ENGINEERING PLANNING REPORT

for

A PROPOSED STRATEGIC HOUSING DEVELOPMENT

at

BALLYMANY ROAD, NEWBRIDGE, CO. KILDARE

for

BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED

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DOCUMENT HISTORY

Job Ref: D1920

Date	Revision	Prepared	Approved	Issue
05.05.2021	A	SOR/SS	SOR	Draft Issue
14.05.2021	B	SS/SOR	SOR	Planning Issue
01.02.2022	C	SS/SOR	SOR	Reissued for Planning

CONTENTS

1.0 INTRODUCTION

This report has been prepared by Muir Associates Limited (MAL) to accompany a planning application for a Strategic Housing Development at Ballymany Road, Newbridge, Co. Kildare.

The engineering report includes sections on traffic and transportation, foul water drainage, surface water drainage and water supply. The report includes design calculations for the foul and surface water drainage together with an estimate of the water demand for the proposed development.

The proposed development site benefits from a previous planning permission (Kildare County Council File Number 16/658; ABP Reference PL09.249038) which was granted by An Bord Pleanála in April 2018 for the construction of 280 No residential units together with a Creche and a 103 No bedroom nursing home. A phase of this permitted development comprising 54 No residential units together with related infrastructure including a section of the link road from the L7042 Green Road to the L7037 Standhouse Road is currently under construction on site.

A list of the engineering drawings accompanying this application is presented in Appendix A of this document.

2.0 LOCATION AND DESCRIPTION OF THE PROPOSED DEVELOPMENT

The proposed development site is located within the Ballymany area to the southwest of Newbridge in Co. Kildare. The subject site is located on the north-western side of the R445 Ballymany Road, approximately 700m from Junction 12 on the M7 Motorway, opposite Ballymany Manor. The location of the proposed development site is shown in Figure 2.1 below.

The existing ground levels on the subject site vary from approximately 107.0mAOD in the south east of the site to 95.0mAOD in the north west of the site. Some significant earthworks were previously undertaken on the site which has reduced a substantial portion of the site to formation level. Some stockpiles from this initial earthmoving exercise remain on the site.

The Strategic Housing development with creche, served by a Link Road will consist of the following:

- Construction of 336 No residential units consisting of 245 No houses, 27 No apartments and 64 No duplex units;
- The 245 No houses will comprise 2-storey, detached, semi-detached and terraced units to include:
  - 17 no. 2-bed houses;
  - 184 no. 3-bed houses;
  - 44 no. 4-bed houses;
- The 27 No apartments are located in a part 3-storey and part 4-storey building and include:
  - 13 No 1-bed units;
  - 13 No 2-bed units;

- 1 No 3-bed unit;
- The 64 no. duplexes are located across 6 no. 2 to 3-storey buildings and include:
  - 32 No 1-bed units;
  - 16 No 2-bed units;
  - 16 No 3-bed units;
- A 2-storey creche;
- Car parking, bicycle parking, internal roads, services infrastructure, bin stores and bicycle stores;
- Footpath improvements along Standhouse Road;
- Landscaping, play areas, boundary treatment and public lighting;
- All associated site works and services.

A full development description is provided in the planning report which accompanies the planning application.

Figure 2.1: Site Location Map;

3.0 TRAFFIC AND TRANSPORTATION

3.1 Introduction

This section of the report deals with traffic and transportation issues namely, Pedestrian Movement, Link Road, Cyclist Provision, Vehicular Access, Compliance with DMURS, Car Parking Provision, Development Traffic and responses to the Roads, Transportation & Public Safety Department Comments Contained in the Kildare County Council Section 6(4)(b) Report.

This section of the report also refers to various documents which will be submitted with the full application and are listed below:

- A combined Stage 1 and 2 Road Safety Audit (undertaken by Bruton Consulting Engineers);
- Traffic and Transport Assessment (undertaken by PMCE);

3.2 Pedestrian Movement

Pedestrian Access to the proposed development will be from the R445 Ballymany Road and from the Standhouse Road.

There is an existing pedestrian footpath on the southeast side of Ballymany Road. The previously permitted development (granted under Kildare County Council File Number 16/658; ABP Reference PL09.249038) includes enhancement of the existing pedestrian provisions along the R445 Ballymany Road in the form of a new pedestrian footpath on the north western side of Ballymany Road from the new development access junction to tie into the existing footpath at the Keadeen Hotel. These permitted works also include the provision of a signalised pedestrian crossing of the R445 Ballymany Road.

It is proposed to provide a pedestrian footpath with a minimum width of 1.8m along the southern side of Standhouse Road which will provide a pedestrian link from the proposed development to the existing footpath network on Standhouse Road. This pedestrian provision will provide a safe route from the proposed development to Scoil Mhuire on the Standhouse Road.

Pedestrians are catered for within the proposed development via a network of minimum 1.8m wide footpaths and shared surface treatments.

3.3 Link Road

The previously permitted development (granted under Kildare County Council File Number 16/658; ABP Reference PL09.249038) includes a section of the link road from the L7042 Green Road to the L7037 Standhouse Road. This road is listed in the

Newbridge Local Area Plan 2013-2019 as Objective SRO 5(b). An extract from Map Ref 2 of the Newbridge LAP is presented in Figure 3.1 below. The construction of the Link Road has commenced on site and is programmed to be complete in Q4 of 2021.

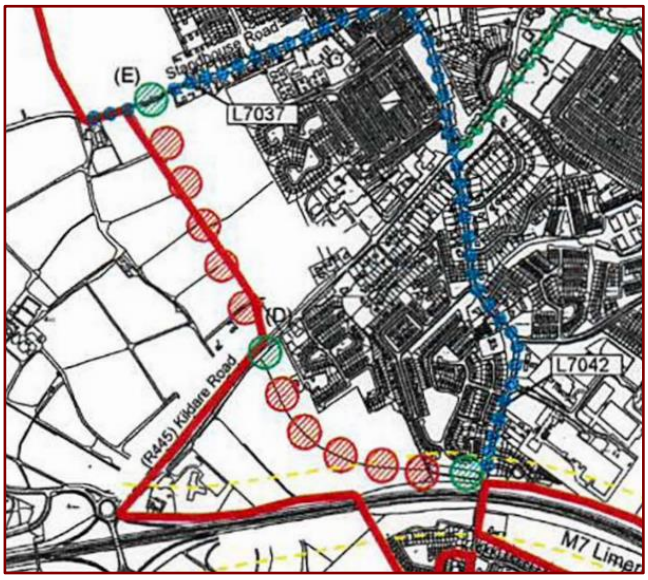


Figure 3.1: Extract from Map Ref 2 of the Newbridge LAP 2013-2019;

3.4 Cyclist Provision

Generally, within the proposed development cyclists will share the carriageways with other road users. The Link Road includes the provision of a two-way cycle lane along its southwestern edge.

Cycle parking will be available to the rear of the semi-detached houses, a bike store will be included to the front of the terraced houses, 28 No secure cycle parking spaces will be provided for the apartments in a dedicated cycle store and 64 No cycle parking spaces will be provided for the duplex units. In addition, 6 No cycle parking spaces will be provided for the creche in a covered cycle store and 48 visitor cycle parking spaces will also be provided.

3.5 Vehicular Access

The proposed development will be accessed via the R445 Ballymany Road along the south-eastern boundary of the site and via a new signalised junction on Standhouse Road to the north in accordance with the previously permitted plans.

3.6 Compliance with DMURS

The proposed development internal road layout is shown on MAL drawing No's D1920-MAL-00-XX-C-002, D1920-MAL-00-XX-C-003, D1920-MAL-00-XX-C-004 and D1920-MAL-00-XX-C-005.

The proposed development incorporates a hierarchy of internal streets which are set within the context of the local residential receiving environment. The internal road hierarchy comprises of Local Streets which are 6.0m wide and 5.5m wide together with shared surface Local Streets which have a 4.8m wide carriageway. The key aspects adopted for the proposed development which provide for safer movement for all include:

- Minimum 1.8m wide footpaths;
- Typical Cross Fall – 1/40;
- The planting of trees to emphasise a sense of enclosure and as a traffic calming measure;
- Radius kerbs at junctions are generally 3.0m to encourage slower speeds. By providing small radii a more desirable location and shorter length of crossing is achieved;
- Providing linked internal roads within the development so as to avoid unacceptably long cul-de-sacs;
- A design speed limit of 30 kph has generally been applied throughout the development with lower speeds within the shared surface areas in accordance with DMURS;

Street Design Speed

The design speed generally for the streets within the proposed development is 30kph with a lower speed limit in the shared surface areas. Appropriate signage will be provided at key locations within the proposed development to emphasise these speed limits.

Permeability

Providing a permeable layout which includes more frequent junctions which in turn has a traffic-calming effect as drivers slow and show greater levels of caution;

Junction Design

Radius kerbs at junctions are generally 3.0m to encourage slower speeds. By providing small radii a more desirable location and shorter length of pedestrian crossing is achieved.

Parking

Parking for the proposed housing units has generally been provided in curtilage. Perpendicular on street parking has also been provided and has been designed to ensure at least 6m width is available to allow manoeuvring in and out of the parking space.

Traffic Calming

The proposed layout seeks to create a "Self-Regulating Street" environment. In summary, the following key traffic calming features has been incorporated into the layout:

- Frequency of junctions;
- Shared surfaces;
- Table junctions;
- The planting of trees;

Pedestrian Movement

Minimum footpath widths within the proposed development will be 1.8m. Pedestrian crossing facilities are provided along key travel desire lines throughout the proposed development in addition to those located at street nodes. All uncontrolled pedestrian crossings are provided with either dropped kerbs or a raised flat top treatment thus allowing pedestrians to informally assert a degree of priority.

It is also worth noting that all proposed road works will comply with Kildare County Council Standards and will include the appropriate road marking, signage, and lighting.

3.7 Car Parking Provision

It is proposed to provide 617 No car parking spaces as part of the proposed development as follows:

- 477 No car parking spaces allocated to the houses;
- 78 No car parking spaces allocated to the duplex units;
- 35 No car parking spaces allocated to the apartments (including 3 No universal access spaces and 3 No parking spaces equipped with electrical charging facility);
- 6 No visitor car parking spaces;
- Creche: 21 No car parking spaces (including 1 No universal access spaces and 1 No parking space equipped with electrical charging facility), there are also 3 No drop off spaces provided for the creche;

The car parking is indicated on the Architects site layout drawings.

3.8 Development Traffic

A separate Traffic and Transportation Assessment prepared by PMCE is submitted under separate cover with this application. This assessment includes modelling of the following junctions:

- Site Access: Three-arm priority junction on the R455 Ballymany Road;
- Site Access: Three-arm signal-controlled junction on the Standhouse Road;
- Future Site Access: Four-arm signal-controlled junction on the R445 Ballymany Road;
- R445/Green Road signalised junction;
- Standhouse Road/Morristown (Langton) Road signalised junction; and
- R445/R413/M7 roundabout junction.

Classified traffic counts were undertaken at the locations listed below in April 2021 and junction capacity analysis was undertaken for a number of nearby junctions to assess the impact, if any, of the proposed development:

- 7-day ATC survey on the R445 near the Keadeen Hotel;
- 7-day ATC survey on Standhouse Road to the east of the entrance to the Ballymany Stud;
- 12-hour JTC survey at the R445/Green Road signalised junction;
- 12-hour JTC survey at the Standhouse Road/Morristown (Langton) Road signalised junction;
- 12-hour JTC survey at the R445/R413/M7 roundabout junction;

The junctions have been modelled for the opening year, opening year + 5 years and opening year + 15 years. The detailed modelling results are presented in the Traffic and Transportation Assessment prepared by PMCE. In summary the modelling concluded the following:

- The Standhouse Road will continue to operate within capacity for each of the assessment years 2024 (Opening Year), 2029 and 2039.
- The Ballymany Road currently operates above capacity and will continue to do so for each of the assessment years with and without the development. The AADTs forecast for the future assessment years, however, indicate that traffic generated by the development will have a negligible impact on traffic flows (between 2.81% and 3.83%).

Junction capacity analysis was undertaken for three scenarios. **Scenario 1** assesses the assignment of the forecast development traffic onto the adjacent road network and is based on the existing traffic flow distribution at each junction as derived from the traffic counts This scenario analysed the capacity of the following junctions:

- Proposed Standhouse Road Development Access;
- Morristown Road Signalised Junction
- Proposed R445 Development Access

The proposed development accesses will operate within capacity for each of the assessment years 2024, 2029 and 2039 for all scenarios assessed. However, the Morristown Road signalised junction is currently operating, and will continue to operate,

above capacity, with and without the proposed development, for all future assessment years. It is however considered that the impact that the proposed development traffic will have on the junction will be negligible. Capacity issues occur during the AM and Peak periods and are below capacity for the rest of the day. However, this is considered to be representative of signalised junctions within urban and peri-urban locations.

Scenario 2 assesses the two development accesses, on the R445 and on Standhouse Road, and the Morristown Junction assuming a portion of existing traffic has been redistributed through the development access road as a means of bypassing Newbridge Town Centre. The results of the analysis indicate that the development access junctions will operate within capacity for assessment years 2024, 2029 and 2039. The Morristown Junction however will operate above capacity with long delays experience. These delays are greater than the current delays at this junction. However, it should be noted, that the primary motivation for drivers using the new residential access in Scenario 2 is to reduce their journey time. Where journey times are not reduced, existing traffic will avoid this route during peak hours, thus reducing the identified delays.

Scenario 3 assesses a proposed future signalised junction on the R445 which will provide an additional access to this development as well as providing access to a proposed future development on the southern side of the R445 which is currently at the planning stage. The results of the analysis indicate that the junction will operate within capacity for assessment years 2024, 2029 and 2039.

3.9 Response to the Roads, Transportation & Public Safety Department Comments Contained in the Kildare County Council Section 6(4)(b) Report

The issues listed below were raised by the Transportation & Public Safety Department in their report dated 09.11.2020 and a related response to each item is also provided:

Number of Junctions on the Link Road (Roads Objective SR05 (b) in the Newbridge LAP): The Link Road was previously permitted as part of (Kildare County Council File Number 16/658; ABP Reference PL09.249038) and this permission included individual access to 23 No houses together with 2 No T junctions along the length of the Link Road. The current proposal includes 9 No priority-controlled T junctions, and the frequency of the junctions is deemed to be compatible with the design principles set out in DMURS for such roads.

Noise from the R445: A Noise Impact Assessment has been prepared by Decibel Noise Control and is submitted under separate cover.

Vehicular Parking: The car parking provision for the proposed development is described in Section 3.6 of this report and is also dealt with in the Outline Travel Plan submitted in support of the proposed development.

Electrical vehicle Charging Points: It is proposed that 10% of all car parking spaces will be provided with electrical charging points and the balance of parking spaces will be provided with the necessary ducting to facilitate the installation of electrical charging points in the future.

Segregation of Open Space from the Link Road: It is proposed to provide a planted buffer strip in order to segregate the open spaces from the Link Road. The buffer strip is illustrated on Landscape Architects drawings.

Number of Universal Access Parking Spaces: the location of the universal access car parking spaces is detailed in 3.7 above and the locations within the development are shown on the architects site layout drawings.

Provision of Home Zones: MAL drawing No D1920-MAL-00-XX-C-033 illustrates the street hierarchy within the proposed development and this drawing identifies the location of the Home Zones.

Carriageway Surface Course: MAL drawing No D1920-MAL-00-XX-C-035 includes details of the carriageway surface course which is in accordance with the stated requirements of the Roads, Transportation & Public Safety Department of Kildare County Council.

Detailing of Pedestrian Crossings: MAL drawing No D1920-MAL-00-XX-C-035 includes details of the uncontrolled pedestrian crossings.

Lines of Sight at Junctions: All junctions have been examined to ensure that they provide the appropriate lines of sight for the related traffic speed. MAL drawing No D1920-MAL-00-XX-C-031 illustrates the typical visibility splays available at junctions within the proposed development.

Junction Corner Radii: Junction radii have been generally set at 3.0m and this is indicated on MAL drawing No's D1920-MAL-00-XX-C-002, D1920-MAL-00-XX-C-003, D1920-MAL-00-XX-C-004 and D1920-MAL-00-XX-C-005.

Provision of Bus Stops on the R445: The provision of bus stops on the R445 is outside the control of the applicant. However, the applicant is willing to accept a condition to provide these bus stops at locations determined by the Roads, Transportation & Public Safety Department of Kildare County Council.

Swept Path Analysis: MAL drawing No D1920-MAL-00-XX-C-032 includes swept path analysis for a refuse vehicle.

Vehicle Parking Manoeuvrability: MAL drawing No D1920-MAL-00-XX-C-032 includes swept path analysis for the typical parking spaces.

Mobility Management Plan: An Outline Travel Plan has been prepared for the proposed development and is submitted under separate cover.

Details of Future 4-Arm Signalized Junction on the R445: The location of this future junction is outside the scope of the proposed development on lands outside the control of the applicant. However, the Traffic and Transport Assessment prepared for the proposed development includes modelling of this future junction.

Road Safety Audit: A Combined Stage 1 and 2 Road Safety Audit has been prepared for the proposed development by Bruton Consulting Engineers and is submitted under separate cover.

Traffic and Transport Assessment: A Traffic and Transportation Assessment prepared by PMCE is submitted under separate cover with this application.

Public Lighting Arrangements: A public lighting arrangement has been prepared for the proposed development and is submitted under separate cover.

Construction Demolition and Waste Management Plan: A Construction and Demolition Waster Management Plan has been prepared for the proposed development and is submitted under separate cover.

4.0 FOUL WATER DRAINAGE

4.1 Existing Drainage Network

The subject site does not currently generate any foul effluent. There is an existing 225 mm diameter foul sewer along the R445 Ballymany Road immediately to the southeast of the proposed development and a 225 mm diameter foul sewer along Standhouse Road to the north west of the site. A copy of Irish Water records illustrating the existing foul sewers is presented in Appendix B of this report.

4.2 Liaison with Irish Water

A Pre-Connection enquiry form was submitted to Irish Water for 360 No residential units on the site in October 2020 based on a gravity connection to the existing foul sewer in Standhouse Road. Irish Water responded in November 2020 and noted that subject to a valid connection agreement being put in place, the proposed connection to the Irish Water wastewater network can be facilitated subject to the completion of the Upper Liffey Valley Regional Sewerage Scheme Contracts 2A and 2B which are due to be completed by February 2021. A copy of the related response from Irish Water is presented in Appendix B of this report.

Irish Water have also issued a Statement of Design Acceptance in respect of the foul drainage arrangements and a copy of the related Irish Water Statement is presented in Appendix B of this report.

4.3 Proposed Scheme Design

It is proposed to connect the foul drainage discharge from the proposed development to the existing 225 mm diameter foul sewer located in Standhouse Road. The location of the outfall sewer is illustrated on MAL drawing No's D1920-MAL-00-XX-C-017 and D1920-MAL-00-XX-C-018. The outfall will require the replacement of a 270 m section of the existing foul sewer in Standhouse Road and this upgrade proposal has been submitted to and agreed with Irish Water.

The details of the primary on plot drainage together with the off-plot outfall are illustrated on MAL drawing No's D1920-MAL-00-XX-C-014, D1920-MAL-00-XX-C-015, D1920-MAL-00-XX-C-016, D1920-MAL-00-XX-C-017 and D1920-MAL-00-XX-C-018 with foul drainage longitudinal sections illustrated on MAL drawing No's D1920-MAL-00-XX-C-019, D1920-MAL-00-XX-C-020, D1920-MAL-00-XX-C-021 and D1920-MAL-00-XX-C-022. MAL drawing No's D1920-MAL-00-XX-C-027 and D1920-MAL-00-XX-C-028 illustrate the related standard foul drainage construction details. The works to be undertaken outside the application red line within the public domain will be the subject of a Connection Agreement with Irish Water.

The peak foul water discharge from the proposed development has been estimated at 9.48 litres per second. The design is based on Irish Water's Code of Practice for Wastewater Infrastructure of 6 x DWF and defines DWF as 2.7 persons per house and a per capita wastewater flow of 150 litres per person per day. Calculations for the estimated foul drainage discharge are presented in Appendix C of this Report.

The proposed foul gravity drainage system will be constructed with uPVC or concrete pipes to IS 6 and laid in accordance with Irish Water Code of Practice for Wastewater Infrastructure, Building Regulations (Section H) and in accordance with the selected pipe manufacturer's recommendations. A minimum pipe diameter of 225mm has been utilised on the primary foul piped drainage network. All proposed works affecting the public drainage system will be subject to detailed agreement with Kildare County Council Water Services and Irish Water.

All proposed works affecting the public drainage system will be subject to detailed agreement with the Water and Drainage Department of Kildare County Council and Irish Water.

5.0 SURFACE WATER DRAINAGE

5.1 Overview

The overall proposed development site area is c. 11.383 hectares and is zoned by Kildare County Council for R1 – new proposed residential. This zoning seeks to "provide for residential development".

Available topographic survey of the site indicates that existing ground levels across overall site are typically graded from the highest point of approximately 107m AOD, at the eastern corner, to the lower level of approximately 95m AOD, at the north-western corner.

The existing levels on Standhouse Road, which aligns the northern boundary of the site, vary from approximately 94.9 to 100.5m AOD.

5.2 Existing Drainage Network

There is an existing 225mm diameter public surface water drainage network at the Stnadhouse Road and The Seven Springs Road junction which runs along Standhouse Road in an easterly direction. Refer to Appendix B for a copy of related public records.

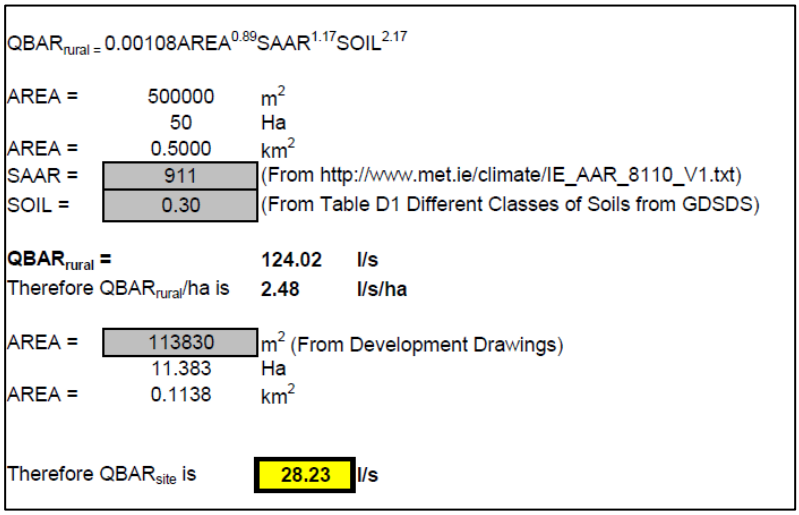
As detailed above, the site is currently graded in a north-westerly direction, to its lowest existing levels, with existing rainfall runoff appearing to drain naturally to the existing ditch, adjacent to the site boundary.

5.3 Existing Site Rainfall Runoff

Based on geotechnical ground investigations undertaken on the site the existing soils, in approximate stratigraphic order, were as follows:

- **Fluvioglacial deposits:** typically, medium dense sands and gravels with localised pockets of firm to stiff sandy gravelly clays interspersed throughout;
- **Glacial till:** sandy gravelly clay/silt, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth;

Based on the above information and using the "Flood estimation for small catchments" (Institute of Hydrology report 124) method, the greenfield rainfall runoff discharging from site are of 11.383ha has been estimated at $Q_{BARRURAL}$ = 28.2l/s (2.48l/s/ha). Refer to Figure 5.1 presented below for an excerpt of the results from the Runoff Calculation Spreadsheet.



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

AREA =	500000	m^2
	50	Ha
AREA =	0.5000	km^2
SAAR =	911	(From http://www.met.ie/climate/IE_AAR_8110_V1.txt)
SOIL =	0.30	(From Table D1 Different Classes of Soils from GDSDS)
$QBAR_{rural}$ =		**124.02 l/s**
Therefore $QBAR_{rural}$/ha is		**2.48 l/s/ha**
AREA =	113830	m^2 (From Development Drawings)
	11.383	Ha
AREA =	0.1138	km^2
Therefore $QBAR_{site}$ is	28.23	l/s

Figure 5.1: Existing Site Runoff Calculation Results (Excel Spreadsheet);

The rural runoff design results produced by the Microdrainage software, is included in Appendix D of this report.

5.4 Proposed Surface Water Network Overview

Firstly, it is worth noting that the proposed development will have separate foul and surface water drainage networks which, in turn, will discharge to separate foul and surface water sewer networks. The details of the proposed surface water drainage network to serve the proposed development is described below.

Infiltration tests undertaken in accordance with BRE 365 recommendations have been carried out on site at the locations of the proposed geocellular attenuation storage facilities and soakaways. The infiltration test results obtained have been used to design the attenuation storage/soakaway facilities. A copy of related test report is presented in Appendix E of this report. It is worth noting that the geocellular attenuation storage facilities have been designed to avail of the soil infiltration characteristics established by the infiltration tests undertaken on the site.

The design of the surface water drainage network for the proposed development consists of a piped gravity system. It is proposed to discharge the surface water runoff from the proposed development to the existing storm water sewer in Standhouse Road via a series of geocellular attenuation storage facilities located on the site. The surface water discharge to Standhouse Road will be controlled by a flow control device which will limit the discharge rate to the greenfield site peak runoff rate. There are also 2 No soakaways which will discharge surface water runoff directly to ground.

The layout of the proposed surface water drainage network is indicated on MAL drawing No's D1920-MAL-00-XX-C-006, D1920-MAL-00-XX-C-007, D1920-MAL-00-XX-C-008 and D1920-MAL-00-XX-C-009 with surface water longitudinal sections illustrated on MAL drawing No's D1920-MAL-00-XX-C-010, D1920-MAL-00-XX-C-011, D1920-MAL-00-

XX-C-012 and D1920-MAL-00-XX-C-013. MAL drawing No's D1920-MAL-00-XX-C-027 and D1920-MAL-00-XX-C-028 illustrate the related standard drainage construction details.

5.5 Proposed Surface Water Network Design

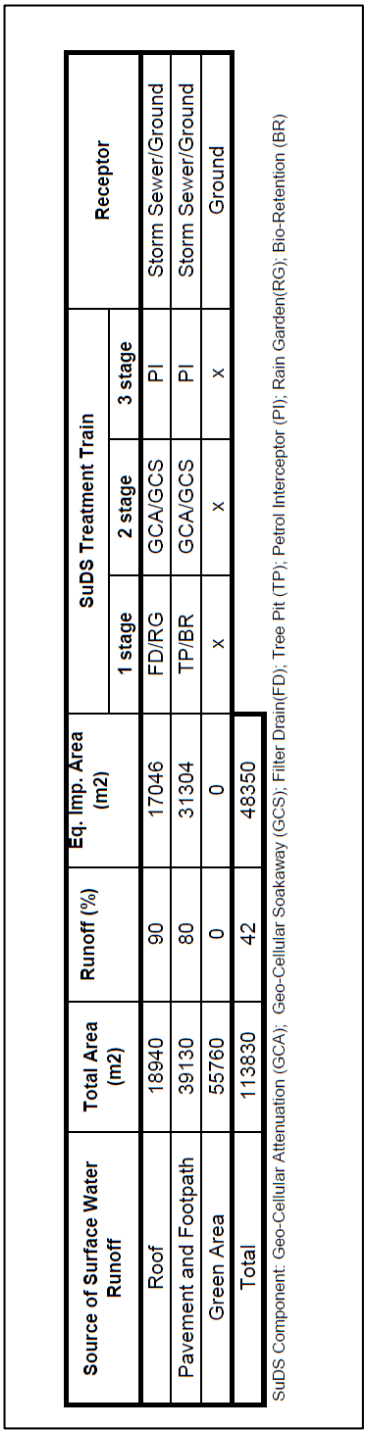
The design of the surface water drainage network has taken cognisance of the objectives and guidance contained in the Greater Dublin Strategic Drainage Study (GDSDS). The measures provided include the following:

- Reducing the rate of run-off to the appropriate GDSDS rate of runoff to the calculated Qbar value (2.48 l/s/ha) by a combination of underground cellular storage and infiltration with the flow control devices;
- Using the site critical duration storm for the 1 in 100-year return period in infiltration/attenuation storage volume calculations;
- Providing treatment via the use of Sustainable Drainage Systems;
- Ensuring that the majority of the rain falling on the site will pass through at least one type of interception storage in the form of geocellular attenuation, geocellular soakaway, filter drain, tree pit, bioretention system and rain garden;
- Increase in rainfall event depth by 20% to take account of climate change;

Item	Criteria
Return period for pipework	5-year check for surcharging. 100-year check for flooding
Time of entry	4 minutes
Pipe Friction (Ks):	0.6mm
Minimum Velocity	1.00m/s
Standard Average Annual Rainfall	911 mm (from Met Eireann website)
M5-60	15.3mm
Ratio r (M5-60/M5-2D):	0.283
Attenuation Storm Return Event:	100 year
Climate Change:	20% for rainfall intensities
Restricted Discharge Rate	2.48 l/s/ha up to 100-year event (Qbar)

Table 5.5.1: Design Criteria for Proposed Development;

The runoff characteristics used in the design calculations together with the treatment train are summarised in Table 5.5.2 below and a copy of the related Qbar calculation is presented in Appendix D of this report.



Source of Surface Water Runoff	Total Area (m2)	Runoff (%)	Eq. Imp. Area (m2)	SuDS Treatment Train			Receptor
				1 stage	2 stage	3 stage	
Roof	18940	90	17046	FD/RG	GCA/GCS	PI	Storm Sewer/Ground
Pavement and Footpath	39130	80	31304	TP/BR	GCA/GCS	PI	Storm Sewer/Ground
Green Area	55760	0	0	x	x	x	Ground
Total	113830	42	48350				

SuDS Component: Geo-Cellular Attenuation (GCA); Geo-Cellular Soakaway (GCS); Filter Drain(FD); Tree Pit (TP); Petrol Interceptor (PI); Rain Garden(RG); Bio-Retention (BR)

Table 5.5.2 Runoff Characteristics and SuDS Treatment Train for the Proposed Development;

The surface water design has been based on the criteria set out in Section 5.5 above. The discharge rate of 2.48 l/s/ha for the runoff from the proposed development site produces a requirement for an overall attenuation storage volume of c 1,923 m^3. The attenuation storage has been provided as follows:

- Geo-cellular Attenuation "A" – 650 m^3
- Geo-cellular Attenuation "B" – 335 m^3
- Geo-cellular Attenuation "C" – 694 m^3
- Geo-cellular Attenuation "D" – 244 m^3

The proposed surface water drainage design also produces a requirement for an overall soakaway volume of c 130 m^3 distributed in 2 No soakaways as follows:

- Soakaway "E" – 100 m^3
- Soakaway "F" – 30 m^3

The technical information for the proposed geo-cellular storage system is presented in Appendix D of this report.

Analysis of the storm water drainage network, by means of hydraulic simulations, has been carried out to establish the networks capability to cater for expected summer and winter storms with return periods of up to and including 100 years.

The analyses have been carried out using time-varying design rainstorms and the "Micro Drainage" simulation" software package. This computer-based flow simulation model performs full hydraulic simulations for the various storms. The rainfall profiles have been calculated using the Wallingford Procedure and Flood Study Methods, which are included within the software. Rainfall event depths have been increased by 20%. A copy of the attenuation storage and soakaway calculations is presented in Appendix D of this Report.

Summaries of the analysis for the storm water network are presented in Appendix D of this report. The pipe numbers that are predicted to experience possible surcharging for critical storm durations of varying length are highlighted in the results. The results indicate that no flooding occurs for the storm events modelled.

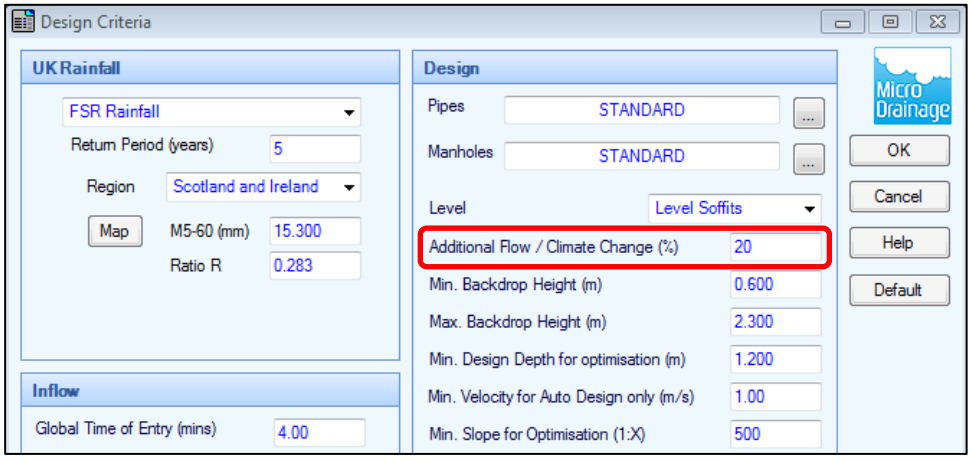


Figure 5.2: Surface Water Design Criteria (Extract from Microdrainage Design Criteria Input);

As highlighted in Figure 5.2 presented above, the proposed network was designed to allow for an additional 20% increase in rainfall intensity, to allow for Climate Change, in accordance with the Kildare County Council Development Plan and the GDSDS.

The proposed surface water gravity drainage system will be constructed with uPVC or concrete pipes laid in accordance with IS 6 and more particularly the Building Regulations, Section H and in accordance with the selected pipe manufacturer's recommendations. A minimum pipe diameter of 225mm has been utilised on the primary surface water piped drainage network. All proposed works affecting the public drainage system will be subject to detailed agreement with the Water Services Department of Kildare County Council.

Maintenance of the surface water system will be undertaken on a biannual basis. The inspection of the system will also be undertaken on biannual basis and following any significant rainfall event.

It is worth noting that the surface water disposal strategy is very similar to the strategy adopted for the previously permitted development on the site (granted under Kildare County Council File Number 16/658; ABP Reference PL09.249038).

5.6 Mid Kildare (Curragh) Aquifer

It is worth noting that the subject site is located within an area of high groundwater vulnerability and the Geological Survey of Ireland maps indicate that there is a regionally important gravel aquifer below the site.

Groundwater monitoring has been undertaken on the site via a standpipe which was installed on the site during a geotechnical ground investigation undertaken in November

2018. The groundwater level in the standpipe was recorded during the investigation and has been recorded on a number of subsequent occasions. A copy of the recorded groundwater levels is presented in Appendix E of this report. It is worth noting that the highest recorded groundwater level was 5.5m below existing ground level which is significantly below the base of the attenuation/soakaways and thus will not impact the functionality of the soakaways.

It is also worth noting that the seasonal variation in the groundwater levels within the aquifer have been recorded as being in the order of 1.25m to 2.5m with the lowest levels occurring in October and the highest levels in February (Hayes, T., Sutton, S., Cullen, K. and Faherty, J. (2001). The Curragh Aquifer. Current Conceptual Understanding & Numerical Modelling. Paper presented at the Proceedings of the Annual Groundwater Seminar, IAH (Irish Group) 16th-17th October 2001 Tullamore).

It is proposed to provide surface water attenuation and soakaways in a number of open space locations using proprietary geocellular storage units. Attenuation storage locations will also facilitate infiltration to ground. Bypass petrol interceptors will be fitted upstream of all soakaway and attenuation storage facilities.

It is proposed that the soakaways and geocellular attenuation storage facilities will be wrapped with a Permafilter Geotextile which will retain any oil contamination which escapes capture in the interceptors. A copy of the Permafilter Geotextile data sheet is presented in Appendix D of this report. The main benefits of the Permafilter Geotextile are as follows:

- Capture of residual hydrocarbons;
- Removal of pollutants by biodegradation;
- Enhancement of water quality;
- Designed to be self-maintaining for the life of the installation;

It is worth noting that Permafilter Geotextile comprises of a blend of polyester fibres that incorporates hydrophilic (water attracting and oil repellent) and hydrophobic (oil attracting and water repellent) properties to achieve superior oil retention. The entrapped hydrocarbons are biodegraded by naturally occurring microorganisms providing a self-cleansing mechanism.

5.7 Response to the Water Services Planning Section Comments Contained in the Kildare County Council Section 6(4)(b) Report

The issues listed below were raised by the Water Services Planning Section in their report dated 03.11.2020 and a related response to each item is also provided:

Details of Subsoil Conditions to be Provided including Infiltration Tests to BRE 365: Soil infiltration tests have been undertaken on the site by Geoenvironmental Environmental Consultants and a copy of their related Soil Infiltration Test Report is presented in

Appendix E of this report. The design of the soakaways and attenuation storage areas has been based on the results of these tests.

Groundwater Monitoring A standpipe was installed on the site during a geotechnical ground investigation undertaken in November 2018. The groundwater level in the standpipe was recorded during the investigation and has been recorded on a number of subsequent occasions. The recorded groundwater levels are presented in Appendix E of this report.

It is worth noting that the recorded groundwater level is significantly below the base of the soakaways and attenuation areas and thus should not impact on their functionality. It is also worth noting that excavations on the site during the current construction works have confirmed that the groundwater levels identified in the monitoring borehole are typical for the site as a whole.

Mid Kildare (Curragh) Aquifer: Bypass petrol interceptors will be fitted upstream of all soakaways and attenuation storage facilities. It is proposed that the geocellular infiltration/attenuation storage facilities will be wrapped with a Permafilter Geotextile which will retain any oil contamination which escape capture in the interceptors. The entrapped hydrocarbons are biodegraded by naturally occurring microorganisms providing a self-cleansing mechanism.

Permeable Paving: No permeable paving is being proposed in public areas.

Treatment of Surface Water: All surface water runoff will be treated by one or more of the following SuDS elements prior to discharge into the public surface water drainage system or prior to infiltration to ground:

- Filter drains and rain gardens within dwelling curtilages;
- Tree pits;
- Bio-retention areas;
- Petrol Interceptors;
- Geocellular Storage Tanks;
- Soakaways;

Maximise SuDS Provision: As noted above the following SuDS elements are included as a part of the surface water drainage system for the proposed development:

- Filter drains and rain gardens within dwelling curtilages;
- Tree pits;
- Bio-retention areas;
- Petrol Interceptors;
- Geocellular Storage Tanks;
- Soakaways;

Qbar Value: The Qbar value for the site has been calculated based on a Soil Value of 0.3 which assumes a High Winter Rainfall Acceptance Potential (WRAP) and a Low Runoff. Given that the soils below the topsoil are variable and consist of sands, gravels, silts and clays, the adopted value is deemed to be conservative.

Discharge to Existing Surface Water Sewer in Standhouse Road: It is proposed to discharge the attenuated surface water to the existing surface water sewer in Standhouse Road. The surface water discharge will be limited to the greenfield runoff rate (Qbar) calculated in accordance with the GDSDS. An assessment of the existing receiving surface water sewer network will be undertaken, and any local upgrade deemed necessary will be implemented as part of the proposed development.

Attenuation Storage Calculations: Calculations for the surface water network (including the infiltration/attenuation storage facilities) are presented in Appendix D of this report.

Surface Water Pipework Design: The piped surface water network design has been based on a 5-year return period plus 20% for climate change. The extract from the calculations presented in section 5.5 above highlights this criterion in the calculations which are presented in Appendix D of this report.

Individual Connections to the Surface Water Network: All properties will have individual connections to the surface water piped network.

Submit a Detailed Site-Specific Flood Risk Assessment: A Site-Specific Flood Risk Assessment has been prepared and is submitted under separate cover with this application.

6.0 WATER SUPPLY

6.1 Existing Water Supply

There is an existing 100 mm diameter uPVC watermain along the R445 Ballymany Road immediately to the southeast of the site. A 50 mm diameter watermain is located on the northern boundary of the site on Standhouse Road. A copy of Irish Water records illustrating the existing watermains is presented in Appendix B of this report.

6.2 Liaison with Irish Water

A Pre-Connection enquiry form was submitted to Irish Water for 360 No residential units on the site in November 2020. Irish Water responded in December 2020 and noted that subject to a valid connection agreement being put in place, the proposed connection to the Irish Water network can be facilitated subject to the completion of the water network upgrades involving the following works:

- Approximately 10m of new 200mm ID pipe main to be laid to connect the site development (see yellow sections below) to the new 200mm ID main.
- Approximately 700m of new 200mm ID pipe main to replace the existing 3" uPVC main.

Irish Water have further advised that they do not have any plans to implement these upgrades, however the applicant is willing to fund these works as part of the proposed development and has included the upgrades in the drawings prepared and submitted with this application. A copy of the related response from Irish Water is presented in Appendix B of this report.

Irish Water have also issued a Statement of Design Acceptance in respect of the water supply arrangements and a copy of the related Irish Water Statement is presented in Appendix B of this report.

6.3 Proposed Scheme Design

As noted above the main connection for the water supply for the proposed development will be from the upgraded watermain on the Standhouse Road. It is also proposed to connect to the existing watermain network currently under construction. A 200mm diameter watermain central feed will be provided throughout the development which in turn will feed 150mm and 100mm diameter loops.

Valve controlled metered supplies will be provided to each individual dwelling. It is estimated that the daily peak water supply required by the proposed development following full occupancy will be 9.89 litres per second with an average daily water demand of 137 m^3/day. A copy of the related calculations is presented in Appendix F of this report.

Water storage in accordance with the requirements of Irish Water and Kildare County Council Water Services Department will be provided within each dwelling and the new water mains will be laid in accordance with the requirements of Kildare County Council Water Services Department and Irish Water.

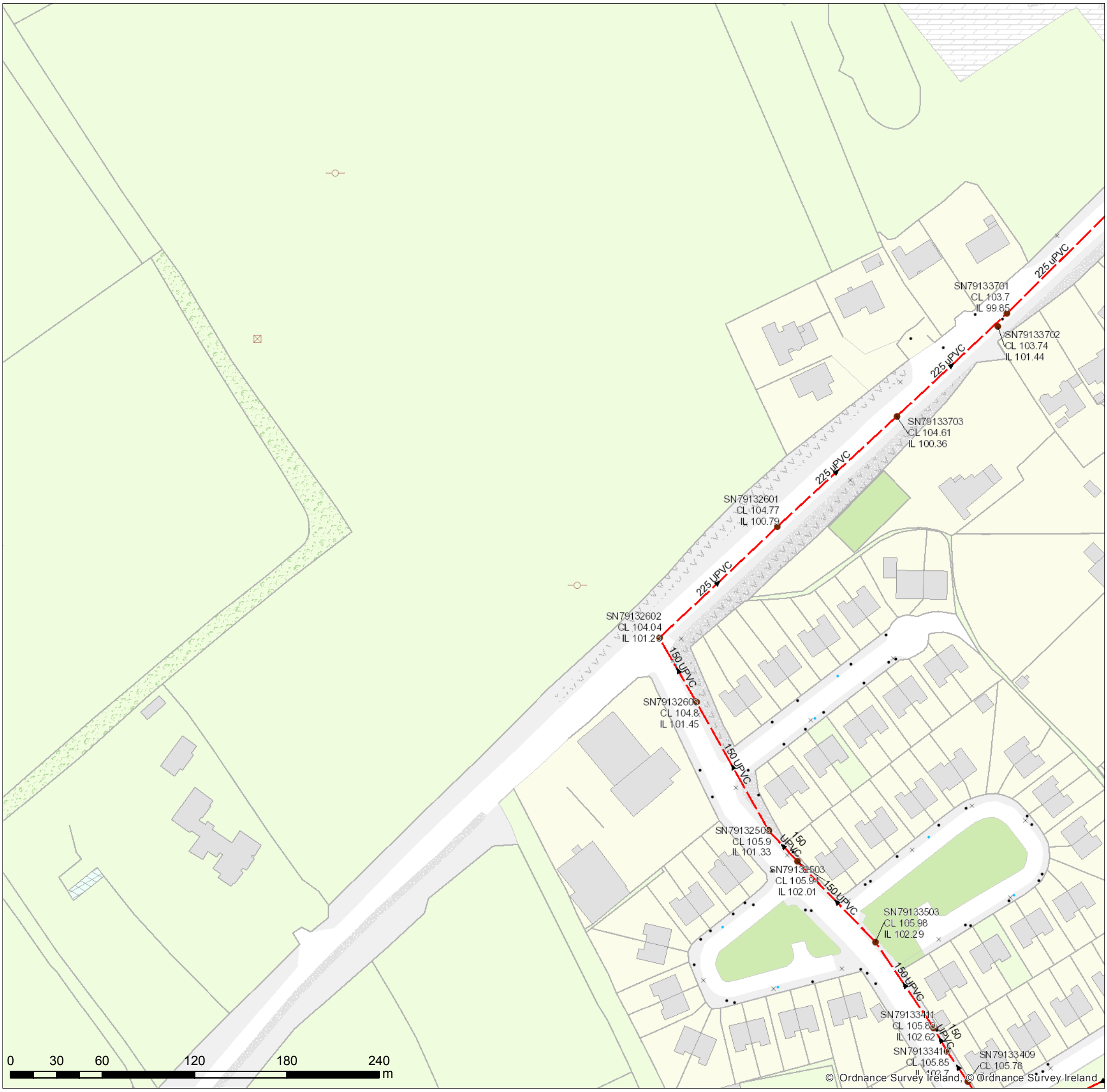
All proposed works affecting the public water supply system will be subject to detailed agreement with the Water and Drainage Department of Kildare County Council and with Irish Water.

APPENDIX A – LIST OF ENGINEERING DRAWINGS

Drawing No.	Drawing Title
D1920-MAL-00-XX-C-001	Key Plan
D1920-MAL-00-XX-C-002	Roads Layout Sheet 1 of 4
D1920-MAL-00-XX-C-003	Roads Layout Sheet 2 of 4
D1920-MAL-00-XX-C-004	Roads Layout Sheet 3 of 4
D1920-MAL-00-XX-C-005	Roads Layout Sheet 4 of 4
D1920-MAL-00-XX-C-006	Storm Water Drainage Layout Sheet 1 of 4
D1920-MAL-00-XX-C-007	Storm Water Drainage Layout Sheet 2 of 4
D1920-MAL-00-XX-C-008	Storm Water Drainage Layout Sheet 3 of 4
D1920-MAL-00-XX-C-009	Storm Water Drainage Layout Sheet 4 of 4
D1920-MAL-00-XX-C-010	Storm Water Drainage Long Sections Sheet 1 of 4
D1920-MAL-00-XX-C-011	Storm Water Drainage Long Sections Sheet 2 of 4
D1920-MAL-00-XX-C-012	Storm Water Drainage Long Sections Sheet 3 of 4
D1920-MAL-00-XX-C-013	Storm Water Drainage Long Sections Sheet 4 of 4
D1920-MAL-00-XX-C-014	Foul Drainage Layout Sheet 1 of 5
D1920-MAL-00-XX-C-015	Foul Drainage Layout Sheet 2 of 5
D1920-MAL-00-XX-C-016	Foul Drainage Layout Sheet 3 of 5
D1920-MAL-00-XX-C-017	Foul Drainage Layout Sheet 4 of 5
D1920-MAL-00-XX-C-018	Foul Drainage Layout Sheet 5 of 5
D1920-MAL-00-XX-C-019	Foul Drainage Long Sections Sheet 1 of 4
D1920-MAL-00-XX-C-020	Foul Drainage Long Sections Sheet 2 of 4
D1920-MAL-00-XX-C-021	Foul Drainage Long Sections Sheet 3 of 4
D1920-MAL-00-XX-C-022	Foul Drainage Long Sections Sheet 4 of 4
D1920-MAL-00-XX-C-023	Water Main Layout Sheet 1 of 4
D1920-MAL-00-XX-C-024	Water Main Layout Sheet 2 of 4
D1920-MAL-00-XX-C-025	Water Main Layout Sheet 3 of 4
D1920-MAL-00-XX-C-026	Water Main Layout Sheet 4 of 4
D1920-MAL-00-XX-C-027	Drainage Details Sheet 1 of 2
D1920-MAL-00-XX-C-028	Drainage Details Sheet 2 of 2
D1920-MAL-00-XX-C-029	Watermain Details Sheet 1 of 2
D1920-MAL-00-XX-C-030	Watermain Details Sheet 2 of 2
D1920-MAL-00-XX-C-031	Visibility Splays
D1920-MAL-00-XX-C-032	Vehicular Manoeuvres
D1920-MAL-00-XX-C-033	Roads Hierarchy
D1920-MAL-00-XX-C-034	NOT USED
D1920-MAL-00-XX-C-035	Typical Road Details
D1920-MAL-00-XX-C-036	Standhouse Road Watermain Upgrade Works

APPENDIX B – IRISH WATER RECORDS and CORRESPONDENCE

Irish Water Web Map



Water Distribution Network
- Water Treatment Plant
- Water Pump Station
- Storage Cell/Tower
- Dosing Point
- Meter Station
- Abstraction Point
- Telemetry Kiosk

Reservoir
- Potable
- Raw Water

Water Distribution Mains
- Irish Water
- Private

Trunk Water Mains
- Irish Water
- Private

Water Lateral Lines
- Irish Water
- Non IW
- Water Casings
- Water Abandoned Lines
- Boundary Meter
- Bulk/Check Meter
- Group Scheme
- Source Meter
- Waste Meter
- Unknown Meter ; Other Meter
- Non-Return
- PRV
- PSV
- Sluice Line Valve Open/Closed
- Butterfly Line Valve Open/Closed
- Sluice Boundary Valve Open/Closed
- Butterfly Boundary Valve Open/Closed
- Scour Valves
- Single Air Control Valve
- Double Air Control Valve
- Water Stop Valves
- Water Service Connections
- Water Distribution Chambers
- Water Network Junctions
- Pressure Monitoring Point
- Fire Hydrant
- Fire Hydrant/Washout

Water Fittings
- Cap
- Reducer
- Tap
- Other Fittings

Sewer Foul Combined Network
- Waste Water Treatment Plant
- Waste Water Pump station

Sewer Mains Irish Water
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow

Sewer Mains Private
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow
- Sewer Lateral Lines
- Sewer Casings

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Inlet Type
- Gully
- Standard
- Other; Unknown

Storm Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Gas Networks Ireland
- Transmission High Pressure Gasline
- Distribution Medium Pressure Gasline
- Distribution Low Pressure Gasline

ESB Networks

ESB HV Lines
- HV Underground
- HV Overhead
- HV Abandoned

ESB MVLV Lines
- MV Overhead Three Phase
- MV Overhead Single Phase
- LV Overhead Three Phase
- LV Overhead Single Phase
- MVLV Underground
- Abandoned

Non Service Categories
- Proposed
- Under Construction
- Out of Service
- Decommissioned

Water Non Service Assets
- Water Point Feature
- Water Pipe
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

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Irish Water Web Map

Water Distribution Network
- Water Treatment Plant
- Water Pump Station
- Storage Cell/Tower
- Dosing Point
- Meter Station
- Abstraction Point
- Telemetry Kiosk

Reservoir
- Potable
- Raw Water

Water Distribution Mains
- Irish Water
- Private

Trunk Water Mains
- Irish Water
- Private

Water Lateral Lines
- Irish Water
- Non IW
- Water Casings
- Water Abandoned Lines
- Boundary Meter
- Bulk/Check Meter
- Group Scheme
- Source Meter
- Waste Meter
- Unknown Meter ; Other Meter
- Non-Return
- PRV
- PSV
- Sluice Line Valve Open/Closed
- Butterfly Line Valve Open/Closed
- Sluice Boundary Valve Open/Closed
- Butterfly Boundary Valve Open/Closed
- Scour Valves
- Single Air Control Valve
- Double Air Control Valve
- Water Stop Valves
- Water Service Connections
- Water Distribution Chambers
- Water Network Junctions
- Pressure Monitoring Point
- Fire Hydrant
- Fire Hydrant/Washout

Water Fittings
- Cap
- Reducer
- Tap
- Other Fittings

Sewer Foul Combined Network
- Waste Water Treatment Plant
- Waste Water Pump station

Sewer Mains Irish Water
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow

Sewer Mains Private
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow
- Sewer Lateral Lines
- Sewer Casings

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Inlet Type
- Gully
- Standard
- Other; Unknown

Storm Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Gas Networks Ireland
- Transmission High Pressure Gasline
- Distribution Medium Pressure Gasline
- Distribution Low Pressure Gasline

ESB Networks

ESB HV Lines
- HV Underground
- HV Overhead
- HV Abandoned

ESB MVLV Lines
- MV Overhead Three Phase
- MV Overhead Single Phase
- LV Overhead Three Phase
- LV Overhead Single Phase
- MVLV Underground
- Abandoned

Non Service Categories
- Proposed
- Under Construction
- Out of Service
- Decommissioned

Water Non Service Assets
- Water Point Feature
- Water Pipe
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

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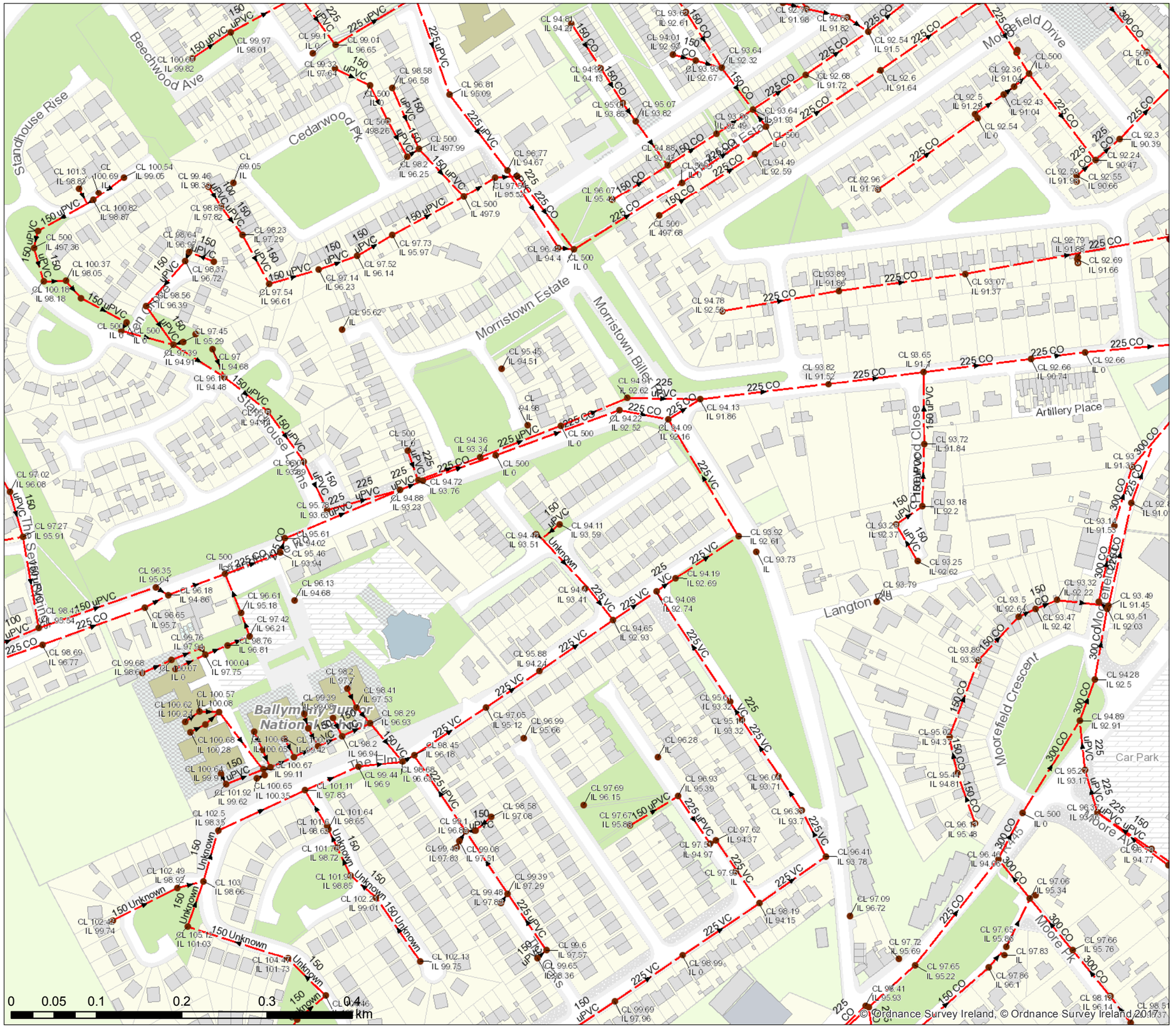
Irish Water Web Map



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Water Distribution Network
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- Abstraction Point
- Telemetry Kiosk

Reservoir
- Potable
- Raw Water

Water Distribution Mains
- Irish Water
- Private

Trunk Water Mains
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- Pumping - Unknown
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- Overflow
- Sewer Lateral Lines
- Sewer Casings

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
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- Surface Water Pressurised Mains Private

Inlet Type
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- Other; Unknown

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- Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
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- Overflow
- Soakaway
- Other; Unknown

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- LV Overhead Three Phase
- LV Overhead Single Phase
- MVLV Underground
- Abandoned

Non Service Categories
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- Water Pipe
- Water Structure

Waste Non Service Assets
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Irish Water Web Map

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Reservoir
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Trunk Water Mains
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- Overflow

Sewer Mains Private
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- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
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- Sewer Casings

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Inlet Type
- Gully
- Standard
- Other; Unknown

Storm Manholes
- Standard
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- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Gas Networks Ireland
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- Distribution Low Pressure Gasline

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Water Non Service Assets
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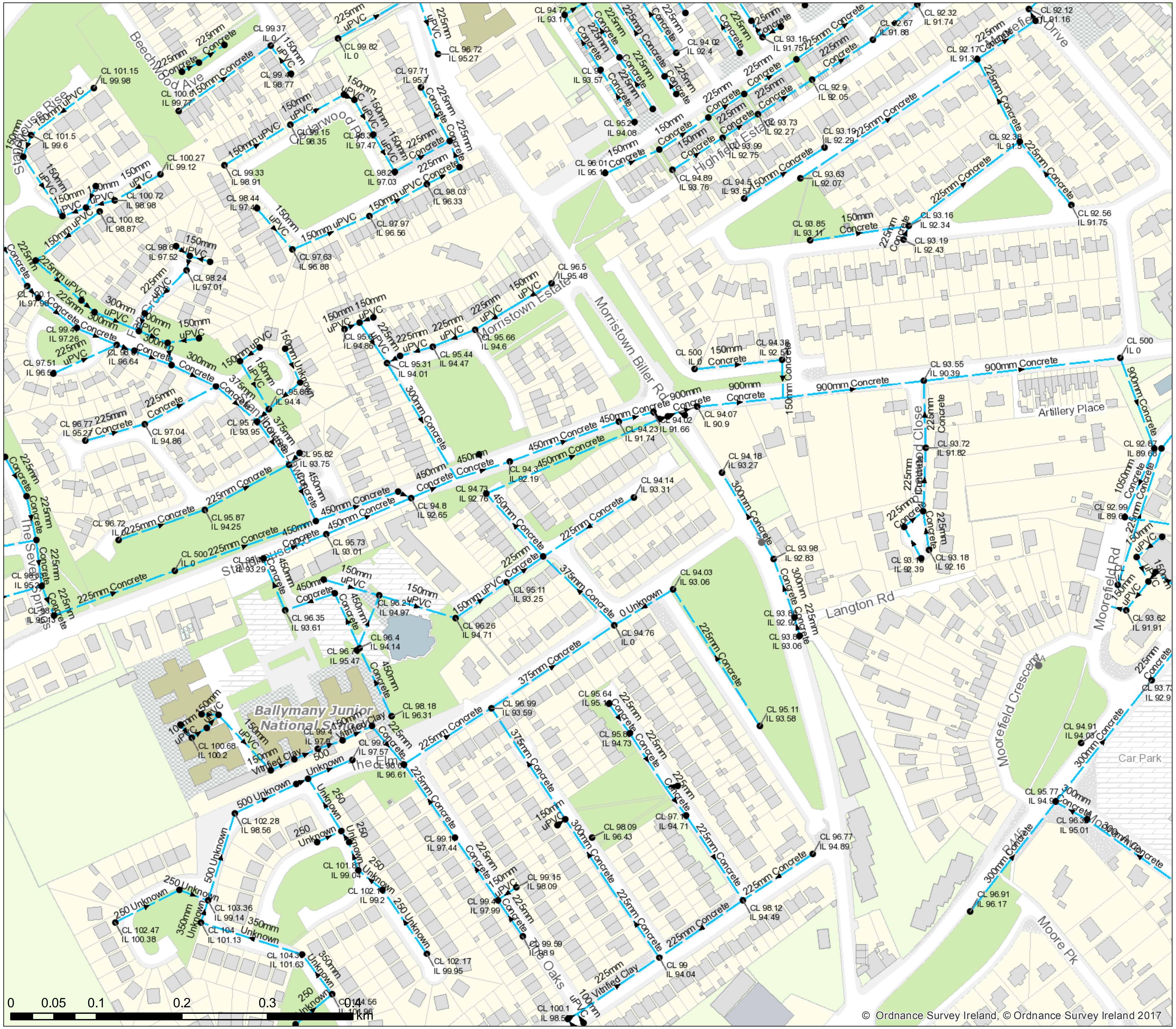
- Water Pipe
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

Irish Water Web Map



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- Storage Cell/Tower
- Dosing Point
- Meter Station
- Abstraction Point
- Telemetry Kiosk

Reservoir
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- Raw Water

Water Distribution Mains
- Irish Water
- Private

Trunk Water Mains
- Irish Water
- Private

Water Lateral Lines
- Irish Water
- Non IW
- Water Casings
- Water Abandoned Lines
- Boundary Meter
- Bulk/Check Meter
- Group Scheme
- Source Meter
- Waste Meter
- Unknown Meter ; Other Meter
- Non-Return
- PRV
- PSV
- Sluice Line Valve Open/Closed
- Butterfly Line Valve Open/Closed
- Sluice Boundary Valve Open/Closed
- Butterfly Boundary Valve Open/Closed
- Scour Valves
- Single Air Control Valve
- Double Air Control Valve
- Water Stop Valves
- Water Service Connections
- Water Distribution Chambers
- Water Network Junctions
- Pressure Monitoring Point
- Fire Hydrant
- Fire Hydrant/Washout

Water Fittings
- Cap
- Reducer
- Tap
- Other Fittings

Sewer Foul Combined Network
- Waste Water Treatment Plant
- Waste Water Pump station

Sewer Mains Irish Water
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow

Sewer Mains Private
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow
- Sewer Lateral Lines
- Sewer Casings

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Inlet Type
- Gully
- Standard
- Other; Unknown

Storm Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Gas Networks Ireland
- Transmission High Pressure Gasline
- Distribution Medium Pressure Gasline
- Distribution Low Pressure Gasline

ESB Networks

ESB HV Lines
- HV Underground
- HV Overhead
- HV Abandoned

ESB MVLV Lines
- MV Overhead Three Phase
- MV Overhead Single Phase
- LV Overhead Three Phase
- LV Overhead Single Phase
- MVLV Underground
- Abandoned

Non Service Categories
- Proposed
- Under Construction
- Out of Service
- Decommissioned

Water Non Service Assets
- Water Point Feature
- Water Pipe
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

Irish Water Web Map

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Water Distribution Network
- Water Treatment Plant
- Water Pump Station
- Storage Cell/Tower
- Dosing Point
- Meter Station
- Abstraction Point
- Telemetry Kiosk

Reservoir
- Potable
- Raw Water

Water Distribution Mains
- Irish Water
- Private

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Discharge Type
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Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
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Inlet Type
- Gully
- Standard
- Other; Unknown

Storm Manholes
- Standard
- Backdrop
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- Other; Unknown
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- Storm Clean Outs
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Discharge Type
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- Other; Unknown

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Water Non Service Assets
- Water Point Feature
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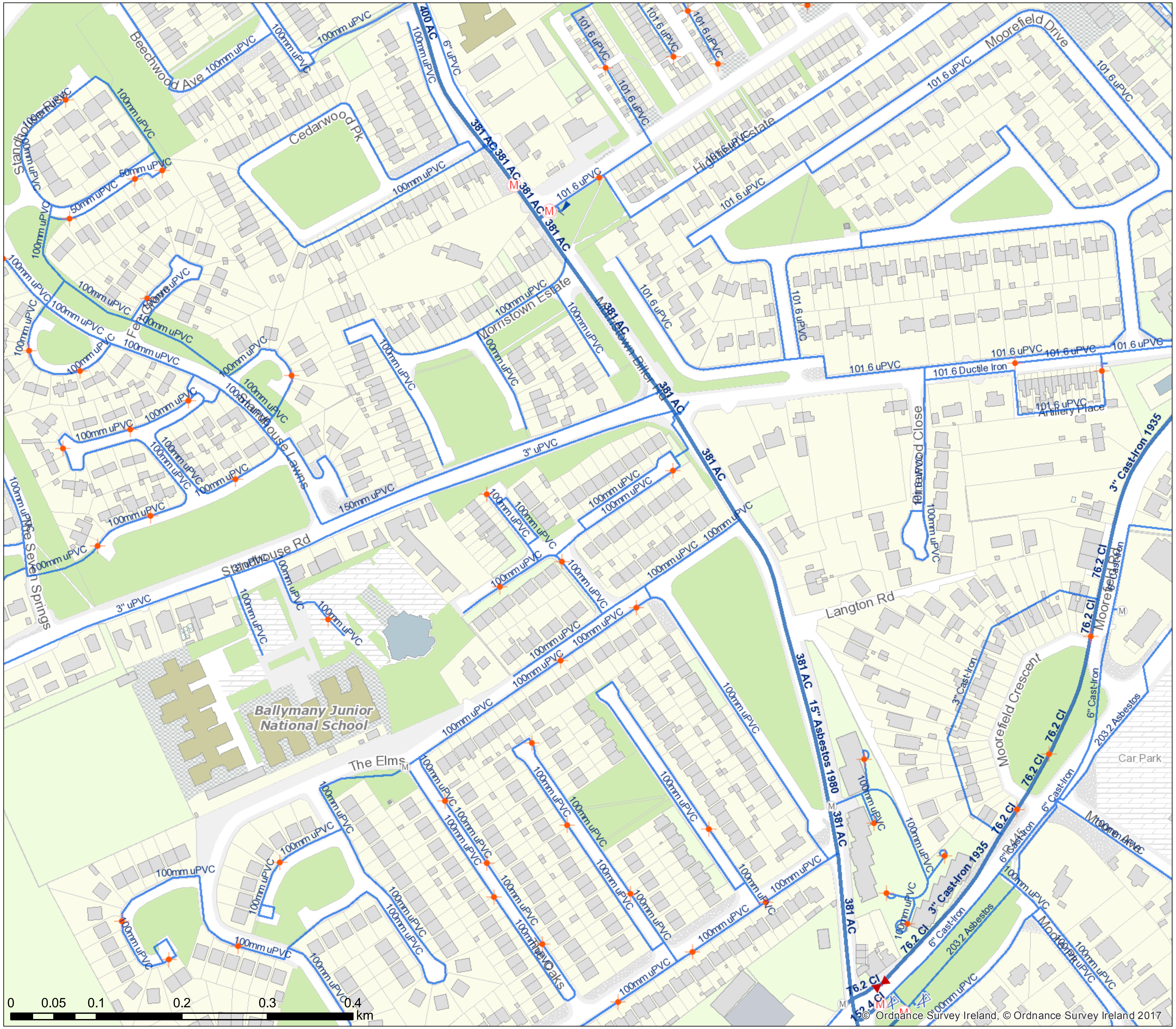
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

Irish Water Web Map



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UISCE ÉIREANN : IRISH WATER

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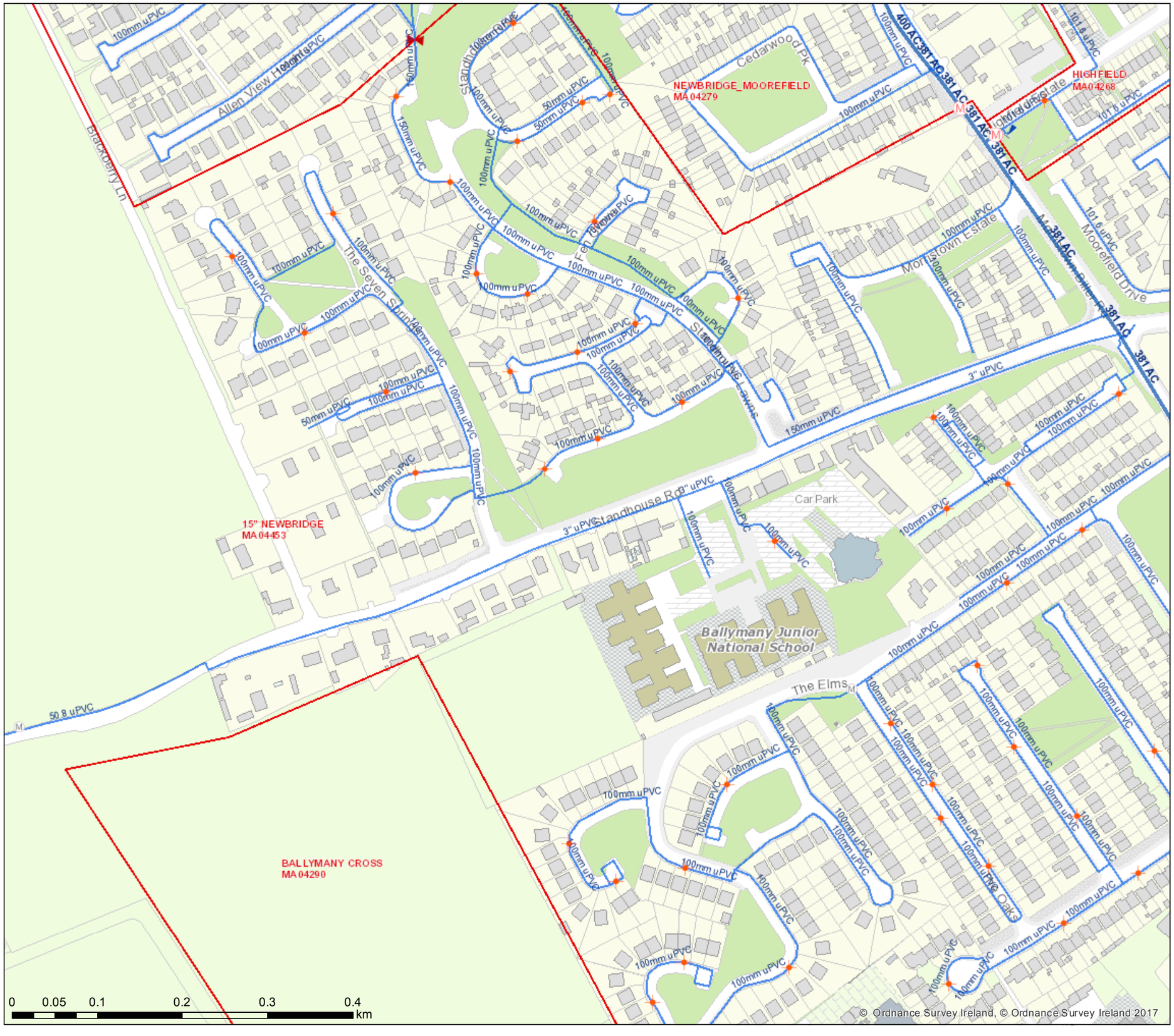

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Seamus O' Rourke
Marketing Network House
Argyle Square
Morehampton Road
Dublin

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

30 April 2021

Re: Design Submission for Ballymany Road, Newbridge, Co. Kildare (the "Development") (the "Design Submission") / Connection Reference No: CDS20006671

Dear Seamus O' Rourke,

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: Alvaro Garcia
Email: agarcia@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

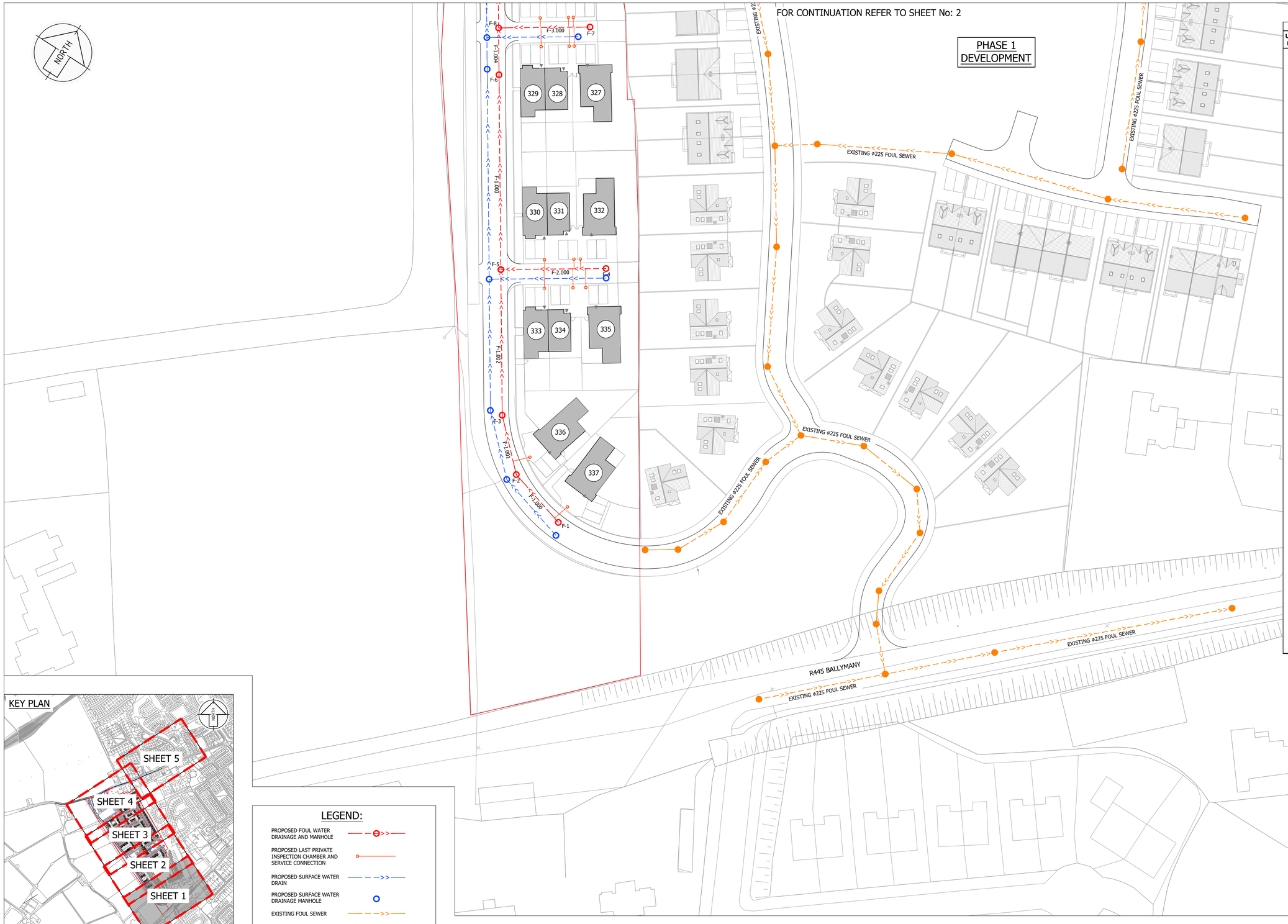
Appendix A

Document Title & Revision

D1920-MAL-00-XX-C-014 Foul Drainage Layout
D1920-MAL-00-XX-C-015 Foul Drainage Layout
D1920-MAL-00-XX-C-016 Foul Drainage Layout
D1920-MAL-00-XX-C-017 Foul Drainage Layout
D1920-MAL-00-XX-C-018 Foul Drainage Layout
D1920-MAL-00-XX-C-019 Foul Drainage Longsections - Sheet 1
D1920-MAL-00-XX-C-020 Foul Drainage Longsections - Sheet 2
D1920-MAL-00-XX-C-021 Foul Drainage Longsections - Sheet 3
D1920-MAL-00-XX-C-022 Foul Drainage Longsections - Sheet 4
D1920-MAL-00-XX-C-023 Water Main Layout
D1920-MAL-00-XX-C-024 Water Main Layout
D1920-MAL-00-XX-C-025 Water Main Layout
D1920-MAL-00-XX-C-026 Water Main Layout
D1920-MAL-00-XX-C-036 Water Main Layout

*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.



DO NOT SCALE USE FIGURED DIMENSIONS ONLY

FOUL WATER DRAINAGE NETWORK SCHEDULE

Upstream Manhole	CL(m)	US/IL(m)	PN	Pipe Length(m)	DS/IL(m)	Slope (1:X)	Pipe DIA (mm)
F-1	103.580	102.155	F-1.000	16.753	101.875	59.8	225
F-2	103.300	101.875	F-1.001	16.031	101.585	55.3	225
F-3	103.010	101.585	F-1.002	38.298	100.885	54.7	225
F-4	102.570	101.345	F-2.000	27.660	100.885	60.1	225
F-5	102.310	100.885	F-1.003	51.202	100.025	59.5	225
F-6	101.450	100.025	F-1.004	12.316	99.845	68.4	225
F-7	101.450	100.225	F-3.000	24.040	99.845	63.3	225
F-8	101.270	99.845	F-1.005	64.268	99.417	150.0	225
F-9	102.110	100.885	F-4.000	25.182	100.495	64.6	225
F-10	101.920	99.417	F-1.006	12.467	99.354	200.0	225
F-11	102.090	99.354	F-1.007	49.316	99.108	200.0	225
F-12	105.970	104.545	F-5.000	27.819	104.081	60.0	225
F-13	106.250	104.081	F-5.001	5.300	103.993	60.0	225
F-14	106.310	103.993	F-5.002	6.374	103.886	60.0	225
F-15	106.380	103.886	F-5.003	79.200	102.984	87.8	225
F-16	104.410	102.984	F-5.004	11.557	102.664	36.1	225
F-17	104.090	102.664	F-5.005	8.373	102.404	32.2	225
F-18	103.830	102.404	F-5.006	10.378	102.224	57.7	225
F-19	104.630	103.205	F-6.000	35.149	102.225	35.9	225
F-20	103.650	101.925	F-5.007	63.804	100.965	66.5	225
F-21	102.390	99.108	F-1.008	58.219	98.817	200.0	225
F-22	102.250	100.825	F-7.000	46.528	100.050	60.0	225
F-23	101.650	98.817	F-1.009	72.578	98.454	200.0	225
F-24	101.770	100.345	F-8.000	42.172	99.635	59.4	225
F-25	101.060	99.635	F-8.001	9.998	99.535	100.0	225
F-26	100.960	98.454	F-1.010	34.378	98.282	200.0	225
F-27	101.560	98.282	F-1.011	39.844	98.083	200.0	225
F-28	101.760	100.335	F-9.000	45.136	99.845	92.1	225
F-29	101.270	99.845	F-9.001	9.985	99.778	150.0	225
F-30	101.260	98.083	F-1.012	37.976	97.893	200.0	225
F-31	100.570	97.893	F-1.013	31.339	97.736	200.0	225
F-32	100.000	97.736	F-1.014	3.698	97.717	200.0	225
F-33	100.040	97.717	F-1.015	72.471	97.355	200.0	225
F-34	100.200	97.355	F-1.016	20.316	97.254	200.0	225
F-35	103.730	102.305	F-10.000	53.209	101.165	46.7	225
F-36	102.590	101.165	F-10.001	53.142	99.665	35.4	225
F-37	103.010	101.585	F-11.000	65.486	100.165	46.1	225
F-38	101.590	99.665	F-10.002	33.073	99.125	61.2	225
F-39	101.050	99.125	F-10.003	35.589	98.947	200.0	225
F-40	102.080	100.655	F-12.000	69.845	99.795	81.2	225
F-41	101.220	98.947	F-10.004	89.709	97.857	82.3	225
F-42	99.990	97.254	F-1.017	48.437	97.011	200.0	225
F-43	104.430	103.005	F-13.000	56.237	102.068	60.0	225
F-44	104.990	102.068	F-13.001	5.158	101.982	60.0	225
F-45	105.070	103.645	F-14.000	18.750	103.333	60.0	225
F-46	104.890	101.982	F-13.002	21.037	101.631	60.0	225
F-47	103.870	101.631	F-13.003	30.400	101.428	149.8	225
F-48	103.640	101.428	F-13.004	10.938	101.355	150.0	225
F-49	103.630	101.355	F-13.005	29.645	101.157	149.7	225
F-50	102.900	101.157	F-13.006	41.906	100.414	56.4	225
F-51	101.840	100.414	F-13.007	27.881	99.284	24.7	225
F-52	100.710	99.284	F-13.008	29.256	98.674	48.0	225
F-53	100.100	98.674	F-13.009	5.143	98.564	46.8	225
F-54	100.030	98.605	F-15.000	64.073	98.178	150.0	225
F-55	99.990	98.178	F-13.010	58.910	97.805	157.9	225
F-56	99.520	98.295	F-16.000	29.035	97.805	59.3	225
F-57	99.230	97.805	F-13.011	11.926	97.745	200.0	225
F-58	99.380	97.745	F-13.012	31.965	97.585	199.8	225
F-59	99.860	97.585	F-13.013	56.468	97.118	120.9	225
F-60	100.640	97.011	F-1.018	38.819	96.817	200.0	225
F-61	100.150	96.742	F-1.019	49.918	96.576	300.7	300
F-62	100.800	96.576	F-1.020	5.723	96.557	300.0	300
F-63	100.500	96.557	F-1.021	31.414	96.452	300.0	300
F-64	100.500	96.452	F-1.022	31.836	96.346	300.0	300
F-65	100.500	96.346	F-1.023	13.496	96.301	300.0	300
F-66	100.500	96.301	F-1.024	35.271	96.184	300.0	300
F-67	99.700	96.184	F-1.025	3.293	96.173	300.0	300
F-68	99.650	96.173	F-1.026	34.332	96.058	300.0	300
F-69	99.270	96.058	F-1.027	73.704	95.813	300.0	300
F-70	98.550	95.813	F-1.028	60.235	95.612	300.0	300
F-71	98.750	95.612	F-1.029	98.914	94.980	156.5	300

KEY PLAN

LEGEND:

- PROPOSED FOUL WATER DRAINAGE AND MANHOLE
- PROPOSED LAST PRIVATE INSPECTION CHAMBER AND SERVICE CONNECTION
- PROPOSED SURFACE WATER DRAIN
- PROPOSED SURFACE WATER DRAINAGE MANHOLE
- EXISTING FOUL SEWER
- EXISTING FOUL MANHOLE
- PROPOSED UPGRADE WORKS

PLANNING

NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS SHOWN OTHERWISE;
2. ALL PRIMARY DRAINAGE DETAILS ARE TO COMPLY WITH THE REQUIREMENT OF IRISH WATER CODE OF PRACTICE;
3. PIPEWORK MATERIAL uPVC AND IS TO COMPLY WITH THE SECTION 3.13 OF IRISH WATER CODE OF PRACTICE FOR WASTE WATER INFRASTRUCTURE;
4. PRIOR TO CONSTRUCTION THE INVERT LEVELS OF THE EXISTING FOUL SEWER TO BE CONFIRMED

Ordnance Survey Ireland Licence No.
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REVISION	DATE	DESCRIPTION	REV BY	CHK BY
A	23.04.21	ISSUED TO IRISH WATER	SC	SS
B	28.04.21	REVISED AND REISSUED TO IRISH WATER	SC	SS

Consulting Engineers
Project Managers

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PROJECT	STRATEGIC HOUSING DEVELOPMENT AT BALLYMANY
CLIENT	BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED
TITLE	FOUL DRAINAGE LAYOUT SHEET 1 OF 5

Director	Proj. Eng.	Drawn by	DRG. No.	REV
SOR	SS	SC	D1920-MAL-00-XX-C-014	B
Scale 1:500 @A1	Checked SOR	Date MARCH '21		

FOUL WATER DRAINAGE NETWORK SCHEDULE

Upstream Manhole	CL(m)	US/L(m)	PN	Pipe Length(m)	DS/L(m)	Slope (1:X)	Pipe DIA (mm)
F-1	103.580	102.155	F-1.000	16.753	101.875	59.8	225
F-2	103.300	101.875	F-1.001	16.031	101.585	55.3	225
F-3	103.010	101.585	F-1.002	38.298	100.885	54.7	225
F-4	102.570	101.345	F-2.000	27.660	100.885	60.1	225
F-5	102.310	100.885	F-1.003	51.202	100.025	59.5	225
F-6	101.450	100.025	F-1.004	12.316	99.845	68.4	225
F-7	101.450	100.225	F-3.000	24.040	99.845	63.3	225
F-8	101.270	99.845	F-1.005	64.268	99.417	150.0	225
F-9	102.110	100.885	F-4.000	25.182	100.495	64.6	225
F-10	101.920	99.417	F-1.006	12.467	99.354	200.0	225
F-11	102.090	99.354	F-1.007	49.316	99.108	200.0	225
F-12	105.970	104.545	F-5.000	27.819	104.081	60.0	225
F-13	106.250	104.081	F-5.001	5.300	103.993	60.0	225
F-14	106.310	103.993	F-5.002	6.374	103.886	60.0	225
F-15	106.380	103.886	F-5.003	79.200	102.984	87.8	225
F-16	104.410	102.984	F-5.004	11.557	102.664	36.1	225
F-17	104.090	102.664	F-5.005	8.373	102.404	32.2	225
F-18	103.830	102.404	F-5.006	10.378	102.224	57.7	225
F-19	104.630	103.205	F-6.000	35.149	102.225	35.9	225
F-20	103.650	101.925	F-5.007	63.804	100.965	66.5	225
F-21	102.390	99.108	F-1.008	58.219	98.817	200.0	225
F-22	102.250	100.825	F-7.000	46.528	100.050	60.0	225
F-23	101.650	98.817	F-1.009	72.578	98.454	200.0	225
F-24	101.770	100.345	F-8.000	42.172	99.635	59.4	225
F-25	101.060	99.635	F-8.001	9.998	99.535	100.0	225
F-26	100.960	98.454	F-1.010	34.378	98.282	200.0	225
F-27	101.560	98.282	F-1.011	39.844	98.083	200.0	225
F-28	101.760	100.335	F-9.000	45.136	99.845	92.1	225
F-29	101.270	99.845	F-9.001	9.985	99.778	150.0	225
F-30	101.260	98.083	F-1.012	37.976	97.893	200.0	225
F-31	100.570	97.893	F-1.013	31.339	97.736	200.0	225
F-32	100.000	97.736	F-1.014	3.698	97.717	200.0	225
F-33	100.040	97.717	F-1.015	72.471	97.355	200.0	225
F-34	100.200	97.355	F-1.016	20.316	97.254	200.0	225
F-35	103.730	102.305	F-10.000	53.209	101.165	46.7	225
F-36	102.590	101.165	F-10.001	53.142	99.665	35.4	225
F-37	103.010	101.585	F-11.000	65.486	100.165	46.1	225
F-38	101.590	99.665	F-10.002	33.073	99.125	61.2	225
F-39	101.050	99.125	F-10.003	35.589	98.947	200.0	225
F-40	102.080	100.655	F-12.000	69.845	99.795	81.2	225
F-41	101.220	98.947	F-10.004	89.709	97.857	82.3	225
F-42	99.990	97.254	F-1.017	48.437	97.011	200.0	225
F-43	104.430	103.005	F-13.000	56.237	102.068	60.0	225
F-44	104.990	102.068	F-13.001	5.158	101.982	60.0	225
F-45	105.070	103.645	F-14.000	18.750	103.333	60.0	225
F-46	104.890	101.982	F-13.002	21.037	101.631	60.0	225
F-47	103.870	101.631	F-13.003	30.400	101.428	149.8	225
F-48	103.640	101.428	F-13.004	10.938	101.355	150.0	225
F-49	103.630	101.355	F-13.005	29.645	101.157	149.7	225
F-50	102.900	101.157	F-13.006	41.906	100.414	56.4	225
F-51	101.840	100.414	F-13.007	27.881	99.284	24.7	225
F-52	100.710	99.284	F-13.008	29.256	98.674	48.0	225
F-53	100.100	98.674	F-13.009	5.143	98.564	46.8	225
F-54	100.030	98.605	F-15.000	64.073	98.178	150.0	225
F-55	99.990	98.178	F-13.010	58.910	97.805	157.9	225
F-56	99.520	98.295	F-16.000	29.035	97.805	59.3	225
F-57	99.230	97.805	F-13.011	11.926	97.745	200.0	225
F-58	99.380	97.745	F-13.012	31.965	97.585	199.8	225
F-59	99.860	97.585	F-13.013	56.468	97.118	120.9	225
F-60	100.640	97.011	F-1.018	38.819	96.817	200.0	225
F-61	100.150	96.742	F-1.019	49.918	96.576	300.7	300
F-62	100.800	96.576	F-1.020	5.723	96.557	300.0	300
F-63	100.500	96.557	F-1.021	31.414	96.452	300.0	300
F-64	100.500	96.452	F-1.022	31.836	96.346	300.0	300
F-65	100.500	96.346	F-1.023	13.496	96.301	300.0	300
F-66	100.500	96.301	F-1.024	35.271	96.184	300.0	300
F-67	99.700	96.184	F-1.025	3.293	96.173	300.0	300
F-68	99.650	96.173	F-1.026	34.332	96.058	300.0	300
F-69	99.270	96.058	F-1.027	73.704	95.813	300.0	300
F-70	98.550	95.813	F-1.028	60.235	95.612	300.0	300
F-71	98.750	95.612	F-1.029	98.914	94.980	156.5	300

FOR CONTINUATION REFER TO SHEET No: 3

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

NORTH

SURFACE WATER ATTENUATION

SURFACE WATER ATTENUATION

EXISTING ø225 FOUL SEWER

EXISTING ø225 FOUL SEWER

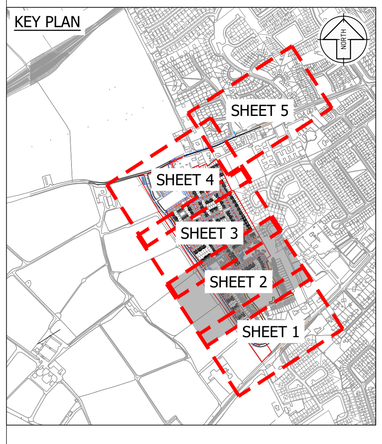
EXISTING ø225 FOUL SEWER

EXISTING ø225 FOUL SEWER

EXISTING ø225 FOUL SEWER

PHASE 1 DEVELOPMENT

KEY PLAN



LEGEND:

- PROPOSED FOUL WATER DRAINAGE AND MANHOLE
- PROPOSED LAST PRIVATE INSPECTION CHAMBER AND SERVICE CONNECTION
- PROPOSED SURFACE WATER DRAIN
- PROPOSED SURFACE WATER DRAINAGE MANHOLE
- EXISTING FOUL SEWER
- EXISTING FOUL MANHOLE
- PROPOSED UPGRADE WORKS

FOR CONTINUATION REFER TO SHEET No: 1

PLANNING

NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS SHOWN OTHERWISE;
2. ALL PRIMARY DRAINAGE DETAILS ARE TO COMPLY WITH THE REQUIREMENT OF IRISH WATER CODE OF PRACTICE;
3. PIPEWORK MATERIAL uPVC AND IS TO COMPLY WITH THE SECTION 3.13 OF IRISH WATER CODE OF PRACTICE FOR WASTE WATER INFRASTRUCTURE;
4. PRIOR TO CONSTRUCTION THE INVERT LEVELS OF THE EXISTING FOUL SEWER TO BE CONFIRMED

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REVISION	DATE	DESCRIPTION	REV BY	CHK BY
A	23.04.21	ISSUED TO IRISH WATER	SC	SS
B	28.04.21	REVISED AND REISSUED TO IRISH WATER	SC	SS

Consulting Engineers
Project Managers

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PROJECT	STRATEGIC HOUSING DEVELOPMENT AT BALLYMANY
CLIENT	BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED
TITLE	FOUL DRAINAGE LAYOUT SHEET 2 OF 5

Director	Proj. Eng.	Drawn by	DRG. No.	REV
SOR	SS	SC	D1920-MAL-00-XX-C-015	B
Scale 1:500 @A1	Checked SOR	Date MARCH '21		

FOUL WATER DRAINAGE NETWORK SCHEDULE

Upstream Manhole	CL(m)	US(I.L)m)	PN	Pipe Length(m)	DS(I.L)m)	Slope (1:X)	Pipe DIA (mm)
F-1	103.580	102.155	F-1.000	16.753	101.875	59.8	225
F-2	103.300	101.875	F-1.001	16.031	101.585	55.3	225
F-3	103.010	101.585	F-1.002	38.298	100.885	54.7	225
F-4	102.570	101.345	F-2.000	27.660	100.885	60.1	225
F-5	102.310	100.885	F-1.003	51.202	100.025	59.5	225
F-6	101.450	100.025	F-1.004	12.316	99.845	68.4	225
F-7	101.450	100.225	F-3.000	24.040	99.845	63.3	225
F-8	101.270	99.845	F-1.005	64.268	99.417	150.0	225
F-9	102.110	100.885	F-4.000	25.182	100.495	64.6	225
F-10	101.920	99.417	F-1.006	12.467	99.354	200.0	225
F-11	102.090	99.354	F-1.007	49.316	99.108	200.0	225
F-12	105.970	104.545	F-5.000	27.819	104.081	60.0	225
F-13	106.250	104.081	F-5.001	5.300	103.993	60.0	225
F-14	106.310	103.993	F-5.002	6.374	103.886	60.0	225
F-15	106.380	103.886	F-5.003	79.200	102.984	87.8	225
F-16	104.410	102.984	F-5.004	11.557	102.664	36.1	225
F-17	104.090	102.664	F-5.005	8.373	102.404	32.2	225
F-18	103.830	102.404	F-5.006	10.378	102.224	57.7	225
F-19	104.630	103.205	F-6.000	35.149	102.225	35.9	225
F-20	103.650	101.925	F-5.007	63.804	100.965	66.5	225
F-21	102.390	99.108	F-1.008	58.219	98.817	200.0	225
F-22	102.250	100.825	F-7.000	46.528	100.050	60.0	225
F-23	101.650	98.817	F-1.009	72.578	98.454	200.0	225
F-24	101.770	100.345	F-8.000	42.172	99.635	59.4	225
F-25	101.060	99.635	F-8.001	9.998	99.535	100.0	225
F-26	100.960	98.454	F-1.010	34.378	98.282	200.0	225
F-27	101.560	98.282	F-1.011	39.844	98.083	200.0	225
F-28	101.760	100.335	F-9.000	45.136	99.845	92.1	225
F-29	101.270	99.845	F-9.001	9.985	99.778	150.0	225
F-30	101.260	98.083	F-1.012	37.976	97.893	200.0	225
F-31	100.570	97.893	F-1.013	31.339	97.736	200.0	225
F-32	100.000	97.736	F-1.014	3.698	97.717	200.0	225
F-33	100.040	97.717	F-1.015	72.471	97.355	200.0	225
F-34	100.200	97.355	F-1.016	20.316	97.254	200.0	225
F-35	103.730	102.305	F-10.000	53.209	101.165	46.7	225
F-36	102.590	101.165	F-10.001	53.142	99.665	35.4	225
F-37	103.010	101.585	F-11.000	65.486	100.165	46.1	225
F-38	101.590	99.665	F-10.002	33.073	99.125	61.2	225
F-39	101.050	99.125	F-10.003	35.589	98.947	200.0	225
F-40	102.080	100.655	F-12.000	69.845	99.795	81.2	225
F-41	101.220	98.947	F-10.004	89.709	97.857	82.3	225
F-42	99.990	97.254	F-1.017	48.437	97.011	200.0	225
F-43	104.430	103.005	F-13.000	56.237	102.068	60.0	225
F-44	104.990	102.068	F-13.001	5.158	101.982	60.0	225
F-45	105.070	103.645	F-14.000	18.750	103.333	60.0	225
F-46	104.890	101.982	F-13.002	21.037	101.631	60.0	225
F-47	103.870	101.631	F-13.003	30.400	101.428	149.8	225
F-48	103.640	101.428	F-13.004	10.938	101.355	150.0	225
F-49	103.630	101.355	F-13.005	29.645	101.157	149.7	225
F-50	102.900	101.157	F-13.006	41.906	100.414	56.4	225
F-51	101.840	100.414	F-13.007	27.881	99.284	24.7	225
F-52	100.710	99.284	F-13.008	29.256	98.674	48.0	225
F-53	100.100	98.674	F-13.009	5.143	98.564	46.8	225
F-54	100.030	98.605	F-15.000	64.073	98.178	150.0	225
F-55	99.990	98.178	F-13.010	58.910	97.805	157.9	225
F-56	99.520	98.295	F-16.000	29.035	97.805	59.3	225
F-57	99.230	97.805	F-13.011	11.926	97.745	200.0	225
F-58	99.380	97.745	F-13.012	31.965	97.585	199.8	225
F-59	99.860	97.585	F-13.013	56.468	97.118	120.9	225
F-60	100.640	97.011	F-1.018	38.819	96.817	200.0	225
F-61	100.150	96.742	F-1.019	49.918	96.576	300.7	300
F-62	100.800	96.576	F-1.020	5.723	96.557	300.0	300
F-63	100.500	96.557	F-1.021	31.414	96.452	300.0	300
F-64	100.500	96.452	F-1.022	31.836	96.346	300.0	300
F-65	100.500	96.346	F-1.023	13.496	96.301	300.0	300
F-66	100.500	96.301	F-1.024	35.271	96.184	300.0	300
F-67	99.700	96.184	F-1.025	3.293	96.173	300.0	300
F-68	99.650	96.173	F-1.026	34.332	96.058	300.0	300
F-69	99.270	96.058	F-1.027	73.704	95.813	300.0	300
F-70	98.550	95.813	F-1.028	60.235	95.612	300.0	300
F-71	98.750	95.612	F-1.029	98.914	94.980	156.5	300

FOR CONTINUATION REFER TO SHEET No: 4

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

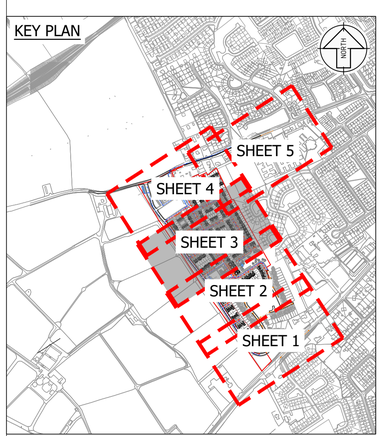
NORTH

SURFACE WATER ATTENUATION

SURFACE WATER ATTENUATION

SURFACE WATER ATTENUATION

KEY PLAN



LEGEND:

- PROPOSED FOUL WATER DRAINAGE AND MANHOLE
- PROPOSED LAST PRIVATE INSPECTION CHAMBER AND SERVICE CONNECTION
- PROPOSED SURFACE WATER DRAIN
- PROPOSED SURFACE WATER DRAINAGE MANHOLE
- EXISTING FOUL SEWER
- EXISTING FOUL MANHOLE
- PROPOSED UPGRADE WORKS

FOR CONTINUATION REFER TO SHEET No: 2

PLANNING

NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS SHOWN OTHERWISE;
2. ALL PRIMARY DRAINAGE DETAILS ARE TO COMPLY WITH THE REQUIREMENT OF IRISH WATER CODE OF PRACTICE;
3. PIPEWORK MATERIAL uPVC AND IS TO COMPLY WITH THE SECTION 3.13 OF IRISH WATER CODE OF PRACTICE FOR WASTE WATER INFRASTRUCTURE;
4. PRIOR TO CONSTRUCTION THE INVERT LEVELS OF THE EXISTING FOUL SEWER TO BE CONFIRMED

REVISION	DATE	DESCRIPTION	REV BY	CHK BY
A	23.04.21	ISSUED FOR PLANNING	SC	SS
B	28.04.21	REVISED AND REISSUED TO IRISH WATER	SC	SS

Consulting Engineers
Project Managers

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PROJECT	STRATEGIC HOUSING DEVELOPMENT AT BALLYMANY
CLIENT	BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED
TITLE	FOUL DRAINAGE LAYOUT SHEET 3 OF 5

Director	Proj. Eng.	Drawn by	DRG. No.	REV
SOR	SS	SC	D1920-MAL-00-XX-C-016	B
Scale 1:500 @A1	Checked SOR	Date MARCH '21		

FOUL WATER DRAINAGE NETWORK SCHEDULE

Upstream Manhole	CL(m)	USIL(m)	PN	Pipe Length(m)	DSIL(m)	Slope (1:X)	Pipe DIA (mm)
F-1	103.580	102.155	F-1.000	16.753	101.875	59.8	225
F-2	103.300	101.875	F-1.001	16.031	101.585	55.3	225
F-3	103.010	101.585	F-1.002	38.298	100.885	54.7	225
F-4	102.570	101.345	F-2.000	27.660	100.885	60.1	225
F-5	102.310	100.885	F-1.003	51.202	100.025	59.5	225
F-6	101.450	100.025	F-1.004	12.316	99.845	68.4	225
F-7	101.450	100.225	F-3.000	24.040	99.845	63.3	225
F-8	101.270	99.845	F-1.005	64.268	99.417	150.0	225
F-9	102.110	100.885	F-4.000	25.182	100.495	64.6	225
F-10	101.920	99.417	F-1.006	12.467	99.354	200.0	225
F-11	102.090	99.354	F-1.007	49.316	99.108	200.0	225
F-12	105.970	104.545	F-5.000	27.819	104.081	60.0	225
F-13	106.250	104.081	F-5.001	5.300	103.993	60.0	225
F-14	106.310	103.993	F-5.002	6.374	103.886	60.0	225
F-15	106.380	103.886	F-5.003	79.200	102.984	87.8	225
F-16	104.410	102.984	F-5.004	11.557	102.664	36.1	225
F-17	104.090	102.664	F-5.005	8.373	102.404	32.2	225
F-18	103.830	102.404	F-5.006	10.378	102.224	57.7	225
F-19	104.630	103.205	F-6.000	35.149	102.225	35.9	225
F-20	103.650	101.925	F-5.007	63.804	100.965	66.5	225
F-21	102.390	99.108	F-1.008	58.219	98.817	200.0	225
F-22	102.250	100.825	F-7.000	46.528	100.050	60.0	225
F-23	101.650	98.817	F-1.009	72.578	98.454	200.0	225
F-24	101.770	100.345	F-8.000	42.172	99.635	59.4	225
F-25	101.060	99.635	F-8.001	9.998	99.535	100.0	225
F-26	100.960	98.454	F-1.010	34.378	98.282	200.0	225
F-27	101.560	98.282	F-1.011	39.844	98.083	200.0	225
F-28	101.760	100.335	F-9.000	45.136	99.845	92.1	225
F-29	101.270	99.845	F-9.001	9.985	99.778	150.0	225
F-30	101.260	98.083	F-1.012	37.976	97.893	200.0	225
F-31	100.570	97.893	F-1.013	31.339	97.736	200.0	225
F-32	100.000	97.736	F-1.014	3.698	97.717	200.0	225
F-33	100.040	97.717	F-1.015	72.471	97.355	200.0	225
F-34	100.200	97.355	F-1.016	20.316	97.254	200.0	225
F-35	103.730	102.305	F-10.000	53.209	101.165	46.7	225
F-36	102.590	101.165	F-10.001	53.142	99.665	35.4	225
F-37	103.010	101.585	F-11.000	65.486	100.165	46.1	225
F-38	101.590	99.665	F-10.002	33.073	99.125	61.2	225
F-39	101.050	99.125	F-10.003	35.589	98.947	200.0	225
F-40	102.080	100.655	F-12.000	69.845	99.795	81.2	225
F-41	101.220	98.947	F-10.004	89.709	97.857	82.3	225
F-42	99.990	97.254	F-1.017	48.437	97.011	200.0	225
F-43	104.430	103.005	F-13.000	56.237	102.068	60.0	225
F-44	104.990	102.068	F-13.001	5.158	101.982	60.0	225
F-45	105.070	103.645	F-14.000	18.750	103.333	60.0	225
F-46	104.890	101.982	F-13.002	21.037	101.631	60.0	225
F-47	103.870	101.631	F-13.003	30.400	101.428	149.8	225
F-48	103.640	101.428	F-13.004	10.938	101.355	150.0	225
F-49	103.630	101.355	F-13.005	29.645	101.157	149.7	225
F-50	102.900	101.157	F-13.006	41.906	100.414	56.4	225
F-51	101.840	100.414	F-13.007	27.881	99.284	24.7	225
F-52	100.710	99.284	F-13.008	29.256	98.674	48.0	225
F-53	100.100	98.674	F-13.009	5.143	98.564	46.8	225
F-54	100.030	98.605	F-15.000	64.073	98.178	150.0	225
F-55	99.990	98.178	F-13.010	58.910	97.805	157.9	225
F-56	99.520	98.295	F-16.000	29.035	97.805	59.3	225
F-57	99.230	97.805	F-13.011	11.926	97.745	200.0	225
F-58	99.380	97.745	F-13.012	31.965	97.585	199.8	225
F-59	99.860	97.585	F-13.013	56.468	97.118	120.9	225
F-60	100.640	97.011	F-1.018	38.819	96.817	200.0	225
F-61	100.150	96.742	F-1.019	49.918	96.576	300.7	300
F-62	100.800	96.576	F-1.020	5.723	96.557	300.0	300
F-63	100.500	96.557	F-1.021	31.414	96.452	300.0	300
F-64	100.500	96.452	F-1.022	31.836	96.346	300.0	300
F-65	100.500	96.346	F-1.023	13.496	96.301	300.0	300
F-66	100.500	96.301	F-1.024	35.271	96.184	300.0	300
F-67	99.700	96.184	F-1.025	3.293	96.173	300.0	300
F-68	99.650	96.173	F-1.026	34.332	96.058	300.0	300
F-69	99.270	96.058	F-1.027	73.704	95.813	300.0	300
F-70	98.550	95.813	F-1.028	60.235	95.612	300.0	300
F-71	98.750	95.612	F-1.029	98.914	94.980	156.5	300

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

NORTH

STANDHOUSE ROAD

SURFACE WATER ATTENUATION

SURFACE WATER ATTENUATION

SURFACE WATER ATTENUATION

SURFACE WATER ATTENUATION

EXISTING Ø225 FOUL SEWER

EXISTING STAND-OFF MANHOLE

PROPOSED UPGRADE OF EXISTING FOUL SEWER ON STANDHOUSE ROAD

STANDHOUSE ROAD

001-028

029 030 031 032 033 034 035 036 037 038 039 040 041 042 043 044 045 046 047 048 049 050 051 052

053 054 055 056 057-058 059-060 061-062 063-064 065-066 067-068 069-070 071-072 073 074 075 076 077 078 079 080 081 082 083 084

085 086 087 088 089 090 091-092 093-094 095-096 097-098 099 100 101 102 103 104 105-106 107-108 109-110 111-112

113 114 115 129 130 131 132 133 134 135 136 247 248 249 250 251 252 253

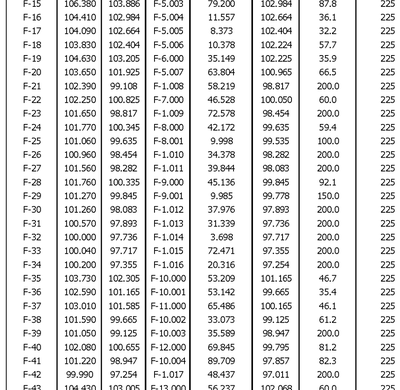
F-1.000 F-1.001 F-1.002 F-1.003 F-1.004 F-1.005 F-1.006 F-1.007 F-1.008 F-1.009 F-1.010 F-1.011 F-1.012 F-1.013 F-1.014 F-1.015 F-1.016 F-1.017 F-1.018 F-1.019 F-1.020 F-1.021 F-1.022 F-1.023 F-1.024 F-1.025 F-1.026 F-1.027 F-1.028 F-1.029 F-2.000 F-3.000 F-4.000 F-5.000 F-5.001 F-5.002 F-5.003 F-5.004 F-5.005 F-5.006 F-5.007 F-6.000 F-7.000 F-8.000 F-8.001 F-9.000 F-9.001 F-10.000 F-10.001 F-10.002 F-10.003 F-10.004 F-11.000 F-12.000 F-13.000 F-13.001 F-13.002 F-13.003 F-13.004 F-13.005 F-13.006 F-13.007 F-13.008 F-13.009 F-13.010 F-13.011 F-13.012 F-13.013 F-14.000 F-15.000 F-16.000

F-1 F-2 F-3 F-4 F-5 F-6 F-7 F-8 F-9 F-10 F-11 F-12 F-13 F-14 F-15 F-16 F-17 F-18 F-19 F-20 F-21 F-22 F-23 F-24 F-25 F-26 F-27 F-28 F-29 F-30 F-31 F-32 F-33 F-34 F-35 F-36 F-37 F-38 F-39 F-40 F-41 F-42 F-43 F-44 F-45 F-46 F-47 F-48 F-49 F-50 F-51 F-52 F-53 F-54 F-55 F-56 F-57 F-58 F-59 F-60 F-61 F-62 F-63 F-64 F-65 F-66 F-67 F-68 F-69 F-70 F-71

FOR CONTINUATION REFER TO SHEET No: 5

FOR CONTINUATION REFER TO SHEET No: 3

KEY PLAN



LEGEND:

- PROPOSED FOUL WATER DRAINAGE AND MANHOLE
- PROPOSED LAST PRIVATE INSPECTION CHAMBER AND SERVICE CONNECTION
- PROPOSED SURFACE WATER DRAIN
- PROPOSED SURFACE WATER DRAINAGE MANHOLE
- EXISTING FOUL SEWER
- EXISTING FOUL MANHOLE
- PROPOSED UPGRADE WORKS

PLANNING

NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS SHOWN OTHERWISE;
2. ALL PRIMARY DRAINAGE DETAILS ARE TO COMPLY WITH THE REQUIREMENT OF IRISH WATER CODE OF PRACTICE;
3. PIPEWORK MATERIAL uPVC AND IS TO COMPLY WITH THE SECTION 3.13 OF IRISH WATER CODE OF PRACTICE FOR WASTE WATER INFRASTRUCTURE;
4. PRIOR TO CONSTRUCTION THE INVERT LEVELS OF THE EXISTING FOUL SEWER TO BE CONFIRMED

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REVISION	DATE	DESCRIPTION	REV BY	CHK BY
A	23.04.21	ISSUED TO IRISH WATER	SC	SS
B	28.04.21	REVISED AND REISSUED TO IRISH WATER	SC	SS

Consulting Engineers
Project Managers

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PROJECT	STRATEGIC HOUSING DEVELOPMENT AT BALLYMANY
CLIENT	BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED
TITLE	FOUL DRAINAGE LAYOUT SHEET 4 OF 5

Director	Proj. Eng.	Drawn by	DRG. No.	REV
SOR	SS	SC	D1920-MAL-00-XX-C-017	B
Scale 1:500 @A1	Checked SOR	Date MARCH '21		

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

NORTH

FOR CONTINUATION REFER TO SHEET No: 4

F-70

F-1.028

F-71

STANDHOUSE ROAD

F-1.029

PROPOSED UPGRADE OF EXISTING FOUL SEWER ON STANDHOUSE ROAD

PROPOSED CONNECTION TO EXISTING FOUL SEWER ON STANDHOUSE ROAD
CL: 96.18
EXISTING IL: 94.89
PROPOSED IL: 94.98

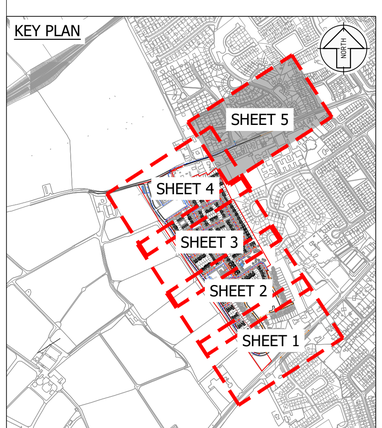
EXISTING Ø225 FOUL SEWER

STANDHOUSE ROAD

FOUL WATER DRAINAGE NETWORK SCHEDULE

Upstream Manhole	CL(m)	US/IL(m)	PN	Pipe Length(m)	DS/IL(m)	Slope (1:X)	Pipe DIA (mm)
F-1	103.580	102.155	F-1.000	16.753	101.875	59.8	225
F-2	103.300	101.875	F-1.001	16.031	101.585	55.3	225
F-3	103.010	101.585	F-1.002	38.298	100.885	54.7	225
F-4	102.570	101.345	F-2.000	27.660	100.885	60.1	225
F-5	102.310	100.885	F-1.003	51.202	100.025	59.5	225
F-6	101.450	100.025	F-1.004	12.316	99.845	68.4	225
F-7	101.450	100.225	F-3.000	24.040	99.845	63.3	225
F-8	101.270	99.845	F-1.005	64.268	99.417	150.0	225
F-9	102.110	100.885	F-4.000	25.182	100.495	64.6	225
F-10	101.920	99.417	F-1.006	12.467	99.354	200.0	225
F-11	102.090	99.354	F-1.007	49.316	99.108	200.0	225
F-12	105.970	104.545	F-5.000	27.819	104.081	60.0	225
F-13	106.250	104.081	F-5.001	5.300	103.993	60.0	225
F-14	106.310	103.993	F-5.002	6.374	103.886	60.0	225
F-15	106.380	103.886	F-5.003	79.200	102.984	87.8	225
F-16	104.410	102.984	F-5.004	11.557	102.664	36.1	225
F-17	104.090	102.664	F-5.005	8.373	102.404	32.2	225
F-18	103.830	102.404	F-5.006	10.378	102.224	57.7	225
F-19	104.630	103.205	F-6.000	35.149	102.225	35.9	225
F-20	103.650	101.925	F-5.007	63.804	100.965	66.5	225
F-21	102.390	99.108	F-1.008	58.219	98.817	200.0	225
F-22	102.250	100.825	F-7.000	46.528	100.050	60.0	225
F-23	101.650	98.817	F-1.009	72.578	98.454	200.0	225
F-24	101.770	100.345	F-8.000	42.172	99.635	59.4	225
F-25	101.060	99.635	F-8.001	9.998	99.535	100.0	225
F-26	100.960	98.454	F-1.010	34.378	98.282	200.0	225
F-27	101.560	98.282	F-1.011	39.844	98.083	200.0	225
F-28	101.760	100.335	F-9.000	45.136	99.845	92.1	225
F-29	101.270	99.845	F-9.001	9.985	99.778	150.0	225
F-30	101.260	98.083	F-1.012	37.976	97.893	200.0	225
F-31	100.570	97.893	F-1.013	31.339	97.736	200.0	225
F-32	100.000	97.736	F-1.014	3.698	97.717	200.0	225
F-33	100.040	97.717	F-1.015	72.471	97.355	200.0	225
F-34	100.200	97.355	F-1.016	20.316	97.254	200.0	225
F-35	103.730	102.305	F-10.000	53.209	101.165	46.7	225
F-36	102.590	101.165	F-10.001	53.142	99.665	35.4	225
F-37	103.010	101.585	F-11.000	65.486	100.165	46.1	225
F-38	101.590	99.665	F-10.002	33.073	99.125	61.2	225
F-39	101.050	99.125	F-10.003	35.589	98.947	200.0	225
F-40	102.080	100.655	F-12.000	69.845	99.795	81.2	225
F-41	101.220	98.947	F-10.004	89.709	97.857	82.3	225
F-42	99.990	97.254	F-1.017	48.437	97.011	200.0	225
F-43	104.430	103.005	F-13.000	56.237	102.068	60.0	225
F-44	104.990	102.068	F-13.001	5.158	101.982	60.0	225
F-45	105.070	103.645	F-14.000	18.750	103.333	60.0	225
F-46	104.890	101.982	F-13.002	21.037	101.631	60.0	225
F-47	103.870	101.631	F-13.003	30.400	101.428	149.8	225
F-48	103.640	101.428	F-13.004	10.938	101.355	150.0	225
F-49	103.630	101.355	F-13.005	29.645	101.157	149.7	225
F-50	102.900	101.157	F-13.006	41.906	100.414	56.4	225
F-51	101.840	100.414	F-13.007	27.881	99.284	24.7	225
F-52	100.710	99.284	F-13.008	29.256	98.674	48.0	225
F-53	100.100	98.674	F-13.009	5.143	98.564	46.8	225
F-54	100.030	98.605	F-15.000	64.073	98.178	150.0	225
F-55	99.990	98.178	F-13.010	58.910	97.805	157.9	225
F-56	99.520	98.295	F-16.000	29.035	97.805	59.3	225
F-57	99.230	97.805	F-13.011	11.926	97.745	200.0	225
F-58	99.380	97.745	F-13.012	31.965	97.585	199.8	225
F-59	99.860	97.585	F-13.013	56.468	97.118	120.9	225
F-60	100.640	97.011	F-1.018	38.819	96.817	200.0	225
F-61	100.150	96.742	F-1.019	49.918	96.576	300.7	300
F-62	100.800	96.576	F-1.020	5.723	96.557	300.0	300
F-63	100.500	96.557	F-1.021	31.414	96.452	300.0	300
F-64	100.500	96.452	F-1.022	31.836	96.346	300.0	300
F-65	100.500	96.346	F-1.023	13.496	96.301	300.0	300
F-66	100.500	96.301	F-1.024	35.271	96.184	300.0	300
F-67	99.700	96.184	F-1.025	3.293	96.173	300.0	300
F-68	99.650	96.173	F-1.026	34.332	96.058	300.0	300
F-69	99.270	96.058	F-1.027	73.704	95.813	300.0	300
F-70	98.550	95.813	F-1.028	60.235	95.612	300.0	300
F-71	98.750	95.612	F-1.029	98.914	94.980	156.5	300

KEY PLAN



LEGEND:

- PROPOSED FOUL WATER DRAINAGE AND MANHOLE
- PROPOSED LAST PRIVATE INSPECTION CHAMBER AND SERVICE CONNECTION
- PROPOSED SURFACE WATER DRAIN
- PROPOSED SURFACE WATER DRAINAGE MANHOLE
- EXISTING FOUL SEWER
- EXISTING FOUL MANHOLE
- PROPOSED UPGRADE WORKS

PLANNING

NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS SHOWN OTHERWISE;
2. ALL PRIMARY DRAINAGE DETAILS ARE TO COMPLY WITH THE REQUIREMENT OF IRISH WATER CODE OF PRACTICE;
3. PIPEWORK MATERIAL uPVC AND IS TO COMPLY WITH THE SECTION 3.13 OF IRISH WATER CODE OF PRACTICE FOR WASTE WATER INFRASTRUCTURE;
4. PRIOR TO CONSTRUCTION THE INVERT LEVELS OF THE EXISTING FOUL SEWER TO BE CONFIRMED

REVISION	DATE	DESCRIPTION	REV BY	CHK BY
A	23.04.21	ISSUED FOR PLANNING	SC	SS
B	28.04.21	REVISED AND REISSUED TO IRISH WATER	SC	SS

Consulting Engineers
Project Managers

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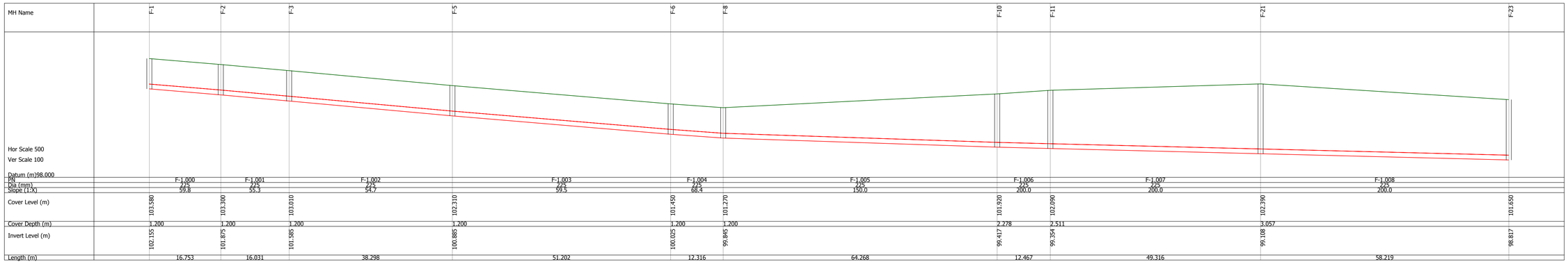
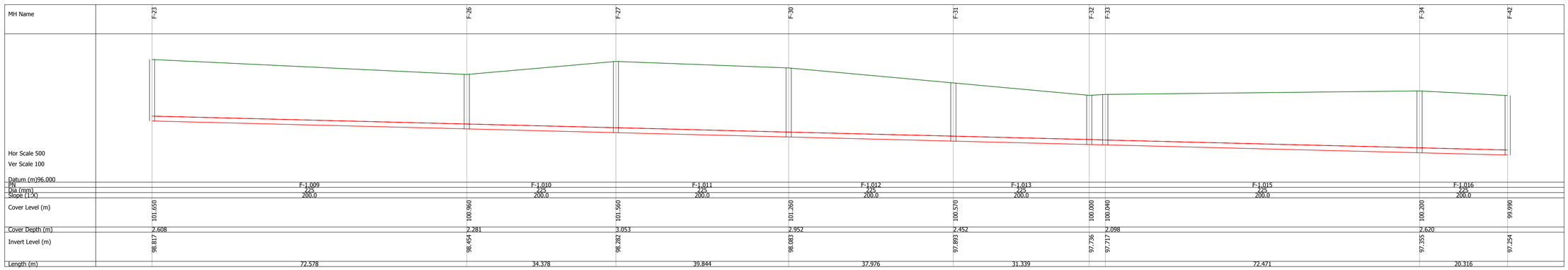
PROJECT	STRATEGIC HOUSING DEVELOPMENT AT BALLYMANY
CLIENT	BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED
TITLE	FOUL DRAINAGE LAYOUT SHEET 5 OF 5

Director	Proj. Eng.	Drawn by	DRG. No.	REV
SOR	SS	SC	D1920-MAL-00-XX-C-018	B
Scale 1:500 @A1	Checked SOR	Date MARCH '21		

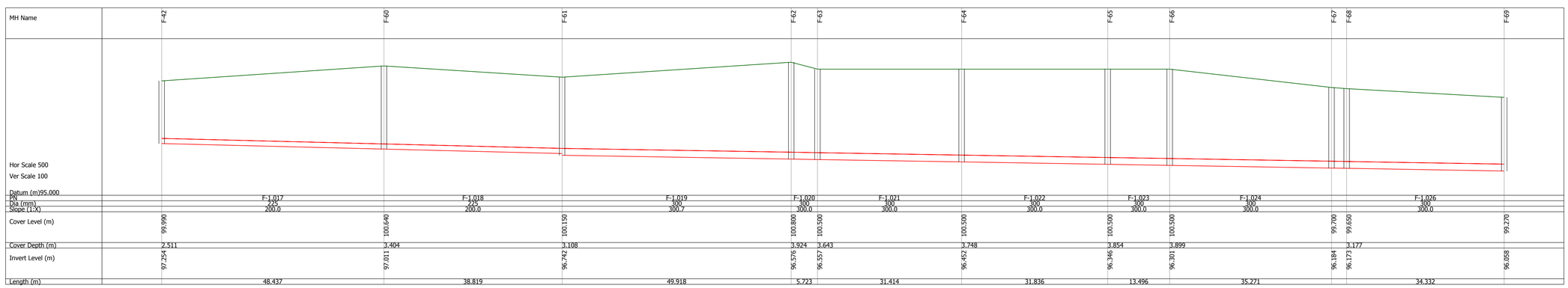
DO NOT SCALE USE FIGURED DIMENSIONS ONLY



MH Name	F-1	F-2	F-3	F-5	F-6	F-8	F-10	F-11	F-21	F-23
PN	F-1.000	F-1.001	F-1.002	F-1.003	F-1.004	F-1.005	F-1.006	F-1.007	F-1.008	
Dia (mm)	225	225	225	225	225	225	225	225	225	
Slope (1:X)	59.8	55.3	54.7	59.5	68.4	150.0	200.0	200.0	200.0	
Cover Level (m)	103.580	103.300	103.010	102.310	101.450	101.270	101.920	102.090	102.390	101.650
Cover Depth (m)	1.200	1.200	1.200	1.200	1.200	1.200	2.278	2.511	3.057	
Invert Level (m)	102.155	101.875	101.585	100.885	100.025	99.845	99.417	99.354	99.108	98.817
Length (m)	16.753	16.031	38.298	51.202	12.316	64.268	12.467	49.316	58.219	



MH Name	F-23	F-26	F-27	F-30	F-31	F-32	F-33	F-34	F-42
PN	F-1.009	F-1.010	F-1.011	F-1.012	F-1.013	F-1.015	F-1.016		
Dia (mm)	225	225	225	225	225	225	225		
Slope (1:X)	200.0	200.0	200.0	200.0	200.0	200.0	200.0		
Cover Level (m)	101.650	100.960	101.560	101.260	100.570	100.000	100.040	100.200	99.990
Cover Depth (m)	2.608	2.281	3.053	2.952	2.452	2.098		2.620	
Invert Level (m)	98.817	98.454	98.282	98.083	97.893	97.736	97.717	97.355	97.254
Length (m)	72.578	34.378	39.844	37.976	31.339	72.471		20.316	



MH Name	F-42	F-60	F-61	F-62	F-63	F-64	F-65	F-66	F-67	F-68	F-69
PN	F-1.017	F-1.018	F-1.019	F-1.020	F-1.021	F-1.022	F-1.023	F-1.024	F-1.026		
Dia (mm)	225	225	300	300	300	300	300	300	300		
Slope (1:X)	200.0	200.0	300.7	300.0	300.0	300.0	300.0	300.0	300.0		
Cover Level (m)	99.990	100.640	100.150	100.800	100.500	100.500	100.500	100.500	99.700	99.650	99.270
Cover Depth (m)	2.511	3.404	3.108	3.924	3.643	3.748	3.854	3.899	3.177		
Invert Level (m)	97.254	97.011	96.742	96.576	96.557	96.452	96.346	96.301	96.184	96.173	96.058
Length (m)	48.437	38.819	49.918	5.723	31.414	31.836	13.496	35.271	34.332		

PLANNING

NOTES:

REVISION	DATE	DESCRIPTION	REV BY	CHK BY
A	23.04.21	ISSUED TO IRISH WATER	SC	SS

Consulting Engineers
Project Managers

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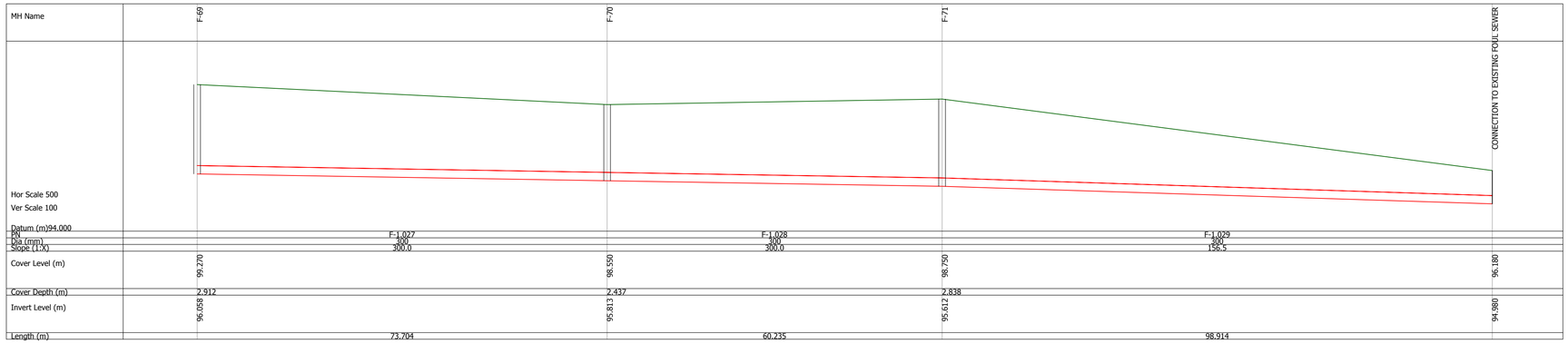
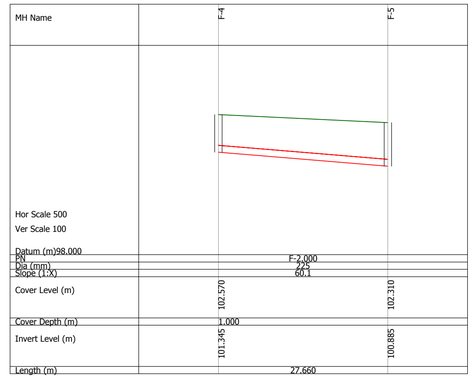
MUIR ASSOCIATES

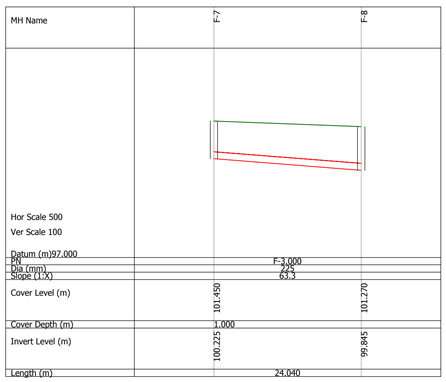
PROJECT	STRATEGIC HOUSING DEVELOPMENT AT BALLYMANY
CLIENT	BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED
TITLE	FOUL DRAINAGE LONGSECTIONS SHEET 1 OF 4

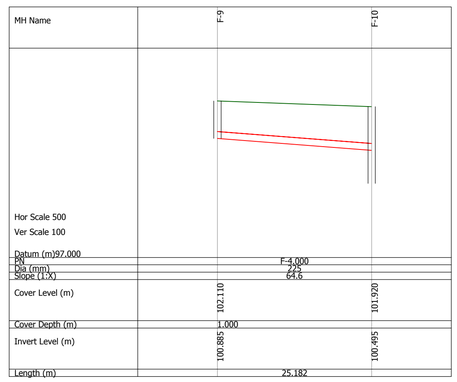
Director	Proj. Eng.	Drawn by	DRG. No.	REV
SOR	SS	SC	D1920-MAL-00-XX-C-019	A
Scale: AS SHOWN @A1	Checked: SS	Date: APR '21		

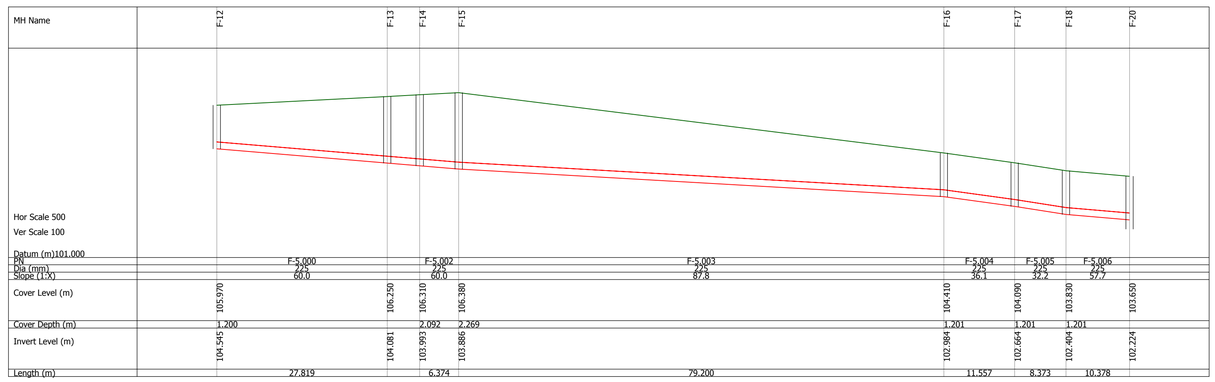
DO NOT SCALE USE FIGURED DIMENSIONS ONLY

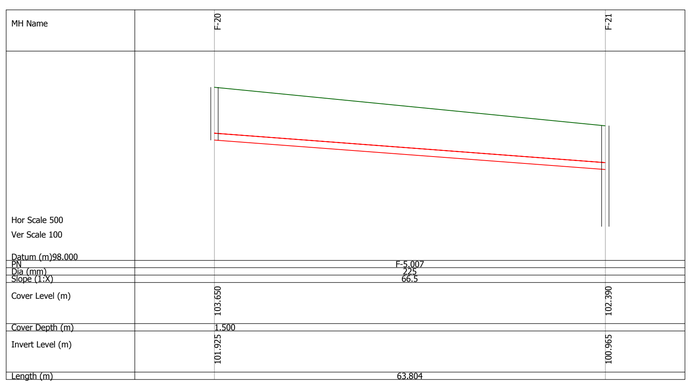


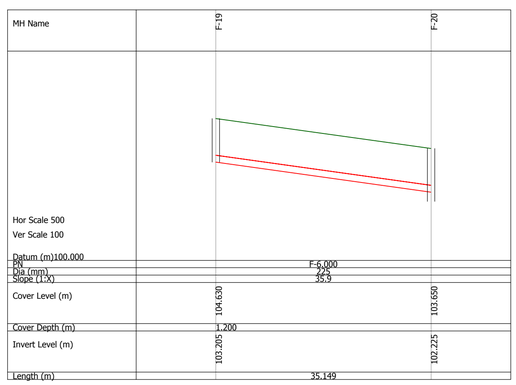


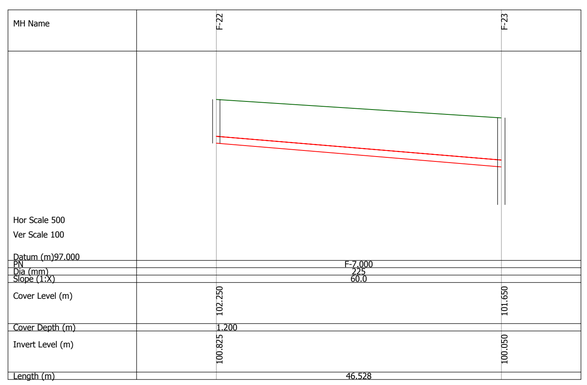












PLANNING

NOTES:

REVISION	DATE	DESCRIPTION	REV BY	CHK BY
A	23.04.21	ISSUED TO IRISH WATER	SC	SS

Consulting Engineers
Project Managers

Marketing Network House,
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PROJECT	STRATEGIC HOUSING DEVELOPMENT AT BALLYMANY
CLIENT	BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED
TITLE	FOUL DRAINAGE LONGSECTIONS SHEET 2 OF 4

Director	Proj. Eng.	Drawn by	DRG. No.	REV
SOR	SS	SC	D1920-MAL-00-XX-C-020	A
Scale: AS SHOWN @A1	Checked: SS	Date: APR '21		

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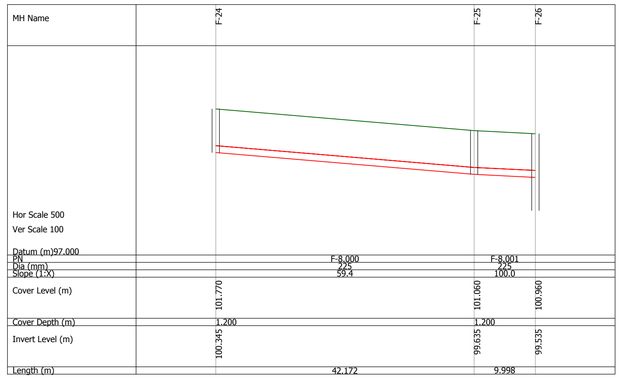

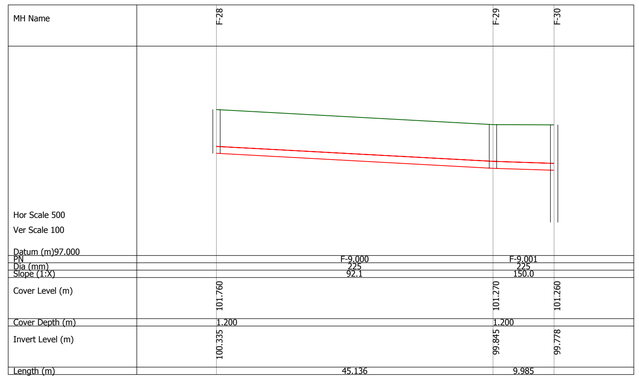

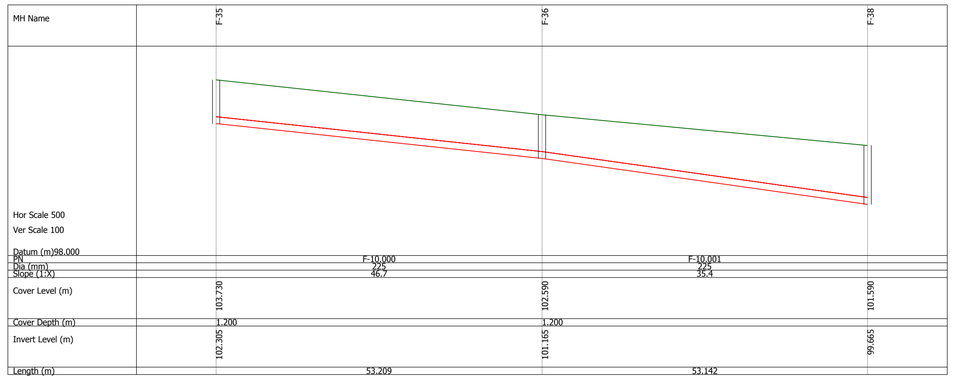

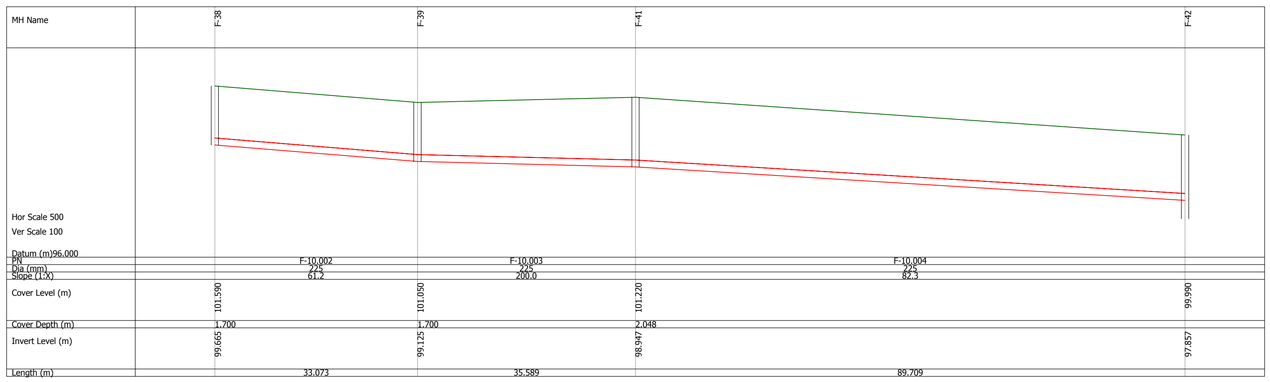

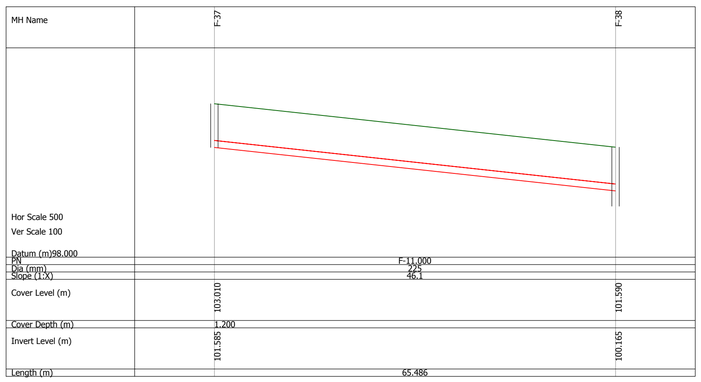

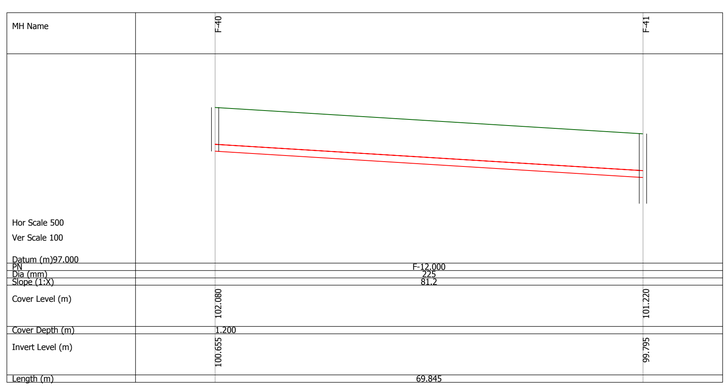

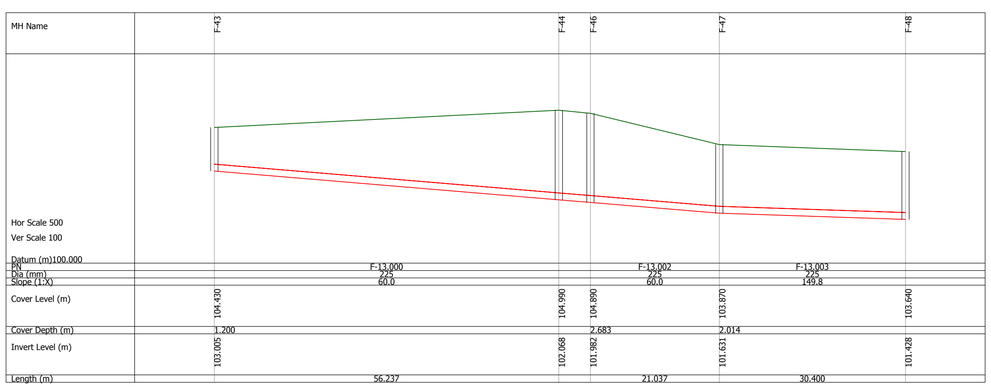

PLANNING

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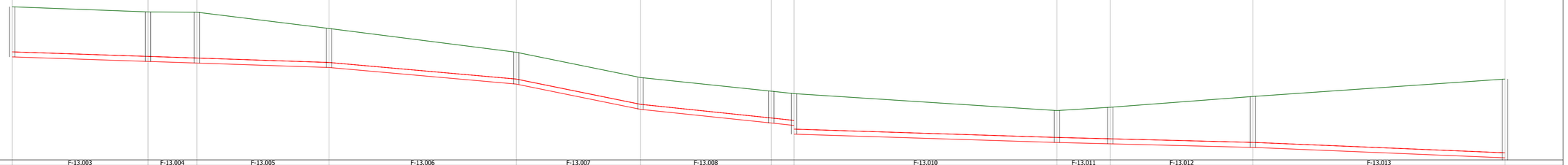
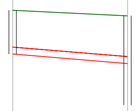
PROJECT	STRATEGIC HOUSING DEVELOPMENT AT BALLYMANY
CLIENT	BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED
TITLE	FOUL DRAINAGE LONGSECTIONS SHEET 3 OF 4

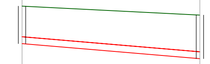
Director	Proj. Eng.	Drawn by	DRG. No.	REV
SOR	SS	SC	D1920-MAL-00-XX-C-021	A
Scale: AS SHOWN @A1	Checked: SS	Date: APR '21		

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

MH Name	F-47		F-48	F-49		F-50		F-51		F-52	F-53	F-55		F-57	F-58	F-59		F-60
Hor Scale 500 Ver Scale 100 Datum (m)97.025																		
PN	F-13.003		F-13.004	F-13.005		F-13.006		F-13.007		F-13.008		F-13.010		F-13.011	F-13.012	F-13.013		
Dia (mm)	225		225	225		225		225		225		225		225	225	225		
Slope (1:X)	149.8		150.0	149.7		56.4		24.7		48.0		157.9		200.0	199.8	120.9		
Cover Level (m)	103.870		103.640	103.630		102.900		101.840		100.710	100.100	99.990		99.230	99.380	99.860		100.640
Cover Depth (m)	2.014		1.987	2.050		1.518		1.201		1.201		1.587		1.200	1.410	2.050		
Invert Level (m)	101.631		101.428	101.355		101.157		100.414		99.284	98.674	98.178		97.805	97.745	97.585		97.118
Length (m)	30.400		10.938	29.645		41.906		27.881		29.256		58.910		11.926	31.965	56.468		

MH Name	F-45	F-46
Hor Scale 500 Ver Scale 100 Datum (m)100.000		
PN	F-14.000	
Dia (mm)	225	
Slope (1:X)	60.0	
Cover Level (m)	105.070	104.899
Cover Depth (m)	1.200	
Invert Level (m)	103.645	103.333
Length (m)	18.750	

MH Name	F-54	F-55
Hor Scale 500 Ver Scale 100 Datum (m)96.000		
PN	F-15.000	
Dia (mm)	225	
Slope (1:X)	150.0	
Cover Level (m)	100.030	99.990
Cover Depth (m)	1.200	
Invert Level (m)	98.605	98.178
Length (m)	64.073	

MH Name	F-56	F-57
Hor Scale 500 Ver Scale 100 Datum (m)95.000		
PN	F-16.000	
Dia (mm)	225	
Slope (1:X)	59.3	
Cover Level (m)	99.520	99.230
Cover Depth (m)	1.000	
Invert Level (m)	98.295	97.805
Length (m)	29.035	

PLANNING

NOTES:

REVISION	DATE	DESCRIPTION	REV BY	CHK BY
A	23.04.21	ISSUED TO IRISH WATER	SC	SS

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PROJECT	STRATEGIC HOUSING DEVELOPMENT AT BALLYMANY			
CLIENT	BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED			
TITLE	FOUL DRAINAGE LONGSECTIONS SHEET 4 OF 4			
Director SOR	Proj. Eng. SS	Drawn by SC	DRG. No. D1920-MAL-00-XX-C-022	REV A
Scale AS SHOWN @A1	Checked SS	Date APR '21		

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

NOTES:

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2. DO NOT SCALE, USE FIGURED DIMENSIONS ONLY.
3. PIPEWORK MATERIAL IS TO BE HDPE PE-80 SDR-17 UNLESS OTHERWISE NOTED AND IS TO COMPLY WITH SECTION 3.9 OF IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE.
4. PROPOSED BULK WATER METER TO COMPLY WITH SECTION 2.6.6 OF THE IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE AND IS TO BE CHOSEN AND SUPPLIED BY IRISH WATER.
5. ALL WATERMAIN DETAILS ARE TO COMPLY WITH THE REQUIREMENTS OF IRISH WATER CODE OF PRACTICE.
6. FOR APARTMENTS OR SIMILAR PROPERTIES A METRE WILL BE INSTALLED INTERNALLY WITHIN THE PREMISES IN ACCORDANCE WITH THE BUILDING CONTROL AUTHORITY REQUIREMENTS AND SUBJECT TO REVIEW BY IRISH WATER.

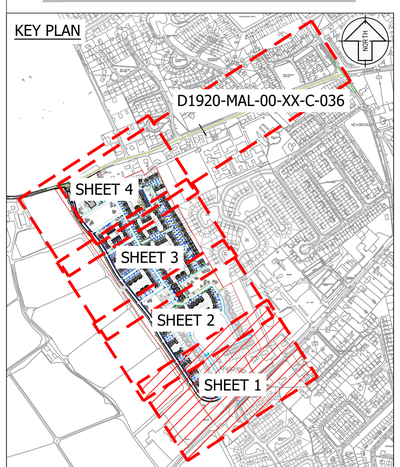
LEGEND
PROPOSED WATERMAIN INFRASTRUCTURE

- PROPOSED 100 ⌀ WATERMAIN
- PROPOSED 150 ⌀ WATERMAIN
- PROPOSED 200 ⌀ WATERMAIN
- PROPOSED UPGRADE WORKS TO EXISTING INFRASTRUCTURE
- PROPOSED BULK WATER METER — Me
- PROPOSED SLUICE VALVE — SV
- PROPOSED SCOUR VALVE — ScV
- PROPOSED FIRE HYDRANT — FH
- PROPOSED AIR VALVE — AV
- PROPOSED BOUNDARY BOX — BB
- PROPOSED MANIFOLD CHAMBER — MC

LEGEND
EXISTING WATERMAIN INFRASTRUCTURE

- EXISTING 150 ⌀ WATERMAIN
- EXISTING IRISH WATER WATERMAIN
- EXISTING BULK WATER METER — Me.EX
- EXISTING SLUICE VALVE — SV
- EXISTING SCOUR VALVE — ScV
- EXISTING HYDRANT — H
- EXISTING AIR VALVE — av

KEY PLAN



PHASE 1 DEVELOPMENT

NORTH

PROPOSED CONNECTION TO EXISTING ⌀150mm WATERMAIN

EXISTING KIOSK CONTAINING METER READING PANEL SUITABLY LOCATED FOR GAINING ACCESS

CONNECTED TO EXISTING LOCAL AUTHORITY WATERMAIN

Town Bdy

UND

Tennis Grounds

PLANNING

NOTES:

REVISION	DATE	DESCRIPTION	REV BY	CHK BY
A	23.04.21	ISSUED TO IRISH WATER	SC	SS
B	28.04.21	REVISED AND REISSUED TO IRISH WATER	SC	SS

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MUIR ASSOCIATES

PROJECT	STRATEGIC HOUSING DEVELOPMENT AT BALLYMANY
CLIENT	BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED
TITLE	WATER MAIN LAYOUT SHEET 1 OF 4

Director	Proj. Eng.	Drawn by	DRG. No.	REV
SOR	SS	SC	D1920-MAL-00-XX-C-023	B
Scale 1:500 @A1	Checked SOR	Date MARCH '21		

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4. PROPOSED BULK WATER METER TO COMPLY WITH SECTION 2.6.6 OF THE IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE AND IS TO BE CHOSEN AND SUPPLIED BY IRISH WATER.
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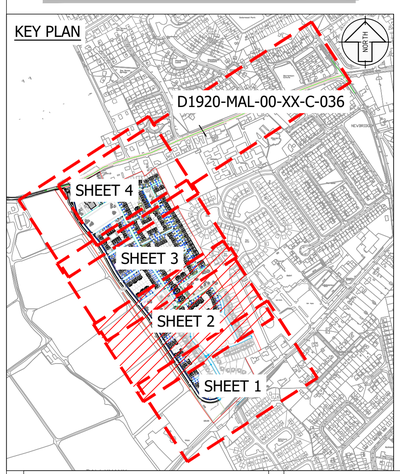
LEGEND
PROPOSED WATERMAIN INFRASTRUCTURE

- PROPOSED 100 ⌀ WATERMAIN
- PROPOSED 150 ⌀ WATERMAIN
- PROPOSED 200 ⌀ WATERMAIN
- PROPOSED UPGRADE WORKS TO EXISTING INFRASTRUCTURE
- PROPOSED BULK WATER METER — Me
- PROPOSED SLUICE VALVE — SV
- PROPOSED SCOUR VALVE — ScV
- PROPOSED FIRE HYDRANT — FH
- PROPOSED AIR VALVE — AV
- PROPOSED BOUNDARY BOX — BB
- PROPOSED MANIFOLD CHAMBER — MC

LEGEND
EXISTING WATERMAIN INFRASTRUCTURE

- EXISTING 150 ⌀ WATERMAIN
- EXISTING IRISH WATER WATERMAIN
- EXISTING BULK WATER METER — Me.EX
- EXISTING SLUICE VALVE — SV
- EXISTING SCOUR VALVE — ScV
- EXISTING HYDRANT — H
- EXISTING AIR VALVE — av

KEY PLAN



PROPOSED CONNECTION TO EXISTING ⌀150mm WATERMAIN

PROPOSED CONNECTION TO EXISTING ⌀150mm WATERMAIN

PHASE 1 DEVELOPMENT

NORTH

The Elms

PLANNING

NOTES:

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REVISION	DATE	DESCRIPTION	REV BY	CHK BY
A	23.04.21	ISSUED TO IRISH WATER	SC	SS
B	28.04.21	REVISED AND REISSUED TO IRISH WATER	SC	SS

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PROJECT	STRATEGIC HOUSING DEVELOPMENT AT BALLYMANY
CLIENT	BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED
TITLE	WATER MAIN LAYOUT SHEET 2 OF 4

Director	Proj. Eng.	Drawn by	DRG. No.	REV
SOR	SS	SC	D1920-MAL-00-XX-C-024	B
Scale 1:500 @A1	Checked SOR	Date MARCH '21		

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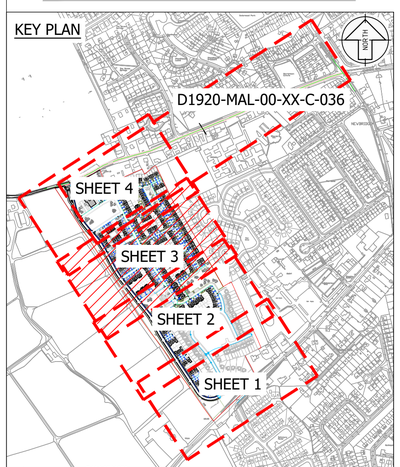
LEGEND
PROPOSED WATERMAIN INFRASTRUCTURE

- PROPOSED 100 ø WATERMAIN
- PROPOSED 150 ø WATERMAIN
- PROPOSED 200 ø WATERMAIN
- PROPOSED UPGRADE WORKS TO EXISTING INFRASTRUCTURE
- PROPOSED BULK WATER METER (Me)
- PROPOSED SLUICE VALVE (SV)
- PROPOSED SCOUR VALVE (ScV)
- PROPOSED FIRE HYDRANT (FH)
- PROPOSED AIR VALVE (AV)
- PROPOSED BOUNDARY BOX (BB)
- PROPOSED MANIFOLD CHAMBER (MC)

LEGEND
EXISTING WATERMAIN INFRASTRUCTURE

- EXISTING 150 ø WATERMAIN
- EXISTING IRISH WATER WATERMAIN
- EXISTING BULK WATER METER (Me.EX)
- EXISTING SLUICE VALVE (SV)
- EXISTING SCOUR VALVE (ScV)
- EXISTING HYDRANT (H)
- EXISTING AIR VALVE (av)

KEY PLAN



SCOUR VALVE TO BE CONNECTED TO THE CLOSEST SURFACE WATER DRAINAGE MANHOLE

PLANNING

NOTES:

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REVISION	DATE	DESCRIPTION	REV BY	CHK BY
A	23.04.21	ISSUED TO IRISH WATER	SC	SS
B	28.04.21	REVISED AND REISSUED TO IRISH WATER	SC	SS

Consulting Engineers
Project Managers

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PROJECT	STRATEGIC HOUSING DEVELOPMENT AT BALLYMANY
CLIENT	BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED
TITLE	WATER MAIN LAYOUT SHEET 3 OF 4

Director	Proj. Eng.	Drawn by	DRG. No.	REV
SOR	SS	SC	D1920-MAL-00-XX-C-025	B
Scale 1:500 @A1	Checked SOR	Date MARCH '21		

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NORTH

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PROPOSED WATERMAIN INFRASTRUCTURE

- PROPOSED 100 ⌀ WATERMAIN
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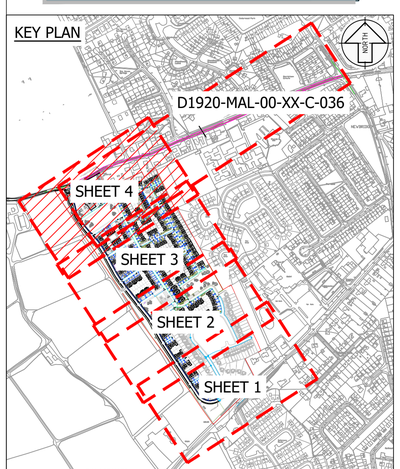
- PROPOSED 200 ⌀ WATERMAIN
- PROPOSED UPGRADE WORKS TO EXISTING INFRASTRUCTURE
- PROPOSED BULK WATER METER — Me
- PROPOSED SLUICE VALVE — SV
- PROPOSED SCOUR VALVE — ScV
- PROPOSED FIRE HYDRANT — FH
- PROPOSED AIR VALVE — AV
- PROPOSED BOUNDARY BOX — BB
- PROPOSED MANIFOLD CHAMBER — MC

LEGEND
EXISTING WATERMAIN INFRASTRUCTURE

- EXISTING 150 ⌀ WATERMAIN
- EXISTING IRISH WATER WATERMAIN
- EXISTING BULK WATER METER — Me.EX
- EXISTING SLUICE VALVE — SV
- EXISTING SCOUR VALVE — ScV
- EXISTING HYDRANT — H
- EXISTING AIR VALVE — av

KEY PLAN



PROPOSED CONNECTION TO EXISTING 50mm DIAMETER WATERMAIN

EXISTING 50mm uPVC WATERMAIN

EXISTING 50mm DIAMETER uPVC AND 3" DIAMETER uPVC WATERMAINS TO BE UPGRADED TO 200mm DIAMETER HDPE WATERMAIN

KIOSK CONTAINING METER READING PANEL SUITABLY LOCATED FOR GAINING ACCESS

EXISTING 3" uPVC

EXISTING 50mm DIAMETER uPVC AND 3" DIAMETER uPVC WATERMAINS TO BE UPGRADED TO 200mm DIAMETER HDPE WATERMAIN

EXISTING 3" uPVC

FOR FULL WATERMAIN UPGRADE EXTENT REFER TO DRAWING No. D1920-MAL-00-XX-C-036

SCOUR VALVE TO BE CONNECTED TO THE CLOSEST SURFACE WATER DRAINAGE MANHOLE

BM 100.92

PLANNING

NOTES:

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A	23.04.21	ISSUED FOR PLANNING	SC	SS
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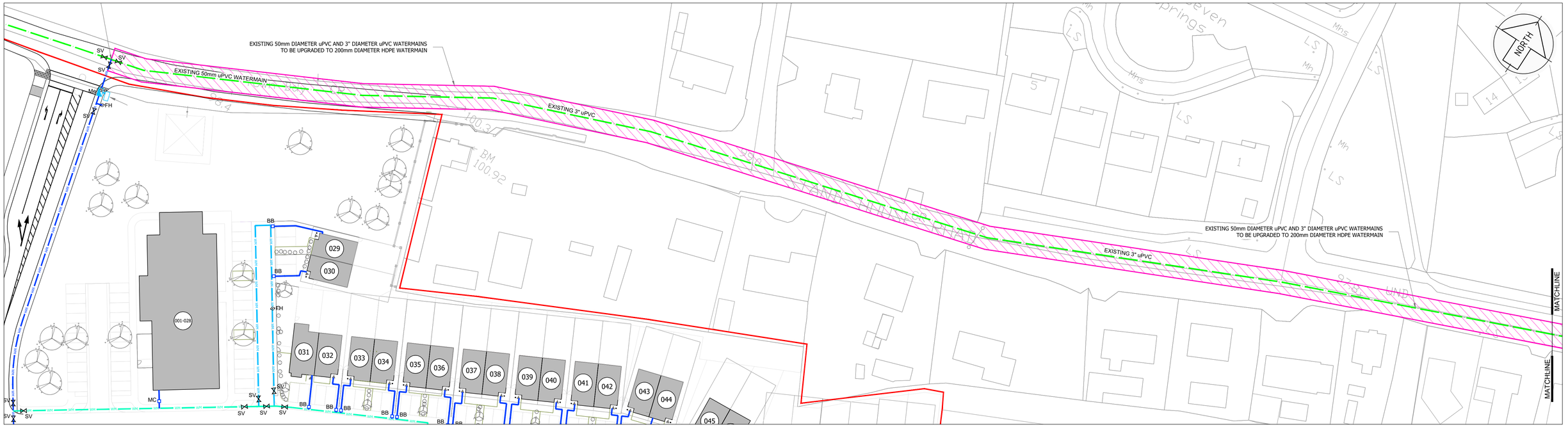
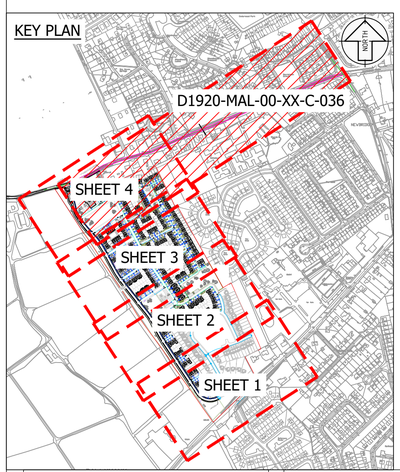
CLIENT	BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED
TITLE	WATER MAIN LAYOUT SHEET 4 OF 4

Director	Proj. Eng.	Drawn by	DRG. No.	REV
SOR	SS	SC	D1920-MAL-00-XX-C-026	B
Scale 1:500 @A1	Checked SOR	Date MARCH '21		

DO NOT SCALE USE FIGURED DIMENSIONS ONLY





NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS SHOWN OTHERWISE.
2. DO NOT SCALE, USE FIGURED DIMENSIONS ONLY.
3. PIPEWORK MATERIAL IS TO BE HDPE PE-80 SDR-17 UNLESS OTHERWISE NOTED AND IS TO COMPLY WITH SECTION 3.9 OF IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE.
4. PROPOSED BULK WATER METER TO COMPLY WITH SECTION 2.6.6 OF THE IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE AND IS TO BE CHOSEN AND SUPPLIED BY IRISH WATER.
5. ALL WATERMAIN DETAILS ARE TO COMPLY WITH THE REQUIREMENTS OF IRISH WATER CODE OF PRACTICE.
6. FOR APARTMENTS OR SIMILAR PROPERTIES A METRE WILL BE INSTALLED INTERNALLY WITHIN THE PREMISES IN ACCORDANCE WITH THE BUILDING CONTROL AUTHORITY REQUIREMENTS AND SUBJECT TO REVIEW BY IRISH WATER.

LEGEND
PROPOSED WATERMAIN INFRASTRUCTURE

PROPOSED 100 ø WATERMAIN	
PROPOSED 150 ø WATERMAIN	
PROPOSED 200 ø WATERMAIN	
PROPOSED UPGRADE WORKS TO EXISTING INFRASTRUCTURE	
PROPOSED BULK WATER METER	Me
PROPOSED SLUICE VALVE	SV
PROPOSED SCOUR VALVE	ScV
PROPOSED FIRE HYDRANT	FH
PROPOSED AIR VALVE	AV
PROPOSED BOUNDARY BOX	BB
PROPOSED MANIFOLD CHAMBER	MC

LEGEND
EXISTING WATERMAIN INFRASTRUCTURE

EXISTING 150 ø WATERMAIN	
EXISTING IRISH WATER WATERMAIN	
EXISTING BULK WATER METER	Me.EX
EXISTING SLUICE VALVE	SV
EXISTING SCOUR VALVE	ScV
EXISTING HYDRANT	H
EXISTING AIR VALVE	av

PLANNING

NOTES:

REVISION	DATE	DESCRIPTION	REV BY	CHK BY
A	29.04.21	ISSUED TO IRISH WATER	SC	SS

Consulting Engineers
Project Managers

MUIR ASSOCIATES

Marketing Network House,
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Telephone: +353-1-6762788
email: info@muir.ie www.muir.ie

PROJECT	STRATEGIC HOUSING DEVELOPMENT AT BALLYMANY
CLIENT	BRIARGATE DEVELOPMENTS NEWBRIDGE LIMITED
TITLE	STANDHOUSE ROAD WATERMAIN UPGRADE WORKS

Director	Proj. Eng.	Drawn by	DRG. No.	REV
SOR	SS	SC	D1920-MAL-00-XX-C-036	A
Scale 1:500 @A1	Checked SOR	Date APRIL '21		

Seamus O' Rourke

Marketing Network House
Argyle Square
Morehampton Road
Dublin

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Cathrach Theas
Cathair Chorcaí

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

www.water.ie

11 November 2020

Re: CDS20006671 pre-connection enquiry - Subject to contract | Contract denied

Connection for Housing Development of 360 unit(s) at Ballymany Road, Newbridge, Co. Kildare

Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Wastewater connection at Ballymany Road, Newbridge, Co. Kildare (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.**
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	
Wastewater Connection	Irish Water has determined capacity does not exist in the network to accommodate the proposed development at this time. However the connection will be feasible subject to competition of upgrades works due to be completed by February 2021. (Section NE06.1 of the Upper Liffey Valley Contracts 2A &2B)
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 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:

Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

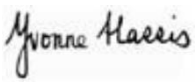
Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

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,



Yvonne Harris

Head of Customer Operations

Seamus O'Rourke

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

www.water.ie

15 December 2020

Re: CDS20007354 pre-connection enquiry - Subject to contract | Contract denied

Connection for Housing Development of 360 unit(s) at Ballymany Road, Newbridge, Co. Kildare

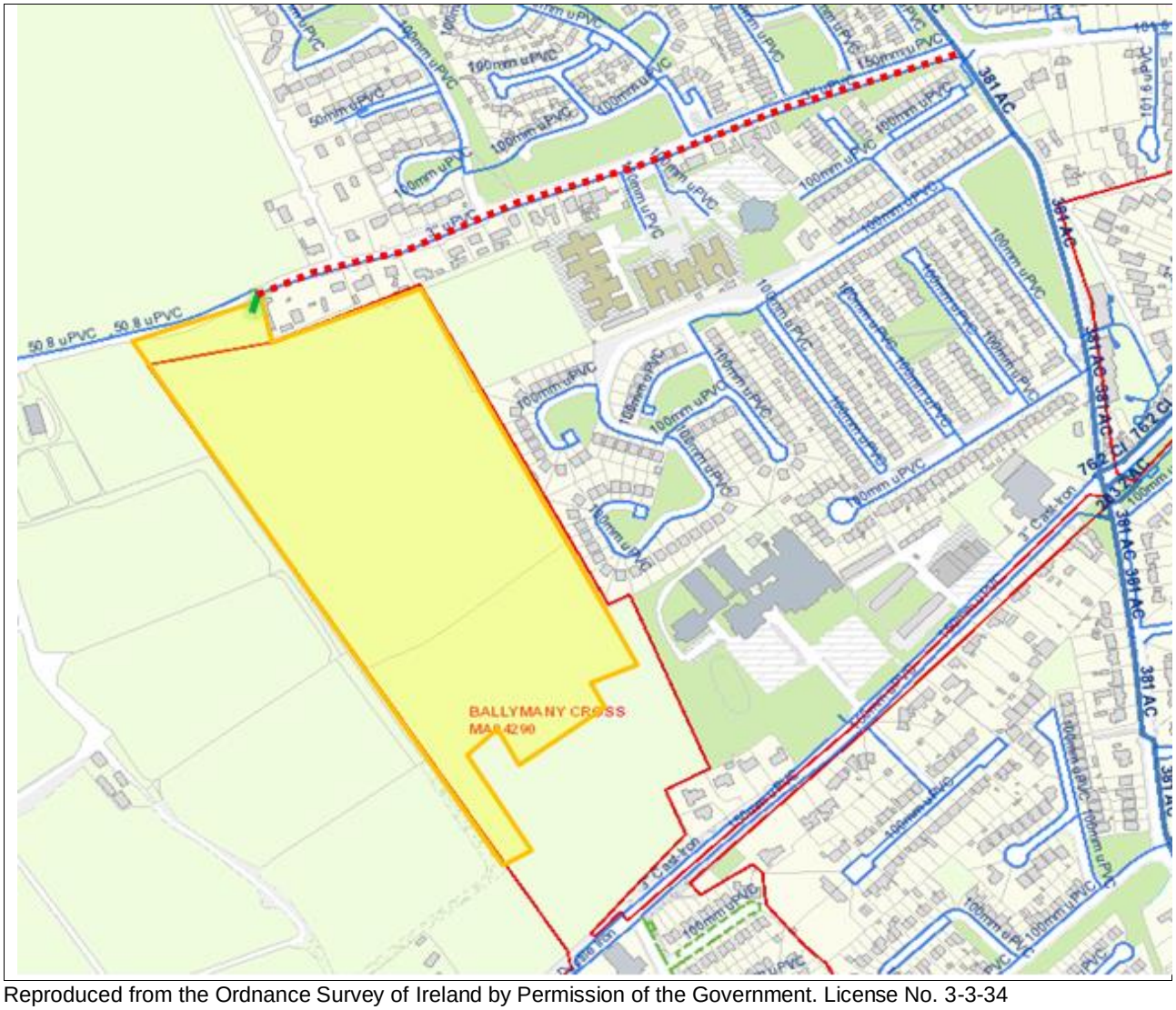
Dear Sir/Madam,

Irish Water has reviewed your pre-connection enquiry in relation to a Water connection at Ballymany Road, Newbridge, Co. Kildare (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 subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	In order to accommodate the proposed connection to Irish Water network at the Premises, the following upgrade works are required: • Connection main – Approx. 10m of new 200mm ID pipe main to be laid to connect the site development (see yellow sections below) to the new 200mm ID main. (See green line in figure). Bulk meter to be installed on the connection main. • New main – Approx. 700m of new 200mm ID pipe main to replace the existing 3" uPVC main. See red dashed line in figure. Irish Water currently does not have any plans to extend its network in this area. Should you wish to progress with the connection you will be required to fund this network extension. Also, 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.
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 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:



Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

General Notes:

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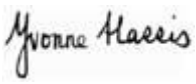
2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.
3) The feedback provided is subject to a Connection Agreement/contract 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,



Yvonne Harris

Head of Customer Operations

APPENDIX C – FOUL DRAINAGE DISCHARGE CALCULATIONS

Development Strategic Housing Development at Ballymany, Newbridge

Job No: D1920

Section Wastewater Design Flow Calculations

Element	Occupancy Rate	Average Daily Flow (l/p/d)	Average Day/Peak week Flow factor	Peak Demand factor (for pipe sizing)
Domestic	2.7	150	1	6
Creche	10	150	1	6

	Mean Organic Loading				
	BOD	**COD**	**SS**	**N**	**P**
mg/l	300	400	200	50	10
Total (kg/day)	40.97	54.63	27.32	6.83	1.37

Element	Unit	No of Units	Occupancy Rate (p/unit)	Total Occupancy (persons)		Daily Flow per Person* (l/p/d)	Daily Flow (l/d)	Daily Peak Flow (l/d)	Average Flow (l/s)	Factored (6) Peak Demand for pipe sizing (l/s)
Residential	Dwelling	336	2.7	907.2		150	**136,080**	**136,080**	**1.58**	**9.45**
Creche	Person	10	1	10		50	**500**	**500**	**0.01**	**0.03**
						Total	**136,580**	**136,580**	**1.58**	**9.48**

APPENDIX D – SURFACE WATER DRAINAGE INFORMATION

Scheme	Strategic Housing Development at Ballymany	**Page**	1		
		Job No	D1920		
Section	Surface Water Management	**Date**	September '20		
		By	SS **Chk**	SOR	

MUIR

Calculations

A. Allowable Discharge

Calculations are in accordance with the Greater Dublin Strategic Drainage Study (GDSDS), Volume 2, New Developments, Flood Estimation for Small Catchments (Institute of Hydrology report No. 124)

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

AREA =	500000	m^2	
	50	Ha	
AREA =	0.5000	km^2	
SAAR =	911	(From http://www.met.ie/climate/IE_AAR_8110_V1.txt)	
SOIL =	0.30	(From Table D1 Different Classes of Soils from GDSDS)	

$QBAR_{rural}$ = 124.02 l/s

Therefore $QBAR_{rural}$/ha is **2.48 l/s/ha**

AREA =	113830	m^2 (From Development Drawings)	
	11.383	Ha	
AREA =	0.1138	km^2	

Therefore $QBAR_{site}$ is **28.23 l/s**

To obtain the 1 year, 30 year and 100 year throttle rates the growth curve advised for use for developments, which is shown in GDSDS Appendix C is required. Proposed values for Dublin are:

1 year factor =	0.85
30 year factor =	2.10
100 year factor =	2.60

Therefore limited discharge rates are:

		GDSDS			Proposed Discharge Rate		
1 year factor =	2.11	l/s/ha	24.0	l/s	l/s/ha	28.2	l/s
30 year factor =	5.21	l/s/ha	59.3	l/s	l/s/ha	28.2	l/s
100 year factor =	6.45	l/s/ha	73.4	l/s	l/s/ha	28.2	l/s

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm Drainage Network Catchment A-B-C-D

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	PIMP (%)	100
M5-60 (mm)	15.300	Add Flow / Climate Change (%)	20
Ratio R	0.283	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm Drainage Network Catchment A-B-C-D

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S-1.000	19.589	0.360	54.4	0.053	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-1.001	18.654	0.230	81.1	0.034	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-1.002	34.505	0.635	54.3	0.033	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-2.000	30.759	0.220	139.8	0.086	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-1.003	55.209	0.935	59.0	0.055	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-1.004	8.304	0.138	60.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-3.000	24.022	0.152	158.0	0.073	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S-1.000	50.00	4.18	102.155	0.053	0.0	0.0	1.4	1.78	70.7	8.6
S-1.001	50.00	4.40	101.795	0.086	0.0	0.0	2.3	1.45	57.8	14.0
S-1.002	50.00	4.72	101.565	0.119	0.0	0.0	3.2	1.78	70.7	19.4
S-2.000	50.00	4.46	101.550	0.086	0.0	0.0	2.3	1.10	43.9	13.9
S-1.003	50.00	5.26	100.930	0.260	0.0	0.0	7.0	1.71	67.8	42.2
S-1.004	50.00	5.34	99.995	0.260	0.0	0.0	7.0	1.69	67.2	42.2
S-3.000	50.00	4.39	100.409	0.073	0.0	0.0	2.0	1.04	41.3	11.8

Network Design Table for Storm Drainage Network Catchment A-B-C-D

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S-1.005	63.564	0.259	245.0	0.069	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-4.000	23.880	0.150	159.2	0.080	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-1.006	17.348	0.053	325.0	0.019	0.00	0.0	0.600	o	375	Pipe/Conduit	
S-1.007	50.133	0.154	325.0	0.049	0.00	0.0	0.600	o	375	Pipe/Conduit	
S-1.008	17.099	0.053	325.0	0.036	0.00	0.0	0.600	o	375	Pipe/Conduit	
S-5.000	25.989	0.153	170.0	0.062	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-5.001	9.286	0.055	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-5.002	85.356	1.333	64.0	0.150	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-5.003	10.818	0.330	32.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-5.004	9.270	0.269	34.5	0.017	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-5.005	13.945	0.230	60.6	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-6.000	35.159	0.950	37.0	0.053	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-5.006	46.584	0.770	60.5	0.092	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-1.009	10.568	0.087	121.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S-1.010	32.259	0.010	3225.9	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S-1.005	50.00	6.40	99.782	0.402	0.0	0.0	10.9	1.00	70.7	65.3
S-4.000	50.00	4.39	100.615	0.080	0.0	0.0	2.2	1.03	41.1	13.0
S-1.006	50.00	6.69	99.448	0.501	0.0	0.0	13.6	1.00	110.4	81.4
S-1.007	49.32	7.53	99.394	0.550	0.0	0.0	14.7	1.00	110.4	88.1
S-1.008	48.52	7.81	99.240	0.585	0.0	0.0	15.4	1.00	110.4	92.3
S-5.000	50.00	4.43	104.555	0.062	0.0	0.0	1.7	1.00	39.8	10.1
S-5.001	50.00	4.59	104.402	0.062	0.0	0.0	1.7	1.00	39.8	10.1
S-5.002	50.00	5.46	104.348	0.212	0.0	0.0	5.7	1.64	65.1	34.5
S-5.003	50.00	5.54	103.015	0.212	0.0	0.0	5.7	2.29	91.2	34.5
S-5.004	50.00	5.60	102.685	0.229	0.0	0.0	6.2	2.24	88.9	37.2
S-5.005	50.00	5.74	102.416	0.243	0.0	0.0	6.6	1.68	66.9	39.5
S-6.000	50.00	4.27	103.135	0.053	0.0	0.0	1.4	2.16	85.8	8.6
S-5.006	50.00	6.13	102.110	0.388	0.0	0.0	10.5	2.03	143.1	63.1
S-1.009	48.26	7.91	99.112	0.973	0.0	0.0	25.4	1.84	293.2	152.7
S-1.010	44.49	9.45	98.910	0.973	0.0	0.0	25.4	0.35	55.4«	152.7

Network Design Table for Storm Drainage Network Catchment A-B-C-D

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S-7.000	45.797	1.030	44.5	0.202	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-7.001	63.023	0.770	81.8	0.127	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-7.002	10.325	0.042	245.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-1.011	18.035	0.106	170.0	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-8.000	23.348	0.360	64.9	0.044	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-1.012	89.374	0.526	170.0	0.089	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-9.000	43.465	0.479	90.7	0.193	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-9.001	9.999	0.059	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-1.013	35.848	0.146	245.0	0.041	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-1.014	38.205	0.118	325.0	0.036	0.00	0.0	0.600	o	375	Pipe/Conduit	
S-10.000	52.119	0.490	106.4	0.163	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-10.001	9.985	0.060	166.4	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-1.015	35.148	0.108	325.0	0.054	0.00	0.0	0.600	o	375	Pipe/Conduit	
S-1.016	33.033	0.082	405.0	0.061	0.00	0.0	0.600	o	450	Pipe/Conduit	
S-1.017	8.632	0.021	405.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S-7.000	50.00	4.39	102.255	0.202	0.0	0.0	5.5	1.97	78.2	32.8
S-7.001	50.00	4.99	101.150	0.329	0.0	0.0	8.9	1.74	122.9	53.5
S-7.002	50.00	5.16	100.380	0.329	0.0	0.0	8.9	1.00	70.7	53.5
S-1.011	50.00	4.30	99.200	0.000	6.1	0.0	1.0	1.00	39.8	6.1
S-8.000	50.00	4.24	100.815	0.044	0.0	0.0	1.2	1.63	64.7	7.1
S-1.012	50.00	5.79	99.094	0.132	6.1	0.0	4.8	1.00	39.8	28.8
S-9.000	50.00	4.53	100.075	0.193	0.0	0.0	5.2	1.37	54.6	31.4
S-9.001	50.00	4.69	99.596	0.193	0.0	0.0	5.2	1.00	39.8	31.4
S-1.013	50.00	6.39	98.493	0.366	6.1	0.0	11.1	1.00	70.7	66.8
S-1.014	50.00	7.02	98.272	0.402	6.1	0.0	12.1	1.00	110.4	72.7
S-10.000	50.00	4.69	100.345	0.163	0.0	0.0	4.4	1.27	50.4	26.5
S-10.001	50.00	4.85	99.855	0.176	0.0	0.0	4.8	1.01	40.2	28.6
S-1.015	49.08	7.61	98.154	0.633	6.1	0.0	18.0	1.00	110.4	108.2
S-1.016	47.59	8.16	97.971	0.694	6.1	0.0	19.1	1.00	159.7	114.6
S-1.017	47.22	8.30	97.890	0.694	6.1	0.0	19.1	1.00	159.7	114.6

Network Design Table for Storm Drainage Network Catchment A-B-C-D

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S-1.018	72.182	0.178	405.0	0.119	0.00	0.0	0.600	o	450	Pipe/Conduit	
S-1.019	7.900	0.040	200.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S-1.020	9.131	0.046	200.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S-1.021	29.676	0.005	5935.2	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S-1.022	4.724	0.028	170.0	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-11.000	45.971	0.880	52.2	0.174	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-11.001	12.249	0.260	47.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-11.002	28.763	0.720	39.9	0.122	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-11.003	40.973	1.030	39.8	0.122	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-11.004	27.323	0.570	47.9	0.092	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-11.005	35.932	1.310	27.4	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-11.006	9.807	0.110	89.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S-12.000	46.505	0.900	51.7	0.195	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-13.000	84.093	1.750	48.1	0.145	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-12.001	38.691	0.570	67.9	0.109	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-12.002	30.317	0.093	325.0	0.107	0.00	0.0	0.600	o	375	Pipe/Conduit	
S-14.000	61.317	1.003	61.1	0.141	4.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S-1.018	44.38	9.50	97.868	0.813	6.1	0.0	20.8	1.00	159.7	124.5
S-1.019	44.18	9.59	97.690	0.813	6.1	0.0	20.8	1.43	228.1	124.5
S-1.020	43.95	9.70	97.651	0.813	6.1	0.0	20.8	1.43	228.1	124.5
S-1.021	40.23	11.64	97.505	0.813	6.1	0.0	20.8	0.25	40.4«	124.5
S-1.022	50.00	4.08	97.500	0.000	9.5	0.0	1.6	1.00	39.8	9.5
S-11.000	50.00	4.42	103.285	0.174	0.0	0.0	4.7	1.81	72.1	28.2
S-11.001	50.00	4.53	102.405	0.174	0.0	0.0	4.7	1.91	76.0	28.2
S-11.002	50.00	4.76	102.145	0.296	0.0	0.0	8.0	2.08	82.5	48.0
S-11.003	50.00	5.03	101.350	0.418	0.0	0.0	11.3	2.50	176.7	67.9
S-11.004	50.00	5.23	100.320	0.510	0.0	0.0	13.8	2.28	160.9	82.9
S-11.005	50.00	5.43	99.750	0.610	0.0	0.0	16.5	3.01	213.0	99.1
S-11.006	50.00	5.52	98.365	0.610	0.0	0.0	16.5	1.92	212.0	99.1
S-12.000	50.00	4.42	101.075	0.195	0.0	0.0	5.3	1.82	72.5	31.6
S-13.000	50.00	4.74	101.925	0.145	0.0	0.0	3.9	1.89	75.2	23.5
S-12.001	50.00	5.08	100.100	0.449	0.0	0.0	12.1	1.91	135.1	72.9
S-12.002	50.00	5.58	99.455	0.555	0.0	0.0	15.0	1.00	110.4	90.2
S-14.000	50.00	4.61	100.515	0.141	0.0	0.0	3.8	1.68	66.6	23.0

Network Design Table for Storm Drainage Network Catchment A-B-C-D

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S-12.003	60.831	0.397	153.2	0.189	0.00	0.0	0.600	o	450	Pipe/Conduit	
S-12.004	9.613	0.210	45.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S-12.005	85.431	0.500	170.9	0.155	0.00	0.0	0.600	o	450	Pipe/Conduit	
S-11.007	8.153	0.082	100.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S-11.008	43.583	0.010	4358.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S-11.009	3.573	0.025	142.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-15.000	29.862	0.310	96.3	0.087	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-16.000	44.815	0.480	93.4	0.083	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-15.001	12.049	0.080	150.6	0.028	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-11.010	30.002	0.092	325.0	0.063	0.00	0.0	0.600	o	375	Pipe/Conduit	
S-11.011	59.578	0.183	325.0	0.144	0.00	0.0	0.600	o	375	Pipe/Conduit	
S-17.000	43.356	0.255	170.0	0.155	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-11.012	8.658	0.197	43.9	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S-12.003	50.00	6.20	99.287	0.886	0.0	0.0	24.0	1.64	260.8	143.9
S-12.004	50.00	6.26	98.890	0.886	0.0	0.0	24.0	3.01	478.9	143.9
S-12.005	50.00	7.17	98.680	1.041	0.0	0.0	28.2	1.55	246.9	169.1
S-11.007	50.00	7.24	98.180	1.651	0.0	0.0	44.7	2.03	323.4	268.3
S-11.008	44.01	9.67	97.980	1.651	0.0	0.0	44.7	0.30	47.5«	268.3
S-11.009	50.00	4.05	97.970	0.000	8.6	0.0	1.4	1.09	43.4	8.6
S-15.000	50.00	4.37	98.335	0.087	0.0	0.0	2.4	1.33	53.0	14.1
S-16.000	50.00	4.55	98.505	0.083	0.0	0.0	2.2	1.35	53.8	13.5
S-15.001	50.00	4.74	98.025	0.198	0.0	0.0	5.4	1.06	42.3	32.2
S-11.010	50.00	5.24	97.795	0.261	8.6	0.0	8.8	1.00	110.4	52.8
S-11.011	50.00	6.23	97.703	0.405	8.6	0.0	12.7	1.00	110.4	76.1
S-17.000	50.00	4.72	98.555	0.155	0.0	0.0	4.2	1.00	39.8	25.1
S-11.012	50.00	6.29	97.519	0.560	8.6	0.0	16.9	2.74	302.6	101.2

Network Design Table for Storm Drainage Network Catchment A-B-C-D

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S-1.023	28.650	0.071	405.0	0.068	0.00	0.0	0.600	o	450	Pipe/Conduit	
S-18.000	34.073	0.200	170.0	0.117	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-19.000	10.000	0.080	125.0	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-18.001	39.524	0.254	155.6	0.042	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-1.024	53.073	0.131	405.0	0.079	0.00	0.0	0.600	o	450	Pipe/Conduit	
S-1.025	7.444	0.018	405.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S-1.026	24.197	0.060	405.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S-1.027	21.363	0.010	2136.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-1.028	8.107	0.033	245.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-1.029	27.392	0.112	245.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-1.030	42.327	0.173	245.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-1.031	82.846	0.338	245.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-1.032	88.520	0.361	245.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S-1.033	10.534	0.043	245.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S-1.023	50.00	6.76	97.247	0.628	18.1	0.0	20.6	1.00	159.7	123.8
S-18.000	50.00	4.57	97.855	0.117	0.0	0.0	3.2	1.00	39.8	19.1
S-19.000	50.00	4.14	97.735	0.000	0.0	0.0	0.0	1.17	46.4	0.0
S-18.001	50.00	5.09	97.580	0.159	0.0	0.0	4.3	1.26	88.9	25.8
S-1.024	48.99	7.64	97.176	0.866	18.1	0.0	26.6	1.00	159.7	159.6
S-1.025	48.65	7.77	97.045	0.866	18.1	0.0	26.6	1.00	159.7	159.6
S-1.026	47.57	8.17	97.026	0.866	18.1	0.0	26.6	1.00	159.7	159.6
S-1.027	44.96	9.24	96.810	0.866	18.1	0.0	26.6	0.33	23.4«	159.6
S-1.028	50.00	4.14	96.800	0.000	28.2	0.0	4.7	1.00	70.7	28.2
S-1.029	50.00	4.59	96.767	0.000	28.2	0.0	5.6	1.00	70.7	33.8
S-1.030	50.00	5.30	96.655	0.000	28.2	0.0	5.6	1.00	70.7	33.8
S-1.031	50.00	6.68	96.482	0.000	28.2	0.0	5.6	1.00	70.7	33.8
S-1.032	47.61	8.15	96.144	0.000	28.2	0.0	5.6	1.00	70.7	33.8
S-1.033	47.16	8.33	95.783	0.000	28.2	0.0	5.6	1.00	70.7	33.8

Area Summary for Storm Drainage Network Catchment A-B-C-D

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Roof	90	0.010	0.009	0.009
	Classification	Pavement	80	0.054	0.043	0.053
1.001	Classification	Roof	90	0.010	0.009	0.009
	Classification	Pavement	80	0.030	0.024	0.034
1.002	Classification	Pavement	80	0.041	0.033	0.033
2.000	Classification	Pavement	80	0.051	0.041	0.041
	Classification	Roof	90	0.014	0.013	0.054
	Classification	Roof	90	0.010	0.009	0.063
	Classification	Roof	90	0.010	0.009	0.073
	Classification	Roof	90	0.014	0.013	0.086
1.003	Classification	Pavement	80	0.069	0.055	0.055
1.004	-	-	100	0.000	0.000	0.000
3.000	Classification	Pavement	80	0.041	0.033	0.033
	Classification	Pavement	80	0.014	0.012	0.045
	Classification	Pavement	80	0.010	0.008	0.053
	Classification	Pavement	80	0.010	0.008	0.061
	Classification	Pavement	80	0.014	0.012	0.073
1.005	Classification	Pavement	80	0.087	0.069	0.069
4.000	Classification	Pavement	80	0.044	0.035	0.035
	Classification	Roof	90	0.014	0.013	0.048
	Classification	Roof	90	0.010	0.009	0.057
	Classification	Roof	90	0.010	0.009	0.067
	Classification	Roof	90	0.014	0.013	0.080
1.006	Classification	Pavement	80	0.024	0.019	0.019
1.007	Classification	Pavement	80	0.061	0.049	0.049
1.008	Classification	Roof	90	0.014	0.013	0.013
	Classification	Pavement	80	0.028	0.023	0.036
5.000	Classification	Pavement	80	0.046	0.037	0.037
	Classification	Roof	90	0.013	0.012	0.049
	Classification	Roof	90	0.014	0.013	0.062
5.001	-	-	100	0.000	0.000	0.000
5.002	Classification	Roof	90	0.015	0.014	0.014
	Classification	Roof	90	0.015	0.014	0.028
	Classification	Roof	90	0.015	0.014	0.042
	Classification	Pavement	80	0.136	0.109	0.150
5.003	-	-	100	0.000	0.000	0.000
5.004	Classification	Pavement	80	0.021	0.017	0.017
5.005	Classification	Pavement	80	0.018	0.014	0.014
6.000	Classification	Pavement	80	0.044	0.035	0.035
	Classification	Roof	90	0.005	0.005	0.040
	Classification	Roof	90	0.014	0.013	0.053
5.006	Classification	Roof	90	0.014	0.013	0.013
	Classification	Roof	90	0.019	0.017	0.030
	Classification	Pavement	80	0.077	0.061	0.092
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
7.000	Classification	Pavement	80	0.110	0.088	0.088
	Classification	Pavement	80	0.009	0.007	0.095
	Classification	Pavement	80	0.025	0.020	0.116
	Classification	Roof	90	0.037	0.033	0.149
	Classification	Roof	90	0.059	0.053	0.202

Area Summary for Storm Drainage Network Catchment A-B-C-D

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
7.001	Classification	Pavement	80	0.108	0.086	0.086
	Classification	Roof	90	0.030	0.027	0.113
	Classification	Roof	90	0.015	0.014	0.127
7.002	-	-	100	0.000	0.000	0.000
1.011	-	-	100	0.035	0.035	0.035
8.000	Classification	Pavement	80	0.055	0.044	0.044
1.012	Classification	Pavement	80	0.111	0.089	0.089
9.000	Classification	Roof	90	0.015	0.014	0.014
	Classification	Roof	90	0.015	0.014	0.028
	Classification	Roof	90	0.015	0.014	0.042
	Classification	Roof	90	0.015	0.014	0.056
	Classification	Roof	90	0.015	0.014	0.069
	Classification	Roof	90	0.014	0.013	0.083
	Classification	Pavement	80	0.138	0.111	0.193
9.001	-	-	100	0.000	0.000	0.000
1.013	Classification	Pavement	80	0.051	0.041	0.041
1.014	Classification	Pavement	80	0.045	0.036	0.036
10.000	Classification	Pavement	80	0.138	0.111	0.111
	Classification	Roof	90	0.015	0.014	0.125
	Classification	Roof	90	0.015	0.014	0.139
	Classification	Roof	90	0.027	0.024	0.163
10.001	Classification	Roof	90	0.014	0.013	0.013
1.015	Classification	Pavement	80	0.052	0.041	0.041
	Classification	Roof	90	0.014	0.013	0.054
1.016	Classification	Roof	90	0.015	0.014	0.014
	Classification	Roof	90	0.014	0.013	0.027
	Classification	Pavement	80	0.043	0.034	0.061
1.017	-	-	100	0.000	0.000	0.000
1.018	Classification	Pavement	80	0.075	0.060	0.060
	Classification	Pavement	80	0.043	0.035	0.094
	Classification	Roof	90	0.027	0.024	0.119
1.019	-	-	100	0.000	0.000	0.000
1.020	-	-	100	0.000	0.000	0.000
1.021	-	-	100	0.000	0.000	0.000
1.022	-	-	100	0.030	0.030	0.030
11.000	Classification	Pavement	80	0.106	0.085	0.085
	Classification	Roof	90	0.014	0.013	0.098
	Classification	Roof	90	0.026	0.023	0.121
	Classification	Roof	90	0.022	0.020	0.141
	Classification	Roof	90	0.022	0.020	0.161
	Classification	Roof	90	0.014	0.013	0.174
11.001	-	-	100	0.000	0.000	0.000
11.002	Classification	Pavement	80	0.072	0.058	0.058
	Classification	Roof	90	0.022	0.020	0.077
	Classification	Roof	90	0.022	0.020	0.097
	Classification	Roof	90	0.014	0.013	0.110
	Classification	Roof	90	0.013	0.012	0.122
11.003	Classification	Pavement	80	0.078	0.062	0.062
	Classification	Roof	90	0.013	0.012	0.074
	Classification	Roof	90	0.014	0.013	0.087
	Classification	Roof	90	0.013	0.012	0.099

Area Summary for Storm Drainage Network Catchment A-B-C-D

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	Classification	Roof	90	0.013	0.012	0.111
	Classification	Roof	90	0.013	0.012	0.122
11.004	Classification	Roof	90	0.014	0.013	0.013
	Classification	Roof	90	0.013	0.012	0.025
	Classification	Roof	90	0.013	0.012	0.036
	Classification	Roof	90	0.013	0.012	0.048
	Classification	Pavement	80	0.055	0.044	0.092
11.005	Classification	Pavement	80	0.058	0.046	0.046
	Classification	Roof	90	0.013	0.012	0.058
	Classification	Roof	90	0.014	0.013	0.071
	Classification	Roof	90	0.013	0.012	0.083
	Classification	Roof	90	0.019	0.017	0.100
11.006	-	-	100	0.000	0.000	0.000
12.000	Classification	Pavement	80	0.132	0.106	0.106
	Classification	Roof	90	0.014	0.013	0.119
	Classification	Roof	90	0.015	0.014	0.133
	Classification	Roof	90	0.015	0.014	0.146
	Classification	Roof	90	0.014	0.013	0.159
	Classification	Roof	90	0.013	0.012	0.171
	Classification	Roof	90	0.013	0.012	0.183
	Classification	Roof	90	0.013	0.012	0.195
13.000	Classification	Roof	90	0.013	0.012	0.012
	Classification	Roof	90	0.013	0.012	0.023
	Classification	Roof	90	0.019	0.017	0.041
	Classification	Roof	90	0.013	0.012	0.053
	Classification	Pavement	80	0.092	0.073	0.126
	Classification	Pavement	80	0.024	0.019	0.145
12.001	Classification	Pavement	80	0.073	0.058	0.058
	Classification	Roof	90	0.014	0.013	0.071
	Classification	Roof	90	0.014	0.013	0.084
	Classification	Roof	90	0.013	0.012	0.096
	Classification	Roof	90	0.014	0.013	0.109
12.002	Classification	Roof	90	0.031	0.028	0.028
	Classification	Roof	90	0.013	0.012	0.039
	Classification	Roof	90	0.014	0.013	0.052
	Classification	Pavement	80	0.068	0.054	0.107
14.000	Classification	Roof	90	0.019	0.017	0.017
	Classification	Roof	90	0.013	0.012	0.029
	Classification	Roof	90	0.013	0.012	0.041
	Classification	Roof	90	0.013	0.012	0.053
	Classification	Pavement	80	0.111	0.089	0.141
12.003	Classification	Pavement	80	0.125	0.100	0.100
	Classification	Roof	90	0.014	0.013	0.113
	Classification	Roof	90	0.015	0.013	0.126
	Classification	Roof	90	0.013	0.012	0.137
	Classification	Roof	90	0.013	0.012	0.149
	Classification	Roof	90	0.014	0.013	0.162
	Classification	Roof	90	0.014	0.013	0.175
	Classification	Roof	90	0.015	0.014	0.189
12.004	-	-	100	0.000	0.000	0.000
12.005	Classification	Roof	90	0.014	0.013	0.013

Area Summary for Storm Drainage Network Catchment A-B-C-D

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	Classification	Pavement	80	0.100	0.080	0.093
	Classification	Roof	90	0.013	0.012	0.105
	Classification	Roof	90	0.013	0.012	0.117
	Classification	Roof	90	0.015	0.014	0.131
	Classification	Roof	90	0.027	0.024	0.155
11.007	-	-	100	0.000	0.000	0.000
11.008	-	-	100	0.000	0.000	0.000
11.009	-	-	100	0.000	0.000	0.000
15.000	Classification	Roof	90	0.013	0.012	0.012
	Classification	Roof	90	0.013	0.012	0.023
	Classification	Roof	90	0.013	0.012	0.035
	Classification	Roof	90	0.013	0.012	0.047
	Classification	Pavement	80	0.050	0.040	0.087
16.000	Classification	Pavement	80	0.075	0.060	0.060
	Classification	Roof	90	0.026	0.023	0.083
15.001	Classification	Pavement	80	0.021	0.017	0.017
	Classification	Roof	90	0.013	0.012	0.028
11.010	Classification	Roof	90	0.027	0.024	0.024
	Classification	Roof	90	0.013	0.012	0.036
	Classification	Pavement	80	0.033	0.027	0.063
11.011	Classification	Pavement	80	0.089	0.071	0.071
	Classification	Roof	90	0.015	0.014	0.085
	Classification	Roof	90	0.013	0.012	0.097
	Classification	Roof	90	0.013	0.012	0.109
	Classification	Roof	90	0.013	0.012	0.120
	Classification	Roof	90	0.013	0.012	0.132
	Classification	Roof	90	0.013	0.012	0.144
17.000	Classification	Pavement	80	0.131	0.105	0.105
	Classification	Roof	90	0.014	0.013	0.118
	Classification	Roof	90	0.013	0.012	0.130
	Classification	Roof	90	0.013	0.012	0.142
	Classification	Roof	90	0.014	0.013	0.155
11.012	-	-	100	0.000	0.000	0.000
1.023	Classification	Roof	90	0.013	0.012	0.012
	Classification	Roof	90	0.014	0.013	0.025
	Classification	Pavement	80	0.055	0.044	0.068
18.000	Classification	Pavement	80	0.056	0.045	0.045
	Classification	Roof	90	0.081	0.073	0.117
19.000	-	-	100	0.000	0.000	0.000
18.001	Classification	Pavement	80	0.052	0.042	0.042
1.024	Classification	Pavement	80	0.084	0.067	0.067
	Classification	Roof	90	0.013	0.012	0.079
1.025	-	-	100	0.000	0.000	0.000
1.026	-	-	100	0.000	0.000	0.000
1.027	-	-	100	0.000	0.000	0.000
1.028	-	-	100	0.000	0.000	0.000
1.029	-	-	100	0.000	0.000	0.000
1.030	-	-	100	0.000	0.000	0.000
1.031	-	-	100	0.000	0.000	0.000
1.032	-	-	100	0.000	0.000	0.000
1.033	-	-	100	0.000	0.000	0.000

Area Summary for Storm Drainage Network Catchment A-B-C-D

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
				Total 5.619	Total 4.697	Total 4.697

Free Flowing Outfall Details for Storm Drainage Network Catchment A-B-C-D

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S-1.033	S-	98.550	95.740	95.130	0	0

Online Controls for Storm Drainage Network Catchment A-B-C-D

Hydro-Brake® Optimum Manhole: S-26, DS/PN: S-1.011, Volume (m³): 9.8

Unit Reference	MD-SHE-0106-6100-1700-6100
Design Head (m)	1.700
Design Flow (l/s)	6.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	106
Invert Level (m)	99.200
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	6.1
Flush-Flo™	0.461	5.8
Kick-Flo®	0.943	4.6
Mean Flow over Head Range	-	5.2

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.2	3.000	8.0	7.000	11.9
0.200	5.2	1.400	5.6	3.500	8.6	7.500	12.3
0.300	5.6	1.600	5.9	4.000	9.1	8.000	12.7
0.400	5.8	1.800	6.3	4.500	9.6	8.500	13.0
0.500	5.8	2.000	6.6	5.000	10.1	9.000	13.4
0.600	5.8	2.200	6.9	5.500	10.6	9.500	13.8
0.800	5.4	2.400	7.2	6.000	11.1		
1.000	4.8	2.600	7.4	6.500	11.5		

Hydro-Brake® Optimum Manhole: S-42, DS/PN: S-1.022, Volume (m³): 9.0

Unit Reference	MD-SHE-0130-9500-1800-9500
Design Head (m)	1.800
Design Flow (l/s)	9.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	130
Invert Level (m)	97.500
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1500

Hydro-Brake® Optimum Manhole: S-42, DS/PN: S-1.022, Volume (m³): 9.0

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.800	9.5
Flush-Flo™	0.538	9.5
Kick-Flo®	1.103	7.5
Mean Flow over Head Range	-	8.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.7	1.200	7.8	3.000	12.1	7.000	18.1
0.200	8.1	1.400	8.4	3.500	13.0	7.500	18.7
0.300	9.0	1.600	9.0	4.000	13.9	8.000	19.3
0.400	9.3	1.800	9.5	4.500	14.6	8.500	19.9
0.500	9.5	2.000	10.0	5.000	15.4	9.000	20.4
0.600	9.5	2.200	10.4	5.500	16.1	9.500	21.0
0.800	9.2	2.400	10.9	6.000	16.8		
1.000	8.4	2.600	11.3	6.500	17.5		

Hydro-Brake® Optimum Manhole: S-60, DS/PN: S-11.009, Volume (m³): 8.9

Unit Reference	MD-SHE-0136-8600-1000-8600
Design Head (m)	1.000
Design Flow (l/s)	8.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	136
Invert Level (m)	97.970
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	8.6
Flush-Flo™	0.299	8.6
Kick-Flo®	0.664	7.1
Mean Flow over Head Range	-	7.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.9	0.300	8.6	0.500	8.2	0.800	7.7
0.200	8.4	0.400	8.5	0.600	7.8	1.000	8.6

Hydro-Brake® Optimum Manhole: S-60, DS/PN: S-11.009, Volume (m³): 8.9

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
1.200	9.4	2.400	13.0	5.000	18.4	8.000	23.1
1.400	10.1	2.600	13.5	5.500	19.3	8.500	23.8
1.600	10.7	3.000	14.5	6.000	20.1	9.000	24.5
1.800	11.3	3.500	15.6	6.500	20.9	9.500	25.1
2.000	11.9	4.000	16.6	7.000	21.7		
2.200	12.5	4.500	17.5	7.500	22.4		

Hydro-Brake® Optimum Manhole: S-76, DS/PN: S-1.028, Volume (m³): 5.5

Unit Reference	MD-SHE-0226-2820-1350-2820
Design Head (m)	1.350
Design Flow (l/s)	28.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	226
Invert Level (m)	96.800
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.350	28.2
Flush-Flo™	0.431	28.2
Kick-Flo®	0.937	23.7
Mean Flow over Head Range	-	24.0

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.6	1.200	26.7	3.000	41.4	7.000	62.4
0.200	22.5	1.400	28.7	3.500	44.6	7.500	64.5
0.300	27.6	1.600	30.6	4.000	47.5	8.000	66.5
0.400	28.2	1.800	32.4	4.500	50.3	8.500	68.5
0.500	28.1	2.000	34.0	5.000	53.0	9.000	70.5
0.600	27.7	2.200	35.6	5.500	55.5	9.500	72.3
0.800	26.4	2.400	37.2	6.000	57.9		
1.000	24.4	2.600	38.6	6.500	60.1		

Storage Structures for Storm Drainage Network Catchment A-B-C-D

Cellular Storage Manhole: S-26, DS/PN: S-1.011

Invert Level (m) 98.900 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.01811 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	341.0	341.0	2.000	341.0	341.0

Cellular Storage Manhole: S-42, DS/PN: S-1.022

Invert Level (m) 97.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.01140 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	196.0	196.0	1.800	196.0	196.0

Cellular Storage Manhole: S-60, DS/PN: S-11.009

Invert Level (m) 97.970 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.02642 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	730.0	730.0	1.000	730.0	730.0

Cellular Storage Manhole: S-76, DS/PN: S-1.028

Invert Level (m) 96.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.08802 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	190.0	190.0	1.350	190.0	190.0

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Drainage Network Catchment A-B-C-D

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	4
Number of Online Controls	4	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.283
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	15.300	Cv (Winter)	0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S-1.000	S-1	15 Winter	100	+20%				
S-1.001	S-2	15 Winter	100	+20%	100/15 Winter			
S-1.002	S-3	15 Winter	100	+20%	100/15 Summer			
S-2.000	S-4	15 Winter	100	+20%	100/15 Summer			
S-1.003	S-5	15 Winter	100	+20%	100/15 Summer			
S-1.004	S-6	15 Winter	100	+20%	100/15 Summer			
S-3.000	S-7	1440 Winter	100	+20%	100/15 Summer			
S-1.005	S-8	1440 Winter	100	+20%	100/15 Summer			
S-4.000	S-9	1440 Winter	100	+20%	100/600 Winter			
S-1.006	S-10	1440 Winter	100	+20%	100/15 Summer			
S-1.007	S-11	1440 Winter	100	+20%	100/15 Summer			
S-1.008	S-12	1440 Winter	100	+20%	100/15 Summer			
S-5.000	S-13	15 Winter	100	+20%	100/15 Summer			
S-5.001	S-14	15 Winter	100	+20%	100/15 Summer			
S-5.002	S-15	15 Winter	100	+20%	100/15 Summer			
S-5.003	S-16	15 Winter	100	+20%	100/15 Winter			
S-5.004	S-17	15 Winter	100	+20%	100/15 Summer			

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Drainage Network Catchment A-B-C-D

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S-1.000	S-1	102.242	-0.138	0.000	0.32			20.4	OK
S-1.001	S-2	102.030	0.010	0.000	0.64			33.3	SURCHARGED
S-1.002	S-3	101.986	0.196	0.000	0.61			40.3	SURCHARGED
S-2.000	S-4	101.928	0.153	0.000	0.76			31.0	SURCHARGED
S-1.003	S-5	101.857	0.702	0.000	1.04			67.9	SURCHARGED
S-1.004	S-6	100.944	0.724	0.000	1.30			68.3	SURCHARGED
S-3.000	S-7	100.912	0.278	0.000	0.05			1.7	SURCHARGED
S-1.005	S-8	100.911	0.829	0.000	0.14			9.4	SURCHARGED
S-4.000	S-9	100.909	0.069	0.000	0.05			1.9	SURCHARGED
S-1.006	S-10	100.908	1.085	0.000	0.13			11.5	SURCHARGED
S-1.007	S-11	100.906	1.137	0.000	0.12			12.4	SURCHARGED
S-1.008	S-12	100.904	1.289	0.000	0.15			13.2	SURCHARGED
S-5.000	S-13	104.874	0.094	0.000	0.59			21.6	SURCHARGED
S-5.001	S-14	104.814	0.187	0.000	0.78			25.7	SURCHARGED
S-5.002	S-15	104.764	0.192	0.000	1.05			66.8	SURCHARGED
S-5.003	S-16	103.255	0.015	0.000	0.86			66.3	SURCHARGED
S-5.004	S-17	103.010	0.100	0.000	0.96			69.9	SURCHARGED

PN	US/MH Name	Level Exceeded
S-1.000	S-1	
S-1.001	S-2	
S-1.002	S-3	
S-2.000	S-4	
S-1.003	S-5	
S-1.004	S-6	
S-3.000	S-7	
S-1.005	S-8	
S-4.000	S-9	
S-1.006	S-10	
S-1.007	S-11	
S-1.008	S-12	
S-5.000	S-13	
S-5.001	S-14	
S-5.002	S-15	
S-5.003	S-16	
S-5.004	S-17	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Drainage Network Catchment A-B-C-D

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S-5.005	S-18	15 Winter	100	+20%	100/15 Summer			
S-6.000	S-19	15 Winter	100	+20%				
S-5.006	S-20	15 Winter	100	+20%				
S-1.009	S-21	1440 Winter	100	+20%	100/15 Summer			
S-1.010	S-22	1440 Winter	100	+20%	100/15 Summer			
S-7.000	S-23	15 Winter	100	+20%	100/15 Summer			
S-7.001	S-24	15 Winter	100	+20%	100/15 Summer			
S-7.002	S-25	1440 Winter	100	+20%	100/15 Summer			
S-1.011	S-26	1440 Winter	100	+20%	100/15 Summer			
S-8.000	S-27	15 Winter	100	+20%				
S-1.012	S-28	15 Winter	100	+20%	100/15 Summer			
S-9.000	S-29	15 Winter	100	+20%	100/15 Summer			
S-9.001	S-30	15 Winter	100	+20%	100/15 Summer			
S-1.013	S-31	15 Winter	100	+20%	100/15 Summer			
S-1.014	S-32	960 Winter	100	+20%	100/15 Summer			
S-10.000	S-33	15 Winter	100	+20%	100/15 Summer			
S-10.001	S-34	15 Winter	100	+20%	100/15 Summer			
S-1.015	S-35	960 Winter	100	+20%	100/15 Summer			
S-1.016	S-36	960 Winter	100	+20%	100/15 Summer			
S-1.017	S-37	960 Winter	100	+20%	100/15 Summer			
S-1.018	S-38	960 Winter	100	+20%	100/15 Summer			
S-1.019	S-39	960 Winter	100	+20%	100/15 Summer			
S-1.020	S-40	960 Winter	100	+20%	100/15 Summer			
S-1.021	S-41	960 Winter	100	+20%	100/15 Summer			
S-1.022	S-42	960 Winter	100	+20%	100/15 Summer			
S-11.000	S-43	15 Winter	100	+20%	100/15 Summer			
S-11.001	S-44	15 Winter	100	+20%	100/15 Summer			
S-11.002	S-45	15 Winter	100	+20%	100/15 Summer			
S-11.003	S-46	15 Winter	100	+20%	100/15 Winter			
S-11.004	S-47	15 Winter	100	+20%	100/15 Summer			
S-11.005	S-48	15 Winter	100	+20%	100/15 Summer			
S-11.006	S-49	15 Winter	100	+20%	100/15 Summer			
S-12.000	S-50	15 Winter	100	+20%	100/15 Summer			
S-13.000	S-51	15 Winter	100	+20%				
S-12.001	S-52	15 Winter	100	+20%	100/15 Summer			
S-12.002	S-53	15 Winter	100	+20%	100/15 Summer			
S-14.000	S-54	15 Winter	100	+20%	100/15 Winter			
S-12.003	S-55	15 Winter	100	+20%	100/15 Summer			
S-12.004	S-56	15 Winter	100	+20%	100/15 Summer			
S-12.005	S-57	15 Winter	100	+20%	100/15 Summer			
S-11.007	S-58	15 Winter	100	+20%	100/15 Summer			
S-11.008	S-59	15 Winter	100	+20%	100/15 Summer			
S-11.009	S-60	600 Winter	100	+20%	100/15 Summer			
S-15.000	S-61	15 Winter	100	+20%	100/15 Summer			
S-16.000	S-62	15 Winter	100	+20%				
S-15.001	S-63	15 Winter	100	+20%	100/15 Summer			
S-11.010	S-64	15 Winter	100	+20%	100/15 Summer			
S-11.011	S-65	15 Winter	100	+20%	100/15 Summer			

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Drainage Network Catchment A-B-C-D

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S-5.005	S-18	102.762	0.121	0.000	1.25			72.8	SURCHARGED
S-6.000	S-19	103.212	-0.148	0.000	0.25			20.5	OK
S-5.006	S-20	102.338	-0.072	0.000	0.91			122.7	OK
S-1.009	S-21	100.902	1.340	0.000	0.13			22.2	SURCHARGED
S-1.010	S-22	100.901	1.541	0.000	0.31			22.0	SURCHARGED
S-7.000	S-23	102.558	0.078	0.000	0.97			72.4	SURCHARGED
S-7.001	S-24	101.594	0.144	0.000	0.98			115.1	SURCHARGED
S-7.002	S-25	100.900	0.220	0.000	0.14			7.7	SURCHARGED
S-1.011	S-26	100.898	1.473	0.000	0.17		1180	5.9	SURCHARGED
S-8.000	S-27	100.897	-0.143	0.000	0.29			16.9	OK
S-1.012	S-28	99.684	0.365	0.000	0.96			37.2	SURCHARGED
S-9.000	S-29	100.752	0.452	0.000	1.26			65.4	SURCHARGED
S-9.001	S-30	99.982	0.161	0.000	1.97			65.1	SURCHARGED
S-1.013	S-31	99.463	0.669	0.000	1.57			102.2	SURCHARGED
S-1.014	S-32	99.329	0.683	0.000	0.18			18.0	SURCHARGED
S-10.000	S-33	100.890	0.320	0.000	1.16			56.0	SURCHARGED
S-10.001	S-34	100.205	0.125	0.000	1.79			59.8	SURCHARGED
S-1.015	S-35	99.323	0.794	0.000	0.25			25.2	SURCHARGED
S-1.016	S-36	99.317	0.896	0.000	0.19			27.0	SURCHARGED
S-1.017	S-37	99.313	0.973	0.000	0.29			26.7	SURCHARGED
S-1.018	S-38	99.311	0.992	0.000	0.20			29.7	SURCHARGED
S-1.019	S-39	99.304	1.164	0.000	0.20			29.0	SURCHARGED
S-1.020	S-40	99.302	1.202	0.000	0.19			28.9	SURCHARGED
S-1.021	S-41	99.300	1.345	0.000	0.43			28.7	SURCHARGED
S-1.022	S-42	99.296	1.571	0.000	0.33		967	9.5	SURCHARGED
S-11.000	S-43	103.598	0.088	0.000	0.89			61.1	SURCHARGED
S-11.001	S-44	102.987	0.357	0.000	0.91			59.0	SURCHARGED
S-11.002	S-45	102.793	0.423	0.000	1.24			95.3	SURCHARGED
S-11.003	S-46	101.720	0.070	0.000	0.82			134.3	SURCHARGED
S-11.004	S-47	101.177	0.557	0.000	1.02			148.2	SURCHARGED
S-11.005	S-48	100.664	0.614	0.000	0.86			169.6	SURCHARGED
S-11.006	S-49	99.832	1.092	0.000	1.20			155.9	FLOOD RISK
S-12.000	S-50	101.685	0.385	0.000	0.91			63.1	SURCHARGED
S-13.000	S-51	102.073	-0.077	0.000	0.74			54.2	OK
S-12.001	S-52	101.260	0.860	0.000	1.08			135.1	SURCHARGED
S-12.002	S-53	100.803	0.973	0.000	1.52			148.8	FLOOD RISK
S-14.000	S-54	100.846	0.106	0.000	0.83			53.4	SURCHARGED
S-12.003	S-55	100.624	0.887	0.000	0.94			225.5	SURCHARGED
S-12.004	S-56	100.332	0.992	0.000	0.81			209.4	SURCHARGED
S-12.005	S-57	100.180	1.050	0.000	1.00			233.2	FLOOD RISK
S-11.007	S-58	99.675	1.046	0.000	2.29			387.9	FLOOD RISK
S-11.008	S-59	99.201	0.771	0.000	4.52			382.3	SURCHARGED
S-11.009	S-60	98.965	0.770	0.000	0.30		604	8.6	SURCHARGED
S-15.000	S-61	98.666	0.106	0.000	0.61			30.0	SURCHARGED
S-16.000	S-62	98.671	-0.059	0.000	0.61			31.4	OK
S-15.001	S-63	98.636	0.386	0.000	1.77			63.9	SURCHARGED
S-11.010	S-64	98.571	0.401	0.000	0.75			72.8	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Drainage Network Catchment A-B-C-D

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S-11.011	S-65	98.489	0.412	0.000	1.06			109.8	SURCHARGED

PN	US/MH Name	Level Exceeded
S-5.005	S-18	
S-6.000	S-19	
S-5.006	S-20	
S-1.009	S-21	
S-1.010	S-22	
S-7.000	S-23	
S-7.001	S-24	
S-7.002	S-25	
S-1.011	S-26	
S-8.000	S-27	
S-1.012	S-28	
S-9.000	S-29	
S-9.001	S-30	
S-1.013	S-31	
S-1.014	S-32	
S-10.000	S-33	
S-10.001	S-34	
S-1.015	S-35	
S-1.016	S-36	
S-1.017	S-37	
S-1.018	S-38	
S-1.019	S-39	
S-1.020	S-40	
S-1.021	S-41	
S-1.022	S-42	
S-11.000	S-43	
S-11.001	S-44	
S-11.002	S-45	
S-11.003	S-46	
S-11.004	S-47	
S-11.005	S-48	
S-11.006	S-49	
S-12.000	S-50	
S-13.000	S-51	
S-12.001	S-52	
S-12.002	S-53	
S-14.000	S-54	
S-12.003	S-55	
S-12.004	S-56	
S-12.005	S-57	
S-11.007	S-58	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Drainage Network Catchment A-B-C-D

PN	US/MH Name	Level Exceeded
S-11.008	S-59	
S-11.009	S-60	
S-15.000	S-61	
S-16.000	S-62	
S-15.001	S-63	
S-11.010	S-64	
S-11.011	S-65	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Drainage Network Catchment A-B-C-D

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S-17.000	S-66	15 Winter	100	+20%	100/15 Summer			
S-11.012	S-67	15 Winter	100	+20%	100/15 Summer			
S-1.023	S-68	15 Winter	100	+20%	100/15 Summer			
S-18.000	S-69	15 Winter	100	+20%	100/15 Summer			
S-19.000	S-70	15 Winter	100	+20%	100/15 Summer			
S-18.001	S-71	15 Winter	100	+20%	100/15 Summer			
S-1.024	S-72	15 Winter	100	+20%	100/15 Summer			
S-1.025	S-73	360 Winter	100	+20%	100/15 Summer			
S-1.026	S-74	360 Winter	100	+20%	100/15 Summer			
S-1.027	S-75	360 Winter	100	+20%	100/15 Summer			
S-1.028	S-76	360 Winter	100	+20%	100/15 Summer			
S-1.029	S-77	1440 Summer	100	+20%				
S-1.030	S-78	1440 Summer	100	+20%				
S-1.031	S-79	1440 Summer	100	+20%				
S-1.032	S-80	1440 Summer	100	+20%				
S-1.033	S-81	1440 Summer	100	+20%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S-17.000	S-66	99.096	0.316	0.000	1.49			56.4	SURCHARGED
S-11.012	S-67	98.399	0.505	0.000	0.87			151.4	SURCHARGED
S-1.023	S-68	98.260	0.563	0.000	1.08			147.8	SURCHARGED
S-18.000	S-69	98.307	0.227	0.000	1.15			43.0	SURCHARGED
S-19.000	S-70	98.260	0.300	0.000	0.07			2.7	SURCHARGED
S-18.001	S-71	98.260	0.381	0.000	0.60			49.9	SURCHARGED
S-1.024	S-72	98.204	0.578	0.000	1.26			184.1	SURCHARGED
S-1.025	S-73	98.183	0.689	0.000	0.70			67.6	SURCHARGED
S-1.026	S-74	98.177	0.700	0.000	0.50			66.9	SURCHARGED
S-1.027	S-75	98.164	1.054	0.000	3.35			66.5	SURCHARGED
S-1.028	S-76	98.131	1.031	0.000	0.53		257	28.1	SURCHARGED
S-1.029	S-77	96.906	-0.161	0.000	0.44			28.1	OK
S-1.030	S-78	96.792	-0.164	0.000	0.43			28.1	OK
S-1.031	S-79	96.616	-0.166	0.000	0.41			28.1	OK
S-1.032	S-80	96.278	-0.166	0.000	0.41			28.1	OK
S-1.033	S-81	95.934	-0.149	0.000	0.50			28.1	OK

PN	US/MH Name	Level Exceeded
S-17.000	S-66	
S-11.012	S-67	
S-1.023	S-68	
S-18.000	S-69	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Drainage Network Catchment A-B-C-D

PN	US/MH Name	Level Exceeded
S-19.000	S-70	
S-18.001	S-71	
S-1.024	S-72	
S-1.025	S-73	
S-1.026	S-74	
S-1.027	S-75	
S-1.028	S-76	
S-1.029	S-77	
S-1.030	S-78	
S-1.031	S-79	
S-1.032	S-80	
S-1.033	S-81	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm Drainage Network Catchment E

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	PIMP (%)	100
M5-60 (mm)	15.300	Add Flow / Climate Change (%)	20
Ratio R	0.283	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm Drainage Network Catchment E

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S-20.000	42.640	1.110	38.4	0.068	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-20.001	44.728	1.040	43.0	0.053	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-21.000	18.285	0.108	170.0	0.037	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-20.002	14.159	0.207	68.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-20.003	25.814	0.010	2581.4	0.015	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-20.004	2.000	0.010	200.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S-20.000	50.00	4.34	97.905	0.068	0.0	0.0	1.9	2.12	84.2	11.1
S-20.001	50.00	4.71	96.795	0.121	0.0	0.0	3.3	2.00	79.5	19.7
S-21.000	50.00	4.30	95.325	0.037	0.0	0.0	1.0	1.00	39.8	6.1
S-20.002	50.00	4.86	95.217	0.158	0.0	0.0	4.3	1.58	63.0	25.7
S-20.003	50.00	6.59	95.010	0.173	0.0	0.0	4.7	0.25	9.9«	28.2
S-20.004	50.00	6.63	96.000	0.173	0.0	0.0	4.7	0.92	36.6	28.2

Area Summary for Storm Drainage Network Catchment E

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
20.000	Classification	Pavement	80	0.085	0.068	0.068
20.001	Classification	Pavement	80	0.066	0.053	0.053
21.000	Classification	Pavement	80	0.047	0.037	0.037
20.002	-	-	100	0.000	0.000	0.000
20.003	-	-	100	0.015	0.015	0.015
20.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.213	0.173	0.173

Free Flowing Outfall Details for Storm Drainage Network Catchment E

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S-20.004	S-	96.680	95.990	0.000	0	0

Storage Structures for Storm Drainage Network Catchment E

Cellular Storage Manhole: S-87, DS/PN: S-20.004

Invert Level (m) 95.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.02793 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	116.0	116.0	0.900	116.0	116.0

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Drainage Network Catchment E

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.283
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	15.300	Cv (Winter)	0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S-20.000	S-82	15 Winter	100	+20%				
S-20.001	S-83	15 Winter	100	+20%				
S-21.000	S-84	2160 Winter	100	+20%	100/15 Summer			
S-20.002	S-85	2160 Winter	100	+20%	100/15 Summer			
S-20.003	S-86	2160 Winter	100	+20%	100/15 Summer			
S-20.004	S-87	2160 Winter	100	+20%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S-20.000	S-82	97.994	-0.136	0.000	0.33			26.4	OK
S-20.001	S-83	96.923	-0.097	0.000	0.61			46.6	OK
S-21.000	S-84	95.896	0.346	0.000	0.02			0.6	SURCHARGED
S-20.002	S-85	95.896	0.453	0.000	0.05			2.7	SURCHARGED
S-20.003	S-86	95.895	0.660	0.000	0.27			2.9	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Drainage Network Catchment E

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S-20.004	S-87	95.894	-0.331	0.000	0.00		2018	0.0	OK

PN	US/MH Name	Level Exceeded
S-20.000	S-82	
S-20.001	S-83	
S-21.000	S-84	
S-20.002	S-85	
S-20.003	S-86	
S-20.004	S-87	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm Drainage Network Catchment F

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	PIMP (%)	100
M5-60 (mm)	15.300	Add Flow / Climate Change (%)	20
Ratio R	0.283	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm Drainage Network Catchment F

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S-22.000	19.717	0.200	98.6	0.028	4.00	0.0	0.600	o	225	Pipe/Conduit	
S-22.001	10.307	0.061	170.0	0.061	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-22.002	13.000	0.010	1300.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S-22.003	2.000	0.010	200.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S-22.000	50.00	4.25	103.275	0.028	0.0	0.0	0.8	1.32	52.4	4.5
S-22.001	50.00	4.42	103.075	0.089	0.0	0.0	2.4	1.00	39.8	14.5
S-22.002	50.00	5.03	102.910	0.089	0.0	0.0	2.4	0.35	14.1«	14.5
S-22.003	50.00	5.07	104.000	0.089	0.0	0.0	2.4	0.92	36.6	14.5

Area Summary for Storm Drainage Network Catchment F

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
22.000	Classification	Roof	90	0.015	0.014	0.014
	Classification	Roof	90	0.015	0.014	0.028
22.001	Classification	Pavement	80	0.077	0.061	0.061
22.002	-	-	100	0.000	0.000	0.000
22.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.108	0.089	0.089

Free Flowing Outfall Details for Storm Drainage Network Catchment F

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S-22.003	S-	104.700	103.990	0.000	0	0

Storage Structures for Storm Drainage Network Catchment F

Cellular Storage Manhole: S-91, DS/PN: S-22.003

Invert Level (m) 102.900 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.15733 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	35.0	35.0	0.900	35.0	35.0

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Drainage Network Catchment F

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.283
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	15.300	Cv (Winter)	0.840

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

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

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S-22.000	S-88	360 Winter	100	+20%	100/60 Winter			
S-22.001	S-89	360 Winter	100	+20%	100/30 Summer			
S-22.002	S-90	360 Winter	100	+20%	100/15 Summer			
S-22.003	S-91	360 Winter	100	+20%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S-22.000	S-88	103.738	0.238	0.000	0.03			1.6	SURCHARGED
S-22.001	S-89	103.737	0.437	0.000	0.15			5.0	SURCHARGED
S-22.002	S-90	103.736	0.601	0.000	0.41			4.8	SURCHARGED
S-22.003	S-91	103.735	-0.490	0.000	0.00			0.0	OK

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Drainage Network Catchment F

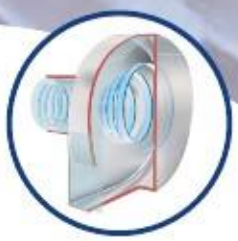
PN	US/MH Name	Level Exceeded
S-22.000	S-88	
S-22.001	S-89	
S-22.002	S-90	
S-22.003	S-91	

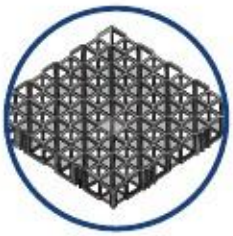
Modular Geo-Void Systems

Total Water Management

ESS EcoCell

Ecological Tank Systems





ENVIRONMENTAL SUSTAINABLE SOLUTIONS LTD

Environmental Sustainable Solutions

Welcome to Environmental Sustainable Solutions; specialist suppliers and designers of geocomposites and water re-use systems. Environmental Sustainable Solutions can help you achieve innovative results for all your requirements:-

- Stormwater Management
- Gas Barrier Protection
- Stormwater Attenuation
- Contaminated Land Development
- Stormwater Drainage
- Ground Stabilisation
- Rainwater Recycling Management
- Structural Waterproofing
- Gas Venting Systems
- Damp-proofing projects

Over the last 12 years Environmental Sustainable Solutions, and associated companies, have designed and installed thousands of water recycling, drainage and attenuation tank systems for schools, car parks, retail parks, offices and sports arenas throughout Ireland, UK, Europe and the Middle East.

Our wide range of environmental protection products, surface water drainage modules and modular water storage tank systems provides maximum design flexibility for engineers and architects working on even the most demanding of storm water storage and recycling projects.

Stormwater Management And Design

Stormwater is the phrase used to describe the excess rainwater that flows from rooftops, roads, car parks and other buildings. This water can contain many pollutants picked up from roofs and highways. In extreme weather conditions sudden heavy downpours of rain can cause major environmental disasters. Using our Rainmanager products; stormwater can not only safely be removed, but it can be stored and recycled for commercial and domestic use.

How it works - ESS Attenuation Tank

Stormwater enters the attenuation tank via the inlet manhole, which incorporates a silt collection sump and a galvanised leaf collection basket. Water passes through the tank and exits through the outlet manhole, which contains an AquaBrake flow control device.
This flow control device regulates the release rate of water from the tank, and in so doing, enables the tank to fill. As a result of water entering the tank at a greater rate than it can exit, the void space then fills with water. While the tank fills, air is vented from the tank.
The Inlet/Outlet pipe will act as a flushing channel. This perforated pipe is wrapped completely in High Flow Filtering Geotextile, which prevents silt entering the block area. As the tank continues to empty at a pre-determined rate, air re-enters the tank via the same air vent system. The roof of the completed tank must be lower than the lowest gully trap on site.

Benefits

- 100% sealed tank
- Full installation service provided
- 12 years experience as market leader
- Quick installation – reduce site access delays
- Increased land usage – tanks are sub surface
- Economical – generally more cost efficient than any other equivalent sealed tank
- Cost effective – reduced costs for excavation and disposal of material
- Modular – easy to create any shape
- Strong – designed to support shear loading
- Lightweight – no cranes required
- Determinate volume – one cubic metre of matrix tank modules contain 950 litres of water, whereas stone fill will only provide 300 litres of storage per cubic metre.

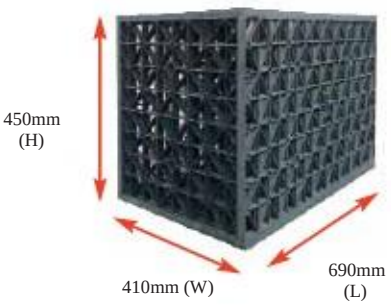
Soakaway

The soakaway is normally best built as a long narrow structure.
The inlet pipe comes in at roof level and faces downwards so that the water can percolate into the tank.
The blocks are wrapped in Geotextile, to protect them and also to keep clay from filling up the void.
An air vent pipe is installed on the highest point with a cowl on top or vented back to an inlet manhole.
There is no outlet from a soakaway, therefore no flow control unit is required.

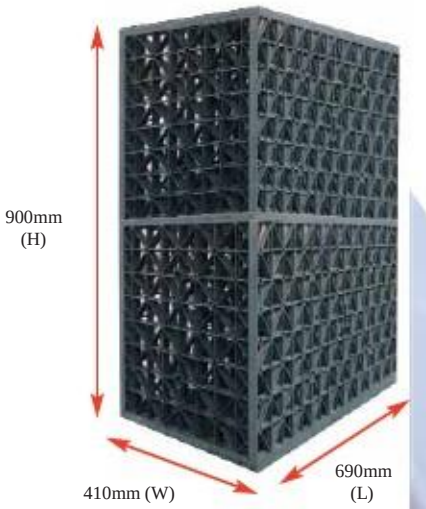
Protecting the Environment

Stormwater Storage Tank

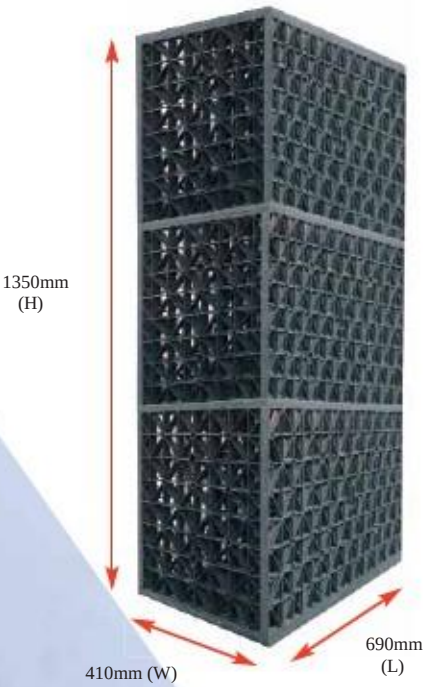
SUITABLE FOR USE UNDER:
- Roadways
- Car parks
- Green areas



Single
8 Modules/m3
Flowrate - 2300 I/min



Double
4 Modules/m3
Flowrate - 4600 I/min



Triple
2.6 Modules/m3
Flowrate - 6900 I/min

Notes:
Blocks must be positioned in the correct orientation.
See opposite above

SPECIFICATION (SINGLE)

Weight (maximum)	9.17kg
Crush Strength (up to)	400kN/m2
Lateral Strength	80kN/m2
Minimum Cover (green areas)	500mm
(trafficked areas)	650mm
Maximum Cover	3m
Material	Polypropylene
Void Ratio (Internal)	>95%

Design Requirements:

Tank storage capacity (m3)
Depth restrictions
Location (Road, Car Park, Green Area)
Design constraints on site

A set of loading calculations specific to the site requirement will be done by ESS and submitted on all tanks

DESIGN CRITERIA

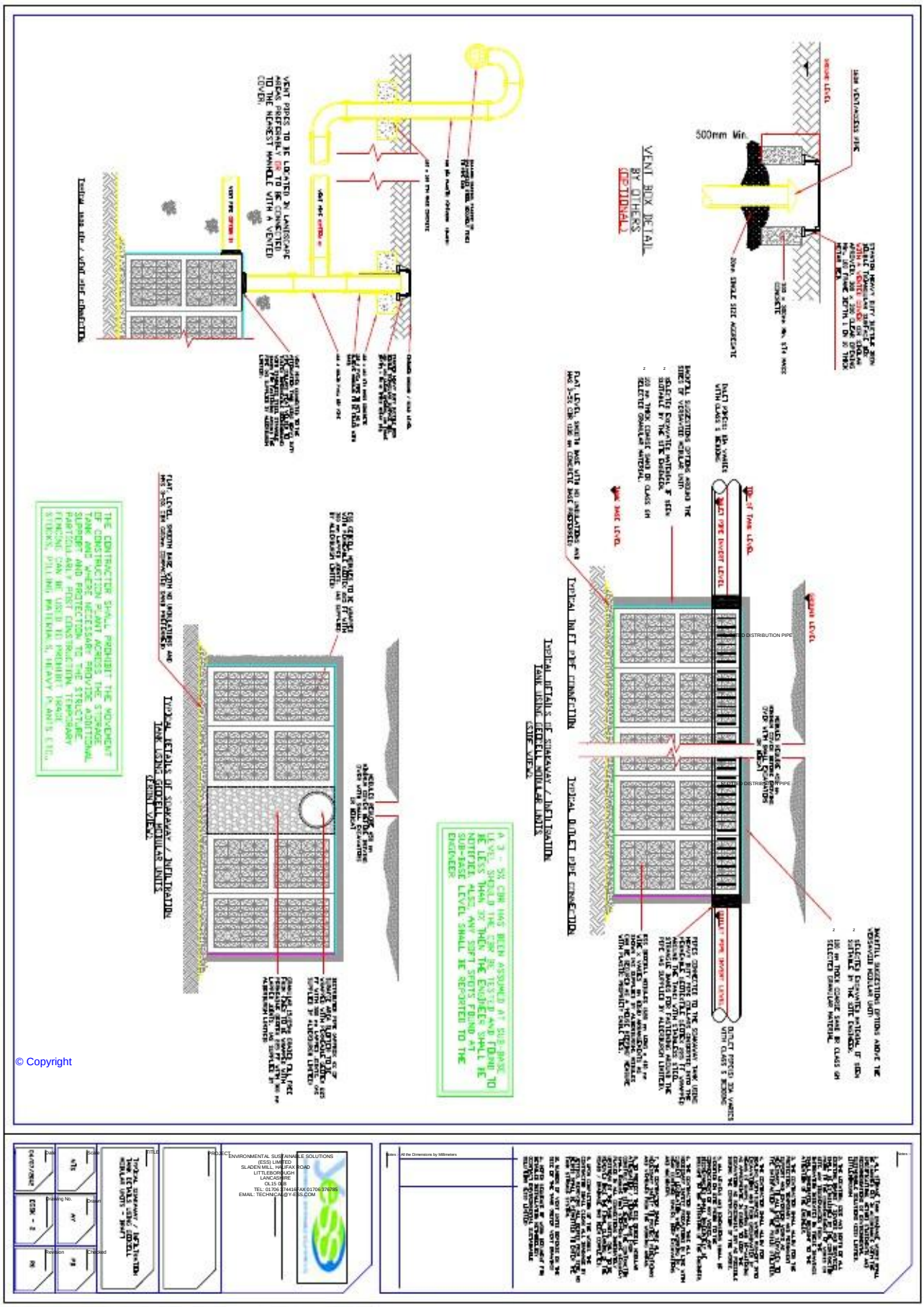
The attenuation tank is constructed using matrix module blocks. These blocks can take passing loads of up to 40 tonnes/m2. The void ratio of each block is 95%. The blocks are made from polypropylene.

The tank is sealed with a layer of Tuflex membrane, which is fully welded together to form a 100% seal. All pipe penetrations are fully sealed to the membrane. The Tuflex membrane is protected by a layer of heavy duty protection geotextile, to prevent damage from construction or backfilling. A number of air extraction vents/flushing points are placed in the roof of the tank.

Note:
It is vital that the underground tanks are fully sealed, otherwise ground water and silt particles may enter the void space and use up capacity. Preferably, the base of the tank should be 500mm above the ground water level. Otherwise ground water relief measures should be implemented.

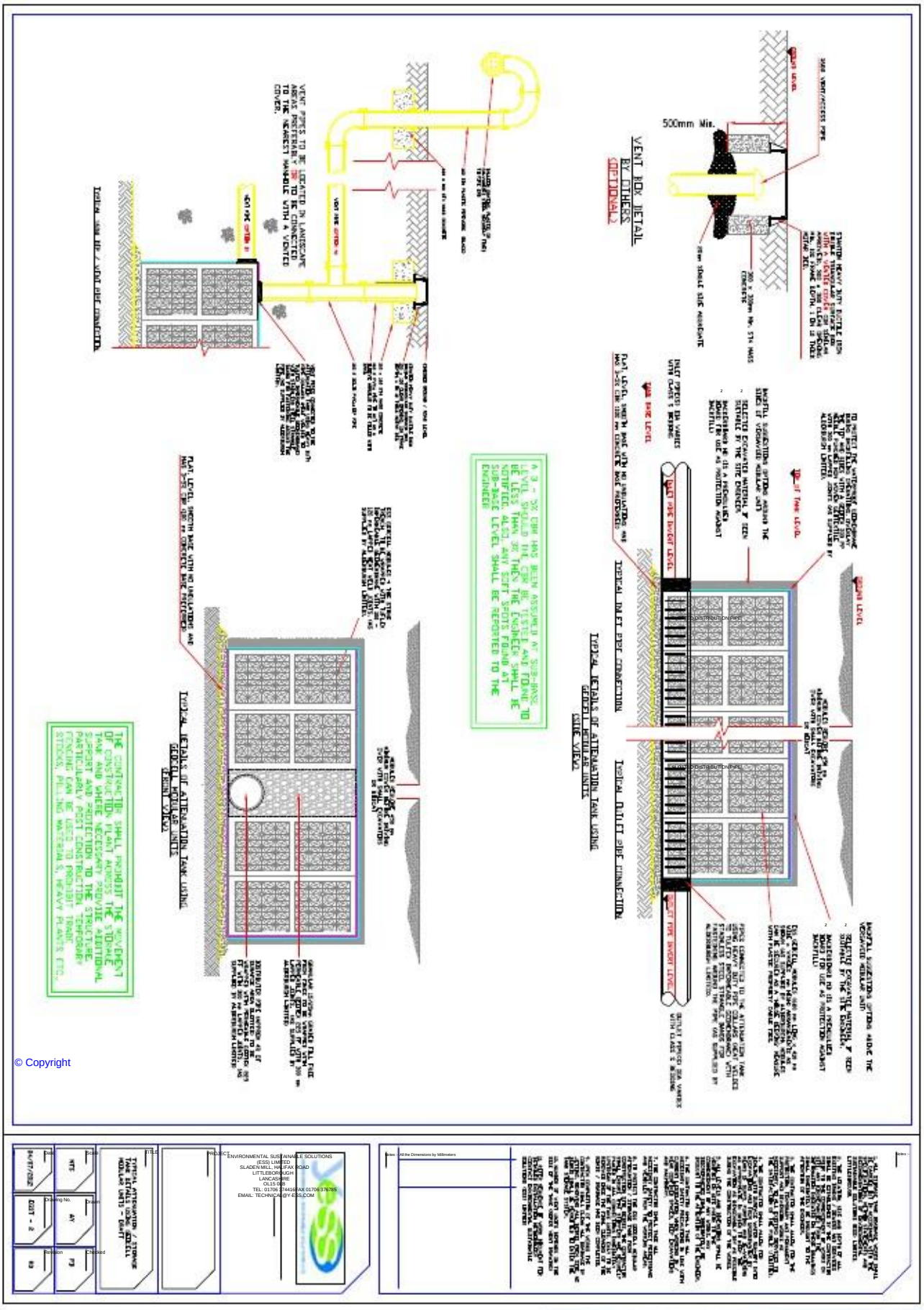
Infiltration System

Typical arrangement using ESS Ecological Tank System for water quality



Retention System

Typical on site collection and recycling arrangement using ESS Ecological Tank System



Infiltration Swales & Underground Channels

Please refer to separate data sheets for the following products

Modular VersaVoid System

Benefits

G **Quick**
Reduce site access delays

G **Lightweight**
No cranes required

G **Strong**
Designed for maximum anticipated loads

G **Maintenance Free Tank**
All debris and sediment is pre-filtered

G **Determinate Volume**
One cubic metre of Tank modules contain 950 litres of water

G **Cost Effective**
Reduces excavation and disposal by up to 5 x compared with conventional soak wells

G **High Infiltration**
98% void surface area

G **Totally Modular**
For greatest flexibility designed to cope. Units start at 300mm deep for shallow inverts to 3050mm+ deep in 250mm increments.

G **Designed by Engineers for Engineers** – to specify with confidence.

G **Designing out Problems**
with such systems (access, maintenance, loading etc.)

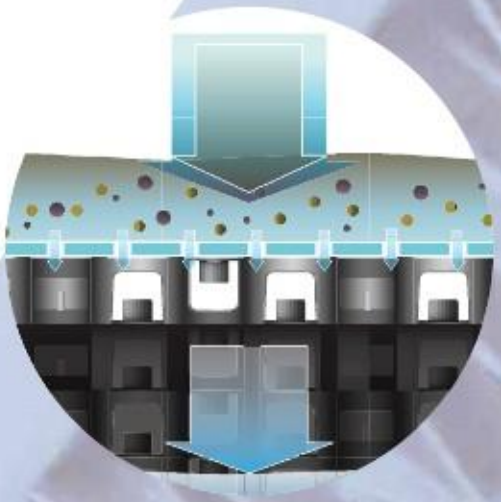
G **Designing in Answers**
to design requirements.

G **Total 3D Access**
For total maintenance with total confidence.

G **Structurally Designed**
with built in safety factor to carry all loads with complete confidence.
16 clear vertical access chambers per m2.

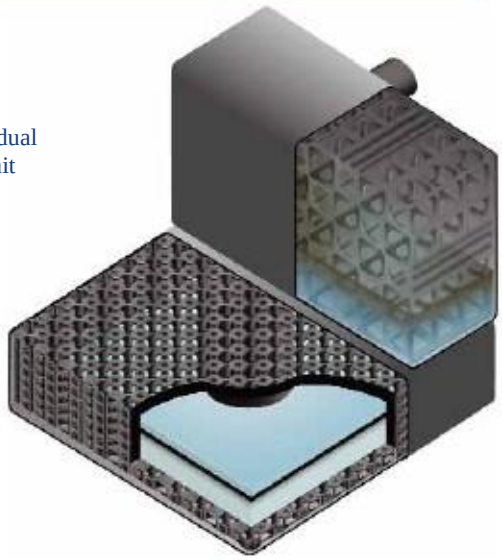
G **Total Void Creation**
With the greatest strength from any modular systems.

Oil Filtration

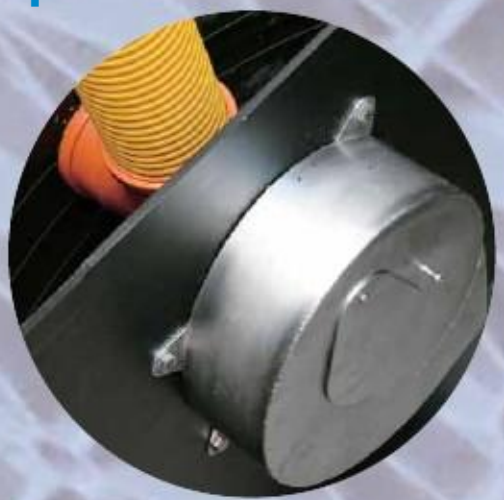


Benefits

G Source control designed to handle catastrophic spillages
G Capture, filter and break down residual hydrocarbons - all in one compact unit
G Self-maintaining ecosystems decompose hydrocarbon compounds and clean filters
G Load bearing, modular components provide up to 200t/m² loading capacity



Aquabrake



Benefits

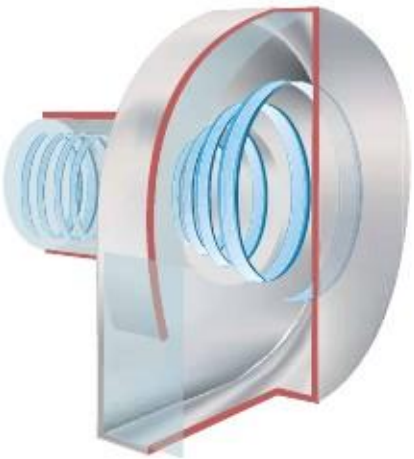
G Cost Savings
Can reduce upstream storage requirements by up to 30%.

G Durability
Corrosion resistant stainless steel.

G No energy requirements
Self-activating solution with no moving parts.

G Clog Resistant
AquaBrake design prevents blockages likely to occur in traditional orifices.

G Flexible Design
Several options for attachment available.



The ESS CombiSwale

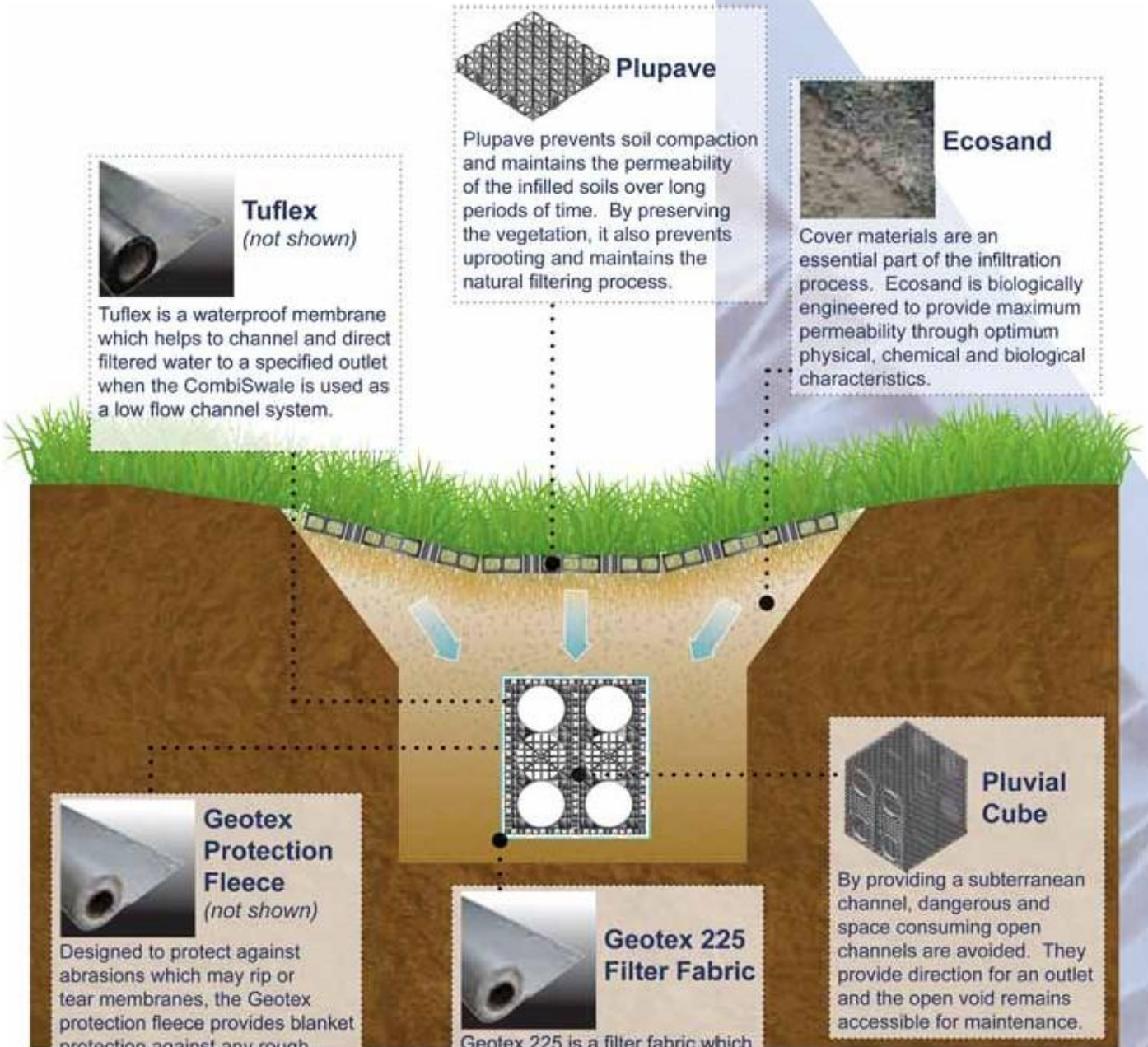
Please refer to separate data sheets for the following products

Water Sensitive Urban Channels

Surface and Sub-Surface Water Treatment

By combining surface and sub-surface channeling and treatment solutions, ESS has created the ideal in bioswale water management.

The CombiSwale system includes the addition of permeable sub-surface waterways that further restore water quality and recharge the natural environment. The sub-surface ESS channel system provides a unique way of working with nature to solve the enormous problems currently associated with open concrete channels and swales.



All products are manufactured to the highest quality, being subject to rigid quality control. However, the company cannot control conditions of application and use of its products, thus any warranty, written or implied, is given in good faith for materials only. ESS Ltd will not accept any responsibility for damage or injury arising from storage handling, misapplication or misuse of its products All transactions are subject to our standard condition of sale, copies of which are available on request.

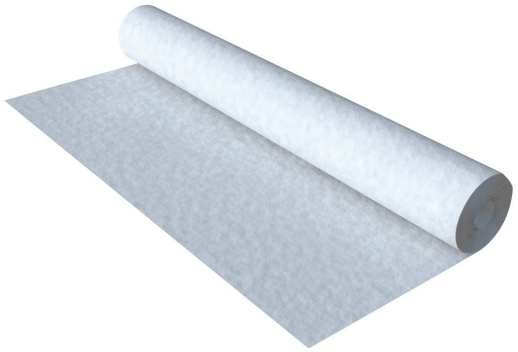
Permafilter Geotextile

Data Sheet

PRODUCT INFORMATION **P1** **ISSUE 3 - JUNE 2018**

Product code: PV23002

Permafilter Geotextile is a non-woven, dimpled, needle punched geotextile that has been specifically designed for hydrocarbon pollution treatment in sustainable drainage systems (SuDS) and other civil engineering applications.



Applications

Permafilter Geotextile is suitable for a wide range of applications including podium decks, cycle paths, infiltration tanks, tree protection, bio-retention, swales, permeable paving, filter drain and filter strips.

Key Benefits

- Captures residual hydrocarbons
- Removes pollutants by biodegradation
- Enhances water quality when used as part of a source control sustainable drainage system and eliminates the need for end of line petrol/oil interceptors
- 100% recyclable
- Designed to be self-maintaining for the life of the installation

Performance

The dimpled Geotextile comprises a proprietary blend of polyester fibres that incorporates hydrophilic (water attracting and oil repellent) and hydrophobic (oil attracting and water repellent) properties to achieve superior oil retention. Permafilter Geotextile is capable of retaining oil contamination ranging from daily car drip losses up to catastrophic spillages, i.e. originating from car oil-sump failures. The entrapped hydrocarbons are biodegraded by naturally occurring microorganisms providing a self cleansing mechanism.

Installation

Permafilter will be laid to suit site specific requirements. Overlaps shall be a minimum of 300mm or heat sealed. Ensure geotextile is clean and debris free before installing Permavoid.

Technical Support

Detailed guidance and assistance is available.
For further information, please contact our Technical Team on **+44 (0) 1509 615 100** or email **civils@polypipe.com** or visit **www.polypipe.com/civils-technical-hub**

ELEMENT	VALUE
PHYSICAL PROPERTIES	
Weight	300g/m²
Roll length	100m
Roll width	2.4m
Roll weight	72kg
MECHANICAL PROPERTIES	
Tensile strength EN10319 (md/cmd)	9/12kN/m
Static puncture (CBR test) EN12236	1575N
HYDRAULIC PROPERTIES	
Water permeability EN ISO 11058	57 l/m²/s
OTHER PROPERTIES	
Air permeability	1000 l/m²/s
Max. oil retention	6L /10m²
Effluent discharge at max. spacing oil loading	10ppm
Material	Modified polyester

Polypipe Civils,
Charnwood Business Park, Loughborough, Leicestershire LE11 1LE
Tel: +44 (0) 1509 615100 Fax: +44 (0) 1509 610215 Email: civils@polypipe.com
www.polypipe.com/wms

Polypipe

Permafilter Geotextile

Data Sheet

Permafilter Geotextile can be utilised in these SuDS techniques

TECHNIQUES													
Blue-Green roofs	Podium Decks	Trees	Sports Pitches	Cycle Paths	Permeable Paving (sub base & podium)	Bioretention & Rain Gardens	Attenuation Storage Tanks	Infiltration	Swales	Filter Drains	Detention Basins	Ponds & Wetlands	Filter Strips
	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓

Visit **www.polypipe.com/greeninfrastructure**

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Charnwood Business Park, Loughborough, Leicestershire LE11 1LE
Tel: +44 (0) 1509 615100 Fax: +44 (0) 1509 610215 Email: civils@polypipe.com
www.polypipe.com/wms

Polypipe

APPENDIX E – SOIL INFILTRATION TEST REPORT AND GROUNDWATER MONITORING

MIXED-USE DEVELOPMENT at BALLYMANY, NEWBRIDGE, CO. KILDARE

Groundwater Monitoring in Borehole Standpipe Located to the Eastern Boundary of the Development

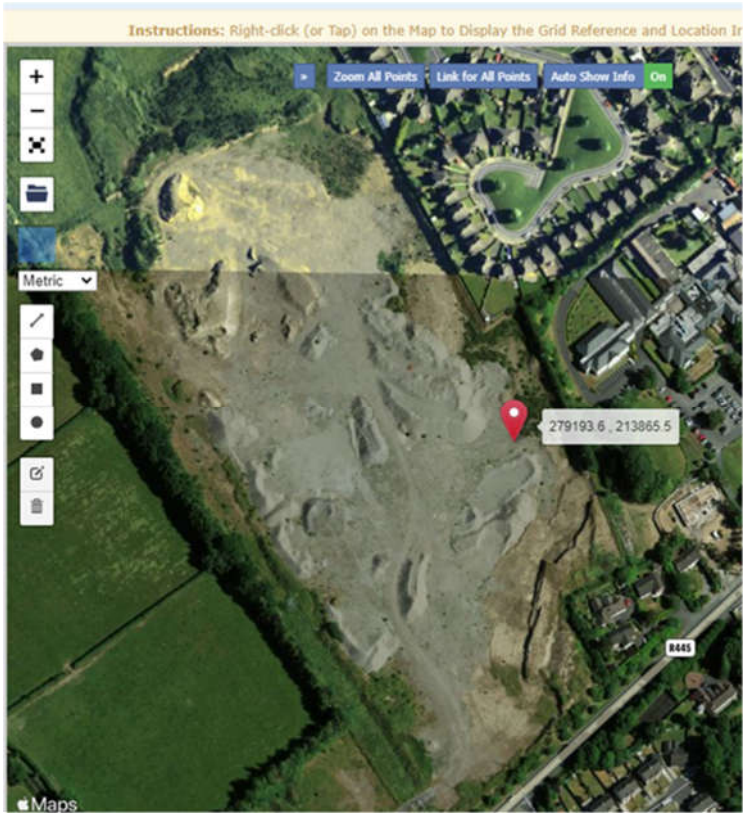

Figure 1: Location of Borehole Standpipe

Date of Inspection	Depth measured (Meters)	Presence of Water? (Yes/No)	Comments
18/11/2018	5.5	Yes	Date Borehole was put down;
05/06/2020	6.2	No	
20/08/2020	6.2	No	Raining
20/09/2020	6.2	No	
19/10/2020	6.2	No	Light Rain
16/11/2020	6.2	No	
21/12/2020	6.2	No	

Ground Level at Standpipe – 105.15mAOD

Standpipe has a depth of 6.2m. (98.95mAOD)

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Address: Knocklas, Coolcotts, Wexford Town
Tel: 087 7556013; 053 9166743
Email: info@geoenvironmental.ie
Web: www.geoenvironmental.ie

SOIL INFILTRATION TEST REPORT

As requested by Muir Associates

On behalf of Anthony Neville Homes Ltd

Test Location: Curragh Farm, Ballymany, Newbride, Co. Kildare

May 2021

Soil infiltration Test Report

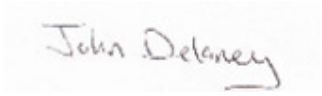
Existing Housing Project

at

Curragh Farm
Ballymany
Newbridge
Co. Kildare

On behalf of

Anthony Neville
Homes
Ltd



Field Testing & Report Writing:

John Delaney (MSc; BSc; HDip Eng)
Geoscientist & Environmental Engineer

Date

8th May 2021

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Contents:

1.0 Summary

The results of the six soil infiltration tests conducted at the existing Development Site at Curragh Farm, Ballymany, Newbridge, Co. Kildare are set out below. The results were variable across the site. Significant volumes of the in-site overburden (5-7m in depth) have been removed from the eastern portion of the site where Test Holes 1 and 2 are located. Test holes 3, 4, 5 and 6 were located in an area closer to the western boundary of the development site. Results were also variable in this area. The rate was dependent on the type and compaction of the in-situ material.

Soil infiltration Test Results:

TP#1	$5.03163 * 10^{-06}$	m/sec
TP#2	$4.37018 * 10^{-05}$	m/sec
TP#3	$3.16701 * 10^{-06}$	m/sec
TP#4	$7.33779 * 10^{-06}$	m/sec
TP#5	$2.44487 * 10^{-05}$	m/sec
TP#6	$7.75862 * 10^{-06}$	m/sec

2.0 Introduction/Scope

Geoevironmental Ltd were commissioned by Muir Associates Consulting Engineers to carry out six * Soil infiltration Tests on at an existing residential development project located at Curragh Farm, Ballymany, Newbridge, Co. Kildare. The tests were conducted to investigate the ground conditions and to establish if the in-situ subsoil could be used a storm water infiltration/attenuation medium. This document contains information on the results of the soil infiltration tests conducted on site. The test procedure is as per the methodology set out in BRE digest No. 365. The tests were conducted on 19th April 2021.

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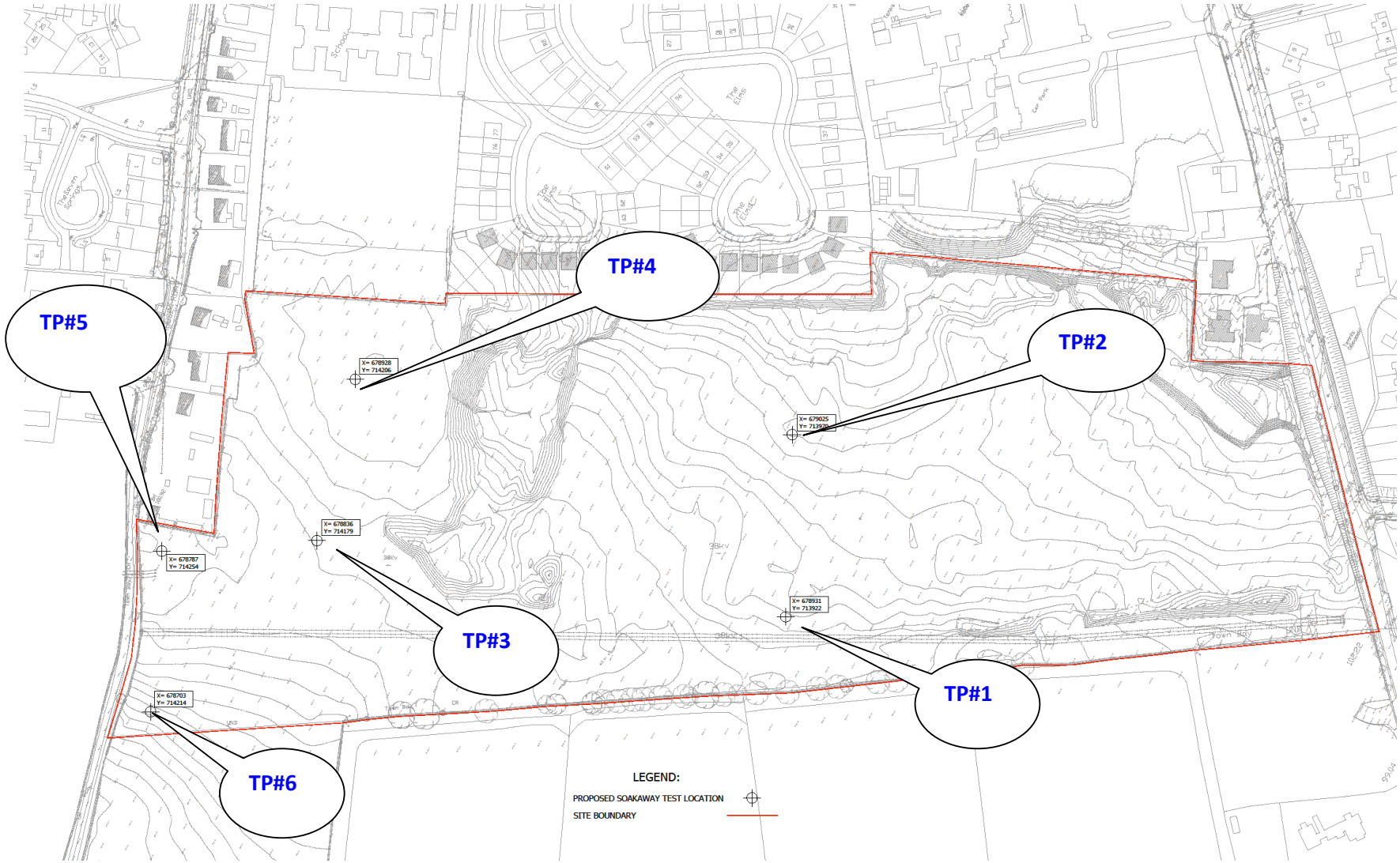
Site Layout showing location of 6 infiltration test locations (TP#1 TP#6)



3.0 Solid & Drift Geology

The solid bedrock underlain the study location at Ballymany comprises of Dinantin Limestones and more specifically the **'Rickardstown Formation'.** The formation comprises Cherty often dolomitised limestone. The Dinantian Limestone Series laid down during the Carboniferous Period. The drift geology consist of gravel derived from limestone There is a strip of alluvium material illustrate at the western boundary of the site. The GSI groundwater mapping (see indicates a high degree of subsoil permeability

Figure 2.0: Subsoil Type: Gravel Derived from Limestone (Gls)

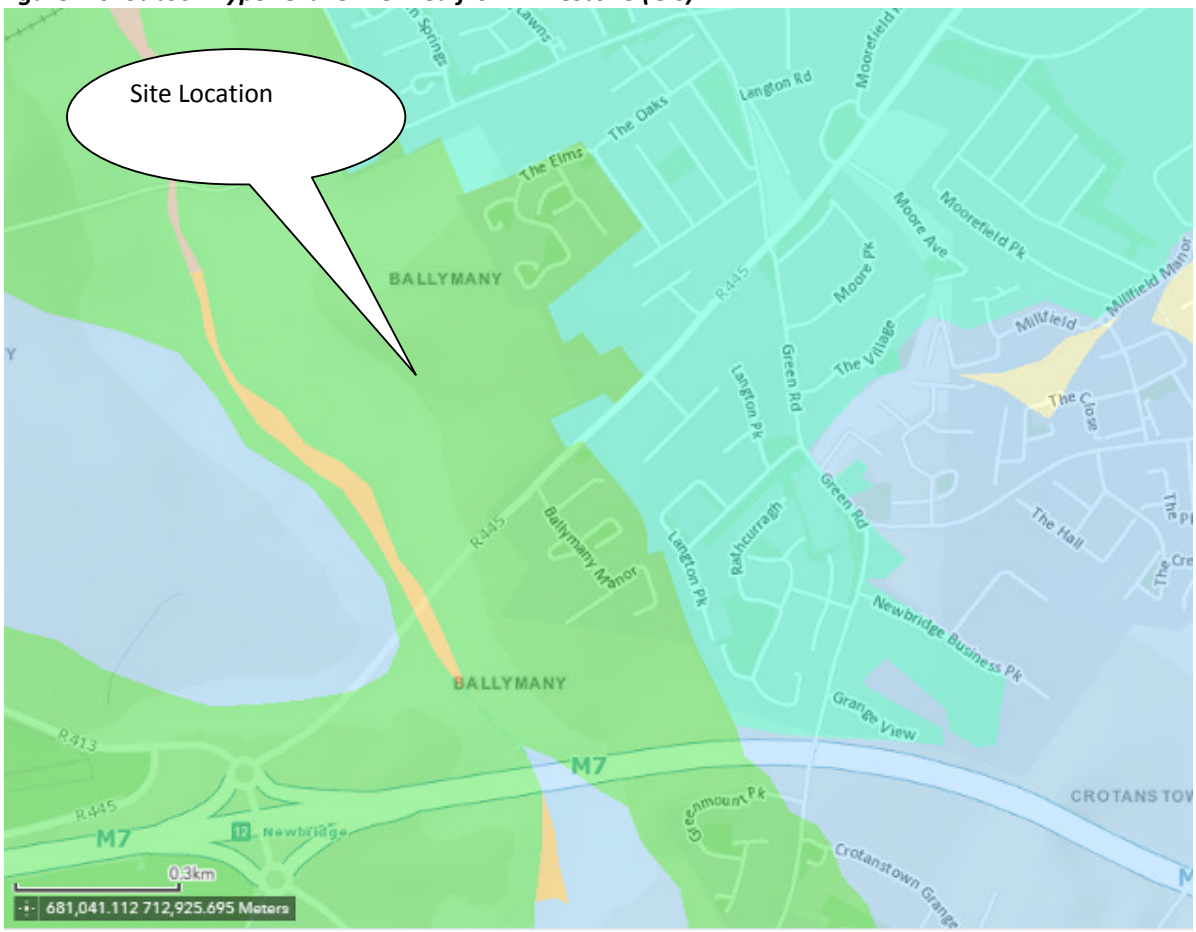
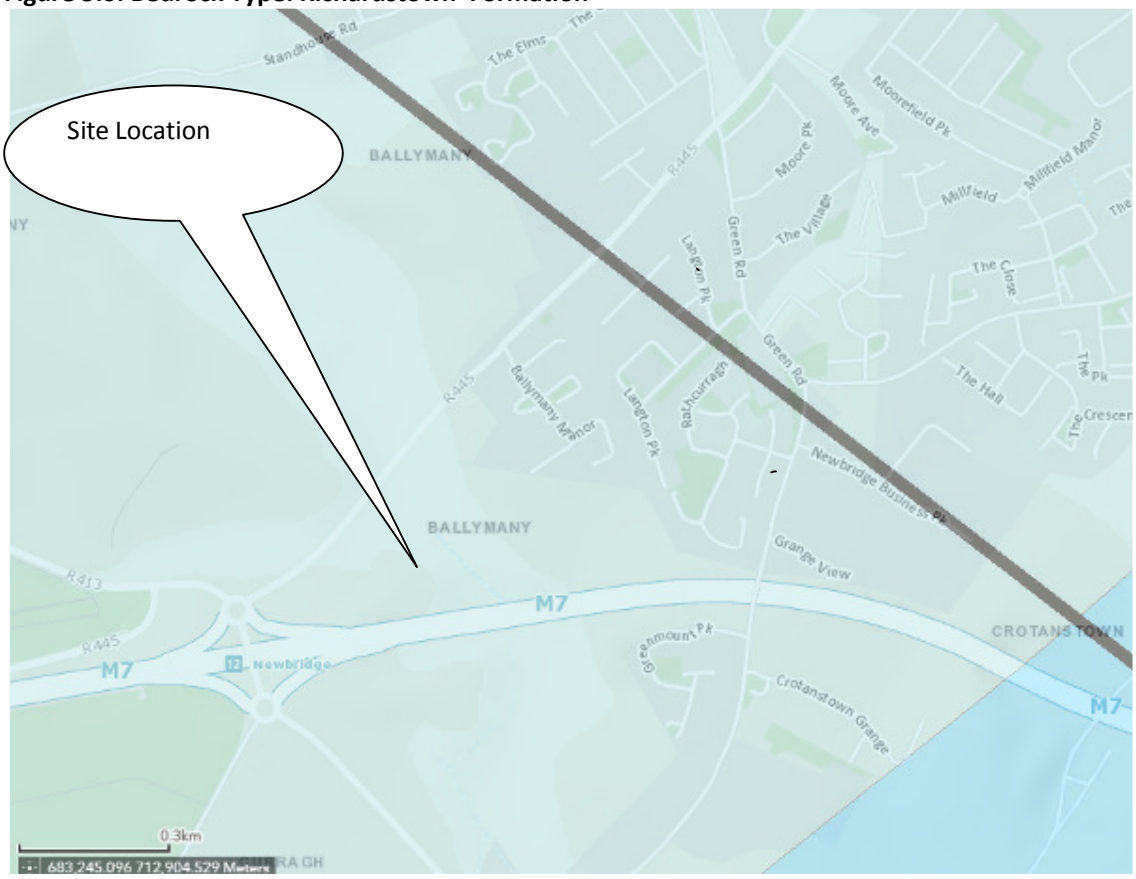


Figure 3.0: Bedrock Type: Richardstown Formation



4.0 Infiltration Rate Test Methodology

The Soil Infiltration tests will be completed in accordance with th BRE Digest Guidance Document – Soakaway Design

- Each trial pit was excavated to 1.5-2 deep
- Each trial pit was approximately 0.9m wide and 1-2m in length
- The dimensions of the trial pit were measured before each test is started
- The water inflow into the hole was by means of a skip and was rapid such that the pit was filled to its maximum effective depth in a short time as required.
- The water level and time were recorded when the test commenced
- The water level was monitored at intervals sufficiently close to clearly define water level versus time.

Figure 4:0. Pic showing water discharging quickly into trial pit

5.0 Soil Infiltration Test Results

Each of the 6 test holes was excavated as per the location identified on map provided by Muir Associates. The details and results are as follows:

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Curragh Farm, Ballymany Soil Infiltration Test Data TP#1 – TP#6

TP#1

Vo75 - 25	0.672	m^3
ap50	3.76	m^2
tp75-25	592	mins
f =	**5.03163E-06**	**m/sec**

TP 1 Inputs

Avg Width	0.8	m
Avg length	1.4	m
Avg Dept	1.75	m
Water Level Depth m		

100	1.2
75	0.9
50	0.6
25	0.3

TP#2

Vo75 - 25	0.714	m^3
ap50	3.89	m^2
tp75-25	70	mins
f =	**4.37018E-05**	**m/sec**

TP 2 Inputs

Avg Width	0.85	m
Avg length	1.4	m
Avg Dept	1.63	
Water Level Depth m		

100	1.2
75	0.9
50	0.6
25	0.3

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TP#3			TP 3 Inputs				
Vo75 - 25	0.58125	m^3	Avg Width	0.775	m		
			Avg length	1.25	m		
			Avg Dept	1.43			
			Water Level Depth				
			m			100	1.2
ap50	3.39875	m^2				75	0.9
						50	0.6
						25	0.3
tp75-25	900	mins					
f =	**3.16701E-06**	**m/sec**					

TP#4			TP 4 Inputs				
Vo75 - 25	1.0210625	m^3	Avg Width	0.775	m		
			Avg length	1.7	m		
			Avg Dept	1.73			
			Water Level Depth				
			m			100	1.55
ap50	5.15375	m^2				75	1.1625
						50	0.775
						25	0.3875
tp75-25	450	mins					
f =	**7.33779E-06**	**m/sec**					

TP#5			TP 5 Inputs				
Vo75 - 25	1.3005	m^3	Avg Width	0.9	m		
			Avg length	1.7	m		
			Avg Dept	1.86			
			Water Level Depth m			100	1.7
ap50	5.95	m^2				75	1.275
						50	0.85
						25	0.425
tp75-25	149	mins					
f =	**2.44487E-05**	**m/sec**					

TP#6			TP 5 Inputs				
Vo75 - 25	0.729	m^3	Avg Width	0.9	m		
			Avg length	1.35	m		
			Avg Dept	1.73			
			Water Level Depth m			100	1.2
ap50	3.915	m^2				75	0.9
						50	0.6
						25	0.3
tp75-25	400	mins					
f =	**7.75862E-06**	**m/sec**					

6.0 Test Hole Pictures

Pic of TH #1

Pic of TH #2

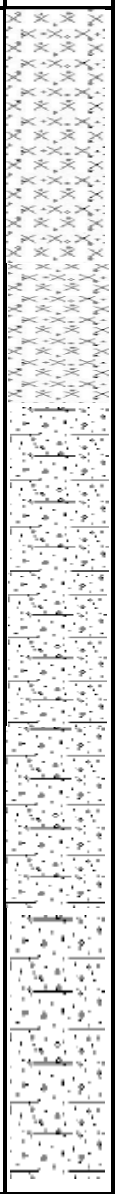
Pic of TH #3

Pic of TH#4

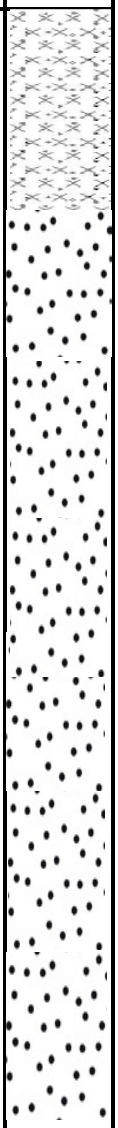
TH#5

TH#6

7.0 Test Hole Logs (TH1-TH6)

geoenvironmental ENVIRONMENTAL CONSULTANTS			**Loc:** Ballymany, Newbridge	**Trial Pit No.:** TP #1	
			Client: Anthony Neville Homes Ltd	**Logger**: John Delaney	
Method and Equipment: Excavation 0.00 -1.8m: 15 Tonne Tracked Excavator			**Time and Date:** 19/4/2021 @ 10.00	**ITN Co-ordiantes:** (X678936, Y713922)	
Depth (M)	**Density/Structure**	**Level Depth**	**Stratum Description**	**Water Level**	**Legend**
0.1	crumb		**Made Ground**		
0.2					
0.3					
0.4					
0.5					
0.6					
0.7	Firm		**Compacted Sand and Gravel**		
0.8					
0.9					
1m					
1.1					
1.2					
1.3					
1.4					
1.5					
1.6					
1.7					
1.8			End of Trial Hole at 1.8 m		
Comments: Trial Hole excavated to 1.8m. Made Ground to 0.6m. Compacted Sand & Gravel below this depth. No bedrock encountered. Slight water seeapge at 1.5m bgl					

geoenvironmental ENVIRONMENTAL CONSULTANTS	**Loc:** Ballymany, Newbridge	**Trial Pit No.:** TP #2
	Client: Anthony Neville Homes Ltd	**Logger**: John Delaney
Method and Equipment: Excavation 0.00 -1.7m: 10 Tonne Tracked Excavator	**Time and Date:** 19/4/2021 @ 11.00	**ITN Co-ordiantes:** (X679025;Y713970)

Depth (M)	Density/Structure	Level Depth	Stratum Description	Water Level	Legend
0.1	crumb		**Mix of Topsoil and Made Ground**		
0.2					
0.3					
0.4	Single Grain		**Single grain SAND**		
0.5					
0.6					
0.7					
0.8					
0.9					
1m					
1.1					
1.2					
1.3					
1.4					
1.5					
1.6					
1.7			End of Trial Hole at 1.7 m		

Comments: Trial Hole excavated to 1.7m. Made Grouind/Fill to 0.3m. Highly Permeable Single Grain Sand below 0.3m. No indicators of poor drinage. No bedrock or water table encountered.

geoenvironmental ENVIRONMENTAL CONSULTANTS	**Loc:** Ballymany, Newbridge	**Trial Pit No.:** TP #3
	Client: Anthony Neville Homes Ltd	**Logger**: John Delaney
Method and Equipment: Excavation 0.00 -1.8m: 15 Tonne Tracked Excavator	**Time and Date:** 19/4/2021 @ 11.30	**ITN Co-ordiantes:** (X678836; Y713970)

Depth (M)	Density/Structure	Level Depth	Stratum Description	Water Level	Legend
0.1	crumb		**Light Brown Loamy Topsoil**		
0.2					
0.3					
0.4					
0.5	Firm		**Light Brown SILT/CLAY**		
0.6					
0.7					
0.8					
0.9					
1m					
1.1					
1.2					
1.3					
1.4					
1.5					
1.6					
1.7					
1.8			End of Trial Hole at 1.8 m		

Comments: Trial Hole excavated to 1.8m. Well drained topsoil to 0.4m. SILT/CLAY from 0.3m. No bedrock or water table encountered

geoenvironmental ENVIRONMENTAL CONSULTANTS			**Loc:** Ballymany, Newbridge	**Trial Pit No.:** TP# 4	
			Client: Anthony Neville Homes Ltd	**Logger**: John Delaney	
Method and Equipment: Excavation 0.00 -1.9m: 15 Tonne Tracked Excavator			**Time and Date:** 19/4/2021 @ 11.50	**ITN Co-ordiantes:** (X678928; Y714201)	
Depth (M)	**Density/Structure**	**Level Depth**	**Stratum Description**	**Water Level**	**Legend**
0.1	crumb		**Light Brown Loamy Topsoil with vegetation rootlets**		
0.2					
0.3					
0.4					
0.5	Firm		**Light Brown SILT with clay**		
0.6					
0.7					
0.8					
0.9					
1m					
1.1					
1.2					
1.3					
1.4					
1.5					
1.6					
1.7					
1.8					
1.9			End of Trial Hole at 1.9 m		
Comments: Trial Hole excavated to 1.9m. Well drained topsoil to 0.3m. Subsoil consists of reasonabley well drained SILT with clay. No bedrock or water table encountered.					

geoenvironmental ENVIRONMENTAL CONSULTANTS	**Loc:** Ballymany, Newbridge	**Trial Pit No.** TP #5
	Client: Anthony Neville Homes Ltd	**Logger**: John Delaney
Method and Equipment: Excavation 0.00 -2.1m: 15 Tonne Tracked Excavator	**Time and Date:** 19/4/2021 @ 12:10	**ITN Co-ordiantes:** (X678787; Y714259)

Depth (M)	Density/Structure	Level Depth	Stratum Description	Water Level	Legend
0.1	crumb		**Light Brown Loamy Topsoil**		
0.2					
0.3					
0.4	Firm		**Light Brown Sandy SILT**		
0.5					
0.6					
0.7					
0.8					
0.9					
1m					
1.1					
1.2					
1.3					
1.4					
1.5					
1.6					
1.7					
1.8					
1.9					
2					
2.1			End of Trial Hole at 2.1 m		

Comments: Trial Hole excavated to 2.1m. Well drained topsoil to 0.3m. Subsoil consists of well drained sandy SILT. No indicators of poor drinage. No bedrock or water table encountered

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	Loc: Ballymany, Newbridge	**Trial Pit No.:** TP #6
	Client: Anthony Neville Homes Ltd	**Logger**: John Delaney
Method and Equipment: Excavation 0.00 -1.5m: 10 Tonne Tracked Excavator	**Time and Date:** 19/5/2016 @ 12.30	**ITN Co-ordiantes:** (X678703 Y714214)

Depth (M)	Density/Structure	Level Depth	Stratum Description	Water Level	Legend
0.1	crumb		**Light Brown Loamy Topsoil**		
0.2					
0.3					
0.4					
0.5	Firm		**Light Brown SILT with clay**		
0.6					
0.7					
0.8					
0.9					
1m					
1.1					
1.2					
1.3					
1.4					
1.5					
1.6					
1.7					
1.8					
1.9			End of Trial Hole at 1.9 m		

Comments: Trial Hole excavated to 1.9m. Well drained topsoil to 0.3m. Subsoil consists of well drained loamy granite till. No indicators of poor drinage. No bedrock or water table encountered.

APPENDIX F – WATER SUPPLY DEMAND CALCULATION

Development Strategic Housing Development at Ballymany, Newbridge

Job No: D1920

Section Water Demand Calculations

Element	Occupancy Rate	Average Daily Demand (l/p/d)	Average Day/Peak week Demand factor	Peak Demand factor (for pipe sizing)
Domestic	2.7	150	1.25	5
Creche	10	60	1.25	5

Element	Unit	No of Units	Occupancy Rate (p/unit)	Total Occupancy (persons)	Daily Demand* (l/p/d)	Average Daily Demand (l/d) and 24 hour storage	Average Daily Peak Demand (l/d)	Average Demand (l/s)	Factored (5) Peak Demand for pipe sizing (l/s)	Fire Flow Requirements
Residential	Dwelling	336	2.7	907.2	150	**136,080**	**170,100**	**1.97**	**9.84**	TBA
Creche	Person	10	1	10	60	**600**	**750**	**0.01**	**0.04**	TBA
					TOTALS	**136,680**	**170,850**	**1.98**	**9.89**	