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**PROPOSED RESIDENTIAL DEVELOPMENT  
AT THE CLOISTER,  
HILLHOUSE, LUCAN ROAD  
LUCAN, CO DUBLIN.  
K78 R5P6**

**ENGINEERING SERVICES &  
DRAINAGE DESIGN REPORT**

Prepared by GK, Consulting

Engineers Date: July 2022



## INTRODUCTION

GK Consulting Engineers have undertaken a detailed assessment of proposed foul & surface water drainage & water supply infrastructure, associated with the proposed new residential development on the Cloister site, Lucan Road. The proposed development comprises of a 4-storey structure. The existing site area is circa 1800m<sup>2</sup>. The proposed development provides residential accommodation over four floors. The site is accessed from the front via Lucan Road.

It is proposed to outfall the foul sewer to the existing 225 mm foul network serving Lucan Heights. Surface water runoff is collected entirely onsite to an infiltration trench, designed in accordance with the requirements of BRE Digest 365, subject to source control management, attenuation & treatment. A site infiltration test has been carried out by IGSL.

## EXISTING SITE SERVICES LOCAL AUTHORITY NETWORKS

Referring to Irish Water drainage maps, the existing site is serviced the following site infrastructure.

### Foul Sewer

There is an existing 300mm diameter unknown foul sewer & manhole on the Lucan Road and 225 mm diameter foul sewer & manhole serving Lucan Heights .

### Surface water

There is existing 225mm diameter surface water sewer on Lucan Road. It is proposed to percolate surface water runoff entirely on site.

### Watermain

There is an existing 4" upvc water main serving Lucan Heights.

## PERCOLATION TEST

A surface water percolation test was carried out by IGSL. The report is attached to the appendix. IGSL have reported, the site has a moderate percolation rate of 6.19E-06 m/s. A calculation has been carried out for a SUDs infiltration trench in accordance with BRE 365. The infiltration trench satisfies the requirement to ½ empty in 24 hours.

## WATER DEMAND

Reference is made to Irish Water Code of Practice for Water Infrastructure. Section 3.7.3, Average domestic daily demand in a development can be established based on daily per-capita consumption, house occupancy, number of properties, etc. For design purposes the average daily domestic demand shall be based on a per-capita consumption of 150 l/person/day and an average occupancy ratio of 2.7 persons per



dwelling unit. The average day/peak week demand should be taken as 1.25 times the average daily domestic demand.

Based on the Architects schedule of accommodation.

Number of Apartment units = 21

Average daily demand =  $21 \times 150 \times 2.7 = 8500$  litres

Peak daily demand =  $1.25 \times 8500 = 10630$  litres

Based on a 10hr day =  $10630 / (10 \times 60 \times 60) = 0.3$  l/s

## FOUL DRAINAGE

The foul drainage layout is indicated on Site Layout Drawing C101. The sewer discharges by gravity via an onsite 150/225 mm diameter pipe to the existing public sewer on the lane serving Lucan Heights.

The pipe materials and gradients are chosen to ensure self-cleaning velocities (i.e. between approximately 0.75 and 1.8 m/sec) at flows greater than approximately 1/8 of the pipe bore.

The Upvc pipe grade is ultrarib solid wall SN8 classification.

### ESTIMATION OF FOUL WATER FLOWS

Foul Water flow based on IS EN 752 Discharge Units (DU):

Based on the values of Table C2 of IS EN 752:

WCs:	36 No. x 1.8 =	64.8
WHBs:	36 No. x 0.3 =	10.8
Showers without plug:	15No. x 0.4 =	6
bath:	21No. x 1.3 =	27.3
Kitchen sink	21No. x 1.3 =	27.3
dishwasher	21No. x 0.2 =	4.2
Washing machine	21No. x 1.2 =	25.2





Total:		165.6 D.U.
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From table C1 of IS EN 752, the frequency factor,  $k_{cu}$ , is 0.5.

Therefore, the wastewater design flow is:  $Q = 0.5 \times \sqrt{47} = 6.44 \text{ l/s}$

The foul pipe network for the site is designed for 6.5 l/s based on the discharge unit method. This is within the capacity of the receiving public sewer system.

The onsite network will utilise 150mm & 225mm diameter uPVC pipes at a minimum fall of 1:50

Allowable foul flow at 75 % of proportional depth for 150mm diameter pipes at min. gradient of 1:50 = 20 l/s.

Pipe sizes, gradients, invert and cover levels and connection to public sewers are shown on drawing C101 Site Drainage Layout

All connections will be in accordance with the requirements of Irish Water and the recommendations of IW Code of Practice for wastewater infrastructure.

## **WATER SUPPLY**

A new water supply with an approved bulk water meter will be provided to the proposed development. The connection will be made in accordance with the requirements of Irish Water. Details are provided on drawing C101.

The peak water demand has been calculated as 10630 l/day

To ensure adequate water pressure to each apartment, we propose to install a 10000 litre balancing tank & booster pumps, fed from the mains at ground level.

## **SURFACE WATER**

A site percolation test was carried out by IGSL to verify the suitability of the site for onsite percolation. The site has a moderate percolation rate of  $6.19E-06 \text{ m/s}$ . An onsite infiltration trench is proposed with an overflow to the public surface water sewer on the Lucan Road. The infiltration trench design has been carried out by Stormtech / Cubic M3. Details are provided below.

### SURFACE WATER PIPE NETWORK DESIGN

The system is designed in accordance with BS8301: 1985 British Standard Code of Practice for Building Drainage.

Check Pipe network design for a worst-case storm with 1:2 year return period.



The worst-case storm duration is when the storm duration equals the time of concentration of the system.

BS8301 8.8.3 (Wallingford Rational Method)

From drawings - effective impermeable area drained to surface water sewer is 1257m<sup>2</sup>

- Roof Runoff = 580m<sup>2</sup>
- Pavement Runoff = 357m<sup>2</sup>
- Footpath runoff = 320m<sup>2</sup>

Time of concentration = time of entry + (length of drain / full bore velocity of flow)

BS8301 8.8.4 ( c)

Time of entry for a two-year return period is 4 to 7 mins

For a flat catchments we take the longer time of 7 mins = 420 s

Taking an average velocity = 0.75m/s

Total length of drain picking up the development catchment = 150m approx

$$t = 420 + (150 / 0.75) = 620s \quad t = 10.50 \text{ mins}$$

Referring to published Met office rainfall data:

Closest data is for storm duration of 15 mins with a two-year return period,

Rainfall = 7.0mm per 15min period

$$= 28.0 \text{ mm per hour}$$

$$Q = A_p \times i \times C_v \times C_r \times 2.78 \quad (\text{area drained by section of network } 1257\text{m}^2)$$

$$Q = 1257 \times 28.0 \times 1.3 \times .8 \times 2.78$$

$$Q = 10.3\text{l/s}$$



## Extreme Rainfall Return Periods

Location: Dublin City Centre  
Average Annual Rainfall: 751

Maximum rainfall (mm) of indicated duration expected in the indicated return period.

Duration	Return Period (years)								
	1/2	1	2	5	10	20	30	50	100
1 min				1.8	2.1	2.5	2.8	3.1	3.6
2 min				3.0	3.5	4.3	4.8	5.4	6.2
5 min				5.4	6.4	7.7	8.6	9.9	11.3
10 min				7.7	9.2	11.3	12.6	14.5	16.8
15 min	4.6	5.8	6.6	9.3	11.6	14.3	16.1	18.7	22
30 min	6.2	7.8	8.8	12.4	15.4	18.8	21.1	24	28
60 min	8.2	10.4	11.5	16.0	19.7	24	27	31	36
2 hour	11.0	13.6	15.3	20.5	25	30	33	37	43
4 hour	15.1	18.4	20.4	27	32	37	41	46	52
6 hour	18.1	22.2	24	32	37	44	48	53	61
12 hour	23.5	28	31	40	47	54	59	66	75
24 hour	29	35	38	49	57	66	71	79	89
48 hour	36	43	47	59	69	78	85	94	106
96 hour									

Notes: Larger margins of error for 1, 2, 5 and 10 minute values and for 100 year return periods  
M560: 16      M52d: 56      M560/m52d: 0.29

BS8301 8.8.2 design for rainfall intensity of 50mm/hr

$$\text{Outfall Flow} = [(1257 \times 50 / 1000) / (60 \times 60)] \times 1000 = 17.0 \text{ l/s}$$

*Summary*

**The surface water pipe network is designed to cater for an outfall of 17 l/s, per the requirements of BS8301 8.8.3**

The proposed surface water network utilises 150mm diameter UPVC pipes at a minimum fall of 1:100. The capacity of the proposed pipe is 22l/s

## SURFACE WATER INFILTRATION DESIGN

The infiltration design has been carried out by Stormtech using Micro drainage software to the following criteria

- Site Hard standing Area=1257m<sup>2</sup> (10% allowance for ponding)
- 1/100yr storm event
- Allowance for 20% climate change





Microstrain Ltd		Page 1
Unit B3	The Cloister, Lucan Rd	
Metropoint Business Park Swords Co. Dublin	100YRP+20% SOAKAWAY	
Date 02APR19	Designed by STORMTECH SC740	
File	Checked by LP	
XP Solutions	Source Control 2015.1	

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 1200 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Winter	0.347	0.347	0.4	20.8	O K
30 min Winter	0.471	0.471	0.4	28.3	O K
60 min Winter	0.595	0.595	0.4	35.7	O K
120 min Winter	0.727	0.727	0.4	43.6	O K
180 min Winter	0.804	0.804	0.4	48.3	O K
240 min Winter	0.859	0.859	0.4	51.6	O K
360 min Winter	0.932	0.932	0.4	55.9	O K
480 min Winter	0.978	0.978	0.4	58.7	O K
600 min Winter	1.009	1.009	0.4	60.5	O K
720 min Winter	1.029	1.029	0.4	61.7	O K
960 min Winter	1.050	1.050	0.4	63.0	O K
1440 min Winter	1.050	1.050	0.4	63.0	O K
2160 min Winter	1.025	1.025	0.4	61.8	O K
2880 min Winter	0.989	0.989	0.4	59.3	O K
4320 min Winter	0.904	0.904	0.4	54.2	O K
5760 min Winter	0.814	0.814	0.4	48.9	O K
7200 min Winter	0.726	0.726	0.4	43.6	O K
8640 min Winter	0.642	0.642	0.4	38.5	O K
10080 min Winter	0.563	0.563	0.4	33.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m <sup>3</sup> )	Time-Peak (mins)
15 min Winter	91.990	0.0	26
30 min Winter	62.656	0.0	41
60 min Winter	39.995	0.0	70
120 min Winter	24.904	0.0	128
180 min Winter	16.717	0.0	186
240 min Winter	13.262	0.0	244
360 min Winter	11.412	0.0	360
480 min Winter	9.274	0.0	476
600 min Winter	7.890	0.0	590
720 min Winter	6.918	0.0	704
960 min Winter	5.608	0.0	926
1440 min Winter	4.175	0.0	1340
2160 min Winter	3.107	0.0	1668
2880 min Winter	2.518	0.0	2196
4320 min Winter	1.870	0.0	3036
5760 min Winter	1.512	0.0	3926
7200 min Winter	1.289	0.0	4760
8640 min Winter	1.121	0.0	5616
10080 min Winter	1.000	0.0	6366

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Microstrain Ltd		Page 2
Unit B3	The Cloister, Lucan Rd	
Metropoint Business Park Swords Co. Dublin	100YRP+20% SOAKAWAY	
Date 02APR19	Designed by STORMTECH SC740	
File	Checked by LP	
XP Solutions	Source Control 2015.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
MS-60 (mm)	17.000	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	No	Climate Change %	+20


Time Area Diagram

Total Area (ha) 0.110

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
0	4	4	8	8	12
	0.037		0.037		0.037





Microstrain Ltd		Page 3			
Unit E3	The Cloister, Lucan Rd				
Metropoint Business Park	100YRP+20%				
Swords Co. Dublin	SOAKAWAY				
Date 02APR19	Designed by STORMTECH SC740				
File	Checked by LP				
XP Solutions	Source Control 2015.1				
<u>Model Details</u>					
Storage is Online Cover Level (m) 2.000					
<u>Cellular Storage Structure</u>					
Invert Level (m) 0.000 Safety Factor 2.0					
Infiltration Coefficient Base (m/hr) 0.02230 Porosity 0.60					
Infiltration Coefficient Side (m/hr) 0.02230					
<b>Depth (m)</b>	<b>Area (m<sup>2</sup>)</b>	<b>Inf. Area (m<sup>2</sup>)</b>	<b>Depth (m)</b>	<b>Area (m<sup>2</sup>)</b>	<b>Inf. Area (m<sup>2</sup>)</b>
0.000	100.0	100.0	1.200	0.0	145.1
1.100	100.0	145.1			
©1982-2015 XP Solutions					



## STORMTECH Stormwater Management System Design Tool

ver. Jan18

PROJECT REF:	R90321
PROJECT:	The Cloister, Lucan Rd
DATE:	02-Apr-19
CREATED BY:	Lukasz

### SYSTEM PARAMETERS

Required Total Storage	63 m <sup>3</sup>
Stormtech chamber model	SC740
Filtration Permeable Geo or Impermeable Geo	Filter geo
Number of Isolator Rows (IR)	1

### SITE PARAMETERS

Stone Porosity	43%	
Excavation Batter Angle (degrees)	90°	<i>Minimum Requirement</i>
Stone Above Chambers	0.15 m	0.15
Stone Below Chambers	0.15 m	0.15
In-between Row Spacing	0.15 m	0.15
Additional Storage outside Excavation E.g manholes, Header Pipe	0 m <sup>3</sup>	

### HEADER PIPE

Is Header pipe required within excavation	No
Orientation of Header Pipe	Parrallel to IR
Diameter of Header Pipe	0.6 m
Length of Header Pipe	0 m

### CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted
Number of Rows		5 ea
Number of units per Row		5 ea
System Installed Storage Depth (effective storage depth)	1.060	m
Tank overall installed Width at base	7.68	8 m
Tank overall installed Length at Base	11.55	12 m
<b>Total Effective System Storage</b>	<b>59.6</b>	<b>63.0 m<sup>3</sup></b>

### STORMTECH SYSTEM DETAIL

StormTech Chamber Model	SC740
Unit Width	1.295 m
Unit Length	2.17 m
Unit Height	0.76 m
Min Cover Over System	0.3 m
Max Cover Over Chamber	2.4 m
Chamber Internal Storage Vol.	1.3 m <sup>3</sup>
Header Pipe Internal Storage Vol in Excavation	0.0 m <sup>3</sup>

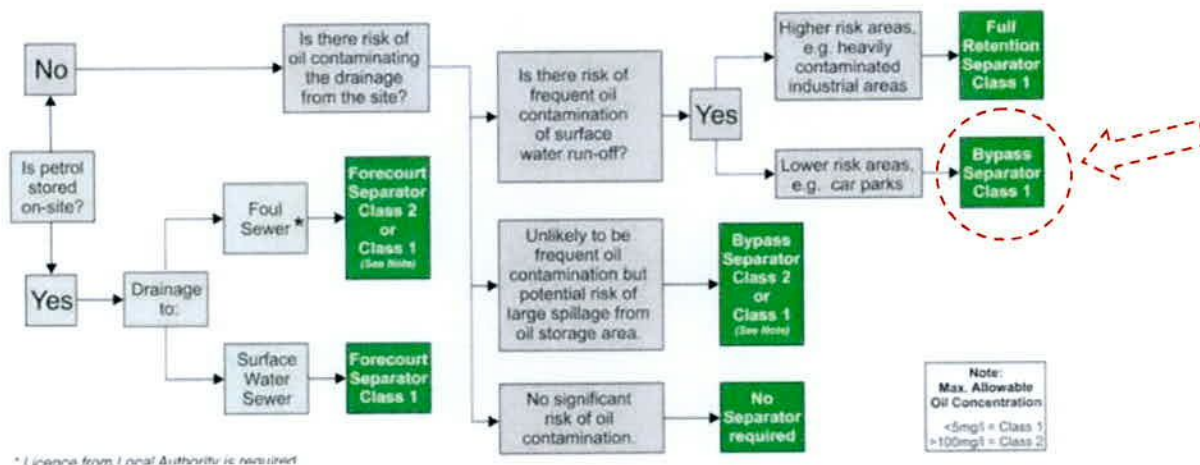
### STONE AND EXCAVATION DETAIL

Volume of Dig for System	102 m <sup>3</sup>
Width at base	8.00 m
Width at top	8.00 m
Length at base	12.00 m
Length at top	12.00 m
Depth Of System	1.06 m
Area of Dig at Base of System	96 m <sup>2</sup>
Area of Dig at Top of System	96 m <sup>2</sup>
Void Ratio	62%
Stone Requirement - m <sup>3</sup>	69 m <sup>3</sup>
Stone Requirement - tonne	112 tonne

## OIL WATER SEPARATOR

Referring to the Condor schematic below, the site is a low risk carpark area. A Condor CNSB3s / 21 bypass class 1 separator is proposed.

The separator is sized based on the area drained (1257m<sup>2</sup>)



## FLOOD RISK ASSESSMENT

### Historic Flood Events.

Historical flood events have been researched with reference to an online Office of Public Works database, [www.floodmaps.ie](http://www.floodmaps.ie). A summary report generated from [www.floodmaps.ie](http://www.floodmaps.ie) is contained within Appendix A. The report indicates the site has no record of historic flooding.

### Fluvial Flooding Risk

CFRAMS flood hazard risk maps for the Liffey River have been researched with reference to an online Office of Public Works database,

[http://maps.opw.ie/floodplans/fhr\\_map/](http://maps.opw.ie/floodplans/fhr_map/)

#### 1/100yr flood risk(1% AEP)

Reference to the fluvial flooding CFRAMS maps indicates the site is not at risk of flooding

#### 1/1000yr flood risk(0.1% AEP)

Reference to the fluvial flooding CFRAMS maps indicates the site is not at risk of flooding.





## **TRAFFIC ACCESS**

The design proposes to provide a left turn only direct access onto the R835. Traffic signage & line markings are detailed on drawing C102.

An auto turn analysis is provided on Drawing C100 for a refuse truck and disabled persons parking.

A stopping sight distance of 45m is achievable on the R835 in both directions, per requirements of the Design Manual for Urban Roads & Streets.



## Appendix A

# Past Flood Event Local Area Summary Report

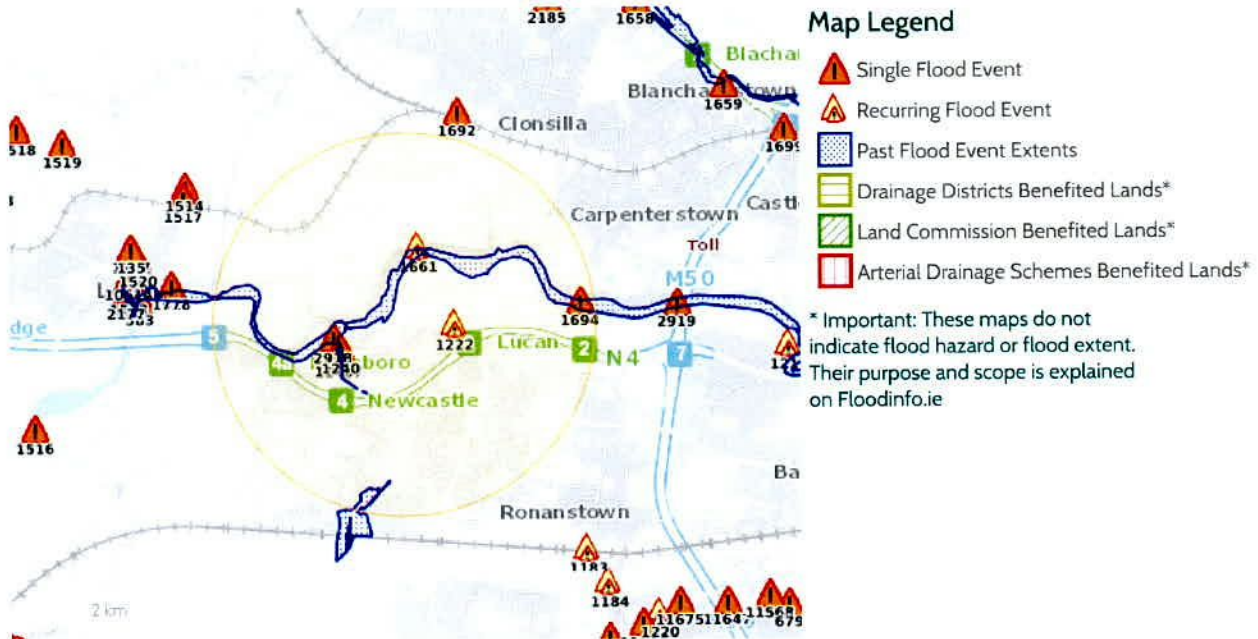


**OPW** Óifig na nDibreacha Poiblí  
Office of Public Works

Report Produced: 25/7/2022 11:04

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

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



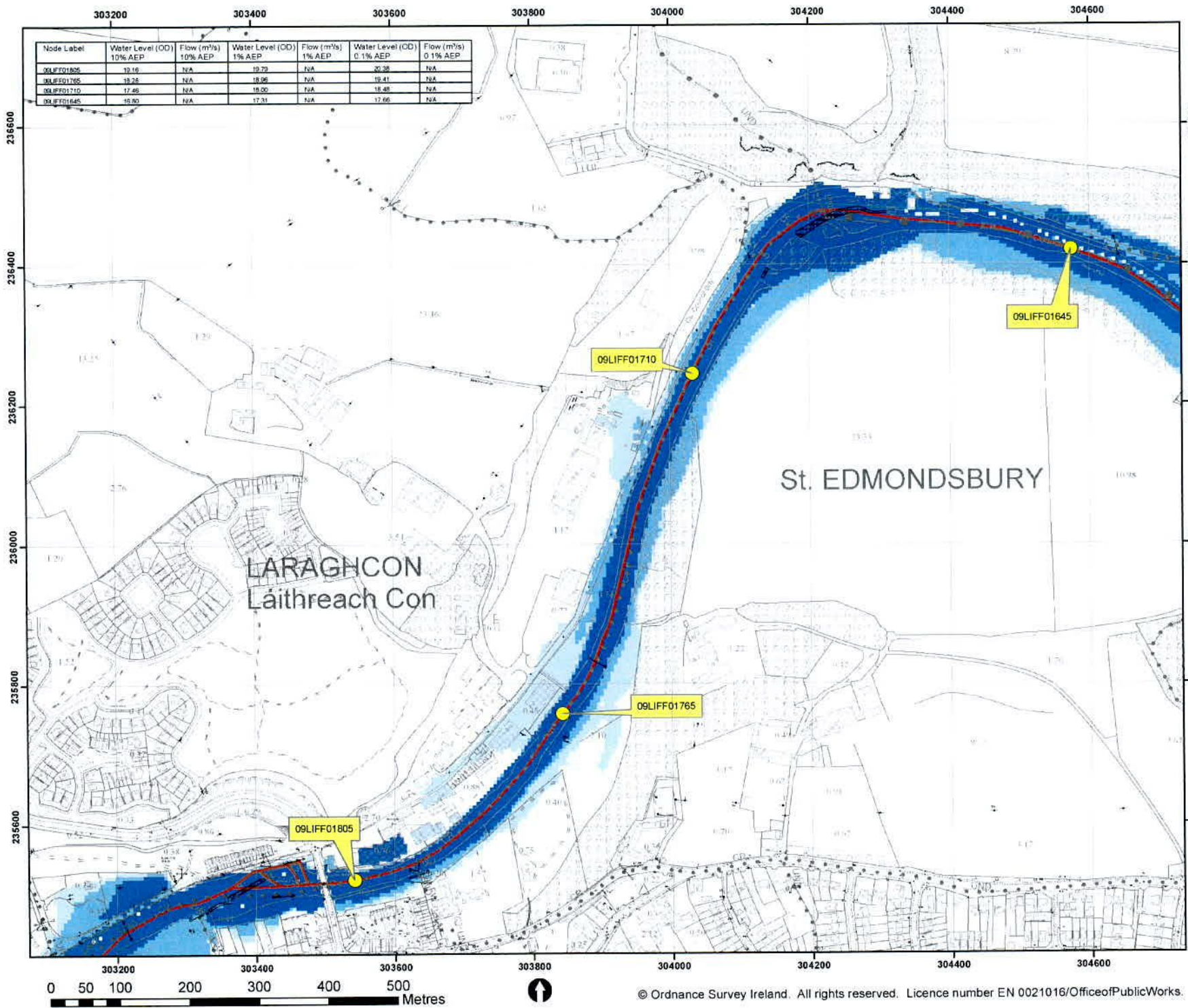
\* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

## 11 Results

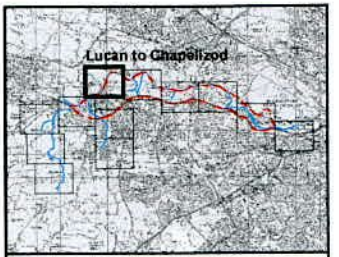
Name (Flood_ID)	Start Date	Event Location
1.  Liffey R109 at the Strawberry Beds Nov 2002 (ID-1694) Additional Information: <a href="#">Reports (2)</a> <a href="#">Press Archive (0)</a>	13/11/2002	Approximate Point
2.  Liffey Sommerton Rd Luttrellstown Golf C Oct 2004 (ID-2190) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	25/10/2004	Approximate Point
3.  Griffeen November 2000 (ID-1237) Additional Information: <a href="#">Reports (16)</a> <a href="#">Press Archive (6)</a>	05/11/2000	Area
4.  Griffeen June 1993 (ID-1240) Additional Information: <a href="#">Reports (7)</a> <a href="#">Press Archive (0)</a>	10/06/1993	Approximate Point
5.  Liffey Lower - Dec 1954 (ID-241) Additional Information: <a href="#">Reports (5)</a> <a href="#">Press Archive (2)</a>	08/12/1954	Area
6.  Liffey Lucan June 1993 (ID-2918) Additional Information: <a href="#">Reports (3)</a> <a href="#">Press Archive (2)</a>	09/06/1993	Approximate Point



	Name (Flood_ID)	Start Date	Event Location
7.	 Griffeen River 24th Oct 2011 Lucan (ID-11487) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	23/10/2011	Approximate Point
8.	 Griffeen Nov 2002 (ID-350) Additional Information: <a href="#">Reports (1)</a> <a href="#">Press Archive (0)</a>	15/11/2002	Approximate Point
9.	 Lucan St Edmonsbury Road Recurring (ID-1222) Additional Information: <a href="#">Reports (2)</a> <a href="#">Press Archive (0)</a>	n/a	Approximate Point
10.	 Liffey Lr Lucan Rd R109 Strawberry Beds Recurring (ID-1661) Additional Information: <a href="#">Reports (2)</a> <a href="#">Press Archive (0)</a>	n/a	Exact Point
11.	 Griffeen Aug 1986 (ID-1239) Additional Information: <a href="#">Reports (3)</a> <a href="#">Press Archive (0)</a>	24/08/1986	Approximate Point



Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
09LIFF01805	19.16	N/A	19.70	N/A	20.28	N/A
09LIFF01765	18.25	N/A	18.96	N/A	19.41	N/A
09LIFF01710	17.46	N/A	18.00	N/A	18.48	N/A
09LIFF01645	15.90	N/A	17.31	N/A	17.66	N/A



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

- Legend**
- 10% Fluvial AEP Event
  - 1% Fluvial AEP Event
  - 0.1% Fluvial AEP Event
  - Modelled River Centreline
  - AFA Extents
  - Node Point
  - Node ID Node Label

**FINAL**

REV.	NOTE	DATE



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<b>Map:</b> Lucan to Chapelizod Fluvial Flood Extents	
<b>Map Type:</b> EXTENT	
<b>Source:</b> FLUVIAL	
<b>Map Area:</b> HPW	
<b>Scenario:</b> CURRENT	
<b>Drawn By:</b> C.C.	<b>Date:</b> 27 July 2016
<b>Checked By:</b> S.P.	<b>Date:</b> 27 July 2016
<b>Approved By:</b> G.G.	<b>Date:</b> 27 July 2016
<b>Drawing No.:</b> E09LUC_EXFCD_F0_07	
<b>Map Series:</b> Page 7 of 12	
<b>Drawing Scale:</b> 1:5,000 @ A3	