TEMPLEMONT DEVELOPMENTS LTD

ENGINEERING SERVICES REPORT

INFILL RESIDENTIAL DEVELOPMENT
AT COLBERTS FORT
TALLAGHT
DUBLIN 24

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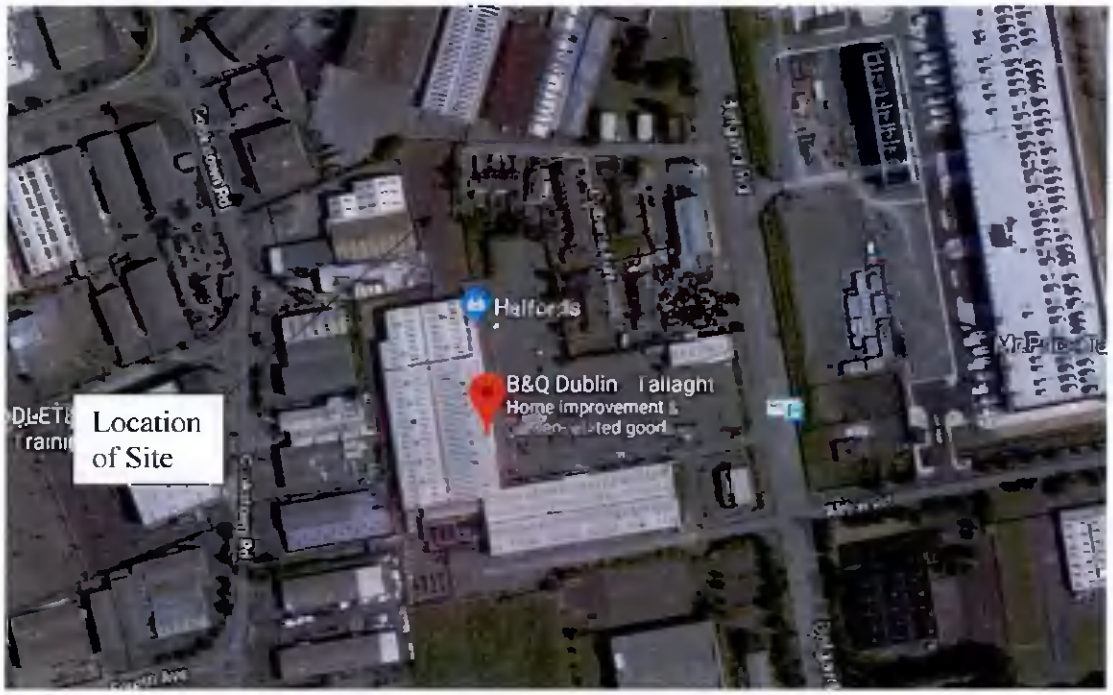
CONTENTS

1.0 INTRODUCTION

1.1. Site Location

The proposed new residential development of 9 No. residential properties is located to the north of B&Q at Colberts Fort, Tallaght, Dublin 24. An aerial photograph of the site is shown below.



1.2. Proposed Development

The proposed development is for the construction of 9 No. residential properties in a terrace block consisting of 4 No. 2-bedroom ground floor apartments, 1 No. 2-bedroom duplex apartment and 4 No. 3-bedroom duplex apartments at Colberts Fort, Tallaght, Dublin 24. There will be communal parking to the front of the development. All of the units will have dedicated parking spaces assigned to them.

1.3. Site Description

The site is an existing brownfield site located to the north of B&Q currently vacant and finished in asphalt. The site is relatively flat with a slight gradient of circa 1 in 200 from south to north. The total area of this site is circa 0.1493 hectares. The site will be accessed from Colberts Fort.

2.0 SURFACE WATER DRAINAGE - GENERAL

2.1 Existing Services

There is an existing 900mm concrete surface water sewer located close to the northern boundary of the site. It is proposed to discharge surface water run-off from the development into this surface water sewer. The area of the site is circa 1,493m^2.

2.2 Surface Water Drainage System

It is proposed to discharge surface water from the development to the existing 900mm concrete surface water sewer running through the site close to the northern boundary.

All surface water discharging from the site will be attenuated and pass through an orifice flow control device. The flow from this development will be limited to 0.31 litres per second. There will be a Class 1 by-pass separator located after the orifice flow control device and prior to final discharge into the existing surface water sewer.

2.3 Surface Water – General

Strict separation of surface water and wastewater will be imposed on the development. Drains will be laid out to minimise the risk of inadvertent connection of sinks, etc. to the surface water system.

Surface water discharge from the public roads and footpaths will be discharged to gully traps and permeable paving in the parking areas which will then connect into the new drainage network. In order to minimise the risk of floating contamination to the surface water system, a Class 1 by-pass separator (Kingspan Klargester NSBP003) will be installed along the surface water system.

Surface water local drains will generally be 150mm diameter and generally will consist of uPVC (to IS123) with concrete surround or concrete socket and spigot pipes (to IS 6). These drains will be laid to comply with "Recommendations for Site Development Works for Housing Areas" by the Department of the Environment and Local Government, Technical Guidance Document, Section H and B.S. 8301: Building Drainage.

Surface water sewers will consist of uPVC (to IS 123) and laid strictly in accordance with South Dublin County Council requirements for taking in charge.

2.2 Surface Water – Calculations

Calculations for pipe sizes and gradients are based on storm water runoff from the roofs and surfaced areas using the Modified Rational Method for surface water design 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 0.6mm.

The maximum discharge into the drain / watercourse will be limited to 0.31 litres per second for the site.

3 SURFACE WATER ATTENUATION

3.1 Design Storm and Allowable Runoff

The critical duration design storm has been determined using Excel software for the 100 year design storms with 20% allowed for climate change.

The discharge rate of surface water from the development to the surface water sewer located at the northern end of the site will be limited to 0.31 l/s. Long term storage will be provided in the form of 2 No. underground concrete storage tanks (54 cubic metres of storage), tanked permeable paving to the private parking bays which will provide capacity for 18 cubic metres of storage, a 600x600 filter drain to the rear of the block providing 2 cubic metres of storage and the pipe and manhole network itself which will provide 5 cubic metres of storage. Long term storage calculations are included in Appendix A of this report for the 100 year storm event with a 20% climate change factor. The total storage provided on-site will 79 cubic metres which is the minimum required for the 1 in 100 year return period plus 20% climate change factor added.

Surface water discharges in excess of the above allowable flow rate will be required to be stored on site for the duration of the storm.

It is proposed to use a sustainable urban drainage system (SuDS) approach to stormwater management throughout the site, the overall strategy aims to provide an effective system to mitigate the adverse effects of urban stormwater runoff on the environment by reducing runoff rates, volumes and frequency, reducing pollutant concentrations in stormwater, contributing to amenity, aesthetics and biodiversity enhancement and allow for the maximum collection of rainwater for re-use where possible. In addition SuDS features should aim to replicate the natural characteristics of rainfall runoff for any site by providing control of runoff at source.

There are a number of SuDS features proposed which have been designed in accordance with CIRIA documents C753 and C609 as follows:

Filter Drains:
Trenches filled with permeable material and a perforated collection pipe at the invert with an optional permeable sandy topsoil at surface. These can treat, convey and attenuate runoff, at source and can infiltrate to the ground where the subgrade is suitable. These systems will allow some form of storage for small rainfall events and can result in water evaporation and adsorption in small quantities, therefore there will be less run off from these areas in small rainfall events thus mimicking the natural response for this catchment. These will be located in the back gardens of dwelling houses and will result in improved quality of surface water draining from the roofs of houses and paved areas in rear gardens and will also allow groundwater to recharge to its natural state.

Permeable Pavement (tanked system):
Porous paving block surfacing which can treat rainwater, at source, and allow infiltration through to an underlying porous sub-base. Water is stored within the voids of the sub-base before being slowly released through natural flow via the porous medium. A tanked permeable paving system includes an impermeable geotextile at its base; these systems will allow some form of storage for small

rainfall events and can result in water evaporation and absorption in small quantities, therefore there will be less run-off from these areas in small rainfall events thus mimicking the natural response of the catchment. As well as reducing the amount of run-off from the surface, permeable paving will slow down the rate of run-off from the pavement in extreme rainfall events contributing to attenuation of flows. In addition permeable paving will increase the quality of water which is intercepted by the system through filtration, biodegradation, pollutant absorption and settlement and retention of solids, also the peak flows to the outfall will enhance settlement and biodegradation of pollutants. It is proposed to use these tanked systems on all the car-parking areas as shown on the enclosed drawings.

3.1.1 Interception Volume

The GDSDS requires that no run-off should directly pass to the receiving watercourse for rainfall depths of 5mm, therefore interception should be provided at source where practicable. The interception volume was calculated as 14m^3 and is based on treatment 5mm of rainfall depth from 80% of the runoff from impermeable areas.

Each of the SuDS features provided will allow a volume of storage below the invert of the outgoing pipe or control within the feature. The storage will be additional to the attenuation storage required and will allow long term infiltration of run-off corresponding to the 5mm rainfall depth mentioned above.

Impermeable Area:	1020 sqm
Rainfall Depth:	5mm
Interception Volume:	4.08 m^3

Treatment Volume

The GDSDS requires that a treatment volume (Vt) be provided in order to prevent any pollutants discharging into river systems.
The treatment volume was calculated as 12.2m^3 and is based on treatment of 15mm of rainfall depth from 80% of the run off from impermeable areas.

All runoff areas will pass through the required number of treatment stages prior to discharging to the downstream outfall. Treatment methods include filter drains, permeable paving, and silt trap chambers.

Impermeable Area:	1020 sqm
Rainfall Depth:	15mm
Treatment Volume:	12.2m^3

3.2 Storage Requirements

The total quantity of surface water discharged at the outfalls from the development site has been calculated for the impermeable area.

The storage calculations have been prepared using Excel Software and are included in Appendix A.

The required storage will be provided as discussed above. The total storage volume required for the site is 79 cubic metres.

4 FOUL WATER DRAINAGE

4.1. Receiving Environment

It is proposed to connect the development to the existing 150mm foul sewer located on Colberts Fort to the east of the site. The new extended sewer will consist of a 150mm uPVC pipe and will connect to the existing sewer as shown on the enclosed drawings. All new sewers and drains will be laid in accordance with Irish Water standards.

4.2 Foul Water – General

Drains generally will consist of uPVC (to IS123) or concrete socket and spigot pipes (to IS 6).

Drains will be laid to comply with "Recommendations for Site Development Works for Housing Areas" by the Department of the Environment and Local Government, Technical Guidance Document, Section H and B.S. 8005: Sewerage.

Foul water sewers will consist of uPVC (to IS 123) and laid strictly in accordance with Irish Water Standards.

4.3. Foul Water Calculations

Pipe capacities and velocities have been calculated using the Colebrook-White equation with a roughness coefficient of 0.6mm. Calculations for the foul sewer network for the development were carried out using Pipeflow software at 6 times dry weather flow and the results are included in the table below.

The design of the foul water drainage has been based on the "Code of Practice for Waste Supply" by Irish Water.

Table 4.1 Estimated Foul Flows

Description	Area / No. of Units	P.E.	Per Capita Flow (l/h/d)	Total Daily Flow (l/d)
Site	9	27	180	4,860
Total				4,860

The total daily flow from the site is estimated as 4,860 l/d

Dry Weather Flow = 0.056 l/s

Peak Foul Flow = 0.3375 l/s

4.4. Outfall Capacity

The estimated peak flow from the development is 0.3375 l/s. The new 150mm diameter uPVC sewer to be installed within the curtilage of the site will be from the extended 150mm sewer located on Colberts Fort.

It is considered that this development provides minimal additional loading to the existing foul water system.

5 WATER SUPPLY

5.1. Water Supply – General

There is a 100mm MDPE public water main located on Colberts Fort to the east of the site entrance.

In order to facilitate the development it is proposed to extend the existing 100mm watermain from this existing public main to service the development. The water supply to each dwelling will be provided with a 25mm supply pipe to Irish Water standards. Each dwelling will be fitted with a water meter and boundary box; Talbot matrix type.

The supply arrangements will be carried out to the requirements of and under the directions of Irish Water and their agents.

5.2. Water Demand Calculation

The estimated water usage for the development is calculated as follows:

Table 5.1 Water Demand Calculation

Description	Area / No. of Units	P.E.	Per Capita Flow (l/h/d)	Total Daily Flow (l/d)
Site	9	27	180	4,860
Total				4,860

The estimated water demand is therefore 4.86m^3/d.

6 TRANSPORT AND ROADS ACCESS

6.1. Introduction

Each unit will be provided with off-street parking places within the development.

6.2. Roads & Footpaths

Internal roads within the development will generally be 6.0m wide.

6.3. Parking

Off Street parking has been provided to each dwelling. A total of 11 off street parking spaces have been provided within the overall development.

7 FLOOD RISK ASSESSMENT

7.1 Background

This flood risk assessment has been compiled based on information received from the following sources:

- South Dublin County Council Drainage Department
- Available Drainage Record Drawings
- Available OPW Flood Maps and Reports (www.floodmaps.ie)
- Available CFRAMS Pluvial Maps
- Site Visit

This report is compiled from the information gathered from the above and is prepared for the purposes of a planning application.

The risks categorised above are based on the judgement and experience of the Engineer carrying out the assessment and based on documentation sourced from the above location.

The sources of potential risk of flooding include coastal, fluvial, pluvial, public sewers and groundwater. This document will identify these potential sources and categorise the risk as either very low, low, medium, high or very high.

7.2 Flooding History

From our enquiries made to the OPW (www.floodmaps.ie) we determined that there are no recorded flood events in the vicinity of the site. A copy of the flood map from the area is included in Appendix B of this report.

7.3 Coastal

Coastal flooding is caused by higher sea levels than normal, largely as a result of storm surges resulting in sea overflowing onto the land. Coastal flooding is influenced by the following factors which can work in tandem:

- High tide level
- Low barometer pressure made worse by high winds
- Wave action dependent on wind speeds and direction, local topography and exposure.

The primary historical coastal flood event in Dublin City occurred on the 1st of February 2002, which was recorded as 5.46m Lowest Astronomical Tide (LAT) at Dublin Port and exceeded the previously recorded 1924 flood event levels (5.1m). The LAT is the metric Admiralty Charts of Dublin and is converted to Malin Head datum by the subtraction of 2.51m. That is the 5.46m LAT equated to 2.95m Malin Head.

The subject site floor levels are greater than 95m over Malin Head datum, which is greater than 98m higher than the exceptionally high event of 2002.The subject

site is located some 11km from the nearest coastline and is deemed sufficiently distant to be not effected by coastal flooding.

The 2002 event caused extensive flooding in parts of Dublin City and the coastal region, but there is no recorded flooding having occurred at this development site or its immediate environs.

In our opinion the risk of coastal flooding on this site is very low.

7.4 Fluvial

River flooding occurs when the capacity of a watercourse is exceeded or the channel is blocked or restricted, and excess water spills out from the channel onto adjacent low lying areas.

There are no known fluvial watercourses in the general area of the site. There are no records of the subject site flooding following inspection of OPW flood maps.

In our opinion the risk of fluvial flooding is low.

7.5 Pluvial

Overland flow occurs when the amount of rainfall exceeds the infiltration capacity of the ground to absorb it. This excess water flows overland ponding in natural hollows.

In the Dublin City area there were two recorded significant events during August and October 2004 and again in October 2011.

An inspection of the OPW flood mapping shows no risk of pluvial flooding to the site.

In our opinion the risk of pluvial flooding on this site is low.

7.6 Flooding from Sewers

Flooding resulting when flow entering a drainage system exceeds its capacity and the system becomes blocked and / or cannot discharge due to a high water level in the receiving watercourse or outfall.

Irish Water have provided the drainage pipeline map surrounding the development and these maps show the existing piped foul network and surface water network. The 900mm surface water pipe passing through the northern end of the site is circa 2-3m below ground level. The stormwater discharge from the site to the public storm sewer will be restricted to 0.31 litres per second.

In our opinion the risk of flooding from sewers on this site is low.

7.7 Groundwater

Groundwater flooding occurs when the level of water stored in the ground rises as a result of prolonged rainfall to meet the ground surface and flows out over it. Groundwater flooding tends to be very local and results from interactions of site specific factors such as tidal variations. This site has no recorded history of groundwater flooding.

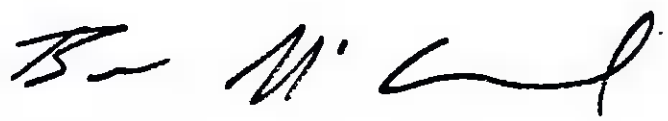
There is no visible evidence to suggest groundwater flooding would be an issue.

In our opinion the risk of flooding from groundwater on this site is low

7.8 Conclusion

Based on the information available it is our opinion that this site is suitable for development and we would consider the site has an overall low risk of been affected by flooding.

Signed:



Brian McCormack BE, CEng, P.Grad.Dip., MIEI
AKM Consultants

APPENDIX A

Residential Development at Colberts Fort, Tallaght, Dublin 24

A. Site Area and Permeability

Sub-catchment	Units	1	2	3	4	Total
Description		*Roofs*	*Paving*	*Roads*	*Grass*	
Discharge Outlet point from site						
Plan Area	m^2	476	256	424	337	1,493
Impermeability Factor	unit	1.00	0.80	0.80	0.00	
Equivalent Impermeable Area	m^2	476	205	339	-	**1,020**

Summary :

Total Site Area : **0.1493** hA

Equivalent Impermeable Site Area : **1,020** m2

B. Permissible Site Run-off

Q Bar = $0.00108 \times (AREA)^{0.89} \times (SAAR)^{1.17} \times (SOIL)^{2.17}$

Area land	1,493	0.00	km2	Area km2	0.15
SAAR	790.00	790.00	SAAR	rainfall mm	
SOIL	S2 * 100%	0.30		soil index	
Q Bar	0.000313	m3/sec	Q Bar	mean pa	
	0.31	**l/sec**	0.02	m3/min	
	2.10	**l/sec/hA**			

Storm Drainage Table 1. Calculation of site runoff characteristics

Soil Class	1	2	3	4	5
Soil Index	0.15	0.3	0.4	0.45	0.5

Residential Development at Colberts Fort, Tallaght, Dublin 24

Total Site Area : **0.1493** hA
Equivalent Impermeable Site Area : **1020** m3
Allowable Site Runoff : **0.31** l/s

Return Period : **100 years** plus 20% Climate Change

Extreme Rainfall Event				Runoff		Attenuation
Duration	Duration	depth	rate	Total	Excess	Volume
minutes	hrs	mm	mm/hr	l/s	l/s	m3
2	0.03	7.00	210.00	59.50	59.19	7.10
5	0.08	14.00	168.00	47.60	47.29	14.19
10	0.17	20.00	120.00	34.00	33.69	20.21
15	0.25	26.00	104.00	29.47	29.15	26.24
30	0.50	34.00	68.00	19.27	18.95	34.12
60	1.00	42.00	42.00	11.90	11.59	41.71
	2	52.00	26.00	7.37	7.05	50.79
	4	61.00	15.25	4.32	4.01	57.71
	6	72.00	12.00	3.40	3.09	66.68
	12	88.00	7.33	2.08	1.76	76.24
	24	104.00	4.33	1.23	0.91	79.04
	48	122.00	2.54	0.72	0.41	70.35

Required Attenuation Volume for extreme 100 year Storm Event : **79 m3**

Proposed Storage
Tanked Permeable Paving Area based on 400mm of 63/20 stone with 30% voids rations provides **18m3** of storage
Underground concrete tank provides **54m3** of storage (27m3 per tank)
Pipe & Manhole Network provides **5m3** of storage
600x600 Filter Drain provides **2m3** of storage

APPENDIX B

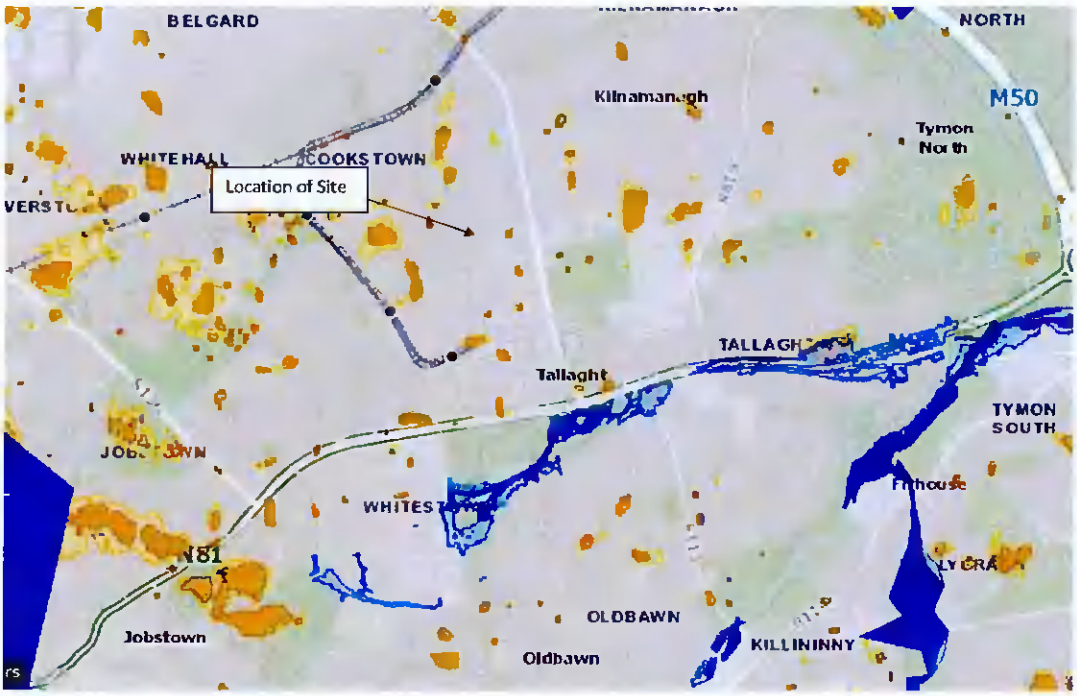
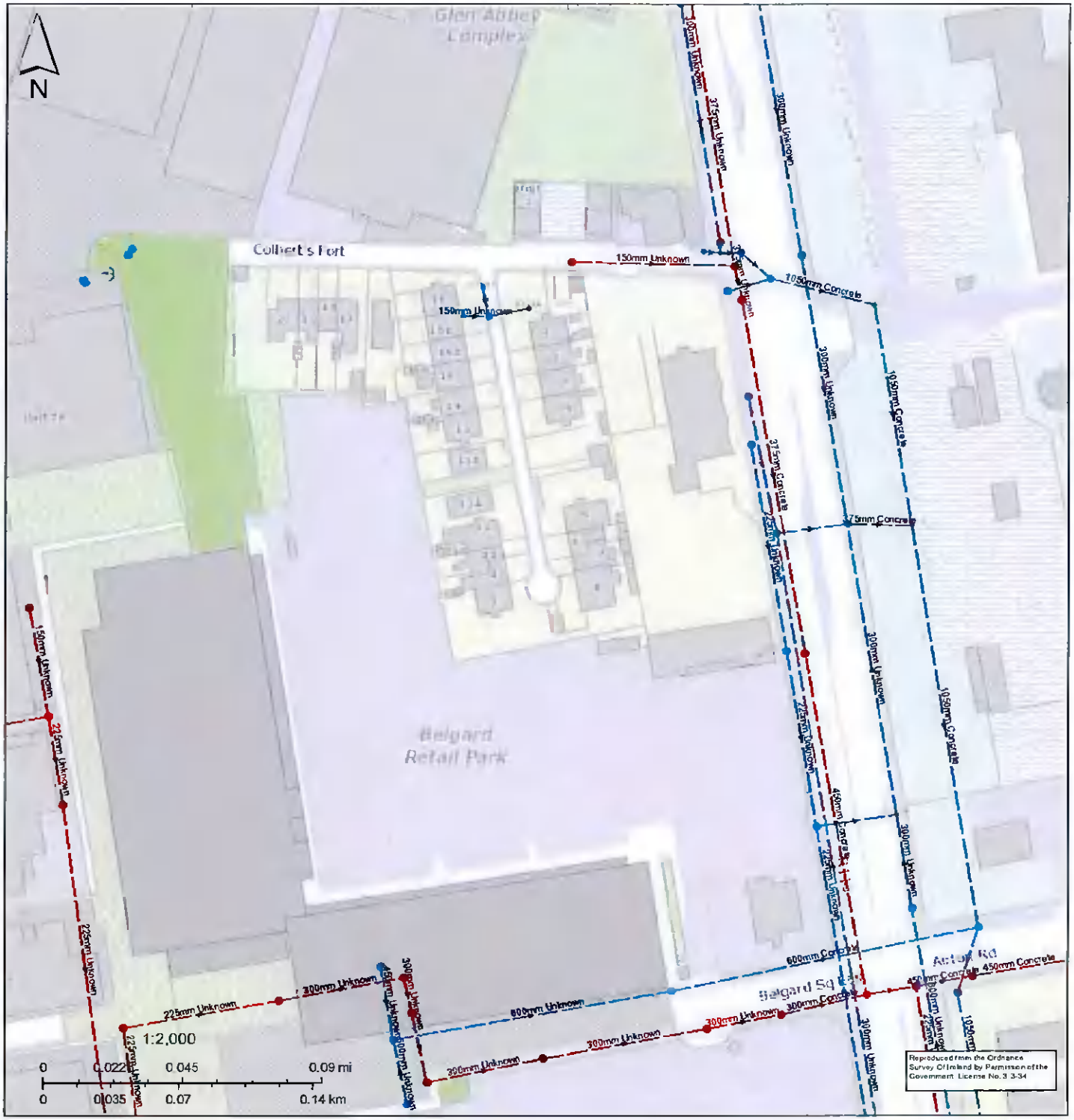


Fig 1: Predicted Fluvial & Pluvial Flooding (1% Event)

APPENDIX C

Irish Water Webmap



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Legend

Stormwater Gravity Mains (Irish Water Owned)
- Surface

Stormwater Gravity Mains (Non-Irish Water Owned)
- Surface

Storm Manholes
- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other, Unknown

Storm Inlets
- Gully
- Standard
- Other, Unknown

Storm Fittings
- Vent/Col
- Other, Unknown

Storm Discharge Points
- Outfall
- Overflow
- Soakaway
- Other, Unknown
- Storm Culverts
- Storm Clean Outs

Sewer Gravity Mains (Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Sewer Pressurized Mains (Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Sewer Gravity Mains (Non-Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Sewer Pressurized Mains (Non-Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

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. It should not be relied upon in the event of excavations or other works being carried out in the vicinity of the network. The onus is on the parties carrying out the works to ensure the exact location of the network is identified prior to mechanical works being carried out. Service pipes are not generally shown but their presence should be anticipated.


Cookstown
Industrial
Estate
Glen Abbey
Complex
Unit
Carpet's Fort
UISCE
ÉIREANN : IRISH
WATER
Legend