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**Fitzsimons Doyle
& Associates**



Engineering Services Report


For

Bancroft View SHD

at

Greenhills Road,

Dublin 24

Ref	Revision	Date	Comment	By	Checked
20-4993	D	April 22	Issued for planning	AF	AB
Approved for Issue C(Eng) Approved Engineer: 					



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1 Introduction

The proposed development site is located on Greenhills Road at the Junction with Airton Road Tallaght D24

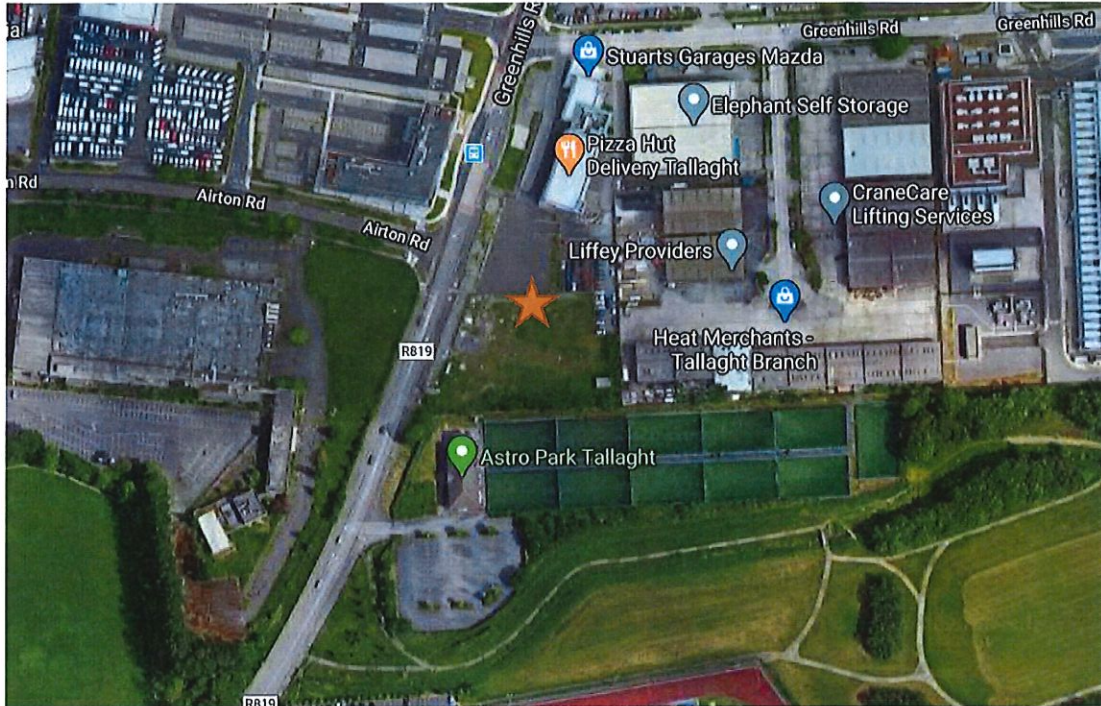


Figure 1 – Site Location Map

 = Site Location

The proposed development involves the construction of 197 apartments, a crèche (330m²) and 870m² of retail/ commercial space and a concierge’s office at ground level in a series of contiguous blocks located around a central courtyard. The site at present has been cleared. The site area is approximately 7900m²

2 Report

This reports addresses the foul water drainage, surface water drainage, and flood risk potential of the site.

The following standards are used in the design of the internal drainage systems.

- Code of practice for development works Version 6 Dublin City Council
- Technical Guidance Document H Drainage and wastewater disposal
- Code of Practice for Wastewater Infrastructure. Irish Water July 2020
- BS-En 12056:2000 Gravity Drainage Systems Inside Buildings
- Code of Practice for Water Infrastructure. Irish Water 2020
- Suds Manual Ciria C697

The existing site has been cleared and has no buildings erected on it. Surface water on the site discharges to ground and the foul connections have been removed.

3 Existing Public Drainage

There are two trunk sewers running across the front of the site facing greenhills Road and turning down the southern Boundary with The Astro Park. The position of these sewers is shown on Drawing No. 20-4993_FDA_604-P5 Existing Site Layout Drainage at Appendix A Existing Drainage infrastructure. The Irish Water record drawing is also attached. It should be noted that the Irish Water record drawing is incorrect in so far as the trunk sewers shown traversing the site along Greenhills Road have been relocated as per 20-4993_FDA_604-P5 Existing Site Layout Drainage.

The proposed development will maintain a wayleave of 5.5m from the building façade to the edge of the existing surface water sewer and 7.1m to the edge of the existing foul trunk sewer. A CCTV survey of both foul and surface water trunk sewers will be carried out prior and post construction.

4 Water Consumption

Based on The Irish water Code of Practice for Waste Water Infrastructure per capita consumption is based on 50 litres per day for the commercial units and Creche and 150 litres per day for the residential units.

Occupancy for the dwelling units is calculated at 2.7 persons per unit.

Commercial Occupancy is based on an occupancy load factor of 5

Location	Commercial Area	Pop ⁿ	Consumption(L)
Unit 1	167m ²	33	1650
Unit 2	255	51	2550
Unit 3	232	46	2300
Unit 4	217	43	2150
Concierge Office	76	15	750
Crèche	330	66	3300

Residential

	No of Apts	Population	Consumption(L)
Block A	41	111	16650
Block B	79	214	32100
Block C	42	114	17100
Block D	35	95	14250

The water demand for the site is calculated at **92,800 Lt/Day**.



The water main layout is shown on drawing 20 4993 FDA 610 P4

5 Estimate of foul/wastewater flows

Existing foul drainage is discharged via a foul drainage system to the public sewer

Estimate of additional daily waste water dry weather flows:	Litres
Estimate of daily foul dry weather flow	92,800
Allowance for infiltration 10%	9,280
 Average daily flow rate	 1.18 l/s
 6DWF	 7.1 l/s

Covered Car Park at Ground Level

The area of the ground level covered car park is approximately 1640m²

Drainage will be through a class 2 Full retention petrol interceptor which will provide a concentration of 100mg/L or less at discharge to the foul system.

Foul Water Design

Foul water pipe sizing is based on Irish Water Code of Practice for Waste water infrastructure.

Pipe sizes and gradients follow the guidance in Section 3.6 of The Irish Water Code of Practice for Waste Water

The wastewater pipelayout is shown on drawings

20-4993-601-P4 Foul Drainage

607 P1 Car Park Drainage

1001 P1 Foul Long Sections

606 P1 drainage details sheet 1

Wastewater design table

MH Upstream	MH Downstream	No. of Apartments	Pipe Size	Gradient
1	4	21	225	1:80
2	3	21	225	1:90
3	4	72	225	1:150
4	8	120	225	1:165
5	6	creche	150	1:55
6	8	12	225	1:80
8	9	132	225	1:130
7	9	42	225	1:80
9	10	197	225	1:120
10	10.1	197	225	1:150
10.1	10.2	197	225	1:180

Flow Balancing and Pumping

Flow balancing

IW have advised flow balancing may be required due to network capacity issues downstream of the proposed connection. IW have advised this is a temporary condition pending upgrades of the existing network

Provide for 24 Hours Storage for waste water

Capacity required= $24 \times 1.19\text{L/s} \times 3600 = 103\text{m}^3$

Provide 3.5mx12m x2.5m effective depth of storage

See Drawing 20-4993-606-P1 Drainage Details

Assume storage required from 6am to 10am

Pumping

Provide 2 No Sulzer Sanisett MF254W vortex impeller

Discharge=5l/s at 3m static head

No of pump starts per hour =3

Pumps run for approximately 6 minutes

Tank discharges over a twenty hour period

6 Surface Water

The existing site area of the site is 7900m². The existing site has been cleared.

It is proposed to provide storm water attenuation within the site and limit the outfall to 1.6l/s. Attenuation will be provided for a 100 year storm event with a 20% allowance for climate change.

Greenfield run off estimate for a site of area 0.8Ha at Greenhills Road is estimated at 4.26L/s based on Institute of Hydraulics Report 124 for a 100 year return period.

However as no long term storage is available on site the outflow is restricted to 1.6l/s as per Section 16.3 of The Regional Code of Practice for Drainage

The values used were as follows:

Soil Value=0.3

Standard annual average rainfall=771mm

This is in accordance with Paragraph 7.1.2 of the South Dublin County Council Development Plan 2016-2022 Strategic Flood risk assessment.

Calculations for the surface water can be found in Appendix B.

The proposed surface water layout is shown on Drawing 20-4993-600-P1

6.1 SUDS

The following SUDS measures are proposed:

Blue/ Green Roofs are provided to all blocks and the podium area / internal courtyard at first floor level. This will provide interception and treatment storage at source along with attenuating flows.

Permeable paving: Pedestrian and vehicular trafficked areas to the perimeter of the development will incorporate permeable paving. The paving will Type C , no infiltration due to the proximity of the paving to the buildings. The permeable paving will provide treatment at source and provide temporary storage upstream of controlled discharge to the public surface water system

Bio retention tree pits are located on the northern and western boundaries.

Blue/Green Roofs are proposed for Blocks A,B,C, & D and the internal courtyard. Flow from each of these roofs will be attenuated between 0.2l/s

The maximum area of roof drained to a flow control outlet is 177m²

The maximum depth of water retained on the roofs during an extreme weather event is less than 100mm.

The roofs will be fitted with overflow weirs

The area of these roofs are as follows:

Block A	359m ²
Block B	894m ²
Block C	356m ²
Block D	353m ²
Courtyard Podium over Car Park	1290m ²

Each of the roof outlets drains to the permeable paving.

Permeable paving is provided in the paved areas to the perimeter of the buildings.

The Blue Green Roofs will provide an interception volume of 16.2m³

Calculations are provided at Appendix B

Surface water drainage is shown on drawing 20-4993-600

-602

-603

7 Flood Risk

The site was assessed under the Catchment Flood Risk Assessment and Management Program. The site has an area of 7900m²

Ground levels across the site vary from 87.9m OD to 85.9m OD along the southern Boundary and 86.6 to 85.6 along the northern boundary.

The assessment of flood risk was carried out as per the following stages:

Flood Risk identification

Initial Flood risk assessment

Detailed Flood risk assessment

7.1 Flood Risk Identification

Historic Mapping: The OPW Past Flood Event Summary indicates there is no recorded history of flooding on the site or adjacent sites. The nearest recorded flood event is at Avonmore Park approximately 1.5km from the development Site.

The summary Report is included at Appendix C

Coastal Flooding: the site is located approximately 10km from the coast. The risk of coastal flooding is not considered significant.

Pluvial: All rain landing on the site will be dealt with using SUDS strategies. Pluvial flows are attenuated using SUDS strategies to the 1: 100 estimate of the Greenfield Run off. Rain fall intensities are increased by 20% to allow for climate change in estimating the storage required to limit flows to 1:100 greenfield run off rate.

In the event of a blockage in the network overland flows will be towards the south eastern corner at 86.0m . Floor levels are set a minimum 150mm above outside ground level.

The risk of pluvial flooding is not considered significant.

Fluvial

The Tymon Stream is located to the south of the Astro Park approximately 135m from the site boundary. There are no recorded flood incidents in the vicinity of the site.

Flood zones

Flood Zone A

Where the probability of flooding from rivers is greater than 1:100 and 1:200 for coastal flooding

Flood Zone B

Where the probability of flooding from rivers is between 1:100 and 1:1000 for rivers and 1:200 and 1:1000 for coastal

Flood Zone C

Where the probability of flooding is less than 1:1000 for both rivers and coastal flooding. All areas that are not in Zones A or B are deemed to be in Zone C

Vulnerability

Developments are classified as highly vulnerable, less vulnerable or water compatible
Highly vulnerable: Hospitals, Residential, Student residences, emergency access and egress points, essential infrastructure

Less Vulnerable: Retail, leisure, commercial, industrial, non residential, agriculture etc

Water compatible: Docks, marinas, flood control infrastructure, amenity open space, water based leisure activities.

Initial Flood Risk assessment

Possible sources of flood water are assessed as set out below using source- pathway-receptor model

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Tidal	Breach of defences	People Property	Extremely unlikely	High	Negligible
Fluvial	Overtopping Breach of Banks	People Property	Possible	High	Low
Pluvial	Blockage	People Property	Possible	High	Low
Ground Water	Rising levels	People Property	unlikely	Medium	negligible

A review of the PFRA(Preliminary flood risk assessment carried out under the CFRAM program did not identify any major source of flooding on or adjacent to the site.

The CFRAM study indicates that the site is in ZONE C and that the risk of flooding from Fluvial sources is less than 1:1000

The relevant maps are included at Appendix C

Residual Risks

Blockage of the Surface water Drainage system

Blockage of the surface water system will result in flooding of the permeable paved areas and subsequent surface water overland flows towards the south west corner of the site.

7.2 Summary of Flood risk

The site lies within Zone C as per Flood Risk Management Guidelines for Planning Authorities based on the CFRAM East Draft Study.

Flood Zone C is defined as where the probability of flooding is low.

In accordance with Table 3 of the above Guidelines development is considered appropriate for a highly vulnerable development.

Table 3

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

8 Summary

The proposal will increase the foul water discharge from the site. The proposed connection is shown on the accompanying drainage plans.

Covered Car parking will discharge through a Class 2 Full retention interceptor before being discharged to the final foul sewer system.

There will be no increase in surface water run-off. Attenuation will be provided for a 100 year storm event including a 20% allowance for Climate Change.

Surface water attenuation is provided through the use of Blue/Green roofs and Type C Permeable paving

Sustainable urban drainage systems are utilised by providing Extensive Blue/Green roofs throughout the development and Blue/Green Podium along with permeable paving which provides for attenuating flows and interception.

The site has a low probability of flooding and is classified as being in Zone C

Chartered Engineer

For

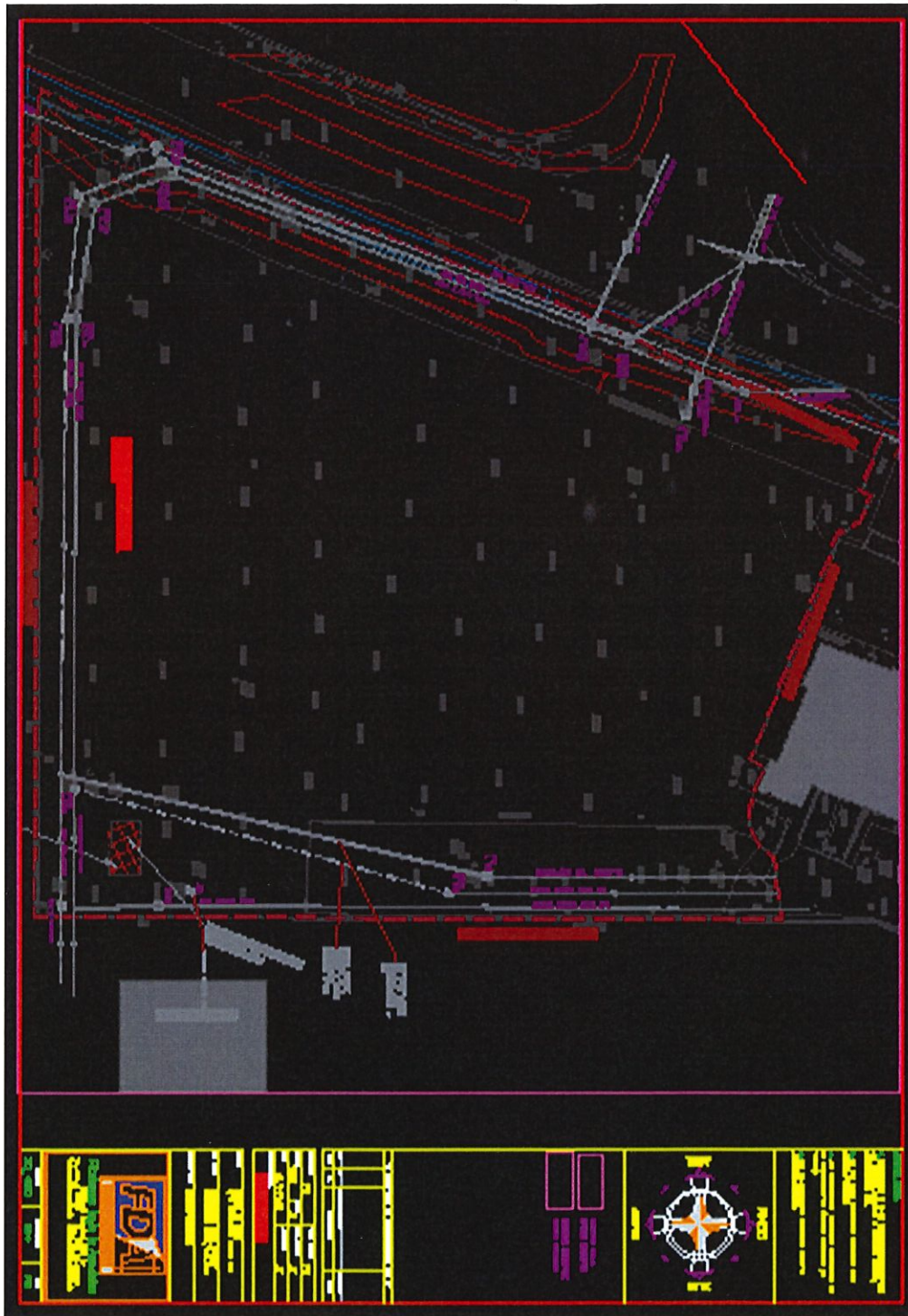
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Appendix A – Existing Drainage Infrastructure

Drawings 19-4799 – 601 P1 Drainage Diversion

20 4993-604 P5 Existing Drainage

Irish Water Record Drawing



Existing Drainage FDA 204993-604-P5

Appendix B – Surface water Calculations

Estimate of Greenfield Run Off

Calculation Of Blue Roof Storage Volumes

Calculation of Permeable Paving Storage Volumes

Greenfield site Run off estimate

Print Close Report

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by: Andrew Fitzsimons

Site name: Greenhills Development

Site location: Greenhills Road

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SO000219 (2013), the SuDS Manual G753 (Ciba, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach: H124

Site characteristics

Total site area (ha): 0.8

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOL type

Soil characteristics

	Default	Edited
SOL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1015	771
Hydrological region:	12	12
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.13	2.13
Growth curve factor 100 years:	2.61	2.61
Growth curve factor 200 years:	2.88	2.88

Site Details

Latitude: 53.29332° N

Longitude: 6.35518° W

Reference: 2678071335

Date: Apr 24 2022 12:42

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	2.25	1.83
1 in 1 year (l/s):	1.91	1.39
1 in 30 years (l/s):	4.8	3.48
1 in 100 year (l/s):	5.88	4.26
1 in 200 years (l/s):	6.44	4.67

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Estimate of storage Volumes on Blue Roofs A, B, C, D, and Podium

Outfall from each roof limited between 0.2l/s

Maximum area drained to an outlet=177m²

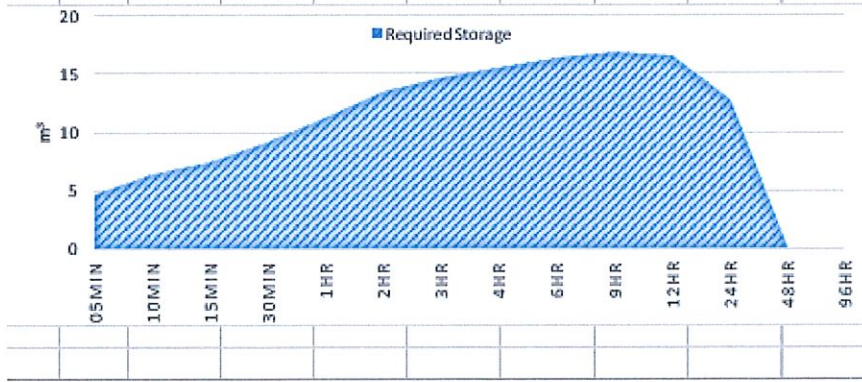
Roof Areas	No of outlets	area per outlet
Roof Block A 590m ²	4	148
Roof Block B 1180m ²	7	169
Roof Block C 530m ²	3	177
Roof Block D 480m ²	3	160
Podium 1290	8	162

Design Criteria Max storage depth not to exceed 100mm

Max storage volume drained away in 24 hours

Development Areas		Area Drained to Blue roof flow control outlet		
Development site Run-off		Run off coef. area		
Impermeable Surface		1	0	0
Blue roof		1	177	177
Light residential		0.45	0	0
Normal residential		0.6	0	0
Dense residential		0.8	0	0
Green roof		0.3		0
Total area for runoff			Σ=	177 m ²
Rainfall Parameters				
Climate Change Factor				1.2
Outflow limit input				0.2
Outflow limit				0.2 l/s
			$0.2 / 1e3 \times 3.6e3 =$	0.72 m ³ /h
F.O.S				1.25
Interception Volume				
Rainfall Depth				5 mm
Interception Storage			$5 / 1e3 \times 177 =$	0.89 m ³
Storage required				
Return Period	Critical storm			
100 year	9hr 00min		$16.83 - 0.88 =$	15.95 m ³

100 year storm								
100 year storm	[mm]		[m ³]					
duration	rainfall depth	climate change 20%	inflow	outflow	storage volume	x F.O.S		
05min	17.7	21.24	3.76	0.06	3.70	4.62		
10min	24.6	29.52	5.23	0.12	5.11	6.38		
15min	29	34.8	6.16	0.18	5.98	7.47		
30min	36.4	43.68	7.73	0.36	7.37	9.21		
1hr	45.7	54.84	9.71	0.72	8.99	11.23		
2hr	57.3	68.76	12.17	1.44	10.73	13.41		
3hr	65.5	78.6	13.91	2.16	11.75	14.69		
4hr	72	86.4	15.29	2.88	12.41	15.52		
6hr	82.2	98.64	17.46	4.32	13.14	16.42		
9hr	93.9	112.68	19.94	6.48	13.46	16.83		
12hr	103.2	123.84	21.92	8.64	13.28	16.60		
24hr	129.6	155.52	27.53	17.28	10.25	12.81		
48hr	143.4	172.08	30.46	34.56	-4.10			
96hr	165.4	198.48	35.13	69.12	-33.99			
			storage required for 100 year storm				16.83	



Depth of water =95mm

Time to drain=23 hours 20 minutes with a factor of safety of 1.25

Permeable Paving

The permeable paving will provide attenuation storage

Area drained to Zone A and C

Attenuated flows from Blue roofs

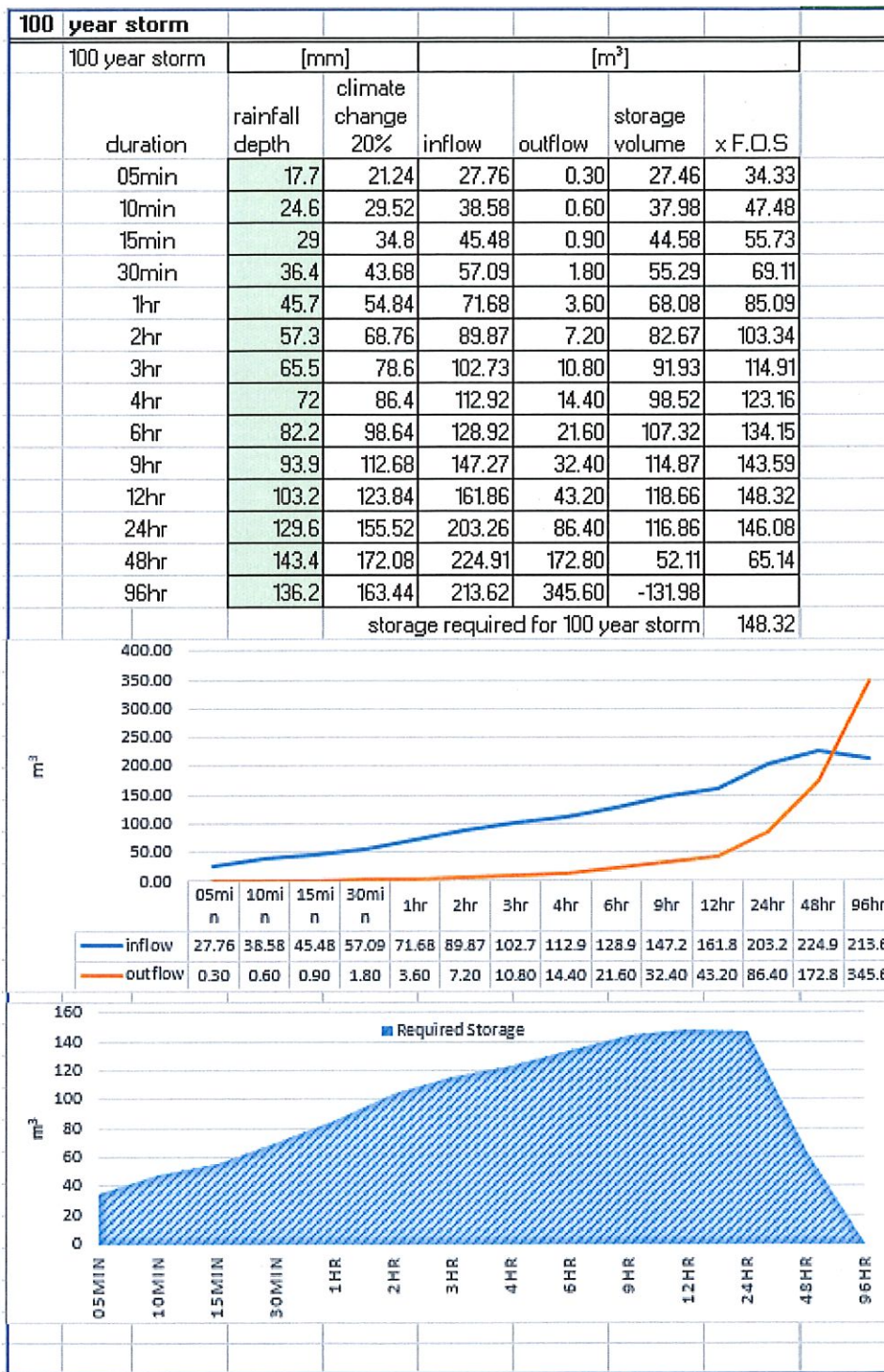
Block A 4x0.2l/s

Block B 2x 0.2l/s

Podium 6x0.2l/s

Permeable paving/hardstanding=1307m²

Area drained to Zones A and C			
Development site Run-off	Run off coef.	area	
Impermeable Surface	1	0	0
Permeable Paving type C	1	1307	1307
Light residential	0.45	0	0
Normal residential	0.6	0	0
Dense residential	0.8	0	0
Green roof	0.3		0
Total area for runoff		Σ=	1307 m ²
Page 1			
Rainfall Parameters			
Climate Change Factor			1.2
Outflow limit input			1
Outflow limit			1 l/s
		$1 / 1e3 \times 3.6e3=$	3.6 m ³ /h
F.O.S			1.25
Interception Volume			
Rainfall Depth			5 mm
Interception Storage		$5 / 1e3 \times 1.31e3=$	6.54 m ³
Storage required			
Return Period	Critical storm		
100 year	12hr 00min	$148.3 - 6.54=$	141.79 m ³



Required storage = $148\text{m}^3 + 2.4\text{l/s}$ from Blue roofs

Total storage Zone A = $148 + 104 = 208\text{m}^3$

Depth of permeable paving subbase required = $(208/731)/0.3 = 0.95\text{m}$

Area drained to Zones B and D

Attenuated flows from Blue roofs

Block B 5x 0.2l/s

Block C 3x0.2l/s

Block D 3x0.2l/s

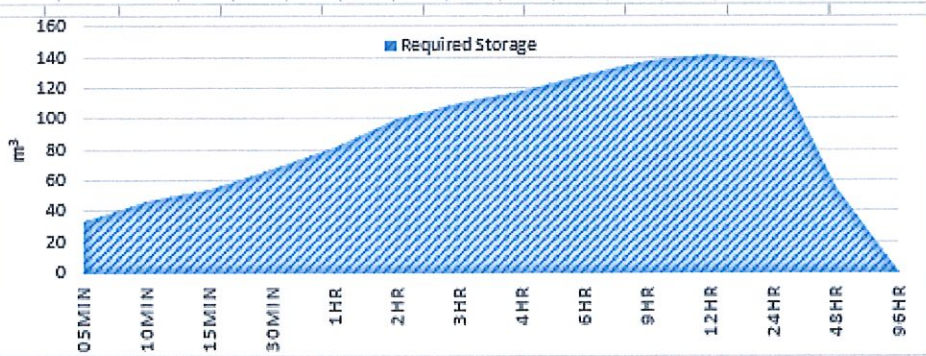
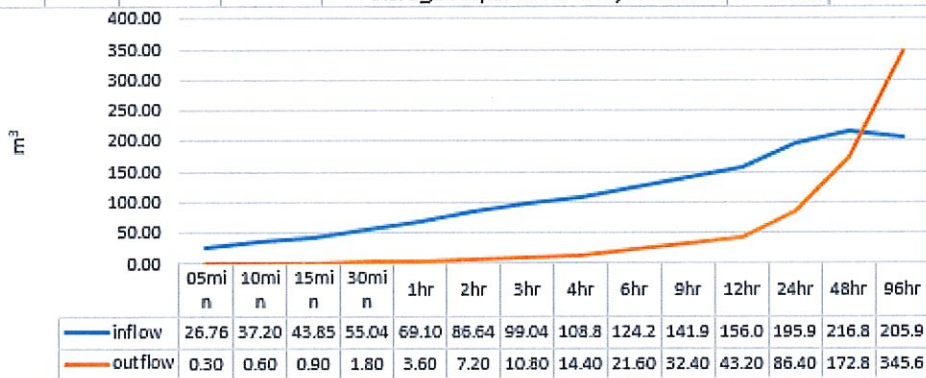
Podium 2x0.2l/s

Permeable paving/hardstanding=1260m²

Area drained to Zones B and D			
Development site Run-off	Run off coef.	area	
Impermeable Surface	1	0	0
Permeable Paving type C	1	1260	1260
Light residential	0.45	0	0
Normal residential	0.6	0	0
Dense residential	0.8	0	0
Green roof	0.3	0	0
Total area for runoff		Σ=	1260 m ²
Rainfall Parameters			
Climate Change Factor			1.2
Outflow limit input			1
Outflow limit			1 l/s
		$1/1e3 \times 3.6e3=$	3.6 m ³ /h
F.O.S			1.25
Interception Volume			
Rainfall Depth			5 mm
Interception Storage		$5/1e3 \times 1.26e3=$	6.30 m ³
Storage required			
Return Period	Critical storm		
100 year	12hr 00min	$141 - 6.3=$	134.75 m ³

Page 1

100 year storm							
100 year storm	[mm]		[m ³]				
duration	rainfall depth	climate change 20%	inflow	outflow	storage volume	x F.O.S	
05min	17.7	21.24	26.76	0.30	26.46	33.08	
10min	24.6	29.52	37.20	0.60	36.60	45.74	
15min	29	34.8	43.85	0.90	42.95	53.69	
30min	36.4	43.68	55.04	1.80	53.24	66.55	
1hr	45.7	54.84	69.10	3.60	65.50	81.87	
2hr	57.3	68.76	86.64	7.20	79.44	99.30	
3hr	65.5	78.6	99.04	10.80	88.24	110.30	
4hr	72	86.4	108.86	14.40	94.46	118.08	
6hr	82.2	98.64	124.29	21.60	102.69	128.36	
9hr	93.9	112.68	141.98	32.40	109.58	136.97	
12hr	103.2	123.84	156.04	43.20	112.84	141.05	
24hr	129.6	155.52	195.96	86.40	109.56	136.94	
48hr	143.4	172.08	216.82	172.80	44.02	55.03	
96hr	136.2	163.44	205.93	345.60	-139.67		
storage required for 100 year storm						141.05	



Required storage = $141\text{m}^3 + 2.6\text{l/s}$ from Blue roofs

Total storage Zone B and D= $141+112=253\text{m}^3$

Depth of permeable paving subbase required= $(253/643)/0.3=1.3\text{m}$

Provide 50mm of 5mm open graded bedding course on Geotextile Inbitex or similar equal approved on 100mm of 20mm open graded aggregate on 950mm/1350mm of 63mm coarse graded aggregate on impermeable liner



APPENDIX C

Flood Maps and Reports

PAST FLOOD LOCAL AREA SUMMARY REPORT

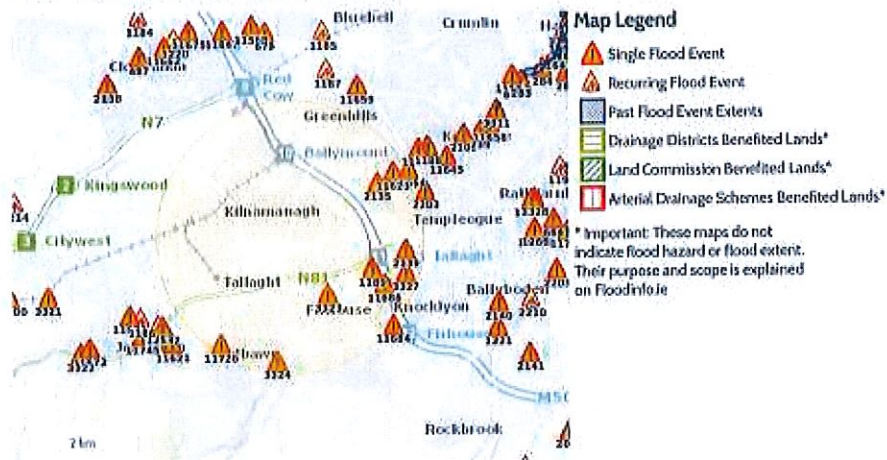
Past Flood Event Local Area Summary Report



Report Produced: 20/11/2021 10:34






This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

This report has been downloaded from www.floodinfo.ie (the "Website"). The users should take account of the restrictions and limitations relating to the content and use of the Website that are explained in the Terms and Conditions. It is a condition of use of the Website that you agree to be bound by the disclaimer and other terms and conditions set out on the Website and to the privacy policy on the Website.

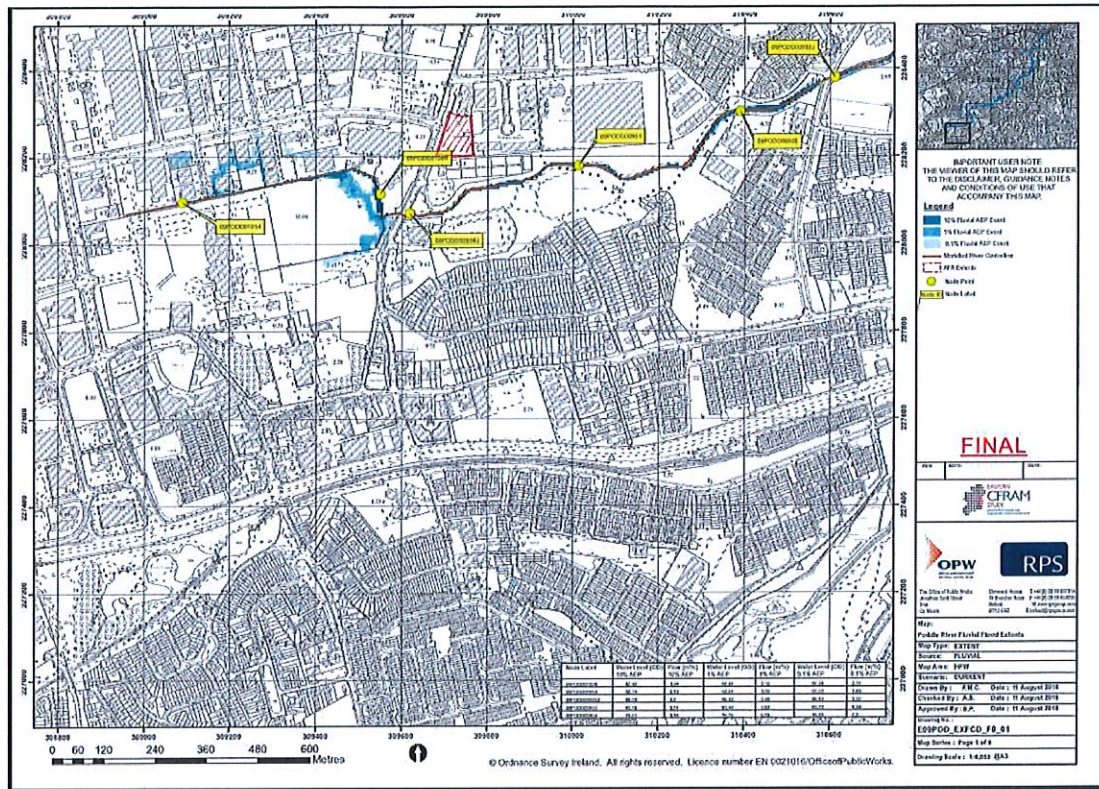


11 Results

Name (Flood_ID)	Start Date	Event Location
1. Dodder Mount Carmel Park recurring (ID-1189) Additional Information: Reports (2) Press Archive (1)	n/a	Approximate Point
2. Old City water Course Spawell House Feb 1994 (ID-2139) Additional Information: Reports (1) Press Archive (0)	03/02/1994	Exact Point
3. Dodder Avonmore Park Nov 2000 (ID-3323) Additional Information: Reports (1) Press Archive (0)	05/11/2000	Approximate Point
4. Dodder Kiltipper Road Nov 2000 (ID-3324) Additional Information: Reports (1) Press Archive (0)	05/11/2000	Approximate Point
5. Knocklyon Ave Nov 2000 (ID-3327) Additional Information: Reports (1) Press Archive (0)	05/11/2000	Approximate Point
6. Mount Carmel Park Firhouse Nov 2000 (ID-3333) Additional Information: Reports (1) Press Archive (1)	05/11/2000	Approximate Point

	Name (Flood_ID)	Start Date	Event Location
7.	 Flooding at Whitestown Way, Tallaght, Dublin 24 on 24th Oct 2011 (ID-11726) Additional Information: Reports (1) Press Archive (0)	24/10/2011	Exact Point
8.	 Flooding at Castlefield, Glenvara and Glenlyon, Knocklyon, Dublin 16.on 24th Oct 2011 (ID-11684) Additional Information: Reports (1) Press Archive (0)	24/10/2011	Exact Point
9.	 Osprey Estate Nov 1982 (ID-2135) Additional Information: Reports (1) Press Archive (0)	05/11/1982	Exact Point
10.	 Flooding at Limekiln Road, Ballyboden Rd, Co. Dublin on 24th Oct 2011 (ID-11623) Additional Information: Reports (1) Press Archive (0)	24/10/2011	Approximate Point
11.	 Flooding at Homeville, Knocklyon, Dublin 16.on 24th Oct 2011 (ID-11686) Additional Information: Reports (1) Press Archive (0)	24/10/2011	Exact Point

CFRAMS MAPS PODDLE RIVER FLUVIAL EXTENTS



Appendix D Drainage Drawings

Existing drainage	20-4993-604 Existing drainage
	19 4799 601 Drainage Diversion
	Irish Water Existing Infrastructure
Water Main	20-4993-610 Water main Layout
	20-4993 621-626 Water Main details
Waste Water	20 -4993-601 Foul Drainage
	20 4993 607 Car Park Drainage
	20 -4993 605 Balancing Tank Detail
	20 4993 606 Drainage Detail
	20 -4993 1001 Longitudinal Sections
	20-4993 627-630 Waste Water Details
Surface Water	20 4993 613 Roof Drainage
	20 4993 612 First Floor Podium
	20 4993 600 Ground Floor

Appendix E

Irish Water

Irish Water CDS21006258 Confirmation of Feasibility

Irish Water Water Design Submission Check List

Irish Water Waste Water Design Submission Check List

Appendix E

Irish Water

Irish Water CDS21006258 Confirmation of Feasibility

Irish Water Water Design Submission Check List

Irish Water Waste Water Design Submission Check List

Andrew Fitzsimons
 250 Harolds Cross
 Co. Dublin
 D6WYD63

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

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

www.water.ie

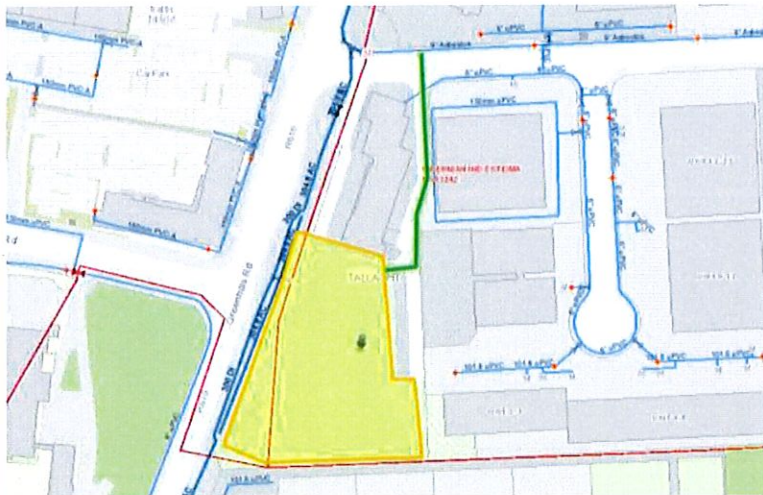
18 October 2021

Re: CDS21006258 pre-connection enquiry - Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 241 unit(s) at Site at Junction Of Airton Road, Greenhills Road, Co. Dublin

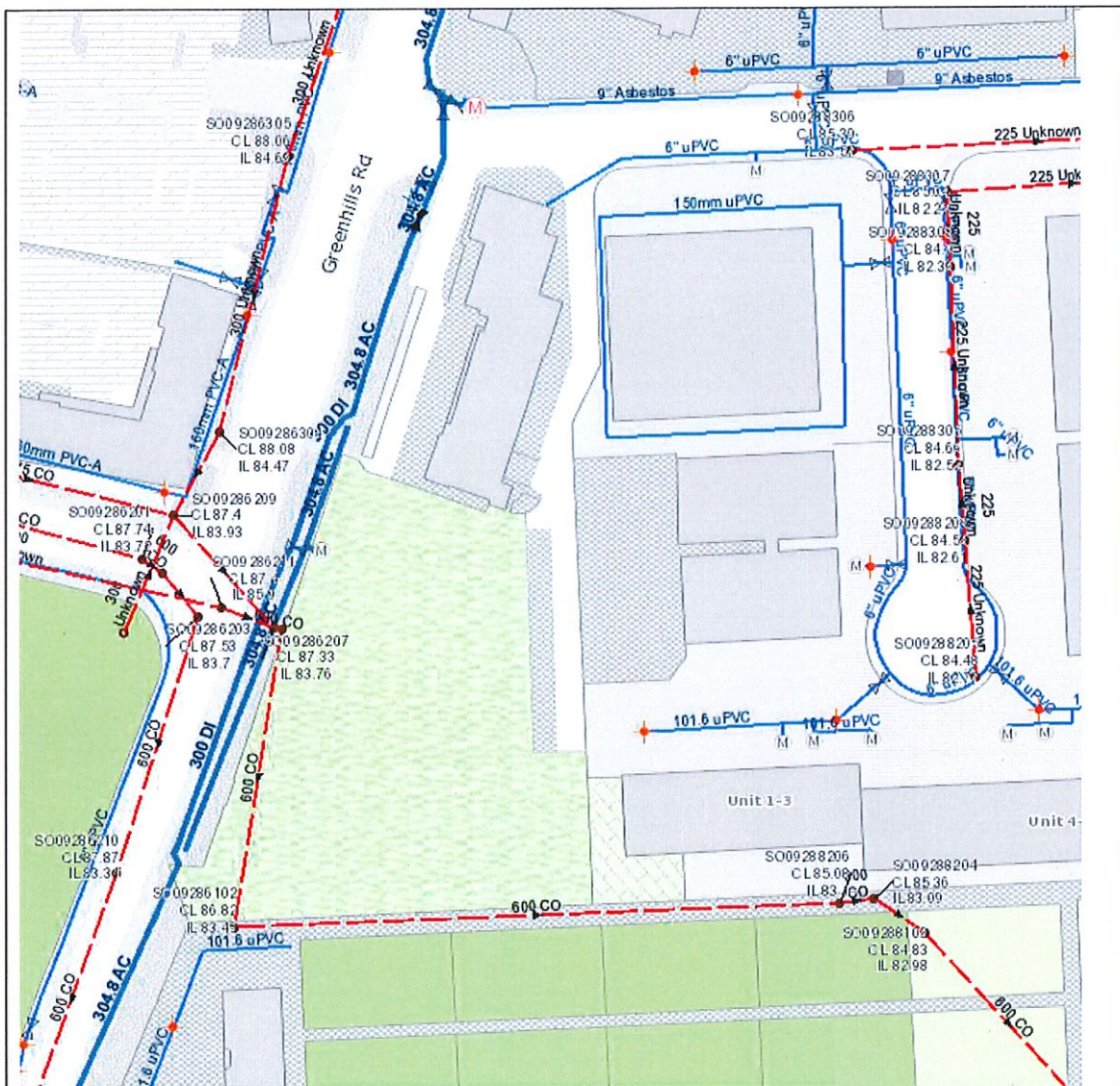
Dear Sir/Madam,

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

SERVICE	OUTCOME OF PRE-CONNECTION ENQUIRY <u>THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.</u>
Water Connection	Feasible Subject to upgrades
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	<p>Approximately 100m of network extension will be required to connect the site development to the existing 9" AC main as shown below.</p> 

	<p>The connection main should be 150mm ID pipe with a bulk meter installed on the line.</p> <p>24-hour (average day peak week demand) on-site water storage will be required, for all commercial units, with 12- hour re-fill time.</p>
<p>Wastewater Connection</p>	<p>Irish Water can facilitate the connection subject to the development adhering to strict flow management. This is to ensure no further detriment in the downstream network resulting from the new connections to the existing sewer. The flow control and storage measures will be installed, owned, operated and managed by the developer locally on the private side, and will be required until Irish Water have increased capacity in the downstream network.</p> <p>Providing this arrangement can be facilitated and managed on the private network, your connection can be facilitated subject to a Connection Agreement with Irish Water. The period for operating and maintaining flow control measures are subject to the delivery of the public network upgrade and will be a condition of any potential connection. The capital upgrade project is currently at preliminary design stage.</p> <p>In addition to the above removing any existing misconnections or installing dedicated separate storm water systems will be required to preserve the existing capacity for foul only flows.</p> <p>Local Network upgrades or extensions required to connect to strategic infrastructure and point of connection will be assessed at connection application stage.</p> <p>For design submissions and queries related to diversion/build near or over, please contact IW Diversion Team via email address diversions@water.ie</p>
<p>The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.</p>	

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



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

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

General Notes:

- 1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**

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

If you have any further questions, please contact Marina Byrne from the design team via email mzbyrne@water.ie For further information, visit www.water.ie/connections.

Yours sincerely,



Yvonne Harris

Head of Customer Operations

Appendix 1: Water Design Submission Checklist

Name of Company	Greenhills Living C/O Bevedere Living Ltd
Address	118 Drumcondra Business Centre, Drumcondra Road Upper Dublin 9
Phone No	0857271991
Email	conor@marconcapital.net
Developer's	Andrew Fitzsimons Fitzsimons Doyle & Associates 250 Harold's Cross Road Dublin 6W
Design Engineer	afitzsimons@fdaconsulting.ie Tel 01 4966011

1	Planning Considerations	Y/N
1.1	The design complies with the current Development Plan	Y

2	External Approvals	Y/N
2.1	All consents are in place.	Y
2.2	No clash detected with other utilities.	Y

3	Drawing Format	Y/N
3.1	The drafting is to the appropriate Irish Water CAD Standard	Y
3.2	The drawings contain all of the relevant Irish Water referencing to Standard Drawings	Y
3.3	Individual properties to be connected have been identified and numbered.	Y
3.4	All easements have been denoted.	Y
3.5	Drawings to have the following notation: Length and type of mains. Number of valves and hydrants	Y
3.6	The design submission has all the relevant documentation as outlined in Section 2.3 of the Codes of Practice	Y

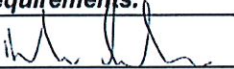
4.	Design Criteria (Tick Y/N for each individual Item below)	Y/N
4.1	<p>The design meets the fundamental objectives of the Code of Practice and Standard Details for Water Infrastructure:</p> <ul style="list-style-type: none"> a) Water Main layouts shall be arranged in loops or rings so as to avoid "dead ends" or terminal points. All Mains shall terminate in a loop or ring to accommodate one-directional flushing of the network. The loop pipe size shall match the size of the spur Main to which it is connected. Loops shall have a minimum of four connected houses and one hydrant. b) The minimum pipe size shall be 100mm internal diameter in housing Developments of 40 houses and up to 100 houses. Developments of 100 houses and above shall have minimum pipe sizes of 150mm internal diameter spine Main with 100mm branch Mains. Nominal internal diameters of 80mm and less may be allowed in smaller Developments but not where hydrants are located and only after prior written agreement has been received from Irish Water (See Section Error! Reference source not found. of the Code of Practice, Water Infrastructure). c) The minimum pipe size shall be 150mm in industrial or commercial Developments, or as agreed with Irish Water. d) Every property, whether domestic or business, shall have a separate Service Connection. A connection shall not be taken from an existing service connection. The use of common service pipes is not allowed. Service Connections shall be as short as reasonably possible. Long Service Connections (in excess of 15m) will not be allowed. Service Connections shall be a minimum pipe size of 25mm outside diameter, 20mm internal diameter. e) Service Connections shall not be taken across roads where the width of the road is greater than 15m, except with the prior agreement of Irish Water. In certain circumstances, a rider Main, located entirely on public property, may be provided to serve small numbers of houses at the street-side remote from the Water Main. This rider Main shall be looped back to the Water Main. Individual house Service Connections shall be provided off the rider Main. f) Water Mains should be laid to provide the optimum circulation in the local water network. Water Mains may terminate in a dead end only with Irish Water approval, in which case a washout hydrant, located within a Chamber or kiosk, shall be provided at the dead end. g) Valves shall be arranged at junctions and spine water mains in such a manner so as to ensure that water shut-down will affect no more than 40 properties at any one time. h) Water mains greater than 300mm in diameter laid under heavily trafficked roads shall be 	Y

ductile iron.

- i) Looped water mains shall return to the spur main downstream of a sluice valve to allow for one directional flushing.
- j) The location of hydrants should be such that they can be accessed in an emergency. Hydrants should not be located in roads or parking areas. Off line hydrants shall have dead end pipe lengths of 3.0m or less.
- k) Where possible, a hydrant should be located within 20m of each junction.
- l) No domestic property within a Development shall be more than **46m** from a hydrant. Hydrant details and locations shall be subject to the approval of the relevant Fire Authority. This requirement should not take account of dead-end or wash-out hydrants which are used for operational flushing. A hydrant shall not be closer than 6m to a property.
- m) Fire hydrants should not be supplied from water mains less than 100mm diameter.
- n) The location of branch valves, hydrants or other apparatus shall be in agreement with Irish Water.
- o) Where a water main is located in an area of restricted access such as under motorways, canals, railways, rivers etc., a duplicate water main (or a sleeve with a replacement main) shall be installed to maintain water supply in the event of a problem with the live main until access is available to carry out repairs. The second main shall be the same as the first main in regards to material, diameter and flow capacity. Isolation valves shall be provided on both sides of the inaccessible area to allow the water supply to be redirected between the live main and the duplicate main.
- p) Where a water main is to be located within a structure such as a bridge or culvert, the Developer shall consult with Irish Water to establish if the water main is to be duplicated. In most instances Irish Water may require that the mains are placed within sleeves to facilitate easy replacement of the pipe. In general, however, Irish Water discourages the construction of water mains within bridge or culvert structures and the installation of the mains across the watercourse adjacent to the bridge/culvert structure is preferred.
- q) Surface water attenuation tanks shall not be constructed over water mains.
- r) Irish Water will require the Developer to provide bulk metering of the water supply connection to developments with a water demand exceeding 20 m³ per day. The bulk meter will be linked to an Irish Water telemetry data collection system in cases where the water demand exceeds 200 m³ per day. Developments with water demands less than 20 m³ per day will not require a flow meter but separate infrastructure shall be provided in these Developments to measure night flow. (Refer to Section 3.15.4 of the Code of Practice for Water Infrastructure). Irish Water will choose and supply the bulk meter and associated equipment based on the range of flow at the Development.
- s) Where there is the possibility of connecting into or extending the water main network into adjoining land that is not developed, the water mains shall be extended to the boundary if required by Irish Water and easements for these extensions provided and executed to include Irish Water as the named beneficiary as part of the overall easement for the Water and Wastewater Services Infrastructure for the Development (Refer to Section 1.23 of the Code of Practice for Water Infrastructure).
- t) Pressure control shall be provided at the take-off point of the new connection if required to control high pressures by way of a pressure reducing valve (PRV). Where possible their need shall be determined in advance but in some cases Irish Water may require these to be installed after the main is made live. The cost of this work shall be borne by the Developer. The need for PRVs shall be agreed with Irish Water. Pressure sustaining valves (PSV) may be required in specific exceptional circumstances and only by agreement with Irish Water. The PRVs and PSVs will be chosen and supplied by Irish Water for installation in Developer supplied chambers.
- u) Individual service connections shall generally not be taken across roads and their length shall be kept to a minimum. The provisions outlined in (e) above may be used to limit long service connections.
- v) Water supply mains shall be laid in common areas and not through individual private gardens or driveways etc.
- w) Any redundant water services shall be traced back to the Irish Water supply main by the Developer and shall be blanked off by Irish Water at the Developer's expense.
- x) Any existing lead services pipes to the site shall be replaced / made redundant at no cost to Irish Water. This work shall be carried out to the satisfaction of Irish Water.
- y) Water main bends and road crossings should be kept to an absolute minimum.
- z) A three-way sluice valve arrangement shall be provided at all water main junctions.
- aa) The water main pipework to new developments should be located at the right hand side of

	the entrance to the new development (from a view facing into the development) if possible, and where the properties served are equally or reasonably distributed at both sides of the estate roadway.	Y
4.2	The design should relate to finished surface levels when specifying cover to pipes.	Y
4.3	Connections to existing works have been appropriately designed.	Y
4.4	Alignments have been approved by both Irish Water and other service providers.	Y
4.5	The design should consider the proposed construction technique and/or constraints	Y

5	Influencing Factors	Y/N
5.1	The Developer's Design Engineer confirms that the design has made allowance for existing or proposed physical features of influence i.e. retaining walls, significant trees, other services, buildings etc. In established green field's areas	Y
5.2	In the case of designs in existing established or green fields areas the Developer's Design Engineer confirms that the route has been "walked".	Y
5.3	Where the design requires the approval of other parties these must be obtained.	N/A

I certify that this design has been reviewed and complies with Water Irish's Code of Practice for Water Infrastructure requirements.	
Signature 	Date 14 April 2022
Print Name and Firm Andrew Fitzsimons Fitzsimons Doyle & Associates 250 Harold's Cross Road Dublin 6W	
afitzsimons@fdaconsulting.ie Tel 01 4966011	
Complete this form and send to: newconnections@water.ie	

List of Attachments

Ref	Description	Comment
1	Water and Drainage Technical Compliance Report incl Flood Risk Assessment	Water and Drainage Calculations
2	20 4993 FDA 610 Water Main Layout	
3	20 4993 FDA 621-626 Water Main Details	
4	20 4993 FDA	
5	20 4993 FDA	

Appendix 2: Wastewater Design Submission Checklist

Name of Company	Greenhills Living C/O Belvedere Living Ltd
Address	118 Drumcondra Business Centre Drumcondra Road Upper, Drumcondra Dublin 9
Phone No	085 7271991
Email	conor@marconcapital.net
Developer's	Andrew Fitzsimons, Fitzsimons Doyle and Associates 250 Harold's Cross Road Dublin 6W
Design Engineer	afitzsimons@fdaconsulting.ie Tel 01 4966011

1	Planning Considerations	Y/N
1.1	The design complies with the current Development Plan.	Y

2	External Approvals	Y/N
2.1	All consents are in place.	Y
2.2	No clash detected with other utilities.	Y

3	Drawing Format	Y/N
3.1	The drafting is to the appropriate Irish Water CAD Standard	Y
3.2	The drawings contain all of the relevant Irish Water referencing to Standard Drawings	Y
3.3	Individual properties to be connected have been identified and numbered.	Y
3.4	All easements have been denoted.	Y
3.5	Drawings to have the following notation: Length and type of mains. Number of valves.	Y
3.6	The design submission has all the relevant documentation as outlined in Section 2.3 of the Codes of Practice	Y

4	Design Criteria (Tick Y/N for each individual Item below)	Y/N
4.1	<p>Without compromising the planning, the design meets the fundamental objectives the Code of Practice and Standard Details for Wastewater Infrastructure:</p> <p>a) The external face of any new Sewer shall be at least 3.0 m or a distance equivalent to the depth of the Sewer below the foundation, whichever is greater, from the external face of any building or Development structure. Modified foundation arrangements do not obviate the need for this separation distance. This is to allow future access for maintenance, operation, future renewal, replacement, upgrading work, etc. of the pipeline. Foundations and basements of adjacent buildings should be designed to ensure that no extra loads are transferred to the pipeline, i.e. the pipe should be located outside the zone of influence of the building foundation. The minimum clear distance shall be increased if the Sewer is greater than 3m deep or if the diameter is greater than 375mm. The minimum clear distances for pipe diameters of 450mm diameter and greater (outside the diameter size covered by this Code of Practice) or depths exceeding 4.0m shall be based on specific consultation with Irish Water. These separation distances also apply to separation from other existing structures, including attenuation structures and swales;</p> <p>b) Sewers and service connections should not be constructed under any building or structure. No building may be constructed over the line of a Wastewater Sewer, service connection or Drain, This approach is in accordance with the Section 29 of the Public Health Act 1878 and the Water Services Act;</p> <p>c) Sewers and Rising Main locations shall be agreed with Irish Water and, where practicable, shall be located in areas that are or will in future be maintained by the Local Authority, i.e., road verges, roads and public open space or a space where they are reasonably accessible and visible. Wayleaves and Deeds of Easement shall be provided for all Sewer routes. Sewers shall not be laid in enclosed private land, where there is a practicable alternative route;</p> <p>d) Between Manholes, Sewers shall be laid in straight lines in both the vertical alignment (profile) and horizontal alignment (plan). However, long radius bends up to 45 degrees may be laid on 100mm wastewater service connections downstream of the private side</p>	<p>Y</p> <p>Y</p> <p>Y</p> <p>Y</p>

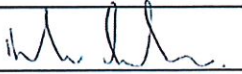
	inspection chambers to facilitate the transition from horizontal to vertical at the point where the service connection drops into the trench to connect to branch connection on the Network Sewer;	
e)	The angle between any inlet pipe to a Manhole and the outlet pipe from the Manhole shall not be less than 90 degrees, i.e., the inlet flow from any inlet pipe should not run counter to the outlet flow direction and suitably profiled benching shall be provided to ensure smooth flow conditions;	Y
f)	Where Wastewater and Storm Water Manholes are adjacent, their positions shall be staggered to allow for crossing over of Sewers. Staggered positioning of Wastewater and Storm Water Manholes is required with a full separation between the Wastewater and Storm Water Sewer systems (Note that Irish Water does not have responsibility for Storm Water Sewer systems.). The external walls of the staggered manholes shall be separated by at least 500mm to allow compaction of backfill material between the structures;	Y
g)	The design of landscaping shall be undertaken at the same time as the design of the Drains and Sewers so that the impact of tree roots on the Works can be considered (see Section 3.21 of the Code of Practice for Wastewater Infrastructure). Trees/bushes/shrubs shall not be located closer to the Sewer or Drain than the canopy width at mature height, except where special protection measures are provided. A tree should not be planted directly over Sewers or where excavation onto the Sewer would require removal of the tree;	Y
h)	When in a road or highway, the outside of the Sewer should be in the vehicle carriageway (not footway) and shall be at least 1.0 m from the kerb line. The external faces of Manholes and chambers should be at least 0.5 m from the kerb line;	Y
i)	A Storm Water sewer or a Wastewater Sewer should generally not be installed to cross over a Water Main. When the surface water or Wastewater Sewer is being installed under a Water Main, adequate structural supports shall be provided to maintain the structural integrity of the Water Main. A method statement for the proposed crossing shall be provided. Where crossing over a Water Main is unavoidable, the surface water or Wastewater Sewer crossings shall not be located directly above the joints in the Water Main. No other utility service should be laid longitudinally directly above the line of the Wastewater Sewer;	
j)	Any Sewer crossing of a Water Main shall do so at right angles, or as near to as possible, to avoid prolonged envelopes of influence between the services. Crossings shall be located midway between the Water Main joints with a minimum vertical clear distance of at least 300mm and up to 500mm or more in some instances between the Sewer pipe and the Water Main. All such crossings shall be to Irish Water approval and shall not be undertaken until Irish Water or its agents has examined the work at the crossing point and deemed it fit for backfilling;	Y
k)	Specific vertical separation distances for wastewater service connections and Sewers to other pipework, including utility service pipes and ducts, shall be in accordance with the Table at the end of Section 3.5 of the Code of Practice for Wastewater Infrastructure;	Y
l)	There should be a minimum clear horizontal distance of at least 900mm between the external face of a Gravity Sewer/Rising Main and other pipe/duct utilities running parallel to it, with a clear local horizontal distance of 300mm between the external face of a Gravity Sewer/Rising Main and cabinets, poles, junction boxes, Manholes or chambers;	
m)	Specific separation clearance distances in excess of those outlined above shall be provided for services such as gas, electricity, fibre-optic or oil filled cables as the case may be. The particular utility providers shall be consulted to determine these minimum separation distances and evidence of this consultation, with the specified separation distances, shall be provided to Irish Water at design submission stage. For example, the minimum separation distances for Gas Networks Ireland infrastructure shall be in accordance with IS329 'Gas Distribution Mains' and IS328 'Code of Practice for Gas Transmission Mains' as amended/updated;	Y
n)	A Deed of Grant of Easement shall be provided for all Sewers and Rising Mains prior to their construction. Connections to the Irish Water Network will not be permitted without such Easements having been submitted and accepted by Irish Water. Construction and permanent Deed of Grant of Easement, comprising a conditional Burden on the Title, are to be provided complying with particular widths requirements outlined in the Connection Agreement and such Easement should be to the benefit of and registered with Irish Water as the owner following Vesting. The Easement shall not be built upon after the installation of the Sewer or Rising Main. The construction techniques should be	Y

	<p>selected to ensure that the maximum settlement is within the agreed limits;</p> <p>o) Rising Mains shall be laid in straight lines or in gentle curves, to manufacturer's requirements, or using long radius bends. Where bends are used, they should be formed with proprietary bends of suitable material allowing for a fully integrated joint, and securely anchored with thrust blocks, if deemed necessary;</p> <p>p) The provision of access points, comprising rodding points and chambers, for pigging, rodding or cleaning of the Rising Main is required along its entire length, especially along long Rising Mains;</p> <p>q) Where possible, Rising Mains shall be evenly graded between the intake point and the discharge point. If a continuous rise cannot be achieved, the Rising Main should be fitted with sewage air valves and scour valves as per the hydraulic design of the system. Both of these should be suitable for use with raw Wastewater. The valve locations shall be clearly marked by the provision of indicator plates and posts;</p> <p>r) The design of the Rising Main shall take account of the containment of the Wastewater volume during pigging, rodding and cleaning operations at the scouring point and provisions shall be made for ease of collection of the Rising Main contents by vacuum tanker and transportation of this to a suitable point for treatment or reintroduction into the Wastewater collection Network;</p> <p>s) The route of Rising Mains should be marked at every field boundary and, where practicable, at every change of direction by marker posts. The marker plates shall be labelled "RM" and the depth to the top of the Rising Main as well as the distance to the main shall also be provided;</p> <p>t) Non-degradable marker tape, red or orange in colour, shall be installed 300mm above the crown of the Rising Main. In the case of non-metal pipe material, the marker tape should incorporate a trace wire which is linked to the marker posts and terminating at the Wastewater pumping station and the discharge Manhole. The trace wire shall be tested to ensure that it is continuous and capable of transmitting locating signals.</p>	Y
4.2	The most appropriate Access Chamber types have been shown where required.	Y
4.3	All properties served have drain junctions at a location and depth suitable to correctly serve the development and inspection chambers where required.	Y
4.4	All fill requirements are denoted (i.e. if design based on contours appropriate tolerances have been applied)	
4.5	All sewer grades are within acceptable tolerances.	Y
4.6	Connections to existing works have been appropriately designed (i.e. flow to flow where called for) and isolation from live works requirements have been considered and designed appropriately.	Y
4.7	The design considers the proposed construction technique and/or constraints.	Y
4.8	Irish Water approval has been sought for any design standard variations.	Y

5	Influencing Factors	Y/N
5.1	The design makes appropriate allowance for existing or proposed physical features of influence i.e. retaining walls, trees, other services, buildings etc.	Y
5.2	In the case of designs in existing established areas the route has been "walked".	Y
5.3	Where the design requires the approval of other parties (i.e.; affected landowners, other service providers) a strategy to obtain these approvals has been developed.	N/A
5.4	<p>A report is included for projects that relocate/divert assets and includes:</p> <ul style="list-style-type: none"> • Details of the proponent and justification for of the works (including alternative options) • Plan for the abandoned main • Plan for managing shutdowns for piece-ups 	N/A

I certify that this design has been reviewed and complies with Water Irish's Code of Practice for Wastewater Infrastructure requirements.

Signature



Date 14 April 2022

Print Name and Firm Andrew Fitzsimons Fitzsimons Doyle And Associates

250 Harold'sCross Road Dublin 6W, Tel 01 4966011 e mail afitzsimons@fdaconsulting.ie

Complete this form and send to: newconnections@water.ie

List of Attachments

Ref	Description	Comment
1	Water and Drainage Technical Compliance Report Incl. Flood Risk Assessment	water and drainage calculations
2	20-4993 FDA- 601 Foul Drainage layout	
3	20-4993 FDA- 607 Car Park drainage	
4	20-4993 FDA-605 Balancing Tank detail	
5	20-4993 FDA-1001 Longitudinal Sections	