Proposed New Development at Garristown, Co. Dublin.

Engineering Report

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1 Introduction

This report has been prepared for Desiun Design Architecture to address the foul & surface water drainage and flood risk assessment for the proposed development works at Garristown, Fingal, Co. Dublin.

1.1 Desk Study/Site Characteristics

The proposed site is located to the east Garristown, Fingal, Co. Dublin, as shown in figure 1 below.

Figure 1 – Site Location taken from Google Maps

There is a public sewer located along the road way to the north of the site. The location of the proposed new connection to the public sewer is indicated on CORA drawing 2019 – CORA - C.001 with the existing drainage records included in Appendix A – Existing Drainage Records.

It is proposed to construct six single storey residential houses on the site.

A review of the Office of Public Works records in relation to flooding reveals that there is no history of flooding on the site. A flood risk assessment has been carried out and details are contained in Section 4.

2 Proposed Works

It is proposed to construct six single storey residential houses, comprising of two detached houses and four semi-detached houses on the site. There will be a communal parking area and green area to the front of the houses

3 Proposed Drainage Scheme

3.1 Existing Drainage

The proposed site is located between two residential properties on an undeveloped piece of land. As the site is undeveloped it is assumed that there is no drainage to the site. A survey shall be completed prior to construction to establish if there are any services crossing the site. The existing drainage records from Irish Water show a 225mm diameter sewer and a 180mm diameter HDPE water mains on the road to the north of the site. From a walk of the site there are a number for road gullies along the road to the North of the site for surface water. Refer to Appendix A for existing drainage records from Irish Water.

3.2 Proposed Scheme

In order to comply with modern drainage standards, it is proposed to drain the foul and surface water generated from the proposed dwelling using a separate system for each. It is proposed to provide new pipework to serve the newly constructed properties which shall then discharge to a new connection to the public sewer system.

The rainwater falling on the roof areas of the new properties shall flow by gravity through an entirely separate network to soakaways located under the parking and green areas to the north of the site.

3.3 Reference Publications used

Code of Practice – Wastewater Treatment and Disposal Systems Serving Single Houses (p.e. ≤ 10)
Greater Dublin Strategic Drainage Study – Volumes 1 to 6
Greater Dublin Regional Code of Practice for Drainage Works – Version 6.0
Technical Guidance Documents – Part H
Recommendations for Site Development Works for Housing Areas

3.4 Foul Waste Discharge

The foul sewage generated from the property is to fall by gravity via new foul pipework to connect to the public foul sewer running along the road to the north of the site. It is proposed to install a new network of 150mm diameter pipes to serve the proposed house.

In order to calculate the volume of foul sewage generated on site, the following calculations have been adopted:

Number of houses	6
Total number of bed spaces:	9
Population Equivalent:	18PE
Wastewater Loading:	225Litres/person/day
Flow Rate:	**4050Litres/day**

The previous discharge volume represents a discharge flow (1 DWF) of approximately 0.0469Litres/second and a design flow (6 DWF) of 0.29 litres/second which is within the capacity of the proposed 150mm diameter connection which installed at a minimum fall of approximately 1:60 which would have an approximate capacity of 7.2Litres/second.

Details of the proposed network are shown on drawing number 2019-CORA-C001.

3.5 Surface Water Discharge

The proposed surface water drainage schemes have been designed in accordance with Greater Dublin Strategic Drainage Study using sustainable drainage systems (SuDS).

It is proposed that the surface water generated on the roofs will drain by gravity to new surface water soakaways located in to the north of the site under the parking and green areas. There is sufficient space in this location to comply with the recommended separation distance. The new rainwater pipes shall be installed to the properties with 150mm diameter surface water pipes forming a network where necessary which will feed the surface water soak-aways. The proposed soak-away shall be constructed with 20-40mm crushed stone with no fines wrapped in a geotextile membrane.

The soak-away has been sized based on rainfall data for the specific site location and in accordance with BRE Digest 365. An on-site soakaway test was carried out to determine the soil infiltration rate.

Details of the proposed network are shown on drawing number 2019-CORA-C001.

3.6 Sustainable Urban Drainage (SuDS)

The proposed surface water drainage scheme has been designed in accordance with Greater Dublin Strategic Drainage Study using sustainable drainage systems (SuDS).

The measures to be implemented on site are surface water soakaway and permeable paving. The surface water soakaway allows water generated from the roof areas to infiltrate to the ground within the site boundaries.

The soakaway will facilitate the dispersal of water from the various roof areas while the permeable paving shall provide a sustainable solution to the new paved areas.

The soakaway is designed to receive water from a roof area of 450m^2. All design is in accordance with the BRE Digest 365 – Design of soakaways (2016). A site specific test have been

undertaken to determine the actual permeability value for the ground. Refer to appendix E for the calculation for the size of the soak-away.

4 Flood Risk Assessment

The purpose of the flood risk assessment is to both identify and quantify the potential of flooding of the property from all potential flood risks and/or the effect of the increased flood risk to neighbouring properties. The risk will be quantified on a numerical scale from 1 (Very Low) to 5 (Very High).

The compilation of the following flood risk assessment is based on a desk study compiling information obtained from the Local Authority along with the Office of Public Works (OPW) flood maps and reports.

4.1 Reference Publications used

OPW Flood Records – www.floodmaps.ie
OPW Flood Records – www.myplan.ie
OPW Flood Studies update web portal – www.CFRAM.ie
Historic O.S. Maps
Fingal County Council Reports
Fingal County Council Drainage Records
The Planning system and Flood Risk Management – Guidelines for Planning Authorities November 2009
The Planning system and Flood Risk Management – Technical Appendices November 2009

4.2 Sources of Potential Flooding

The following potential sources of flooding have been reviewed and evaluated for this particular site:

4.2.1 Coastal

Reviewing the records of the OPW's floodmaps.ie website, there are no records of coastal flooding at the site location. The flood predication maps available from the OPW on Floodmaps.ie indicate that there are no predicted risks from coastal flooding sources (all events) for present day assessment.

Figure 2 –Coastal flooding taken from Floodmaps.ie (All flood events)

Figure 3 –Coastal flooding including Climate Change taken from Floodmaps.ie

As shown in figure 3 above, the available flood maps show the site is not within the areas at risk when considering an annual exceedance of 0.1%, 0.5% & 10% when accounting for future climate change also.

Based on this information we believe that the risk of coastal flooding to the site can be rated as 1 (Very Low).

4.2.2 Fluvial

Fluvial or river flooding occurs where the capacity of the conveying watercourse (river or stream) is exceeded as a result of heavy rainfall or blockage and water overspills the banks of the water course. Additional maps have been included in Appendix B of this report which also indicate that the site is outside the present day fluvial flooding zone.

Figure 4 –Fluvial Flooding taken from Floodinfo.ie (All events – Present Day)

Figure 5 – Fluvial Flooding taken from Floodinfo.ie (All events – Mid range future)

As shown on the previous figures, the site is not at risk from fluvial flooding for any event occurrence in relation to present day and predicted future sea levels. Therefore the risk posed from fluvial sources can be classed as 1 (Very Low).

4.2.3 Pluvial

Pluvial or over ground flooding occurs as a result of water flowing over the surface of the ground which can occur where the infiltration of the receiving ground is exceeded. There are no historic recorded instances of flooding to the site.

Figure 6 – Pluvial flooding taken from Floodinfo.ie

The map from Floodinfo.ie in Figure 6 above indicates that the area surrounding the subject site has no risk of pluvial flooding. With this information the risk of pluvial flooding can be classed as 1(Very Low).

4.2.4 Flooding from Public Sewers

The dwellings along the road to the north of the site are served by a 225mm sewer. It is proposed to discharge the foul water to the public network with a new connection to the public main pipe. There are no past recorded instances of flooding from public sewers in the OPW records. According to record drawings received from Irish Water the public sewer's invert level are greater than 1500mm below road level and the finished floor level in the houses will be approximately 1500mm above the road level. Given the above, the risk of flooding from the public sewer can be classed as 1 (Very Low).

4.2.5 Flooding from Ground Water Sources

There are no recorded instances of flooding from ground water sources in the OPW records. Future flood predictions show no ground water level rising to cause flooding. Given the above, the risk of flooding from ground water sources can be classed as 1 (Very Low).

4.3 Justification Test

A review of the Strategic Flood Risk Assessment (SFRA) for the Fingal County Council Development Plan 2017 to 2023 has produced a map for the Garristown area. Map 3 of 24 indicates that the site area at Garristown is not located within Flood Zones A or B. While the proposed residential property would be considered as a highly vulnerable development, Table 3.2 of the SFRA indicates that such a development would be appropriate in Flood Zone C without the need for a Justification Test.

However to complete this report, it is prudent to follow the Justification Test Tables which are provided within Appendix A of SFRA for such a development type. As a Justification Test is not necessary for a development with a Flood Zone C area, the criteria within the Justification Test are detailed in relation to Flood Zones A&B only. Within the Fingal County Council Development Plan 2017 to 2023, the site is located within an area designated as objective RES which is an area to protect and/or improve residential amenity. An extract from the table has been included on the following pages which highlights that the following criteria should be met for development:

Justification Test for zoning objectives RES areas in the County that are already developed and include existing vulnerable uses in Zone A and /or B

Criteria		Response
1.	The urban settlement is targeted for growth under the National Spatial Strategy, regional planning guidelines, statutory plans or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.	The National Spatial Strategy 2002-2022 is a twenty year plan for the Country and consolidating the Greater Dublin Area, a Gateway, is a primary policy of this Strategy. The Consolidation Area within the Gateway of Dublin is identified within the top tier of the settlement hierarchy in accordance with the Regional Planning Guidelines in order to promote the consolidation and sustainable intensification of the existing urban/built form to the east of the M50 thereby maximising efficiencies from establishing physical and social infrastructure. Lucan, Tallaght and Clondalkin are designated Metropolitan Consolidation Towns in the Regional Planning Guidelines for the Greater Dublin Area 2010 – 2022. (see Core Strategy Map- page 10 of Draft Plan)
2.	The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement and, in particular:	
2(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement:	All of these areas are developed areas that include suburban housing and are essential in order to support the continued viability of the urban centres in the County.
2(ii)	Comprises significant previously developed and/or under-utilised lands:	The subject lands accommodate existing development and are therefore previously developed lands.
2(iii)	Is within or adjoining the core of an established or designated urban settlement:	The subject developed lands are within the Metropolitan Area of the Greater Dublin Area.
2(iv)	Will be essential in achieving compact and sustainable urban growth; and,	The subject lands accommodate existing development and are therefore previously developed lands. These lands are already essential in achieving and maintaining compact and sustainable urban growth.
2(v)	There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement.	The subject lands accommodate existing development and are therefore previously developed lands. This criterion is set aside in accordance with the Circular PL 2/2014.
3.	A flood risk assessment to an appropriate level of detail has been carried out as part of the Strategic Environmental Assessment as part of the development plan preparation process, which demonstrates that flood risk to the development can be adequately managed and the use or development of the	

	lands will not cause unacceptable adverse impacts elsewhere. N.B. The acceptability or otherwise of levels of any residual risk should be made with consideration for the proposed development and the local context and should be described in the relevant flood risk assessment.
	A SFRA has been carried out as part of the Strategic Environmental Assessment as part of the development plan preparation process. The SFRA outlines how development can be adequately managed. The main points include: ▪ Existing open spaces and water compatible uses in Flood Zones A and B should be retained to maintain flood storage areas. ▪ New highly vulnerable development should be avoided in Flood Zones A and B. ▪ Development adjacent to the Whitechurch Stream at St. Enda's and Tara Hill should not be permitted until the completion of the Flood Alleviation Works as part of the Dodder CFRAM. ▪ Development adjacent to the Poddle Stream at Whitehall Road should not be permitted until the completion of the planned Flood Alleviation Works ▪ Development adjacent to the Ballycullen Stream at should not be permitted until the completion of the planned Flood Alleviation Works ▪ FRAs for developments should demonstrate that finished floor levels are designed for the 1% AEP (1 in 100 year) flood level plus an allowance for climate change and a minimum freeboard of 300mm. FRAs should also examine residual risk associated with culvert blockages, defence failure and climate change to set finished flood levels where appropriate. The FRAs should ensure development does not block flow paths, does increase flood risk elsewhere, is designed to appropriate standard of flood resilient construction and demonstrates emergency evacuation procedures during flood events. ▪ FRAs should also address surface water management for development, demonstrating consideration of GDSDS policies and incorporation of SuDS e.g. Green Roofs, Rainwater Harvesting and Permeable Surfacing. ▪ Additional development such as extensions or changes of use can generally be considered appropriate but an appropriately detailed flood risk assessment will be required in support of any planning application. The level of detail will vary depending on the risks identified and the proposed land use. The FRA should be aimed at setting finished floor levels and demonstrating no increase in flood risk elsewhere. ▪ The Development Plan shall incorporate the requirement to consider such measures outlined in the SFRA and provide an objective to support and facilitate the delivery of flood alleviation schemes.

The proposed development satisfies Criteria 1 as a new dwellings shall be constructed within an urban settlement which is targeted for growth.

Criteria 2 could be considered satisfied due to the proposed in-fill property providing an expansion of the centre of the urban settlement. The new dwelling would make use of previously under-utilised lands and would be considered within the core of an established urban settlement. This development would achieve compact and sustainable urban growth which would be provided in an area considered as a very low risk of flooding.

Criteria 3 highlights that any flood risks can be adequately managed and that the use of the development would not cause unacceptable adverse impacts elsewhere. As stated previously, the proposed development is located in an area outside of those deemed Flood Zones A&B and there is a very low risk of flooding to the site or the surrounding area. The finished floor level of the proposed development shall be 106.0mAOD. It is proposed to provide a soakaway and permeable paving as sustainable measures to deal with surface water discharge from the site. The soakaway will be located at the lower end of the site, approximately 0.5m below the finished

floor level in the houses. Therefore if there was any surcharge from the soakaway it wouldn't flood the houses.

4.4 Conclusion

We are of the opinion that the proposed construction on the site to the east of Garristown shall have no adverse flood risk impacts. This is based on the assessment within this report of the volume of foul water discharging to the public network. The surface water from the roof areas shall discharge to the on-site soakaway and permeable paving shall be constructed for all hardstanding areas to ensure that the surface water is dealt with on site.

The property is not susceptible to any flood events which is also confirmed upon review of the Stategic Flood Risk Assessment from Fingal County Council Development Plan 2017 to 2023. Following a review of previous known flooding events within the local area and accounting for local knowledge there have been no previous instances of flooding for the site location. With this information and the extent of the proposed development there should be no change in flood risk for the subject site.

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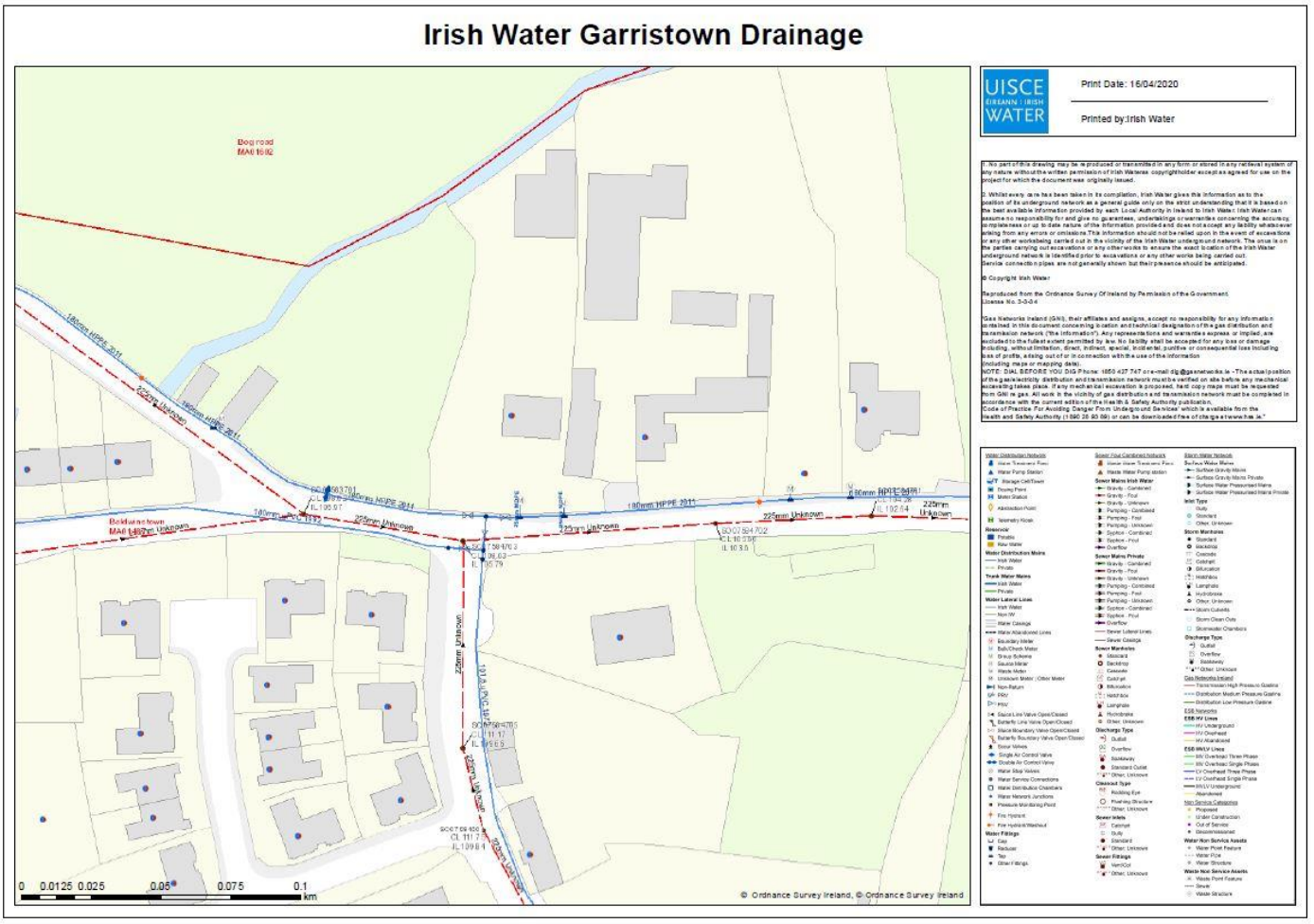
5 Appendix A

Existing Drainage Records



6 Appendix B

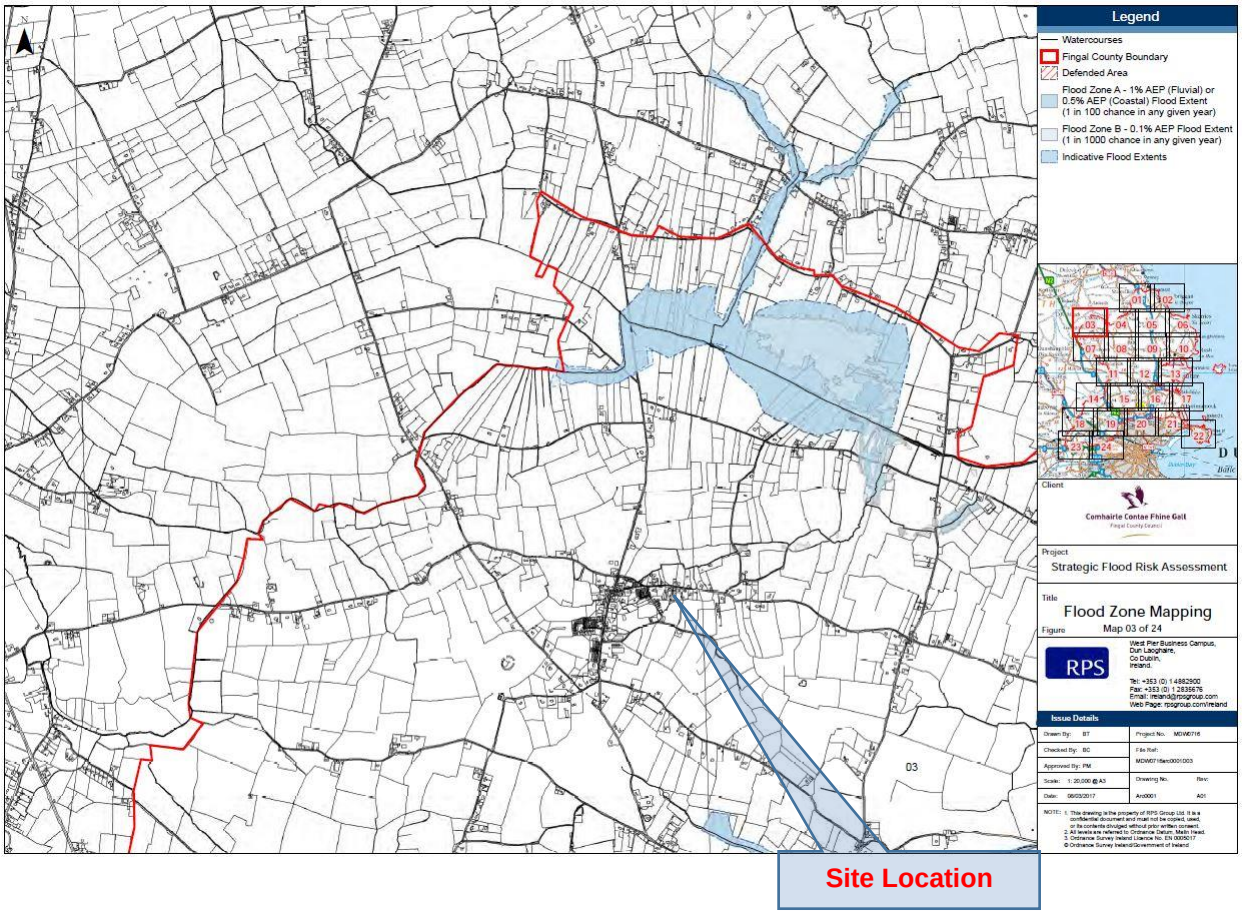
Flooding – Local Area Report

The flood incidents reported in the surrounding area have not occurred in the area of the subject site and should not be applicable to the subject site. All recorded instances of flooding were detailed at a distance of greater than one kilometre away from the site except for one event, a flood event that occurred at Garristown steam in 1986 which is approximately three hundred metres downhill from the site.

7 Appendix C

Flooding – CFRAMs

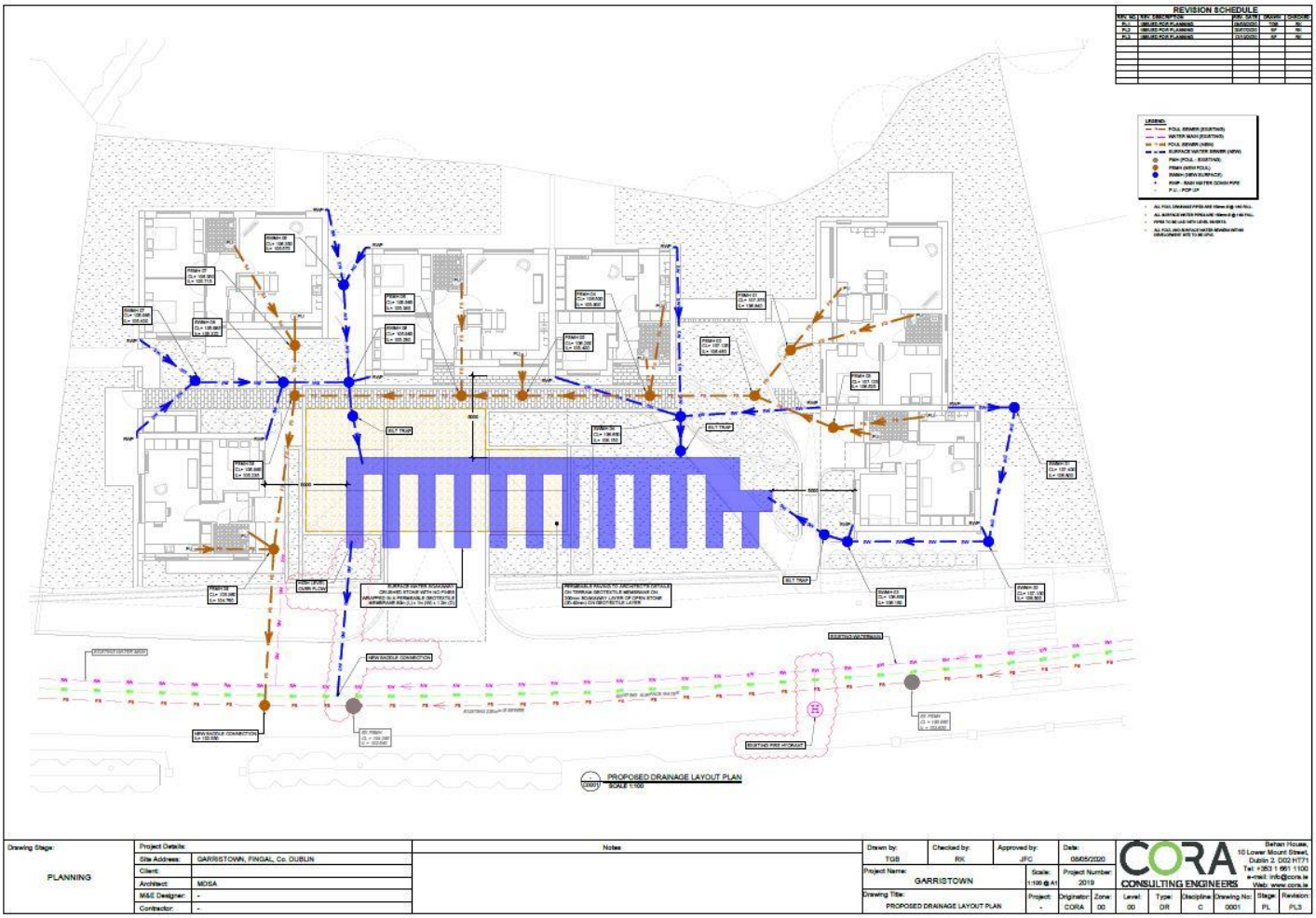
Fluvial Flood Extents



8 Appendix D

Drainage Drawings

Proposed layout



9 Appendix E

Surface Soakaway Calculation

CORA Consulting Engineers Behan House, 10 Lower Mount Street, Dublin 2	Project Garristown				Job Ref. 2019	
	Section Soakaway Wih 20% Increase				Sheet no./rev. 1	
	Calc. by RK	Date 25-Aug-20	Chk'd by	Date	App'd by	Date

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.04

Design rainfall intensity

Location of catchment area	Other
Impermeable area drained to the system	A = **450.0** m²
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.300**
5-year return period rainfall of 60 minutes duration	M5_60min = **16.5** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **20** %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = **1100** mm
Width of pit	w = **1000** mm
Length of pit	l = **80000** mm
Percentage free volume	V_{free} = **30** %

Soil infiltration rate (BRE digest 365)

Length of trial pit	l_{trial} = **1500** mm
Width of trial pit	b_{trial} = **1000** mm
Depth of trial pit (below invert)	d_{trial} = **1000** mm
Free volume (if fill used)	V_{trial} = **100** %
75% depth of pit	$d_{75} = (d_{trial} \times 0.75)$ = **750.00** mm
50% depth of pit	$d_{50} = (d_{trial} \times 0.50)$ = **500.00** mm
25% depth of pit	$d_{25} = (d_{trial} \times 0.25)$ = **250.00** mm
Test 1 - time to fall from 75% depth to 25% depth	T1 = **1320** min
Test 2 - time to fall from 75% depth to 25% depth	T2 = **1320** min
Test 3 - time to fall from 75% depth to 25% depth	T3 = **1320** min
Longest time to fall from 75% depth to 25% depth	t_g = max(T1, T2, T3) = **1320** min
Storage volume from 75% to 25% depth	$V_{p75\_25} = (l_{trial} \times b_{trial} \times (d_{75} - d_{25})) \times V_{trial}$ = **0.75** m³
Internal surface area to 50% depth	$a_{p50} = ((l_{trial} \times b_{trial}) + (l_{trial} + b_{trial}) \times 2 \times d_{50})$ = **4.00** m²
Surface area of soakaway to 50% storage depth	$A_{s50} = 2 \times (l_{trial} + b_{trial}) \times d_{trial} / 2$ = **2.500** m²
Soil infiltration rate	$f = V_{p75\_25} / (a_{p50} \times t_g)$ = **2.37x10⁻⁶** m/s
Wetted area of pit 50% full	$a_{s50} = l \times d + w \times d$ = **89100000** mm²

Table equations

Inflow (cl.3.3.1)	$I = M100 \times A$
Outflow (cl.3.3.2)	$O = a_{s50} \times f \times D$
Storage (cl.3.3.3)	$S = I - O$

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m³)	Outflow (m³)	Storage required (m³)
5	0.34;	6.7;	1.90;	12.8;	5.75;	0.06;	5.69

CORA Consulting Engineers Behan House, 10 Lower Mount Street, Dublin 2	Project Garristown				Job Ref. 2019	
	Section Soakaway Wih 20% Increase				Sheet no./rev. 2	
	Calc. by RK	Date 25-Aug-20	Chk'd by	Date	App'd by	Date

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m^3)	Outflow (m^3)	Storage required (m^3)
10	0.49;	9.7;	1.96;	19.0;	8.57;	0.13;	8.45
15	0.59;	11.7;	1.97;	23.1;	10.37;	0.19;	10.18
30	0.77;	15.2;	1.98;	30.1;	13.57;	0.38;	13.19
60	1.00;	19.8;	1.93;	38.3;	17.21;	0.76;	16.45
120	1.25;	24.8;	1.89;	46.8;	21.07;	1.52;	19.55
240	1.57;	31.1;	1.84;	57.2;	25.76;	3.04;	22.72
360	1.78;	35.2;	1.81;	63.7;	28.68;	4.56;	24.12
600	2.12;	42.0;	1.76;	73.9;	33.25;	7.59;	25.65
1440	2.84;	56.2;	1.70;	95.3;	42.89;	18.23;	24.67

Required storage volume $S_{req} = 25.65\ m^3$

Soakaway storage volume $S_{act} = l \times d \times w \times V_{free} = 26.40\ m^3$

PASS - Soakaway storage volume

Time for emptying soakaway to half volume $t_{e50} = S_{req} \times 0.5 / (a_{s50} \times f)$ = 16hr 53min 20s

PASS - Soakaway discharge time less than or equal to 24 hours