ENGINEERING DESIGN REPORT

Cloghroe Development
Cloghroe
Cork

January 2022

Contents

This report should be read in conjunction with the submitted Engineering and Architectural Design Drawings

1. INTRODUCTION

PROJECT: **CLOGHROE DEVELOPMENT, CLOGHROE, CORK**

CLIENT: **Cloghroe Development Limited**

PROPOSED DEVELOPMENT: 198 residential units, a 42-child creche, a retail food store, and a café

MHL Consulting Engineers have been engaged by Cloghroe Development Limited to provide design consultancy services for the civil engineering elements associated with a proposed development of 198 residential units, a 42-child creche, a retail food store, and a café, to be determined by way of the Strategic Infrastructure Application process to An Bord Pleanála. The proposed site is located along the R617 in Cloghroe and is highlighted in **Figure 1.1** below.

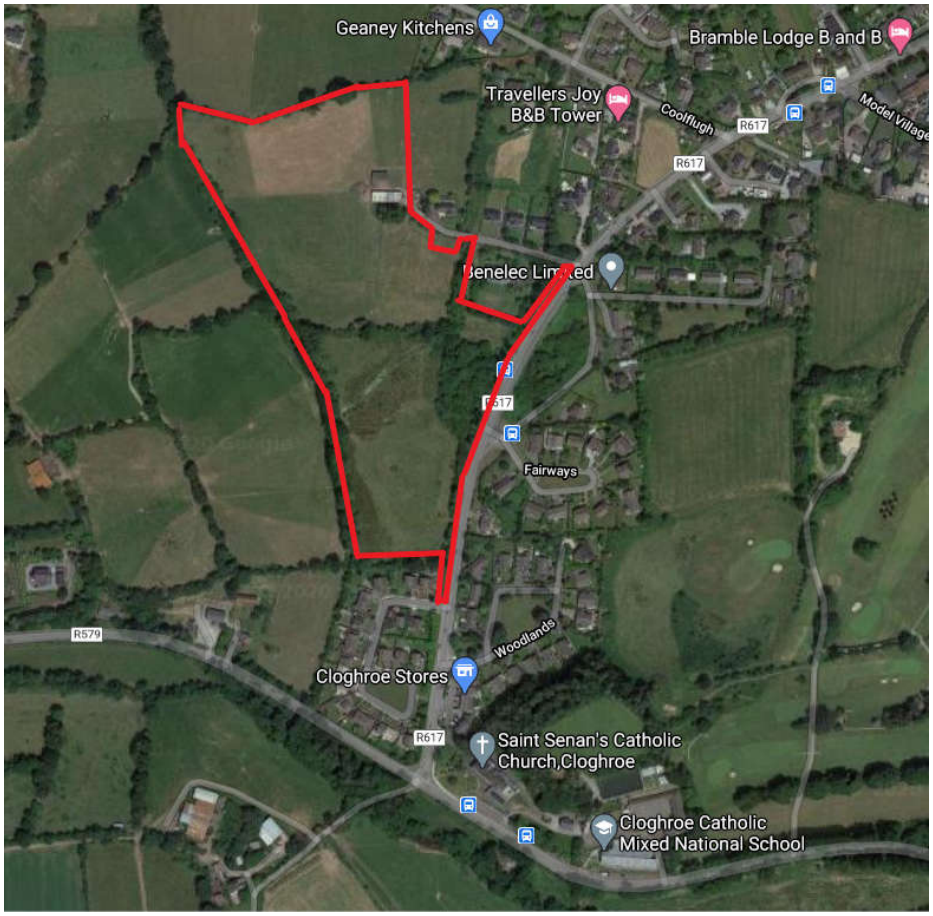

Figure 1.1: Site location

2. ROADS

PROJECT: **CLOGHROE DEVELOPMENT, CLOGHROE, CORK**

CLIENT: **Cloghroe Development Limited**

PROPOSED DEVELOPMENT: 198 residential units, a 42-child creche, a retail food store, and a café

Internal Estate Roads

The internal estate roads have been designed in accordance with the Design Manual for Urban Roads and Streets (DMURS). In general, a maximum gradient of 5% and minimum gradient of 0.6% was used for all internal estate roads. Due to the sloped nature of the site, a gradient of 8.3% was required for short sections of Estates Roads 1 and 3 in areas featuring no direct access to dwellings. The design team has ensured that the lengths of road necessitating a gradient of 8.3% were kept to a minimum.

Figure 2.1: Overall proposed estate roads with cut and fill lines (refer to MHL drawing RL1-ERO-P01)

The parameters for a design speed of 20km/h were used to produce the horizontal and vertical alignments in accordance with the standards set out in Design Manual for Urbans Roads and Streets (DMURS), as required per Objective 5.16 in the Cork City Development Plan 2015-2021. Table 4.3 in DMURS outlines the minimum requirement for horizontal and vertical curvature for a 20km/h road. The minimum value used for horizontal curvature is 11m. To produce a robust design regarding the vertical alignment it is prudent to use K-values relating to a 40km/h road, 4.1 for a crest curve and 2.6 for a sag curve. **Figure 2.1** highlights each of the

internal roads and corresponds with **Table 2.1** which highlights the maximum and minimum design parameters used.

Estate Roads Design	Max Gradient	Min Gradient	Max K	Min K	Junction Approach Gradient	Junction Approach Length
Estate Road 1	8.3%	2.4%	30.0	5.0	2.5%/5.0%	64m/165m
Estate Road 2	5.0%	2.0%	5.0	5.0	2.0%/5.0%	60m/31m
Estate Road 3	8.3%	1.9%	5.0	3.0	1.9%/5.0%	110m/47m
Estate Road 4	5.0%	3.0%	10.0	5.0	3.0%	10m
Estate Road 5	3.0%	1.6%	30.0	30.0	3.0%/1.6%	20m/43m
Estate Road 6	0.6%	0.6%	-	-	0.6%	37m
Estate Road 7	0.6%	0.6%	-	-	0.6%	35m
Estate Road 8	1.0%	1.0%	-	-	1.0%	90m
Estate Road 9	0.7%	0.7%	-	-	0.6%/0.6%	39m/39m
Estate Road 10	0.6%	0.6%	-	-	0.6%	39m
Estate Road 11	0.6%	0.6%	-	-	0.6%	22m
Estate Road 12	0.6%	0.6%	-	-	0.6%	45m
Reference Document: ➢ Design Manual for Urban Roads and Streets 2019						

Table 2.1: Internal Estate Roads Design

3. TRAFFIC AND PEDESTRIAN MANAGEMENT

PROJECT: **CLOGHROE DEVELOPMENT, CLOGHROE, CORK**

CLIENT: **Cloghroe Development Limited**

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An overview of traffic calming and pedestrian connectivity throughout the site is presented in **Figure 3.1** below. Shared surface streets with road widths of 5.0m and minimum road radii per DMURS are proposed at selected internal roads. Appropriate surface treatments, such as paving, will be used on these roads to serve as a reminder to motorists that they are in a shared space requiring low speeds. The site is very well located in terms of connectivity to pedestrian footpaths which provide a link to public transport and local services such as retail stores, the Church, the Local National School, and the Village Centre in Tower.

Figure 3.2 presents proposed public realm works on the R617 including a 2.0m footpath, 1.0m grass verge, a 2.0m cycle lane, and a 3.25m reservation for a possible future bus lane to be provided as part of CMATS (Bus Connects). An off-road bus stop including bus shelter is also being proposed. It is expected that the provision of the above public realm improvement works will urbanise the area, resulting in a reduction in traffic speed in the area which will be a road safety gain.

Figure 3.1: Traffic Calming & Pedestrian Connectivity

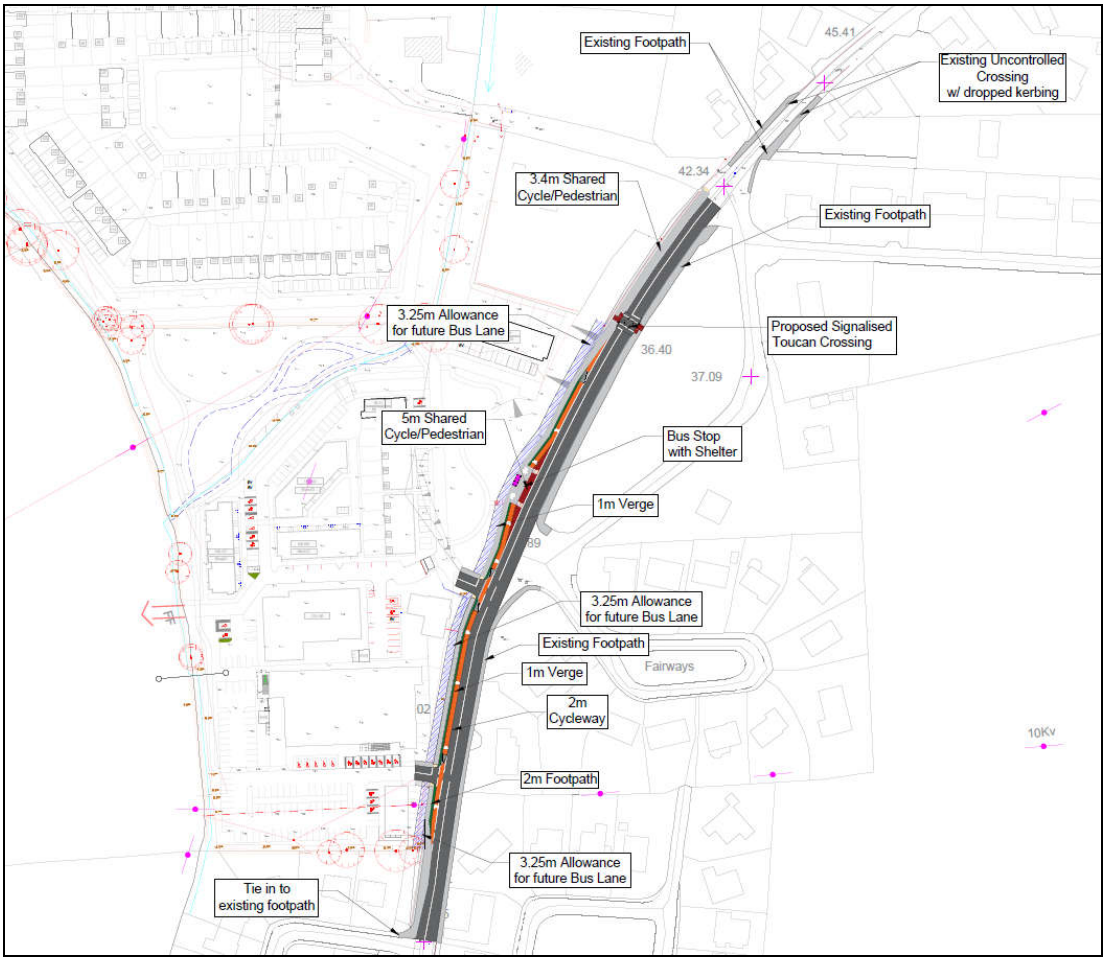


Figure 3.2: Proposed Pedestrian/Cycle Connectivity Improvement Measures along the R617

Currently a footpath is provided on the R617, opposite the development site, which connects as far as Blarney Village via Tower. Muskerry Golf Club is also accessible by footpath using a pedestrian entrance. It is proposed to provide a segregated footpath and cycle lane on the development side of the R617 to further enhance connectivity and create a safer environment for all road users.

Future connectivity to adjoining lands is also proposed at several locations within the site. These will be provided to ensure future connectivity to the creche, and retail element of the scheme is available.

Internally within the scheme, each developed area has multiple options of connectivity for each of the different modes of travel, maximising accessibility to the various amenities provided as part of the scheme, as set out in further detail in Landscape Architect's drawings submitted with the application. The quality of these routes has been carefully considered to ensure their viability in terms of desire lines and to ensure users will feel comfortable and safe when availing of these facilities.

A separate Statement of Consistency for "Traffic and Transportation and Associated Infrastructure" and "DMURS Compliance" is included as a part of this submittal.

A separate Traffic & Transport Assessment (TTA) report is included with this submittal for review. The TTA assesses & quantifies how the proposed development will impact upon the surrounding roads network.

4. SITE INVESTIGATION

PROJECT: **CLOGHROE DEVELOPMENT, CLOGHROE, CORK**

CLIENT: **Cloghroe Development Limited**

PROPOSED DEVELOPMENT: 198 residential units, a 42-child creche, a retail food store, and a café

As part of the design for the proposed development, comprehensive site investigations were carried out by OCB Geotechnical on the green field site in September 2020. In total, site investigation consisted of 6 No. bore holes to measure the depth and strength of rock, 14 No. trial pits to measure the depth of soil and rock, 3 No. on-site CBR tests to measure the subgrade strength, and 3 No. infiltration pits to measure the on-site infiltration rate. The investigation also included laboratory testing on samples taken from trial pits and bore holes. The results of investigation indicate a shallow water table at the south of the site. No bedrock was encountered during the course of the study.

Figure 4.1 & **Figure 4.2** below highlight the test locations of the site investigation.

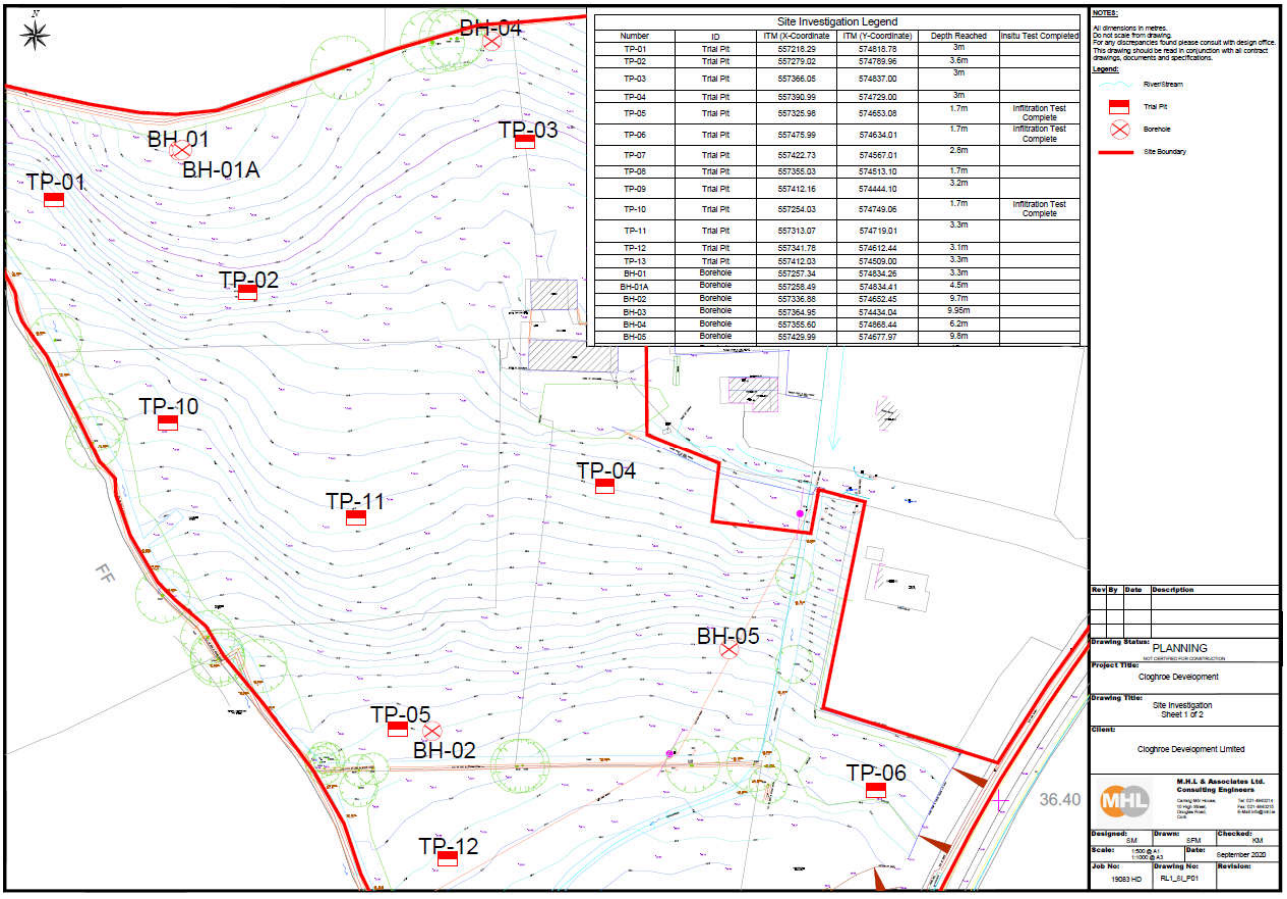
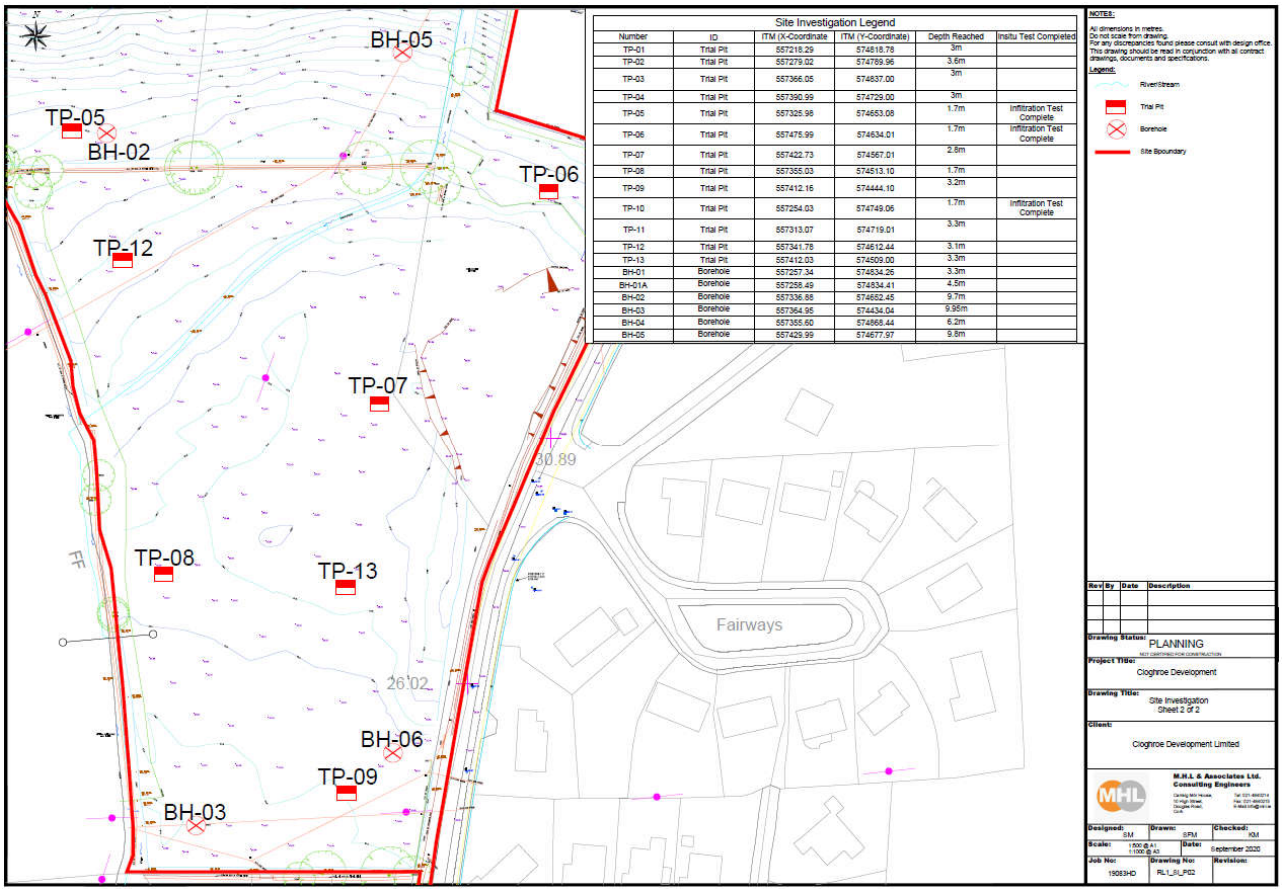


Figure 4.1: Site investigation locations



Number	ID	ITM (X-Coordinate	ITM (Y-Coordinate)	Depth Reached	Insitu Test Completed
TP-01	Trial Pit	557218.29	574818.78	3m	
TP-02	Trial Pit	557279.02	574789.96	3.6m	
TP-03	Trial Pit	557366.05	574837.00	3m	
TP-04	Trial Pit	557390.99	574729.00	3m	
TP-05	Trial Pit	557325.98	574653.08	1.7m	Infiltration Test Complete
TP-06	Trial Pit	557475.99	574634.01	1.7m	Infiltration Test Complete
TP-07	Trial Pit	557422.73	574567.01	2.8m	
TP-08	Trial Pit	557365.03	574513.10	1.7m	
TP-09	Trial Pit	557412.16	574444.10	3.2m	
TP-10	Trial Pit	557254.03	574749.06	1.7m	Infiltration Test Complete
TP-11	Trial Pit	557313.07	574719.01	3.3m	
TP-12	Trial Pit	557341.78	574612.44	3.1m	
TP-13	Trial Pit	557412.03	574509.00	3.3m	
BH-01	Borehole	557257.34	574634.26	3.3m	
BH-01A	Borehole	557258.49	574634.41	4.5m	
BH-02	Borehole	557336.88	574662.45	9.7m	
BH-03	Borehole	557364.95	574434.04	9.95m	
BH-04	Borehole	557355.60	574668.44	6.2m	
BH-05	Borehole	557429.99	574677.97	9.8m	

Figure 4.2: Site investigation locations

The complete results and logs of the site investigations are included in appendices of this report. A full Site Investigation Factual and Interpretative Report will be included as part of full application.

In addition to the site investigation, the design team has consulted with Irish Hydrodata Limited to conduct hydraulic modelling of the stream running along the western boundary of the site. This study, which has encompassed the entire floodplain of the stream, has clarified the potential impact of flood storage within the site. The results of this study have been included as part of the application documentation.

Site Investigation - Storm design

With regards to the design of the storm water network, it was found that some soil infiltration was possible to the north of the site with no infiltration potential to the south. This result, in combination with a known history of localised flooding, informed the design team that soak pits should not be utilised as a method of catering for surface water within the site. Rather, the decision was made to utilise several attenuation tanks with a designed flow control of less than greenfield run-off (QBar). See extract from infiltration test results in **Figure 4.2** below. The infiltration tests were carried out in accordance with BRE Digest 365.

INFILTRATION TEST DATA — *OCB Geotechnical Ltd*

Project Name	Cloghroe Housing Development			**Date**	25/09/20
Project No.	20-087			**Location**	TP05
Easting	557325.98	**Northing**	574653.08	**Level**	29.42

length, m	**2.4**	b, m (wid	**1.2**	depth, m	**1.7**
l_base, m	**1.2**			d_eff, m	**0.645**
l_eff, m	**1.8**				

	Time, min	Measure	Time, sec	depth	Fall, m	Volume	
Start	0	0.645	0	1.055	0	0	
	0.5	0.647	30	1.053	0.002	0.00288	
	0.75	0.648	45	1.052	0.003	0.00432	
	1	0.649	60	1.051	0.004	0.00576	
	2	0.65	120	1.05	0.005	0.0072	
	3	0.65	180	1.05	0.005	0.0072	
	4	0.65	240	1.05	0.005	0.0072	
	5	0.65	300	1.05	0.005	0.0072	
	10	0.66	600	1.04	0.015	0.0216	
	15	0.66	900	1.04	0.015	0.0216	
	20	0.660	1200	1.040	0.015	0.0216	
	25	0.660	1500	1.040	0.015	0.0216	
	30	0.660	1800	1.040	0.015	0.0216	
	35	0.66	2100	1.04	0.015	0.0216	
	40	0.660	2400	1.040	0.015	0.0216	
	45	0.680	2700	1.020	0.035	0.0504	
	50	0.68	3000	1.02	0.035	0.0504	
	55	0.680	3300	1.020	0.035	0.0504	
	60	0.680	3600	1.020	0.035	0.0504	
	70	0.690	4200	1.010	0.045	0.0648	
	80	0.690	4800	1.010	0.045	0.0648	
	90	0.690	5400	1.010	0.045	0.0648	
	100	0.700	6000	1.000	0.055	0.0792	1/4 full
	120	0.7	7200	1.000	0.055	0.0792	
	150	0.72	9000	0.980	0.075	0.108	
	180	0.73	10800	0.970	0.085	0.1224	
	210	0.74	12600	0.960	0.095	0.1368	
	270	0.76	16200	0.940	0.115	0.1656	
	330	0.77	19800	0.930	0.125	0.18	
	390	0.78	23400	0.920	0.135	0.1944	
	450	0.8	27000	0.900	0.155	0.2232	
	2000	1.13	120000	0.570	0.485	0.6984	3/4 full

Area	1.44 m^2			
50% Area_eff, a_{p50}	3.375 m^2	$V_{p75\text{-}25\ theory}$	volume	0.6966 m^3
		$V_{p75\text{-}25}$	volume	1.2384
		$t_{p\ 75\text{-}25}$	time	114000 s
		Infiltration Coefficient	***f***	**3.2E-06 ms^-1**

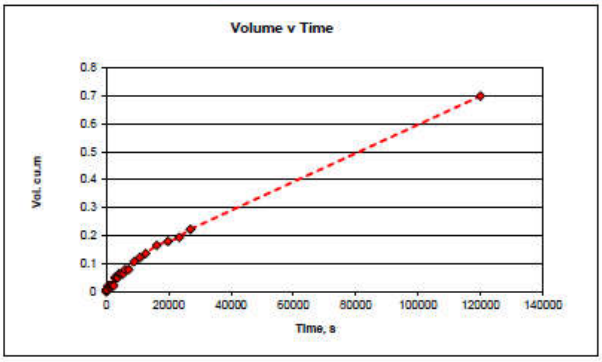


Figure 4.2: Infiltration test results – TP05

Site Investigation - Road design

The site investigation bore holes and trial pits have informed the design team of the depth and strength of subsoil throughout the site. No rock was encountered during the site investigation. From this information an approximate volume of cut and fill material needed to construct the proposed development has been determined. The samples taken from each pit and borehole also went through a series of lab testing to examine the re-usability of the subsoil. The results of these tests have been included in the Site Investigation Interpretive Report completed by OCB Geotechnical, which has been submitted as part of the application documentation.

It was found that the volume of subsoil to be excavated is approx. 9,700m^3 with the volume of fill required being approx. 34,300m^3. All excavated subsoil will be considered for suitability to be used as fill on site. It is proposed that excavated material generated on site shall be treated as necessary for use as general fill around the site. As a result of the assessment of several soil samples taken from the trial pits, the grading capability of the subsoils has been assessed as follows:

- Made ground consisting of reworked clay fill extending to approximately 0.70m in depth. Foundations will transfer to below any Made Ground.
- Glacial till consisting of sandy gravelly clay, frequently with low cobble content, typically firm or stiff, and extending to depths of approximately 2.80m. Observed below the topsoil or made ground and atop the sands and gravels beneath. Estimated Allowable Bearing Pressure (ABP) ranges from 40-150 kPa.
- Fluvioglacial deposits consisting of medium dense to very dense sands and gravels, extending to at least the depth of the borehole (4.50m – 10.00m). Estimated Allowable Bearing Pressure (ABP) ranges from 75-300 kPa..

The full results from this analysis has been included as a part of the application documentation.

Extracts from trial pit and borehole logs generated by OCB Geotechnical are highlighted in **Figure 4.3** below. The full log information is included in the attached appendices.

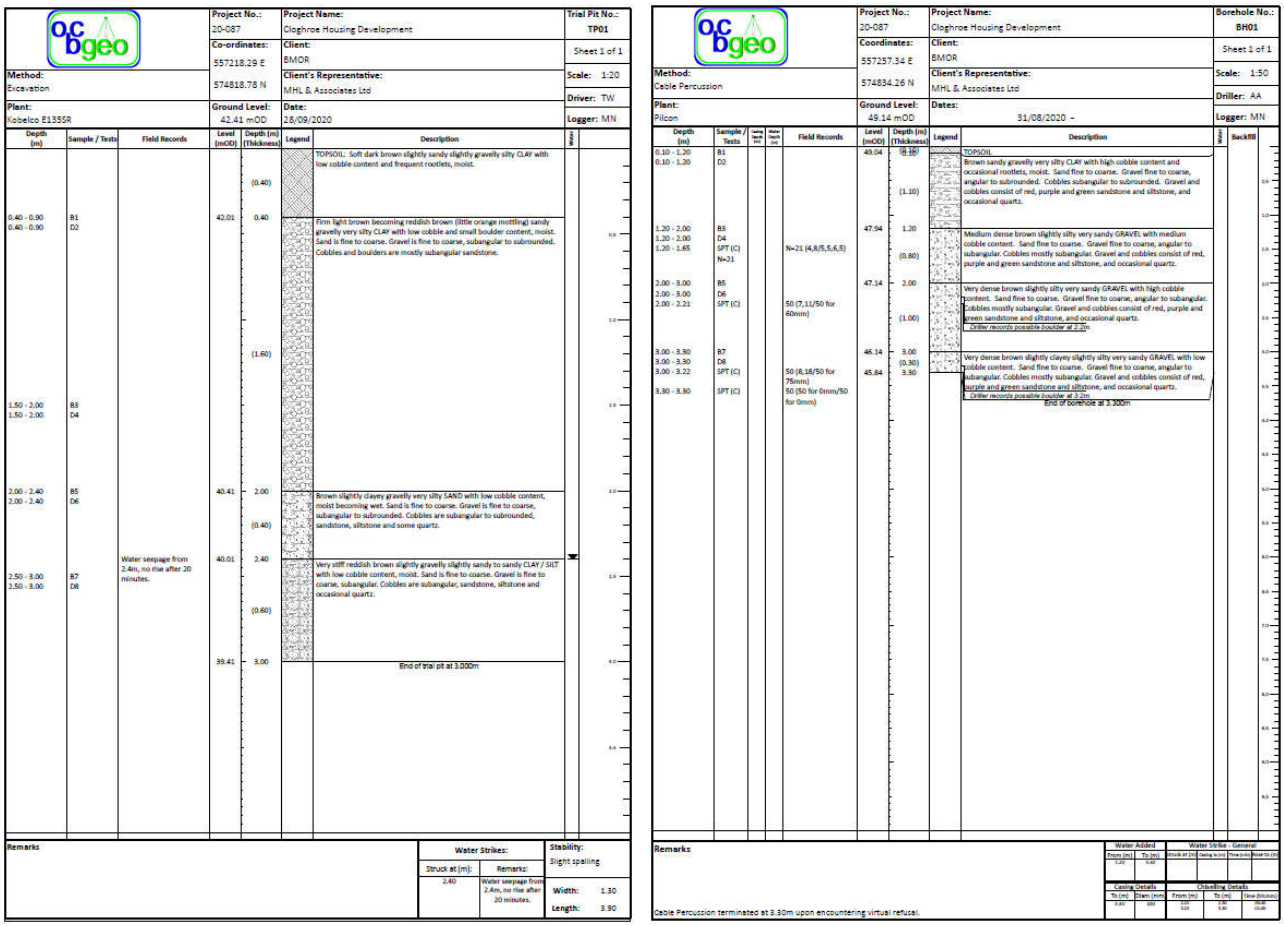


Figure 4.3: Trial Pit 01 and Bore Hole 01 logs

5. STORM WATER NETWORK

Storm design: (Return Period 1:100 with a 20% Climate Change Factor)

PROJECT: **CLOGHROE DEVELOPMENT, CLOGHROE, CORK**

CLIENT: **Cloghroe Development Limited**

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The proposed surface water drainage system is in accordance with Sustainable Urban Drainage Systems (SUDS) principles and divides the site into six (6) drainage catchments: all of which are proposed for attenuation utilising Stormtech Underground Chamber systems. Each attenuation system is designed with a controlled flow rate of less than the greenfield run-off rate for the catchment area. This results in an overall discharge from the site of 20.8 l/s which is less than the greenfield run-off of 25.29 l/s. The attenuated systems will ultimately discharge into the Owennagearagh River downstream of the Currabeha bridge via the public storm sewer present on the R617, refer to **Figure 5.2**.

The pipe diameters of the storm sewer were calculated to provide adequate capacity for the development and are shown in **Table 5.1** below. The minimum gradient in the development storm sewer network is 1/200. The maximum gradient in the development storm sewer network is 1/15.

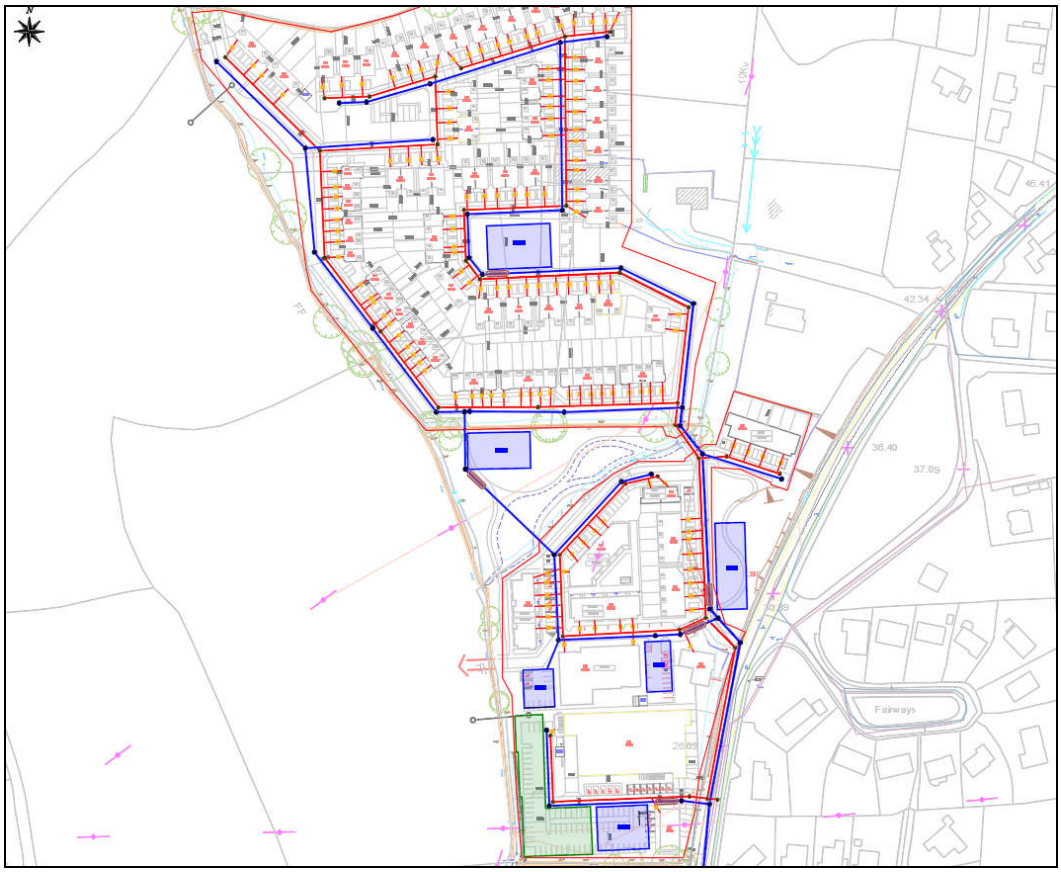


Figure 5.1: Proposed storm/foul lines, attenuation tank, and flood storage tank locations

The storm-runs generally flow in a south-easterly direction to the six proposed attenuation tanks. The design of the attenuation tanks was informed by the actual site greenfield run-off rate for each catchment using HR Wallingford Methodology IH124. However, in order to produce a robust design, the surface water run-off rate has been restricted further for each tank. Details of the attenuation tanks design and sizes are included in **Table 5.2** below. Attenuation tanks have been designed for a storm return period of 1 in 100 year and with a 20% climate change factor.
One outfall is proposed from the surface water network to tie into the existing storm sewer running along R617 Blarney Rd. As stated previously in this section, and shown in **Figure 5.2**, the development surface water will

ultimately discharge into the Owennagearagh River to the east of the Currabeha Bridge. The proposed storm design greatly reduces the quantity of surface water from the development lands entering the stream running along the western boundary of the site.

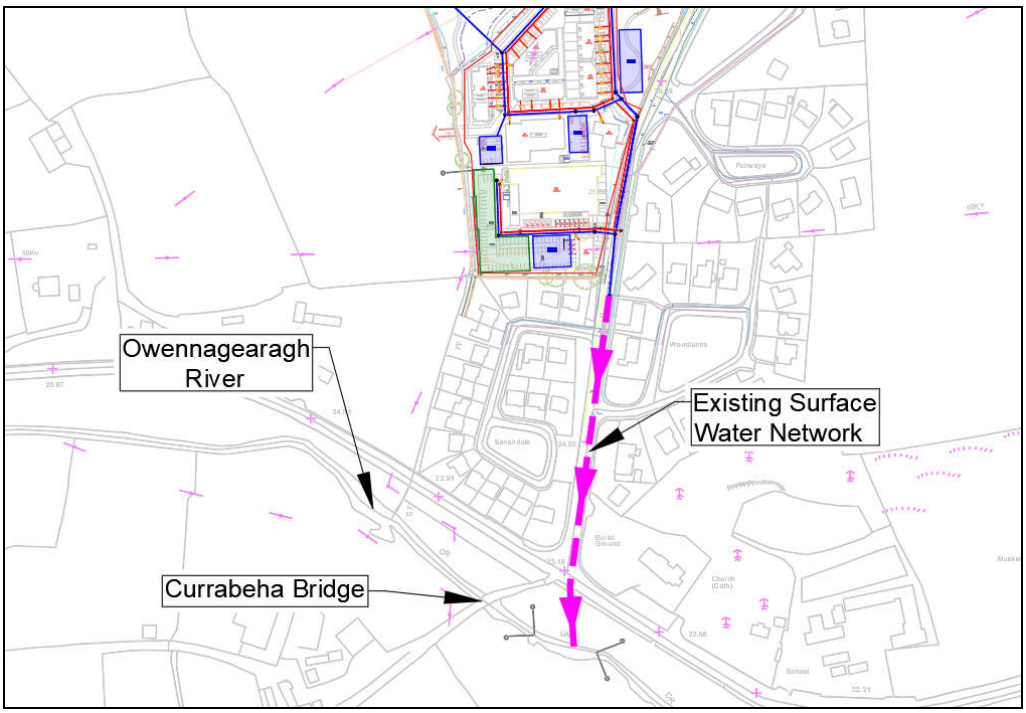


Figure 5.2: Proposed tie-in to existing surface water network

The existing land drain running from east to west through the centre of the site is to be expanded upon with the creation of two basins/wetland meadows prior to merging with the western boundary stream. In addition to slowing the velocity of surface water entering the western boundary stream, the basins provide for a good source of groundwater recharge.

Per **Figure 5.1**, a flood storage tank system incorporating Stormtech SC740 chambers is proposed at the southwest corner of the site. This system is proposed to accommodate for existing flood storage potential within the site during a 1000-year storm event. Refer to section 9 of this report for further detail.

Layout details of the stormwater network can be found in drawings **RL1-OPN-P01** and **RL1-OPN-P02**. Longsections of the stormwater network are presented in drawings **RL1-SLS-P01**, **RL1-SLS-P02**, and **RL1-SLS-P03**.

Pipe Name	Upstream MH ID	Downstream MH Node	Length (m)	Dia (mm)	Vel (m/s)	Outflow (l/s)	Σ Area (ha)
S1.000	S1.000	S1.001	13.899	225	0.871	9.4	0.031
S1.001	S1.001	S1.002	33.712	225	0.842	18.0	0.060
S1.002	S1.002	S1.003	69.790	225	1.349	43.9	0.152
S1.003	S1.003	S1.004	85.667	225	3.075	120.4	0.422
S1.004	S1.004	S1.005	48.451	300	3.068	195.9	0.737
S1.005	S1.005	S1.006	22.196	300	3.234	227.7	0.863
S1.006	S1.006	S1.007	10.903	300	3.541	243.2	0.925
S1.007	S1.007	S1.008	70.834	300	1.526	7.2	0.961
S1.008	S1.008	S1.009	41.284	300	4.121	76.0	1.211
S1.009	S1.009	S1.010	53.387	375	4.042	80.4	1.228
S1.010	S1.010	S1.011	9.231	375	4.093	161.0	1.508

S1.011	S1.011	S1.012	18.480	375	2.282	161.3	1.508
S1.012	S1.012	S1.013	79.271	375	2.858	182.4	1.558
S1.013	S1.013	S1.014	6.223	450	0.906	11.3	1.838
S1.014	S1.014	S1.015	16.885	525	1.002	21.8	2.932
S1.015	S1.015	S4.003	84.036	525	1.065	21.3	2.932
S2.000	S2.000	S2.001	65.313	225	1.729	21.2	0.070
S2.001	S2.001	S2.002	53.310	225	3.370	85.6	0.283
S2.002	S2.002	S2.003	48.879	225	3.791	118.3	0.399
S2.003	S2.003	S2.004	53.715	225	4.202	145.3	0.489
S2.004	S2.004	S2.005	14.471	225	4.353	173.1	0.579
S2.005	S2.005	S2.006	29.312	300	4.478	181.8	0.579
S2.006	S2.006	S5.002	63.108	300		3.7	0.579
S3.000	S3.000	S2.001	63.425	225	0.000	0.0	0.000
S4.000	S4.000	S4.001	38.615	375	0.000	0.0	0.000
S4.001	S4.001	S4.002	67.549	375	2.100	46.7	0.150
S4.002	S4.002	S4.003	14.366	375		2.4	0.272
S4.003	S4.003	Existing Storm	43.228	525	1.222	20.2	3.265
S5.000	S5.000	S5.001	15.709	225	0.000	0.0	0.000
S5.001	S5.001	S5.002	50.615	225	0.490	0.6	0.002
S5.002	S5.002	S5.003	43.552	300	0.940	12.4	0.621
S5.003	S5.003	S5.004	49.508	375		4.9	0.792
S5.004	S5.004	S5.005	12.757	375		6.5	1.032
S5.005	S5.005	S1.014	21.089	375	1.025	19.9	1.094
S6.000	S6.000	S6.001	48.202	225	0.624	24.8	0.083
S6.001	S6.001	S1.010	60.344	225	1.314	47.5	0.166
S7.000	S7.000	S1.012	42.346	225	1.812	15.0	0.050

Table 5.1: Storm Sewer design output

Attenuation tank ID	Catchment (m^2)	Runoff area (m^2)		Storage volume required (m^3)
		Impervious area (100% runoff)	Green Area (10% runoff)	
AT-A	21,100	11,840	930	815
AT-B	12,300	6525	570	470
AT-C	10,980	6020	500	416
AT-D	8230	6450	180	471
AT-E	3850.	3070	80	210
AT-F	4650	3390	130	235
Reference Document: ➢ *CIRIA C697 2007: The Suds Manual*				

Table 5.2: Storm water attenuation tank design and sizing

The construction of the storm sewer pipe network shall be in accordance with BS EN 752:2008 - drain and sewer systems outside buildings.

6. FOUL WATER NETWORK

Foul design

PROJECT: **CLOGHROE DEVELOPMENT, CLOGHROE, CORK**

CLIENT: **Cloghroe Development Limited**

PROPOSED DEVELOPMENT: 198 residential units, a 42-child creche, a retail food store, and a café

Each person is assumed to consume 150 litres of water per day.
Dry Weather Flow (DWF) = 450 litres/dwelling/day (2.7 persons per dwelling with a 10%-unit consumption allowance).
Design for Peak Flow (6 X DWF) = 2,700 litres/dwelling/day (to account for surges in the consumption at peak times leading to surcharges in the pipe network).

For each pipe run, the accumulative number of households contributing to that section of pipework is used to calculate the design flow. Contributions from the creche, retail unit, and café with offices were also determined and included in the design.

The calculated foul pipe diameters to provide adequate capacity for the development are shown in **Table 6.1** below.

Layout details of the foul network can be found in drawings **RL1-OPN-P01** and **RL1-OPN-P02**. Longsections of the foul network are presented in drawings **RL1-FLS-P01**, **RL1-FLS-P02**, and **RL1-FLS-P03**.

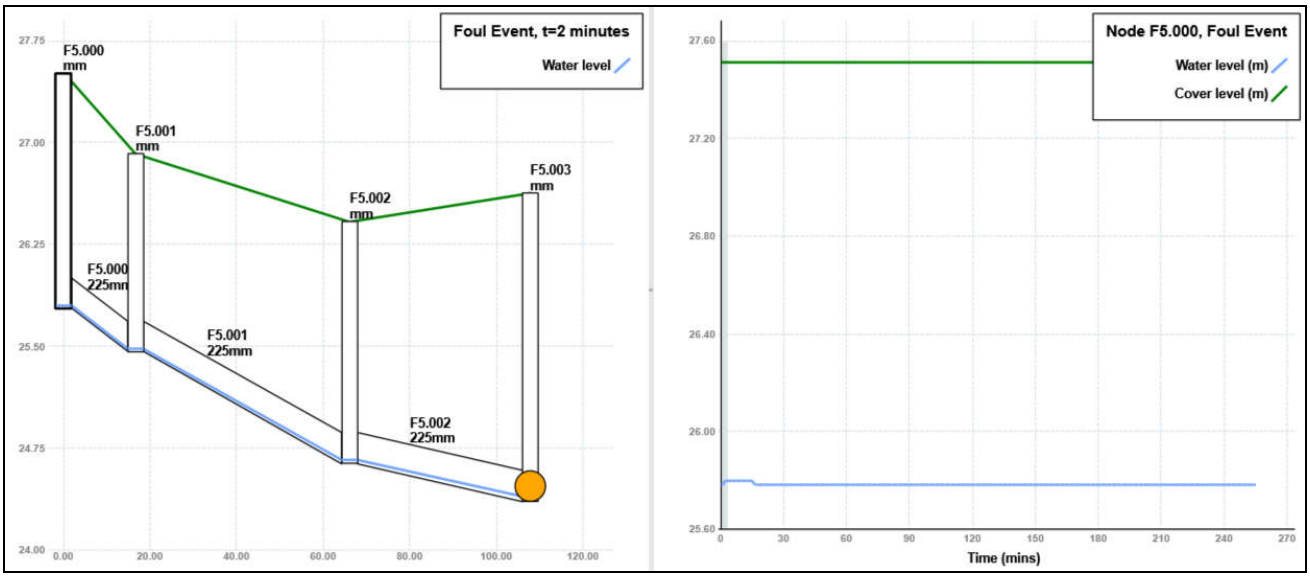


Figure 6.1: Typical Output profile plot and graph of F5.000 – F4.003 from foul sewer analysis package

The construction of the foul sewer pipe network shall be in accordance with Irish Water Code of Practice for Wastewater Infrastructure Doc IW-CDS-5030-03.

Pipe ID	Upsteam MH ID	Downstream MH ID	Length (m)	Dia (mm)	Vel (m/s)	Flow (l/s)
F1.000	F1.000	F1.001	23.006	150	1.546	1.2
F1.001	F1.001	F1.002	35.114	150	1.526	2.1
F1.002	F1.002	F1.003	34.681	150	1.879	3.3
F1.003	F1.003	F1.004	60.260	150	2.560	4.8
F1.004	F1.004	F1.005	54.684	150	2.562	5.4
F1.005	F1.005	F1.006	47.245	150	2.561	6.5
F1.006	F1.006	F1.007	48.769	150	2.562	7.1
F1.007	F1.007	F1.008	50.930	150	1.783	7.6
F1.008	F1.008	F2.008	71.353	150	0.826	8.5
F2.000	F2.000	F2.001	55.447	150	1.529	1.2
F2.001	F2.001	F2.002	86.484	225	2.582	4.3
F2.002	F2.002	F2.003	52.404	225	2.576	6.9
F2.003	F2.003	F2.004	25.921	225	2.517	7.5
F2.004	F2.004	F2.005	11.762	225	2.545	8.0
F2.005	F2.005	F2.006	71.555	225	2.733	8.2
F2.006	F2.006	F2.007	39.359	225	3.304	9.1
F2.007	F2.007	F2.008	49.127	225	3.301	9.1
F2.008	F2.008	F2.009	11.263	225	3.024	13.4
F2.009	F2.009	F2.010	20.986	225	3.189	13.5
F2.010	F2.010	F2.011	81.614	375	2.027	14.3
F2.011	F2.011	F2.012	21.348	375	2.895	15.4
F2.012	F2.012	F6.003	78.313	375	1.491	15.4
F3.000	F3.000	F1.004	67.954	225	3.304	1.2
F4.000	F4.000	F2.001	23.264	150	2.563	1.2
F5.000	F5.000	F5.001	16.763	225	2.125	1.2
F5.001	F5.001	F5.002	49.426	225	1.978	1.7
F5.002	F5.002	F5.003	41.681	225	1.243	3.0
F5.003	F5.003	F5.004	59.559	225	1.071	4.5
F5.004	F5.004	F2.011	14.842	225	1.035	5.4
F6.000	F6.000	F6.001	33.677	225	1.238	1.2
F6.001	F6.001	F6.002	69.743	225	1.085	1.2
F6.002	F6.002	F6.003	9.167	225	1.238	1.7
F6.003	F6.003	Ext Foul MH	5.227	375	1.285	15.6
F7.000	F7.000	F7.001	28.576	150	1.538	1.2
F7.001	F7.001	F2.010	14.114	150	1.532	2.8
Ext Pipe	Ext Foul MH	Ext MH 2	64.211	450	4.012	15.6

Table 6.1: Foul design output

Refer to **Appendix B** of this report for Irish Water statement of design acceptance letter received.

In order to accommodate the proposed connection, upgrade works to the existing pumps are required at the Cloghroe Wastewater Pumping Station. **Figure 6.2** shows the location of the pumping station in relation to the proposed development. The required works are classed as Exempted Development under Class 58 of the Planning and Development (Amendment) Regulations 2018 relating to the development by Irish Water, for the purpose of the provision of water services. Irish Water has confirmed that following the upgrades the pumping station will have sufficient capacity to adequately process the additional input from the operational demand of the proposed development.

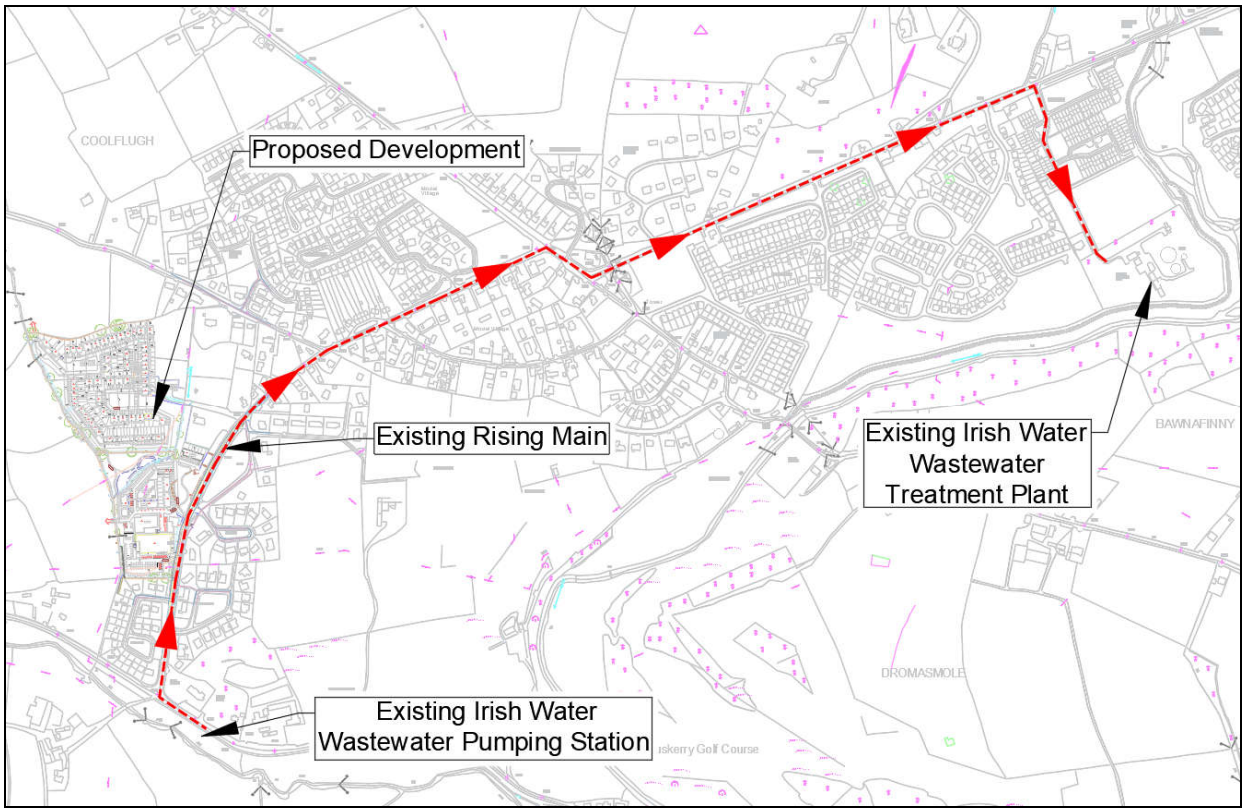


Figure 6.2: Location of existing Irish Water wastewater infrastructure

7. WATERMAIN NETWORK

Water design

PROJECT: **CLOGHROE DEVELOPMENT, CLOGHROE, CORK**

CLIENT: **Cloghroe Development Limited**

PROPOSED DEVELOPMENT: 198 residential units, a 42-child creche, a retail food store, and a café

A 150mm diameter HDPE watermain is proposed to supply potable water to all units and fire hydrants within the development. The proposed pipe network has no dead ends with loops serving a minimum of 4 units in accordance with Irish Water Code of Practice for Water Infrastructure Doc IW-CDS-5020-03.

The 150mm mains will be connected to the existing mainline present on R617.

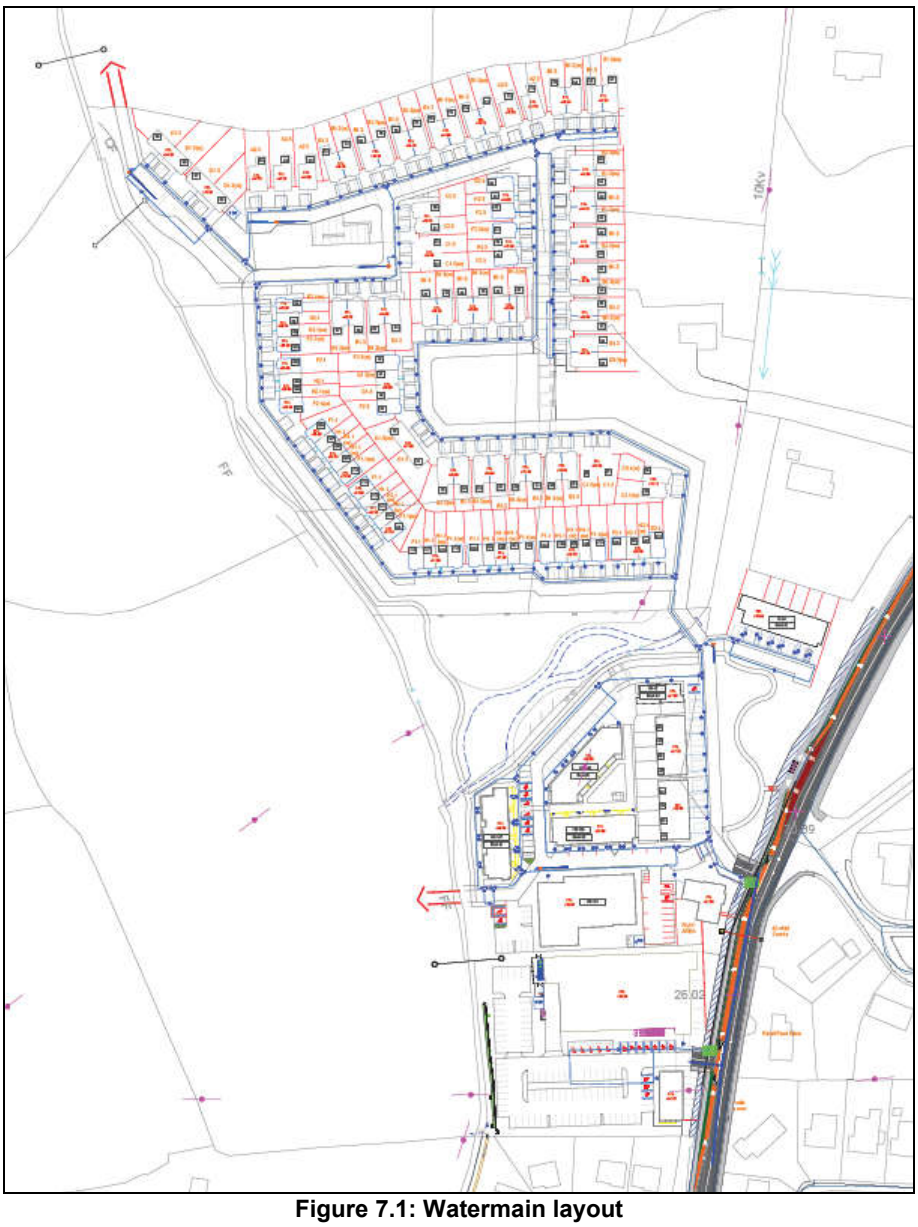


Figure 7.1: Watermain layout

Layout details of the watermain network can be found in drawings **PHDC-PWM-P01**, **PHDC-PWM-P02**, **PHDC-PWM-P03**, **PHDC-PWM-P04**, **PHDC-PWM-P05**, **PHDC-PWM-P06**, and **PHDC-PWM-P07**.

The construction of the water supply pipe network shall be in accordance with Irish Water Code of Practice for Water Infrastructure Doc IW-CDS-5020-03. Service layout distances to comply with Irish Water Detail STD-W-11. A Statement of Design Acceptance from Irish Water has been received and included in **Appendix B** for the proposed design.

A Pre-Connection Enquiry Form has been submitted to Irish Water to progress connection details. The response from Irish Water is included in **Appendix A** of this report.

8. PUBLIC LIGHTING

PUBLIC LIGHTING DESIGN

PROJECT: **CLOGHROE DEVELOPMENT, CLOGHROE, CORK**

CLIENT: **Cloghroe Development Limited**

PROPOSED DEVELOPMENT: 198 residential units, a 42-child creche, a retail food store, and a café

A separate public lighting design report is included as part of the application documentation.

The public road lighting is designed to EN 13201 and British Standard BS 5489 utilising the "Lighting Reality Pro" software package. This design package is used to select an appropriate lantern type and to optimise the lighting design. The selected lantern is designed and manufactured to comply with EN 13201 with IP65 optic and 10 joules shock resistant gear housing. To meet with ecology requirements, in particular regarding potential bat activity, all installed lighting in the development will be Warm White (<3000K). Additionally, as agreed with the Cork City Council lighting department, minor estate roads will receive a step down in lighting classification to P4 instead of P3.

The design and selection of lighting columns is included in the public lighting design report. In response to the ecology report, all estate lighting columns are 6m high instead of 8m (or 10m) on the public roads.

In addition to internal estate roads, it is proposed to install a new public lighting scheme along the extent of the works as part of proposed public realm improvements.

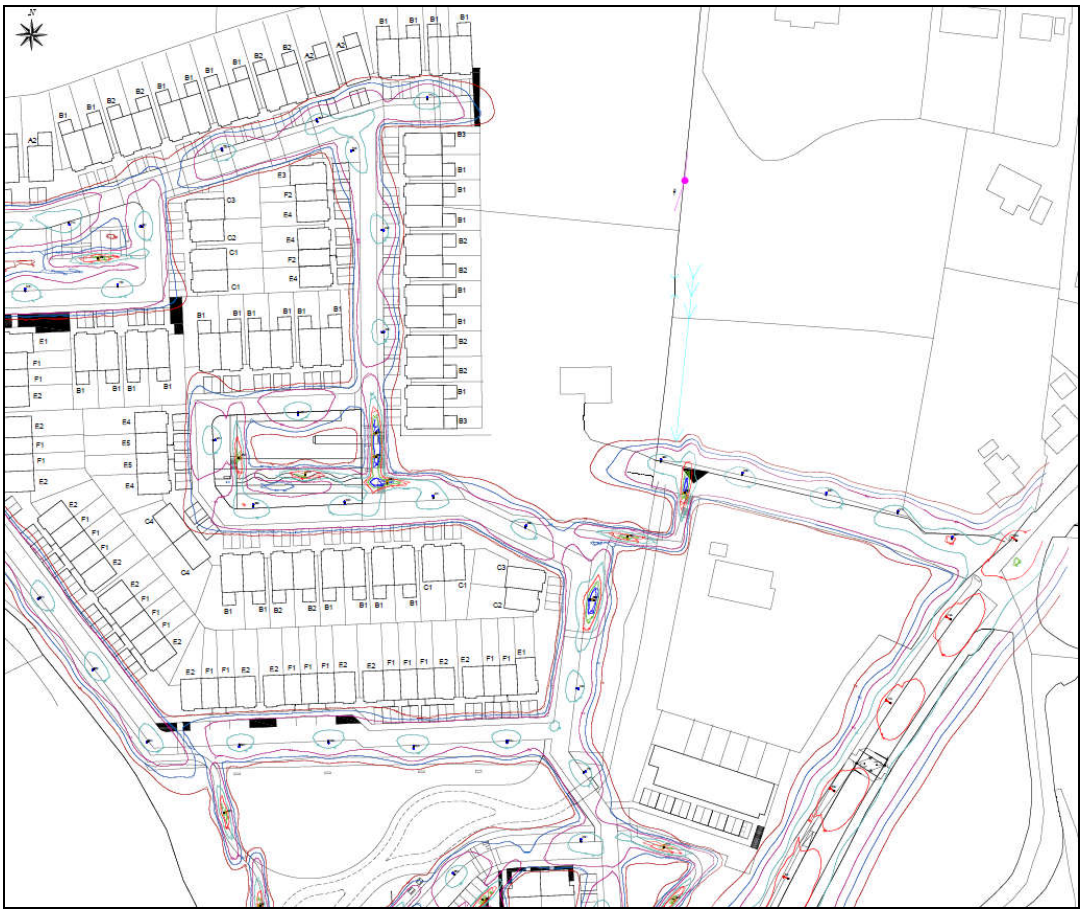


Figure 8.1: Public lighting layout to north-east of development

Full details of the public lighting network can be found in the separate public lighting report including with this submission and drawings **RL1-PPL-P01**, **RL1-PPL-P02**, and **RL1-PPL-P03**.

9. FLOOD RISK ASSESSMENT

PROJECT: CLOGHROE DEVELOPMENT, CLOGHROE, CORK

CLIENT: Cloghroe Development Limited

PROPOSED DEVELOPMENT: 198 residential units, a 42-child creche, a retail food store, and a café

Irish Hydrodata Limited (IHD) was commissioned to prepare a site specific flood risk assessment [SSFRA] for the proposed SHD. The completed assessment is included in a separate report submitted with the application documentation.

Planning guidelines on flood risk and development have been published by the OPW and Department of Environment, Heritage and Local Government (DoEHLG). The below sections summarise how the developments design was assessed in accordance with the main principals of the guidelines.

SEQUENTIAL APPROACH

The sequential approach makes use of flood zones for river and coastal flooding, as described below:

Zone A High probability. This zone defines areas with the highest risk of flooding from of flooding. For river flooding it is defined as more than 1% probability or more than 1 in 100 years, and for coastal flooding it is defined as 0.5% probability or more than 1 in 200 years.

Zone B Moderate probability. This zone defines areas with a moderate risk of flooding. For river flooding it is defined as 0.1% to 1% probability or between 1 in 100 and 1 in 1000 years, and for coastal flooding 0.1% and 0.5% probability or between 1 in 200 and 1 in 1000 years.

Zone C Low probability. This zone defines areas with a low risk of flooding less than 0.1% probability or less than 1 in 1000.

The flood zones are then to be looked at with the vulnerability of the buildings proposed.

- Highly Vulnerable Hospitals, Garda stations, homes, motorways etc.
- Less Vulnerable commercial, retail, offices etc.
- Water Compatible Marina's, green areas

A sequential approach is then taken to assess the most favourable location for the development based on its vulnerability.

Zone A Water Compatible or Justification Test
Zone B Less Vulnerable if no other lands are available or highly vulnerable with Justification Test
Zone C Any development

DEVELOPMENT SEQUENTIAL TEST

Coastal Flood Risk
There is no risk associated with coastal flooding for this site as general ground levels for the site (circa 24.00m – 47.00m OD) are much higher than expected extreme coastal flood levels.

Fluvial Flood Risk
Fluvial flooding is the result of a river exceeding its capacity and excess water spilling out onto the adjacent floodplain.

Myplan.ie map incorporates many different sets of spatial information, including OPW Flood Mapping data (fluvial, pluvial, coastal flooding data and groundwater flood extents).

Figure 9.1 is an extract from www.myplan.ie and indicates that there is no fluvial flooding threat to the site of the proposed development.

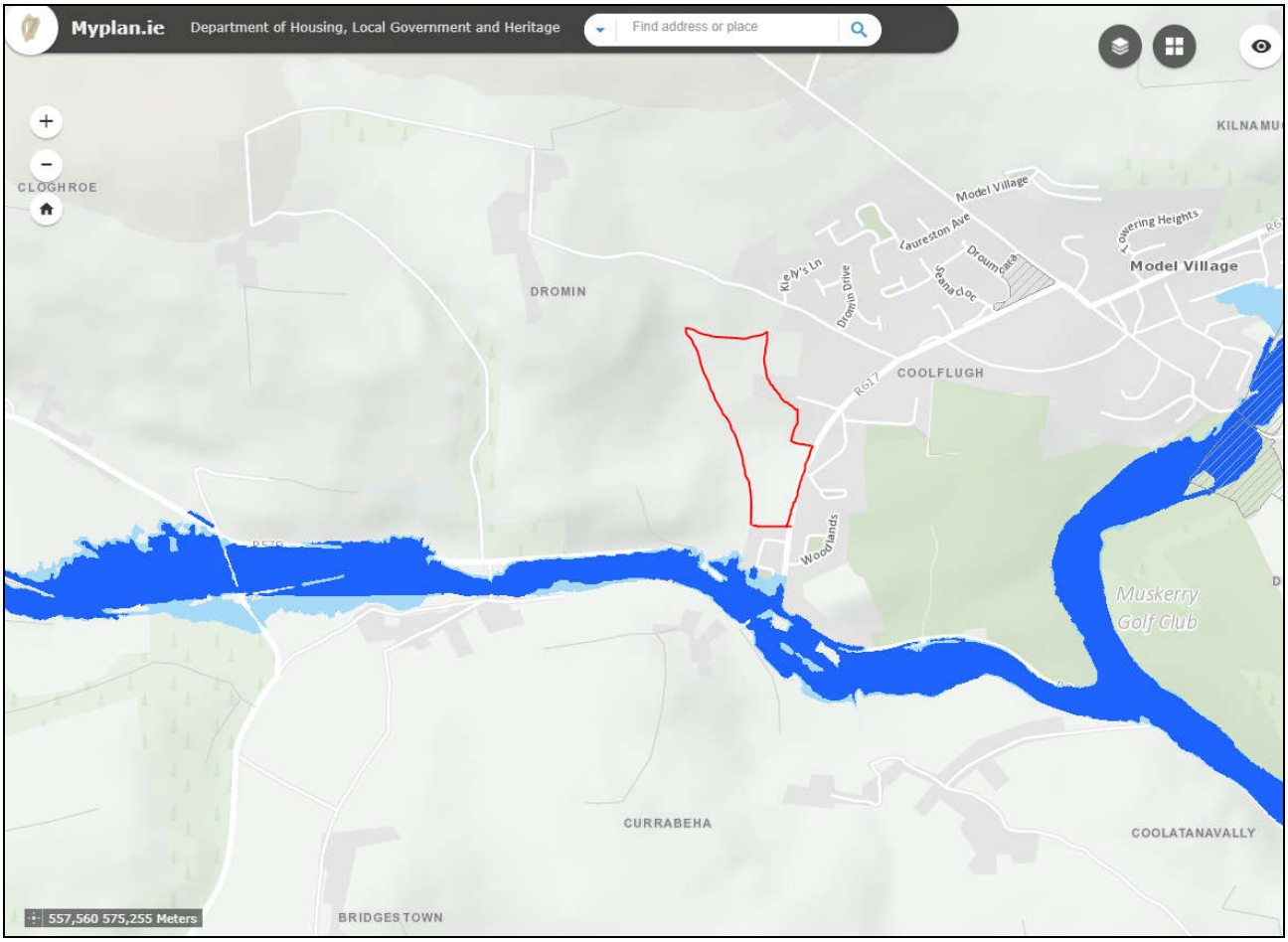


Figure 9.1: Fluvial flood map in the vicinity of the proposed site (outlined in red)

Pluvial Flooding

The OPW Flood Hazard Mapping Website is a record of historic flood events, and this database indicates that there is a recurring flood risk on the R579 and at its junction with the R617, see **Figure 9.2** below.

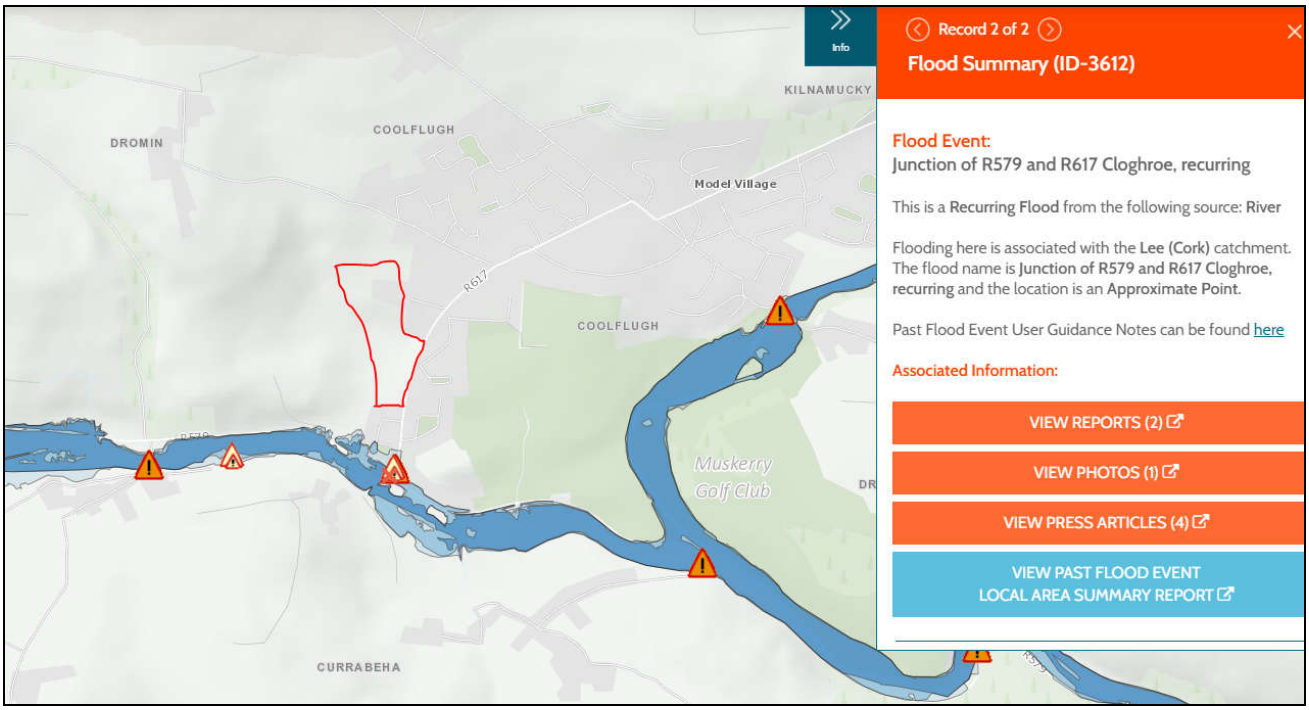


Figure 9.2: Historical flood events in surrounding area

The flood is as a result of the Owennagearagh River over topping its banks and has been further investigated as part of the Lee CFRAMS Study. **Figure 9.3** below shows the expected extent of flooding for each of the risk categories from 10% to 0.1% AEP Flood Events.

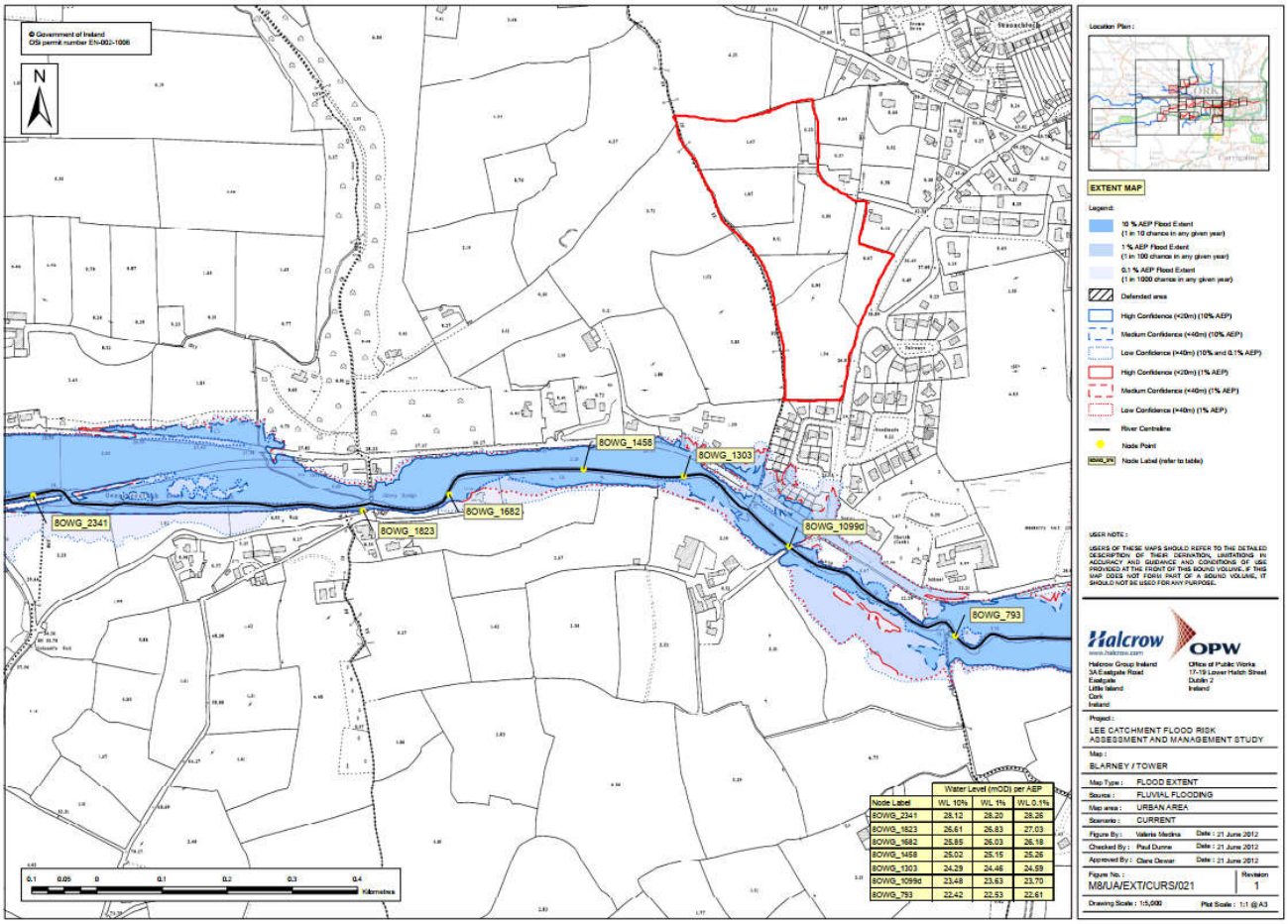


Figure 9.3: Flood Extent Mapping from the Lee CFRAMS Study

It is noted that the site of the proposed development has not been affected by the historical flood events nor is it vulnerable to predicted flood events as part of the Lee CFRAMS study. Evident from the mapping is that the adjoining residential scheme, Senandale, is vulnerble and will continue to be at risk unless remedial measures are put in place.

The following diagram indicates the location of rivers and streams in the vicinity of the site. **Figure 9.5** shows the historic 6 inch mapping for the area which does not include the man-made land drain running through the site. The stream running on the western boundary of the site is indicated on the historic map and hence a review of the catchment of this stream was undertaken. **Figure 9.6** is an extract from the OPW online map system which includes details of this stream. Evident from this map is the contributing catchment of 1.135 km², which is significantly less than the lower limit of 5 km² used to determine if watercourses are included in the CFRAMS model. The conclusion is that this northern stream running adjacent to the site was not included in the CFRAMS model and, therefore, the results of **Figure 9.3** relating to the site may be incomplete.

Figure 9.4 below presents the location and direction of the existing watercourses in relation to the site.

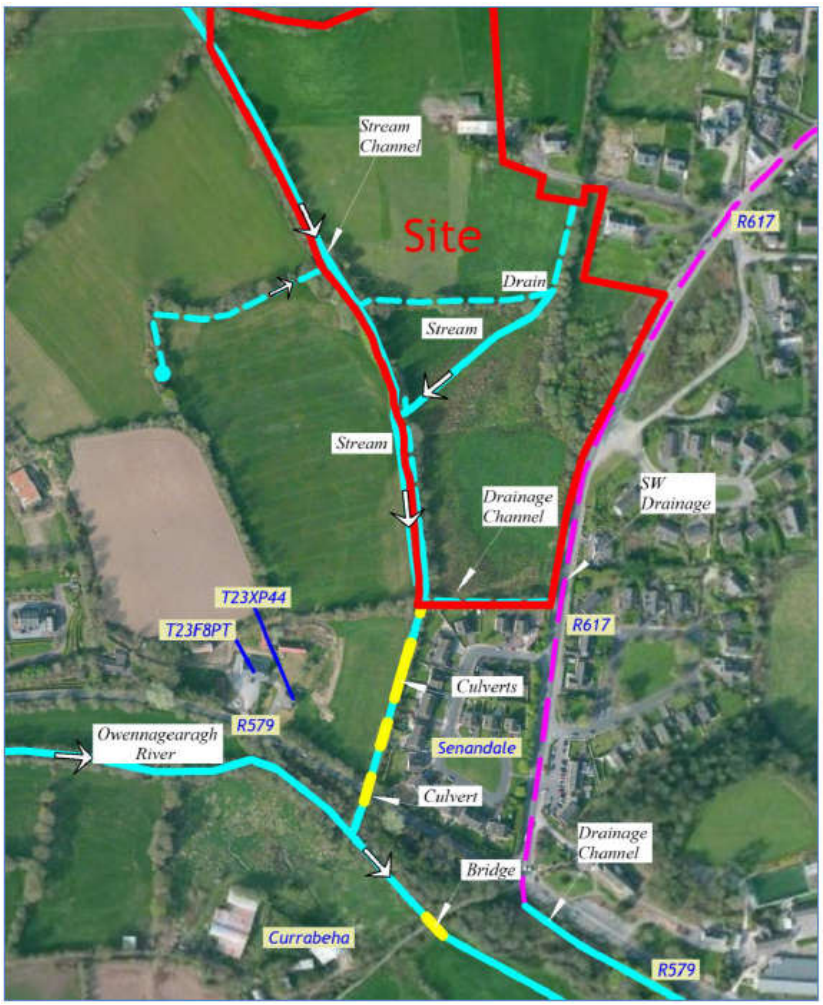


Figure 9.4: Location and direction of watercourses in relation to site

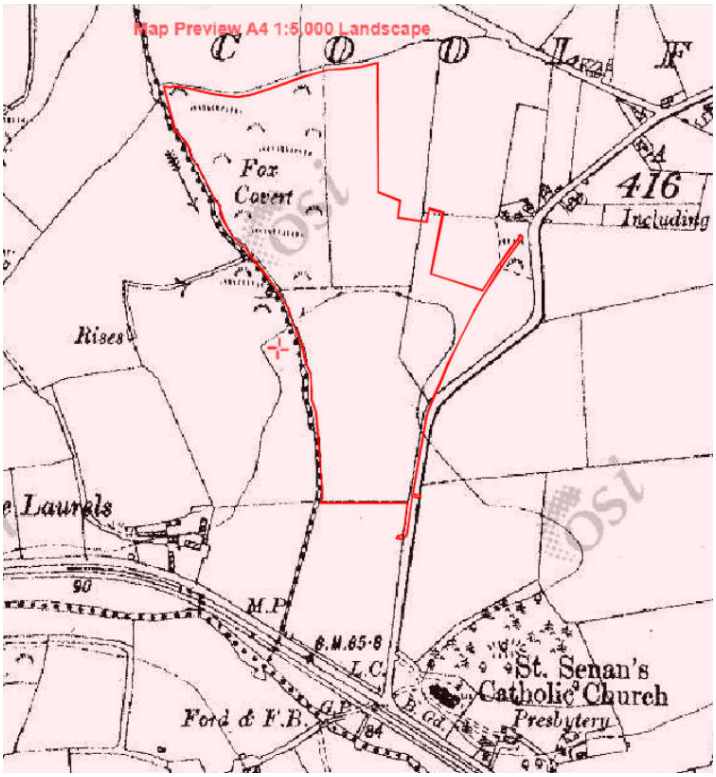


Figure 9.5: 6'' Historic Map of the area

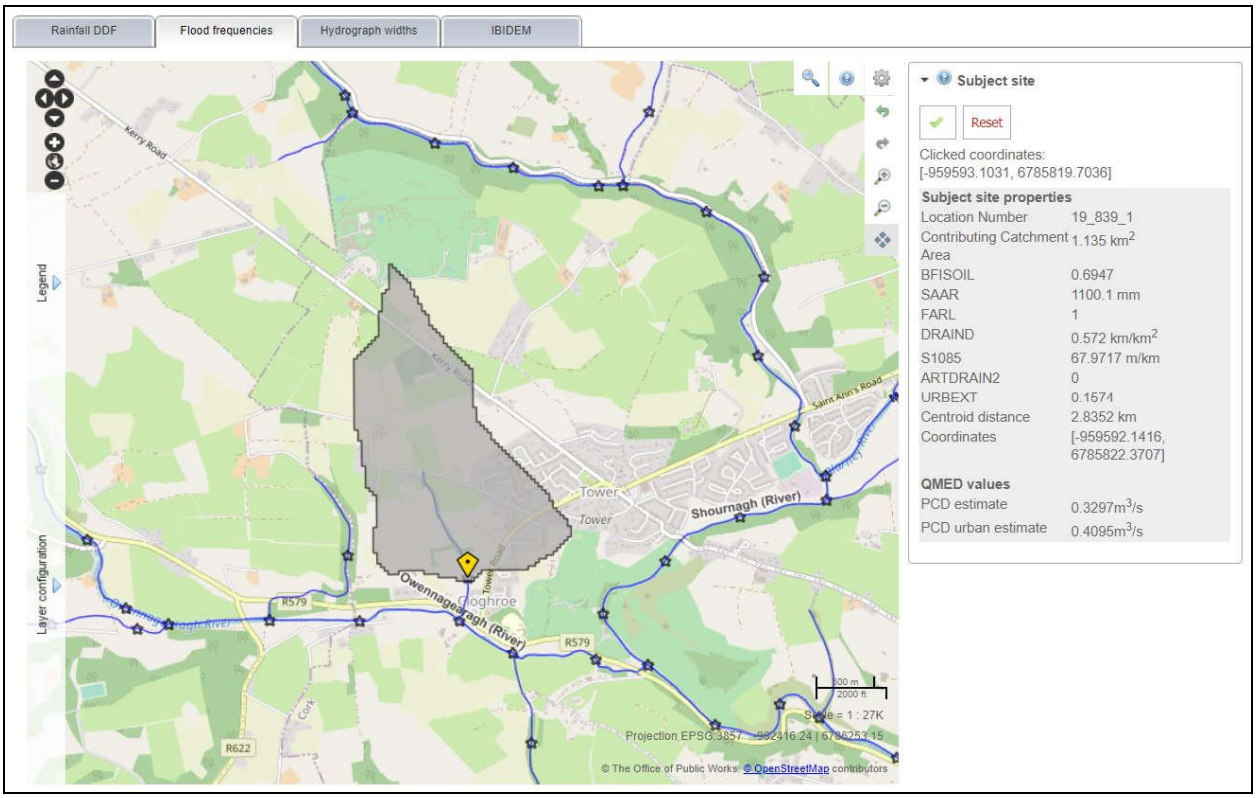


Figure 9.6: Catchment of stream running on the western boundary of the site

Figure 9.7: Flood mapping based on existing topography (stream flow at 0.1% AEPCC, river flow at 10m^3/s)

Development Drainage

The proposed surface water drainage design proposes to discharge below QBAR for all rainfall events up to and including the 1 in 100-year storm event plus 20% climate change as discussed and agreed with the Cork City Council's Drainage Department. This exceeds the climate change factor of 10% required as part of GDSDS. As is evident from the HR Wallingford Greenfield Runoff Estimation tool (refer to **Appendix G**), the proposed discharge rate of 20.8 l/s is considerably lower than the 30-year and 100-year greenfield runoff rates and represents a substantial reduction in the peak run-off rates from the site. Furthermore, additional SuDS elements are proposed in areas where the designed layout, topography and ground conditions allow, which have not been included when sizing of the attenuation tanks. Specifically, a series of 'floodable' basins is proposed within the main greenspace serving the site that will restrict the volumes entering the stream on the western boundary.

When the overall site area is included, the resulting reduction in runoff used in the design is considerable, from 25.3 l/s down to 20.8 l/s. All positive storm drainage within the site is being redirected to an existing storm sewer in the R617 where it will ultimately outfall to the Owennagearagh River downstream of the Currabeha Bridge, resulting in current peak fluvial flows from the site entering the western boundary stream being largely removed. The result is that the proposed control is very conservative and will result in a reduced flood risk downstream.

Flood Storage System

The southern part of the site is low-lying and subject to flooding during heavy rainfall, refer to **Figure 9.7** above. A flood storage network with a volume of 1,200 m³ is proposed as part of the proposed development at the southwest corner of the site to compensate for the loss of floodable area following construction. This system will take the form of a Stormtech subsurface unit that will allow the stream to flood as required, refer to **Figure 9.9**. This unit will be located beneath the car park area of the proposed retail unit. In addition to the compensatory flood storage, a headwall with non-return valve is proposed at the outfall of the existing land drain running along the southern boundary of the site. This land drain falls in a westerly direction towards the western boundary stream and is located along the boundary between the proposed retail car park and Senandale. This non-return valve will remove the risk of any flood waters from the western stream entering the land drain and thereafter flooding into Senandale.

Figure 9.8 below presents the proposed layout for the storm network and the proposed 1,200 m³ compensatory flood storage system (displayed in green) at the south-west corner of the site.

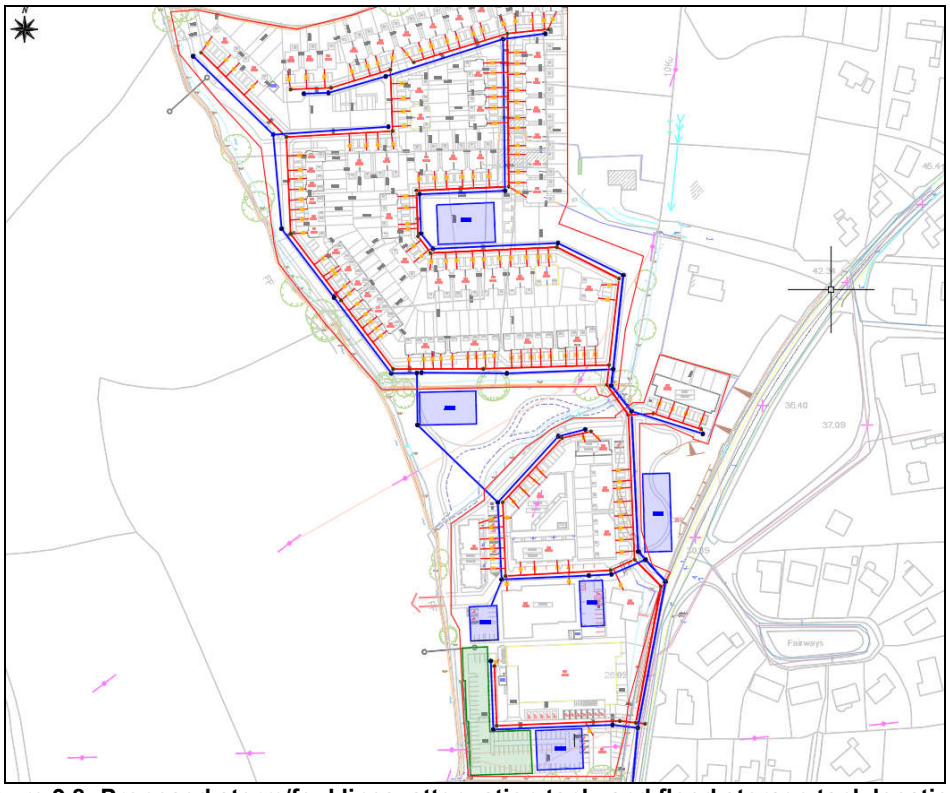


Figure 9.8: Proposed storm/foul lines, attenuation tank, and flood storage tank locations

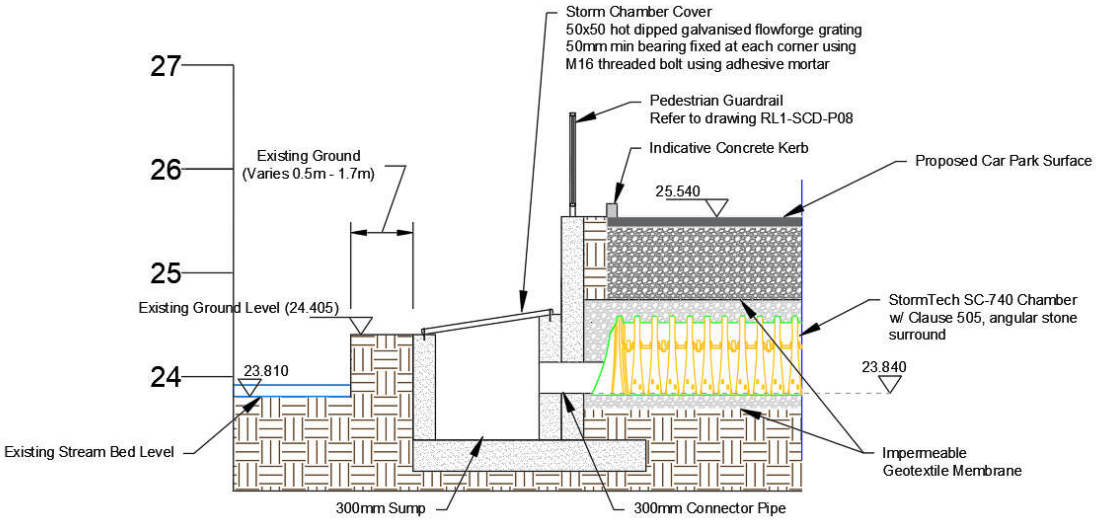


Figure 9.9: Cross-section of proposed flood storage with flood water receiving chamber

The proposed flood storage system is designed to manage the overflow from the western boundary stream during times of flooding and will provide protection to both the proposed development and adjoining properties in Senandale.

Figure 9.10 below presents the maximum flood level during a 0.1% AEPCC event when the proposed development is complete. It can be seen that flood waters previously evident at the north of Senandale, refer **Figure 9.7**, are no longer present. The flooding of Senandale emanating from the Owennagearagh River is still clearly visible.

Figure 9.10: Flood mapping with proposed development (stream flow at 0.1% AEPCC, river flow at 10m^3/s)

Referring to the separate Site-Specific Flood Risk Assessment completed by Irish Hydrodata Limited, longitudinal water surface profile comparisons indicate a negligible change in water levels arising from the development. The influence of the Owennagearagh River on water levels is clearly evident, however, with water levels predicted to be 300mm above the R579 road level during a 0.1% AEPCC event. Sections through the northern section of the Senandale housing estate show current potential flood waters to be removed from the site and contained within the proposed flood storage tank, where the overall level increase will be 60mm, during the 0.1% AEP event. As a consequence of protecting Senandale and diverting conveyance flows west, water levels over a very localised region in the lands west of Senandale (designated Flood Zone A) can be seen to marginally increase by 20mm. This increase quickly drops further to the south towards the R579 when the Owennagearagh River levels dominate. The modelling indicates no measurable increase in flood risk to any Senandale properties or to the dwelling further west along R579.

Complete layout details of the stormwater network can be found in drawings **RL1-OPN-P01** and **RL1-OPN-P02**. Layout and cross-section details of the proposed flood storage system are provided in drawings **RL1-PFS-P01**, **RL1-PFS-P02**, **RL1-PFS-P03,** and **RL1-PFS-P04**. Detail of the land drain outfall with non-return valve is provided on drawing **RL1-SCD-P07**.

Flood Risk Assessment Conclusions

The site has been assessed in accordance with the Flood Risk Management Guidelines. As part of the sequential test, the OPW flood hazard maps, the draft OPW Preliminary Catchment Flood Risk Assessment Maps, and the SSFRA by Irish Hydrodata Limited with comprehensive modelling have been consulted.

Other sources of flood risk have been investigated including development drainage, however, the stream along the western boundary was identified as the source of flood waters that could potentially impact the site and the adjoining Senandale estate. To mitigate this risk, measures including compensatory flood storage, headwall with non-return valve at southern boundary land drain, and attenuated surface water drainage have been proposed. These measures will remove the risk of flooding occuring within the development site and remove the existing flood risk to Senandale from the western boundary stream.

As a consequence of the above measures and the diversion of conveyance flows west, a marginal increase of 20mm in water levels on a localised region within Flood Zone A lands to the west of Senandale is predicted. There is no increased risk to any nearby properties or developable land.

For the aforementioned reasons, the development is deemed appropriate in the proposed site location.

10. NZEB COMPLIANCE

PROJECT: CLOGHROE DEVELOPMENT, CLOGHROE, CORK

CLIENT: Cloghroe Development Limited

PROPOSED DEVELOPMENT: 198 residential units, a 42-child creche, a retail food store, and a café

This document provides an overview of the developments energy strategy and relates to the sustainability and energy targets proposed for the project. The development must approach the energy design in an efficient manner that reduces energy demand initially through passive strategies such as an efficient envelope which in turn reduces the energy demands relating to items such as the heating system. This initial approach in reducing the energy demand significantly aids the project in obtaining the required energy goals. Performance criteria relating to the development's envelope are set out in the following document.

The energy systems design must also focus on specifying energy efficient equipment to ensure the day to day running of the energy systems are optimised to further enhance energy savings and the related energy cost. Specifications relating to efficient heating, lighting and auxiliary equipment are set out in the document.

The report sets out to demonstrate a number of methodologies in Energy Efficiency, Conservation and Renewable Technologies that will be employed in part or in combination with each other for this development. These techniques will be employed to achieve compliance with the building regulations Part L and NZEB standards currently in public consultation.

BUILDING ENERGY RATING

As of 2006 all domestic buildings that were newly built and existing buildings that are for sale or rent require a BER (Building Energy Rating) certificate. The actual building energy rating is based on the primary energy used for one year and is classified on a scale of A1 to G with A1 being the most energy efficient. It also gives the anticipated carbon emissions for a year's occupation based on the type of fuel that the systems use. In order to identify Primary energy consumption of the building, the BER assesses energy consumed under the following headings:

- Building type (house, apartment etc)
- Building orientation
- Thermal envelope (insulation levels of the façade, roofs, ground floor etc)
- Air Permeability (how much air infiltrates into the building through the façade)
- Heating systems (what type of heat source is used and how efficient)
- Ventilation (what form of ventilation is used. Natural vent, mixed mode mechanical ventilation)
- Fan and pump efficiency (how efficient are the pumps and fans)
- Domestic hot water generation (is a high efficiency boiler used)
- Lighting systems (how efficient is the lighting in the building

Through the specification of an energy efficient façade and HVAC systems, the energy consumption of the building will be reduced compared to a set baseline. This ensures the environmental and economic impact of the operation of the building is reduced. The key philosophy of this plan is to reduce energy consumption by firstly limiting the energy needed by improving the buildings insulation. The second step is to utilise energy in the most efficient way through the selection and installation of energy efficient plant and equipment. The final step is to introduce energy from renewable sources to reduce the burden on Fossil Fuels.

BUILDING SERVICES (M&E) OVERVIEW

Heating & Ventilation systems

Various options for heating of residential units will be considered including include possible gas boilers, heat pumps or exhaust air heat pumps.

Air source heat pumps utilize low grade heat from external ambient air and transfer heat to heating system pipework. These systems operate with very high efficiencies (>400%) which provides significant carbon reductions in comparison to a traditional boiler system.

Gas heating options would comprise a high efficiency gas boiler for provision of heating and hot water. Photovoltaic panels would be installed in conjunction with the gas boiler option to achieve the Part L renewable energy requirements.

Exhaust air heat pumps utilise an exhaust air heat pump type system for heating, hot water and ventilation of the individual units. This will re-cycle the heat from your house's ventilation system. These machines are ideal for more compact air-tight low energy or passive homes. Air is drawn through ducts to the heatpump from the bathrooms, utility and kitchen areas. The cold waste air is discharged to outside through another duct, and condensation to a drain. Additional heat generated internally from lighting, people and domestic appliances is also utilised through heat recovery.

For every unit of electricity used to operate the heat pump, up to four to five units of heat are generated. Therefore, for every unit of electricity used to generate heat, 4-5 (400-500%) units of heat are produced. Efficiencies in order of 600% may also be achieved depending on ambient conditions.

Photovoltaic panels are best suited to sites which have an unobstructed southerly and south-easterly elevations. PV is particularly suitable due where there is a simultaneous requirement for heating, hot water and electrical demand. The on-site generation of electricity can supplement the electrical requirement for lighting, motors, etc & reduce the electrical demand and from the grid.

Applying this to each dwelling would considerably reduce the demand from the grid and consequently reduce losses and emissions from power stations. Such is the benefit of on site or distributed generation, the DEAP model determines that each kWh offset from PV equates to circa 2.5 times the thermal equivalent and reduces CO2 emissions by some 0.47Kg/kWh generated.

Lighting

All lighting to be energy efficient with provision made for low energy lamps such as Compact Fluorescent Lamps (CFLs) which use 80% less electricity and last up to 10 times longer than ordinary light bulbs in the dwellings.

11. FIRE SAFETY

PROJECT: CLOGHROE DEVELOPMENT, CLOGHROE, CORK

CLIENT: Cloghroe Development Limited

PROPOSED DEVELOPMENT: 198 residential units, a 42-child creche, a retail food store, and a café

The scheme has been designed in compliance with Technical Guidance Document B of the Building Regulations. The various design drawings and documents have been developed to align with these requirements. Refer in particular to overall site layout drawings and water services design drawings. The water services have been designed in accordance with Irish Water Standard Details. Please note Irish Water's Statement of Design Acceptance included in Appendix B.

Appendices

APPENDIX A

Irish Water Pre-connection response

SHANE MORIARTY

CARRIG MOR HOUSE
10 HIGH STREET, DOUGLAS ROAD
Cork
T12KC66

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

16 October 2020

Re: CDS20006124 pre-connection enquiry - Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 185 unit(s) at Cloghroe, Blarney, Co. Cork

Dear Sir/Madam,

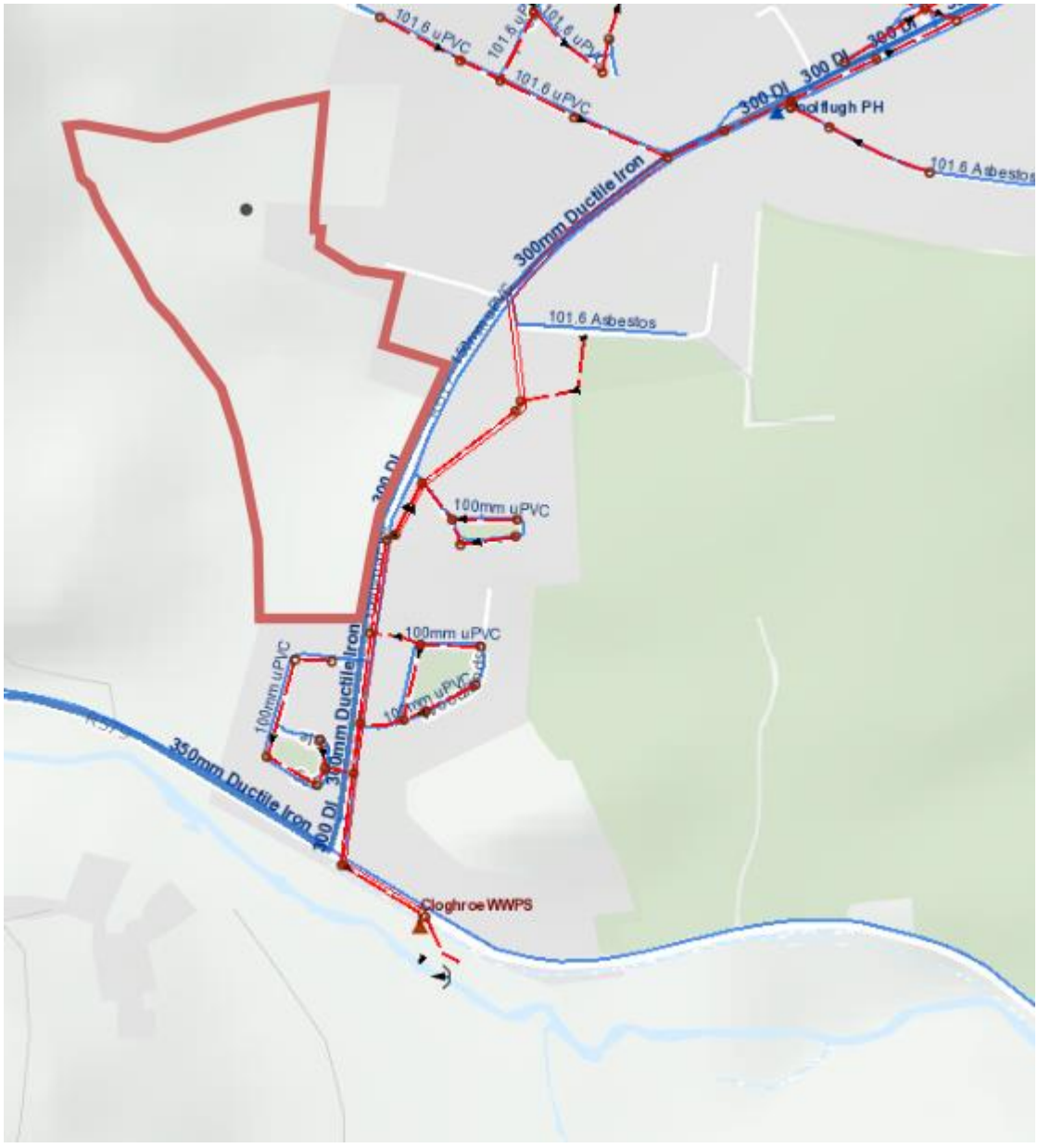
Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Cloghroe, Blarney, Co. Cork (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	**OUTCOME OF PRE-CONNECTION ENQUIRY** **THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.**
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	This Confirmation of Feasibility to connect to the Irish Water infrastructure does not extend to your fire flow requirements. Please note that Irish Water can not guarantee a flow rate to meet fire flow requirements and in order to guarantee a flow to meet the Fire Authority requirements, you should provide adequate fire storage capacity within your development.
Wastewater Connection	In order to accommodate the proposed connection at the Premises, upgrade works are required at the Cloghroe Waste Water Pumping Station. Irish Water does not currently have any plans to carry out the works required. Should you wish to have such upgrade works progressed, Irish Water will require you to provide a contribution of a relevant portion of the costs for the required upgrades, please contact Irish Water to discuss.
Strategic Housing Development	Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. In advance of

	submitting your full application to An Bord Pleanala for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services.

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 that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.

The map included below outlines the current Irish Water infrastructure adjacent to your site:



General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**
2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.
3) The feedback provided is subject to a Connection Agreement/contract being signed at a later date.
4) A Connection Agreement will be required to commencing the connection works associated with the enquiry this can be applied for at https://www.water.ie/connections/get-connected/
5) A Connection Agreement cannot be issued until all statutory approvals are successfully in place.
6) Irish Water Connection Policy/ Charges can be found at https://www.water.ie/connections/information/connection-charges/
7) Please note the Confirmation of Feasibility does not extend to your fire flow requirements.
8) Irish Water is not responsible for the management or disposal of storm water or ground waters. You are advised to contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges
9) To access Irish Water Maps email datarequests@water.ie
10) All works to the Irish Water infrastructure, including works in the Public Space, shall have to be carried out by Irish Water.

If you have any further questions, please contact Marko Komso from the design team on 022 54611 or email mkomso@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,

Maria O'Dwyer

Connections and Developer Services

APPENDIX B

Irish Water Statement of Design Acceptance

Shane Moriarty
Carrig Mor House
10 High Street
Douglas Road
Co. Cork T12KC66

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

26 January 2022

Re: Design Submission for Cloghroe, Blarney, Co. Cork (the "Development") (the "Design Submission") / Connection Reference No: CDS20006124

Dear Shane Moriarty,

Many thanks for your recent Design Submission.

We have reviewed your proposal for the connection(s) at the Development. Based on the information provided, which included the documents outlined in Appendix A to this letter, Irish Water has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before you can connect to our network you must sign a connection agreement with Irish Water. This can be applied for by completing the connection application form at www.water.ie/connections. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities (CRU)(https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/).

You the Customer (including any designers/contractors or other related parties appointed by you) is entirely responsible for the design and construction of all water and/or wastewater infrastructure within the Development which is necessary to facilitate connection(s) from the boundary of the Development to Irish Water's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Irish Water does not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Irish Water representative:
Name: Michael Galvin
Email: mgalvin@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

- PHDC-PWM-P01 Rev. 02 Proposed Watermain Sheet 1 of 7
- PHDC-PWM-P02 Rev. 02 Proposed Watermain Sheet 2 of 7
- PHDC-PWM-P03 Rev. 02 Proposed Watermain Sheet 3 of 7
- PHDC-PWM-P04 Rev. 02 Proposed Watermain Sheet 4 of 7
- PHDC-PWM-P05 Rev. 02 Proposed Watermain Sheet 5 of 7
- PHDC-PWM-P06 Rev. 02 Proposed Watermain Sheet 6 of 7
- PHDC-PWM-P07 Rev. 02 Proposed Watermain Sheet 7 of 7
- RL1-OPN-P01 Rev. D Overall Pipe Network Plan Sheet 1 of 2
- RL1-OPN-P02 Rev. E Overall Pipe Network Plan Sheet 2 of 2
- RL1-FLS-P01 Rev. 02 Foul Long Sections Sheet 1 of 3
- RL1-FLS-P02 Rev. 02 Foul Long Sections Sheet 2 of 3
- RL1-FLS-P03 Rev. 02 Foul Long Sections Sheet 3 of 3

*For further information, visit **www.water.ie/connections***

Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Irish Water will not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

APPENDIX C

Site Investigation Bore Logs

	Project No.: 20-087	**Project Name:** Cloghroe Housing Development	**Borehole No.:** BH01
	Coordinates: 557257.34 E 574834.26 N	**Client:** BMOR	Sheet 1 of 1
Method: Cable Percussion		**Client's Representative:** MHL & Associates Ltd	**Scale:** 1:50
Plant: Pilcon	**Ground Level:** 49.14 mOD	**Dates:** 31/08/2020 -	**Driller:** AA
			Logger: MN

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.10 - 1.20	B1				49.04	(0.10) 0.10		TOPSOIL		
0.10 - 1.20	D2							Brown sandy gravelly very silty CLAY with high cobble content and occasional rootlets, moist. Sand fine to coarse. Gravel fine to coarse, angular to subrounded. Cobbles subangular to subrounded. Gravel and cobbles consist of red, purple and green sandstone and siltstone, and occasional quartz.		
						(1.10)				
1.20 - 2.00	B3				47.94	1.20		Medium dense brown slightly silty very sandy GRAVEL with medium cobble content. Sand fine to coarse. Gravel fine to coarse, angular to subangular. Cobbles mostly subangular. Gravel and cobbles consist of red, purple and green sandstone and siltstone, and occasional quartz.		
1.20 - 2.00	D4									
1.20 - 1.65	SPT (C) N=21			N=21 (4,8/5,5,6,5)		(0.80)				
2.00 - 3.00	B5				47.14	2.00		Very dense brown slightly silty very sandy GRAVEL with high cobble content. Sand fine to coarse. Gravel fine to coarse, angular to subangular. Cobbles mostly subangular. Gravel and cobbles consist of red, purple and green sandstone and siltstone, and occasional quartz. *Driller records possible boulder at 2.2m.*		
2.00 - 3.00	D6									
2.00 - 2.21	SPT (C)			50 (7,11/50 for 60mm)		(1.00)				
3.00 - 3.30	B7				46.14	3.00		Very dense brown slightly clayey slightly silty very sandy GRAVEL with low cobble content. Sand fine to coarse. Gravel fine to coarse, angular to subangular. Cobbles mostly subangular. Gravel and cobbles consist of red, purple and green sandstone and siltstone, and occasional quartz. *Driller records possible boulder at 3.2m.*		
3.00 - 3.30	D8					(0.30)				
3.00 - 3.22	SPT (C)			50 (8,18/50 for 75mm)	45.84	3.30				
3.30 - 3.30	SPT (C)			50 (50 for 0mm/50 for 0mm)						
								End of borehole at 3.300m		

Remarks

Cable Percussion terminated at 3.30m upon encountering virtual refusal.

Water Added	
From (m)	To (m)
1.20	3.30

Water Strike - General			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details	
To (m)	Diam (mm)
3.30	200

Chiselling Details		
From (m)	To (m)	Time (hh:mm)
2.20	2.30	00:40
3.20	3.30	01:00

Project No.: 20-087	**Project Name:** Cloghroe Housing Development		**Borehole No.:** BH01A
Coordinates: 557258.49 E 574834.41 N	**Client:** BMOR		Sheet 1 of 1
Method: Cable Percussion	**Client's Representative:** MHL & Associates Ltd		**Scale:** 1:50
Plant: Pilcon	**Ground Level:** 49.13 mOD	**Dates:** 02/09/2020 -	**Driller:** AA
			Logger: MN

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description
0.10 - 1.20	B1				49.03	(0.10) 0.10		TOPSOIL
0.10 - 1.20	D2							Brown sandy gravelly very silty CLAY with high content of cobbles up to small boulder size and occasional rootlets, moist. Sand fine to coarse. Gravel fine to coarse, angular to subrounded. Cobbles subangular to subrounded. Gravel and cobbles consist of red, purple and green sandstone and siltstone, and occasional quartz.
						(1.10)		
1.20 - 2.00	B3				47.93	1.20		Very dense brown slightly silty very sandy GRAVEL with high cobble content. Sand fine to coarse. Gravel fine to coarse, angular to subangular. Cobbles mostly subangular. Gravel and cobbles consist of red, purple and green sandstone and siltstone, and occasional quartz.
1.20 - 2.00	D4							*Driller records possible boulder at 1.2m.*
1.20 - 1.21	SPT (C)			50 (50 for 10mm/50 for 0mm)				*Driller records possible boulder at 1.7m.*
2.00 - 3.00	B5							
2.00 - 3.00	D6					(1.80)		
2.00 - 2.32	SPT (C)			59 (7,9/59 for 170mm)				*Driller records possible boulder at 2.3m.*
3.00 - 4.00	B7				46.13	3.00		Dense brown slightly silty very sandy GRAVEL with medium cobble content. Sand fine to coarse. Gravel fine to coarse, angular to subangular. Cobbles mostly subangular. Gravel and cobbles consist of red, purple and green sandstone and siltstone, and occasional quartz.
3.00 - 4.00	D8							
3.00 - 3.45	SPT (C)			N=45				
	N=45			(7,7/11,13,10,11)		(1.00)		*Driller records possible boulder at 3.7m.*
4.00 - 4.50	B9				45.13	4.00		Very dense brown slightly silty very sandy GRAVEL with high cobble content. Sand fine to coarse. Gravel fine to coarse, angular to subangular. Cobbles mostly subangular. Gravel and cobbles consist of red, purple and green sandstone and siltstone, and occasional quartz.
4.00 - 4.50	D10							
4.00 - 4.45	SPT (C)			N=55		(0.50)		
	N=55			(9,11/11,10,15,19)	44.63	4.50		*Driller records possible boulder at 4.5m.*
4.50 - 4.50	SPT (C)			50 (50 for 0mm/50 for 0mm)				End of borehole at 4.500m

Remarks

Cable Percussion terminated at 4.50m upon encountering virtual refusal.

Water Added	
From (m)	To (m)
1.20	4.50

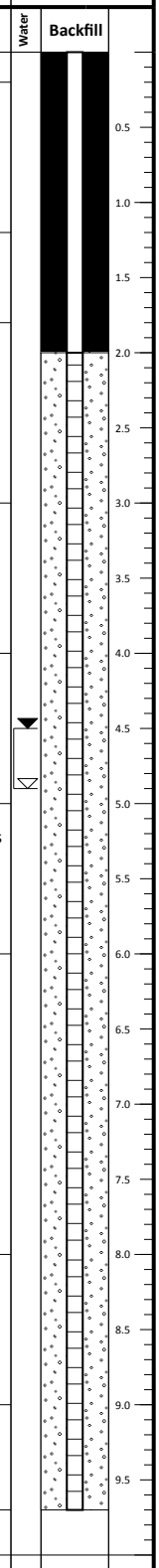
Water Strike - General			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details	
To (m)	Diam (mm)
4.50	200

Chiselling Details		
From (m)	To (m)	Time (hh:mm)
1.20	1.30	00:40
1.70	1.80	00:30
2.30	2.40	00:30

Project No.: 20-087	**Project Name:** Cloghroe Housing Development		**Borehole No.:** BH02
Coordinates: 557336.88 E	**Client:** BMOR		Sheet 1 of 1
Method: Cable Percussion	574652.45 N	**Client's Representative:** MHL & Associates Ltd	**Scale:** 1:50
Plant: Pilcon	**Ground Level:** 29.35 mOD	**Dates:** 03/09/2020 - 07/09/2020	**Driller:** AA
			Logger: IH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description
						(0.20)		TOPSOIL
0.20 - 1.20	B1				29.14	0.20		Light brown slightly gravelly slightly sandy very silty CLAY with rootlets. Gravel is fine to coarse, angular to subangular. Sand is fine to coarse.
0.20 - 1.20	D2					(1.00)		
1.20 - 1.80	B3				28.14	1.20		Stiff brown slightly sandy silty very gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular. Cobbles are angular to subangular.
1.20 - 1.80	D4							
1.20 - 1.65	SPT (C) N=29			N=29 (0,1/4,7,9,9)		(0.60)		
1.80 - 3.00	B5				27.54	1.80		Firm brown slightly sandy silty gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular. Cobbles are angular to subangular.
1.80 - 3.00	D6							
2.00 - 2.45	SPT (C) N=13			N=13 (2,2/4,3,3,3)		(1.20)		
3.00 - 4.00	B7				26.34	3.00		Stiff dark brown slightly sandy silty gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular. Cobbles are angular to subangular.
3.00 - 4.00	D8							
3.00 - 3.45	SPT (C) N=16			N=16 (3,4/4,4,4,4)		(1.00)		
4.00 - 5.00	B9				25.34	4.00		Medium Dense brown slightly silty sandy very clayey GRAVEL with medium cobble content and low small boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular. Cobbles and boulders are subangular.
4.00 - 5.00	D10							
4.00 - 4.45	SPT (C) N=24			N=24 (5,5/5,5,8,6)		(1.00)		
5.00 - 6.00	B11				24.34	5.00		Dense dark grey slightly silty clayey very sandy GRAVEL with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular. Cobbles are subangular.
5.00 - 6.00	D12							
5.00 - 5.45	SPT (C) N=35			N=35 (6,10/8,9,8,10)		(1.00)		
6.00 - 7.00	B13				23.34	6.00		Very Dense dark grey slightly clayey very sandy GRAVEL. Sand is fine to coarse. Gravel is angular to subangular.
6.00 - 7.00	D14							
6.00 - 6.45	SPT (C) N=54			N=54 (12,17/12,12,17,13)				
7.00 - 8.00	B15					(2.00)		
7.00 - 8.00	D16							
7.00 - 7.45	SPT (C) N=65			N=65 (10,10/14,19,16,16)				
8.00 - 9.00	B17				21.34	8.00		Very Dense dark grey slightly clayey very sandy GRAVEL with medium cobble content and low small boulder content. Sand is fine to coarse. Gravel is angular to subangular. Cobbles and boulders are angular to subangular.
8.00 - 9.00	D18							
8.00 - 8.45	SPT (C) N=54			N=54 (9,13/13,12,15,14)		(1.00)		
9.00 - 9.70	B19				20.34	9.00		Very Dense dark grey slightly clayey very sandy GRAVEL with medium cobble content. Sand is fine to coarse. Gravel is angular to subangular. Cobbles are angular to subangular.
9.00 - 9.70	D20							
9.00 - 9.45	SPT (C) N=54			N=54 (11,12/12,12,15,15)		(0.70)		
9.60 - 9.74	SPT (C)			50 (43 for 135mm/50 for 0mm)	19.64	9.70		End of borehole at 9.700m



Remarks

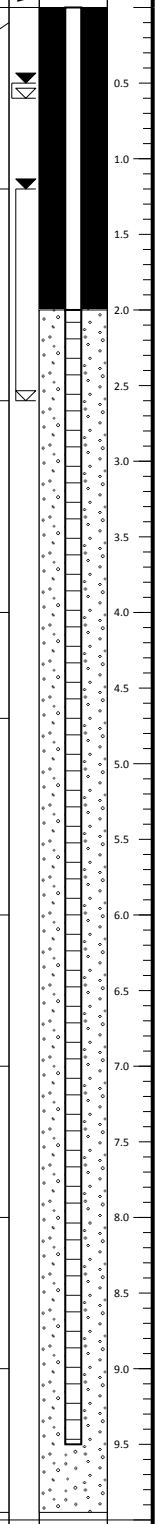
Cable Percussion terminated at 9.70m upon encountering virtual refusal.

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
1.20	4.90	4.90	4.90	20	4.50

Casing Details		Chiselling Details		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)
9.70	200	9.60	9.70	01:00

Project No.: 20-087	**Project Name:** Cloghroe Housing Development		**Borehole No.:** BH03
Coordinates: 557364.95 E 574434.04 N	**Client:** BMOR		Sheet 1 of 1
Method: Cable Percussion	**Client's Representative:** MHL & Associates Ltd		**Scale:** 1:50
Plant: Pilcon	**Ground Level:** 24.49 mOD	**Dates:** 10/09/2020 - 11/09/2020	**Driller:** AA **Logger:** IH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description
0.10 - 1.20	B1				24.38	(0.10) 0.10		TOPSOIL
0.10 - 1.20	D2							Mottled brown and light brown slightly sandy slightly gravelly silty CLAY with occasional rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular.
						(1.10)		
1.20 - 2.00	B3				23.28	1.20		Firm to Stiff brown slightly silty slightly gravelly sandy to very sandy CLAY with occasional rootlet fragments.
1.20 - 2.00	D4							
1.20 - 1.65	SPT (C) N=16			N=16 (4,4/3,5,4,4)				
						(1.40)		
2.00 - 2.60	B5							
2.00 - 2.60	D6							
2.00 - 2.45	SPT (C) N=16			N=16 (3,3/3,5,4,4)				
					21.88	2.60		Medium Dense purple / brown slightly silty clayey very sandy GRAVEL with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular. Cobbles are angular to subrounded.
3.00 - 4.00	B7							
3.00 - 4.00	D8							
3.00 - 3.45	SPT (C) N=22			N=22 (2,5/4,7,6,5)		(1.40)		
4.00 - 4.70	B9				20.48	4.00		Loose purple / brown slightly silty clayey very sandy GRAVEL with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular. Cobbles are angular to subrounded.
4.00 - 4.70	D10							
4.00 - 4.45	SPT (C) N=5			N=5 (0,1/0,1,2,2)		(0.70)		
4.70 - 6.00	B11				19.78	4.70		Loose purple / brown clayey SAND. Sand is fine to coarse.
4.70 - 6.00	D12							
5.00 - 5.45	SPT (C) N=9			N=9 (1,2/2,2,3,2)				
						(1.30)		
6.00 - 7.00	B13				18.48	6.00		Loose to Medium Dense purple / brown slightly silty very gravelly SAND. Gravel is fine to coarse, subangular to subrounded. Sand is fine to coarse.
6.00 - 7.00	D14							
6.00 - 6.45	SPT (C) N=10			N=10 (2,5/3,3,2,2)				
						(1.00)		
7.00 - 8.00	B15				17.48	7.00		Medium Dense reddish brown slightly clayey SAND. Sand is fine to coarse.
7.00 - 8.00	D16							
7.00 - 7.45	SPT (C) N=17			N=17 (3,4/6,4,3,4)				
7.50	U21					(1.00)		
8.00 - 9.00	B17				16.48	8.00		Medium Dense reddish brown slightly clayey gravelly SAND with low cobble content. Gravel is fine to coarse, subangular. Sand is fine to coarse. Cobbles are subangular to subrounded.
8.00 - 9.00	D18							
8.00 - 8.45	SPT (C) N=17			N=17 (4,4/4,4,5,4)				
						(1.00)		
9.00 - 9.50	B19				15.48	9.00		Dense reddish brown slightly clayey gravelly SAND with medium cobble and low boulder content. Gravel is fine to coarse, subangular. Sand is fine to coarse. Cobbles and boulders are subangular to subrounded.
9.00 - 9.50	D20							
9.00 - 9.45	SPT (C) N=31			N=31 (7,8/5,9,9,8)				
9.50 - 9.95	SPT (C) N=38			N=38 (8,11/9,10,10,9)		(0.95)		
					14.54	9.95		End of borehole at 9.950m



Remarks

Cable Percussion terminated upon reaching scheduled depth.

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
		0.60 2.60	2.60	20 20	0.50 1.20

Casing Details		Chiselling Details		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)
9.95	200			

Project No.: 20-087	**Project Name:** Cloghroe Housing Development		**Borehole No.:** BH04
Coordinates: 557355.60 E	**Client:** BMOR		Sheet 1 of 1
Method: Cable Percussion	574868.44 N	**Client's Representative:** MHL & Associates Ltd	**Scale:** 1:50
Plant: Pilcon	**Ground Level:** 47.76 mOD	**Dates:** 27/08/2020 - 31/08/2020	**Driller:** AA
			Logger: MN

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.00 - 1.20	B1							Brown slightly sandy gravelly very silty CLAY with low cobble content and occasional rootlets, moist. Sand fine to coarse. Gravel fine to coarse, angular to subrounded. Cobbles mostly subangular. Gravel and cobbles consist of red, purple and green sandstone and siltstone, and occasional quartz.		
0.00 - 1.20	D2					(1.20)				
1.20 - 2.00	B3				46.56	1.20		Medium dense brown slightly clayey slightly silty very sandy GRAVEL with low cobble content. Sand fine to coarse. Gravel fine to coarse, angular to subangular. Cobbles mostly subangular. Gravel and cobbles consist of red, purple and green sandstone and siltstone, and occasional quartz.		
1.20 - 2.00	D4									
1.20 - 1.65	SPT (C) N=14			N=14 (3,4/2,5,4,3)		(0.80)				
2.00 - 3.00	B5				45.76	2.00		Medium dense brown slightly silty very sandy GRAVEL with medium cobble content. Sand fine to coarse. Gravel fine to coarse, angular to subangular. Cobbles mostly subangular. Gravel and cobbles consist of red, purple and green sandstone and siltstone, and occasional quartz.		
2.00 - 3.00	D6									
2.00 - 2.45	SPT (C) N=24	2.00	0.80	N=24 (5,5/5,7,6,6) 27-08-2020		(1.00)				
3.00 - 4.00	B7				44.76	3.00		Very Dense to Dense brown slightly silty very sandy GRAVEL with medium, locally high, cobble content and a trace of slightly sandy gravelly silty clay pockets. Sand fine to coarse. Gravel fine to coarse, angular to subangular. Cobbles mostly subangular. Gravel and cobbles consist of red, purple and green sandstone and siltstone, occasional red conglomeratic sandstone, and occasional quartz. *Driller records possible boulder at 3.0m.*		
3.00 - 4.00	D8									
3.00 - 3.24	SPT (C)			70 (4,12/70 for 90mm)						
4.00 - 5.00	B9					(2.00)				
4.00 - 5.00	D10									
4.00 - 4.45	SPT (C) N=47	4.00	2.90	N=47 (3,5/11,12,11,13) 28-08-2020						
5.00 - 6.20	B11				42.76	5.00		Very dense brown slightly clayey slightly silty sandy GRAVEL with high cobble content and a trace of slightly sandy gravelly silty clay pockets. Sand fine to coarse. Gravel fine to coarse, angular to subangular. Cobbles mostly subangular. Gravel and cobbles consist of red, purple and green sandstone and siltstone, and occasional quartz.		
5.00 - 6.20	D12									
5.00 - 5.45	SPT (C) N=48			N=48 (4,5/9,12,14,13)		(1.20)				
6.00 - 6.20	SPT (C)			50 (6,9/50 for 50mm)						
6.20 - 6.20	SPT (C)			50 (50 for 0mm/50 for 0mm)	41.56	6.20		*Driller records possible boulder at 6.2m.* End of borehole at 6.200m		
		6.20		31-08-2020						

Remarks

Cable Percussion terminated at 6.20m upon encountering virtual refusal.

Water Added	
From (m)	To (m)
1.20	6.20

Water Strike - General			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Casing Details	
To (m)	Diam (mm)
6.20	200

Chiselling Details		
From (m)	To (m)	Time (hh:mm)
3.00	3.40	01:00
6.20	6.20	01:00

	Project No.: 20-087	**Project Name:** Cloghroe Housing Development	**Borehole No.:** BH05
	Coordinates: 557429.99 E	**Client:** BMOR	Sheet 1 of 1
Method: Cable Percussion	574677.97 N	**Client's Representative:** MHL & Associates Ltd	**Scale:** 1:50
Plant: Pilcon	**Ground Level:** 30.74 mOD	**Dates:** 09/09/2020 - 10/09/2020	**Driller:** AA
			Logger: IH

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.10 - 1.20	B1				30.64	(0.10) 0.10		TOPSOIL		
0.10 - 1.20	D2							Light brown (light grey and yellow mottling) slightly sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded.		
						(1.10)				
1.20 - 2.00	B3				29.54	1.20				
1.20 - 2.00	D4							Stiff light brown (light grey and yellow mottling) slightly sandy gravelly silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded.		
1.20 - 1.65	SPT (C) N=18			N=18 (1,3/4,4,5,5)		(0.80)				
2.00 - 2.30	B5				28.74	2.00				
2.00 - 2.30	D6					(0.30)		Stiff yellowish brown slightly sandy slightly silty gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular.		
2.00 - 2.45	SPT (C) N=20			N=20 (4,7/5,4,5,6)	28.44	2.30		Stiff light brown slightly silty sandy very gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular. Cobbles are angular to subangular.		
2.30 - 4.00	B7									
2.30 - 4.00	D8									
3.00 - 3.45	SPT (C) N=29			N=29 (6,4/7,7,6,9)		(1.70)				
4.00 - 5.00	B9				26.74	4.00				
4.00 - 5.00	D10							Dense light brown slightly silty clayey very sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular.		
4.00 - 4.45	SPT (C) N=30			N=30 (5,7/9,7,6,8)		(1.00)				
5.00 - 6.00	B11				25.74	5.00				
5.00 - 6.00	D12							Dense light brown slightly silty clayey very sandy GRAVEL with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular. Cobbles are angular.		
5.00 - 5.45	SPT (C) N=46			N=46 (8,11/14,10,10,12)						
6.00 - 7.00	B13					(2.00)				
6.00 - 7.00	D14									
6.00 - 6.45	SPT (C) N=42			N=42 (9,11/10,9,9,14)						
7.00 - 8.00	B15				23.74	7.00				
7.00 - 8.00	D16							Very Dense light brown slightly silty clayey very sandy GRAVEL with medium cobble and low small boulder content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular. Cobbles are angular.		
7.00 - 7.45	SPT (C) N=50			N=50 (10,12/12,12,11,15)		(1.00)				
8.00 - 9.00	B17				22.74	8.00				
8.00 - 9.00	D18							Very Dense light greyish brown slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular.		
8.00 - 8.45	SPT (C) N=51			N=51 (9,14/13,13,11,14)		(1.00)				
9.00 - 9.80	B19				21.74	9.00				
9.00 - 9.80	D20							Very Dense light greyish brown slightly clayey sandy GRAVEL with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular. Cobbles are angular.		
9.00 - 9.45	SPT (C) N=68			N=68 (12,12/12,17,20,19)		(0.80)				
9.80 - 9.81	SPT (C)			50 (50 for 10mm/50 for 0mm)	20.94	9.80		End of borehole at 9.800m		

Remarks

Cable Percussion terminated at 9.80m upon encountering virtual refusal.

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
		2.40	2.40	20	0.60

Casing Details		Chiselling Details		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)
9.80	200	9.80	9.80	01:00

Project No.: 20-087	**Project Name:** Cloghroe Housing Development		**Borehole No.:** BH06
Coordinates: 557426.96 E	**Client:** BMOR		Sheet 1 of 2
Method: Cable Percussion	574456.90 N	**Client's Representative:** MHL & Associates Ltd	**Scale:** 1:50
Plant: Pilcon	**Ground Level:** 24.56 mOD	**Dates:** 14/09/2020 - 15/09/2020	**Driller:** AA
			Logger: MN

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
0.10 - 1.00	B1				24.46	(0.10) 0.10		TOPSOIL		
0.10 - 1.00	D2							Driller Described: Brown / grey slightly gravelly sandy CLAY.		
						(0.90)				
1.00 - 1.80	B3				23.56	1.00		Driller Described: (Firm) Brown slightly gravelly sandy CLAY.		
1.00 - 1.80	D4									
1.20 - 1.65	SPT (C) N=9			N=9 (2,1/2,3,2,2)		(0.80)				
1.80 - 2.40	B5				22.76	1.80		Driller Described: (Firm) Grey / Purple slightly gravelly silty sandy CLAY.		
1.80 - 2.40	D6									
2.00 - 2.45	SPT (C) N=11			N=11 (2,2/4,2,3,2)		(0.60)				
2.40 - 3.00	B7				22.16	2.40		Driller Described: (Medium Dense) Sandy GRAVEL		
2.40 - 3.00	D8									
3.00 - 4.00	B9									
3.00 - 4.00	D10					(1.60)				
3.00 - 3.45	SPT (C) N=16			N=16 (2,2/3,3,5,5)						
4.00 - 4.60	B11				20.56	4.00		Driller Described: (Medium Dense) Silty sandy gravelly CLAY.		
4.00 - 4.60	D12									
4.00 - 4.45	SPT (C) N=18			N=18 (3,3/4,5,5,4)		(0.60)				
4.60 - 6.00	B13				19.96	4.60		Driller Described: (Medium Dense to Dense) Very sandy GRAVEL.		
4.60 - 6.00	D14									
5.00 - 5.45	SPT (C) N=28			N=28 (3,5/5,5,8,10)						
						(2.40)				
6.00 - 7.00	B15									
6.00 - 7.00	D16									
6.00 - 6.45	SPT (C) N=45			N=45 (2,7/8,14,13,10)						
7.00 - 8.00	B17				17.56	7.00		Driller Described: (Dense to Very dense) Slightly silty very sandy CLAY.		
7.00 - 8.00	D18									
7.00 - 7.45	SPT (C) N=48			N=48 (5,9/11,9,15,13)						
8.00 - 9.00	B19									
8.00 - 9.00	D20									
8.00 - 8.45	SPT (C) N=55			N=55 (7,7/10,14,14,17)		(3.00)				
9.00 - 10.00	B21									
9.00 - 10.00	D22									
9.00 - 9.45	SPT (C) N=58			N=58 (6,8/11,13,18,16)						
					14.56	10.00				

Continued on Next Page

Remarks

Cable Percussion terminated upon reaching scheduled depth.

Water Added		Water Strike - General			
From (m)	To (m)	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
		2.40	2.40	20	1.60
		4.60		20	2.00

Casing Details		Chiselling Details		
To (m)	Diam (mm)	From (m)	To (m)	Time (hh:mm)
10.00	200			

	Project No.: 20-087	**Project Name:** Cloghroe Housing Development	**Borehole No.:** BH06
	Coordinates: 557426.96 E	**Client:** BMOR	Sheet 2 of 2
Method: Cable Percussion	574456.90 N	**Client's Representative:** MHL & Associates Ltd	**Scale:** 1:50
Plant: Pilcon	**Ground Level:** 24.56 mOD	**Dates:** 14/09/2020 - 15/09/2020	**Driller:** AA **Logger:** MN

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
10.00 - 10.45	SPT (C) N=59			N=59 (8,10/14,11,17,17)				End of borehole at 10.000m		

10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5 19.0 19.5

Remarks

Cable Percussion terminated upon reaching scheduled depth.

Water Added	
From (m)	To (m)

Water Strike - General			
Struck at (m)	Casing to (m)	Time (min)	Rose to (m)
2.40 4.60	2.40	20 20	1.60 2.00

Casing Details	
To (m)	Diam (mm)
10.00	200

Chiselling Details		
From (m)	To (m)	Time (hh:mm)

APPENDIX D

Site Investigation Trial Pit Logs

Project No.: 20-087	**Project Name:** Cloghroe Housing Development		**Trial Pit No.:** TP01
Co-ordinates: 557218.29 E 574818.78 N	**Client:** BMOR		Sheet 1 of 1
Method: Excavation	**Client's Representative:** MHL & Associates Ltd		**Scale:** 1:20
Plant: Kobelco E135SR	**Ground Level:** 42.41 mOD	**Date:** 28/09/2020	**Driver:** TW **Logger:** MN

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.40)		TOPSOIL: Soft dark brown slightly sandy slightly gravelly silty CLAY with low cobble content and frequent rootlets, moist.	
0.40 - 0.90 0.40 - 0.90	B1 D2		42.01	0.40		Firm light brown becoming reddish brown (little orange mottling) sandy gravelly very silty CLAY with low cobble and small boulder content, moist. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. Cobbles and boulders are mostly subangular sandstone.	
				(1.60)			
1.50 - 2.00 1.50 - 2.00	B3 D4						
2.00 - 2.40 2.00 - 2.40	B5 D6		40.41	2.00		Brown slightly clayey gravelly very silty SAND with low cobble content, moist becoming wet. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. Cobbles are subangular to subrounded, sandstone, siltstone and some quartz.	
				(0.40)			
		Water seepage from 2.4m, no rise after 20 minutes.	40.01	2.40		Very stiff reddish brown slightly gravelly slightly sandy to sandy CLAY / SILT with low cobble content, moist. Sand is fine to coarse. Gravel is fine to coarse, subangular. Cobbles are subangular, sandstone, siltstone and occasional quartz.	▼
2.50 - 3.00 2.50 - 3.00	B7 D8						
				(0.60)			
			39.41	3.00		End of trial pit at 3.000m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5

Remarks

Water Strikes:

Struck at (m):	Remarks:
2.40	Water seepage from 2.4m, no rise after 20 minutes.

Stability: Slight spalling

Width: 1.30

Length: 3.90

	Project No.: 20-087	**Project Name:** Cloghroe Housing Development	**Trial Pit No.:** TP02
	Co-ordinates: 557279.02 E	**Client:** BMOR	Sheet 1 of 1
Method: Excavation	574789.96 N	**Client's Representative:** MHL & Associates Ltd	**Scale:** 1:20
Plant: Kobelco E135SR	**Ground Level:** 43.23 mOD	**Date:** 28/09/2020	**Driver:** TW
			Logger: MN

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.30)		TOPSOIL: Soft dark brown slightly gravelly sandy very silty CLAY with frequent rootlets, moist.	
			42.93	0.30			
				(0.20)		Orange brown slightly silty very gravelly SAND with low cobble content and occasional rootlets, moist. Sand is fine to coarse. Gravel is fine to coarse, subangular. Cobbles are subangular, sandstone, siltstone and occasional quartz.	
0.50 - 1.00	B1		42.73	0.50			
0.50 - 1.00	D2					Brown silty very gravelly SAND with low cobble and small boulder content, moist. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. Cobbles are subangular, sandstone, siltstone and occasional quartz.	
				(1.90)			
1.50 - 2.00	B3						
1.50 - 2.00	D4						
			40.83	2.40			
						Dark brown silty very gravelly SAND with low cobble and small boulder content, moist t wet. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. Cobbles are subangular, sandstone, siltstone and occasional quartz.	
2.60 - 3.10	B5						
2.60 - 3.10	D6						
				(1.20)			
			39.63	3.60			
						End of trial pit at 3.600m	

Remarks

Water Strikes:	
Struck at (m):	Remarks:
	None Encountered

Stability: Slight spalling

Width: 1.30

Length: 3.80

Project No.: 20-087	**Project Name:** Cloghroe Housing Development		**Trial Pit No.:** TP03
Co-ordinates: 557366.05 E 574837.00 N	**Client:** BMOR		Sheet 1 of 1
Method: Excavation	**Client's Representative:** MHL & Associates Ltd		**Scale:** 1:20
Plant: Kobelco E135SR	**Ground Level:** 44.24 mOD	**Date:** 28/09/2020	**Driver:** TW **Logger:** MN

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.30)		TOPSOIL: Soft dark brown slightly sandy slightly gravelly silty CLAY with low cobble content and frequent rootlets, moist.	
			43.94	0.30		Firm light greyish brown sandy gravelly very silty CLAY with low cobble content and occasional rootlets, moist. Sand is fine to coarse. Gravel is fine to coarse, subangular. Cobbles are subangular, sandstone, siltstone and occasional quartz.	
				(0.30)			
0.60 - 1.10 0.60 - 1.10	B1 D2		43.64	0.60		Firm becoming stiff orange brown and light greyish brown mottled sandy gravelly very silty CLAY with low to medium cobble content nd low small boulder content, moist. Sand is fine to coarse. Gravel is fine to coarse, subangular. Cobbles and boulders are subangular, sandstone, siltstone and occasional quartz.	
				(1.70)			
1.60 - 2.10 1.60 - 2.10	B3 D4						
			41.94	2.30		Brown silty very gravelly SAND with low cobble content, moist to wet. Sand is fine to coarse. Gravel is fine to coarse, mostly subangular. Cobbles are subangular, siltstone, sandstone and occasional quartz.	
2.50 - 3.00 2.50 - 3.00	B5 D6						
				(0.70)			
		Water seepage from 2.8m, no rise after 20 minutes.					▼
			41.24	3.00		End of trial pit at 3.000m	

Remarks

Water Strikes:

Struck at (m):	Remarks:
2.80	Water seepage from 2.8m, no rise after 20 minutes.

Stability: Slight spalling

Width: 1.30

Length: 4.40

	Project No.: 20-087	**Project Name:** Cloghroe Housing Development	**Trial Pit No.:** TP04
	Co-ordinates: 557390.99 E	**Client:** BMOR	Sheet 1 of 1
Method: Excavation	574729.00 N	**Client's Representative:** MHL & Associates Ltd	**Scale:** 1:20
Plant: Kobelco E135SR	**Ground Level:** 37.96 mOD	**Date:** 25/09/2020	**Driver:** TW
			Logger: MN

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.30)		TOPSOIL / SUBSOIL: Soft dark brown becoming greyish brown slightly sandy silty CLAY with occasional gravel and rootlets.	
0.40 - 0.90 0.40 - 0.90	B1 D2		37.66	0.30 (0.60)		Firm light greyish brown and orange brown mottled slightly sandy slightly gravelly silty CLAY with low cobble content and occasional partially decayed rootlets, moist. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. Cobbles are subangular.	
0.90 - 1.15 0.90 - 1.15	B3 D4		37.06	0.90 (0.25)		Light brown clayey silty sandy GRAVEL with medium cobble content, moist Sand is fine to coarse. Gravel is fine to coarse, angular to subangular.	
1.30 - 1.80 1.30 - 1.80	B5 D6		36.81	1.15 (1.25)		Stiff orange brown mottled light brownish grey slightly sandy slightly gravelly silty CLAY with low cobble content, moist.	
2.40 - 2.90 2.40 - 2.90	B7 B8	Water seepage from 2.5m, slight pooling after 20 minutes.	35.56	2.40 (0.60)		Yellowish brown slightly clayey slightly silty very sandy GRAVEL with medium to high cobble and small boulder content, wet. Sand is fine to coarse. Gravel is fine to coarse, angular subangular. Cobbles and boulders are subangular, sandstone, siltstone and occasional quartz.	▼
			34.96	3.00		End of trial pit at 3.000m	

Remarks

Water Strikes:

Struck at (m):	Remarks:
2.50	Water seepage from 2.5m, slight pooling after 20 minutes.

Stability: Slight spalling in gravel

Width: 1.30

Length: 4.70

	Project No.: 20-087	**Project Name:** Cloghroe Housing Development	**Trial Pit No.:** TP05
	Co-ordinates: 557325.98 E	**Client:** BMOR	Sheet 1 of 1
Method: Excavation	574653.08 N	**Client's Representative:** MHL & Associates Ltd	**Scale:** 1:20
Plant: Kobelco E135SR	**Ground Level:** 29.42 mOD	**Date:** 24/09/2020	**Driver:** TW
			Logger: MN

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.25)		TOPSOIL: Soft dark brown slightly sandy slightly gravelly silty CLAY with frequent rootlets, moist.	
0.30 - 0.80	B1		29.17	0.25		Firm light greyish brown with a little orange brown mottling slightly sandy slightly gravelly silty CLAY with low cobble content, moist. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. Cobbles are subangular to subrounded, sandstone, siltstone and occasional quartz.	
0.30 - 0.80	D2			(0.55)			
1.00 - 1.50	B3		28.62	0.80		Brown with a little orange brown mottling slightly clayey slightly silty very gravelly SAND with low cobble and small boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. Cobbles and boulders are mostly subangular, sandstone.	
1.00 - 1.50	D4			(0.90)			
		Steady inflow from 1.65m, rose from base to 1.65m depth after 20 minutes.	27.72	1.70		End of trial pit at 1.700m	▼

Remarks

Water Strikes:	
Struck at (m):	Remarks:
1.65	Steady inflow from 1.65m, rose from base to 1.65m depth after 20 minutes.

Stability: Spalling below 0.8m

Width: 1.15

Length: 2.40

Project No.: 20-087	**Project Name:** Cloghroe Housing Development		**Trial Pit No.:** TP06
Co-ordinates: 557475.99 E 574634.01 N	**Client:** BMOR		Sheet 1 of 1
Method: Excavation	**Client's Representative:** MHL & Associates Ltd		**Scale:** 1:20
Plant: Kobelco E135SR	**Ground Level:** 28.80 mOD	**Date:** 25/09/2020	**Driver:** TW / **Logger:** MN

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.25)		TOPSOIL: Soft dark greyish brown sandy CLAY with occasional gravel and frequent rootlets, moist.	
0.30 - 0.80	B1		28.55	0.25		Soft becoming light brownish grey sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. Cobbles are subangular, sandstone, siltstone and occasional quartz.	
0.30 - 0.80	D2			(0.55)			
1.00 - 1.50	B3		28.00	0.80		Firm brown gravelly very silty very sandy CLAY with medium cobble and low small boulder content, moist. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. Cobbles and boulders are mostly subangular, sandstone.	
1.00 - 1.50	D4			(0.90)			
			27.10	1.70		End of trial pit at 1.700m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5

Remarks

Water Strikes:

Struck at (m):	Remarks:
	None Encountered

Stability: Slight spalling below 0.8m

Width: 1.15

Length: 2.30

Project No.: 20-087	**Project Name:** Cloghroe Housing Development		**Trial Pit No.:** TP07
Co-ordinates: 557422.73 E 574567.01 N	**Client:** BMOR		Sheet 1 of 1
Method: Excavation	**Client's Representative:** MHL & Associates Ltd		**Scale:** 1:20
Plant: Kobelco E135SR	**Ground Level:** 25.82 mOD	**Date:** 24/09/2020	**Driver:** TW
			Logger: MN

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.15)		TOPSOIL / MADE GROUND: Soft greyish brown slightly gravelly sandy silty clay with frequent rootlets, moist.	
0.15 - 0.50	B1		25.67	0.15			
0.15 - 0.50	D2					MADE GROUND: Soft light brown slightly gravelly sandy very silty Clay with low cobble and small boulder content and occasional rootlets, moist. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded. Cobbles and boulders are subangular, sandstone, siltstone and occasional quartz.	
				(0.35)			
			25.32	0.50		FORMER TOPSOIL: Soft dark greyish brown slightly sandy slightly gravelly silty CLAY with occasional partially decayed rootlets, moist.	
				(0.20)			
0.70 - 1.20	B3		25.12	0.70		Firm light grey with a little orange brown mottling slightly gravelly sandy silty CLAY with low cobble content, moist. Sand is fine to coarse. Gravel is fine to coarse, angular subrounded. Cobbles are subangular, sandstone, siltstone and occasional quartz.	
0.70 - 1.20	B4						
				(0.90)		*STONE FIELD DRAIN - Along south side of TP (1.1m - 1.7m)*	
		Rapid water inflow from west end of field drain at 1.6m. Rose to 0.45m after 20 minutes.	24.22	1.60		Firm grey sandy gravelly silty CLAY with low cobble content, moist to wet. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded. Cobbles are subangular, sandstone, siltstone and occasional quartz.	
1.70 - 2.20	B5						
1.70 - 2.20	D6						
				(0.60)			
2.20 - 2.40	B7		23.62	2.20		Firm to stiff light grey to grey and locally pale yellow slightly sandy gravelly silty CLAY with low cobble and small boulder content, moist. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded. Cobbles are angular to subrounded, sandstone, siltstone, limestone and occasional quartz.	
2.20 - 2.40	D8						
2.40 - 2.80	B9						
2.40 - 2.80	D10						
				(0.60)			
			23.02	2.80		End of trial pit at 2.800m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5

Remarks

Water Strikes:

Struck at (m):	Remarks:
1.60	Rapid water inflow from west end of field drain at 1.6m. Rose to 0.45m after

Stability: Sides collapsing below groundwater

Width: 1.30

Length: 4.70

Project No.: 20-087	**Project Name:** Cloghroe Housing Development		**Trial Pit No.:** TP08
Co-ordinates: 557355.03 E	**Client:** BMOR		Sheet 1 of 1
Method: Excavation	574513.10 N	**Client's Representative:** MHL & Associates Ltd	**Scale:** 1:20
Plant: Kobelco E135SR	**Ground Level:** 25.30 mOD	**Date:** 24/09/2020	**Driver:** TW / **Logger:** MN

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.20)		TOPSOIL: Soft dark brown slightly sandy slightly gravelly silty CLAY with frequent rootlets, moist.	
0.20 - 0.70	B1		25.10	0.20			
0.20 - 0.70	D2					Possible MADE GROUND: Firm light greyish brown with some reddish brown slightly sandy slightly gravelly to gravelly silty CLAY with low cobble content and occasional rootlets, moist becoming wet. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded. Cobbles are subangular to subrounded, sandstone, siltstone and occasional quartz.	
				(0.50)			
			24.60	0.70		Stiff reddish brown sandy gravelly clayey SILT with low cobble content, moist. Sand is fine to coarse. Gravel is fine to coarse, subangular. Cobbles are subangular, sandstone, siltstone and occasional quartz. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded. Cobbles are subangular to subrounded, sandstone, siltstone and occasional quartz.	
		Rapid water inflow from 0.8m, rose to 0.6m after 20 minutes.				*Possible former STONE FIELD DRAIN. Angular and tabular boulder-sized slabs of purple siltstone.*	
1.00 - 1.50	B3						
1.00 - 1.50	D4						
				(1.00)			
			23.60	1.70		End of trial pit at 1.700m	

Remarks

Water Strikes:	
Struck at (m):	Remarks:
0.80	Rapid water inflow from 0.8m, rose to 0.6m after 20 minutes.

Stability: Sides collapsing

Width: 1.60

Length: 4.50

Project No.: 20-087	**Project Name:** Cloghroe Housing Development		**Trial Pit No.:** TP09
Co-ordinates: 557412.16 E 574444.10 N	**Client:** BMOR		Sheet 1 of 1
Method: Excavation	**Client's Representative:** MHL & Associates Ltd		**Scale:** 1:20
Plant: Kobelco E135SR	**Ground Level:** 24.42 mOD	**Date:** 24/09/2020	**Driver:** TW / **Logger:** MN

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.20)		TOPSOIL / SUBSOIL: Soft dark brown becoming greyish brown slightly sandy slightly gravelly silty CLAY with frequent rootlets, moist.	
			24.22	0.20			
0.60 - 1.10	B1					Firm becoming stiff light greyish brown with a little orange brown mottling slightly sandy slightly gravelly silty CLAY with low cobble content and occasional partially decayed rootlets, moist. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. Cobbles are subangular to subrounded, sandstone, siltstone and occasional quartz.	
0.60 - 1.10	D2						
				(1.20)			
			23.02	1.40			
						Purplish brown silty fine SAND with occasional thin interbeds of fine sandy silt and slightly gravelly fine to medium sand, moist.	
1.70 - 2.20	B3						
1.70 - 2.20	D4						
				(1.30)			
							▼
2.70 - 3.20	B5		21.72	2.70			
2.70 - 3.20	D6	Rapid water inflow from 2.7m, rose to 2.6m after 20 minutes.				Brown slightly silty very sandy GRAVEL with low cobble content, wet. Sand is fine to coarse. Gravel is fine to coarse, subangular. Cobbles are subangular, sandstone, siltstone and occasional quartz.	
				(0.50)			
			21.22	3.20		End of trial pit at 3.200m	

Remarks

Water Strikes:	
Struck at (m):	Remarks:
2.70	Rapid water inflow from 2.7m, rose to 2.6m after 20 minutes.

Stability: Sides collapsing

Width: 2.60

Length: 4.40

	Project No.: 20-087	**Project Name:** Cloghroe Housing Development	**Trial Pit No.:** TP10
	Co-ordinates: 557254.03 E	**Client:** BMOR	Sheet 1 of 1
Method: Excavation	574749.06 N	**Client's Representative:** MHL & Associates Ltd	**Scale:** 1:20
Plant: Kobelco E135SR	**Ground Level:** 36.71 mOD	**Date:** 25/09/2020	**Driver:** TW
			Logger: MN

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.25)		TOPSOIL: Soft dark brown slightly and slightly gravelly CLAY with frequent rootlets, moist.	
			36.46	0.25		Firm light greyish brown with a little orange brown mottling slightly gravelly sandy very silty CLAY with low cobble content and occasional brown partially decayed rootlets, moist.	
0.60 - 1.10 0.60 - 1.10	B1 D2			(0.85)			
1.10 - 1.45 1.10 - 1.45	B3 D4		35.61	1.10		Greyish brown slightly clayey slightly silty very sandy GRAVEL with low cobble content, moist becoming wet.	
				(0.35)			
1.45 - 1.70 1.45 - 1.70	B5 D6	Steady water inflow from 1.45m, rose to 1.6m after 20 minutes.	35.26	1.45		Firm to stiff light brownish grey mottled orange brown sandy gravelly silty CLAY with medium cobble content and low small boulder content, moist.	
				(0.25)			
			35.01	1.70		End of trial pit at 1.700m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5

Remarks

Water Strikes:

Struck at (m):	Remarks:
1.45	Steady water inflow from 1.45m, rose to 1.6m after 20 minutes.

Stability: Slight spalling below 1.0m

Width: 1.15

Length: 2.20

Project No.: 20-087	**Project Name:** Cloghroe Housing Development		**Trial Pit No.:** TP11
Co-ordinates: 557313.07 E 574719.01 N	**Client:** BMOR		Sheet 1 of 1
Method: Excavation	**Client's Representative:** MHL & Associates Ltd		**Scale:** 1:20
Plant: Kobelco E135SR	**Ground Level:** 37.83 mOD	**Date:** 25/09/2020	**Driver:** TW **Logger:** MN

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.25)		TOPSOIL: Soft dark brown slightly sandy slightly gravelly silty CLAY with frequent rootlets, moist.	
			37.58	0.25			
				(0.15)		Firm light greyish brown slightly sandy slightly gravelly silty CLAY with low cobble content and occasional rootlets, moist. Sand is fine to coarse. Gravel is fine to coarse, subangular. Cobbles are subangular, sandstone, siltstone and occasional quartz.	
			37.43	0.40			
0.50 - 1.00	B1					Stiff brown / orange and light grey mottled sandy gravelly very silty CLAY with low cobble content, moist. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. Cobbles are subangular, sandstone, siltstone and occasional quartz.	
0.50 - 1.00	D2						
				(0.70)			
			36.73	1.10			
				(0.20)		Brown clayey silty sandy GRAVEL with low to medium cobble content, moist. Sand is fine to coarse. Gravel is fine to coarse, subangular.	
			36.53	1.30			
1.60 - 2.10	B3					Stiff orange brown and light grey to grey mottled slightly sandy gravelly silty CLAY with low cobble content, moist. Sand is fine to coarse. Gravel is fine to coarse, subangular. Cobbles are subangular, sandstone, siltstone and occasional quartz.	
1.60 - 2.10	D4						
				(1.50)			
2.30 - 2.80	B5						
2.30 - 2.80	D6						
2.80 - 3.30	B7		35.03	2.80			
2.80 - 3.30	D8					Very stiff light grey mottled orange brown slightly sandy slightly gravelly silty CLAY, moist. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular. Cobbles are subangular, sandstone, siltstone and occasional quartz.	
				(0.50)			
			34.53	3.30		End of trial pit at 3.300m	

Remarks

Water Strikes:	
Struck at (m):	Remarks:
	None Encountered

Stability: Good

Width: 1.20

Length: 4.20

	Project No.: 20-087	**Project Name:** Cloghroe Housing Development	**Trial Pit No.:** TP12
	Co-ordinates: 557341.78 E	**Client:** BMOR	Sheet 1 of 1
Method: Excavation	574612.44 N	**Client's Representative:** MHL & Associates Ltd	**Scale:** 1:20
Plant: Kobelco E135SR	**Ground Level:** 27.43 mOD	**Date:** 24/09/2020	**Driver:** TW
			Logger: MN

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.25)		TOPSOIL: Soft dark brown becoming greyish brown slightly sandy slightly gravelly silty CLAY with frequent rootlets, moist.	
			27.18	0.25		Firm becoming stiff light brownish grey with a little orange brown mottling slightly sandy slightly gravelly very silty CLAY with low cobble content and occasional rootlets, moist. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded. Cobbles are angular to subrounded.	
0.70 - 1.20	B1						
0.70 - 1.20	D2			(1.15)			
			26.03	1.40		Stiff purplish brown sandy gravelly very silty CLAY with low cobble content, moist. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded. Cobbles are angular to subrounded.	
1.60 - 2.10	B3						
1.60 - 2.10	D4			(1.10)			
2.50 - 2.70	B5		24.93	2.50		Brown slightly clayey slightly silty very sandy GRAVEL with medium cobble content and with a thin dark partially cemented iron pan layer near the upper surfaces, moist becoming wet. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded. Cobbles are angular to subrounded.	
2.50 - 2.70	D6						
2.70 - 3.10	B7						
2.70 - 3.10	D8	Steady water inflow from 2.8m, no rise after 20 minutes.		(0.60)			▼
			24.33	3.10		End of trial pit at 3.100m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5

Remarks

Water Strikes:

Struck at (m):	Remarks:
2.80	Steady water inflow from 2.8m, no rise after 20 minutes.

Stability: Sides collapsing below 2.5m

Width: 1.20

Length: 5.50

	Project No.: 20-087	**Project Name:** Cloghroe Housing Development	**Trial Pit No.:** TP13
	Co-ordinates: 557412.03 E	**Client:** BMOR	Sheet 1 of 1
Method: Excavation	574509.00 N	**Client's Representative:** MHL & Associates Ltd	**Scale:** 1:20
Plant: Kobelco E135SR	**Ground Level:** 25.59 mOD	**Date:** 24/09/2020	**Driver:** TW
			Logger: MN

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.20)		TOPSOIL: Soft dark brown slightly sandy slightly gravelly silty CLAY with frequent rootlets, moist.	
			25.39	0.20		Possible MADE GROUND: Firm light greyish brown with some reddish brown slightly sandy slightly gravelly to gravelly silty CLAY with low cobble content and occasional rootlets, moist becoming wet. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded. Cobbles are subangular to subrounded, sandstone, siltstone and occasional quartz.	
0.50 - 1.00 0.50 - 1.00	B1 D2						
				(1.50)			
1.70 - 2.20 1.70 - 2.20	B3 D4		23.89	1.70		Brown slightly gravelly silty to very silty fine to medium SAND with occasional interbeds of slightly gravelly sandy silt, moist becoming wet. Sand is fine to medium. Gravel is fine to coarse, angular to subrounded. Cobbles are angular to subangular, sandstone, siltstone and occasional quartz.	
		Seepage from 2.5m, no rise after 20 minutes.		(1.50)			▼
2.70 - 3.20 2.70 - 3.20	B5 D6						
			22.39	3.20		End of trial pit at 3.300m	

Remarks

Water Strikes:	
Struck at (m):	Remarks:
2.50	Seepage from 2.5m, no rise after 20 minutes.

Stability: Spalling below 1.7m

Width: 1.20

Length: 5.20

Project No.: 20-087	**Project Name:** Cloghroe Housing Development		**Trial Pit No.:** **TP14**
Co-ordinates: E	**Client:** BMOR		Sheet 1 of 1
Method: Excavation	**Client's Representative:** MHL & Associates Ltd	N	**Scale:** 1:20
Plant: Kobelco E135SR	**Ground Level:** mOD	**Date:** 25/09/2020	**Driver:** TW / **Logger:** MN

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.20)		TOPSOIL: Soft dark brown slightly sandy slightly gravelly CLAY with frequent rootlets, moist.	
				0.20		Firm becoming stiff greyish brown becoming orange brown mottled slightly gravelly to gravelly sandy very silty CLAY with low cobble content, moist.	
0.50 - 1.00	B1						
0.50 - 1.00	D2						
				(1.00)			
				1.20		Brown with a little orange brown mottling slightly clayey slightly silty very sandy GRAVEL with low cobble content, moist to wet.	
1.30 - 1.80	B3						
1.30 - 1.80	D4	Water seepage from 1.4m, no rise after 20 minutes.					▼
				(0.70)			
				1.90		End of trial pit at 1.900m	

Remarks

Water Strikes:	
Struck at (m):	Remarks:
1.40	Water seepage from 1.4m, no rise after 20 minutes.

Stability: Slight spalling below 1.2m

Width: 1.20

Length: 2.90

APPENDIX E

Site Investigation Infiltration Test Data

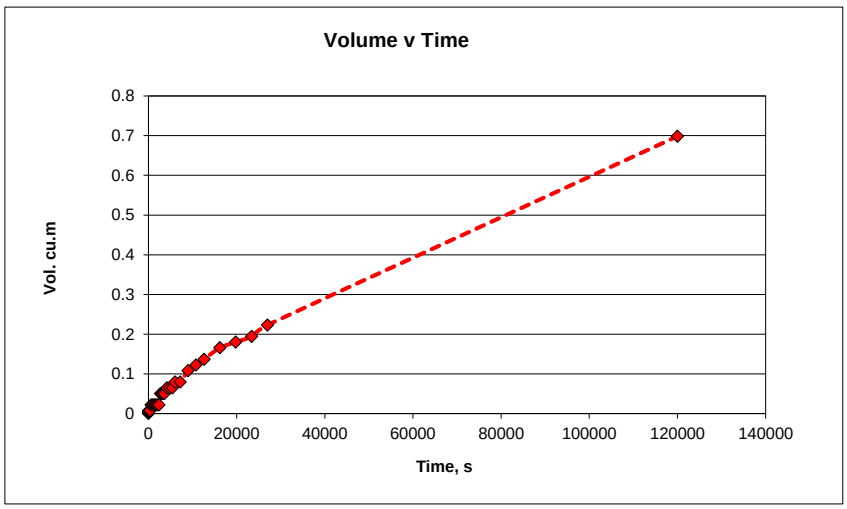
INFILTRATION TEST DATA *OCB Geotechnical Ltd*

Project Name	Cloghroe Housing Development			**Date**	25/09/20
Project No.	20-087			**Location**	TP05
Easting	557325.98	**Northing**	574653.08	**Level**	29.42

length, m	**2.4**	b, m (wid	**1.2**	depth, m	**1.7**
l_base, m	**1.2**			d_eff, m	**0.645**
l_eff, m	**1.8**				

	Time, min	Measure	Time, sec	depth	Fall, m	Volume	
Start	0	0.645	0	1.055	0	0	
	0.5	0.647	30	1.053	0.002	0.00288	
	0.75	0.648	45	1.052	0.003	0.00432	
	1	0.649	60	1.051	0.004	0.00576	
	2	0.65	120	1.05	0.005	0.0072	
	3	0.65	180	1.05	0.005	0.0072	
	4	0.65	240	1.05	0.005	0.0072	
	5	0.65	300	1.05	0.005	0.0072	
	10	0.66	600	1.04	0.015	0.0216	
	15	0.66	900	1.04	0.015	0.0216	
	20	0.660	1200	1.040	0.015	0.0216	
	25	0.660	1500	1.040	0.015	0.0216	
	30	0.660	1800	1.040	0.015	0.0216	
	35	0.66	2100	1.04	0.015	0.0216	
	40	0.660	2400	1.040	0.015	0.0216	
	45	0.680	2700	1.020	0.035	0.0504	
	50	0.68	3000	1.02	0.035	0.0504	
	55	0.680	3300	1.020	0.035	0.0504	
	60	0.680	3600	1.020	0.035	0.0504	
	70	0.690	4200	1.010	0.045	0.0648	
	80	0.690	4800	1.010	0.045	0.0648	
	90	0.690	5400	1.010	0.045	0.0648	
	100	0.700	6000	1.000	0.055	0.0792	1/4 full
	120	0.7	7200	1.000	0.055	0.0792	
	150	0.72	9000	0.980	0.075	0.108	
	180	0.73	10800	0.970	0.085	0.1224	
	210	0.74	12600	0.960	0.095	0.1368	
	270	0.76	16200	0.940	0.115	0.1656	
	330	0.77	19800	0.930	0.125	0.18	
	390	0.78	23400	0.920	0.135	0.1944	
	450	0.8	27000	0.900	0.155	0.2232	
	2000	1.13	120000	0.570	0.485	0.6984	3/4 full

Area	1.44 m^2				
50% Area_eff, a_{p50}	3.375 m^2	$V_{p75\text{-}25\ theory}$	volume	0.6966	m^3
		$V_{p75\text{-}25}$	volume	1.2384	
		$t_{p\ 75\text{-}25}$	time	114000	s
		Infiltration Coefficient	***f***	**3.2E-06**	**ms^-1**



NOTES:

Last datapoint extrapolated from available data to facilitate an estimated Infiltration Coefficient calculation

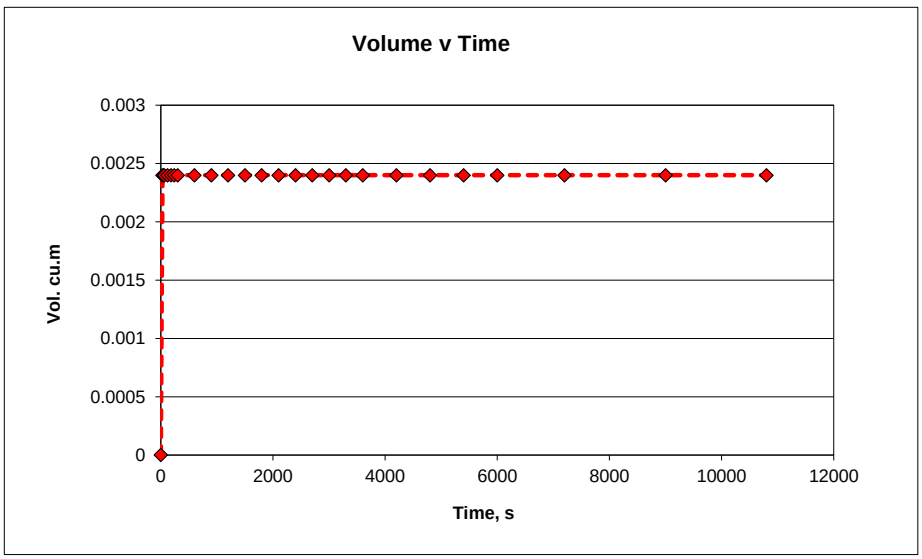
INFILTRATION TEST DATA *OCB Geotechnical Ltd*

Project Name	Cloghroe Housing Development			**Date**	25/09/20
Project No.	20-087			**Location**	TP06
Easting	557475.99	**Northing**	574634.01	**Level**	28.804

length, m	**2.3**	b, m (wid	**1.2**	depth, m	**1.5**
l_base, m	**2**			d_eff, m	**0.7**
l_eff, m	**2.15**				

	Time, min	Measure,	Time, sec	depth	Fall, m	Volume
Start	0	0.700	0	0.8	0	0
	0.5	0.701	30	0.799	0.001	0.0024
	0.75	0.701	45	0.799	0.001	0.0024
	1	0.701	60	0.799	0.001	0.0024
	2	0.701	120	0.799	0.001	0.0024
	3	0.701	180	0.799	0.001	0.0024
	4	0.701	240	0.799	0.001	0.0024
	5	0.701	300	0.799	0.001	0.0024
	10	0.701	600	0.799	0.001	0.0024
	15	0.701	900	0.799	0.001	0.0024
	20	0.701	1200	0.799	0.001	0.0024
	25	0.701	1500	0.799	0.001	0.0024
	30	0.701	1800	0.799	0.001	0.0024
	35	0.701	2100	0.799	0.001	0.0024
	40	0.701	2400	0.799	0.001	0.0024
	45	0.701	2700	0.799	0.001	0.0024
	50	0.701	3000	0.799	0.001	0.0024
	55	0.701	3300	0.799	0.001	0.0024
	60	0.701	3600	0.799	0.001	0.0024
	70	0.701	4200	0.799	0.001	0.0024
	80	0.701	4800	0.799	0.001	0.0024
	90	0.701	5400	0.799	0.001	0.0024
	100	0.701	6000	0.799	0.001	0.0024
	120	0.701	7200	0.799	0.001	0.0024
	150	0.701	9000	0.799	0.001	0.0024
	180	0.701	10800	0.799	0.001	0.0024

Area	2.4	m^2			
50% Area_eff, a_{p50}	4.745	m^2	$V_{p75\text{-}25\ theory}$	volume	0.903 m^3
			$V_{p75\text{-}25}$	volume	
			$t_{p\ 75\text{-}25}$	time	s
			Infiltration Coefficient	***f***	**ms^-1**



NOTES:

Water level did not fall sufficiently to calculate an Infiltration Coefficient

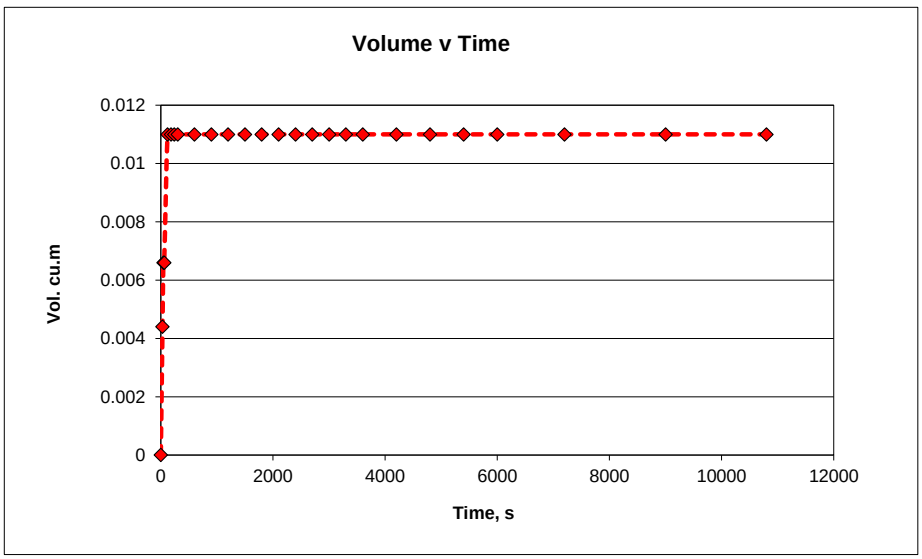
INFILTRATION TEST DATA *OCB Geotechnical Ltd*

Project Name	Cloghroe Housing Development			**Date**	25/09/20
Project No.	20-087			**Location**	TP10
Easting	557254.03	**Northing**	574749.06	**Level**	36.711

length, m	**2.2**	b, m (wid	**1.1**	depth, m	**1.6**
l_base, m	**2**			d_eff, m	**0.6**
l_eff, m	**2.1**				

	Time, min	Measure,	Time, sec	depth	Fall, m	Volume
Start	0	0.585	0	1.015	0	0
	0.5	0.587	30	1.013	0.002	0.0044
	0.75	0.588	45	1.012	0.003	0.0066
	1	0.588	60	1.012	0.003	0.0066
	2	0.59	120	1.01	0.005	0.011
	3	0.59	180	1.01	0.005	0.011
	4	0.59	240	1.01	0.005	0.011
	5	0.59	300	1.01	0.005	0.011
	10	0.59	600	1.01	0.005	0.011
	15	0.59	900	1.01	0.005	0.011
	20	0.59	1200	1.010	0.005	0.011
	25	0.59	1500	1.010	0.005	0.011
	30	0.59	1800	1.010	0.005	0.011
	35	0.59	2100	1.01	0.005	0.011
	40	0.59	2400	1.010	0.005	0.011
	45	0.59	2700	1.010	0.005	0.011
	50	0.59	3000	1.01	0.005	0.011
	55	0.59	3300	1.010	0.005	0.011
	60	0.59	3600	1.010	0.005	0.011
	70	0.59	4200	1.010	0.005	0.011
	80	0.59	4800	1.010	0.005	0.011
	90	0.59	5400	1.010	0.005	0.011
	100	0.59	6000	1.010	0.005	0.011
	120	0.59	7200	1.010	0.005	0.011
	150	0.59	9000	1.010	0.005	0.011
	180	0.59	10800	1.010	0.005	0.011

Area	2.2	m^2				
50% Area_eff, a_{p50}	4.12	m^2	$V_{p75\text{-}25\ theory}$	volume	0.693	m^3
			$V_{p75\text{-}25}$	volume		
			$t_{p\ 75\text{-}25}$	time		s
			Infiltration Coefficient	***f***		**ms^-1**



NOTES:

Water level did not fall sufficiently to calculate an Infiltration Coefficient

APPENDIX F

Site Investigation On-Site CBR Test Data

CBR TEST DATA *OCB Geotechnical Ltd*

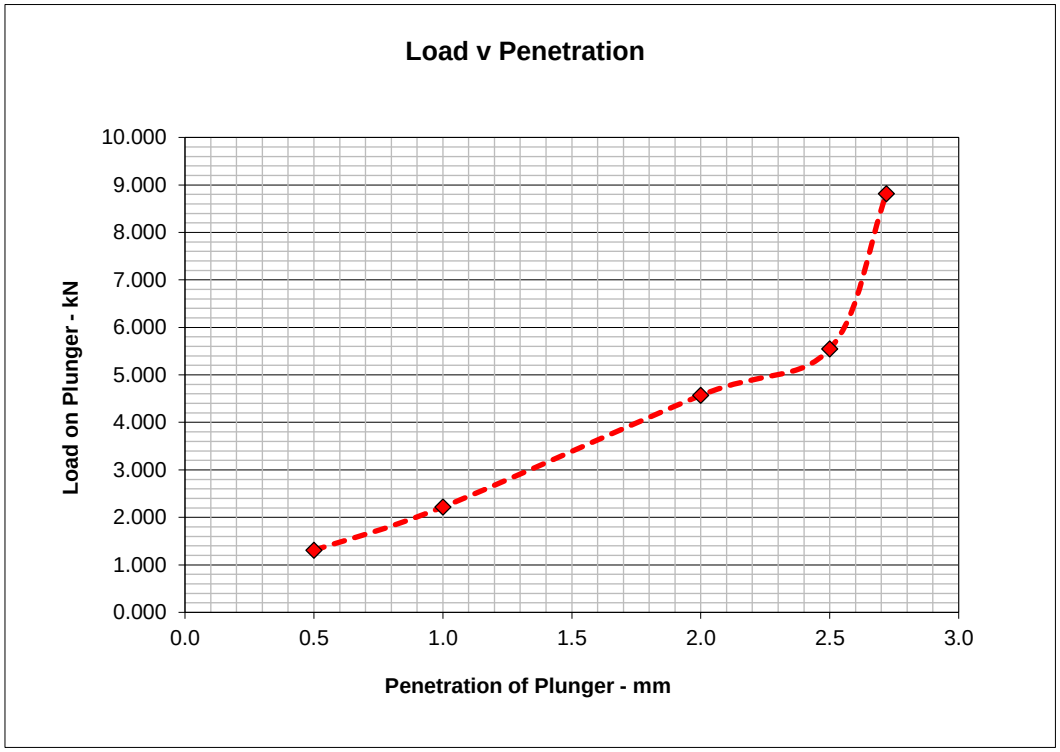
Project Name	Cloghroe Housing Development	**Date**	17/09/20
Project No.	20-087	**Operator**	GOC
Test Location	CBR1	**Depth**	0.385m

Penetration (mm)	Standard load (kg)
2.5	1370
5	2055
7.5	2630
10	3180
12.5	3600

$$I_{2.5} = \frac{\text{Load at 2.5mm penetration}}{1370} \times 100$$

$$I_{5} = \frac{\text{Load at 5mm penetration}}{2055} \times 100$$

Penetration (mm)	Load Reading (Divisions)	Load Reading (kN)	Standard Load (Kg)	Load (Kg)	CBR (%)
0.5	40.0	1.305		133	
1	68.0	2.219		226	
2	140.0	4.569		466	
2.5	170.0	5.548	1370	566	41.30
3	270.0	8.812		899	



CBR TEST DATA *OCB Geotechnical Ltd*

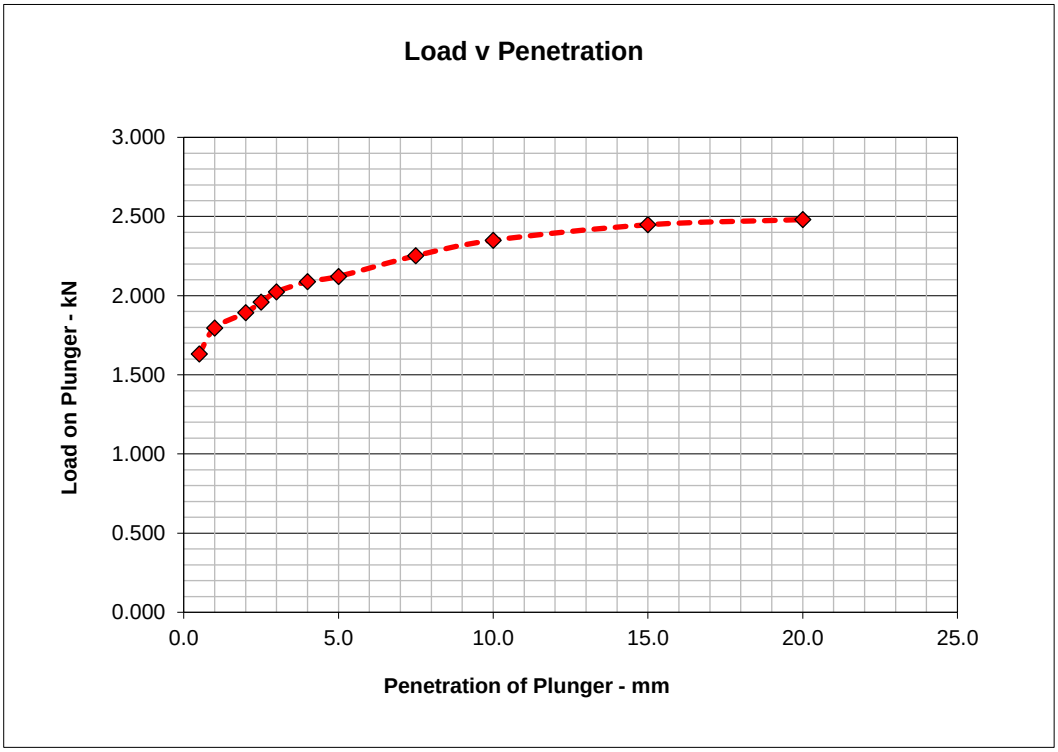
Project Name	Cloghroe Housing Development	**Date**	17/09/20
Project No.	20-087	**Operator**	GOC
Test Location	CBR2	**Depth**	0.385m

Penetration (mm)	Standard load (kg)
2.5	1370
5	2055
7.5	2630
10	3180
12.5	3600

$$I_{2.5} = \frac{\text{Load at 2.5mm penetration}}{1370} \times 100$$

$$I_{5} = \frac{\text{Load at 5mm penetration}}{2055} \times 100$$

Penetration (mm)	Load Reading (Divisions)	Load Reading (kN)	Standard Load (Kg)	Load (Kg)	CBR (%)
0.5	50.0	1.632		166	
1	55.0	1.795		183	
2	58.0	1.893		193	
2.5	60.0	1.958	1370	200	14.58
3	62.0	2.024		206	
4	64.0	2.089		213	
5	65.0	2.121	2055	216	10.53
7.5	69.0	2.252		230	
10	72.0	2.350		240	
15	75.0	2.448		250	
20	76.0	2.480		253	



CBR TEST DATA *OCB Geotechnical Ltd*

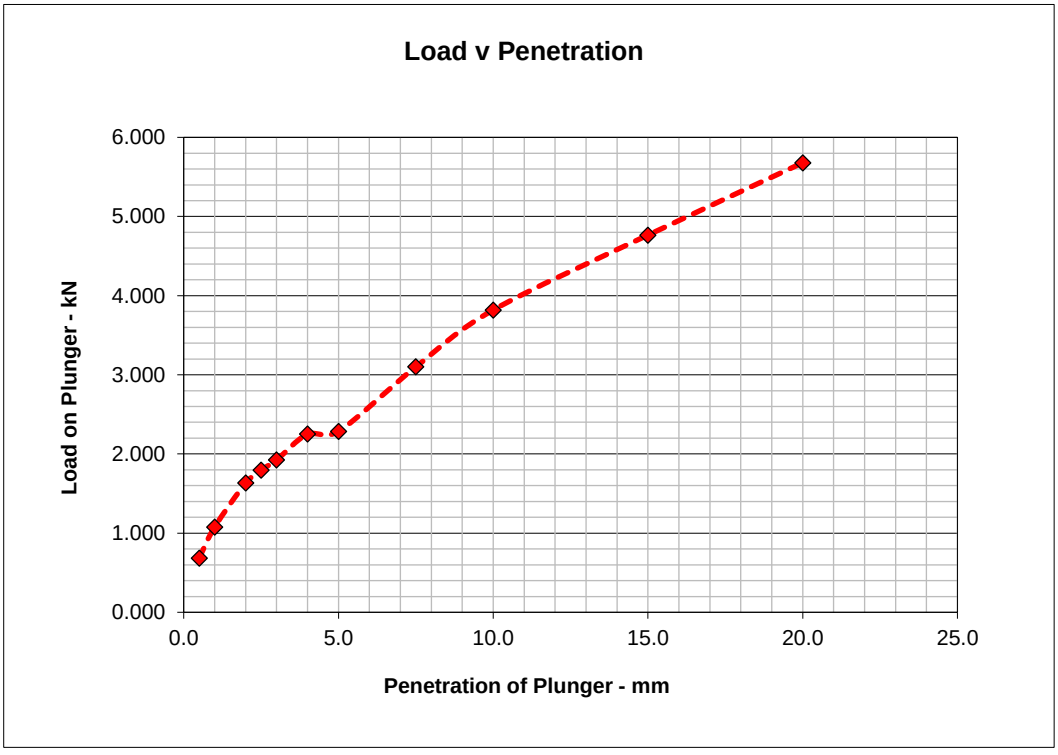
Project Name	Cloghroe Housing Development	**Date**	18/09/20
Project No.	20-087	**Operator**	GOC
Test Location	CBR3	**Depth**	0.385m

Penetration (mm)	Standard load (kg)
2.5	1370
5	2055
7.5	2630
10	3180
12.5	3600

$$I_{2.5} = \frac{\text{Load at 2.5mm penetration}}{1370} \times 100$$

$$I_{5} = \frac{\text{Load at 5mm penetration}}{2055} \times 100$$

Penetration (mm)	Load Reading (Divisions)	Load Reading (kN)	Standard Load (Kg)	Load (Kg)	CBR (%)
0.5	21.0	0.685		70	
1	33.0	1.077		110	
2	50.0	1.632		166	
2.5	55.0	1.795	1370	183	13.36
3	59.0	1.926		196	
4	69.0	2.252		230	
5	70.0	2.285	2055	233	11.34
7.5	95.0	3.101		316	
10	117.0	3.819		389	
15	146.0	4.765		486	
20	174.0	5.679		579	



APPENDIX G

HR Wallingford Greenfield Runoff Estimation

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Shane Moriarty
Site name:	Full Site
Site location:	Cloghoe SHD

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.92113° N
Longitude:	8.61907° W
Reference:	712845480
Date:	Dec 10 2020 13:16

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 7.4

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1198	1198
Hydrological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Growth curve factor 200 years:	2.15	2.15

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	25.29	25.29
1 in 1 year (l/s):	21.49	21.49
1 in 30 years (l/s):	41.73	41.73
1 in 100 year (l/s):	49.31	49.31
1 in 200 years (l/s):	54.37	54.37

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Shane Moriarty
Site name:	AT-A
Site location:	Cloghoe SHD

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.92099° N
Longitude:	8.61918° W
Reference:	2472807567
Date:	Oct 27 2020 16:35

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 2.11

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1198	1198
Hydrological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Growth curve factor 200 years:	2.15	2.15

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	7.21	7.21
1 in 1 year (l/s):	6.13	6.13
1 in 30 years (l/s):	11.9	11.9
1 in 100 year (l/s):	14.06	14.06
1 in 200 years (l/s):	15.5	15.5

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Shane Moriarty
Site name:	AT-B
Site location:	Cloghoe SHD

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.92087° N
Longitude:	8.61928° W
Reference:	245384712
Date:	Dec 09 2020 12:24

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1.23

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1198	1198
Hydrological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Growth curve factor 200 years:	2.15	2.15

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	4.2	4.2
1 in 1 year (l/s):	3.57	3.57
1 in 30 years (l/s):	6.94	6.94
1 in 100 year (l/s):	8.2	8.2
1 in 200 years (l/s):	9.04	9.04

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Shane Moriarty
Site name:	AT-C
Site location:	Cloghoe SHD

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.92130° N
Longitude:	8.61906° W
Reference:	599565295
Date:	Dec 09 2020 12:21

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1.098

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1198	1198
Hydrological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Growth curve factor 200 years:	2.15	2.15

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	3.75	3.75
1 in 1 year (l/s):	3.19	3.19
1 in 30 years (l/s):	6.19	6.19
1 in 100 year (l/s):	7.32	7.32
1 in 200 years (l/s):	8.07	8.07

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Shane Moriarty
Site name:	AT-D
Site location:	Cloghoe SHD

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.92130° N
Longitude:	8.61906° W
Reference:	285042199
Date:	Dec 09 2020 12:21

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.8223

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1198	1198
Hydrological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Growth curve factor 200 years:	2.15	2.15

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	2.81	2.81
1 in 1 year (l/s):	2.39	2.39
1 in 30 years (l/s):	4.64	4.64
1 in 100 year (l/s):	5.48	5.48
1 in 200 years (l/s):	6.04	6.04

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by: Shane Moriarty

Site name: AT-E

Site location: Cloghoe SHD

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude: 51.92130° N

Longitude: 8.61906° W

Reference: 3217272976

Date: Dec 09 2020 12:18

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.385

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1198	1198
Hydrological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Growth curve factor 200 years:	2.15	2.15

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	1.32	1.32
1 in 1 year (l/s):	1.12	1.12
1 in 30 years (l/s):	2.17	2.17
1 in 100 year (l/s):	2.57	2.57
1 in 200 years (l/s):	2.83	2.83

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Shane Moriarty
Site name:	AT-F
Site location:	Cloghoe SHD

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.92130° N
Longitude:	8.61906° W
Reference:	1581708699
Date:	Dec 09 2020 12:19

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.465

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	1198	1198
Hydrological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Growth curve factor 200 years:	2.15	2.15

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	1.59	1.59
1 in 1 year (l/s):	1.35	1.35
1 in 30 years (l/s):	2.62	2.62
1 in 100 year (l/s):	3.1	3.1
1 in 200 years (l/s):	3.42	3.42