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Associates**

CONSULTING ENGINEERS & PROJECT MANAGERS

Structural Engineering

Civil Engineering

Conservation Engineering

Health & Safety

Project Management

Legal / Expert Witness

Civil Engineering Planning Report

Project:

Deerpark
Adare
Co. Limerick

Client:

Limerick City & County Council

Date of Report:

16/10/2019

Project Ref. No.:

L200

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1.0 Introduction

The following report outlines the Civil Engineering design elements for the proposed residential development at Deerpark, Adare, Co. Limerick. It has been prepared to accompany the submission of a Planning Application for development at this site comprising 31 no. units and 8 no. plots for affordable housing at two separate development locations. It shall also incorporate a new street connecting the proposed scheme with the existing Deerpark Estate, new street connections to the N21 national road, associated footpaths, the reconfiguration of the existing carpark and the provision of new car parking and other ancillary site works.

2.0 Civil Engineering Services

2.1 Overview

The following section outlines the Civil Engineering services for the proposed residential development.

For reference, included herewith are the following drawings:

- South Site:
 - Drawing no. L200-100: *Proposed Road Layout & Details*
 - Drawing no. L200-150: *Proposed Foul & Surface Water Drainage Layouts*
 - Drawing no. L200-200: *Proposed Watermain Layout*
 - Drawing no. L200-250: *Sightlines Compliance (Residential Development to Link Road)*
 - Drawing no. L200-251: *Sightlines Compliance (Link Road to N21 National Road)*

- North Site:
 - Drawing no. L200-101: *Proposed Road Layout & Details*
 - Drawing no. L200-151: *Proposed Foul & Surface Water Drainage Layouts (1 of 2)*
 - Drawing no. L200-152: *Proposed Foul & Surface Water Drainage Layouts (2 of 2)*
 - Drawing no. L200-201: *Proposed Watermain Layout (1 of 2)*
 - Drawing no. L200-202: *Proposed Watermain Layout (2 of 2)*
 - Drawing no. L200-260: *Vehicle Swept Path Analysis*

2.2 Existing Services

The existing South Site is a greenfield site in which there are no existing services. Foul and surface water from the South Site shall be discharged to proposed drainage pipework to be installed as part of enabling works for development of lands in the area. Surface water shall be attenuated prior to discharge from the South Site to the proposed drainage pipework installed as part of the enabling works.

The existing North Site contains both greenfield and brownfield site elements. The existing Deerpark Estate is located to the north west of the North Site and there are existing farm buildings and a kiln in this area. In the eastern part of the North Site, there is an existing public car park under which there is existing surface water pipework and an attenuation tank. It is proposed that the existing car park and associated services shall be reconfigured as part of the proposed works.

Foul and surface water from the North Site shall be discharged to the proposed drainage pipework to be installed as part of the enabling works for development of lands in the area. Surface water shall be attenuated prior to discharge from the North Site to the proposed drainage pipework installed as part of the enabling works.

2.3 Roads

Drawing no. L200-100 & L200-101 *Proposed Road Layout & Details* show the road, footpath, parking and cycle lane layouts together with locations for use of tactile paving at proposed pedestrian crossing points. These drawings also incorporate details of proposed road markings and associated signage as necessary. Road markings and signage shall be in accordance with the document titled *Traffic Signs Manual* published by the Department of Transport.

Cross-sectional details of the construction build-up for the proposed roads and footpaths have been prepared and are included on the aforementioned drawings.

It is noted that 'home zones' are to be incorporated into both residential developments at the North and South Sites. Please refer to the Architectural Layouts for further information.

We confirm that Vehicle Swept Path analyses have been carried out where necessary to determine feasibility for larger vehicles such as refuse vehicles and / or fire appliances to navigate safely throughout the scheme road networks. Drawing no. L200-260 *Vehicle Swept Path Analysis* has been prepared to demonstrate that a refuse vehicle could safely navigate the 'home zone' area incorporated into the North Site adjacent to the existing Deerpark Estate.

2.4 Traffic & Transport

A Traffic and Transport Assessment (TTA) has been commissioned and carried out for the proposed South Site residential development by Malachy Walsh and Partners. Please refer to this document for the recommendations contained therein.

Access to the South Site shall be via a new road to be constructed as part of enabling works. This road hereinafter referred to as a 'link road' has been incorporated to facilitate future access to development lands in the area. It could also form part of a link road that has been included in the Adare Local Area Plan (LAP) which may or may not be constructed into the future.

Footpaths, cycle lanes and on-street parking have been incorporated into this link road as shown on the accompanying drawings.

2.5 Surface Water

As briefly outlined previously in this report, it is proposed to discharge the surface water generated by the proposed residential developments at both the North and South Sites to new drainage pipework to be installed as part of the enabling works for development of lands in the area.

Prior to discharge from the subject sites, it is proposed to attenuate the surface water generated by the respective developments so as to minimise the downstream impact. Attenuation tanks have therefore been incorporated into the respective developments as shown on the accompanying drawings.

Attenuation volume calculations are included in Appendix A of this report for reference.

Please refer to drawing no. L200-150, L200-151 and L200-152 *Proposed Foul & Surface Water Drainage Layouts* for both the North and South Sites for details.

2.6 Foul Water

It is proposed to discharge the foul water generated by the proposed residential developments at both the North and South Sites to new drainage pipework to be installed as part of the enabling works for development of lands in the area.

Please refer to drawing no. L200-150, L200-151 and L200-152 *Proposed Foul & Surface Water Drainage Layouts* for both the North and South Sites for details.

All proposed wastewater services and connections to the existing wastewater network are to be constructed in accordance with details contained within the following documents:

- Irish Water Document IW-CDS-5030-01 – *Wastewater Infrastructure Standard Details – Connection and Developer Services – Construction Requirements for Self-Lay Developments.*
- Irish Water Document IW-CDS-5030-03 – *Code of Practice for Wastewater Infrastructure – Connection and Developer Services – Construction Requirements for Self-Lay Development.*

2.7 Water Supply

Drawing no. L200-200, L200-201 & L200-202 *Proposed Watermain Layouts* have been prepared to show the watermain layouts for the proposed residential developments at both the North and South Sites. This drawing includes details for proposed and existing pipework together with thrust and support blocks, hydrants, air valves, sluice valves and scour valves. Boundary boxes are also shown indicatively in the footpath at individual service connections.

All proposed water services and connections to the existing water services are to be constructed in accordance with details contained within the following documents:

- Irish Water Document IW-CDS-5020-01 – *Water Infrastructure Standard Details – Connection and Developer Services – Construction Requirements for Self-Lay Developments.*
- Irish Water Document IW-CDS-5020-03 – *Code of Practice for Water Infrastructure – Connection and Developer Services – Construction Requirements for Self-Lay Developments.*

We trust you find the above to be of use however, should you have any queries or require any further information, please don't hesitate to contact us.

End of Report

Yours sincerely,



Austin Dennany
Chartered Engineer

Date: 16th October 2019

Appendix A – Drainage Calculations

Surface Water Attenuation Calculations - South Site

Project:	South Site, Deerpark, Adare, Co.Limerick			Job No.:	L200
Section:	Assessment of Proposed Surface Water Discharge Rate - With Attenuation			Date:	02/10/19
Client:	Limerick City & County Council			Revision:	1st
				Designer:	STR
				Checked:	CMcD
				Approved:	AD

TABLE 1 - Areas (Proposed Development):				Site Area:	9586 m ²	0.9586 ha	0.009586 km ²
				SAAR	1011 mm		
				Soil Index	0.3 per GSDSDS		
				Mean Annual Peak Flow (Permissible Outflow Rate)			
				Mean Annual Flow (MAF)	0.00108 x (AREA) ^{0.69} (SAAR) ^{1.17} (SOIL) ^{2.17} m ³ /s		
				Interpolated for a 50ha site Qbar = 5.0 l/s			
Roads	Area m ²	Permblty Co-eff	Net non Permeable Area m ²	MAF =	5.0 l/s	QBAR =	5.0 l/s
Main Bldg	1901	1.0	1901	MAF =	0.005 m ³ /s	QBAR =	0.005 m ³ /s
TOTAL	6058	-	6058				

Duration	Seconds	Return Period (Years)									
		0.5	1.0	2.0	5.0	10.0	20.0	30.0	50.0	100.0	
1 min	60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2 min	120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
5 min	300	2.3	3.3	3.9	5.8	7.3	9.0	10.2	11.8	14.4	
10 min	600	3.2	4.7	5.4	8.1	10.2	12.6	14.2	16.4	20.1	
15 min	900	3.8	5.5	6.4	9.5	12.0	14.8	16.7	19.3	23.6	
30 min	1800	5.0	7.2	8.3	12.1	15.2	18.6	20.9	24.1	29.2	
60 min	3600	6.6	9.3	10.8	15.5	19.2	23.4	26.1	30.0	36.1	
2 hours	7200	8.8	12.2	14.0	19.8	24.3	29.4	32.7	37.4	44.7	
4 hours	14400	11.6	15.9	18.1	25.3	30.9	37.0	41.0	46.5	55.2	
6 hours	21600	13.7	18.5	21.1	29.3	35.4	42.3	46.7	52.9	62.5	
12 hours	43200	18.1	24.2	27.3	37.4	44.9	53.2	58.5	65.9	77.3	
24 hours	86400	23.9	31.5	35.5	47.8	57.0	66.9	73.3	82.1	95.5	
48 hours	172800	30.5	39.3	43.7	57.4	67.4	78.0	84.8	94.1	108.0	

Duration	Seconds	Return Period (Years)									
		0.5	1	2	5	10	20	30	50	100	
1 min	60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2 min	120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
5 min	300	13.9	20.0	23.6	35.1	44.2	54.5	61.8	71.5	87.2	
10 min	600	19.4	28.5	32.7	49.1	61.8	76.3	86.0	99.4	121.8	
15 min	900	23.0	33.3	38.8	57.6	72.7	89.7	101.2	116.9	143.0	
30 min	1800	30.3	43.6	50.3	73.3	92.1	112.7	126.6	146.0	176.9	
60 min	3600	40.0	56.3	65.4	93.9	116.3	141.8	158.1	181.7	218.7	
2 hours	7200	53.3	73.9	84.8	119.9	147.2	178.1	198.1	226.6	270.8	
4 hours	14400	70.3	96.3	109.6	153.3	187.2	224.1	248.4	281.7	334.4	
6 hours	21600	83.0	112.1	127.8	177.5	214.5	256.3	282.9	320.5	378.6	
12 hours	43200	109.6	146.6	165.4	226.6	272.0	322.3	354.4	399.2	468.3	
24 hours	86400	144.8	190.8	215.1	289.6	345.3	405.3	444.1	497.4	578.5	
48 hours	172800	184.8	238.1	264.7	347.7	408.3	472.5	513.7	570.1	654.3	

Duration	Seconds	Return Period (Years)									
		0.5	1	2	5	10	20	30	50	100	
1 min	60	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
2 min	120	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
5 min	300	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
10 min	600	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
15 min	900	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
30 min	1800	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	
60 min	3600	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	
2 hours	7200	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	
4 hours	14400	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	
6 hours	21600	108.0	108.0	108.0	108.0	108.0	108.0	108.0	108.0	108.0	
12 hours	43200	216.0	216.0	216.0	216.0	216.0	216.0	216.0	216.0	216.0	
24 hours	86400	432.0	432.0	432.0	432.0	432.0	432.0	432.0	432.0	432.0	
48 hours	172800	864.0	864.0	864.0	864.0	864.0	864.0	864.0	864.0	864.0	

Duration	Seconds	Return Period (Years)									
		0.5	1	2	5	10	20	30	50	100	
1 min	60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2 min	120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
5 min	300	12.4	18.5	22.1	33.6	42.7	53.0	60.3	70.0	85.7	
10 min	600	16.4	25.5	29.7	46.1	58.8	73.3	83.0	96.4	118.8	
15 min	900	18.5	28.8	34.3	53.1	68.2	85.2	96.7	112.4	138.5	
30 min	1800	21.3	34.6	41.3	64.3	83.1	103.7	117.6	137.0	167.9	
60 min	3600	22.0	38.3	47.4	75.9	98.3	123.8	140.1	163.7	200.7	
2 hours	7200	17.3	37.9	48.8	83.9	111.2	142.1	162.1	190.6	234.8	
4 hours	14400	0.0	24.3	37.6	81.3	115.2	152.1	176.4	209.7	262.4	
6 hours	21600	0.0	4.1	19.8	69.5	106.5	148.3	174.9	212.5	270.6	
12 hours	43200	0.0	0.0	0.0	10.6	56.0	106.3	138.4	183.2	252.3	
24 hours	86400	0.0	0.0	0.0	0.0	0.0	0.0	12.1	65.4	146.5	
48 hours	172800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

MAX STORAGE REQUIRED (m³) =		270.6
MAX STORAGE REQUIRED (m3) WITH 20% CLIMATE CHANGE ALLOWNACE		325

Surface Water Attenuation Calculations - North Site (Tank 1)

Project:	North site, Deerpark, Adare, Co.Limerick			Job No.:	L200
Section:	Assessment of Proposed Surface Water Discharge Rate - With Attenuation (1)			Date:	10/10/19
Client:	Limerick City & County Council			Revision:	1st
				Designer:	STR
				Checked:	CMcD
				Approved:	AD

TABLE 1 - Areas (Existing & Proposed Development):				Site Area:	2989 m ²	0.29889 ha	0.002989 km ²
	Area	Permbilty	Net non Permeable	SAAR	1011 mm		
	m ²	Co-eff	Area m ²	Soil Index	0.3 per GDSDS		
				Mean Annual Peak Flow (Permissible Outflow Rate)			
				Mean Annual Flow (MAF)	0.00108 x (AREA) ^{0.89} (SAAR) ^{1.17} (SOIL) ^{2.17} m ³ /s		
Roads	943	1.0	943	Interpolated for a 50ha site Qbar = 5.0 l/s			
Main Bldg	214	1.0	214	MAF =	5.0 l/s	QBAR =	5.0 l/s
TOTAL	1157	-	1157	MAF =	0.005 m ³ /s	QBAR =	0.005 m ³ /s

Duration	Return Period (Years)									
	Seconds	0.5	1.0	2.0	5.0	10.0	20.0	30.0	50.0	100.0
1 min	60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 min	120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5 min	300	2.3	3.3	3.9	5.8	7.3	9.0	10.2	11.8	14.4
10 min	600	3.2	4.7	5.4	8.1	10.2	12.6	14.2	16.4	20.1
15 min	900	3.8	5.5	6.4	9.5	12.0	14.8	16.7	19.3	23.6
30 min	1800	5.0	7.2	8.3	12.1	15.2	18.6	20.9	24.1	29.2
60 min	3600	6.6	9.3	10.8	15.5	19.2	23.4	26.1	30.0	36.1
2 hours	7200	8.8	12.2	14.0	19.8	24.3	29.4	32.7	37.4	44.7
4 hours	14400	11.6	15.9	18.1	25.3	30.9	37.0	41.0	46.5	55.2
6 hours	21600	13.7	18.5	21.1	29.3	35.4	42.3	46.7	52.9	62.5
12 hours	43200	18.1	24.2	27.3	37.4	44.9	53.2	58.5	65.9	77.3
24 hours	86400	23.9	31.5	35.5	47.8	57.0	66.9	73.3	82.1	95.5
48 hours	172800	30.5	39.3	43.7	57.4	67.4	78.0	84.8	94.1	108.0

Duration	Return Period (Years)									
	Seconds	0.5	1	2	5	10	20	30	50	100
1 min	60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 min	120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5 min	300	2.7	3.8	4.5	6.7	8.4	10.4	11.8	13.7	16.7
10 min	600	3.7	5.4	6.2	9.4	11.8	14.6	16.4	19.0	23.3
15 min	900	4.4	6.4	7.4	11.0	13.9	17.1	19.3	22.3	27.3
30 min	1800	5.8	8.3	9.6	14.0	17.6	21.5	24.2	27.9	33.8
60 min	3600	7.6	10.8	12.5	17.9	22.2	27.1	30.2	34.7	41.8
2 hours	7200	10.2	14.1	16.2	22.9	28.1	34.0	37.8	43.3	51.7
4 hours	14400	13.4	18.4	20.9	29.3	35.8	42.8	47.4	53.8	63.9
6 hours	21600	15.9	21.4	24.4	33.9	41.0	48.9	54.0	61.2	72.3
12 hours	43200	20.9	28.0	31.6	43.3	51.9	61.6	67.7	76.2	89.4
24 hours	86400	27.7	36.4	41.1	55.3	65.9	77.4	84.8	95.0	110.5
48 hours	172800	35.3	45.5	50.6	66.4	78.0	90.2	98.1	108.9	125.0

Duration	Return Period (Years)									
	Seconds	0.5	1	2	5	10	20	30	50	100
1 min	60	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
2 min	120	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
5 min	300	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
10 min	600	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
15 min	900	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
30 min	1800	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
60 min	3600	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
2 hours	7200	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0
4 hours	14400	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0
6 hours	21600	108.0	108.0	108.0	108.0	108.0	108.0	108.0	108.0	108.0
12 hours	43200	216.0	216.0	216.0	216.0	216.0	216.0	216.0	216.0	216.0
24 hours	86400	432.0	432.0	432.0	432.0	432.0	432.0	432.0	432.0	432.0
48 hours	172800	864.0	864.0	864.0	864.0	864.0	864.0	864.0	864.0	864.0

Duration	Return Period (Years)									
	Seconds	0.5	1	2	5	10	20	30	50	100
1 min	60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 min	120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5 min	300	1.2	2.3	3.0	5.2	6.9	8.9	10.3	12.2	15.2
10 min	600	0.7	2.4	3.2	6.4	8.8	11.6	13.4	16.0	20.3
15 min	900	0.0	1.9	2.9	6.5	9.4	12.6	14.8	17.8	22.8
30 min	1800	0.0	0.0	0.6	5.0	8.6	12.5	15.2	18.9	24.8
60 min	3600	0.0	0.0	0.0	0.0	4.2	9.1	12.2	16.7	23.8
2 hours	7200	0.0	0.0	0.0	0.0	0.0	0.0	1.8	7.3	15.7
4 hours	14400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 hours	21600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 hours	43200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24 hours	86400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48 hours	172800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

MAX STORAGE REQUIRED (m³) = 24.8										
MAX STORAGE REQUIRED (m3) WITH 20% CLIMATE CHANGE ALLOWNACE = 30										

Surface Water Attenuation Calculations - North Site (Tank 2)

Project:	North site, Deerpark, Adare, Co.Limerick			Job No.:	L200
Section:	Assessment of Proposed Surface Water Discharge Rate - With Attenuation (2)			Date:	02/10/19
Client:	Limerick City & County Council			Revision:	1st
				Designer:	STR
				Checked:	CMcD
				Approved:	AD

TABLE 1 - Areas (Existing & Proposed Development):				Site Area:	6875 m ²	0.687478 ha	0.006875 km ²
				SAAR	1011 mm		
				Soil Index	0.3 per GSDS		
				Mean Annual Peak Flow (Permissible Outflow Rate)			
				Mean Annual Flow (MAF)	0.00108 x (AREA) ^{0.89} (SAAR) ^{1.17} (SOIL) ^{2.17} m ³ /s		
				Interpolated for a 50ha site Qbar = 5.0 l/s			
Roads	Area m ²	Permbilty Co-eff	Net non Permeable Area m ²	MAF =	5.0 l/s	QBAR =	5.0 l/s
Main Bldg	702	1.0	702	MAF =	0.005 m ³ /s	QBAR =	0.005 m ³ /s
TOTAL	4358	-	4358				

Duration	Seconds	Return Period (Years)								
		0.5	1.0	2.0	5.0	10.0	20.0	30.0	50.0	100.0
1 min	60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 min	120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5 min	300	2.3	3.3	3.9	5.8	7.3	9.0	10.2	11.8	14.4
10 min	600	3.2	4.7	5.4	8.1	10.2	12.6	14.2	16.4	20.1
15 min	900	3.8	5.5	6.4	9.5	12.0	14.8	16.7	19.3	23.6
30 min	1800	5.0	7.2	8.3	12.1	15.2	18.6	20.9	24.1	29.2
60 min	3600	6.6	9.3	10.8	15.5	19.2	23.4	26.1	30.0	36.1
2 hours	7200	8.8	12.2	14.0	19.8	24.3	29.4	32.7	37.4	44.7
4 hours	14400	11.6	15.9	18.1	25.3	30.9	37.0	41.0	46.5	55.2
6 hours	21600	13.7	18.5	21.1	29.3	35.4	42.3	46.7	52.9	62.5
12 hours	43200	18.1	24.2	27.3	37.4	44.9	53.2	58.5	65.9	77.3
24 hours	86400	23.9	31.5	35.5	47.8	57.0	66.9	73.3	82.1	95.5
48 hours	172800	30.5	39.3	43.7	57.4	67.4	78.0	84.8	94.1	108.0

Duration	Seconds	Return Period (Years)								
		0.5	1	2	5	10	20	30	50	100
1 min	60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 min	120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5 min	300	10.0	14.4	17.0	25.3	31.8	39.2	44.5	51.4	62.8
10 min	600	13.9	20.5	23.5	35.3	44.5	54.9	61.9	71.5	87.6
15 min	900	16.6	24.0	27.9	41.4	52.3	64.5	72.8	84.1	102.8
30 min	1800	21.8	31.4	36.2	52.7	66.2	81.1	91.1	105.0	127.3
60 min	3600	28.8	40.5	47.1	67.5	83.7	102.0	113.7	130.7	157.3
2 hours	7200	38.4	53.2	61.0	86.3	105.9	128.1	142.5	163.0	194.8
4 hours	14400	50.6	69.3	78.9	110.3	134.7	161.2	178.7	202.6	240.6
6 hours	21600	59.7	80.6	92.0	127.7	154.3	184.3	203.5	230.5	272.4
12 hours	43200	78.9	105.5	119.0	163.0	195.7	231.8	254.9	287.2	336.9
24 hours	86400	104.2	137.3	154.7	208.3	248.4	291.6	319.4	357.8	416.2
48 hours	172800	132.9	171.3	190.4	250.1	293.7	339.9	369.6	410.1	470.7

Duration	Seconds	Return Period (Years)								
		0.5	1	2	5	10	20	30	50	100
1 min	60	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
2 min	120	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
5 min	300	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
10 min	600	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
15 min	900	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
30 min	1800	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
60 min	3600	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
2 hours	7200	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0
4 hours	14400	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0
6 hours	21600	108.0	108.0	108.0	108.0	108.0	108.0	108.0	108.0	108.0
12 hours	43200	216.0	216.0	216.0	216.0	216.0	216.0	216.0	216.0	216.0
24 hours	86400	432.0	432.0	432.0	432.0	432.0	432.0	432.0	432.0	432.0
48 hours	172800	864.0	864.0	864.0	864.0	864.0	864.0	864.0	864.0	864.0

Duration	Seconds	Return Period (Years)								
		0.5	1	2	5	10	20	30	50	100
1 min	60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 min	120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5 min	300	8.5	12.9	15.5	23.8	30.3	37.7	43.0	49.9	61.3
10 min	600	10.9	17.5	20.5	32.3	41.5	51.9	58.9	68.5	84.6
15 min	900	12.1	19.5	23.4	36.9	47.8	60.0	68.3	79.6	98.3
30 min	1800	12.8	22.4	27.2	43.7	57.2	72.1	82.1	96.0	118.3
60 min	3600	10.8	22.5	29.1	49.5	65.7	84.0	95.7	112.7	139.3
2 hours	7200	2.4	17.2	25.0	50.3	69.9	92.1	106.5	127.0	158.8
4 hours	14400	0.0	0.0	6.9	38.3	62.7	89.2	106.7	130.6	168.6
6 hours	21600	0.0	0.0	0.0	19.7	46.3	76.3	95.5	122.5	164.4
12 hours	43200	0.0	0.0	0.0	0.0	0.0	15.8	38.9	71.2	120.9
24 hours	86400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48 hours	172800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

MAX STORAGE REQUIRED (m³) =		168.6
MAX STORAGE REQUIRED (m³) WITH 20% CLIMATE CHANGE ALLOWNACE		203

Surface Water Drainage Calculations – South Site

DENNANYREIDY ASSOCIATES CONSULTING CIVIL & STRUCTURAL ENGINEERS THE PARK, LORD EDWARD ST. LIMERICK Tel: 061 310 701 Fax: 061 416 534 email: mail@dennanyreidy.ie										Dennany Reidy Associates CONSULTING CIVIL & STRUCTURAL ENGINEERS								
Project:		South Site, Deerpark, Adare, Co. Limerick		Job No.:		L200		Revision:		1st								
Section:		Surface Water Sewer Design in accordance with BS8301:1985		Date:		02/10/19		Designer:		STR								
Client		Limerick City & County Council		Design Data:		ks = 0.6mm		Checker:		CWC/D								
Sewer Section	Upstream MH/CL (mOD)	Upstream MH/IL (mOD)	Depth to Crown (mOD)	Length (m)	Gradient (1 in)	Pipe Diameter (mm)	Velocity (m/sec)	Time in Sewer (min)	Time of Entry (min)	T _c (min)	Rainfall Intensity, R (mm/hr)	Area Taken (m ²)	Area Taken (ha)	Impervious Area Cumulative (hectares)	Rate of Flow (l/sec)	Pipe Capacity (l/sec)	Capacity Suitable	Remarks
SWMH 1.0 - SWMH 2.0	19.60	18.10	1.20	37.16	196	300	1.119	0.55	4.00	4.55	75	778	0.078	0.078	32.36	79.04	YES	
SWMH 2.0 - SWMH 3.0	19.90	17.91	1.69	16.33	148	300	1.286	0.21	4.55	4.77	50	320	0.032	0.132	56.69	90.87	YES	
SWMH 3.0 - SWMH 4.0	20.20	17.80	2.10	9.11	152	300	1.272	0.12	4.77	4.88	75	0	0.000	0.220	56.69	88.85	YES	
SWMH 4.0 - SW FC MH 5.0	20.30	17.74	1.83	47.94	200	375	1.276	0.63	4.88	5.51	75	329	0.033	0.190	94.98	140.91	YES	
SW FC MH 5.0 - SSMH 1	19.70	17.50	1.98	9.21	35	225	2.204	0.07	4.88	4.95	75	0	0.000	0.416	5.00	87.58	YES	
SWMH 2.1 - SWMH 2.0	20.00	18.55	1.23	12.60	140	225	1.101	0.19	0.00	0.19	75	222	0.022	0.022	13.54	77.27	YES	
SWMH 4.1 - SWMH 4.0	20.70	19.25	1.23	30.38	78	225	1.481	0.34	0.00	0.34	75	252	0.025	0.025	19.31	77.27	YES	


Surface Water Drainage Calculations – North Site

Dennany Reidy Associates CONSULTING CIVIL & STRUCTURAL ENGINEERS																		
THE PARK, LORD EDWARD ST. LIMERICK Tel: 061 310 701 Fax 061 416 534 email: mail@dennanyreidy.ie																		
Project:	North Site, Deerpark, Adare, Co. Limerick			Job No.:	L200			Revision:	1st									
Section:	Surface Water Sewer Design in accordance with BSS301:1985			Date:	02/10/19			Designer:	STR									
Client:	Limerick City & County Council			Design Data:		ks = 0.6mm		Checker:	CMCD									
Sewer Section	Upstream MH CL (mOD)	Downstream MH CL (mOD)	Depth to Crown (mOD)	Length (m)	Gradient (1 in)	Pipe Diameter (mm)	Velocity (m/sec)	Time in Sewer (min.)	Time of Entry (min)	Tc (min)	Rainfall Intensity, R (mm/hr.)	Area Taken (m2)	Area Taken (ha)	Impervious Area Cumulative (hectares)	Rate of Flow ((l/sec)	Pipe Capacity ((l/sec)	Capacity Suitable	Remarks
SWMH 1.0 - SWMH 2.0	12.23	11.20	3.91	20.70	104	225	1.283	0.27	4.00	4.27	75	0	0.000	0.000	4.33	50.98	YES	
SWMH 2.0 - SWMH 3.0	11.20	9.15	3.08	40.70	71	225	1.548	0.44	4.27	4.71	75	107	0.011	0.011	9.88	61.51	YES	
SWMH 3.0 - SWMH 4.0	9.15	9.01	1.60	13.55	194	225	0.835	0.24	4.71	4.95	75	0	0.000	0.014	11.73	37.14	YES	
SW MH 4.0 - SW FC MH 5.0	9.01	8.63	1.53	11.28	188	225	0.948	0.20	4.95	5.15	75	109	0.011	0.022	15.38	37.69	YES	
SW FC MH 5.0 - EX SW MH 6.0	8.63	8.44	1.21	5.40	108	225	1.256	0.07	4.95	5.02	75	0	0.000	0.022	5.00	49.90	YES	
											50	0	0.000	0.081				

Foul Water Drainage Calculations – South Site

DENNANY REIDY ASSOCIATES CONSULTING CIVIL & STRUCTURAL ENGINEERS THE PARK, LORD EDWARD ST. LIMERICK Tel: 061 310 701 Fax 061 416 534 email mail@dennanyreidy.ie		Project:		Job No.:		Revision:		1st		
		South Site, Deerpark, Adare, Co. Limerick		L200		Designer:		STR		
Section:		Section:		Date:		Checked by		CMcD		
Client:		Client:		Design Data:		Approved by		AD		
Foul Water Sewer Design in accordance with BS8005:1987		Limerick City & County Council		ks = 1.5						
Section	Upstream	Upstream	Downstream	Downstream	Length	Gradient	Diameter	Velocity	Pipe Capacity	
	MH CL (mOD)	MH IL (mOD)	MH CL (mOD)	MH IL (mOD)	(m)	(1 in)	(mm)	Flowing Full (m/s)	Flowing Full (l/s)	
	19.60	18.20	19.90	17.83	36.82	100	150	0.88	15.50	
FWMH 1.0 - FWMH 2.0										Capacity > Flow Rate (10 dwellings = 4.10 l/s)
FWMH 2.0 - FWMH 3.0										Capacity > Flow Rate (12 dwellings = 4.30 l/s)
FWMH 3.0 - FWMH 4.0										Capacity > Flow Rate (12 dwellings = 4.30 l/s)
FWMH 4.0 - FWMH 5.0										Capacity > Flow Rate (21 dwellings = 5.16 l/s)
FWMH 5.0 - FSMH 1										Capacity > Flow Rate (21 dwellings = 5.16 l/s)
FWMH 4.1 - FWMH 4.0										Capacity > Flow Rate (5 dwellings = 3.50 l/s)
	20.70	19.30	20.30	18.74	33.33	60	150	1.14	20.08	

Foul Water Drainage Calculations – North Site

DENNANY REIDY ASSOCIATES CONSULTING CIVIL & STRUCTURAL ENGINEERS THE PARK, LORD EDWARD ST. LIMERICK Tel: 061 310 701 Fax 061 416 534 email mail@dennanyreidy.ie		Project:		Job No.:		Revision:		1st		Dennany Reidy Associates CONSULTING CIVIL & STRUCTURAL ENGINEERS		
		North Site, Deerpark, Adare, Co. Limerick		L200		Designer:		STR				
		Foul Water Sewer Design in accordance with BS8005:1987		Date: 08/10/2019		Checked by:		CMcD				
		Client: Limerick City & County Council		Design Data: ks = 1.5		Approved by:		AD				
Section	Upstream MH CL (mOD)	Upstream MH IL (mOD)	Depth to Crown (m)	Downstream MH CL (mOD)	Downstream MH IL (mOD)	Depth to Crown (m)	Length (m)	Gradient (1 in)	Diameter (mm)	Velocity Flowing Full (m/s)	Pipe Capacity Flowing Full (l/s)	Comments
FWMH 1.0 - FWMH 2.0	8.95	8.05	0.75	8.44	7.54	0.75	14.86	29	150	1.63	28.74	(Flow rates based on Table 1 of TGD Part H)
FWMH 2.0 - FWMH 3.0	8.44	7.54	0.75	7.90	7.00	0.75	41.75	77	150	1.00	17.60	Capacity > Flow Rate (4 dwellings = 3.25 l/s)
FWMH 3.0 - EX.FWMH 4.0	7.90	7.00	0.75	7.37	6.50	0.72	22.61	45	150	1.30	23.05	Capacity > Flow Rate (4 dwellings = 3.25 l/s)