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Site Specific Flood Risk Assessment

Strategic Housing Development

Frankfort Castle, Old Frankfort, Dundrum, Dublin 14

Client: Pembroke Partnership Limited

Job No. H081

August 2021

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SITE SPECIFIC FLOOD RISK ASSESSMENT

STRATEGIC HOUSING DEVELOPMENT

FRANKFORT CASTLE, OLD FRANKFORT, DUNDRUM, DUBLIN 14

CONTENTS

File Location: Job-H081\B_Documents\C_Civil\A_CS Reports\FRA\

BS 1192 FIELD	**H081-CSC-ZZ-XX-RP-C-0002-P3**

Job Ref.	Author	Reviewed By	Authorised By	Issue Date	Rev. No.
H081	FB	GF	NB	03.08.2021	P3
H081	DS	RFM	NB	16.04.2021	P2
H081	AB	NB	NB	21.12.2020	P1

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1.0 INTRODUCTION

Cronin & Sutton Consulting Engineers (CS Consulting) have been commissioned by Pembroke Partnership Limited to prepare a Site Specific Flood Risk Assessment for a proposed strategic housing development at Frankfort Castle, Old Frankfort, Dundrum, Dublin 14.

In preparing this report, CS Consulting has made reference to the following:

- Dún Laoghaire-Rathdown County Development Plan 2016–2022 (including Strategic Flood Risk Assessment)
- Greater Dublin Regional Code of Practice for Drainage Works
- Office of Public Works Flood Maps [accessed: 12/09/2019]
- The Planning System and Flood Risk Management: Guidelines for Planning Authorities 2009 (Flood Risk Management Guidelines)
- Geological Survey of Ireland Maps [accessed: 22/06/2021]
- Local Authority Drainage Records

The Flood Risk Assessment is to be read in conjunction with the engineering drawings and documents submitted by CS Consulting and with the various additional information submitted by the other members of the design team, as part of the Planning Submission.

2.0 SITE LOCATION AND PROPOSED DEVELOPMENT

2.1 Site Location

The site of the proposed development lies immediately east of Dundrum Road, approximately 750m to the north of Dundrum village centre in Dublin 14. The site has a total area of approx. 0.9ha and is located in the administrative jurisdiction of Dún Laoghaire-Rathdown County Council (DLRCC).

Figure 2-1 Site Location
(map data & imagery: EPA, OSM Contributors, Google)

The location of the proposed development site is shown in Figure 2-1 above; the indicative extents of the development site, as well as relevant elements of the surrounding road network, are shown in more detail in Figure 2-2.

The site is bounded to the north, south and east by existing residential properties and to the west by the Luas Green Line. The site has extensive

street frontage on Frankfort, on its eastern boundary and on Frankfort Court on its southern boundary.

Figure 2-2 Surrounding Elements and Road Network
(map data & imagery: NTA, OSM Contributors, Google)

2.2 Existing Land Use

The site of the proposed development is brownfield and comprises the existing properties of 97A Highfield Park, Dundrum, Dublin 14, D14 P710; 1 Frankfort Castle, Old Frankfort, Dublin 14, D14 HY03; 2 Frankfort Castle, Old Frankfort, Dublin 14, D14 DE72; and Frankfort Lodge, Old Frankfort, Dublin 14, D14 C9P2.

2.3 Proposed Development

The proposed development will consist of 115no. residential units comprising 45no. one-bed units and 70no. two-bed units. The proposed units will be accommodated in the partially retained Frankfort Castle building and in 3no. blocks with a maximum height of 5 storeys. The subject proposal also includes for the demolition of the existing 97A Highfield Park residence (192.5sqm) and for the demolition of annexe buildings associated with Frankfort Castle including Frankfort Lodge (368sqm).

Additional works proposed include the provision of a childcare facility (80sqm), car and cycle parking at surface and basement level, hard and soft landscaping, surface water drainage infrastructure and attenuation tank, and all associated site development and infrastructure works.

3.0 LEVEL OF SERVICE

There is an existing inherent risk of any flood event occurring during any given year. Typically, this likelihood of occurrence was traditionally expressed as a 1-in-100 chance of a 100 year storm event happening in any given year.

A less ambiguous expression of probability is the Annual Exceedance Probability (AEP), which may be defined as the probability of a flood event being exceeded in any given year. Therefore a 1-in-100-year event has a return period of 1% AEP flood event, similarly a 100% AEP can be expressed as a 1-in-1-year event.

The Planning System and Flood Risk Management, Guidelines for Planning Authorities (Flood Risk Management Guidelines), published in 2009 set out the best practice standards for flood risk assessment in Ireland. These are summarised in Table 1 below (Table 8.1 from Flood Risk Management Guidelines document).

Table 1 Summary of Level of Service – Flooding Source

Flooding Source	Drainage	River	Tidal/Coastal
Residential	1% AEP	0.1% AEP	0.1% AEP
Commercial	1% AEP	1% AEP	0.5% AEP
Water-compatible (docks, marinas)	-	>1% AEP	>0.5% AEP

Under these guidelines a proposed development site has first to be assessed to determine the flood zone category it falls under.

It is a requirement of Dún Laoghaire-Rathdown County Council, the *Greater Dublin Strategic Drainage Study* (DCC 2005), and the Flood Risk Management Guidelines that the predicted effects of climate change are

incorporated into any proposed design. Table 2 below indicates the predicted climate change variations.

Table 2 The predicted climate change variations

Design Category	Predicted Impact of Climate Change
Drainage	20% Increase in rainfall
Fluvial (River flows)	20% Increase in flood flow
Tidal / Coastal	Minimum Finished Floor Level 4.0 – 4.15m AOD

The flooding guidelines categorise the risks associated with flooding into three areas, Zone A, B & C. This categorisation is indicated below.

- **Zone A** – High Probability of Flooding. Where the average probability of flooding from rivers and sea is highest (greater than 1% annually or 1 in 100 for river flooding or 0.5% annually or 1 in 200 for coastal flooding).
- **Zone B** – Moderate Probability of Flooding. Where the average probability of flooding from rivers and sea is moderate (risk between 0.1% annually or 1 in 1000 years and 1% annually or 1 in 100 years for river flooding, and between 0.1% or 1 in 1000 years and 0.5% annually or 1 in 200 for coastal flooding).
- **Zone C** – Low Probability of Flooding. Where the probability of flooding from rivers and sea is moderate (risk is less than 0.1% annually or 1 in 1000 years for both rivers and coastal flooding).

In accordance with the Flood Risk Management Guidelines, dwellings are classified as 'highly vulnerable developments'.

Following a review of the DLRCC flood maps, the subject site is located in **Flood Zone C**. See **Appendix A**.

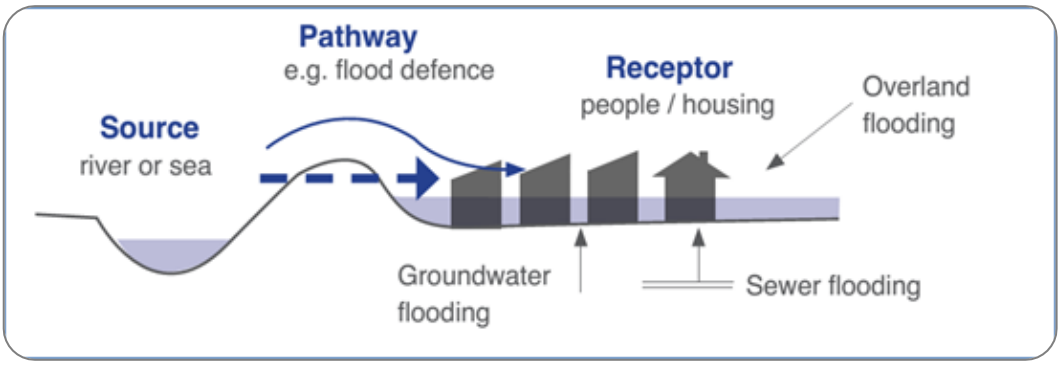

Figure 3-1 Source-pathway-receptor model
(The Planning System and Flood Risk Management Guidelines)

The Flood Risk Management Guidelines have developed an 'appropriateness' matrix for various developments and their potential risk factor. The table indicates if further analysis is required in the form of a justification test. Table 3 below outlines the conditions that require a justification test.

Table 3 Flood Zone Vs Justification Test Matrix

	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable Development	***Justification Test***	***Justification Test***	Appropriate
Less Vulnerable Development	***Justification Test***	Appropriate	Appropriate
Water-compatible Development	Appropriate	Appropriate	Appropriate

As noted above the subject site is located within **Flood Zone C**, as such a justification test is not required.

4.0 FLOOD RISK & MITIGATION MEASURES

4.1 Fluvial Flooding

The site is located approximately 137m from the Slang River (also known as the Dundrum Slang or the Dundrum River) to the east of the development. A review of the Office of Public Works flood maps database, www.floodmaps.ie, for the area does not indicate historical flooding at the site. See the OPW Map-report included in **Appendix B**.

Recent modelling of the area as part of the *Dodder Catchment Flood Risk Assessment and Management* Mapping, CFRMA, project indicates that the subject site is deemed to be located outside of the 0.1% AEP fluvial floodplain, based on the currently available maps, see **Appendix C**. Although the subject site is outside of a flood zone, areas of fluvial flood risk exist along the Slang river both upstream and downstream of the subject site. The minimum finished floor level of the proposed development shall be 45.10mOD, whereas the predicted floodwater levels closest to the subject site for a 0.1% AEP fluvial flooding event (as modelled by the CFRAM study) vary between 39.72mOD (node DSS1_3450) and 41.22mOD (node DSS1_3227).

The risk of fluvial flooding impacting upon the subject development is therefore negligible, even during a 1-in-1000-year flooding event, and no mitigation measures are required.

4.2 Tidal Flooding

The site's location is such that it is not affected by tidal water bodies and as such the risk of tidal flooding is negligible.

4.3 Pluvial Flooding

The proposed development will be required to drain all surface water into the existing surface water sewers surrounding the site. Pluvial flooding is flooding which has originated from overland flow resulting from high intensity rain fall. Previous flood events in the area can be reviewed on the Office of Public Works web site (www.floodmaps.ie). The historical flood mapping does not indicate flood events in the area. See **Appendix B**.

4.4 Potential for Proposed Development to Contribute to Off-Site Flooding

The proposed development will include an attenuation system. The attenuation tank has been sized for a 1-in-100-year extreme storm event, increased by 20% for the predicted effects of climate change. The attenuation will release the storm water in a controlled manner after the peak storm duration has passed. By restricting the flow, the likelihood of the proposed development adversely affecting the public drainage system or contributing to downstream flooding is mitigated.

An attenuation storage volume of 343m^3 is required to ensure that stormwater runoff from the development does not exceed the greenfield rate for the site. The relevant calculations, as well as a more detailed description of the proposed attenuation system, are given in the accompanying Engineering Services Report.

4.5 Existing Off Site Drainage

It is the understanding of CS Consulting that at present there are no issues with the local drainage arrangements. The Greater Dublin Strategic Drainage Study, GDSDS, maps do not indicate any hydraulic issue on the public drainage network. See **Appendix D** for GDSDS Map. However, the subject lands will only discharge a restricted flow into the public system

thereby reducing the hydraulic pressure on the public network during extreme rainfall events.

4.6 Groundwater Flooding

According to the Geological Survey of Ireland, GSI, interactive maps, the subject site is underlain with *Dark limestone & shale*. The area is listed as overlaying a locally important aquifer which has bedrock which is *moderately productive only in local zones*. The groundwater vulnerability assessment of the site shows that the vulnerability of groundwater in the area is *low*. The proposed development will not increase the potential for groundwater flooding as such the risk is deemed acceptable. See **Appendix E** for GSI mapping information for background groundwater & geology data for the subject lands.

5.0 RESPONSE TO AN BORD PLEANÁLA OPINION

An Bord Pleanála has in February 2020 issued an opinion enumerating the items of specific information that should be submitted with any application for permission. The following items among these are of relevance to this Flood Risk Assessment Report:

9. *Additional detail in relation to Flood Risk, having regard to the report of the Drainage Division of the Planning Authority (dated 16th January 2020), namely the need to provide a surcharge analysis of the surface water drainage system and details of safe overland flow routes.*

Windes Microdrainage Analysis, including a surcharging analysis of 50% blockage (as requested by the DLRCC Drainage Planning Section), has been conducted and is provided as **Appendix F** to this report.

At the request of DLRCC, further details showing the safe overland flow routes, corresponding to the storm sewer surcharge scenario described above, are shown on CS Consulting drawing no. **H081-CSC-XX-XX-DR-C-0022** in **Appendix G**.

6.0 CONCLUSION

- The proposed development site historically has no recorded flood events, as noted in the OPW's historical flood maps.
- Predicted flood mapping for pluvial / tidal & Fluvial flood events will not affect the proposed development site.
- The permitted development will have a storm water attenuation system to address a 1 in 100 year extreme storm events increased by 20% for predicted climate change values. This will significantly reduce the volume of storm water leaving the site during extreme storms, which in turn will have the effect of reducing the pressure on the existing public drainage system.
- The likelihood of onsite flooding from the hydrogeological ground conditions are deemed to be minor and within acceptable levels.
- Surcharge analysis of surface water demonstrates that in the event of a potential network system blockage of 50% occurring, no adverse flooding effects are anticipated on the proposed development site; and
- Details illustrating overland storm flow routes are indicated.

Appendix A

DLRCC Flood Maps

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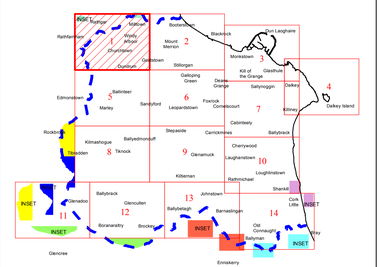
dlr
Comhairle Contae County Council
Planning and Organisational Innovation Department

COMHAIRLE CHONTAE DHÚN LAOGHAIRE-RÁTH AN DÚIN

DÚN LAOGHAIRE-RATHDOWN COUNTY COUNCIL

Flood Zone Maps



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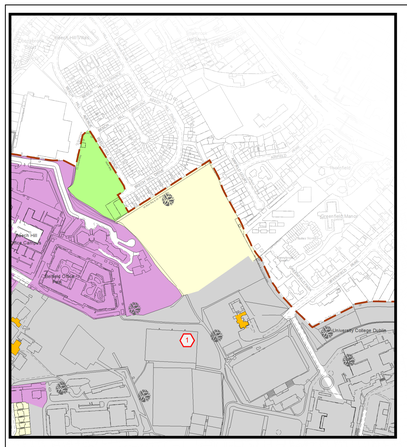

INSET ADJOINING MAP No. 1

Hotspots

Hotspots Predicted

Flood Zone A

Flood Zone B

County Boundary

0 0.1 0.2 0.3 0.4 0.5
Kilometres

Planning and Organisational Innovation

M Henchy
Director

dlr Comhairle Contae County Council

Flood Zone Maps

Senior Planner:	D. Irvine	Acting Chief Technician:	M. Hevehan
Prepared By:	Louise McGauran	Drawn By:	B. Mwenelupembe
Date: March 2016	Scale: 1:5,000	Map No.	MAP1

Appendix B

OPW Historic Flood Maps

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OPW National Flood Hazard Mapping

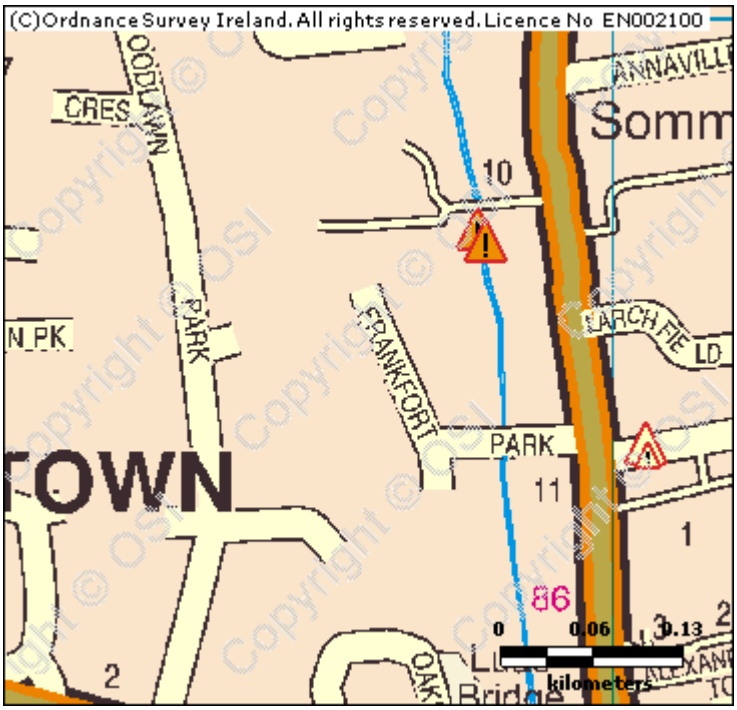
Summary Local Area Report

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

The map centre is in:

County: Dublin

NGR: O 168 287



Map Scale 1:5,229

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.

52 Results

1. Dodder 24th Oct 2011 Waldron's Br — Start Date: 24/Oct/2011
County: Dublin — Flood Quality Code:2
Additional Information: Reports (1) More Mapped Information

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

3. Dodder Dartry Cottages Nov 2000 — Start Date: 05/Nov/2000
County: Dublin — Flood Quality Code:3
Additional Information: Reports (3) More Mapped Information

4. Dodder Classon's Bridge Nov 2000 — Start Date: 05/Nov/2000
County: Dublin — Flood Quality Code:3
Additional Information: Reports (1) More Mapped Information

5. Dodder August 1905 — Start Date: 24/Aug/1905
County: Dublin — Flood Quality Code:3

Additional Information: Reports (4) Press Archive (4) More Mapped Information

---

6. Dodder November 1901 — Start Date: 10/Nov/1901
County: Dublin — Flood Quality Code:3

Additional Information: Reports (2) More Mapped Information

---

7. Dodder Sept 1931 — Start Date: 03/Sep/1931
County: Dublin — Flood Quality Code:3

Additional Information: Reports (7) Press Archive (3) More Mapped Information

---

8. Dodder November 1915 — Start Date: 11/Nov/1915
County: Dublin — Flood Quality Code:3

Additional Information: Reports (3) More Mapped Information

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9. Dodder Oct 1880 — Start Date: 27/Oct/1880
County: Dublin — Flood Quality Code:3

Additional Information: Reports (2) More Mapped Information

---

10. Dodder October 1891 — Start Date: 19/Oct/1891
County: Dublin — Flood Quality Code:3

Additional Information: Reports (3) More Mapped Information

---

11. Dodder September 1883 — Start Date: 03/Sep/1883
County: Dublin — Flood Quality Code:3

Additional Information: Reports (2) More Mapped Information

---

12. Dodder Lr Dodder Road Orwell Gardens Dec 1958 — Start Date: 18/Dec/1958
County: Dublin — Flood Quality Code:3

Additional Information: Reports (7) More Mapped Information

---

13. Dodder December 1956 — Start Date: 29/Dec/1956
County: Dublin — Flood Quality Code:3

Additional Information: Reports (2) More Mapped Information

---

14. Dodder November 1898 — Start Date: 23/Nov/1898
County: Dublin — Flood Quality Code:3

Additional Information: Reports (2) More Mapped Information

---

15. Dodder August 1946 — Start Date: 11/Aug/1946
County: Dublin — Flood Quality Code:3

Additional Information: Reports (6) Press Archive (2) More Mapped Information

---

16. Dodder November 1968 — Start Date: 02/Nov/1968
County: Dublin — Flood Quality Code:3

Additional Information: Reports (2) More Mapped Information

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17. Dodder August 1912 — Start Date: 26/Aug/1912
County: Dublin — Flood Quality Code:3

Additional Information: Reports (4) More Mapped Information

---

18. Dodder October 1886 — Start Date: 16/Oct/1886
County: Dublin — Flood Quality Code:3

Additional Information: Reports (3) Press Archive (2) More Mapped Information

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19. Dodder Sept 1957
Start Date: 24/Sep/1957
County: Dublin
Flood Quality Code:3
Additional Information: Reports (5) More Mapped Information

20. Slang Frankfort August 1986
Start Date: 25/Aug/1986
County: Dublin
Flood Quality Code:3
Additional Information: Reports (1) More Mapped Information

21. Little Dargle Grange Road Nov 1982
Start Date: 07/Nov/1982
County: Dublin
Flood Quality Code:3
Additional Information: Reports (1) More Mapped Information

22. Little Dargle Feb 1958
Start Date: 10/Feb/1958
County: Dublin
Flood Quality Code:3
Additional Information: Reports (2) More Mapped Information

23. Little Dargle Sept 1957
Start Date: 24/Sep/1957
County: Dublin
Flood Quality Code:3
Additional Information: Reports (3) More Mapped Information

24. Little Dargle Dec 1956
Start Date: 25/Dec/1956
County: Dublin
Flood Quality Code:3
Additional Information: Reports (3) More Mapped Information

25. Little Dargle Sept 1931
Start Date: 03/Sep/1931
County: Dublin
Flood Quality Code:3
Additional Information: Reports (3) More Mapped Information

26. Nutley Elm Park Streams June 1963
Start Date: 11/Jun/1963
County: Dublin
Flood Quality Code:2
Additional Information: Photos (7) Reports (6) Press Archive (20) More Mapped Information

27. Rathgar June 1963
Start Date: 11/Jun/1963
County: Dublin
Flood Quality Code:3
Additional Information: Reports (3) Press Archive (2) More Mapped Information

28. Roebuck June 1963
Start Date: 11/Jun/1963
County: Dublin
Flood Quality Code:3
Additional Information: Reports (3) Press Archive (2) More Mapped Information

29. Dundrum June 1963
Start Date: 11/Jun/1963
County: Dublin
Flood Quality Code:3
Additional Information: Reports (3) Press Archive (8) More Mapped Information

30. Churchtown June 1963
Start Date: 11/Jun/1963
County: Dublin
Flood Quality Code:3
Additional Information: Reports (3) Press Archive (2) More Mapped Information

31. Dodder Lower Dodder Road Recurring
Start Date:
County: Dublin
Flood Quality Code:4
Additional Information: Reports (2) More Mapped Information

32. Flooding at Nutgrove Avenue, Rathfarnham, Dublin 14on 24th
Start Date: 24/Oct/2011

Oct 2011
County: Dublin
Flood Quality Code: 2

Additional Information: Reports (1) More Mapped Information

---

33. Flooding at Riverdale, Dundrum, Dublin 14 on 24th Oct 2011
Start Date: 24/Oct/2011
County: Dublin
Flood Quality Code: 2

Additional Information: Reports (1) More Mapped Information

---

34. Flooding at Milltown, Dublin 6 on 24th Oct 2011
Start Date: 24/Oct/2011
County: Dublin
Flood Quality Code: 2

Additional Information: Reports (1) More Mapped Information

---

35. Flooding at Dundrum, Dublin 14 on 24th Oct 2011
Start Date: 24/Oct/2011
County: Dublin
Flood Quality Code: 2

Additional Information: Reports (1) More Mapped Information

---

36. Flooding at Willow Bank Apartments, Sandyford Rd, Dublin 14 on 24th Oct 2011
Start Date: 24/Oct/2011
County: Dublin
Flood Quality Code: 2

Additional Information: Reports (1) More Mapped Information

---

37. Flooding at Dundrum Shopping Centre and Taney Cross, Co. Dublin on 24th Oct 2011
Start Date: 24/Oct/2011
County: Dublin
Flood Quality Code: 2

Additional Information: Reports (1) More Mapped Information

---

38. Dodder Dec 2003
Start Date: 02/Dec/2003
County: Dublin
Flood Quality Code: 4

Additional Information: Reports (1) More Mapped Information

---

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

Additional Information: Reports (1) More Mapped Information

---

40. Ashlawn Ballinteer Road June 1993
Start Date: 11/Jun/1993
County: Dublin
Flood Quality Code: 4

Additional Information: Reports (1) More Mapped Information

---

41. Pine Copse Road Ballinteer Nov 1982
Start Date: 05/Nov/1982
County: Dublin
Flood Quality Code: 3

Additional Information: Reports (1) More Mapped Information

---

42. Dodder Orwell Gardens Nov 1965
Start Date: 17/Nov/1965
County: Dublin
Flood Quality Code: 2

Additional Information: Photos (2) Reports (7) More Mapped Information

---

43. Willbrook Rathfarnham Dec 1958
Start Date: 16/Dec/1958
County: Dublin
Flood Quality Code: 4

Additional Information: Reports (1) More Mapped Information

---

44. Dundrum River Sept 1957
Start Date: 24/Sep/1957
County: Dublin
Flood Quality Code: 3

Additional Information: Reports (1) More Mapped Information

45. Larchfield Estate Recurring
Start Date:
County: Dublin
Flood Quality Code:3
Additional Information: Reports (5) More Mapped Information

46. Slang Old Ballinteer Road Recurring
Start Date:
County: Dublin
Flood Quality Code:3
Additional Information: Reports (3) More Mapped Information

47. Slang Pyelands Dundrum recurring1
Start Date:
County: Dublin
Flood Quality Code:3
Additional Information: Reports (1) More Mapped Information

48. Ludford Area Ballinteer Recurring
Start Date:
County: Dublin
Flood Quality Code:3
Additional Information: Reports (1) More Mapped Information

49. Old Railway line Dundrum recurring
Start Date:
County: Dublin
Flood Quality Code:3
Additional Information: Reports (5) More Mapped Information

50. Rosemount Dundrum Road Recurring
Start Date:
County: Dublin
Flood Quality Code:4
Additional Information: Reports (3) More Mapped Information

51. Manor Rise Recurring
Start Date:
County: Dublin
Flood Quality Code:4
Additional Information: Reports (2) More Mapped Information

52. Pine Copse Willow Road Recurring
Start Date:
County: Dublin
Flood Quality Code:4
Additional Information: Reports (2) More Mapped Information

Appendix C

CFRAM Maps

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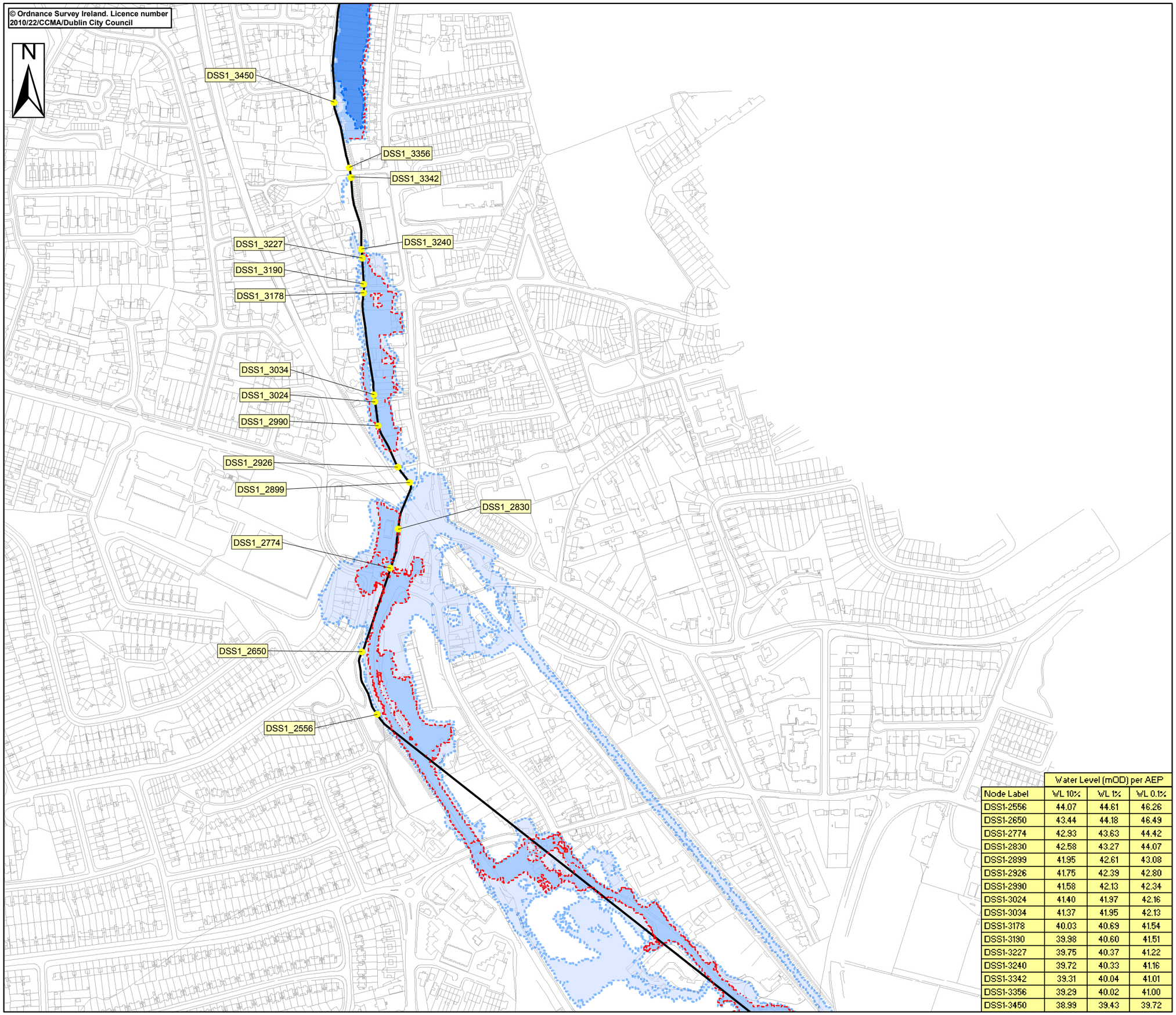
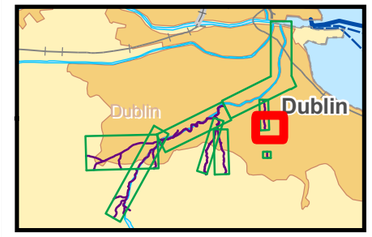


Node Label	Water Level (mOD) per AEP		
	WL 10%	WL 1%	WL 0.1%
DSS1-2556	44.07	44.61	46.26
DSS1-2650	43.44	44.18	46.49
DSS1-2774	42.93	43.63	44.42
DSS1-2830	42.58	43.27	44.07
DSS1-2899	41.95	42.61	43.08
DSS1-2926	41.75	42.39	42.80
DSS1-2990	41.58	42.13	42.34
DSS1-3024	41.40	41.97	42.16
DSS1-3034	41.37	41.95	42.13
DSS1-3178	40.03	40.69	41.54
DSS1-3190	39.98	40.60	41.51
DSS1-3227	39.75	40.37	41.22
DSS1-3240	39.72	40.33	41.16
DSS1-3342	39.31	40.04	41.01
DSS1-3356	39.29	40.02	41.00
DSS1-3450	38.99	39.43	39.72

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:

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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 DUNDRUM SLANG

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

DSS/EXT/UA/CURS/105

Map Series : Page 2 of 3

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

0 0.1 0.2
Kilometers

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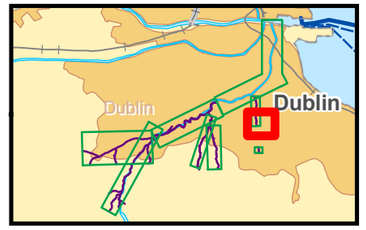
N

Location Plan:



Legend:

Depth Grid [m]

- 0 - 0.25 m
- 0.25 - 0.50 m
- 0.50 - 1.00 m
- 1.00 - 1.50 m
- 1.5 - 2.00 m
- > 2.00 m
- River Centreline

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:

DUNDRUM SLANG

Map Type:	DEPTH
Return Period:	1% AEP EVENT
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. :

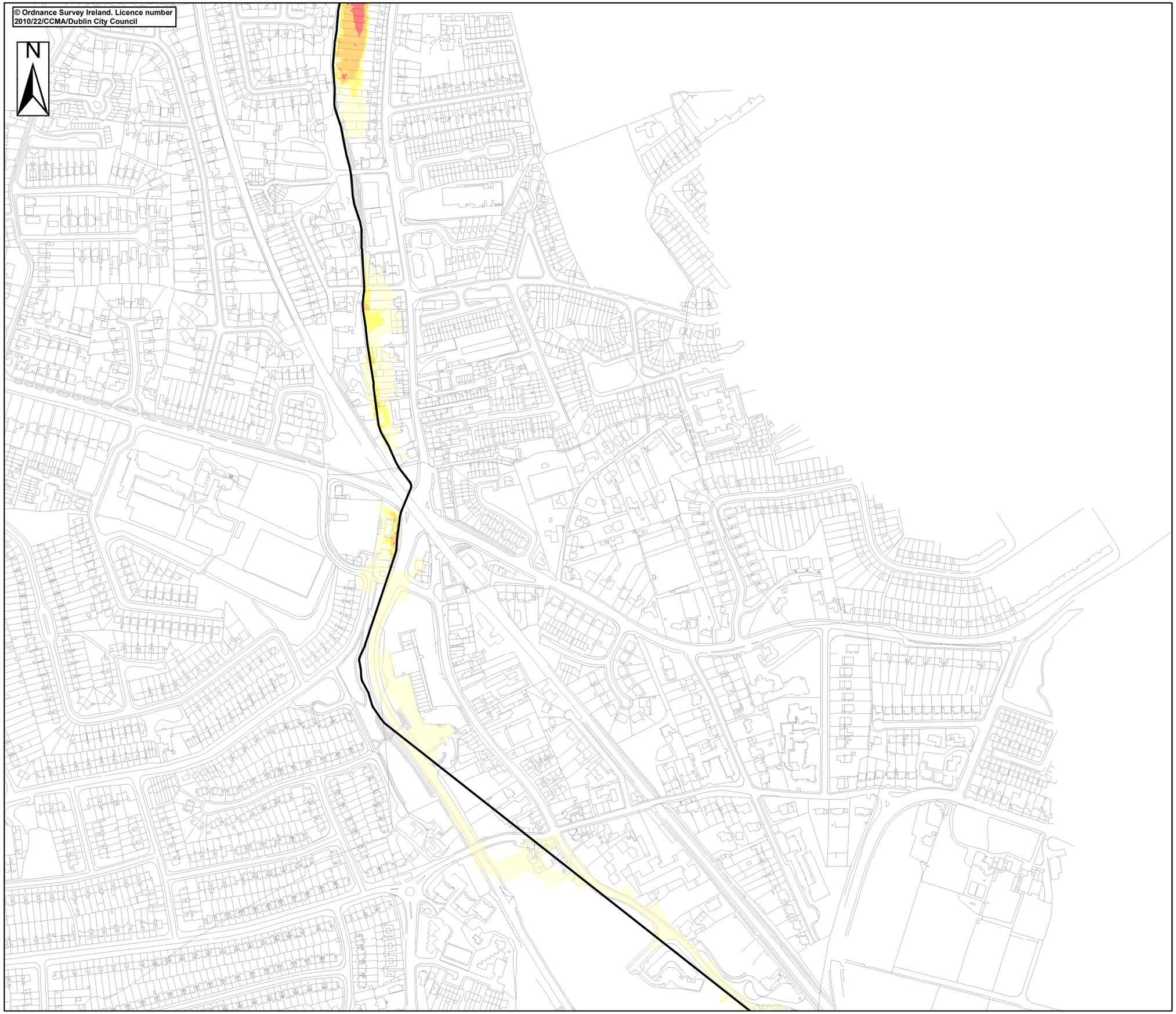
DSS/EXT/UA/DEP/100/105D

Map Series : Page 2 of 3

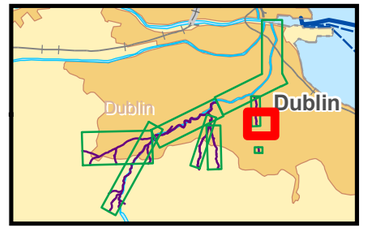
Drawing Scale : 1: 5,000 Plot Scale : 1:1 @ A3

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



Location Plan:



Legend:

Hazard

- Low - Caution
- Moderately dangerous for some
- Significant danger for most people
- Extreme Danger for all
- River Centreline

USER NOTE:

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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:

DUNDRUM SLANG

Map Type:	HAZARD
Return Period:	1% AEP EVENT
Source:	FLUVIAL FLOODING
Map Area:	URBAN AREA
Scenario:	CURRENT
Drawn By :	A.G. Date : 26 November 2010
Checked By :	A.J. Date : 26 November 2010
Approved By :	A.G.B Date : 26 November 2010

Figure No. :

DSS/EXT/UA/HAZ/100/105F

Map Series : Page 2 of 3

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

0 0.1 0.2
Kilometers

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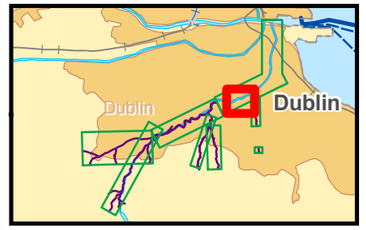
BELFAST BT12 6RZ
TEL : 028 9066 7914
FAX : 028 9066 8286
www.rpsgroup.com/Ireland

N

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)

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:

FUTURE MAPPING - DUNDRUM SLANG

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

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. :

DSS/EXT/UA/FUTURE/IBE0064_105

Map Series : Page 2 of 3

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

0 0.1 0.2
Kilometers

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Appendix D

GDSDS & Council Drainage Records

CS CONSULTING
GROUP

DUN LAOGHAIRE - RATHDOWN COUNTY COUNCIL

DODDER VALLEY (DLRCC) CATCHMENT (F006)

DODDER VALLEY (DLRCC) CATCHMENT (F006)

CHURCHTOWN

DUNDRUM

WINDY ARBOUR

BRAEMOR ROAD

CHURCHTOWN ROAD LOWER

SLANG RIVER

DUNDRUM RD

NUTGROVE AVENUE

BARTON ROAD EAST

BEAUMONT AVENUE

TANEY ROAD

HP11

Drains to Dodder Valley (DLRCC) Catchment (F006)

Legend

- County Council Boundaries
- Clonskeagh & Kimmage Catchment Boundaries
- R&P Catchment Boundary
- Pipe from SUS database
- River/Watercourse
- Culverted River/Watercourse
- Direction of Flow (on sewer line)
- 1:1000 OS Grid Line Boundaries
- 1:5000 OS Grid Line Boundaries
- Combined Sewer Overflow
- Foul/Combined Bifurcation
- Foul/Combined Apex Manhole
- Foul/Combined Flow Management Chamber

Flooding Performance Key

- Flooding greater than 25m3 volume for 5yr Return Period Event (Volume m3)
- Flooding less than 25m3 volume for 5yr Return Period Event (Volume m3)
- Modelled Manhole does not flood for 5 year Return Period Event
- All Historically Reported Flooding Incidents caused by Hydraulic Overloading

Foul/Combined Hydraulic Performance Key

- Foul/Combined Sewer floods for 30 year return period or less
- Foul/Combined Sewer surcharges for 1 or 2 year return period events
- Foul/Combined Sewer does not surcharge for 1 or 2 year return period events and does not flood for a 30 year return period event or below (e.g 1,2,5,10,20)

Important Hydraulic Considerations

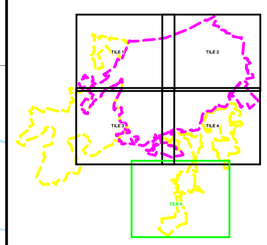
- Location of Known Basements
- Assumed Location of Basements
- Key Hydraulic Problem Areas
- Other Hydraulic Problem Areas
- Environmental Problem Areas
- HP1 — Hydraulic Problem Area Reference No.
- EP1 — Environmental Problem Area Reference No.
- SCD1 — Structural Deficiency Reference No.
- OP1 — Operational Deficiency Reference No.
- GEN1 — General Deficiency Reference No.

Structural Condition Assessment (Previously Reported/Graded Defects)

- Structural Condition - Grade 5
- Structural Condition - Grade 4

New Developments

- Residential Development
- Commercial Development
- Mixed Development
- Industrial Development



Project: GREATER DUBLIN STRATEGIC DRAINAGE STUDY

Catchment: Rathmines and Pembroke (High-Level) Catchment

Title: Phase 3 - 2031 Sysytem Performance Assessment

Drg. No.: GDSDS/MAR3079/F005/P3-003/ TILE 5

Dublin Drainage — A Strategic Study for Greater Dublin

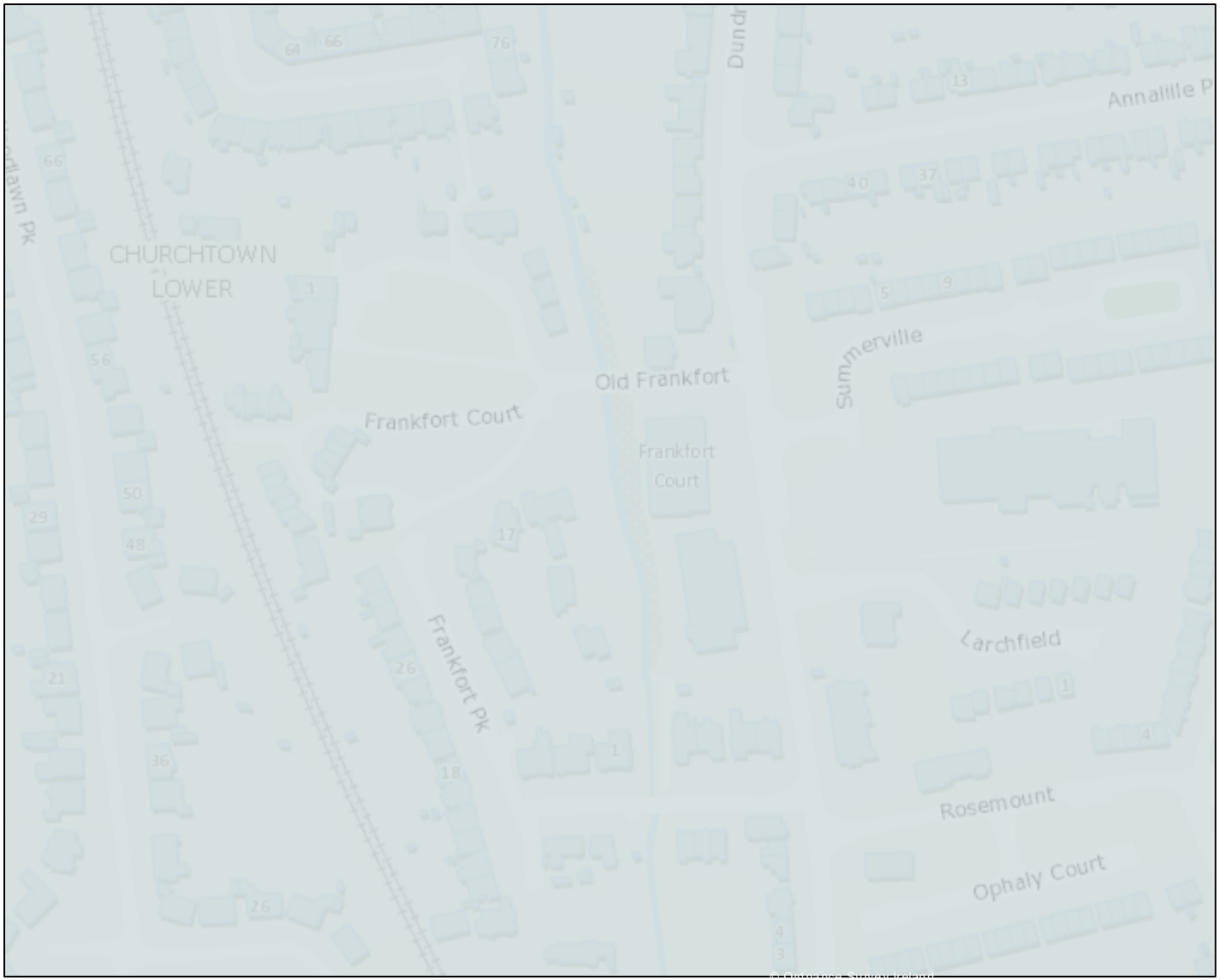
Drawn	KR	Chk'd	HUC
Approved	HUC		
Scale	N.T.S.	REVISION	A
Date	28.05.04		

Appendix E

GSI Hydrogeology & Geological Maps

CS CONSULTING
GROUP

Geological Survey Ireland Public Data



Scale: 1:2,500

Geological Survey Ireland

PSI Licence

0 0.0175 0.035 0.07 mi

0 0.0275 0.055 0.11 km

Map Centre Coordinates (ITM) 716,834 728,857

8/16/2019, 11:55:53 AM

Legend

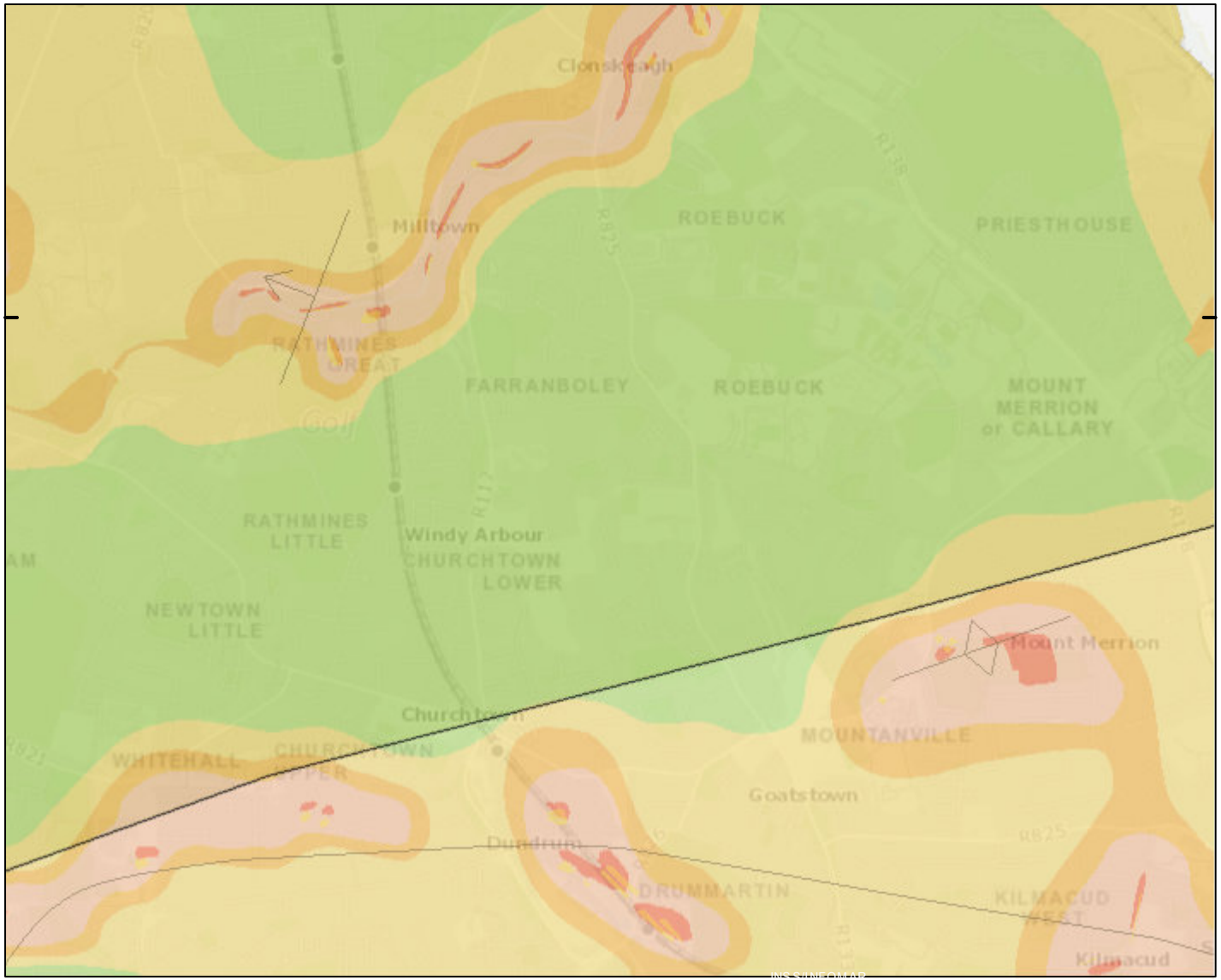
Structural Symbols 100K ITM 2018

- <all other values>
- Dip of bedding or main foliation, old GSI data
- First foliation parallel to bedding
- Foliation trend, Thorr and Rosses Granites
- Horizontal Bedding
- Strike and dip of bedding, right way up
- Strike and dip of bedding, way up unknown
- Strike and dip of first foliation
- Strike and dip of overturned bedding
- Strike and dip of second foliation
- Strike and dip of third foliation
- Strike and plunge of first generation fold axis
- Strike and plunge of second generation fold axis
- Strike and plunge of third generation fold axis
- Strike of vertical bedding/foliation
- Strike of vertical first foliation
- Bedrock Outcrops 100 ITM 2018

Bedrock Linework 100k ITM 2018

- Anticlinal Axis
- Antiformal axis
- Aquifer Boundary
- Area
- Coal seam
- Dyke
- Fault
- Ghost Line
- Goniatite marine band (R1-R4)
- Lithological boundary offshore
- Metadolerite sheet, mainly sills
- Paleogene/ Tertiary Dyke
- Synclinal Axis
- Synformal axis
- Tectonic Slide, barbs on hanging-wall
- Thin stratigraphical unit, diagrammatic
- Thrust, barbs on hanging-wall side
- Tuff band
- Unconformity, dots on younger side
- X-Section

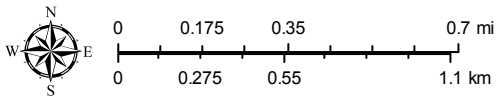
Geological Survey Ireland Public Data



Scale: 1:25,000

Geological Survey Ireland

PSI Licence



Map Centre Coordinates (ITM) 717,424 729,331

8/16/2019, 11:53:08 AM

Legend

Gravel Aquifer

- Locally important gravel aquifer
- Regionally important gravel aquifer
- Bedrock Aquifer Faults

Bedrock Aquifer

- Rkc - Regionally Important Aquifer - Karstified (conduit)
- Rkd - Regionally Important Aquifer - Karstified (diffuse)
- RK - Regionally Important Aquifer - Karstified
- Rf - Regionally Important Aquifer - Fissured bedrock
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Lk - Locally Important Aquifer - Karstified
- Ll - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Pl - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
- Pu - Poor Aquifer - Bedrock which is Generally Unproductive
- Lake

Bedrock Structure Symology

- Bedding or main foliation, old GSI data
- Contorted bedding or main foliation, old GSI data
- First foliation parallel to bedding
- Foliation trend, Thorr and Rosses Granite
- Horizontal Bedding
- Horizontal first generation fold axis
- Horizontal second generation fold axis
- Strike and Dip of Bedding, right way up
- Strike and Dip of Bedding, way up unknown
- Strike and Dip of First Foliation
- Strike and Dip of Foliation
- Strike and Dip of Second Foliation
- Strike and Dip of overturned Bedding
- Strike and plunge of first generation fold axis
- Strike and plunge of second generation fold axis
- Strike and plunge of third generation fold axis
- Strike of Shear fabric
- Strike of vertical Bedding
- Strike of vertical First Foliation

Appendix F

Microdrainage Analysis (50% Network Blockage)

CS CONSULTING
GROUP

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	5	Add Flow / Climate Change (%)	0
M5-60 (mm)	18.000	Minimum Backdrop Height (m)	0.000
Ratio R	0.277	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	500	Min Design Depth for Optimisation (m)	0.000
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500
PIMP (%)	80		

Designed with Level Inverts

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
S1.000	22.163	0.111	199.7	0.102	5.00	0.0	0.600	o	300
S1.001	2.986	0.015	199.1	0.009	0.00	0.0	0.600	o	300
S2.000	21.158	0.106	199.6	0.027	5.00	0.0	0.600	o	300
S1.002	18.299	0.091	201.1	0.029	0.00	0.0	0.600	o	300
S1.003	17.034	0.085	200.4	0.026	0.00	0.0	0.600	o	300
S3.000	18.110	0.091	199.0	0.037	5.00	0.0	0.600	o	300
S3.001	24.113	0.121	199.3	0.014	0.00	0.0	0.600	o	300
S1.004	5.972	0.020	298.6	0.018	0.00	0.0	0.600	o	300
S1.005	8.874	0.044	201.7	0.010	0.00	0.0	0.600	o	300
S1.006	8.041	0.040	201.0	0.011	0.00	0.0	0.600	o	300
S4.000	6.831	0.034	200.9	0.090	5.00	0.0	0.600	o	300
S1.007	8.609	0.043	200.2	0.010	0.00	0.0	0.600	o	300

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	66.01	5.33	43.990	0.102	0.0	0.0	0.0	1.11	78.4	18.2
S1.001	65.81	5.38	43.879	0.111	0.0	0.0	0.0	1.11	78.5	19.8
S2.000	66.09	5.32	44.147	0.027	0.0	0.0	0.0	1.11	78.4	4.9
S1.002	64.56	5.65	43.864	0.167	0.0	0.0	0.0	1.11	78.1	29.2
S1.003	63.45	5.91	43.773	0.193	0.0	0.0	0.0	1.11	78.2	33.1
S3.000	66.30	5.27	43.500	0.037	0.0	0.0	0.0	1.11	78.5	6.6
S3.001	64.64	5.63	42.500	0.050	0.0	0.0	0.0	1.11	78.5	8.8
S1.004	62.98	6.02	42.379	0.261	0.0	0.0	0.0	0.90	63.9	44.5
S1.005	62.43	6.15	42.359	0.270	0.0	0.0	0.0	1.10	78.0	45.7
S1.006	61.95	6.28	42.315	0.281	0.0	0.0	0.0	1.11	78.1	47.2
S4.000	67.11	5.10	43.967	0.090	0.0	0.0	0.0	1.11	78.1	16.4
S1.007	61.43	6.41	42.275	0.381	0.0	0.0	0.0	1.11	78.3	63.4

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
S1.008	5.576	0.028	199.1	0.000	0.00	0.0	0.600	o	375
S1.009	30.309	0.152	199.4	0.034	0.00	0.0	0.600	o	375
S1.010	16.972	0.085	199.7	0.046	0.00	0.0	0.600	o	225
S1.011	16.360	0.082	199.5	0.000	0.00	0.0	0.600	o	225
S1.012	14.552	0.073	200.0	0.000	0.00	0.0	0.600	o	225
S1.013	5.992	0.030	200.0	0.000	0.00	0.0	0.600	o	225
S1.014	14.934	0.075	200.0	0.000	0.00	0.0	0.600	o	225

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.008	61.15	6.48	42.232	0.381	0.0	0.0	0.0	1.28	141.4	63.4
S1.009	59.67	6.87	42.204	0.415	0.0	0.0	0.0	1.28	141.3	67.1
S1.010	66.14	5.31	42.052	0.000	2.6	0.0	0.0	0.92	36.6	2.6
S1.011	64.78	5.60	41.867	0.000	2.6	0.0	0.0	0.92	36.7	2.6
S1.012	63.63	5.87	41.785	0.000	2.6	0.0	0.0	0.92	36.6	2.6
S1.013	63.18	5.97	41.712	0.000	2.6	0.0	0.0	0.92	36.6	2.6
S1.014	62.07	6.24	41.682	0.000	2.6	0.0	0.0	0.92	36.6	2.6

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SMH8A	45.000	1.010	Open Manhole	1200	S1.000	43.990	300				
SMH8	45.000	1.121	Open Manhole	1200	S1.001	43.879	300	S1.000	43.879	300	
SMH11	45.000	0.853	Open Manhole	1200	S2.000	44.147	300				
SMH12	45.000	1.136	Open Manhole	1200	S1.002	43.864	300	S1.001	43.864	300	
								S2.000	44.041	300	177
SMH15	45.000	1.227	Open Manhole	1200	S1.003	43.773	300	S1.002	43.773	300	
SMH19	45.000	1.500	Open Manhole	1200	S3.000	43.500	300				
SMH20	45.000	2.500	Open Manhole	1200	S3.001	42.500	300	S3.000	43.409	300	909
SMH21	45.000	2.621	Open Manhole	1200	S1.004	42.379	300	S1.003	43.688	300	1309
								S3.001	42.379	300	
SMH22	45.000	2.641	Open Manhole	1200	S1.005	42.359	300	S1.004	42.359	300	
SMH23	45.000	2.685	Open Manhole	1200	S1.006	42.315	300	S1.005	42.315	300	
SMH28	45.000	1.033	Open Manhole	1200	S4.000	43.967	300				
SMH29	45.000	2.725	Open Manhole	1200	S1.007	42.275	300	S1.006	42.275	300	
								S4.000	43.933	300	1658
SMH30	45.000	2.768	Open Manhole	1350	S1.008	42.232	375	S1.007	42.232	300	
SMH31	45.000	2.796	Open Manhole	1350	S1.009	42.204	375	S1.008	42.204	375	
SMH32	45.000	2.948	Open Manhole	1350	S1.010	42.052	225	S1.009	42.052	375	
SMH33	45.000	3.133	Open Manhole	1200	S1.011	41.867	225	S1.010	41.967	225	100
SMH34	43.800	2.015	Open Manhole	1200	S1.012	41.785	225	S1.011	41.785	225	
SMH35	42.800	1.088	Open Manhole	1200	S1.013	41.712	225	S1.012	41.712	225	
SMH36	42.700	1.018	Open Manhole	1200	S1.014	41.682	225	S1.013	41.682	225	
S	42.600	0.992	Open Manhole	0		OUTFALL		S1.014	41.608	225	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	300	SMH8A	45.000	43.990	0.710	Open Manhole	1200
S1.001	o	300	SMH8	45.000	43.879	0.821	Open Manhole	1200
S2.000	o	300	SMH11	45.000	44.147	0.553	Open Manhole	1200
S1.002	o	300	SMH12	45.000	43.864	0.836	Open Manhole	1200
S1.003	o	300	SMH15	45.000	43.773	0.927	Open Manhole	1200
S3.000	o	300	SMH19	45.000	43.500	1.200	Open Manhole	1200
S3.001	o	300	SMH20	45.000	42.500	2.200	Open Manhole	1200
S1.004	o	300	SMH21	45.000	42.379	2.321	Open Manhole	1200
S1.005	o	300	SMH22	45.000	42.359	2.341	Open Manhole	1200
S1.006	o	300	SMH23	45.000	42.315	2.385	Open Manhole	1200
S4.000	o	300	SMH28	45.000	43.967	0.733	Open Manhole	1200
S1.007	o	300	SMH29	45.000	42.275	2.425	Open Manhole	1200
S1.008	o	375	SMH30	45.000	42.232	2.393	Open Manhole	1350
S1.009	o	375	SMH31	45.000	42.204	2.421	Open Manhole	1350
S1.010	o	225	SMH32	45.000	42.052	2.723	Open Manhole	1350
S1.011	o	225	SMH33	45.000	41.867	2.908	Open Manhole	1200
S1.012	o	225	SMH34	43.800	41.785	1.790	Open Manhole	1200
S1.013	o	225	SMH35	42.800	41.712	0.863	Open Manhole	1200
S1.014	o	225	SMH36	42.700	41.682	0.793	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	22.163	199.7	SMH8	45.000	43.879	0.821	Open Manhole	1200
S1.001	2.986	199.1	SMH12	45.000	43.864	0.836	Open Manhole	1200
S2.000	21.158	199.6	SMH12	45.000	44.041	0.659	Open Manhole	1200
S1.002	18.299	201.1	SMH15	45.000	43.773	0.927	Open Manhole	1200
S1.003	17.034	200.4	SMH21	45.000	43.688	1.012	Open Manhole	1200
S3.000	18.110	199.0	SMH20	45.000	43.409	1.291	Open Manhole	1200
S3.001	24.113	199.3	SMH21	45.000	42.379	2.321	Open Manhole	1200
S1.004	5.972	298.6	SMH22	45.000	42.359	2.341	Open Manhole	1200
S1.005	8.874	201.7	SMH23	45.000	42.315	2.385	Open Manhole	1200
S1.006	8.041	201.0	SMH29	45.000	42.275	2.425	Open Manhole	1200
S4.000	6.831	200.9	SMH29	45.000	43.933	0.767	Open Manhole	1200
S1.007	8.609	200.2	SMH30	45.000	42.232	2.468	Open Manhole	1350
S1.008	5.576	199.1	SMH31	45.000	42.204	2.421	Open Manhole	1350
S1.009	30.309	199.4	SMH32	45.000	42.052	2.573	Open Manhole	1350
S1.010	16.972	199.7	SMH33	45.000	41.967	2.808	Open Manhole	1200
S1.011	16.360	199.5	SMH34	43.800	41.785	1.790	Open Manhole	1200
S1.012	14.552	200.0	SMH35	42.800	41.712	0.863	Open Manhole	1200
S1.013	5.992	200.0	SMH36	42.700	41.682	0.793	Open Manhole	1200
S1.014	14.934	200.0	S	42.600	41.608	0.767	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.102	0.102	0.102
1.001	-	-	100	0.009	0.009	0.009
2.000	-	-	80	0.034	0.027	0.027
1.002	-	-	80	0.036	0.029	0.029
1.003	-	-	80	0.032	0.026	0.026
3.000	-	-	80	0.046	0.037	0.037
3.001	-	-	80	0.017	0.014	0.014
1.004	-	-	80	0.022	0.018	0.018
1.005	-	-	80	0.012	0.010	0.010
1.006	-	-	80	0.014	0.011	0.011
4.000	-	-	100	0.090	0.090	0.090
1.007	-	-	80	0.012	0.010	0.010
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.034	0.034	0.034
1.010	-	-	80	0.058	0.046	0.046
1.011	-	-	80	0.000	0.000	0.000
1.012	-	-	80	0.000	0.000	0.000
1.013	-	-	80	0.000	0.000	0.000
1.014	-	-	80	0.000	0.000	0.000
				Total	Total	Total
				0.518	0.461	0.461

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.014	S	42.600	41.608	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	20.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0	Number of Offline Controls 0	Number of Time/Area Diagrams 0
Number of Online Controls 1	Number of Storage Structures 4	Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	15
Ratio R	0.277		

Online Controls for Storm

Hydro-Brake® Manhole: SMH32, DS/PN: S1.010, Volume (m³): 7.4

Design Head (m) 2.620 Hydro-Brake® Type Md14 Invert Level (m) 42.052
Design Flow (l/s) 2.6 Diameter (mm) 34

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.5	0.800	1.4	2.000	2.2	4.000	3.1	7.000	4.1
0.200	0.7	1.000	1.6	2.200	2.3	4.500	3.3	7.500	4.3
0.300	0.9	1.200	1.7	2.400	2.4	5.000	3.5	8.000	4.4
0.400	1.0	1.400	1.9	2.600	2.5	5.500	3.7	8.500	4.6
0.500	1.1	1.600	2.0	3.000	2.7	6.000	3.8	9.000	4.7
0.600	1.2	1.800	2.1	3.500	2.9	6.500	4.0	9.500	4.8

Summary of Results for 15 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SMH8A	44.219	-0.071	0.000	0.60	0.0	41.4	OK
S1.001	SMH8	44.174	-0.005	0.000	0.84	0.0	42.9	OK
S2.000	SMH11	44.230	-0.217	0.000	0.17	0.0	11.4	OK
S1.002	SMH12	44.160	-0.004	0.000	0.94	0.0	63.5	OK
S1.003	SMH15	44.076	0.003	0.000	1.08	0.0	72.1	SURCHARGED
S3.000	SMH19	43.598	-0.202	0.000	0.23	0.0	15.6	OK
S3.001	SMH20	42.813	0.013	0.000	0.29	0.0	20.4	SURCHARGED
S1.004	SMH21	42.806	0.127	0.000	1.36	0.0	60.4	SURCHARGED
S1.005	SMH22	42.782	0.123	0.000	1.03	0.0	61.3	SURCHARGED
S1.006	SMH23	42.771	0.156	0.000	0.85	0.0	49.9	SURCHARGED
S4.000	SMH28	44.151	-0.116	0.000	0.68	0.0	38.3	OK
S1.007	SMH29	42.770	0.195	0.000	1.34	0.0	79.3	SURCHARGED
S1.008	SMH30	42.769	0.162	0.000	0.56	0.0	49.5	SURCHARGED
S1.009	SMH31	42.769	0.190	0.000	0.44	0.0	55.2	SURCHARGED
S1.010	SMH32	42.767	0.490	0.000	0.04	0.0	1.3	SURCHARGED
S1.011	SMH33	41.896	-0.196	0.000	0.04	0.0	1.3	OK
S1.012	SMH34	41.814	-0.196	0.000	0.04	0.0	1.3	OK
S1.013	SMH35	41.744	-0.194	0.000	0.05	0.0	1.3	OK
S1.014	SMH36	41.711	-0.196	0.000	0.04	0.0	1.3	OK

Summary of Results for 30 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SMH8A	44.148	-0.142	0.000	0.51	0.0	35.6	OK
S1.001	SMH8	44.091	-0.088	0.000	0.75	0.0	38.4	OK
S2.000	SMH11	44.221	-0.226	0.000	0.14	0.0	9.5	OK
S1.002	SMH12	44.080	-0.084	0.000	0.86	0.0	57.6	OK
S1.003	SMH15	44.012	-0.061	0.000	0.99	0.0	66.2	OK
S3.000	SMH19	43.588	-0.212	0.000	0.19	0.0	12.9	OK
S3.001	SMH20	42.960	0.160	0.000	0.24	0.0	16.9	SURCHARGED
S1.004	SMH21	42.959	0.280	0.000	1.18	0.0	52.4	SURCHARGED
S1.005	SMH22	42.957	0.298	0.000	0.88	0.0	52.4	SURCHARGED
S1.006	SMH23	42.955	0.340	0.000	0.56	0.0	32.6	SURCHARGED
S4.000	SMH28	44.128	-0.139	0.000	0.56	0.0	31.6	OK
S1.007	SMH29	42.953	0.378	0.000	1.03	0.0	61.4	SURCHARGED
S1.008	SMH30	42.952	0.345	0.000	0.39	0.0	34.7	SURCHARGED
S1.009	SMH31	42.954	0.375	0.000	0.34	0.0	42.6	SURCHARGED
S1.010	SMH32	42.951	0.674	0.000	0.05	0.0	1.5	SURCHARGED
S1.011	SMH33	41.898	-0.194	0.000	0.05	0.0	1.5	OK
S1.012	SMH34	41.816	-0.194	0.000	0.05	0.0	1.5	OK
S1.013	SMH35	41.746	-0.192	0.000	0.05	0.0	1.5	OK
S1.014	SMH36	41.713	-0.194	0.000	0.05	0.0	1.5	OK

Summary of Results for 45 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SMH8A	44.124	-0.166	0.000	0.41	0.0	28.6	OK
S1.001	SMH8	44.057	-0.122	0.000	0.61	0.0	31.1	OK
S2.000	SMH11	44.213	-0.234	0.000	0.11	0.0	7.6	OK
S1.002	SMH12	44.049	-0.115	0.000	0.69	0.0	46.7	OK
S1.003	SMH15	43.978	-0.095	0.000	0.81	0.0	53.8	OK
S3.000	SMH19	43.578	-0.222	0.000	0.15	0.0	10.3	OK
S3.001	SMH20	43.067	0.267	0.000	0.19	0.0	13.3	SURCHARGED
S1.004	SMH21	43.067	0.388	0.000	0.84	0.0	37.5	SURCHARGED
S1.005	SMH22	43.066	0.407	0.000	0.63	0.0	37.8	SURCHARGED
S1.006	SMH23	43.064	0.449	0.000	0.37	0.0	21.8	SURCHARGED
S4.000	SMH28	44.108	-0.159	0.000	0.45	0.0	25.2	OK
S1.007	SMH29	43.063	0.488	0.000	0.79	0.0	46.7	SURCHARGED
S1.008	SMH30	43.062	0.455	0.000	0.28	0.0	24.7	SURCHARGED
S1.009	SMH31	43.061	0.482	0.000	0.26	0.0	32.0	SURCHARGED
S1.010	SMH32	43.060	0.783	0.000	0.05	0.0	1.6	SURCHARGED
S1.011	SMH33	41.899	-0.193	0.000	0.05	0.0	1.6	OK
S1.012	SMH34	41.817	-0.193	0.000	0.05	0.0	1.6	OK
S1.013	SMH35	41.747	-0.191	0.000	0.06	0.0	1.6	OK
S1.014	SMH36	41.714	-0.193	0.000	0.05	0.0	1.6	OK

Summary of Results for 60 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SMH8A	44.113	-0.177	0.000	0.35	0.0	24.2	OK
S1.001	SMH8	44.040	-0.139	0.000	0.52	0.0	26.4	OK
S2.000	SMH11	44.209	-0.238	0.000	0.09	0.0	6.4	OK
S1.002	SMH12	44.031	-0.133	0.000	0.59	0.0	39.7	OK
S1.003	SMH15	43.957	-0.116	0.000	0.69	0.0	45.9	OK
S3.000	SMH19	43.572	-0.228	0.000	0.13	0.0	8.7	OK
S3.001	SMH20	43.149	0.349	0.000	0.16	0.0	11.2	SURCHARGED
S1.004	SMH21	43.148	0.469	0.000	0.68	0.0	30.0	SURCHARGED
S1.005	SMH22	43.147	0.488	0.000	0.53	0.0	31.4	SURCHARGED
S1.006	SMH23	43.145	0.530	0.000	0.30	0.0	17.5	SURCHARGED
S4.000	SMH28	44.096	-0.171	0.000	0.38	0.0	21.4	OK
S1.007	SMH29	43.144	0.569	0.000	0.64	0.0	38.2	SURCHARGED
S1.008	SMH30	43.143	0.536	0.000	0.23	0.0	20.7	SURCHARGED
S1.009	SMH31	43.158	0.579	0.000	0.21	0.0	26.9	SURCHARGED
S1.010	SMH32	43.147	0.870	0.000	0.05	0.0	1.6	SURCHARGED
S1.011	SMH33	41.899	-0.193	0.000	0.05	0.0	1.6	OK
S1.012	SMH34	41.818	-0.192	0.000	0.05	0.0	1.6	OK
S1.013	SMH35	41.747	-0.190	0.000	0.06	0.0	1.6	OK
S1.014	SMH36	41.715	-0.193	0.000	0.05	0.0	1.6	OK

Summary of Results for 90 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SMH8A	44.097	-0.193	0.000	0.27	0.0	18.9	OK
S1.001	SMH8	44.016	-0.163	0.000	0.40	0.0	20.4	OK
S2.000	SMH11	44.200	-0.247	0.000	0.07	0.0	5.0	OK
S1.002	SMH12	44.007	-0.157	0.000	0.46	0.0	30.7	OK
S1.003	SMH15	43.930	-0.143	0.000	0.53	0.0	35.3	OK
S3.000	SMH19	43.564	-0.236	0.000	0.10	0.0	6.8	OK
S3.001	SMH20	43.266	0.466	0.000	0.13	0.0	8.7	SURCHARGED
S1.004	SMH21	43.266	0.587	0.000	0.53	0.0	23.6	SURCHARGED
S1.005	SMH22	43.265	0.606	0.000	0.42	0.0	24.8	SURCHARGED
S1.006	SMH23	43.264	0.649	0.000	0.23	0.0	13.5	SURCHARGED
S4.000	SMH28	44.079	-0.188	0.000	0.30	0.0	16.7	OK
S1.007	SMH29	43.263	0.688	0.000	0.51	0.0	30.4	SURCHARGED
S1.008	SMH30	43.262	0.655	0.000	0.18	0.0	16.3	SURCHARGED
S1.009	SMH31	43.269	0.690	0.000	0.17	0.0	21.4	SURCHARGED
S1.010	SMH32	43.260	0.983	0.000	0.05	0.0	1.7	SURCHARGED
S1.011	SMH33	41.900	-0.192	0.000	0.05	0.0	1.7	OK
S1.012	SMH34	41.818	-0.192	0.000	0.05	0.0	1.7	OK
S1.013	SMH35	41.748	-0.189	0.000	0.06	0.0	1.7	OK
S1.014	SMH36	41.716	-0.192	0.000	0.05	0.0	1.7	OK

Summary of Results for 120 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SMH8A	44.086	-0.204	0.000	0.23	0.0	15.6	OK
S1.001	SMH8	44.001	-0.178	0.000	0.33	0.0	17.0	OK
S2.000	SMH11	44.195	-0.252	0.000	0.06	0.0	4.2	OK
S1.002	SMH12	43.992	-0.172	0.000	0.38	0.0	25.5	OK
S1.003	SMH15	43.912	-0.161	0.000	0.44	0.0	29.4	OK
S3.000	SMH19	43.558	-0.242	0.000	0.08	0.0	5.6	OK
S3.001	SMH20	43.354	0.554	0.000	0.10	0.0	7.2	SURCHARGED
S1.004	SMH21	43.353	0.674	0.000	0.44	0.0	19.5	SURCHARGED
S1.005	SMH22	43.352	0.693	0.000	0.34	0.0	20.5	SURCHARGED
S1.006	SMH23	43.351	0.736	0.000	0.19	0.0	11.3	SURCHARGED
S4.000	SMH28	44.067	-0.200	0.000	0.25	0.0	13.8	OK
S1.007	SMH29	43.350	0.775	0.000	0.43	0.0	25.5	SURCHARGED
S1.008	SMH30	43.349	0.742	0.000	0.16	0.0	13.8	SURCHARGED
S1.009	SMH31	43.349	0.770	0.000	0.14	0.0	18.1	SURCHARGED
S1.010	SMH32	43.348	1.071	0.000	0.05	0.0	1.8	SURCHARGED
S1.011	SMH33	41.901	-0.191	0.000	0.05	0.0	1.8	OK
S1.012	SMH34	41.819	-0.191	0.000	0.06	0.0	1.8	OK
S1.013	SMH35	41.749	-0.188	0.000	0.06	0.0	1.8	OK
S1.014	SMH36	41.716	-0.191	0.000	0.06	0.0	1.8	OK

Summary of Results for 180 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SMH8A	44.074	-0.216	0.000	0.17	0.0	12.0	OK
S1.001	SMH8	43.984	-0.195	0.000	0.25	0.0	13.0	OK
S2.000	SMH11	44.188	-0.259	0.000	0.05	0.0	3.2	OK
S1.002	SMH12	43.974	-0.190	0.000	0.29	0.0	19.6	OK
S1.003	SMH15	43.893	-0.180	0.000	0.34	0.0	22.6	OK
S3.000	SMH19	43.549	-0.251	0.000	0.06	0.0	4.3	OK
S3.001	SMH20	43.487	0.687	0.000	0.08	0.0	5.6	SURCHARGED
S1.004	SMH21	43.487	0.808	0.000	0.34	0.0	15.3	SURCHARGED
S1.005	SMH22	43.487	0.828	0.000	0.27	0.0	16.1	SURCHARGED
S1.006	SMH23	43.486	0.871	0.000	0.15	0.0	8.8	SURCHARGED
S4.000	SMH28	44.055	-0.212	0.000	0.19	0.0	10.6	OK
S1.007	SMH29	43.485	0.910	0.000	0.34	0.0	20.0	SURCHARGED
S1.008	SMH30	43.484	0.877	0.000	0.12	0.0	10.9	SURCHARGED
S1.009	SMH31	43.483	0.904	0.000	0.11	0.0	14.3	SURCHARGED
S1.010	SMH32	43.482	1.205	0.000	0.06	0.0	1.9	SURCHARGED
S1.011	SMH33	41.902	-0.190	0.000	0.06	0.0	1.9	OK
S1.012	SMH34	41.820	-0.190	0.000	0.06	0.0	1.9	OK
S1.013	SMH35	41.750	-0.187	0.000	0.07	0.0	1.9	OK
S1.014	SMH36	41.717	-0.190	0.000	0.06	0.0	1.9	OK

Summary of Results for 240 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SMH8A	44.065	-0.225	0.000	0.14	0.0	9.8	OK
S1.001	SMH8	43.973	-0.206	0.000	0.21	0.0	10.7	OK
S2.000	SMH11	44.185	-0.262	0.000	0.04	0.0	2.6	OK
S1.002	SMH12	43.963	-0.201	0.000	0.24	0.0	16.1	OK
S1.003	SMH15	43.880	-0.193	0.000	0.28	0.0	18.6	OK
S3.000	SMH19	43.614	-0.186	0.000	0.05	0.0	3.5	OK
S3.001	SMH20	43.614	0.814	0.000	0.07	0.0	4.6	SURCHARGED
S1.004	SMH21	43.615	0.936	0.000	0.28	0.0	12.6	SURCHARGED
S1.005	SMH22	43.611	0.952	0.000	0.22	0.0	13.2	SURCHARGED
S1.006	SMH23	43.620	1.005	0.000	0.13	0.0	7.3	SURCHARGED
S4.000	SMH28	44.045	-0.222	0.000	0.15	0.0	8.7	OK
S1.007	SMH29	43.644	1.069	0.000	0.28	0.0	16.5	SURCHARGED
S1.008	SMH30	43.673	1.066	0.000	0.11	0.0	10.0	SURCHARGED
S1.009	SMH31	43.834	1.255	0.000	0.10	0.0	12.0	SURCHARGED
S1.010	SMH32	43.991	1.714	0.000	0.06	0.0	2.0	SURCHARGED
S1.011	SMH33	41.904	-0.188	0.000	0.06	0.0	2.0	OK
S1.012	SMH34	41.822	-0.188	0.000	0.06	0.0	2.0	OK
S1.013	SMH35	41.752	-0.185	0.000	0.07	0.0	2.0	OK
S1.014	SMH36	41.718	-0.189	0.000	0.06	0.0	2.0	OK

Summary of Results for 360 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SMH8A	44.055	-0.235	0.000	0.11	0.0	7.4	OK
S1.001	SMH8	43.959	-0.220	0.000	0.16	0.0	8.1	OK
S2.000	SMH11	44.180	-0.267	0.000	0.03	0.0	2.0	OK
S1.002	SMH12	43.949	-0.215	0.000	0.18	0.0	12.1	OK
S1.003	SMH15	43.866	-0.207	0.000	0.21	0.0	14.0	OK
S3.000	SMH19	43.775	-0.025	0.000	0.04	0.0	2.7	OK
S3.001	SMH20	43.775	0.975	0.000	0.05	0.0	3.4	SURCHARGED
S1.004	SMH21	43.775	1.096	0.000	0.22	0.0	9.7	SURCHARGED
S1.005	SMH22	43.781	1.122	0.000	0.17	0.0	10.1	SURCHARGED
S1.006	SMH23	43.816	1.201	0.000	-0.11	0.0	-6.6	SURCHARGED
S4.000	SMH28	44.035	-0.232	0.000	0.12	0.0	6.5	OK
S1.007	SMH29	43.889	1.314	0.000	0.21	0.0	12.7	SURCHARGED
S1.008	SMH30	43.970	1.363	0.000	-0.16	0.0	-14.3	SURCHARGED
S1.009	SMH31	44.161	1.582	0.000	0.10	0.0	12.1	SURCHARGED
S1.010	SMH32	44.357	2.080	0.000	0.06	0.0	2.1	SURCHARGED
S1.011	SMH33	41.906	-0.186	0.000	0.06	0.0	2.1	OK
S1.012	SMH34	41.822	-0.188	0.000	0.06	0.0	2.1	OK
S1.013	SMH35	41.753	-0.184	0.000	0.07	0.0	2.1	OK
S1.014	SMH36	41.720	-0.188	0.000	0.06	0.0	2.1	OK

Summary of Results for 720 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

WARNING: The analysis maybe unstable. Please see the method of analysis help for more details.

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SMH8A	44.040	-0.250	0.000	0.07	0.0	4.5	OK
S1.001	SMH8	44.015	-0.164	0.000	0.10	0.0	4.9	OK
S2.000	SMH11	44.172	-0.275	0.000	0.02	0.0	1.2	OK
S1.002	SMH12	44.014	-0.150	0.000	0.11	0.0	7.4	OK
S1.003	SMH15	44.012	-0.061	0.000	0.13	0.0	8.6	OK
S3.000	SMH19	44.011	0.211	0.000	0.02	0.0	1.6	SURCHARGED
S3.001	SMH20	44.010	1.210	0.000	0.03	0.0	2.1	SURCHARGED
S1.004	SMH21	44.010	1.331	0.000	0.14	0.0	6.1	SURCHARGED
S1.005	SMH22	44.023	1.364	0.000	0.11	0.0	6.4	SURCHARGED
S1.006	SMH23	44.065	1.450	0.000	0.08	0.0	4.6	SURCHARGED
S4.000	SMH28	44.320	0.053	0.000	0.07	0.0	4.0	SURCHARGED
S1.007	SMH29	44.286	1.711	0.000	0.14	0.0	8.1	SURCHARGED
S1.008	SMH30	44.511	1.904	0.000	0.10	0.0	9.2	SURCHARGED
S1.009	SMH31	44.374	1.795	1.071	0.05	0.0	6.2	FLOOD
S1.010	SMH32	44.653	2.376	0.233	0.08	0.0	2.6	FLOOD
S1.011	SMH33	41.907	-0.185	0.000	0.08	0.0	2.6	OK
S1.012	SMH34	41.824	-0.186	0.000	0.08	0.0	2.6	OK
S1.013	SMH35	41.755	-0.182	0.000	0.10	0.0	2.6	OK
S1.014	SMH36	41.721	-0.186	0.000	0.08	0.0	2.6	OK

Summary of Results for 1440 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

WARNING: The analysis maybe unstable. Please see the method of analysis help for more details.

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SMH8A	44.028	-0.262	0.000	0.04	0.0	2.8	OK
S1.001	SMH8	43.956	-0.223	0.000	0.06	0.0	3.0	OK
S2.000	SMH11	44.162	-0.285	0.000	0.01	0.0	0.7	OK
S1.002	SMH12	43.956	-0.208	0.000	0.07	0.0	4.5	OK
S1.003	SMH15	43.949	-0.124	0.000	0.08	0.0	5.2	OK
S3.000	SMH19	43.948	0.148	0.000	0.02	0.0	1.2	SURCHARGED
S3.001	SMH20	43.948	1.148	0.000	0.04	0.0	2.6	SURCHARGED
S1.004	SMH21	43.947	1.268	0.000	0.57	0.0	25.4	SURCHARGED
S1.005	SMH22	43.994	1.335	0.000	0.41	0.0	24.6	SURCHARGED
S1.006	SMH23	43.973	1.358	0.000	0.65	0.0	37.8	SURCHARGED
S4.000	SMH28	44.482	0.215	0.000	0.05	0.0	3.0	SURCHARGED
S1.007	SMH29	44.695	2.120	0.844	0.65	0.0	38.8	FLOOD
S1.008	SMH30	44.931	2.324	0.000	0.49	0.0	43.3	FLOOD RISK
S1.009	SMH31	45.003	2.424	20.860	0.37	0.0	46.0	FLOOD
S1.010	SMH32	47.185	4.908	2.048	0.07	0.0	2.1	FLOOD
S1.011	SMH33	41.907	-0.185	0.000	0.07	0.0	2.1	OK
S1.012	SMH34	41.824	-0.186	0.000	0.07	0.0	2.1	OK
S1.013	SMH35	41.754	-0.183	0.000	0.08	0.0	2.1	OK
S1.014	SMH36	41.721	-0.187	0.000	0.07	0.0	2.1	OK

Summary of Results for 2880 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

WARNING: The analysis maybe unstable. Please see the method of analysis help for more details.

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	SMH8A	44.022	-0.268	0.000	0.02	0.0	1.7	OK
S1.001	SMH8	43.916	-0.263	0.000	0.04	0.0	1.9	OK
S2.000	SMH11	44.156	-0.291	0.000	0.01	0.0	0.5	OK
S1.002	SMH12	43.903	-0.261	0.000	0.04	0.0	2.8	OK
S1.003	SMH15	43.846	-0.227	0.000	0.05	0.0	3.2	OK
S3.000	SMH19	43.840	0.040	0.000	0.01	0.0	0.8	SURCHARGED
S3.001	SMH20	43.839	1.039	0.000	0.03	0.0	2.2	SURCHARGED
S1.004	SMH21	43.838	1.159	0.000	0.55	0.0	24.5	SURCHARGED
S1.005	SMH22	43.836	1.177	0.000	0.41	0.0	24.3	SURCHARGED
S1.006	SMH23	43.876	1.261	0.000	0.66	0.0	38.3	SURCHARGED
S4.000	SMH28	44.050	-0.217	0.000	0.05	0.0	2.5	OK
S1.007	SMH29	43.899	1.324	0.000	0.58	0.0	34.7	SURCHARGED
S1.008	SMH30	43.810	1.203	0.000	0.49	0.0	43.6	SURCHARGED
S1.009	SMH31	44.640	2.061	5.236	0.41	0.0	51.5	FLOOD
S1.010	SMH32	44.729	2.452	0.564	0.06	0.0	2.1	FLOOD
S1.011	SMH33	41.907	-0.185	0.000	0.06	0.0	2.1	OK
S1.012	SMH34	41.824	-0.186	0.000	0.07	0.0	2.1	OK
S1.013	SMH35	41.753	-0.185	0.000	0.08	0.0	2.1	OK
S1.014	SMH36	41.720	-0.187	0.000	0.07	0.0	2.1	OK

Appendix G

Overland Storm Overflow Routes

CS CONSULTING
GROUP

LEGEND:

OVERLAND FLOOD ROUTE

MANHOLES FLOODING WITH A 50% BLOCKAGE/STORM SURGE SCENARIO

N

SWMH8A CL: 45.000 IL: 43.990

SWMH8 CL: 45.000 IL: 43.879

SWMH12 CL: 45.000 IL: 43.864

SWMH11 CL: 45.000 IL: 44.147

SC10 CL: 45.000 IL: 44.183

SC16 CL: 45.000 IL: 44.250

SC17 CL: 45.000 IL: 44.135

SC18 CL: 45.000 IL: 44.106

SWMH19 CL: 45.000 IL: 43.500

SWMH20 CL: 45.000 IL: 42.500

SWMH15 CL: 45.000 IL: 43.773

SC7 CL: 45.000 IL: 44.250

SC8 CL: 45.000 IL: 44.250

SC24 CL: 45.000 IL: 44.000

SC27 CL: 45.000 IL: 44.135

SWMH28 CL: 45.000 IL: 43.967

SWMH23 CL: 45.000 IL: 42.315

SWMH21 CL: 45.000 IL: 42.379

SWMH22 CL: 45.000 IL: 42.359

SWMH29 CL: 45.000 IL: 42.275

SWMH30 CL: 45.000 IL: 42.232

SWMH31 CL: 45.000 IL: 42.204

SC25 CL: 45.000 IL: 44.032

SC24 CL: 45.000 IL: 44.250

SC IL: 43.000

SWMH36 CL: 42.700 IL: 41.682

SWMH35 CL: 42.800 IL: 41.712

SWMH37 CL: 42.600 IL: 41.608

SWMH32 HYDROBRAKE MANHOLE LIMITING FLOW TO 4.6L/SEC CL: 45.000 IL: 42.052

SWMH33 CL: 43.750 IL: 41.867

SWMH34 CL: 43.800 IL: 41.785

BIO RETENTION AREA AREA=23m² SEE DRG. No. H081-020 FOR DETAILS

ORIFICE PLATE ON OUTLET LIMITING FLOW TO 0.5L/SEC. SEE DRG. No. H081-020 FOR DETAILS

STORMWATER ATTENUATION SYSTEM VOLUME=100m³ IL: 42.379 TWL: 44.525

STORMWATER ATTENUATION SYSTEM VOLUME=60m³ IL: 42.315 TWL: 44.494

STORMWATER ATTENUATION SYSTEM VOLUME=60m³ IL: 42.232 TWL: 44.435

STORMWATER ATTENUATION SYSTEM VOLUME=123m³ IL: 42.052 TWL: 44.435

PETROL INTERCEPTOR

BLOCK A

BLOCK B

BLOCK C

BLOCK D

FFL+45.100

FFL+43.300

FFL+42.700

FFL 45.131 ex

STOP

ACO CHANNEL

EV

5.600m EXCLUSION ZONE

225mmø @ 1:200

300mmø @ 1:200

100mmø @ 1:200

150mmø uPVC PERMEABLE PAVING OVERFLOW PIPE

EXISTING 225mmø uPVC SW SEWER

EXISTING 225mmø uPVC FOUL SEWER

7804 EX. SWMH CL: 45.630 IL: 44.800

7809 EX. SWMH CL: 45.650 IL: 44.500

7812 EX. FWMH CL: 45.550 IL: 44.560

7806 EX. FWMH CL: 46.040 IL: 44.250

8805 EX. SWMH CL: 45.330 IL: 43.700

8803 EX. SWMH CL: 43.550 IL: 42.050

8807 EX. SWMH CL: 42.080 IL: 40.900

EXISTING OUTFALL TO DUNDRUM RIVER IL: 38.520m

CONNECT TO NEW MANHOLE ON EXISTING 225mmø SURFACE WATER SEWER. INVERT LEVEL TO BE CONFIRMED BY CONTRACTOR PRIOR TO COMMENCEMENT OF ANY WORKS

Job No.H081

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Rev. No.	Date	REVISION NOTE	Drn. By	Chkd. By

Architect	OMP
Project	Proposed Residential Development at Frankfort Castle.
Title	Overland Flood Routes
Dwg. No.	H081-CSC-XX-RF-DR-C-0022

Date	Drn by	Chkd by	Aprvd by	Scale	Revision
FEB 2021	DD	NB	NB	1:250 @A1	

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