Project

Residential Development, Scholarstown Road, Dublin 16

Report Title

Site Specific Flood Risk Assessment

Client

Ardstone Homes Limited

INFRASTRUCTURE

DBFL CONSULTING ENGINEERS

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1.0 INTRODUCTION

1.1 Background

DBFL Consulting Engineers have been instructed to prepare a Site Specific Flood Risk Assessment (SSFRA) to support a planning application for a proposed residential development at Scholarstown Road, Dublin 16.

The proposed development ("the site") comprises of 590 No. residential dwellings (480 No. Build-to-Rent Apartments and 110 No. Build-to-Sell Duplexes) on a 6.05 Ha site. The development will also consist of the provision of an ancillary amenity block within the central open space which comprises a gymnasium, lobby, kitchenette and lounge at ground floor level and lounge at first floor level in addition to a roof terrace (to serve the Build-to-Rent residents only); a two storey retail/café/restaurant building; a creche and a management suite.

The proposed site layout is shown on John Fleming Architects Drawing Number 1661-P-S-R-002.

This SSFRA should be read in conjunction with DBFL's Infrastructure Design Report (170232-rep-001).

1.2 Objectives

The objectives of this report are to inform the planning authority in relation to flood risk associated with the site.

The report will assess the site in accordance the requirements of "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices (Office of Public Works, November 2009).

This flood risk assessment will outline the following;

- Information to allow an informed decision by the planning authority in relation to flood risk
- The site's flood zone category
- Appropriate flood risk mitigation and management measures for any residual flood risk

1.3 Flood Risk Assessment Scope

This SSFRA relates only to the proposed development lands at Scholarstown Road, Dublin 16 and its immediate surroundings.

This SSFRA uses information obtained from various sources in order to carry out an assessment of flood risk for the existing land and proposed development.

1.4 Approach

Section 2.0 of this SSFRA considers "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices as they relate to the site.

Flood risk identification is presented in Section 3.0, an initial flood risk assessment is carried out in Section 4.0, while a more detailed flood risk assessment is presented in Section 5.0.

Conclusions and recommendations are outlined in Section 6.0.

1.5 Existing Site

The site is currently greenfield and is located immediately adjacent to Scholarstown Road (approximately 500m east of the M50 motorway, refer to Fig. 1.1).

Existing residential development is located to the north, west and east of the site.

A public park (adjacent to Dargle Wood) is located to the north-east of the site and St. Colmcilles Community School is located to the south of the site (directly across Scholarstown Road).

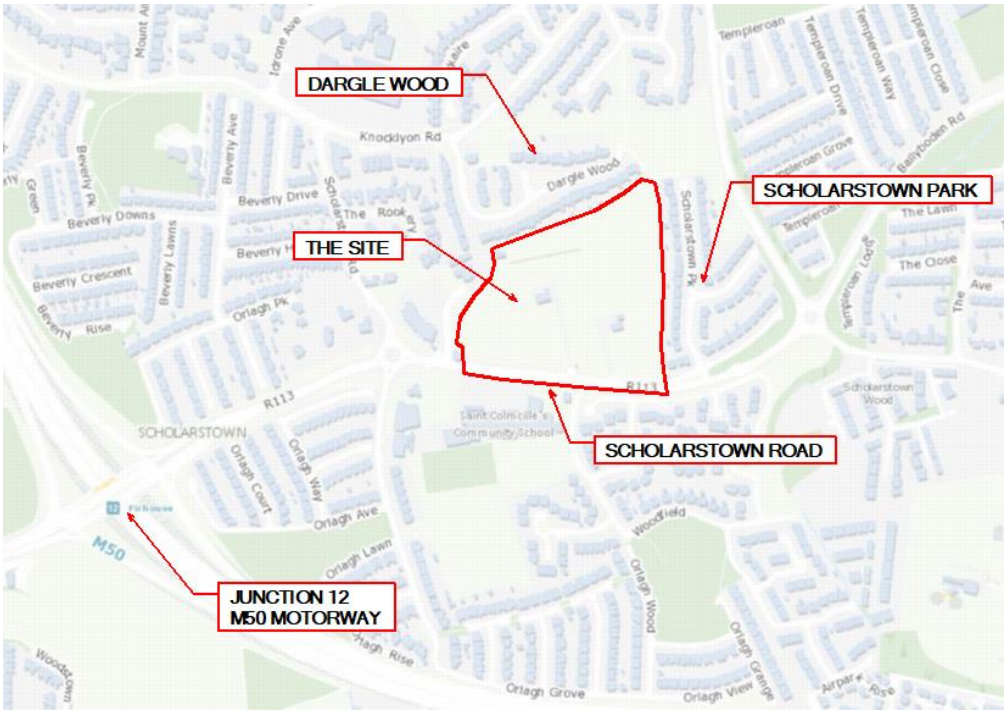


Figure 1.1 Site Location – Extract from myplan.ie viewer (Site Boundary Indicative Only).

The site generally falls from south-west to north-east at surface gradients ranging from 1:50 to 1:80. On approach to the site's north-eastern corner surface gradients increase locally to approximately 1:30.

Scholarstown Road (running along the site's southern boundary) is somewhat elevated above the site.

Existing topographic survey information is shown in the background of the Proposed Roads Layout Plan (refer to DBFL Drawing No. SCH-DBF-ZZ-XX-DR-C-2102).

Figure 1.2 Extract from EPA Online Mapping Service

1.6 Proposed Development

The proposed development comprises of 590 residential dwellings as well as other Build-to-Rent and commercial facilities. Refer to John Fleming Architects Schedule of Accommodation and Site Layout Plans for further detail.

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

- Works along Scholarstown Road (formation of site access including upgrade of traffic signals and improvement to pedestrian and cycle facilities).
- Provision of internal site roads including associated footpaths.
- Provision of surface water drainage, foul drainage and water supply infrastructure (including installation of a 450 diameter trunk foul sewer in conjunction with Irish Water).

2.0 PLANNING SYSTEM FLOOD RISK MANAGEMENT GUIDELINES

2.1 General

"The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices outline the requirements for a Site Specific Flood Risk Assessment.

Table 3.1 of the guidelines classify "dwelling houses" as "highly vulnerable development".

Table 3.2 of the guidelines indicates that "highly vulnerable development" are classified as "appropriate" once located in Flood Zone C i.e. where probability of flooding from rivers is low (less than 0.1% AEP or 1 in 1,000 year).

If a "highly vulnerable development" is to be located in Flood Zone A or Flood Zone B a Justification Test is required.

2.2 Sequential Approach

This SSFRA will initially use existing flood risk information to determine the flood zone category of the site i.e. to determine whether the development is considered appropriate or whether a justification test is required (see Figure 2.1 below).

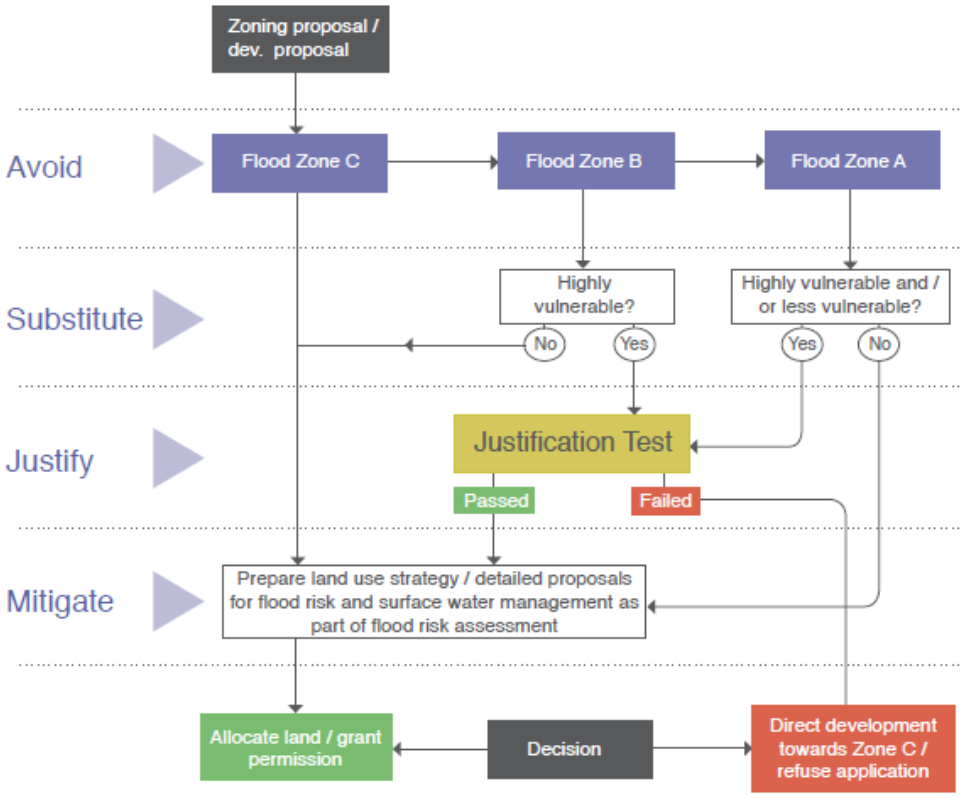


Figure 2.1 – Extract from The Planning System and Flood Risk Management Guidelines (*Fig. 3.2: Sequential Approach Mechanism in the Planning Process*)

2.3 Flood Risk Assessment Stages

The stages of a Flood Risk Assessment as defined by "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices are as follows:

- Stage 1 – Flood Risk Identification
- Stage 2 – Initial Flood Risk Assessment
- Stage 3 – Detailed Flood Risk Assessment

The following sections of this SSFRA follows this approach.

3.0 STAGE 1 – FLOOD RISK ASSESSMENT

3.1 General

The flood risk identification stage uses existing information to identify whether there may be any flooding or surface water management issues related to the site that may require further investigation.

3.2 Information Sources

Information sources consulted for the identification exercise are outlined in Table 3.1 below.

Information Source	Comments
Predictive and historic flood maps, and Benefiting Lands Maps, such as those at www.floods.ie and www.floodinfo.ie;	Information obtained (and reviewed) from www.floods.ie & www.floodinfo.ie (OPW websites)
Predictive flood maps produced under CFRAM Studies;	Information obtained (and reviewed) from *www.cfram.ie* (Dodder CFRAMS), fluvial flood depth, fluvial flood extents etc.
Previous Strategic Flood Risk Assessments;	Eastern CFRAM Study consulted.
Topographical maps, in particular digital elevation models produced by aerial survey or ground survey techniques;	Site topographic survey undertaken (refer to Appendix A).
Information on flood defence condition and performance;	No flood defences identified in the Eastern CFRAM Study in the immediate vicinity of the site.
Alluvial deposit maps of the Geological Survey of Ireland (which would allow the potential for the implementation of source control and infiltration techniques and for groundwater and overland flood risk to be assessed).	GSI maps consulted.
Walkover survey to assess potential sources of flooding, likely routes for flood waters and the site's key features, including flood defences, and their condition;	Walkover survey carried out.
'Liable to flood' markings on the old '6 Inch' maps;	Historic OSI maps consulted.
Trial Pit Logs from Site Investigations	IGSL carried out a site investigation in August 2018

Table 3.1 - Information Sources Consulted

3.2.1 OPW National Flood Hazard Mapping and Benefitting Lands Mapping

OPW's Summary Local Area Report is included in Appendix B (Flood Hazard Information). This report is sourced from the OPW website (www.floodmaps.ie) and summarises all flood events within 2.5 km of the site.

No flood events are noted in the immediate vicinity of the site. Also, no benefitting lands are identified in the vicinity of the site.

Note: Benefiting lands are lands that might benefit from implementation of a major drainage scheme or lands subject to flooding or poor drainage.

3.2.2 Dodder Catchment Flood Risk Assessment and Management Study

Extracts from the Dodder Catchment Flood Risk Assessment and Management Study are included in Appendix B (Flood Hazard Information) which indicates the extent of fluvial flooding in the vicinity of the site.

No Fluvial flooding in indicated in the vicinity of the site.

3.2.3 Other Sources

Other information sources were consulted to determine if there was any additional flood risk to the site including:

- Topographical surveys of the area – the site is significantly elevated above the predicated 0.1% APE fluvial flood event as shown in the Dodder Catchment Flood Risk Assessment and Management Study Maps (refer to Appendix A and Appendix B).
- Soils data from the GSI – no alluvium deposits within the site boundary.
- Groundwater information from GSI – there are no underlying aquifer located within the site.
- Walkover survey – there are no open drains within the site's boundary (refer to the Topographical Survey Plan included in Appendix A).
- 6 inch OSI Map – no evidence of flooding or marsh areas shown within the site.
- IGSL carried out 6 No. infiltration tests and excavated 15 No. Trial Pits and at the site in August 2018 (depths ranging from 2.0m to 3.0m). Groundwater was not encountered at any trial pit locations.

Review of the 'other sources' of information noted above do not indicate evidence of flood risk to the site.

3.3 Source Pathway Receptor Model

A Source-Pathway-Receptor model has been produced to summarise the possible sources of floodwater, the pathways by which flood water could reach receptors and the receptors that could be affected by potential flooding, see Table 3.2 below.

It outlines effects of various potential sources, the performance and response of pathways and the consequences to the receptors in the context of the proposed development.

These sources, pathways and receptors will be assessed further by the initial flood risk assessment stage.

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Fluvial	Overbank from the Owendoher River 950m east of the site (refer to Figure 1.2)	People and Property (the proposed development).	Remote	Medium	Low
Surface Water (Pluvial)	Blockage and / or surcharging of the proposed surface water drainage network	People and Property (the proposed development).	Possible	Medium	Medium
Human / Mechanical Error (Pluvial)	Failure of proposed SuDS measures (e.g. Hydrobrake failure)	People and Property (the proposed development).	Possible	Medium	Medium
Groundwater	Rising groundwater levels within the site	People and Property (the proposed development).	Remote	Low	Low

Table 3.2 - Source-Pathway-Receptor Analysis

4.0 STAGE 2 – INITIAL FLOOD RISK ASSESSMENT

Flood risks identified during Stage 1 – Flood Risk Identification, are outlined in Table 3.2 (Source Pathway Receptor Analysis) and noted below. These risks are assessed further in this section of the SSFRA.

- Low risk of fluvial flooding
- Medium risk of pluvial flooding (surface water and human / mechanical error)
- Low risk of groundwater flooding

The information sources identified in Section 3.2 are considered adequate for the purpose of an Initial Flood Risk Assessment for the site and no further technical studies are proposed.

4.1 Initial Fluvial Flood Risk Assessment

The Eastern CFRAM flood extents mapping identifies the location of the predicated 1% AEP and 0.1% AEP fluvial flood events associated with the Rivers Dodder and Owendoher (refer to Appendix B).

No fluvial flooding is indicated in the vicinity of the site

The closest modelled node to the site is located on the Owendoher River (Node OS_1710), approximately 950m east of the site. The location of this node is shown on CFRAM Drawing OSWS/EXT/UA/CURS/103 (Appendix B).

The location of the Owendoher River in relation to the site is shown in Figure 1.2.

- Node OS_1710, 1:10 year fluvial flood level +70.77
- Node OS_1710, 1:100 year fluvial flood level +71.21
- Node OS_1710, 1:1000 year fluvial flood level +71.61
- Lowest Proposed FFL +80.625

The lowest Proposed FFL (+80.625) is approximately 9.0m above the predicted 1:1000 year fluvial flood event associated with the node OS_1710 (+71.61).

4.2 Initial Pluvial Flood Risk Assessment

The Source-Pathway-Receptor model identified a medium risk of pluvial flooding relating to the proposed surface water drainage network and human / mechanical error. This risk can be mitigated by designing the surface water network in accordance with the Greater Dublin Strategic Drainage Study (GDSDS) including attenuation of the 1:100 year storm event and implementation of SuDS methodologies.

Proper operation and maintenance of the drainage system should also be implemented to reduce the risk of human or mechanical error causing pluvial flood risk from blockages, fuel / oil interceptor operation problems, Hydrobrake failure etc.

4.3 Initial Groundwater Flood Risk Assessment

During the site walkover survey no marshy ground was observed. No groundwater wells or marsh areas are located within the site (based on review of information available on the GSI and OSI websites).

15 No. Trial Pits were carried out at the site. Groundwater was not encountered at any trial pit locations.

Therefore, the risk of groundwater flooding occurring at the site is considered negligible.

4.4 Flood Zone Category

On completion of Stage 2 – Initial Flood Risk Assessment, the site is considered to be located in Flood Zone C as defined by the requirements of “The Planning System and Flood Risk Management, Guidelines for Planning Authorities” and its Technical Appendices.

The proposed development (“dwelling houses”) is therefore considered appropriate as it is located in a Flood Zone C area.

.

5.0 STAGE 3 – DETAILED FLOOD RISK ASSESSMENT

5.1 General

As the Initial Flood Risk Assessment considers the site to be located in Flood Zone C and the proposed development is considered appropriate, the Detailed Flood Risk Assessment Stage will only consider pluvial flood risk in relation to the following;

- Proposed Surface Water Management Measures and SuDS
- Flood Exceedance.
- Impact on Adjacent Areas.
- Climate Change.
- Access and Egress for Emergency Services during Flood Events.
- Residual Risks.
- Effectiveness of Flood Mitigation Measures.

5.2 Surface Water Management Measures and SuDS

An existing 1200 diameter surface water drain runs along the site's eastern boundary (falling towards the site's north-east corner) and will provide suitable surface water discharge point for the proposed development.

Surface water discharge rates from the proposed surface water drainage network will be controlled by a vortex flow control device (Hydrobrake or equivalent) and associated underground attenuation tanks (Stormtech Chambers). Surface water discharge will also pass via a full retention fuel / oil separator (sized in accordance with permitted discharge from the site). Refer to DBFL Drawing SCH-DBF-ZZ-XX-DR-C-3102 and DBFL's Infrastructure Design Report for further detail in relation to the proposed SUDS Strategy.

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

Surface water runoff from the site's road network will be directed to tree pits via conventional road gullies (with high level overflow to the piped surface water network).

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

Surface water runoff from duplex roofs and the ancillary amenity block will be routed to the proposed surface water pipe network via the porous aggregates beneath permeable paved parking areas (providing an additional element of attenuation).

A drainage reservoir (drainage board) is to be provided on the podium slab over basement (Block B3, Block B4 and Block B5).

5.8.1 SuDS Methodoligies

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

- Permeable paving in parking spaces / in curtilage areas.
- Typically, road gullies discharge to tree pits (with high level overflow to the piped surface water network).
- Surface water runoff from duplex roofs will be routed to the proposed surface water pipe network via the stone reservoir beneath permeable paved driveways. Note, this detail does not rely on infiltration (although some degree of infiltration will occur), the stone reservoir is intended to provide an additional element of attenuation storage.
- Surface water runoff from apartment roofs will be captured by green roofs (sedum blanket) prior to being routed to the piped surface water drainage network.
- A drainage reservoir (drainage board) is to be provided on the podium slab over basement (Block B3, Block B4 and Block B5). The podium will have a typical roof garden build up with a mix of soft landscaping and permeable hard landscaping (over a drainage board which would serve as a reservoir).
- Attenuation of the 1 in 50 year storm event in underground attenuation chambers (Stormtech) with the difference between the 1 in 100 year event and the 1 in 50 year event is being attenuated above ground in shallow basins. Note our calculation is based on infiltration rates taken from Soakaway Testing carried out by IGSL in April 2017 (refer to Appendix C).
- Installation of a vortex flow control device (Hydrobrake or equivalent), limiting surface water discharge from the site to 2.5 l/sec/ha.
- Surface water discharge will also pass via a Class 1 full retention fuel / oil separator (sized in accordance with permitted discharge from the site).

5.8.2 Surface Water Attenuation and Storage

Attenuation volumes have been calculated based on an allowable outflow / greenfield runoff rate of 2.50 l/sec/ha (refer to DBFL Infrastructure Design Report 170232-rep-001).

5.3 Flood Risk Exceedance

During storms greater than the 1% AEP pluvial event, the development's drainage network design may be exceeded and areas with low ground levels will begin to flood.

Proposed road levels fall towards the North-East. Overland flow is therefore directed towards open space areas in Dargle Wood Park to the North-East of the site (refer to Figure 5.1).

Figure 5.1 – Flood Exceedance (>1%AEP) Overland Flow Routes

5.4 Impact on Adjacent Areas

Adjacent areas will not be impacted by the development up to the 1% AEP flood event.

Storms greater that the 1% AEP (exceeding the design capacity of the site's drainage system) may result in overland flow being directed towards open space located adjacent to Dargle Park.

5.5 Climate Change

The potential impact of climate change has been allowed for as follows;

- Pluvial flood risk - attenuation storage design allows for a 10% increase in rainfall intensities, as recommended by the GDSDS.
- Pluvial flood risk - drainage system design allows for a 10% increase in flows, as recommended by the GDSDS.

5.6 Access and Egress for Emergency Services During Flood Events

The primary access point for motorised vehicles is located along the site's southern boundary (Scholarstown Road).

An access point is also located in the south-west corner of the site. Although this access is principally intended to facilitate pedestrian and cyclist permeability between the proposed scheme and Scholarstown Road, it can also serve as an alternative access and egress point for Emergency Services.

Both of these access points are located in Flood Zone C; therefore, it is expected that the site can be safely accessed during storms up to the 1% AEP event.

5.7 Residual Risks

Remaining residual flood risks, following the detailed assessment include the following;

1. Pluvial flooding from the private drainage system related to pipe blockage, flood exceedance or mechanical failure.
2. Pluvial flooding from the development's drainage system for storms in excess of the 1% AEP storm event.

5.8 Mitigation Measures

Proposed mitigation measures to address residual flood risks are summarised below;

M1. Proposed drainage system to be maintained on a regular basis to reduce the risk of a blockage.

M2. In the event of storms exceeding the 1% AEP design capacity of the attenuation system, possible overland flow routing towards open space areas should not to be blocked (refer to Section 5.3).

5.8.1 Effectiveness of Mitigation Measures

It is considered that the flood risk mitigation measures if implemented are sufficient to provide a suitable level of protection to the proposed development. A regularly maintained drainage system will ensure that it remains effective and in good working order should a large pluvial storm occur.

Should extreme pluvial flooding occur that is in excess of the development's attenuation capacity (i.e. greater than 1%AEP), then overland flow routes directed towards open space areas are provided in order to protect the proposed development.

6.0 CONCLUSIONS

The Site Specific Flood Risk Assessment for proposed development at Scholarstown Road was undertaken in accordance with the requirements of "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices.

Following the Flood Risk Assessment, it has been determined that it is located in Flood Zone C as defined by the Guidelines.

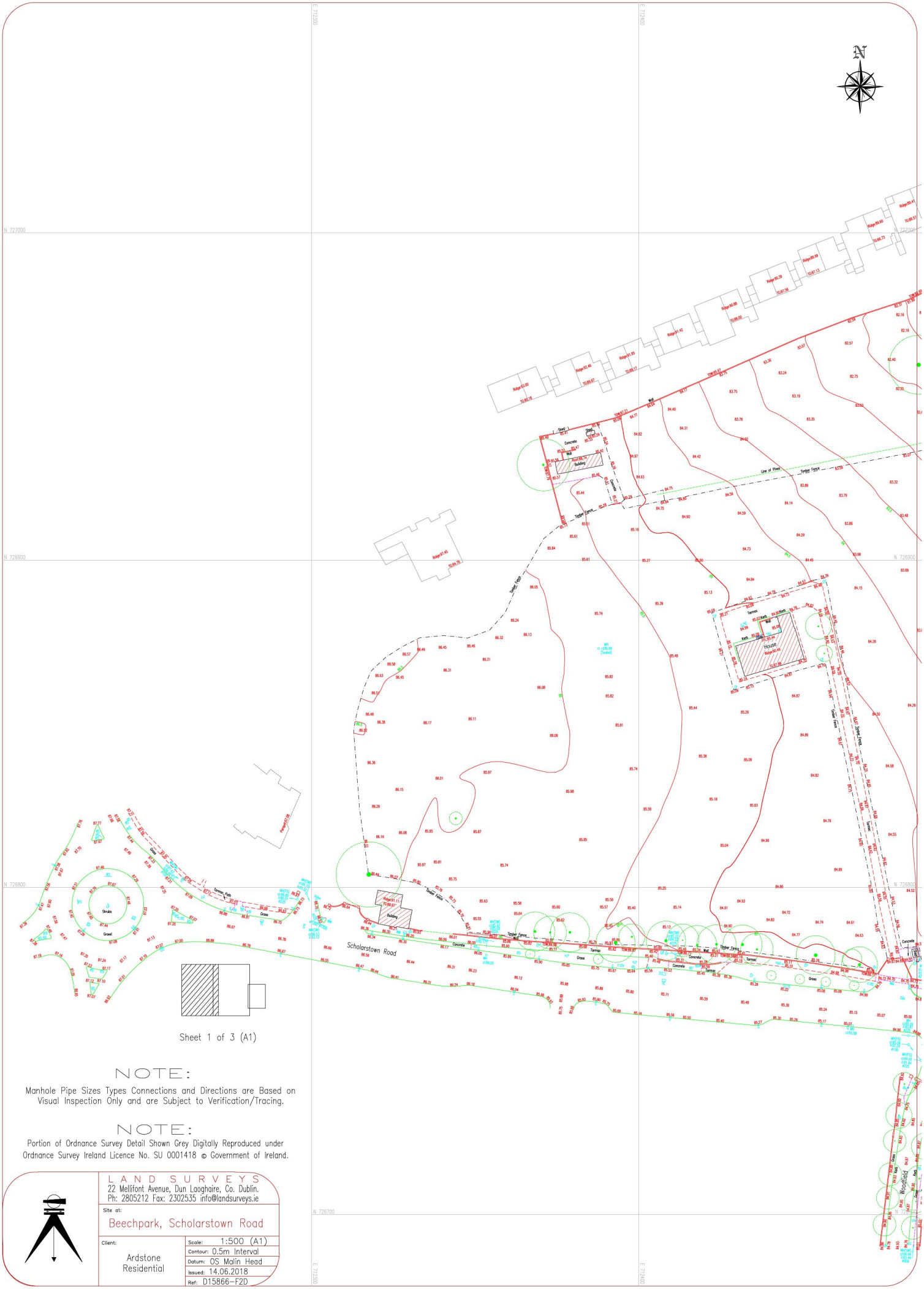
It is concluded that the;

- Proposed mixed use development is appropriate for the site's flood zone category.
- The sequential approach outlined in Planning System and Flood Risk Management Guidelines has been adhered to and that the 'Avoid' principal has been achieved.

In conclusion, the proposed development is considered to have the required level of flood protection up to and including the 100 year return event.

Overland flow paths have been identified for pluvial flooding exceeding the capacity of the surface water drainage network.

APPENDIX A – TOPOGRAPHIC SURVEY PLANS



Sheet 1 of 3 (A1)

NOTE:

Manhole Pipe Sizes Types Connections and Directions are Based on Visual Inspection Only and are Subject to Verification/Tracing.

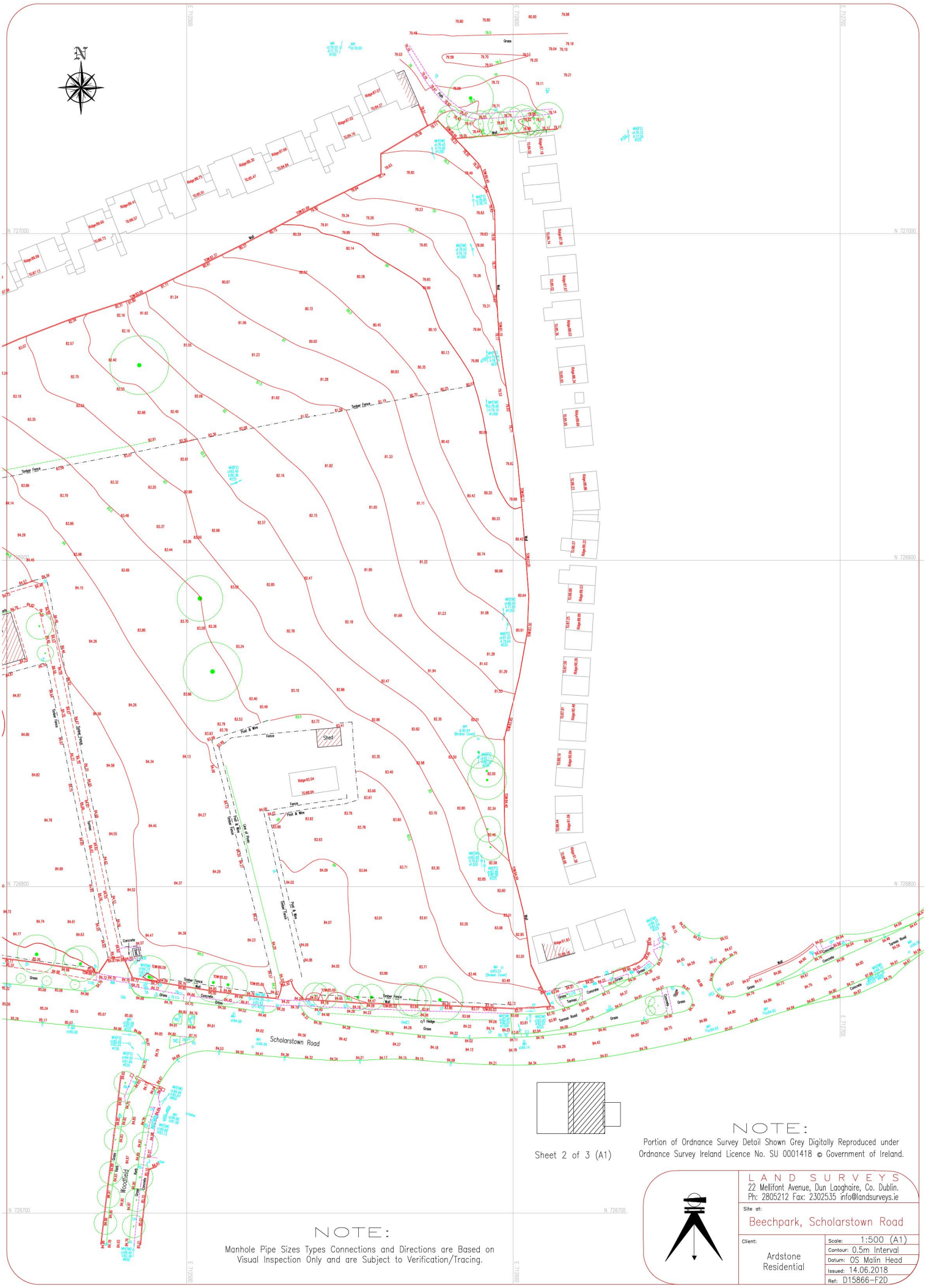
NOTE:

LAND SURVEYS
22 Mellifont Avenue, Dun Laoghaire, Co. Dublin.
Ph: 2805212 Fax: 2302535 info@landsurveys.ie

Site at:
Beechpark, Scholarstown Road

Client:
Ardstone Residential

Scale:	1:500 (A1)
Contour:	0.5m Interval
Datum:	OS Malin Head
Issued:	14.06.2018
Ref:	D15866-F2D



Sheet 2 of 3 (A1)

NOTE:

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NOTE:

Manhole Pipe Sizes Types Connections and Directions are Based on Visual Inspection Only and are Subject to Verification/Tracing.

LAND SURVEYS
22 Mellifont Avenue, Dun Laoghaire, Co. Dublin.
Ph: 2805212 Fax: 2302535 info@landsurveys.ie

Site at:

Beechpark, Scholarstown Road

Client:

Ardstone Residential

Scale:	1:500 (A1)
Contour:	0.5m Interval
Datum:	OS Malin Head
Issued:	14.06.2018
Ref:	D15866-F2D

APPENDIX B – FLOOD HAZARD INFORMATION

OPW National Flood Hazard Mapping

Summary Local Area Report

This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

The map centre is in:

County: Dublin

NGR: O 124 268

Map Scale 1:8,166

Map Legend	
	Flood Points
	Multiple / Recurring Flood Points
	Areas Flooded
	Hydrometric Stations
	Rivers
	Lakes
	River Catchment Areas
	Land Commission *
	Drainage Districts *
	Benefiting Lands *

* Important: These maps do not indicate flood hazard or flood extent. Thier purpose and scope is explained in the Glossary.

15 Results

1. Owendoher River 24th Oct 2011 Willbrook Road
County: Dublin
Start Date: 24/Oct/2011
Flood Quality Code:2
Additional Information: Reports (1) More Mapped Information

2. Dodder Avonmore Park Nov 2000
County: Dublin
Start Date: 05/Nov/2000
Flood Quality Code:3
Additional Information: Reports (1) More Mapped Information

3. Poddle Glendown Crescent Feb 1994
County: Dublin
Start Date: 03/Feb/1994
Flood Quality Code:3
Additional Information: Reports (1) More Mapped Information

4. Dodder Mount Carmel Park recurring
County: Dublin
Start Date:
Flood Quality Code:4
Additional Information: Reports (1) Press Archive (1) More Mapped Information

5. Flooding at Homeville, Knocklyon, Dublin 16.on 24th Oct 2011
County: Dublin
Start Date: 24/Oct/2011
Flood Quality Code:2

Additional Information: Reports (1) More Mapped Information

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6. Flooding at Castlefield, Glenvara and Glenlyon, Knocklyon, Dublin 16 on 24th Oct 2011
County: Dublin
Start Date: 24/Oct/2011
Flood Quality Code:2

Additional Information: Reports (1) More Mapped Information

---

7. Mount Carmel Park Firhouse Nov 2000
County: Dublin
Start Date: 05/Nov/2000
Flood Quality Code:3

Additional Information: Reports (1) Press Archive (1) More Mapped Information

---

8. Owenadoher Edmondstown Road. Nov 2000
County: Dublin
Start Date: 05/Nov/2000
Flood Quality Code:3

Additional Information: Reports (2) More Mapped Information

---

9. Knocklyon Ave Nov 2000
County: Dublin
Start Date: 05/Nov/2000
Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information

---

10. Old City water Course Spawell House Feb 1994
County: Dublin
Start Date: 03/Feb/1994
Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information

---

11. Boden Villas Feb 1994
County: Dublin
Start Date: 03/Feb/1994
Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information

---

12. Whitechurch Court Feb 1994
County: Dublin
Start Date: 03/Feb/1994
Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information

---

13. Barton Drive Ballyboden Feb 1994
County: Dublin
Start Date: 03/Feb/1994
Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information

---

14. Owendoher Willbrook Road August 1986
County: Dublin
Start Date: 25/Aug/1986
Flood Quality Code:3

Additional Information: Reports (2) Press Archive (1) More Mapped Information

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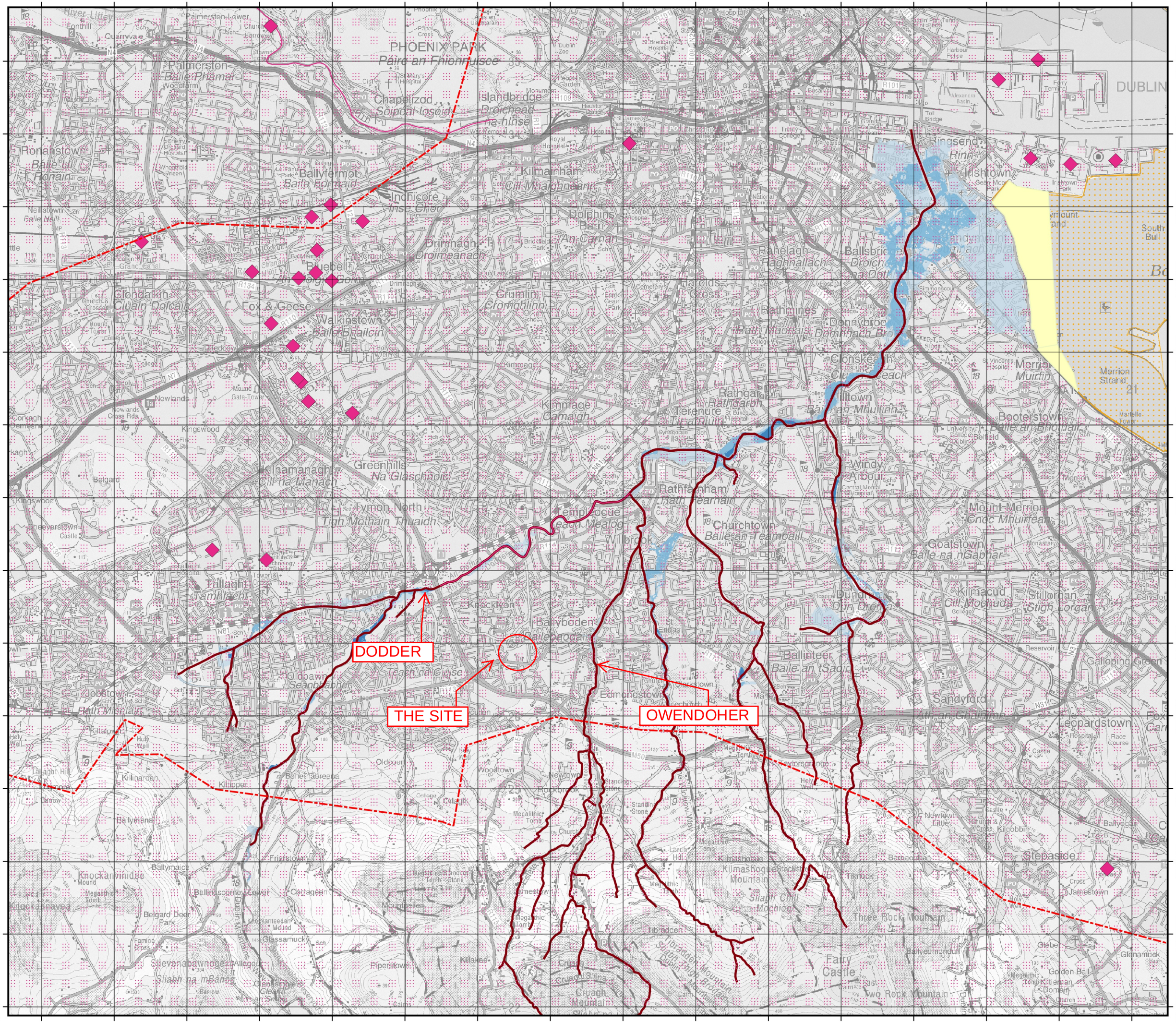
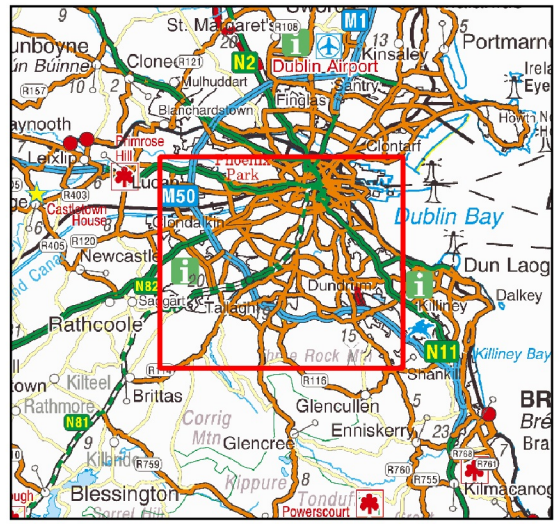
15. Ballyboden Road Whitecliff Recurring
County: Dublin
Start Date:
Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information



Location Plan:



LEGEND

- AFA Boundary
- IED Sites
- Designated for Drinking Water Abstraction
- Designated for Drinking Water Abstraction
- Recreational Waters
- SAC Water Dependent
- SAC Water Dependent
- SAC Water Dependent
- SPA Water Dependent
- Modelled River Centreline
- 10% AEP Fluvial
- 1% AEP Fluvial
- 0.1% AEP Fluvial

IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

OPW
Oifig na nOibreacha Poiblí
The Office of Public Works

The Office of Public Works
Jonathan Swift Street
Trim
Co. Meath

Project:

DODDER STUDY

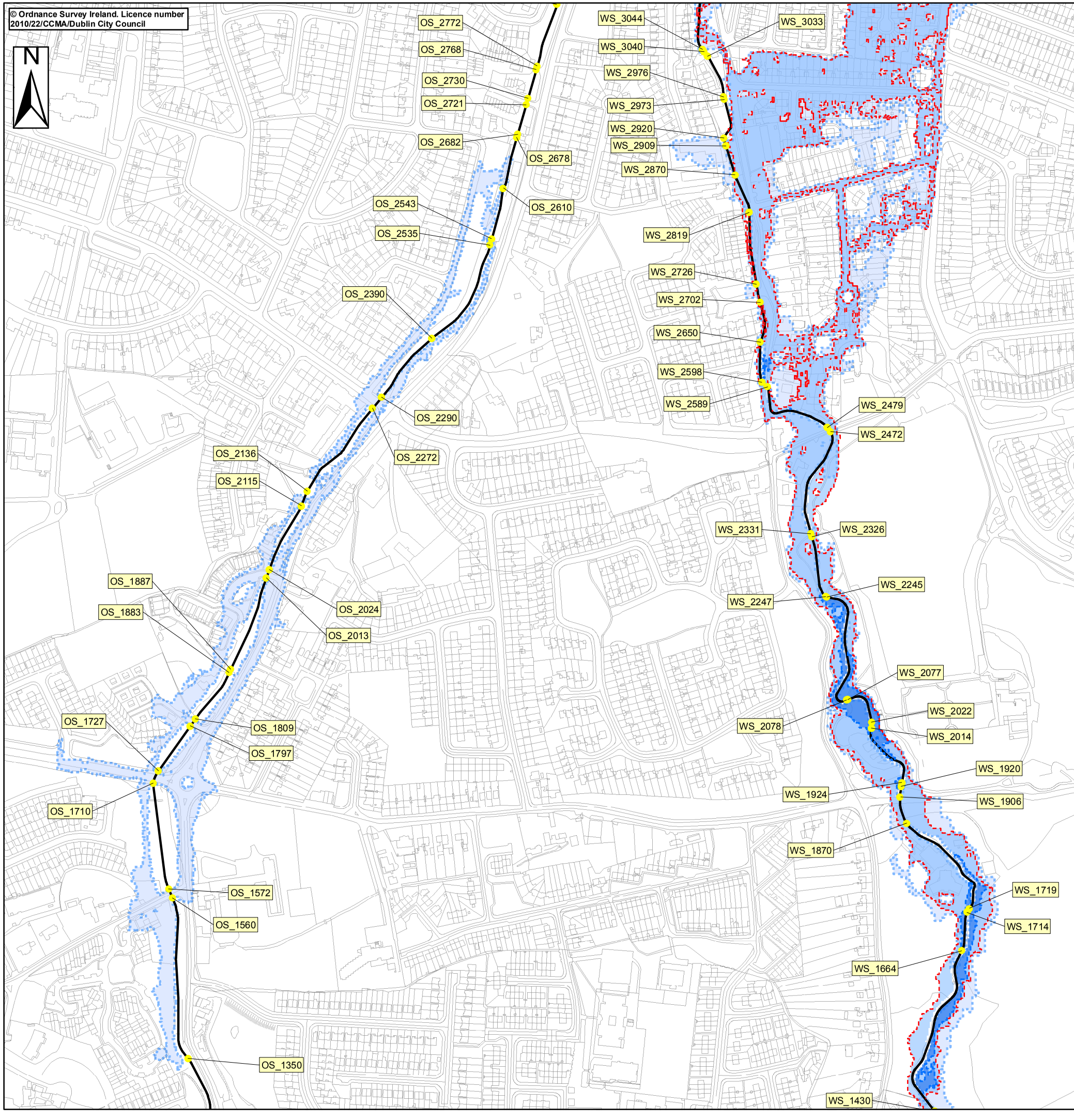
Map: **DUBLIN CITY FLUVIAL GENERAL RISK - ENVIRONMENT**

Map Type:	GENERAL RISK ENVIRONMENT		
Source:	FLUVIAL		
Map Area:	HPW		
Scenario:	CURRENT		
Drawn by:	IH	Date:	Sep - 2016
Checked by:	MC	Date:	Sep - 2016
Approved by:	JM	Date:	Sep - 2016

Map No.: E09DCD_RVFCD_F0_01

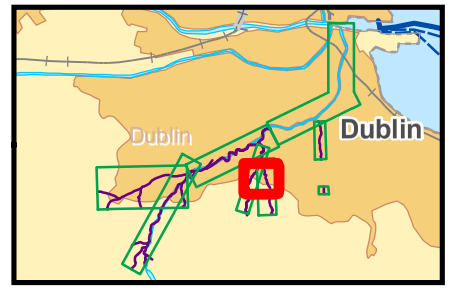
Revision: F0

Map Scale: 1:50,000 Plot Scale: 1:1 @ A3



Node Label	Water Level (mOD) per AEP		
	WL 10%	WL 1%	WL 0.1%
OS-1350	81.68	81.94	82.25
OS-1560	74.26	74.66	74.73
OS-1572	74.13	74.52	74.60
OS-1710	70.77	71.21	71.61
OS-1727	70.61	71.10	71.52
OS-1797	68.97	69.26	69.50
OS-1809	68.82	69.10	69.32
OS-1883	68.06	68.35	68.58
OS-1887	67.99	68.28	68.50
OS-2013	66.32	66.63	66.92
OS-2024	66.19	66.50	66.80
OS-2115	65.15	65.48	65.89
OS-2136	64.97	65.28	65.67
OS-2272	59.47	59.79	60.16
OS-2290	59.33	59.65	60.03
OS-2390	58.24	58.57	58.96
OS-2535	56.43	56.75	57.14
OS-2543	56.37	56.68	57.05
OS-2610	55.67	56.04	56.50
OS-2678	54.93	55.33	55.84
OS-2682	54.90	55.30	55.80
OS-2721	54.69	55.08	55.57
OS-2730	54.64	55.03	55.53
OS-2768	54.36	54.73	55.21
OS-2772	54.33	54.71	55.18
WS-1664	76.78	76.73	76.88
WS-1714	75.95	75.89	76.02
WS-1719	75.88	75.82	75.94
WS-1870	73.35	73.32	73.84
WS-1906	72.76	72.73	73.21
WS-1920	72.66	72.62	73.13
WS-1924	72.57	72.54	72.87
WS-2014	71.96	71.92	72.06
WS-2022	68.56	68.39	68.80
WS-2077	68.39	68.18	68.64
WS-2078	68.38	68.17	68.62
WS-2245	66.81	66.63	67.04
WS-2247	66.79	66.61	67.02
WS-2326	65.63	65.45	65.92
WS-2331	65.47	65.31	65.76
WS-2472	63.35	63.20	64.03
WS-2479	63.27	63.14	63.95
WS-2589	61.53	61.70	62.00
WS-2598	61.09	61.20	61.43
WS-2650	60.36	60.37	60.70
WS-2702	59.83	59.84	60.28
WS-2726	59.34	59.35	59.81
WS-2819	58.57	58.59	59.19
WS-2870	57.52	57.53	57.82
WS-2909	57.38	57.39	57.70
WS-2920	56.80	56.81	57.12
WS-2973	56.34	56.35	56.74
WS-2976	56.28	56.29	56.63
WS-3033	54.82	54.83	55.88
WS-3040	54.72	54.74	55.97
WS-3044	54.72	54.73	55.96

Location Plan:



Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Defended Area
- High Confidence (<20m) (10% AEP)
- Medium Confidence (<40m) (10% AEP)
- Low Confidence (>40m) (10% and 0.1% AEP)
- High Confidence (<20m) (1% AEP)
- Medium Confidence (<40m) (1% AEP)
- Low Confidence (>40m) (1% AEP)
- River Centreline
- Node Point
- OS_2975 — Node Label (refer to table)
- Flow reporting location
- 10% Flow = 1.20 / 1% Flow = 1.56 / 0.1% Flow = 2.17 — Peak flow during design flood extent

USER NOTE:

USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.

Client:

Dublin City Baile Átha Cliath · South Dublin County Council · Dún Laoghaire-Rathdown County Council Comhairle Contae Dhún Laoghaire-Ráth an Dúin · OPW

Project:

DODDER CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

Map:

PRESENT DAY OWENDOHER & WHITECHURCH

Map Type:	FLOOD EXTENT		
Source:	FLUVIAL FLOODING		
Map Area:	URBAN AREA		
Scenario:	CURRENT		
Drawn By :	A.A.B	Date :	26 November 2010
Checked By :	A.J.	Date :	26 November 2010
Approved By :	A.G.B	Date :	26 November 2010

Figure No. :

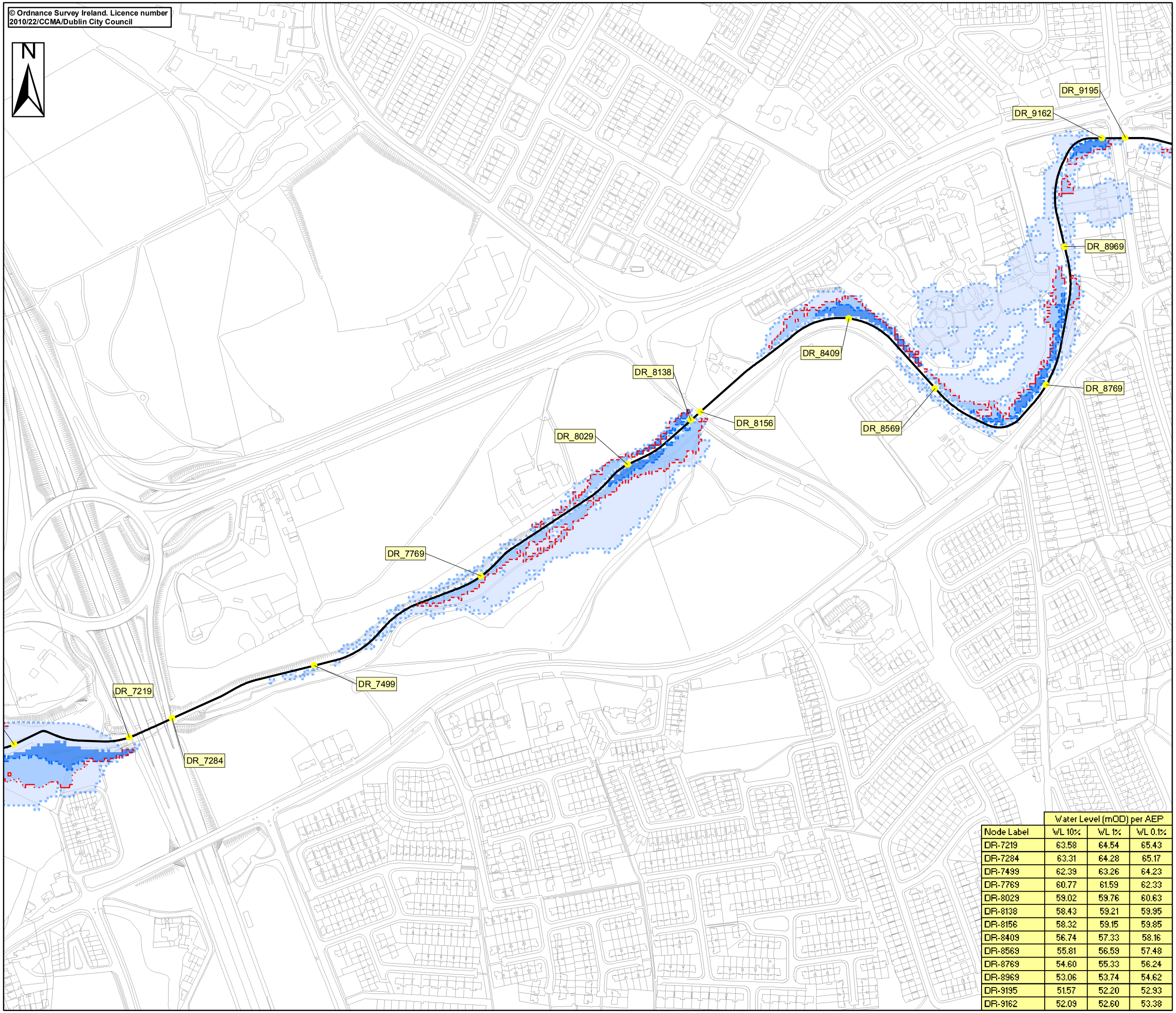
OSWS/EXT/UA/CURS/103

Map Series : Page 2 of 3

Drawing Scale : 1: 5,000 — Plot Scale : 1:1 @ A3

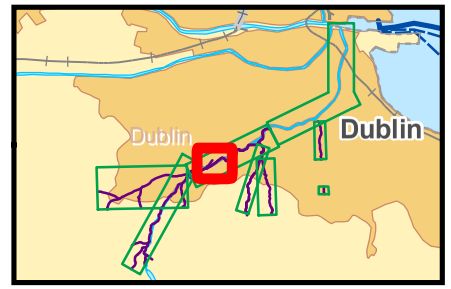
0 — 0.1 — 0.2 Kilometers

RPS Consulting Engineers
ELMWOOD HOUSE
74 BOUCHER ROAD
BELFAST BT12 6RZ
TEL : 028 9066 7914
FAX : 028 9066 8286
www.rpsgroup.com/Ireland



Node Label	Water Level (mOD) per AEP		
	WL 10%	WL 1%	WL 0.1%
DR-7219	63.58	64.54	65.43
DR-7284	63.31	64.28	65.17
DR-7499	62.39	63.26	64.23
DR-7769	60.77	61.59	62.33
DR-8029	59.02	59.76	60.63
DR-8138	58.43	59.21	59.95
DR-8156	58.32	59.15	59.85
DR-8409	56.74	57.33	58.16
DR-8569	55.81	56.59	57.48
DR-8769	54.60	55.33	56.24
DR-8969	53.06	53.74	54.62
DR-9195	51.57	52.20	52.93
DR-9162	52.09	52.60	53.38

Location Plan:



Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 1 % AEP Flood Extent (1 in 100 chance in any given year)
- 0.1 % AEP Flood Extent (1 in 1000 chance in any given year)
- Defended Area
- High Confidence (<20m) (10% AEP)
- Medium Confidence (<40m) (10% AEP)
- Low Confidence (>40m) (10% and 0.1% AEP)
- High Confidence (<20m) (1% AEP)
- Medium Confidence (<40m) (1% AEP)
- Low Confidence (>40m) (1% AEP)
- River Centreline
- Node Point
- OS_2975 — Node Label (refer to table)
- Flow reporting location
- 10% Flow = 1.20, 1% Flow = 1.56, 0.1% Flow = 2.17 — Peak flow during design flood extent

USER NOTE:

USERS OF THESE MAPS SHOULD REFER TO THE DETAILED DESCRIPTION OF THEIR DERIVATION, LIMITATIONS IN ACCURACY AND GUIDANCE AND CONDITIONS OF USE PROVIDED AT THE FRONT OF THIS BOUND VOLUME. IF THIS MAP DOES NOT FORM PART OF BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.

Client:

Dublin City Baile Átha Cliath | South Dublin County Council | Dún Laoghaire-Rathdown County Council Comhairle Contae Dhún Laoghaire-Ráth an Dúin | OPW

Project:

DODDER CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT STUDY

Map:

PRESENT DAY DODDER

Map Type: FLOOD EXTENT
Source: FLUVIAL FLOODING
Map Area: URBAN AREA
Scenario: CURRENT

Drawn By : A.A.B **Date :** 26 November 2010
Checked By : A.J. **Date :** 26 November 2010
Approved By : A.G.B **Date :** 26 November 2010

Figure No. :

DR/EXT/UA/CURS/101

Map Series : Page 4 of 12

Drawing Scale : 1: 5,000 **Plot Scale : 1:1 @ A3**

0 0.1 0.2
Kilometers

RPS Consulting Engineers
ELMWOOD HOUSE
74 BOUCHER ROAD
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www.rpsgroup.com/Ireland

APPENDIX C – IGSL SITE INVESTIGATION REPORT (EXTRACTS)

Appendix V BRE Digest 365 Tests

Soakaway Design f -value from field tests

IGSL

Contract: Beech House, Scholarstown
Contract No. 21167
Test No. IT01 (1st cycle)
712569.377
Engineer DBFL Consulting Engineers
726990.853
Date: 09.08.2018
79.908

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL with rootlets	No water
0.20	0.70	Stiff light brown sandy slightly gravelly SILT with occasional cobbles	
0.70	2.00	Stiff to firm brown sandy slightly gravelly cobbly SILT	

Field Data

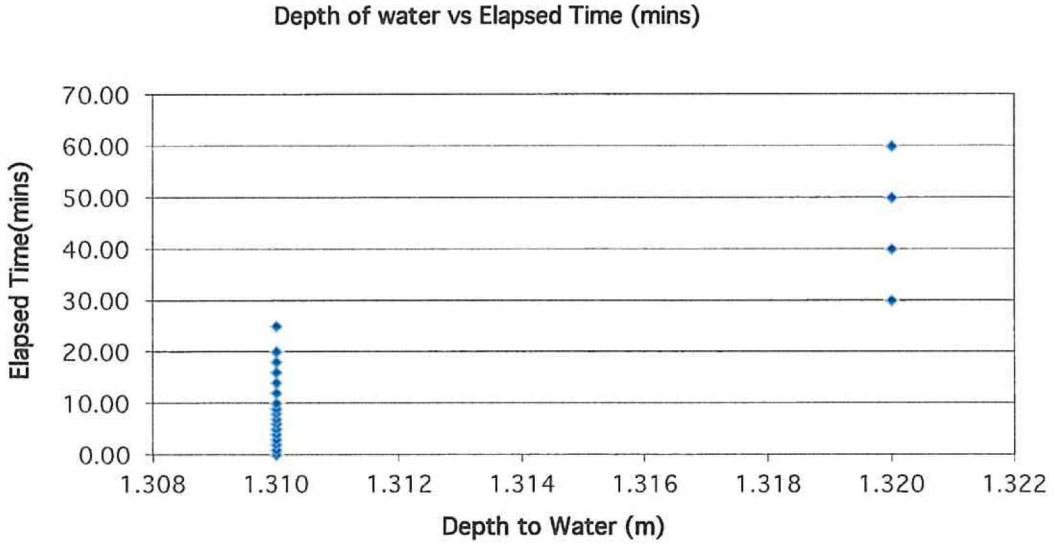
Depth to Water (m)	Elapsed Time (min)
1.310	0.00
1.310	1.00
1.310	2.00
1.310	3.00
1.310	4.00
1.310	5.00
1.310	6.00
1.310	7.00
1.310	8.00
1.310	9.00
1.310	10.00
1.310	12.00
1.310	14.00
1.310	16.00
1.310	18.00
1.310	20.00
1.310	25.00
1.320	30.00
1.320	40.00
1.320	50.00
1.320	60.00

Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.60	m
Initial depth to Water =	1.31	m
Final depth to water =	1.320	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.96	m2
*Av. side area of permeable stratum over test period=	3.014	m2
Total Exposed area =	3.974	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 4E-05 m/min or 6.71028E-07 m/sec



Soakaway Design f -value from field tests

IGSL

Contract: Beech House, Scholarstown
Contract No. 21167
Test No. IT01 (2nd cycle)
712569.377
Engineer DBFL Consulting Engineers
726990.853
Date: 09.08.2018
79.908

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL with rootlets	No water
0.20	0.70	Stiff light brown sandy slightly gravelly SILT with occasional cobbles	
0.70	2.00	Stiff to firm brown sandy slightly gravelly cobbly SILT	

Field Data

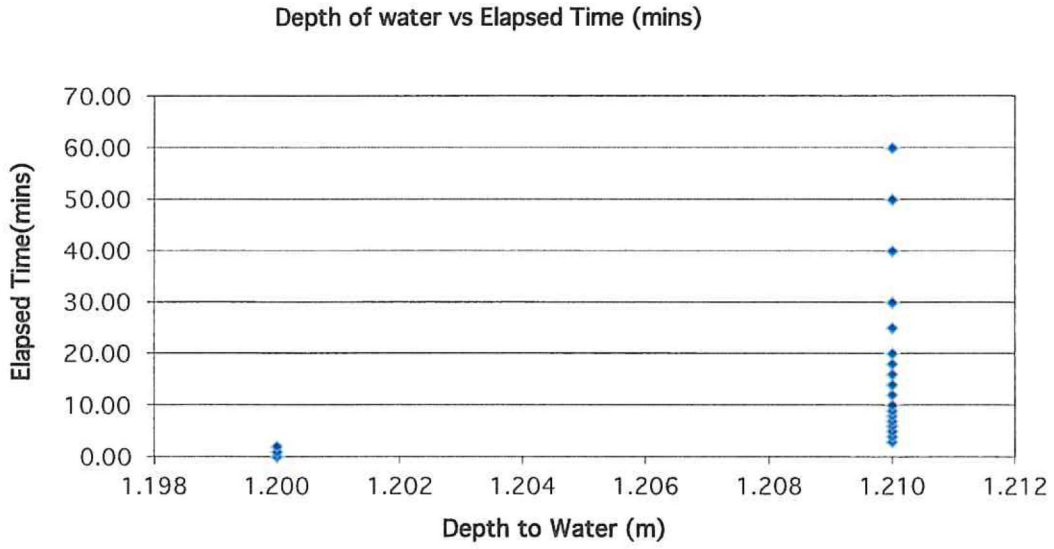
Depth to Water (m)	Elapsed Time (min)
1.200	0.00
1.200	1.00
1.200	2.00
1.210	3.00
1.210	4.00
1.210	5.00
1.210	6.00
1.210	7.00
1.210	8.00
1.210	9.00
1.210	10.00
1.210	12.00
1.210	14.00
1.210	16.00
1.210	18.00
1.210	20.00
1.210	25.00
1.210	30.00
1.210	40.00
1.210	50.00
1.210	60.00

Field Test

Depth of Pit (D)	2.00	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.60	m
Initial depth to Water =	1.20	m
Final depth to water =	1.210	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.96	m2
*Av. side area of permeable stratum over test period=	3.498	m2
Total Exposed area =	4.458	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 3.6E-05 m/min or 5.98176E-07 m/sec



Soakaway Design f -value from field tests

IGSL

Contract: Beech House, Scholarstown — Contract No. 21167
Test No. IT02 (1st cycle) — 712550.476
Engineer DBFL Consulting Engineers — 726992.458
Date: 09.08.2018 — 80.112

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL with rootlets	No water
0.20	0.70	Stiff light brown sandy slightly gravelly SILT with occasional cobbles	
0.70	1.80	Firm to stiff brown sandy slightly gravelly SILT with occasional cobbles	

Field Data

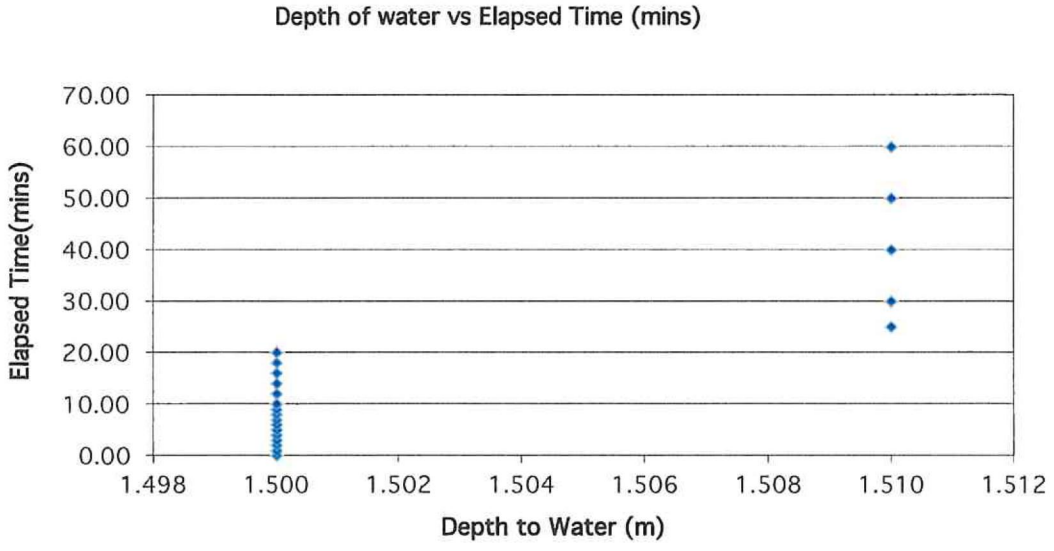
Depth to Water (m)	Elapsed Time (min)
1.500	0.00
1.500	1.00
1.500	2.00
1.500	3.00
1.500	4.00
1.500	5.00
1.500	6.00
1.500	7.00
1.500	8.00
1.500	9.00
1.500	10.00
1.500	12.00
1.500	14.00
1.500	16.00
1.500	18.00
1.500	20.00
1.510	25.00
1.510	30.00
1.510	40.00
1.510	50.00
1.510	60.00

Field Test

Depth of Pit (D)	1.80	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.50	m
Initial depth to Water =	1.50	m
Final depth to water =	1.510	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	1.239	m2
Total Exposed area =	2.139	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 7E-05 m/min or 1.16877E-06 m/sec



Soakaway Design f -value from field tests

IGSL

Contract: Beech House, Scholarstown
Contract No. 21167
Test No. IT02 (2nd cycle)
712550.476
Engineer DBFL Consulting Engineers
726992.458
Date: 09.08.2018
80.112

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL with rootlets	No water
0.20	0.70	Stiff light brown sandy slightly gravelly SILT with occasional cobbles	
0.70	1.80	Firm to stiff brown sandy slightly gravelly SILT with occasional cobbles	

Field Data

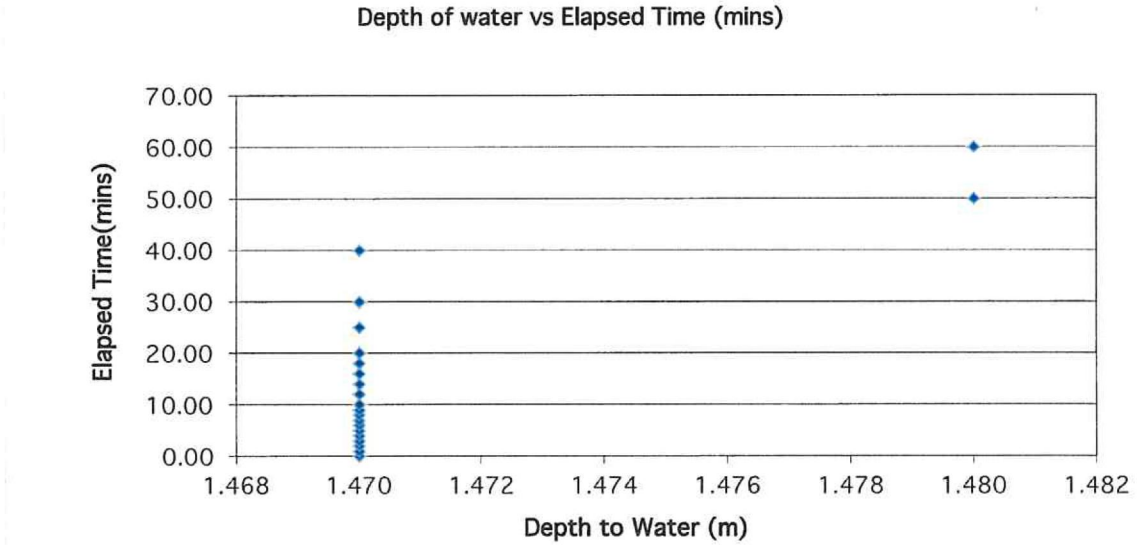
Depth to Water (m)	Elapsed Time (min)
1.470	0.00
1.470	1.00
1.470	2.00
1.470	3.00
1.470	4.00
1.470	5.00
1.470	6.00
1.470	7.00
1.470	8.00
1.470	9.00
1.470	10.00
1.470	12.00
1.470	14.00
1.470	16.00
1.470	18.00
1.470	20.00
1.470	25.00
1.470	30.00
1.470	40.00
1.480	50.00
1.480	60.00

Field Test

Depth of Pit (D)	1.80	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.50	m
Initial depth to Water =	1.47	m
Final depth to water =	1.480	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	1.365	m2
Total Exposed area =	2.265	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 6.6E-05 m/min or 1.10375E-06 m/sec



Soakaway Design f -value from field tests

IGSL

Contract: Beech House, Scholarstown
Contract No. 21167
Test No. IT03 (1st cycle)
712484.337
Engineer DBFL Consulting Engineers
726902.736
Date: 09.08.2018
83.542

Summary of ground conditions

from	to	Description	Ground water
0.00	0.15	Firm brown TOPSOIL with rootlets	No water
0.15	0.80	Stiff light brown sandy SILT with occasional gravel and rare cobbles	
0.80	1.75	Stiff brown sandy gravelly cobbly SILT	

Field Data

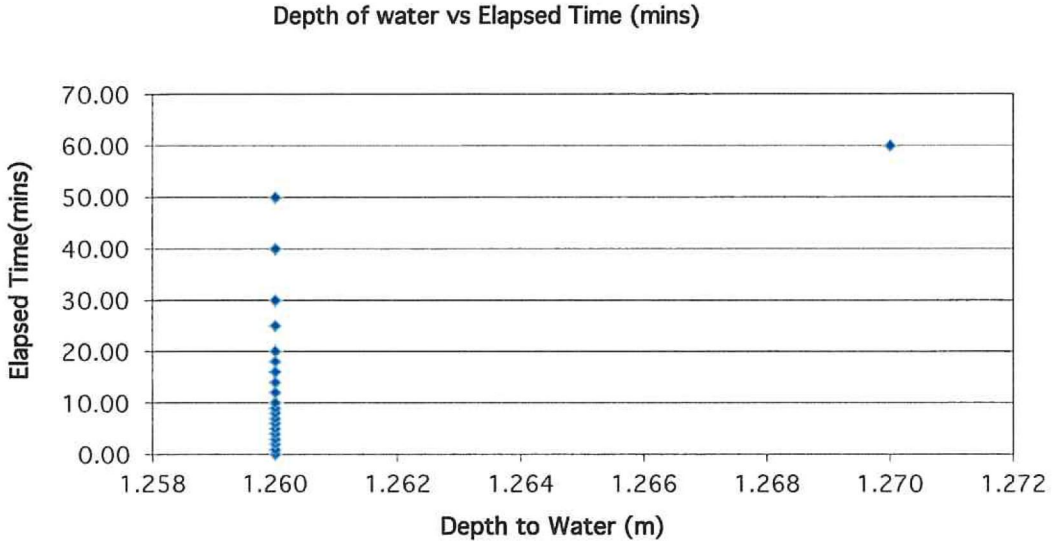
Depth to Water (m)	Elapsed Time (min)
1.260	0.00
1.260	1.00
1.260	2.00
1.260	3.00
1.260	4.00
1.260	5.00
1.260	6.00
1.260	7.00
1.260	8.00
1.260	9.00
1.260	10.00
1.260	12.00
1.260	14.00
1.260	16.00
1.260	18.00
1.260	20.00
1.260	25.00
1.260	30.00
1.260	40.00
1.260	50.00
1.270	60.00

Field Test

Depth of Pit (D)	1.75	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.50	m
Initial depth to Water =	1.26	m
Final depth to water =	1.270	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	2.037	m2
Total Exposed area =	2.937	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 5.1E-05 m/min or 8.51209E-07 m/sec



Soakaway Design f -value from field tests

IGSL

Contract: Beech House, Scholarstown
Test No. IT03 (2nd cycle)
Engineer DBFL Consulting Engineers
Date: 09.08.2018

Contract No. 21167
712484.337
726902.736
83.542

Summary of ground conditions

from	to	Description	Ground water
0.00	0.15	Firm brown TOPSOIL with rootlets	No water
0.15	0.80	Stiff light brown sandy SILT with occasional gravel and rare cobbles	
0.80	1.75	Stiff brown sandy gravelly cobbly SILT	

Field Data

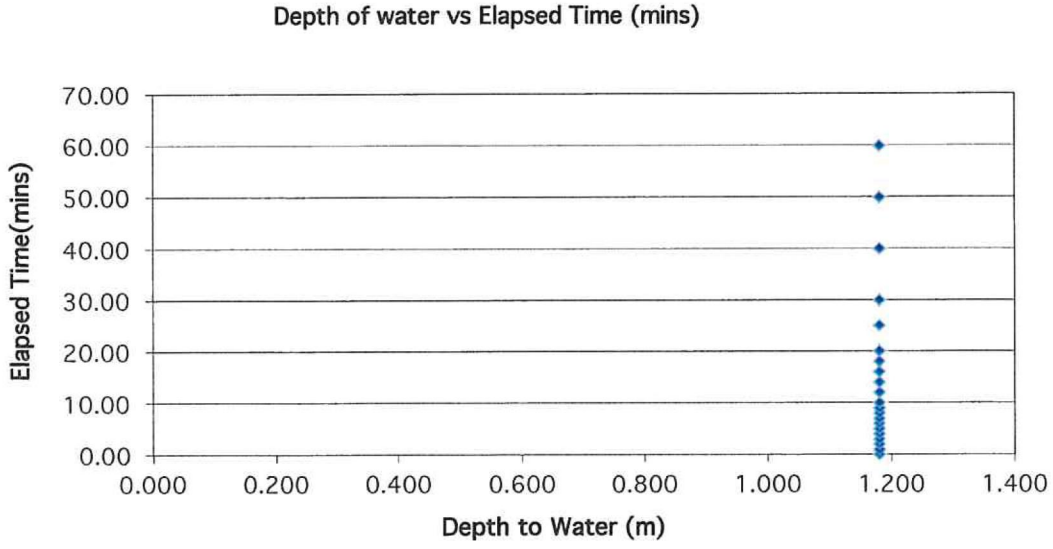
Depth to Water (m)	Elapsed Time (min)
1.180	0.00
1.180	1.00
1.180	2.00
1.180	3.00
1.180	4.00
1.180	5.00
1.180	6.00
1.180	7.00
1.180	8.00
1.180	9.00
1.180	10.00
1.180	12.00
1.180	14.00
1.180	16.00
1.180	18.00
1.180	20.00
1.180	25.00
1.180	30.00
1.180	40.00
1.180	50.00
1.180	60.00

Field Test

Depth of Pit (D)	1.75	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.50	m
Initial depth to Water =	1.18	m
Final depth to water =	1.180	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	2.394	m2
Total Exposed area =	3.294	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Soakaway Design f -value from field tests

IGSL

Contract:	Beech House, Scholarstown	Contract No.	21167
Test No.	IT04 (1st cycle)		712556.069
Engineer	DBFL Consulting Engineers		726812.607
Date:	09.08.2018		83.836

Summary of ground conditions

from	to	Description	Ground water
0.00	0.15	Firm brown TOPSOIL with rootlets	No water
0.15	0.80	Stiff light brown sandy slightly gravelly SILT with occasional cobbles	
0.80	1.75	Firm to stiff brown sandy gravelly cobbly SILT with rare boulders	

Field Data

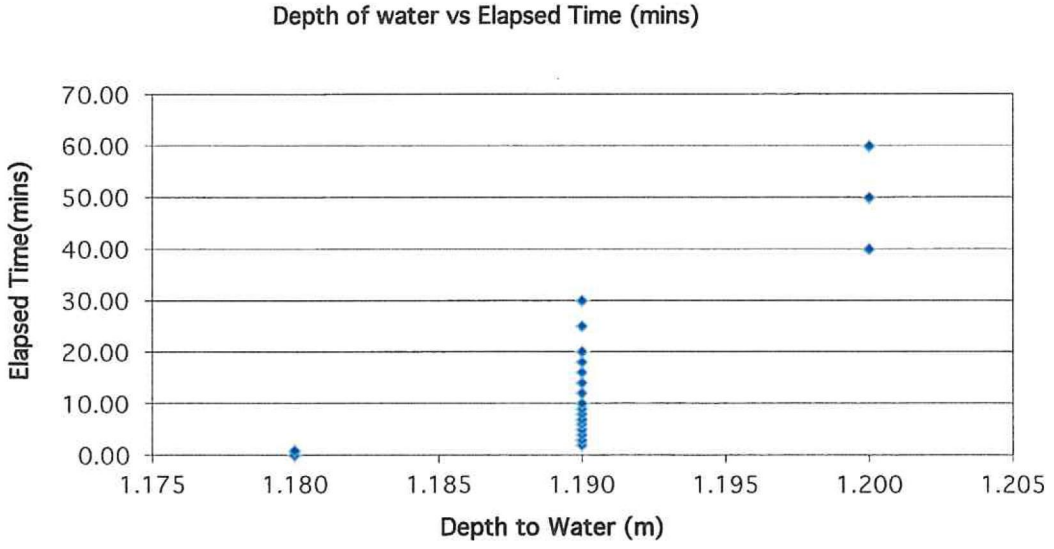
Depth to Water (m)	Elapsed Time (min)
1.180	0.00
1.180	1.00
1.190	2.00
1.190	3.00
1.190	4.00
1.190	5.00
1.190	6.00
1.190	7.00
1.190	8.00
1.190	9.00
1.190	10.00
1.190	12.00
1.190	14.00
1.190	16.00
1.190	18.00
1.190	20.00
1.190	25.00
1.190	30.00
1.200	40.00
1.200	50.00
1.200	60.00

Field Test

Depth of Pit (D)	1.75	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.50	m
Initial depth to Water =	1.18	m
Final depth to water =	1.200	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	2.352	m2
Total Exposed area =	3.252	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 9.2E-05 m/min or 1.53752E-06 m/sec



Soakaway Design f -value from field tests

IGSL

Contract: Beech House, Scholarstown — Contract No. 21167
Test No. IT04 (2nd cycle) — 712556.069
Engineer DBFL Consulting Engineers — 726812.607
Date: 09.08.2018 — 83.836

Summary of ground conditions

from	to	Description	Ground water
0.00	0.15	Firm brown TOPSOIL with rootlets	No water
0.15	0.80	Stiff light brown sandy slightly gravelly SILT with occasional cobbles	
0.80	1.75	Firm to stiff brown sandy gravelly cobbly SILT with rare boulders	

Field Data

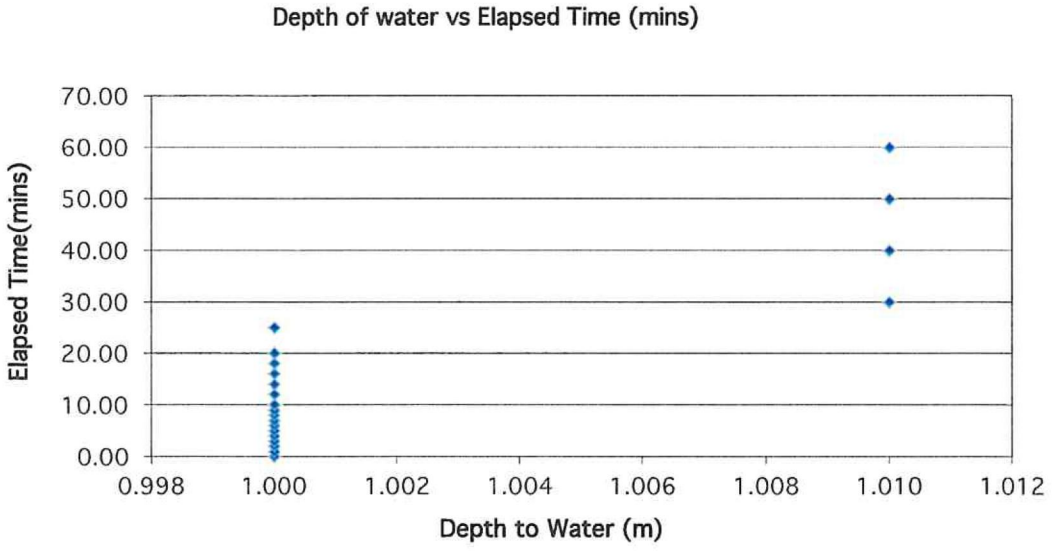
Depth to Water (m)	Elapsed Time (min)
1.000	0.00
1.000	1.00
1.000	2.00
1.000	3.00
1.000	4.00
1.000	5.00
1.000	6.00
1.000	7.00
1.000	8.00
1.000	9.00
1.000	10.00
1.000	12.00
1.000	14.00
1.000	16.00
1.000	18.00
1.000	20.00
1.000	25.00
1.010	30.00
1.010	40.00
1.010	50.00
1.010	60.00

Field Test

Depth of Pit (D)	1.75	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.50	m
Initial depth to Water =	1.00	m
Final depth to water =	1.010	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	3.129	m2
Total Exposed area =	4.029	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 3.7E-05 m/min or 6.20501E-07 m/sec



Soakaway Design f -value from field tests

IGSL

Contract: Beech House, Scholarstown — Contract No. 21167
Test No. IT05 (1st cycle) — 712484.706
Engineer DBFL Consulting Engineers — 726923.714
Date: 09.08.2018 — 83.146

Summary of ground conditions

from	to	Description	Ground water
0.00	0.15	Firm brown TOPSOIL with roots and rootlets	No water
0.15	0.80	Stiff light brown sandy SILT with occasional gravel	
0.80	1.40	Stiff brown sandy gravelly slightly cobbly SILT	

Field Data

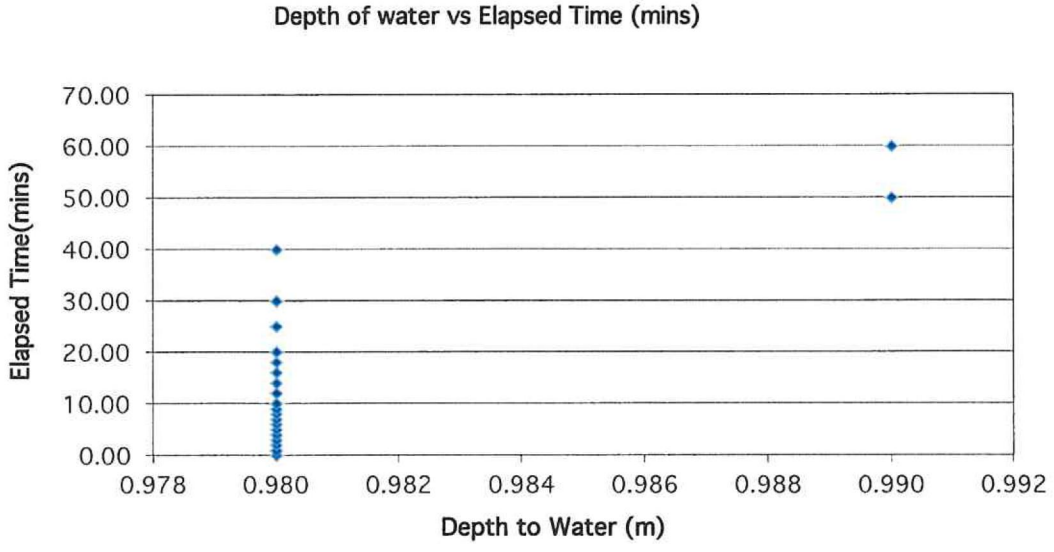
Depth to Water (m)	Elapsed Time (min)
0.980	0.00
0.980	1.00
0.980	2.00
0.980	3.00
0.980	4.00
0.980	5.00
0.980	6.00
0.980	7.00
0.980	8.00
0.980	9.00
0.980	10.00
0.980	12.00
0.980	14.00
0.980	16.00
0.980	18.00
0.980	20.00
0.980	25.00
0.980	30.00
0.980	40.00
0.990	50.00
0.990	60.00

Field Test

Depth of Pit (D)	1.40	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.50	m
Initial depth to Water =	0.98	m
Final depth to water =	0.990	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	1.743	m2
Total Exposed area =	2.643	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 5.7E-05 m/min or 9.45895E-07 m/sec



Soakaway Design f -value from field tests

IGSL

Contract: Beech House, Scholarstown
Contract No. 21167
Test No. IT05 (2nd cycle)
712484.706
Engineer DBFL Consulting Engineers
726923.714
Date: 09.08.2018
83.146

Summary of ground conditions

from	to	Description	Ground water
0.00	0.15	Firm brown TOPSOIL with roots and rootlets	No water
0.15	0.80	Stiff light brown sandy SILT with occasional gravel	
0.80	1.40	Stiff brown sandy gravelly slightly cobbly SILT	

Field Data

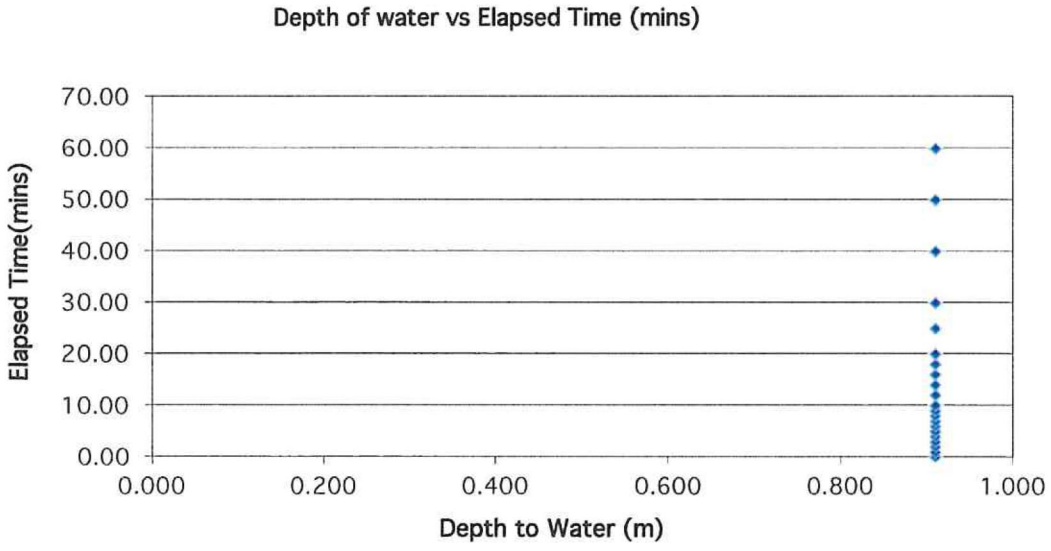
Depth to Water (m)	Elapsed Time (min)
0.910	0.00
0.910	1.00
0.910	2.00
0.910	3.00
0.910	4.00
0.910	5.00
0.910	6.00
0.910	7.00
0.910	8.00
0.910	9.00
0.910	10.00
0.910	12.00
0.910	14.00
0.910	16.00
0.910	18.00
0.910	20.00
0.910	25.00
0.910	30.00
0.910	40.00
0.910	50.00
0.910	60.00

Field Test

Depth of Pit (D)	1.40	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.50	m
Initial depth to Water =	0.91	m
Final depth to water =	0.910	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	2.058	m2
Total Exposed area =	2.958	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Soakaway Design f -value from field tests

IGSL

Contract: Beech House, Scholarstown — Contract No. 21167
Test No. IT06 (1st cycle) — 712368.625
Engineer DBFL Consulting Engineers — 726851.292
Date: 10.08.2018 — 86.117

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL with rootlets	No water
0.20	0.65	Stiff light brown sandy SILT with occasional gravel	
0.80	1.75	Stiff brown/light greyish brown sandy gravelly with occasional cobbles	

Field Data

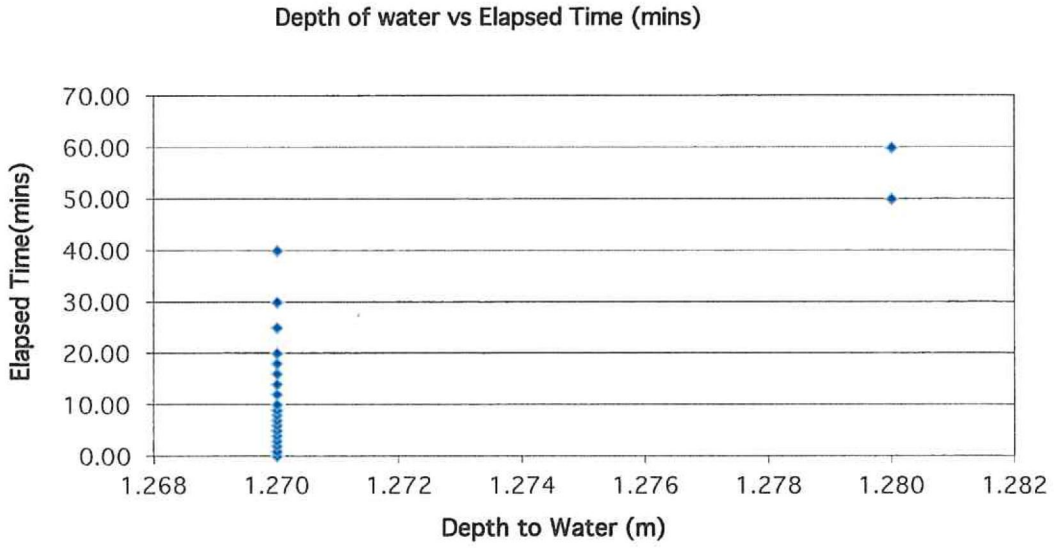
Depth to Water (m)	Elapsed Time (min)
1.270	0.00
1.270	1.00
1.270	2.00
1.270	3.00
1.270	4.00
1.270	5.00
1.270	6.00
1.270	7.00
1.270	8.00
1.270	9.00
1.270	10.00
1.270	12.00
1.270	14.00
1.270	16.00
1.270	18.00
1.270	20.00
1.270	25.00
1.270	30.00
1.270	40.00
1.280	50.00
1.280	60.00

Field Test

Depth of Pit (D)	1.75	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.50	m
Initial depth to Water =	1.27	m
Final depth to water =	1.280	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	1.995	m2
Total Exposed area =	2.895	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 5.2E-05 m/min or 8.63558E-07 m/sec



Soakaway Design f -value from field tests

IGSL

Contract: Beech House, Scholarstown — Contract No. 21167
Test No. IT06 (2nd cycle) — 712368.625
Engineer DBFL Consulting Engineers — 726851.292
Date: 10.08.2018 — 86.117

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	Firm brown TOPSOIL with rootlets	No water
0.20	0.65	Stiff light brown sandy SILT with occasional gravel	
0.80	1.75	Stiff brown/light greyish brown sandy gravelly with occasional cobbles	

Field Data

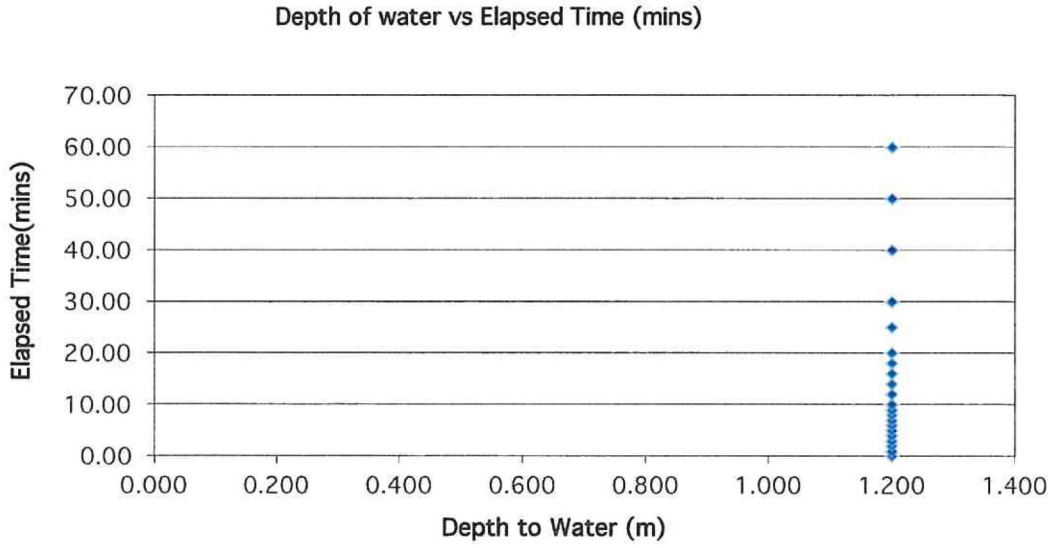
Depth to Water (m)	Elapsed Time (min)
1.200	0.00
1.200	1.00
1.200	2.00
1.200	3.00
1.200	4.00
1.200	5.00
1.200	6.00
1.200	7.00
1.200	8.00
1.200	9.00
1.200	10.00
1.200	12.00
1.200	14.00
1.200	16.00
1.200	18.00
1.200	20.00
1.200	25.00
1.200	30.00
1.200	40.00
1.200	50.00
1.200	60.00

Field Test

Depth of Pit (D)	1.75	m
Width of Pit (B)	0.60	m
Length of Pit (L)	1.50	m
Initial depth to Water =	1.20	m
Final depth to water =	1.200	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m
Base area=	0.9	m2
*Av. side area of permeable stratum over test period=	2.31	m2
Total Exposed area =	3.21	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Appendix II Trial Pit Records

TRIAL PIT RECORD

REPORT NUMBER 21167

CONTRACT	Beech House, Scholarstown	**TRIAL PIT NO.**	**TP01**
		SHEET	Sheet 1 of 1
LOGGED BY	EK	**CO-ORDINATES**	712,578.73 E 726,784.07 N
		DATE STARTED	08/08/2018
		DATE COMPLETED	08/08/2018
CLIENT		**GROUND LEVEL (m)**	83.45
		EXCAVATION METHOD	
ENGINEER	DBFL Consulting Engineers		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Firm to stiff brown gravelly CLAY with a low cobble content and a low boulder content. Cobbles are sub-angular and boulders are sub-angular to sub-rounded. Boulders are less than 400mm in size. (Possible made ground).		0.30	83.15						
1.0					AA94906	B	1.00		
Stiff brown gravelly CLAY with some cobbles and occasional boulders		1.20	82.25						
2.0					AA94907	B	2.00		
Stiff purple mottled blue SILT/CLAY with gravel		2.50	80.95						
End of Trial Pit at 2.80m		2.80	80.65		AA94908	B	2.80		
3.0									
4.0									

Groundwater Conditions

Stability
Good

General Remarks
Pit terminated due to very slow progress

IGSL TP LOG 21167.GPJ IGSL.GDT 15/8/18

TRIAL PIT RECORD

REPORT NUMBER 21167

CONTRACT	Beech House, Scholarstown	**TRIAL PIT NO.**	**TP02**
		SHEET	Sheet 1 of 1
LOGGED BY	K. Kinsella	**CO-ORDINATES**	712,550.65 E 726,800.61 N
		DATE STARTED	10/08/2018
		DATE COMPLETED	10/08/2018
CLIENT		**GROUND LEVEL (m)**	84.00
ENGINEER	DBFL Consulting Engineers	**EXCAVATION METHOD**	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 Firm brown TOPSOIL with rootlets									
Stiff brown/light brown sandy SILT/CLAY with rare subangular to subrounded gravel		0.20	83.80		AA98917	B	0.40-0.50		
Stiff brown sandy gravelly slightly cobbly SILT/CLAY with rare subrounded boulders up to 350mm, cobble content increases with depth		0.80	83.20		AA98918	B	1.00-1.10		
					AA98919	B	2.50-2.60		
End of Trial Pit at 2.70m		2.70	81.30						

1.0
2.0
3.0
4.0

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated due to very slow progress

IGSL TP LOG 21167.GPJ IGSL.GDT 15/8/18

TRIAL PIT RECORD

REPORT NUMBER 21167

CONTRACT	Beech House, Scholarstown	**TRIAL PIT NO.**	**TP03**
		SHEET	Sheet 1 of 1
LOGGED BY	EK	**CO-ORDINATES**	712,582.41 E 726,843.35 N
		DATE STARTED	08/08/2018
		DATE COMPLETED	08/08/2018
CLIENT		**GROUND LEVEL (m)**	82.45
ENGINEER	DBFL Consulting Engineers	**EXCAVATION METHOD**	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
MADE GROUND (Comprised of brown gravelly clay with a low cobble content. Contains brick fragments and tiles. Cobbles are less than 300mm and sub-angular to sub-rounded)		0.20	82.25						
1.0					AA94904	B	1.00		
Stiff brown gravelly CLAY with a high cobble content and a low boulder content. Cobbles are angular to sub-angular. Boulders are sub-angular and less than 500mm in size. (Possibly made ground).		1.70	80.75						
2.0					AA94905	B	2.00		
End of Trial Pit at 2.50m		2.50	79.95						
3.0									
4.0									

Groundwater Conditions

Stability
Good

General Remarks
Pit terminated due to very slow progress

IGSL TP LOG 21167.GPJ IGSL.GDT 15/8/18

TRIAL PIT RECORD

REPORT NUMBER 21167

CONTRACT	Beech House, Scholarstown	**TRIAL PIT NO.**	**TP04**
		SHEET	Sheet 1 of 1
LOGGED BY	K. Kinsella	**CO-ORDINATES**	712,580.24 E 726,937.92 N
		DATE STARTED	10/08/2018
		DATE COMPLETED	10/08/2018
CLIENT		**GROUND LEVEL (m)**	80.24
ENGINEER	DBFL Consulting Engineers	**EXCAVATION METHOD**	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 Firm brown TOPSOIL with rootlets		0.20	80.04						
Stiff brown/light brown sandy very gravelly SILT with subangular to subrounded cobbles up to 120mm		0.45	79.79		AA98920	B	0.30-0.40		
Stiff to locally firm brown sandy gravelly CLAY with cobbles and rare subrounded boulders up to 450mm					AA98921	B	1.20-1.30		
2.0 End of Trial Pit at 2.20m		2.20	78.04		AA98922	B	2.10-2.20		
3.0									
4.0									

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated due to very slow progress

IGSL TP LOG 21167.GPJ IGSL.GDT 15/8/18

TRIAL PIT RECORD

REPORT NUMBER 21167

CONTRACT	Beech House, Scholarstown	TRIAL PIT NO.	TP05
		SHEET	Sheet 1 of 1
LOGGED BY	EK	CO-ORDINATES	712,536.88 E 726,860.16 N
		DATE STARTED	08/08/2018
		DATE COMPLETED	08/08/2018
CLIENT		GROUND LEVEL (m)	83.09
ENGINEER	DBFL Consulting Engineers	EXCAVATION METHOD	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Firm to stiff MADE GROUND in a gravelly clay matrix with a low cobble content. Contains brick fragments and tiles. Cobbles are less than 200mm and rounded to sub-rounded.		0.30	82.79		AA94901	B	1.00		
					AA94902	B	2.00		
Firm to stiff greyish brown gravelly CLAY with a low cobble content. Cobbles are angular to sub-angular and less than 200mm in size. (Possibly made ground).		2.30	80.79						
End of Trial Pit at 2.80m		2.80	80.29		AA94903	B	2.70		

1.0
2.0
3.0
4.0

Groundwater Conditions

Stability
Good

General Remarks
Pit terminated due to very slow progress

IGSL TP LOG 21167.GPJ IGSL.GDT 15/8/18

TRIAL PIT RECORD

REPORT NUMBER 21167

CONTRACT	Beech House, Scholarstown	**TRIAL PIT NO.**	**TP06**
		SHEET	Sheet 1 of 1
LOGGED BY	EK	**CO-ORDINATES**	712,333.26 E 726,830.99 N
		DATE STARTED	07/08/2018
		DATE COMPLETED	07/08/2018
CLIENT		**GROUND LEVEL (m)**	86.08
ENGINEER	DBFL Consulting Engineers	**EXCAVATION METHOD**	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Firm to stiff brown slightly gravelly SILT/CLAY		0.30	85.78						
1.0 Firm to stiff greyish brown slightly gravelly CLAY with a low cobble content and rare shells. Cobbles are sub-angular to sub-rounded and less than 300mm.		1.00	85.08		AA81273	B	1.00		
2.0					AA81274	B	2.00		
Firm to stiff grey slightly gravelly CLAY eith a low cobble content. Cobbles are sun-angular to sub-rounded and less than 300mm.		2.40	83.68						
End of Trial Pit at 2.50m		2.50	83.58		AA81275	B	2.50		
3.0									
4.0									

Groundwater Conditions

Stability
Good

General Remarks
Pit terminated due to very slow progress

IGSL TP LOG 21167.GPJ IGSL.GDT 15/8/18

TRIAL PIT RECORD

REPORT NUMBER 21167

CONTRACT	Beech House, Scholarstown	**TRIAL PIT NO.**	**TP07**
		SHEET	Sheet 1 of 1
LOGGED BY	EK	**CO-ORDINATES**	712,385.49 E 726,811.90 N
		DATE STARTED	07/08/2018
		DATE COMPLETED	07/08/2018
CLIENT		**GROUND LEVEL (m)**	85.82
ENGINEER	DBFL Consulting Engineers	**EXCAVATION METHOD**	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.30	85.52						
Firm to stiff greyish brown gravelly CLAY with a medium cobble content. Cobbles are angular to sub-angular and less than 300mm in size.					AA81276	B	1.00		
					AA81277	B	2.00		
End of Trial Pit at 2.50m		2.50	83.32						

1.0
2.0
3.0
4.0

Groundwater Conditions

Stability
Good

General Remarks
Pit terminated due to very slow progress

IGSL TP LOG 21167.GPJ IGSL.GDT 15/8/18

TRIAL PIT RECORD

REPORT NUMBER 21167

CONTRACT	Beech House, Scholarstown	**TRIAL PIT NO.**	**TP08**
		SHEET	Sheet 1 of 1
LOGGED BY	EK	**CO-ORDINATES**	712,455.10 E 726,802.32 N
		DATE STARTED	07/08/2018
		DATE COMPLETED	07/08/2018
CLIENT		**GROUND LEVEL (m)**	84.73
ENGINEER	DBFL Consulting Engineers	**EXCAVATION METHOD**	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.30	84.43						
Firm to stiff brown slightly gravelly CLAY with a medium cobble content and pockets of sand and gravel which are less than 10mm. Cobbles are sub-angular to sub-rounded and less than 300mm in size.					AA81278	B	1.00		
1.0									
2.0					AA81279	B	2.00		
End of Trial Pit at 2.50m		2.50	82.23						
3.0									
4.0									

Groundwater Conditions

Stability
Good

General Remarks
Pit terminated due to very slow progress

IGSL TP LOG 21167.GPJ IGSL.GDT 15/8/18

TRIAL PIT RECORD

REPORT NUMBER 21167

CONTRACT	Beech House, Scholarstown	**TRIAL PIT NO.**	**TP09**
		SHEET	Sheet 1 of 1
LOGGED BY	EK	**CO-ORDINATES**	712,394.71 E 726,888.26 N
		DATE STARTED	07/08/2018
		DATE COMPLETED	07/08/2018
CLIENT		**GROUND LEVEL (m)**	85.56
ENGINEER	DBFL Consulting Engineers	**EXCAVATION METHOD**	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL									
Firm to stiff brown slightly gravelly CLAY with a low cobble content. Cobbles are angular to sub-angular and less than 300mm.		0.30	85.26						
1.0					AA81271	B	1.10		
2.0					AA81272	B	2.10		
End of Trial Pit at 2.50m		2.50	83.06						
3.0									
4.0									

Groundwater Conditions

Stability
Good

General Remarks
Pit terminated due to very slow progress

TRIAL PIT RECORD

REPORT NUMBER 21167

CONTRACT	Beech House, Scholarstown	**TRIAL PIT NO.**	**TP10**
		SHEET	Sheet 1 of 1
LOGGED BY	EK	**CO-ORDINATES**	712,483.42 E 726,850.01 N
		DATE STARTED	07/08/2018
		DATE COMPLETED	07/08/2018
CLIENT		**GROUND LEVEL (m)**	84.38
ENGINEER	DBFL Consulting Engineers	**EXCAVATION METHOD**	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.30	84.08						
Firm to stiff brown slightly gravelly CLAY with a medium cobble content and a medium boulder content. Cobbles are angular to sub-angular and boulders are angular. Boulders are less than 400mm.					AA81286	B	0.30		
					AA81287	B	0.50		
1.0					AA81288	B	1.00		
2.0					AA81289	B	2.00		
End of Trial Pit at 2.50m		2.50	81.88						
3.0									
4.0									

Groundwater Conditions

Stability
Good

General Remarks
Pit terminated due to very slow progress

IGSL TP LOG 21167.GPJ IGSL.GDT 15/8/18

TRIAL PIT RECORD

REPORT NUMBER 21167

CONTRACT	Beech House, Scholarstown	**TRIAL PIT NO.**	**TP11**
		SHEET	Sheet 1 of 1
LOGGED BY	EK	**CO-ORDINATES**	712,498.97 E 726,906.05 N
		DATE STARTED	07/08/2018
		DATE COMPLETED	07/08/2018
CLIENT		**GROUND LEVEL (m)**	83.22
ENGINEER	DBFL Consulting Engineers	**EXCAVATION METHOD**	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (kPa)	Hand Penetrometer (kPa)
0.0 TOPSOIL		0.30	82.92						
Firm to stiff brown gravelly CLAY with a low cobble content. Cobbles are sub-angular to sub-rounded amd less than 200mm in size.					AA81282	B	1.00		
End of Trial Pit at 2.10m		2.10	81.12		AA81283	B	2.00		

1.0
2.0
3.0
4.0

Groundwater Conditions

Stability
Good

General Remarks
Pit terminated due to very slow progress

IGSL TP LOG 21167.GPJ IGSL.GDT 15/8/18

TRIAL PIT RECORD

REPORT NUMBER 21167

CONTRACT	Beech House, Scholarstown	**TRIAL PIT NO.**	**TP12**
		SHEET	Sheet 1 of 1
LOGGED BY	K. Kinsella	**CO-ORDINATES**	712,427.12 E 726,940.30 N
		DATE STARTED	10/08/2018
		DATE COMPLETED	10/08/2018
CLIENT		**GROUND LEVEL (m)**	83.88
ENGINEER	DBFL Consulting Engineers	**EXCAVATION METHOD**	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 Firm brown TOPSOIL with rootlets		0.15	83.73						
Firm brown/light brown sandy SILT/CLAY with occasional subangular to subrounded gravel		0.55	83.33		AA98926	B	0.40-0.50		
Firm to stiff brown sandy gravelly SILT/CLAY with occasional subrounded boulders up to 450mm, cobble content increases with depth					AA98927	B	1.00-1.10		
1.0									
2.0					AA98928	B	2.00-2.10		
End of Trial Pit at 2.80m		2.80	81.08						
3.0									
4.0									

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated due to very slow progress

IGSL TP LOG 21167.GPJ IGSL.GDT 15/8/18

TRIAL PIT RECORD

REPORT NUMBER 21167

CONTRACT	Beech House, Scholarstown	TRIAL PIT NO.	TP13
		SHEET	Sheet 1 of 1
LOGGED BY	EK	CO-ORDINATES	712,427.12 E 726,847.94 N
		DATE STARTED	07/08/2018
		DATE COMPLETED	07/08/2018
CLIENT		GROUND LEVEL (m)	85.23
ENGINEER	DBFL Consulting Engineers	EXCAVATION METHOD	

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	TOPSOIL									
	Firm to stiff brown gravelly CLAY with a low cobble content. Cobbles are sub-angular to sub-rounded amd less than 300mm in size.		0.30	84.93						
1.0						AA81280	B	1.00		
2.0						AA81281	B	2.00		
	End of Trial Pit at 2.60m		2.60	82.63						
3.0										
4.0										

Groundwater Conditions

Stability
Good

General Remarks
Pit terminated due to very slow progress

IGSL TP LOG 21167.GPJ IGSL.GDT 15/8/18

TRIAL PIT RECORD

REPORT NUMBER 21167

CONTRACT	Beech House, Scholarstown	TRIAL PIT NO.	TP14
		SHEET	Sheet 1 of 1
LOGGED BY	K. Kinsella	CO-ORDINATES	712,513.34 E 726,975.55 N
		DATE STARTED	10/08/2018
		DATE COMPLETED	10/08/2018
CLIENT		GROUND LEVEL (m)	81.03
ENGINEER	DBFL Consulting Engineers	EXCAVATION METHOD	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 Firm brown TOPSOIL with rootlets		0.10	80.93						
Firm brown sandy SILT/CLAY with occasional subangular to subrounded gravel					AA98923	B	0.50-0.60		
1.0 Stiff to firm brown sandy gravelly slightly cobbly SILT/CLAY with rare subangular to subrounded boulders up to 450mm, cobble content increases with depth.		1.05	79.98		AA98924	B	1.50-1.60		
2.0					AA98925	B	2.50-2.60		
End of Trial Pit at 2.75m		2.75	78.28						
3.0									
4.0									

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit terminated due to very slow progress

IGSL TP LOG 21167.GPJ IGSL.GDT 15/8/18

TRIAL PIT RECORD

REPORT NUMBER 21167

CONTRACT	Beech House, Scholarstown	TRIAL PIT NO.	TP15
		SHEET	Sheet 1 of 1
LOGGED BY	EK	CO-ORDINATES	712,528.38 E 726,918.79 N
		DATE STARTED	07/08/2018
		DATE COMPLETED	07/08/2018
CLIENT		GROUND LEVEL (m)	82.23
ENGINEER	DBFL Consulting Engineers	EXCAVATION METHOD	

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.30	81.93						
Firm to stiff brown slightly gravelly SILT/CLAY with a medium cobble content and a low boulder content. Cobbles and boulders are sub-angular to sub-rounded and less than 400mm in size.					AA81284	B	1.00		
					AA81285	B	2.00		
End of Trial Pit at 2.30m		2.30	79.93						

1.0
2.0
3.0
4.0

Groundwater Conditions

Stability
Good

General Remarks
Pit terminated due to very slow progress

IGSL TP LOG 21167.GPJ IGSL.GDT 15/8/18