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1 INTRODUCTION

1.1 Background

This infrastructure design report has been prepared by DBFL Consulting Engineers for the planning application for the Clonburris T3 development. The proposed development is part of the Clonburris Strategic Development Zone (SDZ) within the administrative area of South Dublin County Council (SDCC).

The proposed development is located within development area Clonburris South West (CSW) within the SDZ as indicated in Figure 1-1. The CSW comprises of 4 sub sectors that will be mixed-use development areas with medium density residential developments. The subject site falls within Sector 3 (CSW S3).

The proposed site will benefit from trunk infrastructure proposed as part of the Clonburris Infrastructure Development for which planning has been granted in August 2021 under planning reference SDZ20A/0021. The CSLS includes trunk road, drainage, watermain and utility infrastructure to serve the Clonburris Strategic Development Zone lands to the south of the Kildare/Cork Railway Line which includes the subject site.

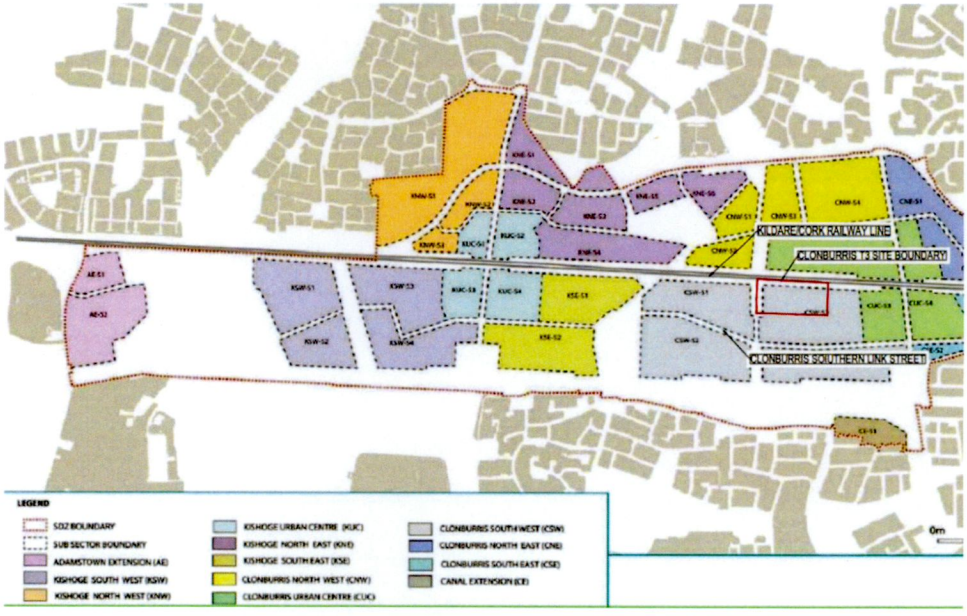


Figure 1-1 Subject site within SDZ (Boundary Indicative)

1.2 Objectives

This report aims to consider the proposed development main infrastructure elements, including the following;

- Road Layout/Site access.
- Surface water strategy and servicing.
- Foul sewer strategy and servicing.
- Water supply and servicing
- Flood Risk.

1.3 Location

The overall Clonburris SDZ lands, of approximately 280 Ha, are located within the townlands of Cappagh, Clonburris Little & Kishoge, Co. Dublin all on wider lands bounded generally by undeveloped lands and the Dublin-Cork railway line to the north, undeveloped lands and the Grand Canal to the south, the R113 (Fonthill Road) to the east and the R136 to the west.

The subject site for this planning application is situated in the southern area of the SDZ lands to the south of the Kildare/Cork railway adjacent to the R113, the R136 Grange Castle Road is situated approximately 1.2km west of the subject site. The Clonburris South Link Street which links the R113 to the R136 will provide access to the subject site via the Proposed Clonburris T1A development as granted under planning reference SDZ21A/0022. The Adamstown SDZ is located to the north-west of the subject site. Refer to Figure 1-2 for the Clonburris T3 site Location.

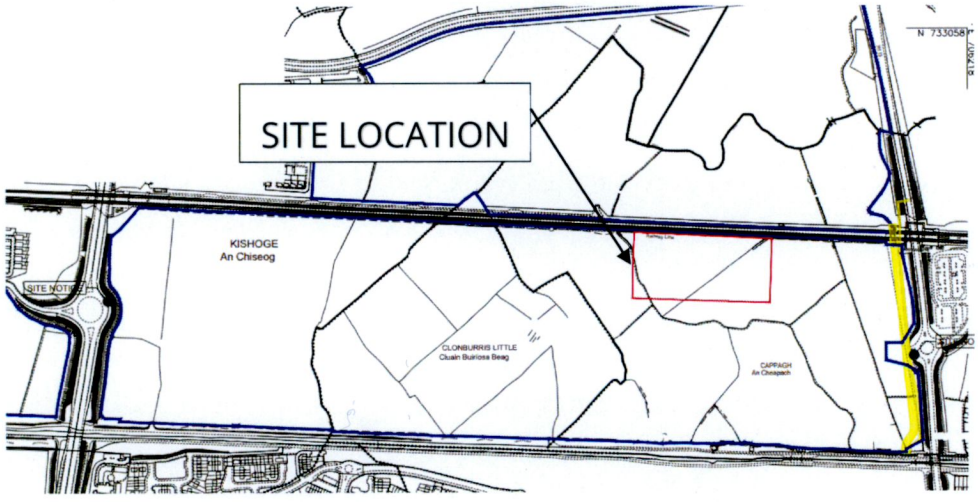


Figure 1-2 Site Location. (Boundary Indicative)

1.4 Topography

Overall, the topography of the site is relatively flat. There is a slight fall from west to east over the site. A number of drainage ditches are located throughout the site. There is a high points on site located to the west as shown in Figure 1-3. A topographical survey of the Site is provided as a background to the layout drawings issued with this report.

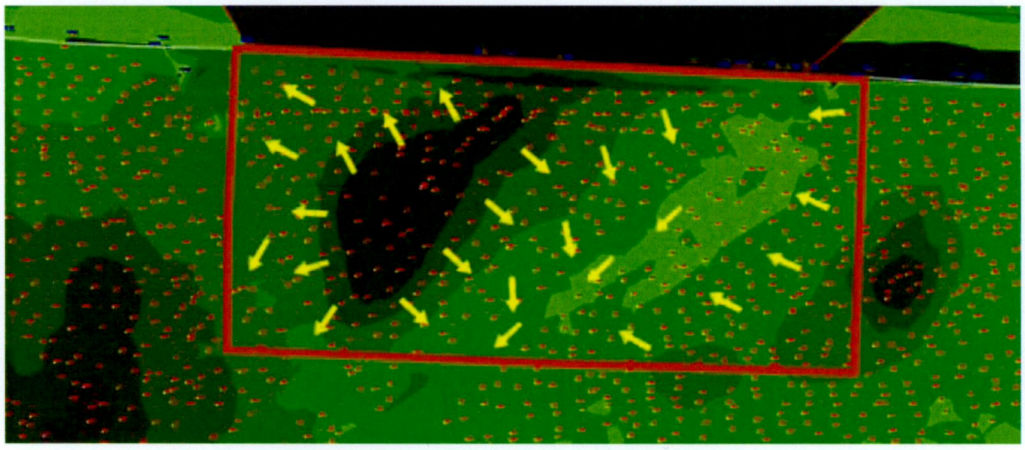


Figure 1-3 Site Topography (Boundary Indicative)

1.5 Proposed Development

The development will consist of the construction of 157 no. dwellings on a site of c.3.45 hectares in the Clonburris South-West Development Area of the Clonburris Strategic Development Zone (SDZ) Planning Scheme 2019 as follows:

A) 81 no. houses comprising 4 no. 2-bedroom houses, 65 no. 3-bedroom houses and 12 no. 4-bedroom houses (all 2-no. storey with associated private open space and car parking);

B) 76 no. apartment units consisting of 26 no. 1-bedroom and 50 no. 2-bedroom units within Block 1 (4 no. storeys);

C) Vehicular access will be provided from the permitted street under SDZ21A/0022 and the permitted Clonburris Southern Link Street (SDZ20A/0021) and R113 (Fonthill Road) to the east;

D) All ancillary site development works including footpaths, landscaping boundary treatments, public and private open space areas, car parking (170 no. spaces) and bicycle parking (170 no. spaces), single-storey ESB sub-stations, bin and bicycle stores and all ancillary site development/construction works.

1.6 Existing Ground Conditions

A site investigation was undertaken by Ground Investigations Ireland to ascertain the existing ground conditions. This investigation included the following.

- 9 No. Trial Pits to a maximum depth of 3.10m BGL
- 3 No. Plate Bearing Test to ascertain constrained modulus and equivalent CBR
- 5 No. Soakaways to determine a soil infiltration value to BRE digest 365
- 9 No. Dynamic Probes to determine soil strength/density characteristics
- 4 No. Rotary Core Boreholes to a maximum depth of 6.80m BGL
- 2 No. Groundwater monitoring wells
- Geotechnical & Environmental Laboratory testing

The sequence of strata encountered were consistent across the site and are generally comprised;

- Topsoil: Topsoil was encountered in all the exploratory holes and was present to a maximum depth of 0.3m BGL.
- Made Ground: Made Ground deposits were encountered beneath the Topsoil and were present to a relatively consistent depth of between 0.5m and 1.0m BGL. These deposits were described generally as brown sandy slightly gravelly CLAY with frequent cobbles and boulders and contained occasional fragments of concrete, red brick, glass and plastic.
- Cohesive Deposits: Cohesive deposits were encountered beneath the Made Ground and were described typically as brown slightly sandy slightly gravelly CLAY or grey mottled brown slightly sandy slightly gravelly CLAY with occasional cobbles overlying a grey slightly sandy slightly gravelly CLAY with occasional cobbles and boulders.
- Granular Deposits: Granular deposits were encountered within and below of the cohesive deposits and were typically described as Grey brown clayey sandy angular to sub angular fine to coarse GRAVEL or grey slightly clayey slightly gravelly fine to medium SAND with occasional cobbles and rare boulders.
- Weathered Bedrock: In the majority of exploratory holes weathered rock was encountered which was digable with the large excavator to a depth of up to 0.50m below the top of the stratum. The trial pits were terminated upon encountering the more competent bedrock, in which further excavation became more difficult.
- Bedrock: The rotary core boreholes recovered weak to medium strong dark grey fine to medium grained laminated LIMESTONE interbedded with weak black fine grained

laminated Mudstone. This is typical of the Calp Formation, which is noted on the geological mapping to the east of the proposed site. Rare visible pyrite veins were noted during logging which are typically present within the Calp Limestone.

2 ACCESS AND ROADS

2.1 Overall Road and Access Layout

The overall road and access layout is accordance with the requirements defined in the Clonburris SDZ planning scheme.

The proposed development will be accessed from the Clonburris Southern Link Street (CSLS) which has been granted permission in August 2021 under planning reference SDZ20A/0021, mostly via the Clonburris 1A development granter under planning reference SDZ21A/0022. The CSLS includes minor priority-controlled junctions along the street alignment to provide access to future development cells within the Clonburris SDZ including the subject site.

The subject site's internal road layout has been designed with a number of junctions and a meandering alignment through the development to promote traffic calming and discourage "rat running" through the development. Filtered priority junctions have been incorporated at key locations in order to prioritise pedestrian and cyclist movements. The proposed road hierarchy and typologies are generally consistent with those set out in section 2.2.4 of Clonburris SDZ.

The proposed Local streets will be 5m to 6m wide with a 2m to 2.5m wide footpath on both sides of the road. Intimate Scale/Home-Zone Streets are 4.8m wide with a 2m to 2.5m vulnerable user / service strip on each side. This design allows enough room for perpendicular parking for Local Streets, accommodates utility infrastructure utilities while creating a safe shared use area for all road users. The development's internal layout has been designed with speed reduction bends to provide traffic calming together with a combination of road vertical and horizontal deflections to reduce speeds. Flat top table ramps have been provided at strategic locations to calm traffic at junctions in particular at Homezone / vehicular interfaces. Design speed limits of 30km/hr are applied throughout the development as per Design Manual for Urban Roads and Streets (DMURS).

It is intended that the roads and footpaths of the proposed development are designed to accommodate pedestrian and cycle links to future infrastructure to be constructed as part of the overall Clonburris SDZ. There are number of vehicular and pedestrian/cycle bridges proposed within the SDZ boundary. It is intended that the road, pedestrian and cycle infrastructure of the proposed development will be extended in the future to provide links to these locations as shown in Figure 2-1.

Figure 2-1 Indicative Future Bridge Location Plan

The proposed development's road layout is shown on drawing CLB-T3-95-SW-DTM-DR-DBFL-CE-1201. The standard road cross-sections and construction details are shown on drawings CLB-T3-95-SW-XX-DR-DBFL-CE-5201 to 5202 and comprise the following;

- Local Streets – typically 5m to 6m wide carriageway with min 2m footways and intermittent 2.4m wide private parking bays. Where required to accommodate perpendicular parking either the parking bay width has been increased or the road width increased.
- Intimate Scale / Home-Zone Streets – 4.8m wide home zone with 2m to 2.5m wide vulnerable user strip each side. Road surfaces are to be in a different colour contrast and texture to Local Streets. Vulnerable user strips will be concrete with an exposed aggregate finish.

Maximum road corner radii of 4.5m are provided within the local streets, with the exception of certain turning heads which have corner radii 7m to accommodate refuse vehicles.

Refer to Figure 2-2 for an illustrated comparison between the proposed movement concept and the movement concept specified for the wider SDZ.

A Stage 1 Road Safety Audit has been conducted on the proposed roads layout as attached in **Appendix A**.

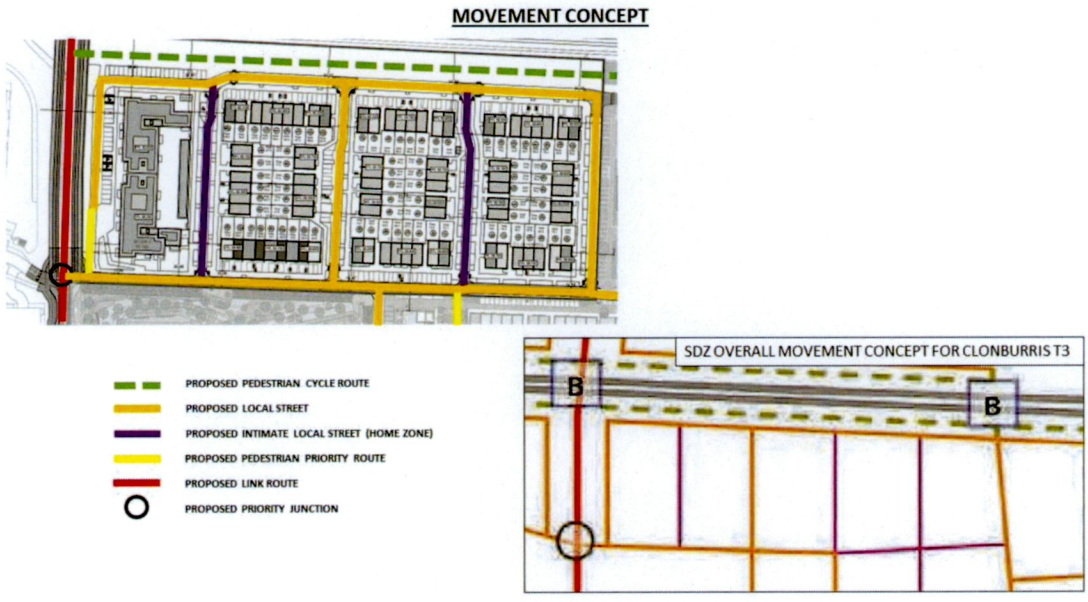


Figure 2-2 Schematic Roads Hierarchy

1.1 Pavement Design Standards

The main internal access roads are designed in accordance with the Design Manual for Urban Roads and Streets (DMURS) and Local Authority taking in charge requirements. A 100mm high kerb separation is proposed between typical roads and footpaths. In the case of the homezone areas a 25mm kerb separation is intended between the roads and the vulnerable user strips. Refer to drawings CLB-T3-95-SW-XX-DR-DBFL-CE-5201 to 5202 for the proposed road construction details based on existing in-situ CBRs from the preliminary site investigation. Actual CBRs and ground conditions will be confirmed by detailed site investigations prior to construction.

1.2 Vehicle Tracking

The proposed development has been tracked to show that the development's proposed streets and turning heads will accommodate a large refuse vehicle as shown on drawing CLB-T3-95-SW-DTM-DR-DBFL-CE-1201. Refuse staging areas have been indicated on these drawings and reflect the proposed refuse collection areas of the refuse collection strategy.

1.3 Driveway Access

Access driveways are set to accommodate a targeted maximum 1:20 driveway gradient. All driveways are permeable paving within private curtilage. Entrances to driveways in public

footpaths comprise drop kerbs with 150mm deep concrete pavement. Parking bays will be minimum 5m in length to allow enough space for parking.

3 SURFACE WATER DRAINAGE

3.1 Existing Drainage

The existing site has a gradient as shown in Figure 1-3. There are a number of existing interconnected field drains on the site. These have extremely flat gradients but are understood to drain to existing drainage networks to the east of the site and ultimately to the Camac River. Additional detail on existing drainage within the SDZ is provided in the SWMP. Existing agricultural drainage on site will be maintained as required until it is replaced by drainage networks for the developed site. The approximate locations of these drainage ditches are indicated in the Figure 3-1.

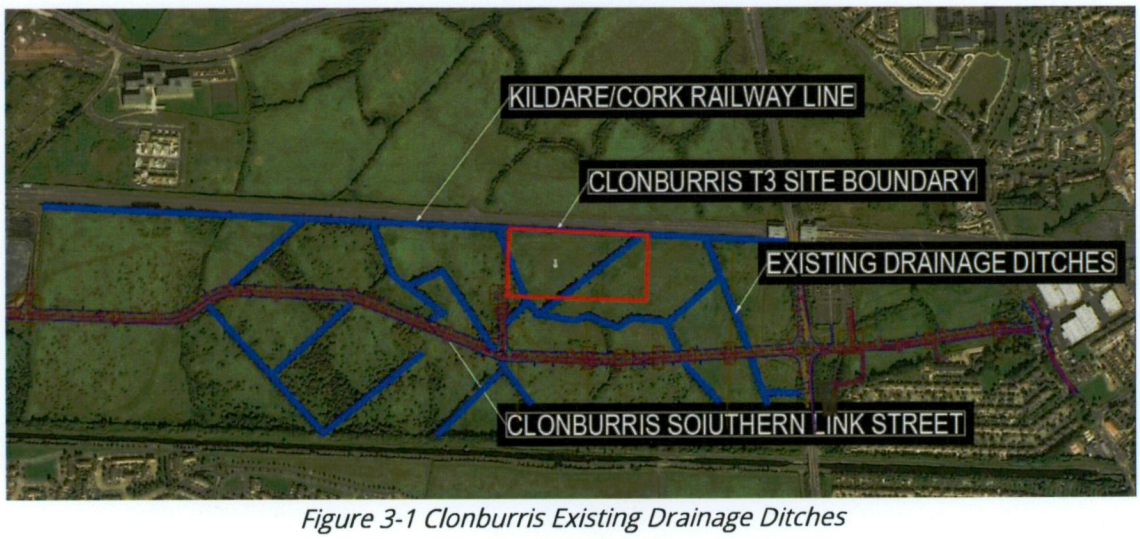


Figure 3-1 Clonburris Existing Drainage Ditches

The north boundary of the subject site is bounded by drainage ditch for the adjacent rail line. This ditch runs alongside the rail line before draining south at a very moderate slope and eventually into the Grand Canal.

3.2 Surface Water Drainage Strategy

3.2.1 Compliance With SWMP

DBFL Consulting Engineers have undertaken a "Surface Water Management Plan" (SWMP) for the overall Clonburris Strategic Development Zone (SDZ). The SWMP for the SDZ has been submitted to SDCC and agreed with SDCC. The SWMP outlines the surface water strategy for the overall SDZ lands and the requirements for each individual site within the SDZ which includes the subject site. The SWMP includes the strategy for attenuation design, SUDS features, run off rates and trunk infrastructure layout. The subject site has been designed in accordance the strategy agreed upon in the SWMP.

The proposed site will benefit from trunk surface water infrastructure proposed as part of the Clonburris Infrastructure Development for which planning was granted under reference SDZ20A/0021. The planning application included trunk surface water sewers and regional attenuation to serve the subject site, this strategic infrastructure aligns with the SWMP proposals and allows for a treatment train of Suds measures within individual sites and within the regional features.

It is intended that the stormwater run-off generated from the proposed development will be collected in a new gravity sewer and discharged to the regional attenuation systems constructed as part of the CSLS. The subject site falls within catchments within the Catchment 4B and will be served by attenuation ATN 07, as shown in Figure 3-2. The regional attenuation systems will consist of modular underground storage with over ground detention basins. Outflow from each attenuation structure within the SDZ will limit flow to a rate of 3.1 l/s/ha as detailed in the SWMP for the SDZ.

The subject development application has been coordinated with the Clonburris CSLS application and therefore no significant alterations are proposed to the layout or design of the surface water infrastructure under planning reference SDZ20A/0021.

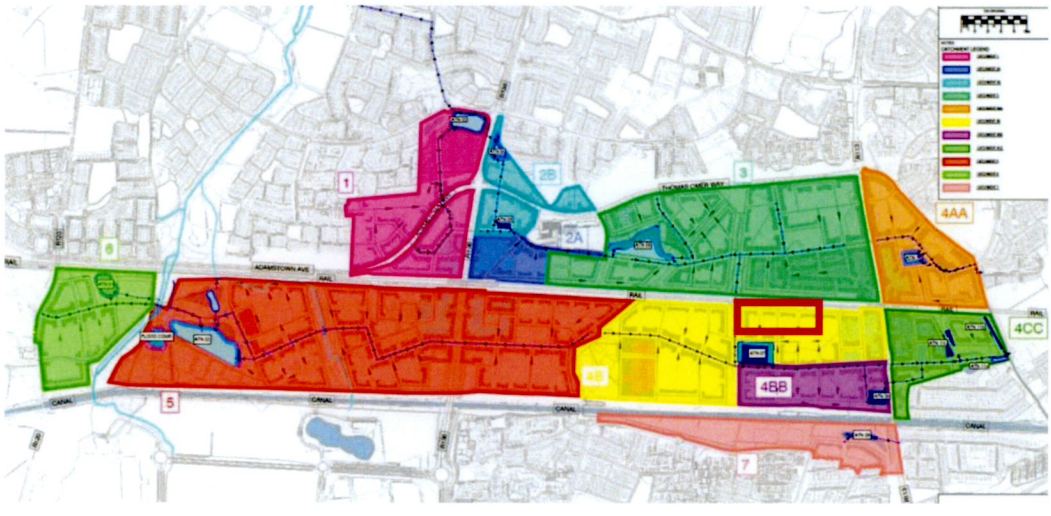


Figure 3-2 SDZ Catchment breakdown

The below Table 3-1 documents the site design compliance with the SWMP Requirements & Objectives.

Table 3-1 SWMP Requirements & Objectives

SDZ Requirements/ Objectives	Proposed Development Compliance
O1. It is an objective of the Surface Water Management Plan that proposals for all development cells include provision for at least two separate SuDS features	The proposed objective is met and exceeded in the subject design. Suds features in the site design (prior to discharge to regional SuDS features) include • Permeable paving • Bioretention areas • Swales • SuDS tree pits
O2. It is an objective of the Surface Water Management Plan that green roofs are provided to any suitable buildings with area >300m² within Urban Centre sub sectors. Green roof coverage should be minimum of 60% of building area	The proposed site is not within an Urban Centre sub sector therefore objective is not applicable. Nonetheless as part of the Further Information submission, green roofs have been added to Apartment Blocks as shown on architectural plans.
O3. It is an objective of the Surface Water Management Plan that runoff from roads adjacent to suitable parkland or landscape strips should be conveyed in vegetated open channel SuDS features	The proposed objective is met in the subject design. Swales are provided to collect and convey road runoff along western and southern boundaries where adjacent to open space. Where possible, swales adjacent to attenuation basins route surface water runoff to bioretention areas in the detention

	basins before infiltrating into the attenuation structure below.
O4. It is an objective of the Surface Water Management Plan that new link streets incorporate drainage discharges from carriageway runoff to tree pits or similar features.	Link street design is provided separately to this development under planning reference SDZ20A/0021. Drainage discharges to suds features are noted to incorporated into this separate application
O5. It is an objective of the Surface Water Management Plan that all private parking areas are surfaced with pervious paving.	The proposed objective is met in the subject design. All Private parking areas are proposed to be surfaced with pervious paving.

3.2.2 Compliance with Surface Water Policy

Surface water management for the proposed development is designed to comply with the Greater Dublin Strategic Drainage Study (GDSDS) policies and guidelines and the requirements of South Dublin County Council. The guidelines require the following four main criteria to be provided by the development's surface water design;

- Criterion 1: River Water Quality Protection – satisfied by providing interception storage and treatment of run-off within the SUDS features e.g. permeable paving for driveways/parking bays, swales and bioretention areas. SuDS tree pits are also proposed to intercept road runoff.
- Criterion 2: River Regime Protection – satisfied by attenuating run-off with flow control devices prior to discharge to the outfall.
- Criterion 3: Level of Service (flooding) for the site – satisfied by the Site being outside the 1000 year coastal and fluvial flood zones, (See Flood Risk Assessment). Pluvial flood risk addressed by development designed to accommodate a 100 year storm as per GDSDS. Planned flood routing for storms greater than 100 year level, considered in design, the development has been designed to provide an overland flood route from the development towards the surface water outfall.

- Criterion 4: River flood protection – attenuation and long term storage provided within the SUDS features e.g. permeable paving construction, swales, bioretention areas, tree pits and attenuation facilities.

3.3 SUDS

In accordance with the GDSDS it is proposed to use Sustainable Urban Drainage systems (SUDS) for managing storm-water for the proposed development. The aim of the SUDS strategy for the site will be to;

- Attenuate storm-water runoff.
- Reduce storm-water runoff.
- Reduce pollution impact.
- Replicate the natural characteristics of rainfall runoff for the site.
- Recharge the groundwater profile

The proposed layout of the drainage and SUDS is detailed on drawings CLB-T3-94-SW-DTM-DR-DBFL-CE-1311.

The Surface Water Management Plan agreed with SDCC includes a number of potential SUDs feature to be implemented on individual sites within the SDZ. The following SUDs features are incorporated into the design for the subject site:

3.3.1 Swales

Where possible Swales have been implemented into the design as shown on drawing CLB-T3-94-SW-DTM-DR-DBFL-CE-1311. Surface water generated from the adjacent roads and footpaths will discharge directly to these SuDS features via inlet kerbs detailed on drawing CLB-T3-94-SW-XX-DR-DBFL-CE-5303 to 5304.

Water Quality

Surface water runoff from the adjacent road is conveyed to grated manhole inlets along the swale which routes any surface water that has not infiltrated naturally into the ground, to the surface water pipe network to be attenuated in the regional attenuation basins. Surface water routed to the swales will create opportunities for particle, oil/grease and nutrient absorption before discharging into the surface water pipe network.

Biodiversity

Swales will contribute significantly to the biodiversity of the development by adding additional area for planting. For detail on specific plant proposed within the swales, refer to the landscape architect detail.

Amenity

Swales are generally proposed adjacent to roads to form a drainage channel for road runoff and follow the general alignment of the road, avoiding sharp turns and steep gradients. Swale depths are proposed to be maximum 250mm deep with 1:4 side slopes to avoid any danger to the general public. Swales will be landscaped in order to maximise amenity benefits.

3.3.2 Bioretention Areas / Rain Gardens

Where possible Bioretention areas have been implemented into the design as shown on drawing CLB-T3-94-SW-DTM-DR-DBFL-CE-1311. Surface water generated from the adjacent roads and footpaths will discharge directly to these SuDS features via inlet kerbs detailed on drawing CLB-T3-95-SW-XX-DR-DBFL-CE-5202.

Water Quality

Surface water runoff from the adjacent roads/ roofs is conveyed to the bioretention area which routes any surface water that has not infiltrated naturally into the ground or absorbed by the vegetation, to the surface water pipe network to be attenuated in the regional attenuation basins.

The build-up of the bioretention consists of a filter medium, a transition layer and a drainage layer as detailed on drawing CLB-T3-94-SW-XX-DR-DBFL-CE-5303. The free draining filter medium will filter out pollutants and provides natural surface water flow control. The 300mm transition layer prevents fine filter medium from entering the drainage layer. The 200mm drainage layer is a surrounds the 150mm perforated pipe which collects the surface water after it has filtered through the bioretention area build-up and is then discharged into the surface water pipe network.

Biodiversity

The bioretention areas will contribute to the biodiversity of the proposed development by adding habitat for wildlife. See the landscape architect drawings for further details on specific plants proposed in the bioretention areas.

Amenity

The bioretention areas are generally proposed along roads to receive runoff from adjacent roads and will contribute to aesthetics of the streetscape. Local bioretention areas are also proposed

within the detention basins to receive surface water runoff from nearby roads to create local "wet" areas. This will encourage the growth of plants proposed in these areas, further adding to the biodiversity of the development and create enjoyable and aesthetically pleasing public open space areas.

3.3.3 Permeable Paving

The proposed design includes permeable finishes on all private driveways and parking bays within the development as shown on drawings CLB-T3-95-SW-DTM-DR-DBFL-CE-1201. Surface water runoff from the paved areas and from the house/duplex roofs is intercepted by the permeable build-up of the paved areas where it is intended to naturally infiltrate into the ground. If the porous build-up of the paving and the in-situ material beneath becomes saturated, surface water would drain to the surface water pipe network through a perforated pipe provided as shown on drawing CLB-T3-94-SW-XX-DR-DBFL-CE-5303.

Water Quality

Permeable paving reduces pollutants such as petrol and diesel as it contributes to its biodegrading process. It also assists in filtering solid particles out of surface water runoff, providing filtration before discharge into the surface water pipe network and ultimately the receiving watercourse.

Biodiversity

Permeable paving does not directly contribute to the biodiversity of the development, but the surface water treatment it provides maximises the biodiversity in the downstream watercourses at the discharge point.

Amenity

Permeable provides amenity in its usefulness as it can be used for a range of activities, while also acting as a valuable component in the surface water treatment and storage train.

3.3.4 Tree Pits

Tree Pits are proposed to intercept road runoff throughout the entire development. SuDS tree pits have been proposed as shown on drawing CLB-T3-94-SW-XX-DR-DBFL-CE-5304. Tree pits are slightly lowered below the road surface to allow surface water to be directly intercepted at the base of the tree pit and infiltrate down to the tree root system. Once the tree pit is saturated, water would be routed to the surface water pipe network through an overflow.

Water Quality

Surface water runoff will be filtered through the soil surrounding the tree root ball, removing pollutants. Pollutants are also naturally broken down during the transpiration process. This filtration process results in surface water with less pollutants being discharged into the surface water pipe network end the eventual receiving wasters.

Biodiversity

The addition of SuDS street trees will increase the habitat for a variety of animal species and insects and act as bridge for wildlife in the post-developed urban landscape. Filtered water passing through the tree pit and into the receiving watercourse would also add to the biodiversity downstream. See the landscape architect detail for proposed species of the street trees.

Amenity

The street trees will add significant amenity benefits such as improving the aesthetics of the urban landscape. The canopies of the trees will also provide a cooling effect in the post developed streetscape.

3.3.5 Green Roofs

Green roofs are proposed for Apartment Block 1 at the western side of the development as shown on site drainage drawing CLB-T3-94-SW-DTM-DR-DBFL-CE-1311. Details of the proposed build-up of the green roof are shown on drawing CLB-T3-95-SW-XX-DR-DBFL-CE-5204.

Water Quality - Surface water runoff from the green roof areas would be filtered by the substate/growing medium and into the drainage layer before discharging in to the surface water pipe network. This process will reduce pollution from entering the surface water pipe network and ultimately the receiving water.

Biodiversity - The green roofs will provide further ecological benefits by attracting birds, bees, butterflies and other insects by creating pockets of habitat at high level for nesting and foraging.

Amenity - The use of green roofs will improve on a range of amenity principles such as improved climate resistance, air quality, noise levels and increased building services life due to aesthetic appeal, reduced anergy costs and increased association with sustainable design and social responsibility (CIRIA SuDS Manual 2015).

3.4 Attenuation

As set out in the SWMP and the Infrastructure Design Report for SDZ20A/0021, attenuation volumes for the SDZ are generally provided on a regional basis (with the exception of urban centre and school sites).

The attenuation that will serve the subject site is to be constructed as part of the Clonburris Southern Link Street (CSLS) in advance of the proposed development. As mentioned in Section 3.2.1 the proposed development spans across catchment 4B within the Clonburris SDZ.

The catchment discharges to separate attenuation zones, ATN 07 and ATN 08, with an allowable discharge rate of 3.1l/s/ha, detailed below and illustrated in Figure 3-3:

- Attenuation ATN 07 comprises of underground modular storage with a maximum storage capacity of 6,900m^3. Above this structure is a detention basin that will provide 3,100m^3. Overall, the structure provides 10,000m^3 of storage required for a 100 year storm for the subject site north of the CSLS and other lands within Catchment 4B and the overall SDZ.
- Attenuation ATN 08 comprises of underground modular storage with a maximum storage capacity of 3,140 m^3 with an above ground detention basin that will provide 1,350m^3 providing a total of 4,490m^3 storage required for a 100 year storm for Catchment 4BB.

Surface water discharge from ATN08 will continue to flow through the surface water sewers constructed as part of the CSLS will pass through downstream attenuation pond designated ATN 11a before discharging to the existing surface water network on Ninth Lock Road.

The attenuation systems for the CSLS have been approved under planning reference SDZ20A/0021. Minor amendments to the plan footprints permitted under SDZ20A/0021 are proposed as part of the current application however the overall general arrangement and attenuation volumes are to be maintained as per the permitted application.

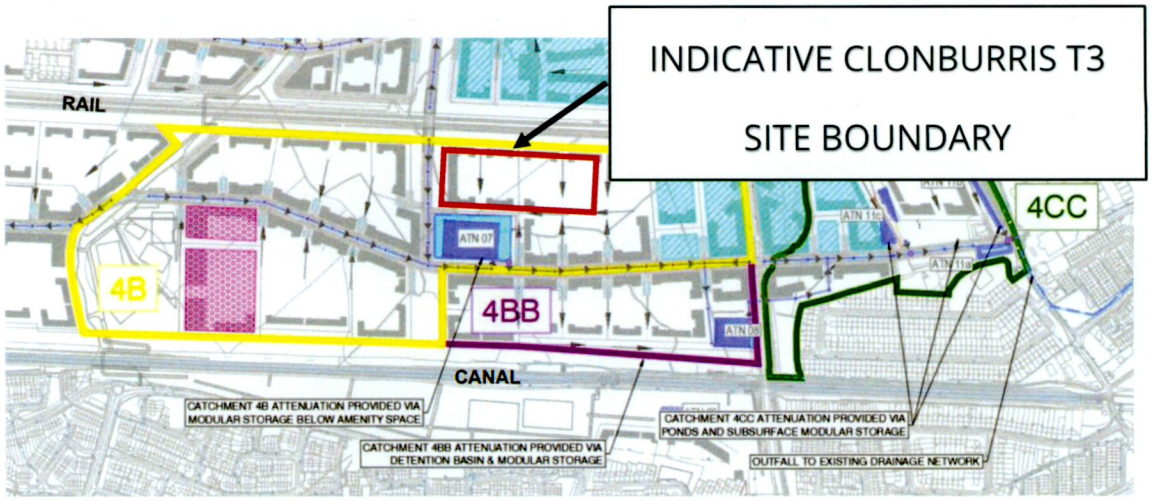


Figure 3-3 Regional Attenuation and Outfall

3.4.1 Compliance with Attenuation Design

Calculation of regional attenuation volumes is included within the SWMP and within the CSLS infrastructure application. These regional features cater for the attenuation volumes required for individual developments such as the subject site, Clonburris T3.

In the absence of development plans for individual development parcels, the attenuation volumes required in the regional features were based on an assumed % impermeable for each parcel. This section documents the proposed development's characteristics against those assumed for regional attenuation volume calculations to ensure the development falls within the design allowances.

Table 3-2 Extract from Clonburris SWMP Summary Table

Sub-Catchment	Attenuation Ref	Catchment Area (ha)	Assumed Impermeable Area [from Runoff Factors]	Assumed % Impermeable [from Runoff Factors]	Storage Type	Allowable Outflow (l/s) [Sub-catchment]	Allowable Outflow (l/s) [Catchment]	Storage Volume Required (100 years, m3)
1	ATN03	18.9	9.28	49.1%	Pond	58.59	58.59	5,100
2A	ATN05	5.2	2.47	47.5%	Modular	16.12	149.11	1,250
2B	ATN04	6.8	4.56	67.1%	Pond	21.8	170.19	3,000
3	ATN06	42.9	23.52	54.8%	Pond	132.99	132.99	14,500
4AA	ATN10	13.5	7.12	52.7%	Pond	41.85	41.85	4,000
4B	ATN07	33.08	17.93	54.2%	Modular & Basin	102.55	102.55	10,000
4BB	ATN08	9.02	7.02	77.8%	Modular & Basin	27.98	130.53	4,430
4CCc	ATN11c	7.29	3.21	44.0%	Modular	22.60	155.00	2,200
4CCb	ATN11b	1.60	1.04	65.0%	Modular	4.97	158.11	715
4CCa	ATN11a	1.76	1.15	65.3%	Pond	5.46	163.56	785
5	ATN02	67.52	35.49	52.6%	Pond	209.31	209.31	21,300
6	ATN01	14.43	8.46	58.6%	Pond	44.74	44.74	4,930
7	ATN09	11.8	2.94	24.9%	Pond	36.58	36.58	1,250

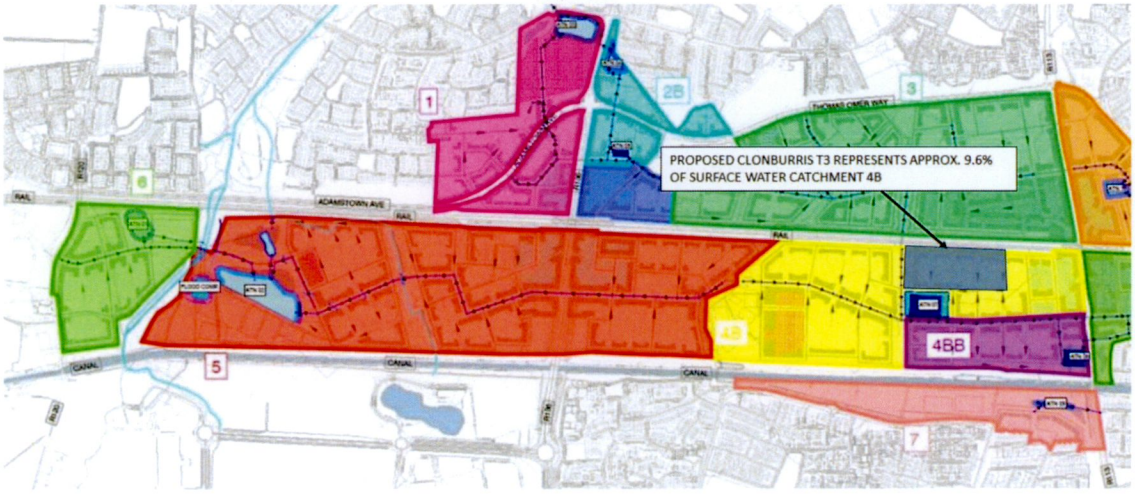


Figure 3-4: Phase 1A Development Areas [shown black] overlaid on SWMP Catchment Plan

Catchment 4B has an overall area of 33.08ha with an assumed impermeable area of 17.93ha as detailed in the Surface Water Management Plan, shown in Table 3-2. Clonburris T3 within Catchment 4b span approximately 10.43% of the overall catchment. Therefore the impermeable area contribution for the subject site assumed for regional attenuation sizing would be approximately 10.43% of 17.930ha = 1.87ha. Calculated impermeable area from the subject site contributing to ATN 07 is 1.815ha (see Table 3-3 below). The calculated contribution is therefore 1.815ha versus an allowance of 1.87ha, therefore the development falls within the design allowances made in the regional attenuation sizing.

Table 3-3: Impermeable Areas – Phase 1A – Catchment 4B

Type	Area (ha)	Runoff Coeff.	Effective Area (ha)
Roofs	0.508	0.95	0.482
Green Roofs	0.098	0.80	0.079
Roads and Footpaths	0.941	1.00	0.941
Permeable Paving (Driveways & Parking Bays)	0.204	0.70	0.143
Grassed Areas	1.699	0.10	0.170
Total	3.450		1.815

3.5 Design Standards

Drainage is designed in accordance with the Greater Dublin Regional Code of Practice for Drainage Works and the agreed Clonburris Joint Infrastructure Works. Surface water pipe-work was sized using the Microdrainage Windes drainage modelling software. The following parameters apply to the design:

- Return period for pipe network 30 years
- Return period for attenuation 100 years
- Time of entry 4 minutes
- Allowable Outflow for the SDZ 3.1 l/s/ha (Applicable to regional Attenuation)
- Pipe Friction (Ks) 0.6 mm
- Minimum Velocity 1.0 m/s
- Standard Average Annual Rainfall 765mm (Met Eireann)
- M5-60 16.9mm (Met Eireann)
- Ratio r (M5-60/M5-2D) 0.276 (Met Eireann)
- Storage System Storm Return Event GDSDS Volume 2, Criterion 3
    - 30-year no flooding on site;
    - 100-year check no internal property flooding. Flood routing plan. FFL freeboard above 100-year flood level.
- Climate Change 20% for rainfall intensities.
- Runoff Factors as indicated in Table 3-3.

Surface water sewers have been designed in accordance with IS EN 752 and the recommendations of the 'Greater Dublin Strategic Drainage Study', (GDSDS).

Standard drainage details, as outlined on DBFL drawings CLB-T3-94-SW-XX-DR-DBFL-CE-5301 to 5304 are in accordance with the Greater Dublin Regional Code of Practice for Drainage Works.

The minimum pipe diameter for public surface water sewers is 225mm. Private drains within the proposed development will comply with Irish Water/ GDSDS minuimum requirements.

Surface water sewer modelling results for the main drainage networks included in **Appendix B**.

3.6 Climate Change

Rainfall values for the proposed development are sourced from Met Eireann to calculate the FSR input hydrograph for the drainage design as required by the GDSDS. The design rainfall intensities were increased by a factor of 20% to take account of climate change, as required by the GDSDS for attenuation storage design.

3.7 Pluvial Flooding Provision

The surface water network, regional attenuation storage and site levels are designed to accommodate a 100 year storm event and includes climate change provision. Floor levels of houses are set above the 100 year flood levels by a minimum of 0.5m for protection. For storms in excess of 100 years, the development has been designed to provide overland flood routes along the various development roads without affecting building floor levels.

3.8 Surface Water Quality Impact

Run-off rates from the regional attenuation systems are controlled by vortex flow control devices. Surface water management proposals for the development also incorporate the following to reduce its impact;

- Designed in accordance with the 'Greater Dublin Strategic Drainage Study' GDSDS and the Clonburris joint infrastructure works surface water management plan requirements;
- Incorporates SUDS features e.g. permeable paving in high risk parking areas at the front of houses;
- On-line attenuation/infiltration facilities with an oil separator prior to discharge to a public surface water sewer has been included in the trunk infrastructure under planning reference SDZ20A/0021.

3.9 Flood Risk Assessment

As part of the Clonburris SDZ Draft Planning Scheme, South Dublin Co Council commissioned a Strategic Flood Risk Assessment SFRA for the lands which was completed by JBA Consulting and is listed as a supporting document to the planning scheme (http://www.clonburris.ie/Documentation/Clonburris-SDZ-SFRA.pdf). The subject sites land was accounted for in the Clonburris SDZ Strategic Flood Risk Assessment. It was predicted that the subject site was at low risk of flooding (Flood Zone C) for events up to the Q1000 event. The study

also found there is no existing development within the subject site that is at potential risk of flooding.

As part of the flood risk assessment, historic and predicted flood risk mapping published by the OPW on the Flood Hazard Mapping Website http://www.floodinfo.ie/ was reviewed.

Historical flood maps/data indicate there are no recorded flood events within the proposed site boundary. There are to recorded recurring flood events within 1km of the proposed site. The first is a recurring flood event at the Cappaghmore Culvert located approximately 500m to the east of the site. The Second is located at the Beech Row Bungalows approximately 380m to the east of the site.

The Eastern CFRAM (Catchment Flood Risk Assessment and Management) study details the predicted risk for a variety of fluvial and coastal flood scenarios. The mapping does not include the watercourse reaches affected by the proposed scheme and only maps downstream flooding. The proposed development is therefore outside of the Q100 and Q1000 flood extents and is therefore in within Flood Zone C (low risk of flooding).

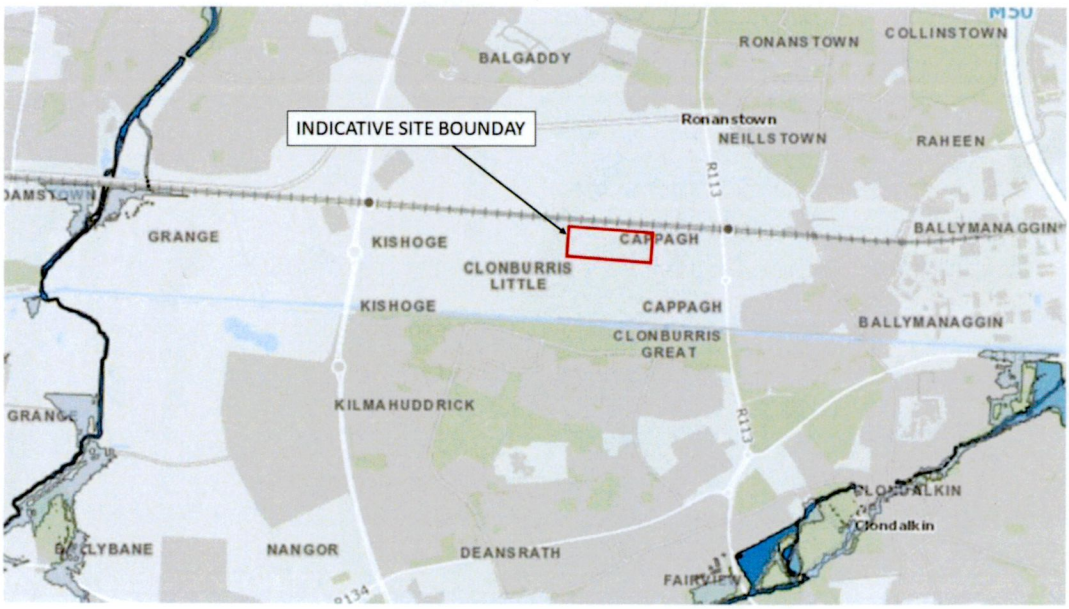


Figure 3-5 Extract of CFRAMS Data from OPW FloodInfo.ie

The OPW undertook an Irish Coastal Protection Strategy Study (ICPSS) which produced coastal/tidal flood extents maps for the Irish coastline for a 0.5% AEP tidal flood level. This map indicates that the Site is far outside the extents of the coastal/tidal flood zone.

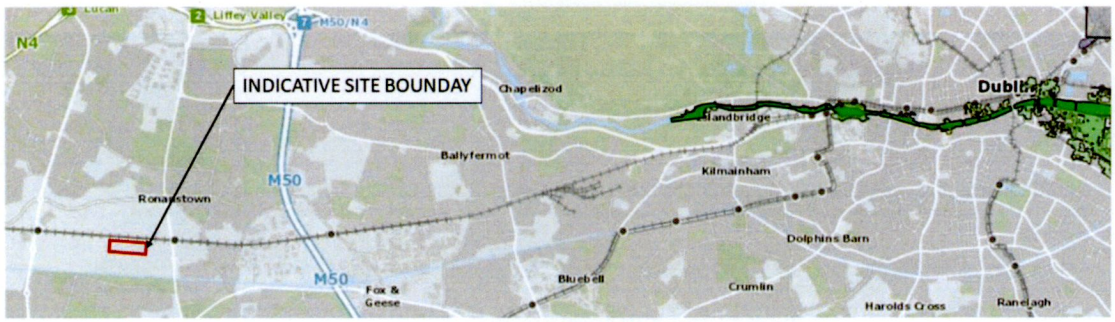


Figure 3-6 Extract of ICPSS Data from OPW FloodInfo.ie

3.10 Flood Exceedance

For storms greater than the 1%AEP pluvial event, the development's drainage network design may be exceeded and run-off may flow above ground along the main roads. The development has been designed without minimal areas/depressions where possible and run-off will generally make its way along the proposed roads south towards the regional detention basin at ATN07, or north towards soft landscaped open space. House floor levels have been set to make allowance for any possible areas of surface ponding during exceedance events. Refer to Figure 3-7 for the overland flood exceedance routes for the proposed development.

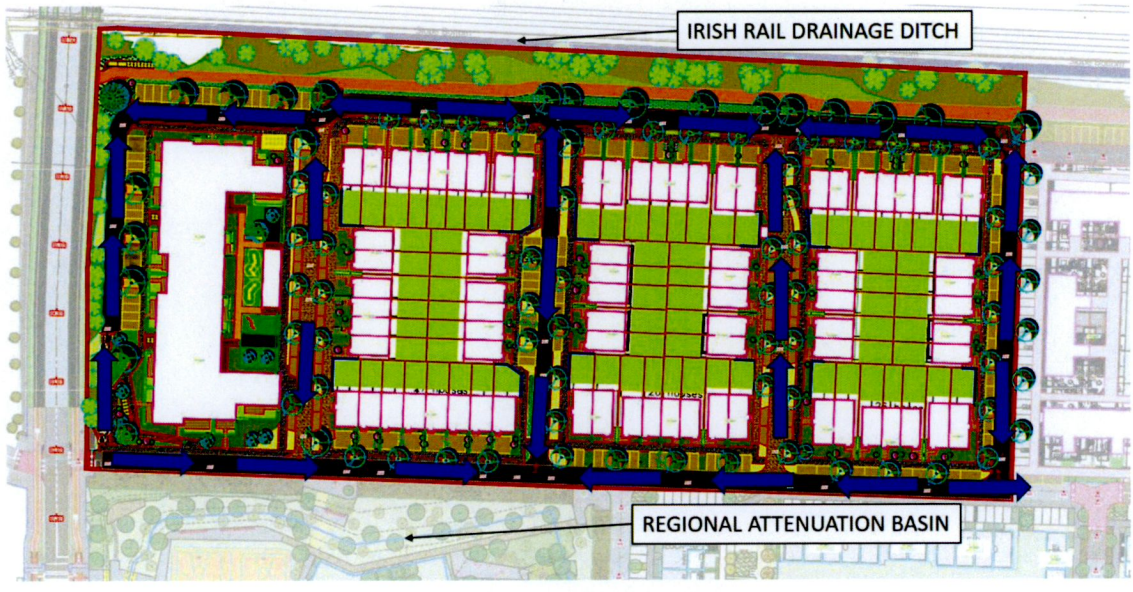


Figure 3-7 Flood Exceedance Allowance

3.11 Allowance for Future Development

Certain portions of Stormwater infrastructure installed as part of the adjacent Clonburris 1A development have been upsized so that they are suitable to receive runoff from future development phases, including the subject development.

Figure 3-8 indicates the surface water runoff areas that were accounted for from the subject development during the design of the adjacent Clonburris 1A development.

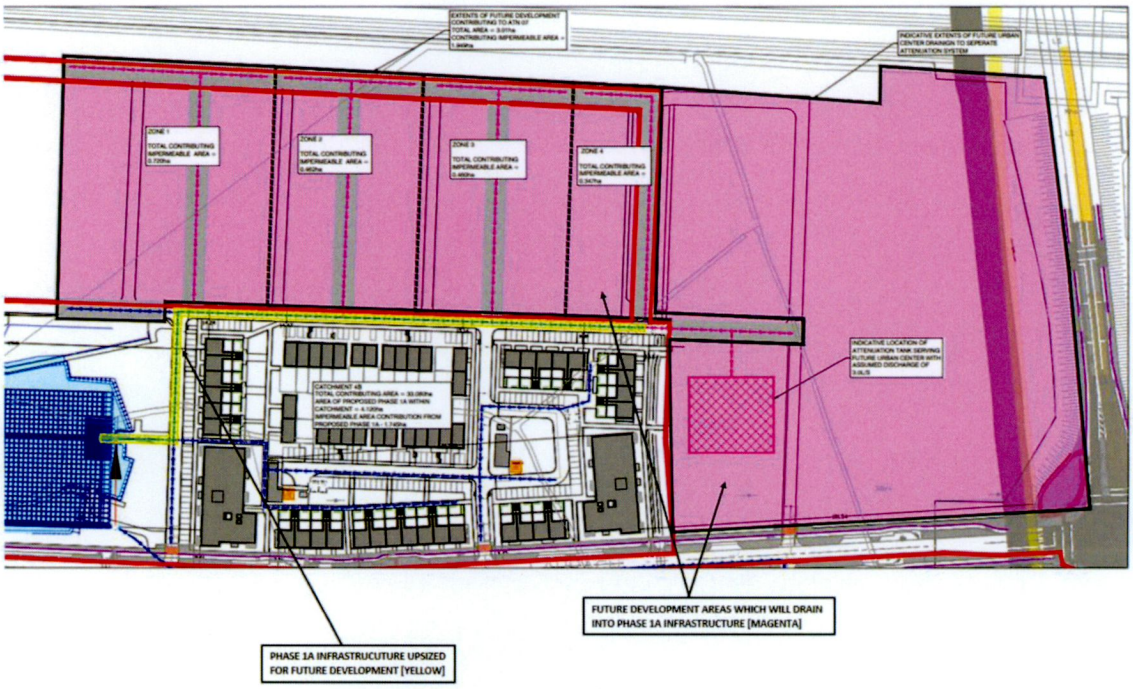


Figure 3-8 Surface Water Network Allowance for Future Development (Clonburris 1A)

4 FOUL DRAINAGE

4.1 Existing Foul Drainage

The existing site is predominantly greenfield and therefore has no foul loading at present. The granted planning application SDZ20A/0021 includes the trunk foul sewers which the subject site will connect into via the adjacent Clonburris 1A development granted under planning reference SDZ21A/0022.

4.2 Design Strategy

The overall SDZ site has been divided into 7 separate wastewater catchments (refer to Figures 4.1). The subject site is within Catchment X. The proposed site will benefit from foul infrastructure proposed as part of the CSLS. Trunk Foul sewer network has been designed as part of the CSLS to serve the subject based on the average net density for catchment X, ranging from the "Low margin" to a "High Margin".

Table 4-1 Development Figures for Each Catchment

Catchment	Residential Dwellings Low Margin	Residential Dwellings Target	Residential Dwellings High Margin	Retail GFA (m^2)	Employment GFA (m^2)	Community/Civic Building GFA (m^2)	Number of Schools
Catchment 1	1236	1466	1705	600	4800	0	2 & 1 (Existing)
Catchment 5	0	0	0	0	0	0	0
Catchment U	2035	2615	3198	14370	9215	3100	2
Catchment Y	1521	1760	1991	850	2600	600	1
Catchment X	2680	3293	3896	5400	14100	1500	2
Catchment 7	148	162	175	0	0	0	
Catchment Z	110	121	133	0	0	0	

The overall SDZ lands are relatively flat therefore the pumping of wastewater is required. It is proposed that the wastewater generated from the new houses and apartments for this application will be collected by new gravity sewers that discharges to the trunk sewer within the new Link Road. This in turn discharges to a future Irish Water pumping station (Pumping Station #1 as shown in Figure 4.2) adjacent to the R113 Fonthill Road. This future pumping station and its rising main connection to the existing 9B trunk sewer on Fonthill Road is being delivered by Irish Water as part of the Irish Water Clonburris Local Infrastructure Housing Activation Fund (LIHAF) Scheme. The pump station is currently at planning application stage with SDCC under planning reference SDZ21A/0006.

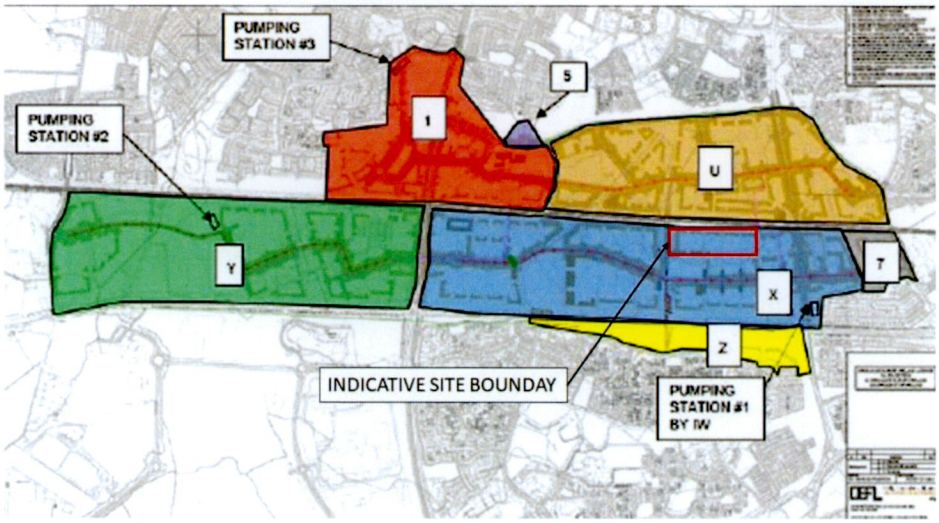


Figure 4-1: Wastewater Catchment Plan

4.3 Design Criteria

Foul sewers have been designed in accordance with the Building Regulations and specifically in accordance with the principles and methods set out in the Irish Water Design and Construction Requirements for Self-Lay Developments July 2020 (Revision 2) and the recommendations of the 'Greater Dublin Strategic Drainage Study', (GDSDS).

The following criteria have been applied:

Demand	446l/dwelling/day (based on 2.7 persons per house, a per capita wastewater flow of 150 litres per head per day and a 10% allowance for infiltration)
Discharge units	14 units per house (as BS8301)
Pipe Friction (Ks)	1.5 mm
Minimum Velocity	0.75 m/s (self-cleansing velocity)
Maximum Velocity	2.5 m/s
Frequency Factor	0.5 for domestic use
Manhole Depths	< 5.0m

All foul sewers and manholes will be constructed in accordance with the Irish Water Standard Details and the Irish Water Code of Practice for Wastewater.

Longitudinal sections for the proposed foul sewers are detailed on drawing CLB-T3-94-SW-XXX-DR-DBFL-CE-3601 to 3602.

4.4 Compliance with Irish Water Standards

The proposed foul sewer design and layout is in accordance with the Irish Water Code of Practice for Wastewater Infrastructure and The Irish Water Wastewater Infrastructure Standard Details. Refer to **Appendix C** for the Irish Water Confirmation of Feasibility for the subject development as received form Irish Water.

4.5 Compliance with Clonburris Water and Wastewater Report

The proposed foul sewer design and layout complies with the Clonburris Water and Wastewater Report as agreed with SDCC and Irish Water.

4.6 Design Calculations

This application comprises 157 residential units, 680m^2 of communal area. The development will discharge to Pumping Station 1. The estimated average daily load from the development is 63m^3. See below Table 4-2 for calculations. Full network calculations are contained in **Appendix D**.

Table 4-2 Predicted Clonburris Phase 1A Foul Flow Calculations

TITLE		Job Reference	
Clonburris T3		220047	
SUBJECT		Calc. Sheet No.	
Wastewater Demand for Irish Water		1	
DRAWING NUMBER	Calculations by	Checked by	Date
-	DB	JPC	06/10/2022

RESIDENTIAL - PREDICTED DEVELOPMENT FOUL FLOWS						
Unit Type	No.	Loading l/person/day	Occupancy person/unit	Occupancy	Daily Loading l/day	Daily Loading l/s
Apartments	76	150	2.7	205	30,780	0.36
Houses	81	150	2.7	219	32,805	0.38
					Residential Daily Loading	0.74
					Growth Factor	1
					Infiltration @ 10% (as CoP App C 1.2.4)	0.07
					Dry Weather Flow l/s	0.81
					Residential Peak Factor (as CoP App C 1.2.5)	6.0
					Design Foul Flow l/s	4.86
*Flow rates calculated using IW CoP for Wastewater Infrastructure Appendix C						

NON-RESIDENTIAL - PREDICTED DEVELOPMENT FOUL FLOWS						
Unit Type	Floor Area m2	Occupancy Load m2 /person	Occupancy	Loading l/Person/day	Daily Loading l/day	Daily Loading l/day
Community Facilities - Multi-purpose	680	30	23	50	1,133	0.01
					Non - Residential Daily Loading	0.01
					Growth Factor	1
					Infiltration @ 10% (as CoP App C 1.2.4)	0.00
					Dry Weather Flow l/s	0.01
					Commercial Peak Factor (as CoP App C 1.2.7)	6
					Design Foul Flow l/s	0.09

PREDICTED DEVELOPMENT FOUL FLOWS SUMMARY				
Unit Type	Average Daily Loading l/day	Average Daily Loading m3	Average Daily Loading l/s	Design Foul Flows l/s
Residential	63,585	64	0.81	4.86
Non-Residntial	1,133	1	0.01	0.09
Total	64,718	65	0.82	4.94

4.7 Allowance for Future Development (Receiving Foul Network)

Allowance for the subject development discharging to the foul sewers constructed as part of Clonburris Phase 1A has been incorporated into this design of that development. These flows were assumed based on the "High Level" net development density set out in the SDZ documents as per Table 4.1 below.

Table 4-3 Predicted Dwelling Contribution from Future Development

Development Area	Sub-Sector	Net Area (Ha)	Target Dwellings (High Level)	Density (Units/ha)	Contributing Area (Ha)	Contributing Dwellings
Clonburris South West	CSW-S3	8.27	504	61	3.01	183

As calculated in *Table 4-4* below, a design foul flow allowance of 5.6l/s from the subject site was allowed for when designing the receiving Clonburris 1A development, which is more than the actual design foul flow of 4.86l/s as calculated in *Table 4-2*.

Table 4-4 Predicted Foul Contribution from Future Development (Subject Development)

PREDICTED FUTURE DEVELOPMENT CONTRIBUTING FLOWS						
Unit Type	**No.**	**Loading l/person/day**	**Occupancy person/unit**	**Occupancy**	**Daily Loading l/day**	**Daily Loading l/s**
Dwellings	183	150	2.7	494	74,115	0.86
					Residential Daily Loading	**0.86**
					Growth Factor	1
					Infiltration @ 10% (as CoP App C 1.2.4)	0.09
					Dry Weather Flow l/s	**0.94**
					Residential Peak Factor (as CoP App C 1.2.5)	6.0
					Design Foul Flow l/s	**5.66**
*Flow rates calculated using IW CoP for Wastewater Infrastructure Appendix C						

The areas that were assumed to discharge into the foul sewers constructed as part of Phase 1A during the design of that development are shown in Figure 4-2.

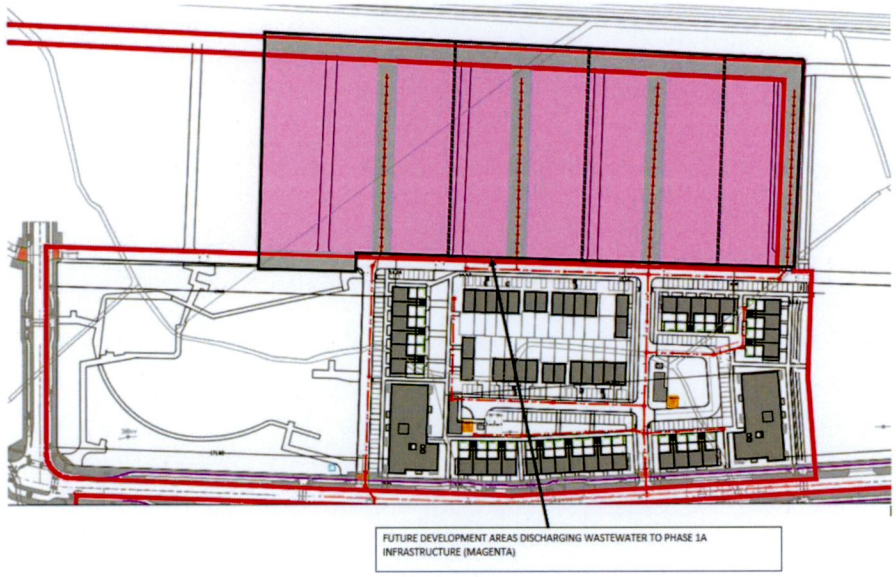


Figure 4-2 Foul Network Allowance for Future Development

5 WATER SUPPLY AND DISTRIBUTION

5.1 Existing Water supply

The proposed site will benefit from trunk watermain infrastructure proposed as part of the Clonburris Infrastructure Development for which was granted permission under planning reference SDZ20A/0021. The planning application includes a 400mm diameter watermain running along the Proposed CSLS at the north of the subject site.

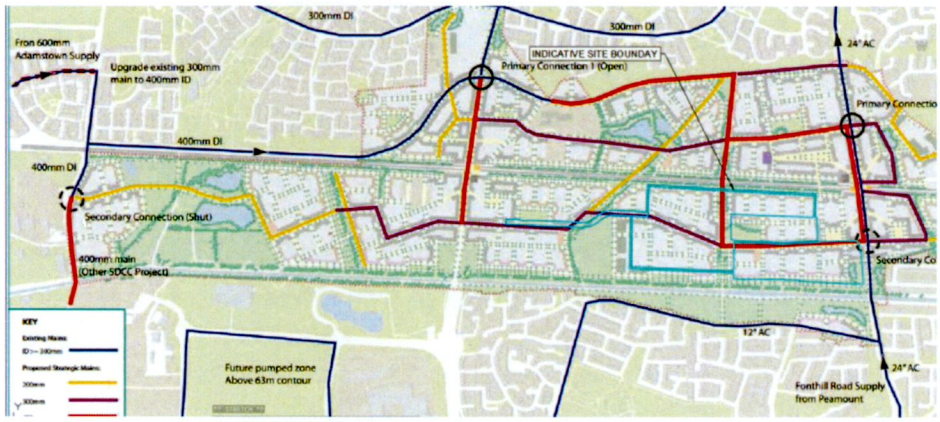


Figure 5-1 Irish Water Strategic Watermain Plan

5.2 Development Water Main Layout

The subject section of the site will connect into the CLSL trunk watermain infrastructure via the Clonburris 1A development granted under planning reference SDZ21A/0022 at two locations. A 180mm watermain loop serving the site is proposed. The 180mm loops within the subject site will then feed smaller 125mm distribution watermains.

The connection to the public water main will include a metered connection with sluice valve arrangement in accordance with the requirements of Irish Water.

Individual houses will have their own connections to the distribution main via service connections and boundary boxes. Individual service boundary boxes will be of the type to suit Irish Water and to facilitate domestic meter installation.

Hydrants are provided for fire-fighting at locations to ensure that each dwelling is within the required Building Regulations distance of a hydrant.

The development's proposed water-main distribution system is shown on drawings CLB-T3-93-SW-DTM-DR-DBFL-CE-1351.

5.3 Compliance with Irish Water Standards

The proposed watermain design and layout is in accordance with the Irish Water Code of Practice for Water Infrastructure and The Irish Water, Water Infrastructure Standard Details.

5.4 Compliance with Clonburris Water and Wastewater Report

A confirmation of feasibility for the overall SDZ lands has been received from Irish Water (ref: CDS22004868). The proposed watermain design and layout complies with the Clonburris Water and Wastewater Report as agreed with SDCC and Irish Water. Refer to **Appendix B** for further details.

5.5 Design Calculations

The water demand is designed in accordance with the principles and methods set out in Irish Water's Code of Practice for Water Infrastructure Connections and Developer Services Design & Construction Requirements for Self-Lay Developments JULY 2020:

Overall water demand is calculated using IW CoP for Water Infrastructure section 3.7.2, as outlined below:

- Per-capita consumption 150l/person/day
- Average day/week demand factor 1.25
- Peak demand factor 5.0
- Average daily domestic demand = Total occupancy * Per-capita consumption
- Average day/peak week demand = Average daily domestic demand * Average day/week demand factor
- Peak hour water demand = Average day/peak week demand * Peak demand factor
- Estimated water demand for the proposed development is provided in Table 5.1

Table 5-1 Predicted Water Calculations

TITLE Clonburris T3		Job Reference 220047	
SUBJECT Water Demand for Irish Water		Calc. Sheet No. 2	
DRAWING NUMBER -	Calculations by DB	Checked by JPC	Date 06/10/2022

RESIDENTIAL - WATER DEMAND						
Unit Type	No. Dwellings	Occupancy Rate /dwelling	Occupancy	Per Capita Consumption l/Person/day	Average Daily Domestic Demand l/day	Average Daily Domestic Demand l/s
Apartments	76	2.7	205	150	30,780	0.36
Houses	81	2.7	219	149	32,586	0.38
					Total Average Daily Loading l/s	**0.73**
					Average Day/Week Domestic Demand	1.25
					Average Day/Peak Week Demand l/s	**0.92**
					Peak Demand Factor	5
					Peak Hour Water Demand l/s	**4.58**
*Flow rates calculated using IW CoP for Water Infrastructure						

NON-RESIDENTIAL WATER DEMAND						
Unit Type	Floor Area m^2	Occupancy Rate m^2/person	Occupancy	Per Capita Consumption l/Person/day	Average Daily Demand l/day	Average Daily Demand l/s
Community Facilities - Multi-purpose	680	30	23	150	3,400	0.04
					Total Average Daily Loading l/s	**0.04**
					Average Day/Week Demand	1.25
					Average Day/Peak Week Demand l/s	**0.05**
					Peak Demand Factor	5
					Peak Hour Water Demand l/s	**0.25**
*Flow rates calculated using IW CoP for Water Infrastructure						

PREDICTED DEVELOPMENT WATER DEMAND SUMMARY		
Unit Type	Average Daily Demand l/day	Design Foul Flows l/s
Residential	63,366	4.58
Non-Residntial	3,400	0.25
Total	66,766	4.83

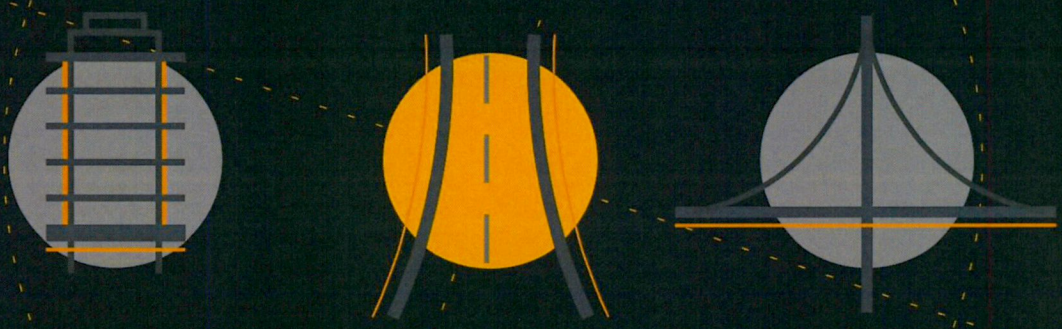
Appendix A : Stage 1 Road Safety Audit

Clonburris Tile 3

Stage 1 Road Safety Audit

CLB-T3-ZZZ-SW-DTM-RP-DBFL-CE-0004

TRANSPORTATION



November 2022

DBFL CONSULTING ENGINEERS

Project Title:	**Clonburris Tile 3**		
Document Title:	**Stage 1 Road Safety Audit**		
File Ref:	**CLB-T3-ZZZ-SW-DTM-RP-DBFL-CE-0004**		
Status:	**P3 - Planning**	Rev:	**1**
	S - Issued		

Rev.	Date	Description	Prepared	Reviewed	Approved
P00	21/11/22	First Issue	Sayed Ahmad Saeed	Thomas Jennings	Thomas Jennings
P01	25/11/2022	Final	Sayed Ahmad Saeed	Thomas Jennings	Thomas Jennings

Contents

Figures

Tables

1 INTRODUCTION

1.1 BACKGROUND

This report describes a Stage 1 Road Safety Audit (RSA) carried out for Cairn Homes Ltd. The Audit considers those elements of the design that have safety implications for all road users. The development will consist of the construction of 157 no. dwellings on a site of c.3.45 hectares in the Clonburris South-West Development Area of the Clonburris Strategic Development Zone.

The subject development site is currently a greenfield site located within the Clonburris Strategic Development Zone (SDZ) lands. The Clonburris SDZ lands have an approximate land area of 280 hectares. In recent years, Lucan East Educate Together National School and two secondary schools; Griffeen Community College and Kishoge Community College, have been constructed on the SDZ lands. The lands also contain a number of private residences, together with Irish Traveller accommodation which has been provided by South Dublin County Council. There are two train stations constructed within the SDZ; the Clondalkin-Fonthill station which is currently operational whilst the Kishoge Station is constructed but has not been operational to date.

The subject Tile 3 site is bound to the south by the proposed Phase 1A development and to the east by the proposed Phase 1B development. The Kildare railway line forms the northern boundary while the Clonburris Southern Link Street forms the western boundary. The general location of the subject site in relation to the surrounding road network is illustrated in **Figure** 1-1 below, whilst **Figure** 1-2 illustrates the indicative extent of the subject site lands.

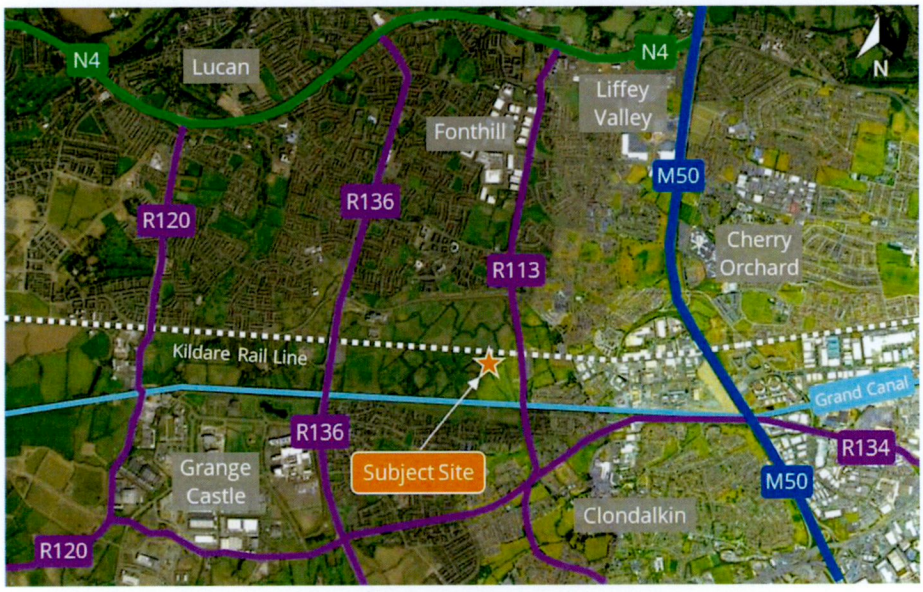


Figure 1-1 Subject Site Location

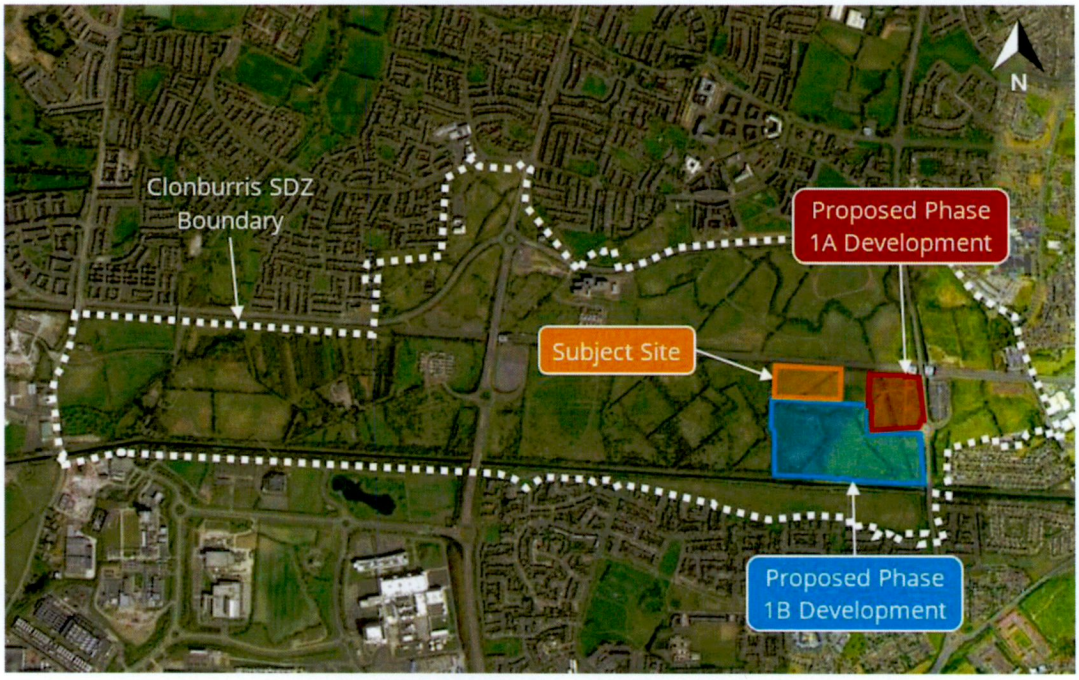


Figure 1-2 Indicative Site Boundary

1.2 Scheme Description

The Tile 3 development will consist of the construction of 157 no. dwellings on a site of c.3.45 hectares in the Clonburris South-West Development Area of the Clonburris Strategic Development Zone (SDZ) Planning Scheme 2019 as follows:

- 81 no. houses comprising 4 no. 2-bedroom houses, 65 no. 3-bedroom houses and 12 no. 4-bedroom houses (all 2-no. storey with associated private open space and car parking);
- 76 no. apartment units consisting of 26 no. 1-bedroom and 50 no. 2-bedroom units within Block 1 (4 no. storeys);
- Vehicular access will be provided from the permitted street under SDZ21A/0022 and the permitted Clonburris Southern Link Street (SDZ20A/0021) and R113 (Fonthill Road) to the east;
- All ancillary site development works including footpaths, landscaping boundary treatments, public and private open space areas, car parking (170 no. spaces) and bicycle parking (170 no. spaces), single-storey ESB sub-stations, bin and bicycle stores and all ancillary site development/construction works.

1.3 RSA Scope

The geographical scope of this Stage 1 Road Safety Audit considers all internal transport infrastructure and the subject site access junctions on the Clonburris Southern Link Street. The immediate approaches leading to/from this junction is also included in the scope of the RSA, as illustrated in **Figure** 1-3 below.

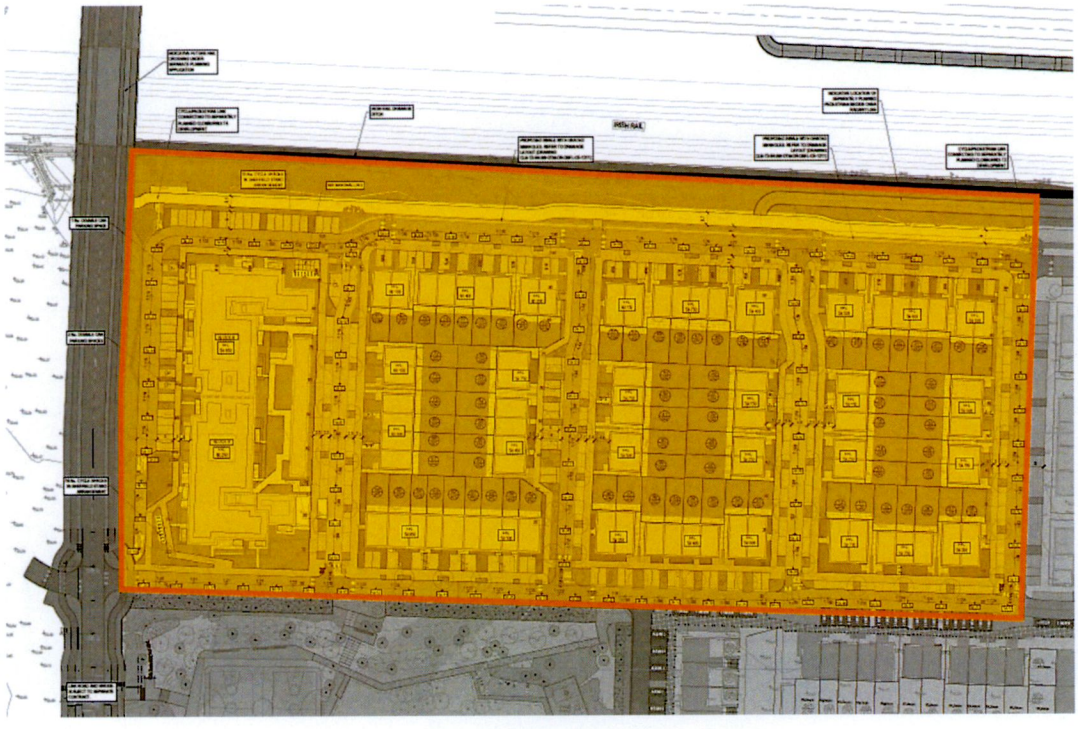


Figure 1-3 Geographical Scope of RSA

The Audit Team membership was as follows:

Team Leader: Thomas Jennings
BEng MSc MIEI MIHT CMILT
DBFL Consulting Engineers (Waterford)
TII approval number: *TJ 135381*

Team Member: Sayed Ahmad Saeed
BEng Tech BEng (Hons) MEng MIEI
DBFL Consulting Engineers (Dublin)
TII approval number: *SS 3419515*

Observer: Daniel Gill
BEng Tech BEng (Hons) MIEI
DBFL Consulting Engineers (Dublin)

The Audit comprised a desktop review of the information listed in Section 5 of this report in addition to an examination on-site of the existing local road network characteristics. The site was visited on Tuesday 16th August 2022 between 10:30 and 11:30. At the time of the site audit the weather was dry with all road/footway surfaces being noted as dry.

This Audit has been carried out in accordance with the relevant sections of the Transport Infrastructure Ireland guidance (TII) guidance GE-STY-01024 December 2017 for Road Safety Audit.

The Audit Team has examined only those issues within the proposed design relating to the road safety implications of the scheme and has therefore not examined or verified the compliance of the design to any other design criteria. The objective of the site visit was quantifying:

- existing traffic (pedestrian, cyclist and vehicular) and travel demand characteristics,
- the provision of dedicated facilities availability for vulnerable road users,
- the likely travel desire lines/links to/from the subject site, and
- any issues that might impact the safety of non-motorised users (NMU's).

The problems identified and described in this report are considered by the Audit Team to require action in order to improve the safety of the Scheme and minimise accident occurrence.

1.4 Collision History

With the objective of ascertaining the road safety record of the immediate routes leading to/from the subject site, the collision statistics as detailed on the Road Safety Authority's (RSA) website (www.rsa.ie) have been examined. The RSA website includes basic information relating to reported collisions over the most recent twelve-year period, from 2005 to 2016 inclusive. **Figure** 1-4 below highlights the location and severity of all road traffic accidents recorded in the Clonburris area in the period 2005 – 2016. As can be seen from the map, there was no collisions recorded in the immediate vicinity of the subject site during this time.

The review of the RSA data reveals that there was one fatal accident near Clonburris, which occurred in the Grange Castle Business Park. A cluster of minor accidents was recorded to the

south of the site on the New Nangor Road, Fonthill Road South and Lucan Newlands Road. Less dense clusters of minor accidents have also been recorded on the Balgaddy Road and Fonthill Road North. In summary the review confirms that no significant incident trends or significant safety concerns are evident across the local road network immediately adjoining the subject Tile 3 development plot.

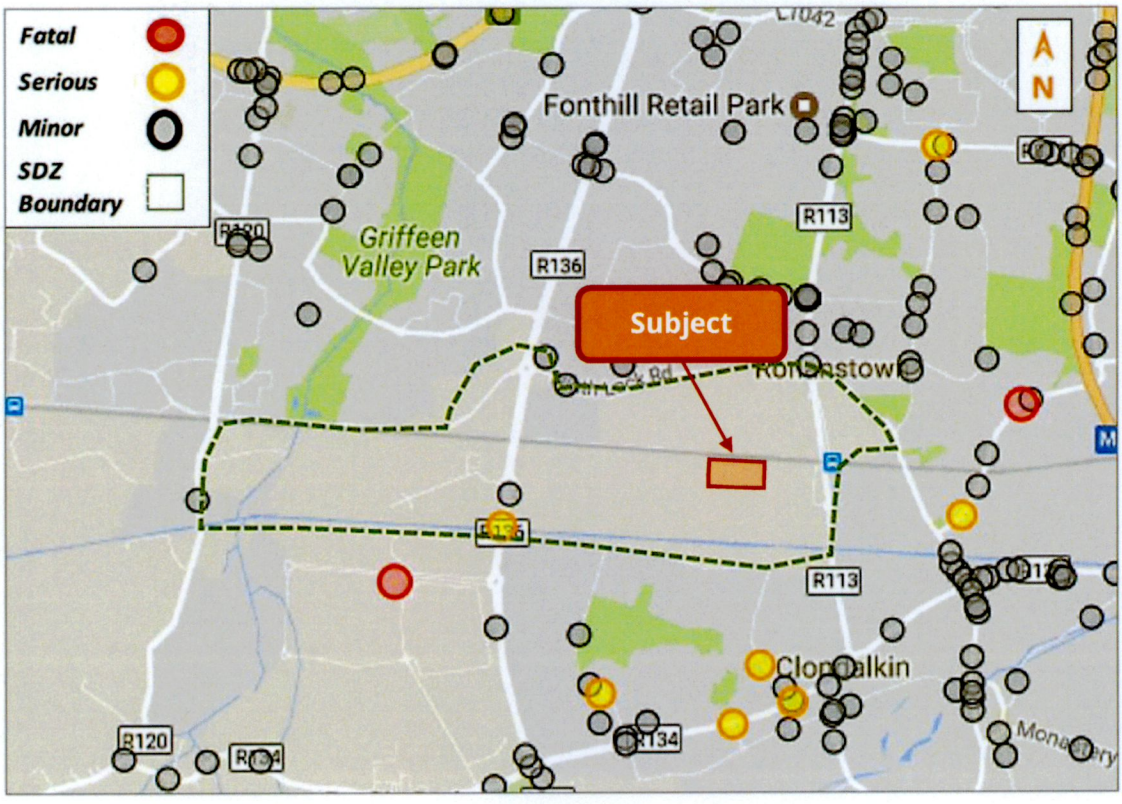


Figure 1-4 Collision Record

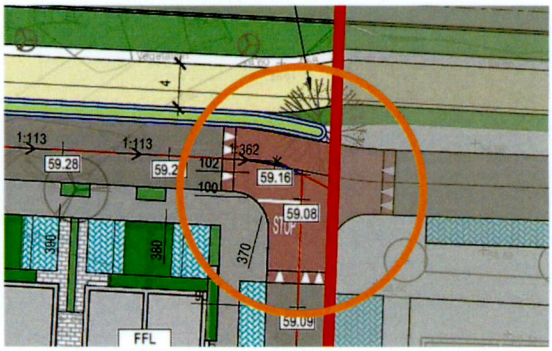
2 ITEMS RAISED DURING THIS STAGE 1 ROAD SAFETY AUDIT

2.1 PROBLEMS AT GENERAL LOCATIONS

Location (G1) – Dropped Kerbs and Tactile Paving

Problem

The drawings provided for the purpose of the RSA do not show provision of dropped kerbs and tactile paving at certain locations where pedestrian crossing points are proposed. This could lead to accessibility issues for road users, particularly wheelchair users and can cause confusion for partially sighted pedestrians who may encounter difficulties when crossing the road carriageway.



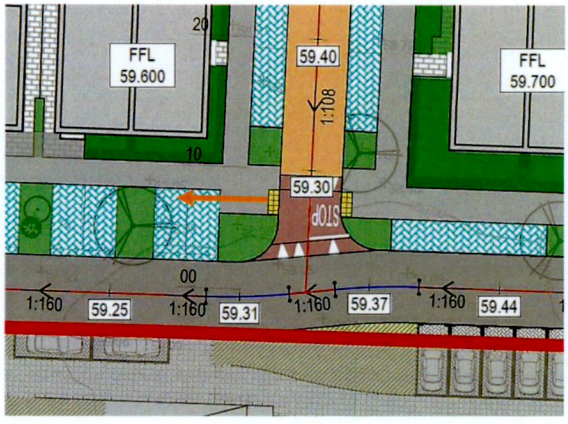
Recommendation:

It is recommended that dropped kerbs and / or tactile paving in accordance with the appropriate design recommendations is provided at all key pedestrian travel desire lines that require a pedestrian to cross a road carriageway.

Location (G2) – Crossing Alignment with Footpath

Problem

The auditors note that proposed pedestrian crossings at some instances have not been aligned with footpaths on both sides of the crossings such as shown in the figure opposite. This may direct visually impaired pedestrians toward car parking bays resulting in a conflict between pedestrian and vehicles.



Recommendation:

Ensure pedestrian crossings are appropriately aligned with the footways on both sides to safeguard the safety of visually impaired pedestrians.

Location (G3) –Signage

Problem

The drawings provided for the purposes of the RSA do not show details of signage. Failure to provide the appropriate regulatory signs may result in vehicles failing to stop at the minor arm of junctions which may lead to side impact collisions with vehicles travelling along the major arm through junctions.

Recommendation:

It is recommended that appropriate road marking and signages are provided in accordance with the requirements of the Traffic Signs Manual.

Location (G4) – Street Lighting

Problem

No details regarding the proposed schemes street lighting have been provided to the audit team. As a result, the audit team cannot comment upon the appropriateness of the proposed schemes street lighting strategy.

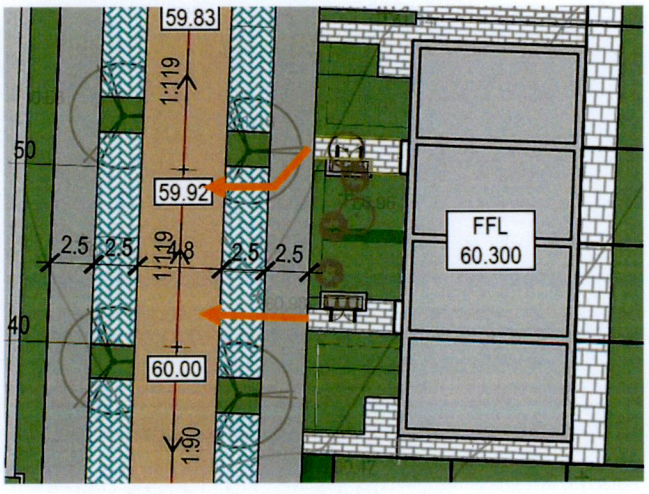
Recommendation:

Ensure appropriate street lighting is provided across <u>all</u> pedestrians, cycle, and vehicle routes.

Location (G5) – Waste Bin Service Arrangement

Problem

The auditors note that the drawing illustrates the locations of waste bin storage areas within the site. However, the transfer arrangements for the waste bins between the carriageway and the house units is unclear. Should waste bins be inappropriately stored in the path of pedestrians, this could block pedestrian routes or limit the space available to pedestrians as they could



step onto the adjacent landscaping area or onto the parallel parking bays. This could result in pedestrian / vehicle conflicts. No consideration has been given to waste collection services requirements to transfer (e.g., manually pull the bins via the footpath and between the parallel parking bays) the waste from the storage area. If parking bays are occupied by vehicles, no route would be available when transferring bins to / from the waste collection vehicle on the carriageway.

Recommendation:

Ensure appropriate bin transfer areas / locations and appropriate routes are be provided for waste bin transfer which do not result in the reduction of footpath widths to such an extent that pedestrian must leave the footpath to move around bins. Ensure a navigable route in the form of an appropriately designed pathway is provided that offers a route for waste collection activities on the carriageway.

Location (G6) – Surface Drainage

Problem

From the scheme information provided for this audit, it has not been possible to ascertain the specific details of the surface drainage strategy. Surface water can prove a trip hazard in both warm and cold weather conditions in addition to adversely impacting the skid resistance of bicycles and motorized vehicles.

Recommendation:

During the detail design stage, the design team should provide adequate measures are taken to ensure that all surface areas benefit from having sufficient drainage and that localised ponding does not arise during wet weather conditions. All access routes leading to/from the subject site should have adequate surface water drainage.

Location (G7) – Pedestrian Crossing Desire Lines

Problem

At some locations within the scheme, no provision has been made for pedestrians (and cyclists) that will be seeking to cross the road carriageway at key desire lines. This is noted between the house and the apartment units. No crossing has been provided along the entirety of the southern

boundary of the scheme that connects to the park and the residential units as part of the Phase 1B Development to the south. Furthermore, no midblock crossing points are provided on the four internal north-south aligned streets. Absence of appropriate crossing provision could lead to trips and falls as pedestrians, children and particularly wheelchair users if trying to undertake crossing between parked vehicles and / or via landscaped or tree planting buffers. The issue could also lead to collisions with vehicles.

Recommendation:

Appropriate pedestrian crossing facilities should be provided at all key pedestrian desire lines as indicated in the figure above to enable pedestrians safely crossing at key crossing desire lines along the internal roads as well as towards the adjacent proposed development.

Location (G8) – Long Straight Sections of Carriageway

Problem

The internal local roads exhibit long straight sections with the carriageway lacking necessary traffic calming measures. This could lead to high excessive vehicle speeds. Higher speeds would lead to higher severity injury collisions should a driver lose control or come into contact with another road user.

Recommendation:

The designers are requested to confirm the adopted design speed for each of the development streets. It is recommended that suitable traffic calming measures are provided to manage vehicular speeds along the local road/streets and ensure vehicle drivers do not exceed the adopted design speed. The measures should be in compliance with the principles set out in DMURS in regards to managing vehicle speeds.

Location (G9) – Cycle Parking

Problem

The auditors note in reference to the drawing provided for the purpose of the audit that no long term (residents) or short term (visitors) bicycle parking has been provided. The auditors are concerned that in the absence of such facilities indiscriminate bicycle parking practices (eg. Light poles etc) may arise which have the potential to block the footpath and represent trip hazard for pedestrians.

Recommendation

The designer should ensure that the appropriate quantum of bicycle parking is provided for booth resident and visitors. The design and location of the bicycle parking should respect the appropriate design guidance and safeguard pedestrian routes free from trip hazard.

Location (G10) – EV Parking

Problem

It is noted upon review of TTA report that a minimum of 34 no. electric vehicle (EV) parking spaces will be provided. However, the scheme does not provide details of the location and size of EV parking bays or the location of EV charging points. The auditors are concerned that the proposed EV parking bays may be of a substandard size that could impact accessibility and result in cables encroaching to the public footpath which would represent trip hazard. Furthermore, the auditors are concerned that EV charge point may be located in either 1) the public footpath which could subsequently represent obstruction and /or 2) a grass landscaped area which, particularly in wet conditions, could be slip hazard for drivers seeking to access the charge point.

Recommendation:

The designers are requested to confirm the location and size of all EV parking spaces meet best practice design guidance. EV charging points should be located in an area of hard standing, outside of the footpath area, and in close proximity to EV bays.

Location (G11) – Visibility Splays at Junction

Problem

The proximity of car parking bays adjoining a number of internal junctions throughout the site may obstruct driver's visibility. Failure to provide sufficient visibility for vehicle drivers at the junctions could result in overshoot incidents or side impact collisions with vehicles/cyclists travelling along the road.

Recommendation:

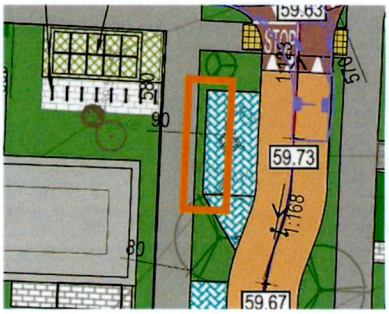
Ensure sufficient visibility is provided at all junctions and vehicle access points as outlined in DMURS by ensuring car parking and tree species are located /specified such that unobstructed visibility splays safeguarded.

2.2 PROBLEMS AT SPECIFIC LOCATIONS

Location (S1) – Mobility Impaired Parking Bay

Problem

The mobility impaired parking bays are proposed to adjoin the landscaping area that does not provide a hardstanding area or dropped kerbs. A disabled person may find it difficult when entering / egressing the vehicle parked at this bay if a kerb is present which could result in a fall and cause an injury.



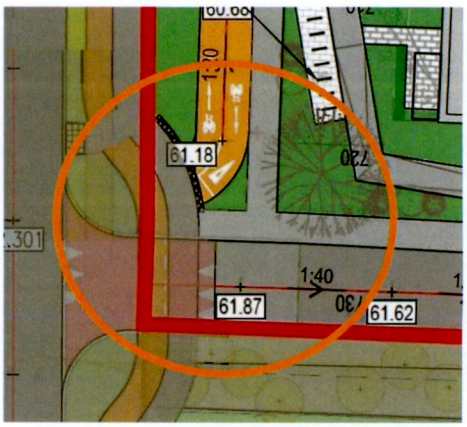
Recommendation:

It is recommended that appropriate hardstanding areas with dropped kerb are provided to connect the parking bay with the footpath. The layout of 'parallel' disabled bay should respect the guidance outlined in the Traffic Signs Manual.

Location (S2) – Two-Way Cycle Track Link to Western Road

Problem

The auditors note that the proposed two-way cycle track located to the south-west of the site terminates with the pedestrian footway. Cyclists travelling to and from the two-way track could be travelling at high speed and will have to cross through the footway. This can be considered hazardous and could result in a conflict between pedestrians and cyclists.



Recommendation:

It is recommended that a suitable transition be provided between the internal two-way cycle track and the external one-way cycle track facilities on the road to the west of the scheme to ensure the safety of all users and the appropriate level of integration between cycle links. The footpath area connecting both the internal cycle track and the external pedestrian / cycle facility could be converted into a 'shared-area' and could implement the corduroy tactile paving on either side of the pedestrian / cycle facilities to warn the vulnerable and the visually impaired. The designers should also confirm how cyclists are to travel to and from the northbound one-way cycle track located on the western side of the external road corridor.

Location (S3) – Parking Bay Close to Two-Way Cycle Track

Problem

It is noted that the proposed two-way cycle track located to the south-west of the site is located very close to the car parking bay along the frontage of Block B. Vehicle reversing out from parking bay would encroach onto the two-way cycle track. A conflict could occur between a cyclist travelling northwards and a vehicle reversing at the same time.

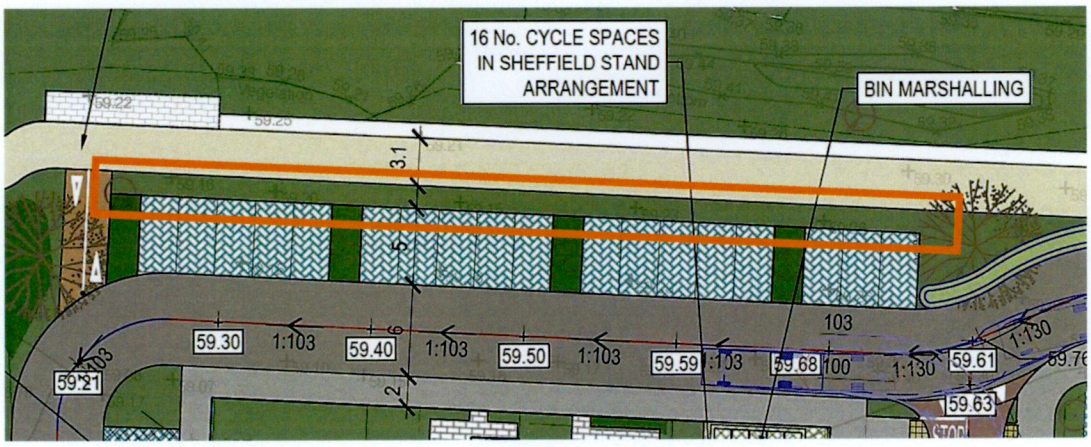
Recommendation:

The two-way cycle track could commence / terminate further south to ensure that a reversing vehicle does not need to drive onto the cycle track.

Location (S4) – Parking Bay and Pedestrian / Cycle Facility Connection

Problem

No connection has been provided between the parking bays (located north of Block B) and the continuous pedestrian / cycle link at the northern boundary of the site. The parking bay and the pedestrian / cycle link has been separated by a landscaping strip. The landscaping strip could be a trip hazard for pedestrians particularly during wet conditions.



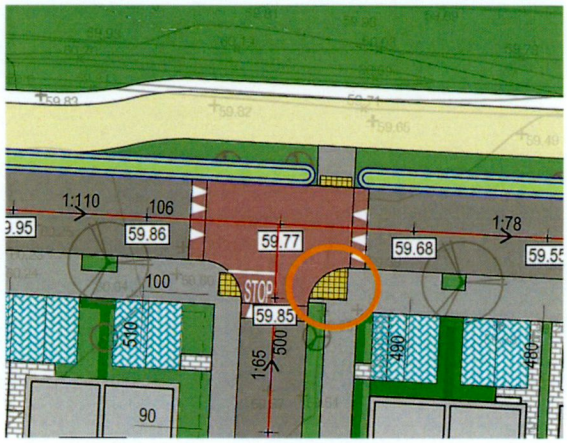
Recommendation:

It is recommended that a concrete handstand be provided to ensure the shared pedestrian / cycle link is easily accessible by individuals accessing / egressing their vehicles.

Location (S5) – Tactile Paving

Problem

The tactile paving on the eastern edge of the minor arm is misleading and would currently direct visually impaired pedestrians towards the carraigeway resulting in collisions .



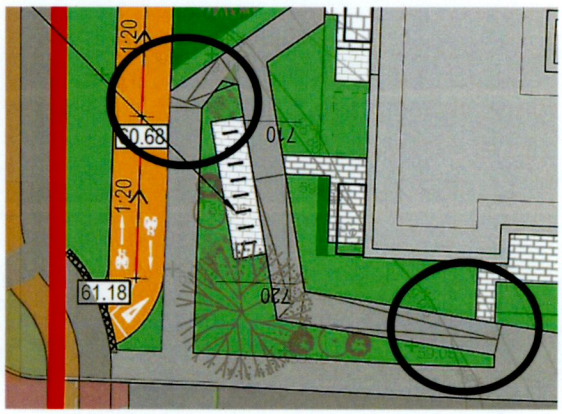
Recommendation:

Ensure tactile paving is appropriately placed . A separate tactile paving should be provided for north-south movements at the eastern arm of this junction.

Location (S6) – Pedestrian Access / Bicycle Parking Access

Problem

The auditors have noted that there is a significant level difference between the bicycle parking spaces to the south-west of Block B and the dedicated cycle tracks to the west of the cycle parking. Ramped accesses from two locations towards this parking spaces have been provided, however, the auditors cannot ascertain if the proposed gradient is suitable for cyclists accessing these spaces to and from the cycle tracks as well as for pedestrians (particularly for wheelchair users).



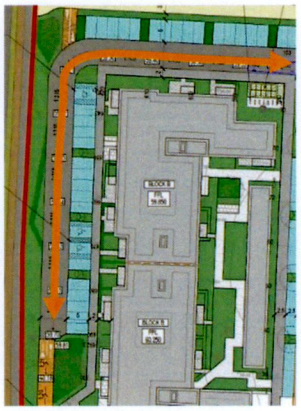
Recommendation :

The designer should confirm that the proposed pedestrians path and cycle facility access will have a suitable gradient for pedestrians and particularly for wheelchair users and cyclists.

Location (S7) – Lack of Vehicle Turning Head

Problem

It is unclear how cars and large refuge vehicles will be able to access and undertaking u turn manoeuvre at the southern termination of the north-south street located immediately to the west of appartment block at the western edge of the site. The auditors request clarification regarding how large vehicles can be accommodated as the road terminates with a cul-de-sac.



Recommendation:

To ensure a safe and convenient turning movement at this location, it is recommended to provide a turning head on this carraigeway.

Location (S8) – Residential Local Street

Problem

The auditors are concerned that the proposed 6m width for the ' Local' residential street is excessive compared to DMURS recommendation and could result in higher vehicle speed. This a concern in the area as cyclists are likely to be present on the road carriageway in this general area when travelling between the segregated cycle track (to the south) and the shared ped/cycle path along the site's northern boundary.

Recommendation:

The street should be narrow to meet the DMURS recommendations. Consideration should also be given to implementing signage that would provide advanced cycle warning to the drivers of the presence of cylists on the carriageway in this area.

Location (S9) – Classification of East-West Road

Problem

The designers are requested to clarify the intended function and associated traffic characteristics of the eas-west orientated street along the southern boundary of the subject Tile 3 plot. The proposals advocate the potential for perpendicular car parking along the northern and southern sides of this street. It is noted that DMURS does not permit such perpendicular parking

arrangements on either arterial or link streets due to problems associated with vehicles reversing into and from a high volume trafficed street.

Recommendation:

In the context of the overall SDZ master plan proposals and , the number of external plots serviced by this east-west oriented Tile 3 street, the designers are requested to clarify the function of this street in reference to DMURS principles. Should it be classified as a 'link' street (or above) then the specification of perpendicular parking should be revisited. If the street is to function as a local street then additional traffic calming should be considered.

Location (S10) – Perpendicular Parking Bays

Problem

The auditors have noted that perpendicular car parking bays are provided immediately adjacent pedestrian walkways in several locations. It is noted that there are no physical barriers (e.g. bollards, wheel stops etc) between the parking bays and pedestrian walkway. There is a risk that drivers parking their cars (or worse case light goods vehicle such as vans) may cross over / encroach into the intended pedestrian footway resulting in pedestrian / vehicle collisions and / or pedestrian movements becoming obstructed.

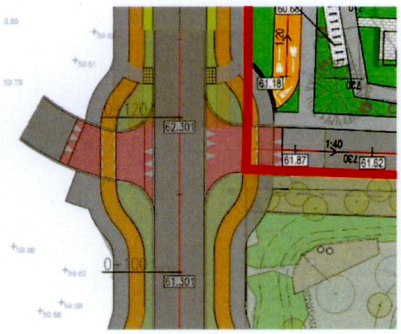
Recommendation:

It is recommended that measures are implemented to prevent vehicles encroaching into the pedestrian footway.

3 COMMENTS

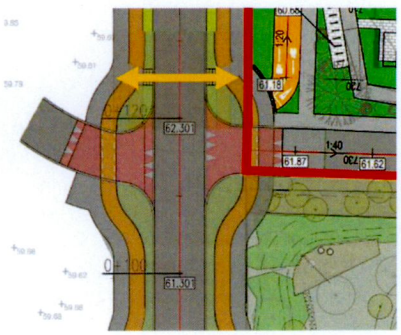
Comment (C1) – Junction Performance

The subject Tile 3 development is proposed to be accessed via a priority controlled junction located south-west of the site. This junction will also be used by other development Phases of Clonburris SDZ, therefore, the auditors feel that the priority arrangement of this junction, due to anticipated high traffic volume may result in the junction poor performance. The designer may consider signalised junction arrangement which could operate better in this case.



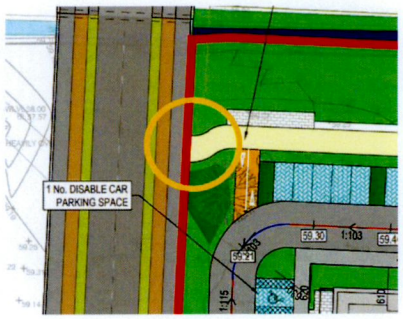
Comment (C2) – Need for Controlled Pedestrians Crossings

Further to C1, uncontrolled crossing is provided at the site access junction. The auditors feel that there is a need for controlled crossing for pedestrian and cyclists at this location due to anticipated high number of pedestrians and cyclists using the facility.



Comment (C3) – Pedestrian/Cycle Link to T4

The auditors are not sure about how the shared pedestrian/cycle route will connect to T4 development. If it connects to T4 via a tunnel, ensure sufficient lighting and headroom are provided for cyclists.



4 AUDIT TEAM STATEMENT

4.1 AUDIT TEAM STATEMENT

I certify that I have examined the drawings and other information listed in Chapter 5. This Audit has been carried out with the sole purpose of identifying any features of the Design that could be removed or modified to improve the safety of the Scheme. The problems that I have identified have been noted in the report, together with suggestions for improvement which we recommend should be studied for implementation.

Audit Team Leader: Mr. Thomas Jennings *BEng MSc MIEI MIHT CMILT*
DBFL Consulting Engineers (Waterford)

Signed: 

Date: 25/11/2022

Audit Team Member: Mr. Sayed Ahmad Saeed *BEng Tech BEng (Hons) MEng MIEI*
DBFL Consulting Engineers (Dublin)

Signed: 

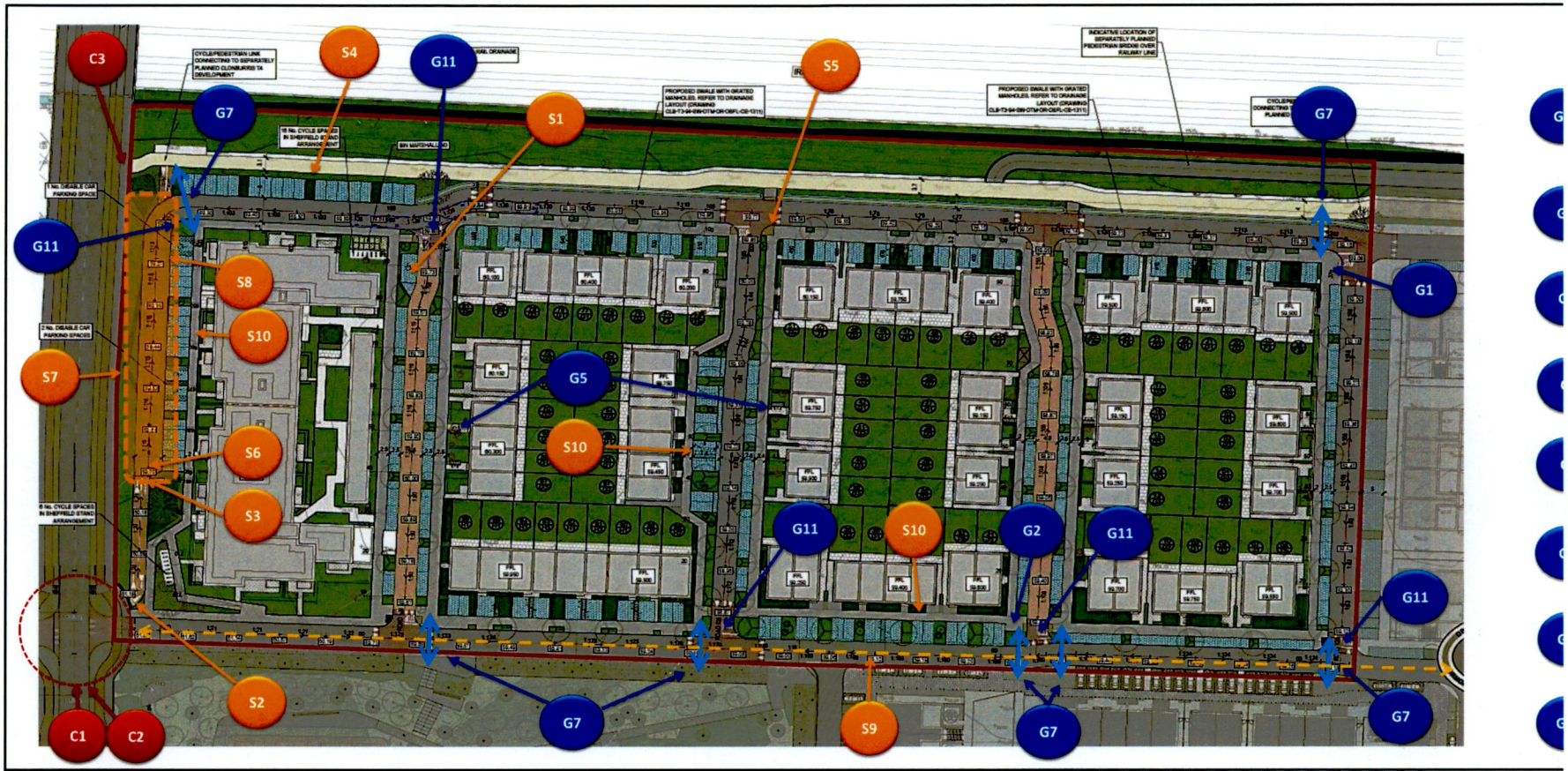
Date: 25/11/2022

5 LIST OF INFORMATION RECEIVED

Items Received		Yes/No	Details
1	Scheme Description	Yes	Information was provided in an email. The scheme description was also provided with the Final Draft TTA (Report No. CLB-T3-ZZZ-SW-DTM-RP-DBFL-CE-0003)
2	Project Brief	No	
3	Scheme / Project Drawings	Yes	Drawing No. CLB-T3-95-SW-DTM-DR-DBFL-CE-1201 Roads Layout - DBFL Consulting Engineers
4	Departures from Standard	No	
5	Traffic Signal Information	N/A	
6	Road Signs & Road Marking Details	No	
7	Traffic Count Information	No	
8	Speed Survey Data	No	
9	Collision Data	Yes	Provided within the Final Draft TTA
10	Previous Road Safety Audit Reports	No	
11	Relevant Design Standards	No	
12	Public Transport Information	Yes	Provided within the Final Draft TTA
13	Other Information	No	

Table 5-1 Information Received as basis for Road Safety Audit

Appendix A : Problem Location Figure



Project :	Clonburris Tile 3	Date :	04/11/2022
Client :	Cairn Homes	Scale :	NTS
Drawing Title :	Stage 1 Road Safety Audit - Problem Locations	File Ref :	220047 RSA Figure
		Drawing No :	
			1

Appendix B : Feedback Form

220047

ROAD SAFETY AUDIT FEEDBACK FORM

Scheme: Clonburris Tile 3

Audit Stage: 1

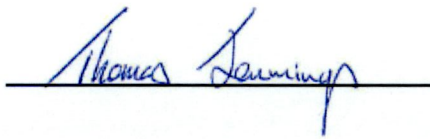
Date Audit Completed: 22th of November 2022

To be Completed by Designer				To be Completed by Audit Team Leader
Problem No. in RSA Report	**Problem accepted (yes/no)**	**Recommended Measure accepted (yes/no)**	**Describe alternative measure(s). Give reasons for not accepting recommended measure. Only complete if recommended measure is not accepted.**	**Alternative measures or reasons accepted by Auditors (yes/no)**
G1	yes	yes		Noted
G2	yes	yes		Noted
G3	yes	yes	A detailed signage drawing will be produced and issued at detail design stage	Noted. Consider amendments as part of a Stage 2 audit
G4	yes	yes	A detailed lighting layout will be produced at detailed design stage to ensure adequate lighting across public areas	Noted. Consider amendments as part of a Stage 2 audit
G5	yes	yes	Layout amended with footpath connections added between house bin stores to the carriageway.	Noted
G6	yes	yes	A preliminary drainage design has been produced and will be progressed during the detail design stage to drain all surfaced intended for public use.	Noted. Consider amendments as part of a Stage 2 audit
G7	yes	yes	Appropriate pedestrian crossings have been introduces where possible as recommended	Noted
G8	yes	yes	The design speed of the development is 30km/h. Several bends in alignment have been introduced in Local Streets and different carriageway treatment utilisied in Home Zones to manage vehicle speeds. Additional raised intersections and pedestrian crossings have also been introduced to address auditors concerns. Traffic signage will also be used to mitigate speeds along the streets within the development.	Noted. Consider amendments as part of a Stage 2 audit
G9	yes	yes	Short (visitors) and long term (residents) bicycle parking has been provided at the apartment blocks in the appropriate quantum and locations. It is noted that House units with rear/side accesses have the opportunity to utilize gardens for bicycle parking opportunities. Additional cycle parking for residents (houses with no side / rear access) and visitors will be incorporated at detail design stage to address auditors concerns and encourage the update of cycling.	Noted. Consider amendments as part of a Stage 2 audit

G10	Yes	Yes	EV Charging stations for parallel parking bays will be positioned on footpaths, which at 2.5m wide provide adequate space to address auditors' concerns. For perpendicular bays additional hard standing areas will be provided (at detail design stage) in specific locations where the available footpath width might otherwise be compromised if a EV charge point was to be implemented.	Noted. Consider amendments as part of a Stage 2 audit
G11	yes	yes	Visibility will be verified at detail design stage and amendments will be made as required to ensure all sight lines comply with DMURS requirements.	Noted. Consider amendments as part of a Stage 2 audit
S1	yes	yes	Dropped kerbs with corduroy tactile paving have been included at the vulnerable user parking bays to ensure accessibility as per auditors recommendations.	Noted
S2	yes	no	The Link Street in question is separately permitted and cannot be changed at this stage. However, discussions will be arranged with Local Roads Authority to raise the auditors concerns and agreed details how the cycle track can appropriately tie into the Link Street and associated cycle infrastructure and crossing desire lines.	Noted. Ensure road authority are informed of the auditors concerns
S3	yes	no	The roadway adjacent to the subject parking space has been widened as part of the implementation of a new hammer head treatment thereby providing a dedicated reversing space for the last parking area. This would eliminate the need for the vehicle to reverse onto the cycle track.	Yes
S4	yes	yes	The landscape strip behind the subject parking areas have been changed to hard standing as part of the pedestrian/cycle route to eliminate any barrier between the parking area and the ped/cycle route	Noted
S5	yes	yes	The design of the tactile paving has been revisited to address the auditors concerns.	Noted
S6	yes	yes	All pedestrian routes conform to Part M gradients, including the paths to the cycle parking in question	Noted
S7	yes	yes	The refuse bin collection / transfer area is located on the northern eastern side of the apartment building. As a result a large refuse vehicle has no reason to turn into travel down as far as the point where the street terminates for motor vehicles. Nevertheless to address the auditors concerns for other motor vehicles a dedicated vehicle turning head for this cul-de-sac has been included in the updated design.	Noted
S8	yes	yes	The road width has been designed in accordance with the SDZ, specifying road widths for Local Streets of 5m to 6m. The design speed of the development is 30km/h. Several bends in alignment have been introduced in Local Streets and Home zones to manage vehicle speeds. Raised intersections and pedestrian crossings also assist in managing vehicle speeds. As per auditors' recommendations Traffic signage will be implemented to inform vehicle drivers and manage along the local residential streets within the development.	Noted. At detail design stage landscape buffers between perpendicular parking bays should be extended to locally narrow the carriageway in accordance with DMURS and as proposed in some of the proposed residential streets. Consider amendments as part of a Stage 2 audit
S9	no	no	This East/West street along the southern border of the subject site is design as a Local Street. A parallel 'Link' street is to be provided a short distance to the south as part of another phase of the SDZ development. The additional measures now	Yes

			incorporated in response to G8 will ensure that vehicle speeds are maintained to that appropriate for a Local street.	
S10	yes	yes	Wheel stops will be provided to prevent vehicles from encroaching onto the footpaths.	Noted

Signed:  **Designer:** **Dieter Bester** **Date: 23/11/2022**

Signed:  **Audit Team Leader:** **Thomas Jennings** **Date: 25/11/2022**

Signed: _____ **Employer:** _____ **Date:** _____

Please complete and return to safety auditor.

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Appendix B : Surface Water Network Calculations [Micro Drainage Network Module]

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	20
Ratio R	0.277	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.867	4-8	0.948

Total Area Contributing (ha) = 1.815

Total Pipe Volume (m³) = 104.480

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	41.038	0.237	173.2	0.050	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	9.932	0.057	174.2	0.050	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	12.404	0.072	172.3	0.075	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	76.961	0.297	259.1	0.075	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.69	57.919	0.050	0.0	0.0	1.8	0.99	39.4	10.8
S1.001	50.00	4.86	57.682	0.100	0.0	0.0	3.6	0.99	39.3	21.7
S1.002	50.00	5.07	57.625	0.175	0.0	0.0	6.3	0.99	39.5	37.9
S1.003	50.00	6.39	57.478	0.250	0.0	0.0	9.0	0.97	68.7	54.2

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.000	57.198	0.363	157.6	0.075	4.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	36.734	0.165	222.6	0.075	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	56.981	0.215	265.0	0.075	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	71.014	0.390	182.1	0.100	0.00	0.0	0.600	o	450	Pipe/Conduit	
S3.000	55.948	0.932	60.0	0.075	4.00	0.0	0.600	o	225	Pipe/Conduit	
S3.001	52.534	0.220	238.8	0.075	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.002	50.536	0.167	302.6	0.075	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.005	11.956	0.030	398.5	0.100	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.006	10.685	0.059	181.1	0.100	0.00	0.0	0.600	o	525	Pipe/Conduit	
S4.000	55.658	0.705	78.9	0.050	4.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	34.456	0.379	90.9	0.075	4.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	16.593	0.104	159.5	0.050	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.002	13.249	0.087	152.3	0.075	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.000	50.00	4.92	58.000	0.075	0.0	0.0	2.7	1.04	41.3	16.2
S2.001	50.00	5.62	57.562	0.150	0.0	0.0	5.4	0.87	34.7	32.5
S2.002	50.00	6.61	57.396	0.225	0.0	0.0	8.1	0.96	67.9	48.7
S1.004	50.00	7.39	57.031	0.575	0.0	0.0	20.8	1.50	239.1	124.6
S3.000	50.00	4.55	58.300	0.075	0.0	0.0	2.7	1.69	67.2	16.2
S3.001	50.00	5.42	57.292	0.150	0.0	0.0	5.4	1.01	71.6	32.5
S3.002	50.00	6.23	56.998	0.225	0.0	0.0	8.1	1.04	114.5	48.7
S1.005	50.00	7.57	56.681	0.900	0.0	0.0	32.5	1.12	241.5	195.0
S1.006	50.00	7.68	56.651	1.000	0.0	0.0	36.1	1.66	359.6	216.7
S4.000	50.00	4.63	58.222	0.050	0.0	0.0	1.8	1.47	58.6	10.8
S5.000	50.00	4.42	57.900	0.075	0.0	0.0	2.7	1.37	54.5	16.2
S4.001	50.00	4.90	57.518	0.175	0.0	0.0	6.3	1.03	41.1	37.9
S4.002	50.00	5.07	57.338	0.250	0.0	0.0	9.0	1.27	89.9	54.2

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.003	73.363	0.308	238.2	0.075	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.000	28.440	0.169	168.3	0.075	4.00	0.0	0.600	o	225	Pipe/Conduit	
S6.001	54.179	0.310	174.8	0.075	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.002	47.602	0.191	249.2	0.075	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.000	31.511	0.070	450.2	0.015	4.00	0.0	0.600	o	600	Pipe/Conduit	
S6.003	32.771	0.073	448.9	0.075	0.00	0.0	0.600	o	600	Pipe/Conduit	
S6.004	33.207	0.074	448.7	0.075	0.00	0.0	0.600	o	600	Pipe/Conduit	
S4.004	46.139	0.103	448.0	0.100	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.007	6.163	0.021	300.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.003	50.00	6.28	57.251	0.325	0.0	0.0	11.7	1.01	71.7	70.4
S6.000	50.00	4.47	57.825	0.075	0.0	0.0	2.7	1.01	40.0	16.2
S6.001	50.00	5.23	57.580	0.150	0.0	0.0	5.4	1.19	83.9	32.5
S6.002	50.00	6.03	57.272	0.225	0.0	0.0	8.1	0.99	70.1	48.7
S7.000	50.00	4.46	56.876	0.015	0.0	0.0	0.5	1.14	322.7	3.2
S6.003	50.00	6.51	56.781	0.315	0.0	0.0	11.4	1.14	323.1	68.2
S6.004	50.00	7.00	56.734	0.390	0.0	0.0	14.1	1.14	323.2	84.5
S4.004	50.00	7.67	56.648	0.815	0.0	0.0	29.4	1.14	323.5	176.6
S1.007	50.00	7.75	56.557	1.815	0.0	0.0	65.5	1.40	396.0	393.2

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	S9	59.344	57.919	1.200	Open Manhole	1200
S1.001	o	225	S8	59.716	57.682	1.809	Open Manhole	1200
S1.002	o	225	S7	59.710	57.625	1.860	Open Manhole	1200
S1.003	o	300	S6	59.662	57.478	1.884	Open Manhole	1200
S2.000	o	225	S3-5	59.204	58.000	0.979	Open Manhole	1200
S2.001	o	225	S3-4	59.740	57.562	1.953	Open Manhole	1200
S2.002	o	300	S3-1	61.726	57.396	4.030	Open Manhole	1200
S1.004	o	450	S3	59.546	57.031	2.065	Open Manhole	1350
S3.000	o	225	S2-3	59.830	58.300	1.305	Open Manhole	1200
S3.001	o	300	S2-2	59.611	57.292	2.019	Open Manhole	1200
S3.002	o	375	S2-1	59.226	56.998	1.853	Open Manhole	1350
S1.005	o	525	S2	59.039	56.681	1.833	Open Manhole	1500
S1.006	o	525	S1	58.979	56.651	1.803	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	41.038	173.2	S8	59.716	57.682	1.809	Open Manhole	1200
S1.001	9.932	174.2	S7	59.710	57.625	1.860	Open Manhole	1200
S1.002	12.404	172.3	S6	59.662	57.553	1.884	Open Manhole	1200
S1.003	76.961	259.1	S3	59.546	57.181	2.065	Open Manhole	1350
S2.000	57.198	157.6	S3-4	59.740	57.637	1.878	Open Manhole	1200
S2.001	36.734	222.6	S3-1	61.726	57.397	4.104	Open Manhole	1200
S2.002	56.981	265.0	S3	59.546	57.181	2.065	Open Manhole	1350
S1.004	71.014	182.1	S2	59.039	56.641	1.948	Open Manhole	1500
S3.000	55.948	60.0	S2-2	59.611	57.368	2.018	Open Manhole	1200
S3.001	52.534	238.8	S2-1	59.226	57.072	1.854	Open Manhole	1350
S3.002	50.536	302.6	S2	59.039	56.831	1.833	Open Manhole	1500
S1.005	11.956	398.5	S1	58.979	56.651	1.803	Open Manhole	1500
S1.006	10.685	181.1	SExMH	59.056	56.592	1.939	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S4.000	o	225	S10-4	59.647	58.222	1.200	Open Manhole	1200
S5.000	o	225	S10-3-1	59.343	57.900	1.218	Open Manhole	1200
S4.001	o	225	S10-3	59.391	57.518	1.648	Open Manhole	1200
S4.002	o	300	S10-2	59.017	57.338	1.379	Open Manhole	1200
S4.003	o	300	S10-1	58.814	57.251	1.263	Open Manhole	1200
S6.000	o	225	S12-3	59.300	57.825	1.250	Open Manhole	1200
S6.001	o	300	S12-2	59.353	57.580	1.473	Open Manhole	1200
S6.002	o	300	S12-1	59.463	57.272	1.891	Open Manhole	1200
S7.000	o	600	S13	59.227	56.876	1.751	Open Manhole	1500
S6.003	o	600	S12	59.136	56.781	1.755	Open Manhole	1500
S6.004	o	600	S11	59.420	56.734	2.086	Open Manhole	1500
S4.004	o	600	S10	59.336	56.648	2.088	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S4.000	55.658	78.9	S10-3	59.391	57.517	1.649	Open Manhole	1200
S5.000	34.456	90.9	S10-3	59.391	57.521	1.645	Open Manhole	1200
S4.001	16.593	159.5	S10-2	59.017	57.414	1.378	Open Manhole	1200
S4.002	13.249	152.3	S10-1	58.814	57.251	1.263	Open Manhole	1200
S4.003	73.363	238.2	S10	59.336	56.943	2.093	Open Manhole	1500
S6.000	28.440	168.3	S12-2	59.353	57.656	1.472	Open Manhole	1200
S6.001	54.179	174.8	S12-1	59.463	57.270	1.893	Open Manhole	1200
S6.002	47.602	249.2	S12	59.136	57.081	1.755	Open Manhole	1500
S7.000	31.511	450.2	S12	59.136	56.806	1.730	Open Manhole	1500
S6.003	32.771	448.9	S11	59.420	56.708	2.112	Open Manhole	1500
S6.004	33.207	448.7	S10	59.336	56.660	2.076	Open Manhole	1500
S4.004	46.139	448.0	SExMH	59.056	56.545	1.911	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.007	o	600	SExMH	59.056	56.557	1.899	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.007	6.163	300.0	S	59.068	56.536	1.931	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.050	0.050	0.050
1.001	-	-	100	0.050	0.050	0.050
1.002	-	-	100	0.075	0.075	0.075
1.003	-	-	100	0.075	0.075	0.075
2.000	-	-	100	0.075	0.075	0.075
2.001	-	-	100	0.075	0.075	0.075
2.002	-	-	100	0.075	0.075	0.075
1.004	-	-	100	0.100	0.100	0.100
3.000	-	-	100	0.075	0.075	0.075
3.001	-	-	100	0.075	0.075	0.075
3.002	-	-	100	0.075	0.075	0.075
1.005	-	-	100	0.100	0.100	0.100
1.006	-	-	100	0.100	0.100	0.100
4.000	-	-	100	0.050	0.050	0.050
5.000	-	-	100	0.075	0.075	0.075
4.001	-	-	100	0.050	0.050	0.050
4.002	-	-	100	0.075	0.075	0.075
4.003	-	-	100	0.075	0.075	0.075
6.000	-	-	100	0.075	0.075	0.075
6.001	-	-	100	0.075	0.075	0.075
6.002	-	-	100	0.075	0.075	0.075
7.000	-	-	100	0.015	0.015	0.015
6.003	-	-	100	0.075	0.075	0.075
6.004	-	-	100	0.075	0.075	0.075
4.004	-	-	100	0.100	0.100	0.100
1.007	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.815	1.815	1.815

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.007	S	59.068	56.536	56.428	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	5	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	16.900	Storm Duration (mins)	30
Ratio R	0.277		

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.277
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	16.900	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	20, 20, 20

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S9	15 minute 100 year Winter I+20%	15	59.344	58.379	0.235	0.000
S1.001	S8	15 minute 100 year Winter I+20%	15	59.716	58.329	0.422	0.000
S1.002	S7	15 minute 100 year Winter I+20%	15	59.710	58.267	0.417	0.000
S1.003	S6	15 minute 100 year Winter I+20%	15	59.662	58.042	0.264	0.000
S2.000	S3-5	15 minute 100 year Winter I+20%	15	59.204	58.310	0.085	0.000
S2.001	S3-4	15 minute 100 year Winter I+20%	15	59.740	58.167	0.380	0.000
S2.002	S3-1	15 minute 100 year Winter I+20%	15	61.726	57.853	0.157	0.000
S1.004	S3	15 minute 100 year Winter I+20%	15	59.546	57.642	0.161	0.000
S3.000	S2-3	15 minute 100 year Winter I+20%	15	59.830	58.412	-0.113	0.000
S3.001	S2-2	15 minute 100 year Winter I+20%	15	59.611	57.596	0.004	0.000
S3.002	S2-1	15 minute 100 year Winter I+20%	15	59.226	57.505	0.132	0.000
S1.005	S2	15 minute 100 year Winter I+20%	15	59.039	57.453	0.247	0.000
S1.006	S1	15 minute 100 year Winter I+20%	15	58.979	57.396	0.220	0.000
S4.000	S10-4	15 minute 100 year Winter I+20%	15	59.647	58.397	-0.050	0.000
S5.000	S10-3-1	15 minute 100 year Winter I+20%	15	59.343	58.426	0.301	0.000
S4.001	S10-3	15 minute 100 year Winter I+20%	15	59.391	58.345	0.602	0.000

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S1.000	S9	0.46		0.514	17.2	SURCHARGED
S1.001	S8	1.05		2.310	34.3	SURCHARGED
S1.002	S7	1.80		1.067	61.2	SURCHARGED
S1.003	S6	1.24		1.078	82.0	SURCHARGED
S2.000	S3-5	0.71		0.345	28.1	SURCHARGED
S2.001	S3-4	1.46		2.869	47.9	SURCHARGED
S2.002	S3-1	1.07		1.924	68.8	SURCHARGED
S1.004	S3	0.70		9.565	155.2	SURCHARGED
S3.000	S2-3	0.49		0.121	31.6	OK
S3.001	S2-2	0.86		0.597	58.0	SURCHARGED
S3.002	S2-1	0.63		4.175	66.7	SURCHARGED
S1.005	S2	1.59		17.903	230.7	SURCHARGED
S1.006	S1	1.03		3.571	248.6	SURCHARGED
S4.000	S10-4	0.37		0.192	20.9	OK
S5.000	S10-3-1	0.54		0.589	27.9	SURCHARGED
S4.001	S10-3	1.52		4.337	55.5	SURCHARGED

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S4.002	S10-2	15 minute 100 year Winter I+20%	15	59.017	58.111	0.473	0.000
S4.003	S10-1	15 minute 100 year Winter I+20%	15	58.814	58.012	0.461	0.000
S6.000	S12-3	15 minute 100 year Winter I+20%	15	59.300	57.986	-0.064	0.000
S6.001	S12-2	15 minute 100 year Winter I+20%	15	59.353	57.822	-0.058	0.000
S6.002	S12-1	15 minute 100 year Winter I+20%	15	59.463	57.668	0.096	0.000
S7.000	S13	15 minute 100 year Winter I+20%	15	59.227	57.409	-0.067	0.000
S6.003	S12	15 minute 100 year Winter I+20%	15	59.136	57.409	0.028	0.000
S6.004	S11	15 minute 100 year Winter I+20%	15	59.420	57.389	0.055	0.000
S4.004	S10	15 minute 100 year Winter I+20%	15	59.336	57.367	0.119	0.000
S1.007	SExMH	15 minute 100 year Winter I+20%	15	59.056	57.310	0.153	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S4.002	S10-2	1.05		1.480	77.9	SURCHARGED
S4.003	S10-1	1.43		1.707	98.5	SURCHARGED
S6.000	S12-3	0.85		0.177	31.7	OK
S6.001	S12-2	0.73		0.642	58.1	OK
S6.002	S12-1	1.21		3.280	79.9	SURCHARGED
S7.000	S13	0.01		0.933	3.3	OK
S6.003	S12	0.32		11.477	86.7	SURCHARGED
S6.004	S11	0.36		9.911	97.7	SURCHARGED
S4.004	S10	0.73		14.353	203.8	SURCHARGED
S1.007	SExMH	2.12		15.949	450.2	SURCHARGED

Appendix C : Irish Water Confirmation of Feasibility

CONFIRMATION OF FEASIBILITY

Uisce Éireann
Bosca OP448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

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

www.water.ie

Dieter Bester

DBFL Consulting Engineers
Ormond House
Upper Ormond Quay
Dublin
D07 W704

2 August 2022

Our Ref: CDS22004868 Pre-Connection Enquiry
Clonburris Little, Clondalkin, Dublin

Dear Applicant/Agent,

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

Irish Water has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 280 unit(s) at Clonburris Little, Clondalkin, Dublin, (the **Development)**.

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

- **Water Connection**
  - Feasible Subject to upgrades
  - The Development is within Clonburris Strategic Development Zone. All relevant core water infrastructure within the Zone have to be completed, of adequate capacity and integrity, connected to the Irish Water networks and in operation prior the connection. The infrastructure will be delivered by Clonburris Infrastructure Limited developers.

- **Wastewater Connection**
  - Feasible Subject to upgrades
  - The Development is within Clonburris Strategic Development Zone. All relevant core wastewater infrastructures within the Zone have to be completed, of adequate capacity and

integrity, connected to the Irish Water networks and in operation prior the connection. The infrastructure will be delivered by Clonburris Infrastructure Limited developers only Pumping Station PS01will be delivered by Irish Water, and it is scheduled to be completed by Q3/2025 (this may be subject to change)

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water 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 Irish Water.

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 Irish Water's Network(s)

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

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

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

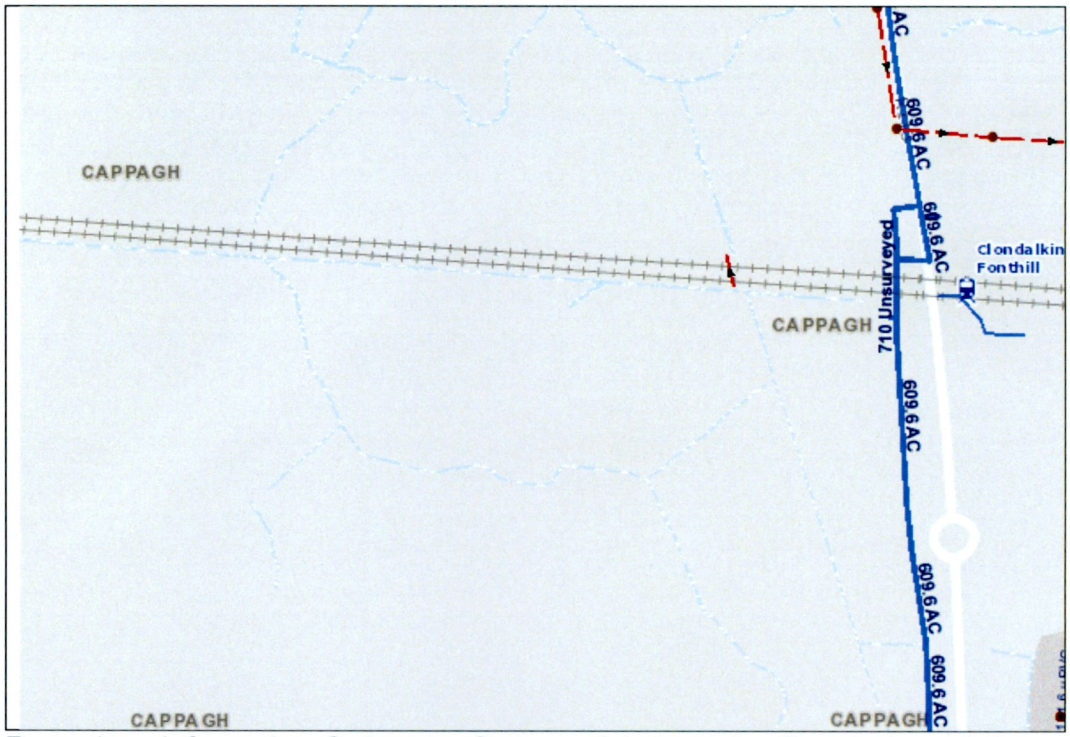
Section A - What is important to know?

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 Irish Water's network(s). • Before the Development can connect to Irish Water's network(s), you must submit a connection application and be granted and sign a connection agreement with Irish Water.
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?	• Irish Water connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Irish Water's network(s), including works in the public space, must be carried out by Irish Water*. *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 Irish Water's network(s)?	• Requests for maps showing Irish Water'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 ***the Irish Water Connections and Developer Services Standard Details and Codes of Practice,*** 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 Irish Water's Network(s)

The map included below outlines the current Irish Water infrastructure adjacent the Development: To access Irish Water 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 Irish Water'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 Irish Water.

Whilst every care has been taken in respect of the information on Irish Water's network(s), Irish Water 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 Irish Water's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Irish Water'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.

Appendix D : Foul Network Calculations [Micro Drainage Network Module]

FOUL SEWERAGE DESIGN

Network Design Table for Foul - Unit

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	40.801	0.204	200.0	0.000	9	0.0	1.500	o	225	Pipe/Conduit	
F1.001	53.029	0.265	200.0	0.000	9	0.0	1.500	o	225	Pipe/Conduit	
F1.002	60.036	0.770	78.0	0.000	9	0.0	1.500	o	225	Pipe/Conduit	
F2.000	46.226	0.462	100.1	0.000	13	0.0	1.500	o	225	Pipe/Conduit	
F2.001	14.266	0.071	200.9	0.000	13	0.0	1.500	o	225	Pipe/Conduit	
F2.002	7.794	0.039	199.8	0.000	13	0.0	1.500	o	225	Pipe/Conduit	
F2.003	80.434	0.969	83.0	0.000	10	0.0	1.500	o	225	Pipe/Conduit	
F1.003	67.680	0.451	150.0	0.000	9	0.0	1.500	o	225	Pipe/Conduit	
F3.000	56.687	0.567	100.0	0.000	9	0.0	1.500	o	225	Pipe/Conduit	
F3.001	50.341	0.336	150.0	0.000	2	0.0	1.500	o	225	Pipe/Conduit	
F3.002	55.977	1.646	34.0	0.000	4	0.0	1.500	o	225	Pipe/Conduit	
F1.004	26.907	0.345	78.0	0.000	2	0.0	1.500	o	225	Pipe/Conduit	
F4.000	55.768	1.239	45.0	0.000	6	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	57.643	0.000	0.0	9	0.0	15	0.24	0.81	32.2	0.3
F1.001	57.439	0.000	0.0	18	0.0	21	0.30	0.81	32.2	0.6
F1.002	57.174	0.000	0.0	27	0.0	20	0.47	1.30	51.7	0.8
F2.000	57.946	0.000	0.0	13	0.0	15	0.34	1.15	45.6	0.4
F2.001	57.484	0.000	0.0	26	0.0	25	0.34	0.81	32.1	0.8
F2.002	57.413	0.000	0.0	39	0.0	30	0.38	0.81	32.2	1.2
F2.003	57.374	0.000	0.0	49	0.0	27	0.56	1.26	50.1	1.5
F1.003	56.405	0.000	0.0	85	0.0	41	0.54	0.94	37.2	2.6
F3.000	58.500	0.000	0.0	9	0.0	13	0.31	1.15	45.6	0.3
F3.001	57.933	0.000	0.0	11	0.0	16	0.28	0.94	37.2	0.3
F3.002	57.597	0.000	0.0	15	0.0	13	0.52	1.97	78.4	0.5
F1.004	55.955	0.000	0.0	102	0.0	38	0.72	1.30	51.7	3.2
F4.000	58.269	0.000	0.0	6	0.0	9	0.35	1.71	68.1	0.2

FOUL SEWERAGE DESIGN

Network Design Table for Foul - Unit

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F5.000	38.338	0.737	52.0	0.000	6	0.0	1.500	o	225	Pipe/Conduit	
F4.001	20.310	0.197	103.0	0.000	2	0.0	1.500	o	225	Pipe/Conduit	
F4.002	9.742	0.095	103.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F4.003	76.362	0.741	103.0	0.000	5	0.0	1.500	o	225	Pipe/Conduit	
F4.004	9.071	0.088	103.0	0.000	2	0.0	1.500	o	225	Pipe/Conduit	
F4.005	32.963	0.294	112.0	0.000	4	0.0	1.500	o	225	Pipe/Conduit	
F1.005	8.819	0.052	169.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F6.000	21.492	0.107	200.0	0.000	2	0.0	1.500	o	225	Pipe/Conduit	
F6.001	51.635	0.258	200.0	0.000	5	0.0	1.500	o	225	Pipe/Conduit	
F6.002	53.267	0.266	200.0	0.000	5	0.0	1.500	o	225	Pipe/Conduit	
F7.000	56.284	0.473	119.0	0.000	8	0.0	1.500	o	225	Pipe/Conduit	
F6.003	30.859	0.259	119.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F5.000	57.753	0.000	0.0	6	0.0	9	0.33	1.59	63.4	0.2
F4.001	57.020	0.000	0.0	14	0.0	16	0.35	1.13	45.0	0.4
F4.002	56.824	0.000	0.0	14	0.0	16	0.35	1.13	45.0	0.4
F4.003	56.730	0.000	0.0	19	0.0	18	0.39	1.13	45.0	0.6
F4.004	55.995	0.000	0.0	21	0.0	19	0.40	1.13	45.0	0.6
F4.005	55.904	0.000	0.0	25	0.0	21	0.41	1.08	43.1	0.8
F1.005	55.610	0.000	0.0	127	0.0	51	0.58	0.88	35.1	3.9
F6.000	58.314	0.000	0.0	2	0.0	8	0.15	0.81	32.2	0.1
F6.001	58.217	0.000	0.0	7	0.0	14	0.22	0.81	32.2	0.2
F6.002	57.949	0.000	0.0	12	0.0	17	0.26	0.81	32.2	0.4
F7.000	57.682	0.000	0.0	8	0.0	13	0.28	1.05	41.8	0.2
F6.003	57.682	0.000	0.0	20	0.0	19	0.37	1.05	41.8	0.6

FOUL SEWERAGE DESIGN

Network Design Table for Foul - Unit

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F6.004	7.426	0.037	200.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F6.004	57.423	0.000	0.0	20	0.0	22	0.31	0.81	32.2	0.6

PIPELINE SCHEDULES for Foul - Unit

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	o	225	F2-4	59.186	57.643	1.318	Open Manhole	1200
F1.001	o	225	F2-2	59.560	57.439	1.896	Open Manhole	1200
F1.002	o	225	F2-1	61.911	57.174	4.512	Open Manhole	1200
F2.000	o	225	F8	59.334	57.946	1.163	Open Manhole	1200
F2.001	o	225	F7	59.794	57.484	2.085	Open Manhole	1200
F2.002	o	225	F6	59.691	57.413	2.053	Open Manhole	1200
F2.003	o	225	F5	59.641	57.374	2.042	Open Manhole	1200
F1.003	o	225	F2	59.561	56.405	2.931	Open Manhole	1200
F3.000	o	225	F1-3	60.005	58.500	1.280	Open Manhole	1200
F3.001	o	225	F1-2	59.825	57.933	1.667	Open Manhole	1200
F3.002	o	225	F1-1	59.263	57.597	1.441	Open Manhole	1200
F1.004	o	225	F1	59.051	55.955	2.871	Open Manhole	1200
F4.000	o	225	F14	59.697	58.269	1.203	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	40.801	200.0	F2-2	59.560	57.439	1.896	Open Manhole	1200
F1.001	53.029	200.0	F2-1	61.911	57.174	4.512	Open Manhole	1200
F1.002	60.036	78.0	F2	59.561	56.404	2.931	Open Manhole	1200
F2.000	46.226	100.1	F7	59.794	57.484	2.085	Open Manhole	1200
F2.001	14.266	200.9	F6	59.691	57.413	2.053	Open Manhole	1200
F2.002	7.794	199.8	F5	59.641	57.374	2.042	Open Manhole	1200
F2.003	80.434	83.0	F2	59.561	56.405	2.931	Open Manhole	1200
F1.003	67.680	150.0	F1	59.051	55.954	2.873	Open Manhole	1200
F3.000	56.687	100.0	F1-2	59.825	57.933	1.667	Open Manhole	1200
F3.001	50.341	150.0	F1-1	59.263	57.597	1.441	Open Manhole	1200
F3.002	55.977	34.0	F1	59.051	55.951	2.876	Open Manhole	1200
F1.004	26.907	78.0	FExMH	59.038	55.610	3.203	Open Manhole	1200
F4.000	55.768	45.0	F13	59.299	57.030	2.044	Open Manhole	1200

PIPELINE SCHEDULES for Foul - Unit

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F5.000	o	225	F13-1	59.350	57.753	1.372	Open Manhole	1200
F4.001	o	225	F13	59.299	57.020	2.054	Open Manhole	1200
F4.002	o	225	F12	58.985	56.824	1.936	Open Manhole	1200
F4.003	o	225	F11	58.847	56.730	1.892	Open Manhole	1200
F4.004	o	225	F10	59.310	55.995	3.090	Open Manhole	1200
F4.005	o	225	F9	59.252	55.904	3.123	Open Manhole	1200
F1.005	o	225	FExMH	59.038	55.610	3.203	Open Manhole	1200
F6.000	o	225	F17	59.280	58.314	0.741	Open Manhole	1200
F6.001	o	225	F16	59.338	58.217	0.896	Open Manhole	1200
F6.002	o	225	F15	59.398	57.949	1.224	Open Manhole	1200
F7.000	o	225	F26	59.373	57.682	1.466	Open Manhole	1200
F6.003	o	225	F26	59.139	57.682	1.232	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F5.000	38.338	52.0	F13	59.299	57.016	2.058	Open Manhole	1200
F4.001	20.310	103.0	F12	58.985	56.823	1.938	Open Manhole	1200
F4.002	9.742	103.0	F11	58.847	56.729	1.893	Open Manhole	1200
F4.003	76.362	103.0	F10	59.310	55.989	3.096	Open Manhole	1200
F4.004	9.071	103.0	F9	59.252	55.907	3.120	Open Manhole	1200
F4.005	32.963	112.0	FExMH	59.038	55.610	3.203	Open Manhole	1200
F1.005	8.819	169.0	F	59.647	55.558	3.864	Open Manhole	0
F6.000	21.492	200.0	F16	59.338	58.207	0.906	Open Manhole	1200
F6.001	51.635	200.0	F15	59.398	57.959	1.214	Open Manhole	1200
F6.002	53.267	200.0	F26	59.139	57.683	1.231	Open Manhole	1200
F7.000	56.284	119.0	F26	59.139	57.209	1.705	Open Manhole	1200
F6.003	30.859	119.0	F27	59.220	57.423	1.572	Open Manhole	1200

PIPELINE SCHEDULES for Foul - Unit

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F6.004	o	225	F27	59.220	57.423	1.572	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F6.004	7.426	200.0	F	59.098	57.386	1.487	Open Manhole	0

Free Flowing Outfall Details for Foul - Unit

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F1.005	F	59.647	55.558	55.000	0	0

Free Flowing Outfall Details for Foul - Unit

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F6.004	F	59.098	57.386	0.000	0	0

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