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SHB1-CRA-CS-MOR  
Date: April 2017

## **Kildare County Council**

# **Proposed Development of 74 no. Residential Units at Craddockstown Road, Craddockstown Demesne, Naas, Co. Kildare.**

## **Engineering Report**



2B Richview Office Park  
Clonskeagh  
Dublin 14

# Contents Amendment Record

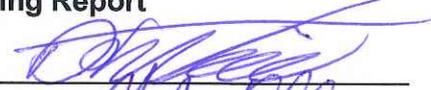


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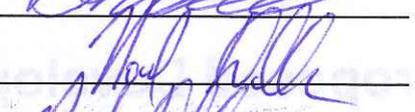
**Title:** Proposed Development of  
 74 no. Residential Units at Craddockstown Road,  
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**Job Number:** SHB1-CRA-CS-MOR-DOC-Engineering Report

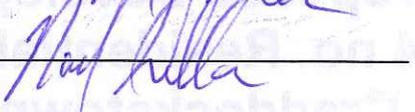
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**Approved By:** Noel Dillon

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## Revision Record

Issue No.	Date	Description	Remark	Prepared	Checked	Approved
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## 1 INTRODUCTION

### 1.1 Introduction

Malone O'Regan have been commissioned to prepare drainage, water supply and road infrastructure plans in relation to a proposed residential development on Craddockstown Road, Naas, County Kildare. This report has been prepared to describe the proposed infrastructure and to support a Part VIII planning application for the development.

The proposed development is fully described on the drawings which accompany this planning submission. Where reference is made to drawings and drawing numbers within this report these should be taken as meaning those drawings produced by Malone O'Regan unless specifically stated otherwise.

### 1.2 The Site

The proposed site is located along the Craddockstown Road (L6043) approximately 1.5km to the southeast of Naas town centre. The site is located at the southern edge of an established residential area. Naas Community National School is located immediately to the north of the site and the Oak Glade residential estate lies to the north of the college. The Ban na Greinne residential development is located to the west of the Craddockstown Road, across from Naas Community National School. 2 no. detached residential properties fronting onto the Craddockstown Road are located to the west of the site.

The lands to the south of the site are principally used for agricultural purposes. Craddockstown Golf Course is located to the southeast of the site.

The lands to the north and east of the site are currently undeveloped, residential zoned lands under the ownership of Ballymore Developments Ltd. Planning permission for a large residential development on these lands has recently granted (planning register reference. 15176). This development is to be constructed by Ballymore in two Phases. Phase 1 will be located to the northeast of the development which is now proposed and Phase 2 will be located to the east.



Figure 1.1 – Site Location

### 1.3 Project Description

The proposed development includes the construction of 74 residential properties as well as access roads, car parking bays and other ancillary utility services. Details of the proposed development are indicated on Malone O'Regan drawing SHB1-CRA-CS-MOR-DR-101.

### 1.4 Site Topography

The site has an overall area of 3.58 hectares. A topographical survey has been conducted which indicates that there is a gentle slope across the site. The existing ground level falls from a highest elevation of +118.0m at the southwest corner of the site to a lowest elevation of +112.5m in the northeast corner of the site.

The intention is to maintain the existing ground levels as far as possible. Some minor re-grading of the existing ground levels within the site will be required in order to maintain acceptable gradients on internal roads and footpaths.

### 1.5 Consultation

In preparing this planning application Malone O'Regan consulted with the following personnel within the Local Authority and within Irish Water:

Mr David Creighton	Kildare County Council, Architectural Services
Mr Alan Dunney	Kildare County Council, Water Services
Mr Colum Fagan	Kildare County Council, Water Services
Mr George Willoughby	Kildare County Council, Roads Services
Mr Fionán Ginty	Irish Water

A Pre-Connection enquiry form was also submitted to Irish Water. A feedback form was returned from Irish Water which confirmed that the potable and wastewater connections are "feasible without infrastructure upgrade by Irish Water".

### 1.6 References

Reference has been made to the following publications in the preparation of this report.

- Greater Dublin Regional Code of Practice for Drainage Works, Version 6.0.
- Greater Dublin Strategic Drainage Study.
- Kildare County Development Plan 2017-2023.
- Naas Town Development Plan 2011-2017.
- EPA Wastewater Treatment Manuals, Treatment Systems for Small Communities, Business, Leisure Centres and Hotels.
- Planning Systems and Flood Risk Management: Guidelines for Planning Authorities November 2009

## 2 SURFACE WATER DRAINAGE DESIGN

### 2.1 Proposed Layout

The proposed surface water drainage layout is indicated on drawing SHB1-CRA-CS-MOR-DR-102. It is proposed to discharge all surface water runoff from the site into a surface water manhole which is to be located on the lands owned by Ballymore Developments Ltd. This manhole will be constructed by Ballymore Developments Ltd as part of their phase 2 works as described in Section 1.2 above.

Surface water runoff from the new road surfaces and the roofs of the new buildings will be collected by gullies and directed towards a new attenuation tank from where it will discharge at a controlled rate. The rate of discharge will be controlled using a Hydrobrake and will be limited to the QBAR value for the site. This will ensure that the rate of surface water discharge from the proposed site is not greater than that from the existing greenfield site.

### 2.2 Attenuation / Runoff Calculations

#### Development Area Details

Total Area = 35,800 m<sup>2</sup> (3.58 hectares)

Calculation of Impermeable area:

	Impermeable Area (m <sup>2</sup> )
Roofs	4,735
Roads	7,000
Footpaths	2,060
<b>Total Imp. Area =</b>	<b>13,795 m<sup>2</sup></b>

#### Rainfall Data

The rainfall data used was based on Met Eireann Rainfall Data for Naas. The rainfall data and drainage criteria employed is as follows:

M5 – 60 = 17.9mm (Max. rainfall in 1 hour for 5 year return period)

M5 - 2D = 61.8mm (Max. rainfall in 2 days for 5 year return period)

Ratio, r = 0.29 (M5 - 60/ M5 - 2D)

Standard Average Annual Rainfall (SAAR) = 823mm

When calculating the required size of attenuation tank using Micro Drainage, an additional 10% was added to the above rainfall intensities to account for the future effects of climate change.

### Permissible Runoff

The regression equation recommended for use by the Greater Dublin Strategic Drainage Study 2005 calculates a value, QBARrural. This value is the mean annual flood flow from a rural catchment in m<sup>3</sup>/s and is given by the equation,

$$QBARrural = 0.00108[Area^{0.89}] \times [SAAR^{1.17}] \times [Soil^{2.17}]$$

Where:

QBARrural – Mean annual flood flow from a rural catchment in m<sup>3</sup>/s

Area – Area of the catchment in km<sup>2</sup>

SAAR – Standard average rainfall in mm.

Soil – Soil index

When this equation is applied to the proposed development in Kilkenny the following value for QBARrural is obtained.

$$\text{For 50 Ha area} \sim QBARrural = 0.00108 [0.5]^{0.89} \times [823]^{1.17} \times [0.3]^{2.17} = 0.110 \text{ m}^3/\text{s}$$

$$\text{For 3.58 Ha} \sim QBARrural = 0.110 \text{ m}^3/\text{s} \times (3.58/50) = 0.0079 \text{ m}^3/\text{s}$$

$$= 7.9 \text{ l/s}$$

This equates to 2.20 l/s per hectare.

In accordance with the Greater Dublin Strategic Drainage Study document, it is proposed to limit the outflow from the attenuation tank to the QBARrural value calculated above using a Hydrobrake flow control device. A Class I bypass separator unit will be installed on the drainage pipework downstream of the attenuation tank prior to discharge.

### Attenuation Design & Outflow Connection

Calculations for the design of the attenuation tank are provided in Appendix A. These calculations are based on the design parameters listed above. The attenuation tank has been sized to cater for a 1 in 100 year storm event.

The required attenuation volume has been calculated using industry-standard design package Micro Drainage. The calculations provided in Appendix A show that the required volume of attenuation storage for a 1 in 100 year storm event is **702m<sup>3</sup>**.

### 3 FOUL WATER DRAINAGE DESIGN

#### 3.1 Proposed Layout

The proposed foul drainage layout is indicated on drawing SHB1-CRA-CS-MOR-DR-102. It is proposed to discharge all foul water from the site into a manhole which is to be located on the lands owned by Ballymore Developments Ltd. This manhole will be constructed by Ballymore Developments Ltd as part of their phase 2 works as described in Section 1.2 above.

It is proposed to provide a network of gravity sewers within the site to collect foul waste from each property and discharge it towards the manhole described above.

#### 3.2 Foul Discharge Calculations

The average and peak discharge rates were calculated using loading rates provided by Irish Water:

Dry Weather Flow (DWF) = 600 litres per dwelling  
(Source: Irish Water Pre-Connection Enquiry Form)

Number of properties = 74.

Total DWF = 600 x 74 = 44,400 litres / day  
= 0.514 l/s

Peak Discharge = 6 x DWF = 6 x 0.514  
= 3.08 l/s

## 4 WATERMAINS

### 4.1 Proposed Layout

The proposed watermain layout is indicated on drawing SHB1-CRA-CS-MOR-DR-104. It is proposed to connect the internal watermain network within the site into the watermain network which is to be constructed as part of the Ballymore Development Ltd. Phase 1 works.

A Pre-Connection enquiry form was submitted to Irish Water who, in return, provided a feedback form. This feedback form (Irish Water customer reference CUST16578) states that the proposed potable water connection would be “feasible without infrastructure upgrade by Irish Water”.

### 4.2 Water Demand Calculations

The average and peak water demand rates were calculated in accordance with the Irish Water Pre-Connection Enquiry Form which assumes a loading rate of 150 litres / person / day and an average occupancy ratio of 2.7 persons per dwelling. The average day, peak week demand is taken as 1.25 times the average daily domestic demand. The peak demand is taken to be 2.1 times the average day, peak week demand.

Number of properties = 74

Average Daily Domestic Demand =  $150 \times 74 \times 2.7 = 29,970$  litres / day  
= 0.347 l/s

Average Day Peak Week Demand =  $0.347 \times 1.25 = 0.434$  l/s

Peak Demand =  $0.434 \times 2.1 = 0.911$  l/s

Normal Demand (assuming principal water usage over 8 hrs) =  $0.434 \times 24/8 = 1.302$  l/s

## APPENDIX A – ATTENUATION TANK CALCULATIONS

Microstrain Ltd		Page 1
Unit B3 Metropoint Business Park Swords Co. Dublin	Craddockstown 100YRP+10% 7.9 l/s	
Date 6 Apr 17	Designed by SN	
File	Checked by	
XP Solutions	Source Control 2015.1	

Summary of Results for 100 year Return Period (+10%)

Half Drain Time : 855 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E (l/s)	Max Outflow Volume (m³)	Status
15 min Winter	0.423	0.423	0.0	6.3	6.3	248.9	O K
30 min Winter	0.573	0.573	0.0	6.3	6.3	337.7	O K
60 min Winter	0.725	0.725	0.0	6.3	6.3	427.3	O K
120 min Winter	0.884	0.884	0.0	6.8	6.8	520.6	O K
180 min Winter	0.975	0.975	0.0	7.1	7.1	574.3	O K
240 min Winter	1.036	1.036	0.0	7.3	7.3	610.3	O K
360 min Winter	1.112	1.112	0.0	7.6	7.6	655.2	O K
480 min Winter	1.155	1.155	0.0	7.7	7.7	680.3	O K
600 min Winter	1.178	1.178	0.0	7.8	7.8	694.1	O K
720 min Winter	1.190	1.190	0.0	7.8	7.8	700.7	O K
960 min Winter	1.191	1.191	0.0	7.8	7.8	701.8	O K
1440 min Winter	1.182	1.182	0.0	7.8	7.8	696.5	O K
2160 min Winter	1.131	1.131	0.0	7.6	7.6	666.3	O K
2880 min Winter	1.064	1.064	0.0	7.4	7.4	626.6	O K
4320 min Winter	0.922	0.922	0.0	6.9	6.9	542.8	O K
5760 min Winter	0.784	0.784	0.0	6.4	6.4	461.9	O K
7200 min Winter	0.651	0.651	0.0	6.3	6.3	383.5	O K
8640 min Winter	0.516	0.516	0.0	6.3	6.3	303.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Winter	88.084	0.0	246.0	26
30 min Winter	59.996	0.0	334.1	40
60 min Winter	38.455	0.0	441.5	70
120 min Winter	24.032	0.0	551.8	126
180 min Winter	18.115	0.0	623.7	184
240 min Winter	14.790	0.0	678.6	242
360 min Winter	11.088	0.0	762.1	356
480 min Winter	9.027	0.0	825.9	470
600 min Winter	7.692	0.0	877.8	580
720 min Winter	6.748	0.0	921.3	686
960 min Winter	5.486	0.0	989.1	866
1440 min Winter	4.097	0.0	1038.7	1098
2160 min Winter	3.057	0.0	1271.8	1564
2880 min Winter	2.481	0.0	1375.3	2020
4320 min Winter	1.846	0.0	1530.3	2900
5760 min Winter	1.496	0.0	1662.6	3752
7200 min Winter	1.270	0.0	1764.7	4608
8640 min Winter	1.111	0.0	1852.2	5360

Microstrain Ltd		Page 2
Unit B3 Metropoint Business Park Swords Co. Dublin	Craddockstown 100YRP+10% 7.9 l/s	
Date 6 Apr 17	Designed by SN	
File	Checked by	
XP Solutions	Source Control 2015.1	

Summary of Results for 100 year Return Period (+10%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max $\Sigma$ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
10080 min Winter	0.374	0.374	0.0	6.3	6.3	220.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m <sup>3</sup> )	Discharge Volume (m <sup>3</sup> )	Time-Peak (mins)
10080 min Winter	0.993	0.0	1928.3	5968

Microstrain Ltd		Page 3
Unit B3 Metropoint Business Park Swords Co. Dublin	Craddockstown 100YRP+10% 7.9 l/s	
Date 6 Apr 17	Designed by SN	
File	Checked by	
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
M5-60 (mm)	17.900	Shortest Storm (mins)	15
Ratio R	0.290	Longest Storm (mins)	10080
Summer Storms	No	Climate Change %	+10

Time Area Diagram

Total Area (ha) 1.379

Time (mins) Area			Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	0.460	4	8	0.460	8	12	0.460

Microstrain Ltd		Page 4
Unit B3 Metropoint Business Park Swords Co. Dublin	Craddockstown 100YRP+10% 7.9 l/s	
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File	Checked by	
XP Solutions	Source Control 2015.1	

Model Details

Storage is Online Cover Level (m) 2.000

Cellular Storage Structure

Invert Level (m) 0.000 Safety Factor 2.0  
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95  
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	620.0	620.0	1.300	0.0	742.4
1.200	620.0	742.4			

Hydro-Brake® Outflow Control

Design Head (m) 1.200 Hydro-Brake® Type Md6 SW Only Invert Level (m) 0.000  
 Design Flow (l/s) 7.9 Diameter (mm) 112

Depth (m)	Flow (l/s)						
0.100	3.5	1.200	7.8	3.000	12.4	7.000	18.9
0.200	6.2	1.400	8.5	3.500	13.4	7.500	19.6
0.300	6.3	1.600	9.1	4.000	14.3	8.000	20.2
0.400	5.9	1.800	9.6	4.500	15.2	8.500	20.9
0.500	5.8	2.000	10.1	5.000	16.0	9.000	21.5
0.600	5.9	2.200	10.6	5.500	16.8	9.500	22.1
0.800	6.5	2.400	11.1	6.000	17.5		
1.000	7.2	2.600	11.5	6.500	18.2		