Waterman Moylan
Engineering Consultants

Engineering Assessment Report

Post Primary School at Griffeen Community College in Lucan

May 2021

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This document has been prepared and checked in accordance with Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015)

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Comments

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Content

1. Introduction

1.1 Site Location

The proposed school is located to the south of Griffeen Avenue in Lucan. The site is bounded by green space, existing roads and residential areas to the North, East and West and the South.

The exact site location is shown in Waterman Moylan Drawing 19-037-21-P100

Figure 1: Site Location

1.2 Proposed Development

The proposed development consists of a 1000 pupil post primary school. The proposed post primary school will comprise of 4 Special Needs Units (SNU's).

The site area of the proposed development is 2.34 Ha. The total hard surfaced area of the school development is approximately 1.240 Ha.

1.3 Site Description

The Griffeen College school campus is situated on an area of approximately 2.34 hectares and is generally flat.

There is an existing road to the west of the site which is entrance to the Lucan East Educate National School.

1.4 Background of Report and Summary

This report describes the impact of the proposed development on the foul water, storm water, watermain and road networks to serve the proposed development.

The quantity of storm water discharged from the proposed development to the existing 225mm diameter stormwater located north-west of the site at Griffeen Avenue. The storm water from the proposed development will be restricted to 1.91 l/s/Ha based on the recommendations of the Greater Dublin Strategic Drainage Study, as required by South Dublin City Council. This flow restriction is achieved by means of a Hydro-brake, or similar approved, installed at the outfall manhole of the development with the excess storm water stored on site for the duration of the storm.

It is proposed to drain the foul sewage via gravity through a network of 150mm - 225 mm diameter pipes before connecting to the existing foul drainage to the south west of the site to the existing foul drainage located at the adjacent school.

It is proposed that the surface water from the proposed schools on site shall drain via gravity and discharge to the existing 225mm diameter stormwater located north-west of the site at Griffeen Avenue. Surface water flow will be restricted in accordance with the requirements of the Greater Dublin Strategic Drainage Study.

A proposed new connection to the existing watermain at the adjacent access road to the west of the site will provide potable water for the development. All water supply details shall be in accordance with Irish Water requirements.

2. Foul Water Drainage

2.1 Receiving Environment

It is proposed to connect the proposed foul sewer from the subject site via a 150 mm diameter foul pipe to the existing 225mm diameter foul located on the adjacent school site to the south west of the subject site. It is proposed to connect the foul drainage from the proposed development to this existing foul sewer via gravity. A Pre-connection Enquiry Form has been submitted to Irish Water to confirm capacity for the subject site within the surrounding network for site flows.

Refer to Waterman-Moylan 19-037-21-P200 which shows the proposed foul network for the subject site.

A Pre-Connection Enquiry form was submitted to Irish Water on 4th of February 2020 which outlined the foul water discharge proposal. A response was received on 06th of February 2020 stating that the proposed connection to the Irish Water network can be facilitated. The response letter from Irish Water can be found in Appendix D.

2.2 Foul Water – General

Drains generally will consist of PVC pipes (to IS 123). Pipes will be laid to comply with the requirement of the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H. Foul water sewers will consist of PE or concrete pipes (to IS 6) and laid strictly in accordance with Irish Water requirements for taking in charge.

2.3 Foul Water Calculations

The design of the foul water drainage has been based on the "*Code of Practice for Wastewater Supply*", (July 2020) published by Irish Water and on Table 1 of DoES Guidance Note 1a Design of Wastewater Systems for use in Post Primary Schools – Non–residential schools with no canteen. For post primary schools, it is assumed that each classroom has 30 students and 2 staff and for the SNU's 12 pupils and 2 staff per unit.

The population assumptions for the proposed development are as follows:

Table 1: Population Assumptions

Description	Size	No. pupils	No. staff	Total Population
Post primary school		1000	67	1067

The peak foul flow is based on Irish Water recommended peak demand/ flow factors for a site smaller than 5.5 hectares. Pipe capacities and velocities have been calculated using Colebrook-White formula with a roughness coefficient (Ks) of 1.5 mm.

The estimated foul flows generated from the proposed development are as follows:

Table 2: Calculation of Proposed Foul Water Flow

Description	Flow l/h/day	PE	Infiltration Factor	Total Discharge (l/d)
Proposed School	50	1067	1.1	58,685

Calculation of Proposed Peak Foul Flow		
Total Daily Discharge *(from Table 1.)*	58,685	l/d
Dry Weather Flow (DWF)	0.679	l/s
Peak Foul Flow (=3 x DWF)	***2.038***	***l/s***

The outfall pipe from the development is a 150mm diameter foul sewer laid at a gradient of 1:150, which has a capacity of 12.6 l/s. This ties into the existing 225mm foul sewer at adjacent school site at gradient 1:97.5, which has a capacity of 52.6 l/s. Therefore, there is adequate capacity in the foul sewer at the adjacent school, available to cater for the proposed development.

3. Surface Water Drainage

3.1 Introduction

The storm water will discharge from the proposed development to the 225 mm diameter existing surface water located north-west of the site at Griffeen Avenue. Flow will be restricted in accordance with the requirements of the Greater Dublin Strategic Drainage Study.

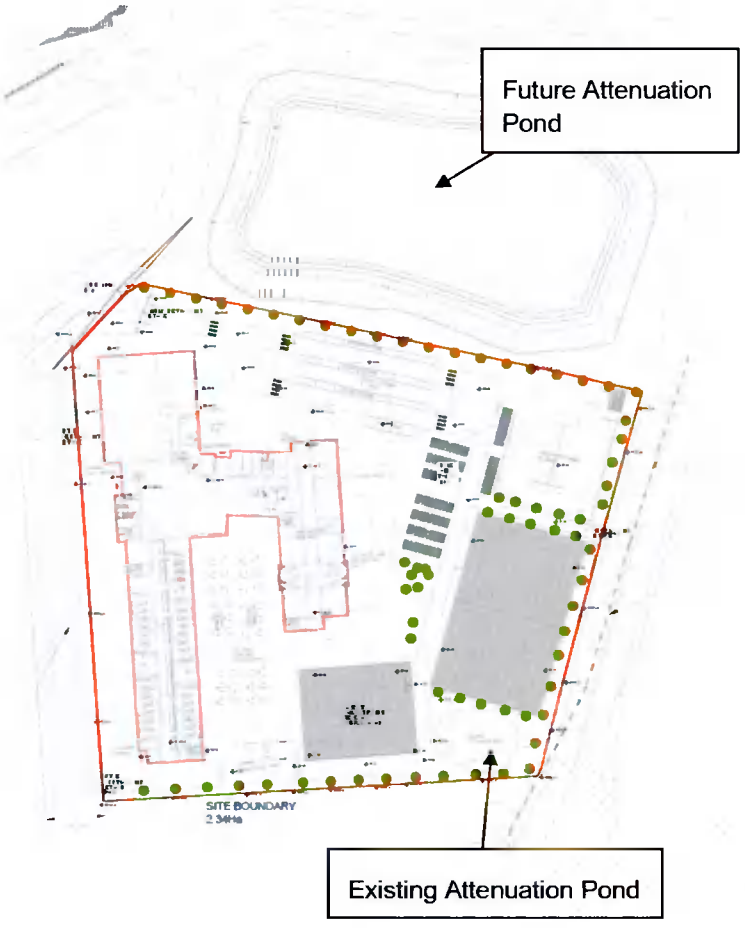
Runoff will be restricted to the equivalent of the existing runoff. Excess storm water will be stored in the proposed stormtech attenuation tank at the north of the subject site. All surface water runoff shall be restricted via a hydrobrake.

The layout of the proposed surface water drainage network is shown on Waterman Moylan Drawing No 19-037-21-P200.

3.2 Existing/Future Attenuation

There is an existing attenuation pond located to the south-east of the site. This existing attenuation pond will remain in position to cater to the South Dublin County Council requirements to facilitate the development of the SDZ.

There is larger attenuation pond proposed in the adjacent site located to the north of the subject site as shown in the figure below.



3.3 Surface Water – General

Sustainable Urban Drainage systems (SUDS) have been developed and are in use to alleviate the detrimental effects of traditional urban storm water drainage practice that typically consisted of piping runoff of rainfall from developments to the nearest receiving watercourse. Surface water drainage methods that take account of quantity, quality and amenity issues are collectively referred to as sustainable urban drainage systems; they are typically made up of one or more structures built to manage surface water runoff.

The proposed surface water drainage system for this development has been designed as a sustainable urban drainage system and uses filter drains/direct runoff to greenfield areas, green roofs, rainwater harvesting, permeable paving, underground attenuation, porous surfacing, petrol interceptor together with flow control device to:

- Treat runoff and remove pollutants to improve quality
- Restrict outflow and to control quantity
- Increase amenity value

Strict separation of surface water and wastewater will be implemented within the development. Drains will be laid out to minimise the risk of inadvertent connection of waste pipes etc. to the surface water system.

Surface water local drains will be 225 mm dia. and generally will consist of PVC (to IS 123) or concrete socket and spigot pipes (to IS 6). These drains will be laid to comply with the Requirement of the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H. Surface water sewers will consist of PVC or concrete socket and spigot pipes (to IS 6) and lay strictly in accordance with the requirements of South Dublin County Council.

The surface water drainage system was designed with reference to the Sustainable Urban Drainage Systems 'SuDS' published by the Construction Industry Research and Information Association.

3.4 Site Characteristics

The following site characteristics are contained in the Attenuation calculations in Appendix C, and are reiterated in the following sections.

	Proposed Development
Site Area (Catchment) – Ha	2.34
Impermeable Area - Ha	1.240
% Hardstanding	53%
SAAR - mm	779
SOIL Index	0.3
Climate Change	20%

3.5 Outflow Limits

The outflow limits are calculated in accordance with the Institute of Hydrology report No 124 "Flood Estimation for Small Catchments", where:

$Qbar = 0.00108(Area)^{0.89} \times (SAAR)^{1.17} \times (SOIL)^{2.17}$

Greenfield Run-off = Qbar x ("n-year" factor)

Allowable Discharge = Greenfield Run-off x Area

Where:

- Area = Site area in km^2 (Or 50 hectares if site is less than 50 Hectares)
- SAAR = Taken from "Extreme Rainfall in Ireland" maps (779 mm)
- SOIL = Runoff constant (Varies between 0.1 and 0.53: Given as 0.3)

→ $Qbar_{rural} = 0.00108(0.5)^{0.89} \times (779)^{1.17} \times (0.3)^{2.17}$

→ $Qbar_{rural}$ = 95.70 l/s (For a 50 hectare site)

→ $Qbar_{rural}$ = 1.91 l/s/Ha

Therefore, the permitted outflow for varying return periods is as follows:

Table 3: Surface Water Outflow

	Proposed Development
Site Area (Catchment)	2.34ha
$Qbar_{rural}$	4.48 l/s

3.6 SUDS Selection Criteria

Sustainable drainage systems aim towards maintaining or restoring a more natural hydrological regime, such that the impact of urbanisation on downstream flooding and water quality is minimised. Originally, SUDS were introduced primarily as single purpose facilities, however this has now evolved into more integrated systems which serve a variety of purposes, including habitat and amenity enhancement. The main advantages of an integrated SUDS facility are the savings on land-take and maintenance.

SUDS minimise the impacts of urban runoff by capturing runoff as close to source as possible and then releasing it slowly. The use of SuDS to control runoff also provides the additional benefit of reducing pollutants in the surface water by settling out suspended solids, and in some cases providing biological treatment.

A stormwater management or treatment train approach assures that runoff quantity and quality is addressed. The following objectives of the treatment train provide an integrated and balanced approach to help mitigate the changes in stormwater runoff flows that occur as land is urbanised and to help mitigate the impacts of stormwater quality on receiving systems:

1) **Source Control:** conveyance and infiltration of runoff, and

2) **Site Control:** reduction in volume and rate of surface runoff, with some additional treatment provided.

The applicant has considered the use of all appropriate SUDS devices as part of the site SUDS strategy;

SUDS Stage	SUDS Measure	Measure Outline
Source Control	Permeable Pavements/ Porous Surfacing	Permeable pavements are alternative paving surfaces to standard finishes that allow stormwater runoff to filter through voids in the pavement surface into an underlying stone reservoir, where it is temporarily stored and/or infiltrated.
	Rainwater Harvesting Tank	The rainwater harvester tank will collect rainwater from the roof area. The collected water will be used to provide water supply to internal facilities (i.e. toilets). Any remaining water which will not be re-used will be drained into the main foul network.
	Green Roof	Green roofs are multi-layered system that covers the roof of a building or podium structure with vegetation over a drainage layer. Green roofs are used to reduce the volume and rate of runoff from development roofs, and hence reduce the amount of hardstanding resulting from a development. It is proposed that green roofs be provided extensively as part of the proposed development.
Site Control	Petrol Interceptor	A petrol interceptor is a trap used to filter out hydrocarbon pollutants from rainwater runoff. It is typically used in road construction to prevent fuel contamination of water courses carrying away the runoff. Petrol interceptors work on the premise that some hydrocarbons such as petroleum and diesel float on the top of water. The contaminated water enters the interceptor typically after flowing off roads and entering a channel drain before being deposited into the first tank inside the interceptor. The first tank builds up a layer of the hydrocarbon as well as other scum preventing it from entering the water course
	Stormtech Attenuation Tank	The proposed Stormtech MC-4500 will attenuate surface water to restrict the outflow to the equivalent of the existing agricultural runoff. This ensures the development will not give rise to any impact downstream of the site.

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

into a proposed sewer manhole to boundary to the west of the site, ultimately discharging into the existing 225mm diameter public stormwater at Griffeen Avenue.

3.7 Proposed Surface Water Drainage Strategy

It is proposed that the surface water from the site shall drain via gravity and discharge into the 225mm existing public surface water network on Griffeen Avenue north-west of the subject site.

Excess storm water runoff from the school site shall be diverted to an underground storage tank to the east of the proposed school buildings, via a hydro-brake, and attenuated within.

The surface water shall discharge via a hydro brake at a restricted rate of 4.48 l/s.

Please refer to Waterman Moylan drawing No's 19-037-21-P200 and 19-037-21-P245 for details of the proposed drainage arrangements.

The Suds strategy for the proposed development is set out in Section 3.6 below.

3.7.1 Surface Water Storage Design

It is proposed that the 1 in 100-year critical design storm will be used for storm water attenuation volumetric calculations.

Excess storm water shall be attenuated in a proposed underground storage tank as indicated on Waterman Moylan Drawings No's 19-037-21-P200 and 19-037-21-P245.

The underground storage tank will facilitate the normal flow of water as it is online and will fill up during storm events. The storm water will then be released after the storm, at a controlled rate via a hydrobrake, as indicated on the drainage drawing. The storm water system will be designed to cater for the 1 in 100-year storm.

3.8 Storm Water Calculations

The total hardstanding area of the school development site, including roads, car-parking and roofs, is c. 1.24 ha.

It is proposed that, in accordance with the recommendations of the Greater Dublin Strategic Drainage Study, that the 1 in 100 year critical design storm will be used for storm water attenuation volumetric calculations.

Calculations for pipe sizes and gradients are based on storm water runoff from the roofs and surfaced areas using the Rational Method for surface water design (Bilhams Formula), with a storm return period (N) of 5 years.

Pipe capacities and velocities have been calculated using Colebrook-White formula with a roughness coefficient (Ks) of 0.6 mm.

The total impermeable area for the subject site set out above was used in the Flow Causeway calculations for the design of the surface water system which are included in Appendix C.

The maximum attenuated outflow from the subject site at this location is calculated as 4.48 l/s.

The calculations for the storage design are included in Appendix C of this report; these indicate that for a return period of 100 years, the 1440-minute winter storm is the critical storm and requires a storage volume of approximately 1303.40 m^3 which includes 20% storage to facilitate climate change.

As such a Stormtech MC-4500 has been specified, which has a volume of 1306.97 m^3. Waterman Moylan Drawing No. 19-037-21-P245 details this attenuation tank and the drainage layout proposals.

4. Water Supply

4.1 Water Supply – General

It is proposed to connect to the existing 110mm diameter watermain on access road of the Lucan East Educate Together National School west of the subject site. This connection will provide potable water for the development.

The layout of the proposed water network is shown on Waterman Moylan Drawing No's 19-037-21-P300.

A Pre-Connection Enquiry form was submitted to Irish Water on 4th of February 2020 which outlined the foul water discharge proposal. A response was received on 6th of February 2020 stating that the proposed connection to the Irish Water network can be facilitated.

4.2 Water Demand Calculation

Water calculations providing details of the anticipated water consumption for the proposed development are illustrated in Table 4.1. below. For post primary schools, it is assumed that each classroom has 30 students and 2 staff and for the SNU's 12 pupils and 2 staff per unit.

Table 4: Water Demand for Proposed Development

Description	Flow l/h/day	PE	Total Discharge (l/d)
Post primary school	50	1067	53,350
		Total	**53,350**

The total water requirements, from the public supply, for the development will therefore be 53.35 m^3/day.

All water supply details shall be in accordance with Irish Water's requirements.

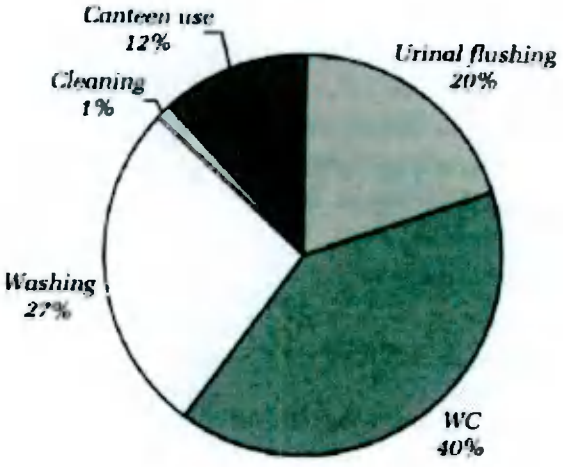
4.3 Water Conservation

The water demand for the development can be subdivided as follows:

- Potable / Non-potable Breakdown

Detailed studies have quantified the breakdown between potable and non-potable uses for commercial uses which are comparable to a school site.

The following diagram illustrates the current percentage breakdown of water usage in commercial circumstances and is from Griggs and Shouler 1994 as published in Chapter 11 of 'Water, Sanitary & Waste Services for Buildings' by Wise and Sheffield.



In addition, water conservation measures will be used, to further reduce overall water demand, including:

- Low volume flush / dual flush WC's
- Spray taps
- Draw off tap controls
- Leak detection measures – through the metering of supply

5. Transport

5.1 Introduction

The proposed school development is located to the south of Griffeen Avenue on a total site area of c. 2.34 hectares. A separate Traffic and Transport Assessment is submitted as part of the planning application and a School Travel Plan.

It is proposed that the site will be accessible from the adjacent school site access road from Griffeen Avenue. There will be Pedestrian/Cycle access along the Lucan East Educate Together National School west of the subject site. There are 40 no. spaces for staff and visitors, 2 no. accessible drop off spaces and 21 no. drop off spaces provided. A bus drop off setdown area will be provided. 540 No. bicycle parking spaces/scooter parking spaces will be provided. Details are shown on Waterman Moylan drawing No. 19-037-21-P100.

5.2 Site Access

It is proposed site access will provide pedestrian and vehicular drop off access from the adjacent school's access road, west of the subject site. An additional pedestrian entrance is also located southwest separate to the vehicle access. Details are shown on Waterman-Moylan Drawing No. 19-037-21-P100.

5.3 Traffic

A traffic impact assessment and school travel plan were prepared for the proposed school development and is attached as part of this application.

5.4 Parking

The car park provision proposals have been detailed in line with the requirements of Table 11.4.2 of the South Dublin County Council Development Plan 2016-2022, which stipulates that there should be a maximum of 1 spaces per classroom. The proposed development will have 40 no. onsite parking for visitors and staff, 21 drop off spaces for pupils drop off and 2 No. accessible parking spaces. The proposed development will also provide for a dedicated bus set down drop of space.

The South Dublin County Council Development Plan 2016-2022 sets out the cycle parking requirements in Table 11.4.1 for various types of development. The minimum bicycle parking requirement is 1 space per 5 staff, and 1 per 2 pupils required for the development, a minimum of 537 no. bicycle parking spaces are required and 540 no. cycle parking stands are provided.

Please refer to school travel plan for more information in this regard.

APPENDICES

A. Foul Water Calculations

Design Settings

Frequency of use (kDU)	0.50	Minimum Velocity (m/s)	0.75
Flow per dwelling per day (l/day)	4000	Connection Type	Level Soffits
Domestic Flow (l/s/ha)	0.0	Minimum Backdrop Height (m)	0.200
Industrial Flow (l/s/ha)	0.0	Preferred Cover Depth (m)	1.000
Additional Flow (%)	0	Include Intermediate Ground	✓

Nodes

Name	Cover Level (m)	Manhole Type	Easting (m)	Northing (m)	Depth (m)
13	56.600	Adoptable	704429.305	733155.065	1.909
12	56.600	Adoptable	704460.330	733157.053	1.702
1	55.550	Adoptable	704395.555	733257.141	1.740
2	56.600	Adoptable	704422.704	733259.709	2.608
4	56.600	Adoptable	704420.594	733290.324	1.483
5	56.600	Adoptable	704456.076	733292.599	1.246
6	56.600	Adoptable	704458.118	733261.525	1.038
7	56.600	Adoptable	704501.791	733264.139	0.600
8	56.600	Adoptable	704505.625	733200.094	0.600
9	56.600	Adoptable	704480.469	733198.421	0.852
10	56.600	Adoptable	704478.320	733230.749	1.068
11	56.600	Adoptable	704455.591	733229.257	1.220

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
12	11	12	72.359	1.500	55.380	54.898	0.482	150.0	150
10	10	11	22.778	1.500	55.532	55.380	0.152	150.0	150
9	9	10	32.399	1.500	55.748	55.532	0.216	150.0	150
8	8	9	25.212	1.500	56.000	55.748	0.252	100.0	150
2	2	1	27.270	1.500	53.992	53.810	0.182	150.0	150
13	13	2	104.852	1.500	54.691	53.992	0.699	150.0	150
4	4	2	30.688	1.500	55.117	54.912	0.205	150.0	150
5	5	4	35.555	1.500	55.354	55.117	0.237	150.0	150
6	6	5	31.141	1.500	55.562	55.354	0.208	150.0	150
7	7	6	43.751	1.500	56.000	55.562	0.438	100.0	150
14	12	13	31.089	1.500	54.898	54.691	0.207	150.0	150

Name	Pro Vel @ 1/3 Q (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)
12	0.000	0.714	12.6	0.0	1.070	1.552	0.000	0	0.0	0.0	0	0.000
10	0.000	0.714	12.6	0.0	0.918	1.070	0.000	0	0.0	0.0	0	0.000
9	0.000	0.714	12.6	0.0	0.702	0.918	0.000	0	0.0	0.0	0	0.000
8	0.000	0.876	15.5	0.0	0.450	0.702	0.000	0	0.0	0.0	0	0.000
2	0.000	0.714	12.6	0.0	2.458	1.590	0.000	0	0.0	0.0	0	0.000
13	0.000	0.714	12.6	0.0	1.759	2.458	0.000	0	0.0	0.0	0	0.000
4	0.000	0.714	12.6	0.0	1.333	1.538	0.000	0	0.0	0.0	0	0.000
5	0.000	0.714	12.6	0.0	1.096	1.333	0.000	0	0.0	0.0	0	0.000
6	0.000	0.714	12.6	0.0	0.888	1.096	0.000	0	0.0	0.0	0	0.000
7	0.000	0.876	15.5	0.0	0.450	0.888	0.000	0	0.0	0.0	0	0.000
14	0.000	0.714	12.6	0.0	1.552	1.759	0.000	0	0.0	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
12	72.359	150.0	150	Circular	56.600	55.380	1.070	56.600	54.898	1.552
10	22.778	150.0	150	Circular	56.600	55.532	0.918	56.600	55.380	1.070
9	32.399	150.0	150	Circular	56.600	55.748	0.702	56.600	55.532	0.918
8	25.212	100.0	150	Circular	56.600	56.000	0.450	56.600	55.748	0.702
2	27.270	150.0	150	Circular	56.600	53.992	2.458	55.550	53.810	1.590
13	104.852	150.0	150	Circular	56.600	54.691	1.759	56.600	53.992	2.458
4	30.688	150.0	150	Circular	56.600	55.117	1.333	56.600	54.912	1.538
5	35.555	150.0	150	Circular	56.600	55.354	1.096	56.600	55.117	1.333
6	31.141	150.0	150	Circular	56.600	55.562	0.888	56.600	55.354	1.096
7	43.751	100.0	150	Circular	56.600	56.000	0.450	56.600	55.562	0.888
14	31.089	150.0	150	Circular	56.600	54.898	1.552	56.600	54.691	1.759

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
12	11	1200	Manhole	Adoptable	12	1200	Manhole	Adoptable
10	10	1200	Manhole	Adoptable	11	1200	Manhole	Adoptable
9	9	1200	Manhole	Adoptable	10	1200	Manhole	Adoptable
8	8	1200	Manhole	Adoptable	9	1200	Manhole	Adoptable
2	2	1200	Manhole	Adoptable	1	1200	Manhole	Adoptable
13	13	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
4	4	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
5	5	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
6	6	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable
7	7	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
14	12	1200	Manhole	Adoptable	13	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
13	704429.305	733155.065	56.600	1.909	1200		1	14	54.691	150
							0	13	54.691	150
12	704460.330	733157.053	56.600	1.702	1200		1	12	54.898	150
							0	14	54.898	150
1	704395.555	733257.141	55.550	1.740	1200		1	2	53.810	150
2	704422.704	733259.709	56.600	2.608	1200		1	13	53.992	150
							2	4	54.912	150
							0	2	53.992	150
4	704420.594	733290.324	56.600	1.483	1200		1	5	55.117	150
							0	4	55.117	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
5	704456.076	733292.599	56.600	1.246	1200	1	6	55.354	150
									
						0	5	55.354	150
6	704458.118	733261.525	56.600	1.038	1200	 1	7	55.562	150
						0	6	55.562	150
7	704501.791	733264.139	56.600	0.600	1200				
						0	7	56.000	150
8	704505.625	733200.094	56.600	0.600	1200				
						0	8	56.000	150
9	704480.469	733198.421	56.600	0.852	1200	 1	8	55.748	150
						0	9	55.748	150
10	704478.320	733230.749	56.600	1.068	1200	1	9	55.532	150
									
						0	10	55.532	150
11	704455.591	733229.257	56.600	1.220	1200	1	10	55.380	150
									
						0	12	55.380	150

B. Surface Water Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	16.700	Minimum Backdrop Height (m)	0.200
Ratio-R	0.275	Preferred Cover Depth (m)	1.000
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
23	0.076	4.00	56.600	1200	704426.037	733162.711	0.600
22	0.024	4.00	56.600	1200	704423.735	733201.901	0.796
21	0.176	4.00	56.600	1200	704460.442	733263.875	0.600
20	0.058	4.00	56.600	1200	704458.528	733293.918	0.826
19	0.098	4.00	56.600	1200	704418.499	733291.070	2.252
18	0.134	4.00	56.600	1200	704484.748	733197.145	0.600
17	0.082	4.00	56.600	1200	704507.607	733198.153	0.789
16	0.168	4.00	56.600	1200	704504.711	733263.826	1.118
15	0.017	4.00	56.380	1200	704496.518	733273.586	0.962
14	0.011	4.00	56.250	1200	704469.589	733279.774	0.970
11	0.096	4.00	57.250	1200	704526.992	733191.873	0.600
10	0.043	4.00	57.000	1200	704541.755	733243.481	0.618
9	0.060	4.00	57.000	1200	704573.349	733234.756	0.782
8	0.082	4.00	56.650	1200	704583.440	733270.840	1.340
7	0.069	4.00	56.420	1200	704544.277	733280.835	1.312
6	0.025	4.00	56.120	1350	704471.682	733296.796	1.459
5	0.022	4.00	54.920	1350	704431.506	733305.463	1.448
4			54.860	1350	704425.026	733310.861	1.430
3			54.710	1350	704450.477	733330.481	1.441
2			54.990	1350	704458.496	733362.548	1.886
1			55.370	1350	704465.390	733374.114	2.333

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.009	2	1	13.465	0.600	53.104	53.037	0.067	200.0	450	8.96	49.3
1.008	3	2	33.054	0.600	53.269	53.104	0.165	200.0	450	8.80	49.6
1.007	4	3	32.136	0.600	53.430	53.269	0.161	200.0	450	8.42	50.0
1.006	5	4	8.434	0.600	53.472	53.430	0.042	200.0	450	8.05	50.0
1.005	6	5	41.100	0.600	54.661	54.147	0.514	80.0	375	7.95	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.009	1.434	228.0	220.8	1.436	1.883	1.240	0.0	359	1.622
1.008	1.434	228.0	222.5	0.991	1.436	1.240	0.0	363	1.622
1.007	1.434	228.0	224.1	0.980	0.991	1.240	0.0	365	1.623
1.006	1.434	228.0	224.1	0.998	0.980	1.240	0.0	365	1.623
1.005	2.027	223.9	142.1	1.084	0.398	0.786	0.0	217	2.141

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
4.002	19	5	19.399	0.600	54.348	53.622	0.726	26.7	300	6.43	50.0
4.001	22	19	89.323	0.600	55.804	55.357	0.447	200.0	225	6.33	50.0
5.001	20	19	40.130	0.600	55.774	55.573	0.201	200.0	300	5.15	50.0
5.000	21	20	30.104	0.600	56.000	55.849	0.151	200.0	225	4.54	50.0
4.000	23	22	39.258	0.600	56.000	55.804	0.196	200.0	225	4.71	50.0
3.004	14	6	17.150	0.600	55.280	55.194	0.086	200.0	300	6.27	50.0
1.004	7	6	74.329	0.600	55.108	54.736	0.372	200.0	300	7.61	50.0
1.003	8	7	40.418	0.600	55.310	55.108	0.202	200.0	300	6.49	50.0
1.002	9	8	37.468	0.600	56.218	55.385	0.833	45.0	225	5.88	50.0
1.001	10	9	32.777	0.600	56.382	56.218	0.164	200.0	225	5.57	50.0
1.000	11	10	53.678	0.600	56.650	56.382	0.268	200.0	225	4.97	50.0
3.003	15	14	27.631	0.600	55.418	55.280	0.138	200.0	300	6.01	50.0
3.002	16	15	12.743	0.600	55.482	55.418	0.064	200.0	300	5.59	50.0
3.001	17	16	65.737	0.600	55.811	55.482	0.329	200.0	300	5.40	50.0
3.000	18	17	22.881	0.600	56.000	55.886	0.114	200.0	225	4.41	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
4.002	3.053	215.8	78.0	1.952	0.998	0.432	0.0	125	2.815
4.001	0.921	36.6	18.0	0.571	1.018	0.100	0.0	111	0.916
5.001	1.108	78.3	42.2	0.526	0.727	0.234	0.0	157	1.127
5.000	0.921	36.6	31.8	0.375	0.526	0.176	0.0	162	1.033
4.000	0.921	36.6	13.7	0.375	0.571	0.076	0.0	95	0.856
3.004	1.108	78.3	74.4	0.670	0.626	0.412	0.0	235	1.254
1.004	1.108	78.3	63.3	1.012	1.084	0.350	0.0	205	1.229
1.003	1.108	78.3	50.9	1.040	1.012	0.282	0.0	177	1.177
1.002	1.955	77.7	36.1	0.557	1.040	0.200	0.0	108	1.919
1.001	0.921	36.6	25.2	0.393	0.557	0.140	0.0	138	0.991
1.000	0.921	36.6	17.4	0.375	0.393	0.096	0.0	109	0.910
3.003	1.108	78.3	72.4	0.662	0.670	0.401	0.0	229	1.251
3.002	1.108	78.3	69.4	0.818	0.662	0.384	0.0	221	1.246
3.001	1.108	78.3	39.0	0.489	0.818	0.216	0.0	150	1.107
3.000	0.921	36.6	24.2	0.375	0.489	0.134	0.0	134	0.983

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.009	13.465	200.0	450	Circular	54.990	53.104	1.436	55.370	53.037	1.883
1.008	33.054	200.0	450	Circular	54.710	53.269	0.991	54.990	53.104	1.436
1.007	32.136	200.0	450	Circular	54.860	53.430	0.980	54.710	53.269	0.991
1.006	8.434	200.0	450	Circular	54.920	53.472	0.998	54.860	53.430	0.980
1.005	41.100	80.0	375	Circular	56.120	54.661	1.084	54.920	54.147	0.398

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.009	2	1350	Manhole	Adoptable	1	1350	Manhole	Adoptable
1.008	3	1350	Manhole	Adoptable	2	1350	Manhole	Adoptable
1.007	4	1350	Manhole	Adoptable	3	1350	Manhole	Adoptable
1.006	5	1350	Manhole	Adoptable	4	1350	Manhole	Adoptable
1.005	6	1350	Manhole	Adoptable	5	1350	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
4.002	19.399	26.7	300	Circular	56.600	54.348	1.952	54.920	53.622	0.998
4.001	89.323	200.0	225	Circular	56.600	55.804	0.571	56.600	55.357	1.018
5.001	40.130	200.0	300	Circular	56.600	55.774	0.526	56.600	55.573	0.727
5.000	30.104	200.0	225	Circular	56.600	56.000	0.375	56.600	55.849	0.526
4.000	39.258	200.0	225	Circular	56.600	56.000	0.375	56.600	55.804	0.571
3.004	17.150	200.0	300	Circular	56.250	55.280	0.670	56.120	55.194	0.626
1.004	74.329	200.0	300	Circular	56.420	55.108	1.012	56.120	54.736	1.084
1.003	40.418	200.0	300	Circular	56.650	55.310	1.040	56.420	55.108	1.012
1.002	37.468	45.0	225	Circular	57.000	56.218	0.557	56.650	55.385	1.040
1.001	32.777	200.0	225	Circular	57.000	56.382	0.393	57.000	56.218	0.557
1.000	53.678	200.0	225	Circular	57.250	56.650	0.375	57.000	56.382	0.393
3.003	27.631	200.0	300	Circular	56.380	55.418	0.662	56.250	55.280	0.670
3.002	12.743	200.0	300	Circular	56.600	55.482	0.818	56.380	55.418	0.662
3.001	65.737	200.0	300	Circular	56.600	55.811	0.489	56.600	55.482	0.818
3.000	22.881	200.0	225	Circular	56.600	56.000	0.375	56.600	55.886	0.489

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
4.002	19	1200	Manhole	Adoptable	5	1350	Manhole	Adoptable
4.001	22	1200	Manhole	Adoptable	19	1200	Manhole	Adoptable
5.001	20	1200	Manhole	Adoptable	19	1200	Manhole	Adoptable
5.000	21	1200	Manhole	Adoptable	20	1200	Manhole	Adoptable
4.000	23	1200	Manhole	Adoptable	22	1200	Manhole	Adoptable
3.004	14	1200	Manhole	Adoptable	6	1350	Manhole	Adoptable
1.004	7	1200	Manhole	Adoptable	6	1350	Manhole	Adoptable
1.003	8	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.002	9	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
1.001	10	1200	Manhole	Adoptable	9	1200	Manhole	Adoptable
1.000	11	1200	Manhole	Adoptable	10	1200	Manhole	Adoptable
3.003	15	1200	Manhole	Adoptable	14	1200	Manhole	Adoptable
3.002	16	1200	Manhole	Adoptable	15	1200	Manhole	Adoptable
3.001	17	1200	Manhole	Adoptable	16	1200	Manhole	Adoptable
3.000	18	1200	Manhole	Adoptable	17	1200	Manhole	Adoptable

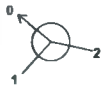
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
23	704426.037	733162.711	56.600	0.600	1200				
						0	4.000	56.000	225
22	704423.735	733201.901	56.600	0.796	1200		1	4.000	55.804	225
						0	4.001	55.804	225
21	704460.442	733263.875	56.600	0.600	1200				
						0	5.000	56.000	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
20	704458.528	733293.918	56.600	0.826	1200	1	5.000	55.849	225
						0	5.001	55.774	300
19	704418.499	733291.070	56.600	2.252	1200	1	5.001	55.573	300
						2	4.001	55.357	225
						0	4.002	54.348	300
18	704484.748	733197.145	56.600	0.600	1200	0	3.000	56.000	225
17	704507.607	733198.153	56.600	0.789	1200	1	3.000	55.886	225
						0	3.001	55.811	300
16	704504.711	733263.826	56.600	1.118	1200	1	3.001	55.482	300
						0	3.002	55.482	300
15	704496.518	733273.586	56.380	0.962	1200	1	3.002	55.418	300
						0	3.003	55.418	300
14	704469.589	733279.774	56.250	0.970	1200	1	3.003	55.280	300
						0	3.004	55.280	300
11	704526.992	733191.873	57.250	0.600	1200	0	1.000	56.650	225
10	704541.755	733243.481	57.000	0.618	1200	1	1.000	56.382	225
						0	1.001	56.382	225
9	704573.349	733234.756	57.000	0.782	1200	1	1.001	56.218	225
						0	1.002	56.218	225
8	704583.440	733270.840	56.650	1.340	1200	1	1.002	55.385	225
						0	1.003	55.310	300
7	704544.277	733280.835	56.420	1.312	1200	1	1.003	55.108	300
						0	1.004	55.108	300
6	704471.682	733296.796	56.120	1.459	1350	1	3.004	55.194	300
						2	1.004	54.736	300
						0	1.005	54.661	375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
5	704431.506	733305.463	54.920	1.448	1350		1 2 0	4.002 1.005 1.006	53.622 54.147 53.472	300 375 450
4	704425.026	733310.861	54.860	1.430	1350		1 0	1.006 1.007	53.430 53.430	450 450
3	704450.477	733330.481	54.710	1.441	1350		1 0	1.007 1.008	53.269 53.269	450 450
2	704458.496	733362.548	54.990	1.886	1350		1 0	1.008 1.009	53.104 53.104	450 450
1	704465.390	733374.114	55.370	2.333	1350		1	1.009	53.037	450

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	Scotland and Ireland	Skip Steady State	x
M5-60 (mm)	15.300	Drain Down Time (mins)	240
Ratio-R	0.275	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
5	0	0	0
30	0	0	0
100	20	0	0

Node 5 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	53.472	Product Number	CTL-SHE-0093-4500-1500-4500
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	4.5	Min Node Diameter (mm)	1200

Node 9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	56.218
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	900.0	0.0	0.510	901.0	0.0	0.512	0.0	0.0

C. Surface Water Attenuation Calculations

Column1	Proposed Developme
Site Area (Catchment) – Ha	2.340
Impermeable Area - Ha	1.240
% Hardstanding	53%
SAAR - mm	779
SOIL Index	0.3
Climate Change	20%

Soil Type	SOIL
1	0.1
2	0.3
3	0.37
4	0.47
5	0.53

QBAR (50 Hectares) 95.70 l/s
QBAR per Hectare 1.91 l/s/Ha

Column1	Proposed Developme nt
Site Area (Catchment)	2.34
$Qbar_{rural}$	4.48

Imp Area 12400 m2

Rainfall (mm) https://www.met.ie/climate/services

Duration	Insert Rainfall Data						
(min)	1	5	10	20	30	50	100
30	7.3	13.1	16.6	20.8	23.6	27.6	34
60	9.6	16.7	21.1	26.2	29.6	34.5	42.2
120	12.5	21.4	26.8	33.1	37.2	43.1	52.4
240	16.3	27.4	34.1	41.7	46.7	53.8	65
360	19	31.6	39.2	47.7	53.3	61.3	73.8
720	24.8	40.5	49.7	60.2	67	76.5	91.5
1,440	32.3	51.8	63.2	75.8	84.1	95.6	113.6
2,880	39.4	60.7	72.8	86	94.6	106.4	124.5

Inflow (m3)

Duration	Return Period (Years)						
(min)	1	5	10	20	30	50	100
30.00	108.62	194.93	247.01	309.50	351.17	410.69	505.92
60.00	142.85	248.50	313.97	389.86	440.45	513.36	627.94
120.00	186.00	318.43	398.78	492.53	553.54	641.33	779.71
240.00	242.54	407.71	507.41	620.50	694.90	800.54	967.20
360.00	282.72	470.21	583.30	709.78	793.10	912.14	1,098.14
720.00	369.02	602.64	739.54	895.78	996.96	1,138.32	1,361.52
1,440.00	480.62	770.78	940.42	1,127.90	1,251.41	1,422.53	1,690.37
2,880.00	586.27	903.22	1,083.26	1,279.68	1,407.65	1,583.23	1,852.56

Outflow (m3)

Duration	Return Period (Years)						
(min)	1	5	10	20	30	50	100
30.00	8.06	8.06	8.06	8.06	8.06	8.06	8.06
60.00	16.12	16.12	16.12	16.12	16.12	16.12	16.12
120.00	32.25	32.25	32.25	32.25	32.25	32.25	32.25
240.00	64.49	64.49	64.49	64.49	64.49	64.49	64.49
360.00	96.74	96.74	96.74	96.74	96.74	96.74	96.74
720.00	193.48	193.48	193.48	193.48	193.48	193.48	193.48
1,440.00	386.96	386.96	386.96	386.96	386.96	386.96	386.96
2,880.00	773.93	773.93	773.93	773.93	773.93	773.93	773.93

Storage Reqd. (m3)

Duration	Return Period (Years)						
(min)	1	5	10	20	30	50	100
30.00	100.56	186.87	238.95	301.44	343.11	402.63	497.86
60.00	126.72	232.37	297.84	373.73	424.32	497.24	611.81
120.00	153.75	286.18	366.54	460.28	521.29	609.08	747.46
240.00	178.05	343.22	442.91	556.00	630.40	736.05	902.71
360.00	185.98	373.47	486.55	613.03	696.36	815.40	1,001.40
720.00	175.54	409.16	546.05	702.29	803.48	944.84	1,168.04
1,440.00	93.66	383.82	553.45	740.94	864.44	1,035.56	1,303.40
2,880.00	0.00	129.29	309.33	505.75	633.72	809.30	1,078.63

D. Pre-Connection Enquiry Response

Esaivani Naicker
Block S
East Point Business Park
Dublin 3, Co. Dublin D03H3F4

6 February 2020

Dear Esaivani Naicker,

Re: Connection Reference No CDS20000774 pre-connection enquiry - Subject to contract | Contract denied

Connection for Business Connection of 1 unit(s) at Balgaddy Road, Griffeen Road Avenue, Co. Dublin.

Irish Water has reviewed your pre-connection enquiry in relation to a water connection at Balgaddy Road, Griffeen Road Avenue, Co. Dublin. Based upon the details you have provided with your pre-connection enquiry and on the capacity currently available 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 can be facilitated.

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 us on **1850 278 278** or **+353 1 707 2828, 8.00am-4.30pm, Mon-Fri** or email **newconnections@water.ie**. For further information, visit **www.water.ie/connections.**

Yours sincerely,

Maria O'Dwyer

Connections and Developer Services

UK and Ireland Office Locations