Malachy Walsh and Partners

Engineering & Environmental Consultants

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Drainage
Engineering Report

Development of 15 Dwelling Unit, Connelly Park, Phase 2 Tobercurry. Co Sligo

Project	Document	Revision	Issue	Prepared	Checked	Approved	Date
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1 General

1.1 Introduction

This report has been prepared to accompany the Part 8 planning application for a proposed housing development of 15 Dwelling Units, Connelly Park, Phase 2, Tobercurry Co Sligo. The Site is located in close proximity to the N17 and is accessed off Connelly Park Road.

This report outlines the current and proposed traffic, surface water, foul drainage, watermain design associated with the development.

The layout of the proposed scheme is detailed in a series of planning drawings by Sligo County Council's Architectural Department, these which accompany this planning submission.

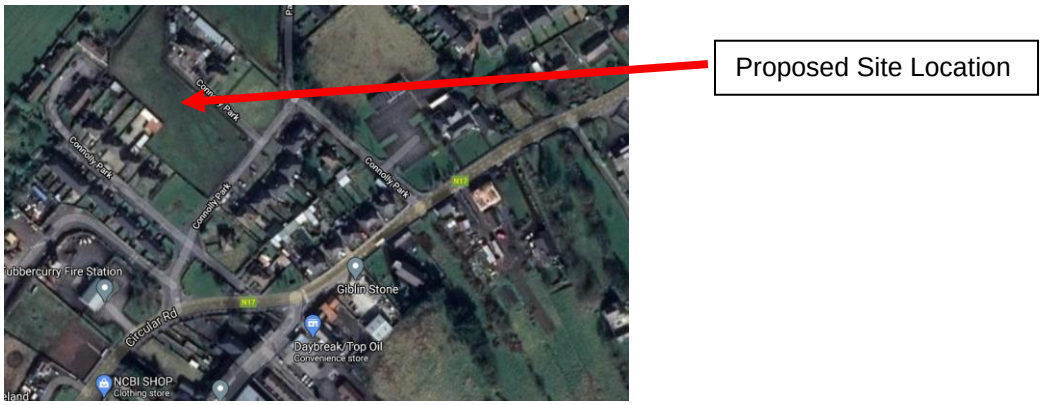

Figure 1. Site Location

1.2 Site Description and Topography

The project is part of an overall regeneration scheme for the area. The natural topography of the site is generally flat. Phase one of this development is currently under construction. Phase two consists of the provision of an additional 15 units on what is a relatively flat site. Access to the site his being maintained from existing infrastructure. There is a fully compliant designed junction onto the N17 in place which will be the primary access to this development. Secondary minor lanes are also available to access the site. Improvements to these lanes sightlines have been achieved where possible. The internal road networks have been assessed in accordance with DMURs requirements.

1.3 Proposed Development

The proposed development consists of the construction of 15 residential units with associated pavements, installation of foul and storm drainage, watermain, and associated site works. The units will be constructed with trussed roofs over load bearing masonry with timber joists forming all floors. All foul drainage and watermain works will conform to Irish Water Codes of Practice. It is proposed to attenuate storm water within the site extents and improve the discharge from the site. All foul drainage will be discharged to existing infrastructure some of which has been constructed under phase one of the works.

2 Traffic

2.1 Roads and Entrances

2.1.1 Access from R875

The primary exit from Connelly Park will be onto the N17 to the west of the development. Secondary exits from the site are possible via Parklands Cres and Connelly Park road junctions. It is reasonable to expect that the vast majority of traffic movements to and from the site will be via the N17 road to the west. Sight lines onto Parklands Cres and Connelly Park road junctions are poor but will be improved by the works by the setting back of the housing units and the proposed alignments of the roadways.

3 Foul Water Drainage Design

3.1 Existing Foul Water Drainage

There is existing infrastructure proposed within the overall site. This is being installed in accordance with Irish water specifications and under the guidance of Irish Water Field Engineers. Drawing 19835-SCC01-MWP-00-00-DR-C-5002 details the proposed connection locations. All details and designs will be in accordance with Irish Water Codes of Practice.

The proposed foul water drainage required to service the site has been designed in accordance with the Irish Water Codes of Practice for Wastewater Design. According to Part 3 of the Irish Water Code of Practice, a Dry Weather Flow of 446 litres per dwelling is taken for the design of the domestic wastewater system. Additionally, according to 1.2.5 of Appendix C of the Code of Practice, it states that works should be designed to carry a wastewater volume of between 6 and 2.5 times the Dry Weather Flows. See Calculations below.

15 Units

Use 446 litres per dwelling per day – Section 3.6.3 of Irish Water Wastewater Infrastructure

15 x 446l/d/day = 6,690/day

Use 24 hour day

6,690/day/(24x60x60) = .0774l/sec

Maximum flow at 6 DWF will be $0.0774 \times 6 = 0.465/s$

4 Storm Water Drainage

4.1 Existing Drainage Regime

Phase one of the development incorporated attenuation into the design in order to ensure the overall discharges from the site would mimic Greenfield run off rates. A similar approach has been taken to the phase two element of the stormwater design. Limited space on the site dictates that attenuation storage be providers under the turning head on the North western corner of the site. The attenuation structure has been designed for a one in 100 year storm with a 20% global warming factor. The majority of the overall site has therefore been controlled to a 100 year returned period with 20% global warming factors. BS EN 752 recommends attenuation to the 30 year storm with surcharging. The approach taken pays cognisance of the phased development. It is a more conservative approach and in this case permits the free discharge of a number of units located on the eastern side of the site. The result on the overall

performance of the site will be a net decrease in existing storm water runoff peak discharge when compared with current peak run off discharges.

4.2 Proposed Storm Drainage

4.2.1 Design Parameters

The proposed storm drainage system has been designed taking on board the principles of Sustainable Drainage Systems (SuDS). SuDS endeavours to slow down runoff from developed sites, the ideal SuDS system will mimic existing green field runoff in terms to volume, rate of runoff and quality of the runoff. The storm water drainage system has been designed in accordance with the "Ciria SuDS Manual 2015, the design has paid due cognisance of the OPW document "The planning System and Flood Risk Management".

- Site Location: Connelly Park Co Sligo.
- Rainfall data received from Met Eireann.
- SAAR 1230mm
- M5-60 17mm
- "r" 0.3
- Climate Change Factor 20%

Q Bar Growth Factors

- 1 year 0.85
- 30 year 1.65
- 100 year 1.95
- 200 year 2.15

4.3 Design Guidance and Legislation.

Storm water design has been based on the following guidance.

- Ciria SuDS Manual 2015
- Institute of Hydrology Report No. 124, Flood Estimation for Small Catchments.
- Sewers for Adoption by WRc PLC Seventh Edition.
- IS EN 752:2008 Drain and Sewer Systems Outside Buildings.

It is intended that the below ground drainage system will be designed to accommodate the 1 in 100 year, plus 20% allowance for climate change. This is a conservative approach in this case as noted but based on the premise of a free discharge to a very limited area.

Refer to Appendix 1 for storm water drainage calculations.

5 Watermain Design

5.1 Existing Water Supply

There is an existing 150mm water main terminated in close proximity to this site from the Phase 1 works. MWP drawing indicates a connection to this 150mm water main at a single point, there will be diversions required on the site.

5.2 Proposed Water Supply

The proposed watermain layout has been designed in accordance with the Irish Water Code of Practice. All watermain connections are to be constructed in accordance with Irish Waters requirements. The new connection will be metered in accordance with Irish Water's requirements.

6 Appendices.

6.1 Storm Design Calculations

Stormwater Attenuation Calculation for Development at Connelly Park

1 Year Return Period

			1 hr	2 hr	3 hr	4 hr	6 hr	9 hr	12 hr	18 hr	24 hr	48 hr
Duration (min)	15	30	60	120	180	240	360	540	720	1080	1440	2880
Rainfall (mm)	7.3	9.5	12.4	16.2	19.0	21.1	24.7	28.8	32.2	37.6	42.0	53.2
Impervious Area (ha)	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Max. Rainfall (m^3)	12.52	16.21	21.14	27.70	32.42	36.12	42.27	49.25	54.99	64.23	71.82	90.90
Throttle 1 Discharge Rate (l/s)	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87	2.87
Throttle 1 Discharge (m^3)	2.58	5.16	10.32	20.64	30.95	41.27	61.91	92.86	123.81	185.72	247.62	495.25
Required Storage (m^3)	9.94	11.05	10.82	7.07	1.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00

30 Year Return Period

			1 hr	2 hr	3 hr	4 hr	6 hr	9 hr	12 hr	18 hr	24 hr	48 hr
Duration (min)	15	30	60	120	180	240	360	540	720	1080	1440	2880
Rainfall (mm)	18.0	25.4	31.9	40.0	45.6	50.0	57.0	65.0	71.4	81.5	89.5	103.3
Impervious Area (ha)	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Max. Rainfall (m^3)	30.78	43.50	54.58	68.33	77.98	85.57	97.47	111.22	122.09	139.33	153.08	176.68
1 Year Storage Provided (m^3)	11.05	11.05	11.05	11.05	11.05	11.05	11.05	11.05	11.05	11.05	11.05	11.05
30 Year Spill Volume (m^3)	19.73	32.45	43.53	57.28	66.92	74.52	86.42	100.17	111.04	128.28	142.03	165.63
Throttle 2 Discharge Rate (l/s)	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
Throttle 1 & 2 Discharge (m^3)	4.40	9.39	19.37	39.66	60.18	80.80	122.28	184.85	247.68	373.80	500.34	1005.94
Additional Storage (m^3)	15.33	23.06	24.16	17.62	6.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00

100 Year Return Period

			1 hr	2 hr	3 hr	4 hr	6 hr	9 hr	12 hr	18 hr	24 hr	48 hr
Duration (min)	15	30	60	120	180	240	360	540	720	1080	1440	2880
Rainfall (mm)	17.2	23.9	42.8	53.0	60.0	65.5	74.3	84.0	91.8	103.9	113.4	127.3
Impervious Area (ha)	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Max. Rainfall (m^3)	29.17	40.60	72.83	90.17	102.00	111.38	126.28	142.80	156.06	176.66	192.78	216.44
30 Year Storage Provided (m^3)	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21
100 Year Spill Volume (m^3)	0.00	5.38	37.61	54.95	66.79	76.17	91.06	107.59	120.85	141.45	157.57	181.23
Throttle 3 Discharge Rate (l/s)	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43
Throttle 1, 2 & 3 Discharge (m^3)	4.40	9.73	22.03	45.95	70.31	94.92	144.60	219.83	295.61	448.15	601.54	1213.27
Additional Storage (m^3)	0.00	0.00	15.58	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Summary

Trottle 1 Discharge Rate	2.87	l/s
Trottle 2 Discharge Rate	3.15	l/s
Trottle 3 Discharge Rate	1.43	l/s
Required Storage for 1 year Event	11.05	m^3
Additional Storage for 30 year Event	24.16	m^3
Additional Storage for 100 year Event	15.58	m^3
Total Storage Required	50.79	m^3

Rainfall factored by 1.2 for climate change

Greenfield Runoff Calculation for Development at Connelly Park Co Sligo

The greenfield runoff of the site is estimated using the equation developed by the UK Institute of Hydrology and published in their Report 124

$QBAR_{rural} = 0.00108AREA^{0.89}SAAR^{1.17}SOIL^{2.17}$

where:

$QBAR_{rural}$ = mean annual flood for catchment	
AREA = area of catchment in km2	0.5
SAAR = standard average annual average rainfall in mm	1230
SOIL = soil index taken from maps in the report	0.3

for catchments less than 50 ha, it is recommended that the greenfield runoff should first be calculated for 50 ha and then linearly interpolated for the smaller catchment size.

therefore:

$QBAR_{rural}$ = 0.00108 0.539614 4122.769 0.073342

= 0.176218 m3/s

for catchment of: 0.8132 ha

$QBAR_{rural}$ = 0.002866 m3/s

= 2.87 l/s

30y $QBAR_{rural}$ =	6.02	l/s	(based on 30 year growth factor of 2.1 as recommended in GDSDS)
100y $QBAR_{rural}$ =	7.45	l/s	(based on 30 year growth factor of 2.6 as recommended in GDSDS)
Throttle 1 =	2.87	l/s	(to cater for events up to 1 year return period)
Throttle 2 = (30yQbar-Qbar)	3.15	l/s	(to cater for events > 1 year and < 30 year return period)
Throttle 3 = 100yQbar-30yQbar)	1.43	l/s	(to cater for events greater than 30 year return period)

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Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 152324, Northing: 312185,

	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.6,	3.7,	4.3,	5.1,	5.7,	6.2,	7.6,	9.3,	10.3,	11.9,	13.2,	14.3,	15.9,	17.1,	18.2,	N/A ,
10 mins	3.7,	5.2,	6.0,	7.2,	8.0,	8.6,	10.6,	12.9,	14.4,	16.5,	18.4,	19.9,	22.1,	23.9,	25.3,	N/A ,
15 mins	4.3,	6.1,	7.0,	8.4,	9.4,	10.1,	12.5,	15.2,	17.0,	19.4,	21.7,	23.4,	26.0,	28.1,	29.8,	N/A ,
30 mins	5.7,	7.9,	9.1,	10.8,	12.0,	12.9,	15.8,	19.1,	21.2,	24.2,	26.9,	28.9,	32.0,	34.5,	36.5,	N/A ,
1 hours	7.6,	10.3,	11.8,	13.9,	15.4,	16.5,	20.0,	24.0,	26.6,	30.2,	33.3,	35.7,	39.4,	42.3,	44.6,	N/A ,
2 hours	10.0,	13.5,	15.3,	18.0,	19.7,	21.1,	25.4,	30.2,	33.3,	37.6,	41.3,	44.2,	48.6,	51.9,	54.7,	N/A ,
3 hours	11.8,	15.8,	17.8,	20.8,	22.8,	24.3,	29.2,	34.5,	38.0,	42.7,	46.9,	50.0,	54.8,	58.5,	61.5,	N/A ,
4 hours	13.3,	17.6,	19.8,	23.1,	25.3,	26.9,	32.2,	38.0,	41.7,	46.8,	51.2,	54.6,	59.8,	63.7,	66.9,	N/A ,
6 hours	15.6,	20.6,	23.1,	26.8,	29.2,	31.1,	37.0,	43.4,	47.5,	53.2,	58.1,	61.9,	67.5,	71.8,	75.4,	N/A ,
9 hours	18.4,	24.0,	26.9,	31.1,	33.8,	35.9,	42.5,	49.7,	54.2,	60.5,	65.9,	70.0,	76.2,	81.0,	84.8,	N/A ,
12 hours	20.6,	26.8,	30.0,	34.5,	37.5,	39.8,	46.9,	54.6,	59.5,	66.3,	72.1,	76.5,	83.1,	88.2,	92.3,	N/A ,
18 hours	24.3,	31.3,	34.9,	40.0,	43.4,	45.9,	53.9,	62.5,	67.9,	75.3,	81.7,	86.6,	93.9,	99.4,	103.9,	N/A ,
24 hours	27.3,	35.0,	38.9,	44.4,	48.1,	50.8,	59.5,	68.7,	74.6,	82.5,	89.4,	94.5,	102.3,	108.2,	113.0,	129.3,
2 days	35.6,	44.3,	48.6,	54.7,	58.6,	61.5,	70.6,	80.1,	86.1,	94.1,	101.0,	106.1,	113.7,	119.4,	124.1,	139.6,
3 days	42.9,	52.4,	57.1,	63.6,	67.7,	70.9,	80.4,	90.4,	96.5,	104.7,	111.7,	116.9,	124.6,	130.3,	135.0,	150.4,
4 days	49.6,	59.9,	64.8,	71.7,	76.1,	79.4,	89.4,	99.7,	106.1,	114.5,	121.6,	126.9,	134.7,	140.5,	145.2,	160.8,
6 days	62.0,	73.5,	79.0,	86.6,	91.4,	94.9,	105.7,	116.7,	123.4,	132.3,	139.7,	145.2,	153.3,	159.3,	164.1,	179.9,
8 days	73.6,	86.2,	92.2,	100.4,	105.5,	109.3,	120.7,	132.3,	139.3,	148.5,	156.2,	161.9,	170.2,	176.4,	181.3,	197.4,
10 days	84.8,	98.3,	104.7,	113.4,	118.8,	122.8,	134.8,	146.8,	154.2,	163.7,	171.7,	177.5,	186.1,	192.4,	197.4,	213.8,
12 days	95.6,	110.0,	116.7,	125.8,	131.5,	135.7,	148.2,	160.7,	168.3,	178.2,	186.4,	192.4,	201.1,	207.5,	212.7,	229.4,
16 days	116.6,	132.5,	139.8,	149.7,	155.8,	160.3,	173.7,	187.1,	195.1,	205.5,	214.0,	220.3,	229.4,	236.0,	241.3,	258.5,
20 days	137.1,	154.2,	162.0,	172.6,	179.2,	183.9,	198.1,	212.1,	220.4,	231.2,	240.1,	246.6,	256.0,	262.8,	268.3,	285.8,
25 days	162.2,	180.7,	189.1,	200.4,	207.3,	212.4,	227.3,	242.0,	250.7,	262.0,	271.2,	277.9,	287.5,	294.6,	300.2,	318.2,

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