Slope	I.Area	T.E.	Base	k	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)	(mins)	Flow (l/s)	(mm)	SECT	(mm)		Design
S6.005	22.917	0.082	279.5	0.047	0.00	0.0	0.600	0	375	Pipe/Conduit	<b>ď</b>
S6.006	16.601	0.055	301.9	0.036	0.00	0.0	0.600	0	375	Pipe/Conduit	ð
S6.007	16.165	0.054	300.0	0.034	0.00	0.0	0.600	0	375	Pipe/Conduit	ð
S10.000	21.651	0.492	44.0	0.021	4.00	0.0	0.600	0	225	Pipe/Conduit	<del>3</del>
S10.001	20.030	0.250	80.0	0.023	0.00	0.0	0.600	0	225	Pipe/Conduit	- The second sec
S10.002	23.954	0.260	92.0	0.009	0.00	0.0	0.600	0	225	Pipe/Conduit	- T
S10.003	50.972	0.631	80.8	0.031	0.00	0.0	0.600	0	225	Pipe/Conduit	

# <u>Network Results Table</u>

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (1/s)	Vel (m/s)	Cap (1/s)	Flow (1/s)	
S6.005 S6.006	50.00		18.556	0.289	0.0	0.0	7.8		119.2 114.6	47.0	
s6.007	50.00		18.419	0.359	0.0	0.0	9.7		115.0	58.3	
S10.000 S10.001 S10.002 S10.003	50.00 50.00 50.00 50.00	4.41 4.70	20.475 19.983 19.733 19.472	0.021 0.044 0.053 0.084	0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0	0.6 1.2 1.4 2.3	1.98 1.46 1.36 1.46	78.6 58.2 54.2 57.9	3.4 7.1 8.6 13.6	

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Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION 1 in 100 YEAR STORM EVENT	
Dublin 7		Micro
Date 23/08/2021 17:58	Designed by dalye	
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Drainage
Innovyze	Network 2020.1	

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)		Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S11.000	27.528	0.376	73.2	0.086	4.00	0.0	0.600	0	225	Pipe/Conduit	ð
S10.004	31.220	0.156	200.1	0.008	0.00	0.0	0.600	0	375	Pipe/Conduit	<del>0</del>
S6.008	11.371	0.037	311.0	0.017	0.00	0.0	0.600	0	375	Pipe/Conduit	ď
S6.009	21.052	0.070	300.7	0.020	0.00	0.0	0.600	0	375	Pipe/Conduit	
S6.010	52.584	0.939	56.0	0.055	0.00	0.0	0.600	0	375	Pipe/Conduit	ē
S6.011	17.288	0.288	60.0	0.023	0.00	0.0	0.600	0	375	Pipe/Conduit	ď
S6.012	18.044	0.323	55.9	0.010	0.00	0.0	0.600	0	375	Pipe/Conduit	

# <u>Network Results Table</u>

(mm/hr) (mi	ins) (m)		Σ Base Low (l/s)		Add Flow (1/s)	Vel (m/s)	Cap (1/s)	Flow (l/s)
S11.000 50.00 4	4.30 19.475	0.086	0.0	0.0	2.3	1.53	60.8	14.0
S10.004 50.00 5	5.69 18.521	0.178	0.0	0.0	4.8	1.28	141.1	28.9
\$6.009       \$0.00       \$6         \$6.010       \$0.00       \$6         \$6.011       \$0.00       \$6	6.29 18.365 6.63 18.327 6.99 18.257 7.11 17.318 7.23 17.030	0.554 0.574 0.629 0.652 0.662	0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0	15.0 15.5 17.0 17.7 17.9	1.04 2.43 2.34	112.9 114.8 267.9 258.7 268.1	105.9

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	Micro
Designed by dalye	
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Network 2020.1	
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PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	ase (1/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
		. ,	. ,		· - /	<b>、</b> , , , ,					
S1.01	3 12.708	0.104	122.2	0.000	0.00	0.0	0.600	0	450	Pipe/Conduit	8
S1.01	6.243	0.027	231.2	0.000	0.00	0.0	0.600	0	300	Pipe/Conduit	ē
S1.01	5 25.474	0.136	188.0	0.000	0.00	0.0	0.600	0	300	Pipe/Conduit	ē
S1.01	5 29.555	0.130	227.3	0.000	0.00	0.0	0.600	0	300	Pipe/Conduit	ē
S1.01	29.961	0.119	251.8	0.000	0.00	0.0	0.600	0	300	Pipe/Conduit	Ā
S1.01	8 19.883	0.079	251.7	0.000	0.00	0.0	0.600	0	300	Pipe/Conduit	Ā
S1.01	24.828	0.099	250.8	0.000	0.00	0.0	0.600	0	300	Pipe/Conduit	Ā
S1.02	35.005	0.140	250.0	0.000	0.00	0.0	0.600	0	300	Pipe/Conduit	ă
S1.02	36.565	0.146	250.4	0.000	0.00	0.0	0.600	0	300	Pipe/Conduit	ă
S1.022	38.440	0.156	246.4	0.000	0.00	0.0	0.600	0	300	Pipe/Conduit	ě

#### <u>Network Results Table</u>

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 (1/s)	Flow (l/s)	
S1.013	50.00	8.57	15.720	1.752	0.0	0.0	47.4	1.84	292.3	284.7	Reduced fLow
S1.014	50.00	8.67	15.616	1.752	0.0	0.0	47.4	1.03	72.8«	284.7	
S1.015	50.00	9.04	15.589	1.752	0.0	0.0	47.4	1.14	80.8«	284.7	Following
S1.016	50.00	9.52	15.454	1.752	0.0	0.0	47.4	1.04	73.4«	284.7	Hydrobrake
S1.017	50.00	10.02	15.324	1.752	0.0	0.0	47.4	0.99	69.7«	284.7	
S1.018	50.00	10.36	15.205	1.752	0.0	0.0	47.4	0.99	69.7«	284.7	MaxQ 8.5 l/s
S1.019	50.00	10.78	15.126	1.752	0.0	0.0	47.4	0.99	69.9«	284.7	
S1.020	50.00	11.37	14.150	1.752	0.0	0.0	47.4	0.99	70.0«	284.7	
S1.021	50.00	11.98	14.010	1.752	0.0	0.0	47.4	0.99	69.9«	284.7	
S1.022	50.00	12.63	13.863	1.752	0.0	0.0	47.4	1.00	70.5«	284.7	

DBFL Consulting Engineers												Page 9
Ormond House					SURF	ACE WATER						
Upper Ormond Quay Dublin 7						00 YEAR STO			~L00			
Dublin / Date 23/08/2021 17:58					Docia	ned by dal	110					— Micro
File 190226 - Drainage Des	ian 23	08 2	021 MDX		Check	—	уe					Drainage
Innovyze	1911 20	.00.2	021.1101			rk 2020.1						
		N	etwork	Design	Table	for Surf	ace Wa	ater 1	Netw	ork		
PN	Lengt	th Fal	.1 Slope	I.Area	T.E.	Base	k	HYD	DIA	Section Type	e Auto	
	(m)		) (1:X)			Flow (1/s)					Design	
S1.02	23 85.51	11 0.33	39 252.2	0.000	0.00	0.0	0.600	0	300	Pipe/Conduit	t 🔒	
										± ·	•	
				Ne	etwork	Results I	<u>able</u>					
	PN B	Rain	т.с.	us/IL Σ	I.Area	Σ Base	Foul	Add F	low	Vel Cap	Flow	
			(mins)	(m)	(ha)	Flow (1/s)				(m/s) (1/s)		
S1	.023	50.00	14.07 1	3.707	1.752	0.0	0.0	) 4	17.4	0.99 <mark>69.7«</mark>	284.7 🛥	Following Hydrobrake - flow
												control MaxQ 8.5 l/s
				(	D1982-2	2020 Innov	vze					

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Ormond House Upper Ormond Quay Dublin 7	SURFACE WATER DRAINAGE CALCULATION 1 in 100 YEAR STORM EVENT	Micro
Date 23/08/2021 17:58	Designed by dalye	
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Drainage
Innovyze	Network 2020.1	
Outfall Outf Pipe Number Nam	all C. Level I. Level Min D,L W ne (m) (m) I. Level (mm) (mm) (m)	
S1.023	S 15.660 13.368 0.000 0 0	
Simulation Cr	riteria for Surface Water Network	
Hot Start (mins) 0 Additional Flo	lloss Coeff (Global) 0.500 Inlet Coeffied e per hectare (l/s) 0.000 Flow per Person per Day (l/per/ w - % of Total Flow 20.000 Run Time (m or * 10m³/ha Storage 2.000 Output Interval (m	(day) 0.000 nins) 60
	umber of Offline Controls O Number of Time/Area Diagrams O per of Storage Structures 5 Number of Real Time Controls O	
<u>Syn</u>	thetic Rainfall Details	
Rainfall Model	FSR M5-60 (mm) 17.300 Cv (Summer) 0.750	

Rainfall ModelFSRM5-60 (mm)17.300Cv (Summer)0.750Return Period (years)100Ratio R0.280Cv (Winter)0.840Region Scotland and Ireland Profile TypeSummer Storm Duration (mins)30

DBFL Consulting Engineers				Page	30
Drmond House				Г	
Jpper Ormond Quay		NATER DRAINAGE CALC	ULATION		
Dublin 7	1 in 100 YE	AR STORM EVENT			Micro
Date 23/08/2021 17:58	Designed	by dalye			
File 190226 - Drainage Design 23.08.2021	.MDX Checked b	Y			Drainage
Innovyze	Network 2	020.1			
Or	line Controls for S	irface Water Networ	<u>`k</u>		
<u>Hydro-Brake® O</u>	ptimum Manhole: S21,	DS/PN: S1.004, Vo.	lume (m³): 4.4		
Unit Reference MD	-SHE-0053-2000-2733-200	) S1	ump Available Ye	s	
Design Head (m)	2.73		Diameter (mm) 5		
Design Flow (l/s)	2.		ert Level (m) 16.84		
Flush-Flo™		Minimum Outlet Pipe I			
Objective M Application	inimise upstream storage Surface	55	Diameter (mm) 120	0	
Application	Suriace				
Control Points	Head (m) Flow (l/s)	Control Points	Head (m) Flow (	1/s)	
Design Point (Calculated	a) 2.733 2.0	Kick-F	lo® 0.470	0.9	
Flush-Flo		Mean Flow over Head Ram	nge –	1.4	
The hydrological calculations have been based					
another type of control device other than a Hy	dro-Brake Optimum® be u	tilised then these sto	rage routing calcul	ations will be	e invalidate
Depth (m) Flow (l/s) Depth (m) Flow (l/s)	Depth (m) Flow (1/s)	Depth (m) Flow (1/s) D	epth (m) Flow (l/s)	Depth (m) Fl	Low (l/s)
		_			
0.100 1.0 0.600 1.0		2.600 1.9	5.000 2.6		3.2
0.200 1.1 0.800 1.1		3.000 2.1	5.500 2.8		3.3
0.300 1.1 1.000 1.3		3.500 2.2	6.000 2.9		3.4
	1 2 200 1 0				
0.400 1.0 1.200 1.4 0.500 0.9 1.400 1.5		4.000 2.4 4.500 2.5	6.500 3.0 7.000 3.1		3.5 3.6

BFL Consulting	Enginee	ers									Page 3	1
rmond House												
pper Ormond Qua	чy					AR STORM	AINAGE CAL	CULATION				
ublin 7											M	cro
ate 23/08/2021	17:58				Designed	by dalye						
ile 190226 - Dr	ainage	Design 2	3.08.2021.1	MDX	Checked b	у						ainage
nnovyze					Network 2	020.1						
		<u>Hydro</u>	<u>-Brake® Opt</u>	timum Mar	hole: S20	DS/PN:	S1.005, V	'olume (n	n <sup>3</sup> ): 5.9			
		Unit Re	eference MD-S	SHE-0093-4'	700-1675-470	0		Sump Avai	lable	Yes		
		Design H	. ,		1.67			Diameter	. ,	93		
		Design Flo			4.			vert Leve				
			lsh-Flo™				Outlet Pipe			150		
			jective Mir	nimise upst	ream storag Surfac	55	sted Manhole	e Diameter	(mm) 1	.200		
		Appi	ication		Suriac	е						
		Control	Points	Head (m)	Flow (l/s)	Cont	rol Points	Head	l (m) Flow	v (l/s)		
	Des	ign Point	(Calculated)	1.675	4.7		Kick-	-Flo® 0	.829	3.4		
			Flush-Flo™	0.409	4.2	Mean Flow	over Head F	Range	-	3.9		
The hydrological another type of c												
another type of t	JUNICIOI U	evice othe	i chan a nyu	IU-BLAKE C	permane pe a	itiliseu ti	lieli cliese si	LUIAYE IUL	icing care	uiacions v	viii be .	liivalluate
Depth (m) Flo	ow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (1,	/s) Depth	(m) Flow	(1/s)
0.100	2.9	0.600	4.1	1.600	4.6	2.600	5.8	5.000	) -	7.8 7.	500	9.5
0.200	3.9	0.800	3.6	1.800	4.9	3.000	6.2	5.500	) (	8.2 8.	000	9.8
0.300	4.2			2.000		3.500					500	10.1
0.400	4.2			2.200	5.3	4.000	7.1				000	10.4
0.500	4.2	1.400	4.3	2.400	5.6	4.500	7.5	7.000	) (	9.2 9.	500	10.6
		<u>Hydro</u>	-Brake® Opt	timum Mar	hole: S16	DS/PN:	S1.009, V	'olume (n	n <sup>3</sup> ): 7.7			
		Unit '	Reference MD	-SHE-0093-	4700-1670-4	700 Flush	-Flo™		Calculate	be		
			Head (m)	5 0000			ctive Minim	ise upstre				
		2	low (l/s)			1.7 Applic		T	Surfac	5		
					©1982-2020							

	Engineers	5						Pa	ge 32
Ormond House									
Jpper Ormond Qua	У				WATER DRAINAGE AR STORM EVENT		TION		
Dublin 7									Micro
Date 23/08/2021	17:58			Designed	by dalye				
File 190226 - Dr	ainage De	sign 23.08.	2021.MDX	Checked b	у				Drainage
nnovyze				Network 2	020.1				
		<u>Hydro-Brake</u>	e® Optimum Ma	nhole: S16,	DS/PN: S1.00	9, Volume	e (m³): 7.7		
		Suu	mp Available	Yes Minimum	Outlet Pipe Diam	neter (mm)	150		
			iameter (mm)		sted Manhole Diam				
		Inve	rt Level (m) 16	.077					
		Control Points	s Head (m)	Flow (l/s)	Control Poi	ints	Head (m) Flow	(l/s)	
	Desig	n Point (Calcu	lated) 1.670	4.7		Kick-Flo®	0.825	3.4	
		Flus	h-Flo™ 0.403	4.3 1	Mean Flow over H	ead Range	-	3.9	
another type of c					elationship for tilised then the				
another type of c	control dev	ice other than	a Hydro-Brake	Optimum® be u		ese storage	routing calcu	lations will	be invalidat
another type of c	control dev	ice other than	a Hydro-Brake	Optimum® be u Flow (l/s)	tilised then the	ese storage 1/s) Depth	routing calcu	s) Depth (m)	be invalidat
another type of c <b>Depth (m) Flo</b> 0.100 0.200	control dev. cow (1/s) De 2.9 3.9	ice other than epth (m) Flow 0.600 0.800	a Hydro-Brake (1/s) Depth (m) 4.1 3.5 1.600 1.800	Optimum® be u <b>Flow (1/s)</b> 4.6 4.9	tilised then the <b>Depth (m) Flow (</b> 2.600 3.000	<b>1/s) Depth</b> 5.8 5 6.2 5	(m) Flow (1/s .000 7. .500 8.	Depth (m)           9         7.500           2         8.000	be invalidat Flow (1/s) 9.5 9.8
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300	control dev. cow (1/s) De 2.9 3.9 4.2	ice other than epth (m) Flow 0.600 0.800 1.000	a Hydro-Brake (1/s) Depth (m) 4.1 3.5 3.7 2.000	Optimum® be u Flow (1/s)   1 4.6 4.9 5.1	tilised then the Depth (m) Flow ( 2.600 3.000 3.500	<b>1/s) Depth</b> 5.8 5 6.2 5 6.6 6	(m) Flow (l/s .000 7. .500 8. .000 8.	Depth (m)           9         7.500           2         8.000           6         8.500	be invalidat Flow (1/s) 9.5 9.8 10.1
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev. cow (1/s) De 2.9 3.9 4.2 4.3	ice other than (m) Flow 0.600 0.800 1.000 1.200	a Hydro-Brake (1/s) Depth (m) 4.1 3.5 3.7 4.0 2.200	Optimum® be u Flow (1/s) 1 4.6 4.9 5.1 5.3	Depth (m) Flow ( 2.600 3.000 3.500 4.000	See storage           1/s)         Depth           5.8         5           6.2         5           6.6         6           7.1         6	(m) Flow (1/s (000 7. 500 8. 500 8. 500 8.	Depth (m)           9         7.500           2         8.000           6         8.500           9         9.000	be invalidat <b>Flow (1/s)</b> 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300	control dev. cow (1/s) De 2.9 3.9 4.2	ice other than epth (m) Flow 0.600 0.800 1.000	a Hydro-Brake (1/s) Depth (m) 4.1 3.5 3.7 2.000	Optimum® be u Flow (1/s) 1 4.6 4.9 5.1 5.3	tilised then the Depth (m) Flow ( 2.600 3.000 3.500	See storage           1/s)         Depth           5.8         5           6.2         5           6.6         6           7.1         6	(m) Flow (1/s (000 7. 500 8. 500 8. 500 8.	Depth (m)           9         7.500           2         8.000           6         8.500	be invalidat <b>Flow (1/s)</b> 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev. cow (1/s) De 2.9 3.9 4.2 4.3 4.2 4.3 4.2	ice other than (m) Flow 0.600 0.800 1.000 1.200 1.400	a Hydro-Brake (1/s) Depth (m) 4.1 1.600 3.5 1.800 3.7 2.000 4.0 2.200 4.3 2.400	Optimum® be u Flow (1/s)   1 4.6 4.9 5.1 5.3 5.6	Depth (m) Flow ( 2.600 3.000 3.500 4.000	See storage           1/s)         Depth           5.8         5           6.2         5           6.6         6           7.1         6           7.5         7	(m) Flow (1/s (m) Flow (1/s (500 7. (500 8. (500 8. (500 8. (500 8.) (500 9.	Depth (m)           9         7.500           2         8.000           6         9.000           9         9.500	be invalidat Flow (1/s) 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev. cow (1/s) De 2.9 3.9 4.2 4.3 4.2 4.3 4.2	ice other than epth (m) Flow 0.600 0.800 1.000 1.200 1.400 <u>Hydro-Brake@</u>	a Hydro-Brake (1/s) Depth (m) 4.1 1.600 3.5 1.800 3.7 2.000 4.0 2.200 4.3 2.400	Optimum® be u Flow (1/s)   1 4.6 4.9 5.1 5.3 5.6 hole: S12-5	Depth (m) Flow ( 2.600 3.000 3.500 4.000 4.500 5, DS/PN: S6.0	I/s)         Depth           5.8         5           6.2         5           6.6         6           7.1         6           7.5         7           08,         Volum	(m) Flow (1/s (m) Flow (1/s (.000 7. (.500 8. (.000 8. (.000 8. (.000 9. (.000 9. (.000 9.)	Depth (m)           9         7.500           2         8.000           6         9.000           9         9.500	be invalidat Flow (1/s) 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev. cow (1/s) De 2.9 3.9 4.2 4.3 4.2 4.3	ice other than epth (m) Flow 0.600 0.800 1.000 1.200 1.400 <u>Hydro-Brake@</u>	a Hydro-Brake (1/s) Depth (m) 4.1 1.600 3.5 1.800 3.7 2.000 4.0 2.200 4.3 2.400 B Optimum Man ce MD-SHE-0064-2	Optimum® be u Flow (1/s)   1 4.6 4.9 5.1 5.3 5.6 hole: S12-5	<pre>tilised then the Depth (m) Flow (         2.600         3.000         3.500         4.000         4.500         5. DS/PN: S6.0 0</pre>	ese storage <b>1/s) Depth</b> 5.8 5 6.2 5 6.6 6 7.1 6 7.5 7 08, Volun Sump 2	(m) Flow (1/s (m) Flow (1/s (.000 7. (.500 8. (.000 8. (.000 8. (.000 8. (.000 9. (.000 9. (.000 9. (	lations will 5) Depth (m) 9 7.500 2 8.000 6 8.500 9 9.000 2 9.500	be invalidat Flow (1/s) 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev. cow (1/s) De 2.9 3.9 4.2 4.3 4.2 4.3 4.2	ice other than <b>apth (m) Flow</b> 0.600 0.800 1.000 1.200 1.400 <u>Hydro-Brake@</u> Unit Reference Design Head (m sign Flow (1/s	a Hydro-Brake (1/s) Depth (m) 4.1 1.600 3.5 1.800 3.7 2.000 4.0 2.200 4.3 2.400 B Optimum Man Ce MD-SHE-0064-2 1) 5)	Optimum® be u Flow (1/s)   1 4.6 4.9 5.1 5.3 5.6 hole: S12-5 2600-2110-2600 2.110 2.0	<pre>tilised then the Depth (m) Flow (         2.600         3.000         3.500         4.000         4.500         5. DS/PN: S6.0         0         6 </pre>	ese storage 1/s) Depth 5.8 5 6.2 5 6.6 6 7.1 6 7.5 7 08, Volun Sump 2 Diame Invert 1	routing calcu         (m) Flow (1/s         .000       7.         .500       8.         .000       8.         .000       9.         .000       9.         ne (m <sup>3</sup> ): 9.0         Available       Yeter (mm)         Level (m) 18.3	lations will 5) Depth (m) 9 7.500 2 8.000 6 8.500 9 9.000 2 9.500 es 64 65	be invalidat Flow (1/s) 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev. cow (1/s) De 2.9 3.9 4.2 4.3 4.2 4.3 4.2	ice other than (m) Flow 0.600 0.800 1.000 1.200 1.400 Hydro-Brake@ Unit Reference Design Head (m sign Flow (1/s Flush-Floc	a Hydro-Brake (1/s) Depth (m) 4.1 3.5 3.7 4.0 4.0 4.0 2.200 4.3 2.400 B Optimum Man Ce MD-SHE-0064-2 N S)	Optimum® be u Flow (1/s)   1 4.6 4.9 5.1 5.3 5.6 hole: S12-5 2600-2110-2600 2.110 Calculated	<pre>tilised then the Depth (m) Flow (         2.600         3.000         3.500         4.000         4.500         5. DS/PN: S6.0         0         6         d Minimum Outlet</pre>	ese storage 1/s) Depth 5.8 5 6.2 5 6.6 6 7.1 6 7.5 7 08, Volum Sump 2 Diame Invert 1 Pipe Diame	routing calcu         (m) Flow (1/s         .000       7.         .500       8.         .000       8.         .000       9.         .000       9.         ne (m <sup>3</sup> ): 9.0         Available       Yeter (mm)         Level (m) 18.3         eter (mm)       1	lations will 5) Depth (m) 9 7.500 2 8.000 6 8.500 9 9.000 2 9.500 es 64 65 00	be invalidat <b>Flow (1/s)</b> 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev. cow (1/s) De 2.9 3.9 4.2 4.3 4.2 4.3 4.2	ice other than (m) Flow 0.600 0.800 1.000 1.200 1.400 Hydro-Brake@ Unit Reference Design Head (m sign Flow (1/s Flush-Floc Objectiv	a Hydro-Brake (1/s) Depth (m) 4.1 3.5 3.7 4.0 4.0 4.0 2.200 4.3 2.400 B Optimum Man C MD-SHE-0064-2 N S Minimise ups	Optimum® be u Flow (1/s)   1 4.6 4.9 5.1 5.3 5.6 hole: S12-5 2600-2110-2600 2.110 2.00 Calculated stream storage	atilised then the         Depth (m) Flow (         2.600         3.000         3.500         4.000         4.500         5, DS/PN: S6.0         0         0         6         d Minimum Outlet         e       Suggested Ma	ese storage 1/s) Depth 5.8 5 6.2 5 6.6 6 7.1 6 7.5 7 08, Volum Sump 2 Diame Invert 1 Pipe Diame	routing calcu         (m) Flow (1/s         .000       7.         .500       8.         .000       8.         .000       9.         .000       9.         ne (m <sup>3</sup> ): 9.0         Available       Yeter (mm)         Level (m) 18.3         eter (mm)       1	lations will 5) Depth (m) 9 7.500 2 8.000 6 8.500 9 9.000 2 9.500 es 64 65 00	be invalidat Flow (1/s) 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev. cow (1/s) De 2.9 3.9 4.2 4.3 4.2 4.3 4.2	ice other than (m) Flow 0.600 0.800 1.000 1.200 1.400 Hydro-Brake@ Unit Reference Design Head (m sign Flow (1/s Flush-Floc	a Hydro-Brake (1/s) Depth (m) 4.1 3.5 3.7 4.0 4.0 4.0 2.200 4.3 2.400 B Optimum Man C MD-SHE-0064-2 N S Minimise ups	Optimum® be u Flow (1/s)   1 4.6 4.9 5.1 5.3 5.6 hole: S12-5 2600-2110-2600 2.110 Calculated	atilised then the         Depth (m) Flow (         2.600         3.000         3.500         4.000         4.500         5, DS/PN: S6.0         0         0         6         d Minimum Outlet         e       Suggested Ma	ese storage 1/s) Depth 5.8 5 6.2 5 6.6 6 7.1 6 7.5 7 08, Volum Sump 2 Diame Invert 1 Pipe Diame	routing calcu         (m) Flow (1/s         .000       7.         .500       8.         .000       8.         .000       9.         .000       9.         ne (m <sup>3</sup> ): 9.0         Available       Yeter (mm)         Level (m) 18.3         eter (mm)       1	lations will 5) Depth (m) 9 7.500 2 8.000 6 8.500 9 9.000 2 9.500 es 64 65 00	be invalidat <b>Flow (1/s)</b> 9.5 9.8 10.1 10.4
another type of c <b>Depth (m) Flo</b> 0.100 0.200 0.300 0.400	control dev. cow (1/s) De 2.9 3.9 4.2 4.3 4.2 4.3 4.2	ice other than (m) Flow 0.600 0.800 1.000 1.200 1.400 Hydro-Brake@ Unit Reference Design Head (m sign Flow (1/s Flush-Floc Objectiv	a Hydro-Brake (1/s) Depth (m) 4.1 3.5 3.7 4.0 4.0 4.0 2.200 4.3 2.400 B Optimum Man C MD-SHE-0064-2 N S Minimise ups	Optimum® be u Flow (1/s)   1 4.6 4.9 5.1 5.3 5.6 hole: S12-5 2600-2110-2600 2.110 2.00 Calculated stream storage	atilised then the         Depth (m) Flow (         2.600         3.000         3.500         4.000         4.500         5, DS/PN: S6.0         0         0         6         d Minimum Outlet         e       Suggested Ma	ese storage 1/s) Depth 5.8 5 6.2 5 6.6 6 7.1 6 7.5 7 08, Volum Sump 2 Diame Invert 1 Pipe Diame	routing calcu         (m) Flow (1/s         .000       7.         .500       8.         .000       8.         .000       9.         .000       9.         ne (m <sup>3</sup> ): 9.0         Available       Yeter (mm)         Level (m) 18.3         eter (mm)       1	lations will 5) Depth (m) 9 7.500 2 8.000 6 8.500 9 9.000 2 9.500 es 64 65 00	be invalidat Flow (1/s) 9.5 9.8 10.1 10.4

	Engineers	5								Pa	ge 33
Ormond House					SUDEACE	WATER DRAIN					
Upper Ormond Quay	У					EAR STORM E		ATION			
Dublin 7											Micro
Date 23/08/2021 1	17 <b>:</b> 58				Designed	by dalye					
File 190226 - Dra	ainage De	esign 2	3.08.2021.1	MDX	Checked b	ру					Drainage
Innovyze					Network 2	2020.1					
		<u>Hydro-1</u>	Brake® Opt:	imum Manh	nole: S12-	5, DS/PN: S	6.008, Vol	ume (m³)	: 9.0		
		Control	Points	Head (m)	Flow (l/s)	Control	Points	Head (m)	Flow (1	/s)	
	Desig	n Point	(Calculated) Flush-Flo™		2.6	Mean Flow ove	Kick-Flo			1.4 1.9	
			FIUSH FIO	0.205	1.0	Heali FIOW OV	er neau nang	-		1.5	
The hydrological of another type of conditional data and the type of the data and t	ontrol dev	ice othe	er than a Hyd	dro-Brake O	ptimum® be	utilised then	these stora	ge routing	calcula	tions will	l be invalidated
0.100 0.200	1.5	0.600		1.600 1.800	2.3 2.4	2.600 3.000	2.9 3.1	5.000 5.500	3.9 4.0	7.500 8.000	
0.200		1.000		2.000		3.500	3.3	6.000	4.2	8.500	
0.300	1.8									9.000	
0.300 0.400	1.8 1.7	1.200	2.0	2.200	2.6	4.000	3.5	6.500	4.4	9.000	J.1
				2.200 2.400	2.6 2.8	4.000 4.500	3.5 3.7	6.500 7.000	4.4 4.5	9.500	
0.400	1.7	1.200 1.400	2.1	2.400	2.8		3.7	7.000	4.5		
0.400	1.7	1.200 1.400 <u>Hydro</u>	2.1	2.400 timum Man	2.8 hole: S11	4.500 , DS/PN: S1	3.7  014, Volu	7.000 me (m³):	4.5 <u>6.1</u>		
0.400	1.7 1.6	1.200 1.400 <u>Hydro-</u> Unit Re	2.1	2.400 timum Man	2.8 hole: S11	4.500 , DS/PN: S1 0	3.7   014, Volu Sump	7.000	4.5 <u>6.1</u> e Yes	9.500	
0.400	1.7 1.6	1.200 1.400 <u>Hydro</u>	2.1 -Brake® Opt eference MD-S Head (m)	2.400 timum Man	2.8 hole: S11 500-2749-850	4.500 , <u>DS/PN: S1</u> 0 9	3.7   014, Volu 	7.000 <u>me (m³):</u> p Available	4.5 6.1 e Yes ) 111	9.500	
0.400	1.7 1.6	1.200 1.400 <u>Hydro</u> Unit Re Design Flo Sign Flo	2.1 -Brake® Opt eference MD-S Head (m) pw (1/s) ush-Flo™	2.400 <u>timum Man</u> SHE-0111-85	2.8 hole: S11 500-2749-850 2.74 8. Calculate	4.500 , DS/PN: S1 0 9 5 d Minimum Ou	3.7 014, Volu Sump Dia Invert tlet Pipe Dia	7.000 me (m <sup>3</sup> ): p Available ameter (mm t Level (m ameter (mm	4.5 6.1 e Yes ) 111 ) 15.616 ) 150	9.500	
0.400	1.7 1.6	1.200 1.400 <u>Hydro</u> Unit Re Design Flo Sign Flo Ok	2.1 -Brake® Opt eference MD-S Head (m) pw (1/s)	2.400 <u>timum Man</u> SHE-0111-85	2.8 hole: S11 500-2749-850 2.74 8. Calculate	4.500 , DS/PN: S1 0 9 5 d Minimum Our e Suggested	3.7 014, Volu Sump Dia Invert	7.000 me (m <sup>3</sup> ): p Available ameter (mm t Level (m ameter (mm	4.5 6.1 e Yes ) 111 ) 15.616 ) 150	9.500	
0.400	1.7 1.6	1.200 1.400 <u>Hydro</u> Unit Re Design Flo Sign Flo Ok	2.1 -Brake® Opt eference MD-S Head (m) pw (1/s) ush-Flo™ ojective Min lication	2.400 <u>timum Man</u> SHE-0111-85 nimise upst	2.8 hole: S11 500-2749-850 2.74 8. Calculate tream storage	4.500 , DS/PN: S1 0 9 5 d Minimum Our e Suggested e	3.7 014, Volu Sump Dia Invert tlet Pipe Dia	7.000 me (m <sup>3</sup> ): p Available ameter (mm t Level (m ameter (mm	4.5 6.1 e Yes ) 111 ) 15.616 ) 150 ) 1200	9.500	
0.400	1.7 1.6	1.200 1.400 Unit Re Design Flo Sign Flo Ok Appl Control	2.1 -Brake® Opt eference MD-S Head (m) pw (1/s) ush-Flo™ ojective Min lication	2.400 <u>timum Man</u> SHE-0111-85 nimise upst <b>Head (m)</b>	2.8 hole: S11 500-2749-850 2.74 8. Calculate tream storag Surfac	4.500 , DS/PN: S1 0 9 5 d Minimum Our e Suggested e	3.7 Sump Dia Invert tlet Pipe Dia d Manhole Dia	7.000 me (m <sup>3</sup> ): p Available ameter (mm t Level (m ameter (mm ameter (mm Head (m)	4.5 e Yes ) 111 ) 15.616 ) 150 ) 1200 Flow (1)	9.500	
0.400	1.7 1.6	1.200 1.400 Unit Re Design Flo Sign Flo Ok Appl Control	2.1 -Brake® Opt eference MD-S Head (m) ow (1/s) ush-Flo™ ojective Min lication Points	2.400 <u>timum Man</u> SHE-0111-85 nimise upst <b>Head (m)</b> 2.749	2.8 hole: S11 500-2749-850 2.74 8. Calculate tream storac Surfac Flow (1/s) 8.5	4.500 , DS/PN: S1 0 9 5 d Minimum Our e Suggested e	3.7 Sump Dia Invert tlet Pipe Dia d Manhole Dia Points Kick-Floo	7.000 <u>me (m<sup>3</sup>):</u> p Available ameter (mm t Level (m ameter (mm ameter (mm Head (m) 0.999	4.5 e Yes ) 111 ) 15.616 ) 150 ) 1200 Flow (1,	9.500 /s)	

DBFL Consulting Engineers		Page 34
Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION 1 in 100 YEAR STORM EVENT	
Dublin 7		Micro
Date 23/08/2021 17:58	Designed by dalye	Drainage
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Digitiada
Innovyze	Network 2020.1	

## Hydro-Brake® Optimum Manhole: S11, DS/PN: S1.014, Volume (m<sup>3</sup>): 6.1

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)										
0.100	3.9	0.600	6.6	1.600	6.6	2.600	8.3	5.000	11.3	7.500	13.7
0.200	5.9	0.800	6.3		7.0		8.8	5.500	11.8		14.1
0.300	6.4	1.000	5.3	2.000	7.3	3.500	9.5	6.000	12.3	8.500	14.5
0.400	6.6	1.200	5.8	2.200	7.6	4.000	10.1	6.500	12.8	9.000	14.9
0.500	6.7	1.400	6.2	2.400	8.0	4.500	10.7	7.000	13.2	9.500	15.3

BFL Consulting Engin	neers											Page 35
)rmond House					SURFACE WATER DRAINAGE CALCULATION							
Jpper Ormond Quay												
Dublin 7					1 in 100	YEAR S		Micco				
ate 23/08/2021 17:58	3				Designe	d by d		Micro				
'ile 190226 - Drainag	ge Design	23.08.	.2021.N		Checked by							Drainage
innovyze	· <u>-</u>				Network	2020.	1					
-												
	Summar	y of Re	sults	for 30 mi	nute 10	)0 year	Summer	(Surface	Water	Network)		
		-				-						
	Ma	argin foi	f Flood	Risk Warnin	ng (mm) 3	800.0 D1	'S Status	ON Inerti	a Statu	s OFF		
				Analysis T	lmestep	Fine DV	D Status	OFF				
	WAR	NING: Ha	lf Drain	n Time has	not been	calcula	ted as th	e structur	e is to	o full.		
				Surcharged				Half Drain	-			
		US/MH	Level	Depth		•	Overflow	Time	Flow	<u>.</u>		
	PN	US/MH Name	Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	_	
	<b>PN</b> S1.000	Name		-	(m³)	•		-	(l/s)	<b>Status</b> SURCHARGED	]	Lington of
	S1.000 S1.001	Name	(m) 20.449 20.096	(m) 0.649 0.865	(m <sup>3</sup> ) 0.000 0.000	Cap. 0.89 0.88		-	(1/s) 49.5 74.5	SURCHARGED SURCHARGED	]	Upstream of
	\$1.000 \$1.001 \$1.002	Name \$25 \$24 \$23	(m) 20.449 20.096 19.254	(m) 0.649 0.865 1.127	(m <sup>3</sup> ) 0.000 0.000 0.000	Cap. 0.89 0.88 1.43		-	(1/s) 49.5 74.5 90.6	SURCHARGED SURCHARGED FLOOD RISK		hydrobrake and
	\$1.000 \$1.001 \$1.002 \$1.003	Name S25 S24 S23 S22	(m) 20.449 20.096 19.254 17.378	(m) 0.649 0.865 1.127 0.147	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000	Cap. 0.89 0.88 1.43 1.67		-	(1/s) 49.5 74.5 90.6 95.6	SURCHARGED SURCHARGED FLOOD RISK SURCHARGED		hydrobrake and
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004	Name \$25 \$24 \$23 \$22 \$21	(m) 20.449 20.096 19.254 17.378 17.209	(m) 0.649 0.865 1.127 0.147 0.067	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000	Cap. 0.89 0.88 1.43 1.67 0.00		-	(1/s) 49.5 74.5 90.6 95.6 0.6	SURCHARGED SURCHARGED FLOOD RISK SURCHARGED SURCHARGED	~	hydrobrake and
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1	(m) 20.449 20.096 19.254 17.378 17.209 17.316	(m) 0.649 0.865 1.127 0.147 0.067 0.308	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.89 0.88 1.43 1.67 0.00 1.35		-	(1/s) 49.5 74.5 90.6 95.6 0.6 82.9	SURCHARGED SURCHARGED FLOOD RISK SURCHARGED SURCHARGED SURCHARGED		hydrobrake and
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2	(m) 20.449 20.096 19.254 17.378 17.209 17.316 17.258	(m) 0.649 0.865 1.127 0.147 0.067 0.308 0.125	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.89 0.88 1.43 1.67 0.00 1.35 0.57		-	(1/s) 49.5 74.5 90.6 95.6 0.6 82.9 25.2	SURCHARGED SURCHARGED FLOOD RISK SURCHARGED SURCHARGED SURCHARGED		hydrobrake and
	S1.000 S1.001 S1.002 S1.003 S1.004 S2.000 S3.000 S2.001	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1	(m) 20.449 20.096 19.254 17.378 17.209 17.316 17.258 17.210	(m) 0.649 0.865 1.127 0.147 0.067 0.308 0.125 0.237	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.89 0.88 1.43 1.67 0.00 1.35 0.57 1.99		-	(1/s) 49.5 74.5 90.6 95.6 0.6 82.9 25.2 107.8	SURCHARGED SURCHARGED FLOOD RISK SURCHARGED SURCHARGED SURCHARGED SURCHARGED	~	hydrobrake and
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000 \$2.001 \$4.000	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9	(m) 20.449 20.096 19.254 17.378 17.209 17.316 17.258 17.210 17.152	(m) 0.649 0.865 1.127 0.147 0.067 0.308 0.125 0.237 0.172	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.89 0.88 1.43 1.67 0.00 1.35 0.57 1.99 1.31		-	(1/s) 49.5 74.5 90.6 95.6 0.6 82.9 25.2 107.8 81.6	SURCHARGED SURCHARGED FLOOD RISK SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED	~	hydrobrake and
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000 \$2.001 \$4.000 \$1.005	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20	(m) 20.449 20.096 19.254 17.378 17.209 17.316 17.258 17.210 17.152 17.150	(m) 0.649 0.865 1.127 0.147 0.067 0.308 0.125 0.237 0.172 0.232	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.89 0.88 1.43 1.67 0.00 1.35 0.57 1.99 1.31 0.03		-	(1/s) 49.5 74.5 90.6 95.6 0.6 82.9 25.2 107.8 81.6 4.2	SURCHARGED SURCHARGED FLOOD RISK SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED		hydrobrake and
	S1.000 S1.001 S1.002 S1.003 S1.004 S2.000 S3.000 S2.001 S4.000 S1.005 S1.006	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20 \$20 \$19	(m) 20.449 20.096 19.254 17.378 17.209 17.316 17.258 17.210 17.152 17.150 16.501	(m) 0.649 0.865 1.127 0.147 0.067 0.308 0.125 0.237 0.172 0.232 -0.291	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.89 0.88 1.43 1.67 0.00 1.35 0.57 1.99 1.31 0.03 0.24		-	<pre>(1/s) 49.5 74.5 90.6 95.6 0.6 82.9 25.2 107.8 81.6 4.2 35.4</pre>	SURCHARGED SURCHARGED FLOOD RISK SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED		hydrobrake and
	S1.000 S1.001 S1.002 S1.003 S1.004 S2.000 S3.000 S2.001 S4.000 S1.005 S1.006 S5.000	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20 \$20 \$19 \$18-1	(m) 20.449 20.096 19.254 17.378 17.209 17.316 17.258 17.210 17.152 17.150 16.501 17.013	(m) 0.649 0.865 1.127 0.147 0.067 0.308 0.125 0.237 0.172 0.232 -0.291 -0.156	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.89 0.88 1.43 1.67 0.00 1.35 0.57 1.99 1.31 0.03 0.24 0.20		-	<pre>(1/s) 49.5 74.5 90.6 95.6 0.6 82.9 25.2 107.8 81.6 4.2 35.4 12.7</pre>	SURCHARGED SURCHARGED FLOOD RISK SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED OK OK		hydrobrake and
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000 \$2.001 \$4.000 \$1.005 \$1.006 \$5.000 \$1.007	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20 \$20 \$19 \$18-1 \$18	(m) 20.449 20.096 19.254 17.378 17.209 17.316 17.258 17.210 17.152 17.150 16.501 17.013 16.424	(m) 0.649 0.865 1.127 0.147 0.067 0.308 0.125 0.237 0.172 0.232 -0.291 -0.156 -0.280	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.89 0.88 1.43 1.67 0.00 1.35 0.57 1.99 1.31 0.03 0.24 0.20 0.31		-	<pre>(1/s) 49.5 74.5 90.6 95.6 0.6 82.9 25.2 107.8 81.6 4.2 35.4 12.7 48.0</pre>	SURCHARGED SURCHARGED FLOOD RISK SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED		hydrobrake and
	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000 \$2.001 \$4.000 \$1.005 \$1.006 \$5.000 \$1.007 \$1.008	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20 \$19 \$18-1 \$18 \$17	(m) 20.449 20.096 19.254 17.378 17.209 17.316 17.258 17.210 17.152 17.150 16.501 17.013 16.424 16.372	(m) 0.649 0.865 1.127 0.147 0.067 0.308 0.125 0.237 0.172 0.232 -0.291 -0.156 -0.280 -0.285	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.89 0.88 1.43 1.67 0.00 1.35 0.57 1.99 1.31 0.03 0.24 0.20 0.31 0.29		-	<pre>(1/s) 49.5 74.5 90.6 95.6 0.6 82.9 25.2 107.8 81.6 4.2 35.4 12.7 48.0 52.4</pre>	SURCHARGED SURCHARGED FLOOD RISK SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED OK OK		hydrobrake and
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	\$1.000 \$1.001 \$1.002 \$1.003 \$1.004 \$2.000 \$3.000 \$2.001 \$4.000 \$1.005 \$1.006 \$5.000 \$1.007 \$1.008 \$1.009 \$1.010	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20 \$19 \$18-1 \$18 \$17 \$16 \$15 \$14	(m) 20.449 20.096 19.254 17.378 17.209 17.316 17.258 17.210 17.152 17.150 16.501 17.013 16.424 16.372 16.300 16.234	(m) 0.649 0.865 1.127 0.147 0.067 0.308 0.125 0.237 0.172 0.232 -0.291 -0.156 -0.280 -0.285 -0.227 -0.258	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.89 0.88 1.43 1.67 0.00 1.35 0.57 1.99 1.31 0.03 0.24 0.20 0.31 0.29 0.02 0.02		-	<pre>(1/s) 49.5 74.5 90.6 95.6 0.6 82.9 25.2 107.8 81.6 4.2 35.4 12.7 48.0 52.4 2.1 4.0 19.0</pre>	SURCHARGED SURCHARGED FLOOD RISK SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED OK OK OK OK		
	S1.000 S1.001 S1.002 S1.003 S1.004 S2.000 S3.000 S2.001 S4.000 S1.005 S1.006 S5.000 S1.007 S1.008 S1.009 S1.010 S1.011 S1.012	Name \$25 \$24 \$23 \$22 \$21 \$20-1-1 \$20-2 \$20-1 \$9 \$20 \$19 \$18-1 \$18 \$17 \$16 \$15 \$14	(m) 20.449 20.096 19.254 17.378 17.209 17.316 17.258 17.210 17.152 17.150 16.501 17.013 16.424 16.372 16.300 16.234 16.233 16.232	(m) 0.649 0.865 1.127 0.147 0.067 0.308 0.125 0.237 0.172 0.232 -0.291 -0.156 -0.280 -0.285 -0.227 -0.258 -0.157	(m <sup>3</sup> ) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Cap. 0.89 0.88 1.43 1.67 0.00 1.35 0.57 1.99 1.31 0.03 0.24 0.20 0.31 0.29 0.02 0.02 0.02 0.10		-	<pre>(1/s) 49.5 74.5 90.6 95.6 0.6 82.9 25.2 107.8 81.6 4.2 35.4 12.7 48.0 52.4 2.1 4.0 19.0</pre>	SURCHARGED SURCHARGED FLOOD RISK SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED SURCHARGED OK OK OK OK OK		hydrobrake and

DBFL Consulting Engineers		Page 36
Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION	
Dublin 7	1 in 100 YEAR STORM EVENT	Micro
Date 23/08/2021 17:58	Designed by dalye	
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Drainage
Innovyze	Network 2020.1	

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)		Flow / Cap.	Overflow (1/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	
					-					
S6.001		19.556		0.000	0.27			14.2	OK	
S6.002		19.401		0.000	0.27			14.7	OK	
S7.000	S12-10-1			0.000	0.21			13.3	OK	
S6.003		19.232		0.000	0.67			29.8	OK	
S8.000		19.722		0.000	0.73			35.3	OK	
S8.001	S12-9-1		-0.047	0.000	0.97			35.8	OK	
S6.004		19.120	0.076	0.000	1.08				SURCHARGED	
S9.000	S12-8-1		-0.153	0.000	0.22			13.8	OK	upstream
S6.005		18.998	0.067	0.000	0.99				SURCHARGED	hydrobrak
S6.006		18.922	0.072	0.000	1.19				SURCHARGED	
S6.007	S12-6	18.899	0.104	0.000	1.28				SURCHARGED	
S10.000	S12-5-5	20.526	-0.174	0.000	0.12			8.4	OK	
S10.001	S12-5-4	20.073	-0.135	0.000	0.33			17.5	OK	
S10.002	S12-5-3	19.836	-0.122	0.000	0.42			21.0	OK	
S10.003	S12-5-2	19.598	-0.099	0.000	0.60			33.2	OK	
S11.000	S12-5-1-1	19.603	-0.097	0.000	0.60			34.0	OK	
S10.004	S12-5-1	18.896	0.000	0.000	0.55			69.0	SURCHARGED	
S6.008	S12-5	18.897	0.157	0.000	0.02				SURCHARGED	
S6.009	S12-4	18.409	-0.293	0.000	0.10			9.6	OK	
S6.010	S12-3	18.346	-0.286	0.000	0.13			31.2	OK	
S6.011	S12-2	17.430	-0.263	0.000	0.19			40.3	OK	
S6.012	S12-1	17.144	-0.261	0.000	0.20			44.3	OK	
S1.013	S12	16.231	0.061	0.000	0.33			59.5	SURCHARGED	
S1.014	S11	16.229	0.313	0.000	0.13			6.7	SURCHARGED	
S1.015	S10	15.650	-0.239	0.000	0.09			6.7	OK	

DBFL Consulting Engineers		Page 37
Ormond House		
Upper Ormond Quay	SURFACE WATER DRAINAGE CALCULATION 1 in 100 YEAR STORM EVENT	
Dublin 7	THI TOU TEAR STORIN EVENT	Micro
Date 23/08/2021 17:58	Designed by dalye	Drainage
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Diamaye
Innovyze	Network 2020.1	L

# Summary of Results for 30 minute 100 year Summer (Surface Water Network)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)		Flow / Cap.	Overflow (1/s)	Half Drain Time (mins)	Flow	Status
S1.016	S9	15.517	-0.237	0.000	0.10			6.7	OK
S1.017	S8	15.389	-0.235	0.000	0.11			6.7	OK
S1.018	s7	15.271	-0.234	0.000	0.11			6.7	OK
S1.019	S6	15.191	-0.235	0.000	0.11			6.7	OK
S1.020	S5	14.214	-0.236	0.000	0.10			6.7	OK
S1.021	S4	14.074	-0.236	0.000	0.10			6.7	OK
S1.022	s3	13.927	-0.236	0.000	0.10			6.7	OK
S1.023	S2	13.770	-0.237	0.000	0.10			6.7	OK

190226-Rep-002

**APPENDIX D – CORRESPONDANCE WITH IRISH WATER** 

# **Brendan Keogh - DBFL Consulting Engineers**

From:	Brendan Keogh - DBFL Consulting Engineers
Sent:	Wednesday 17 June 2020 16:14
То:	Brian O'Mahony
Subject:	RE: 190226 - Sandford Road - PCE Request CDS19008588
Attachments:	Irish Water Map - Sandford Ranelagh (BK 17 06 2020).pdf

Brian,

RE: PCE Request CDS19008588 (Ardstone Homes Lands at Sandford Road, Ranelagh).

Just following up on the e-mail trail below.

We have explored options to direct surface water flows from the proposed development to the existing surface water drainage infrastructure in Eglinton Road rather than the combined sewers adjacent to the site.

We now confirmed that surface water drainage flows will go to Eglinton Road and only foul drainage flows will be directed to the combined sewer in Milltown Road and Sandford Road (also refer to the attached marked up extract from the IW network plan).

As per the yellow highlight in the e-mail below, can you provide Irish Water's COF letter ?

# Regards

From: Brian O'Mahony <bomahony@water.ie>
Sent: Wednesday 6 May 2020 16:50
To: Brendan Keogh - DBFL Consulting Engineers <Brendan.Keogh@dbfl.ie>
Subject: RE: 190226 - Sandford Road - PCE Request CDS19008588

Brendan,

As discussed, see comments below in relation to you sewer connection:

Based on the grades the customer has provided and contour map (below) it appears a connection to the storm water sewer to the north of the site is feasible. This will require some revision of internal storm sewers. The connection of the developments ww flows to the combined sewer is feasible once the surface water flows are discharged to the storm sewer.

AP will only consider a connection of surface water flows to the storm sewer with supporting correspondence from the LA that a connection to the storm sewer will not be permitted.



Regards,

Brian O'Mahony (CEng MIEI) Connections & Developer Services - Southern Region – Design Engineer

**Uisce Éireann** Teach na hAbhann Móire, Páirc Ghnó Mhala, Mala, Contae Chorcaí, Éire **Irish Water** Blackwater House, Mallow Business Park, Mallow, County Cork, Ireland

P: +353 22 52205 E: bomahony@water.ie www.water.ie

From: Brendan Keogh - DBFL Consulting Engineers [mailto:Brendan.Keogh@dbfl.ie] Sent: 20 April 2020 11:02 To: Brian O'Mahony Subject: FW: 190226 - Sandford Road - PCE Request CDS19008588

Brian,

Just following up on our discussion on Ardstone's site at Sandford Road, Ranelagh.

You mentioned that another department in IW was to look at DBFL's response to IW's queries.

Have you had any feedback that I could update the design team here with ?

Thanks

From: Brendan Keogh - DBFL Consulting Engineers <<u>Brendan.Keogh@dbfl.ie</u>>
Sent: Tuesday 14 April 2020 11:58
To: bomahony@water.ie
Subject: RE: 190226 - Sandford Road - PCE Request CDS19008588

Brian,

In response to your queries in the e-mail below, please see attached DBFL Technical Note, 190226-TN-002.

An assessment of existing/proposed surface water and foul drainage flows is included. In summary, the proposed development results in a significant reduction of flows when compared to the pre-development scenario (due to implementation of SUDS methodologies which are outlined in the technical note).

The feasibility of directing surface water flows to the existing surface water infrastructure at Milltown Road / Prospect Lane and Eglinton Road has also been assessed.

Can you please review and comment on the attached information ?

You can contact me if you need to discuss this further on 086 4056246.

Regards

From: Brian O'Mahony <<u>bomahony@water.ie</u>>
Sent: Monday 30 March 2020 15:44
To: Brendan Keogh - DBFL Consulting Engineers <<u>Brendan.Keogh@dbfl.ie</u>>
Subject: RE: 190226 - Sandford Road - PCE Request CDS19008588

# Brendan,

Our asset planning team have just finished their review of this. They have requested further information in relation to the storm connection. As you can see from the screenshot below there are 2 storm sewers relatively close to the development. Have these options been explored with Dublin City Council?

In addition to this there is some concern over the capacity of the Combined sewers to take the foul flow load from the development, this would have to go through our modelling team and depend on onginng surveys in the area. All of this would take time. However if you were to connect to the storm sewer and divert any existing hardstanding to this storm sewer it would offset any impact from the foul connection. In this scenario, given the development will be delivering a net reduction in flows we could allow the connection without surveys and modelling.

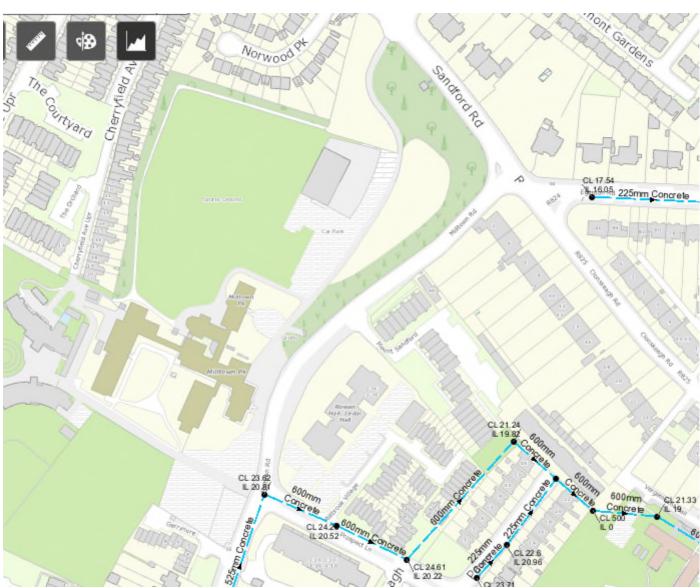
Please return with

- confirmation that you will not connect the storm drainage to the combined sewer
- a high level calculation as to the existing storm load flow from the site

Following this I can give you a confirmation of feasibility letter.

Regards,

Brian



Brian O'Mahony (CEng MIEI) Connections & Developer Services - Southern Region – Design Engineer

**Uisce Éireann** Teach na hAbhann Móire, Páirc Ghnó Mhala, Mala, Contae Chorcaí, Éire **Irish Water** Blackwater House, Mallow Business Park, Mallow, County Cork, Ireland

P: +353 22 52205 E: bomahony@water.ie www.water.ie

From: Brendan Keogh - DBFL Consulting Engineers [mailto:Brendan.Keogh@dbfl.ie]
Sent: 30 March 2020 14:52
To: Brian O'Mahony
Subject: 190226 - Sandford Road - PCE Request CDS19008588

Brian,

I'm following up on Fionan's e-mail from last week.

Ardstone have a PCE request in for a site in Ranelagh (CDS19008588). It was submitted in December 2019.

The last update we received from IW was that this PCE is currently with the Asset Planning team.

Could you advise when this PCE letter might be issued ? We're about 2 weeks from requesting a pre-app meeting with ABP.

If needed you can contact me directly on 086 4056246.

Thanks

From: Fionan Ginty <<u>fginty@water.ie</u>>
Sent: Monday 23 March 2020 15:01
To: Brian O'Mahony <<u>bomahony@water.ie</u>>
Cc: Brendan Keogh - DBFL Consulting Engineers <<u>Brendan.Keogh@dbfl.ie</u>>
Subject: FW: 190226 - Sandford Road - PCE Request CDS19008588

Brian,

See below from DBFL in relation to CDS19008588.

Regards

Fionán

From: Brendan Keogh - DBFL Consulting Engineers [mailto:Brendan.Keogh@dbfl.ie]
Sent: 23 March 2020 14:44
To: Fionan Ginty
Subject: 190226 - Sandford Road - PCE Request CDS19008588

Fionan,

Thanks for your time on the phone this afternoon, as discussed, Ardstone have a PCE request in for a site in Ranelagh (CDS19008588). It was submitted in December 2019.

From our correspondence with <u>newconnections@water.ie</u> we understand this PCE is with asset planning.

As discussed, could you forward this e-mail to your colleague in asset planning that is handling this enquiry?

We're getting closer to requesting a pre-app meeting with ABP (2-3 weeks) and would like an update as to when the IW letter might get issued ? If needed asset planning can contact me directly on 086 4056246.

Thanks

Brendan Keogh Associate Director Civils + 353 1 4004000





Steve Cassidy Ardstone Residential Partners 48 Fitzwilliam Square Dublin 2, Co. Dublin

18 June 2020

Dear Steve Cassidy,

# Re: Connection Reference No CDS19008588 pre-connection enquiry -Subject to contract | Contract denied

# Connection for Multi/Mixed Use Development of 750 unit(s) at Sandford Road, Ranelagh, Dublin.

Irish Water has reviewed your pre-connection enquiry in relation to a water connection at Sandford Road, Ranelagh, Dublin.

Based upon the details that you have provided with your pre-connection enquiry and on the capacity currently available in the network(s), as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place, your proposed connection to the Irish Water network(s) can be facilitated.

Strategic Housing Development:

Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. Therefore, in advance of submitting your full application to An Bord Pleanala for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services. Please submit your design to CDSDesignQA@water.ie.

All infrastructure should be designed and installed in accordance with the Irish Water Codes of Practice and Standard Details. A design proposal for the water and/or wastewater infrastructure should be submitted to Irish Water for assessment. Prior to submitting your planning application, you are required to submit these detailed design proposals to Irish Water for review.

You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed at a later date.

A connection agreement can be applied for by completing the connection application form available at **www.water.ie**/**connections**. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities.

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

Yours sincerely,

M Buyes

Maria O'Dwyer Connections and Developer Services

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

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



Your Ref: ABP-307977-20 Our Ref: CDS19008588

An Bord Pleanála, 64 Marlborough Street, Dublin 1

4<sup>th</sup> September 2020

**Uisce Éireann** Bosca OP 6000 Baile Átha Cliath 1 Éire

**Irish Water** PO Box 6000 Dublin 1 Ireland

T: +353 1 89 25000 F: +353 1 89 25001 www.water.ie

Dear Sir/ Madam,

**Re:** Strategic Housing Development – 714 no. residential units (583 no. Build to Rent apartment, 131 no. Build to Sell apartments) and associated site works. Milltown Park, Sanford Road, Dublin 6.

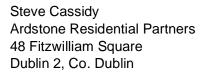
Irish Water has received notification of Sandford Living Limited request to enter into consultations under Section 5 of the Planning and Development (Housing) and Residential Tenancies Act 2016 in respect of the above mentioned proposed development.

Irish Water has assessed and has issued a Confirmation of Feasibility for 750 residential units for connection(s) to the Irish Water network(s).

Please note in general, all development is to be carried out in compliance with Irish Waters Standards Codes and Practices. Where any proposals by the applicant to build over or divert existing water or wastewater services the applicant is required to submit details to Irish Water for assessment of feasibility ahead of any SHD application to the board.

Queries relating to the observations above should be sent to planning@water.ie

Maria O'Dwyer Connections and Developer Services Manager



19 January 2021

# Re: Design Submission for Sandford Road, Ranelagh, Dublin (the "Development") (the "Design Submission") / Connection Reference No: CDS19008588

Dear Steve Cassidy,

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 <u>www.water.ie/connections</u>. 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)(<u>https://www.cru.ie/document\_group/irish-waters-water-charges-plan-2018/</u>).

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: Alvaro Garcia Email: agarcia@water.ie

Yours sincerely,

Monne Massis

Yvonne Harris Head of Customer Operations

Stiúrthóirí / Directors: Cathal Marley (Chairman), Niall Gleeson, Eamon Gallen, Yvonne Harris, Brendan Murphy, Maria O'Dwyer

Oifig Chláraithe / Registered Office: Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86 / Colvill House, 24-26 Talbot Street, Dublin 1, D01 NP86 Is cuideachta ghníomhaíochta ainmnithe atá faoi theorainn scaireanna é Uisce Éireann / Irish Water is a designated activity company, limited by shares. Uimhir Chláraithe in Éirinn / Registered in Ireland No.: 530363



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

www.water.ie

# Appendix A

# **Document Title & Revision**

190226-DBFL-CS-SP-DR-C-1001 Site Services Layout 190226-DBFL-CS-SP-DR-C-1001 Site Services 190226-DBFL-FW-SP-DR-C-3001 Foul Water Longsection Sheet 1 190226-DBFL-FW-SP-DR-C-3002 Foul Water Longsection Sheet 2 190226-DBFL-WM-SP-DR-C-1001 Site Watermain Layout

For further information, visit <u>www.water.ie/connections</u>

<u>Notwithstanding any matters listed above, the Customer (including any appointed</u> <u>designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay</u> <u>Works.</u> 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. 190226-Rep-002

**APPENDIX E – FOUL DRAINAGE CALCULATIONS** 

		Page 1							
Ormond House									
Upper Ormond Quay	FOUL DRAINAGE CALCULATION								
Dublin 7		Micro							
Date 23/08/2021 17:37	Designed by dalye	Drainage							
File 190226 - Drainage Design 23.08.2021.MDX									
Innovyze									
<u>D</u> e	FOUL SEWERAGE DESIGN esign Criteria for Foul								
Pipe Size	es STANDARD Manhole Sizes STANDARD								
Calculation Method EN 752 Add Flow / Frequency Factor 0.50 Minimum D	Backdrop Height (m) 0.200 Min Slope for Optimisation (1: Designed with Level Soffits	's) 1.00							
Netw	OIR DESIGN TADIE IOI FOUL								
	ork Design Table for Foul								
<u>Netw</u> PN Length Fall Slope Are (m) (m) (1:X) (ha	a Units Base k HYD DIA Section Type Auto								
PN Length Fall Slope Are	a Units Base k HYD DIA Section Type Auto ) Flow (1/s) (mm) SECT (mm) Design 00 54.0 0.0 1.500 o 225 Pipe/Conduit 🔒								
PN         Length         Fall         Slope         Area           (m)         (m)         (1:X)         (ha           F1.000         14.021         0.174         80.6         0.000           F1.001         45.021         0.752         59.9         0.000	a Units Base k HYD DIA Section Type Auto ) Flow (1/s) (mm) SECT (mm) Design 00 54.0 0.0 1.500 o 225 Pipe/Conduit 👸								
PN         Length         Fall         Slope         Area           (m)         (m)         (1:X)         (ha           F1.000         14.021         0.174         80.6         0.00           F1.001         45.021         0.752         59.9         0.00	a Units Base k HYD DIA Section Type Auto ) Flow (1/s) (mm) SECT (mm) Design 00 54.0 0.0 1.500 o 225 Pipe/Conduit 00 117.0 0.0 1.500 o 225 Pipe/Conduit Network Results Table								
PN         Length         Fall         Slope         Area           (m)         (m)         (1:X)         (ha           F1.000         14.021         0.174         80.6         0.00           F1.001         45.021         0.752         59.9         0.00	a Units Base k HYD DIA Section Type Auto ) Flow (1/s) (mm) SECT (mm) Design 00 54.0 0.0 1.500 o 225 Pipe/Conduit 00 117.0 0.0 1.500 o 225 Pipe/Conduit Network Results Table ase E Units Add Flow P.Dep P.Vel Vel Cap Flow								
PN Length Fall Slope Area (m) (m) (1:X) (ha F1.000 14.021 0.174 80.6 0.00 F1.001 45.021 0.752 59.9 0.00 PN US/IL Σ Area Σ Ba (m) (ha) Flow (	a Units Base k HYD DIA Section Type Auto ) Flow (1/s) (mm) SECT (mm) Design 00 54.0 0.0 1.500 o 225 Pipe/Conduit 00 117.0 0.0 1.500 o 225 Pipe/Conduit Network Results Table ase E Units Add Flow P.Dep P.Vel Vel Cap Flow (1/s) (1/s) (mm) (m/s) (m/s) (1/s) (1/s)								
PN         Length         Fall         Slope         Area           (m)         (m)         (1:X)         (ha           F1.000         14.021         0.174         80.6         0.00           F1.001         45.021         0.752         59.9         0.00           PN         US/IL         E         Area         E         Ba	a Units Base k HYD DIA Section Type Auto ) Flow (1/s) (mm) SECT (mm) Design 00 54.0 0.0 1.500 o 225 Pipe/Conduit 00 117.0 0.0 1.500 o 225 Pipe/Conduit Network Results Table ase E Units Add Flow P.Dep P.Vel Vel Cap Flow								
PN         Length         Fall         Slope         Area           (m)         (m)         (1:X)         (ha           F1.000         14.021         0.174         80.6         0.00           F1.001         45.021         0.752         59.9         0.00           PN         US/IL         E         Area         E         Ba           (m)         (ha)         Flow         (           F1.000         19.575         0.000	a Units       Base       k       HYD       DIA       Section Type       Auto         )       Flow (1/s)       (mm)       SECT (mm)       Design         00       54.0       0.0       1.500       o       225       Pipe/Conduit       Image: Conduit Conduit         00       117.0       0.0       1.500       o       225       Pipe/Conduit       Image: Conduit       Image: Conduit <td< td=""><td></td></td<>								

DBFL Consulting Engineers		Page 2
Ormond House		
Upper Ormond Quay	FOUL DRAINAGE CALCULATION	
Dublin 7		Micro
Date 23/08/2021 17:37	Designed by dalye	Drainage
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Digitiacie
Innovyze	Network 2020.1	

# <u>Network Design Table for Foul</u>

PN	Length	Fall	Slope	Area	Units	Ba	ase	k	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)		Flow	(l/s)	(mm)	SECT	(mm)		Design
F1.002	34.879	0.650	53.7	0.000	114.0		0.0	1.500	0	225	Pipe/Conduit	6
F1.003	52.249	0.349	149.7	0.000	39.0		0.0	1.500	0	225	Pipe/Conduit	ě
F1.004	31.048	0.206	150.7	0.000	60.0		0.0	1.500	0	225	Pipe/Conduit	ĕ
F1.005	7.611	0.127	59.9	0.000	0.0		0.0	1.500	0	225	Pipe/Conduit	ď
F2.000	5.244	0.052	100.8	0.000	411.0		0.0	1.500	0	225	Pipe/Conduit	<del>0</del>
F1.006	26.559	0.443	60.0	0.000	0.0		0.0	1.500	0	225	Pipe/Conduit	•
F3.000	21.433	0.268	80.0	0.000	267.0		0.0	1.500	0	225	Pipe/Conduit	ð

## <u>Network Results Table</u>

PN	US/IL (m)	Σ Area (ha)		Σ	Units	Add Flow (1/s)	-	P.Vel (m/s)		- · · <b>-</b>	Flow (l/s)	
	18.649 18.000	0.000	0.0		285.0 324.0	1.7 1.8	61 83	1.15 0.81	1.57 0.94	62.4 37.3	10.1 10.8	
	17.651 17.445	0.000	0.0		384.0 384.0	2.0 2.0	87 68	0.83 1.16	0.93 1.48	37.1 59.0	11.8 11.8	
F2.000	17.370	0.000	0.0		411.0	2.0	79	0.97	1.14	45.4	12.2	
F1.006	17.318	0.000	0.0		795.0	2.8	82	1.28	1.48	59.0	16.9	
F3.000	17.375	0.000	0.0		267.0	1.6	67	0.99	1.28	51.1	9.8	
			©19	82	2-2020	Innovyz	ze					

DBFL Consulting Engineers		Page 3
Ormond House		
Upper Ormond Quay	FOUL DRAINAGE CALCULATION	
Dublin 7		Micro
Date 23/08/2021 17:37	Designed by dalye	Drainage
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Diamage
Innovyze	Network 2020.1	

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	ase (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F3.001	22.804	0.219	104.0	0.000	21.0	0.0	1.500	0	225	Pipe/Conduit	•
F1.007	29.528	0.340	86.8	0.000	15.0	0.0	1.500	0	225	Pipe/Conduit	ď
F4.000	35.906	0.378	95.0	0.000	60.0	0.0	1.500	0	225	Pipe/Conduit	ð
F1.008	14.769	0.238	62.1	0.000	0.0	0.0	1.500	0	225	Pipe/Conduit	ď
	53.271 17.438			0.000	141.0 30.0		1.500 1.500	0		Pipe/Conduit Pipe/Conduit	<del>d</del>

### <u>Network Results Table</u>

	PN	US/IL (m)		Σ Base Flow (l/s)		Add Flow (1/s)	-	P.Vel (m/s)		-		
1	F3.001	17.107	0.000	0.0	288.0	1.7	73	0.91	1.13	44.8	10.2	
1	F1.007	16.875	0.000	0.0	1098.0	3.3	100	1.17	1.23	49.0	19.9	
1	F4.000	17.207	0.000	0.0	60.0	0.8	48	0.75	1.18	46.8	4.6	
]	F1.008	16.534	0.000	0.0	1158.0	3.4	92	1.33	1.46	58.0	20.4	
		<b>19.104</b> 17.439	0.000	0.0	141.0 171.0	1.2 1.3	45 63	1.25 0.86	2.03 1.15	80.9 45.6	7.1 7.8	
				©19	82-2020	Innovyz	ze					

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Ormond House		
Upper Ormond Quay	FOUL DRAINAGE CALCULATION	
Dublin 7		Micro
Date 23/08/2021 17:37	Designed by dalye	Drainage
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Diamade
Innovyze	Network 2020.1	

PN	Length	Fall	Slope	Area	Units	Ba	ise	k	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)		Flow	(l/s)	(mm)	SECT	(mm)		Design
F5.002	17.803	0.178	100.0	0.000	0.0		0.0	1.500	0	225	Pipe/Conduit	ď
F5.003	10.346	0.071	146.0	0.000	0.0		0.0	1.500	0	225	Pipe/Conduit	ĕ
F5.004	49.372	0.291	169.8	0.000	84.0		0.0	1.500	0	225	Pipe/Conduit	ĕ
F5.005	24.696	0.137	180.3	0.000	60.0		0.0	1.500	0	225	Pipe/Conduit	- J
F5.006	6.627	0.037	180.0	0.000	0.0		0.0	1.500	0	225	Pipe/Conduit	Ť
F5.007	45.675	0.254	180.0	0.000	0.0		0.0	1.500	0	225	Pipe/Conduit	
F1.009	27.304	0.182	150.0	0.000	0.0		0.0	1.500	0	225	Pipe/Conduit	5
F1.010	5.875	0.039	151.0	0.000	0.0		0.0	1.500	0	225	Pipe/Conduit	6

### <u>Network Results Table</u>

PN	US/IL (m)	Σ Area (ha)	Base (1/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)		Cap (1/s)	Flow (l/s)	
F5.002	17.265	0.000	0.0	171.0	1.3	63	0.86	1.15	45.6	7.8	
F5.003	17.087	0.000	0.0	171.0	1.3	70	0.75	0.95	37.7	7.8	
F5.004	17.016	0.000	0.0	255.0	1.6	80	0.75	0.88	35.0	9.6	
F5.005	16.725	0.000	0.0	315.0	1.8	87	0.76	0.85	33.9	10.6	
F5.006	16.588	0.000	0.0	315.0	1.8	87	0.76	0.85	34.0	10.6	
F5.007	16.551	0.000	0.0	315.0	1.8	87	0.76	0.85	34.0	10.6	
F1.009	16.297	0.000	0.0	1473.0	3.8	128	0.99	0.94	37.2	23.0	
F1.010	16.115	0.000	0.0	1473.0	3.8	128	0.98	0.93	37.1	23.0	

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Ormond House		
Upper Ormond Quay	FOUL DRAINAGE CALCULATION	
Dublin 7		Micro
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PN	Length	Fall	Slope	Area	Units	Ba	ase	k	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)		Flow	(l/s)	(mm)	SECT	(mm)		Design
F6.000	25.575	0.400	63.9	0.000	24.0		0.0	1.500	0	225	Pipe/Conduit	ð
F6.001	7.584	0.092	82.4	0.000	20.0		0.0	1.500	0	225	Pipe/Conduit	ĕ
F6.002	8.025	0.096	83.6	0.000	0.0		0.0	1.500	0	225	Pipe/Conduit	ě
F6.003	18.170	0.216	84.0	0.000	0.0		0.0	1.500	0	225	Pipe/Conduit	
F7.000	40.493	0.425	95.2	0.000	69.0		0.0	1.500	0	225	Pipe/Conduit	ð
F6.004	26.821	0.215	125.0	0.000	0.0		0.0	1.500	0	225	Pipe/Conduit	•
F8.000	25.953	0.270	96.1	0.000	69.0		0.0	1.500	0	225	Pipe/Conduit	ð

### <u>Network Results Table</u>

PN	US/IL (m)		Σ Base Flow (l/s)	Σ Units	Add Flow (1/s)	-	P.Vel (m/s)		-		
	20.454	0.000	0.0	24.0	0.5				57.1		
F6.001	20.054	0.000	0.0	44.0	0.7	43	0.75	1.26	50.3	4.0	
F6.002	19.962	0.000	0.0	44.0	0.7	43	0.75	1.26	49.9	4.0	
F6.003	19.866	0.000	0.0	44.0	0.7	43	0.75	1.25	49.8	4.0	
F7.000	20.075	0.000	0.0	69.0	0.8	50	0.77	1.18	46.8	5.0	
F6.004	19.650	0.000	0.0	113.0	1.1	60	0.75	1.03	40.8	6.4	
F8.000	19.775	0.000	0.0	69.0	0.8	50	0.76	1.17	46.6	5.0	
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Ormond House		
Upper Ormond Quay	FOUL DRAINAGE CALCULATION	
Dublin 7		Micro
Date 23/08/2021 17:37	Designed by dalye	Drainage
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Diamage
Innovyze	Network 2020.1	

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	ase (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F8.00	L 8.467	0.070	121.0	0.000	0.0	0.0	1.500	0	225	Pipe/Conduit	ď
	5 11.751 5 11.472				0.0 36.0		1.500 1.500	0 0		Pipe/Conduit Pipe/Conduit	€ •
F9.00	36.078	0.488	74.0	0.000	24.0	0.0	1.500	0	225	Pipe/Conduit	ð
F6.00	7 22.858 3 16.081 9 22.129	0.088	182.7	0.000	12.0 48.0 0.0	0.0	1.500 1.500 1.500	0 0 0	225	Pipe/Conduit Pipe/Conduit Pipe/Conduit	5 5 8

### <u>Network Results Table</u>

	PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (1/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
E	8.001	19.505	0.000	0.0	69.0	0.8	53	0.70	1.04	41.5	5.0
F	6.005	19.435	0.000	0.0	182.0	1.3	71	0.75	0.94	37.4	8.1
F	6.006	19.356	0.000	0.0	218.0	1.5	76	0.75	0.91	36.2	8.9
F	9.000	19.775	0.000	0.0	24.0	0.5	36	0.71	1.34	53.1	2.9
F	6.007	19.284	0.000	0.0	254.0	1.6	80	0.75	0.88	34.9	9.6
E	6.008	19.150	0.000	0.0	302.0	1.7	86	0.75	0.85	33.7	10.4
F	6.009	19.062	0.000	0.0	302.0	1.7	86	0.74	0.84	33.5	10.4

DBFL Consulting Engineers		Page 7
Ormond House		
Upper Ormond Quay	FOUL DRAINAGE CALCULATION	
Dublin 7		Micro
Date 23/08/2021 17:37	Designed by dalye	Drainage
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Diamaye
Innovyze	Network 2020.1	

PN	Length	Fall	Slope	Area	Units	Ba	ase	k	HYD	DIA	Section Type	Auto
	(m)	(m)	(1:X)	(ha)		Flow	(l/s)	(mm)	SECT	(mm)		Design
F10.000	19.952	0.306	65.2	0.000	24.0		0.0	1.500	0	225	Pipe/Conduit	ð
F10.001	18.563	0.232	80.0	0.000	39.0		0.0	1.500	0	225	Pipe/Conduit	
F10.002	29.015	0.290	100.1	0.000	42.0		0.0	1.500	0	225	Pipe/Conduit	
F10.003	50.942	0.553	92.1	0.000	69.0		0.0	1.500	0	225	Pipe/Conduit	ď
												-
F11.000	33.762	0.482	70.0	0.000	90.0		0.0	1.500	0	225	Pipe/Conduit	ð
												-
F10.004	24.542	0.223	110.1	0.000	0.0		0.0	1.500	0	225	Pipe/Conduit	6
F10.005	9.577	0.128	74.8	0.000	0.0		0.0	1.500	0	225	Pipe/Conduit	

### <u>Network Results Table</u>

I	PN	US/IL (m)	Σ Area (ha)	Base (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)			Cap (1/s)	Flow (l/s)
_1.0											
F10	.000	20.675	0.000	0.0	24.0	0.5	35	0.75	1.42	56.6	2.9
F10	.001	20.368	0.000	0.0	63.0	0.8	46	0.80	1.28	51.0	4.8
F10	.002	20.136	0.000	0.0	105.0	1.0	56	0.80	1.15	45.6	6.1
F10	.003	19.846	0.000	0.0	174.0	1.3	62	0.89	1.20	47.6	7.9
F11	.000	19.775	0.000	0.0	90.0	0.9	49	0.89	1.37	54.6	5.7
F10	.004	19.293	0.000	0.0	264.0	1.6	72	0.88	1.09	43.5	9.7
F10	.005	19.070	0.000	0.0	264.0	1.6	66	1.01	1.33	52.8	9.7
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					<u>Netwo</u>	rk De	sign	Tabl	e fo	or Fo	<u>oul</u>								
	PN	Length (m)		L Slope (1:X)		Units		ase (1/s)					Sect:	ion Tyj		ito sign			
		(111)	(111)	(1.7)	(IIA)		FIOW	(1/5)	, (11		LCI	(11411)			Des	sign			
	F6.010	17.210	0.07	5 229.5	0.000	0.0	)	0.0	) 1.5	500	0	225	Pipe	/Condu:	it.	<b>f</b>			
				6 231.2						500	0	225	Pipe,	/Condu	it (	ď			
	F6.012	6.019	0.02	6 230.0	0.000	0.0	)	0.0	0 1.5	500	0	225	Pipe,	/Condu	it (	Ū.			
					N	etwor	k Res	ults	Tak	ole									
	PI			Area			Units												
		(	m)	(ha) F	'low (l	/s)		(1/	s)	(mm)	(m/	/s)	(m/s)	(1/s)	(l/s)	)			
	F6.(	010 18.	.942	0.000		0.0	566.0		2.4	109	90.	.75	0.76	30.1	14.3	3			
				0.000		0.0								29.9					
	F6.(	012 18.	.831	0.000		0.0	566.0		2.4	109	90.	.75	0.76	30.0	14.3	3			
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Ormond House		
Upper Ormond Quay	FOUL DRAINAGE CALCULATION	
Dublin 7		Micro
Date 23/08/2021 17:37	Designed by dalye	Drainage
File 190226 - Drainage Design 23.08.2021.MDX	Checked by	Diamacje
Innovyze	Network 2020.1	

<u>Manhole Schedules for Foul</u>
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MH Name	MH CL (m)	MH Depth (m)	MH Connect:	ion	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
FA-11	20.978	1.403	Open Manl	hole	1200	F1.000	19.575	225				
FA-10	20.935	1.534	Open Manl	hole	1200	F1.001	19.401	225	F1.000	19.401	225	
FA-9	20.754	2.105	Open Manl	hole	1200	F1.002	18.649	225	F1.001	18.649	225	
FA-8	19.408	1.408	Open Manl	hole	1200	F1.003	18.000	225	F1.002	18.000	225	
FA-7	19.086	1.435	Open Manl	hole	1200	F1.004	17.651	225	F1.003	17.651	225	
FA-6	19.018	1.573	Open Manl	hole	1200	F1.005	17.445	225	F1.004	17.445	225	
FA-5-1	18.900	1.530	Open Manl	hole	1200	F2.000	17.370	225				
FA-5	18.871	1.553	Open Manl	hole	1200	F1.006	17.318	225	F1.005	17.318	225	
									F2.000	17.318	225	
FA-4-2	18.740	1.365	Open Manl	hole	1200	F3.000	17.375	225				
FA-4-1	18.787	1.680	Open Manl	hole	1200	F3.001	17.107	225	F3.000	17.107	225	
FA-4	18.793	1.918	Open Manl	hole	1200	F1.007	16.875	225	F1.006	16.875	225	
									F3.001	16.888	225	13
FA-3-1	18.524	1.317	Open Manl	hole	1200	F4.000	17.207	225				
FA-3	18.502	1.968	Open Manl	hole	1200	F1.008	16.534	225	F1.007	16.534	225	
			-						F4.000	16.829	225	295
FA-2-8	20.618	1.514	Open Manl	hole	1200	F5.000	19.104	225				
			Open Manl		1200	F5.001	17.439	225	F5.000	17.439	225	
			Open Manl			F5.002	17.265		F5.001	17.265	225	
			-									
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Dublin 7		Micro
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	Manhole	Schedules	for	Foul	
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MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
FA-2-5	18.665	1.578	Open Manhole	1200	F5.003	17.087	225	F5.002	17.087	225	
FA-2-4	18.601	1.585	Open Manhole	1200	F5.004	17.016	225	F5.003	17.016	225	
FA-2-3	18.036	1.311	Open Manhole	1200	F5.005	16.725	225	F5.004	16.725	225	
FA-2-2	17.942	1.354	Open Manhole	1200	F5.006	16.588	225	F5.005	16.588	225	
FA-2-1	18.145	1.594	Open Manhole	1200	F5.007	16.551	225	F5.006	16.552	225	1
FA-2	18.378	2.081	Open Manhole	1200	F1.009	16.297	225	F1.008	16.297		
								F5.007	16.297		1
FA-1	18.049	1.934	Open Manhole	1200	F1.010	16.115	225	F1.009	16.115	225	
F	0.000		Open Manhole	0		OUTFALL		F1.010	16.076	225	
FB-13	21.912	1.458	Open Manhole	1200	F6.000	20.454	225				
FB-12	20.902	0.848	Open Manhole	1200	F6.001	20.054	225	F6.000	20.054	225	
FB-11	20.923	0.961	Open Manhole	1200	F6.002	19.962	225	F6.001	19.962	225	
FB-10	21.278	1.412	Open Manhole	1200	F6.003	19.866	225	F6.002	19.866	225	
FB-9-1	21.272	1.197	Open Manhole	1200	F7.000	20.075	225				
FB-9	21.075	1.425	Open Manhole	1200	F6.004	19.650	225	F6.003	19.650	225	
								F7.000	19.650	225	
FB-8-2	20.953	1.178	Open Manhole	1200	F8.000	19.775	225				
FB-8-1	20.705	1.200	Open Manhole	1200	F8.001	19.505	225	F8.000	19.505	225	

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Ormond House		
Upper Ormond Quay	FOUL DRAINAGE CALCULATION	
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				<u>Manho</u>	le Sche	dules for	<u>r Foul</u>				
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
FB-8	20.665	1.230	Open Manhole	1200	F6.005	19.435	225	F6.004	19.435	225	
								F8.001	19.435	225	
FB-7	20.671	1.315	Open Manhole	1200	F6.006	19.356	225	F6.005	19.356	225	
FB-6-1	20.900	1.125	Open Manhole	1200	F9.000	19.775	225				
FB-6	20.665	1.381	Open Manhole	1200	F6.007	19.284	225	F6.006	19.284	225	
								F9.000	19.287	225	4
FB-5	20.859	1.709	Open Manhole	1200	F6.008	19.150	225	F6.007	19.150	225	
FB-4	21.059	1.997	Open Manhole	1200	F6.009	19.062	225	F6.008	19.062	225	
FB-3-6	22.181	1.506	Open Manhole	1200	F10.000	20.675	225				
FB-3-5	21.893	1.525	Open Manhole	1200	F10.001	20.368	225	F10.000	20.369	225	1
F40	22.398	2.262	Open Manhole	1200	F10.002	20.136	225	F10.001	20.136	225	
FB-3-3	22.663	2.817	Open Manhole	1200	F10.003	19.846	225	F10.002	19.846	225	
FB-3-2-1	21.015	1.240	Open Manhole	1200	F11.000	19.775	225				
FB-3-2	21.800	2.507	Open Manhole	1200	F10.004	19.293	225	F10.003	19.293	225	
								F11.000	19.293	225	
FB-3-1	21.274	2.204	Open Manhole	1200	F10.005	19.070	225	F10.004	19.070	225	
FB-3	20.991	2.049	Open Manhole	1200	F6.010	18.942	225	F6.009	18.942	225	
								F10.005	18.942	225	
FB-2	21.025	2.158	Open Manhole	1200	F6.011	18.867	225	F6.010	18.867	225	
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Ormond House							FOUI	DRAINAGE C		ON					
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	MH Name	MH CL (m)	MH Depth (m)		MH nection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes I Inve Level	ert D	iameter (mm)	Backdro (mm)	qo
	FB-1	20.173	1.342	Open	Manhole	1200	F6.012	18.831	225	F6.0	)11 18	.831	225		_
	F	0.000		Open	Manhole	0		OUTFALL		F6.0	12 18	.805	225		
				1H ame	Manhol Eastin (m)		ing	ntersection Easting (m)	Intersect Northin (m)		Manhole Access	-			
			1	FA-11	716873.4	138 731210	.053	716873.438	731210.	053	Required	6			
			I	FA-10	716878.6	504 731223	.087	716878.604	731223.	087	Required	4			
				FA-9	716889.0	)41 731266	.882	716889.041	731266.	882	Required	4			
				FA-8	716901.5	560 731299	.436	716901.560	731299.	436	Required				
				FA-7	716950.1	127 731280	.169	716950.127	731280.	169	Required	-/ 			
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Ormond House							
Upper Ormond Quay			FOU	UL DRAINAGE (	CALCULATION		
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		<u>Manho</u>	le S	Schedules f	or Foul		
MH Name	Manhole Easting (m)	Manhol Northin (m)		Intersection Easting (m)	Intersection Northing (m)		Layout (North)
FA-6	716978.963	731268.0	659	716978.963	731268.659	Required	<b>~</b>
FA-5-1	716983.043	731264.3	350	716983.043	731264.350	Required	
FA-5	716986.562	731268.2	238	716986.562	731268.238	Required	-
FA-4-2	717002.631	731257.0	044	717002.631	731257.044	Required	
FA-4-1	717018.287	731271.0	681	717018.287	731271.681	Required	<b>&gt;</b>
FA-4	717003.294	731288.8	864	717003.294	731288.864	Required	
FA-3-1	717035.643	731290.2	252	717035.643	731290.252	Required	
FA-3	717011.834	731317.3	129	717011.834	731317.129	Required	K.
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Ormond House			FO	UL DRAINAGE	CALCULATION			
Upper Ormond Quay								
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		<u>Manho</u>	le S	Schedules f	<u>or Foul</u>			
MH Name	Manhole Easting (m)	Manhol Northi: (m)		Intersection Easting (m)	Intersection Northing (m)	Manhole Access	-	
FA-2-8	716984.484	731166.	621	716984.484	731166.621	Required	6	
FA-2-7	717002.892	731216.	610	717002.892	731216.610	Required	<b>•</b>	
FA-2-6	717018.850	731223.	640	717018.850	731223.640	Required		
FA-2-5	717031.265	731236.	401	717031.265	731236.401	Required	, de	
FA-2-4	717032.317	731246.	693	717032.317	731246.693	Required		
FA-2-3	717069.884	731278.	730	717069.884	731278.730	Required	×	
FA-2-2	717053.949	731297.	597	717053.949	731297.597	Required		
FA-2-1	717047.456	731296.	270	717047.456	731296.270	Required		
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Ormond House Upper Ormond Quay			FOUL DRAINAGE C	CALCULATION		
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MH Name	Manhole Easting (m)	Manhole Northin (m)		Intersection Northing (m)		Layout (North)
FA-2	717017.514	731330.7	763 717017.514	731330.763	Required	
FA-1	717028.234	731355.8	875 717028.234	731355.875	Required	
F	717032.266	731360.1	148		No Entry	
FB-13	716886.436	731111.0	011 716886.436	731111.011	Required	
FB-12	716895.817	731134.8	803 716895.817	731134.803	Required	<b>~</b>
FB-11	716888.709	731137.4	448 716888.709	731137.448	Required	
FB-10	716885.193	731144.6	661 716885.193	731144.661	Required	
FB-9-1	716854.034	731176.3	312 716854.034	731176.312	Required	
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Ormond House			FO	UL DRAINAGE (	CALCULATION			
Upper Ormond Quay								
Dublin 7							Micro	
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		<u>Manho</u>	le	Schedules f	<u>or Foul</u>			
MH Name	Manhole Easting (m)	Manho: Northi (m)		Intersection Easting (m)	Intersection Northing (m)	Manhole Access	-	
FB-9	716891.761	731161.	602	716891.761	731161.602	Required	-	
FB-8-2	716871.440	731202.	531	716871.440	731202.531	Required		
FB-8-1	716895.305	731192.	333	716895.305	731192.333	Required	-	
FB-8	716901.521	731186.	584	716901.521	731186.584	Required	The second second	
FB-7	716912.524	731182.	456	716912.524	731182.456	Required		
FB-6-1	716910.199	731150.	288	716910.199	731150.288	Required	6	
FB-6	716923.934	731183.	650	716923.934	731183.650	Required		
FB-5	716945.025	731174.	838	716945.025	731174.838	Required		
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Ormond House			FOI	JL DRAINAGE (	CALCULATION		
Upper Ormond Quay							
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		<u>Manho</u>	le S	Schedules f	<u>or Foul</u>		
MH Name	Manhole Easting (m)	Manhol Northin (m)		Intersection Easting (m)	Intersection Northing (m)	Manhole Access	
FB-4	716948.683	731159.3	179	716948.683	731159.179	Required	
FB-3-6	716893.117	731104.3	165	716893.117	731104.165	Required	
FB-3-5	716911.640	731096.	750	716911.640	731096.750	Required	
F40	716904.949	731079.4	435	716904.949	731079.435	Required	
FB-3-3	716932.017	731068.	988	716932.017	731068.988	Required	
FB-3-2-1	716917.549	731129.	900	716917.549	731129.900	Required	
FB-3-2	716948.786	731117.	090	716948.786	731117.090	Required	-
FB-3-1	716958.253	731139.	733	716958.253	731139.733	Required	
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Ormond House			FOI	UL DRAINAGE (			
Upper Ormond Quay			FU	UL DRAINAGE (	ALCULATION		
Dublin 7							Micro
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MH Name	Manhole Easting (m)	Manho North: (m)	ing	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	
FB-3	716965.985	731145	.384	716965.985	731145.384	Required	
FB-2	716979.313	731134	.495	716979.313	731134.495	Required	
FB-1	716985.231	731140	.348	716985.231	731140.348	Required	
F	716991.183	731139	.444			No Entry	· · · · · · · · · · · · · · · · · · ·
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Ormond House		
Upper Ormond Quay	FOUL DRAINAGE CALCULATION	
Dublin 7		Micro
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### <u>Upstream Manhole</u>

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
F1.000	0	225	FA-11	20.978	19.575	1.178	Open Manhole	1200
F1.001	0	225	FA-10	20.935	19.401	1.309	Open Manhole	1200
F1.002	0	225	FA-9	20.754	18.649	1.880	Open Manhole	1200
F1.003	0	225	FA-8	19.408	18.000	1.183	Open Manhole	1200
F1.004	0	225	FA-7	19.086	17.651	1.210	Open Manhole	1200
F1.005	0	225	FA-6	19.018	17.445	1.348	Open Manhole	1200
F2.000	0	225	FA-5-1	18.900	17.370	1.305	Open Manhole	1200

### Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
F1.000	14.021	80.6	FA-10	20.935	19.401	1.309	Open Manhole	1200
F1.001	45.021	59.9	FA-9	20.754	18.649	1.880	Open Manhole	1200
F1.002	34.879	53.7	FA-8	19.408	18.000	1.183	Open Manhole	1200
F1.003	52.249	149.7	FA-7	19.086	17.651	1.210	Open Manhole	1200
F1.004	31.048	150.7	FA-6	19.018	17.445	1.348	Open Manhole	1200
F1.005	7.611	59.9	FA-5	18.871	17.318	1.328	Open Manhole	1200
			_					
F2.000	5.244	100.8	FA-5	18.871	17.318	1.328	Open Manhole	1200

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Ormond House		
Upper Ormond Quay	FOUL DRAINAGE CALCULATION	
Dublin 7		Micro
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### <u>Upstream Manhole</u>

PN	-	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.006	0	225	FA-5	18.871	17.318	1.328	Open Manhole	1200
F3.000 F3.001				18.740 18.787			Open Manhole Open Manhole	1200 1200
F1.007	0	225	FA-4	18.793	16.875	1.693	Open Manhole	1200
F4.000	0	225	FA-3-1	18.524	17.207	1.092	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)
F1.006	26.559	60.0	FA-4	18.793	16.875	1.693	Open Manhole	1200
				18.787 18.793			Open Manhole Open Manhole	1200 1200
F1.007	29.528	86.8	FA-3	18.502	16.534	1.743	Open Manhole	1200
F4.000	35.906	95.0	FA-3	18.502	16.829	1.448	Open Manhole	1200

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### <u>Upstream Manhole</u>

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.008	0	225	FA-3	18.502	16.534	1.743	Open Manhole	1200
F5.000	0	225	FA-2-8	20.618	19.104	1.289	Open Manhole	1200
F5.001	0	225	FA-2-7	18.954	17.439	1.290	Open Manhole	1200
F5.002	0	225	FA-2-6	18.937	17.265	1.447	Open Manhole	1200
F5.003	0	225	FA-2-5	18.665	17.087	1.353	Open Manhole	1200
F5.004	0	225	FA-2-4	18.601	17.016	1.360	Open Manhole	1200
F5.005	0	225	FA-2-3	18.036	16.725	1.086	Open Manhole	1200
F5.006	0	225	FA-2-2	17.942	16.588	1.129	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)
F1.008	14.769	62.1	FA-2	18.378	16.297	1.856	Open Manhole	1200
F5.000	53.271	32.0	FA-2-7	18.954	17.439	1.290	Open Manhole	1200
F5.001	17.438	100.2	FA-2-6	18.937	17.265	1.447	Open Manhole	1200
F5.002	17.803	100.0	FA-2-5	18.665	17.087	1.353	Open Manhole	1200
F5.003	10.346	146.0	FA-2-4	18.601	17.016	1.360	Open Manhole	1200
F5.004	49.372	169.8	FA-2-3	18.036	16.725	1.086	Open Manhole	1200
F5.005	24.696	180.3	FA-2-2	17.942	16.588	1.129	Open Manhole	1200
F5.006	6.627	180.0	FA-2-1	18.145	16.552	1.368	Open Manhole	1200
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### <u>Upstream Manhole</u>

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F5.007	0	225	FA-2-1	18.145	16.551	1.369	Open Manhole	1200
F1.009 F1.010	0	225 225	FA-2 FA-1		16.297 16.115		Open Manhole Open Manhole	1200 1200
F6.000 F6.001 F6.002 F6.003	0 0 0	225 225	FB-13 FB-12 FB-11 FB-10	21.912 20.902 20.923 21.278	20.454 20.054 19.962 19.866	0.623 0.736	Open Manhole Open Manhole Open Manhole Open Manhole	1200 1200 1200 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)
F5.007	45.675	180.0	FA-2	18.378	16.297	1.856	Open Manhole	1200
F1.009	27.304	150.0	FA-1	18.049	16.115	1.709	Open Manhole	1200
F1.010	5.875	151.0	F	0.000	16.076		Open Manhole	0
F6.000	25.575	63.9	FB-12	20.902	20.054	0.623	Open Manhole	1200
F6.001	7.584	82.4	FB-11	20.923	19.962	0.736	Open Manhole	1200
F6.002	8.025	83.6	FB-10	21.278	19.866	1.187	Open Manhole	1200
F6.003	18.170	84.0	FB-9	21.075	19.650	1.200	Open Manhole	1200
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				<u>Upst</u>	ream Ma	nhole			
PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	МН	MH DIAM., L*W	
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)	
77.00	<b>D</b> -	225	<b>FP</b> 0 1	01 070	00 075	0 070	Onen Markela	1000	
F7.00	) 0	225	F.B-A-T	21.272	20.075	0.972	Open Manhole	1200	
F6.00	4 о	225	FB-9	21.075	19.650	1.200	Open Manhole	1200	
F8.00	) 0	225	FB-8-2	20.953	19.775	0.953	Open Manhole	1200	
F8.00	1 o	225	FB-8-1	20.705	19.505		Open Manhole	1200	
F6.00	5 o	225	FB-8	20.665	19.435	1.005	Open Manhole	1200	
				<u>Downs</u>	tream M	<u>lanhole</u>			
PN	Length	Slope	e MH	C.Level	I.Level	D.Depth	n MH	MH DIAM., L*W	
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)	
F7.000	40.493	95.2	2 FB-9	21.075	19.650	1.200	) Open Manhole	e 1200	
F6.004	26.821	125.0	) FB-8	20.665	19.435	5 1.005	5 Open Manhole	e 1200	
F8 000	25,953	96.1	FB-8-1	20.705	19.505	5 0.975	5 Open Manhole	e 1200	
F8.001					19.435		5 Open Manhole		
F6.005	11.751	149.0	) FB-7	20.671	19.356	5 1.090	) Open Manhole	e 1200	
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### <u>Upstream Manhole</u>

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F6.006	0	225	FB-7	20.671	19.356	1.090	Open Manhole	1200
F9.000	0	225	FB-6-1	20.900	19.775	0.900	Open Manhole	1200
F6.007	0	225	FB-6	20.665	19.284		Open Manhole	1200
F6.008 F6.009	0 0	225 225	FB-5 FB-4	20.859 21.059	19.150 19.062		Open Manhole Open Manhole	1200 1200
F10.000	0	225	FB-3-6	22.181	20.675	1.281	Open Manhole	1200

#### <u>Downstream Manhole</u>

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)	
F6.006	11.472	159.0	FB-6	20.665	19.284	1.156	Open Manhole	1200	
F9.000	36.078	74.0	FB-6	20.665	19.287	1.153	Open Manhole	1200	
F6.007	22.858	170.9	FB-5	20.859	19.150	1.484	Open Manhole	1200	
F6.008	16.081	182.7	FB-4	21.059	19.062	1.772	Open Manhole	1200	
F6.009	22.129	185.0	FB-3	20.991	18.942	1.824	Open Manhole	1200	
F10.000	19.952	65.2	FB-3-5	21.893	20.369	1.299	Open Manhole	1200	
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### <u>Upstream Manhole</u>

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F10.001 F10.002 F10.003	0 0 0	225	FB-3-5 F40 FB-3-3	21.893 22.398 22.663	20.368 20.136 19.846	2.037	Open Manhole Open Manhole Open Manhole	1200 1200 1200
F11.000	0	225	FB-3-2-1	21.015	19.775	1.015	Open Manhole	1200
F10.004 F10.005	0	225 225	FB-3-2 FB-3-1	21.800 21.274	19.293 19.070		Open Manhole Open Manhole	1200 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)
F10.001 F10.002			F40 FB-3-3	22.398 22.663	20.136 19.846		Open Manhole Open Manhole	1200 1200
F10.003	50.942	92.1	FB-3-2	21.800	19.293	2.282	Open Manhole	1200
F11.000	33.762	70.0	FB-3-2	21.800	19.293	2.282	Open Manhole	1200
				21.274 20.991			Open Manhole Open Manhole	1200 1200

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# <u>Upstream Manhole</u>

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
F6.010	0	225	FB-3	20.991	18.942	1.824	Open Manhole	1200
F6.011	0	225	FB-2	21.025	18.867	1.933	Open Manhole	1200
F6.012	0	225	FB-1	20.173	18.831	1.117	Open Manhole	1200

### Downstream Manhole

PN	Length (m)	Slope (1:X)		C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F6.010	17.210	229.5	FB-2	21.025	18.867	1.933	Open Manhole	1200
F6.011	8.324	231.2	FB-1	20.173	18.831	1.117	Open Manhole	1200
F6.012	6.019	230.0	F	0.000	18.805		Open Manhole	0

### Free Flowing Outfall Details for Foul

Outfall	Outfall C	C. Level	I. Level	Min	D,L	W
Pipe Number	Name	(m)	(m)	I. Level	(mm)	(mm)
				(m)		
F1.010	F	0.000	16.076	0.000	0	0

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<u>Free Flc</u>	owing Outfall Details for Foul	
Outfall Out: Pipe Number Na	fall C. Level I. Level Min D,L W me (m) (m) I. Level (mm) (mm) (m)	
F6.012	F 0.000 18.805 0.000 0 0	
Sim	ulation Criteria for Foul	
Hot Start (mins) 0 Additional Fl Hot Start Level (mm) 0 MADD Fact Number of Input Hydrographs 0 N	dloss Coeff (Global)0.500Inlet Coeffiedge per hectare (l/s)0.000 Flow per Person per Day (l/per/ow - % of Total Flow 20.000Run Time (mor * 10m³/ha Storage2.000Sumber of Offline Controls 0Number of Time/Area Diagrams 0nber of Storage Structures 0Number of Real Time Controls 0	day) 0.000 iins) 60
	nthetic Rainfall Details	
Rainfall Model Return Period (years) Region Scotland an	FSR M5-60 (mm) 17.300 Cv (Summer) 0.750 5 Ratio R 0.280 Cv (Winter) 0.840 nd Ireland Profile Type Summer Storm Duration (mins) 30	
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**APPENDIX F – EXTRACTS FROM SITE INVESTIGATION REPORT** 



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# **Ground Investigations Ireland**

# Sandford Park Milltown

DBFL

# **Ground Investigation Report**

October 2020



Directors: Fergal McNamara (MD), James Lombard, Conor Finnerty, Aisling McDonnell & Barry Sexton Ground Investigations Ireland Limited | Registered in Ireland Company Regsitration No.: 405726



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Ground Investigations Ireland Ltd. present the results of the fieldworks and laboratory testing in accordance with the specification and related documents provided by or on behalf of the client The possibility of variation in the ground and/or groundwater conditions between or below exploratory locations or due to the investigation techniques employed must be taken into account when this report and the appendices inform designs or decisions where such variation may be considered relevant. Ground and/or groundwater conditions may vary due to seasonal, man-made or other activities not apparent during the fieldworks and no responsibility can be taken for such variation. The data presented and the recommendations included in this report and associated appendices are intended for the use of the client and the client's geotechnical representative only and any duty of care to others is excluded unless approved in writing.





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# **GROUND INVESTIGATIONS IRELAND**

Geotechnical & Environmental

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## GROUND INVESTIGATIONS IRELAND Geotechnical & Environmental

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Appendix 2	Foundation and Trial Pit Records
Appendix 3	Soakaway Records
Appendix 4	Plate Load and TRL Probe Test Records
Appendix 5	Dynamic Probe Records
Appendix 6	Window Sample Records
Appendix 7	Borehole Records
Appendix 8	Laboratory Testing
Appendix 9	Groundwater Monitoring



### 1.0 Preamble

On the instructions of DBFL Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between January and June 2020 at the site of the proposed residential development in Milltown Park in Milltown, Dublin 6, Co. Dublin. A second phase of investigation was undertaken in October 2020.

### 2.0 Overview

### 2.1. Background

It is proposed to construct a new residential development including apartments and town houses with associated services, access roads and car parking at the site. The site is currently the grounds of Millfield Park and is partly greenfield with a portion on the eastern side of the site occupied by a car park and existing access road. The proposed construction is envisaged to consist of conventional or piles foundations and pavement make up with some local excavations for services and plant. A basement is proposed as part of the proposed scheme beneath the apartments at the centre of the site which will require excavation of approximately 4m BGL.

### 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, including both phases of this investigation for this project included the following:

- Visit project site to observe existing conditions
- Carry out 11 No. Trial / Foundation Inspection Pits to determine existing foundation details
- Carry out 3 No. Soakaways to determine a soil infiltration value to BRE digest 365
- Carry out 14 No. Window Sample Boreholes to recover soil samples
- Carry out 13 No. Dynamic Probes to determine soil strength/density characteristics
- Carry out 16 No. Cable Percussion boreholes to a maximum depth of 8m BGL
- Carry out 5 No. Rotary Core follow on boreholes to a maximum depth of 20m BGL
- Carry out 9 No. Plate Load tests to determine CBR Value
- Carry out 1 No TRL probe to determine CBR Value
- Installation of 7 No. Groundwater monitoring wells
- Geotechnical & Environmental Laboratory testing
- 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.

### 3.2. Trial Pits / Foundation Pits

The trial pits were excavated using a JCB 3CX or 3T excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were 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 the exposed foundations were logged and sketched prior to backfilling and reinstatement. The logs and sketches are provided in Appendix 2 of this Report.

### 3.3. Soakaway Testing

The soakaway testing was carried out in selected trial pits at the locations shown in the exploratory hole location plan in Appendix 1. These pits were carefully excavated and filled with water to assess the infiltration characteristics of the proposed site. The pits were allowed to drain and the drop in water level was recorded over time as required by BRE Digest 365. The pits were logged prior to completing the soakaway test and were backfilled with arising's upon completion. The soakaway test results are provided in Appendix 3 of this Report.

### 3.4. Window Sampling

The window sampling was carried out at the locations shown in the location plan in Appendix 1 using a Tecopsa SPT Tec 10 percussion drilling rig. The window sampling consists of a 1m long steel tube with a cutting edge and an internal plastic liner which is mechanically driven into the ground utilising a 50kg weight falling a height of 500mm. Upon completion of the 1m sample, the tube is withdrawn and the plastic liner removed and sealed for logging and sub sampling by a Geotechnical Engineer/Engineering Geologist. The tube is replaced in the borehole and a subsequent 1m sample can be recovered. Occasionally outer casing or a reduced diameter tube is utilised to enable the window sample to progress in difficult drilling conditions. Geotechnical or environmental soil samples can be recovered from each of the liners following logging. The window sample records are provided in Appendix 6 of this Report.

### 3.5. Dynamic Probing

The dynamic probe tests (DPH) were carried out at the locations shown in the location plan in Appendix 1 in accordance with B.S. 1377: Part 9 1990. The test consists of mechanically driving a cone with a 50kg weight in 100mm intervals and monitoring the number of blows required. An equivalent Standard Penetration Test (SPT) 'N' value may be calculated by dividing the total number of blows over a 300mm drive length by 1.5. The dynamic probe logs are provided in Appendix 5 of this Report.

### 3.6. Cable Percussion Boreholes

The Cable Percussion Boreholes were drilled using a Dando 2000 drilling rig with regular in-situ testing and sampling undertaken to facilitate the production of geotechnical logs and laboratory testing.

The standard method of boring in soil for site investigation is known as the Cable Percussion method. It consists of using a Shell in non cohesive soils and a clay cutter in cohesive soils, both operated on a wire cable. Very hard soils, boulders and other hard obstructions are broken up by chiselling and the fragments removed with the Shell. Where ground conditions made it necessary, the borehole was lined with 200mm diameter steel casing. While the use of the Cable Percussion method of boring gives the maximum data on soil conditions, some mixing of laminated soil is inevitable. For this reason, thin lenses of granular material may not be noticed. Disturbed samples were taken from the boring tools at suitable depths, so that there is a representative sample at the top of each change in stratum and thereafter at regular intervals down the borehole until the next stratum was encountered. The disturbed samples were then sealed and sent to the laboratory where they were visually examined to confirm the description of the relevant strata.

Standard Penetration Tests were carried out in the boreholes. The results of these tests, together with the depths at which the tests were taken are shown on the accompanying borehole records. The test consists of a thick wall sampler tube, 50mm external diameter, being driven into the soil by a monkey weighing 63.5kg and with a free drop of 760mm. For gravels and glacial till the driving shoe was replaced by a solid 60° cone. The Standard Penetration Test number referred to as the 'N' value is the number of blows required to drive the tube 300mm, after an initial penetration of 150mm. The number gives a guide to the consistency of the soil and can also be used to estimate the relative strength/density at the depth of the test and also to estimate the bearing capacity and compressibility of the soil. The cable percussion borehole logs are provided in Appendix 7 of this Report.

### 3.7. Rotary Boreholes

The rotary coring was carried out by a track mounted T44 Beretta rig at the locations shown on the location plan in Appendix 1. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring.

The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the "overshoot" recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 7 of this Report.

### 3.8. Surveying

The exploratory hole locations have been recorded using a KQ GEO Technologies KQ-M8 System which records the coordinates and elevation of the locations to ITM or Irish National Grid as required by the project specification. The coordinates and elevations will be included on the exploratory hole logs in the appendices of the final Report. Where levels are not shown on the logs coordinates were taken from GIS.

### 3.9. Groundwater/Gas Monitoring Installations

Groundwater and or Gas Monitoring Installation were installed upon the completion of the boreholes to enable sampling and the determination of the equilibrium groundwater level. The typical groundwater monitoring installation consists of a 50mm HDPE slotted pipe with a pea gravel response zone and bentonite seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report.

### 3.10. Insitu Plate Bearing Test

The plate bearing tests were carried out using a 305mm or 450mm diameter plate at the locations shown on the site plan in Appendix 1. The plate was loaded in increments using a hydraulic jack and an excavator to provide a reaction and the displacement was monitored in accordance with BS1377 Part 9 using independently mounted digital strain gauges. The constrained modulus and equivalent CBR are calculated in accordance with HD29/75 and are provided on the test reports in Appendix 4 of this Report.

### 3.1. TRL Dynamic Cone Penetrometer

The TRL DCP tests were carried out at locations where plate load tests were not possible, to determine a CBR design value for the design of external pavements. The testing was carried out below the Topsoil or existing pavement at the depths detailed on the test report. The test consists of dropping a 10kg weight on

an anvil to drive a small diameter cone and recording the blows for a given penetration. The results of the DCP testing is included in Appendix 4 of this Report.

### 3.2. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.

Environmental & Chemical testing as required by the specification, including the Rilta Suite pH and sulphate testing was carried out by Element Materials Technology Laboratory in the UK. The Rilta suite testing includes both Solid Waste and Leachate Waste Acceptance Criteria.

Geotechnical testing consisting of moisture content, Atterberg limits, Particle Size Distribution (PSD), hydrometer tests were carried out in NMTL's Geotechnical Laboratory in Carlow.

The results of the laboratory testing are included in Appendix 8 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/Surfacing
- Made Ground
- Cohesive Deposits
- Granular Deposits (Rarely Encountered)
- Bedrock

**TOPSOIL/SURFACING:** Topsoil was encountered in the majority of the exploratory holes and was typically present to a depth of between 0.20 and 0.40m BGL with a maximum depth of 0.7m BGL encountered in TP05. Tarmac surfacing was present in WS04, WS12, BH05 and BH11 typically to a depth of between 0.08m and 0.10mBGL. Concrete was encountered in BH08 to a depth on 0.10m BGL.

**MADE GROUND:** Made Ground deposits were encountered beneath the Topsoil/Surfacing in some investigation locations and were present to a depth of between 0.5m and 1.0m BGL. These deposits were described generally as *brown slightly sandy slightly gravelly CLAY with occasional cobbles* or grey sandy angular Gravel. In some locations the made ground contained *occasional fragments of mortar, red brick, and charcoal.* 

**COHESIVE DEPOSITS:** Cohesive deposits were encountered beneath the Topsoil or Made Ground and were described typically as *brown slightly sandy slightly gravelly CLAY with occasional cobbles* overlying a *stiff or very stiff dark grey /black slightly sandy slightly gravelly CLAY with occasional cobbles*. A brown *very stiff slightly sandy slightly gravelly CLAY with occasional cobbles*. A brown *very stiff slightly sandy slightly gravelly CLAY* was also encountered in some boreholes below the dark grey/black clay. 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 very stiff below 2.2m BGL in the majority of the exploratory holes with some extending to 2.6m BGL before very stiff deposits were encountered.

**GRANULAR DEPOSITS:** Granular deposits were encountered in BH16 within the cohesive deposits and were typically described as Grey brown slightly clayey sandy sub angular sub rounded fine to coarse GRAVEL with occasional cobbles.

Based on the SPT N values the deposits are typically medium dense. A significant groundwater strike was noted in the borehole on encountering the granular deposits.

**BEDROCK**: The rotary core boreholes recovered weak to strong grey/dark grey fine to medium grained LIMESTONE w calcite veining. In some locations the beds of stiff brown clay were encountered which have been interpreted as residual weathered mudstone. This is typical of the Calp Formation, which is noted on the geological mapping to the east of the proposed site.

The depth to rock varies from 9.0m BGL in BH11 to a maximum of 18.45m BGL in BH03. In BH03 there was poor recovery and where cobbles of limestone where recovered that presumed to be rock. Generally rock was encountered at higher levels in the eastern area of the site. The total core recovery is good, typically 100% with some of the uppermost runs dropping to 80 or 90%. The SCR and RQD vary in the borehole across the site, with some core recovered as non-intact and some hole encountering clay bands within the limestone, however generally both indices show an increase with depth.

### 4.2. Insitu Strength Testing

The correlated DPH blow counts indicate that the overburden deposits are typically soft to depths of between 0.7 and 1.6m BGL and become firm to stiff and stiff to very stiff with depth. Generally stiff soils were encountered from between depths of 1.2 and 2.4m BGL at the dynamic probe locations.

### 4.3. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred and where possible drilling was suspended for twenty minutes to allow the subsequent rise in groundwater to be recorded. We would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the tide, time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in BH02, BH03, BH07, BH09, BH11 BH14 and BH16 to allow the equilibrium groundwater level to be determined. The groundwater monitoring will be included in Appendix 9 of the final Report.

## 4.4. Laboratory Testing

## 4.4.1. Geotechnical Laboratory Testing

The geotechnical testing carried out on soil samples recovered generally confirm the descriptions on the logs with the primary constituent of the cohesive deposits found to be a CLAY of low to intermediate plasticity. The Particle Size Distribution tests confirm that generally the cohesive deposits are well-graded with percentages of sands and gravels ranging between 20% and 30% generally with fines contents of 40% to 60%.

#### 4.4.1. Chemical Laboratory Testing

The pH and sulphate testing carried out indicate that pH results are near neutral and that the water soluble sulphate results is low when compared to the guideline values from BRE Special Digest 1:2005. The samples tested classify the soil as a Design Sulphate Level DS-1.

## 4.4.1. Environmental Laboratory Testing

A number of samples were analysed for a suite of parameters which allows for the assessment of the sampled material in terms of total pollutant content for classification of materials as *hazardous* or *non-hazardous*. The suite also allows for the assessment of the sampled material in terms of suitability for placement at licenced landfills (inert, stable non-reactive, hazardous etc.). The parameter list for the suite includes analysis of the solid samples for arsenic, barium, cadmium, chromium, copper, cyanide, lead, nickel, mercury, zinc, speciated aliphatic and aromatic petroleum hydrocarbons, pH, sulphate, sulphide, moisture content, soil organic matter and an asbestos screen.

The suite also includes those parameters specified in the EU Council Decision establishing criteria for the acceptance of waste at Landfills (Council Decision 2003/33/EC), which for the solid samples are total organic carbon (TOC), speciated aliphatic and aromatic petroleum hydrocarbons, BTEX, phenol, polychlorinated biphenyls (PCB) and PAH.

As part of the suite a leachate is generated from the solid sample which is analysed for antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, chloride, fluoride, soluble sulphate, sulphide, phenols, dissolved organic carbon (DOC) and total dissolved solids (TDS).

While the laboratory report provides a comparison with the waste acceptance criteria limits it does not provide a waste classification of the material sampled nor does it comment on any potentially hazardous properties of the materials tested. The possibility for contamination, not revealed by the testing undertaken should be borne in mind particularly where Made Ground deposits are present or the previous site use or location indicate a risk of environmental variation. The waste classification report is included under the cover of a sperate report by Ground Investigations Ireland.

## 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. Foundations

An allowable bearing capacity of 200 kN/m<sup>2</sup> is recommended for conventional strip or pad foundations on the stiff or very stiff dark grey/back cohesive deposits encountered at a depth of between 2.0m and 2.6m BGL on the northern part of the site.

On the western part of the site where the 3 storey structures are proposed in the locations of DP03 to DP06 and DP10 to DP12 a bearing capacity 100 kN/m<sup>2</sup> is achievable at depths of between 1.2m and 1.5m BGL.

For the area of the proposed basement a bearing capacity of 350 kN/m<sup>2</sup> would be achievable at 4 m below ground level in the very stiff dark grey Clay, however a settlement assessment should be carried out to ensure the structure can deal with the potential settlement, total and differential due to this increased loading.

In the area to the west on the existing building in the location of BH13, BH16, DP01 and DP02 where a 5 story building is proposed an allowable bearing capacity of 200 kN/m<sup>2</sup> is achievable between depths of 2.0 and 2.6mBGL for conventional strip or pad foundations on the stiff or very stiff dark grey/back cohesive deposits or medium dense granular deposits. It should be noted that the strata varied between holes in this area so foundation inspections should be undertaken and it is recommended that the foundations from the structure be placed on the same strata to avoid differential settlement.

For the area to the south of the existing building near to the location of BH13, BH14 and BH15 where a 7 story building is proposed, a bearing capacity of 200 kN/m<sup>2</sup> would be achievable at depths of between 2.4m to 2.7m BGL and below ground level in the very stiff dark grey Clay. A bearing capacity of 125 kN/m<sup>2</sup> is achievable on the firm to stiff brown clay at a depth of 2.0m BGL.

The possibility for variation in the depth of the made ground of soft ground in the vicinity of these foundations should be considered and foundation inspections should be carried out. Any soft spots encountered at the proposed foundation depths should be excavated and replaced with lean mix concrete.

A ground bearing floor slab is recommended to be based on the firm to stiff cohesive deposits with an appropriate depth of compacted hardcore specified by the consulting engineer and in accordance with the limits and guidelines in SR21:2014 +A1:2016 and/or NRA SRW CL808 Type E granular stone fill. Where the depth of Made Ground/Soft deposits exceeds 0.9m then suspended floor slabs should be considered.

Due to the potential high loading anticipated from some of the proposed structures, piled foundations may be more economically advantageous. The type, size and depth of the pile foundations should be confirmed by a specialist piling contractor based on the loading from the proposed building.

The pH and sulphate testing completed on samples recovered from the exploratory holes indicates the pH results are near neutral and the sulphate results are low, when compared to the guideline values from BRE Special Digest 1:2005. No special precautions are required for concrete foundations to prevent sulphate attack. The samples tested were below the limits of DS1 in the BRE Special Digest 1:2005.

# 5.3. External Pavements

The proposed pavements are recommended to be designed in accordance with the CBR test results included in the Appendixes of this Report. The low CBR test results indicate that a capping layer or a sufficient depth of crushed stone fill may be required. Plate bearing tests are recommended at the time of construction to verify the design assumptions for the proposed pavement make up and to verify adequate compaction has been achieved.

The use of a geogrid and separation membrane may improve the performance of the proposed pavement and enable a more economical pavement design to be achieved, a specialist supplier is recommended to advise of the required strength, depth and type of geotextile for the proposed design.

#### 5.4. Excavations

Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry.

Excavations in the Made Ground, or soft Cohesive Deposits will require to be appropriately battered or the sides supported due to the low strength of these deposits.

Any excavations which penetrate the granular deposits will require to be appropriately battered or the sides supported and are likely to require dewatering due to the groundwater seepages noted in the exploratory hole logs in the Appendices of this Report.

The groundwater and stability noted on the trial pit logs should be consulted when determining the most appropriate construction methods for excavations. An assessment by a specialist dewatering contractor is recommended to determine the most cost effective approach to the proposed excavation.

Excavations in the upper cohesive deposits are expected to be excavatable with conventional excavation equipment.

Any waste material to be removed off site should be disposed of to a suitably licenced landfill. The environmental testing completed during the ground investigation is reported under the cover of a separate GII Waste Classification/Subsoil Assessment Report.

# 5.5. Soakaway Design

At the locations of SA01, SA02 and SA03 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.

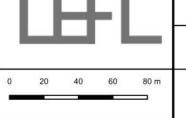
**APPENDIX 1** - Site Location Plan







Ground Investigations Ireland Ltd. Catherinstown House, Hazelhatch Road, Newcastle, Co. Dublin www.gii.ie 01-6015175/5176



 Project Title:

 Sandford Park

 Drawing Title:

 Figure 1 Site Location

 Gll Project Reference:

 9338-12-19

 Drawn By:

 NM

 Date:

 18/06/2020

Site Location

Indicative Site Boundary



731400N

RATE	1P09		TPOB		IR IS	
	• EH13 TP13 • EH15					
	BH14	<b>/</b> ,			Charles P.	
	Client:		Project Title Sandford Par			Indicative Site Boundary
GROUND INVESTIGATIONS IRELAND			<b>Drawing Titl</b> Figure 2: GI L	_ocations	- + 0	Borehole CBR
Geotechnical & Environmental Ground Investigations Ireland Ltd. Catherinstown House,			Gll Project R 9338-12-19	Reference:	•	Dynamic Probe Trial Pit
Hazelhatch Road, Newcastle, Co. Dublin www.gii.ie 01-6015175/5176	0 20 40	60 m	Drawn By: NM	Date: 23/10/2020	•	Window Sample Soakaway
	_1			1		



731200N

GROUND INVESTIGATIONS IRELAND

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Geotechnical & Envir

Ground Investigations Ireland Ltd. Catherinstown House, Hazelhatch Road, Newcastle, Co. Dublin

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GII Project Reference:

Date:

23/10/2020

9338-12-19

Drawn By:

NM

CBR

Trial Pit

Soakaway

Dynamic Probe

Window Sample

APPENDIX 2 - Trial Pit Records



achine : JCB 3CX athod : Trial Pit	Dimensio	Investigations Ireland Ltd www.gii.ie			TP02	
	0.6m W >		Ground	Level (mOD)	Client DBFL	Job Numbe 9338-12-
	Location 7168	345.6 E 731205.5 N	Dates 17	7/01/2020	Project Contractor	Sheet 1/1
Depth (m) Sample	/ Tests Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
					TOPSOIL. Firm light brown slightly sandy slightly gravelly CLAY. Firm to stiff brown slightly sandy slightly gravelly CLAY with occasional sub-angular cobbles. Complete at 1.05m	
					Groundwater not encountered during excavation. Trial pit stable. Trial pit terminated at 1.05m BGL on exposing the foundation a upon completion.	and backfi
					upon completion.	ANG DACKI
	· ·					
				s s	cale (approx) Logged By Figur	re No.

S		Grou	und Inv	/estigations www.gii.ie	Ireland	Ltd	Site Sandford Park Milltown	Trial Pit Number TP03		
Machine Method			Dimension 0.6m W		Ground	l Level (mOD)	Client DBFL	Job Number 9338-12-1		
			Location 716	ocation 716981.8 E 731146 N				7/01/2020	Project Contractor GII	Sheet 1/1
Depth (m)	1	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend		
Plan			. (,			(0.30) (0.90)	MADE GROUND: Topsoil with roots plastic redbrick and concrete fragments. MADE GROUND: Brown slightly sandy slightly gravelly CLAY with root concrete and fragments. Complete at 1.20m			
							Groundwater not encountered during excavation. Trial pit stable. Trial pit terminated at 1.20m BGL due to a concrete protect backfilled upon completion.	ion and		
	•									
	•	· ·	•	· · ·		· · ·	cale (approx) Logged By Fi	gure No.		
								<b>gure No.</b> 338-12-19.TP(		

S		nd Inv	estigations l www.gii.ie	reland	Ltd	Site Sandford Park Milltown	Trial Pit Number TP04
Machine : JO Method : Tr		Dimensio 0.6m W 3		Ground	Level (mOD)	Client DBFL	Job Number 9338-12-1
		Location 7170	097.4 E 731276.8 N	Dates 17	7/01/2020	Project Contractor Gll	Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
Plan						TOPSOIL with roots. Firm dark brown slightly sandy slightly gravelly CLAY with root fragments. Firm to stiff light brown slightly sandy slightly gravelly CLA Complete at 1.40m	
						Groundwater not encountered during excavation. Trial pit stable. Trial pit terminated at 1.40m BGL on exposing the foundatio upon completion.	n and backfille
					]	upon completion.	
					s	cale (approx) Logged By Fig	jure No.

SI		Ind Inv	estigations www.gii.ie	Ireland	Ltd	Site Sandford Park Milltown	Trial Pit Number TP05
Machine : JC Method : Tr		Dimensio 0.6m W >	<b>ns</b> ( 1.5m L	Ground	Level (mOD)	Client DBFL	Job Number 9338-12-
		Location 7170	)43.4 E 731334.3 N	Dates 17	7/01/2020	Project Contractor GII	<b>Sheet</b> 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
					(0.70) 0.70 (0.80) 1.50	TOPSOIL with roots. Firm to stiff brown slightly sandy slightly gravelly CLA Complete at 1.50m	
Plan .				·	• •	Remarks Groundwater not encountered during excavation. Trial pit stable. Trial pit terminated at 1.50m BGL on exposing the foun- upon completion.	
·				·	•••	Trial pit terminated at 1.50m BGL on exposing the foun- upon completion.	dation and backfi
•			· · ·	•	· · ·		
					s	cale (approx) Logged By	Figure No.

	G	iroui	nd Inv	vestig www	ations l ⁄.gii.ie	reland	Ltd	Site Sandford Park Milltown		Trial P Numbo <b>TP0</b>
	JCB 3CX Trial Pit		Dimensi 0.6m W	ons x 1.2m L		Ground	Level (mOD)	Client DBFL		Job Numbo 9338-12
			Location 717	<b>ו</b> 2005.1 E 73	1344 N	Dates	7/01/2020	Project Contractor		Sheet 1/1
Depth (m)	Sample /	Tests	Water Depth (m)	Fie	ld Records	Level (mOD)	Depth (m) (Thickness)	D	Description	Legend
							(0.25)	TOPSOIL with small conc	rete and plastic fragments.	
							- 0.25	Firm dark brown slightly s	andy slightly gravelly CLAY	
							 (0.75)			**************************************
							1.00	Complete at 1.00m		* <u>**</u> **
							-			
							- - -			
							- - -			
							- - -			
							- - -			
							 - 			
							- - -			
							-			
an			•				•••	Remarks Groundwater not encounter	ed during excavation.	
		•						Trial pit stable. Trial pit terminated at 1.0m upon completion.	BGL on exposing the found	lation and backfil
									1	<b>P</b>
							S	cale (approx) 1:25	Logged By	Figure No. 9338-12-19.TF

SI	Grou	nd Inv	vestigations li www.gii.ie	reland	Ltd	Site Sandford Park Milltown	Trial Pit Number TP07
Machine:JC Method:Tr		Dimensio 0.6m W x		Ground	Level (mOD)	Client DBFL	Job Number 9338-12-1
		Location 7169	981.4 E 731292.7 N	17/01/2020		Project Contractor Gll	<b>Sheet</b> 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
Plan .					(0.25) 0.25 (0.90) 1.15	TOPSOIL. Firm to stiff light brown slightly sandy slightly gravelly Complete at 1.15m	
						Groundwater not encountered during excavation. Trial pit stable. Trial pit terminated at 1.15m BGL on exposing the found upon completion.	dation and backfille
 	· ·		· · ·	· ·			
					S	cale (approx) Logged By 1:25 NM	Figure No. 9338-12-19.TPC

lachine : JO		Dimensio 0.6m W		Ground	l Level (mOD)	) Client DBFL	
		Location 716	888.6 E 731317.4 N	Dates	7/01/2020	Project Contractor Gll	9338-12- Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
Plan					•••	MADE GROUND: Topsoil with roots plastic redbrick and concrete fragments. Firm light brown grey slightly sandy slightly gravelly CL/ Firm to stiff light brown slightly sandy slightly gravelly Cl/ Complete at 1.20m Remarks Groundwater not encountered during excavation. Trial pit terminated at 1.20m BGL on exposing the founda upon completion.	
					1		

			vestigations www.gii.ie			Sandford Park Milltown	Numbe
lachine:31 lethod:Tr		Dimensi 0.6m W	ons x 2.0m L	Ground	Level (mOD) 20.90	Client DBFL	Job Numbe 9338-12-
			n (dGPS) 5894.6 E 731152.8 N	Dates 2	7/01/2020	Project Contractor Gll	<b>Sheet</b> 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
50	P			20.75	(0.15)	Topsoil Firm to stiff brown mottled grey slightly sandy slightly gravelly CLAY with occasional subangular cobbles. Gravel is angular to subrounded fine to coarse.	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
50 00	В			20.30	0.60	Stiff greyish brown slightly sandy slightly gravelly CLAY with occasional subanugular cobbles and boulders. Gravel is angular to subrounded fine to coarse.	
.00	Ь						
						Complete at 1.40m	
Plan						Remarks	
						Groundwater encountered at 1.40m Trial pit stable.	
						Trial pit terminated at 1.40m BGL on exposing the foundation a upon completion.	na backfil
	· ·		· · ·		· · ·		

Machine : 37		nd In Dimensio	vestigations I www.gii.ie			Site Sandford Park Milltown Client	Trial Pit Number TP10 Job
Method : Tr			x 1.1m L	Ground	Level (IIIOD)	DBFL	Number 9338-12-1
			n (Handheld GPS) 916.4 E 731157.9 N	Dates 27	/01/2020	Project Contractor GII	<b>Sheet</b> 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
1.20 Plan	в					Topsoil         MADE GROUND: Brown slightly gravelly sandy clay with occasional fragments of metal and red brick.         Firm to stiff brown mottled grey slightly sandy slightly gravelly fravelly CLAY with occasional subangular cobbles. Gravels angular to subrounded fine to coarse.         Stiff brown mottled grey slightly sandy slightly gravelly CLAY with occasional subangular cobbles and boulders Gravel is angular to subrounded fine to coarse.         Complete at 1.20m	el 
						Groundwater not encountered during excavation. Trial pit stable. Trial pit terminated at 1.20m BGL on exposing the foundatio upon completion.	on and backfil
						apon completion.	
				• •		cale (approx) Logged By Fi	gure No.

S	Gro	und Inv	vestigations www.gii.ie	Ireland	Ltd	Site Sandford Park Milltown	Trial Pit Number TP11
Machine:3 Method :7		Dimensio 0.6m W 2	ons		Level (mOD) 20.81	Client DBFL	Job Number 9338-12-1
		Location 7169	(dGPS) 935.8 E 731174.6 N	Dates 27	/01/2020	Project Contractor Gll	Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
D.80	в			20.66 20.51 19.81		Topsoil         MADE GROUND: Brown slightly gravelly sandy Clay with occasional fragments of red brick.         Stiff brown mottled grey slightly sandy slightly gravelly CLAY with occasional subanupular cobles and boulders. Gravel is angular to subrounded fine to coarse.         Complete at 1.00m	
						Groundwater not encountered during excavation. Trial pit stable. Trial pit terminated at 1.00m BGL on exposing the foundatio upon completion.	and backfill
		•				upon completion.	, and backlill
	· ·		· · ·				
	· ·	•		• •		cale (approx) Logged By Fig	ure No.

S	Grou	nd Inv	estigations li www.gii.ie	reland	Ltd	Site Sandford Park Milltown	Trial Pit Number TP13
Machine: 3 <sup>-</sup> Method : Tr		Dimensio 0.6m W x			Level (mOD) 21.95	Client DBFL	Job Number 9338-12-1
		Location 7169	(dGPS) 005.1 E 731084.8 N	Dates 27	7/01/2020	Project Contractor GII	Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
0.50 1.00 <b>Plan</b>	B			21.80	(0.45) 0.60 1.30 1.30	Topsoil         MADE GROUND: Brown slightly gravelly sandy Clay with rootlets and occassional fragments of glass and red brick         Stiff brown mottled grey slightly sandy slightly gravelly CLAY with occasional subanugular cobbles. Gravel is angular to subrounded fine to coarse. Possible madeground.         Complete at 1.30m	
						Groundwater not encountered during excavation. Trial pit stable. Trial pit terminated at 1.30m BGL on exposing the foundation	on and backfille
						upon completion.	
				-			
				•			
					 s		<b>gure No.</b> 338-12-19.TP1

APPENDIX 3 – Soakaway Records



## Soakaway Test Report



Catherinestown House, Hazelhatch Road, Newcastle, Co. Dublin. D22 YD52

Tel: 01 601 5175 / 5176 Email: info@gii.ie Web: www.gii.ie

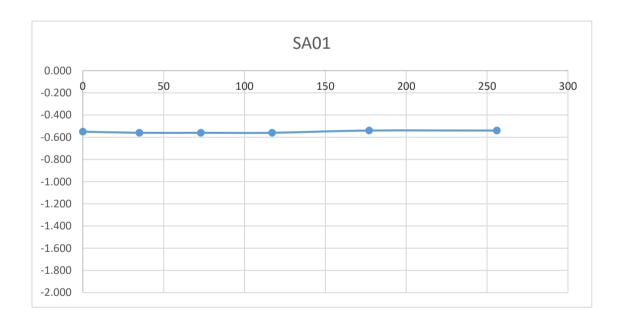
# SA01

Soakaway Test to BRE Digest 365 Trial Pit Dimensions: 2.5m x 0.60m 2.5m (L x W x D)

Date	Time	Water level (m bgl)
16/01/2020	0	-0.550
16/01/2020	35	-0.560
16/01/2020	73	-0.560
16/01/2020	117	-0.560
16/01/2020	177	-0.540
16/01/2020	256	-0.540

# \*Soakaway failed - Pit backfilled

Start depth	Depth of Pit	Diff	75% full	25%full
0.55	2.500	1.950	1.0375	2.0125



# Soakaway Test Report



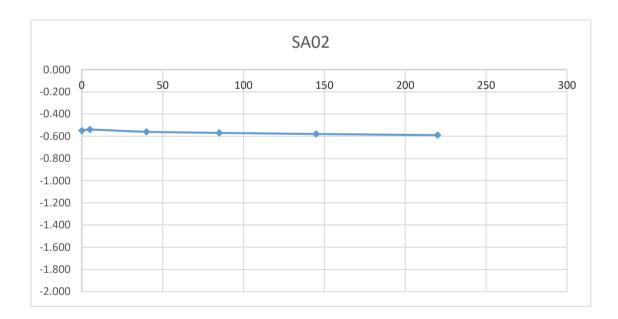
# SA02

Soakaway Test to BRE Digest 365 Trial Pit Dimensions: 2.5m x 0.60m 2.5m (L x W x D)

Date	Time	Water level (m bgl)
16/01/2020	0	-0.550
16/01/2020	5	-0.540
16/01/2020	40	-0.560
16/01/2020	85	-0.570
16/01/2020	145	-0.580
16/01/2020	220	-0.590

# \*Soakaway failed - Pit backfilled

Start depth	Depth of Pit	Diff	75% full	25%full
0.55	2.500	1.950	1.0375	2.0125



Catherinestown House, Hazelhatch Road, Newcastle, Co. Dublin. D22 YD52

Tel: 01 601 5175 / 5176 Email: info@gii.ie Web: www.gii.ie

# Soakaway Test Report



#### Catherinestown House, Hazelhatch Road, Newcastle, Co. Dublin. D22 YD52

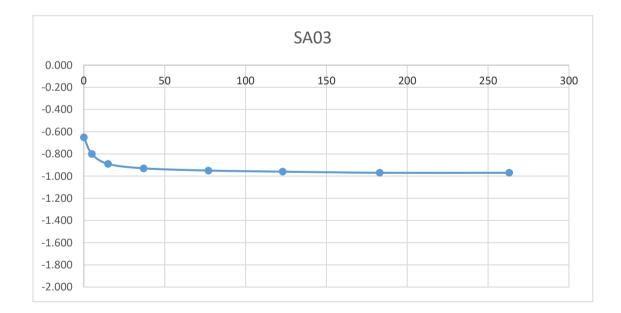
Tel: 01 601 5175 / 5176 Email: info@gii.ie Web: www.gii.ie

# SA03

Soakaway Test to BRE Digest 365 Trial Pit Dimensions: 2.6m x 0.60m 2.60m (L x W x D)

Date	Time		r level bgl)
16/01/2020	0	-0.650	
16/01/2020	5	-0.800	
16/01/2020	15	-0.890	
16/01/2020	37	-0.930	
16/01/2020	77	-0.950	
16/01/2020	123	-0.960	
16/01/2020	183	-0.970	
16/01/2020	263	-0.970	
		*Soakawa	y failed - Pit backfilled

Start depth	Depth of Pit	Diff	75% full	25%full
0.65	2.600	1.950	1.1375	2.1125



S		und Inv	vestigations www.gii.ie	Ireland	Ltd	Site Sandford Park Milltown	Trial Pit Number SA01
Machine:J Method :⊺		Dimensi 0.6m W	ons x 2.5m L		Level (mOD) 20.09	Client DBFL	Job Number 9338-12-19
			Location 716894.1 E 731261.8 N		6/01/2020	Project Contractor GII	<b>Sheet</b> 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
Plan				19.89 19.64 17.79 17.59	(0.20) 0.20 (0.25) 0.45 (1.85) 2.30 (0.20) 2.50	TOPSOIL. POSSIBLE MADE GROUND: Brown slightly sandy slightly gravelly Clay. Firm light brown slightly sandy slightly gravelly CLAY. Firm to stiff brown grey slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles and boulders Complete at 2.50m Remarks	
						Groundwater not encountered during excvation. Trial pit stable. Trial pit terminated at 2.50m BGL and backfilled upon comple	tion of
						soakaway.	
· ·					 s	icale (approx) Logged By Fig	ure No.

Nethod : Tur Pr         0 fm W x 2.5 m L         DBFL         NM         NM           Location 717038 2 E 731238 8 M         Pate 1610 Records         Pate 1600 Records         Pate 1700 Records         Pate 17				vestigations I www.gii.ie			Site Sandford Park Milltown		Trial Pit Numbe
Dogshi Dogshi Nampie / Test         Strate With Coll Participation         Field Records         (k705) (k705)         Description         Left           Image:					Ground	Level (mOD)			Job Numbe 9338-12
Plan					Dates 16	6/01/2020			Sheet 1/1
Plan     .	Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	D	escription	Legend
No groundwater encountered.         Trial pit spalling at 0.50m BGL.         Trial pit terminated at 2.50m BGL and backfilled upon completion of soakaway.         .	Plan					0.20 (0.20) 0.40 (0.80) 1.20 (0.90) 2.10 (0.40) 2.50	Soft to firm brown grey mo with occasional sub-angul Brown grey sandy very cla sub-rounded GRAVEL.	ayey fine to coarse sub-angular slightly gravelly CLAY with sub-rounded cobbles.	
							Trial pit terminated at 2.50m	d. SL. BGL and backfilled upon com	bletion of
							soakaway.		
	·		-		· ·				
						s	cale (approx)	Logged By F	gure No.

	Grou	nd In	vestig	gatio <i>w</i> .gii.	ns Ire <sup>ie</sup>	land	Ltd	Site Sandford Park Milltown	Trial Pi Numbe SA0
lachine : JC lethod : Tri		Dimens 0.6m W	<b>ions</b> / x 2.6m L				<b>Level (mOD)</b> 21.18	Client DBFL	Job Numbe 9338-12
		Locatio	<b>n</b> 6880.2 E 7	31202.2	2 N	Dates 16	/01/2020	Project Contractor Gll	Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Fie	eld Reco	ords	Level (mOD)	Depth (m) (Thickness)	Description	Legend
			Water stri	ke(1) at	2.50m.	20.98 20.78 20.48 19.38 18.58	(0.20) (0.20) (0.20) (0.20) (0.20) (0.20) (0.30) (0.30) (1.10) (1.10) (0.80) (0.80) (0.80) (0.80) (0.80)	TOPSOIL.         POSSIBLE MADE GROUND: Brown slightly sandy slightly gravelly CLAY.         Firm light brown slightly sandy slightly gravelly CLAY with occasional sub-angular cobbles.         Stiff to very stiff brown grey slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles.         Stiff to very stiff brown grey slightly sandy gravelly CLAY with occasional sub-angular to sub-rounded cobbles.         Complete at 2.60m	
Plan .				·			•	Remarks Slow ingress of groundwater encountered at 2.5m BGL. Trial pit stable.	tion of
				·			•	Trial pit terminated at 2.60m BGL and backfilled upon comple soakaway.	IION OT
				·			•		
•	· ·	•				· ·			
								cale (approx) Logged By Figu	re No.

# **APPENDIX 4** – Plate Load Test and TRL Probe Records



Applied Load	Gauge settlement
0	0.000
34.5	-5.3
69	-9.535
138	-23.05
0	-17.715
69	-21.95
138	-27.07
0	-21.335

21/01/2020

DBFL

457mm

Sandford Park Milltown MATERIAL

DEPTH

NOTES

LOCATION

DATE

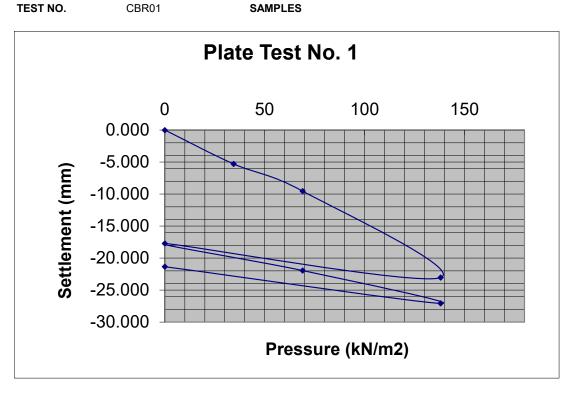
CLIENT

CONTRACT NO.

PLATE DIAMETER



MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets and small redbrick and mortar fragments. 0.40m



Modulus of subgrade reaction, K (Initial) =	4.89 MN/m2/m
Modulus of subgrade reaction, K (Reload) =	11.01 MN/m2/m
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 =	- 0.15 %
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2	= 0.62 %

Applied Load	Gauge settlement
0	0.000
34.5	-3.87
69	-7.38
138	-12.93
0	-6.9
69	-11.415
138	-14.265
0	-8.19

21/01/2020

DBFL

Sandford Park Milltown MATERIAL

DEPTH

NOTES

LOCATION

DATE

CLIENT

CONTRACT NO.

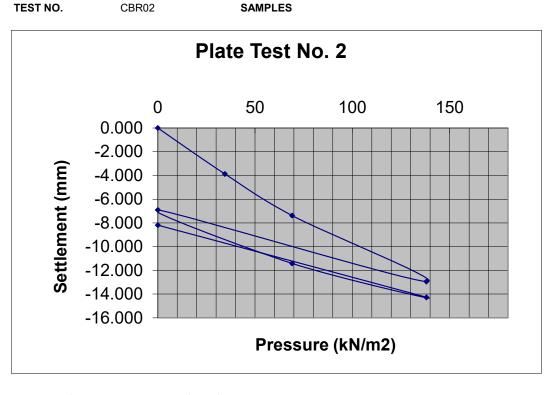
PLATE DIAMETER 457mm



Geotechnical & Environmental

MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets and small redbrick fragments.

0.40m



Modulus of subgrade reaction, K (Initial) =	6.32 MN/m2/m
Modulus of subgrade reaction, K (Reload) =	10.33 MN/m2/m
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 =	0.24 %
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2	= 0.55 %

Applied Load	Gauge settlement
0	0.000
34.5	-1.96
69	-4.265
138	-7.93
0	-3.73
69	-6.24
138	-8.745
0	-4.29

21/01/2020

DBFL

Sandford Park Milltown MATERIAL

LOCATION

DATE

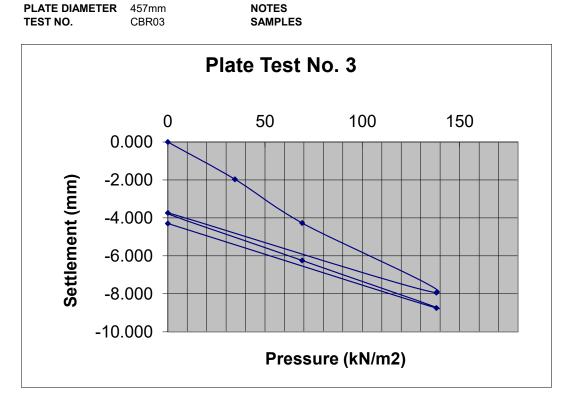
CLIENT

CONTRACT NO.



Geotechnical & Environmental

POSSIBLE MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets. 0.40m



DEPTH

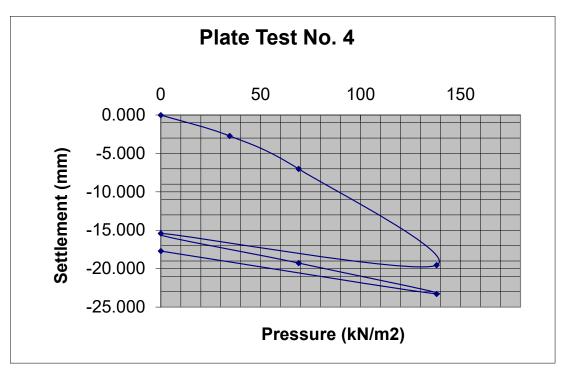
Modulus of subgrade reaction, K (Initial) =	10.93 MN/m2/m
Modulus of subgrade reaction, K (Reload) =	18.58 MN/m2/m
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 =	0.61 %
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2	= 1.53 %

Applied Load	Gauge settlement
0	0.000
34.5	-2.71
69	-7.01
138	-19.54
0	-15.41
69	-19.275
138	-23.28
0	-17.7



LOCATION CONTRACT NO. DATE	Sandford Park Milltown 9338-12-19 20/01/2020	MATERIAL
CLIENT	DBFL	DEPTH
PLATE DIAMETER	457mm	NOTES
TEST NO.	CBR04	SAMPLES

POSSIBLE MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets 0.30m



Modulus of subgrade reaction, K (Initial) =	6.65 MN/m2/m
Modulus of subgrade reaction, K (Reload) =	12.06 MN/m2/m
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 =	0.26 %
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2	= 0.72 %



Catherinestown House, Hazelhatch Road, Newcastle, Co. Dublin. D22 YD52

Tel: 01 601 5175 / 5176 Email: info@gii.ie Web: www.gii.ie

Job Name	Sandford Park Milltown	Test Type	Dynamic Cone Penetration Test
Job No.	9338-12-19	Test Reference	CBR05
Client	DBFL	Ву	N Morgan
		Date	21/01/2020

Initial Depth 0.3

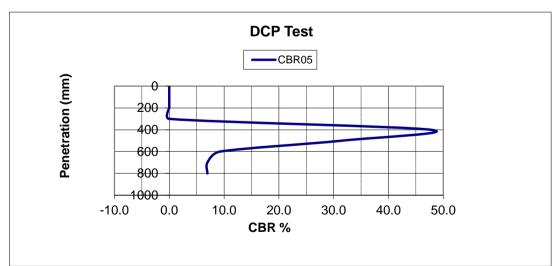
Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	-	-	0.0
200	-	-	0.0
300	-	-	0.0
400	18	5.6	47.7
500	13	7.7	31.5
600	5	20.0	9.3
700	4	25.0	7.0
800	4	25.0	7.0
900	4	25.0	7.0
1000	-		
1100	-		
1200	-		
1300	-		
1400	-		
1500	-		

# Reference

Kleyn and Van Heerden (60° Cone)



Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



Applied Load	Gauge settlement
0	0.000
34.5	-2.225
69	-5.135
138	-10.93
0	-5.815
69	-10.14
138	-12.565
0	-6.81

21/01/2020

DBFL

Sandford Park Milltown MATERIAL

DEPTH

NOTES

LOCATION

DATE

CLIENT

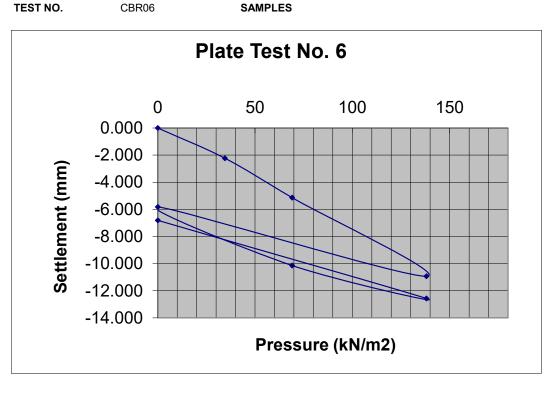
CONTRACT NO.

PLATE DIAMETER 457mm



Possible MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets.

0.40m



Modulus of subgrade reaction, K (Initial) =	9.08 MN/m2/m
Modulus of subgrade reaction, K (Reload) =	10.78 MN/m2/m
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 =	0.44 %
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2	= 0.59 %

Applied Load	Gauge settlement
0	0.000
34.5	-3.275
69	-5.88
138	-13.11
0	-8.275
69	-12.015
138	-14.935
0	-10.29

21/01/2020

DBFL

457mm

Sandford Park Milltown MATERIAL

DEPTH

NOTES

LOCATION

DATE

CLIENT

CONTRACT NO.

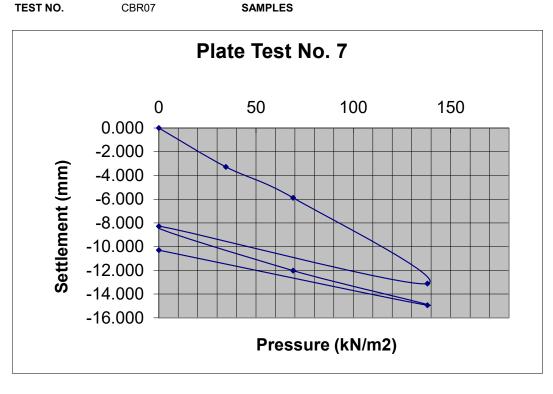
PLATE DIAMETER



Geotechnical & Environmental

MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets redbrick mortar and bone fragments.

0.45m



Modulus of subgrade reaction, K (Initial) =	7.93 MN/m2/m
Modulus of subgrade reaction, K (Reload) =	12.47 MN/m2/m
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 =	0.35 %
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2	= 0.76 %

Applied Load	Gauge settlement
0	0.000
34.5	-3.33
69	-6.305
138	-11.85
0	-6.52
69	-10.36
138	-13.16
0	-7.92

21/01/2020

DBFL

Sandford Park Milltown MATERIAL

DEPTH

LOCATION

DATE

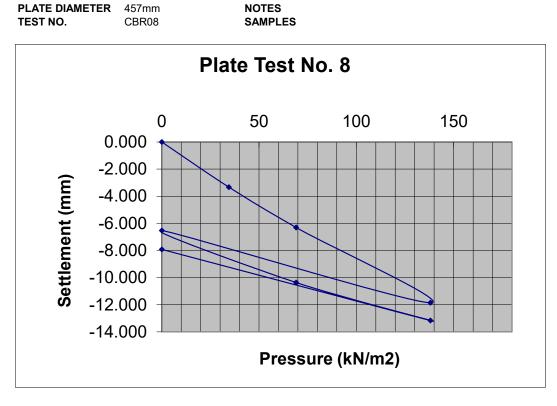
CLIENT

CONTRACT NO.



Geotechnical & Environmental

POSSIBLE MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets. 0.40m



Modulus of subgrade reaction, K (Initial) =	7.39 MN/m2/m
Modulus of subgrade reaction, K (Reload) =	12.14 MN/m2/m
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 =	0.31 %
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2	= 0.73 %

Applied Load	Gauge settlement
0	0.000
34.5	-2.715
69	-5.64
138	-9.94
0	-5.47
69	-8.445
138	-10.56
0	-6.045

9338-12-19

21/01/2020

DBFL

457mm

Sandford Park Milltown MATERIAL

DEPTH

NOTES

LOCATION

DATE

CLIENT

CONTRACT NO.

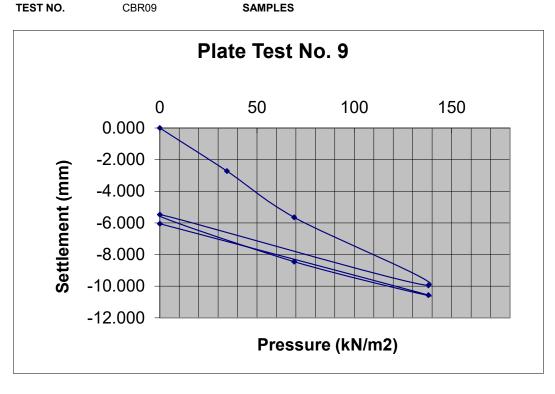
PLATE DIAMETER



Geotechnical & Environmental

MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets and small redbrick and plastic fragments.

0.30m



Modulus of subgrade reaction, K (Initial) =	8.27 MN/m2/m
Modulus of subgrade reaction, K (Reload) =	15.67 MN/m2/m
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 =	0.38 %
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2	= 1.14 %

Applied Load	Gauge settlement
0	0.000
34.5	-3.11
69	-5.82
138	-9.84
0	-4.82
69	-8.385
138	-10.515
0	-5.51

9338-12-19

21/01/2020

DBFL

457mm

Sandford Park Milltown MATERIAL

DEPTH

NOTES

LOCATION

DATE

CLIENT

CONTRACT NO.

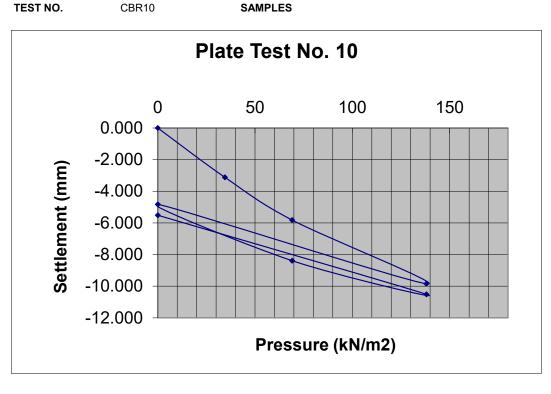
PLATE DIAMETER



Geotechnical & Environmental

MADE GROUND: Light brown slightly sandy slightly gravelly Clay with rootlets and small redbrick and plastic fragments.

0.30m



Modulus of subgrade reaction, K (Initial) =	8.01 MN/m2/m
Modulus of subgrade reaction, K (Reload) =	13.08 MN/m2/m
Equivalent CBR(initial)in accordance with HD25/94 volume7 section2 =	0.36 %
Equivalent CBR(reload)in accordance with HD25/94 volume7 section2	= 0.83 %

**APPENDIX 7** – Borehole Records



The sample / Test         Second Processes	Machine : Da Method : Ca		Casing	WV Diamete	gations Ire vw.gii.ie r ed to 5.70m	Ground	Level (mOD) 18.33	Sandford Park Milltown Client DBFL	Numbe BH0 Job Numbe 9338-12
Description         Dark boom sandy sliphty gravely TOPSOL with occasional notation         Descriptional notational notatio						04			Sheet 1/1
B         Class         Class         Class         Soft light brown slightly sandy slightly gavelly CLAV.         Soft light brown slightly sandy slightly gavelly CLAV.           14.45         BPT(C) N=19         1.22.3.3.3         17.53         0.00         Warry slightly sandy slightly gavelly CLAV.         17.53         0.00           14.45         BPT(C) N=19         2.345.5.5         15.83         2.50         Warry slightly slightly sandy slightly slightly sandy slightly sandy slightly sandy slightly slightly sandy slightly slightly sandy slightly slightly sandy slightly	Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
marks groundwater encountered during drilling ehole backfilled on complertion. ehole terminated at 5.70m BGL due to obstruction, possible boulder or rock	2.50 .00-1.45 .00-2.45 .00-3.45 .00-4.45 .00-5.38	SPT(C) N=11 B SPT(C) N=19 B SPT(C) N=40 B SPT(C) N=39 B			2,3/4,5,5,5 3,5/7,9,11,13 5,6/7,9,9,14	17.53	<ul> <li>0.30</li> <li>(0.50)</li> <li>0.80</li> <li>(1.70)</li> <li>2.50</li> <li>(3.20)</li> <li>5.70</li> </ul>	Soft light brown slightly sandy slightly gravelly CLAY. Firm to stiff light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Very stiff dark grey slightly slity slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.	
ehole terminated at 5.70m BGL due to obstruction, possible boulder or rock	Remarks lo groundwa	ater encountered du	ring drilling	9			<b></b>	Scale (approx	) Logge ) By
	Borehole terr	minated at 5.70m B0	GL due to a	obstructio	on, possible boulder	or rock		1:50	PM

Machine : D	ando 2000 able Percussion		Diamete	<b>/W.gii.ie</b> r ed to 7.00m		Level (mOD) 18.40	Sandford Park Milltown Client DBFL			3H02 ob umber
		Locatio	n (dGPS		Dates	/03/2020	Project Contractor Gli			38-12-1 heet 1/1
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.50 1.00-1.45 1.00 2.00-2.45 2.00 3.00-3.45 3.00 4.00 5.00-5.40 5.00 5.00 5.00 7.00-7.00 7.00 7.00	В SPT(C) N=14 SPT(C) N=18 SPT(C) N=33 SPT(C) 50/250 SPT(C) 50/250 SPT(C) 50/150 SPT(C) 25*/0 SPT(C) 25*/0			1,2/3,3,4,4 2,3/4,5,4,5 4,6/7,8,9,9 6,8/11,15,17,7 7,10/13,15,17,5 8,10/17,21,12 25/50	18.10 17.30 16.10 11.40	(0.80)	Dark brown slightly sandy slightly gravelly TOPSOIL with occasional rootlets.         Soft light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.         Firm to stiff light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.         Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.         Refusal at 7.00m			
Remarks No groundw Slotted pipe	ater encountered du with pea gravel surr	ring drilling ound from	] 7.0m BG	L to 1.0m BGL, plair	n pipe with	bentonite sea	I from 1.0m BGL to GL, finished with an upright	Scale (approx)	Lc B	ogged y
cover								1	1	

Machine : Da T <sup>2</sup> Method : Ca	14		200	<b>Diamete</b> Omm cas	vw.gii.ie r sed to 7.20m d to 20.00m		<b>Lev</b> 19.6	<b>el (mOD)</b> 7	Client DBFL			ob umbei 38-12-	
	th Rotary fol		Locatio	n	731274.9 N	Dates 06/03/2020			Project Contractor GII		Sheet 1/2		
Depth (m)	Sample /	Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	l (Th	Depth (m) ickness)	Description L			Insti	
						19.37		(0.30) 0.30	Dark brown slightly sandy slightly gravelly TOPSOIL with occasional rootlets.				
.50	В							(0.60)	Soft light brown slightly sandy slightly gravelly CLAY.	0 0 0 0 0 0 0 0 0 0			
.00 .00-1.45	B SPT(C) N	l=13			1,2/3,2,4,4	18.77 18.47	E	0.90 (0.30) 1.20	Soft light brown mottled orange grey slightly sandy slightly gravelly CLAY.	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
								(1.10)	Firm to stiff light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Some yellow and grey mottling.				
2.00 2.00-2.45	B SPT(C) N	I=22			7,4/5,6,6,5			. ,		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
						17.37		2.30	Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		0,00,00,00,00,00,00,00,00,00,00,00,00,0	
3.00 3.00-3.31	B SPT(C) 5	0/160			7,12/18,25,7							7 0 4 00 4 0 4 0 4 0 4 0 4 0 4 0 4 0 4 0	
.00 .00-4.45	B SPT(C) N	I=39			7,10/8,9,11,11			(4.20)					
5.00 5.00-5.45	B SPT(C) N	I=47			6,8/10,12,12,13							10 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -	
5.00 5.00-6.45	B SPT(C) N	I=50			6,9/10,11,14,15								
.00	TCR	SCR	RQD	FI	10,20/50 B	13.17		6.50 (0.50)	Very stiff brown slightly sandy gravelly CLAY.				
7.00-7.22 7.00					SPT(C) 50/70	12.67		7.00	Very stiff brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.				
	75												
20-8.28 20			-		22,3/50 SPT(C) 25*/75 50/0					······································			
	93							(4.20)					
.70-9.78 .70			_		22,3/50 SPT(C) 25*/75 50/0								
Remarks	ater encount	ered du	ring cable	percusio	on drilling. Ilow on to 20.00m B	21				Scale (approx)	L	ogge y	

Machine : Da T4 Flush : Wa	ando 2000	Groui	Casing	WN Diamete	ww.gii.ie		<b>Level (mOD)</b> 19.67	Client DBFL			<b>3H03</b> ob umber 38-12-1
Core Dia: 63 Method : Ca wit		ssion ollow on	Locatio	n	E 731274.9 N	Dates 06	/03/2020	Project Contractor GII		Sheet 2/2	
Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
11.20-11.28 -	93				26/50 SPT(C) 26*/75	8.47					
11.20-11.28 11.20	67				50/0	0.47		Very stiff brown slightly sandy gravelly CLAY with some subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse.			
12.70-12.70 - 12.70	73				25/50 SPT(C) 25*/0 50/0	6.27	13.40	Very stiff grey slightly sandy gravelly CLAY with many subangular to subrounded cobbles and			
14.20-14.20 - 14.20					25/50 SPT(C) 25*/0 50/0			many subangular to subrounded cobbles and boulders. Gravel is subangular to subrounded fine to coarse.			
15.70-15.78 -	73				22,3/50 SPT(C) 25*/75		(3.80)				
15.70	100				50/0						
17.20-17.28 - 17.20	33				21,4/50 SPT(C) 25*/75 50/0	2.47	17.20 (1.25)	Poor recovery. Recovery consists of slightly clayey slightly gravelly clayey subangular to subrounded COBBLES of limestone.			
18.70						1.22	18.45	Poor recovery. Recovery consists of COBBLES of limestone. Presumed rock.			
	62						(1.55)			,   , ,	
20.00			1		1	-0.33	20.00	<u> </u>	<u></u>	<del>ا</del>	
									Scale (approx) 1:50		ogged y M, CB

Machine : D Method : C		Casing	WV Diamete	gations Ire vw.gii.ie r ed to 7.30m	Ground	Ltd Level (mOD) 19.44	Sandford Park Milltown Client DBFL	Boreho Number BH04 Job Number 9338-12-
		Location 716		731262.2 N	Dates 10	/03/2020	Project Contractor GII	Sheet 1/1
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
).50	B				19.24 18.54	(0.20) 0.20 (0.70) 0.90	Dark brown sandy slightly gravelly TOPSOIL with occasional rootlets. Soft to firm light brown mottled grey slightly sandy slightly gravelly CLAY. Soft to firm light brown slightly sandy slightly gravelly CLAY.	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
.00-1.45 .00 .00-2.02	SPT(C) N=8 B SPT(C) 25*/20			1,1/2,1,2,3	18.04	(0.50) 1.40 (1.10)	Firm to stiff light brown slightly sandy slightly gravelly CLAY.	
.00-3.45	SPT(C) 23 720 50/0 B			6,8/11,12,13,11	16.94	2.50	Very stiff, dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.	
.00-4.45 .00	SPT(C) N=50			6,8/11,13,14,12				
.00-5.43 .00	SPT(C) 50/275 B			7,8/10,15,16,9		(4.40)		
.00-6.37 .00	SPT(C) 50/215 B			9,10/14,16,20				
7.00-7.35 7.00	SPT(C) 50/195 B			10,10/15,20,15	12.54 12.14	6.90 (0.40) 7.30	Very stiff greyish brown slightly silty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Refusal at 7.30m	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Remarks lo groundwa lorehole baa corehole teri chiselling fro	ater encountered du ckfilled on complertion minated at 7.30m to om 2.50m to 2.62m f	ring drilling on. GL due to d or 0.75 ho	) obstructio urs. Chis	on, possible boulder elling from 7.30m to	or rock 7.30m for <sup>-</sup>	1 hour.	Scale (approx) 1:50 Figure	PM

Method : C	44	ssion		<b>Diamete</b> Omm cas	VW.gii.ie r ed to 5.30m d to 16.50m		<b>Level (mOE</b> 18.75	)) Client DBFL		Job Numbe 9338-12	
	in rolary i		Location 717		31253.8 N	Dates 03	/03/2020	Project Contractor GII		Sheet 1/2	
Depth (m)	Sample	/ Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness	Description		Legend	
0.50 1.00 1.00-1.45	B B SPT(C)	N=12			1,2/3,3,3,3	18.65 18.25	(0.40	<ul> <li>MADE GROUND: Light brown slightly sandy slig gravelly CLAY with occasional subangular to sub cobbles and occasional fragments of red brick cl and tarmacadam.</li> <li>Firm light brown slightly sandy slightly gravelly C orange mottling.</li> </ul>	orounded oth fibres		
.00 .00-2.45	B SPT(C)	N=37			2,4/5,7,12,13	16.55		Very stiff dark grey slightly sandy slightly gravelly Gravel is subangular to subrounded fine to coars	r CLAY. ;e.		
9.00 9.00-3.45	B SPT(C)	N=51			5,7/11,11,14,15 Water strike(1) at 3.10m, rose to 2.60m in 20 mins, sealed at NOm.				- - - - - - - -		
.00 .00-4.45	B SPT(C)	N=55			5,7/10,13,15,17		(4.50	)	- - - - - - - - - - - - - - - - - - -		
5.00 5.00-5.30 5.30	B SPT(C) TCR	50/150 SCR	RQD	FI	7,15/20,30						
.70-6.85 .70					14,22/50 SPT(C) 50/0	12.05	6.70	Very stiff brown slightly sandy slightly gravelly Cl some subangular to subrounded cobbles and bo Gravel is subanugular to subrounded fine to coa	AY with ulders. rse.		
.20-8.28 .20	100				22,3/50 SPT(C) 25*/75 50/0				- - - - - - - - - - - - - - 		
	100				22,3/50					ୄୠୄୄୄୄୄୄୄୄୄୄୠୄୢୄୄୄୄୄୠୄୢ ୄୄୠୣୄୄ୶୰ୄୠୄୢୠୄୄ୶୰ୄ ୡୄୗ୕ୖଡ଼ୄଽୡୄୗଡ଼ୄଽୡୄୗଡ଼ୄ	
.70-9.78 .70 Remarks					SPT(C) 25*/75 50/0						
roundwate	ckfilled on	completior	า.	v ooro fo	llow on to 16.50m BG	N			Scale (approx)	Logge By	

SI				W١	igations Ire ww.gii.ie			Site Sandford Park Milltown		Borehole Number BH05
Machine : Da T4 Flush : Wa	4 ater	), Beretta	20	Diamete Omm case	er sed to 5.30m ed to 16.50m		Level (mOD) 18.75	Client DBFL		Job Number 9338-12-1
Core Dia: 63 Method : Ca wit		ission follow on	Locatio		731253.8 N	253.8 N Dates 03/03/2020 Project Contractor GII		03/03/2020		Sheet 2/2
Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend
11.20-11.28 - 11.20	93				22,3/50 SPT(C) 25*/75 50/0					
12.70-13.15 - 12.70	73			-	8,9/10,12,12,11 SPT(C) N=45					
13.30	50	22	22		-	5.45		Weak- medium strong fine grained grey LIMESTONI distinctly weathered with calcite veining and occasio beds of stiff brown Clay. (possible residual mudstone One set of fractures. F1: 0-10 degrees. Very closely-closely spaced undulating smooth occasion open with brown staining and clay smearing.	nal a)	
14.20	87	59	52	7	-					
15.70	81	23	16	N.I.	-	2.25		From 15.40 to 16.50 Non Intact.		
Remarks		<u> </u>	<u> </u>	<u> </u>	1		<u> </u>	(4	Scale approx)	Logged By
									1:50 Figure N 9338-12	РМ, СВ <b>Io.</b> 2-19.ВН05

Machine : Da	ando 2000	Casing	WV Diamete		Ground	Level (mOD)	Sandford Park Milltown Client	Number BH06 Job Number
Method : Ca	able Percussion	Locatio	n	ed to 8.00m 731242.4 N	Dates	20.32 /03/2020	DBFL Project Contractor GII	9338-12- Sheet 1/1
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
0.50 1.00-1.45 1.00 2.00-2.45 2.00 3.00-3.42 3.00 4.00-4.39 4.00 5.00-5.38 5.00 5.00-5.38 5.00 7.00-7.33 7.00	B SPT(C) N=10 SPT(C) N=19 SPT(C) 50/265 SPT(C) 50/230 SPT(C) 50/230 SPT(C) 50/230 SPT(C) 50/230			1,1/2,2,3,3 2,2/3,4,5,7 10,10/10,15,15,10 11,12/13,14,16,7 10,12/12,16,17,5 11,13/17,19,14 12,14/16,22,12			Dark brown sandy slightly gravelly TOPSOIL with occasional rootlets.         Soft light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.         Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.         Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.         Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.         Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.         Very stiff light brown slightly sandy slightly gravelly CLAY.	
8.00-8.28 8.00	SPT(C) 50/125 B			16,19/25,25			Complete at 8.00m	
Remarks No groundwa Borebole terr	ater encountered du ninated at 8.00m B0	ring drilling	g		<u> </u>	<u>F</u>	Scale (approx)	Logged By
	miateu al o.00111 BC						1:50	PM

		1	WV	gations Ire /w.gii.ie			Site Sandford Park Milltown		E	orehol umber 8H07
Machine:D Method :C	ando 2000 able Percussion	-	<b>Diamete</b> Omm cas	<b>r</b> ed to 8.00m		Level (mOD) 20.00	Client DBFL		N	ob umber 38-12-1
		Locatio		731230.1 N	Dates 12	2/03/2020	Project Contractor		SI	<b>heet</b> 1/1
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.50 1.00-1.45 1.00 2.00-2.45 2.00 3.00-3.45 3.00	B SPT(C) N=5 B SPT(C) N=27 B SPT(C) N=44 B			1,1/1,2,1,1 1,2/4,6,8,9 5,7/10,11,11,12	19.00 18.60 17.60	(1.00) (1.00) (0.40) (0.40) (1.00) (1.00) (1.00) (1.00) (1.00) (1.00)	MADE GROUND: Light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and occasional fragments of concrete and red brick. POSSIBLE MADE GROUND: Light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Firm to Stiff light brown slightly sandy slightly gravelly CLAY. Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.			
4.00-4.44 4.00 5.00-5.43	SPT(C) 50/285 B SPT(C) 50/275			8,8/11,14,15,10				0 0 0 0 0 0 0 0 0 0 0 0 0 0		
6.00-6.37 6.00	SPT(C) 50/220 B			11,14/15,16,19				2		ين بولاي من من من بول بول من من من بولي من من بولي بولي من من بولي بولي بولي بولي بولي بولي بولي بولي
7.00-7.37 7.00	SPT(C) 50/220 B			12,12/14,16,20	12.80	E	Very stiff light brown slightly sandy slightly gravell CLAY with occasional subangular to subrounded cobbles.		•	
8.00-8.31 8.00	SPT(C) 50/155 B			14,17/20,25,5	12.00		Complete at 8.00m	<u>, 0, a</u> , ó		
Remarks No groundwa Slotted pipe	ater encountered du with pea gravel surr	ring drilling	g 8.0m BQ	GL to 1.0m BGL. plair	n pipe with	<u> </u>	I from 1.0m BGL to GL, finished with an upright	Scale (approx)	L	ogged Y
cover	minated at 8.00m B0				E-E-6 (1101			1:50		PM
								Figure N 9338-12		BH07

۲٬ Method :C	ando 2000 44 able Percu ith Rotary t	ssion		)mm cas	<b>r</b> ed to 8.00m d to 13.70m		Level (mOD) 19.76	Client DBFL	Job Numbe 9338-12-
	in rotary i		Location 710		731204.4 N	Dates 13	/03/2020	Project Contractor GII	Sheet 1/2
Depth (m)	Sample	/ Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
.50 .00 .00-1.45	B B SPT(C)	N-5			1,1/1,1,1,2	19.66 19.26	(0.40)	CONCRETE. MADE GROUND: Light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and occasional fragments of red brick and concrete. Soft light brown very sandy slightly gravelly CLAY.	
2.00 2.00 2.00-2.45	B SPT(C)				1.1/1.2.3.3	18.46	1.30	Soft to firm brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
3.00 3.00 3.00-3.45	B SPT(C)				5,5/8,9,10,11	17.16		Very stiff dark grey slightly sandy slightly gravelly CLAY with rare subangular to subrounded cobbles.	0 0 0 0 0 0 0 0 0 0 0 0 0 0
.00 .00-4.45	B SPT(C)	N=41			4,5/8,10,11,12				2010 001 001 001 001 001 001 001
.00 .00-5.45	B SPT(C)	N=41			5,6/7,9,11,14		(4.60)		
.00 .00-6.45	B SPT(C)	N=47			8,9/10,11,13,13				0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
7.00 7.00-7.37	B SPT(C)	55/220			11,14/16,17,22	12.56	7.20	Very stiff dark brown very sandy very gravelly CLAY. Gravel is subangular to subrounded fine to coarse.	
8.00 8.00-8.25 8.00 8.20	<b>TCR</b> 100	SCR	RQD	FI	14,20/27,23 B SPT(C) 50/95	11.76	8.00	Very stiff brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and boulders. Gravel is subangular to subrounded fine to coarse.	
	63						(1.70)		00000000000000000000000000000000000000
0.70-9.78 0.70 <b>Remarks</b>					12,13/50 SPT(C) 25*/75 50/0	10.06	9.70	Medium strong- strong fine grained grey LIMESTONE partially- distinctly weathered with calcite veining.	

<b>SI</b>		Grou	nd In	vest wv	igations Ire vw.gii.ie	land	Ltd	Site Sandford Park Milltown		Borehole Number BH08
Machine : Da T4 Flush : W Core Dia: 96	l4 ater	, Beretta	20	Diamete Omm cas mm case	ed to 8.00m ed to 13.70m		Level (mOD) 19.76	Client DBFL		Job Number 9338-12-1
Method : Ca		ssion ollow on	Locatio 71		731204.4 N	Dates 13	3/03/2020	Project Contractor GII		Sheet 2/2
Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Legend
	100	67	60					Two sets of fractures. F1: 0-10 degrees. Very close closely spaced undulating smooth occasionally ope with clay smearing. F2: 30-45 degrees. Very closely closely spaced undulating smooth closed.	ely- en y-	
1.20	100	59	59	9			(4.00)			
12.50	100	75	68							
13.70						6.06		Complete at 13.70m		
Remarks	I		1	1	1	1		(a	Scale approx)	Logged By
									1:50 Figure N 9338-12	PM, CB <b>Io.</b> 2-19.BH08

	ando 2000, Beretta 44	Casing	WW Diamete		Ground	Level (mC	D)	Sandford Park Milltown Client		Jo	b umber
	able Percussion ith Rotary follow on	20 63	0mm cas mm case	ed to 8.00m d to 18.70m		20.84		DBFL			8-12-1
v	in Rotary Ionow on	Locatio 71		731214.8 N	Dates 17	7/03/2020		Project Contractor Gll		Sł	1/2
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thicknes	ss)	Description	Legend	Water	Instr
					20.54	(0.3		Dark brown sandy slightly gravelly TOPSOIL with occasional rootlets.			
0.50	В					(0.6	0)	Soft light brown slightly sandy slightly gravelly CLAY.	* · · · · · · · · · · · · · · · · · · ·		
.00 .00-1.45	B SPT(C) N=10			1,1/2,3,3,2	19.94	0.9	0	Firm light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
2.00 2.00-2.45	B SPT(C) N=11			1,2/3,3,3,2		(1.5	0)		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		20040000000000000000000000000000000000
3.00 3.00-3.45	B SPT(C) N=28			2,3/5,7,7,9	18.44		- 0	Very stiff dark grey slightly silty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.		2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2, 10,20,00,00,20,00,00,00,00,00,00,00,00,00
1.00 1.00-4.45	B SPT(C) N=38			5,7/7,9,11,11						0 - 1100 - 00 pp 0 - 1100 - 00 pp 0 - 110	80 % ~
5.00 5.00-5.45	B SPT(C) N=43			7,7/8,10,12,13		[ (5.2	0)		2 2 2 2 2 2 2 2 2 2 2 2 2 2	<u> </u>	
3.00 3.00-6.44	B SPT(C) 50/285			10,12/12,14,14,10							
7.00 7.00-7.34	B SPT(C) 50/190			12,14/16,23,11					0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	600-1080-00 R00-108	
3.00 3.00-8.28 3.00	TCR         SCR           100	RQD	FI	12,17/24,26 B SPT(C) 50/125	13.24 12.84	(0.4	0)	Very stiff light brown slightly sandy slightly gravelly CLAY with rare subangular to subrounded cobbles Very stiff slightly sandy slightly gravelly CLAY with occsional subangular to subrounded cobbles.			
3.20	100						0)	Gravel is subangular to subrounded fine to coarse			აზებად შეაკა ფევებაფება. აკუ იკი და ბალიანი იკისი იკილიანი აკისი იკილიანი იკილიანი კისი იკილიანი იკისი იკილიანი თამაა ფევტი კისი იფიკოცი იკილიანი ფე
9.70-9.85 9.70				12,22/50 SPT(C) 50/0							
Remarks	ater encountered du	rig cable p	ercussio	n drilling ollow on to 18.70m B	GI				Scale (approx)	Lc By	ogged /
Slotted pipe	installed from 9.5 BC an upright cover	GL to 3.0m	BGL wit	h pea gravel filter zon	e from 9.5	5m BGL to	1.0r	n BGL and bentonite seal from 1.0m BGL to GL,	1:50	PI	M, CB
									Figure N 9338-12		

<b>SI</b>			nd In		igations Ire ww.gii.ie	eland	Ltd	Site Sandford Park Milltown		N	orehole umber 8H09
Machine : Da T4 Flush : Wa	4	, Beretta	Casing 200 631	0mm ca	e <b>r</b> sed to 8.00m ed to 18.70m		Level (mOD) 20.84	Client DBFL		N	ob umber 38-12-19
Core Dia: 63 Method : Ca wit			Locatio		E 731214.8 N	Dates 17	/03/2020	Project Contractor GII		SI	n <b>eet</b> 2/2
Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
11.20-11.28 -	100				19,6/50 SPT(C) 25*/75	10.34	10.50	Very stiff brown slightly sandy slightly gravelly CLAY with somel subangular to subrounded cobbles and boulders.			
11.20	83				50/0		(2.50)				
12.70	27		-			7.84	13.00	No recovery. Driller notes possible rock at 13.00m.	• • • • • • • • • • • • • • • • • • •		
14.20	77		_			6.64	(1.50)	Possible weathered rock recovered as slightly sandy gravelly CLAY with subangular to subrounded cobbles of limestone.			
15.70	93	51	51			5.14		Medium strong- strong fine grained grey LIMESTONE partially to distinctly weathered, with closely to medium spaced thin beds of stiff brown Clay (possible residual mudstone). One set of fractures. F1: 0-10 degrees. Very closely-closely spaced undulating smooth occasionally open with brown staining and clay smearing.			
17.20	80	32	32								
18.70						2.14		Complete at 18.70m			
Remarks		<u> </u>	1		1		<u> </u>		Scale (approx)		ogged y
								-	1:50 Figure N 9338-12	lo.	M, CB .BH09

Machine : Da		Casing	WV Diamete	gations lre /w.gii.ie r ed to 7.20m	Ground	Level (mOD) 20.35	Sandford Park Milltown Client DBFL	Job Number
		Locatio	n	731201 N	Dates	/03/2020- /03/2020	Project Contractor	9338-12- Sheet 1/1
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness		Legend
					20.15	(0.20)	Dark brown sandy slightly gravelly TOPSOIL with occasional rootlets.	
0.50	В					(1.00)	Soft light brown slightly sandy slightly gravelly CLAY. Mottled grey.	· · · · · · · · · · · · · · · · · · ·
1.00-1.45 1.00	SPT(C) N=11 B			1,1/2,3,3,3	19.15	1.20	Firm to stiff light brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.	0 <u>10</u> 0
						(1.30)		
2.00-2.45 2.00	SPT(C) N=21 B			2,3/4,5,5,7	17.85	2.50		0 <u>00</u> 00
3.00-3.45 3.00	SPT(C) N=44 B			5,7/9,10,12,13			Very stiff dark grey slightly silty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.	10 10 10 10 10 10 10 10 10 10 10 10 10 1
4.00-4.44 4.00	SPT(C) 50/285 B			7,9/11,14,16,9 Water strike(1) at 4.30m, rose to				
5.00-5.40 5.00	SPT(C) 44/245 B			4.20m in 20 mins. 7,10/10,10,17,7		(4.70)		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
5.00-6.37 5.00	SPT(C) 50/215 B			9,11/14,17,19				
7.00-7.17 7.00	SPT(C) 50/20 B			12,14/50	13.15	7.20	Refusal at 7.20m	
<b>Remarks</b> Groundwater	r encountered at 4.3 ckfilled on completio	0m.					Scale (approx)	Logged
3orehole bad 3orehole terr	ckfilled on completio minated at 7.20m BC	n GL due to o	obstructio	on, possible boulder o	or rock		1:50	PM
							<b>Figure</b> 9338-1	<b>No.</b> 2-19.BH10

Depth (m)         Sa           0.50         B           1.00         B           1.00-1.45         B           2.00         B           2.00-2.45         B           3.00         B           3.00-3.45         B           4.00         F           4.00         B           5.00         B	PT(C) N=6 PT(C) N=12 PT(C) N=48			731182.2 N Field Records 1,1/1,2,1,2 1,1/2,3,3,4 7,9/10,12,12,14	Dates 18 (mOD) 20.35 19.95 19.75 19.25 19.25	(0.40 0.50 (0.20	MADE GROUND: Tarmacadam MADE GROUND: Light brown slightly sandy slightly gravelly CLAY with occasional subangu to subrounded cobbles Soft light brown slightly sandy slightly gravelly CLAY with rare subangular to subrounded cob Soft light brown mottled grey slightly sandy slig gravelly CLAY with occasional subangular to subrounded cobbles. Firm light brown slightly sandy slightly gravelly CLAY.	10         12         20           10         12         20         20           10         12         20         20           10         12         20         20           10         12         20         20           10         12         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         10         20           10         10         10         10<		neet 1/2 Instr
2.00 B 2.00-2.45 SF 3.00-3.45 SF 4.00 B 5.00 B	PT(C) N=6 PT(C) N=12 PT(C) N=48	Casing Depth (m)	Water Depth (m)	1,1/1,2,1,2 1,1/2,3,3,4	20.35 19.95 19.75 19.25	0.10 (0.40 0.50 0.70 (0.50 1.20	MADE GROUND: Tarmacadam MADE GROUND: Light brown slightly sandy slightly gravelly CLAY with occasional subangu to subrounded cobbles Soft light brown slightly sandy slightly gravelly CLAY with rare subangular to subrounded cob Soft light brown mottled grey slightly sandy slig gravelly CLAY with occasional subangular to subrounded cobbles. Firm light brown slightly sandy slightly gravelly CLAY. Very stiff dark grey slightly slightly slightly sandy slightly gravelly CLAY with occasional subangu	lar $\frac{1}{10} \frac{10}{10} \frac{10}{9} \frac{10}{9}$ $\frac{10}{10} \frac{10}{10} \frac{10}{9} \frac{10}{9}$	Water	
1.00     B       1.00-1.45     SF       2.00     B       2.00-2.45     SF       3.00     B       3.00-3.45     SF       4.00     A       4.00-4.45     SF       5.00     B	PT(C) N=6 PT(C) N=12 PT(C) N=48			1,1/2,3,3,4	19.95 19.75 19.25	(0.40 0.50 (0.20 (0.20 (0.50 1.20 (1.20	MADE GROUND: Light brown slightly sandy slightly gravelly CLAY with occasional subangu to subrounded cobbles         Soft light brown slightly sandy slightly gravelly CLAY with rare subangular to subrounded cob         Soft light brown mottled grey slightly sandy slig gravelly CLAY with occasional subangular to subrounded cobbles.         Firm light brown slightly sandy slightly gravelly CLAY.         Very stiff dark grey slightly silty slightly sandy slightly gravelly CLAY with occasional subangu	10         12         20           10         12         20         20           10         12         20         20           10         12         20         20           10         12         20         20           10         12         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         20         20           10         10         10         20           10         10         10         10<		
2.00-2.45 SF 3.00 3.00-3.45 SF 4.00 B 1.00-4.45 SF 5.00 B	PT(C) N=12 PT(C) N=48				18.05		Subrounded cobbles. Firm light brown slightly sandy slightly gravelly CLAY. Very stiff dark grey slightly silty slightly sandy slightly gravelly CLAY with occasional subangu		ົບ <u>ນັ້</u> ດ ຄຣິຕິມູນິນ ດູ້ໃນ ແລະ ຄຣິຕິມູນິນ ດູ້ນີ້ນີ້ ແລະ ຄຣິກ ມີດູ້ນີ້ ແລະ ລະດີ ແມ່ນປີ ທີ່ແລະ ສິນໃຫ້ແລະ ດັບນັ້ນແມ່ນ ນີ້	ታ ውስ ምሳሌ በማስታ በማስታ የሰው
.00-3.45 SF .00 B .00-4.45 SF	PT(C) N=48			7,9/10,12,12,14			slightly gravelly CLAY with occasional subangu	lar	ອັນດີ ລັດດ້າວ ລາວ ອັນດູດ້ານ ດີກດີ ອ້າດກາດດີນ ຄົດດ້ານ ອ້າດກາດ ດັ່ງ	წარე და ერელი და და ერთავი და და კალი გარი იკინი იკილი იკი იკი იკი იკი იკი იკი იკი გარი იკინი იკილი იკი იკი იკი იკი იკი იკი იკი იკი იფი იკი თვი ივი იკი იკი იკი იკი იფი იკი იფი იკი
5.00 B	PT(C) N=49							0 <u>.0</u> 0 0 <u>.0</u> 0 0 <u>.0</u> 0	ดัสจี ฮ"ออ"ก อ อ่	88.64
				7,10/10,12,14,13					<u>"" ("" " " " " " " " " " " " " " " " " </u>	0.000 0.000
	PT(C) 50/285			8,9/11,12,13,14				10000000000000000000000000000000000000	విరహంధరి జర్మాం జిరహదధరి జరిగా	6 % 5 6 6 % % 5 % 5 % 5 % 6 % % 6 % 7 % 6 % 7 % 6 % 7 % 6 % 7 % 6 % 7 % 7
6.00 B 6.00-6.40 SF	PT(C) 50/245			8,10/12,14,14,10					<u>อ อ้<sup>า</sup>ย อัสอัส อ้างจำก อ อ้ายอัสอั</u>	
7.00-7.37	CR SCR	RQD	FI	10,11/14,16,20 B SPT(C) 50/220					<u>ส "ออ" n o o "ค</u> ลัสด	
.00	33 -			12,14/17,20,15 SPT(C) 52/190	13.35	(0.90	with occasional subangular to subrounded cob	V 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
.20				B	12.45	8.00 (1.00	CLAY with some subangular to subrounded cobbles and boulders.			
.00	87 18	9			11.45	9.00	Medium strong-strong grey fine grained LIMESTONE partially weathered with calcite veining. Two sets of fractures. F1: 0-10 degrees. Very closely- closely spaced undulating smooth closed. F2 35-45 degrees. Closely- medium spaced undulating smooth closed.			
Remarks	encountered du	ring cable :	nercussi	ive drilling Illow on to 13.00m BC		<u> </u>		Scale (approx)	Lo	ogge /

SI	4			WV	igations Ire vw.gii.ie	eland	Ltd	Site Sandford Park Milltown		N	orehole umber 3H11
Machine : Da T <sup>2</sup> Flush : W	4	, Beretta		Diamete			Level (mOD) 20.45	Client DBFL		N	ob umber
Core Dia: 96					sed to 8.00m ed to 13.00m		20.40			<u> </u>	38-12-1
Method : Ca		ssion ollow on	Locatio 71		731182.2 N	Dates 18	8/03/2020	Project Contractor GII		SI	heet 2/2
Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
	93	89	87	8			(4.00)				
11.20	100	67	36								
12.70	100	67	67			7.45	13.00				
Remarks									Scale (approx)	Lo B	ogged Y
									1:50	P	M, CB
									Figure I 9338-1	No.	

Machine : D				gations Ire /w.gii.ie r		Ltd	Site Sandford Park Milltown	Borehol Number BH12 Job
	able Percussion	-		ed to 8.00m		21.41	DBFL	9338-12-2
		Locatio		731202.8 N	Dates 19	9/03/2020	Project Contractor GII	<b>Sheet</b> 1/1
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
					21.11	(0.30) 0.30	Dark brown sandy slightly gravelly TOPSOIL with occasional rootlets.	
0.50	В					(0.70)	POSSIBLE MADE GROUND: light brown sandy gravelly CLAY.	
1.00-1.45 1.00	SPT(C) N=6 B			1,1/1,1,2,2	20.41	1.00	Soft light brown mottled grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.	10 <u>-0 0</u>
					19.51		Firm light brown slightly sandy slightly gravelly CLAY.	
2.00-2.45 2.00	SPT(C) N=10 B			2,2/2,3,3,2		(0.70)		· · · · · · · · · · · · · · · · · · ·
3.00-3.45 3.00	SPT(C) N=25 B			2,3/4,5,7,9	18.81		Very stiff dark grey slightly silty slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles.	0.000 0.000000
1.00-4.45 1.00	SPT(C) N=30 B			3,4/5,7,9,9				0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -
5.00-5.45 5.00	SPT(C) N=35 B			6,6/7,8,9,11		(5.40)		
3.00-6.45 3.00	SPT(C) N=46 B			7,10/10,11,12,13				
7.00-7.40 7.00	SPT(C) 50/245 B			10,12/14,14,15,7				
8.00-8.37 3.00	SPT(C) 50/220 B			10,14/16,17,17	13.41		Complete at 8.00m	<u>, जुल्ह</u> क <u>, ए</u> ख <u>, ए</u> ख
Pomoria								
Remarks No groundw Borehole ba	ater encountered du ckfilled on completio mplete at 8.00m BGI	rig drillling n.					Scale (approx	) Logged By
	mpiete at 0.00M BGI	<b>-</b>					1:50	PM
							Figure 9338-	<b>No.</b> 12-19.BH12

	Grou	nd In		gations Ire /w.gii.ie	land	Ltd		Site Sandford Park Milltown		Boreho Numbe BH13	r
Machine : D Method : C	ando 2000 able Percussion		Diamete		Ground	<b>Leve</b> 22.64		Client DBFL		Job Numbe 9338-12-	
		Locatio		731106.3 N	Dates	5/10/2	020	Project Contractor GII		<b>Sheet</b> 1/1	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	D (Thie	epth (m) ckness)	Description		Legend	Water
0.50	В				22.34		(0.30) 0.30	Brown slightly sandy slightly gravelly TOPSOIL with occasional rootlets Soft to firm brown slightly sandy slightly gravelly CL occasional subangular to subrounded cobbles and	.AY with		
1.00-1.45 1.00	SPT(C) N=7 B			1,2/2,1,2,2			(1.70)	occasional rootlets. Gravel is subangular to subrour fine to coarse	naea		
2.00-2.45 2.00	SPT(C) N=14 B			2,2/3,3,4,4	20.64		2.00 (0.60)	Firm to stiff brown slightly sandy slightly gravelly CL occasional subangular to subrounded cobbles. Gra subangular to subrounded fine to coarse	AY with	•         •	
3.00-3.45 3.00	SPT(C) N=39 B			4,6/7,9,10,13	20.04		2.60 (1.10)	Very stiff dark grey slightly sandy slightly gravelly C occasional subangular to subrounded cobbles. Gra subangular to subrounded fine to coarse			
3.70	В				18.94		3.70	Obstruction: presumed boulder Complete at 3.70m		· · · · · · · · · · · · · · · · · · ·	
Remarks Borehole ter	minated at 3 70m B6	) due to	an obstru	ction on a presumed	boulder				Scale	Logged	t
Borehole ter No groundw	minated at 3.70m B0 ater encountered du ckfilled upon comple om 3.70m to 3.70m f	GL due to ring drillin tion or 1 hour.	an obstru g	ction on a presumed	boulder				( <b>approx)</b> 1:50	Logged By PC	
									Figure N	<b>lo.</b> 2_10 вн13	ł

Machine : Dando 2000	nd Investigat www.g <sup>Casing Diameter</sup>	ii.ie Groun	d Level (mOD)			B	umber 3H14 ob umber
<b>lethod</b> : Cable Percussion	200mm cased to 3 Location 716916.3 E 73107	Dates	22.96 05/10/2020	DBFL Project Contractor GII			38-12-7 neet 1/1
Depth (m) Sample / Tests	Casing Water Depth Depth Fie (m) (m)	eld Records (mOD	l Depth (m) (Thickness)	Description	Legend	Water	Instr
B 1.00-1.45 B CO0-2.45 B CO0-2.45 B B B B B B B B B B B B B	2,3/3 4,5/6 Wate 3.50	22.5 2,3,3,3 2,3,4,5 20.2 3,8,10,12 er strike(1) at m, rose to m in 20 mins. 19.4	26 2.00 26 2.70 26 0.70) 26 0.80)	Brown slightly sandy slightly gravelly TOPSOIL with occasional rootlets Firm brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded fine to coarse Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded fine to coarse Obstruction: presumed boulder Complete at 3.50m		⊻1	
Remarks Sorehole terminated at 3.50m Bi Groundwater encountered at 3.5 Slotted pipe with pea gravel surr sover Shiselling from 3.50m to 3.50m to	50m BGL round from 3.50m BGL to			eal from 1.00m BGL to GL, finished with a flush	Scale (approx) 1:50		pggeo y PC

Machine : Da	ando 2000 able Percussion	-	Diamete	<b>/W.gii.ie</b> r ed to 9.50m		Level (mOD) 22.71	Sandford Park Milltown Client DBFL	Job Numbe
		Locatio	n	731092 N	Dates	6/10/2020	Project Contractor Gli	9338-12- Sheet 1/1
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
0.50	В				22.41	(0.30)	Brown slightly sandy slightly gravelly TOPSOIL with occasional rootlets MADE GROUND: Brown slightly sandy slightly gravelly Clay with occasional rootlets and occasional fragments of	
1.00-1.45 1.00	SPT(C) N=13 B			2,2/3,3,3,4	21.81	(0.60) 0.90 (1.10)	Firm to stiff brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse	
2.00-2.45 2.00 2.00	SPT(C) N=17 B EN			2,3/3,4,5,5	20.71 20.31	2.00 (0.40) 2.40	Stiff brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse Very stiff dark grey slightly sandy slightly gravelly CLAY with	
3.00-3.45 3.00 3.00	SPT(C) N=32 B EN			3,5/6,8,9,9			occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse	
1.00-4.45 1.00	SPT(C) N=39 B			3,6/7,10,11,11				
5.00-5.42 5.00	SPT(C) 50/270 B			5,8/11,15,17,7				
5.00-6.39 5.00	SPT(C) 50/240 B			4,7/12,15,19,4		(6.70)		
7.00-7.38 7.00	SPT(C) 50/225 B			5,9/13,15,22				
3.00-8.36 3.00	SPT(C) 50/210 B			6,10/14,17,19				
9.00-9.38 9.00	SPT(C) 50/225 B			5,9/12,18,20	13.61	9.10	Very stiff brown slightly sandy gravelly CLAY with some angular to subrounded cobbles. Gravel is angular to subrounded fine to coarse	
9.50	В				13.21	9.50	Obstruction: presumed boulder Complete at 9.50m	
No groundwa	ater encountered du	ring drilling	an obstru	iction on a presumed	l boulder		Scale (approx)	Logged By
3orehole bad Chiselling fro	ckfilled upon comple om 9.40m to 9.50m f	tion or 1 hour.	-				1:50 Figure	PC No. 2-19.BH15

Ground Investigations Ireland Ltd www.gii.ie					Site Sandford Park Milltown		Borehole Number BH16			
Machine : DANDO 2000 Method : Cable Percussion		Casing Diameter 200mm cased to 5.70m Location 716896.6 E 731165.2 N			Ground Level (mOD) 21.38 Dates 07/10/2020		Client DBFL Project Contractor GII		Job Number 9338-12-15 Sheet 1/1	
					20.08	(0.40)	Brown slightly sandy slightly gravelly TOPSOIL with occasional rootlets			
0.50	В				20.98	0.40	Firm brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles and occasional rootlets			
1.00-1.45 1.00	SPT(C) N=12 B			2,2/3,3,3,3		(1.40)			<b>▼</b> 1	
2.00 2.00-2.45	B SPT(C) N=15			Water strike(1) at 1.80m, rose to 1.30m in 20 mins. 2,3/4,3,4,4	19.58		Medium dense greyish brown slightly clayey sand subangular to subrounded fine to coarse GRAVEL with occasional angular to subrounded cobbles	/	<b>∇</b> 1	
3.00-3.45 3.00	SPT(C) N=16 B			3,4/3,3,5,5		(2.70)				
4.00-4.17 4.00	SPT(C) 25*/95 50/75 B			19,6/50	16.88	4.50				
5.00-5.45 5.00	SPT(C) N=41 B			4,3/7,9,12,13		(1.20)	Very stiff dark grey slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles. Gravel is subangular to subrounded fine to coarse			
5.70	В				15.68		Obstruction: presumed boulder Complete at 5.70m			<u></u>
Groundwater	encountered at 1.8	0m BGL		iction on a presumed				Scale (approx)	Lo B	ogged /
over				GL to 1.00m BGL, pla elling from 5.70m to s			eal from 1.00m BGL to GL, finished with a raised	1:50 <b>Figure N</b> 9338-12		PC

# **APPENDIX 9** – Groundwater Monitoring





Catherinestown House, Hazelhatch Road, Newcastle, Co. Dublin. D22 YD52

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# **GROUNDWATER MONITORING**

### Sandford Park Miltown

BOREHOLE	DATE	TIME	GROUNDWATER (m BGL )	Comments
BH02	04/06/2020	17:15	1.31	
BH02	09/06/2020	16:15	1.37	
BH03	05/06/2020	14:58	7.00	
BH03	09/06/2020	15:50	7.25	
BH07	05/06/2020	14:37	1.47	
BH07	09/06/2020	16:06	1.50	
BH09	05/06/2020	15:20	7.50	
BH09	09/06/2020	15:25	7.74	
BH11	05/06/2020	15:55	1.40	
BH11	09/06/2020	16:11	1.50	



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# **GROUNDWATER MONITORING**

### Sandford Park Miltown

BOREHOLE	DATE	TIME	GROUNDWATER (m BGL )	Comments
BH02	23/10/2020	09:05	0.77	
BH03	23/10/2020	08:50	6.30	
BH07	23/10/2020	08:52	1.37	
BH09	23/10/2020	08:47	6.69	
BH11	23/10/2020	09:00	1.10	
BH14	23/10/2020	08:35	1.43	
BH16	23/10/2020	08:45	1.22	