



Engineering Assessment Report

Proposed Large-scale Residential Development (LRD) in
St. Mochta's Lands, Kellystown LAP, Clonsilla, Co. Dublin

June 2025

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1. Introduction

1.1 Context

This Engineering Assessment Report has been prepared by Waterman Moylan as part of the documentation in support of a planning application for a proposed new residential development for St. Mochta's, in lands within the Kellystown Local Area Plan (LAP), Clonsilla, Dublin 15.

This report assesses wastewater and surface water drainage, water supply infrastructure and the road and transportation network in the vicinity of the site, and details the criteria used to design the proposed wastewater and surface water drainage, water supply and transport networks to serve the development.

1.2 Site Location and Description

The subject site is located in the Kellystown LAP, north of Block A (which is currently under construction under Reg. Ref. LRD0034/S3) and the new Kellystown Link Road under construction as part of the adjacent residential development (ABP-312318-21), west of Diswellstown Road, and north of Luttrellstown Road. The site location is outlined in **Figure 1** below:

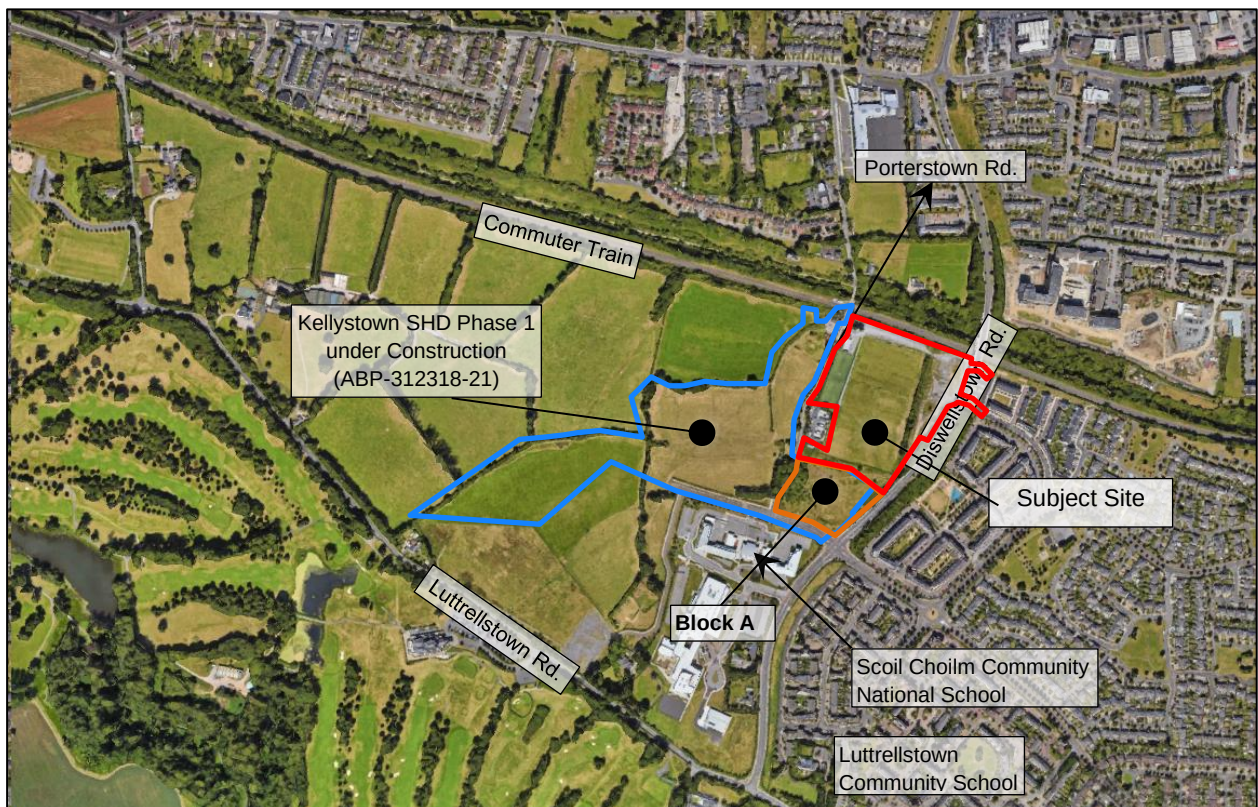


Figure 1 | Site Location (Source: Google Maps)

The site is currently part of St. Mochta's football club & pitches. Topographic survey data indicates that the site generally falls from north to south, with a high point of approximately 63.02m OD Malin at the north-west corner of the site and a low point of approximately 60.84m OD Malin at the south-west of the site.

The subject site seeks to construct a new housing development on the existing St. Mochta's football club lands, which is zoned in the Kellystown LAP for residential development.

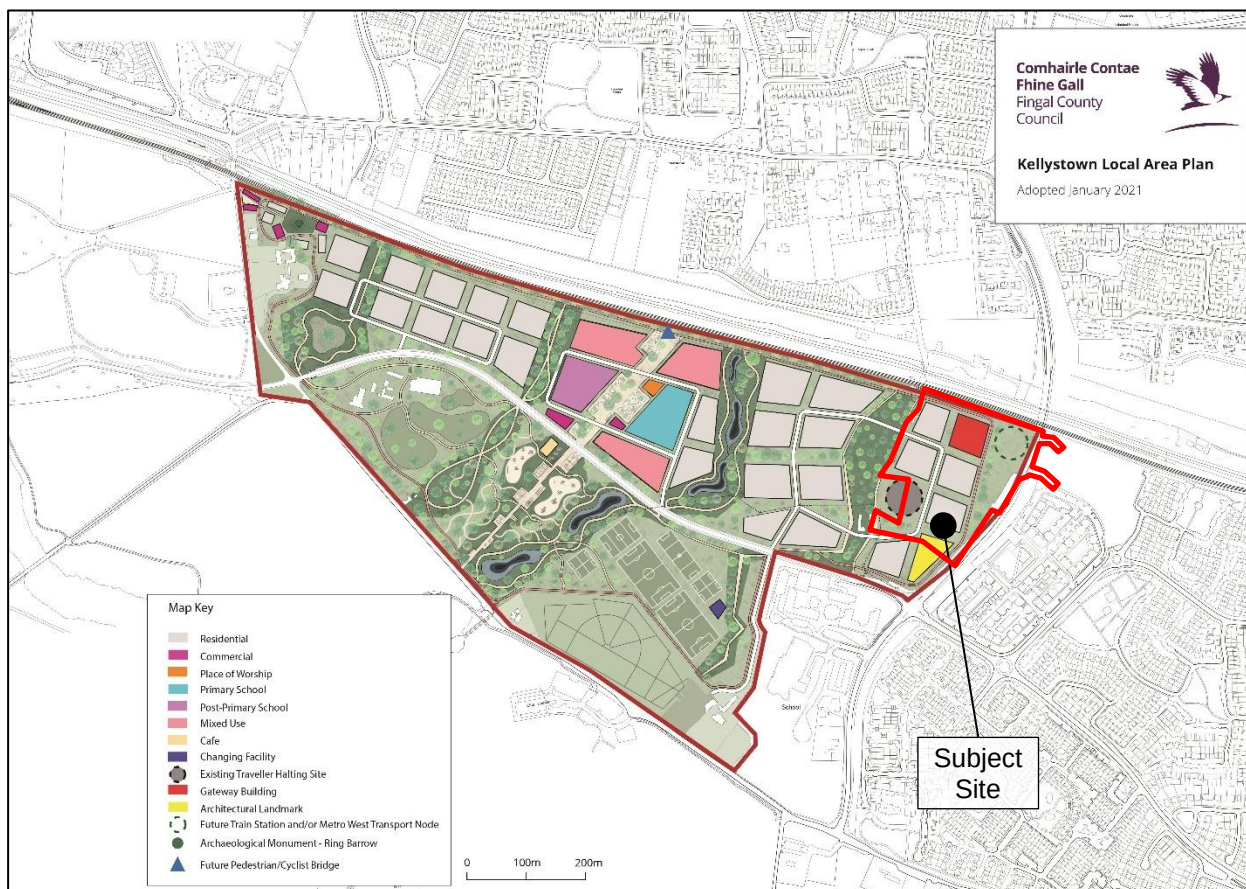


Figure 2 | Kellystown LAP Map

1.3 Proposed Development

The proposed development comprises 302no. residential units in a mix of houses, duplex and apartment units consisting of 62no. 2 storey, 3-bedroom houses and 35no. 3 storey, 4-bedroom houses; 205no. Duplex / Apartment Units (98no. 1-bed, 88no. 2-bed and 19no. 3-bed) across 4no. blocks comprising: Block D ranging in height from 5-7 storeys accommodating 57no. apartment units; Block E ranging in height from 5-7 storeys accommodating 77no. apartment units; Block F ranging in height from 4-5 storeys accommodating 39no. apartment and duplex units; Duplex Blocks G1, G2, G3 & G4 3 storeys in height accommodating 32no. apartment units; and all associated and ancillary site development and infrastructural works, hard and soft landscaping and boundary treatment works, including public open space; public lighting; surface car parking spaces; bicycle parking spaces/stores for mid-terrace units; bin stores. Vehicular access to the proposed development is provided by the road network permitted under Reg. Ref. ABP-312318-21, as amended by Reg. Ref. LRD0034-S3. The schedule of accommodation is outlined below:

Description	1-Bed	2-Bed	3-Bed	4-Bed	Total
Houses	-	-	62	35	97
Duplexes	-	7	19	-	26
Apartments	98	81	-	-	179
Total	98	88	81	35	302

Table 1 | Schedule of Accommodation

The development includes associated car, motorcycle and bicycle parking, storage, services and plant areas, and landscaping. The proposed application includes all site landscaping works, boundary treatments, lighting, servicing, signage, and associated and ancillary works, including site development works and services above and below ground.

2. Foul Water Network

2.1 Existing Foul Water Network

Uisce Éireann records for the surrounding area have been consulted as part of this assessment, and are extracted below:

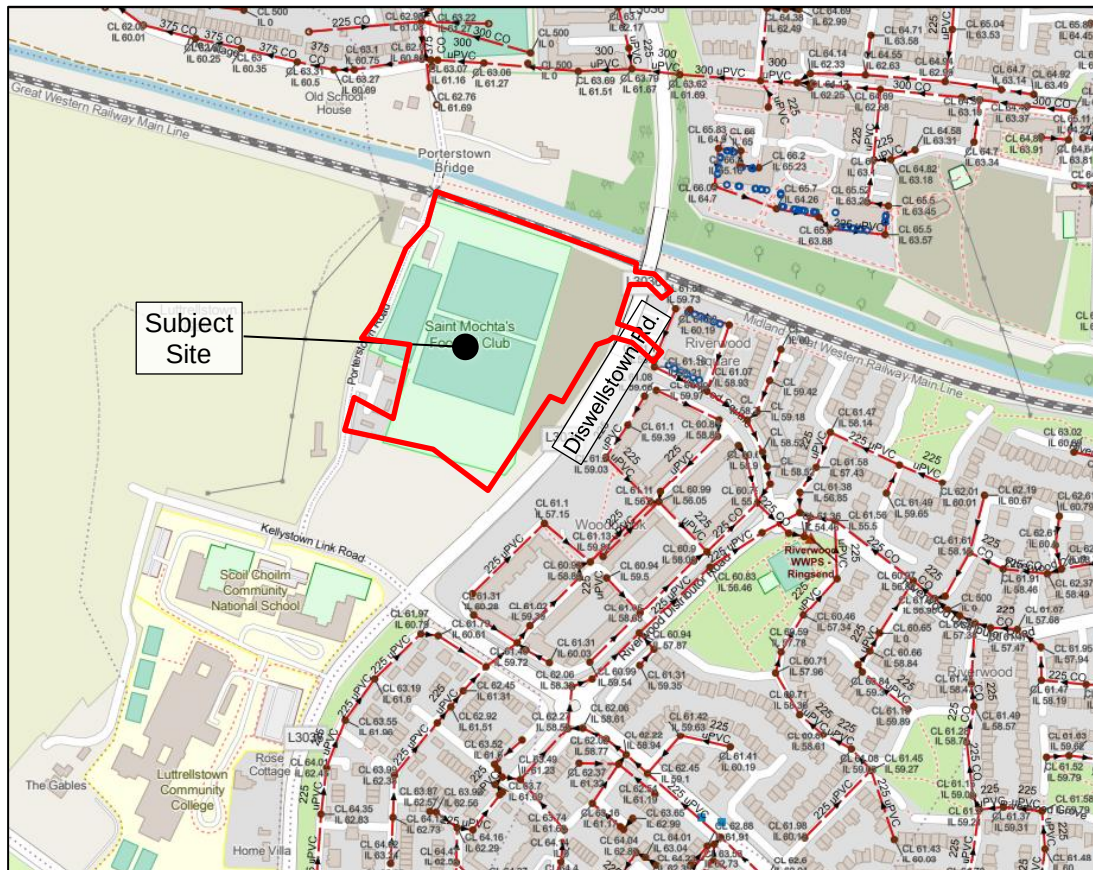


Figure 3 | Extract of Uisce Éireann's Wastewater Drainage Records

The adjacent Kellystown Strategic Housing Development, under construction by the Applicant under ABP-312318-21, is providing a new foul drain under the new Kellystown Link Road with a spur left to serve the subject development. This foul sewer drains to a new pumping station, also permitted and under construction under ABP-312318-21. This pumping station has been designed to cater to the entire LAP lands, including the subject residential development, and is due to become operational in 2025.

2.2 Proposed Foul Water Network

It is proposed to drain wastewater from the site by gravity to the existing SHD spur at the western part of the site, which has been constructed to facilitate the subject development. This wastewater is proposed to be drained through the adjacent Phase 1 lands which is also under the same applicant by upsizing to a 300Ø mm pipe, which will consequently drain to the 450Ø mm pipe immediately north of the foul water pumping station. Please refer to the accompanying drainage drawing STM-WMC-ZZ-00-DR-C-200, which show the proposed foul water drainage levels, gradients and connection point.

A Pre-Connection Enquiry was submitted to Uisce Éireann, reference number CDS24010409. The Confirmation of Feasibility Letter dated 5 March 2025 and as included in Appendix A, advises that the

development is feasible without infrastructure upgrades to the foul water network. Additionally, all relevant wastewater infrastructure within the adjacent development must be completed, of adequate capacity and integrity, connected to the Uisce Éireann networks and in operation prior to connecting to this subject development. Note that the foul water pumping station which is under construction is permitted and included under Uisce Éireann Connection Agreement CDS2100645401. This pumping station has been designed to cater to the subject development and includes 24-hour storage.

A detailed design drawing submission package will be submitted to Uisce Éireann for both foul water and water supply design. Furthermore, a Statement of Design Acceptance was received on 26 May 2025 and is included in Appendix A. The letter states that Uisce Éireann has no objection to the foul water design proposals for the subject site.

2.3 Foul Water Drainage Calculations

The calculated foul water flows at the subject development are set out in the Table below. Wastewater loads have been calculated based on a maximum occupancy of 2.7 persons per unit with a per capita wastewater flow of 150 litres per head per day along with a 10% unit-consumption allowance, in line with the flow rates for design provided in Appendix C of the Code of Practice.

A peak flow multiplier of 4.5 has been used, as per Section 2.2.5 of Appendix B of the Code of Practice.

Description	Total Population	Load per Capita	Daily Load	Total DWF	Peak Flow
	No. People	l/day	l/day	l/s	l/s
Proposed Development (302 units)	815.4	150	134,541	1.557	7.007

Table 2 | Calculation of Total Foul Water Flow from the Development

The total dry weather flow from the development has been calculated as 1.557l/s, with a peak flow of 7.007l/s.

2.4 Foul Water Drainage – General

Foul water sewers will be constructed strictly in accordance with Uisce Éireann requirements. No private drainage will be located within public areas.

Drains will be laid to comply with the requirements of the latest Building Regulations, and in accordance with the recommendations contained in the Technical Guidance Document H.

3. Surface Water Network

3.1 Existing Surface Water Network

The subject site is a greenfield site. Topographic survey data indicates that the site generally falls from north to south, with a high point of approximately 63.02m OD Malin at the north of the site and a low point of approximately 60.84m OD Malin at the south of the site. The site falls within the catchment of the River Liffey, located approximately 1.17km south of the site.

3.2 Proposed Surface Water Network and SuDS Strategy

It is proposed to drain surface water through the site via a series of drains and sewers, ultimately discharging to the spur at the south-east corner of the subject development associated with the adjacent Strategic Housing Development under construction under ABP-312318-21. The surface water drains to Block A (Reg. Ref. LRD0034/S3) drainage (currently under construction) which in turn drains to Kellystown SHD Phase 1. The drainage through this adjacent space has been constructed by the Applicant under ABP-312318-21, with spurs left to serve the subject development.

The discharge rate will be restricted to the greenfield equivalent runoff rate, as calculated in Section 3.3 below, by a Hydrobrake or similar approved flow control device. Excess flows over and above the greenfield runoff will be attenuated. For the purposes of attenuation, the site is divided into 2 sub-catchments, Catchment 1 includes Block D and houses/duplexes in the northern part of the site, while Catchment 2 includes Block E, F, G1, G2 and G3 and houses/duplexes in the southern part of the site. The attenuation has been designed to accommodate runoff volumes up to the 1-in-100-year storm, accounting for a 20% increase due to climate change. This strategy was presented as part of the stage 2 submissions to Fingal County Council and was reviewed by the Water Services department who note that the surface water drainage strategy, design and details are acceptable.

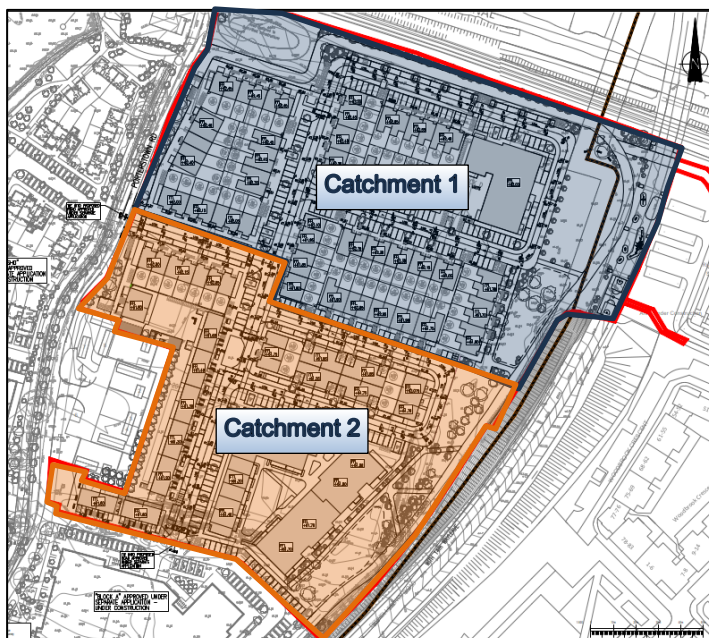


Figure 4 | Surface Water Catchments

The proposed development will be designed to incorporate best drainage practice. Section 3.3, below, sets out the methodology used in determining the existing greenfield runoff rates and calculating attenuation storage requirements for the site.

It is proposed to incorporate a Storm Water Management Plan through the use of various SuDS techniques to treat and minimise surface water runoff from the site. The methodology involved in developing a Storm Water Management Plan for the subject site is based on recommendations set out in the Greater Dublin Strategic Drainage Study (GDSDS) and in the SuDS Manual (Ciria C753). Based on three key elements – Water Quantity, Water Quality and Amenity – the targets of the SuDS train concept have been implemented in the design, providing SuDS devices for Source Control, Site Control and Regional Control.

3.2.1 Source Control

Green Roof:

It is proposed to introduce green roofing on Blocks D, E, F, G1, G2 and G3 as a source control device. The proposed green roof (approximately 1797m²) shall cover a minimum of 60% of the roof area as outlined in the Green/Blue Infrastructure for Development Guidance Note by Fingal County Council. The substrate and the plant layers in a green roof absorb large amounts of rainwater and release it back into the atmosphere by transpiration and evaporation. They also filter water as it passes through the layers, so the run-off, when it is produced, has fewer pollutants. Rainfall not retained by green roofs is detained, effectively increasing the time to peak and slowing peak flows.

A green roof can reduce annual percentage runoff by between 40% and 80% through this retention and evapotranspiration, with the impact dependent on a range of factors including the depth of substrate, the saturation of substrate at the onset of a rain event, the angle of the roof, the range of vegetation growing, intensity of rainfall and the time of year.

Permeable Paving:

It is proposed to introduce permeable paving in all the private driveways and car parking spaces. Downpipes from the building will drain to filter drains beneath the permeable paving to facilitate maximum infiltration of surface water from roof areas.

The goal of permeable paving is to control stormwater at the source to reduce runoff. In addition to reducing surface runoff, permeable paving has the dual benefit of improving water quality by trapping suspended solids and filtering pollutants in the substrata layers.

Filter Drains:

It is proposed to install filter drains, consisting of perforated pipes surrounded in filter stone, around the perimeter of the building and beneath the permeable paving parking spaces. The filter drains will provide infiltration, optimise the retention time and provide quality improvement to the storm water runoff, in particular the first flush from hardstanding areas. The proposed perforated pipes connect to the proposed surface water sewer network.

3.2.2 Site Control

Tree Pits:

It is proposed to introduce tree pits and planting areas through the car parking areas. Surface water runoff from the roads will drain to the tree pits. A high-level gully will allow excess water to discharge to the below-ground surface water network if the tree pits and/or landscaped areas become inundated.

Roads will have the most pollutants, and it is appropriate to provide an at-source treatment SuDS technique to address this. The proposed tree pits will provide infiltration, optimise the retention time, and provide quality improvement to the storm water runoff, in particular the first flush from the roads.

Trees can help control storm water runoff because their leaves, stems, and roots slow rain from reaching the ground and capture and store rainfall to be released later. Trees help to attenuate flows, trap silts and

pollutants, promote infiltration and prevent erosion. Incorporating tree planting offers multiple benefits, including attractive planting features, improved air quality and increased biodiversity whilst helping to ensure adaptation to climate change.

Attenuation and Flow Control:

For Catchments 1, and 2, the attenuation storage required for the 1-in-100-year storm will be provided in dry detention basins supplemented with small underground StormTech tanks. The tanks will provide storage for up to 10-year rainfall event, ensuring the open space remains dry virtually all year long and only fills with surface water for extreme rainfall events with more than the 1 in 10-year event. Flows will be controlled by a Hydrobrake or similar approved flow control device, limited to the greenfield equivalent runoff rate (as calculated in Section 3.3 below), with excess flows being attenuated in the dry detention basin and underground tank before outfalling by gravity.

Petrol Interceptor:

A Class 1 Petrol interceptor is to be installed before the surface water outfall. Petrol Interceptors will remove hydrocarbons from surface flows, protecting the natural watercourse.

Petrol interceptors work on the premise that some hydrocarbons, such as petroleum and diesel, are less dense than water and float on the top of surface water flows. Typically, it is runoff from roads and other trafficked areas that are contaminated with hydrocarbons. The petrol interceptor will prevent a layer of hydrocarbons and other light pollutants in contaminated waters from entering the water course.

Note that all of the other SuDS features described above are upstream of the proposed petrol interceptor and will serve to slow and treat surface water runoff.

3.2.3 Regional Control

Surface water from the proposed development is to be treated, slowed, and attenuated entirely within the site boundary, and as such no regional control measures are proposed.

3.2.4 Treatment Train Summary

The SuDS treatment train at the site includes green roofing, which will encourage transpiration and evaporation, reducing runoff and treating the runoff that is produced. Permeable paving and filter drains will encourage infiltration of surface water into the ground. Rainwater on roads will be directed towards tree pits. During large storm events, there is a high-level overflow from these tree pits into a gully, which discharges to the below-ground sewer network.

After these SuDS devices, rainwater will make its way into the below ground sewer network. The runoff is restricted to the greenfield equivalent rate, and excess storm water above this rate is directed to the proposed attenuation. Finally, a petrol interceptor is proposed as a final measure, but as noted above, all of the other SuDS features described are upstream of the proposed petrol interceptor and will serve to slow and treat surface water runoff before it reaches the interceptor or the outfall.

3.3 Interception or Treatment Storage and Attenuation Storage

As noted above, the methodology involved in developing the Storm Water Management Plan for the subject site is based on recommendations set out in the Greater Dublin Strategic Drainage Study (GDSDS) and in the SuDS Manual (Ciria C753). Appendix E of the Greater Dublin Strategic Drainage Study (GDSDS) sets out criteria for determining the provision of interception or treatment storage, attenuation storage and long-term storage at a development site. These calculations are included in full in Appendix B and are summarised below. Additionally, the Local Authority requirements are that post-development run-off rates

are limited to greenfield run-off rates for the site. The greenfield run-off rates for the site have been calculated in accordance with the Institute of Hydrology report No 124 "Flood Estimation for Small Catchments", using the UK SUDS Website. Based on a total hardstanding of 3.66 Ha, the Greenfield run-off for the site is 9.31 l/s (Q_{BAR}). Please refer to Appendix B.

It is proposed to limit the discharge from the subject site to the Greenfield run-off rate of 9.31/s.

3.3.1 Criterion 1: River Water Quality Protection

Criterion 1.1: Interception

The Greater Dublin Strategic Drainage Study (GDSDS) states that approximately 30% to 40% of rainfall events are sufficiently small that there is no measurable runoff from greenfield areas into the receiving waters. These events are generally considered as the first 5mm of rainfall.

For the purposes of assessing the interception requirements, the site has been divided into two separate catchments as shown in Figure 4 above. Assuming 80% runoff from paved surfaces and 0% from pervious surfaces for the first 5mm of rainfall yields the following:

Catchment 1	Paved surfaces connected to drainage system	$24,655.28m^2 \times 0.4899 \times 1 =$ $12,078.62m^2$	<i>24,655m² site area</i> <i>49% of the site is paved</i> <i>100% of the paved area</i>
	Volume of Interception Storage	$12,078.62m^2 \times 5mm \times 0.8 =$ 48.31m³	<i>Paved area directly drained</i> <i>5mm rainfall depth</i> <i>80% paved runoff factor</i>
Catchment 2	Paved surfaces connected to drainage system	$19,197.95m^2 \times 0.5772 \times 1 =$ $11,081.06m^2$	<i>19,198m² site area</i> <i>58% of the site is paved</i> <i>100% of the paved area</i>
	Volume of Interception Storage	$11,081.06m^2 \times 5mm \times 0.8 =$ 44.32m³	<i>Paved area directly drained</i> <i>5mm rainfall depth</i> <i>80% paved runoff factor</i>

Table 3 | Interception Calculation

Interception is provided in accordance with Table 24.6 of the SuDS Manual (Ciria 753), which sets out interception methods that can be assumed to be compliant for zero runoff from the first 5mm of rainfall.

Catchment 1 includes block D and houses/duplexes in the northern part of the site. The required interception volume is achieved through the use of green roofing, permeable paving and tree pits, with all of the site draining to at least one of these components. All surfaces that have green roofs can be assumed to be compliant with the interception requirement. As set out above, block D includes approximately 876.63m² of intensive green roofing comprising a minimum of 200mm of substrate. Assuming a 30% void ratio, this provides approximately 52.60m³ of interception storage. It is also proposed to introduce 1,294.3m² of permeable paving. Assuming a coarse graded aggregate depth of 350mm and a void ratio of 30%. This yields 135.9m³ of interception volume. Trees and planted areas at ground level provide further interception. As such, the interception requirement for Catchment 1 is met.

Catchment 2 includes the blocks E, F G1, G2 and G3, and houses/duplexes in the southern part of the site. The required interception volume is achieved through the use of green roofing, permeable paving and tree pits, with all of the site draining to at least one of these components. Blocks E, F, G1, G2 and G3 include approximately 3,151.71m² of intensive green roofing comprising a minimum of 200mm of substrate. Assuming a 30% void ratio, this provides approximately 189.1m³ of interception storage. It is also proposed to introduce 247.5m² of permeable paving. Assuming a coarse graded aggregate depth of 350mm and a

void ratio of 30%, this provides approximately 26.0m³ of interception volume. Trees and planted areas at ground level provide further interception. As such, the interception requirement for Catchment 2 is met.

3.3.2 Criterion 2: River Regime Protection

Attenuation storage is provided to limit the discharge rate from the site into the public network. The total impermeable area of the catchment including roads, car-parking and roofs, is approximately 2.32 Ha, and the peak outflow will be limited to 9.31l/s in the 1 in 100-year event.

The FCC Green/Blue Infrastructure for Development 2020 Guidance Note prescribes a Coefficient of Volumetric Runoff (Cv) of 1.00 for all hard surfaces and a Cv of 0.9 for paved areas. Additionally, the designs should be cognisant of urban creep and the resultant increased runoff resulting from the same and as such, an urban creep factor (10%) has been applied for the houses' hardstanding areas.

Based on these coefficients, the 1-in-100-year 36-hour winter storm is the critical storm for Catchment 1, with a required attenuation storage volume of 657.8m³. This is achieved by introducing a 750mm deep dry detention basin and underground MC 3500 Stormtech tank at the eastern part of this catchment, as indicated on the accompanying drainage drawings.

The 1-in-100-year 36-hour winter storm is the critical storm for Catchment 2, with a required attenuation storage volume of 987.8m³. This is achieved by introducing a 750mm deep dry detention basin and underground MC3500 Stormtech tank on the south-eastern part of this catchment, as indicated on the accompanying drainage drawings.

3.3.3 Criterion 3: Levels of Service

There are four criteria for levels of service. These are:

- Criterion 3.1: No external flooding except where specifically planned (30-year high intensity rainfall event).
- Criterion 3.2: No internal flooding (100-year high intensity rainfall event).
- Criterion 3.3: No internal flooding (100-year river event and critical duration for site storage).
- Criterion 3.4: No flood routing off site except where specifically planned (100-year high intensity rainfall event).

Both internal and external flooding have been assessed in the Flood Risk Assessment report which accompanies this Engineering Assessment Report. The Flood Risk Assessment has been carried out in accordance with the *DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management* published in November 2009.

The assessment identifies the risk of both internal and external flooding at the site from various sources and sets out mitigation measures against the potential risks of flooding. The sources of possible flooding assessed in the report include coastal, fluvial, pluvial (direct heavy rain), groundwater and human/mechanical errors.

As a result of the flood risk management and mitigation measures proposed, the residual risk of internal or external flooding for the 30-year and 100-year flood events is low, and accordingly all four of the above criteria have been met. Please refer to the accompanying Flood Risk Assessment report for the full analysis of the flood risk at the subject site.

3.3.4 Criterion 4: River Flood Protection

The long-term storage volume is a comparison of pre- and post-development runoff volumes. The objective is to limit the runoff discharged after development to the same as that which occurred prior to development.

Of the three methods described in the GDSDS for establishing River Flood Protection by comparison of the pre- and post-development runoff volumes, (Criteria 4.1, 4.2 and 4.3 respectively), Criteria 4.3 is selected for use as the most practical criteria at this stage in the design.

The Criteria 4.3 approach is for all runoff be limited to either Q_{BAR} or to 2 l/s/Ha, whichever is greater. The proposed drainage system includes a flow control device to ensure that the discharge rate is limited to the greenfield equivalent and ample attenuation is provided for the 1-in-100-year storm, accounting for a 20% increase due to climate change. Note that as stated in the GDSDS, the extra runoff volume of the development runoff over greenfield runoff is not additional to the attenuation storage volume but is effectively an element of it.

3.4 Surface Water – General

It is noted that roads throughout the development will subsequently be taken in charge. Nonetheless, surface water sewers will be laid strictly in accordance with Fingal County Council requirements for taking in charge and will generally consist of PVC (to IS 123) or concrete socket and spigot pipes (to IS 6).

All private outfall manholes will be built in accordance with the Greater Dublin Regional Code of Practice for Drainage Works. No private drainage will be located within public areas.

Drains will be laid in accordance with the requirements of the Building Regulations, Technical Guidance Document H.

3.5 Flood Risk Assessment

A site-specific Flood Risk Assessment has been carried out for the proposed development and accompanies this submission under separate cover.

4. Water Supply Network

4.1 Existing Water Supply Network

Uisce Éireann records for the surrounding area have been consulted as part of this assessment, and are extracted below:

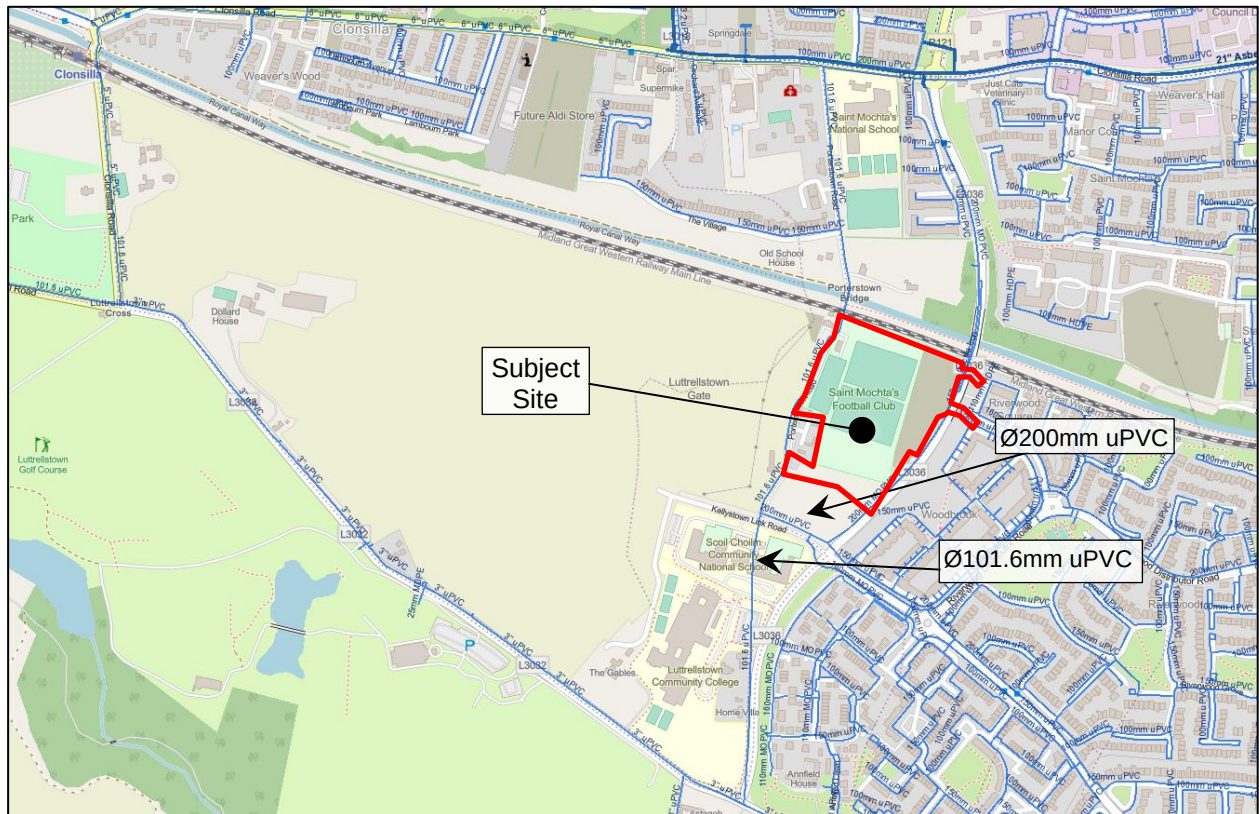


Figure 5 | Extract of Uisce Éireann's Water Supply Service Records

There is an existing 100mm diameter watermain located in Porterstown Road, and a 200mm watermain in the Kellystown Link Road.

As part of the adjacent Kellystown Strategic Housing Development, under construction by the Applicant under ABP-312318-21, the 200mm watermain in Kellystown Link Road has been extended, with a spur left to serve the subject development via a series of 150mm diameter watermains. Additionally, a 150mm watermain spur has been provided as part of the adjacent Block A (Reg. Ref. LRD0034/S3) development to the south to serve the subject development.

4.2 Proposed Water Supply Network

It is proposed to provide a new 150mm connection to the existing SHD & Block A 150mm diameter water supply mains at the south-western part of the site, where the spur has been left for the development. Please refer to the accompanying watermain drawings, which show the proposed water connection, layout, water meter, hydrants and valves.

A Pre-Connection Enquiry was submitted to Uisce Éireann, reference number CDS24010409. The Confirmation of Feasibility Letter dated 5 March 2025 and as included in Appendix A, advises that the development is feasible without infrastructure upgrades to the water supply network.

A detailed design drawing submission package will be submitted to Uisce Eireann for both foul water and water supply design. Furthermore, a Statement of Design Acceptance was received on 26 May 2025 and is included in Appendix A. The letter states that Uisce Éireann has no objection to the water supply design proposals for the subject site.

4.3 Water Supply Calculations

The calculated water demand at the subject development is set out in the below table. The average demand has been established based on an average occupancy ratio of 2.7 persons per dwelling with a daily per capita consumption of 150 litres per head per day and with a 10% allowance factor. The average day/peak week demand has been taken as 1.25 times the average daily domestic demand, while the peak demand has been taken as 5 times the average day/peak week demand, as per Section 3.7.2 of the Uisce Éireann Code of Practice for Water Infrastructure.

Description	Total Population	Water Demand	Average Demand	Average Peak Demand	Peak Demand
	No. People	l/day	l/s	l/s	l/s
Proposed Development (302 units)	815.4	134,541	1.557	1.946	9.730

Table 4 | Calculation of Water Demand for the Development

The average demand for the development is 1.557l/s, with a peak demand of 9.730l/s.

4.4 Water Supply – General

All watermains will be laid strictly in accordance with Uisce Éireann requirements and standard details.

Valves, hydrants, scour and sluice valves and bulk water meters will be provided in accordance with the requirements of Uisce Éireann.

5. Roads and Transport Network

This section provides an overview of the existing and proposed road and transportation network in the vicinity of the site. A comprehensive Traffic and Transport Assessment has also been prepared by Waterman Moylan and accompanies this submission under separate cover.

5.1 Existing Site Access

Vehicular access to the proposed development is proposed off the western extension of Kellystown Link Road via the internal road of the under construction Kellystown Development -Phase 1- (Plg. Apl. Reg. Ref. No. SHDW/004/21).

The Kellystown Link Road is currently a single carriageway that extends for approximately 280 metres from the signalised crossroads with Diswellstown Road & Porterstown Link Road. As outlined in the Kellystown Local Area Plan, the Kellystown Link Road will be extended westwards to the junction of the Clonsilla Road (R121) and Luttrellstown Road.

This 280m section of Kellystown Link Road currently provides access to the northern entrance of Scoil Choilm Community National School and links to the road serving the new burial ground site, further west.

Figure 6 below shows the main roads around the subject development.

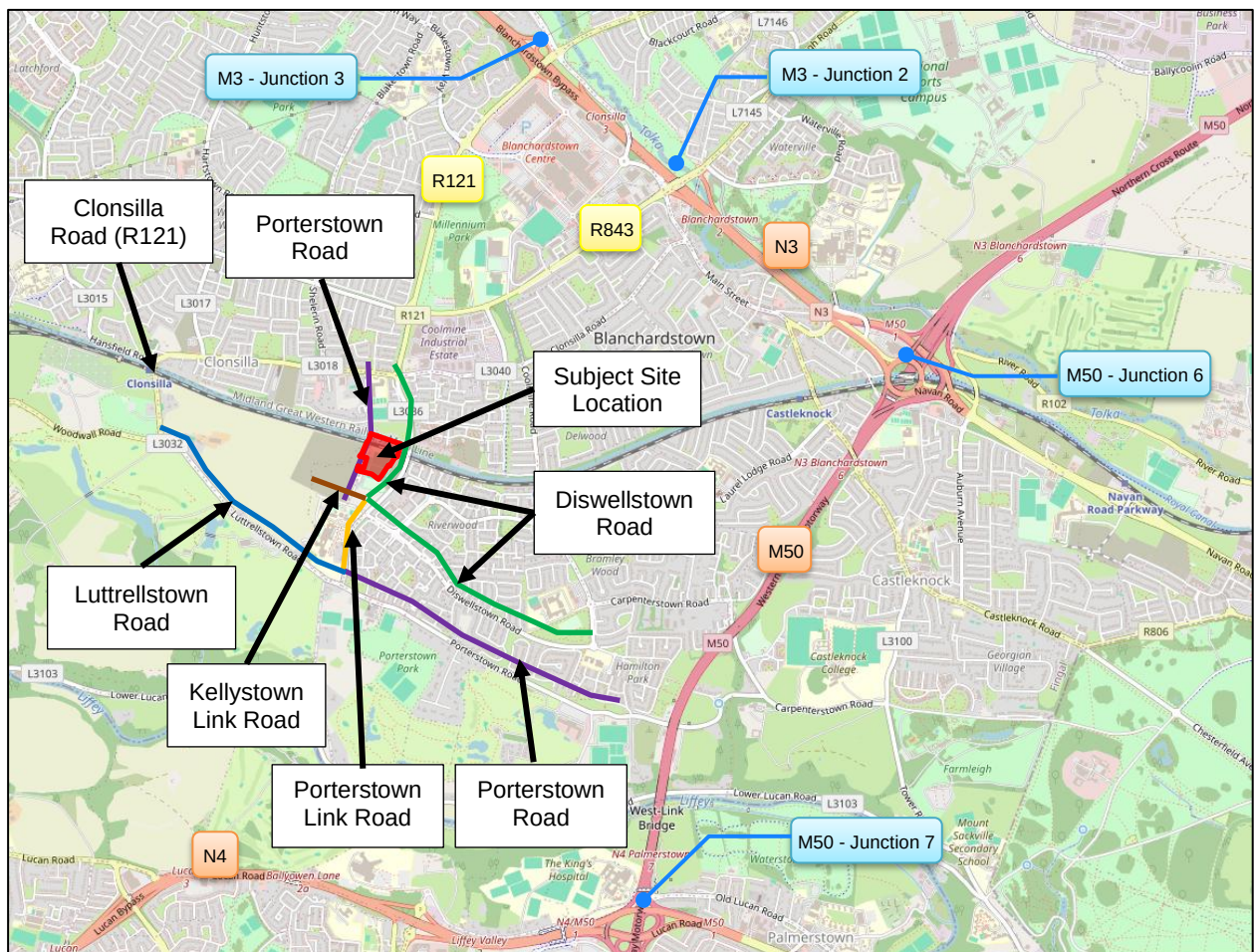


Figure 6 | Site Location – Surrounding Road
(Source: Open Street Maps)

Approximately 100m west of the signalised crossroads at the intersection of Kellystown Link Road and Diswellstown Road, is a priority-controlled junction between Kellystown Link Road & Porterstown Road. The Kellystown Link Road is currently a single carriageway with a width of 10.0 metres, with footpaths and dedicated cycle lanes extending along both sides.

Porterstown Road is a single carriageway road running south-north. This road is approximately 730m in length from the priority-controlled junction with Kellystown Link Road through to a priority-controlled junction with Clonsilla Road (R121). This road crosses the railway line via an automatic level crossing. To the south of the railway line, Porterstown Road comprises a carriageway of approximately 6.5m wide with footpaths running along the western side of the carriageway for the majority of its length and along the eastern side for some meters. No cycle lane is provided.

Diswellstown Road (S-N) is a single carriageway road running south-north for approximately 800m from the signalised crossroads with Kellystown Link Road through to a four-armed roundabout with R121 Clonsilla Road to the north of the railway line. This road, which crosses the railway line via an elevated bridge, currently comprises a carriageway of 7.0m wide with footpaths and cycle lanes provided along both sides.

Diswellstown Road, to the south of the signalised crossroads with Kellystown Link Road, extends approximately 400m towards the signalised T-junction with Luttrellstown Road. This section of the Diswellstown Road comprises the same configuration as the northern section, with a 7.0 m wide carriageway with footpaths and cycle lanes along both sides. Currently, this southern section provides a dedicated right turning pocket lane and signalised pedestrian crossing which facilitate access to Luttrellstown Community College and Scoil Choilm Community National School located to the west.

The M50 Motorway is an important orbital motorway around Dublin which is subject to a speed limit of 100kph. It is a 40km, C-shaped ring around Dublin that connects all the National Primary Roads and carries more than 115,000 vehicles per day.

The N3 road is a national primary road in the Republic of Ireland, running between Dublin, Cavan and the border with County Fermanagh. The A509 and A46 roads in Northern Ireland form part of an overall route connecting to Enniskillen, and northwest to the border again where the N3 reappears to serve Ballyshannon in County Donegal. The route, known as the Navan Road as it leaves Dublin, starts at its junction with the M50 motorway (junction 6). The N3/M3 cross the following counties: Fingal, Meath, and Cavan Donegal in Ireland, and Fermanagh in Northern Ireland.

The N4 road is a national primary road in Ireland, running from Dublin to the northwest of Ireland and Sligo town. The M6 to Galway diverges from this route after Kinnegad, while the N5 to Westport diverges at Longford town. This national road originates at an intersection with the M50 motorway at Junction 7. This is also Junction 1 of the N4/M4. The road has three lanes and a bus lane in each direction between the M50 and Junction 5 which is also the start of the M4 motorway at Leixlip. The N4/M4 cross the following Counties: Kildare, Meath, Westmeath, Longford, Leitrim, and Roscommon

5.2 Existing Public Transport Network

5.2.1 Bus Network

The nearest bus stops in relation to the subject development is situated along Diswellstown Road (Eastern Section). These are Bus Stop No. 7031 (eastbound) and No. 4895 (westbound). The bus Stops are served by the routes 37 and 70n. The distance from the subject development is approximately 500 metres (or 6-minute walk).

Figure 7 below shows the locations of the Bus Stops and walking distances from the development.

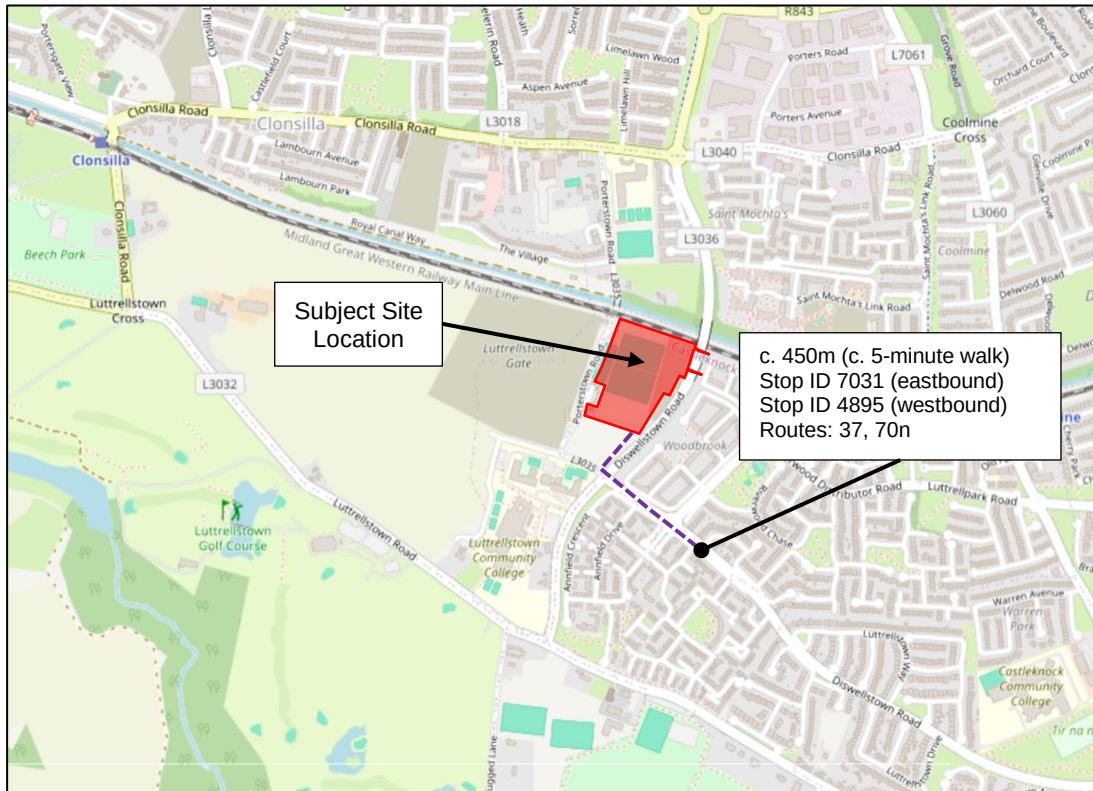


Figure 7 | Location of the nearest Bus Stops
(Source: Google Maps and Transport for Ireland)

Table 5 below shows the Bus Frequencies for each Bus route in the area.

Bus Route	Description	Frequency
70n	Westmoreland Street Towards Tyrrelstown	Monday to Thursday: No service
		Friday to Saturday: 00:00, 02:00, 04:00
		Sunday: No service
37	Blanchardstown Centre Towards Baggot St. / Wilton Terrace	AM Weekday Frequency Every 5 to 10 minutes
		PM Weekday Frequency Every 20 minutes
		Weekend Every 30 minutes
	Baggot St. / Wilton Terrace Towards Blanchardstown Centre	AM Weekday Frequency Every 20 to 35 minutes
		PM Weekday Frequency Every 5 to 10 minutes
		Weekend Every 30 minutes

Table 5 | Local Bus Routes Frequencies
(Source: Transport for Ireland)

5.2.2 Rail Network

There are two rail stations in the vicinity of the subject development site, Clonsilla Rail Station and Coolmine Rail Station. The location of both stations and their relative distance from the subject development site are shown on the in Figure 8 below.

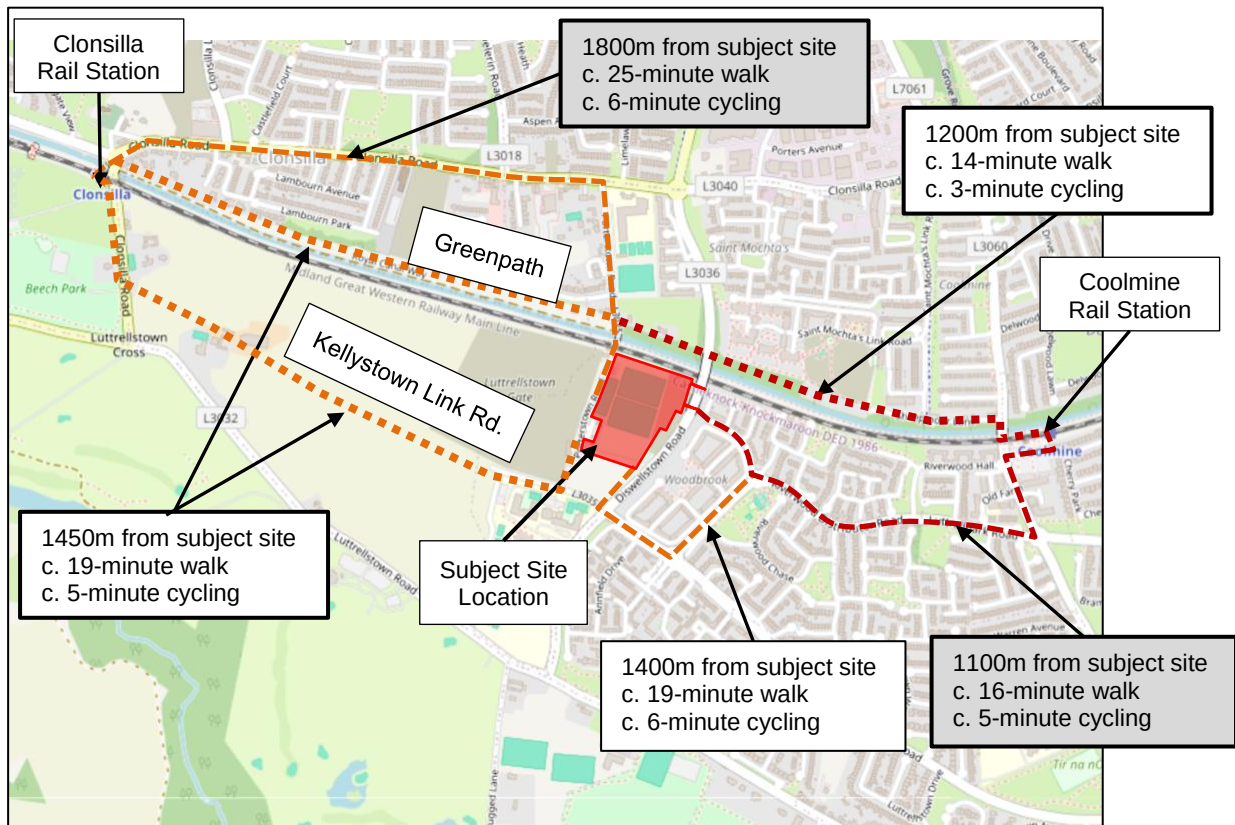


Figure 8 | Location of Clonsilla and Coolmine Train Station and their routes from the Site
(Source: Google maps and Transport for Ireland)

As can be seen in figure above, there are several ways to arrive to both stations.

Clonsilla Railway Station is located approximately 1800m to the north-west of the site and Coolmine Railway Station is located approx. 1500m to the north-east of the site. These distances can be reached in approx. 25-minute walking or c. 6-minute cycling, and in c. 20-minute walking or some 5-minute cycling, respectively.

Furthermore, there is a greenpath along the north bank of the canal which may reduce the distance and walking time. Moreover, when the future Kellystown Link Road is completed (see **Section 4.5.2** below), it will be possible to access Clonsilla Railway Station through the Kellystown developments.

The rail route serving Clonsilla and Coolmine Rail Station is the Dublin - M3 Parkway – Longford. The first train leaves Clonsilla Rail Station at 5:52 AM and it has a frequency of 3 to 20 minutes on weekdays. On Saturday, the first train leaves the station at 6:24 AM and has a frequency of 3 to 20 minutes. On Sunday the first train leaves the station at 9:12 AM and has a frequency of 3 to 20 minutes.

5.2.3 Nearest Car Sharing Facilities (GoCar)

The nearest GoCar stations over a 1km radius of the subject development are shown in Figure 9 below. The closest GoCar station is located 1.6km (23-minute walk) from the subject development site at Coolmine Industrial Estate.

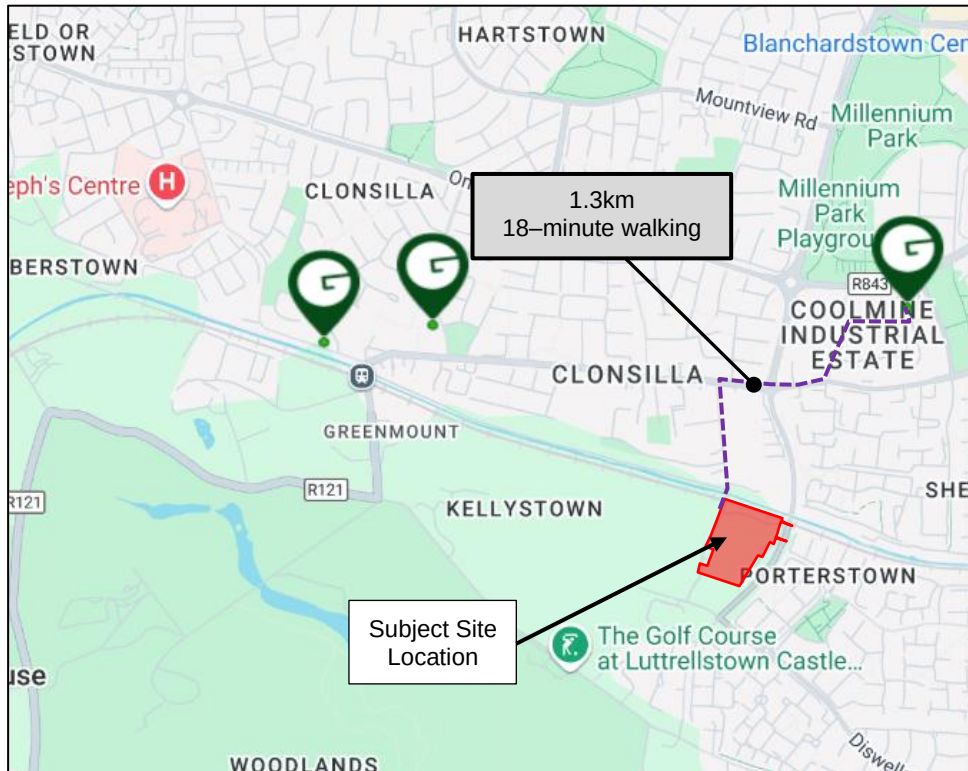


Figure 9 | Location of the Nearest GoCar Stations
(Source: Go Car website)

5.3 Internal Road Layout and Vehicular Access

The internal roads have been designed to comply with DMURS as required by the County Development Plan. The internal roads generally vary between 4.8m and 5.5m in width. All footpaths are 2.0m wide and connect the internal spaces.

The proposed development includes “home-zones” (also called shared surfaces), which have been designed primarily to meet the needs of pedestrians, cyclists, children, and residents. The aim is to reduce the speed and dominance of cars.

All internal roads within the proposed development have been designed with a speed limit of 30km/h. The shared road will have a speed limit of 20km/h. All junctions within the development itself will be priority junctions with raised tables where appropriate.

The low design speeds and traffic calming measures will ensure the safe operation of these junctions and a safe/secure environment for pedestrians and cyclists.

The design and layout of the proposal has been prepared to fully comply with the current relevant design standards and specifications applicable to this form of development.

Additionally, all road intersections within the development itself have been designed as priority junctions. The visibility splays of which these junctions have been designed in accordance with the requirements set

out in the Design Manual for Urban Roads and Streets (DMURS), which recommends visibility splays of 23m x 2.4m on roads without bus routes. The internal junctions have been designed with low speeds to ensure safe operation.

Vehicular access is provided off Kellystown Link Road via the internal roads of the ongoing Kellystown Development -Phase 1- (Plg. Apl. Reg. Ref. No. SHDW/004/21) as can be seen in Figure 10 below.

The main junction located at Kellystown Link Road has been designed to provide access for residents of the entire Kellystown development, which includes the Phase 1 development, the subject site and the future potential development on Molloy Lands, located to the east of the subject site. The junction was designed as part of the traffic and transport assessment carried out by Waterman Moylan Consulting Engineers as part of the Kellystown Development -Phase 1- (Plg. Apl. Reg. Ref. No. SHDW/004/21).

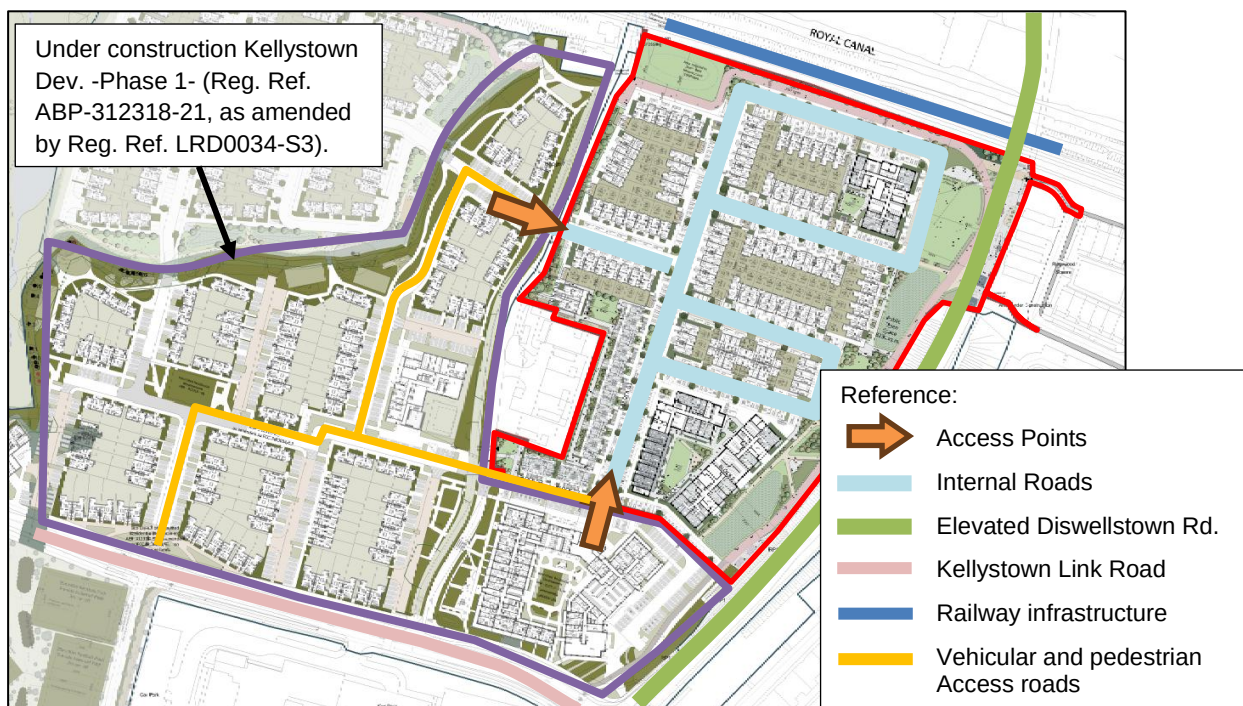


Figure 10 | Proposed development – Vehicular Access

5.4 Pedestrian and Cyclist Infrastructure

The proposed development has been designed with a well-interconnected footpath network providing permeability through the site, to the adjacent Kellystown Development -Phase 1- and to the surrounding area.

All footpaths within the proposed development have been designed as 2.0m wide. This is in accordance with Section 4.3.1 of the DMURS which suggests that a minimum 1.8m footpath should be provided.

There is a cycle path around the subject site connectivity the internal residential units with the main shared pedestrian/cyclist path on Porterstown Road. In addition, the development includes sufficient cycling parking spaces, as outlined in local guidelines (refer to **Section 5.5** below).

The main pedestrian and cycle paths are shown in the figure below.



Figure 11 | Proposed Development – Pedestrian and Cycle Infrastructure.

5.5 Car Parking

5.5.1 Proposed Car Parking Facilities

Based on the County Development Plan and the national policies outlined in section 10.1 of the Traffic and Transport Report which accompanies this report under a separate cover, an appropriate level of car parking is proposed for this location.

The car parking provision detailed below is intended to address Transportation & Access Items XIII, XIV, XV, and XVII of the LRD Opinion Report.

Table below shows the car parking spaces breakdown.

Description		No. Units	Car Parking Ratio		Car Parking Spaces	
			Resident	Visitor	Resident	Visitor
3-bed	Houses	62	1	1 car / 10 units	62	30
4-bed	Houses	35	1.26		44	
1-bed	Apartments / Duplex	98	0.5		49	
2-bed	Apartments / Duplex	88	0.5		44	
3-bed	Apartments / Duplex	19	0.5		8	
Car Sharing Spaces		-	-	-	-	2
ESB Spaces		-	-	-	-	2
Total		302	-	-	207	34
			-	-	241	

Table 6 | Car Parking Spaces Proposed

The subject site includes a total of 241 no. car parking spaces, encompassing 207 no. car parking spaces designated for residents, 30 no. for visitors, 2 no. for car sharing use (i.e. GoCar), and 2 no. are reserved for maintenance of the ESB units. A Letter of Intent has been provided by GoCar confirming provision of 2 no. car sharing spaces for this site, as outlined in Appendix D. Of the total provision, the proposed parking allocation includes:

- **Accessible Car Parking:** 10 No. accessible car parking spaces are distributed through the development.
- **Electric Vehicle Parking:** 48 No. EV parking spaces are distributed through the development. This represents 20% of the total number of proposed car parking spaces.

In addition to this, motorcycle parking is proposed as outlined below:

- **Motorcycle Parking:** 21 no. parking spaces.

The proposed car parking spaces are within the range set out in the Fingal Development Plan for Zone 1 and the Sustainable Residential Development and Compact Settlements Guidelines for Planning Authorities for Accessible Location.

The proposed development is within Zone 1 of the Fingal Development Plan 2023-2029 as the Coolmine Rail Station is approx. 1,100 metres away from the site and the Clonsilla Rail Station is currently 1,800 metres from the site via the road network of the surrounding developments. Upon completion of the Kellystown Link Road, the distance between the site and Clonsilla Rail Station will reduce to 1450 metres. The greenway along the north bank of the Royal Canal, which has the potential to reduce both distance and walking time, is currently closed.

Furthermore, the proposed development falls within accessible location of the Sustainable Residential Development and Compact Settlements Guidelines for Planning Authorities given that the nearest bus stop is approx. 450m away (c. 5-minute walk) which is served by routes 37 and 70n. The route 37 has a frequency of 5-10 minutes during both peak hours. With the implementation of BusConnects routes, the route 64 will run every 8-15 minutes during the AM and PM peak hours.

It is important to note that certain residents within the site will be situated at a greater distance from Coolmine Rail Station, beyond the boundary designated as Zone 1 in the Fingal Development Plan (as referenced in Section 10.1.4 of the Traffic and Transport Assessment Report).

Consequently, the proposed car parking provision is considered to offer an appropriate balance between the relevant standards, considering the site's location, current and future accessibility for residents, and the range of housing typologies proposed.

The visitor car parking spaces will be managed in accordance with the Mobility Management Plan prepared by Waterman Moylan Consulting Engineers (Report No. 15-038.030), which is submitted as part of this Planning Application.

5.6 Cycle Parking

5.6.1 Cycle parking proposed

Based on the guidelines/policies indicated above, it is considered that the *Fingal Development Plan 2023-2029 Standards* are the most appropriate standard for the subject development and is the reference for determining the proposed cycle parking. Compliance with the *Fingal Development Plan 2023-2029 Standards* will satisfy the requirements of the other standards.

It is considered that the end-terrace house units, which are designed with private side access to rear gardens on one side, will be able to park their bicycles in the rear gardens of the units without having to pass through the interior of the houses. Bicycle parking spaces for the mid-terrace units are proposed with the integration of bicycle lockers at the front of the units.

The proposed Cycle Parking is illustrated in the table below.

Description		No. Units	Cycle Parking Ratio		Cycle Parking Spaces	
			Resident	Visitor	Resident	Visitor
3-bed	Houses (Mid-Terrace)	38	5	0	190	-
4-bed	Houses (Mid-Terrace)	22	6	0	136	-
1-bed	Apartments / Duplex	98	2.04	1 / 2 units	200	49
2-bed	Apartments / Duplex	88	3.01	1 / 2 units	265	44
3-bed	Apartments / Duplex	19	5	1 / 2 units	95	9
Total		-	-	-	889	104
		-	-	-	993	

Table 7 | Cycle Parking Spaces – Proposed

The subject development included a total of 993 no. cycle parking spaces for apartments. Of these, 889 no. are for residents and 104 no. for visitors. The house units are provided with access to their rear garden with the possibility of cycle storage and hence it is not deemed necessary to provide any external bicycle storage.

5.7 Quality Audit

A Quality Audit has been carried out by Traffico which is provided in Appendix C of this report. These recommendations have been incorporated into the design.

5.8 Design Manual for Urban Roads and Streets (DMURS)

A DMURS Design Statement, including a Statement of Design Consistency, has been prepared by Waterman Moylan as a standalone report, and accompanies this submission under separate cover.

Appendices

- A. Uisce Éireann Confirmation of Feasibility (CoF) Letter and Statement of Design Acceptance**

CONFIRMATION OF FEASIBILITY

Kevin Muhia

Waterman Moylan
Block S, Eastpoint Business Park
Alfie Byrne Road
Dublin 3
D03H3F4

5 March 2025

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

Our Ref: CDS24010409 Pre-Connection Enquiry
Kellystown, Clonsilla, Dublin 15

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 300 unit(s) at Kellystown, Clonsilla, Dublin 15, (the **Development**).

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection** - Feasible without infrastructure upgrade by Uisce Éireann
- Proposed connections are from the 150mm spine main that is under construction. The main must be completed, connected to the Uisce Éireann networks and in operation, prior the connections.
- **Wastewater Connection** - Feasible without infrastructure upgrade by Uisce Éireann
- Proposed connections are via adjacent development. All relevant wastewater infrastructure within the adjacent development (including Kellistown Pumping Station with 24 hour storage tank) must be completed, of adequate capacity and integrity, connected to the Uisce Éireann networks and in operation.

Stiúthóirí / Directors: Niall Gleeson (POF / CEO), Jerry Grant (Cathaoirleach / Chairperson), Gerard Britchfield, Liz Joyce, Michael Nolan, Patricia King, Eileen Maher, Cathy Mannion, Paul Reid, Michael Walsh.

Oifig Chláraithe / Registered Office: Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86 / Colvill House, 24-26 Talbot Street, Dublin, Ireland D01NP86

Is cuideachta ghníomhaíochta ainmnithe atá faoi theorainn scaireanna é Uisce Éireann / Uisce Éireann is a designated activity company, limited by shares.

Cláraithe in Éirinn Uimh.: 530363 / Registered in Ireland No.: 530363.

- The Development site is within 9C trunk sewer catchment area which has network capacity constraints. In order to accommodate the connection, it will be necessary to install telemetry to link Kellistown Pumping Station to a flow meter on the 9C sewer, so the flows can be stored at the pumping station for up to 24 hours, when the flow reaches a predetermined level.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

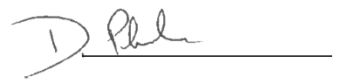
Where can you find more information?

- **Section A** - What is important to know?
- **Section B** - Details of Uisce Éireann's Network(s)

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Uisce Éireann's network(s). This is not a connection offer and capacity in Uisce Éireann's network(s) may only be secured by entering into a connection agreement with Uisce Éireann.

For any further information, visit www.water.ie/connections, email newconnections@water.ie or contact 1800 278 278.

Yours sincerely,



Dermot Phelan
Connections Delivery Manager

Section A - What is important to know?

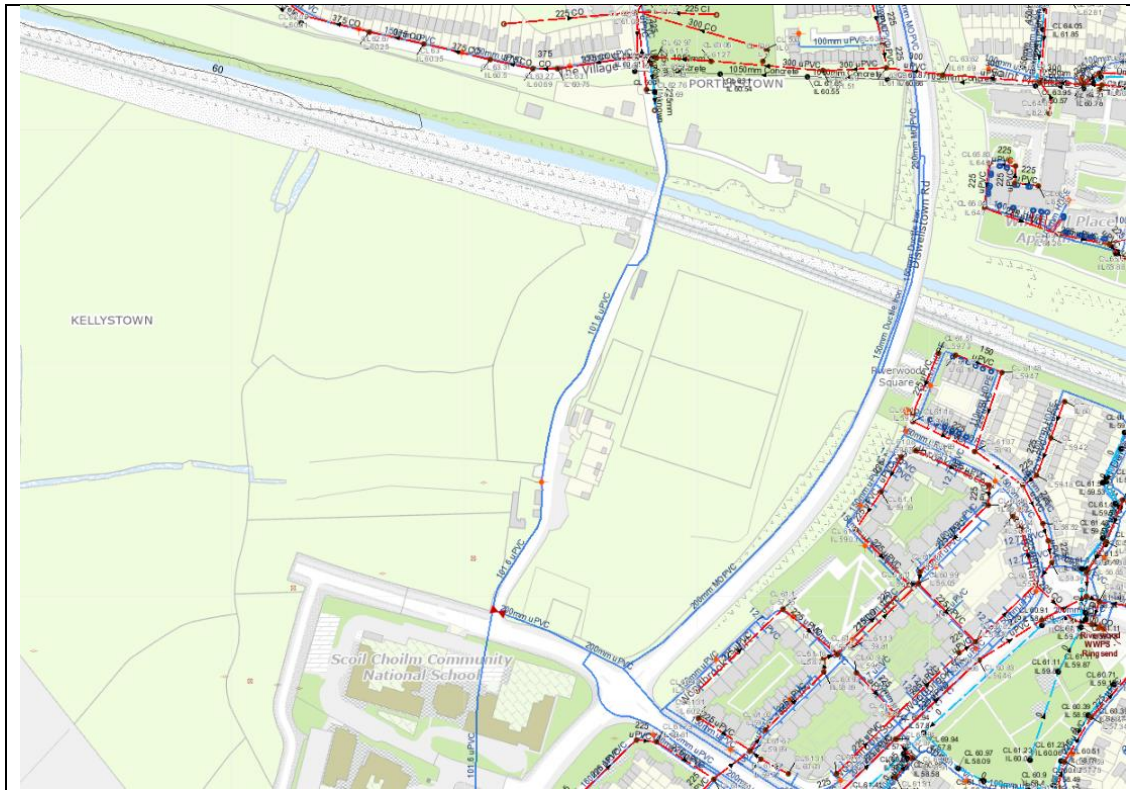
What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application <u>and be granted and sign</u> a connection agreement with Uisce Éireann.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • What to do? - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • What to do? - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Uisce Éireann's network(s)?	• Requests for maps showing Uisce Éireann's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with <i>the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice</i>, available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

Section B – Details of Uisce Éireann’s Network(s)

The map included below outlines the current Uisce Éireann infrastructure adjacent the Development: To access Uisce Éireann Maps email

datarequests@water.ie



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

Note: The information provided on the included maps as to the position of Uisce Éireann’s underground network(s) is provided as a general guide only. The information is based on the best available information provided by each Local Authority in Ireland to Uisce Éireann.

Whilst every care has been taken in respect of the information on Uisce Éireann’s network(s), Uisce Éireann assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Uisce Éireann’s underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Uisce Éireann’s underground network(s) 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.

Kevin Muhia
Waterman Moylan
Block S, Eastpoint Business Park
Alfie Byrne Road
Dublin 3
D03H3F4

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City
www.water.ie

26 May 2025

Re: Design Submission for Kellystown, Clonsilla, Dublin 15, Dublin (the “Development”) (the “Design Submission”) / Connection Reference No: CDS24010409

Dear Kevin Muhia,

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, Uisce Éireann has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before you can connect to our network you must sign a connection agreement with Uisce Éireann. This can be applied for by completing the connection application form at www.water.ie/connections. Uisce Éireann'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 Uisce Éireann's network(s) (the “**Self-Lay Works**”), as reflected in your Design Submission. Acceptance of the Design Submission by Uisce Éireann does not, in any way, render Uisce Éireann liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Uisce Éireann representative:

Name: Alicia Ros Bernal

Email: ailciarosbernal.bernal@water.ie

Yours sincerely,



Dermot Phelan
Connections Delivery Manager

Appendix A

Document Title & Revision

- STM-WMC-ZZ-00-DR-C-300 Watermain Layout
- STM-WMC-ZZ-00-DR-C-200 Drainage Layout
- STM-WMC-ZZ-00-DR-C-206 Foul Water Sewer Long Sections

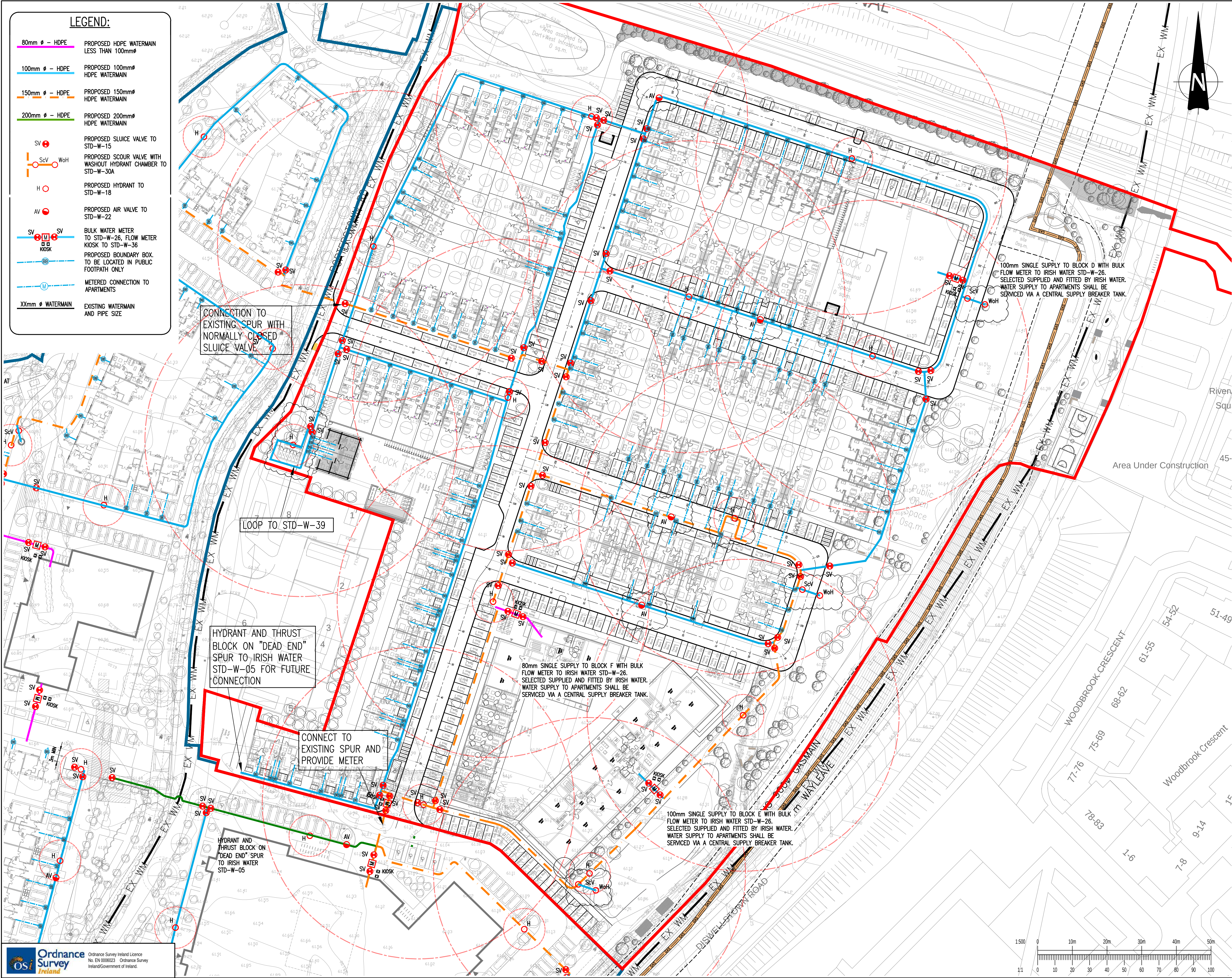
Additional Comments

The design submission will be subject to further technical review at connection application stage.

Uisce Éireann cannot guarantee that its Network in any location will have the capacity to deliver a particular flow rate and associated residual pressure to meet the requirements of the relevant Fire Authority, see Section 1.17 of Water Code of Practice.

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 Uisce Éireann will not, in any way, render Uisce Éireann liable for any elements of the design and/or construction of the Self-Lay Works.



This drawing should not be scaled. Dimensions to be verified on site.
Any discrepancies should be referred to the Engineer prior to work being put in hand.
This drawing is the property of Waterman Moylan Consulting Engineers Limited and is
issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorized person, either
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Waterman Moylan Consulting Engineers Limited
Block S, East Point Business Park, Dublin, D03 H3F4, Ireland t +353 1 664 8900

NOTES:

- DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
- IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL WORKS ARE CONSTRUCTED IN ACCORDANCE WITH THE IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS. THE CODE OF PRACTICE AND STANDARD DETAILS ARE AVAILABLE TO DOWNLOAD FROM THE IRISH WATER WEB SITE AT WWW.IRISHWATER.ie/CONNECTIONS/DEVELOPER-SERVICES/ WHERE THE DETAILS CONTAINED ON THIS DRAWING DIFFER FROM THE IRISH WATER CODE OF PRACTICE OR STANDARD DETAILS THIS MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY. IRISH WATER STANDARDS WILL TAKE PRECEDENCE.
- WATERMANS SHALL BE LAID IN ACCORDANCE WITH THE LOCAL AUTHORITY / IRISH WATER SPECIFICATION FOR THE LAYING OF NEW WATERMANS AND BYLAW WHICH OVER-RIDE THESE NOTES. THE CONSTRUCTION OF THE WATERMAIN SHALL BE IN ACCORDANCE WITH THE BEST CURRENT PRACTICE AND THE LATEST EDITIONS OF THE RELEVANT STANDARDS AND CODES OF PRACTICE.
- WATERMANS SHALL NOT BE LAID UNDER WALLS OR AREAS DESIGNATED FOR TREES/SHRUBS/FLOWERS.
- ALL PIPE MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 3.9 OF THE IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE. WATERMANS SHALL BE EITHER DUCTILE IRON (DI) OR POLYETHYLENE (PE), WITH PE80 OR PE100 RATING (MDPE, HDPEOR HPPE). ALL PLASTIC WATER PIPES SHALL BE BLUE IN COLOUR.
- ALL SERVICE CONNECTIONS TO BE 25# HDPE(SDR-17).
- ALL WATERMANS UNDER ROADS OR AT ROAD CROSSINGS TO BE HDPE OR DUCTILE IRON.
- WATER DISTRIBUTION PIPES TO BE PE-100(SDR-17).
- DUCTILE IRON PIPES TO IS EN 545 WITH C40 POWER RATING.
- AIR VALVE AND HYDRANTS COVERS, WHERE LOCATED IN GRASS AREAS, SHALL BE SURROUNDED BY A CONCRETE PLINTH, 200mm ALL ROUND AND 100mm DEEP FORMED WITH C20/25 CONCRETE, 20mm AGGREGATE SIZE, BEDDED IN CLAUSE 804 MATERIAL. THE PLINTH SHALL INCORPORATE MILD STEEL REINFORCED LINKS AND SHALL HAVE BULL-NOSE FINISH AROUND ITS EXTERNAL PERIMETER.
- THRUST BLOCKS SHALL BE PROVIDED AT EACH BEND ALONG THE COURSE OF THE WATERMAIN.
- PLANTING ADJACENT TO WATER INFRASTRUCTURE SHALL COMPLY WITH IRISH WATER STANDARD DETAIL STD-W-12A.
- HORIZONTAL AND VERTICAL SERVICE LAYOUT DISTANCES SHALL BE AS PER IRISH WATER STANDARD DETAIL STD-W-11.
- WATERMANS SHALL BE LAID UNDER FOOTPATHS PREFERABLY OR GRASS MARGINS WHERE APPROVED. NO PIPE, CONDUIT, CABLE OR OTHER SERVICE SHALL BE LAID LONGITUDINALLY OVER THE LINE OF A WATERMAIN. NO CABINET POLES, JUNCTION BOXES OR CHAMBERS SHALL BE CONSTRUCTED OVER A WATERMAIN.
- THE MINIMUM COVER TO A WATERMAIN SHALL BE 750mm, THE MAXIMUM COVER SHALL BE 900mm UNLESS NOTED OTHERWISE.
- CONNECTIONS TO THE MAINS WHICH ARE THE PROPERTY OF THE IRISH WATER CAN BE MADE BY THE IRISH WATER ONLY. NO OTHER PERSON MAY INTERFERE IN ANY WAY WITH THESE MAINS. SUCH CONNECTIONS WILL BE MADE BY IRISH WATER AT THE EXPENSE OF THE PERSONS REQUIRING THEM. THE ESTIMATED COST OF SUCH CONNECTIONS MUST BE LODGED WITH IRISH WATER BEFORE THE WORK IS UNDERTAKEN.
- WHERE A 25mm SERVICE CONNECTION EXCEEDS 15m IN LENGTH, THE SERVICE CONNECTION SHOULD BE UPSIZED TO 32mm, CONNECTION NOT TO EXCEED 30m IN LENGTH

Rev	Date	Description	By	Chk
01	23/05/25	UPDATED TO SUIT COMMENTS FROM IRISH WATER INCLUDING ADDITION OF AIR VALVES, SLUISE VALVES, BOUNDARY BOYS AND ADDITIONAL NOTES	NS	SKM

Project

**ST. MOCHTA'S
LARGE RESIDENTIAL DEVELOPMENT
(LRD)**

Title

WATERMAIN LAYOUT

Client

CASTLETHORN CONSTRUCTION

Status

PLANNING

Designed By	KM	Approved	MD	Waterman Ref	15-038
Drawn By	NS	Date	MAY 2025	Scales @ A1	1:500

Project	Originator	Volume	Level	Type	Role	Number	Revision
STM-WMC-ZZ	-00-OV-C-300						01

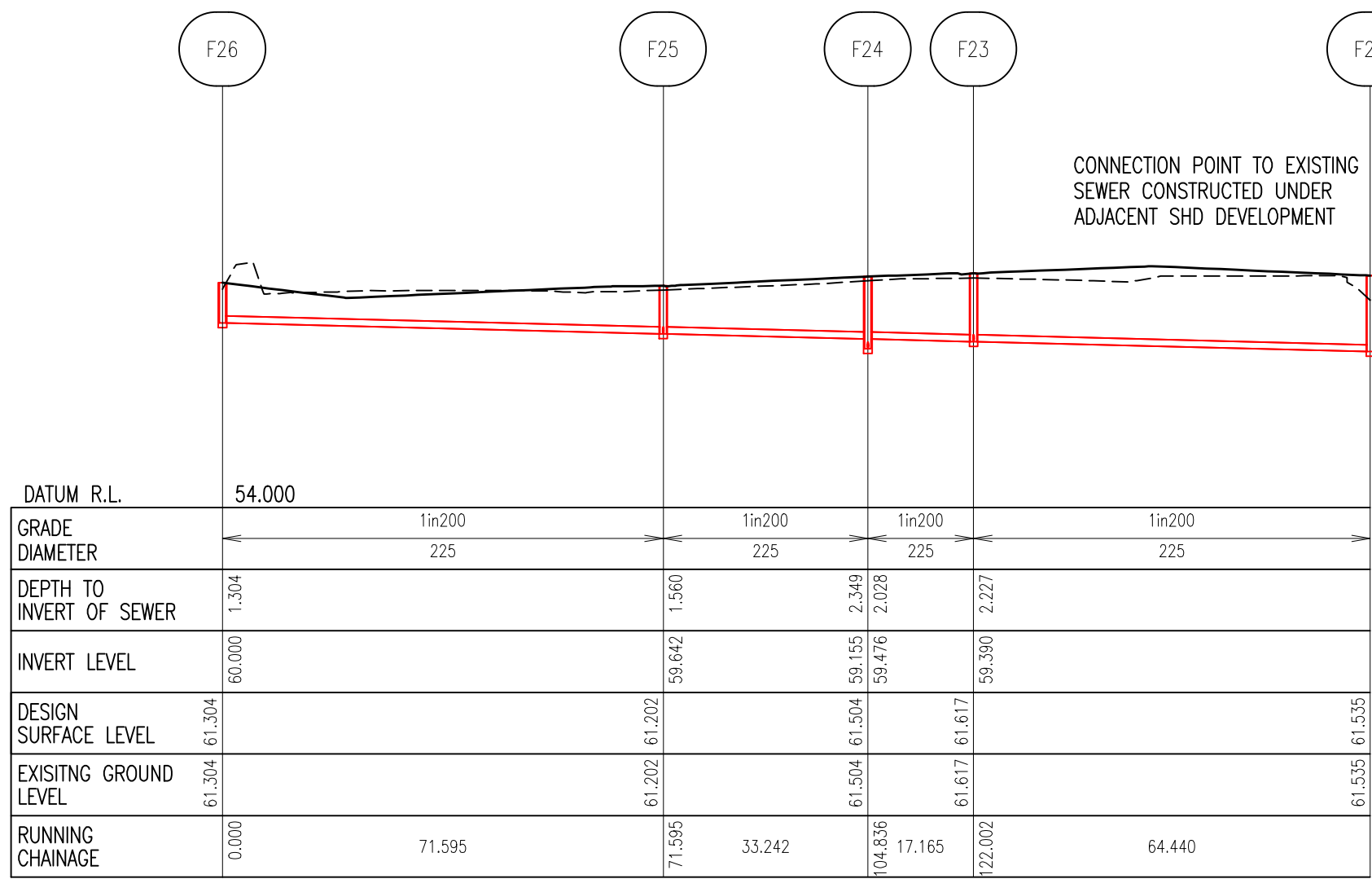
Block S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD,
DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900
Email: info@waterman-moylan.ie www.waterman-moylan.ie

Ordnance Survey Ireland Licence
No. EN 0006023 Ordnance Survey
Ireland/Government of Ireland.

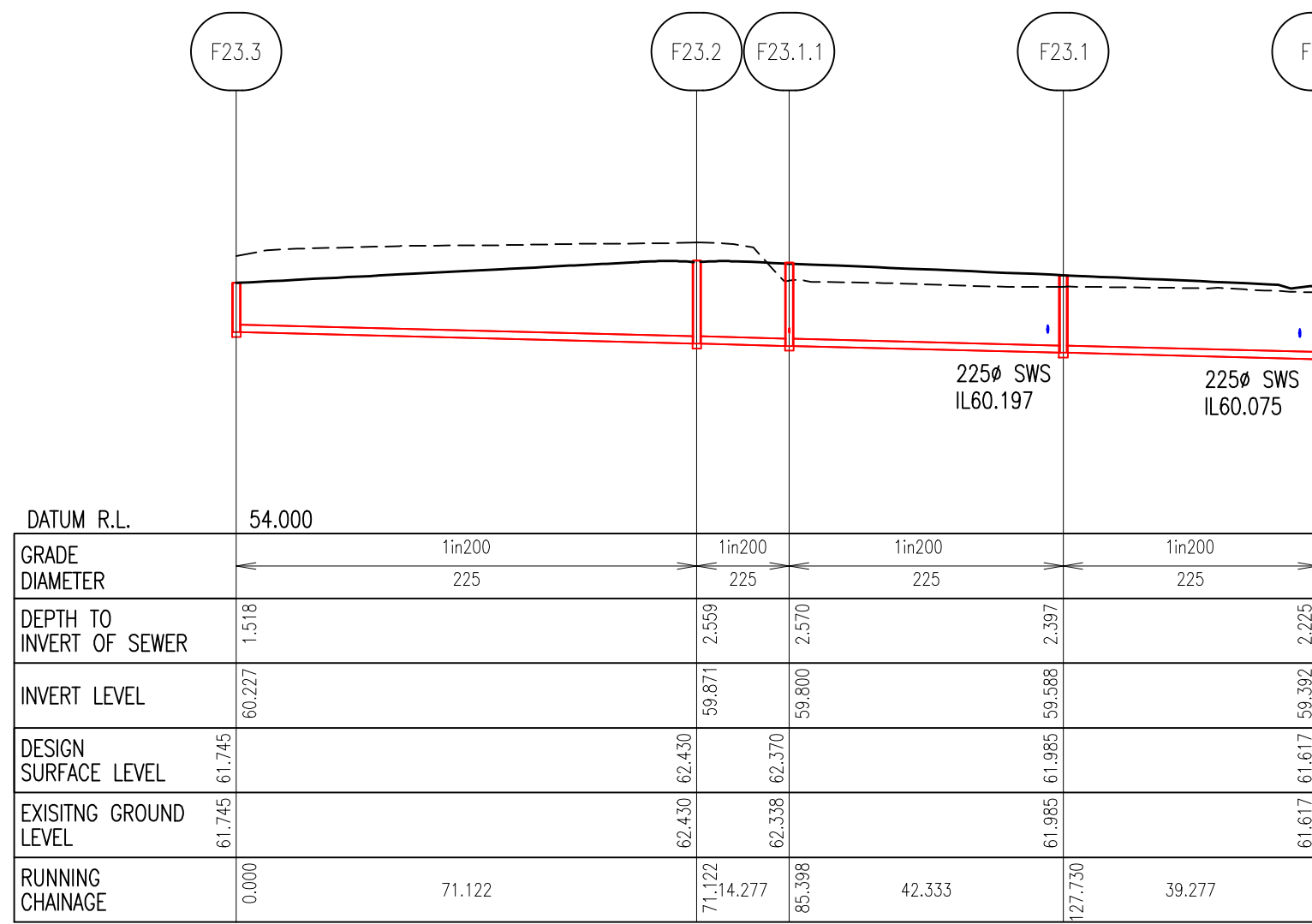
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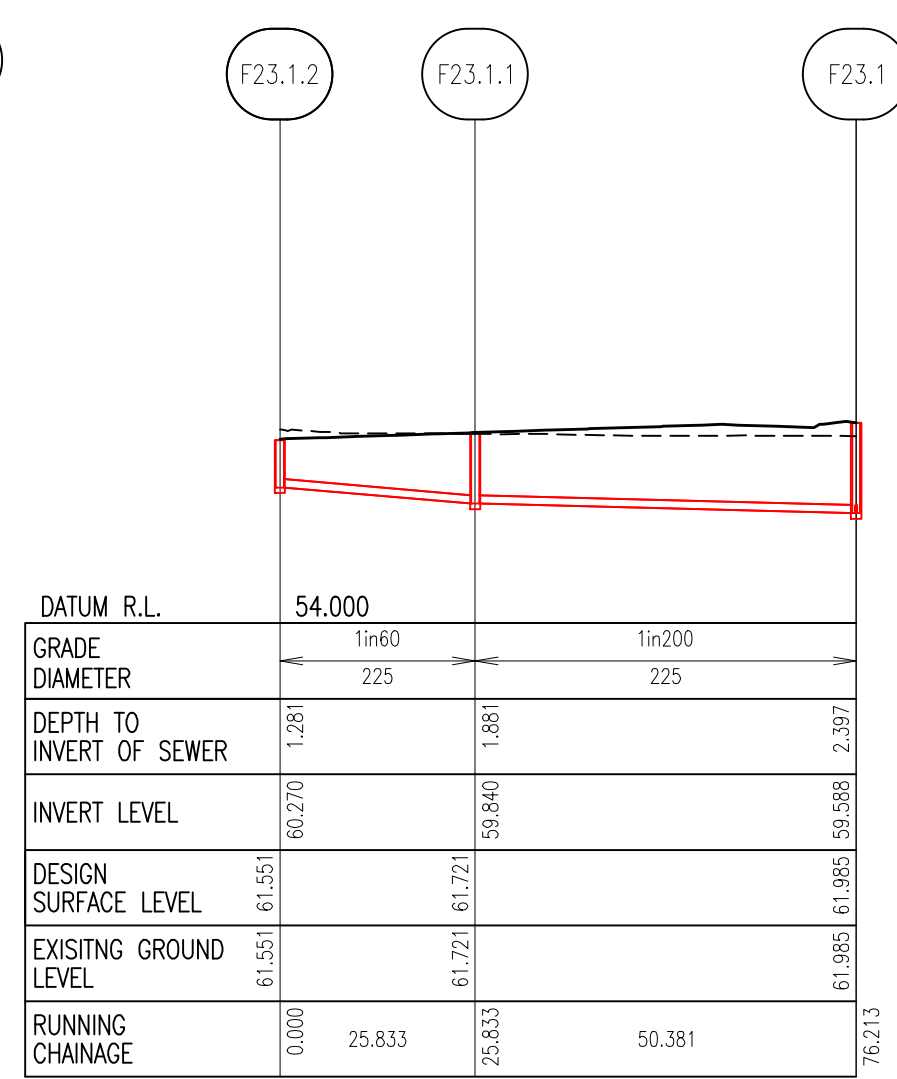
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Date: May 25, 2025 6:03am



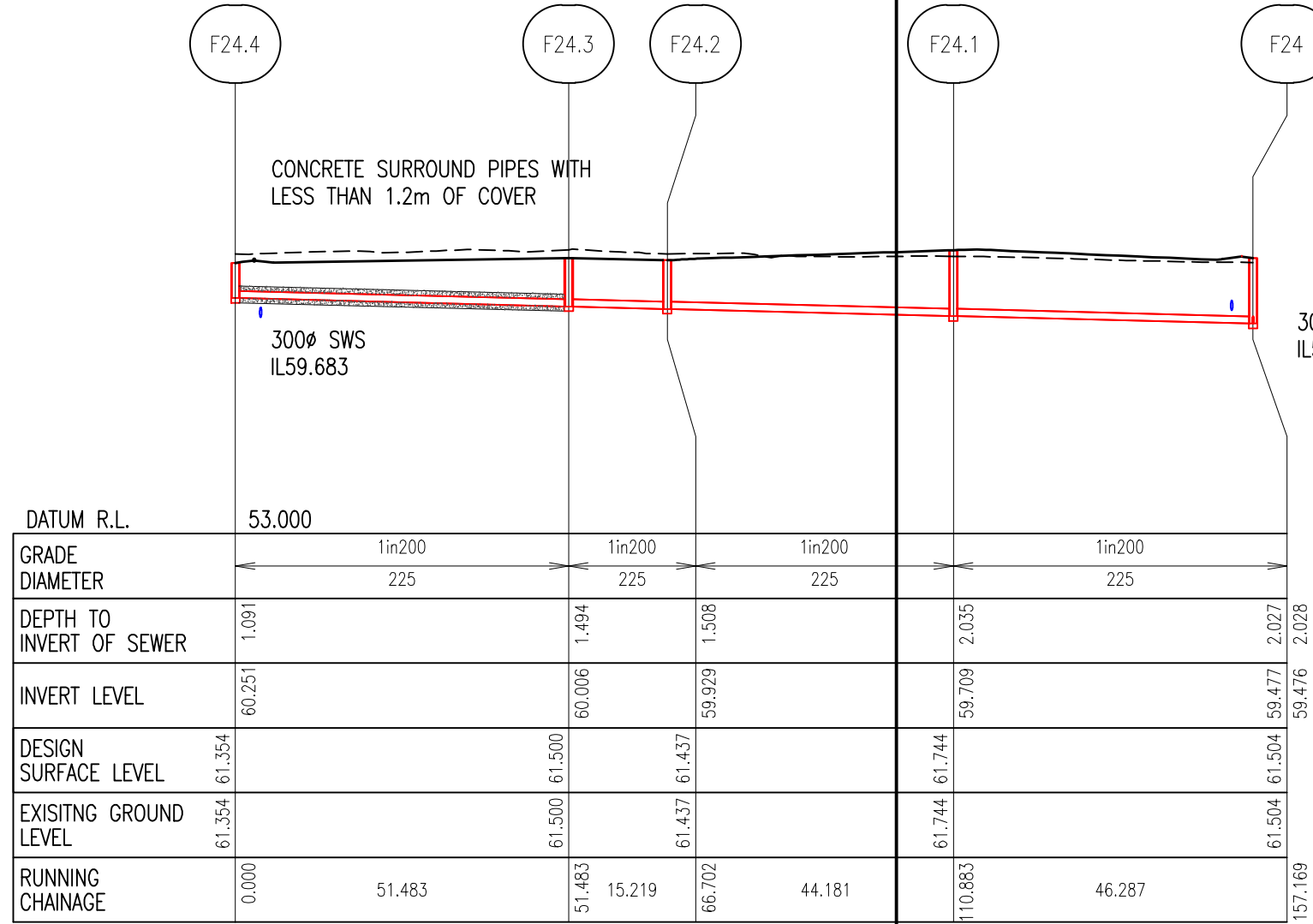
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1:100 VERTICAL @ A1
FOUL SEWER F001



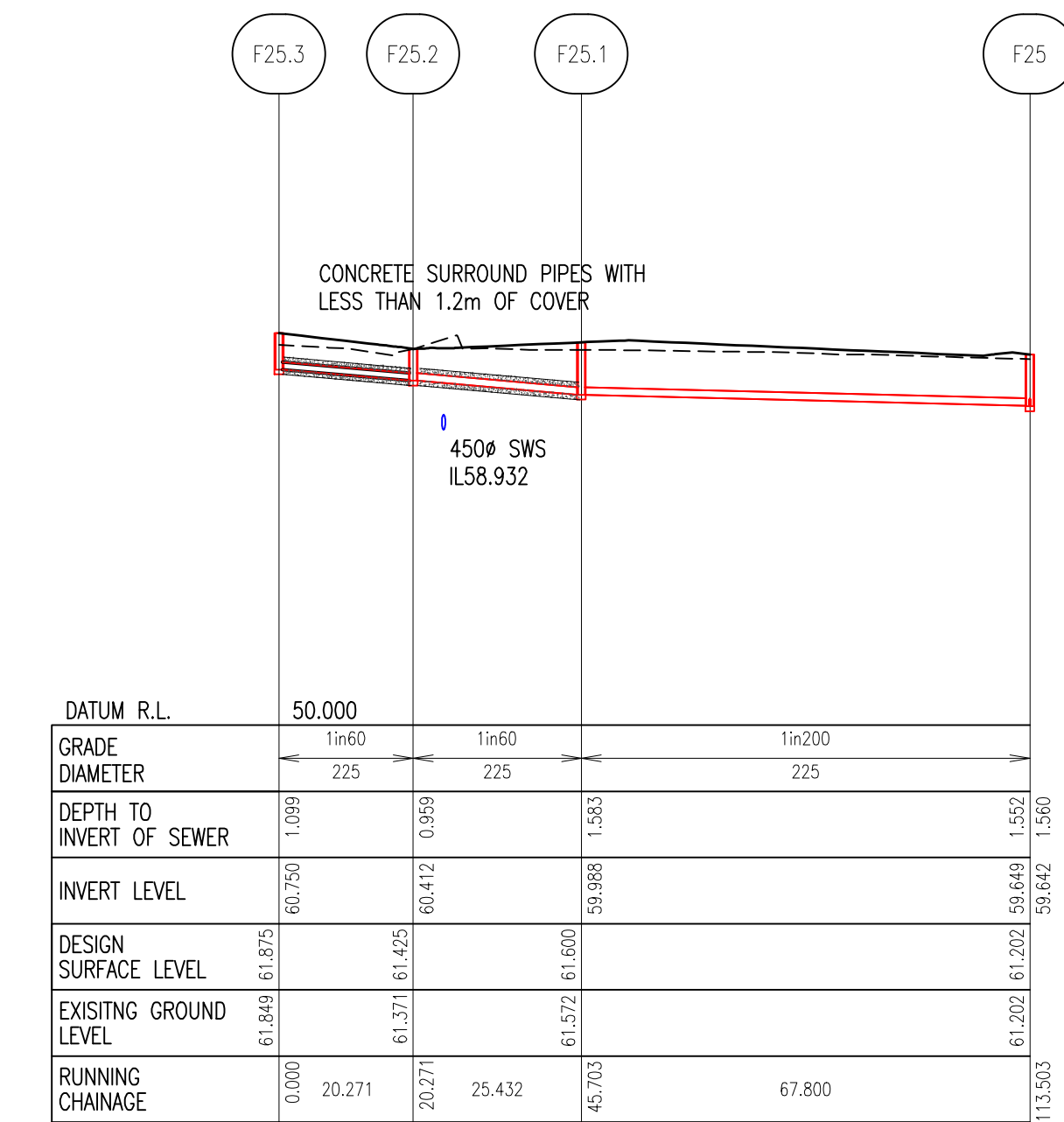
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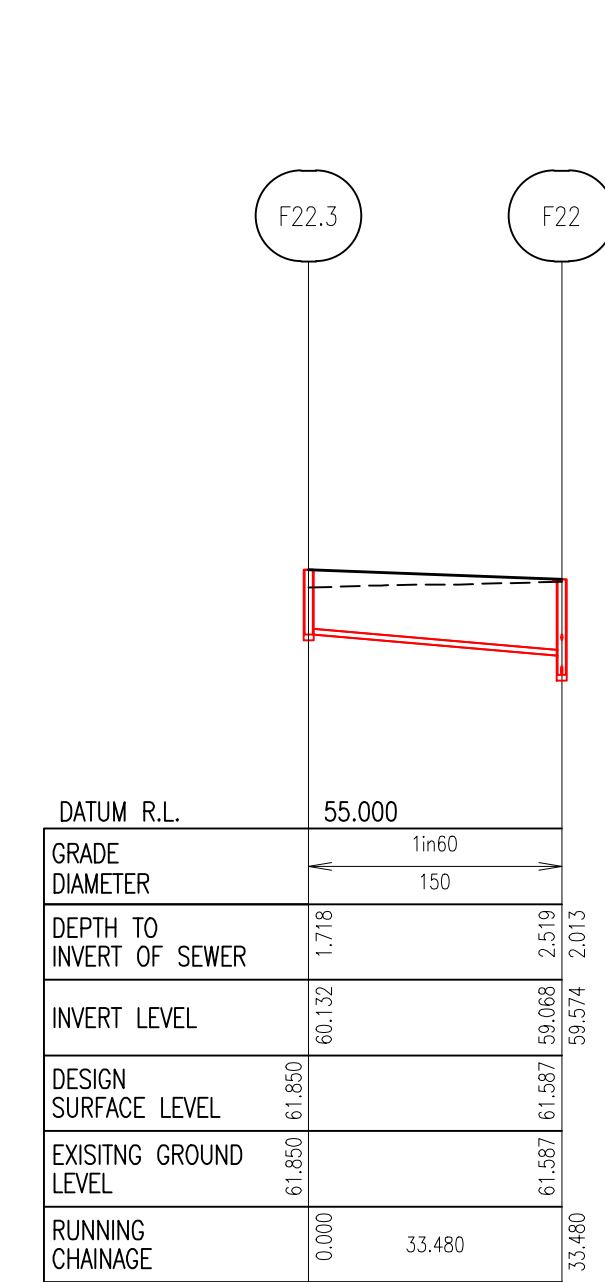
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1:100 VERTICAL @ A1
FOUL SEWER F003



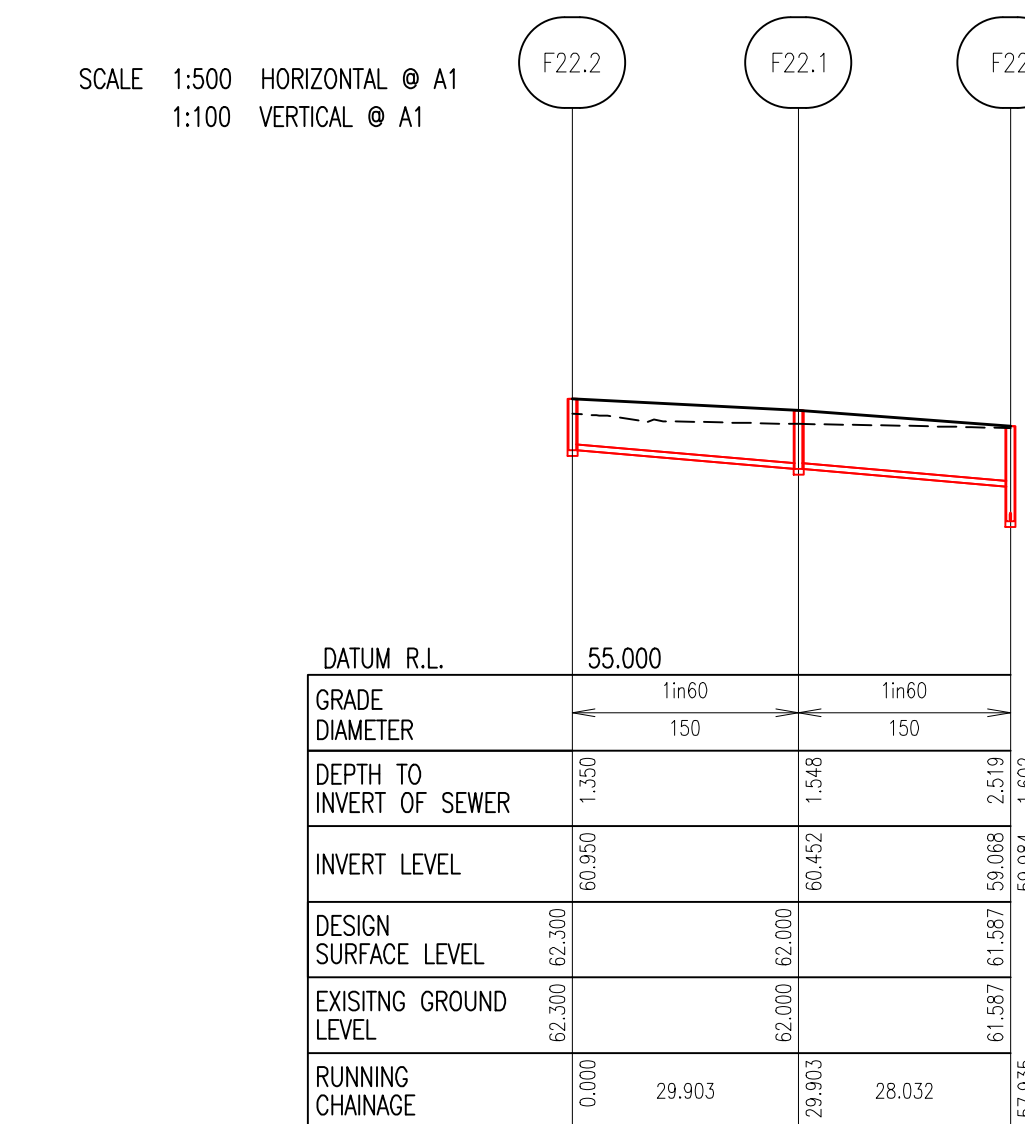
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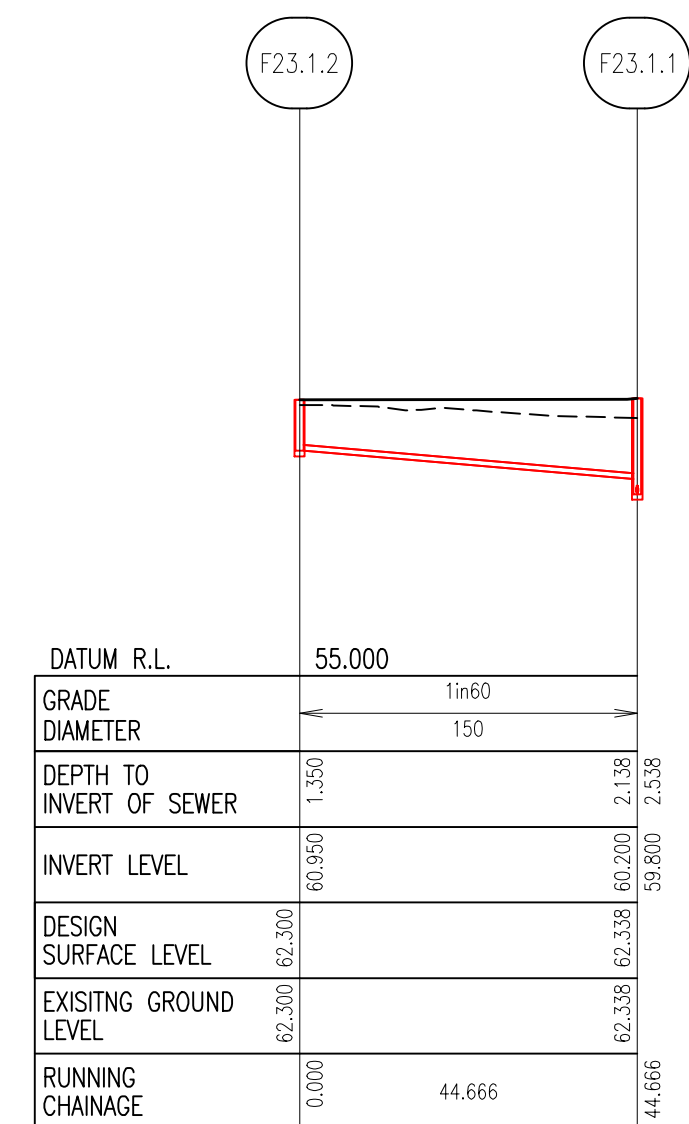
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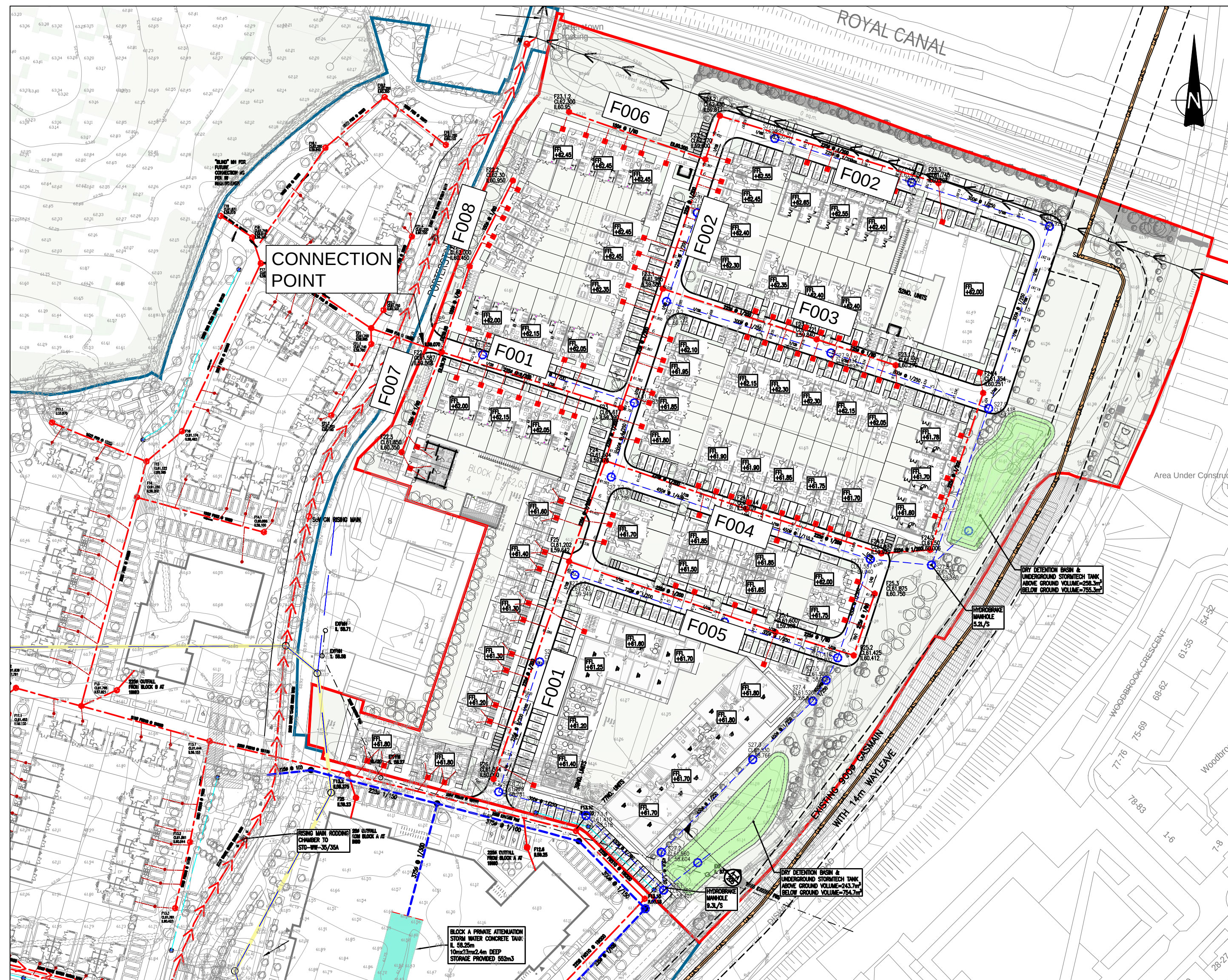
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1:100 VERTICAL @ A1
FOUL SEWER F007



SCALE 1:500 HORIZONTAL @ A1
1:100 VERTICAL @ A1
FOUL SEWER F008



SCALE 1:500 HORIZONTAL @ A1
1:100 VERTICAL @ A1
FOUL SEWER F009



01	20/05/25	STORM WATER PIPE CROSSINGS ADDED AT REQUEST OF UE	NIS	SDN
Rev	Date	Description	By	Chk
Amendments				

Project	ST. MOCHTA'S LARGE RESIDENTIAL DEVELOPMENT (LRD)			
Title	FOUL WATER LONG SECTIONS			
Client	CASTLETHORN CONSTRUCTION			

BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 H3F4 IRELAND. Tel: (01) 664 8900 Email: info@waterman-moylan.ie www.waterman-moylan.ie	

Status	PLANNING			
Designed By	SDN	Approved	Waterman Ref	15-038
Drawn By	SDN	Date	MAR 2025	AS SHOWN
Project	Originator	Volume	Level	Type
STM-WMC-ZZ	-00-OV-C-206			
				01

B. Greenfield Run-off Rate & Attenuation Calculations for Proposed Site



Block S, EastPoint Business Park,
Alfie Byrne Road, Dublin D03 H3F4
t 01 664 8900 f 01 661 3618 e info@waterman-moylan.ie

Calculation By: KM

Approved by: MD

Input Data

Project Name	St. Mochta's LRD
Project Number	15-038
Client	Castletown Construction
Architect	OMP
Status	Planning
Date	16/05/2025

Total Site Area: 43,853m² ... Entire redline area

Paved Area

Total: 53% ... Total paved area as a percentage of site area
Drained: 100% ... Proportion of paved area drained

Soil Area

Drained: 0% ... Proportion of soil area drained

Runoff Growth Factors:

1-Year 0.85 ... Typical value for Dublin is 0.85
30-Year 2.10 ... Typical value for Dublin is 2.10
100-Year 2.60 ... Typical value for Dublin is 2.60

Soil Type:

Type 2 ... From 1 to 5, preferably from Site Investigation report, or else estimate from the adjacent map

SAAR:

797mm ... Values from the Word Document

Climate Change Factor:

20% ... 20% is typically used in Ireland, 30% in DLRCC

Rain Data From:

Met Éireann Archive

Rainfall return period data: <https://www.met.ie/climate/services>

Met Éireann Archive Rainfall Data							
Duration (Hours)	Return Period (Years)						
	1	5	10	20	30	50	100
0.5	7.4	12.6	15.7	19.2	21.5	24.8	30.1
1	9.7	16.0	19.8	24.1	26.9	30.9	37.2
2	12.6	20.5	25.2	30.3	33.7	38.5	45.9
4	16.5	26.2	31.9	38.2	42.3	47.9	56.8
6	19.2	30.3	36.6	43.6	48.2	54.5	64.3
12	25.1	38.7	46.4	54.9	60.4	67.9	79.5
24	32.7	49.5	58.8	69.0	75.6	84.6	98.3
48	39.7	58.0	68.0	78.8	85.6	94.9	108.9

		Project Data	
Block S, EastPoint Business Park, Alfie Byrne Road, Dublin D03 H3F4 t 01 664 8900 f 01 661 3618 e info@waterman-moylan.ie		Project Name	St. Mochta's LRD
		Project Number	15-038
		Client	Castlethorn Construction
		Architect	OMP
Calculation By:	KM	Status	Planning
Approved by:	MD	Date	16/05/2025

Description		%	Area
Total Site Area		-	43,853m ²
Paved Area	Total	53%	23,216m ²
	Drained	100%	23,216m ²
Soil Area	Total	47%	20,637m ²
	Drained	0%	0m ²

Soil Type:	Type 2
SPR Index (from FSR):	0.30
SAAR:	797mm
Rain Data:	Met Éireann
Climate Change Factor:	20%

Greenfield Runoff:			
$Q_{BARrural} = 0.00108 \times Area^{0.89} \times SAAR^{1.17} \times Soil^{2.17}$			
Area	=	0.04385km ²	... Total site area in km ²
SAAR	=	797mm	... Standard Average Annual Rainfall in mm
SOIL	=	0.30	... The "SPR" index from FSR
<i>Note: Where a site is <0.5km², the $Q_{BARrural}$ formula should be applied for 0.5km² and the result factored based on the ratio of the actual site area and the applied area.</i>			
$Q_{BARrural} = 0.009m^3/s$ $Q_{BARrural} = 9.302 \text{ l/s}$ $Q_{BARrural} = 2.121 \text{ l/s/Ha}$			
Return Period	1-year	30-year	100-year
Growth Factor	0.85	2.10	2.60
Q_{BAR} (l/s)	7.91	19.54	24.19
Q_{BAR} (l/s/Ha)	1.80	4.45	5.52
Allowable Discharge	9.30	9.30	9.30

Rainfall Data:

Rain Data From: Met Éireann Archive

Climate Change Factor: 20%

Duration (Hours)	Return Period (Years)						
	1	5	10	20	30	50	100
0.5	8.9	15.1	18.8	23.0	25.8	29.8	36.1
1	11.6	19.2	23.8	28.9	32.3	37.1	44.6
2	15.1	24.6	30.2	36.4	40.4	46.2	55.1
4	19.8	31.4	38.3	45.8	50.8	57.5	68.2
6	23.0	36.4	43.9	52.3	57.8	65.4	77.2
12	30.1	46.4	55.7	65.9	72.5	81.5	95.4
24	39.2	59.4	70.6	82.8	90.7	101.5	118.0
48	47.6	69.6	81.6	94.6	102.7	113.9	130.7

		Criterion 1 River Protection Volume	
Block S, EastPoint Business Park, Alfie Byrne Road, Dublin D03 H3F4 t 01 664 8900 f 01 661 3618 e info@waterman-moylan.ie		Project Name	St. Mochta's LRD
		Project Number	15-038
		Client	Castlethorn Construction
		Architect	OMP
Calculation By:	KM	Status	Planning
Approved by:	MD	Date	16/05/2025

1.1 Interception

Paved surfaces connected to drainage system	$43853m^2 \times 0.5294 \times 1 =$ 23,215.78m ²	43,853m ² site area 53% of the site is paved 100% of the paved area
Volume of Interception Storage	$23215.7782m^2 \times 5mm \times 0.8 =$ 92.86m³	Paved area directly drained 5mm rainfall depth 80% paved runoff factor

1.2 Treatment Volume

Paved surfaces draining to public drainage network	$43853m^2 \times 0.5294 \times 1 =$ 23,215.78m ²	43,853m ² site area 53% of the site is paved 100% of the paved area
Volume of Treatment Storage	$23215.7782m^2 \times 15mm \times 0.8 =$ 278.59m³	Paved area directly drained 15mm rainfall depth 80% runoff from paved surfaces



Block S, EastPoint Business Park,
Alfie Byrne Road, Dublin D03 H3F4
t 01 664 8900 f 01 661 3618 e info@waterman-moylan.ie

Calculation By: KM

Approved by: MD

Input Data

Project Name	St. Mochta's LRD-(C1)
Project Number	15-038
Client	Castletown Construction
Architect	OMP
Status	Planning
Date	17/01/2025

Total Site Area: 24,655m² ... Entire redline area

Paved Area

Total: 49% ... Total paved area as a percentage of site area
Drained: 100% ... Proportion of paved area drained

Soil Area

Drained: 0% ... Proportion of soil area drained

Runoff Growth Factors:

1-Year 0.85 ... Typical value for Dublin is 0.85
30-Year 2.10 ... Typical value for Dublin is 2.10
100-Year 2.60 ... Typical value for Dublin is 2.60

Soil Type:

Type 2 ... From 1 to 5, preferably from Site Investigation report, or else estimate from the adjacent map

SAAR:

797mm ... Values from the Word Document

Climate Change Factor:

20% ... 20% is typically used in Ireland, 30% in DLRCC

Rain Data From:

Met Éireann Archive

Rainfall return period data: <https://www.met.ie/climate/services>

Met Éireann Archive Rainfall Data							
Duration (Hours)	Return Period (Years)						
	1	5	10	20	30	50	100
0.5	7.4	12.6	15.7	19.2	21.5	24.8	30.1
1	9.7	16.0	19.8	24.1	26.9	30.9	37.2
2	12.6	20.5	25.2	30.3	33.7	38.5	45.9
4	16.5	26.2	31.9	38.2	42.3	47.9	56.8
6	19.2	30.3	36.6	43.6	48.2	54.5	64.3
12	25.1	38.7	46.4	54.9	60.4	67.9	79.5
24	32.7	49.5	58.8	69.0	75.6	84.6	98.3
48	39.7	58.0	68.0	78.8	85.6	94.9	108.9

 Block S, EastPoint Business Park, Alfie Byrne Road, Dublin D03 H3F4 t 01 664 8900 f 01 661 3618 e info@waterman-moylan.ie		Project Data	
Calculation By: KM		Project Name	St. Mochta's LRD-(C1)
Approved by: MD		Project Number	15-038
		Client	Castlethorn Construction
		Architect	OMP
		Status	Planning
		Date	17/01/2025

Description		%	Area
Total Site Area		-	24,655m ²
Paved Area	Total	49%	12,079m ²
	Drained	100%	12,079m ²
Soil Area	Total	51%	12,577m ²
	Drained	0%	0m ²

Soil Type:	Type 2
SPR Index (from FSR):	0.30
SAAR:	797mm
Rain Data:	Met Éireann
Climate Change Factor:	20%

Greenfield Runoff:

$$Q_{BARrural} = 0.00108 \times Area^{0.89} \times SAAR^{1.17} \times Soil^{2.17}$$

Area = 0.02466km² ... Total site area in km²
SAAR = 797mm ... Standard Average Annual Rainfall in mm
SOIL = 0.30 ... The "SPR" index from FSR

Note: Where a site is <0.5km², the Q_{BARrural} formula should be applied for 0.5km² and the result factored based on the ratio of the actual site area and the applied area.

Q_{BARrural} = 0.005m³/s
Q_{BARrural} = 5.230 l/s
Q_{BARrural} = 2.121 l/s/Ha

Return Period	1-year	30-year	100-year
Growth Factor	0.85	2.10	2.60
Q _{BAR} (l/s)	4.45	10.98	13.60
Q _{BAR} (l/s/Ha)	1.80	4.45	5.52
Allowable Discharge	5.23	5.23	5.23

Rainfall Data:

Rain Data From: Met Éireann Archive
Climate Change Factor: 20%

Duration (Hours)	Return Period (Years)						
	1	5	10	20	30	50	100
0.5	8.9	15.1	18.8	23.0	25.8	29.8	36.1
1	11.6	19.2	23.8	28.9	32.3	37.1	44.6
2	15.1	24.6	30.2	36.4	40.4	46.2	55.1
4	19.8	31.4	38.3	45.8	50.8	57.5	68.2
6	23.0	36.4	43.9	52.3	57.8	65.4	77.2
12	30.1	46.4	55.7	65.9	72.5	81.5	95.4
24	39.2	59.4	70.6	82.8	90.7	101.5	118.0
48	47.6	69.6	81.6	94.6	102.7	113.9	130.7

 Block S, EastPoint Business Park, Alfie Byrne Road, Dublin D03 H3F4 t 01 664 8900 f 01 661 3618 e info@waterman-moylan.ie		Criterion 1	
		River Protection Volume	
		Project Name	St. Mochta's LRD-(C1)
		Project Number	15-038
		Client	Castlethorn Construction
Calculation By: KM		Architect	OMP
Approved by: MD		Status	Planning
		Date	17/01/2025

1.1 Interception

Paved surfaces connected to drainage system	$24655.28m^2 \times 0.4899 \times 1 =$ $12,078.62m^2$	<i>24,655m² site area</i> <i>49% of the site is paved</i> <i>100% of the paved area</i>
Volume of Interception Storage	$12078.621672m^2 \times 5mm \times 0.8 =$ 48.31m³	<i>Paved area directly drained</i> <i>5mm rainfall depth</i> <i>80% paved runoff factor</i>

1.2 Treatment Volume

Paved surfaces draining to public drainage network	$24655.28m^2 \times 0.4899 \times 1 =$ $12,078.62m^2$	<i>24,655m² site area</i> <i>49% of the site is paved</i> <i>100% of the paved area</i>
Volume of Treatment Storage	$12078.621672m^2 \times 15mm \times 0.8 =$ 144.94m³	<i>Paved area directly drained</i> <i>15mm rainfall depth</i> <i>80% runoff from paved surfaces</i>



Block S, EastPoint Business Park,
Alfie Byrne Road, Dublin D03 H3F4
t 01 664 8900 f 01 661 3618 e info@waterman-moylan.ie

Calculation By: KM

Approved by: MD

Input Data

Project Name	St. Mochta's LRD-(C2)
Project Number	15-038
Client	Castletown Construction
Architect	OMP
Status	Planning
Date	17/01/2025

Total Site Area: 19,198m² ... Entire redline area

Paved Area

Total: 58% ... Total paved area as a percentage of site area
Drained: 100% ... Proportion of paved area drained

Soil Area

Drained: 0% ... Proportion of soil area drained

Runoff Growth Factors:

1-Year 0.85 ... Typical value for Dublin is 0.85
30-Year 2.10 ... Typical value for Dublin is 2.10
100-Year 2.60 ... Typical value for Dublin is 2.60

Soil Type:

Type 2 ... From 1 to 5, preferably from Site Investigation report, or else estimate from the adjacent map

SAAR:

797mm ... Values from the Word Document

Climate Change Factor:

20% ... 20% is typically used in Ireland, 30% in DLRCC

Rain Data From:

Met Éireann Archive

Rainfall return period data: <https://www.met.ie/climate/services>

Met Éireann Archive Rainfall Data							
Duration (Hours)	Return Period (Years)						
	1	5	10	20	30	50	100
0.5	7.4	12.6	15.7	19.2	21.5	24.8	30.1
1	9.7	16.0	19.8	24.1	26.9	30.9	37.2
2	12.6	20.5	25.2	30.3	33.7	38.5	45.9
4	16.5	26.2	31.9	38.2	42.3	47.9	56.8
6	19.2	30.3	36.6	43.6	48.2	54.5	64.3
12	25.1	38.7	46.4	54.9	60.4	67.9	79.5
24	32.7	49.5	58.8	69.0	75.6	84.6	98.3
48	39.7	58.0	68.0	78.8	85.6	94.9	108.9

		Project Data	
Block S, EastPoint Business Park, Alfie Byrne Road, Dublin D03 H3F4 t 01 664 8900 f 01 661 3618 e info@waterman-moylan.ie		Project Name	St. Mochta's LRD-(C2)
		Project Number	15-038
		Client	Castlethorn Construction
		Architect	OMP
Calculation By:	KM	Status	Planning
Approved by:	MD	Date	17/01/2025

Description		%	Area
Total Site Area		-	19,198m ²
Paved Area	Total	58%	11,081m ²
	Drained	100%	11,081m ²
Soil Area	Total	42%	8,117m ²
	Drained	0%	0m ²

Soil Type:	Type 2
SPR Index (from FSR):	0.30
SAAR:	797mm
Rain Data:	Met Éireann
Climate Change Factor:	20%

Greenfield Runoff:			
$Q_{BARrural} = 0.00108 \times Area^{0.89} \times SAAR^{1.17} \times Soil^{2.17}$			
Area	=	0.0192km ²	... Total site area in km ²
SAAR	=	797mm	... Standard Average Annual Rainfall in mm
SOIL	=	0.30	... The "SPR" index from FSR
<i>Note: Where a site is <0.5km², the $Q_{BARrural}$ formula should be applied for 0.5km² and the result factored based on the ratio of the actual site area and the applied area.</i>			
$Q_{BARrural} = 0.004m^3/s$ $Q_{BARrural} = 4.072 \text{ l/s}$ $Q_{BARrural} = 2.121 \text{ l/s/Ha}$			
Return Period	1-year	30-year	100-year
Growth Factor	0.85	2.10	2.60
Q_{BAR} (l/s)	3.46	8.55	10.59
Q_{BAR} (l/s/Ha)	1.80	4.45	5.52
Allowable Discharge	4.07	4.07	4.07

Rainfall Data:

Rain Data From: Met Éireann Archive

Climate Change Factor: 20%

Duration (Hours)	Return Period (Years)						
	1	5	10	20	30	50	100
0.5	8.9	15.1	18.8	23.0	25.8	29.8	36.1
1	11.6	19.2	23.8	28.9	32.3	37.1	44.6
2	15.1	24.6	30.2	36.4	40.4	46.2	55.1
4	19.8	31.4	38.3	45.8	50.8	57.5	68.2
6	23.0	36.4	43.9	52.3	57.8	65.4	77.2
12	30.1	46.4	55.7	65.9	72.5	81.5	95.4
24	39.2	59.4	70.6	82.8	90.7	101.5	118.0
48	47.6	69.6	81.6	94.6	102.7	113.9	130.7

		Criterion 1 River Protection Volume	
Block S, EastPoint Business Park, Alfie Byrne Road, Dublin D03 H3F4 t 01 664 8900 f 01 661 3618 e info@waterman-moylan.ie		Project Name	St. Mochta's LRD-(C2)
		Project Number	15-038
		Client	Castlethorn Construction
		Architect	OMP
Calculation By:	KM	Status	Planning
Approved by:	MD	Date	17/01/2025

1.1 Interception

Paved surfaces connected to drainage system	$19197.95m^2 \times 0.5772 \times 1 =$ 11,081.06m ²	19,198m ² site area 58% of the site is paved 100% of the paved area
Volume of Interception Storage	$11081.05674m^2 \times 5mm \times 0.8 =$ 44.32m³	Paved area directly drained 5mm rainfall depth 80% paved runoff factor

1.2 Treatment Volume

Paved surfaces draining to public drainage network	$19197.95m^2 \times 0.5772 \times 1 =$ 11,081.06m ²	19,198m ² site area 58% of the site is paved 100% of the paved area
Volume of Treatment Storage	$11081.05674m^2 \times 15mm \times 0.8 =$ 132.97m³	Paved area directly drained 15mm rainfall depth 80% runoff from paved surfaces

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	16.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.276	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.103	4.00	62.295	1200	706152.971	737725.595	1.895
2	0.047	4.00	61.855	1200	706195.519	737711.919	1.753
3	0.004	4.00	61.422	1200	706238.362	737698.288	1.500
4	0.112	4.00	62.232	1200	706128.861	737702.515	1.906
5	0.113	4.00	61.989	1200	706119.310	737674.908	1.884
6	0.029	4.00	61.934	1350	706170.419	737658.925	2.043
7	0.124	4.00	61.418	1500	706219.480	737641.633	1.885
DB1	0.171	4.00	61.865		706212.226	737600.724	2.440
9	0.007	4.00	61.520	1200	706201.674	737592.965	2.160
10	0.106	4.00	61.735	1200	706062.107	737658.342	1.530
11	0.246	4.00	61.714	1200	706109.311	737643.389	1.832
12	0.139	4.00	61.513	1350	706102.091	737620.334	1.878
13	0.029	4.00	61.771	1350	706138.279	737608.681	2.309
14	0.041	4.00	61.406	1500	706182.672	737594.774	2.366
15	0.091	4.00	61.243	1200	706090.792	737589.858	1.694
16	0.116	4.00	61.586	1200	706137.305	737575.262	2.356
17	0.052	4.00	61.427	1350	706172.509	737564.138	2.495
19			61.500	1200	706168.914	737557.155	2.599
20	0.002	4.00	61.520	1350	706164.758	737550.633	2.650
21	0.060	4.00	61.530	1350	706146.109	737532.487	2.764
22	0.062	4.00	61.560	1350	706117.686	737503.670	2.956
23	0.134	4.00	60.996	1200	706079.841	737562.875	1.928
24	0.170	4.00	61.278	1200	706067.110	737522.429	2.497
25	0.026	4.00	61.410	1350	706094.265	737515.041	2.892
DB2	0.102	4.00	61.200		706132.827	737503.458	2.719
27	0.027	4.00	61.320	1500	706118.367	737491.879	2.913
28			61.086	1200	706112.699	737486.114	2.711
PP2	0.021	4.00	61.855		706190.454	737707.249	0.500
PP3	0.021	4.00	61.422		706225.921	737696.253	0.500
PP5	0.013	4.00	61.678		706197.883	737657.075	0.500
PP6	0.020	4.00	61.934		706175.541	737664.406	0.500
PP7	0.018	4.00	61.934		706172.316	737653.023	0.500
PP8	0.011	4.00	61.678		706201.741	737643.261	0.500
PP10	0.026	4.00	61.560		706169.841	737606.623	0.500
PP11	0.007	4.00	61.771		706135.405	737606.350	0.500
PP12	0.032		61.560		706166.763	737595.464	0.500
PP13	0.012	4.00	61.586		706141.009	737581.100	0.500
PP4	0.008	4.00	61.463		706221.431	737659.689	0.500

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1	1	2	44.692	0.600	60.400	60.177	0.223	200.0	225	4.81	50.0
2	2	3	44.959	0.600	60.102	59.922	0.180	250.0	300	5.57	50.0
3	3	7	59.719	0.600	59.922	59.683	0.239	250.0	300	6.57	50.0
4	4	5	29.212	0.600	60.326	60.180	0.146	200.1	225	4.53	50.0
5	5	6	53.550	0.600	60.105	59.891	0.214	250.2	300	5.43	50.0
6	6	7	52.019	0.600	59.891	59.683	0.208	250.1	300	6.31	50.0
7	7	9	51.823	0.600	59.533	59.360	0.173	299.6	450	7.31	50.0
8	DB1	9	13.098	0.600	59.425	59.360	0.065	200.0	225	4.24	50.0
9	9	14	19.088	0.600	59.360	59.265	0.095	200.0	225	7.66	50.0
10	10	11	49.516	0.600	60.205	59.957	0.248	199.7	225	4.90	50.0
11	11	12	24.159	0.600	59.882	59.785	0.097	250.0	300	5.30	50.0
12	12	13	38.018	0.600	59.635	59.462	0.173	220.0	450	5.77	50.0
13	13	14	46.520	0.600	59.462	59.040	0.422	110.2	450	6.17	50.0
14	14	17	32.278	0.600	59.040	58.932	0.108	298.9	450	8.12	50.0
15	15	16	48.749	0.600	59.549	59.305	0.244	200.0	225	4.88	50.0
16	16	17	36.920	0.600	59.230	59.082	0.148	250.0	300	5.50	50.0
17	17	19	7.854	0.600	58.932	58.901	0.031	250.0	450	8.22	49.1
19	19	20	7.734	0.600	58.901	58.870	0.031	250.0	450	8.32	48.8
20	20	21	26.020	0.600	58.870	58.766	0.104	250.0	450	8.66	48.0
21	21	22	40.476	0.600	58.766	58.604	0.162	250.0	450	9.18	46.7
22	22	27	11.811	0.600	58.604	58.407	0.197	60.0	450	9.26	46.5
23	23	24	42.402	0.600	59.068	58.856	0.212	200.0	225	4.77	50.0
24	24	25	28.142	0.600	58.781	58.668	0.113	250.0	300	5.24	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1	0.921	36.6	18.7	1.670	1.453	0.103	0.0	114	0.925
2	0.990	70.0	31.0	1.453	1.200	0.171	0.0	140	0.961
3	0.990	70.0	35.4	1.200	1.435	0.196	0.0	151	0.992
4	0.920	36.6	20.3	1.681	1.584	0.112	0.0	120	0.944
5	0.989	69.9	40.7	1.584	1.743	0.225	0.0	164	1.025
6	0.989	69.9	52.6	1.743	1.435	0.291	0.0	195	1.083
7	1.169	185.9	116.2	1.435	1.710	0.643	0.0	258	1.231
8	0.921	36.6	31.0	2.215	1.935	0.171	0.0	160	1.030
9	0.921	36.6	148.4	1.935	1.916	0.821	0.0	225	0.938
10	0.921	36.6	19.2	1.305	1.532	0.106	0.0	116	0.932
11	0.990	70.0	63.7	1.532	1.428	0.352	0.0	226	1.116
12	1.366	217.3	88.8	1.428	1.859	0.492	0.0	200	1.300
13	1.935	307.8	95.4	1.859	1.916	0.528	0.0	171	1.713
14	1.171	186.2	255.9	1.916	2.045	1.416	0.0	450	1.185
15	0.921	36.6	16.4	1.469	2.056	0.091	0.0	106	0.897
16	0.990	70.0	39.7	2.056	2.045	0.219	0.0	162	1.020
17	1.281	203.7	299.4	2.045	2.149	1.687	0.0	450	1.297
19	1.281	203.7	297.8	2.149	2.200	1.687	0.0	450	1.297
20	1.281	203.7	292.9	2.200	2.314	1.689	0.0	450	1.297
21	1.281	203.7	295.4	2.314	2.506	1.749	0.0	450	1.297
22	2.629	418.1	304.8	2.506	2.463	1.812	0.0	286	2.857
23	0.921	36.6	24.2	1.703	2.197	0.134	0.0	134	0.983
24	0.990	70.0	54.9	2.197	2.442	0.304	0.0	201	1.092

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
25	25	27	33.427	0.600	58.518	58.407	0.111	300.0	450	5.72	50.0
26	DB2	27	18.525	0.600	58.481	58.407	0.074	250.0	450	4.24	50.0
27	27	28	8.085	0.600	58.407	58.375	0.032	252.7	300	9.40	47.7
2.000	PP2	2	6.889	0.600	61.355	61.102	0.253	27.2	100	4.08	50.0
3.000	PP3	3	12.606	0.600	60.922	60.710	0.212	59.5	100	4.21	50.0
7.000	PP5	7	26.550	0.600	61.178	60.731	0.447	59.4	100	4.44	50.0
5.000	PP6	6	7.502	0.600	61.434	61.307	0.127	59.1	100	4.12	50.0
6.000	PP7	6	6.199	0.600	61.434	61.329	0.105	59.0	100	4.10	50.0
9.000	PP8	7	17.814	0.600	61.178	60.683	0.495	36.0	100	4.23	50.0
13.000	PP10	14	17.465	0.600	61.060	60.766	0.294	59.4	100	4.29	50.0
12.000	PP11	13	3.700	0.600	61.271	61.208	0.063	58.7	100	4.06	50.0
15.000	PP13	16	6.914	0.600	61.086	60.969	0.117	59.1	100	4.11	50.0
8.000	PP4	7	18.161	0.600	60.963	60.657	0.306	59.3	100	4.30	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
25	1.168	185.8	59.7	2.442	2.463	0.330	0.0	174	1.044
26	1.281	203.7	18.5	2.269	2.463	0.102	0.0	91	0.808
27	0.984	69.6	391.5	2.613	2.411	2.271	0.0	300	0.997
2.000	1.484	11.7	3.8	0.400	0.653	0.021	0.0	39	1.331
3.000	1.000	7.9	3.7	0.400	0.612	0.021	0.0	49	0.990
7.000	1.001	7.9	2.3	0.400	0.587	0.013	0.0	37	0.870
5.000	1.004	7.9	3.7	0.400	0.527	0.020	0.0	48	0.987
6.000	1.004	7.9	3.2	0.400	0.505	0.018	0.0	44	0.950
9.000	1.290	10.1	2.0	0.400	0.635	0.011	0.0	30	1.002
13.000	1.001	7.9	4.7	0.400	0.540	0.026	0.0	56	1.046
12.000	1.007	7.9	1.2	0.400	0.463	0.007	0.0	27	0.735
15.000	1.004	7.9	2.2	0.400	0.517	0.012	0.0	36	0.853
8.000	1.001	7.9	1.4	0.400	0.661	0.008	0.0	28	0.743

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1	44.692	200.0	225	Circular	62.295	60.400	1.670	61.855	60.177	1.453
2	44.959	250.0	300	Circular	61.855	60.102	1.453	61.422	59.922	1.200
3	59.719	250.0	300	Circular	61.422	59.922	1.200	61.418	59.683	1.435
4	29.212	200.1	225	Circular	62.232	60.326	1.681	61.989	60.180	1.584
5	53.550	250.2	300	Circular	61.989	60.105	1.584	61.934	59.891	1.743

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
2	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
3	3	1200	Manhole	Adoptable	7	1500	Manhole	Adoptable
4	4	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable
5	5	1200	Manhole	Adoptable	6	1350	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
6	52.019	250.1	300	Circular	61.934	59.891	1.743	61.418	59.683	1.435
7	51.823	299.6	450	Circular	61.418	59.533	1.435	61.520	59.360	1.710
8	13.098	200.0	225	Circular	61.865	59.425	2.215	61.520	59.360	1.935
9	19.088	200.0	225	Circular	61.520	59.360	1.935	61.406	59.265	1.916
10	49.516	199.7	225	Circular	61.735	60.205	1.305	61.714	59.957	1.532
11	24.159	250.0	300	Circular	61.714	59.882	1.532	61.513	59.785	1.428
12	38.018	220.0	450	Circular	61.513	59.635	1.428	61.771	59.462	1.859
13	46.520	110.2	450	Circular	61.771	59.462	1.859	61.406	59.040	1.916
14	32.278	298.9	450	Circular	61.406	59.040	1.916	61.427	58.932	2.045
15	48.749	200.0	225	Circular	61.243	59.549	1.469	61.586	59.305	2.056
16	36.920	250.0	300	Circular	61.586	59.230	2.056	61.427	59.082	2.045
17	7.854	250.0	450	Circular	61.427	58.932	2.045	61.500	58.901	2.149
19	7.734	250.0	450	Circular	61.500	58.901	2.149	61.520	58.870	2.200
20	26.020	250.0	450	Circular	61.520	58.870	2.200	61.530	58.766	2.314
21	40.476	250.0	450	Circular	61.530	58.766	2.314	61.560	58.604	2.506
22	11.811	60.0	450	Circular	61.560	58.604	2.506	61.320	58.407	2.463
23	42.402	200.0	225	Circular	60.996	59.068	1.703	61.278	58.856	2.197
24	28.142	250.0	300	Circular	61.278	58.781	2.197	61.410	58.668	2.442
25	33.427	300.0	450	Circular	61.410	58.518	2.442	61.320	58.407	2.463
26	18.525	250.0	450	Circular	61.200	58.481	2.269	61.320	58.407	2.463
27	8.085	252.7	300	Circular	61.320	58.407	2.613	61.086	58.375	2.411
2.000	6.889	27.2	100	Circular	61.855	61.355	0.400	61.855	61.102	0.653
3.000	12.606	59.5	100	Circular	61.422	60.922	0.400	61.422	60.710	0.612

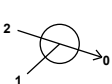
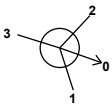
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
6	6	1350	Manhole	Adoptable	7	1500	Manhole	Adoptable
7	7	1500	Manhole	Adoptable	9	1200	Manhole	Adoptable
8	DB1		Junction		9	1200	Manhole	Adoptable
9	9	1200	Manhole	Adoptable	14	1500	Manhole	Adoptable
10	10	1200	Manhole	Adoptable	11	1200	Manhole	Adoptable
11	11	1200	Manhole	Adoptable	12	1350	Manhole	Adoptable
12	12	1350	Manhole	Adoptable	13	1350	Manhole	Adoptable
13	13	1350	Manhole	Adoptable	14	1500	Manhole	Adoptable
14	14	1500	Manhole	Adoptable	17	1350	Manhole	Adoptable
15	15	1200	Manhole	Adoptable	16	1200	Manhole	Adoptable
16	16	1200	Manhole	Adoptable	17	1350	Manhole	Adoptable
17	17	1350	Manhole	Adoptable	19	1200	Manhole	Adoptable
19	19	1200	Manhole	Adoptable	20	1350	Manhole	Adoptable
20	20	1350	Manhole	Adoptable	21	1350	Manhole	Adoptable
21	21	1350	Manhole	Adoptable	22	1350	Manhole	Adoptable
22	22	1350	Manhole	Adoptable	27	1500	Manhole	Adoptable
23	23	1200	Manhole	Adoptable	24	1200	Manhole	Adoptable
24	24	1200	Manhole	Adoptable	25	1350	Manhole	Adoptable
25	25	1350	Manhole	Adoptable	27	1500	Manhole	Adoptable
26	DB2		Junction		27	1500	Manhole	Adoptable
27	27	1500	Manhole	Adoptable	28	1200	Manhole	Adoptable
2.000	PP2		Junction		2	1200	Manhole	Adoptable
3.000	PP3		Junction		3	1200	Manhole	Adoptable

Pipeline Schedule

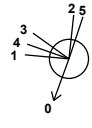
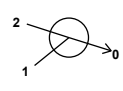
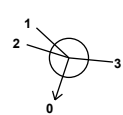
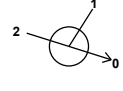
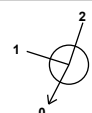
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
7.000	26.550	59.4	100	Circular	61.678	61.178	0.400	61.418	60.731	0.587
5.000	7.502	59.1	100	Circular	61.934	61.434	0.400	61.934	61.307	0.527
6.000	6.199	59.0	100	Circular	61.934	61.434	0.400	61.934	61.329	0.505
9.000	17.814	36.0	100	Circular	61.678	61.178	0.400	61.418	60.683	0.635
13.000	17.465	59.4	100	Circular	61.560	61.060	0.400	61.406	60.766	0.540
12.000	3.700	58.7	100	Circular	61.771	61.271	0.400	61.771	61.208	0.463
15.000	6.914	59.1	100	Circular	61.586	61.086	0.400	61.586	60.969	0.517
8.000	18.161	59.3	100	Circular	61.463	60.963	0.400	61.418	60.657	0.661

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
7.000	PP5		Junction		7	1500	Manhole	Adoptable
5.000	PP6		Junction		6	1350	Manhole	Adoptable
6.000	PP7		Junction		6	1350	Manhole	Adoptable
9.000	PP8		Junction		7	1500	Manhole	Adoptable
13.000	PP10		Junction		14	1500	Manhole	Adoptable
12.000	PP11		Junction		13	1350	Manhole	Adoptable
15.000	PP13		Junction		16	1200	Manhole	Adoptable
8.000	PP4		Junction		7	1500	Manhole	Adoptable

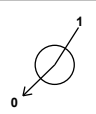
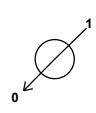
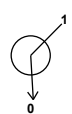
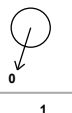
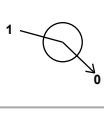
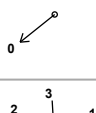
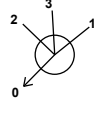
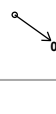
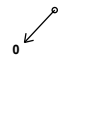
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	706152.971	737725.595	62.295	1.895	1200		0	1	60.400	225
2	706195.519	737711.919	61.855	1.753	1200		1 2	2.000 1	61.102 60.177	100 225
3	706238.362	737698.288	61.422	1.500	1200		1 2	3.000 2	60.710 59.922	100 300
4	706128.861	737702.515	62.232	1.906	1200		0	4	60.326	225
5	706119.310	737674.908	61.989	1.884	1200		1	4	60.180	225
6	706170.419	737658.925	61.934	2.043	1350		1 2 3	6.000 5.000 5	61.329 61.307 59.891	100 100 300
							0	6	59.891	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
7	706219.480	737641.633	61.418	1.885	1500		1 2 3 4 5 0	9.000 8.000 7.000 59.683 59.683 59.533	100 100 100 300 300 450
DB1	706212.226	737600.724	61.865	2.440			0		
9	706201.674	737592.965	61.520	2.160	1200		1 2 0	8 59.360 59.360 59.360	225 225 450 225
10	706062.107	737658.342	61.735	1.530	1200		0	10 60.205	225
11	706109.311	737643.389	61.714	1.832	1200		1 0	10 59.957 59.882	225 300
12	706102.091	737620.334	61.513	1.878	1350		1 0	11 59.785 59.635	300 450
13	706138.279	737608.681	61.771	2.309	1350		1 2 0	12.000 61.208 59.462 59.462	100 450 450
14	706182.672	737594.774	61.406	2.366	1500		1 2 3 0	13.000 60.766 59.040 59.265 59.040	100 450 225 450
15	706090.792	737589.858	61.243	1.694	1200		0	15 59.549	225
16	706137.305	737575.262	61.586	2.356	1200		1 2 0	15.000 60.969 59.305 59.230	100 225 300
17	706172.509	737564.138	61.427	2.495	1350		1 2 0	16 59.082 58.932 58.932	300 450 450
19	706168.914	737557.155	61.500	2.599	1200		1 0	17 58.901 58.901	450 450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
20	706164.758	737550.633	61.520	2.650	1350	 1	19	58.870	450
						0	20	58.870	450
21	706146.109	737532.487	61.530	2.764	1350	 1	20	58.766	450
						0	21	58.766	450
22	706117.686	737503.670	61.560	2.956	1350	 1	21	58.604	450
						0	22	58.604	450
23	706079.841	737562.875	60.996	1.928	1200	 0	23	59.068	225
24	706067.110	737522.429	61.278	2.497	1200	 1	23	58.856	225
						0	24	58.781	300
25	706094.265	737515.041	61.410	2.892	1350	 1	24	58.668	300
						0	25	58.518	450
DB2	706132.827	737503.458	61.200	2.719		 0	26	58.481	450
27	706118.367	737491.879	61.320	2.913	1500	 1	26	58.407	450
						2	25	58.407	450
						3	22	58.407	450
						0	27	58.407	300
28	706112.699	737486.114	61.086	2.711	1200	 1	27	58.375	300
PP2	706190.454	737707.249	61.855	0.500		 0	2.000	61.355	100
PP3	706225.921	737696.253	61.422	0.500		 0	3.000	60.922	100
PP5	706197.883	737657.075	61.678	0.500		 0	7.000	61.178	100
PP6	706175.541	737664.406	61.934	0.500		 0	5.000	61.434	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
PP7	706172.316	737653.023	61.934	0.500					
						0	6.000	61.434	100
PP8	706201.741	737643.261	61.678	0.500					
						0	9.000	61.178	100
PP10	706169.841	737606.623	61.560	0.500					
						0	13.000	61.060	100
PP11	706135.405	737606.350	61.771	0.500					
						0	12.000	61.271	100
PP12	706166.763	737595.464	61.560	0.500					
PP13	706141.009	737581.100	61.586	0.500					
						0	15.000	61.086	100
PP4	706221.431	737659.689	61.463	0.500					
						0	8.000	60.963	100

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	16.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.276	Starting Level (m)	
Summer CV	1.000	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
5	0	0	0
30	0	0	0
100	20	0	0

Node 27 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	58.407	Product Number	CTL-SHE-0127-9300-1964-9300
Design Depth (m)	1.964	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	9.3	Min Node Diameter (mm)	1500

Node 9 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	59.360	Product Number	CTL-SHE-0094-5200-1925-5200
Design Depth (m)	1.925	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.2	Min Node Diameter (mm)	1200

Node DB2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	58.481
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	662.0	0.0	1.140	662.0	0.0	1.141	0.0	0.0

Node DB2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	59.621
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	136.2	0.0	0.750	513.6	0.0	0.751	0.0	0.0

Node DB1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	60.565
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	166.5	0.0	0.750	522.4	0.0	0.751	0.0	0.0

Node DB1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	59.425
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	662.5	0.0	1.140	662.5	0.0	1.141	0.0	0.0

Node PP4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	60.963
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	1

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	75.0	0.0	0.350	75.0	0.0	0.351	0.0	0.0

Node PP2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	61.355
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	212.5	0.0	0.350	212.5	0.0	0.351	0.0	0.0

Node PP3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	60.922
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	6

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	129.8	0.0	0.350	129.8	0.0	0.351	0.0	0.0

Node PP5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	61.178
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	125.0	0.0	0.350	125.0	0.0	0.351	0.0	0.0

Node PP6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	61.434
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	202.1	0.0	0.350	202.1	0.0	0.351	0.0	0.0

Node PP7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	61.434
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	175.0	0.0	0.350	175.0	0.0	0.351	0.0	0.0

Node PP8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	61.178
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	112.5	0.0	0.350	112.5	0.0	0.351	0.0	0.0

Node PP10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	61.060
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	262.5	0.0	0.350	262.5	0.0	0.351	0.0	0.0

Node PP11 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	61.271
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	67.5	0.0	0.350	67.5	0.0	0.351	0.0	0.0

Node PP12 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	61.060
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	60.0	0.0	0.350	60.0	0.0	0.351	0.0	0.0

Node PP13 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	61.086
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	120.0	0.0	0.350	120.0	0.0	0.351	0.0	0.0

Results for 5 year Critical Storm Duration. Lowest mass balance: 99.49%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	60.536	0.136	24.4	0.3024	0.0000	OK
15 minute summer	2	10	60.256	0.154	35.4	0.2563	0.0000	OK
15 minute summer	3	13	60.081	0.159	36.6	0.1880	0.0000	OK
15 minute summer	4	10	60.474	0.148	26.5	0.3407	0.0000	OK
15 minute summer	5	10	60.306	0.201	52.9	0.4680	0.0000	OK
15 minute summer	6	11	60.104	0.213	60.2	0.3645	0.0000	OK
15 minute summer	7	12	60.078	0.545	120.8	1.6778	0.0000	SURCHARGED
1440 minute summer	DB1	960	59.717	0.292	13.0	193.9376	0.0000	SURCHARGED
15 minute summer	9	12	60.048	0.688	80.5	0.8226	0.0000	SURCHARGED
15 minute summer	10	10	60.339	0.134	25.0	0.3374	0.0000	OK
15 minute summer	11	10	60.175	0.293	82.8	1.1198	0.0000	OK
15 minute summer	12	10	59.871	0.236	111.7	0.6884	0.0000	OK
15 minute summer	13	10	59.655	0.193	118.2	0.3258	0.0000	OK
15 minute summer	14	11	59.404	0.364	133.6	0.7695	0.0000	OK
15 minute summer	15	10	59.673	0.124	21.5	0.2741	0.0000	OK
15 minute summer	16	10	59.420	0.190	48.6	0.4028	0.0000	OK
15 minute summer	17	11	59.355	0.423	177.0	0.7802	0.0000	OK
15 minute summer	19	11	59.297	0.396	173.5	0.4480	0.0000	OK
15 minute summer	20	12	59.234	0.364	172.6	0.5258	0.0000	OK
15 minute summer	21	12	59.117	0.351	181.4	0.6564	0.0000	OK
1440 minute summer	22	1080	59.097	0.493	44.0	0.9126	0.0000	SURCHARGED
15 minute summer	23	10	59.234	0.166	31.6	0.4187	0.0000	OK
1440 minute summer	24	1080	59.096	0.315	6.5	0.7857	0.0000	SURCHARGED
1440 minute summer	25	1080	59.096	0.578	16.3	0.9341	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1	2	23.7	0.979	0.647	1.0828	
15 minute summer	2	2	3	34.6	1.031	0.495	1.5920	
15 minute summer	3	3	7	36.1	0.919	0.516	3.2335	
15 minute summer	4	4	5	26.3	1.001	0.719	0.7674	
15 minute summer	5	5	6	52.5	1.067	0.750	2.6765	
15 minute summer	6	6	7	58.6	1.082	0.837	3.1668	
15 minute summer	7	7	9	79.7	0.777	0.429	8.2110	
1440 minute summer	DB1	8	9	-9.3	-0.259	-0.253	0.5209	
15 minute summer	9	9	14	4.5	0.620	0.123	0.3129	
15 minute summer	10	10	11	24.8	0.804	0.677	1.5858	
15 minute summer	11	11	12	78.9	1.237	1.127	1.5118	
15 minute summer	12	12	13	110.8	1.501	0.510	2.8373	
15 minute summer	13	13	14	119.0	1.289	0.387	4.6573	
15 minute summer	14	14	17	122.0	0.840	0.655	4.7129	
15 minute summer	15	15	16	20.7	0.947	0.565	1.0694	
15 minute summer	16	16	17	48.6	0.994	0.695	2.0571	
15 minute summer	17	17	19	173.5	1.146	0.852	1.1876	
15 minute summer	19	19	20	172.3	1.212	0.846	1.1025	
15 minute summer	20	20	21	172.0	1.275	0.844	3.5147	
15 minute summer	21	21	22	182.3	1.519	0.895	4.9946	
1440 minute summer	22	22	27	29.0	0.315	0.069	1.8714	
15 minute summer	23	23	24	31.7	0.982	0.867	1.3846	
1440 minute summer	24	24	25	6.5	0.566	0.092	1.9817	
1440 minute summer	25	25	27	-10.4	-0.102	-0.056	5.2963	

Results for 5 year Critical Storm Duration. Lowest mass balance: 99.49%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	DB2	1080	59.096	0.615	42.3	407.8563	0.0000	SURCHARGED
1440 minute summer	27	1080	59.096	0.689	37.6	1.3457	0.0000	SURCHARGED
480 minute summer	28	456	58.446	0.071	9.1	0.0000	0.0000	OK
60 minute summer	PP2	37	61.382	0.027	3.4	1.7595	0.0000	OK
30 minute summer	PP3	21	60.958	0.036	4.4	1.4276	0.0000	OK
60 minute summer	PP5	37	61.204	0.026	2.1	0.9959	0.0000	OK
60 minute summer	PP6	38	61.464	0.030	3.3	1.8488	0.0000	OK
60 minute summer	PP7	38	61.463	0.029	2.8	1.5245	0.0000	OK
60 minute summer	PP8	36	61.201	0.023	1.8	0.7908	0.0000	OK
60 minute summer	PP10	39	61.092	0.032	4.2	2.5223	0.0000	OK
30 minute summer	PP11	20	61.293	0.022	1.4	0.4448	0.0000	OK
15 minute summer	PP12	1	61.060	0.000	7.7	0.0000	0.0000	OK
60 minute summer	PP13	37	61.112	0.026	1.9	0.9471	0.0000	OK
60 minute summer	PP4	36	60.985	0.022	1.2	0.4995	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	DB2	26	27	-40.5	-0.370	-0.199	2.9352	
1440 minute summer	27	27	28	9.1	0.668	0.130	0.1096	691.8
60 minute summer	PP2	2.000	2	1.8	1.066	0.156	0.0117	
30 minute summer	PP3	3.000	3	2.1	0.844	0.269	0.0316	
60 minute summer	PP5	7.000	7	1.2	0.718	0.148	0.0432	
60 minute summer	PP6	5.000	6	1.5	0.765	0.190	0.0147	
60 minute summer	PP7	6.000	6	1.4	0.743	0.172	0.0113	
60 minute summer	PP8	9.000	7	1.2	0.857	0.115	0.0243	
60 minute summer	PP10	13.000	14	1.7	0.793	0.213	0.0368	
30 minute summer	PP11	12.000	13	0.8	0.632	0.098	0.0045	
60 minute summer	PP13	15.000	16	1.1	0.706	0.143	0.0110	
60 minute summer	PP4	8.000	7	0.8	0.648	0.104	0.0229	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.49%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	1	20	60.591	0.191	32.4	0.4238	0.0000	OK
15 minute summer	2	12	60.565	0.463	50.8	0.7706	0.0000	SURCHARGED
30 minute summer	3	19	60.524	0.602	48.5	0.7120	0.0000	SURCHARGED
30 minute summer	4	20	60.737	0.411	35.2	0.9484	0.0000	SURCHARGED
30 minute summer	5	20	60.679	0.574	69.6	1.3359	0.0000	SURCHARGED
30 minute summer	6	20	60.593	0.702	78.0	1.2019	0.0000	SURCHARGED
30 minute summer	7	20	60.445	0.912	143.4	2.8090	0.0000	SURCHARGED
960 minute summer	DB1	750	59.895	0.470	28.0	312.2394	0.0000	SURCHARGED
15 minute summer	9	12	60.385	1.025	114.7	1.2246	0.0000	SURCHARGED
15 minute summer	10	10	60.556	0.351	35.9	0.8830	0.0000	SURCHARGED
15 minute summer	11	10	60.338	0.456	114.3	1.7421	0.0000	SURCHARGED
15 minute summer	12	10	59.925	0.290	156.9	0.8443	0.0000	OK
15 minute summer	13	12	59.792	0.330	166.5	0.5566	0.0000	OK
15 minute summer	14	11	59.714	0.674	180.3	1.4252	0.0000	SURCHARGED
15 minute summer	15	12	59.768	0.219	30.8	0.4824	0.0000	OK
15 minute summer	16	11	59.718	0.488	71.7	1.0340	0.0000	SURCHARGED
15 minute summer	17	11	59.620	0.688	215.8	1.2685	0.0000	SURCHARGED
15 minute summer	19	11	59.547	0.646	211.6	0.7302	0.0000	SURCHARGED
2160 minute summer	20	1860	59.486	0.616	23.1	0.8895	0.0000	SURCHARGED
2160 minute summer	21	1860	59.486	0.720	24.4	1.3448	0.0000	SURCHARGED
2160 minute summer	22	1860	59.486	0.882	25.3	1.6340	0.0000	SURCHARGED
15 minute summer	23	11	59.511	0.443	45.3	1.1171	0.0000	SURCHARGED
2160 minute summer	24	1860	59.486	0.705	6.8	1.7554	0.0000	SURCHARGED
2160 minute summer	25	1860	59.486	0.968	7.2	1.5628	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	1	1	2	31.3	1.057	0.855	1.6912	
15 minute summer	2	2	3	49.6	1.106	0.709	3.1660	
30 minute summer	3	3	7	40.5	0.863	0.579	4.2054	
30 minute summer	4	4	5	34.2	1.017	0.936	1.1618	
30 minute summer	5	5	6	66.6	1.076	0.953	3.7710	
30 minute summer	6	6	7	61.1	1.084	0.874	3.6631	
30 minute summer	7	7	9	115.8	0.731	0.623	8.2110	
960 minute summer	DB1	8	9	-21.0	-0.528	-0.573	0.5209	
15 minute summer	9	9	14	-18.8	0.619	-0.514	0.7592	
15 minute summer	10	10	11	33.6	0.846	0.918	1.9693	
15 minute summer	11	11	12	109.7	1.568	1.568	1.6218	
15 minute summer	12	12	13	155.8	1.642	0.717	4.0786	
15 minute summer	13	13	14	165.5	1.352	0.538	6.5828	
15 minute summer	14	14	17	158.5	1.000	0.851	5.1142	
15 minute summer	15	15	16	31.5	0.968	0.861	1.9305	
15 minute summer	16	16	17	58.6	0.993	0.838	2.5999	
15 minute summer	17	17	19	211.6	1.335	1.039	1.2444	
15 minute summer	19	19	20	211.6	1.336	1.039	1.2254	
2160 minute summer	20	20	21	23.1	0.787	0.113	4.1227	
2160 minute summer	21	21	22	23.9	0.801	0.117	6.4132	
2160 minute summer	22	22	27	59.1	0.705	0.141	1.8714	
15 minute summer	23	23	24	41.1	1.033	1.122	1.6864	
2160 minute summer	24	24	25	6.6	0.511	0.095	1.9817	
2160 minute summer	25	25	27	19.5	0.183	0.105	5.2963	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.49%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute summer	DB2	1860	59.486	1.005	25.5	665.7853	0.0000	SURCHARGED
2160 minute summer	27	1860	59.486	1.079	89.9	2.1056	0.0000	SURCHARGED
120 minute summer	28	96	58.446	0.071	9.1	0.0000	0.0000	OK
60 minute summer	PP2	36	61.391	0.036	5.1	2.3175	0.0000	OK
30 minute summer	PP3	20	60.970	0.048	6.5	1.9065	0.0000	OK
60 minute summer	PP5	36	61.212	0.034	3.1	1.2986	0.0000	OK
60 minute summer	PP6	37	61.474	0.040	4.9	2.4679	0.0000	OK
60 minute summer	PP7	37	61.473	0.039	4.2	2.0491	0.0000	OK
30 minute summer	PP8	20	61.208	0.030	3.5	1.0293	0.0000	OK
60 minute summer	PP10	38	61.103	0.043	6.3	3.4185	0.0000	OK
30 minute summer	PP11	20	61.299	0.028	2.1	0.5826	0.0000	OK
15 minute summer	PP12	1	61.060	0.000	11.0	0.0000	0.0000	OK
60 minute summer	PP13	36	61.120	0.034	2.9	1.2341	0.0000	OK
30 minute summer	PP4	20	60.992	0.029	2.4	0.6500	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute summer	DB2	26	27	-23.2	-0.174	-0.114	2.9352	
2160 minute summer	27	27	28	9.0	0.668	0.130	0.1095	955.9
60 minute summer	PP2	2.000	2	3.1	1.230	0.262	0.0171	
30 minute summer	PP3	3.000	3	3.5	0.965	0.450	0.0462	
60 minute summer	PP5	7.000	7	1.9	0.829	0.248	0.0624	
60 minute summer	PP6	5.000	6	2.6	0.884	0.324	0.0217	
60 minute summer	PP7	6.000	6	2.4	0.863	0.298	0.0169	
30 minute summer	PP8	9.000	7	2.0	0.992	0.193	0.0351	
60 minute summer	PP10	13.000	14	2.9	0.923	0.373	0.0555	
30 minute summer	PP11	12.000	13	1.3	0.731	0.165	0.0066	
60 minute summer	PP13	15.000	16	1.9	0.811	0.236	0.0159	
30 minute summer	PP4	8.000	7	1.4	0.751	0.175	0.0332	

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.49%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	1	19	61.751	1.351	50.4	3.0008	0.0000	SURCHARGED
30 minute summer	2	19	61.465	1.363	62.9	2.2699	0.0000	SURCHARGED
30 minute summer	3	19	61.348	1.426	71.1	1.6865	0.0000	FLOOD RISK
30 minute summer	4	19	62.131	1.805	54.7	4.1644	0.0000	FLOOD RISK
30 minute summer	5	19	61.912	1.807	88.1	4.2078	0.0000	FLOOD RISK
30 minute summer	6	19	61.569	1.678	92.9	2.8719	0.0000	SURCHARGED
30 minute summer	7	19	61.239	1.706	181.0	5.2559	0.0000	FLOOD RISK
2160 minute winter	DB1	2040	60.416	0.991	14.1	657.8293	0.0000	SURCHARGED
15 minute summer	9	12	61.073	1.713	156.1	2.0473	0.0000	SURCHARGED
30 minute summer	10	19	61.683	1.478	51.8	3.7196	0.0000	FLOOD RISK
30 minute summer	11	19	61.419	1.537	160.6	5.8698	0.0000	FLOOD RISK
30 minute summer	12	19	61.034	1.399	195.2	4.0776	0.0000	SURCHARGED
15 minute summer	13	12	60.901	1.439	220.4	2.4284	0.0000	SURCHARGED
15 minute summer	14	12	60.732	1.692	206.0	3.5771	0.0000	SURCHARGED
30 minute summer	15	19	60.949	1.400	44.4	3.0868	0.0000	FLOOD RISK
30 minute summer	16	19	60.751	1.521	88.5	3.2220	0.0000	SURCHARGED
15 minute summer	17	12	60.561	1.629	289.4	3.0043	0.0000	SURCHARGED
15 minute summer	19	12	60.413	1.512	289.6	1.7096	0.0000	SURCHARGED
2160 minute winter	20	1620	60.347	1.477	23.4	2.1340	0.0000	SURCHARGED
2160 minute winter	21	1620	60.347	1.581	24.1	2.9527	0.0000	SURCHARGED
2160 minute winter	22	1620	60.346	1.742	25.6	3.2288	0.0000	SURCHARGED
15 minute summer	23	11	60.516	1.448	69.5	3.6485	0.0000	SURCHARGED
2160 minute winter	24	1620	60.347	1.566	6.8	3.9002	0.0000	SURCHARGED
2160 minute winter	25	1620	60.347	1.829	28.1	2.9532	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	1	1	2	39.0	1.076	1.064	1.7774	
30 minute summer	2	2	3	63.2	1.053	0.903	3.1660	
30 minute summer	3	3	7	45.8	0.873	0.654	4.2054	
30 minute summer	4	4	5	40.8	1.027	1.116	1.1618	
30 minute summer	5	5	6	82.2	1.167	1.175	3.7710	
30 minute summer	6	6	7	84.1	1.195	1.203	3.6631	
30 minute summer	7	7	9	167.5	1.057	0.901	8.2110	
2160 minute winter	DB1	8	9	-10.2	-0.255	-0.277	0.5209	
15 minute summer	9	9	14	15.8	0.620	0.430	0.7592	
30 minute summer	10	10	11	40.5	1.018	1.105	1.9693	
30 minute summer	11	11	12	131.2	1.864	1.875	1.7013	
30 minute summer	12	12	13	184.3	1.633	0.848	6.0237	
15 minute summer	13	13	14	180.2	1.348	0.585	7.3708	
15 minute summer	14	14	17	202.4	1.278	1.087	5.1142	
30 minute summer	15	15	16	30.9	0.965	0.845	1.9388	
30 minute summer	16	16	17	75.0	1.065	1.072	2.5999	
15 minute summer	17	17	19	289.6	1.828	1.421	1.2444	
15 minute summer	19	19	20	292.0	1.843	1.433	1.2254	
2160 minute winter	20	20	21	22.7	0.756	0.111	4.1227	
2160 minute winter	21	21	22	24.2	0.788	0.119	6.4132	
2160 minute winter	22	22	27	57.8	0.581	0.138	1.8714	
15 minute summer	23	23	24	59.1	1.486	1.615	1.6864	
2160 minute winter	24	24	25	6.7	0.505	0.096	1.9817	
2160 minute winter	25	25	27	-24.1	-0.226	-0.130	5.2963	

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.49%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute winter	DB2	1620	60.347	1.866	27.2	987.7836	0.0000	SURCHARGED
2160 minute winter	27	1620	60.347	1.939	58.1	3.7859	0.0000	SURCHARGED
2160 minute winter	28	1620	58.446	0.071	9.1	0.0000	0.0000	OK
30 minute summer	PP2	21	61.418	0.063	12.3	4.0469	0.0000	OK
30 minute summer	PP3	23	61.073	0.151	17.4	5.9899	0.0000	SURCHARGED
30 minute summer	PP5	20	61.232	0.054	6.3	2.0369	0.0000	OK
30 minute summer	PP6	21	61.505	0.071	13.0	4.3722	0.0000	OK
30 minute summer	PP7	21	61.505	0.071	12.6	3.7891	0.0000	OK
30 minute summer	PP8	20	61.227	0.049	5.5	1.6851	0.0000	OK
60 minute summer	PP10	37	61.121	0.061	9.9	4.8305	0.0000	OK
30 minute summer	PP11	19	61.309	0.038	3.3	0.7857	0.0000	OK
15 minute summer	PP12	1	61.060	0.000	16.8	0.0000	0.0000	OK
30 minute summer	PP13	20	61.133	0.047	5.9	1.7021	0.0000	OK
30 minute summer	PP4	22	61.065	0.102	9.4	2.3244	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2160 minute winter	DB2	26	27	-24.9	-0.211	-0.122	2.9352	
2160 minute winter	27	27	28	9.1	0.668	0.130	0.1098	1073.6
30 minute summer	PP2	2.000	2	7.2	1.522	0.614	0.0447	
30 minute summer	PP3	3.000	3	-9.4	-1.197	-1.192	0.0986	
30 minute summer	PP5	7.000	7	4.1	0.944	0.519	0.1605	
30 minute summer	PP6	5.000	6	6.1	1.084	0.768	0.0517	
30 minute summer	PP7	6.000	6	6.1	1.075	0.778	0.0427	
30 minute summer	PP8	9.000	7	4.3	1.100	0.428	0.1039	
60 minute summer	PP10	13.000	14	5.2	1.061	0.661	0.0856	
30 minute summer	PP11	12.000	13	2.3	0.847	0.287	0.0099	
30 minute summer	PP13	15.000	16	3.3	0.944	0.420	0.0243	
30 minute summer	PP4	8.000	7	6.9	1.127	0.882	0.1421	

C Quality Audit

St. Mochta's Large Residential Development

Quality Audit

Castlethorn

May 2025

St. Mochta’s Large Residential Development

Quality Audit

May 2025

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A.1 Road Safety Audit Feedback Form

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1. Introduction

1.1 Report Context

This report describes the findings of a Quality Audit associated with the St. Mochta's Large Residential Development.

The Audit has been completed by Traffico on behalf of Castlethorn.

1.2 Details of Site Inspection

Date	Daylight / Darkness	Weather & Road Conditions
Tuesday 22 nd April 2025	Daylight	Raining with wet road pavements.

Table 1.1 – Site Inspection Details

1.3 The Road Safety Audit Team

The members of the Road Safety Audit Team have been listed following:

Status	Name / Qualifications	TII Auditor Reference No:
Audit Team Leader (ATL)	Martin Deegan BEng(Hons) MSc CEng FIEI	MD101312
Audit Team Member (ATM)	Sai Janapareddy BEng(Hons), ME, MIEI	SJ285435

Table 1.2 – Audit Team Details

1.4 Design Information Examined as Part of the Audit Process

The following design information was examined as part of the Road Safety Audit (RSA) process:

Drawing No.	Drawing Title	Revision
STM-WMC-ZZ-00-OV-C-100	Road Layout & Levels	00

Table 1.3 – Designers Drawing List

1.5 Quality Audit Content and Compliance

Procedure and Scope for Quality Audit

This Quality Audit is undertaken in accordance with Section 5.4.2 of the Design Manual for Urban Roads and Streets. The UK Department for Transport Traffic Advisory Leaflet (TAL) 5/11 has also been referred to for guidance.

This Quality Audit consists of the following audit sections:

- Walking, Cycling and Access Audit – focusing on accessibility requirements of vulnerable road users (and in particular, those with visual or mobility impairments), and on the movement and place function requirements of pedestrians and cyclists
- Road Safety Audit – focusing on issues relating directly to road safety

Procedure and Scope Specific to the Road Safety Audit

The Road Safety Audit has been carried out in accordance with the procedures and scope set out in TII publication number GE-STY-01024 - Road Safety Audit.

As part of the road safety audit process, the Audit Team have examined only those issues within the design which relate directly to road safety.

Compliance with Design Standards

The road safety audit process is not a design check, therefore verification or compliance with design standards has not formed part of the audit process.

Minimizing Risk of Collision Occurrence

All problems described in this report are considered by the Audit Team to require action in order to improve the safety of the scheme and minimise the risk of collision occurrence.

2. Walking, Cycling and Access Audit

2.1 Best Practice Guidance

This Quality Audit has been carried out in accordance with general best practice guidance set out within the following documents:

- The Disability Act 2005
- Technical Guidance Document M 2022 – Access and Use
- Buildings for Everyone Access and use for all citizens (National Disability Authority)
- Access Auditing of the Built Environment Guidelines (National Disability Authority)
- DMURS Advice Note 4 – Quality Audits
- Traffic Management Guidelines (Irish Government Publications 2003)
- Guidance on the use of Tactile Paving Surfaces: UK Department for Transport.

2.2 Objectives of the Walking, Cycling and Access Audit

The objectives of this Walking, Cycling and Access Audit are as follows:

- To ensure a high level of accessibility to the proposed development site for all vulnerable road users and in particular, for visually and mobility impaired users
- To ensure that the current and future access needs within the scheme are recognised and developed
- To ensure that advantage is afforded to walkers and cyclists at every opportunity.

2.3 General Accessibility Recommendations

Following delivery of the Walking, Cycling and Access Audit, the design team should consider all issues raised herein for inclusion into the final design. It is less costly to make the changes now, pre-construction, than later after the scheme has been commissioned.

The client should consider setting up a dedicated access team for the project, responsible for the long-term management of universal access throughout the development.

This process should be facilitated by an Access Plan, which is a strategy for improving accessibility developed from the Audit and can ensure that access is an on-going concern and help identify opportunities for change.

The access plan should incorporate planned maintenance programmes, a schedule of works that has been devised to take into account the priority information in the Audit, processes to allow regular updating of the Audit information and links to maintenance and management procedures.

It should also set out procedures to ensure that when opportunities for access improvement arise, they are recognised.

2.4 Specific Walking, Cycling and Accessibility Recommendations

A summary of the design features, together with recommended actions to be taken during the relevant stage of the design or operation of the scheme have been detailed in the following table.

Table 2.1 - Walking, Cycling and Access Audit Summary Table

I.D.	Location	Feature	Action	When
 Recommendations to Encourage Walking				
W1	Footpaths within St. Mochta's Large Residential Development	Pedestrian provision & universal access	Ensure pedestrian environments are logical, continuous, easy to understand and consistent throughout the development.	Design Stage
W2	Footpaths within St. Mochta's Large Residential Development	Pedestrian Provision / Universal Access	Ensure continuity for pedestrians is provided at crossing points, and that crossing points are located with good forward stopping sight distance for approaching vehicles.	Design Stage
W3	Pedestrian linkage to external Public Roads serving St. Mochta's Large Residential Development	Pedestrian provision – connections to external public roads	Provide seamless connections onto Porterstown Link Road to encourage uptake for car sharing and public transport, including existing and future nearby bus routes e.g. C4, 39, L52 & 37.	Design Stage
W4	Footpaths serving St. Mochta's Large Residential Development	Street furniture positioning	Ensure street furniture is carefully positioned to avoid obstructions in footways and to maximise the effective width.	Design & Operational Stages
W5	Footpaths serving St. Mochta's Large Residential Development	Footpaths and crossing points	Ensure footpaths and crossing points are located on all significant desire lines, where they are safe and convenient to use for all vulnerable road users.	Design Stage
W6	Footpaths serving St. Mochta's Large Residential Development	Pedestrian Provision / Universal Access	Ensure continuity for pedestrians is provided at crossing points, and that crossing points are located with good forward stopping sight distance for approaching vehicles.	Design Stage
W7	Footpaths serving St. Mochta's Large Residential Development	Pedestrian Provision / Universal Access	At access points through the site boundaries which connect with existing public thoroughfares, all internal footpaths should link seamlessly with external footpaths / walking opportunities to accommodate universal access and facilitate pedestrian progression.	Design Stage

I.D.	Location	Feature	Action	When
 Recommendations to Encourage Cycling				
C1	Shared cycling and walking areas within St. Mochta's Large Residential Development	Pedestrian & cyclist facilities.	Conflicts can arise where different modes of transport share the same space. Ensure cycle environments are logical, continuous, and legible throughout the development. Where cyclists are encouraged to share with pedestrians, ensure that sufficient width and end user information are provided.	Design Stage
C2	Formal Road Crossings within St. Mochta's Large Residential Development	Continuity and crossing.	Ensure continuity for cyclists and pedestrians are provided at key crossing points, and that crossing points are located with good forward stopping sight distance for approaching vehicles (these should not be obscured with landscaping).	Design Stage
C3	All dedicated cycling provisions within St. Mochta's Large Residential Development	Street furniture positioning.	Ensure street furniture is carefully positioned to avoid obstruction in cycle paths and to maximise the effective width available to cyclists.	Design & Operational Stages
C4	Dedicated cycle tracks within St. Mochta's Large Residential Development	Commencements and terminations	Where cycle tracks commence, measures to allow ease of access for cyclists should be included. Where cycle tracks terminate, then termination points should be carefully designed to optimise cycle safety.	Design Stage
C5	Cycle Parking Areas within St. Mochta's Large Residential Development	Cycle Parking	Ensure appropriate cycle parking is provided within the development to encourage uptake of cycling. Ensure it is comfortable and safe for cyclists to access the parking.	Design Stage
C6	Cycle Parking Areas within St. Mochta's Large Residential Development	Cycle Parking & security	To encourage use and safeguard security, position cycle parking away from isolated areas and close to building entrances which are well lit and have natural passive surveillance. Consider providing cover over the cycle parking to protect cyclists from the elements where possible.	Design Stage
 Recommendations to Provide for Universal Access & Accessibility				
A1	Footpaths serving St. Mochta's Large Residential Development	Dropped kerbs & tactile paving	Ensure appropriate dropped kerbs and tactile paving are provided at key crossing points.	Design Stage

I.D.	Location	Feature	Action	When
A2	Footpaths serving St. Mochta's Large Residential Development	Universal Access – footpath types and finishes	Ensure consistency in the types of footpath surface utilised and ensure that the surface provides appropriate contrast with the adjacent road pavement.	Design Stage
A3	Footpaths serving St. Mochta's Large Residential Development	Universal Access – material contrast	Ensure contrasting colours/materials are used to define areas which are meant for sole use by vulnerable road users.	Design Stage
A4	Footpaths serving St. Mochta's Large Residential Development	Universal Access – footpaths	Ensure that measures are taken to actively maintain and police errant car parking on footpaths which might impact negatively upon pedestrian progression.	Design Stage & Operational Stage
A5	Footpaths serving St. Mochta's Large Residential Development	Definition of footpath edges & terminations	Ensure footpath edges are clearly defined and ensure that appropriate termination details are provided when footpaths end.	Design Stage
A6	Footpaths serving St. Mochta's Large Residential Development	Steps - legibility	Ensure steps are legible and easy to define by providing step nosings with contrasting colour.	Design Stage
A7	Building structures – St. Mochta's Large Residential Development	Building Entrances	Ensure that building entrances are well defined and by employing colours and material finishes which contrast with the rest of the building façade.	Design Stage
A8	Building structures – St. Mochta's Large Residential Development	Building Entrances	Ensure clear sight lines to building entrances are provided from all approaches. Trees, planting or street furniture should not block these.	Design Stage
A9	Footpaths serving St. Mochta's Large Residential Development	Street Lighting	Ensure public lighting is located where pedestrian movement decisions are required (i.e. at crossing points, entrances and in shared street areas).	Design Stage
A10	External Landscaped areas serving St. Mochta's Large Residential Development	Drainage gaps	Ensure any break in surface or gap (such as a drainage gully) is no greater than 10mm and is perpendicular to line of travel. Locate drainage features both away from (and up gradient from) crossing points.	Design Stage

I.D.	Location	Feature	Action	When
A11	External Landscaped areas serving St. Mochta's Large Residential Development	Drainage / pavement gradients	Ensure access routes are constructed with even and gentle falls to allow proper drainage and prevent the formation of puddles. The cross-fall gradient to any access route should not exceed 1 in 50, except when associated with a dropped-kerb.	Design Stage
A12	External Landscaped areas serving St. Mochta's Large Residential Development	Obstructions from Street Furniture or landscaping	Ensure street furniture / landscaping do not encroach on the clear width of pathways.	Design Stage
A13	External Landscaped areas St. Mochta's Large Residential Development	Street Furniture – visually impaired	Ensure street furniture contrasts in colour with the surrounding pavement surfaces.	Design Stage
A14	Car Parking Areas within St. Mochta's Large Residential Development	Universal access to parking	Ensure car parking is accessible, easy to use, and sufficient parking spaces are provided within a well-designed environment to meet the needs of all end users who might (reasonably) be expected to use them.	Design Stage
A15	Car Parking Areas within St. Mochta's Large Residential Development	Disabled parking	Ensure the location of designated spaces for car users with disabilities are located as close as possible to the building access points.	Design Stage
A16	Car Parking Areas within St. Mochta's Large Residential Development	Car park & boundary treatment	Ensure that access to/from parked vehicles is not inhibited by boundary treatments, trees, hedges, street furniture or structural features.	Design Stage
A17	Bin storage within St. Mochta's Large Residential Development	Bin storage	Bin storage and collection can lead to obstruction of the footpaths and cycle facilities. The Designer should ensure that refuse truck access and turning, bin storage and bin collection are all considered and comprehensively catered for within the development proposals.	Design Stage

3. Stage 1 Road Safety Audit Issues

3.1 Problem: Pedestrian Connections to Public Road

Location: Development Accesses onto Porterstown Road

The absence of seamless footpath connections between the development streets and Porterstown Road is likely to elevate the risk of conflicts between vehicles and vulnerable road users.

Figure 3.1 –Locations Where Pedestrians Are Likely Require Connectivity onto Porterstown Road



Recommendation

Continuous footpath connections should be provided between the development streets and Porterstown Road.

3.2 Problem: Pedestrian Crossing Risks at Unusual Junctions

Location: Various Junction Locations – See Figure Below

These unusual junction layouts offer extended, discontinuous, confusing or poorly placed crossings which prioritise vehicles over pedestrians. This may lead to collisions when drivers fail to yield for a crossing pedestrian.

Figure 3.2 – Unusual Junction Layouts Which Prioritise the Passage of Vehicles Over Pedestrians



Recommendation

The junctions should be adjusted with a view to prioritizing and improving pedestrian crossing facilities.

3.3 Problem: Obstructions - Footpaths & Pedestrian Refuge Zones

Location: Various Footpaths in Streets & Pedestrian Refuge Zones in Homezones

Several footpaths and pedestrian refuge areas throughout the scheme streets have landscaping features that obstructing them. This may lead to pedestrians stepping into the nearby traffic lanes without warning, potentially increasing the risk of vehicle conflicts.

Figure 3.3 – Example Location Where Landscaping Pockets Appear to Obstruct Footpaths



Recommendation

Landscaping features that block footpaths and pedestrian zones should be adjusted with a view to prioritizing pedestrian movement.

3.4 Problem: Treatment of Homezone Entry Points

Location: All Homezone Gateway Entry Points

Drivers may not realise they must yield to pedestrians on Homezone streets, increasing the risk of conflict with vulnerable road users, including children at play.

Figure 3.4 – Example Entry Points to Homezones Where Pedestrians & Vehicles will Share Space



Recommendation

Drivers should be clearly informed that they are entering a Homezone street. Measures might include conspicuous pedestrian refuge zones, surface colour changes, in-lane roundels, and gateway signage at entry points.

4. Audit Team Statement

4.1 Certification & Purpose

We certify that we have examined the drawing(s) listed in Chapter 1 of this Report.

Sole Purpose of the Road Safety Audit

The Road Safety Audit has been carried out with the sole purpose of identifying any features of the design which could be removed or modified to improve the road safety aspects of the scheme.

4.2 Implementation of RSA Recommendations

The problems identified herein have been noted in the Report together with their associated recommendations for road safety improvements.

We (the Audit Team) propose that these recommendations should be studied with a view to implementation.

Audit Team's Independence to the Design Process

No member of the Audit Team has been otherwise involved with the design of the measures audited.

4.3 Road Safety Audit Team Sign-Off

Martin Deegan

Audit Team Leader

Road Safety Engineering Team

traffico

Signed:



Date:

15th May 2025

Sai Janapareddy

Audit Team Member

Road Safety Engineering Team

traffico

Signed:



Date:

15th May 2025

5. Designers Response

5.1 How the Designer Should Respond to the Road Safety Audit

The Designer should prepare an Audit Response for each of the recommendations using the Road Safety Audit Feedback Form attached in Appendix A.

When completed, this form should be signed by the Designer and returned to the Audit Team for consideration. See flow-chart following for further description.



Figure 5.1 – Road Safety Audit Sign-Off and Completion Process

5.2 Returning the Completed Feedback Form

The Designer should return the completed Road Safety Audit Feedback Form attached in Appendix A of this report to the following email address:

- Email address: martin@traffico.ie
- Telephone: 01 699 1551

The Audit Team will consider the Designer's response and reply indicating acceptance or otherwise of the Designers response to each recommendation.

Triggering the Need for an Exception Report

Where the Designer and the Audit Team cannot agree on an appropriate means of addressing an underlying safety issue identified as part of the audit process, an Exception Report must be prepared by the Designer on each disputed item listed in the audit report.

Appendix A

A.1 Road Safety Audit Feedback Form

Road Safety Audit Feedback Form	
Scheme: St. Mochta's Large Residential Development	
Audit Stage: Quality Audit	Audit Date: 15 th May 2025

Problem Reference (Section 2)	Designer Response Section			Audit Team Response Section
	Problem Accepted (yes / no)	Recommended Measure Accepted (yes / no)	Alternative Measures or Comments	Alternative Measures Accepted (yes / no)
2.1	Yes	Yes	The design has been reviewed to ensure continuous footpath connections to facilitate movement between the development streets and Porterstown Road. There is good E-W connectivity and good N-S connectivity along the western side of Porterstown Road.	Noted.
2.2	Yes	Yes	The junctions have now been redesigned and now prioritise pedestrian crossing at each of the identified locations.	Noted.
2.3	Yes	No	Following a design review with the design team and client, the current design has been coordinated to facilitate best practice as a traffic calming measure as outlined in DMURS. We propose the landscape buildouts to: 1) Allow for pedestrian refuge 2) Ensure low vehicular speeds by manoeuvring the vehicles around the build outs and by avoiding straight roads and straight line of sight. The design team and client have used the current design successfully on other sites, which results in low vehicular speeds and good pedestrian priority and safety.	Yes, agreed.
2.4	Yes	Yes	The entry points to Homezones now include conspicuous pedestrian refuge zones, surface colour changes and gateway signage at entry points.	Noted.

**The Designer should complete the Designer Response Section above, then fill out the designer details below and return the completed form to the Road Safety Audit Team for consideration and signing.*

Designer's

Name:

MARK DEEGAN

Designer's

Signature:

[Signature]

Date:

27/5/25

Employer's

Name:

JAMES LEONARD

Employer's

Signature:

[Signature]

Date:

27/5/25

Audit Team's

Name:

Martin Deegan

Audit Team's

Signature:

[Signature]

Date:

28 / 05 / 2025



traffico

w: www.traffico.ie
e: hello@traffico.ie

D Letter of Intent — GoCar



Castlethorn Construction Company Limited
Usher House,
Main Street,
Dundrum
Dublin 14
D14 N7Y8

27th May 2025

To Whom It May Concern,

This is a letter to confirm that GoCar intends to provide a car sharing service in the Kellystown, Clonilla, Dublin 15 development. GoCar representatives have discussed the project with representatives of Waterman Moylan on behalf of Castlethorn Construction Company Limited and are excited to provide 2 car sharing spaces to service this location. The development consists of 302 unit dwellings, made up of 97 houses, 26 duplexes and 179 apartments within the Kellystown, Clonilla, Dublin 15 area. The developer proposes to have available two (2) vehicles for service, both at surface level for the wider communities and residents within the development.

GoCar is Ireland's leading car sharing service with over 60,000 members and over 1200 cars and vans on fleet. Each GoCar which is placed in a community has the potential to replace the journeys of up to 15 private cars. The Department of Housing's Design Standards for New Apartments - Guidelines for Planning Authorities 2018 outline: "For all types of location, where it is sought to eliminate or reduce car parking provision, it is necessary to ensure... provision is also to be made for alternative mobility solutions including facilities for car sharing club vehicles."

Carsharing is a sustainable service. By allowing multiple people to use the same vehicle at different times, car sharing reduces car ownership, car dependency, congestion, noise, and air pollution. It frees up land which would otherwise be used for additional parking spaces. Most GoCar users only use a car when necessary and walk and use public transport more often than car owners.

By having GoCar car sharing vehicles in a development such as this, the residents therein will have access to pay-as-you go driving, in close proximity to their homes, which will increase usership of the service.

I trust that this information is satisfactory. For any queries, please do not hesitate to contact me.

Daniel Ralston
Business Account Manager
GoCar Carsharing Ltd
Mobile: 086 0414 991
E: daniel.ralston@gocar.ie

UK and Ireland Office Locations

