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Woodbrook Phase 1

Engineering Report

Aeval

October 2019

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This document has 45 pages including the cover.

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Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
Rev 0	Initial Draft	J.Walsh	J.Walsh	K.Boyle	K.Boyle	31/07/19
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Client signoff

Client	Aeval
Project	Woodbrook Phase 1
Job number	5154251
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1. Introduction

This report details the design of the infrastructure elements associated with the proposed phase 1 residential development on lands at R119 Dublin Road, Woodbrook, Co. Dublin.

The proposed development consists of a residential-led development comprising 685no. residential units (207 no. houses, 48 no. duplexes & 430 no. apartments) and 1no. creche facility (429 sq m) in buildings ranging from 2 to 8-storeys. The proposed development also includes the provision of 2no. replacement golf holes for Woodbrook Golf Club and a 164 no. space temporary car park adjacent to the future Woodbrook Dart Station. A detailed description of the development is included in the Architectural Design Statement associated with this application. The location of the site is shown in the Figure below.

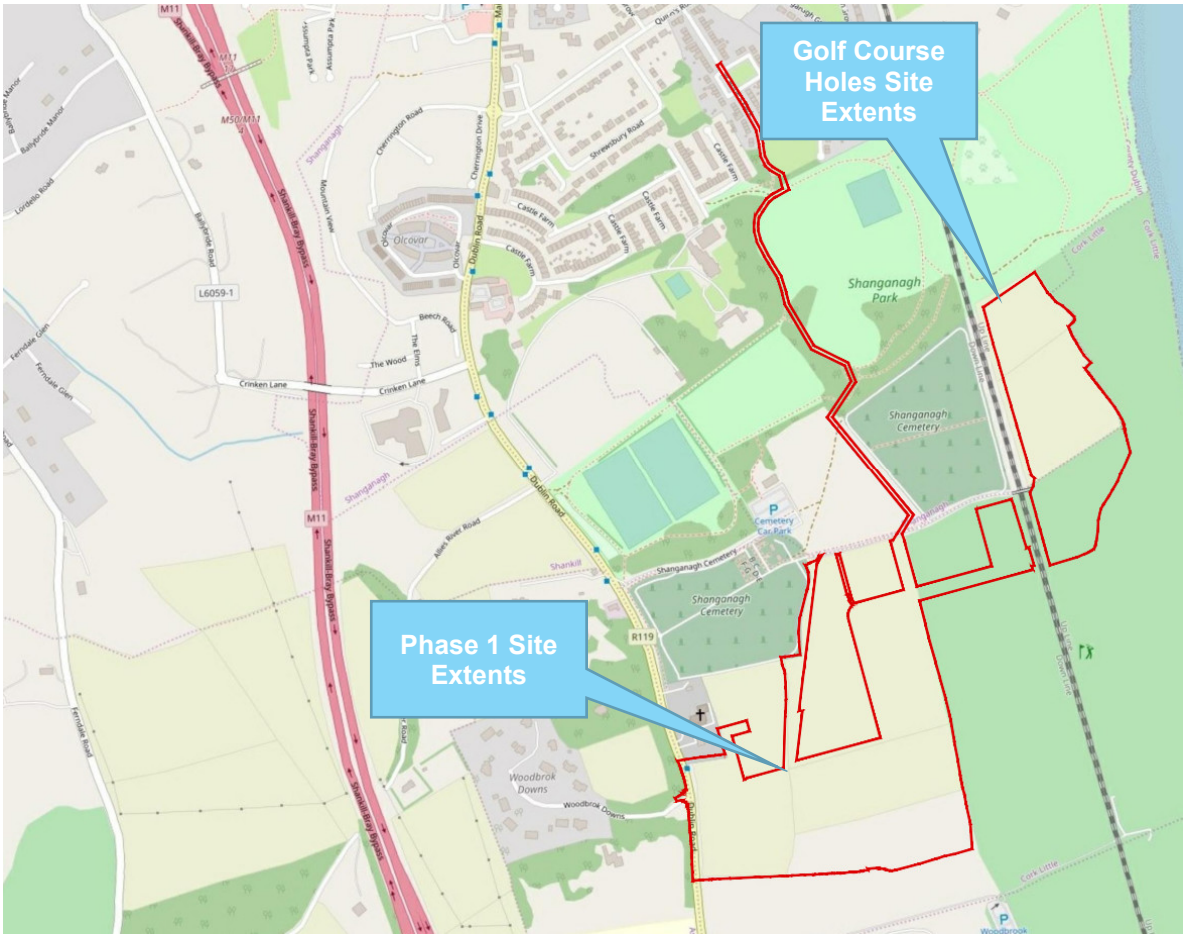

Figure 1-1 – Site Location

2. Design Deliverables

The planning package of infrastructure drawings is as outlined below.

Drawings have a standardised title block for each series showing the drawings as presented below. Scales are shown within the title block and are in accordance with the Planning Guidelines.

Below is a list of the drawings submitted as part of this planning application.

Table 2-1 - Road Scheme Drawing List

Drawing Number	Title of Drawing
5154251 / HTR / DR / 0000	COVER SHEET
5154251 / HTR / DR / 0001	SITE LOCATION MAP
5154251 / HTR / DR / 0002	STREET TYPOLOGY
5154251 / HTR / DR / 0100	PROPOSED ROAD KEY PLAN
5154251 / HTR / DR / 0101	PROPOSED ROAD PLAN LAYOUT - SHEET 1 OF 5
5154251 / HTR / DR / 0102	PROPOSED ROAD PLAN LAYOUT - SHEET 2 OF 5
5154251 / HTR / DR / 0103	PROPOSED ROAD PLAN LAYOUT - SHEET 3 OF 5
5154251 / HTR / DR / 0104	PROPOSED ROAD PLAN LAYOUT - SHEET 4 OF 5
5154251 / HTR / DR / 0105	PROPOSED ROAD PLAN LAYOUT - SHEET 5 OF 5
5154251 / HTR / DR / 0106	VEHICLE TRACKING - SHEET 1 OF 5
5154251 / HTR / DR / 0107	VEHICLE TRACKING - SHEET 2 OF 5
5154251 / HTR / DR / 0108	VEHICLE TRACKING - SHEET 3 OF 5
5154251 / HTR / DR / 0109	VEHICLE TRACKING - SHEET 4 OF 5
5154251 / HTR / DR / 0110	VEHICLE TRACKING - SHEET 5 OF 5
5154251 / HTR / DR / 0111	PROPOSED JUNCTIONS KEY PLAN
5154251 / HTR / DR / 0112	JUNCTION LAYOUT - SHEET 1 OF 7
5154251 / HTR / DR / 0113	JUNCTION LAYOUT - SHEET 2 OF 7
5154251 / HTR / DR / 0114	JUNCTION LAYOUT - SHEET 3 OF 7
5154251 / HTR / DR / 0115	JUNCTION LAYOUT - SHEET 4 OF 7
5154251 / HTR / DR / 0116	JUNCTION LAYOUT - SHEET 5 OF 7
5154251 / HTR / DR / 0117	JUNCTION LAYOUT - SHEET 6 OF 7
5154251 / HTR / DR / 0118	JUNCTION LAYOUT - SHEET 7 OF 7
5154251 / HTR / DR / 0119	DUBLIN ROAD ENTRANCE LAYOUT
5154251 / HTR / DR / 0120	TEMPORARY DART CAR PARK LAYOUT
5154251 / HTR / DR / 0201	PROPOSED LONG SECTION SHEET 1 OF 3
5154251 / HTR / DR / 0202	PROPOSED LONG SECTION SHEET 2 OF 3
5154251 / HTR / DR / 0203	PROPOSED LONG SECTION SHEET 3 OF 3
5154251 / HTR / DR / 0300	PROPOSED TYPICAL ROAD CROSS SECTION
5154251 / HTR / DR / 0301	ROAD SECTIONS AND DETAILS
5154251 / EWE / DR / 0440	PROPOSED WATERMAINS LAYOUT KEY PLAN
5154251 / EWE / DR / 0441	PROPOSED WATERMAINS LAYOUT SHEET 1 of 6
5154251 / EWE / DR / 0442	PROPOSED WATERMAINS LAYOUT SHEET 2 of 6
5154251 / EWE / DR / 0443	PROPOSED WATERMAINS LAYOUT SHEET 3 of 6
5154251 / EWE / DR / 0444	PROPOSED WATERMAINS LAYOUT SHEET 4 of 6
5154251 / EWE / DR / 0445	PROPOSED WATERMAINS LAYOUT SHEET 5 of 6
5154251 / EWE / DR / 0446	PROPOSED WATERMAINS LAYOUT SHEET 6 of 6
5154251 / EWE / DR / 0500	PROPOSED STORM DRAINAGE LAYOUT KEY PLAN

Drawing Number	Title of Drawing
5154251 / EWE / DR / 0501	PROPOSED STORM WATER LAYOUT SHEET 1 of 7
5154251 / EWE / DR / 0502	PROPOSED STORM WATER LAYOUT SHEET 2 of 7
5154251 / EWE / DR / 0503	PROPOSED STORM WATER LAYOUT SHEET 3 of 7
5154251 / EWE / DR / 0504	PROPOSED STORM WATER LAYOUT SHEET 4 of 7
5154251 / EWE / DR / 0505	PROPOSED STORM WATER LAYOUT SHEET 5 of 7
5154251 / EWE / DR / 0506	PROPOSED STORM WATER LAYOUT SHEET 6 of 7
5154251 / EWE / DR / 0507	PROPOSED STORM WATER LAYOUT SHEET 7 of 7
5154251 / EWE / DR / 0510	PROPOSED STORM WATER DRAINAGE LONG SECTIONS SHEET 1 of 5
5154251 / EWE / DR / 0511	PROPOSED STORM WATER DRAINAGE LONG SECTIONS SHEET 2 of 5
5154251 / EWE / DR / 0512	PROPOSED STORM WATER DRAINAGE LONG SECTIONS SHEET 3 of 5
5154251 / EWE / DR / 0513	PROPOSED STORM WATER DRAINAGE LONG SECTIONS SHEET 4 of 5
5154251 / EWE / DR / 0514	PROPOSED STORM WATER DRAINAGE LONG SECTIONS SHEET 5 of 5
5154251 / EWE / DR / 0515	SURFACE WATER FLOW PATH SHEET 1 of 2
5154251 / EWE / DR / 0516	SURFACE WATER FLOW PATH SHEET 2 of 2
5154251 / EWE / DR / 0517	PROPOSED STORM DRAINAGE SUB CATCHMENT AREAS
5154251 / EWE / DR / 0520	PROPOSED FOUL WATER LAYOUTS KEY PLAN
5154251 / EWE / DR / 0521	PROPOSED FOUL WATER DRAINAGE LAYOUT SHEET 1 of 7
5154251 / EWE / DR / 0522	PROPOSED FOUL WATER DRAINAGE LAYOUT SHEET 2 of 7
5154251 / EWE / DR / 0523	PROPOSED FOUL WATER DRAINAGE LAYOUT SHEET 3 of 7
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5154251 / EWE / DR / 0525	PROPOSED FOUL WATER DRAINAGE LAYOUT SHEET 5 of 7
5154251 / EWE / DR / 0526	PROPOSED FOUL WATER DRAINAGE LAYOUT SHEET 6 of 7
5154251 / EWE / DR / 0527	PROPOSED FOUL WATER DRAINAGE LAYOUT SHEET 7 of 7
5154251 / EWE / DR / 0530	PROPOSED FOUL WATER DRAINAGE LONG SECTIONS SHEET 1 of 3
5154251 / EWE / DR / 0531	PROPOSED FOUL WATER DRAINAGE LONG SECTIONS SHEET 2 of 3
5154251 / EWE / DR / 0532	PROPOSED FOUL WATER DRAINAGE LONG SECTIONS SHEET 3 of 3
5154251 / EWE / DR / 0535	PROPOSED PUMP STATION PLAN
5154251 / EWE / DR / 0536	PROPOSED PUMP STATION SECTION
5154251 / EWE / DR / 0537	PROPOSED PUMP STATION AUTOTRACK

Drawing Number	Title of Drawing
5154251 / EWE / DR / 0540	EXISTING SOIL TYPES
5154251 / EWE / DR / 0600	PROPOSED GREEN INTENSIVE COURTYARD AND EXTENSIVE ROOF LAYOUT
5154251 / MEP / DR / 1301	PROPOSED PUBLIC LIGHTING LAYOUT SHEET 1
5154251 / MEP / DR / 1302	PROPOSED PUBLIC LIGHTING LAYOUT SHEET 2
5154251 / MEP / DR / 1303	PROPOSED PUBLIC LIGHTING LAYOUT SHEET 3
5154251 / MEP / DR / 1304	PROPOSED PUBLIC LIGHTING LAYOUT SHEET 4
5154251 / MEP / DR / 1305	PROPOSED PUBLIC LIGHTING LAYOUT SHEET 5
5154251 / EWE / DR / 1530	EXISTING SERVICES - SHEET 1 OF 7
5154251 / EWE / DR / 1531	EXISTING SERVICES - SHEET 2 OF 7
5154251 / EWE / DR / 1532	EXISTING SERVICES - SHEET 3 OF 7
5154251 / EWE / DR / 1533	EXISTING SERVICES - SHEET 4 OF 7
5154251 / EWE / DR / 1534	EXISTING SERVICES - SHEET 5 OF 7
5154251 / EWE / DR / 1535	EXISTING SERVICES - SHEET 6 OF 7
5154251 / EWE / DR / 1536	EXISTING SERVICES - SHEET 7 OF 7
5154251 / EWE / SCD / 0001	STANDARD CONSTRUCTION DETAILS - SHEET 1
5154251 / EWE / SCD / 0002	STANDARD CONSTRUCTION DETAILS - SHEET 2
5154251 / EWE / SCD / 0003	STANDARD CONSTRUCTION DETAILS - SHEET 3
5154251 / EWE / SCD / 0004	STANDARD CONSTRUCTION DETAILS - SHEET 4
5154251 / EWE / SCD / 0021	UNDERGROUND MODULAR ATTENUATION TANKS SHEET 1 OF 7
5154251 / EWE / SCD / 0022	UNDERGROUND MODULAR ATTENUATION TANKS SHEET 2 OF 7
5154251 / EWE / SCD / 0023	UNDERGROUND MODULAR ATTENUATION TANKS SHEET 3 OF 7
5154251 / EWE / SCD / 0024	UNDERGROUND MODULAR ATTENUATION TANKS SHEET 4 OF 7
5154251 / EWE / SCD / 0025	UNDERGROUND MODULAR ATTENUATION TANKS SHEET 5 OF 7
5154251 / EWE / SCD / 0026	UNDERGROUND MODULAR ATTENUATION TANKS SHEET 6 OF 7
5154251 / EWE / SCD / 0027	UNDERGROUND MODULAR ATTENUATION TANKS SHEET 7 OF 7

3. Roads and Streets

3.1. Background

The proposed roads and streets design have been developed in close consultation with the relevant authorities including Dun Laoghaire Rathdown County Council Roads and Traffic Department, National Transport Agency & An Bord Pleanála. Relevant technical aspects of the roads infrastructure elements are incorporated on the roads infrastructure drawings and within this report.

3.2. Principal Design Considerations

During the design of the proposed scheme included within this planning application, the design team took cognisance of the following key considerations / documents:

- Dun Laoghaire Rathdown County Development Plan: 2016 – 2022
- Dun Laoghaire Rathdown Standard for Cycle Parking 2018
- Woodbrook - Shanganagh LAP 2017-2023
- Design Manual for Urban Roads and Streets (DMURS) 2013
- Transport Infrastructure Ireland (TII)) Design Manual for Roads and Bridges (DMRB)
- National Cycle Manual (NCM) 2011
- National Cycle Policy Framework: 2009 – 2020

3.3. Roads and Streets Design

The development of the proposed road and street alignment is based on the details as outlined in the roads infrastructure drawings, taking cognisance of the development layout, the protection and retention (where possible) of existing trees, impact on adjacent lands and in line with the requirements of the Local Area Plan (LAP).

One of the key proposals in relation to the road layout is through the development of a layout that reduces the generation of cul-de-sacs via the use of looped streets and encourages permeability as well as taking cognisance of the requirements of DMURS to ensure that this is achieved.

The roads design package, MX Roads, has been used to design the horizontal and vertical alignments required for the roads included within this planning application.

The developed alignment design sets parameters for development of other design elements such as drainage, determination of earthworks, etc.

As part of the alignment design process, vertical design has been optimised to follow the existing ground profile where possible, minimise the earthworks as much as possible as well as facilitating the drainage design on the basis of the gravity led system (for foul and surface water) where feasible. However, as outlined above, a number of constraints were considered in this process including the desire to retain existing high-quality trees, reduce impact on adjacent lands and this led to a development and associated street layout that we believe achieves these aspirations in a balanced way.

A Digital Terrain Model (DTM) has been prepared based on a 3D topographical survey of the existing ground which covers the entire site to accurately reflect the levels required in the proposed layout arrangement and in particular the access junction on the existing R119 Dublin Road and associated visibility requirements at this location.

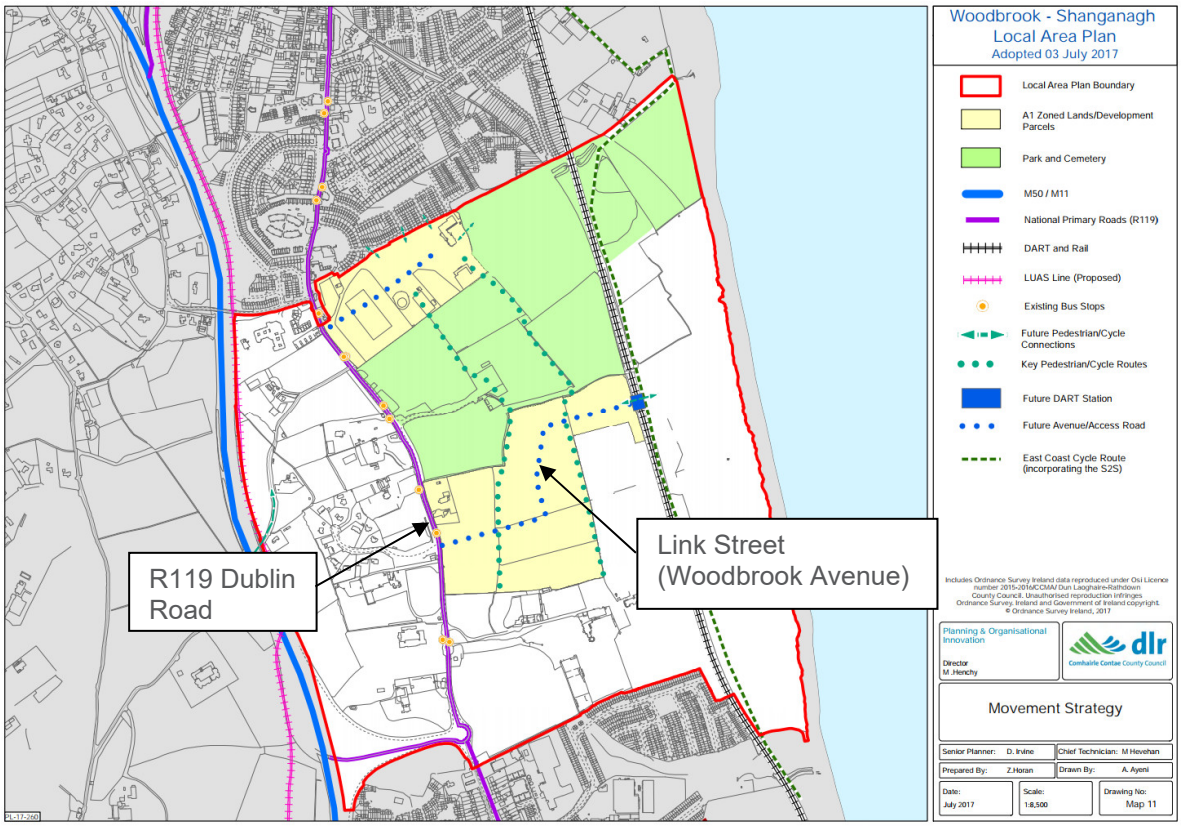
Horizontal alignments of the roads in this application (Link Street – Woodbrook Avenue, Local Streets and Homezone Streets) and junction with the existing R119 Dublin Road are in accordance with the

relevant design standards (including DMURS and TII DMRB). The horizontal alignment defines the roads horizontal geometry and the chainage.

As outlined above, the vertical alignment of the proposed roads follows the existing ground profile where possible and conforms to the gradient recommendations as set out in the DMURS design standards.

The proposed link street (Woodbrook Avenue) alignment follows and ties into the existing R119 Dublin Road broadly in line with the alignment of the future avenue/access road route as shown on Woodbrook – Shanganagh LAP Map 11 as shown in Figure 3-1.

Figure 3-1 - Woodbrook - Shanganagh LAP Map 11



3.4. Compliance with DMURS

The 30km/h special speed limit as required on residential streets is promoted via the combination of the design elements below.

- Horizontal and vertical alignment designed to 20km/h and 30km/h.
- Carriageway widths in line with DMURS requirement for street type.
- Constrained junction radii in line with DMURS requirement
- Raised Pedestrian & Cyclist Crossings at the R119 Dublin Road Junction and along Woodbrook Avenue
- Provision of Raised Tables at Internal Road Junctions

3.5. Internal Road and Street Design Requirements

The proposed alignment and associated cross-sections have been developed in accordance with the necessary design standards for roads, streets and homezone areas of this nature. A description of the proposed junction onto the existing R119 Dublin Road is also included later in this chapter.

Best practice in relation to the design was referenced from the following current design documents and guidelines:

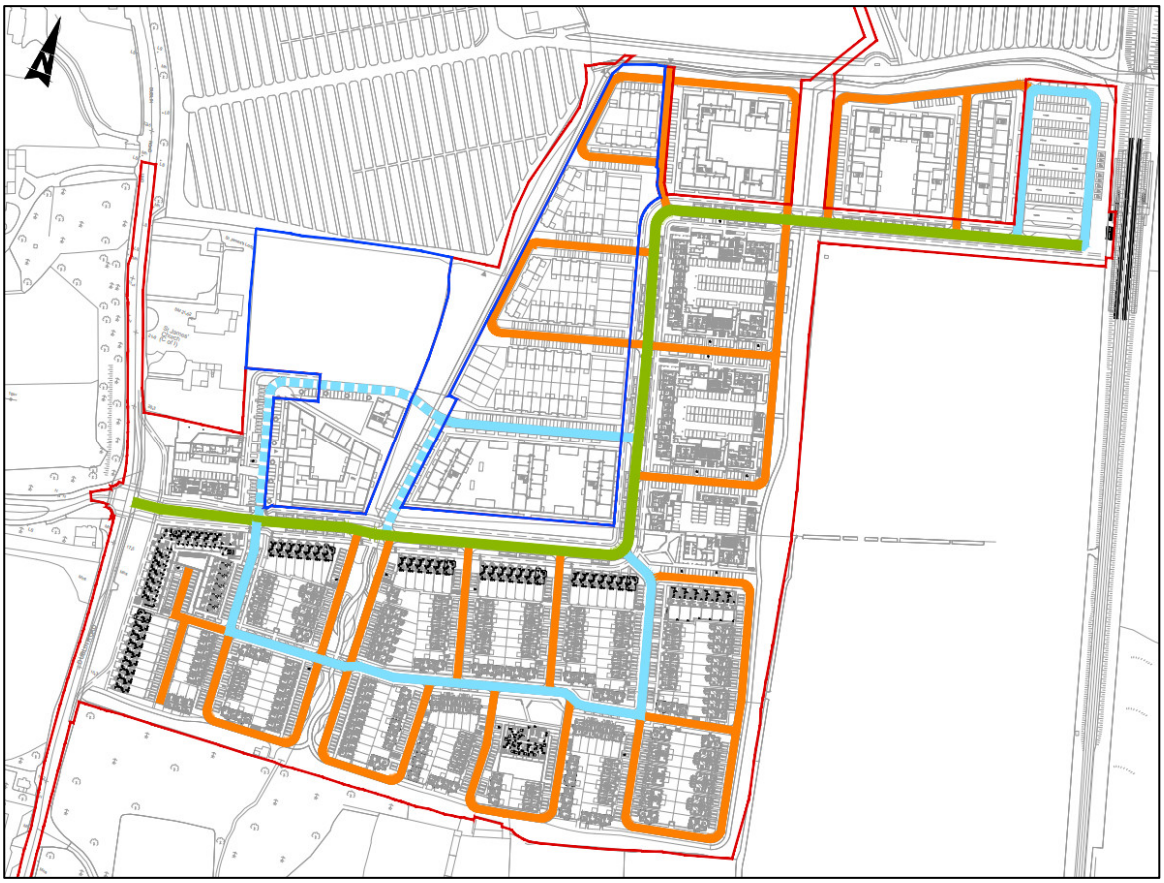
- Design Manual for Urban Roads and Streets (DMURS),
- TII Design Manual for Roads and Bridges (DMRB),
- The National Cycle Manual (NCM).

The site layout has been developed in accordance with the principles of DMURS taking note of the site constraints associated with the level changes across the site, the aspiration to retain some of the existing trees, reduced impact on adjacent lands, required open space provision, and access to the wider road network.

The street layout for the development consists of three types of street typology, the street layout was optimised to reduce the generation of cul-de-sacs using looped local streets and looped home zone streets where feasible to generate the street layout shown in Figure 3-2:

- Link Street (Woodbrook Avenue) - Green
- Local Street - Blue
- Homezone Street - Orange

Figure 3-2 - Street Typology and Layout



The design criteria for the street typologies are detailed below in Table 3-1.

Table 3-1 - Design Criteria

Design Criteria	Link Street (Woodbrook Avenue)	Local Street	Homezone Street
DMURS Recommended Design Speed	30-50km/h	10-30km/h	10-30km/h
Adopted Design Speed	30km/h	20km/h	20km/h
Minimum Horizontal Radius	26m	11m	11m
Maximum Gradient	5%	5%	5%
Minimum Gradient	0.5%	0.5%	0.5%
Carriageway Width	6.5m	5.5-6.0m	4.8m
Footway Width	2.0m	2.0m	1.2m
Junction Radii	6m between Link Street and R119 Dublin Road	4.5m between Link Street and Local Street.	4.5m between Link Street and Home Zone Street. 3m between Homezone Streets and Local Street. 2-3m between Homezone Streets and Homezone Street.
Junction Approach Gradient	2%	2%	2%

Further detail associated with the street typologies and the provision of cyclist and pedestrian facilities are as outlined below in Table 3-2.

Table 3-2 - Street Typology

Typology	Description	Pedestrian Provision	Cyclist Provision
Link Street (Woodbrook Avenue)	Link Streets provide the links to Arterial streets, Local Street and Home Zone streets.	Footpath	Off-Line Cycle Path
Local Street	A Residential Street will provide connectivity more locally and reinforce permeability.	Footpath	Shared Street
Home Zone Street	A Home Zone street will provide intimate and safe local access streets prioritising pedestrians and cyclists.	Shared Street with Flush Footway	Shared Street

Details in relation to typical cross sections are as outlined in Figures 3-3 to 3-7 for each street type, the location of these sections are shown on drawing 5154251/HTR/DR/0100 & detailed on drawing 5154251/HTR/DR/0300.

Figure 3-3 - Link Street (Woodbrook Avenue)

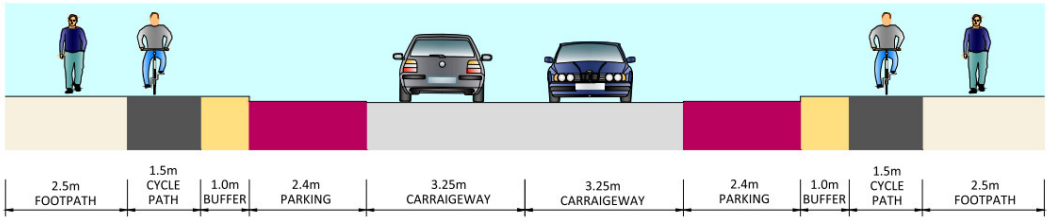


Figure 3-4 - Local Street Type 1

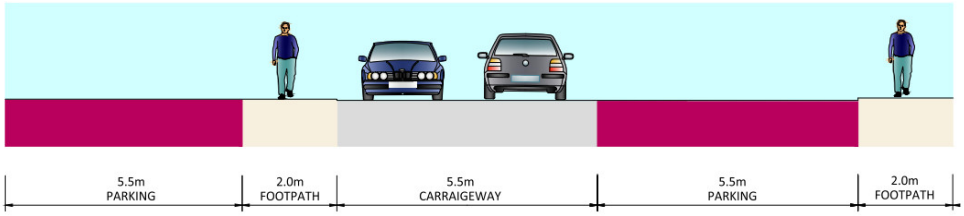


Figure 3-5 - Local Street Type 2

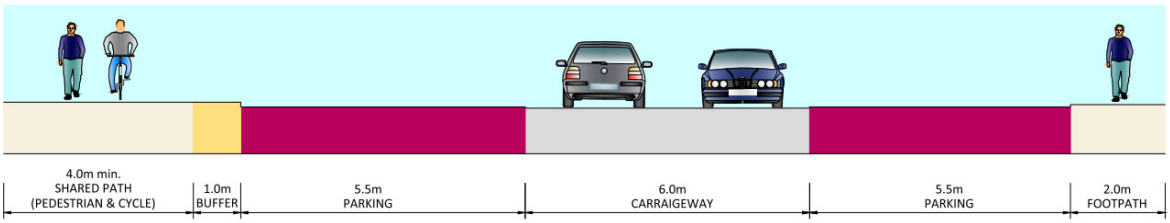
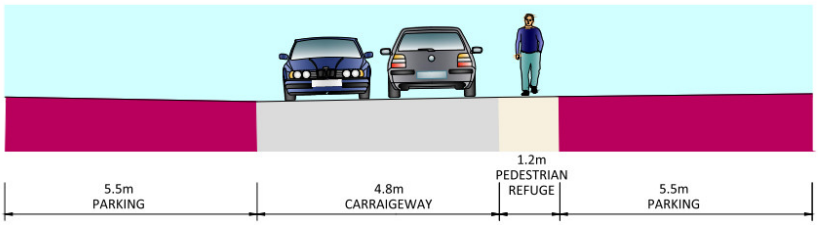


Figure 3-6 - Home Zone Street



3.6. Development Access Junction

In terms of vehicular traffic, the development will be served by a single access junction located along the site frontage on Dublin Road. The form of this junction has been carefully considered in terms of the requirements as follows:

1. Provision for the safe movement of all users with appropriate priority for the movement of pedestrians and cyclists.
2. Appropriate retention of existing trees and boundary wall along the Dublin Road frontage in accordance with Objective WB23 of the Local Area Plan
3. Provision of appropriate traffic carrying capacity at the junction

Objective WB23 of the Local Area Plan states:

> *"Seek to retain and enhance the sylvan character of the site boundaries for biodiversity and amenity value. Design of vehicular access to the new residential neighbourhood shall*

minimise the loss of mature trees and historic boundary wall along the Dublin Road, whilst meeting road safety standards. In accordance with the Landscape Strategy set out in Map 16, the landscape buffer along the Dublin road shall be between 20-30m wide to protect the sylvan character of the area".

Currently Dublin Road operates as a single lane carriageway with footpaths and narrow cycle lanes both sides as shown in Figure 3-7. Woodbrook Downs operates as a priority junction serving 13 residential units along a short cul-de-sac. The proposed development junction will form a four-arm junction incorporating the existing Woodbrook Downs junction, as illustrated in the Local Area Plan.

Figure 3-7 - R119 Dublin Road Existing Layout

In terms of the landscape buffer a minimum 20m width has been incorporated along Dublin Road wherein the building line has been set a minimum of 20m back from the existing boundary wall. There are currently of the order of 50 trees along the Dublin Road boundary and the 2.5m high stone boundary wall extends along the full site boundary except for one field entrance access.

In terms of the landscape buffer a minimum 20m width has been incorporated along Dublin Road wherein the building line has been set a minimum of 20m back from the existing boundary wall. junction layout options were developed and considered in consultation with both DLR and the NTA. In terms of the form of junction it was agreed that the appropriate form to be incorporated is a traffic signal-controlled junction. This form of junction is optimal in terms of delivering the three requirements as outlined above.

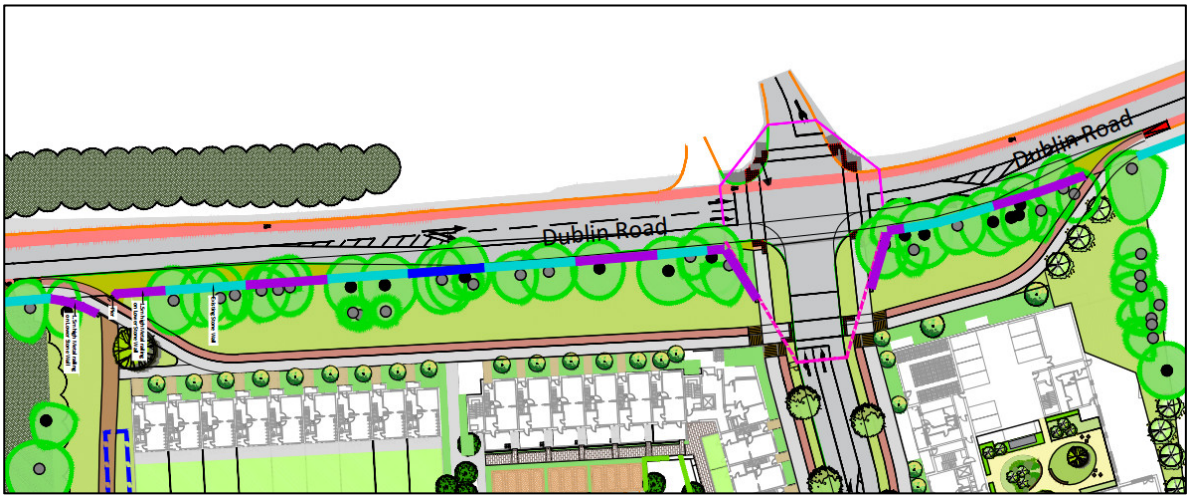
Three traffic signal-controlled junction layout options were developed and were subjected to traffic modelling analysis for the full development of the site masterplan. This analysis, as set out in the TTA, concluded that a right turn lane provision is required along Dublin Road and on the exit from the site in order to provide optimal operating conditions and capacity. The analysis concluded that all three junction layouts would provide adequate capacity in term so the impact of the full development of the subject lands and also the cumulative impact of the other planned development in the LAP lands incorporating residential development at Shanganagh Castle and leisure facilities within Shanganagh Park. The three options are detailed in the sections below.

3.6.1. Development Access Junction Option 1

Cycle tracks are incorporated on both sides of Dublin Road. In order to maintain the maximum number of trees along Dublin Road, the cycle track and footpath on the eastern side of the road are indented behind the existing boundary wall and adjacent to the building line and residential frontages of the proposed development. Cyclists are accommodated on segregated cycle tracks on both sides of the road as opposed to the current integrated cycle lane provision. The existing inline bus stop on the western side of the Dublin Road will be relocated further west away from the signalised junction, the relocated bus stop will be provided as an inline bus stop.

This is the preferred form of junction presented on the planning application drawing 5154251/HTR/DR/0100 and detailed in figure 3-8 below. It optimises the number of trees that can be retained, 34 in total, and minimises the impact on the existing historic boundary wall whilst affording appropriate facilitates for pedestrians and cyclists whilst also providing appropriate traffic carrying capacity with the incorporation of right turning lanes.

Figure 3-8 - R119 Dublin Road Development Access Junction Option 1

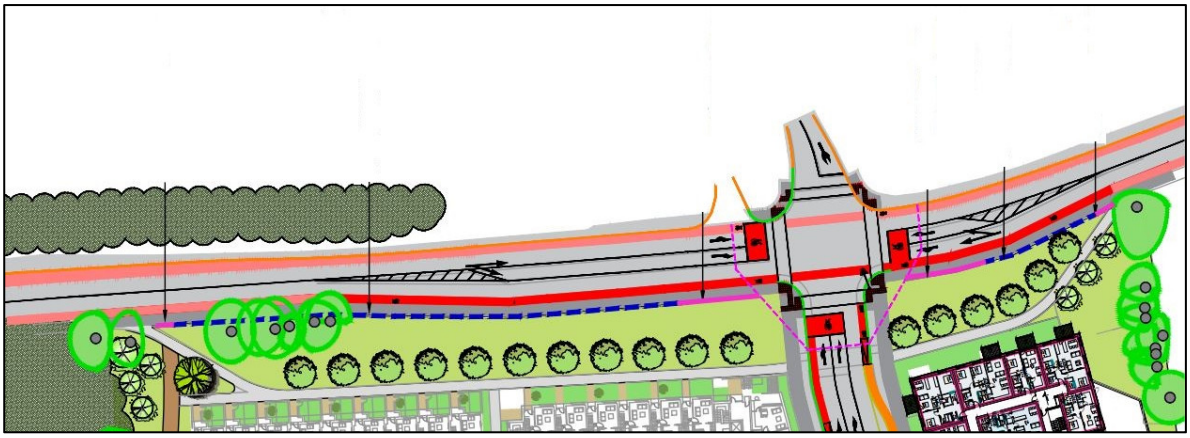


3.6.2. Development Access Junction Option 2

This option incorporated the cycle and footpath provision adjacent the road edge of Dublin Road. In order to facilitate this option, only 8No. trees would be retained along the site frontage along Dublin Road. The majority of the boundary wall would be removed and replaced with a new wall constructed from material salvaged from the existing wall. Similar to Option 1 this option also provides appropriate traffic carrying capacity with the incorporation of right turning lanes.

This loss of the existing mature trees and the impact on the existing wall determined that this layout was less preferable to Option 1 (i.e the Applicants proposal). However, the Applicant would defer to An Bord Plenála's opinion on the impact of the loss of trees and would accept a planning condition to accommodate Option 2 as the junction layout to be adopted. This option is detailed in figure 3-9 below.

Figure 3-9 - R119 Dublin Road Development Access Junction Option 2



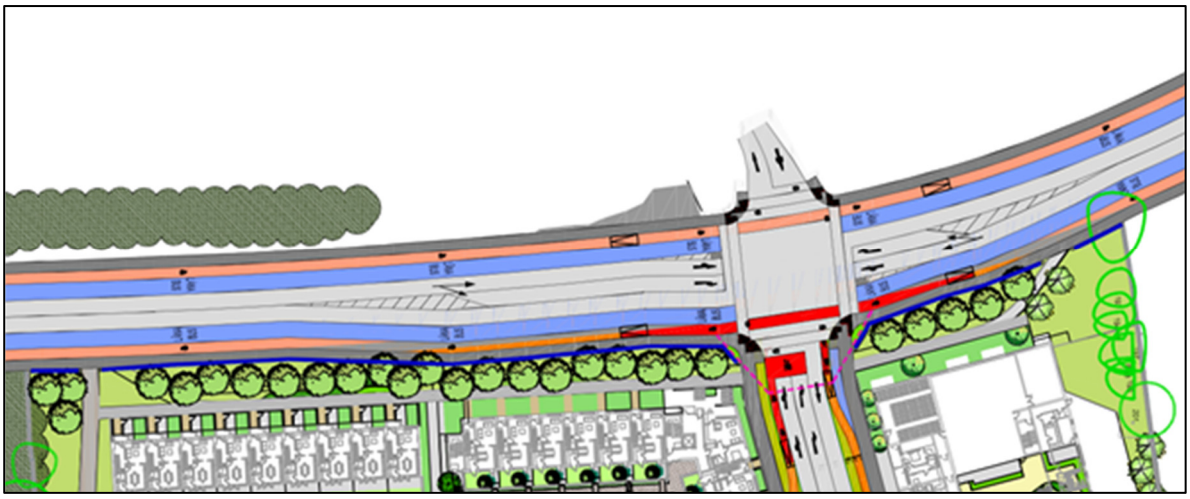
3.6.3. Development Access Junction Option 3: BusConnects

This option was developed in order demonstrate that the junction was future proofed to accommodate the development of the Bus Connects bus corridor along Dublin Road. The layout was developed based on the proposed layout for the bus corridor that was presented during the recent public consultation on this bus corridor. Therein the proposed development access was indicated. The BusConnects layout is presented purely for illustrative purposes and without prejudice to the ongoing consultation and design process for the bus corridor. However, DLR and the NTA have confirmed that the illustrated layout is appropriate in terms of the general layout and bus priority that would be afforded.

This layout would result in the loss of all existing trees along Dublin Road. The full extent of the existing boundary wall would be removed, and a new boundary wall would be formed, constructed from material salvaged from the existing wall. As such, this potential loss of trees and existing boundary wall would be addressed during the planning application stage of the Bus Connects project. This option is detailed in figure 3-10 below with further details provided on the BusConnects layout provided in Appendix B.

Note that this layout represents a worst-case scenario in that the entire land take has been taken from the eastern side (applicant lands) of the Old Dublin Road.

Figure 3-10 - R119 Dublin Road Development Access Junction Option 3: BusConnects



3.6.4. Signalised Junction Design Criteria

The signalised junction is designed in accordance with TII Document Ref DN-GEO-03044 - The Geometric Layout of Signal-Controlled Junctions and Signalised Roundabouts, 6.0m junction radii are incorporated into the design in accordance with DMURS as noted in Table 3-1. The junction approach gradient at the development access junctions is 2%. This is below the relaxed maximum approach gradient of 4% as detailed in TII Document Ref DN-GEO-03060.

3.7. Internal Junction Design

The design of the internal junctions included in this planning application are based on the proposed street typologies at their locations. In general, tight corner radii are proposed in order to reduce traffic speeds which, in turn, creates a safer urban environment for pedestrians and cyclists.

Internal junction radii as designed in accordance with the design criteria outlined in Table 3-1. Sight lines are to provide a visibility splay of 23m commensurate with a design speed of 30km/h at a setback of 2.4m for junctions on link streets (Woodbrook Avenue) and a visibility splay of 14m commensurate with a design speed of 20km/h at a setback of 2.4m for junctions between local streets & homezone streets and junctions between homezone streets and homezone streets.

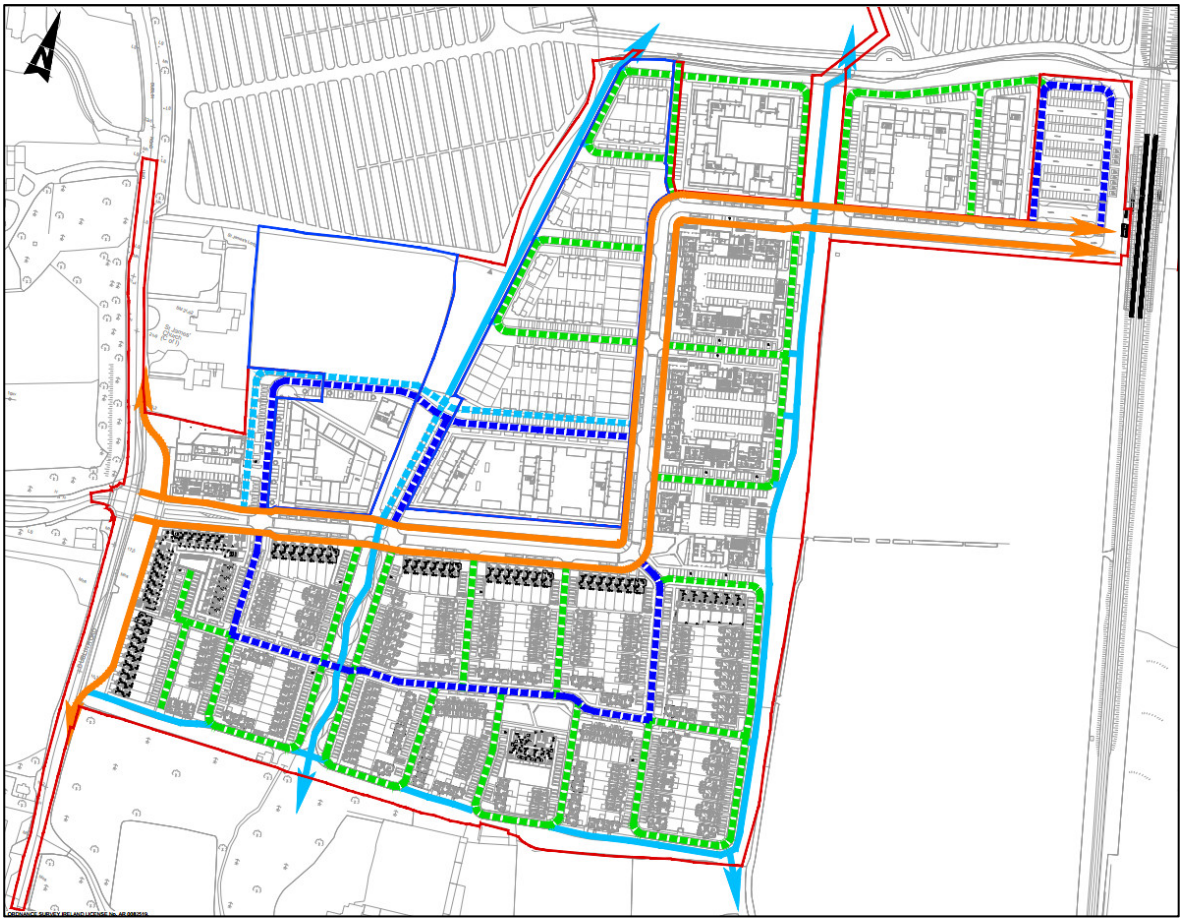
Vehicle swept path analysis has been carried out using the largest expected vehicle, 9m refuse vehicle, within the internal streets of the development. Due to the low traffic flow and speed on the internal streets the refuse vehicle can take up the entire junction while manoeuvring within the site. The vehicle swept path analysis is detailed on drawings 5154251/HTR/DR/0106 to 0110.

3.8. Pedestrian and Cyclist Facilities

The provision of high-quality pedestrian and cyclist facilities within the development is central to the design principles adopted in relation to the proposed development. As outlined above, the majority of the cyclist facilities will be on road facilities in line with the principles set out in DMURS.

In addition, pedestrian linkages through and around the proposed development have been considered in the context of desire lines, particularly in the context of facilitating connections to adjoining lands and onwards towards existing and proposed amenity lands to the north. This is detailed on the masterplan cycle provision in Figure 3-11 below and on drawing 5157801/HTR/SK/0003 provided in Appendix A.

Figure 3-11 - Masterplan Cycle Provision



Drop kerb crossings will be provided at the junctions on local streets and home zone streets throughout the site with raised table crossings provided on Woodbrook Avenue.

The use of raised table crossing points will have the benefit of providing both a convenient crossing point for pedestrians and cyclists and a traffic calming effect for traffic entering local and homezone streets.

The raised table crossing design is based on the recommendations in DMURS and the Traffic Management Guidelines.

3.9. DART Station Temporary Car Park

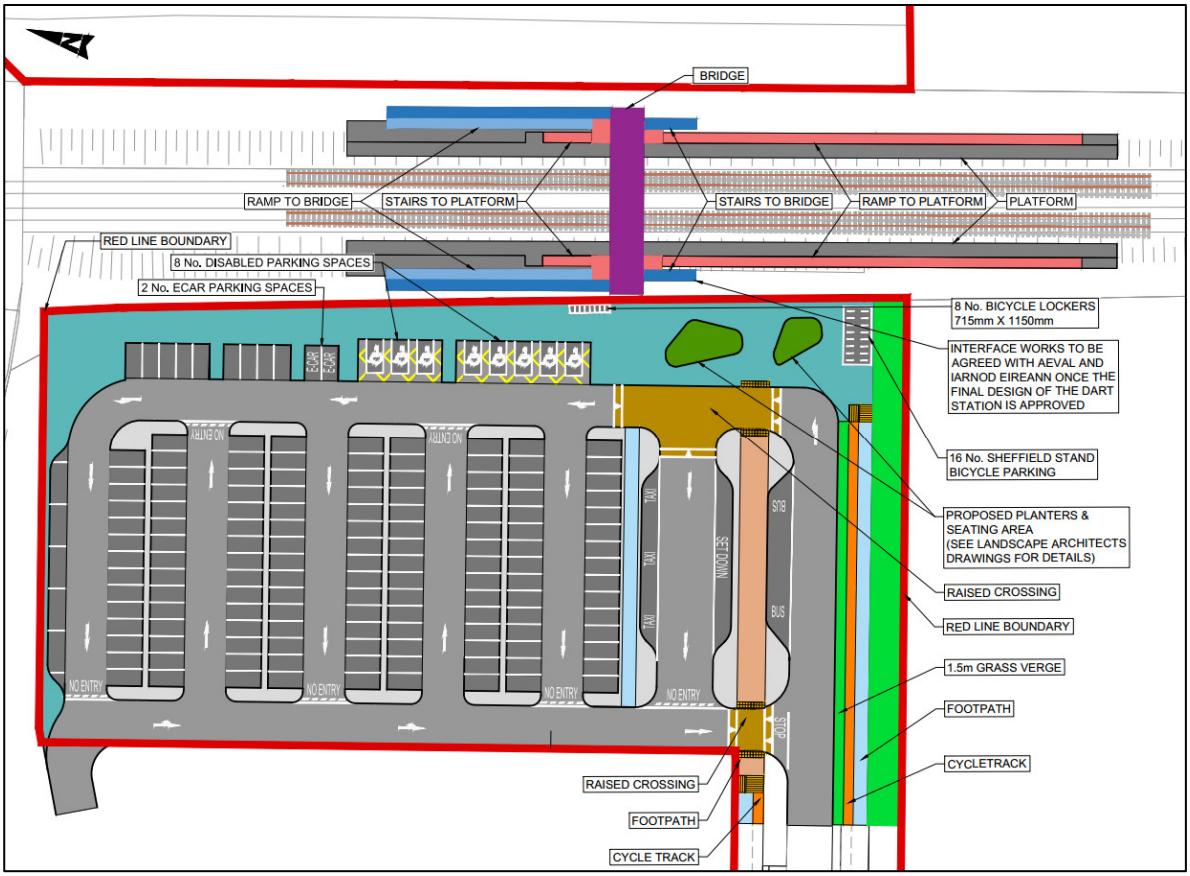
The phase 1 of development is proposed to include the DART station temporary car park which will be located adjacent to the proposed future Woodbrook Dart station. The layout has been developed in consultation with Irish Rail and taking cognisance of their draft DART station layout. The car park layout has been designed so as not to impede amendments to the DART station layout design when being progressed to preliminary design.

Section 3.4 of the Woodbrook - Shanganagh LAP 2017-2023 looks for the provision of a temporary surface car park facility accommodating 150-200 car parking spaces. The proposed design is detailed in Figure 3-12 below and on drawing 5154251/HTR/DR/0120 provides 164 car parking spaces and 24 bicycle parking spaces, the parking provision breakdown is as per below:

- 148 No. General Car Parking
- 8 No. Disabled Car Parking Spaces
- 2 No. ECAR Parking Spaces
- 3 No. Taxi Spaces

- 3 No. Set Down Space
- Bus Pick-up/Drop Off Area
- 16 No. Sheffield Stand Bicycle Parking
- 8 No. Bicycle Lockers

Figure 3-12 - DART Station Temporary Car Park



3.10. Residential Dwelling Car Parking Space Layout

The residential dwelling car parking spaces have been designed in accordance with Sections 8.2.4.6 & 8.2.4.9 of Dún Laoghaire Rathdown County Development Plan.

Residential dwelling car parking spaces that front onto local streets are provided at 5.5m deep to ensure that parked cars do not overhang onto the footpath.

Residential dwelling car parking spaces that front onto home zone streets are provided at 5.5m deep when fronting the carriageway to ensure that parked cars do not overhang onto the carriageway. When fronting the 1.2m pedestrian refuge strip of the home zone streets the parking spaces are provided at 5.0m, minor intrusion (i.e. parked vehicle) into this zone is acceptable as the homezone is a shared space where pedestrians and cyclists can utilise the full extents of the carriageway.

3.11. Emergency Access

In accordance with Sections 8.2.4.15 of Dún Laoghaire Rathdown County Development Plan an additional access for emergency use is required to be provided for developments of over 300 units.

An emergency access road link has been provided to Cemetery Road in Shanganagh Park as detailed on Drawing Ref: 5154251/HTR/DR/0100. This road link extends to the site boundary to

allow connections into the council lands. This road link has been designed to be incorporated into the future Woodbrook Phase 2 development.

3.12. Refuse, Delivery & Emergency Vehicles

Refuse collection and deliveries will be facilitated through the design of the streets to a design vehicle refuse truck. Refuse and delivery vehicles are facilitated via the looped local streets and looped home zone streets to remove the need for the vehicle to reverse on these streets thus mitigating potential conflicts with pedestrians and cyclists. This access is illustrated on the autotracking layouts contained within the engineering drawings. Deliveries will be appropriately accommodated by parking on street on the local and homezone streets which will carry low traffic volumes and wherein there is adequate space for other traffic to pass a delivery vehicle. The design incorporates appropriate access on all streets for fire tender and ambulance access.

3.13. Road Construction Details

The minimum road construction details are detailed below and on Drawing Ref: 5154251/HTR/DR/0301.

Link Street (Woodbrook Avenue)

- 40mm surface course - SMA 10 surf PMB 65/105-60 des to Clause 5.1.1
- 60mm binder course - AC 20 dense bin 40/60 des to Clause 3.1.4
- 100mm base course - AC 32 dense base 40/60 des to Clause 3.1.1
- 150mm sub-base course- Granular Material Type B to Clause 804
- Capping as Required

Local Street

- 40mm surface course - SMA 10 surf PMB 65/105-60 des to Clause 5.1.1
- 60mm binder course - AC 20 dense bin 40/60 des to Clause 3.1.4
- 100mm base course - AC 32 dense base 40/60 des to Clause 3.1.1
- 150mm sub-base course- Granular Material Type B to Clause 804
- Capping as Required

Homezone Street – Carriageway

- 40mm surface course - HRA 30/14 F surf 40/60 (14mm aggregate) to Series 900 Clause 4 with 20mm buff chippings in a clear binder pre-coat to Series 900 Clause 4.2.
- 60mm binder course - AC 20 dense bin 40/60 des to Clause 3.1.4
- 100mm base course - AC 32 dense base 40/60 des to Clause 3.1.1
- 150mm sub-base course - Granular Material Type B to Clause 804
- Capping as Required

Homezone Street – Parking/Footway Areas (Permeable)

- 60mm paving - PCC Modular Permeable Paving
- 50mm laying course - 6mm open graded (no fines) Gravel Material
- 200mm sub-base course - 10-20mm open angular Gravel Material
- Capping as Required

To reinforce the low speed environment a change in surface colour is proposed on raised junctions/crossings to alert drivers of the change in road layout ahead. A buff surface as per the Homezone Street above is proposed.

Footways will be concreted throughout the development as per the standard detail on Drawing Ref: 5154251/HTR/DR/0301.

4. Surface Water Drainage

4.1. Stormwater Drainage

In accordance with Dún Laoghaire Rathdown County Council Development Plan a Stormwater Impact Assessment Report has been carried out along with an independent Stormwater Audit. Refer to Atkins Stormwater Impact Assessment Report 5154251DG0011 for the details of the Storm Water elements associated with the proposed development at Lands at Woodbrook.

4.2. Flood Risk Assessment

A Flood Risk Assessment report has been undertaken to satisfy the requirements of the Planning System and Flood Risk Management Guidelines. Refer to Atkins Flood Risk Assessment Report 5154251DG0003 for the proposed development at Lands at Woodbrook.

5. Foul Water Drainage

5.1. Existing Foul Water Drainage

A pre-connection application form was issued to Irish Water (IW) in December 2017. IW records indicated that the nearest substantial foul drainage network is located within St Anne's Park Development located circa 700m from the Northern boundary of the proposed Woodbrook Development. Refer to Appendix C for a copy of the IW Pre-Connection Enquiry (PCE) form.

IW issued a Confirmation of Feasibility (COF) letter on the 16th of July 2018 which stated that "based upon the details you have provided with your pre-connection enquiry and on the capacity currently available as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place and the conditions listed below, your proposed connection to the Irish Water network can be facilitated".

Refer to Appendix D for details of the COF letter from IW. It is noted that the COF letter was issued based on 435 residential units. Atkins confirmed at pre application stage with An Bord Pleanála (ABP) that a revised COF letter would not be required due to the uplift in residential unit numbers prior to our pre-planning engagement with ABP in December 2018.

5.2. Proposed Development Foul Water Drainage and Pumping Station

Several meetings between Irish Water and Atkins have taken place regarding the foul water drainage proposals. Through discussions it was agreed that due to existing site levels a foul gravity system for the entire Shanganagh – Woodbrook Local Area Plan (LAP) was not feasible. As outlined in the COF letter and the IW Shanganagh – Bray Drainage Area Plan (DAP) catchment study a Pumping Station (PS) would be required to be located at the lowest contour level within the Woodbrook lands. The lowest level and most suitable location for a proposed PS was identified at the Southern Boundary of the Woodbrook Development.

The agreed proposal with IW is to provide a 2-stage solution for the PS and rising main. The Interim solution that is being proposed as part of this planning application will deliver a pumping station and rising main discharging to St Anne's Park Development. The Interim solution will cater for;

- Woodbrook Development Phase 1, including a crèche (to which this application applies)
- Shanganagh Park Development by DLRCC
- Shanganagh Crematorium, Sports Hall and Café by DLRCC

IW have confirmed that the interim solution as outlined above is feasible for the proposed unit numbers as outlined in the Atkins Foul Pumping Station and Rising Main report 5154251DG0053.

The permanent solution is for IW to provide a rising main from an agreed connection point location within the existing Shanganagh Park to the existing Shanganagh Waste Water Treatment Plant (WWTP). IW confirmed that the existing WWTP has the capacity to cater for the foul loadings from the LAP lands. The permanent solution will cater for the foul loadings from the interim solution as indicated above and the future development;

- Woodbrook Development Phase 2
- Retail Units
- School Site

Refer to the Atkins Foul Pumping Station and Rising Main report 5154251DG0053 for further information. This report, which was issued and agreed with IW prior to this submission, outlines the PS design philosophy, specification and pump selection.

5.3. Proposed Development Foul Water Network

The Foul Water Network has been designed in accordance with the IW Code of Practice for Wastewater Infrastructure 'IW-CDS-5030-03' and Standard Construction Details 'IW-CDS-5030-01'.

Each property will have a separate waste water connection in accordance with IW requirements.

The proposed foul drainage layouts are indicated on drawings 5154251 / EWE / DR / 0521 - 0527 with corresponding longitudinal sections indicated on drawing 5154251 / EWE / DR / 0530 – 532.

Foul loading calculations were issued to IW as part of the Foul Pumping Station and Rising Main report 5154251DG0053. The final planning design estimated foul flows that will be generated from the proposed Woodbrook Development Phase 1 are indicated in Table 5-1 below.

Table 5-1 - Foul Water Flow

Description	No. of Units	Volume	Total Discharge l/d
Dwellings	685	405 l/dwelling/d * 685	277,425 l/d
Crèche (circa 500m^2)	3.5m^2/child 500 / 3.5 = 142 children	40/l/p/d * 142	5,680 l/d
		Total	283,105 l/d

Calculation of Proposed Peak Foul Flow	
Total Daily Discharge	283,105 l/d
Dry Weather Flow (DWF)	3.276 l/s
Peak Foul Flow (6 x DWF)	**19.66 l/s**

The foul drainage network for the Woodbrook Development Phase 1 has been designed based upon the criteria set out above.

In consultation with DLRCC and their designers the foul drainage network has also been designed to cater for future flows from the Woodbrook Development Phase 2, Shanganagh Park Development, Crematorium, Sports Hall, Café and School. A blind manhole at the northern boundary of the Woodbrook lands 5154251 / EWE / DR / 0523 has been provided with agreed invert level to allow for connection from the Shanganagh lands network into the Woodbrook Development.

As agreed with both IW and DLRCC a 20% uplift to residential unit numbers at both Woodbrook and Shanganagh Castle Lands has been applied to the Woodbrook Foul network design as headroom for any potential increase in residential density in order to future-proof this foul infrastructure investment.

The proposed foul drainage layouts are indicated on drawings 5154251 / EWE / DR / 0521 – 0527. The drawings display the foul drainage network for the Woodbrook Phase 1 development (to which this application applies) and the future Phase 2 development to which planning will be sought at a later stage. The entire network has been designed and displayed on the planning drawings to ensure adequate capacity and connectivity within the proposed foul system.

"Micro Drainage" which is an industry standard tool for design and assessment of gravity sewer drainage networks has been used to simulate the proposed network. A full clash detection was also carried out with the proposed storm drainage layout. Refer to Appendix E for a copy of the Foul Drainage Network Details

The proposed foul drainage network for the development was designed in compliance with IW Code of Practice for Wastewater Infrastructure IW-CDS-5030-03, Standard Details IW-CDS-5030-01 and with the key design parameters in Table 5-2 below.

Table 5-2 - Key Design Parameters

Parameter	Value/Requirement
Minimum depth*	1.2 m cover roads 0.9 m open space
Minimum sewer size	150 mm
Roughness	1.5 mm
Max. velocity at pipe full	3.0 m/s
Min. velocity at pipe half full	1.0 m/s (gradient requirements below have been utilised where minimum velocity is not achievable)
Gradient - 3 or more contributing dwelling	1 in 150 minimum
Gradient - 2 contributing dwelling	1 in 80 minimum
Gradient - 1 contributing dwelling	1 in 40 minimum

** Without recourse to concrete. Absolute minimum cover in roads is 0.9m. Pipes with cover between 0.9m and 1.2m shall be bedded and surrounded in concrete, 150mm thick, Class E, in accordance with IW requirements.*

In accordance with IW requirements the planning design drawings were issued and reviewed by IW Connection and Developer Services (CDS) in advance of making the planning application. The Statement of Design Acceptance was issued by IW on 2nd of October 2019. Refer to Appendix F for the Statement of Design Acceptance.

5.4. Golf Course Foul Water Drainage

It is noted that there are no foul water drainage requirements associated with the proposed 2No. new golf holes. The 2No. new golf holes will not increase the foul loading from the existing golf course club house as they are replacing 2No. existing golf holes.

6. Potable Water Supply

6.1. Existing Water Supply

A pre-connection application form was issued to Irish Water (IW) in December 2017. IW records indicate existing 6" watermains along the Dublin Road R119 as indicated on drawing 5154251 / EWE / DR / 0441. Refer to Appendix C for a copy of the IW Pre-connection Form.

Through discussions with IW it was determined that the existing 6" watermains would not be sufficient to supply the proposed Woodbrook Development.

On the 16th of July 2018 IW issued a confirmation of feasibility (COF) letter on the which stated that *"An Irish Water Network Extension Project is programmed for completion in Q4 2019, which will facilitate connection of 435 units. The applicant will need to connect to the 250mm diameter extended pipeline"*

Refer to Appendix D for details of the COF letter from IW. It is noted that the COF letter was issued based on 435 residential units. Atkins confirmed at pre application stage with An Bord Pleanála (ABP) that a revised COF letter would not be required due to the uplift in residential unit numbers prior to our pre-planning engagement with ABP in December 2018.

6.2. Proposed Potable Water Supply

The potable water supply for the site has been designed in accordance with the Irish Water Code of Practice for Water Infrastructure 'IW-CDS-5020-03' and Standard Construction Details 'IW-CDS-5020-01'.

The proposed water supply layouts are indicated on drawings 5157801 / EWE / DR / 0441 - 0446.

The drawings display the water supply layouts for the Woodbrook Phase 1 development (to which this application applies) and the future Phase 2 development to which planning will be sought at a later stage. The entire water supply network has been designed and displayed on the planning drawings to ensure adequate supply and connectivity within the proposed potable water system.

The proposed watermain will connect into the new IW 250mm diameter watermain located circa 250m to the north of the proposed site entrance as indicated on drawing 5157801 / EWE / DR / 0441. The proposed watermain will be a 250mm diameter PE pipe at the site and reduced throughout the site in accordance with density demand requirements. A minimum pipe size of 100mm diameter PE pipe has been designed for branches connections.

Each dwelling will have its own separate supply off the proposed watermain along with a boundary box in accordance with IW standard construction details. For the proposed apartment blocks and crèche building a manifold chamber will be used in accordance with IW- CDS-5020-03 section 3.14.

In line Fire Hydrants will be located on the watermains in accordance with IW standard construction details and "2006 Building Regulations" (Part B Fire Safety), the system has been designed so that no Fire Hydrant is greater than 46m from any building.

In accordance with IW requirements the planning design drawings were issued and reviewed by IW Connection and Developer Services (CDS) in advance of making the planning application. The Statement of Design Acceptance was issued by IW on 2nd of October 2019. Refer to Appendix F for the Statement of Design Acceptance.

6.3. Water Demand Calculations

Initial water demand calculations were issued to IW as part of the pre-connection application. The final planning design estimated water demand that will be generated from the proposed development are indicated in Table 6-1 below.

Table 6-1 - Water Demand Calculations

Description	No. of Units	Volume	Total demand
Dwellings	685	685 * 405 l/d/p = 277,425 l/d Peak week = 3.21 l/s * 1.25 4.01 l/s Peak demand = 3.21 l/s * 2.1 6.74 l/s	3.21 l/s 4.01l/s 6.74 l/s
Crèche	142 Children	40 l/p/d * 42 5,680 l/d	0.06l/s
		Total Average flow	3.21 + 0.06 = 6.48 l/s

6.4. Golf Course Water Demand

It is noted that there are no potable water requirements associated with the proposed 2No. new golf holes. The existing irrigation system is supplied from an onsite well which is owned and managed by Woodbrook Golf Club.

The 2No. new golf holes will not increase the demand from the existing well as they are replacing 2No. existing golf holes.

7. Public Lighting Design

This section outlines the proposed public lighting schemes for the proposed phase 1 residential development on lands at R119 Dublin Road, Woodbrook Phase 1. The public lighting system will be a very high quality, energy efficiency and future proofed road lighting for private development in compliance with Dún Laoghaire-Rathdown County Council (DLRCC).

7.1. Public Lighting Standards

Each category of roads, footpath, cycle track of the site development will be designed to its own specific requirements, illuminance level and uniformity to meet the lighting class for each area.

All works will comply with the latest editions of the relevant standards, in particular the works shall be designed to take full account of:

- BS EN 13201 part 2 – Road Lighting Performance requirements.
- BS EN 13201 Part 3 – Road Lighting Details calculation of performance.
- BS EN 13201 Part 4 – Details methods of measuring light performance.
- The Current British Standards for Road Lighting are BS 5489 and BS EN 13201.
- BS EN 60529 - Specification for Degrees of Protection for enclosures.
- BS EN 60598-2-3 - Luminaires for Road and Street Lighting.
- BS 5489 -1 - Code of Practice for the design of road lighting.
- BS EN ISO 1461 Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods.
- IS EN 40-1 – Lighting Columns (Definitions and terms).
- IS EN 40-2- Lighting Columns (General requirements and dimensions).
- IS EN 40-3 - Lighting Columns (Design and verification and Verification by testing).
- IS EN 40-5 - Lighting Columns (Requirements for steel lighting columns).
- Roads Act, 1993. Road Traffic Act, 1994.
- Safety, Health and Welfare at Work Act 2005.
- Safety, Health and Welfare at Work Construction Regulations 2013.
- Building Control Act 2007.
- Road Traffic (Control of Traffic) Regulations 2006.
- ET 101 - National Rules for Electrical Installations published by ETCI.
- ET 211 - Code of Practice for Public Lighting Installations in Residential Areas published by ETCI.
- BS 7671 - Requirements for Electrical Installations.

Where a design standard has been revised, the latest edition will apply to all new lighting design / and installation.

7.2. Health & Safety

The attention of the Designer / Developer will be drawn to the obligations arising under the Safety, Health and Welfare at Work Act 2005 or latest approved version such as:

- Safety, Health and Welfare at Work (General Application) Regulations 2007 to 2012 or latest approved version.
- Safety, Health and Welfare at Work (Construction) regulations 2013 or latest approved version.

Account will be taken of any traffic management measures that may be required during the installation of public lighting schemes including compliance with Chapter 8 of the Traffic Signals Manual published by the Department of Transport.

7.3. General Public Lighting Design Requirement:

The site development public lighting installations will be designed by a competent public lighting engineer who has successfully completed the Institution of Lighting Professionals (ILP) Diploma in Exterior Lighting and is an active member of the Institution of Lighting Professionals, and as accepted by the DLRCC, to ensure that best practice is applied in the external lighting design of this residential development. This will include the requirement that public lighting schemes considers from junctions and traffic (both Pedestrian and Vehicular) conflict areas back i.e. T-junctions, pedestrian crossings, public and private car parking, etc.

All new systems of public lighting of a new development will be designed and installed in accordance with the requirements and as accepted by the DLRCC.

The overall lighting requirements for a specific area will be identified within the British and European design code. This will then be expanded and refined to take account of an area's unique character and needs in terms of vehicular/ pedestrian activity, location of local amenities, etc by the design brief. However, generally the requirements of the specific design code as stated above in Public Lighting Standards will be met.

As a general rule, new luminaires will be of LED technology source although consideration to alternative light sources (particularly for the purposes of floodlighting) will be given where appropriate. Whether there may be situations in popular locations used heavily at night a higher level of illumination will be anticipated. For particularly sensitive vicinity locations it will be recommended to arrange for trial installations to demonstrate the effectiveness of the lighting and its impact on surrounding areas. All luminaires will be manufactured to a minimum of IP 66 to BS EN 60590 for the lamp containment area and should be manufactured from vandal-resistant material. Lanterns will be designed and tested to provide a minimum normal operating life of 25years.

Construction of lighting columns and luminaire specifications shall comply with DLRCC Public Lighting Installations in Residential and Industrial Areas Guideline Document.

Lighting control and installation details shall also comply with the above document.

In determining levels of illumination, lighting positions and styles, the design brief will consider pedestrian and vehicular uses/needs in relation to the following:

- Areas of activity - Shops, School entrances, Creche entrance, bus stops (where appropriate), paths, etc and areas of conflict (junctions, etc).
- Building heights.
- Street features - crossing points, sitting areas, tree planting, pinch-points, materials / colours, etc.
- Ground form levels (important to people with disabilities), hazards, etc. Local knowledge, incidence of vandalism, accident black spots, etc.

7.3.1. Obtrusive Lighting

Considerations will be given to the restriction of obtrusive light by:

- The control of the type of light source Restricting the level of light emitted by the luminaire at high angles usually between 70 and 90 degrees.
- The use of full horizontal cut off luminaires for mounting heights above 6m will have a substantial effect on restricting obtrusive light. Similarly, the use of shallow bowl luminaires for mounting heights of 6m or less will help to reduce the overall level of obtrusive light produced by road lighting installations, but may add to the numbers of lighting units required

Special consideration will be given to the effect of lighting on adjacent areas used by other means of transport such as: Railways, harbours and adjacent unlit traffic routes and car parks. Also, careful consideration will be given to the design, installation, and maintenance of any lighting systems adjacent to the site to reduce the risk of damaging the night sight of the transport operators or reducing the visibility of signalling equipment.

The lighting scheme will also be developed to minimise the disruption to Bats by the following factors:

- Only illuminating what needs to be illuminated – light directed to the path only.
- Reducing night time light levels.
- Confirmation of Bat fly over areas and reducing the height of the luminaires.
- Shielding of Luminaires and Light
- Type of Light – Warmer colour temperature (3000k)
- Lighting Controls - The peak time for feeding for Bats is dusk. This is when they exit the Roost to go foraging. If the lighting was switched off for this period, or at lower light output, this would benefit the Bats. In addition, the lighting could be controlled by occupancy/motion sensors so that it would remain off/low if there was no pedestrian traffic nearby.

7.4. Lighting Classes Proposed

The lighting classes assigned to the various locations within the development are outlined below and detailed in the public lighting report provided in Appendix G.

7.4.1. The Residential Areas

Residential areas will be designed using an 'P4' illuminance class derived from BS EN 13201. General street lighting will be installed on 6m columns.

7.4.2. Car Parks

Car parks are to be lit in accordance with BS5489-1:2013, recommendation as outlined in the CIBSE Lighting Guide and 'Secure by Design' guidance. The maintained illuminance level for the Car Park is proposed 20 lux. Car park luminaires will be installed on 8m columns.

Group switching of car park lighting will be facilitated via an astro-timer and photocell and a suitably rated contactor located within a dedicated feeder pillar.

7.4.3. Pedestrian Crossings

Pedestrian crossings will be lit in accordance with BS5489-1:2013 and ILP Technical Report 12.

The maintained illuminance level for the pedestrian crossing is proposed as follows:

- Average vertical illuminance on this axis of pedestrian crossing at a height of 1m: Ev ≥ 40 lux
- Uniformity of vertical illuminance on lane in front of the driver (Ev min/Ev av): 0.20
- Average horizontal illuminance on pedestrian crossing at ground level: Eh ≥ 80 lux
- Uniformity of horizontal illuminance (Eh min/Eh av): 0.30

Traffic route lighting and lighting of residential estates will be powered by landlord boards.

7.4.4. Cycleways

Cycleways will be lit in accordance with BS5489-1:2013 and BSEN 13201-2. Lighting columns positioned on cycleways will be set back a minimum of 0.5m to avoid contact with handlebars. Where the cycleway cannot be accessed by an elevated platform, raising and lowering columns will be installed. Raising and lowering columns shall be orientated so that the lantern head can be lowered safely without obstruction and, when in its collapsed position, shall not cause an obstruction to road users and pedestrians.

7.5. Trees & Arboriculture

Trees and other vegetation will not impede the functions of public lighting units. A separation of 5 metres between the lighting column and the outside of the crown will be allowed for the lighting to work as designed. Trees or vegetation will not be planted within 7 metres of a public light column.

The design will take into consideration the layout of the proposed public lighting column locations and the proposed landscape design. Both layouts will be coordinated to achieve the 7 metres separation between all trees and public lighting columns.

7.6. Public Lighting Layout

The public lighting layout is detailed in the public lighting report provided in Appendix G and on drawings 5154251/MEP/DR/1301 to 1305.

7.7. Access Chambers

Where appropriate, the access chambers for the site will be selected as per the table below standards:

Table 7-1 - Chamber Type Description

Item	Chamber Type	Chamber Description
01	Large Inspection Chambers	All access chamber covers on the footpath to cater for a change of direction are proposed to be ductile iron with galvanized steel frame with frame opening 615mm x 615 mm to EN 124 B125 marked “Public Lighting” or “Traffic” with M16 stainless steel locking bolt
02	Medium Inspection Chambers	Access chamber covers on the footpath for straight through services are proposed to be ductile iron with galvanized steel frame with frame opening 720mm x 260 mm to EN 124 B125 marked “Public Lighting” or “Traffic” with M16 stainless steel locking bolt.
03	Small Inspection Chambers	Access chamber covers on the footpath for column connections shall be ductile iron with galvanized steel frame with frame opening 385mm x 260 mm to EN 124 B125 marked “Public Lighting” or “Traffic” with M16 stainless steel locking bolt or similar approved

8. Existing Utility Infrastructure

8.1. Identification of Utilities

A desk study of records from various utility companies was undertaken. The following utility holders were contacted, and records obtained / converted into digital format:

- Irish Water (Foul and Watermain)
- ESB
- Gas Networks Ireland (Transmission)
- Gas Networks Ireland (Distribution)
- Virgin Media
- BT
- Eir
- eNet
- Aurora

These utilities are detailed on drawing references 5154251/EWE/DR/1530 to 5154251/EWE/DR/1536.

During the construction phases of the project, realignment, upgrade and replacement of services and utilities will be required in conjunction with and to accommodate the proposed works. These works will include:

- Minor utility diversions in the region of the proposed junction with the Old Dublin Road
- Provision of new services to provide connections to the proposed development.

There is currently a Medium Voltage overhead cable running through the site. Liaison with the ESB will occur before the design process to discuss the relocation of this overhead line.

9. Proposed Utilities

This section outlines the proposed MEP utilities schemes for the proposed phase 1 residential development on lands at R119 Dublin Road, Woodbrook Phase 1. The Gas, Electricity and IT communications system will be designed and installed to the current guidelines.

9.1. Standards

All works will comply with the latest editions of the relevant standards, in particular the works shall be designed to take full account of:

- Safety, Health and Welfare at Work Act 2005.
- Safety, Health and Welfare at Work Construction Regulations 2013.
- National Rules for Electrical Installations 4th Edition ET 101: 2008, including amendments, published by the Electro-Technical Council of Ireland (ETCI).
- Code of Practice for the Design, Selection and Erection of LV Switchboards for Residential Applications: ET 208: 2000 published by the ETCI.
- Code of Practice for Customer Interface, current edition published by ESB Networks (ESBN).
- ELECTRICAL SERVICES GUIDEBOOK – Housing Schemes, current edition published by ESB Networks.
- The Building Regulations published by the Department of Environment, Heritage and Local Government (DOEHLG).
- Code of Practice for Avoiding Danger from Underground Services published by the Health and Safety Authority (H.S.A.).
- Criteria document Cer/08/071 and any other requirements specified by the Commission for Energy Regulation (CER).
- BS 7671 - Requirements for Electrical Installations.

Where a design standard has been revised, the latest edition will apply to all new lighting design / and installation.

9.2. Electrical Infrastructure Preliminary Information (Phase 1)

9.2.1. Primary Electrical Services

The total site electrical load is to be supplied by ESB Networks with a maximum estimated demand load of in the range of 3.2MW for Phase 1 and an additional estimated load of 2.5MW for Phase 2 and the new substations will be built for the 10-kV supply. In the power supply configuration to the Main board form the 10-kV substation.

It is proposed that a new power supply will be provided by the ESBN at 10kV in a ring main loop configuration, so that either side of the loop feed can be loaded to carry twice the load in the event there is a fault on either side of the loop. This supply will be run underground from the site boundary to the dedicated MVA transformer.

New switchgear will be provided for each block apartment buildings which will include new four switch 10kV switchgear and it is proposed to be located in a new main electrical room adjacent MV substation, both located in the Ground Floor. The new 10kV/400V 3 phase transformer will be provided and will be set up as a double ended switchboard configuration with normally open tie breaker. The 400-Volt switchboard will be rated based on the final building load design.

A new power supply at LV will be taken from the new main switchboard to serve all power requirements, including tenants and Landlord's. All switchgears, main distribution and sub-distribution boards will be metal clad pattern generally located in dedicated cubicles and confirmed to local Standards.

The main MV power cable will be buried in ducts or direct buried and the LV power cable for the buildings will be specified as multicore XLPE/SWA/PVC and run on the surface/cable ladder/tray.

Final run-outs to terminals will be PVC cable encased in galvanized metal conduit/trunking to meet Irish standards. The electricity supply to each dwelling via standard ESB Networks standard LV minipillars scattered around the site.

Clarification:

The total estimated power electrical load for the phase 1 development have been based on BSRIA / Rules of Thumb Guidelines for building services (5th Edition) - CIBSE / Energy Benchmarks.

- A figure of 84(W/m²) is allowed for landlord areas. The figure is expressed in W/m² NIA, based on a net to gross ratio of 80% and mechanical power for plantrooms requirements (Rules of thumbs 5th edition / Energy Benchmarks).
- Predicting Electrical Future Load Growth - 10% power load growth factor is considered regarding future power expansion for the building associated with Building expansion and function of the building or facilities and Equipment technology within the building.
- Renewable Energy (Solar PV) - Based on the area available 28kWp (peak output) is estimated the total electrical load.
- Rule of Thumb - Flats / Apartments 80(w/m2) electrical load. Note, Flat or apartment 3kw is employed with gas cooking heating.
- Rule of Thumb - House 5.5kW per house. Note, this figure is for houses with 3 or 4 bedrooms with gas central heating. For housing estate, a coincident diversity may be applied.

9.3. Nearly Zero Energy Building (NZEB)

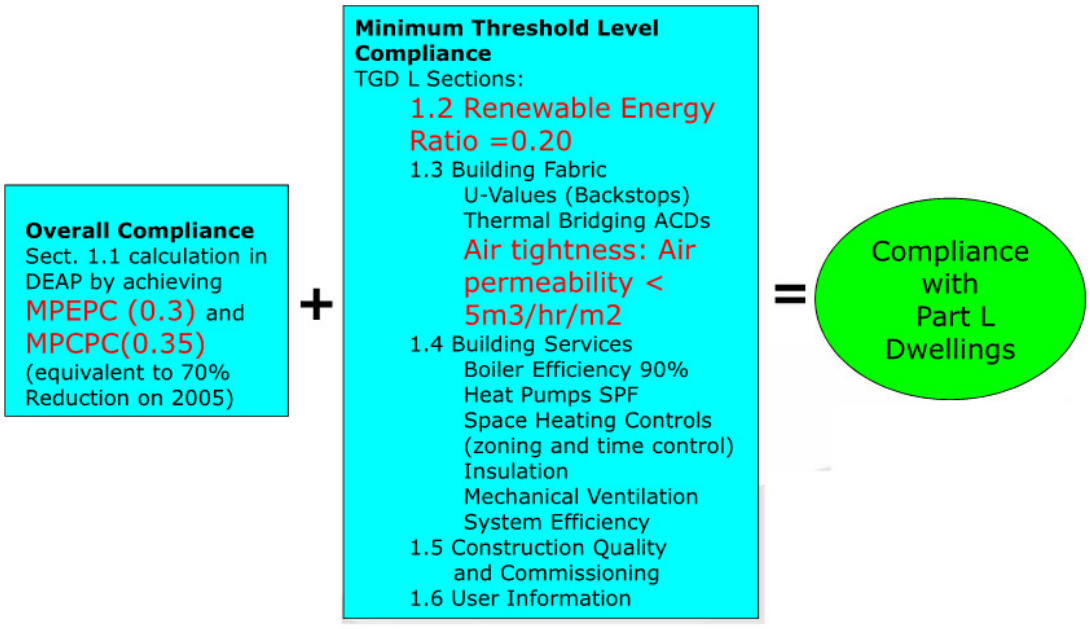
The NZEB standard will apply to all buildings owned and occupied as refer to Department of Housing, Planning and Local Government and as per the building regulations and DEAP methodology. This will be equivalent to a 25% improvement in energy performance on the 2011 Building Regulations.

The key to Part L for NZEB compliance will include a Maximum Energy Performance Coefficient of 0.3, a Maximum Carbon Performance of 0.35 and a renewable Energy Ratio of 20%.

The cost optimal level is a primary energy performance of less than 125 kWh/m2/yr (B2 BER) when calculated using DEAP or upgrade of roof insulation and heating system. The nearly zero or very low amount of energy required will be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby.

Proposed minimum threshold level compliance achieved with TGD L Dwellings as indicated below:

Figure 9-1 - Minimum Threshold Level Compliance



The design for the dwellings and apartments will include:

- PV Solar
- LED lighting accounted for in DEAP (A+ bulbs, 94 lumen/cW, 4 W/m2)
- Efficient hot water uses in showers/taps accounted for in DEAP (125 l/p/d and 6l/min flow restrictor)
- Heat pumps

9.4. Gas Infrastructure

This section outlines the proposed gas supply schemes for the phase 1 residential development on lands at R119 Dublin Road, Woodbrook Phase 1. The gas system will be designed and installed in accordance with the current guidelines, standards and industry regulations.

9.4.1. Standards

All works will comply with the latest editions of the relevant standards, in particular the works shall be designed to take full account of:

General

- Safety, Health and Welfare at Work Act 2005.
- Safety, Health and Welfare at Work Construction Regulations 2013.

For gas and main services

- Code of Practise for Gas Distribution Mains I.S. 329
- Installation of Gas Service Pipes I.S. 265
- Gas Infrastructure – Pipelines for maximum operating pressure up to and including 16 bar SR 12007-5
- Gas Supply Systems – Natural Gas Measuring Stations I.S. EN 1776
- Gas Pressure Testing, Commissioning and Decommissioning Procedures I.S. EN 12327#
- Gas infrastructure - Gas installation pipework I.S./ EN15001-2
- Gas Pressure Regulating Stations for Distribution I.S 821

For downstream of the meter

- Domestic Gas Installations I.S. 813
- Non-Domestic Gas Installations I.S. 820

9.4.2. Existing Situation

On the south-east of the proposed phase 1 residential development, the existing 250mm medium pressure gas pipe (4bar) of polyethylene material located on the right side of the railway, crosses the railway lines with a pipework having a diameter of 125mm. The pipework reduces to a 63mm diameter to feed the existing Woodbrook Golf course.

9.4.3. Proposed solution

As indicated by IGN, the project new gas network will connect from the same point with a medium pressure gas line having a diameter of 125mm. The 125mm diameter pipe will cross the project on the main access road towards old Dublin road. From the main medium pressure gas line, branches with a 90mm diameter will be used to supply the consumer points. A distance of 3mtr needs to be maintained between the medium pressure line and the residential spaces. Where this distance can't be kept a gas regulator will be used to drop the pressure to a low pressure.

9.4.4. Preliminary Total Estimated Gas Load

The residential development is split in two phases with a total gas load of 20MW (1870m^3/h). Phase one has a load of 12MW whereas phase two has a load of 8.6MW.

A detailed description of the gas load for each phase and building type is included in the below schedules:

The total estimated gas load for the development were based: -

- BSRIA / Rules of Thumb Guidelines for building services (5th Edition) - CIBSE / Energy Benchmarks are used to determine estimated total electrical load requirements.

9.4.5. Metering Strategy

- Multi Occupancy Dwellings - The meters supplying the units will be located within the building.
- Single Occupancy Dwellings - The meters supplying the dwelling will be located outside the building

9.5. E-Car Charging Provision

Electric Car (E-Car) charging points are provided in accordance with Section 8.2.4.12 (Electrically Operated Vehicles) of the Dún Laoghaire-Rathdown County Development Plan 2016-2022 which states the following:

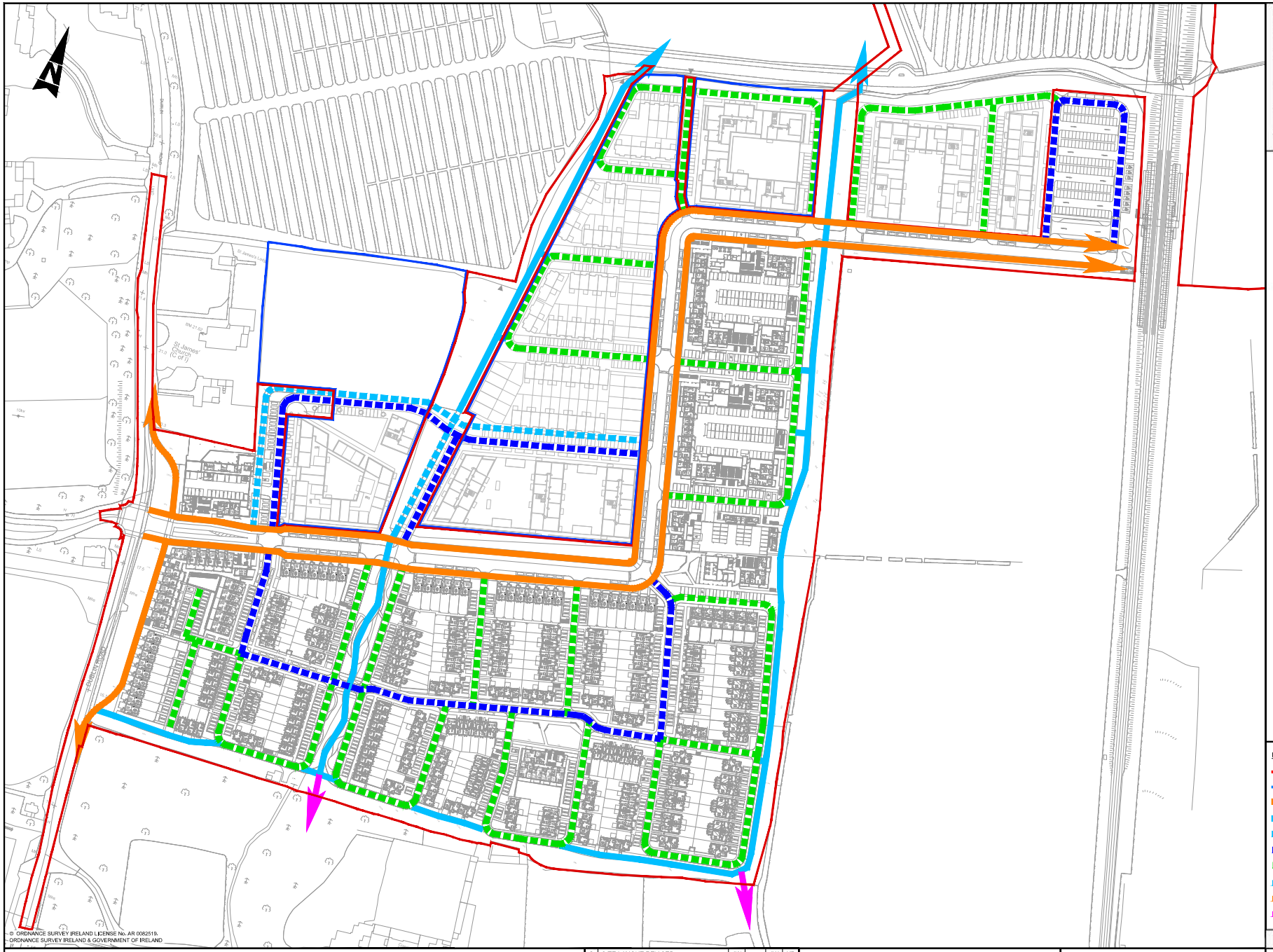
> *"Residential developments (with private car spaces including visitor car parking spaces) – A minimum of one car parking space per ten residential units should be equipped with one fully functional Electric Vehicle Charging Point."*

A total of 69 no. E-Car charging points are to be provided for the development, these will be distributed within the site ensuring E-Car charging points are assigned to private car spaces, 4 visitor car parking spaces, crèche parking space, etc. These shall be designed and installed in accordance with the ESB's specifications for E-Car charging points.

The design of the Electric Car (E-Car) charging points will include ducting for the accommodation of future electric charging points connections for all and any car parking spaces within the development to meet the emerging demands of prospective residents.

Appendices

Appendix A. Masterplan Cycle Provision



GENERAL NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE
2. ONLY WRITTEN DIMENSIONS SHALL BE USED. NO DIMENSIONS SHALL BE SCALED FROM THE DRAWINGS
3. ALL LEVELS ARE IN METRES AND ARE TO MALIN HEAD DATUM
4. ALL COORDINATES ARE IN METRES AND ARE TO IRISH TRANSVERSE MERCATOR
5. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE SPECIFICATION

LEGEND:

- SITE BOUNDARY
- LAND OWNER BOUNDARY
- RAISED SEGREGATED CYCLE TRACK
- SHARED PATH (PEDESTRIAN & CYCLE 3m)
- SHARED PATH (PEDESTRIAN & CYCLE 4m)
- SHARED STREET (LOCAL)
- SHARED STREET (HOME ZONE)
- LINKAGES
- FUTURE POTENTIAL LINKAGES

PLANNING

Rev	Description	By	Date	Chk'd	Auth
G	SITE LAYOUT REVISED	JW	21.05.19	JW	KB
F	SITE LAYOUT REVISED	JW	08.02.19	JW	KB
E	LAYOUT UPDATED	RG	27.08.18	JW	KB
D	UPDATED LAYOUT	RG	16.08.18	JW	KB
C	FOR INFORMATION	JW	02.18.18	JW	KB
B	FOR INFORMATION	JW	21.02.18	KB	KB
A	FOR INFORMATION	JW	20.06.18	KB	KB
-	FOR INFORMATION	RG	18.06.18	JW	KB

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AEVAL

WOODBROOK PHASE 1

MASTERPLAN
CYCLE PROVISION

1:1250 at A1 1:2500 at A3	RG	JW	KB
	18.06.18	18.06.18	18.06.18

P | 5154251 / HTR / SK / 0003 | G

DO NOT SCALE

A1

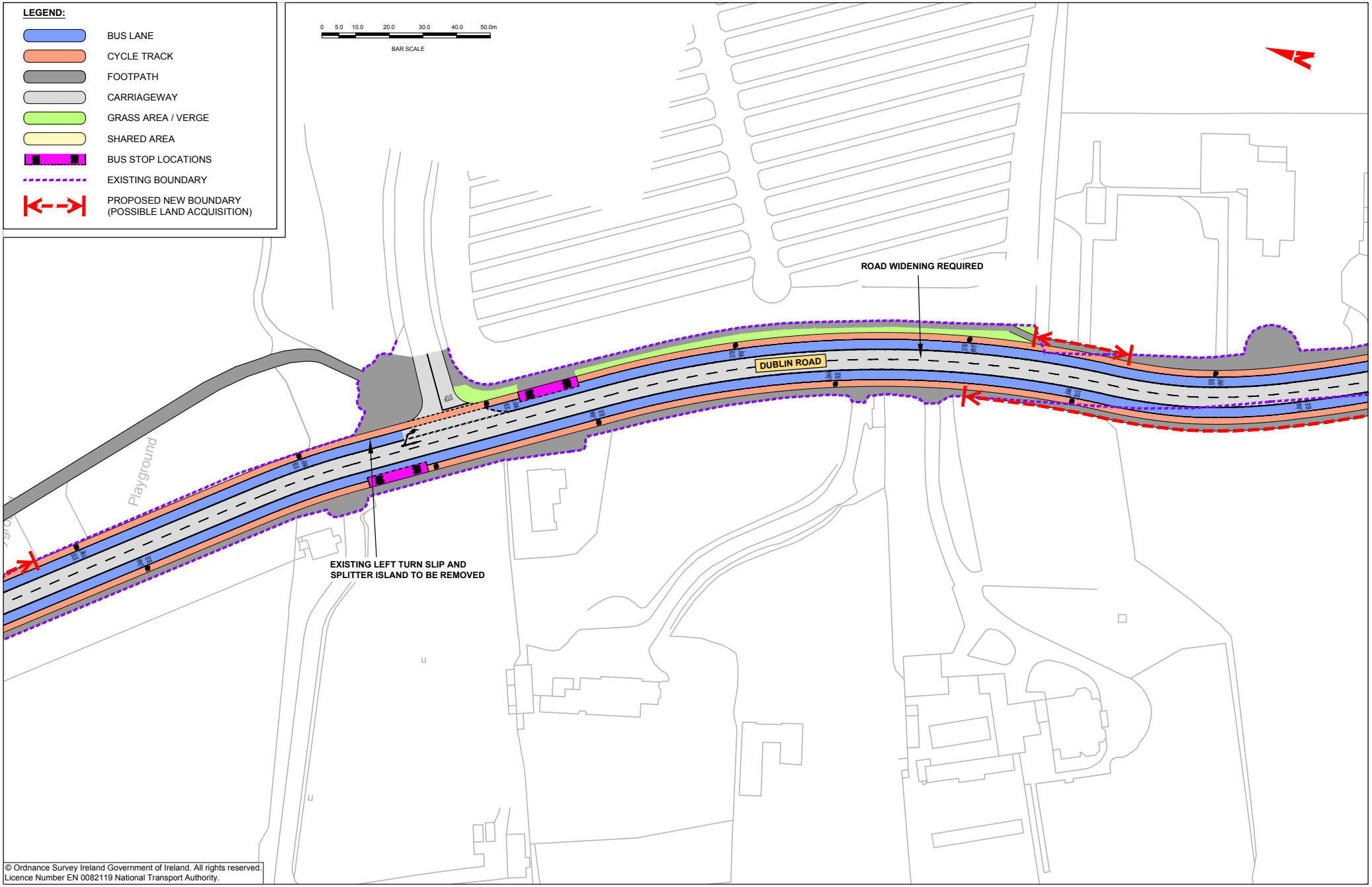
0 10 100

Plot: 5154251_HTR_SK_0003.dwg
Date: Oct 25, 2019 - 8:55am
Plotted by: jestoh

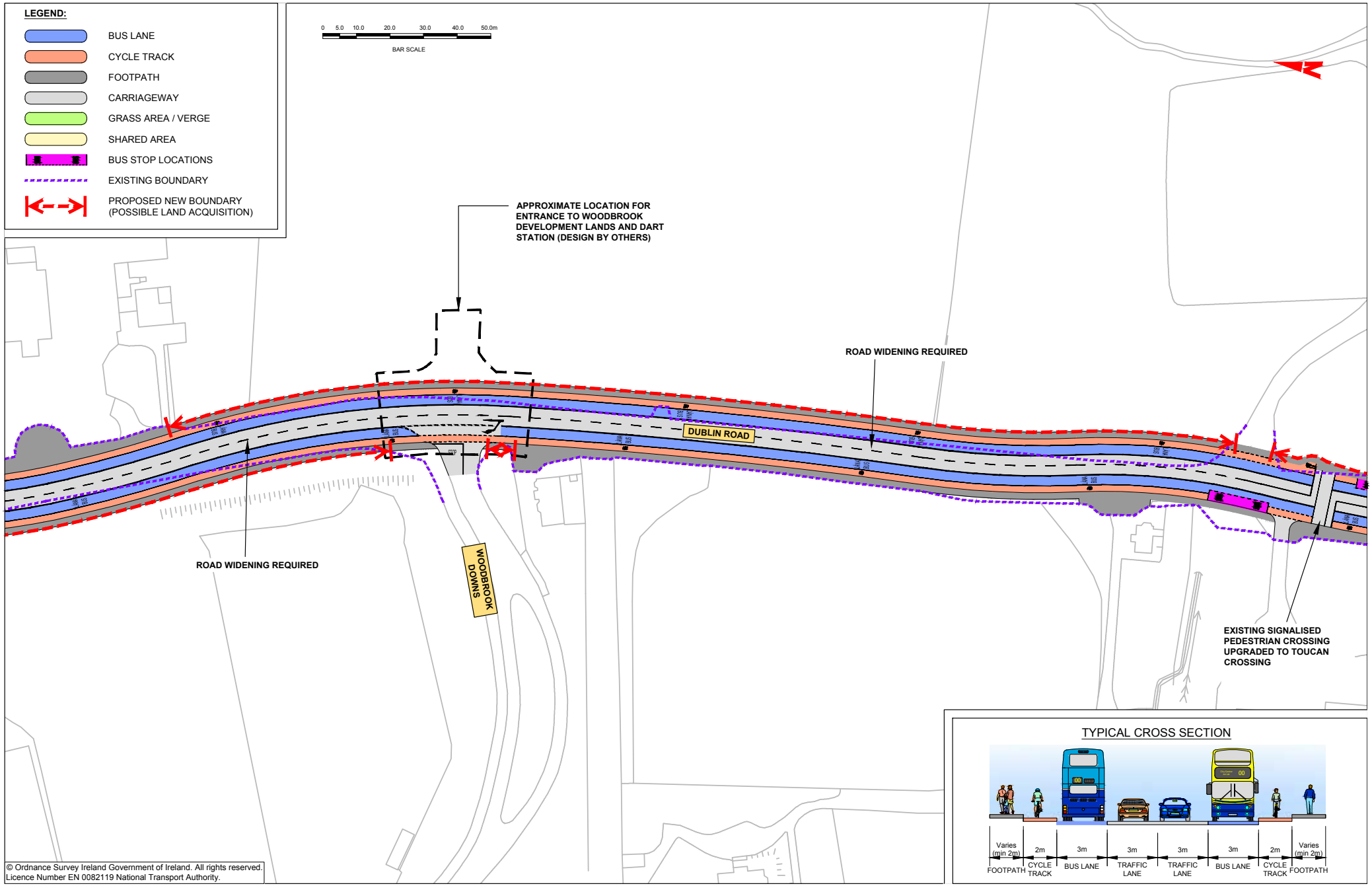
Z:\5154251 Castlethorn Woodbrook\6 Dwgs-Graphics\61 AutoCad\5154251_HTR_SK_0003.dwg

Appendix B. BusConnects Layouts

MAP 49: Emerging Preferred Route



MAP 50: Emerging Preferred Route



Appendix C. IW Pre-connection Enquiry Form

Pre-connection enquiry form

Industrial and commercial developments, mixed use developments, housing developments, business developments

This form is to be filled out by applicants enquiring about the feasibility of a water and/or wastewater connection to Irish Water infrastructure. If completing this form by hand, please use BLOCK CAPITALS and black ink.

Please refer to the **Guide to completing the pre-connection enquiry form** on page 12 of this document when completing the form.

Section A | Applicant details

1 WPRN number (where available):

2 Applicant details:

Registered company name (if applicable): Aeval Unlimited

Company

Trading name (if applicable):

Company registration number (if applicable): 418719

If you are not a registered company/business, please provide the applicant's name:

Contact name:

Postal address:

Usher House, Main Street

Dundrum, Dublin 14

Eircode: D14N7Y8

Telephone: 012164060

Mobile:

Email:

3 Agent details (if applicable):

Contact name: GARRY HANRATTY

Company name (if applicable): ATKINS IRELAND

Postal address: ATKINS HOUSE

150 AIRSIDE BUSINESS PARK

SWORDS, CO. DUBLIN

Eircode:

Telephone: 01 810 8079

Email: garry.hanratty@atkinsglobal.com

4 **Please indicate whether it is the applicant or agent who should receive future correspondence in relation to the enquiry:**

Applicant ☐ Agent ☑

Section B | Site details

5 **Site address:** Cork Little,
Woodbrook

6 **Irish Grid co-ordinates of site:** E(X) 326047 N(Y) 220426

Eg. co-ordinates of GPO, O'Connell St., Dublin: E(X) 315,878 N(Y) 234,619

7 **Local Authority:**

Local Authority that granted planning permission (if applicable):

DLRCC

8 **Has full planning permission been granted?** Yes ☐ No ☑

If 'Yes', please provide the current or previous planning reference number:

9 **Previous use of this site (if applicable):** GREENFIELD

10 **Date that previous development was last occupied (if applicable):** ☐☐ / ☐☐ / ☐☐☐☐

11 **Are there poor ground conditions on-site?** Yes ☐ No ☑

If 'Yes', please include site investigation report and a detailed site-specific report on the approach being taken to deal with ground conditions specifically with regard to pipe support and trenching.

12 **Are there potential contaminated land issues?** Yes ☐ No ☑

If 'Yes', please include a detailed site-specific report on the approach being taken to deal with contaminated land and the measures being taken to mitigate the impact on infrastructure.

13 **Is the development compliant with the local area development plan?** Yes ☐ No ☐

Section C | Water connection and demand details

14 **Is there an existing connection to public water mains at the site?** Yes ☐ No ☑

15 **Is this enquiry for an additional connection to the one already installed?** Yes ☐ No ☑

16 **Is this enquiry to increase the size of an existing water connection?** Yes ☐ No ☐

17 **Is this enquiry for a new water connection?** Yes ☐ No ☐

18 **Approximate date water connection is required:** 01 / 10 / 2018

19 **Please indicate pre-development water demand (if applicable):**

Pre-development peak hour water demand	N/A	**l/s**
Pre-development average hour water demand	N/A	**l/s**

Pre-development refers to brownfield sites only. Please include calculations on the attached sheet provided.

20 **Please indicate the domestic water demand (housing developments only):**

Post-development peak hour water demand	2.343	**l/s**
Post-development average hour water demand	4.921	**l/s**

Please include calculations on the attached sheet provided.

21 **Please indicate the business water demand (shops, offices, schools, hotels, restaurants, etc.):**

Post-development peak hour water demand	N/A	**l/s**
Post-development average hour water demand	N/A	**l/s**

Please include calculations on the attached sheet provided. Where there will be a daily/weekly/seasonal variation in the water demand profile, please provide all such details.

22 **Please indicate the industrial water demand (industry-specific water requirements):**

Post-development peak hour water demand	N/A	**l/s**
Post-development average hour water demand	N/A	**l/s**

Please include calculations on the attached sheet provided. Where there will be a daily/weekly/seasonal variation in the water demand profile, please provide all such details.

23 **What is the existing ground level at the property boundary at connection point (if known) above Malin Head Ordnance Datum?**

20 m

24 **What is the highest finished floor level of the proposed development above Malin Head Ordnance Datum?**

25 m

25 **Is on-site water storage being provided?** Yes ☐ No ☑

Please include calculations (details and capacity) of all water storage provided on-site on the attached sheet provided.

26 **Are there fire flow requirements?** Yes ☐ No ☐

Additional fire flow requirements over and above those identified in Q20, Q21 and Q22 above	35	**l/s**

Please include calculations on the attached sheet provided, and include confirmation of requirements from the Fire Authority.

27 **Do you propose to supplement your potable water supply from other sources?** Yes ☐ No ☑

If 'Yes', please indicate how you propose to supplement your potable water supply from other sources (see **Guide to completing the application form** on page 12 of this document for further details):

Section D | Wastewater connection and discharge details

28 **Is there an existing connection to a public sewer at the site?** Yes ☐ No ☑

29 **Is this enquiry for an additional connection to one already installed?** Yes ☐ No ☑

30 **Is this enquiry to increase the size of an existing connection?** Yes ☐ No ☑

31 **Is this enquiry for a new wastewater connection?** Yes ☐ No ☐

32 **Approximate date that wastewater connection is required:** 01 / 10 / 2018

33 **Please indicate pre-development wastewater discharge (if applicable):**

Pre-development peak discharge	N/A	**l/s**
Pre-development average discharge	N/A	**l/s**

Pre-development refers to brownfield sites only. Please include calculations on the attached sheet provided.

34 **Please indicate the domestic wastewater hydraulic load (housing developments only):**

Post-development peak discharge	16.62	**l/s**
Post-development average discharge	2.77	**l/s**

Please include calculations on the attached sheet provided.

35 **Please indicate the commercial wastewater hydraulic load (shops, offices, schools, hotels, restaurants, etc.):**

Post-development peak discharge	N/A	**l/s**
Post-development average discharge	N/A	**l/s**

Please include calculations on the attached sheet provided.

36 Please indicate the industrial wastewater hydraulic load (industry-specific discharge requirements):

Post-development peak discharge	N/A	**l/s**
Post-development average discharge	N/A	**l/s**

Please include calculations on the attached sheet provided.

37 Wastewater organic load:

Characteristic	Max concentration (mg/l)	Average concentration (mg/l)	Maximum daily load (kg/day)
Biochemical oxygen demand (BOD)	N/A	N/A	N/A
Chemical oxygen demand (COD)	N/A	N/A	N/A
Suspended solids (SS)	N/A	N/A	N/A
Total nitrogen (N)	N/A	N/A	N/A
Total phosphorus (P)	N/A	N/A	N/A
Other	N/A	N/A	N/A

Temperature range	N/A
pH range	N/A

38 Storm water run-off will only be accepted from brownfield sites that already have a storm/surface water connection to a combined sewer. In the case of such brownfield sites, please indicate if the development intends discharging surface water to the combined wastewater collection system:

Yes ☐ No ☑

If 'Yes', please give reason for discharge and comment on adequacy of SUDS/attenuation measures proposed.

Please submit detailed calculations on discharge volumes, peak flows and attenuation volumes with this application.

39 Do you propose to pump the wastewater? Yes ☐ No ☑

If 'Yes', please include justification for your pumped solution with this application.

40 What is the existing ground level at the property boundary at connection point (if known) above Malin Head Ordnance Datum?

20 m

41 What is the lowest finished floor level on-site above Malin Head Ordnance Datum? 20 m

Section E | Development details

42 Please outline the domestic and/or industry/business use proposed:

Property type	Total number of units for this application
Domestic	400
Office	
Residential care home	
Hotel	
Factory	
School	
Institution	
Retail unit	
Industrial unit	
Other (please specify)	

43 Approximate start date of proposed development: 01 / 06 / 2018

44 Is the development multi-phased? Yes ☐ No ☐

If 'Yes', application must include a master-plan identifying the development phases and the current phase number.

If 'Yes', please provide details of variations in water demand volumes and wastewater discharge loads due to phasing requirements.

Section F | Supporting documentation

Please provide the following additional information:

> Site location map: A site location map to a scale of 1:1000, which clearly identifies the land or structure to which the enquiry relates. The map shall include the following details:

a) The scale shall be clearly indicated on the map.

b) The boundaries shall be delineated in red.

c) The site co-ordinates shall be marked on the site location map.

> Details of planning and development exemptions (if applicable).

> Calculations (calculation sheets provided below).

> Site layout map to a scale of 1:500 showing layout of proposed development, water network and wastewater network layouts, additional water/wastewater infrastructure if proposed, connection points to Irish Water infrastructure (if known).

> All design submissions as outlined in the Irish Water Codes of Practice for Water Infrastructure and the Irish Water Codes of Practice for Wastewater Infrastructure, including the layout of all other services to be provided within the site (for example: gas, electricity, telecommunications).

> Any other information that might help Irish Water assess this pre-connection enquiry.

Section G | Declaration

I/We hereby make this application to Irish Water for a water and/or wastewater connection as detailed on this form.

I/We understand that any alterations made to this application must be declared to Irish Water.

The details that I/we have given with this application are accurate.

I/We have enclosed all the necessary supporting documentation.

Signature: Garry Hanratty Date: 22 / 12 / 2017

Your full name (in BLOCK CAPITALS):

GARRY HANRATTY

Irish Water will carry out a formal assessment based on the information provided on this form.
Any future connection offer made by Irish Water will be based on the information that has been provided here.

Please submit the completed form to **newconnections@water.ie** or alternatively, post to:

Irish Water
PO Box 860
South City Delivery Office
Cork City

For office use only:

Input customer number:

Calculations

Water demand

This application requirements
400 Units x 2.7 p/dwelling = 1080 persons

1080 x 150 l/p/d = 162,000(Average daily domestic demand)
= 1.875 l/s

Average day/ Peak Week = 162,000 l/d x 1.25
= 202,500 l/d
= 2.343 l/s

Peak demand = 202,500 l/d x 2.1
= 425,250 l/d
= 4.921 l/s

Overall Woodbrook LAP Masterplan area (including this application requirements)
1,320 Units x 2.7 p/dwelling = 3,564 persons

3,564 x 150 l/p/d = 534,600 (Average daily domestic demand)
= 6.187 l/s

Average day / Peak Week = 534,600 l/d x 1.25
= 668,250 l/d
= 7.734 l/s

Peak demand = 668,250 l/d x 2.1
= 1,403,325 l/d
= 16.242 l/s

On-site storage

N/A

Fire flow requirements

Fire flow = 35 l/s

This application requirements
400 Units x 600 l/dwelling = 240,000 l/d
D.W.F.= 2.77 l/s

Peak (6 D.W.F.) = 16.62 l/s

Overall Woodbrook LAP Masterplan area (including this application requirements)
1,320 Units x 600 l/dwelling = 792,000 l/d
D.W.F = 9.16 l/s

Peak (6 D.W.F.) = 54.96 l/s

N/A

Guide to completing the pre-connection enquiry form

This form should be completed by applicants enquiring about the feasibility of a water and/or wastewater connection to Irish Water infrastructure.

The Irish Water Codes of Practice are available at **www.water.ie** for reference.

Section A | Applicant Details

Question 1: 'Water Point Reference Number (WPRN)' is a unique number assigned to every single water services connection in the country. The WPRN is prominently displayed on correspondence received from Irish Water, and can be found on water bills, previous connection offers, or previous enquiries in relation to the site. Existing customers and brownfield sites should have a WPRN. New customers are not required to answer this question.

Question 2: This question requires the applicant or company enquiring about the feasibility of a connection to identify themselves, their postal address, and to provide their contact details.

Question 3: If the applicant has employed a consulting engineer or an agent to manage the enquiry on their behalf, the agent's address and contact details should be recorded here.

Question 4: Please indicate whether it is the applicant or the agent who should receive future correspondence in relation to the enquiry.

Section B | Site details

Question 5: This is the address of the site requiring the water/wastewater service connection and for which this enquiry is being made.

Question 6: Please provide the Irish Grid co-ordinates of the proposed site. Irish grid positions on maps are expressed in two dimensions as Eastings (E or X) and Northings (N or Y) relative to an origin. You will find these coordinates on your Ordnance Survey map which is required to be submitted with an application.

Question 7: Please identify the Local Authority that is or will be dealing with your planning application, for example Cork City Council.

Question 8: Please indicate if planning permission has been granted for this application, and if so, please provide the planning permission reference number.

Question 9: Please specify the previous use of the site that is proposed to be developed, for example if greenfield, please state 'Agricultural'.

Question 10: Please specify the date that the development site was last occupied. Your answer will help us to determine the previous water usage/wastewater load of the development. If the site was previously greenfield, then this question does not need to be completed.

Question 11: Please provide details in relation to the ground conditions on the site if they are known to be poor, for example soil with a low bearing capacity, high water table, presence of peat, silt, etc. If a site investigation report is available, please include it with your enquiry.

Question 12: Please provide details in relation to contaminated land on your site (if any); this will determine what pipe material will be appropriate in the vicinity of the contaminated ground.

Question 13: Please indicate if the development is compliant with the local area development plan. You should contact your Local Authority in this regard and confirm same by ticking the appropriate box.

Section C | Water connection and demand details

Question 14: Please indicate if a water connection already exists for this site.

Question 15: Please indicate if this enquiry concerns an additional connection to one already installed on the site.

Question 16: Please indicate if you are proposing to upgrade the water connection to facilitate an increase in water demand. Irish Water will determine what impact this will have on our infrastructure.

Question 17: Please indicate if this enquiry concerns a new water connection for this site.

Question 18: Please indicate the approximate date that the proposed connection to the water infrastructure will be required.

Question 19: If the site was previously in use, please provide details of the pre-development peak hour and average hour water demand.

Question 20: Please provide calculations for domestic water demand and include your calculations on the calculation sheet provided. Demand rates (peak and average) are site specific. Average demand is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). For design purposes, please refer to the Irish Water Codes of Practice for Water Infrastructure.

Question 21: If this connection enquiry concerns a business premises, please provide calculations for the water demand and include your calculations on the calculation sheet provided. Business premises include shops, offices, hotels, schools, etc. Demand rates (peak and average) are site specific. Average demand is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). For design purposes, please refer to the Irish Water Codes of Practice for Water Infrastructure.

Question 22: If this connection enquiry is for an industrial premises, please calculate the water demand and include your calculations on the calculation sheet provided. Demand rates (peak and average) are site specific. Average demand is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). The peak demand for sizing of the pipe network will be as per the specific business production requirements. For design purposes, please refer to the Irish Water Codes of Practice for Water Infrastructure.

Question 23: Please specify the ground level at the location where connection to the public water mains will be made. This is required in order to determine if there is sufficient pressure in the existing water infrastructure to serve your proposed development. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 24: Please specify the highest finished floor level on-site. This is required in order to determine if there is sufficient pressure in the existing water infrastructure to serve your proposed development. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 25: If storage is required, water storage capacity of 24-hour water demand must usually be provided at the proposed site. In some cases, 24-hour storage capacity may not be required, for example 24-hour storage for a domestic house would be provided in an attic storage tank. Please calculate the 24-hour water storage requirements and include your calculations on the attached sheet provided. Please also confirm that on-site storage is being provided by ticking the appropriate box.

Question 26: The water supply system shall be designed and constructed to reliably convey the water flows that are required of the development including fire flow requirements by the Fire Authority. The Fire Authority will provide the requirement for fire flow rates that the water supply system will have to carry. Please note that while flows in excess of your required demand may be achieved in the Irish Water network and could be utilised in the event of a fire, Irish Water cannot guarantee a flow rate to meet your fire flow requirement. To guarantee a flow to meet the Fire Authority requirements, you should provide adequate fire storage capacity within your development. Please include your calculations on the attached sheet provided, and further provide confirmation of the Fire Authority requirements.

Question 27: Please identify proposed additional water supply sources, that is, do you intend to connect to the public water mains or the public mains and supplement from other sources? If supplementing public water supply with a supply from another source, please provide details as to how the potable water supply is to be protected from cross contamination at the premises.

Section D | Wastewater connection and discharge details

Question 28: Please indicate if a wastewater connection to a public sewer already exists for this site.

Question 29: Please indicate if this enquiry relates to an additional wastewater connection to one already installed.

Question 30: Please indicate if you are proposing to upgrade the wastewater connection to facilitate an increased discharge. Irish Water will determine what impact this will have on our infrastructure.

Question 31: Please indicate if this enquiry relates to a new wastewater connection for this site.

Question 32: Please specify the approximate date that the proposed connection to the wastewater infrastructure will be required.

Question 33: If the site was previously in use, please provide details of the pre-development peak and average wastewater discharge.

Question 34: Please provide calculations for domestic wastewater discharge and include your calculations on the attached sheet provided. Discharge rates (peak and average) are site specific. Average discharge is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). For design purposes, please refer to the Irish Water Codes of Practice for Wastewater Infrastructure.

Question 35: If this enquiry relates to a business premises, please provide calculations for the wastewater discharge and include your calculations on the attached sheet provided. Business premises include shops, offices, hotels, schools, etc. Discharge rates (peak and average) are site specific. Average discharge is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). For design purposes, please refer to the Irish Water Codes of Practice for Wastewater Infrastructure.

Question 36: If this enquiry relates to an industrial premises, please provide calculations for the wastewater discharge and include your calculations on the calculation sheet provided. Discharge rates (peak and average) are site specific. Average discharge is the total daily volume divided by a 24-hour time period and expressed in litres per second (l/s). The peak discharge for sizing of the pipe network will be as per the specific business production requirements. For design purposes, please refer to the Irish Water Codes of Practice for Wastewater Infrastructure.

Question 37: Please specify the maximum and average concentrations and the maximum daily load of each of the wastewater characteristics listed in the wastewater organic load table (if not domestic effluent), and also specify if any other significant concentrations are expected in the effluent. Please complete the table and provide additional supporting documentation if relevant. Note that the concentration shall be in mg/l and the load shall be in kg/day. Note that for business premises (shops, offices, schools, hotels, etc.) for which only domestic effluent will be discharged (excluding discharge from canteens/ restaurants which would require a Trade Effluent Discharge licence), there is no need to complete this question.

Question 38: In exceptional circumstances, such as brownfield sites, where the only practical outlet for storm/ surface water is to a combined sewer, Irish Water will consider permitting a restricted attenuated flow to the combined sewer. Storm/surface water will only be accepted from brownfield sites that already have a storm/surface water connection to a combined sewer and the applicant must demonstrate how the storm/surface water flow from the proposed site is minimised using sustainable urban drainage system (SUDS). This type of connection will only be considered on a case by case basis. Please advise if the proposed development intends discharging surface water to the combined wastewater collection system. If so, please submit detailed calculations in relation to attenuation volumes, peak discharges and total discharge volumes.

Question 39: Please specify if the development needs to pump its wastewater discharge to gain access to Irish Water infrastructure.

Question 40: Please specify the ground level at the location where connection to the public sewer will be made. This is required to determine if the development can be connected to the public sewer via gravity discharge. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Question 41: Please specify the lowest floor level of the proposed development. This is required in order to determine if the development can be connected to the public sewer via gravity discharge. Levels should be quoted in metres relative to Malin Head Ordnance Datum.

Section E | Development details

Question 42: Please specify the number of different property/premises types by filling in the table provided.

Question 43: Please indicate the approximate commencement date of works on the development.

Question 44: Please indicate if a phased building approach is to be adopted when developing the site. If so, please provide details of the phase master-plan and the proposed variation in water demand/wastewater discharge as a result of the phasing of the development.

Section F | Supporting documentation

Please provide additional information as listed.

Section G | Declaration

Please review the declaration, sign, and return the completed application form to Irish Water by email or by post using the contact details provided in Section G.

Notes

Notes

Appendix D. IW Confirmation of Feasibility Letter

Letter Ref: CDS 9451918857

Uisce Eireann
Bosca OP 860
Oifig Sheachadta
na Cathrach Theas
Cathair Chorcaí

Irish Water
PO Box 860
South City
Delivery Office
Cork City

www.water.ie

Aeval Unlimited Company
c/o Garry Hanratty
150 Airside Business Park
Swords
Co. Dublin

16 July 2018

Dear Sir/Madam,

Re: CUSTO180416 pre-connection enquiry – Subject to contract | Contract denied Cork Little, Woodbrook, 435 Housing Units

Irish Water has reviewed your pre-connection enquiry in relation to water and wastewater connections at Cork Little, Woodbrook (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on the capacity **currently available as assessed** by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place and the conditions listed below, your proposed connection to the Irish Water network can be facilitated.

Strategic Housing Development
Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. Therefore:

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

B. You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed and appropriate connection fee paid at a later date.

Water
An Irish Water Network Extension Project is programmed for completion in Q4 2019, which will facilitate connection of 435 units. The applicant will need to connect to the 250mm diameter extended pipeline.

Wastewater

The proposed development is located within the Shanganagh and Bray Drainage Area Plan (DAP) catchment. The DAP proposes the construction of a foul pumping station at Woodbrook to pump foul flow from the surrounding catchment to Shanganagh Waste Water Treatement Works (WwTW). The Cork Little development will discharge to the proposed new pumping station.

It is envisaged that this pumping station will be delivered by agreement between applicant and Irish Water.

Prior to the delivery of the rising main to Shanganagh WwTW by Irish Water, the Cork Little development may discharge via a rising main to the foul network north of Shanganagh Park. Foul flows from the developments rising main will be controlled and will depend on flow conditions in the receiving network. The pumping station control regime shall be agreed with Irish Water as part of the pumping station design.

A connection agreement can be applied for by completing the connection application form available at **www.water.ie/connections**. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation or Utilities.

Should you wish to have any of the above progressed by Irish Water or if you have any further questions, please contact **1850 278 278 8.00am-4.30pm, Mon-Fri or email newconnections@water.ie.** For further information, visit **www.water.ie/connections**

Yours sincerely,

Maria O'Dwyer

Connections and Developer Services

Appendix E. Foul Drainage Network Details

FOUL SEWERAGE DESIGN

Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00
Industrial Peak Flow Factor	0.00
Calculation Method	BS 8301
Frequency Factor	0.00
Domestic (l/s/ha)	0.00
Domestic Peak Flow Factor	6.00
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	0.75
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	48.747	0.487	100.1	0.000	34.0	0.0	1.500	o	225	Pipe/Conduit	
F1.001	42.045	0.280	150.2	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F2.000	18.448	0.231	79.9	0.000	1780.0	0.0	1.500	o	225	Pipe/Conduit	
F2.001	64.400	0.715	90.1	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F1.002	88.038	0.587	150.0	0.000	991.0	0.0	1.500	o	225	Pipe/Conduit	
F3.000	78.107	1.370	57.0	0.000	991.0	0.0	1.500	o	225	Pipe/Conduit	
F1.003	30.972	0.190	163.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	20.525	0.000	0.0	34.0	0.0	40	0.65	1.15	45.6	3.1
F1.001	20.038	0.000	0.0	34.0	0.0	44	0.57	0.94	37.2	3.1
F2.000	22.450	0.000	0.0	1780.0	0.0	70	1.01	1.29	51.1	10.6
F2.001	22.219	0.000	0.0	1780.0	0.0	72	0.97	1.21	48.1	10.6
F1.002	19.758	0.000	0.0	2805.0	0.0	95	0.87	0.94	37.2	13.8
F3.000	22.100	0.000	0.0	991.0	0.0	55	1.06	1.52	60.5	8.0
F1.003	19.171	0.000	0.0	3796.0	0.0	109	0.88	0.90	35.7	16.8

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F4.000	76.242	1.587	48.0	0.000	840.0	0.0	1.500	o	225	Pipe/Conduit	
F1.004	82.446	0.537	153.5	0.000	1924.0	0.0	1.500	o	225	Pipe/Conduit	
F5.000	75.526	0.755	100.0	0.000	11284.0	0.0	1.500	o	225	Pipe/Conduit	
F5.001	19.797	0.127	155.9	0.000	940.0	0.0	1.500	o	225	Pipe/Conduit	
F1.005	12.093	0.050	241.9	0.000	168.0	0.0	1.500	o	300	Pipe/Conduit	
F1.006	48.980	0.248	197.5	0.000	991.0	0.0	1.500	o	300	Pipe/Conduit	
F1.007	36.471	0.182	200.4	0.000	168.0	0.0	1.500	o	300	Pipe/Conduit	
F6.000	81.370	0.678	120.0	0.000	1444.0	0.0	1.500	o	225	Pipe/Conduit	
F1.008	61.777	0.309	199.9	0.000	991.0	0.0	1.500	o	300	Pipe/Conduit	
F1.009	27.809	0.143	194.5	0.000	168.0	0.0	1.500	o	300	Pipe/Conduit	
F7.000	79.191	0.528	150.0	0.000	1444.0	0.0	1.500	o	225	Pipe/Conduit	
F1.010	45.353	0.227	199.8	0.000	924.0	0.0	1.500	o	300	Pipe/Conduit	
F1.011	6.891	0.034	202.7	0.000	0.0	0.0	1.500	o	300	Pipe/Conduit	
F1.012	8.083	0.040	202.1	0.000	0.0	0.0	1.500	o	300	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F4.000	22.025	0.000	0.0	840.0	0.0	51	1.10	1.66	65.9	7.5
F1.004	18.981	0.000	0.0	6560.0	0.0	135	0.99	0.93	36.8	24.6
F5.000	19.011	0.000	0.0	11284.0	0.0	146	1.26	1.15	45.6	34.3
F5.001	18.256	0.000	0.0	12224.0	0.0	182	1.05	0.92	36.5	36.0
F1.005	18.054	0.000	0.0	18952.0	0.0	197	0.98	0.89	62.9	48.1
F1.006	18.004	0.000	0.0	19943.0	0.0	188	1.07	0.99	69.7	49.9
F1.007	17.756	0.000	0.0	20111.0	0.0	190	1.06	0.98	69.1	50.2
F6.000	18.820	0.000	0.0	1444.0	0.0	73	0.85	1.05	41.6	9.5
F1.008	17.574	0.000	0.0	22546.0	0.0	199	1.08	0.98	69.2	53.8
F1.009	17.265	0.000	0.0	22714.0	0.0	198	1.09	0.99	70.2	54.1
F7.000	17.800	0.000	0.0	1444.0	0.0	78	0.78	0.94	37.2	9.5
F1.010	17.122	0.000	0.0	25082.0	0.0	209	1.09	0.98	69.2	57.6
F1.011	16.895	0.000	0.0	25082.0	0.0	211	1.09	0.97	68.8	57.6
F1.012	16.861	0.000	0.0	25082.0	0.0	210	1.09	0.97	68.9	57.6

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.013	58.335	0.292	199.8	0.000	0.0	0.0	1.500	o	300	Pipe/Conduit	
F1.014	81.289	0.406	200.2	0.000	0.0	0.0	1.500	o	300	Pipe/Conduit	
F1.015	13.552	0.452	30.0	0.000	0.0	0.0	1.500	o	300	Pipe/Conduit	
F8.000	27.309	0.645	42.3	0.000	235.0	0.0	1.500	o	225	Pipe/Conduit	
F8.001	61.947	1.017	60.9	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F9.000	53.118	1.265	42.0	0.000	235.0	0.0	1.500	o	225	Pipe/Conduit	
F8.002	16.400	0.410	40.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F8.003	43.020	0.430	100.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F8.004	11.951	0.120	99.6	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F10.000	39.918	0.998	40.0	0.000	268.0	0.0	1.500	o	225	Pipe/Conduit	
F10.001	8.924	0.223	40.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F8.005	57.102	0.495	115.4	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F8.006	7.552	0.051	148.1	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F11.000	21.100	0.440	48.0	0.000	537.0	0.0	1.500	o	225	Pipe/Conduit	
F11.001	41.944	0.862	48.7	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.013	16.821	0.000	0.0	25082.0	0.0	209	1.09	0.98	69.3	57.6
F1.014	16.529	0.000	0.0	25082.0	0.0	210	1.09	0.98	69.2	57.6
F1.015	16.123	0.000	0.0	25082.0	0.0	117	2.26	2.54	179.3	57.6
F8.000	20.425	0.000	0.0	235.0	0.0	40	1.01	1.77	70.3	4.9
F8.001	19.780	0.000	0.0	235.0	0.0	44	0.89	1.47	58.5	4.9
F9.000	20.125	0.000	0.0	235.0	0.0	40	1.01	1.77	70.5	4.9
F8.002	18.500	0.000	0.0	470.0	0.0	44	1.10	1.82	72.3	6.0
F8.003	18.090	0.000	0.0	470.0	0.0	55	0.80	1.15	45.6	6.0
F8.004	17.660	0.000	0.0	470.0	0.0	55	0.80	1.15	45.7	6.0
F10.000	18.090	0.000	0.0	268.0	0.0	40	1.04	1.82	72.3	5.0
F10.001	17.092	0.000	0.0	268.0	0.0	40	1.04	1.82	72.3	5.0
F8.005	16.869	0.000	0.0	738.0	0.0	62	0.79	1.07	42.5	7.1
F8.006	16.374	0.000	0.0	738.0	0.0	66	0.72	0.94	37.5	7.1
F11.000	17.925	0.000	0.0	537.0	0.0	47	1.05	1.66	66.0	6.3
F11.001	17.485	0.000	0.0	537.0	0.0	47	1.04	1.65	65.5	6.3

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F8.007	14.817	0.098	151.2	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F8.008	44.022	0.863	51.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F8.009	11.464	0.076	150.8	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F12.000	20.276	0.431	47.0	0.000	1343.0	0.0	1.500	o	225	Pipe/Conduit	
F12.001	68.890	1.349	51.1	0.000	924.0	0.0	1.500	o	225	Pipe/Conduit	
F12.002	6.937	0.234	29.6	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F8.010	30.066	0.200	150.3	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F8.011	58.341	0.389	150.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F1.016	15.787	0.079	199.8	0.000	0.0	0.0	1.500	o	300	Pipe/Conduit	
F1.017	73.852	0.369	200.1	0.000	117.0	0.0	1.500	o	300	Pipe/Conduit	
F13.000	23.286	0.155	150.2	0.000	2083.0	0.0	1.500	o	225	Pipe/Conduit	
F13.001	12.223	0.082	149.1	0.000	722.0	0.0	1.500	o	225	Pipe/Conduit	
F13.002	40.084	0.267	150.1	0.000	722.0	0.0	1.500	o	225	Pipe/Conduit	
F13.003	45.869	0.917	50.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F14.000	34.816	0.435	80.0	0.000	588.0	0.0	1.500	o	225	Pipe/Conduit	
F14.001	27.121	0.904	30.0	0.000	134.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F8.007	16.323	0.000	0.0	1275.0	0.0	76	0.77	0.93	37.1	9.0
F8.008	16.225	0.000	0.0	1275.0	0.0	57	1.14	1.61	64.0	9.0
F8.009	15.362	0.000	0.0	1275.0	0.0	75	0.77	0.93	37.1	9.0
F12.000	17.300	0.000	0.0	1343.0	0.0	57	1.18	1.68	66.6	9.2
F12.001	16.869	0.000	0.0	2267.0	0.0	66	1.24	1.61	64.0	12.1
F12.002	15.520	0.000	0.0	2267.0	0.0	58	1.50	2.11	84.0	12.1
F8.010	14.900	0.000	0.0	3542.0	0.0	103	0.90	0.94	37.2	16.1
F8.011	14.700	0.000	0.0	3542.0	0.0	103	0.90	0.94	37.2	16.1
F1.016	14.236	0.000	0.0	28624.0	0.0	225	1.11	0.98	69.2	62.9
F1.017	14.157	0.000	0.0	28741.0	0.0	226	1.11	0.98	69.2	63.1
F13.000	16.525	0.000	0.0	2083.0	0.0	86	0.83	0.94	37.2	11.6
F13.001	16.370	0.000	0.0	2805.0	0.0	95	0.87	0.94	37.3	13.8
F13.002	16.288	0.000	0.0	3527.0	0.0	103	0.90	0.94	37.2	16.0
F13.003	16.021	0.000	0.0	3527.0	0.0	76	1.35	1.63	64.6	16.0
F14.000	16.525	0.000	0.0	588.0	0.0	54	0.88	1.28	51.0	6.5
F14.001	16.090	0.000	0.0	722.0	0.0	44	1.28	2.10	83.5	7.0

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.018	21.422	0.107	200.2	0.000	0.0	0.0	1.500	o	375	Pipe/Conduit	
F1.019	60.707	0.379	160.2	0.000	101.0	0.0	1.500	o	375	Pipe/Conduit	
F15.000	49.918	0.803	62.2	0.000	67.0	0.0	1.500	o	225	Pipe/Conduit	
F1.020	65.381	0.270	242.2	0.000	168.0	0.0	1.500	o	375	Pipe/Conduit	
F16.000	30.581	0.515	59.4	0.000	504.0	0.0	1.500	o	225	Pipe/Conduit	
F16.001	8.384	0.137	61.2	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F16.002	66.487	0.443	150.0	0.000	151.0	0.0	1.500	o	225	Pipe/Conduit	
F16.003	23.434	0.331	70.8	0.000	51.0	0.0	1.500	o	225	Pipe/Conduit	
F16.004	6.669	0.098	68.1	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F1.021	8.434	0.030	281.1	0.000	0.0	0.0	1.500	o	375	Pipe/Conduit	
F1.022	42.886	0.296	144.9	0.000	33.0	0.0	1.500	o	375	Pipe/Conduit	
F17.000	15.080	0.250	60.3	0.000	50.0	0.0	1.500	o	225	Pipe/Conduit	
F17.001	32.740	0.218	150.2	0.000	56.0	0.0	1.500	o	225	Pipe/Conduit	
F17.002	22.980	0.232	99.1	0.000	33.0	0.0	1.500	o	225	Pipe/Conduit	
F17.003	65.540	0.437	150.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F18.000	25.094	0.167	150.3	0.000	546.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.018	13.713	0.000	0.0	32990.0	0.0	200	1.16	1.13	125.0	69.5
F1.019	13.606	0.000	0.0	33091.0	0.0	187	1.26	1.27	139.8	69.6
F15.000	14.650	0.000	0.0	67.0	0.0	38	0.81	1.46	57.9	3.6
F1.020	13.227	0.000	0.0	33326.0	0.0	213	1.08	1.03	113.6	70.0
F16.000	15.950	0.000	0.0	504.0	0.0	49	0.96	1.49	59.3	6.2
F16.001	15.435	0.000	0.0	504.0	0.0	49	0.95	1.47	58.4	6.2
F16.002	15.298	0.000	0.0	655.0	0.0	65	0.71	0.94	37.2	6.8
F16.003	14.855	0.000	0.0	706.0	0.0	54	0.94	1.37	54.3	7.0
F16.004	14.524	0.000	0.0	706.0	0.0	54	0.95	1.39	55.4	7.0
F1.021	12.957	0.000	0.0	34032.0	0.0	226	1.02	0.95	105.4	71.0
F1.022	12.927	0.000	0.0	34065.0	0.0	184	1.32	1.33	147.1	71.1
F17.000	17.125	0.000	0.0	50.0	0.0	37	0.80	1.48	58.8	3.4
F17.001	16.875	0.000	0.0	106.0	0.0	50	0.61	0.94	37.2	4.0
F17.002	16.657	0.000	0.0	139.0	0.0	46	0.72	1.15	45.9	4.2
F17.003	16.425	0.000	0.0	139.0	0.0	51	0.62	0.94	37.2	4.2
F18.000	17.400	0.000	0.0	546.0	0.0	63	0.70	0.94	37.2	6.3

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F18.001	31.272	0.226	138.4	0.000	42.0	0.0	1.500	o	225	Pipe/Conduit	
F18.002	46.395	0.310	149.7	0.000	98.0	0.0	1.500	o	225	Pipe/Conduit	
F18.003	49.277	0.328	150.2	0.000	112.0	0.0	1.500	o	225	Pipe/Conduit	
F17.004	77.179	0.480	160.8	0.000	182.0	0.0	1.500	o	225	Pipe/Conduit	
F19.000	34.926	0.437	79.9	0.000	56.0	0.0	1.500	o	225	Pipe/Conduit	
F19.001	33.551	0.558	60.1	0.000	56.0	0.0	1.500	o	225	Pipe/Conduit	
F19.002	63.535	0.428	148.4	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F17.005	13.172	0.112	117.6	0.000	128.0	0.0	1.500	o	225	Pipe/Conduit	
F17.006	40.005	0.200	200.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F17.007	3.791	0.072	52.7	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F20.000	29.879	0.199	150.1	0.000	196.0	0.0	1.500	o	225	Pipe/Conduit	
F20.001	4.490	0.030	149.7	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F20.002	36.879	0.246	149.9	0.000	196.0	0.0	1.500	o	225	Pipe/Conduit	
F20.003	30.727	0.205	149.9	0.000	198.0	0.0	1.500	o	225	Pipe/Conduit	
F20.004	11.987	0.111	107.9	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F17.008	40.346	0.278	145.1	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F17.009	13.827	0.082	168.6	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F18.001	17.233	0.000	0.0	588.0	0.0	62	0.72	0.98	38.8	6.5
F18.002	17.007	0.000	0.0	686.0	0.0	66	0.72	0.94	37.3	6.9
F18.003	16.697	0.000	0.0	798.0	0.0	68	0.73	0.94	37.2	7.3
F17.004	15.588	0.000	0.0	1119.0	0.0	74	0.74	0.90	35.9	8.5
F19.000	16.325	0.000	0.0	56.0	0.0	40	0.73	1.28	51.1	3.5
F19.001	15.888	0.000	0.0	112.0	0.0	40	0.84	1.48	58.9	4.0
F19.002	15.330	0.000	0.0	112.0	0.0	50	0.61	0.94	37.4	4.0
F17.005	14.902	0.000	0.0	1359.0	0.0	72	0.85	1.06	42.1	9.3
F17.006	14.790	0.000	0.0	1359.0	0.0	83	0.70	0.81	32.2	9.3
F17.007	14.590	0.000	0.0	1359.0	0.0	58	1.13	1.58	62.9	9.3
F20.000	16.800	0.000	0.0	196.0	0.0	54	0.64	0.94	37.2	4.6
F20.001	16.601	0.000	0.0	196.0	0.0	54	0.64	0.94	37.3	4.6
F20.002	16.571	0.000	0.0	392.0	0.0	59	0.68	0.94	37.2	5.7
F20.003	16.325	0.000	0.0	590.0	0.0	64	0.70	0.94	37.2	6.5
F20.004	16.120	0.000	0.0	590.0	0.0	59	0.79	1.10	43.9	6.5
F17.008	14.518	0.000	0.0	1949.0	0.0	84	0.83	0.95	37.9	11.2
F17.009	14.240	0.000	0.0	1949.0	0.0	87	0.78	0.88	35.1	11.2

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F21.000	45.319	0.753	60.2	0.000	294.0	0.0	1.500	o	225	Pipe/Conduit	
F17.010	25.966	0.170	152.7	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F17.011	11.904	0.086	138.4	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F17.012	12.809	0.112	114.4	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F22.000	14.452	0.223	64.8	0.000	56.0	0.0	1.500	o	225	Pipe/Conduit	
F22.001	44.452	0.296	150.2	0.000	112.0	0.0	1.500	o	225	Pipe/Conduit	
F22.002	62.461	0.417	149.8	0.000	140.0	0.0	1.500	o	225	Pipe/Conduit	
F23.000	10.671	0.213	50.1	0.000	167.0	0.0	1.500	o	225	Pipe/Conduit	
F23.001	48.099	0.481	100.0	0.000	51.0	0.0	1.500	o	225	Pipe/Conduit	
F22.003	21.091	0.115	183.4	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F24.000	10.446	0.174	60.0	0.000	133.0	0.0	1.500	o	225	Pipe/Conduit	
F22.004	4.704	0.057	82.5	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F22.005	59.116	0.467	126.6	0.000	151.0	0.0	1.500	o	225	Pipe/Conduit	
F22.006	9.598	0.320	30.0	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F21.000	17.125	0.000	0.0	294.0	0.0	45	0.91	1.48	58.9	5.2
F17.010	14.158	0.000	0.0	2243.0	0.0	89	0.83	0.93	36.9	12.1
F17.011	13.988	0.000	0.0	2243.0	0.0	86	0.86	0.97	38.8	12.1
F17.012	13.902	0.000	0.0	2243.0	0.0	82	0.92	1.07	42.7	12.1
F22.000	17.025	0.000	0.0	56.0	0.0	38	0.79	1.43	56.7	3.5
F22.001	16.802	0.000	0.0	168.0	0.0	53	0.63	0.94	37.2	4.4
F22.002	16.506	0.000	0.0	308.0	0.0	57	0.66	0.94	37.3	5.3
F23.000	17.725	0.000	0.0	167.0	0.0	40	0.93	1.62	64.6	4.4
F23.001	17.512	0.000	0.0	218.0	0.0	49	0.74	1.15	45.6	4.8
F22.003	16.089	0.000	0.0	526.0	0.0	66	0.65	0.85	33.6	6.3
F24.000	16.800	0.000	0.0	133.0	0.0	41	0.86	1.48	59.0	4.2
F22.004	15.974	0.000	0.0	659.0	0.0	56	0.88	1.26	50.3	6.8
F22.005	15.917	0.000	0.0	810.0	0.0	65	0.78	1.02	40.5	7.4
F22.006	15.450	0.000	0.0	810.0	0.0	45	1.29	2.10	83.5	7.4

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F17.013	50.116	0.310	161.7	0.000	33.0	0.0	1.500	o	225	Pipe/Conduit	
F17.014	4.307	0.033	130.5	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F25.000	20.442	0.335	61.0	0.000	140.0	0.0	1.500	o	225	Pipe/Conduit	
F25.001	35.115	0.234	150.1	0.000	140.0	0.0	1.500	o	225	Pipe/Conduit	
F25.002	7.588	0.051	148.8	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F25.003	60.928	1.354	45.0	0.000	151.0	0.0	1.500	o	225	Pipe/Conduit	
F17.015	22.301	0.149	149.7	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F26.000	48.139	0.321	150.0	0.000	84.0	0.0	1.500	o	225	Pipe/Conduit	
F26.001	4.581	0.115	39.8	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F26.002	12.360	0.082	150.7	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F26.003	46.697	0.667	70.0	0.000	134.0	0.0	1.500	o	225	Pipe/Conduit	
F17.016	12.203	0.389	31.4	0.000	0.0	0.0	1.500	o	225	Pipe/Conduit	
F1.023	2.333	0.035	66.7	0.000	0.0	0.0	1.500	o	375	Pipe/Conduit	
F1.024	2.127	0.011	193.3	0.000	0.0	0.0	1.500	o	375	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F17.013	13.790	0.000	0.0	3086.0	0.0	100	0.86	0.90	35.9	14.7
F17.014	13.480	0.000	0.0	3086.0	0.0	94	0.93	1.00	39.9	14.7
F25.000	15.825	0.000	0.0	140.0	0.0	41	0.85	1.47	58.5	4.3
F25.001	15.490	0.000	0.0	280.0	0.0	56	0.66	0.94	37.2	5.1
F25.002	15.256	0.000	0.0	280.0	0.0	56	0.66	0.94	37.4	5.1
F25.003	15.205	0.000	0.0	431.0	0.0	45	1.05	1.71	68.1	5.8
F17.015	13.447	0.000	0.0	3517.0	0.0	103	0.90	0.94	37.3	16.0
F26.000	15.425	0.000	0.0	84.0	0.0	48	0.60	0.94	37.2	3.8
F26.001	15.104	0.000	0.0	84.0	0.0	35	0.96	1.82	72.4	3.8
F26.002	14.589	0.000	0.0	84.0	0.0	49	0.60	0.93	37.1	3.8
F26.003	14.507	0.000	0.0	218.0	0.0	45	0.84	1.37	54.6	4.8
F17.016	13.298	0.000	0.0	3735.0	0.0	69	1.61	2.05	81.6	16.7
F1.023	12.631	0.000	0.0	37800.0	0.0	154	1.80	1.97	217.1	76.7
F1.024	12.596	0.000	0.0	37800.0	0.0	210	1.20	1.15	127.2	76.7

Appendix F. IW Statement of Design Acceptance

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

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

www.water.ie

Aeval Unlimited Company,
C/o Garry Hanratty,
150 Airside Business Park,
Swords,
Co. Dublin

2 October 2019

Re: Design Submission for Townland of Cork Little, Woodbrook (the "Development") (the "Design Submission") / Connection Reference No: 9451918857

Dear Garry Hanratty,

Many thanks for your recent Design Submission.

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

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

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

If you have any further questions, please contact your Irish Water representative:
Name: Dermot Phelan
Phone: 01 89 25466
Email: dphelan@water.ie

Yours sincerely,

Maria O'Dwyer

Connections and Developer Services

Appendix A

Document Title & Revision

- [Proposed Watermains Layout] 5154251_EWE_DR_0441_STAT_I_REV D, 5154251_EWE_DR_0442_STAT_I_REV F, 5154251_EWE_DR_0443_STAT_I_REV D, 5154251_EWE_DR_0444_STAT_I_REV F, 5154251_EWE_DR_0445_STAT_I_REV F, 5154251_EWE_DR_0446_STAT_I_REV E

- [Proposed Foul Water Layout] 5154251_EWE_DR_0521_STAT_I_REV C, 5154251_EWE_DR_0522_STAT_I_REV E, 5154251_EWE_DR_0523_STAT_I_REV D, 5154251_EWE_DR_0524_STAT_I_REV C, 5154251_EWE_DR_0525_STAT_I_REV E, 5154251_EWE_DR_0526_STAT_I_REV C, 5154251_EWE_DR_0527_STAT_I_REV C

- [Proposed Foul Water Drainage Long Sections] 5154251_EWE_DR_0530_STAT_I_REV D, 5154251_EWE_DR_0531_STAT_I_REV C, 5154251_EWE_DR_0532_STAT_I_REV B

Standard Details/Code of Practice Exemption:

1. *Reduced separation distance between foul sewer line (F63 to F112) and foul water pumping station.*
2. *Final pumping station design to be confirmed before connection application.*

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

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

Appendix G. Public Lighting Report

DATE:	**26 March 2019**
DESIGNER:	**AK**
PROJECT No:	**5154251**
PROJECT NAME:	**Woodbrook Development**

ATKINS
Member of the SNC-Lavalin Group

Grids - 1, 2 & 3 Designed to P4 Standard
Grid 4 Carpark - Designed to P1 Standard
Grids 5, 6 & 7 - Designed to P2 Standard

Public Lighting Scheme

PREPARED BY:

Atkins Ireland.
Atkins House,
150 Airside Business Park,
Swords,
Co. Dublin

Layout Report

General Data

Dimensions in Metres Angles in Degrees

Calculation Grids

ID	Grid Name	X	Y	X' Length	Y' Length	X' Spacing	Y' Spacing
1	Grid 1_P4	725799.22	720163.67	256.91	302.13	1.03	1.21
2	Grid 2_P4	725532.76	720163.59	267.66	302.21	1.07	1.21
3	Grid 3_P4	725715.09	720464.44	288.34	313.34	1.49	1.50
4	Grid 4_Carpark	726073.56	720692.71	61.36	113.52	0.54	0.99
5	Grid 5_P2	725557.07	720277.55	388.28	65.86	1.55	1.50
6	Grid 6_P2	725864.71	720426.57	46.43	220.40	1.50	1.50
7	Grid 7_P2	725861.18	720617.31	291.93	36.93	1.45	0.82

Luminaires

Luminaire A Data

Supplier	C U Phosco
Type	P862-32-P1-WW-C0900-87W
Lamp(s)	730P WW
Lamp Flux (klm)	9.53
File Name	P862-32-P1-WW-C0900-87W.ies
Maintenance Factor	0.87
Lum. Int. Class	G2
No. in Project	29

Luminaire B Data

Supplier	C U Phosco
Type	P862-32-P4-WW-C0350-37W
Lamp(s)	730P WW
Lamp Flux (klm)	4.14
File Name	P862-32-P4-WW-C0350-37W.ies
Maintenance Factor	0.87
Lum. Int. Class	G2
No. in Project	60

Luminaire C Data

Supplier	C U Phosco
Type	P862-32-A1-WW-C0750-74W
Lamp(s)	730P WW
Lamp Flux (klm)	8.73
File Name	P862-32-A1-WW-C0750-74W.ies
Maintenance Factor	0.87
Lum. Int. Class	G6
No. in Project	10

Layout

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
1	A	725595.07	720313.24	6.00	97.00	0.00	0.00	1.13			
2	A	725630.82	720331.56	6.00	280.00	0.00	0.00	1.13			
3	A	725682.46	720333.91	6.00	104.00	0.00	0.00	1.13			
4	A	725717.35	720353.37	6.00	284.00	0.00	0.00	1.13			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
5	B	725932.43	720453.71	6.00	108.00	0.00	0.00	0.47			
6	A	725772.07	720354.33	6.00	101.00	0.00	0.00	1.13			
7	A	725822.45	720367.87	6.00	104.00	0.00	0.00	1.13			
8	B	725964.93	720462.48	6.00	118.00	0.00	0.00	0.47			
9	A	725856.63	720388.05	6.00	284.00	0.00	0.00	1.13			
10	A	725899.42	720392.84	6.00	120.00	0.00	0.00	1.13			
11	A	725888.40	720422.24	6.00	18.00	0.00	0.00	1.13			
12	B	725656.14	720319.26	6.00	15.00	0.00	0.00	0.47			
13	B	725668.35	720276.32	6.00	184.00	0.00	0.00	0.47			
14	B	725715.49	720332.70	6.00	5.00	0.00	0.00	0.47			
15	B	725749.26	720337.95	6.00	176.00	0.00	0.00	0.47			
16	B	725805.33	720350.20	6.00	196.00	0.00	0.00	0.47			
18	B	725646.17	720359.61	6.00	14.00	0.00	0.00	0.47			
19	B	725922.43	720392.47	6.00	238.00	0.00	0.00	0.47			
20	B	725859.37	720369.15	6.00	13.00	0.00	0.00	0.47			
21	A	725879.75	720454.46	8.00	15.00	0.00	0.00	1.13			
22	A	725879.67	720502.17	8.00	190.00	0.00	0.00	1.13			
23	A	725867.75	720546.20	8.00	193.00	0.00	0.00	1.13			
24	A	725856.10	720590.20	8.00	194.00	0.00	0.00	1.13			
25	A	725857.48	720621.67	8.00	106.00	0.00	0.00	1.13			
27	A	725893.90	720635.10	8.00	103.00	0.00	0.00	1.13			
28	B	725893.65	720541.13	6.00	101.00	0.00	0.00	0.47			
29	A	725937.24	720659.83	8.00	283.00	0.00	0.00	1.13			
30	A	725980.42	720671.36	8.00	285.00	0.00	0.00	1.13			
31	A	726022.56	720682.59	8.00	285.00	0.00	0.00	1.13			
32	A	726067.86	720694.69	8.00	285.00	0.00	0.00	1.13			
33	A	726086.97	720701.19	8.00	283.00	0.00	0.00	1.13			
33	A	726113.70	720708.10	8.00	283.00	0.00	0.00	1.13			
36	B	725937.50	720629.94	6.00	195.00	0.00	0.00	0.47			
37	C	726066.47	720786.52	8.00	102.00	0.00	0.00	1.13			
38	C	726087.41	720792.17	8.00	103.00	0.00	0.00	1.13			
41	C	726070.72	720769.97	8.00	284.00	0.00	0.00	1.13			
42	C	726091.89	720775.64	8.00	285.00	0.00	0.00	1.13			
44	C	726075.40	720753.79	8.00	103.00	0.00	0.00	1.13			
46	C	726096.41	720759.27	8.00	104.00	0.00	0.00	1.13			
47	C	726079.23	720736.97	8.00	283.00	0.00	0.00	1.13			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
50	C	726100.67	720742.72	8.00	284.00	0.00	0.00	1.13			
51	A	726061.79	720800.31	8.00	285.00	0.00	0.00	1.13			
53	C	726083.76	720721.04	8.00	100.00	0.00	0.00	1.13			
54	C	726104.99	720726.72	8.00	102.00	0.00	0.00	1.13			
56	A	726085.88	720704.57	8.00	99.00	0.00	0.00	1.13			
47	A	726112.37	720711.69	6.00	106.00	0.00	0.00	1.13			
49	B	725640.46	720380.89	6.00	17.00	0.00	0.00	0.47			
50	B	725633.20	720409.03	6.00	18.00	0.00	0.00	0.47			
51	B	725649.74	720434.99	6.00	281.00	0.00	0.00	0.47			
52	B	725619.68	720274.47	6.00	358.00	0.00	0.00	0.47			
53	B	725626.71	720249.44	6.00	90.00	0.00	0.00	0.47			
54	B	725672.03	720251.24	6.00	96.00	0.00	0.00	0.47			
55	B	725722.05	720253.22	6.00	94.00	0.00	0.00	0.47			
56	B	725814.86	720276.64	6.00	287.00	0.00	0.00	0.47			
57	B	725773.58	720258.27	6.00	90.00	0.00	0.00	0.47			
58	B	725678.54	720197.04	6.00	273.00	0.00	0.00	0.47			
59	B	725725.54	720199.22	6.00	275.00	0.00	0.00	0.47			
60	B	725732.89	720227.71	6.00	185.00	0.00	0.00	0.47			
61	B	725669.68	720218.00	6.00	180.00	0.00	0.00	0.47			
62	B	725637.21	720217.76	6.00	182.00	0.00	0.00	0.47			
63	B	725729.59	720289.02	6.00	183.00	0.00	0.00	0.47			
64	B	725762.95	720198.37	6.00	270.00	0.00	0.00	0.47			
65	B	725747.58	720230.10	6.00	0.00	0.00	0.00	0.47			
66	B	725795.74	720199.33	6.00	323.00	0.00	0.00	0.47			
69	B	725737.63	720366.00	6.00	354.00	0.00	0.00	0.47			
70	B	725745.45	720294.00	6.00	1.00	0.00	0.00	0.47			
71	B	725861.45	720206.20	6.00	200.00	0.00	0.00	0.47			
72	B	725889.93	720208.09	6.00	285.00	0.00	0.00	0.47			
73	B	725968.22	720228.44	6.00	260.00	0.00	0.00	0.47			
74	B	725866.02	720283.76	6.00	112.00	0.00	0.00	0.47			
75	B	725816.99	720307.39	6.00	194.00	0.00	0.00	0.47			
76	B	725915.78	720296.53	6.00	270.00	0.00	0.00	0.47			
77	B	725948.56	720307.02	6.00	195.00	0.00	0.00	0.47			
78	B	726015.69	720309.60	6.00	192.00	0.00	0.00	0.47			
79	B	725871.97	720322.00	6.00	12.00	0.00	0.00	0.47			
80	B	725858.49	720248.51	6.00	183.00	0.00	0.00	0.47			

Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
81	B	725906.19	720233.30	6.00	13.00	0.00	0.00	0.47			
82	B	725899.18	720268.05	6.00	15.00	0.00	0.00	0.47			
83	B	725952.60	720258.74	6.00	8.00	0.00	0.00	0.47			
84	B	726008.56	720235.31	6.00	287.00	0.00	0.00	0.47			
85	B	726018.48	720263.59	6.00	11.00	0.00	0.00	0.47			
86	B	726000.64	720350.63	6.00	21.00	0.00	0.00	0.47			
87	B	725979.92	720300.74	6.00	101.00	0.00	0.00	0.47			
88	B	725928.87	720352.15	6.00	22.00	0.00	0.00	0.47			
89	B	725958.18	720396.17	6.00	107.00	0.00	0.00	0.47			
90	B	725995.90	720396.97	6.00	206.00	0.00	0.00	0.47			
91	B	725809.04	720240.38	6.00	181.00	0.00	0.00	0.47			
92	B	725933.44	720552.14	6.00	105.00	0.00	0.00	0.47			
93	B	725968.93	720501.67	6.00	195.00	0.00	0.00	0.47			
94	B	725947.44	720582.60	6.00	196.00	0.00	0.00	0.47			
95	A	726082.41	720805.74	6.00	282.00	0.00	0.00	1.13			
96	A	726052.31	720774.40	8.00	16.00	0.00	0.00	1.00			
98	A	726063.28	720732.92	6.00	20.00	0.00	0.00	1.00			
99	A	726117.50	720755.81	8.00	193.00	0.00	0.00	1.00			
100	A	726108.16	720787.73	8.00	196.00	0.00	0.00	1.00			
101	B	726131.63	720725.68	6.00	195.00	0.00	0.00	0.41			
100	B	725958.73	720541.80	6.00	199.00	0.00	0.00	0.47			
101	B	725901.92	720445.78	6.00	105.00	0.00	0.00	0.47			
102	B	725728.22	720317.94	6.00	181.00	0.00	0.00	0.47			

DATE: 26 March 2019 DESIGNER: AK

PROJECT No: 5154251 PROJECT NAME: Woodbrook Development

Horizontal Illuminance (lux)

Grid 1_P4

Results

Eav	6.96
Emin	1.00
Emax	36.78
Emin/Emax	0.03
Emin/Eav	0.14

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Horizontal Illuminance (lux)

Grid 2_P4

Results

Eav	8.02
Emin	0.99
Emax	36.79
Emin/Emax	0.03
Emin/Eav	0.12

Horizontal Illuminance (lux)

Grid 3_P4

Results

Eav	7.87
Emin	1.23
Emax	36.57
Emin/Emax	0.03
Emin/Eav	0.16

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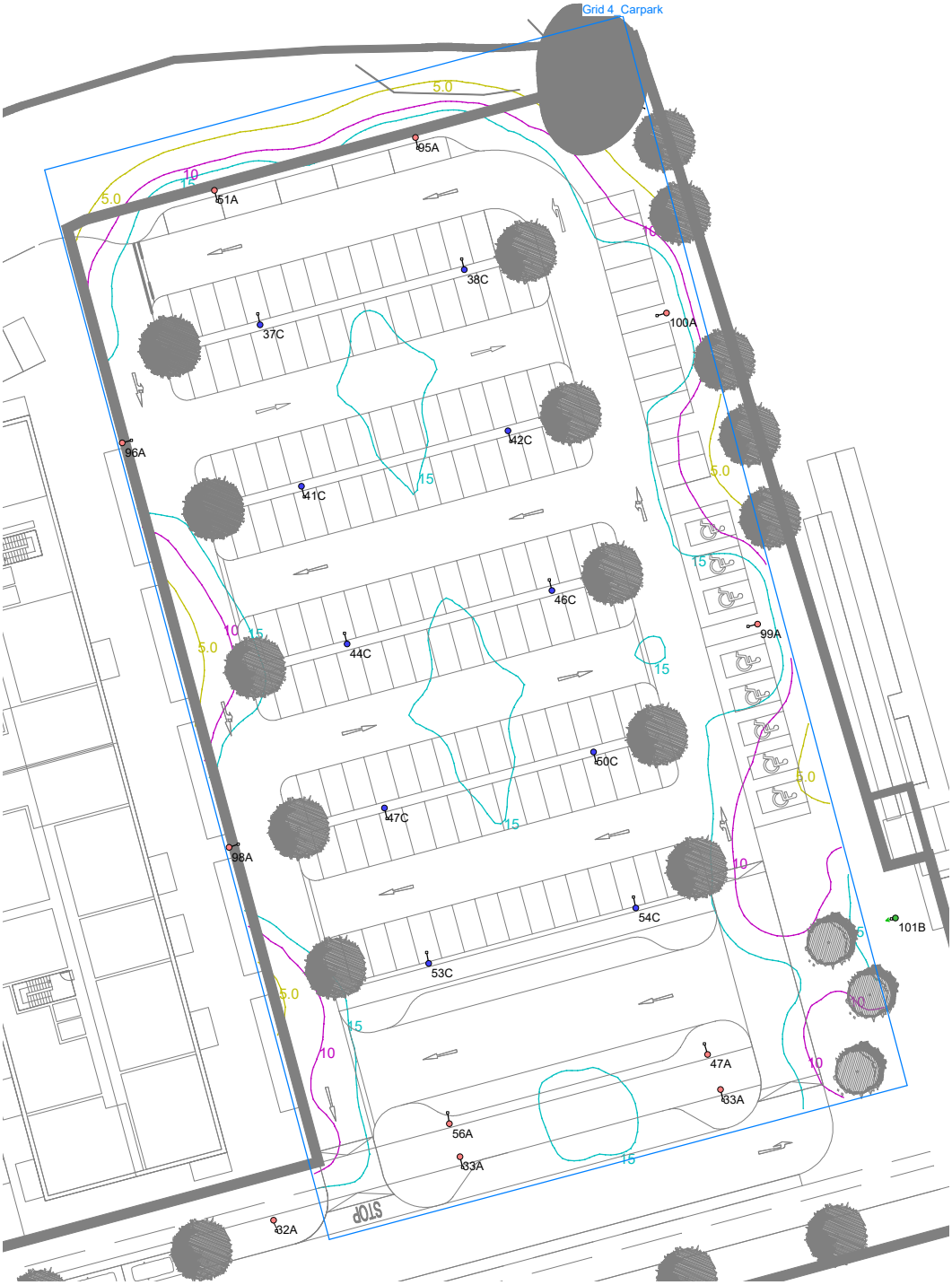
Horizontal Illuminance (lux)

Grid 4_Carpark



Results

Eav	22.48
Emin	3.19
Emax	71.15
Emin/Emax	0.04
Emin/Eav	0.14

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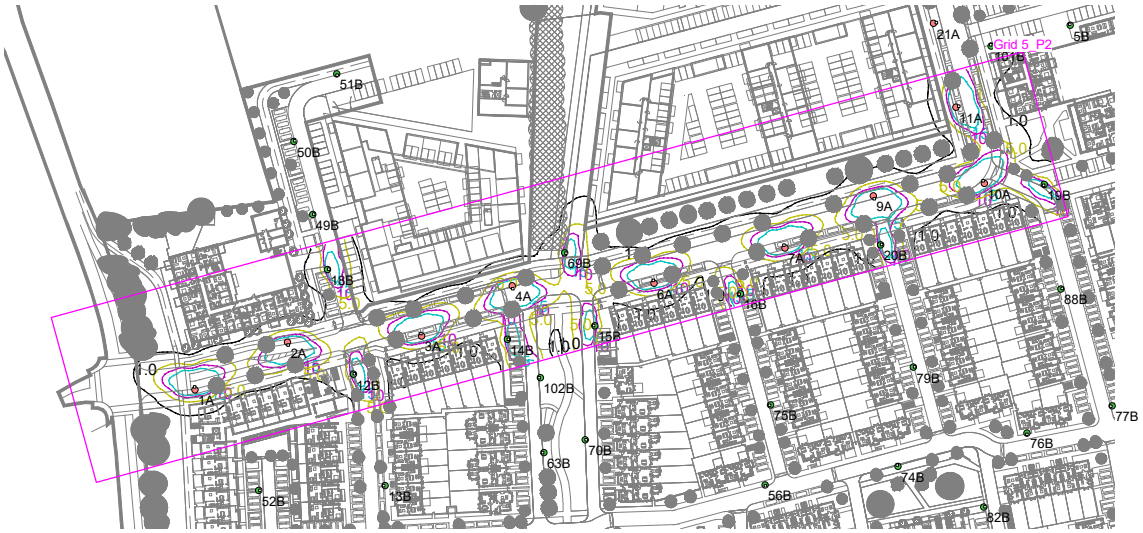
Horizontal Illuminance (lux)

Grid 5_P2



Results

Eav	14.70
Emin	1.97
Emax	62.90
Emin/Emax	0.03
Emin/Eav	0.13

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Horizontal Illuminance (lux)

Grid 6_P2

Results

Eav	10.95
Emin	2.04
Emax	35.54
Emin/Emax	0.06
Emin/Eav	0.19

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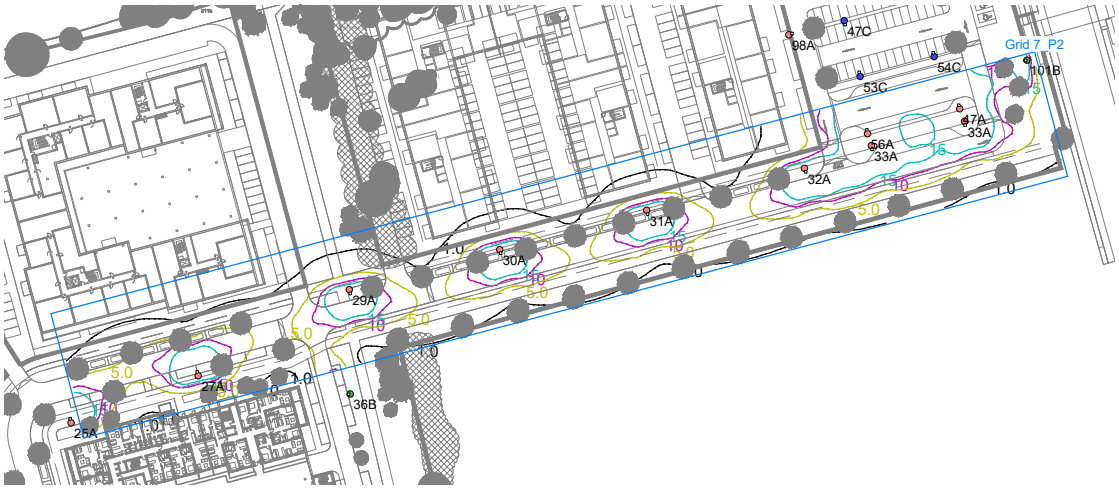
Horizontal Illuminance (lux)

Grid 7_P2



Results

Eav	12.89
Emin	2.08
Emax	39.67
Emin/Emax	0.05
Emin/Eav	0.16

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