The Mill Building, Newtown Link Rd,
Greenhills, Drogheda, Co. Louth
Tel: 041 2137050
www.mcmahonengineers.com
info@mcmahonengineers.com

Engineering Report

Proposed 18No. Dwelling Housing Development at

Rathmore Road,

Lusk, Co. Dublin

Project Ref: P3633
Issued By: S Murphy
Checked By: M Kerr
Date: 23.01.23
Rev: B

Comhairle Contae Fhine Gall
Fingal County Council

Document Control Sheet

Client	**Fingal County Council (FCC)**
Project Title	Proposed 18No. Dwelling Housing Development at Rathmore Road, Lusk, Co. Dublin
Document Title	Engineering Report
Document No.	P3633

Rev.	Status	Author(s)	Reviewed By	Approved By	Issue Date
-	Approval	SM	MK	PMcM	23.01.23
A	Approval	SM	MK	PMcM	27.01.23
B	Approval	SM	MK	PMcM	10.02.23

McMahon Associates

Table of Contents

1.0 Introduction

McMahon Associates have prepared this Engineering Report to address the following;

- Foul & Surface Water Drainage
- SuDS
- Flood Risk Identification
- Water supply Strategy
- Traffic Management Stratgey

for the proposed development at Rathmore Road, Lusk. The proposed development will consist of the construction of 18No dwellings and associated infrastructure.

This report is to be read in conjunction with the engineering & architectural planning drawings to provide a high level overview of the drainage strategy for this development. It is envisaged that at detailed design stage the methodology and rationale outlined in this report will be adhered to ensure a consistency in the final design.

Figure 1: Site Location

2.0 Existing Site and Services

The proposed development site is a greenfield site which is located on Rathmore Road in Lusk. It is bounded by open space to the northwest and southwest and by Fingal County Councils owned housing development; Remount to the northeast and bounded by Rathmore Road to the south & southeast.

The topography of the site is relatively flat with a slight fall from northeast to southwest with a level difference of approximately 1.48m between the north and south boundaries falling at a gradient of approximately 1:48. Access to the 1st floor apartment duplexes will be via a shared entrance with the neighbouring apartment. The apartments will have to have the same finished floor level for practical reasons. This will result in raising levels slightly in the southwest and northwest of the site, above their existing levels, requiring additional fill but with no requirement for retaining walls along the boundaries of the site.

A site investigation was completed in October 2022 (refer to Appendix E). It established the ground conditions within the site; sandy gravelly clay with firm bearing at 1.2m below ground level across majority of the site except in one location where firm bearing was found at 2.0m below ground level. WAC testing was completed on the made ground and has been classified as non-hazardous, with some material across the site to be disposed of to an inert waste facility. Infiltration testing was carried out in the form of soakaway tests which established that there is low infiltration levels across the site and therefore the suitability of certain Sustainable Urban Drainage System (SuDS) features are not possible.

Topographical and Ground Penetrating Radar Surveys were carried out and made available to us to ascertain the location and quantity of existing services currently located in the site and along Rathmore Road.

2.1 Foul Water

There is an existing 225mm diameter foul sewer located within the site to the southeast which discharges to a foul sewer within Rathmore Road; the foul pipe is 450mm diameter as per Irish Water record mapping (& was picked up by the GPR Survey). This sewer is currently taken in charge by Irish Water.

2.2 Surface Water

There is an existing 750mm storm diameter sewer which transverses the site to the southwest; this existing storm sewer is taken in charge by Fingal County Council and discharges to a 1050mm

diameter sewer within Rathmore Road. There is a 1000mm diameter storm sewer which also transverses the site along the south-eastern boundary to the site and a 1000mm diameter storm sewer which is located northeast outside the boundary of the site which is not on Irish Water record mapping but it is assumed that it has been taken in charge by Fingal County Council.

2.3 Watermain

Fingal County Council provided record mapping of Irish Water infrastructure which is located around the site. It indicated that there is existing Irish Water watermain infrastructure within Rathmore Road. This is a 500mm diameter trunk main which is not available for connection to our site.

The GPR survey confirmed that there is an existing watermain northeast of the site within Fingal County Council owned housing development; Remount. At the time the Irish Water Confirmation of Feasibility was issued this watermain was not taken in charge (refer to Appendix F). Fingal County Council have confirmed they are in the process of getting this taken in charge so that the proposed development can connect in this location.

3.0 Foul Water Strategy

As part of this development the foul water drainage network for the proposed dwellings will be separated from the surface water sewers, and will comply with the latest *"Technical Guidance Document H - Drainage and Waste Water Disposal"*.

A proposed 225mm diameter foul gravity sewer will collect the wastewater via soil vent pipes and inspection chambers from the proposed dwellings and discharge into the existing 225mm concrete foul sewer within the site boundary to the southeast via backdrop.

The pipes are designed with a roughness coefficient (ks) of 0.15mm and designed to achieve a minimum self-cleansing velocity of 0.75m/s when flowing half full. Details of the foul drainage pipe design can be found in Appendix B.

All drainage pipes will need to be supported off firm bearing. This may require all soft material to be excavated underneath the pipe runs and backfilled with stone. The depth of this will vary depending on location and invert level of pipe. A geotextile membrane should also be incorporated into the drainage trenches and also to the hardstanding areas.

4.0 Surface Water Strategy

The proposed drainage strategy has been designed to ensure surface water is captured and controlled on site and ensure the proposed development will not have a detrimental impact on Flood Risk on and offsite.

The surface water strategy follows the principle of Sustainable Drainage Systems (SuDS), whereby surface water is collected at source and the rate, volume and quality of runoff controlled and improved. The use of SuDS is discussed further in the sections below.

In accordance with the hierarchy for discharging surface water, infiltration testing was carried out in accordance with the requirements of BRE Digest 365 and as mentioned previously, the results showed low infiltration therefore discharging surface water generated by the development directly to the ground is not possible.

The next preferred means of discharging surface water is to a watercourse. The proposed site is not located close to any watercourse or ditches. Therefore, the discharge from the site will need to be via an existing surface water sewer located to the south of the proposed development within the site boundary. Record mapping indicated that there is a 750mm diameter concrete storm sewer that transverses the site. A ground penetrating radar (GPR) survey provided by FCC confirmed the presence of same.

The proposed discharge rate is outlined in Section 4.1 below.

4.1 Surface Water Runoff Rate

The site is considered to be greenfield with an overall area of 0.415hA.

Using the IH 124 method for calculating QBar which is as follows;

$QBar_{urban} = 0.00108 \times AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$

Where,
Area = 50 hectares

SAAR = 717 (Taken from historic Met Eireann Data for Grid Reference 321000, 253000 http://archive.met.ie/climate/IE_AAR_8110_V1.txt)
SOIL = 0.15 (based on ground investigations)

$QBar_{urban}$ =20.8 l/s (for 50 hectares)

Therefore QBar for the the site is (20.8/50)*0.415 = 0.172 l/s. = 0.2 l/s (see appendix B for calculations).

However, it is not practical to use a vortex flow control device of less than 1.0l/s as it will cause blockages and maintenance issues therefore, the runoff rate will be restricted to 1.0 l/s.

4.2 Attenuation Storage Calculation

The volume of attenuation storage to be provided within the site has been calculated using Microdrainage software, which models the individual drainage elements such as manhole, pipes and attenuation tanks as an entire system using site specific rainfall data.

The rainfall data for the site has been accessed from the Met Eireann website and is included with Appendix B. From this rainfall data, the M5-60 (5 Year, 60 minute event) and R value (ratio of the M5-60 to the M5 – 2day) are calculated and inputted into the software. From this information, Microdrainage scales the values to run multiple rainfall simulation for a range of events and durations, identify the critical storm duration for the site.

The contributing area for the proposed development was calculated and a runoff coefficient applied to each surface type with 10% urban creep added as required by the Greater Dublin regional Code of Practise for Drainage Works. The runoff for each surface type and the applied runoff coefficient is summarised below.

Table 1: Proposed Development Contributing Area

Area Description	Area (ha)	Runoff Coefficient	Contributing Area (ha)
Roof	0.096	1.000	0.096
Landscape	0.143	0.300	0.043
Permeable Paving/Porous Asphalt	0.122	0.600	0.073
Hardstanding (Footway)	0.054	1.000	0.054
Total	0.415	-	0.266
Total + 10% urban creep			0.292

Based on the above contributing areas, the attenuation storage to be provided for the 1 in 100 year event plus 20% climate change is 178m^3. The Microdrainage calculations are included in Appendix B.

The attenuation will be provided in the form of crates which has a 95% void ratio which is sufficient to attenuate the 1 in 100year flood event + 20% climate change. Due to space restrictions, these crates will be constructed online along storm pipe 1.003.

The proposed surface water strategy drawings are shown in Appendix A.

4.2 SuDS Selection

In accordance with local and national guidance, the use of SuDS have been considered as part of the development and implemented where possible.

An important consideration when evaluating the suitability of the various SuDS techniques is the site-specific constraints for a specific development, such as the site layout, the geology and topography of the site and the willingness of the local authority to take a SuDS element in charge.

In the case of the proposed development, the infiltration testing results suggest the site is not suitable for infiltration and therefore SuDS elements will be limited and the current design reflects that.

As part of the surface water drainage strategy, it is proposed to provide the surface water attenuation in the southwest of the development in the form of underground crates. As the underground crates are not a preferred method of attenuation, the surface water will infiltrate through various SuDS components such as permeable paving, porous asphalt, filter drains, rainwater butts and rainwater gardens acting as source control and surface water treatment before entering the main storm line. The site is too small to consider any above ground storage features such as basins, swales or wetlands and Fingal County Council have confirmed they cannot be constructed outside of the site boundary in the adjacent green space.

In accordance with Fingal County Council Green Blue Infrastructure for Development Guidance Note document, road runoff should have a minimum two stage treatment therefore, it is proposed to utilise permeable paving within the car parking spaces and porous asphalt on the carriageway to collect and treat surface water runoff. Filter drains will be used within the subbase of the permeable paving and porous asphalt to collect and treat surface water runoff. Sump manholes will also be provided in manhole S4 & S6 to ensure sediment is caught and collected prior to leaving the site.

In accordance with Fingal County Council Green Blue Infrastructure for Development Guidance Note document, roof runoff should have a minimum one stage of treatment therefore rainwater butts will be provided for each roof which will collect and treat runoff before discharging to the main sewer line via an overflow pipe if the water is not utilised by the home owner/tenant for e.g. plant watering.

A detailed breakdown of the SuDS considered is included in Appendix D and outlines the rationale for their use or exclusion based on specific site conditions.

5.0 Flood Summary

Given the extensive modelling of the CFRAM Flood studies mapping and that there is no historical flooding at the site on the OPW website it is considered than flood risk is minimal for this site.
Please refer to the Flood Maps in Appendix C.

6.0 Watermain Design

The watermain for this development will be connected to the watermain located in Fingal County Council owned housing development; Remount, which is northeast of the site, assuming the completion of Irish Waters taking in charge process. This 100mm diameter watermain connection

will be taken into the development and provide water to the dwellings via boundary box meters; each apartment and dwelling will have their own. From here each meter will be connected to a 25mm diameter flexible pipe which will provide water to the dwellings.

An additional boundary box meter will be provided on a sluice valve at the entrance to allow monitoring of night time flows as per the Code of Practice requirements.

2No. fire hydrants will be located within communal greenspace at a minimum 6m distance from all properties to ensure each dwelling is within 46m of a fire hydrant as per Code of Practice Requirements.

7.0 Traffic Management

7.1 Existing Site

The existing site is open green space accessed via pedestrian gates via Rathmore Road and Remount. As this is a greenfield site, there is no existing traffic management infrastructure in place.

7.2 Justification of the Traffic Management System

This planning application proposes to construct a vehicular access point at the east of the site within Remount. The site will be a one-way traffic management system to increase amenity space and traffic calming. The carriageway will have a 6.0m kerb radius at the entrance from Remount and at the exit onto Remount.

The Design Manual for Urban Roads & Streets (DMURS) recommends a kerb radius of 4.5-6.0m for occasional large vehicles as shown in Appendix A and on drawings C-07 & C-08, the 6.0m radius is required to prevent kerb overrun.

At the entrance, the horizontal alignment will be 26m radius, which acts as a traffic calming measure, as recommended by DMURS for a speed limit of 30km/h which this development will be posted at.

For one lane roads in a development, *DMURS* specifies that the maximum lane width should be between 2.75-3.5m. A carriageway width of 3.7m has been provided to accommodate the manoeuvring of occasional large vehicles and widened to approximately 5.0m on the carriageway corners to the south and west of the site to allow circulation of fire and refuse vehicles.

A yield sign and road marking will be provided at the exit from the site onto the carriageway within Remount to ensure drivers minimise potential risk to pedestrians/drivers when leaving the site. Fingal County Councils Transportation Department proposed 3.7m wide round-top ramps on each straight as a traffic calming measure in order to justify the horizontal centreline alignment of 11m on the south and west corners which is normally used for a speed limit of 20km/h. The development will be 30km/h but the round-top ramps will reduce speed so there is no issues on same. Pedestrian crossing points (PCPs) will also be provided at the site entrance and exit.

There will be pedestrian access surrounding the site via a concrete footway which also connects the site to Rathmore Road and the open space to the north of the site.

7.3 Provision of Bicycle Parking

Refer to Architectural report.

7.4 Provision of Car Parking

Refer to Architectural report for car parking space numbers.

The parallel parking bays within the development comply with the minimum standards set out in DMURS i.e. spaces should be a minimum of 6m long x 2.4m wide. The disabled parking spaces comply with the minimum standards set out in The Traffic Signs Manual i.e, spaces should be a minimum 7.0m long x 3.6m wide.

Provision will also be made for ducting for electric vehicle charging points.

8.0 Conclusion

The proposed development will incorporate a robust surface water drainage strategy to ensure flood risk off and on site will not be affected by the proposed development.

Surface water falling on the development will be collected by gullies, downpipes, rainwater butts, filter drains, rainwater gardens, permeable paving and porous asphalt and conveyed to the dedicated surface water pipe network. Flow will be conveyed southwest of the site to attenuation crates that will accommodate up to the 1 in 100 year event plus 20% for climate change and 10% urban creep.

Flow leaving the site will be controlled by a flow control device which will limit runoff to 1.0l/s, set at this, to prevent flooding through the proposed manholes.

A detailed review of possible SuDS techniques has been undertaken in the overall context of the site and implemented where appropriate. Permeable paving will be implemented within car parking spaces and around the dwellings and porous asphalt will be implemented for the carriageway and both will be conveyed through filter drains before reaching the main storm line. Rainwater gardens will be used to collect and treat runoff from the front of the dwellings then conveyed to the road & car parking spaces. Flow conveyed to the surface water attenuation crates will pass through a sump manhole prior to entering the attenuation area to remove any sediment, ensuring the quality of surface water leaving the development will be maintained.

The layout of the entrance & exit, carriageway and parking dimensions have been reviewed and are deemed to be in compliance with the requirements as set out The Traffic Signs Manual, The Building Regulations and also by DMURS.

Appendix A:

- C-01A Indicative Site Layout
- C-02A Indicative Drainage Layout
- C-03A Indicative Watermain Layout
- C-04A Indicative Site Levels
- C-05A Indicative Road Longsection
- C-06A Indicative Drainage Longsections
- C-07A Fire Engine Swept Path Analysis
- C-08A Refuse Vehicle Swept Path Analysis

Appendix B:

- QBar Calculation
- Met Eireann Data
- Storm Network Details
- 1 in 100 year event plus 20% Climate Change
- 1 in 1 year event plus 10% Climate Change
- 1 in 30 year event plus 10% Climate Change
- Foul Network Details

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.150
Area (ha)	0.415	Urban	0.000
SAAR (mm)	717	Region Number	Ireland National

Results l/s

QBAR Rural	0.2
QBAR Urban	0.2
Q100 years	0.3
Q1 year	0.1
Q30 years	0.3
Q100 years	0.3

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 321951, Northing: 253898,

	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.5,	3.5,	4.0,	4.7,	5.2,	5.6,	6.8,	8.2,	9.1,	10.3,	11.4,	12.3,	13.5,	14.5,	15.4,	N/A ,
10 mins	3.5,	4.9,	5.6,	6.6,	7.3,	7.8,	9.5,	11.4,	12.6,	14.4,	15.9,	17.1,	18.9,	20.2,	21.4,	N/A ,
15 mins	4.2,	5.7,	6.5,	7.7,	8.5,	9.2,	11.2,	13.4,	14.9,	16.9,	18.7,	20.1,	22.2,	23.8,	25.2,	N/A ,
30 mins	5.5,	7.5,	8.5,	10.0,	11.0,	11.7,	14.2,	16.9,	18.6,	21.1,	23.2,	24.8,	27.3,	29.2,	30.8,	N/A ,
1 hours	7.3,	9.7,	11.0,	12.8,	14.0,	15.0,	18.0,	21.2,	23.3,	26.2,	28.8,	30.7,	33.6,	35.9,	37.7,	N/A ,
2 hours	9.6,	12.7,	14.2,	16.5,	18.0,	19.1,	22.8,	26.7,	29.2,	32.7,	35.7,	38.0,	41.4,	44.1,	46.2,	N/A ,
3 hours	11.3,	14.8,	16.6,	19.1,	20.8,	22.1,	26.1,	30.5,	33.3,	37.1,	40.5,	43.0,	46.8,	49.7,	52.0,	N/A ,
4 hours	12.7,	16.5,	18.5,	21.3,	23.1,	24.5,	28.8,	33.6,	36.6,	40.7,	44.2,	46.9,	51.0,	54.1,	56.6,	N/A ,
6 hours	15.0,	19.3,	21.5,	24.6,	26.7,	28.3,	33.1,	38.4,	41.7,	46.3,	50.2,	53.1,	57.6,	61.0,	63.7,	N/A ,
9 hours	17.7,	22.6,	25.0,	28.6,	30.9,	32.6,	38.1,	43.9,	47.6,	52.6,	56.9,	60.1,	65.0,	68.7,	71.7,	N/A ,
12 hours	19.8,	25.2,	27.9,	31.7,	34.2,	36.1,	42.0,	48.3,	52.2,	57.6,	62.2,	65.7,	70.9,	74.8,	78.0,	N/A ,
18 hours	23.3,	29.4,	32.5,	36.8,	39.6,	41.7,	48.3,	55.2,	59.6,	65.5,	70.6,	74.4,	80.1,	84.3,	87.8,	N/A ,
24 hours	26.2,	32.9,	36.2,	40.9,	43.9,	46.2,	53.2,	60.7,	65.4,	71.8,	77.2,	81.2,	87.3,	91.8,	95.5,	108.0,
2 days	32.6,	40.3,	44.0,	49.3,	52.7,	55.3,	63.2,	71.4,	76.5,	83.4,	89.3,	93.6,	100.2,	105.0,	109.0,	122.1,
3 days	37.7,	46.2,	50.4,	56.2,	59.9,	62.6,	71.1,	80.0,	85.5,	92.9,	99.1,	103.8,	110.7,	115.8,	120.0,	133.8,
4 days	42.2,	51.4,	55.9,	62.1,	66.0,	69.0,	78.1,	87.5,	93.3,	101.1,	107.7,	112.6,	119.8,	125.2,	129.5,	144.0,
6 days	50.1,	60.5,	65.4,	72.4,	76.8,	80.1,	90.1,	100.5,	106.8,	115.3,	122.5,	127.8,	135.6,	141.4,	146.1,	161.7,
8 days	57.1,	68.4,	73.9,	81.4,	86.2,	89.8,	100.6,	111.8,	118.6,	127.7,	135.3,	141.0,	149.3,	155.5,	160.5,	177.0,
10 days	63.4,	75.7,	81.5,	89.6,	94.8,	98.6,	110.1,	122.0,	129.3,	138.9,	147.0,	152.9,	161.7,	168.3,	173.5,	190.8,
12 days	69.4,	82.4,	88.7,	97.3,	102.7,	106.7,	119.0,	131.5,	139.1,	149.2,	157.7,	163.9,	173.2,	180.0,	185.5,	203.6,
16 days	80.4,	94.9,	101.8,	111.3,	117.3,	121.7,	135.1,	148.8,	157.1,	168.1,	177.3,	184.0,	194.0,	201.4,	207.3,	226.7,
20 days	90.5,	106.3,	113.9,	124.2,	130.6,	135.4,	149.9,	164.6,	173.5,	185.3,	195.1,	202.3,	212.9,	220.8,	227.0,	247.7,
25 days	102.4,	119.7,	127.9,	139.1,	146.1,	151.3,	167.0,	182.8,	192.4,	205.1,	215.6,	223.3,	234.7,	243.1,	249.8,	271.7,

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

M5-60 = 15.0
R = 15.0/55.3 = 0.271

STORM SEWER DESIGN by the Modified Rational Method

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)	Section Type	Auto Design
1.000	16.221	0.203	80.0	0.013	5.00	0.0	0.150	o	225	Pipe/Conduit	
1.001	45.998	0.460	100.0	0.087	0.00	0.0	0.150	o	225	Pipe/Conduit	
1.002	13.505	0.270	50.0	0.021	0.00	0.0	0.150	o	225	Pipe/Conduit	
1.003	53.759	0.316	170.1	0.038	0.00	0.0	0.150	o	225	Pipe/Conduit	
2.000	58.193	0.582	100.0	0.135	5.00	0.0	0.150	o	225	Pipe/Conduit	
1.004	7.690	0.256	30.0	0.000	0.00	0.0	0.150	o	225	Pipe/Conduit	

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)
1.000	50.00	5.16	20.928	0.013	0.0	0.0	0.0	1.71	68.0	1.8
1.001	50.00	5.66	20.725	0.100	0.0	0.0	0.0	1.53	60.7	13.5
1.002	50.00	5.76	20.265	0.121	0.0	0.0	0.0	2.18	86.5	16.4
1.003	50.00	6.54	18.927	0.159	0.0	0.0	0.0	1.16	46.2	21.5
2.000	50.00	5.64	20.100	0.135	0.0	0.0	0.0	1.53	60.7	18.3
1.004	50.00	6.58	18.611	0.294	0.0	0.0	0.0	2.82	112.2	39.8

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)
1.004		21.130	18.355	18.355	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
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 1	Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	15.000	Storm Duration (mins)	30
Ratio R	0.271		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 6, DS/PN: 1.004, Volume (m³): 7.1

Unit Reference	MD-SHE-0038-1000-2431-1000
Design Head (m)	2.431
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	38
Invert Level (m)	18.611
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.431	1.0	Kick-Flo®	0.337	0.4
Flush-Flo™	0.168	0.5	Mean Flow over Head Range	-	0.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.5	1.200	0.7	3.000	1.1	7.000	1.6
0.200	0.5	1.400	0.8	3.500	1.2	7.500	1.7
0.300	0.5	1.600	0.8	4.000	1.3	8.000	1.7
0.400	0.5	1.800	0.9	4.500	1.3	8.500	1.8
0.500	0.5	2.000	0.9	5.000	1.4	9.000	1.8
0.600	0.5	2.200	1.0	5.500	1.4	9.500	1.9
0.800	0.6	2.400	1.0	6.000	1.5		
1.000	0.7	2.600	1.0	6.500	1.6		

Storage Structures for Storm

Cellular Storage Manhole: 6, DS/PN: 1.004

Invert Level (m) 18.611 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	156.0	156.0	1.201	0.0	288.0
1.200	156.0	288.0			

Volume Summary (Static)

Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	1	1.159	0.645	0.000	1.804
1.001	2	1.306	1.829	0.000	3.135
1.002	3	1.232	0.537	0.000	1.769
1.003	4	2.427	2.137	0.000	4.565
2.000	5	1.684	2.314	0.000	3.998
1.004	6	2.749	0.306	177.889	180.945
Total		10.558	7.768	177.889	196.215

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.271
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	15.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+20%					20.970
1.001	2	2880 Winter	100	+20%					20.931
1.002	3	2880 Winter	100	+20%	100/1440 Winter				20.930
1.003	4	2880 Winter	100	+20%	100/15 Summer				20.930
2.000	5	2880 Winter	100	+20%	100/1440 Winter				20.929
1.004	6	2880 Winter	100	+20%	100/15 Summer				20.928

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.183	0.000	0.08			4.5	OK	
1.001	2	-0.019	0.000	0.03			1.5	OK	

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	3	0.440	0.000	0.02			1.8	SURCHARGED	
1.003	4	1.778	0.000	0.05			2.3	FLOOD RISK	
2.000	5	0.604	0.000	0.03			2.0	SURCHARGED	
1.004	6	2.092	0.000	0.01		3099	1.0	FLOOD RISK	

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.271
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	15.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1
Climate Change (%)	10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	1	+10%					20.952
1.001	2	15 Winter	1	+10%					20.787
1.002	3	15 Winter	1	+10%					20.325
1.003	4	2160 Winter	1	+10%					19.025
2.000	5	15 Winter	1	+10%					20.178
1.004	6	2160 Winter	1	+10%	1/180 Summer				19.025

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.201	0.000	0.02			1.4	OK	
1.001	2	-0.163	0.000	0.17			9.6	OK	

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	3	-0.165	0.000	0.16			11.6	OK	
1.003	4	-0.127	0.000	0.03			1.1	OK	
2.000	5	-0.147	0.000	0.26			15.1	OK	
1.004	6	0.189	0.000	0.01		1522	0.5	SURCHARGED	

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

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 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.271
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	15.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	30
Climate Change (%)	10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	30	+10%					20.962
1.001	2	15 Winter	30	+10%					20.832
1.002	3	15 Winter	30	+10%					20.369
1.003	4	2880 Winter	30	+10%	30/180 Winter				19.527
2.000	5	15 Winter	30	+10%					20.224
1.004	6	2880 Winter	30	+10%	30/30 Summer				19.525

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.191	0.000	0.06			3.2	OK	
1.001	2	-0.118	0.000	0.45			25.8	OK	

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	3	-0.121	0.000	0.43			31.1	OK	
1.003	4	0.375	0.000	0.04			1.7	SURCHARGED	
2.000	5	-0.101	0.000	0.58			33.4	OK	
1.004	6	0.689	0.000	0.01		2539	0.6	SURCHARGED	

FOUL SEWERAGE DESIGN

Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	10
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.200
Flow Per Person (l/per/day)	150.00	Maximum Backdrop Height (m)	1.500
Persons per House	2.70	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	41.262	0.688	60.0	0.000	7	0.0	0.150	o	225	Pipe/Conduit	
1.001	8.476	0.141	60.0	0.000	2	0.0	0.150	o	225	Pipe/Conduit	
1.002	53.289	1.184	45.0	0.000	1	0.0	0.150	o	225	Pipe/Conduit	
1.003	33.719	0.562	60.0	0.000	8	0.0	0.150	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	20.890	0.000	0.0	7	0.0	9	0.43	1.98	78.9	0.2
1.001	20.202	0.000	0.0	9	0.0	10	0.47	1.98	78.8	0.3
1.002	20.061	0.000	0.0	10	0.0	9	0.54	2.30	91.3	0.3
1.003	18.877	0.000	0.0	18	0.1	13	0.58	1.98	78.8	0.6

Free Flowing Outfall Details for Foul - Main

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.003		21.370	18.315	17.710	0	0

Simulation Criteria for Foul - Main

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
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 0	Number of Storage Structures 0	Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	15.000	Storm Duration (mins)	30
Ratio R	0.271		

Appendix C:

- OPW Flood Maps

N

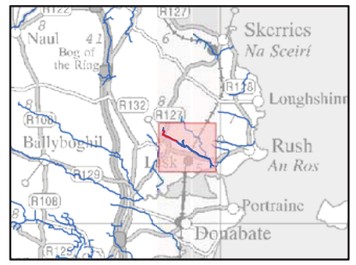
Fluvial flooding may also occur within the area shown on this map. Please refer to the fluvial flood extent map. Figure No. BRI/HPW/EXT/CURS/001

10La3931
10La3725
10La3540
10La3189
10La2764
10La2550
10La2214
10La1650
10La1441D
10La811
10La12U
029
Site Boundary

Node Label	10% AEP Event		0.5% AEP Event		0.1% AEP Event	
	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)
10La3931	23.48	0.43	23.67	0.85	23.84	1.40
10La3725	22.12		22.30		22.47	
10La3540	20.41		20.66		20.95	
10La3189	20.05	0.54	20.32	1.07	20.58	1.75
10La2764	19.39	0.56	19.63	1.12	19.86	1.84
10La2550	18.67		18.90		19.12	
10La2214	17.75		18.01		18.23	
10La1650	16.13		16.25		16.34	
10La1441D	14.89		15.00		15.09	
10La811	7.50	0.63	7.71	1.25	8.70	2.19
10La12U	2.88	2.73	3.30	4.38	3.52	6.48
029	2.83		3.24		3.46	

0.2 0.1 0 0.2
Kilometres

Location Plan :



EXTENT MAP

Legend:

- 10 % AEP Flood Extent (1 in 10 chance in any given year)
- 0.5 % AEP Flood Extent (1 in 200 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) (0.5% AEP)
- Medium Confidence (<40m) (0.5% AEP)
- Low Confidence (>40m) (0.5% AEP)
- Modelled River Centreline
- Node Point
- 21Ma237 Node label with level data (refer to table)
- 21Ma237 Node level with flow & level data (refer to table)

High confidence
Medium confidence
Low confidence
refer to table

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 A BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.

HalcrowBarry
Tramway House
32 Dartry Road
Dublin 6
Tel: +353-1-4975716

Clients :

Fingal County Council
Meath County Council
OPW

Project :
FEM FRAMS

Map :
BRIDE´S MODEL FLOOD EXTENT MAP

Map Type :	FLOOD EXTENT	
Source :	TIDAL FLOODING	
Map area :	HIGH PRIORITY WATERCOURSE	
Scenario :	CURRENT	
Figure By :	Mara Ruiz	Date : 17 January 2011
Checked By :	Sergio Herbón	Date : 17 January 2011
Approved By :	Clare Dewar	Date : 17 January 2011

Figure No. : BRI/HPW/EXT/CURS/T/001
Revision 1

Drawing Scale : 1:10,000
Plot Scale : 1:1 @ A3

N

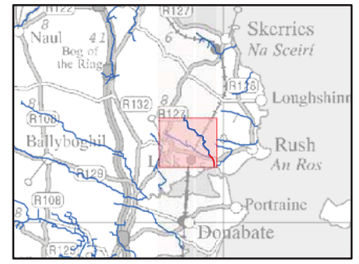
Tidal flooding may also occur within the area shown on this map. Please refer to the tidal flood extent map. Figure No. JON/HPW/EXT/CURS/T/001

10Ta3490
10Ta3082
10Ta2658
10Ta2236D
10Ta1857
10Ta1548
10Ta909D
10Ta613
10Ta245
10La628

Node Label	10% AEP Event Water Level (mOD)	10% AEP Event Flow (m3/s)	1% AEP Event Water Level (mOD)	1% AEP Event Flow (m3/s)	0.1% AEP Event Water Level (mOD)	0.1% AEP Event Flow (m3/s)
10Ta3490	33.71	0.70	33.97	1.38	34.30	2.52
10Ta3082	30.39		30.67		30.87	
10Ta2658	28.05		28.27		28.47	
10Ta2236D	25.91		26.35		27.13	
10Ta1857	21.90		22.13		22.38	
10Ta1548	17.87		18.06		18.25	
10Ta909D	12.57		12.82		13.08	
10Ta613	10.32		10.59		10.85	
10Ta245	6.84		7.00		7.18	
10La628	5.03	2.41	5.33	4.83	5.64	8.75

0.2 0.1 0 0.2
Kilometres

Location Plan :



EXTENT MAP

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)
- Modelled River Centreline
- Node Point
- 21Ma237 Node label with level data (refer to table)
- 21Ma237 Node level with flow & level data (refer to table)
- High confidence / Medium confidence / Low confidence — refer to table

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HalcrowBarry
Tramway House
32 Dartry Road
Dublin 6
Tel: +353-1-4975716

Clients :

Fingal County Council
Meath County Council
OPW

Project :
FEM FRAMS

Map :
JONE´S MODEL FLOOD EXTENT MAP

Map Type :	FLOOD EXTENT		
Source :	FLUVIAL FLOODING		
Map area :	HIGH PRIORITY WATERCOURSE		
Scenario :	CURRENT		
Figure By :	Mara Ruiz	Date :	8 August 2010
Checked By :	Sergio Herbón	Date :	8 August 2010
Approved By :	Clare Dewar	Date :	8 August 2010

Figure No. : JON/HPW/EXT/CURS/001
Revision 0

Drawing Scale : 1:10,000
Plot Scale : 1:1 @A3

N

Tidal flooding may also occur within the area shown on this map. Please refer to the tidal flood extent map. Figure No. BRI/HPW/EXT/CURS/T/001

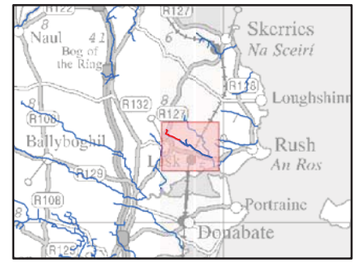
10La3931
10La3725
10La3540
10La3189
10La2764
10La2550
10La2214
10La1650
10La1441D
10La811
10La12U

Site Boundary

Node Label	10% AEP Event Water Level (mOD)	10% AEP Event Flow (m3/s)	1% AEP Event Water Level (mOD)	1% AEP Event Flow (m3/s)	0.1% AEP Event Water Level (mOD)	0.1% AEP Event Flow (m3/s)
10La3931	23.67	0.85	23.90	1.65	24.27	2.97
10La3725	22.30		22.53		22.75	
10La3540	20.66		21.12		21.66	
10La3189	20.32	1.07	20.68	2.06	21.15	3.73
10La2764	19.63	1.12	19.95	2.17	20.31	3.93
10La2550	18.90		19.21		19.54	
10La2214	18.01		18.29		18.49	
10La1650	16.25		16.38		16.55	
10La1441D	15.00		15.12		15.28	
10La811	7.71	1.25	8.76	2.42	8.94	4.04
10La12U	2.65	3.40	2.78	5.08	3.10	6.75

0.2 0.1 0 0.2
Kilometres

Location Plan :



EXTENT MAP

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)
- Modelled River Centreline
- Node Point
- 21Ma237 Node label with level data (refer to table)
- 21Ma237 Node level with flow & level data (refer to table)

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BRIDE´S MODEL FLOOD EXTENT MAP

Map Type :	FLOOD EXTENT		
Source :	FLUVIAL FLOODING		
Map area :	HIGH PRIORITY WATERCOURSE		
Scenario :	CURRENT		
Figure By :	Mara Ruiz	Date :	8 August 2010
Checked By :	Sergio Herbón	Date :	8 August 2010
Approved By :	Clare Dewar	Date :	8 August 2010

Figure No. : BRI/HPW/EXT/CURS/001
Revision 0

Drawing Scale : 1:10,000
Plot Scale : 1:1 @A3

N

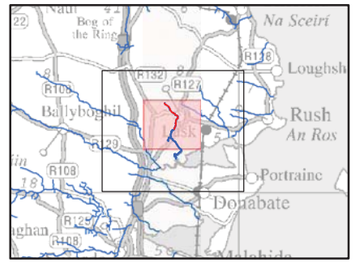
9Ba4385
9Ba4055
9Ba3905U
9Ba3566
9Ba3258
9Ba3030U
9Ba2714
9Ba2444
9Ba1838
9Ba1775
9Ba1207
9Ba949

Site Boundary

Node Label	10% AEP Event		1% AEP Event		0.1% AEP Event	
	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)	Water Level (mOD)	Flow (m3/s)
9Ba4385	26.33	0.11	26.59	0.12	26.89	0.11
9Ba4055	24.25		24.37		24.56	
9Ba3905U	22.96		23.13		23.41	
9Ba3566	20.06	0.41	20.32	0.65	20.61	1.06
9Ba3258	18.95		19.14		19.76	
9Ba3030U	18.37		18.69		19.66	
9Ba2714	17.51		17.81		17.96	
9Ba2444	15.89	1.78	16.09	3.22	16.36	5.32
9Ba1838	12.32		12.71		13.11	
9Ba1775	11.81		12.03		12.25	
9Ba1207	6.94		7.07		7.19	
9Ba949	4.09		4.29		4.48	

0.2 0.1 0 0.2
Kilometres

Location Plan :



EXTENT MAP

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)
- Modelled River Centreline
- Node Point
- 21Ma237 Node label with level data (refer to table)
- 21Ma237 Node level with flow & level data (refer to table)

High confidence
Medium confidence
Low confidence
refer to table

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 A BOUND VOLUME, IT SHOULD NOT BE USED FOR ANY PURPOSE.

HalcrowBarry
Tramway House
32 Dartry Road
Dublin 6
Tel: +353-1-4975716

Clients :

Fingal County Council
Meath County Council
OPW

Project :
FEM FRAMS

Map :
BALLEALLY MODEL FLOOD EXTENT MAP

Map Type :	FLOOD EXTENT		
Source :	FLUVIAL FLOODING		
Map area :	HIGH PRIORITY WATERCOURSE		
Scenario :	CURRENT		
Figure By :	Mara Ruiz	Date :	8 August 2010
Checked By :	Sergio Herbón	Date :	8 August 2010
Approved By :	Clare Dewar	Date :	8 August 2010

Figure No. : BAY/HPW/EXT/CURS/001
Revision 0

Drawing Scale : 1:10,000
Plot Scale : 1:1 @A3

Appendix D:

- SuDS Selection Analysis using Appendices A, B & C from FCC's "*Green / Blue Infrastructure for Development – Guidance Note Final Rev 0.2 November 2021"*

Existing Scenario: **Surface Water Statement**	**(250 words max)** *separate sheet may be included*
Description of existing subject site outlining the drainage characteristics - topography, ground conditions, suitability for infiltration, natural directions and paths for water movement, existing surface water flood risk.	The existing site is a greenfield site situated off Rathmore Road and between greenspace which is to the west of the site and Remount which is to the east of the site. The topography of the site is relatively flat with a slight fall from northeast to southwest. Rainfall and groundwater will follow the natural topography of the site therefore the surface water design will reflect this. Detailed site investigation works was completed in October 2022. The results from the soakaway tests have shown poor infiltration within the site which therefore dictates the SuDS selection and does not allow ground infiltration. OPW mapping shows no record of fluvial or coastal flooding within or surrounding the site. A map was not available for pluvial flooding.
Proposed Scenario: **Surface Water Management Design Statement**	**(250 words max)** *separate sheet may be included*
This shall be a clear concise summary of the surface water design proposal. Applicants shall provide a brief explanation of how they have responded to the principles of Sustainable Drainage Systems (SuDS) Design contained in this policy. This could include implications of SuDS on design of other aspects of the development and price	It's proposed to provide permeable paving around the units and for the car parking spaces and porous asphalt for the carriageway. There will be storage within the permeable paving/porous asphalt which will be within the subbase layer then discharged to filter drains before discharging to the main storm sewer. This requires a cosmetic sweep once a year. The

comparisons. We encourage that proposals are mindful of future implications from the beginning and present outline designs based on realistic options including maintenance activities and how they are resourced. Applicants shall be required to clearly demonstrate how the design makes a significant and positive contribution to the amenity value of the open space provision and shall state how the usability of these areas by the public has been addressed. Reference shall also be made on how the design considered the access and use of maintenance machinery in terms of slopes and any hard structures (e.g. head walls) located within the open space areas.	permeable paving and filter drain provides two sources of treatment to surface water runoff from hardstanding surfaces therefore providing 2 of the SuDS pillars; water quantity and water quality. For roof runoff it is proposed to discharge to rainwater butts for each individual unit. The water butts will have an overflow feature to the main storm system if the water butt is not utilised which therefore provides source control slowing down the runoff discharge rate. This therefore provides 2 of the SuDS pillars; water quantity and amenity. Raingardens will be provided along the front of the dwellings which will treat & store surface runoff which will then be discharged to a filter drain before entering the main storm line. This aligns with all 4 SuDS pillars; water quality, water quantity, biodiversity and amenity. To accommodate the 1 in 100 year storm event +20% climate change and 10% urban creep, attenuation is to be provided in the form of crates as space does not permit swales/basins/ponds/etc. Majority of the surface water will discharge through SuDS elements before reaching the main storm line which therefore aligns with the principles of Fingal CoCo's policy.

SuDS Measures	Measures to be used on this site	Rationale for selecting/not selecting measure
Swales	No	Insufficient space on site.
Integrated constructed tree pits	No	Would require removal of existing trees which would have cost implications.
Rainwater Butts	Yes	Acts as a source control for roof runoff whilst providing additional storage and amenity.
Downpipe Planters	No	Rainwater butts provided instead.
Rainwater harvesting	No	Rainwater butts provided instead due to easier maintenance.
Soakaways	No	Site investigation infiltration tests determined that there is low infiltration across the site therefore not suitable.
Infiltration trenches	No	Site investigation infiltration tests determined that there is low infiltration across the site therefore not suitable.
Permeable pavement (Grasscrete, Block paving, Porous Asphalt etc.)	Yes	Block paving to be used around units and car parking spaces and porous asphalt will be used on the carriageway which will provide surface water treatment and attenuation storage in the subbase layer of drainage stone.
Green Roofs	No	Pitch of roof is not suitable.
Green Wall	No	Insufficient design information within SuDS document
Filter Strips	No	No location suitable for a filter strip.
Bio-retention systems/Raingardens	Yes	Raingardens to be provided along the front of the dwellings which will provide surface water treatment, storage, amenity and biodiversity.
Blue Roofs	No	Pitch of roof is not suitable.
Filter Drain	Yes	Provides surface water treatment and attenuation storage through infiltration to the subbase layer of drainage stone.
Detention Basins	No	Insufficient space on site.
Retention Basins	No	Insufficient space on site.
Ponds	No	Insufficient space on site.
Wetlands	No	Insufficient space on site.
Petrol/Oil Interceptor	No	Selected SuDS elements; filter drain, permeable paving and tree pits eliminate the need.
Attenuation tank – only as a last resort where other measures are not feasible	Yes	Accommodates the 1 in 100 year storm event +20% climate change and 10% urban creep. Majority of surface water will discharge through SuDS elements before reaching the attenuation tank therefore aligning with Fingal County Councils Policy.
Oversized pipes– only as a last resort where other measures are not feasible	No	Not a Fingal County Council preferred method when storage can be provided elsewhere; permeable paving.

Overall Development Site Area (m2)				4145							
% Permeable Areas (open space, green roofs, permeable surfacing etc)				64%							
% Hardstanding Areas (roof areas, road surfaces, concrete paved areas etc)				36%							
Park Type **as per Table 12.5 of the Development Plan)**	**Park size (m^2)**	**Area of Drainage green infrastructure in park (m^2)**	**Percentage of drainage infrastructure per park (%)**	**Swale (m^2)**	**Filter strip (m^2)**	**Bioretention area (m^2)**	**Retention basin (m^2)**	**Detention basin (m^2)**	**Pond (m^2)**	**Wetland ((m^2)**	**No. of head walls located on open**
Pocket Park (500m2- 0.2ha)	N/A	N/A									
Small Park (0.2ha to 2ha)	N/A	N/A									
Local Park (2-20ha)	N/A	N/A									
Urban Park Neighbourhood (20ha to 50ha)	N/A	N/A									
Regional Park (over 50 ha)	N/A	N/A									
Other permeable surfaces **Grass margins/ Environmental open space** ***Not part of open space provision**	2653	1223 (permeable paving &porous asphalt) 105 (raingardens) 1325 (landscape)	100%								

Appendix E:

- Site Investigation Report

Appendix F:

- Irish Water Confirmation of Feasibility

CONFIRMATION OF FEASIBILITY

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 448,
South City
Delivery Office,
Cork City.

www.water.ie

Sinead Murphy

McMahon Associates
The Mill Building,
Newtown Link Road,
Greenhills,
Drogheda
Co. Louth
A92CD3D

19 December 2022

Our Ref: CDS22008839 Pre-Connection Enquiry
Remount Phase II, Rathmore Road, Lusk, Dublin

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Irish Water has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 18 unit(s) at Remount Phase II, Rathmore Road, Lusk, Dublin, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection** - Feasible without infrastructure upgrade by Irish Water

- The proposed water connection for this development connects to the Irish Water network via infrastructure that has not been taken in charge by Irish Water (Third Party Infrastructure). Please be advised that at connection application stage and prior to the commencement of any Self-Lay Works, you have to:
  - Identify and procure transfer to Irish Water of the arterial infrastructure within the Third-Party Infrastructure
  - Demonstrate that the arterial infrastructure is in compliance with the requirements of the Irish Water Code of Practice and Standard Details and in adequate condition and capacity to cater for the additional load from the Development.

- The proposed development appears to connect to the Irish Water Network via private land/s. Please be advised that at connection application stage, you have to provide evidence of consent of the Third Party Landowner/s. A wayleave in favour of Irish Water will be required to be provided by the Customer in order for the works to be carried out in the Third Party Land/s
- The exact connection details will be specified at connection application stage.

- **Wastewater Connection** - Feasible without infrastructure upgrade by Irish Water

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Irish Water.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

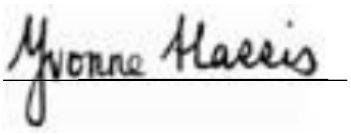
Where can you find more information?

- **Section A -** What is important to know?
- **Section B -** Details of Irish Water's Network(s)

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Irish Water's network(s). This is not a connection offer and capacity in Irish Water's network(s) may only be secured by entering into a connection agreement with Irish Water.

For any further information, visit **www.water.ie/connections**, **email newconnections@water.ie** or contact 1800 278 278**.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations

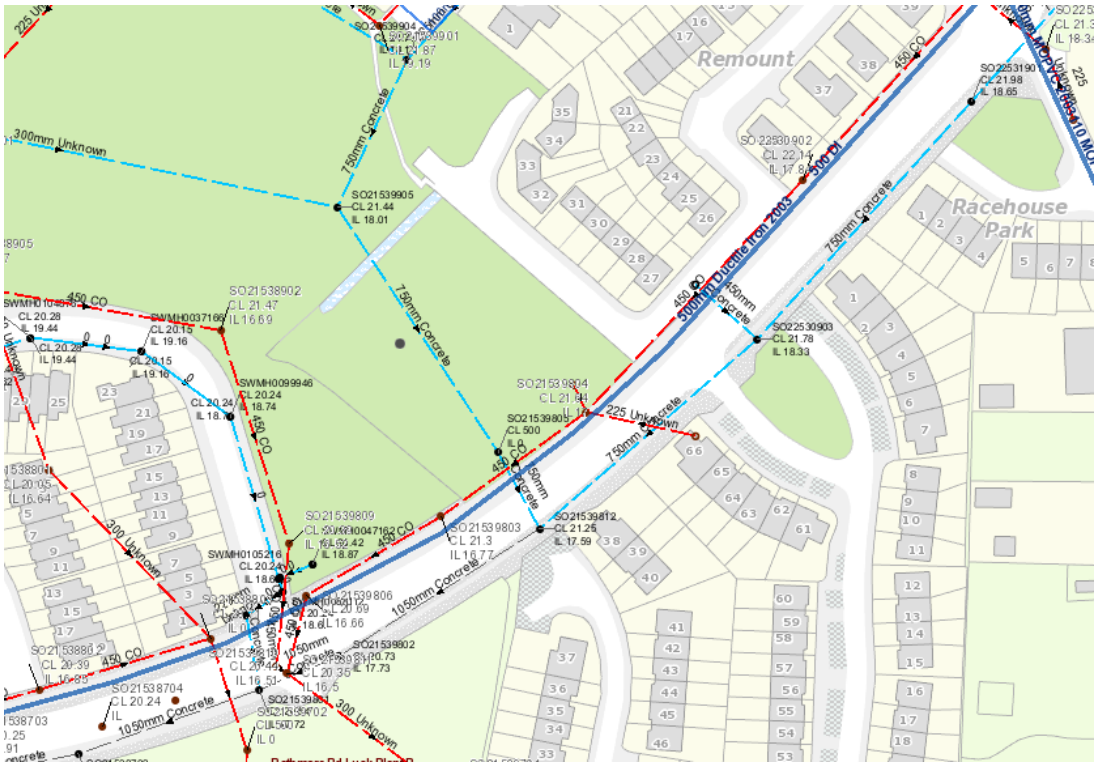
Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Irish Water's network(s). • Before the Development can connect to Irish Water's network(s), you must submit a connection application and be granted and sign a connection agreement with Irish Water.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Irish Water connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Irish Water's network(s), including works in the public space, must be carried out by Irish Water*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • **What to do?** - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Irish Water's network(s)?	• Requests for maps showing Irish Water's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Irish Water Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

Section B – Details of Irish Water's Network(s)

The map included below outlines the current Irish Water infrastructure adjacent the Development: To access Irish Water Maps email datarequests@water.ie



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Note: The information provided on the included maps as to the position of Irish Water's underground network(s) is provided as a general guide only. The information is based on the best available information provided by each Local Authority in Ireland to Irish Water.

Whilst every care has been taken in respect of the information on Irish Water's network(s), Irish Water assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Irish Water's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Irish Water's underground network(s) is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.