Chapter 04
Proposed Scheme Description

Contents

4. Proposed Scheme Description

4.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) provides a description of the Clongriffin to City Centre Scheme (hereafter referred to as the Proposed Scheme).

Article 5(1)(a) of the EIA Directive[1] requires that the EIAR contains:

'*a description of the project comprising information on the site, design, size and other relevant features of the project;….'*

Section 50(2)(b)(i) of the Roads Act 1993 (as amended) states that that the EIAR shall contain the following information:

'a description of the proposed road development comprising information on the site, design, size and other relevant features of the development;…….'.

The layout of the chapter begins with the Proposed Scheme Overview (Section 4.2). This is followed by Sections describing the Design Iteration process (Section 4.3) and the overall Design Principles applied to the Proposed Scheme (Section 4.4). Following this, there is a detailed description of the Proposed Scheme (Section 4.5) and a Section describing the key infrastructure elements associated with the Proposed Scheme (Section 4.6). These Sections should be read in their entirety in order to gain a full understanding of the Proposed Scheme and its associated key infrastructure elements.

4.2 Proposed Scheme Overview

The Proposed Scheme has an overall length of approximately 5.7km, and is routed along the R107 Malahide Road from Mayne River Avenue – R107 Malahide Road Junction to the junction with Marino Mart - Fairview and also routed for cyclists via the junction with Malahide Road-Brian Road along Carleton Road, St Aidan's Park, Haverty Road and Marglann Marino, all in the County of Dublin and within the Dublin City Council (DCC) administrative area. From here the Proposed Scheme ties into a separate project, the Clontarf to City Centre Cycle & Bus Priority Project, currently being developed by DCC. The Clontarf to City Centre Cycle & Bus Priority Project will provide segregated cycling facilities and bus priority infrastructure along a 2.7km route that extends from Clontarf Road at the junction with Alfie Byrne Road, to Amiens Street at the junction with Talbot Street in the City Centre. The start of the scheme ties into a separate project being developed by DCC namely, The Belmayne Main Street and Belmayne Avenue Scheme, which provides bus and cycle linkages to Clongriffin Dart Station.

The route of the Proposed Scheme is shown in Image 1.1 in Chapter 1 (Introduction). The junction where the Proposed Scheme meets the Clontarf to City Centre Cycle & Bus Priority Project is generally referred to as 'the junction with Marino Mart – Fairview' in this EIAR. However, where relevant for the assessment of particular environmental topics, in certain instances, the junction may also be referred to as the Clontarf Road Junction.

The Proposed Scheme includes an upgrade of the existing bus priority and cycle facilities associated with the Malahide Road Quality Bus Corridor (QBC), which has been in place since 1999. The Proposed Scheme includes a substantial increase in the level of bus priority provided along the Malahide QBC, including the provision of additional lengths of bus lane, particularly in the outbound direction resulting in improved journey time reliability. To facilitate bus journey time reliability the existing roundabouts at Blunden Drive / Priorswood Road and Ardlea

[1] Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment, as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (hereafter collectively referred to as the Environmental Impact Assessment (EIA Directive))

Road / Gracefield Road (R808) will be removed and replaced with traffic signal-controlled junctions. Throughout the Proposed Scheme bus stops will be enhanced to improve the overall journey experience for bus passengers.

Throughout the Proposed Scheme cycle facilities will be substantially improved with segregated cycle tracks provided along the links and protected junctions with enhanced signalling for cyclists provided at junctions. Where space for a segregated cycle track is not available on the main corridor an alternative cycle route via quiet roads is proposed such as between the junction with Malahide Road-Brian Road along Carleton Road, St Aidan's Park, Haverty Road and Marglann Marino.

Moreover, pedestrian facilities will be upgraded and additional signalised crossings are provided. In addition, public realm works will be undertaken at key locations with higher quality materials, planting and street furniture provided to enhance the pedestrians experience, an example of this can be seen at the junction adjacent to Donnycarney Church.

Table 4.1 summarises the changes which will be made to the existing corridor as a result of the Proposed Scheme.

Table 4.1: Summary of Changes as a result of the Proposed Scheme

Total Length of Proposed Scheme	**5.7km**	
Bus Priority	**Existing (km)**	**Proposed Scheme (km)**
Bus Lanes		
Inbound	4.5	5.1
Outbound	3.9	5.0
Bus Priority through Traffic Management		
Inbound	0	0.6
Outbound	0	0.7
Total Bus Priority (both directions)	8.4	11.4 (+36%)
Bus Measures		
Proportion of Route with Bus Priority Measures	74%	100%
Cycle Facilities – Segregated		
Inbound	0.2	4.7
Outbound	0.2	5.3
Cyclist Facilities – Non-segregated Online (NS) Offline Quiet Street (QS)		
Inbound	3.5 (NS)	1.2 (QS)
Outbound	4.2 (NS)	0.7 (QS)
Total Cyclist Facilities (both directions)	8.1	11.9 (+47%)
Proportion Segregated (including Quiet Street Treatment)	5%	100%
Other Features		
Number of Pedestrian Signalised Crossings	36	52
Number of Residential Properties with Land Acquisition	Not applicable	80

The description of the Proposed Scheme (Section 4.5) is supported by a series of drawings (listed in Table 4.2), which are contained in Volume 3 of the EIAR and these should be read in conjunction with this chapter.

Table 4.2: List of Drawings

Drawing Series Number	Description
BCIDA-ACM-SPW_ZZ-0001_XX_00-DR-CR-9001	Site Location Plan
BCIDA-ACM-GEO_GA-0001_XX_00-DR-CR-9001	General Arrangement
BCIDA-ACM-GEO_HV-0001_ML_00-DR-CR-9001	Mainline Plan and Profile
BCIDA-ACM-GEO_CS-0001_XX_00-DR-CR-9001	Typical Cross Sections
BCIDA-ACM-ENV_LA-0001_XX_00-DR-LL-9001	Landscaping General Arrangement
BCIDA-ACM-PAV_PV-0001_XX_00-DR-CR-9001	Pavement Treatment Plans
BCIDA-ACM-SPW_BW-0001_XX_00-DR-CR-9001	Fencing and Boundary Treatment
BCIDA-ACM-TSM_GA-0001_XX_00-DR-CR-9001	Traffic Signs and Road Markings
BCIDA-ACM-LHT_RL-0001_XX_00-DR-EO-9001	Street Lighting
BCIDA-ACM-TSM_SJ-0001_XX_00-DR-TR-9001	Junction System Design
BCIDA-ACM-DNG_RD-0001_XX_00-DR-CD-9001	Proposed Surface Water Drainage Works
BCIDA-ACM-UTL_UD-0001_XX_00-DR-CU-9001	IW Foul Sewer Asset Alterations
BCIDA-ACM-UTL_UE-0001_XX_00-DR-CU-9001	ESB Asset Alterations
BCIDA-ACM-UTL_UG-0001_XX_00-DR-CU-9001	GNI Asset Alterations
BCIDA-ACM-UTL_UW-0001_XX_00-DR-CU-9001	IW Water Asset Alterations
BCIDA-ACM-UTL_UL-0001_XX_00-DR-CU-9001	Telecommunications Asset Alterations
BCIDA-ACM-UTL_UC-0001_XX_00-DR-CU-9001	Combined Existing Utility Records

4.3 Design Iteration

The design of the Proposed Scheme has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable, whilst ensuring the objectives of the Proposed Scheme are attained. In addition, feedback received from the comprehensive consultation programme, described in Chapter 1 (Introduction), undertaken throughout the option selection and design development process has been incorporated, where appropriate.

Examples of how the design evolved are as follows:

- The addition of a road closure at the end of Haverty Road following feedback received from residents. This reduced the number of vehicles using the street as a short cut during peak periods and made it safer for use by cyclists;
- The cycle tracks for a short section north of Kilmore Road have been reduced in width to the absolute minimum of 1.5m to reduce the impact on properties in this section;
- The frontage of Maypark was set back following concerns raised by the public in relation to the impact on mature trees and an existing stone wall at Thorndale. This design modification resulted in the retention of the mature trees and wall, while also retaining the existing trees in Maypark through reassessing where the proposed footpath could be located;
- The junction layouts were modified over the course of the design process to provide more protection for cyclists along the length of the Proposed Scheme, including the addition of separately signalised stages for cyclists at large junctions such as Clare Hall and Priorswood Road and early starts and additional physical islands at most other junctions; and
- The layout and signal timings of major junctions along the corridor were determined following significant iterations and analysis using macro and micro traffic modelling to minimise general traffic redistribution onto side roads without compromising the scheme objectives.

4.4 Design Principles

The design of the Proposed Scheme was developed with reference to the Preliminary Design Guidance Booklet for BusConnects Core Bus Corridors (PDGB) (NTA 2021) – refer to Appendix A4.1 in Volume 4 of this EIAR. This guidance document was prepared to ensure that a consistent design approach for the Core Bus Corridor Infrastructure Works was adopted based on the objectives of the Proposed Scheme. The project objectives are described in full in Chapter 2 (Need for the Proposed Scheme).

The purpose of the PDGB is to complement existing guidance documents/design standards relating to the design of urban streets, bus facilities, cycle facilities and public realm, which include the following:

- The Design Manual for Urban Roads and Streets (DMURS) (Government of Ireland 2013);
- The National Cycle Manual (NCM) (NTA 2011);
- TII National Road Design Standards;
- The Traffic Signs Manual (TSM) (DoT 2019);
- Guidance on the use of Tactile Paving (UK DfT 2007);
- Building for Everyone: A Universal Design Approach (NDA 2020), and
- Greater Dublin Strategic Drainage Study (GDSDS) (Irish Water 2005).

An example of the application of the design principles for the Proposed Scheme can be seen at the junction of Malahide Road/ Blunden Drive/ Priorswood Road where an existing large roundabout facilitates the movement of vehicles, but provides poor facilities for pedestrians, cyclists and buses. Pedestrians and cyclists have to walk a significant distance off of their desire line to cross the road at a signalised crossing, which many are observed not to do resulting in unsafe conditions for these vulnerable road users. While buses on the main corridor can pass through the junction with relative ease, those entering from the side road can often be delayed due to traffic flow on the main line. In addition, bus passengers have difficulty accessing bus stops near the junction.

Having considered the objectives for the Proposed Scheme and using the principles set out in the PDGB a traffic signal-controlled junction arrangement was developed to address the issues outlined above. This layout could be used to control the flow of traffic and provide a high level of priority for buses on all arms of the junction. In addition, high quality signal-controlled pedestrian crossing facilities can be provided on all arms of the junction, close to the pedestrian desire lines. For cyclists, taking into account the high traffic volumes and speeds, a fully segregated facility is provided where cyclists are segregated in both space and time from moving vehicles, which significantly enhances the safety of these vulnerable road users. The revised layout is typical of junctions along the corridor that have been developed to meet the objectives of the project.

Accessibility for mobility impaired users is a core element of the Proposed Scheme design and it has been informed by the principles of DMURS, Building for Everyone: A Universal Design Approach (NDA 2020), How Walkable is Your Town (NDA 2015), Shared Space, Shared Surfaces and Home Zones from a Universal Design Approach for the Urban Environment in Ireland (NDA 2012), Best Practice Guidelines, Designing Accessible Environments (Irish Wheelchair Association 2020), Inclusive Mobility (UK Department for Transport 2005), Guidance on the Use of Tactile Paving Surfaces (UK DfT 2007), and BS8300:2018 Volume 1 Design of an accessible and inclusive built environment - External Environment – code of practice. Accessibility is also addressed in Chapter 12 of the PGDB. Further detail on accessibility for mobility impaired users is given in Section 4.6.5.

The Proposed Scheme which has been developed after the consideration of reasonable alternatives and which achieves the aim and objectives for the Proposed Scheme is described in detail in Section 4.5. Further detail on the key infrastructure elements that comprise the Proposed Scheme is provided in Section 4.6

4.5 Description of the Proposed Scheme

The Proposed Scheme runs along the existing R107 Malahide Road from Mayne River Avenue to Marino Mart/ Fairview / Clontarf Road (R105) and is described in the following geographical sections:

- Section 1: Mayne River Avenue to Gracefield Road – Malahide Road; and
- Section 2: Gracefield Road to Marino Mart / Fairview – Malahide Road.

4.5.1 Section 1: Mayne River Avenue to Gracefield Road – Malahide Road

4.5.1.1 General overview of the Proposed Scheme

This Section of the Proposed Scheme is routed along the R107 Malahide Road, commencing from the Mayne River Avenue – Malahide Road Junction, to the junction with the R808 at Gracefield Road. The following junctions are intended to be upgraded to provide bus priority and enhanced pedestrian and cyclist facilities:

- Malahide Road/R139 Clarehall Avenue;
- Malahide Road/Entrance to Clarehall Shopping Centre;
- Malahide Road/Blunden Drive/ Priorswood Road;
- Malahide Road/Tonlegee Road/ Brookville Crescent; and
- Malahide Road/Gracefield Road.

Junctions are being redesigned to improve facilities and reduce conflict between users. On the northbound approach on the Malahide Road, it is proposed to extend the bus lane to the stop line towards the Northern Cross Junction. It is proposed that the speed limit is reduced from 60kph to 50kph from Clarehall Avenue inbound towards the City Centre. Between Clarehall Avenue and Blunden Drive, a single bus lane and two general traffic lanes will be maintained. Temporary land acquisition is required for the Construction Compound between Buttercup Park and Malahide Road. Reinstatement of the proposed Construction Compound will be required in this area following completion of the works. This will involve landscaping with an opportunity to improve the tree cover in this location. A new pedestrian footpath has been incorporated into the design of the greenspace to allow for access. Land acquisition is required 250m west of the Priorswood Road junction to provide a bus turnaround facility.

Between Priorswood Road Junction and Newton Cottages there is a new proposed pedestrian footpath and cycle track through an existing green area which will link Ayrefield Drive and provide a much shorter route for these residents to gain access to the bus corridor. This will require the removal of a section of wall between the housing estate and the Malahide Road. A proposed Toucan crossing has been aligned here with this new access.

Between Tonlegee Road junction and Gracefield Road junction, it is intended to retain the single bus and general traffic lane in each direction. An outbound segregated cycle track will be provided between Malahide Road and Brookville Park. Inbound cyclists will be redirected on to the adjoining quiet street, St. Brendan's Avenue. Cyclists can then re-join the Malahide Road at Gracefield Road.

The existing roundabout at Gracefield Road will be upgraded to a fully signalised junction. The cycle facilities have been enhanced with more segregation provided.

4.5.1.2 Deviations from Standard Cross Sections

There are no deviations from the standard BusConnects cross-sectional elements as outlined in Section 4.6.1.

4.5.1.3 Bus Lane Provision

An overview of the bus lane provision as part of the Proposed Scheme is set out in Section 4.6.4. As outlined within that section, full bus priority is proposed along the entire length of the Proposed Scheme.

4.5.1.4 Bus Stops

The different types of bus stop (island, shared landing and inline) are described in Section 4.6.4. Fourteen out of the fifteen proposed bus stops within this Section of the Proposed Scheme are Island Bus Stops. The bus stop locations and types are outlined in Table 4.3 and shown in the General Arrangement series of drawings (BCIDA-ACM-GEO_GA-0001_XX_00-DR-CR-9001) in Volume 3 of this EIAR. Further details of bus stop design is included in the Preliminary Design Guidance Booklet for BusConnects Core Bus Corridors (PDGB) (NTA 2021) – Appendix A4.1 in Volume 4 of this EIAR.

Table 4.3: Proposed Bus Stop Locations

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type – including full shelter, unless indicated otherwise
Inbound	Malahide Road – Clarehall Shopping Centre	4563	A 3380	Island Bus Stop
Inbound	Malahide Road – Grove Park	1218	A 3670	Shared Landing Bus Stop
Inbound	Malahide Road – Blunden Drive/ Priorswood Road	Relocated Bus Stop	A 4040	Island Bus Stop
Inbound	Malahide Road – Ayrefield Drive	New Bus Stop	A 4450	Island Bus Stop
Inbound	Malahide Road – Greencastle Road	Relocated Bus Stop	A 4800	Island Bus Stop
Inbound	Malahide Road – Tonlegee Road/ Brookville Crescent	1274	A 5220	Island Bus Stop
Inbound	Malahide Road – St. Brendan's Drive	New Bus Stop	A 5500	Island Bus Stop
Inbound	Malahide Road – Mask Avenue	1276	A 5800	Island Bus Stop
Outbound	Malahide Road – Belcamp Lane	Relocated Bus Stop	A 3550	Island Bus Stop
Outbound	Malahide Road – Blunden Drive/ Priorswood Road	New Bus Stop	A 3920	Island Bus Stop
Outbound	Malahide Road – Retail Centre	New Bus Stop	A 4380	Island Bus Stop
Outbound	Malahide Road – Greencastle Road	Relocated Bus Stop	A 4800	Island Bus Stop

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type – including full shelter, unless indicated otherwise
Outbound	Malahide Road – Tonlegee Road/ Brookville Crescent	Relocated Bus Stop	A 5100	Island Bus Stop
Outbound	Malahide Road – Coolock Village	1200	A 5500	Island Bus Stop
Outbound	Malahide Road – Brookville Park	1199	A 5770	Island Bus Stop

4.5.1.5 Junction Information

An overview of the approach to junction review and design is provided in Section 4.6.7. The major and moderate junctions (as defined in the PGDB) within Section 1 – Mayne River Avenue to Gracefield Road of the Proposed Scheme are outlined in Table 4.4.

Table 4.4: Major and Moderate Junctions within Section 1 of the Proposed Scheme

Junction Location	Note
Major Junctions	
R107 Malahide Road / R139 'Northern Cross'	Junction Type 4 design layout with dedicated pedestrian and cycle crossings Bus priority inbound and outbound along the Proposed Scheme proposed. Key interchange location with Orbital bus services
Malahide Road (R107)-Clarehall Shopping Centre	Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction
Malahide Road -Blunden Drive - Priorswood Road	Removal of existing roundabout junction to facilitate upgrade to a signal control junction that includes pedestrian, cycle, and bus infrastructure. Junction Type 4 design
Malahide Road - Greencastle Rd	Introduction of pedestrian and cycle crossings on all arms of the junction, with bus priority at the junction.
Malahide Road -Tonlegee Rd – Brookville Crescent	Existing 4 arm junction to be upgraded to provide pedestrian and cycle crossings on all arms. Bus priority proposed up to the junction.
Moderate Junctions / Priority Junctions	
Malahide Road – Belcamp Lane	Uncontrolled pedestrian crossing maintained. (raised table side entry treatment) No right turn onto Malahide Road
Malahide Road – Grove Park	Uncontrolled pedestrian crossing maintained
Malahide Road – Newton Road	Uncontrolled pedestrian crossing maintained
Main Street – Grange Lodge Avenue	No right turn onto Malahide Road
Malahide Road – Retail Centre	Uncontrolled pedestrian crossing maintained. (raised table side entry treatment)
Malahide Road – Newton Cottages	Uncontrolled pedestrian crossing maintained. (raised table side entry treatment)
Malahide Road – Crown Decorating Centre	Uncontrolled pedestrian crossing maintained. (raised table side entry treatment)
Main Street – Park Avenue	Proposed right turn ban onto Malahide Road
Malahide Road – Coolock Village	No current pedestrian crossing facilities (raised table side entry treatment proposed) Proposed right turn ban onto Malahide Road
Malahide Road – St. Brendan's Drive	Uncontrolled pedestrian crossing maintained. (raised table side entry treatment proposed)
Malahide Road – Newton Road	Proposed right turn ban onto Malahide Road
Malahide Road – Brookville Park	No current pedestrian crossing facilities (raised table side entry treatment proposed)

4.5.1.6 Structures

4.5.1.6.1 Major Structures

One principal structure exists in Section 1 of the Proposed Scheme. The location and type of structure is indicated in Table 4.5.

No new structures are proposed as part of the Proposed Scheme.

Table 4.5: Summary of Principal Structures in Section 1 of the Proposed Scheme

Identity	Irish OS Grid	Chainage	Description
Santry River Crossing	53°23'28.6"N 6°11'42.6"W	A4850	Santry River Crossing, Malahide Road / Greencastle Road

4.5.1.6.2 Retaining Walls

There are two minor low level retaining walls proposed within this section of the Proposed Scheme at the below locations:

- just north of the Malahide Road / Priorswood Road Junction for approximately 155m at chainage A3825; and
- just south of the Malahide Road / Priorswood Road Junction for approximately 25m at chainage A4250.

4.5.1.7 Landscape and Public Realm

For an overview of the design principles and approach, reference should be made to Section 4.6.12. The following sections provide a description of specific landscape and public realm design works in Section 1 of the Proposed Scheme.

4.5.1.7.1 Section 1: Mayne River Avenue to Gracefield Road – Malahide Road

Practically all of the Proposed Scheme is along the Malahide Road where there is already a priority bus lane in place and mature trees, including trees on the median. The following junctions will be upgraded to provide bus priority and enhanced pedestrian and cyclist facilities:

- Junction of Malahide Road with the R139 Clarehall Avenue (Northern Cross Junction)

The pavement and planting along the front of the Hilton Hotel will be retained, road widening on the opposite side of the street will require removal of trees and their replacement with semi-mature trees. The Clarehall / Northern Cross junction will be improved with hedge-lined boundaries, wildflower grassland and mature tree planting, and. There a length of palisade fencing will be replaced with new railings and hedgerow. These public realm works will uplift the overall appearance of the area.

- Malahide Road – Clarehall Avenue to Blunden Drive/ Priorswood Road

Currently this section of Malahide Road is quite open, with security fencing and open grassland at Buttercup Crescent. A Construction Compound is proposed at Buttercup Park. Following completion of the Proposed Scheme the Construction Compound will be turned into a community greenspace enclosed with hedge planting and woodland walkways. A new pedestrian footpath has been incorporated into the design of the reinstated greenspace to allow for access.

- Malahide Road - Junction at Blunden Drive/ Priorswood Road

The Malahide Road Junction with Blunden Drive was highlighted in the public consultation process as a potential focal point. A revised road layout will provide an opportunity for greater public open space, improved pedestrian

and cycling facilities and increased tree planting. The trees are proposed as semi mature native species, interspersed with wildflower / seasonal bulb underplanting which will add to the biodiversity of this area.

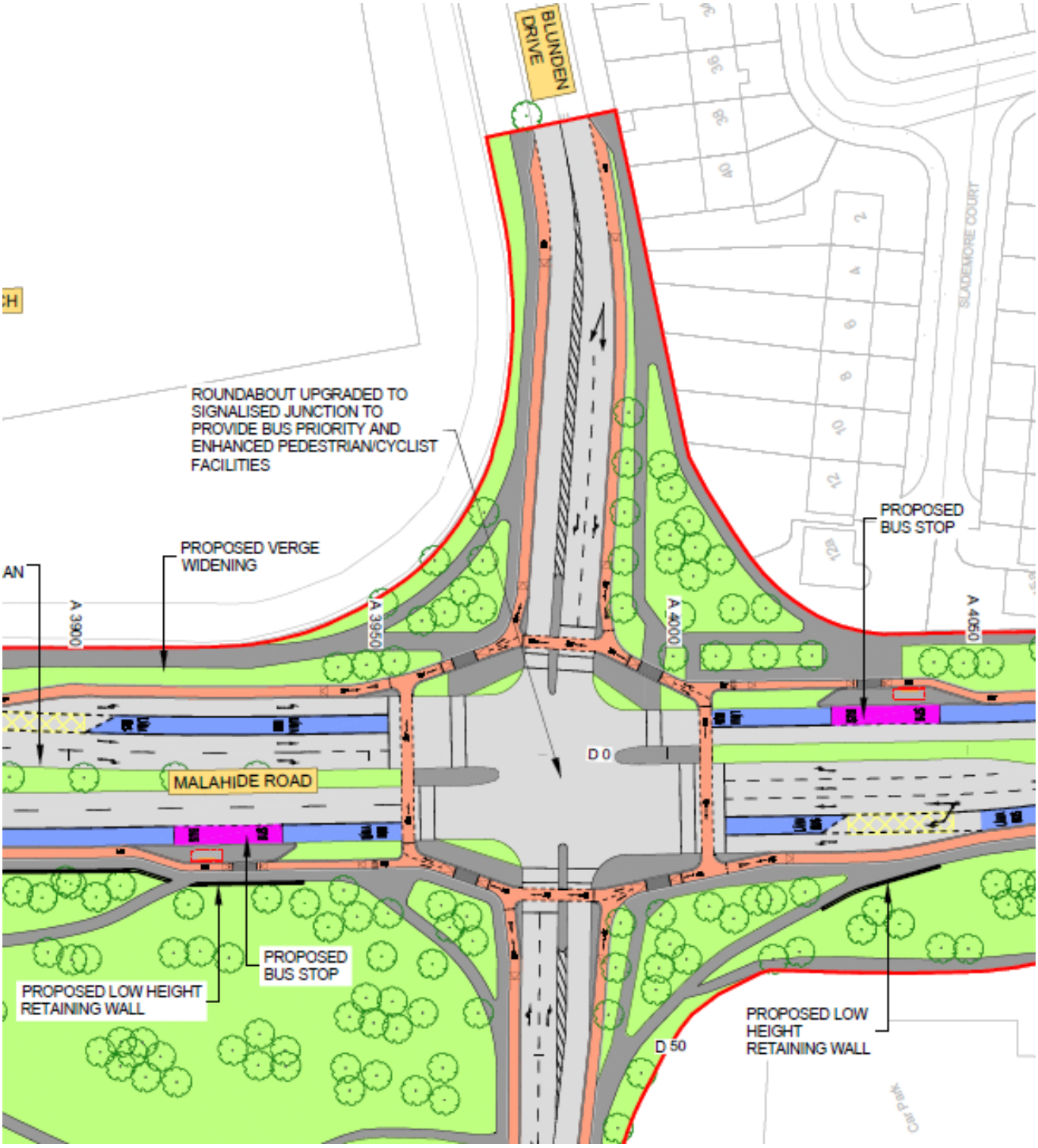

Image 4.1: Blunden Drive Junction Focal Point

- Malahide Road – Blunden Drive to Tonlegee Road / Brookville Crescent

This section of the Malahide Road is a combination of residential properties and commercial estates. The road is tree-lined with grass verges. The proposed public realm works is a component of the Proposed Scheme, and acts to enhance the existing character, reinforcing the tree cover and providing additional median planting. Enhanced planting at Brookville Park / Bothar Mhullach Ide will provide a small community pocket park. Footpaths and cycle

tracks will be improved at Ayrefield Drive, as illustrated in Image 4.2. New tree and hedge planting with newly paved surfaces will improve the appearance of the junction with Brookville Crescent.

Image 4.2: Malahide Road cycle track and footpath improvements at Ayrefield Drive Crossing – looking South

- Malahide Road – Tonlegee Road / Brookville Crescent to Junction with Ardlea Road / Gracefield Road

The tree-lined character of the Malahide Road continues to the junction with Gracefield Road as shown in Image 4.3. The replacement of the roundabout with a junction allows for improved cycle and footpath network. Existing tree cover is retained and supplemented with informal clusters of semi mature native trees. Increased tree planting and wildflower / seasonal bulb underplanting adds to the biodiversity of this area.

Image 4.3: Gracefield Road Junction Focal Point

4.5.1.8 Land Acquisition and Use

Temporary land acquisition is required within this Section at several locations, including the Construction Compound between Buttercup Park and Malahide Road.

Permanent land acquisition is required within this Section at various locations, including the provision of a bus turnaround facility 250m west of the Priorswood Road junction.

The impacts on residential amenity arising from land acquisition in Section 1 of the Proposed Scheme and are addressed in Chapter 10 (Population). Similarly, the impacts on landscape amenity arising from land acquisition in Section 1 of the Proposed Scheme are addressed in Chapter 17 (Landscape (Townscape) & Visual).

4.5.2 Section 2: Gracefield Road to Marino Mart / Fairview – Malahide Road

4.5.2.1 General

This section of the Proposed Scheme commences at the Gracefield Road Junction and extends to Marino Mart/ Fairview/ Clontarf Road Junction. The following junctions on the Malahide Road within this section:

- Malahide Road/Collins Avenue;
- Malahide Road/Copeland Avenue/Griffith Avenue; and
- Malahide Road/Marino Mart/ Fairview/Clontarf Road (linking in to the Clontarf to City Centre Cycle & Bus Priority Project at this junction).

Between Gracefield Road Junction and Killester Avenue Junction, it is intended to provide a continuous bus lane with a single general traffic lane in each direction. Dedicated cycle tracks and footpath facilities will be provided through this section, including a section of new footpath between Kilmore Road and St. David's Wood. To accommodate this, some areas of land acquisition will be required from private properties.

Between Killester Avenue Junction and Collins Avenue Junction, a continuous bus lane with a single general traffic lane in each direction. Dedicated cycle tracks and footpath facilities will be provided through this section. The existing road between these junctions requires widening to accommodate the desired lane widths and bus stop facilities. The existing footpath within Maypark will be realigned to allow for the provision of the road works. Between Maypark and Collins Avenue land take is required from private properties on inbound side of Malahide Road. The indicative extents of this land take are shown on the General Arrangement drawings (BCIDA-ACM-GEO_GA-0001_XX_00-DR-CR-9001) within Volume 3 of the EIAR.

Between Collins Avenue Junction and Griffith Avenue Junction it is intended to provide a continuous bus lane with a single general traffic lane in each direction. In addition, to facilitate continuous dedicated cycle tracks in each direction on this section of the Malahide Road, road widening will be required and therefore will involve land take on properties between Donnycarney Church and Clancarthy Road on the inbound side of Malahide Road. The indicative extents of this land take are shown on the General Arrangement drawings (BCIDA-ACM-GEO_GA-0001_XX_00-DR-CR-9001) within Volume 3 of the EIAR. The proposed works will also require the removal of existing trees currently located on traffic islands or between the existing road and footpath, although opportunities to enhance the streetscape have been identified as part of the design.

Between Griffith Avenue Junction and Clontarf Road Junction, it is proposed to continue the bus and general traffic lanes in both directions. There are currently only three traffic lanes on this section of road. To facilitate the new four lane arrangement, land acquisition is required from adjacent properties at the following locations:

- Between Charlemont Road and Crescent Place (inbound side); and
- Between Crescent Place and Clontarf Road (outbound side).

The indicative extents of this land acquisition are shown on the General Arrangement Drawings (BCIDA-ACM-GEO_GA-0001_XX_00-DR-CR-9001) included in Volume 3 of this EIAR. An alternative cycle route through a parallel, less trafficked quiet route along Carleton Road, St Aidans Park, Haverty Road and Marglann Marino will be provided in this section. Cyclists will then re-join at Marino Mart and tie-in with the separate Clontarf to City Centre Cycle & Bus Priority Project, which is being advanced by DCC and has received Part VIII approval. It is proposed to close Haverty Road for vehicular traffic at the St Aidan's Park end of the street. Local traffic access will be from the Marino Park Avenue end of the street. This proposal will also help to further reduce traffic on Brian Road, Carleton Road and Haverty Road.

4.5.2.2 Deviations from Standard Cross Sections

Generally, the standard BusConnects cross-section is used throughout this section, however for a 500m section between Griffith Avenue and Clontarf Road, providing the full cross-section would result in the existing off-street parking to the front of houses becoming unusable. For this reason, an alternative cycle route via an adjoining quiet street (Brian Road junction, along Carleton Road, St Aidans Park, Haverty Road and Marglann Marino) is proposed, while along the main line corridor (Malahide Road) bus and a traffic lane will be provided in each direction.

4.5.2.3 Bus Lane Provision

An overview of the bus lane provision within this section of the Proposed Scheme is set out in Section 0. Full bus priority is proposed along the entire length of the scheme.

4.5.2.4 Bus Stops

The different types of bus stop (island, shared landing, and inline) are described in Section 0. The bus stop locations and types are outlined in Table 4.6.

Table 4.6: Proposed Bus Stop Locations and Types

Inbound / Outbound	Bus Stop Name	Bus Stop Number	Chainage	Bus Stop Type – includes a full shelter layout unless indicated otherwise
Inbound	Malahide Road – Gracefield Road/ Ardlea Road	1277	A 6130	Shared Landing Bus Stop
Inbound	Malahide Road – Kilmore Road	New Bus Stop	A 6600	Shared Landing Bus Stop (Bus Stop Pole)
Inbound	Malahide Road – Elm Mount Road	1221	A 7020	Shared Landing Bus Stop
Inbound	Malahide Road – Collins Avenue	664	A 7370	Island Bus Stop
Inbound	Malahide Road – Casino Park	665	A 7670	Shared Landing Bus Stop
Inbound	Malahide Road – Casino Park	665	A 7670	Shared Landing Bus Stop
Inbound	Malahide Road – Mount Temple School	666	A 7970	Shared Landing Bus Stop
Inbound	Malahide Road – Brian Road	New Bus Stop	A 8300	Island Bus Stop (Bus Stop Pole)
Inbound	Malahide Road – Marino Crescent	668	A 8700	Layby Bus Stop
Outbound	Malahide Road – Gracefield Road /Ardlea Road	1198	A 6170	Shared Landing Bus Stop
Outbound	Malahide Road – Kilmore Road	New Bus Stop	A 6500	Island Bus Stop
Outbound	Malahide Road – Elm Mount Road	1196	A 6950	Shared Landing Bus Stop
Outbound	Malahide Road – Collins Avenue	4382	A 7370	Island Bus Stop
Outbound	Malahide Road – Casino Park	New Bus Stop	A 7800	Island Bus Stop
Outbound	Malahide Road – Mount Temple School	New Bus Stop	A 8000	Shared Landing Bus Stop

4.5.2.5 Junction Information

An overview of the approach to junction review and design is provided in Section 4.6.7. The major and moderate junctions (signalised) within Section 2 – Gracefield Road to Marino Mart / Fairview – Malahide Road of the Proposed Scheme are outlined in Table 4.7.

Table 4.7: Major and Moderate Junctions within Section 2 of the Proposed Scheme

Junction Location	Note
Major Junctions	
Malahide Rd – Gracefield Road/ Ardlea Rd	Existing roundabout junction proposed to be removed. Introduction of a signal-controlled junction with pedestrian and cycle crossings, with bus priority also up to the stop line.
Malahide Rd - Kilmore Rd	Pedestrian and cycle crossings proposed. Bus priority also up to the stop line
Malahide Road - Killester Avenue	Cycle and pedestrian crossing facilities proposed, with bus priority up to the stop line on inbound.
Malahide Road - Elm Mount Road	Proposed pedestrian and cycle crossings. Bus priority introduced
Malahide Rd-R103 Collins Avenue	Proposed pedestrian and cycle infrastructure & crossings on all arms of the junction. Bus priority proposed up to the stop line
Malahide Rd- Casino Park	Bus priority inbound up to the junction, proposed pedestrian and cycle crossings. Outbound bus lane proposed.
Malahide Rd - Griffith Avenue - Copeland Avenue	Bus priority inbound up to the junction, proposed pedestrian and cycle crossings. Outbound bus lane proposed.
Malahide Rd - Clontarf Road	Proposed direct pedestrian crossings, with bus priority inbound and outbound directions
Moderate Junctions / Priority Junctions	
Malahide Road – Mornington Grove	Uncontrolled pedestrian crossing maintained. (raised table side entry treatment proposed)
Malahide Road – Danieli Road	Uncontrolled pedestrian crossing maintained. (raised table side entry treatment proposed) No left turn onto Danieli Road.
Malahide Road – Elm Road	Existing raised table crossing retained
Malahide Road – Clancarthy Road	Uncontrolled pedestrian crossing maintained. (raised table side entry treatment proposed)
Malahide Road – Donnycarney Road	Uncontrolled pedestrian crossing maintained. (raised table side entry treatment proposed)
Malahide Road – Brian Road	Existing raised table crossing retained No right turn onto Brian Road
Malahide Road – Marino Avenue	Uncontrolled pedestrian crossing maintained. (raised table side entry treatment proposed)
Malahide Road – Charlemont Road	Uncontrolled pedestrian crossing maintained. (raised table side entry treatment proposed)
Malahide Road – Crescent Place	Uncontrolled pedestrian crossing maintained.
Malahide Road – Marino Crescent	Uncontrolled pedestrian crossing maintained. (raised table side entry treatment proposed)

4.5.2.6 Structures

4.5.2.6.1 Major Structures

One principal structure exists in Section 2 of the Proposed Scheme. The location and type of structure is indicated in Table 4.8.

No new structures are proposed as part of the Proposed Scheme.

Table 4.8: Summary of Principal Structures in Section 2 of the Proposed Scheme

Identity	Irish OS Grid	Chainage	Description
Donnycarney Bridge	53°22'33.2"N 6°13'05.1"W	A7220	Donnycarney Bridge

4.5.2.6.2 Retaining Walls

There is one minor low level retaining wall proposed within this section of the Proposed Scheme at the below location:

- just south of the Malahide Road / Griffith Avenue Junction for approximately 40m at chainage A8250.

4.5.2.7 Landscape and Public Realm

An overview of the design principles and approach is included in Section 4.4. The following sections provide a description of specific landscape and public realm design works in Section 2 of the Proposed Scheme.

4.5.2.7.1 Section 2: Gracefield Road to Marino Mart / Fairview – Malahide Road

Between Gracefield Road and Marino Mart/ Fairview / Clontarf Road Junctions, it is proposed to upgrade the junctions on the Malahide Road, establish new tree planting and median planting with a diverse planting mix. In this section, areas of land acquisition are required from private properties, with boundaries to be reinstated 'like for like'. A typical view in this section at Thorndale Grove is shown in Image 4.4.

Image 4.4: Thorndale Grove, Boundary Retained – Looking North

- Malahide Road - Collins Avenue

The junction at Collins Avenue is notable for the stepped entrance to Donnycarney Church. This location has been identified as presenting significant opportunity for public realm treatment. The design includes stone paving to the front of the church with mature trees. The access road for residential properties off Elm Road will receive a similar treatment that embraces the old clock column on the corner to provide a strong local identity. This is illustrated in Image 4.5, Image 4.6 and Image 4.7.

Image 4.5: Donnycarney Focal Point

Image 4.6: Donnycarney Church Public Realm Improvement

Image 4.7: Donnycarney Junction Public Realm Improvement – Looking South

- Malahide Road - Copeland Avenue/Griffith Avenue

The existing junction is quite large leaving wide pedestrian crossings. The proposed layout, includes the cycle tracks, slightly reduces the width of the pedestrian crossings and provides central refuges for pedestrians.

- Malahide Road - Marino Mart/Fairview

The Marino Mart/ Fairview Junction will integrate with the Clontarf to City Centre Cycle & Bus Priority Project. Open paved areas and planting beds will provide an upgraded public space, the use of high-quality materials will be in keeping with the heritage of the surrounding area.

4.5.2.8 Land Acquisition and Use

Temporary land acquisition is required within this Section at various locations, including to facilitate the reconstruction of boundary walls and reinstatement of driveways for those properties where land is being acquired. The existing footpath within Maypark will be realigned to allow for the provision a bus lane and cycle track.

Temporary impacts on residential and landscape amenity arising from land acquisition in this Section include properties in the Artane, Donnycarney and Marino community areas. The identified affected properties in the Artane community area are at 1 to 12 Upper Artane Cottages, 44 Malahide Road and eight properties including Villa Maria, Arva, Sunview, Helenville, Upmeads, St Gerards, Iona and Maria Philomena on R107 Malahide Road.

In the Donnycarney community area, the affected properties are at 1 to 10 Maypark, Malahide Road and all even numbered properties between 198 and 238, Malahide Road.

In the Marino community area, the affected properties are at all even numbered properties between 20 and 62, Malahide Road, and odd numbered properties between 1 and 21 Malahide Road.

Permanent land acquisition is required within this Section at various locations, including to facilitate provision of a continuous bus lane with a single general traffic lane and dedicated cycle tracks and footpath facilities in both directions. Between Griffith Avenue Junction and Marino Mart/ Fairview, it is proposed to provide a bus and general traffic lanes in both directions.

To accommodate this, land will be acquired at Arva, Sunview, Helenville, Upmeads, St Gerards, Iona and Maria Philomena on Malahide Road in the Artane community area. In the Donnycarney community area, land will be acquired from 236 and 234 Malahide Road, and in the Marino community area, land will be acquired from all even numbered properties between 20 and 64, Malahide Road, odd numbered properties between 1 and 21 Malahide Road and 1 to 6, Charlemont Road (communal garden area of the apartment building).

The impacts of this temporary and permanent land acquisition on residential and landscape amenity in this Section is addressed in Chapter 10 (Population) and Chapter 17 (Landscape (Townscape) & Visual).

4.6 Key Infrastructure Elements

The following sections provide a description of the main infrastructure elements of the Proposed Scheme. The Proposed Scheme has been designed following guidance relating to the design principles for urban streets, bus facilities, cycle facilities and public realm encapsulated in the PDGB as outlined in Section 4.4.

4.6.1 Mainline Cross-section

Traffic lane widths (including bus lanes) will follow the guidance outlined in DMURS, with the preferred width of traffic lanes on the Proposed Scheme being:

- 3.0m in areas with a posted speed limit <60km/h; and
- 3.25m in areas with a posted speed limit >60km/h.

Traffic lane width of 2.75m is permissible but not desirable and should only be permitted on straight road sections with very low HGV percentage and where all desirable minimum widths for footpaths, cycle tracks, parking, bus lanes are not achievable without impact on third-party lands, if appropriate taking all design factors into account in the context of the Proposed Scheme objectives.

The desirable minimum width for a single direction, with flow, raised adjacent cycle track is 2.0m. Based on The National Cycle Manual (NCM) this allows for overtaking within the cycle track. The minimum width is 1.5m. The desirable width for a -two-way cycle track is 3.25m with a 0.5m buffer between the cycle track and the carriageway.

2.0m is a desirable minimum width for footpaths with 1.2m being an absolute minimum width at pinch points.

An example of the typical BusConnects road layout (without multiple traffic lanes in each direction or median) is shown in Image 4.8.

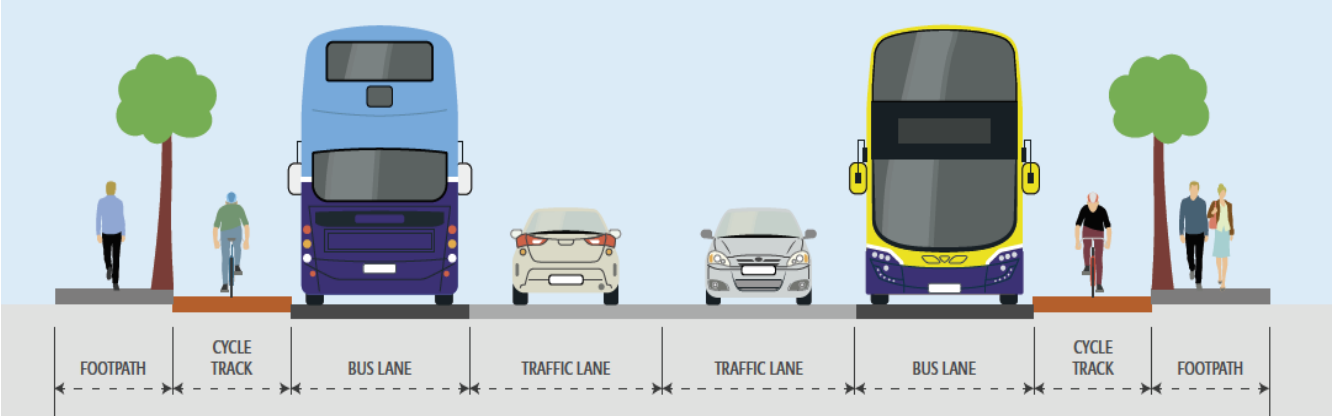

Image 4.8: Typical BusConnects Road Layout (PDGB)

The cross-sectional design of the mainline has been developed to achieve the desirable width criteria contained within the PDGB wherever reasonably practicable. Where these criteria are not achievable, for instance due to physical constraints at pinch points, the widths have been reduced as shown in Table 4.9.

Table 4.9: Cross-Sectional Design Parameters

Design Element	Desirable Minimum Standard	Minimum Width	Permitted Reductions at Constraints
Footpath	2.0m	1.8m	1.2m (over distances <2m as per Preliminary Design Guidance Booklet in Appendix A4.1 in Volume 4 of this EIAR:)
Cycle Track	2.0m	1.5m	1.2m (over distances <2m as per Preliminary Design Guidance Booklet in Appendix A4.1 in Volume 4 of this EIAR:)
Bus Lane	3.0m	3.0m	N/A
Traffic Lane	3.0m (<60kph)	3.0m	2.75m (low HGV flow)
Slopes	2.5H: 1V	N/A	N/A

For the Proposed Scheme the width of the bus lanes and traffic lanes have not been reduced below 3.0m; the nominal width of the footpaths and cycle tracks are at the minimum width or greater.

4.6.2 Pedestrian Provision

4.6.2.1 Footpath Widths

As stated in Section 4.6.4.4, 2.0m is the desirable minimum width for a footpath. This width should be increased in areas catering for significant pedestrian volumes where space permits. DMURS defines the absolute minimum

footpath width for road sections as 1.8m based on the width required for two wheelchairs to pass each other. Building for Everyone: A Universal Design Approach (NDA 2020), defines acceptable minimum footpath widths at specific pinch points as being 1.2m wide over a two-metre length of path.

In line with the Road User Hierarchy designated within DMURS, at pinch points the width of the general traffic lane should be reduced first, then the width of the cycle track should be reduced before the width of the footpath is reduced.

Throughout the Proposed Scheme, footpath widths of two metres or wider have been proposed, with the exception of a limited number of stretches where a width of 1.8m or greater is proposed due to the presence of localised space constraints.

4.6.2.2 Pedestrian Crossings

Where possible, DMURS recommends that designers provide pedestrian crossings that allow pedestrians to cross the street in a single, direct movement. To facilitate road users who cannot cross in a reasonable time, the desirable maximum crossing length without providing a refuge island is 18m. This may be increased to 19m as an absolute maximum. This is applicable at stand-alone pedestrian crossings as well as at junctions.

Refuge islands should be a minimum width of two metres. Larger refuge islands should be considered by designers in locations where the balance of place and movement is weighted towards vehicle movements, such as areas where the speed limit is 60kph or greater, in suburban areas or where there is an increased pedestrian safety risk due to particular traffic movements. Straight crossings can be provided through refuge islands only where the island is 4m wide or more. Islands of less than 4m in width require staggered crossings.

Along the Proposed Scheme pedestrian crossings varying from 2.4m and 4m in width have been incorporated. Larger pedestrian crossing widths have been allocated in areas that are expected to accommodate a high number of pedestrians crossing or at locations where both pedestrians and cyclists share a crossing such as at a Toucan Crossing.

At signalised junctions and standalone pedestrian crossings, the footpath is to be ramped down to carriageway level to facilitate pedestrians who require an unobstructed crossing. At minor junctions, raised tables are provided to raise the road level up to footpath level and facilitate unimpeded crossing. Tactile paving is provided at the mouth of each pedestrian crossing and audio units will be provided on each traffic signal push button to assist mobility impaired users. Pedestrian crossings are indicated in the Landscaping General Arrangement drawings (BCIDA-ACM-ENV_LA-0001_XX_00-DR-LL-9001) in Volume 3 of this EIAR.

4.6.3 Cycling Provision

One of the objectives for the Proposed Scheme is to enhance the potential for cycling by providing safe infrastructure, segregated from general traffic wherever practicable. Physical segregation ensures that cyclists are protected from motorised traffic and can bypass vehicular congestion, thus improving cyclist safety and reliability of journey times. Physical segregation can be provided in the form of vertical segregation, (e.g., raised kerbs), horizontal segregation (e.g., parking/verge protected cycle tracks), or both. Bike racks will generally be provided, where practicable, at Island Bus Stops and key additional locations as noted in the Landscaping General Arrangement drawings (BCIDA-ACM-ENV_LA-0001_XX_00-DR-LL-9001) in Volume 3 of this EIAR.

The ‘preferred cross-section template’ developed for the Proposed Scheme includes protected cycle tracks, providing vertical segregation from the carriageway to the cycle track and vertical segregation from the cycle track to the footpath.

The principal source for guidance on the design of cycle facilities is the National Cycle Manual (NCM) (NTA 2011) and the PDGB.

The desirable minimum width for a single-direction, with-flow, raised-adjacent cycle track is two metres. This arrangement allows for two-abreast cycling, and based on the NCM Width Calculator, this also allows for

overtaking within the cycle track. The minimum width is 1.5m, which based on the NCM Width Calculator, allows for single file cycling. Localised narrowing of the cycle track below 1.5m is also necessary over very short distances to cater for local constraints (e.g., exceptional mature trees).

The desirable minimum width for a two-way cycle track is 3.25m. In addition to this, a buffer of 0.5m should be provided between the two-way cycle track and the carriageway. Using the NCM width calculator, reduction of these desirable minimum widths can be considered on a case-by-case basis, with due cognisance of the volume of cyclists anticipated to use the route as well as the level of service required.

The Proposed Scheme is approximately 5.7km long and includes 10km of segregated cycle tracks compared with an existing provision of just 0.4km of cycle track, and 7.7km unsegregated cycle lane. Details of the proposed cycle provision throughout the extent of the Proposed Scheme are provided in the following sections.

4.6.3.1 Cycle Tracks

A cycle track is a segregated lane dedicated to cycling which is physically separated from the adjacent traffic lane and/or bus lane horizontally and/or vertically, as shown in Image 4.9 taken from the PDGB:

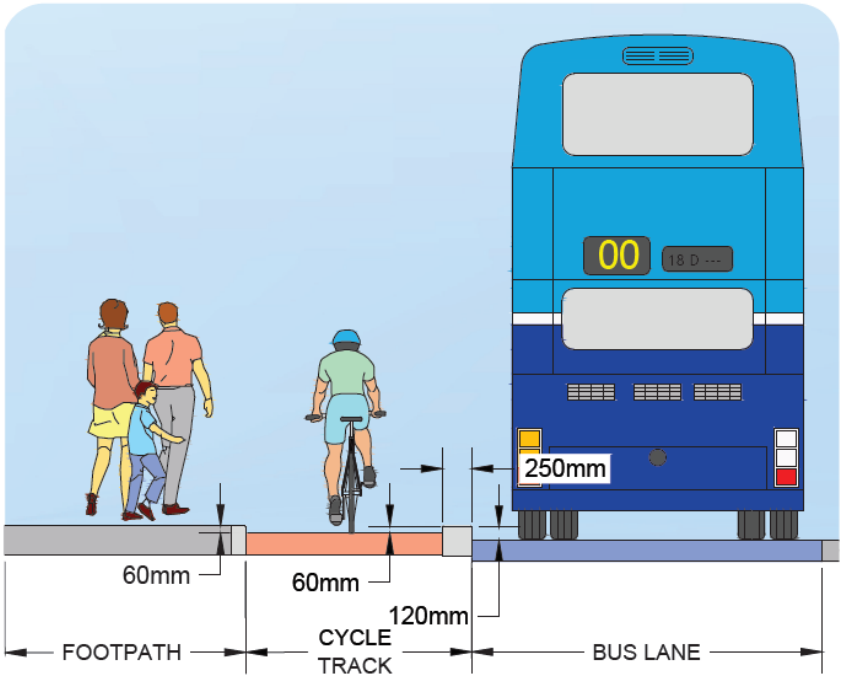

Image 4.9: Fully Segregated Cycle Track

Segregated cycle tracks have been provided in each direction on the Malahide Road (R107), from Mayne River Avenue to Brian Road, with the exception of a 500m section in the inbound direction where cyclists will use an existing quiet street, St Brendan's Avenue. From Brian Road, an alternative cycle route through a parallel, less trafficked route is provided along Carleton Road, St. Aidans Park, Haverty Road and Marglann Marino.

4.6.3.2 Cycle Lanes

Cycle lanes do not have vertical and/or horizontal separation from adjacent traffic lanes. There are no sections of cycle lane proposed as part of the Proposed Scheme, with cycle tracks being preferred where practicable.

4.6.3.3 Quiet Street Treatment

Where Core Bus Corridor roadway widths cannot facilitate cyclists without significant impact on bus priority, alternative cycle routes are explored where appropriate and feasible away from the Proposed Scheme bus route.

Such offline options may include directing cyclists along streets with minimal general traffic other than car users who live on the street. Guidance in this regard has been provided within the PDGB, which states:

> *"Diversions of proposed cycle facilities on to quieter parallel routes, to avoid localised narrowing of cycle tracks on the main CBC route, is to be considered in the context of the CBC route being listed as a primary cycle route as per the Greater Dublin Area Cycle Network Plan. These diversions, however, may also be considered where appropriate cycle facilities cannot be provided along the CBC route without significant impact."*

These are called Quiet Streets due to the low volume of only local general traffic users travelling at low speed and are deemed suitable and safe for cyclists sharing the roadway with the general traffic without the need to construct segregated cycle tracks or painted cycle lanes. The Quiet Street Treatment would involve appropriate advisory signage for both the general road users and cyclists.

On the Proposed Scheme, a Quiet Street treatment is proposed as described in Section 4.6.3.1 above, and as shown in the General Arrangement Drawings (BCID-ACM-GEO-GA-001_XX_00-DR-CR-9001) included in Volume 3 of this EIAR.

4.6.3.4 Treatment of Constrained Areas

At some locations along the Proposed Scheme, standard width of cycleways cannot be achieved, and localised narrowing is required.

Providing a standard width could impact on footpaths or adjacent private properties. Due to high pedestrian volumes a reduced cycle track width of 1.5m is proposed at the following locations along Malahide Road:

- Inbound between A-6400 to A-6500 (between Danieli Road and Kilmore Road);
- Inbound between A-6600 to A-6640 (between Pinebrook Road and Saint David's Wood);
- Inbound between A-6880 to A-6920 (between Saint David's Wood and Maypark);
- Inbound between A-7440 to A-7550 (between Saint David's Wood and Thorndale Park);
- Outbound between A-6220 to A-6200 (between Mornington Grove and Danieli Road);
- Outbound between A-6580 to A-6350 (between Danieli Road and Kilmore Road);
- Outbound between A-6920 to A-6880 (outside Maypark); and
- Outbound between A-7540 to A-7460 (between Clancarthy Road and Donnycarney Church Carpark).

These locations are shown on the General Arrangement drawings (BCIDA-ACM-GEO_GA-0001_XX_00-DR-CR-9001) included in Volume 3 of this EIAR.

Similarly, due to high pedestrian volumes, a reduced cycle track width of 1.75m is proposed at the following locations along the Malahide Road:

- Inbound between A-7140 to A-7270 (between Collins Avenue and Maypark); and
- Outbound between A-7270 to A-7140 (between Collins Avenue and Maypark).

In general cycle tracks are narrowed to a minimum 1.5m width to reduce the speed of cyclists when approaching bus stop islands. Cycle tracks are also narrowed to a minimum 1.0m width at bus stops with shared landing zones to reduce the speed of cyclists for cyclist and pedestrian safety.

4.6.3.5 Cycle Provision through Junctions

Junctions have been designed to facilitate a high level of safety, comfort, and priority for sustainable modes of travel (i.e., walking and cycling) and for public transport by prioritising the space and time allocated to these modes within the operation of a junction. This will also accommodate the forecast future year traffic volumes as safely and efficiently as possible within the remaining space and time. This has allowed the design to maximise the number of people moving through each junction and to prioritise these sustainable modes of travel. These locations are shown on the General Arrangement drawings (BCIDA-ACM-GEO_GA-0001_XX_00-DR-CR-9001) included in Volume 3 of this EIAR.

4.6.4 Bus Priority Provision

One of the objectives of the Proposed Scheme is to enhance the capacity and potential of the public transport system by improving bus speeds, reliability, and punctuality through the provision of bus lanes and other measures to provide priority to bus movement over general traffic movements. Several measures can be used to achieve this. This is described further in this section.

4.6.4.1 Bus Lanes

Bus Priority can be achieved by means of providing a dedicated lane within the carriageway for the bus to travel independently from the general traffic. This includes priority through junctions by bringing the bus lane to the junction stop line as per general traffic lanes. This means in some circumstances that left-turning traffic cannot use the bus lane at junctions and instead will be provided with a dedicated left-turn traffic signal phase for the turn movement off the general traffic lane or will be provided with a separate left-turning lane. In general, bus lanes will be a minimum of 3m wide. This is as per the guidance for traffic lane width outlined in DMURS. Larger lane widths are needed in some instances to enable buses to navigate corners, etc. ('swept path'). Bus Lanes are shown on the General Arrangement drawings (BCIDA-ACM-GEO_GA-0001_XX_00-DR-CR-9001) included in Volume 3 of this EIAR.

4.6.4.2 Signal Controlled Priority

An alternative measure for achieving bus priority at locations where the provision of bus lanes is not possible is the use of Signal Control Priority (SCP). SCP facilitates bus priority by using traffic signals to give buses priority ahead of general traffic on sections of a route with significant physical constraints or pinch-points impacting on the provision of a bus lane. Typical pinch-points arise where the existing carriageway is narrow (no bus lane or segregated cycle track) due to existing buildings or structures that cannot be demolished or modified to widen the road to make space for a bus lane. While SCP is a good alternative to a physical bus lane it is only effective for short distances. It works through the use of traffic signal controls (typically at junctions) where the bus lane and general traffic lane must merge ahead and share the road space for a short distance until the bus lane recommences downstream. The general traffic will be stopped at the signal to allow the bus pass through the narrow section first. SCP will fail if downstream congestion blocks access to the downstream bus lane. Image 4.10 illustrates a schematic operation of SCP.

Image 4.10: Signalised Bus Priority Schematic Operation (Source: PDGB)

Continuous bus priority is being provided along the entire length of the Proposed Scheme. There are no missing sections of bus lanes along the route requiring the alternative use of SCP to facilitate bus priority on the Proposed Scheme.

4.6.4.3 Bus Gates

There are no Bus Gates proposed as part of the Proposed Scheme, however, there is one located at the end of Belmayne Main Street in advance of the northern end of the Proposed Scheme (part of the Belmayne Main Street and Belmayne Avenue Scheme).

4.6.4.4 Treatment at Pinch Points

In line with the Road User Hierarchy designated within DMURS, at pinch points, the width of the general traffic lane should be reduced first, then the width of the cycle track should be reduced before the width of the pedestrian footpath is reduced. The Proposed Scheme design reflects this approach.

4.6.4.5 Bus Stops

To improve the efficiency of the bus service along the Proposed Scheme, the position and number of bus stops has been evaluated as part of a bus stop assessment.

The criteria that are considered when locating a bus stop are as follows:

- Driver and waiting Passengers are clearly visible to each other;
- Location close to key facilities;
- Location close to main junctions without affecting road safety or junction operation;
- Location to minimise walking distance between bus interchange stops;
- Where ideally there is space for a bus shelter;
- Location in pairs, 'Tail to Tail' opposite sides of the road;
- Close to (and on exit side of) pedestrian crossings;
- Away from sites likely to be obstructed; and
- Adequate footpath width.

For the Core Bus Corridor Infrastructure Works it is proposed that bus stops should be preferably spaced approximately 400m apart on typical suburban sections of route, dropping to approximately 250m in urban centres.

It is important that bus stops are not located too far from pedestrian crossings as pedestrians will tend to take the quickest route, which may be hazardous. Locations with no or indirect pedestrian crossings should be avoided.

The following bus stop designs were considered for use on the Proposed Scheme - the Island Bus Stop, the Shared Landing Bus Zone, the Inline Bus Stop, and the Layby Bus Stop. There are no inline bus stops in the Proposed Scheme.

4.6.4.5.1 Island Bus Stops

Where sufficient space allows Island Bus Stops are the preferred bus stop option for the Proposed Scheme.

This option will reduce conflict between cyclists and stopping buses by deflecting cyclists behind the bus stop. To address the pedestrian and cyclist conflict pedestrian priority crossings accompanied by on-call signals will be provided, with narrowing of the cycle track from 2.0m to 1.5m to prevent cyclists overtaking through the bus stop. An example of an island bus stop is shown in Image 4.11.

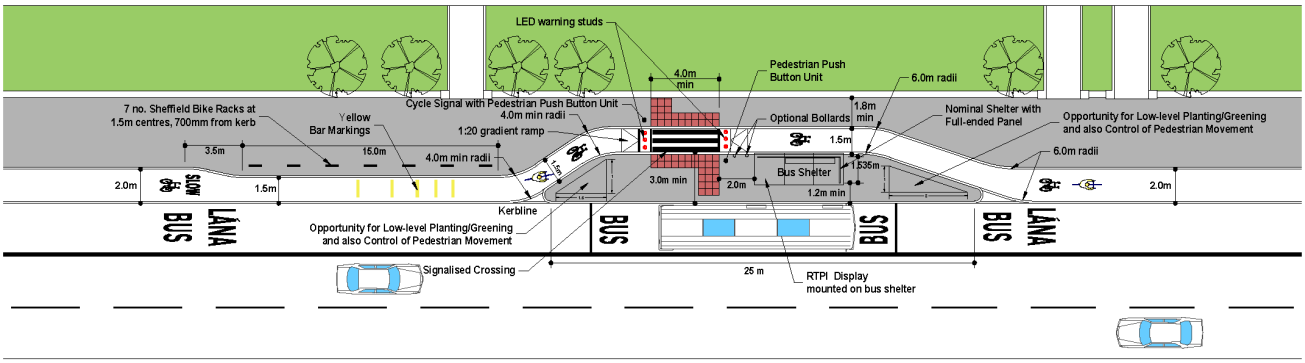

Image 4.11: Island Bus Stop

The island bus stop design is used for most of the bus stops along the Proposed Scheme. These locations are outlined in Section 4.5.

4.6.4.5.2 Shared Bus Stop Landing Zone

Where space constraints do not allow for an island bus stop, an option consisting of a shared bus stop landing zone is proposed. It is designed to reduce conflict between cyclists and stopping buses by ramping cyclists up to footpath level where they continue through the stop. The cycle track will also be narrowed when level to the footpath and tactile paving provided to prevent pedestrian/cyclist conflict. An example of a shared landing area bus stop is shown in Image 4.12.

This type of bus stop is required in ten locations on the Proposed Scheme due to localised space constraints. These locations are outlined in Section 4.5.

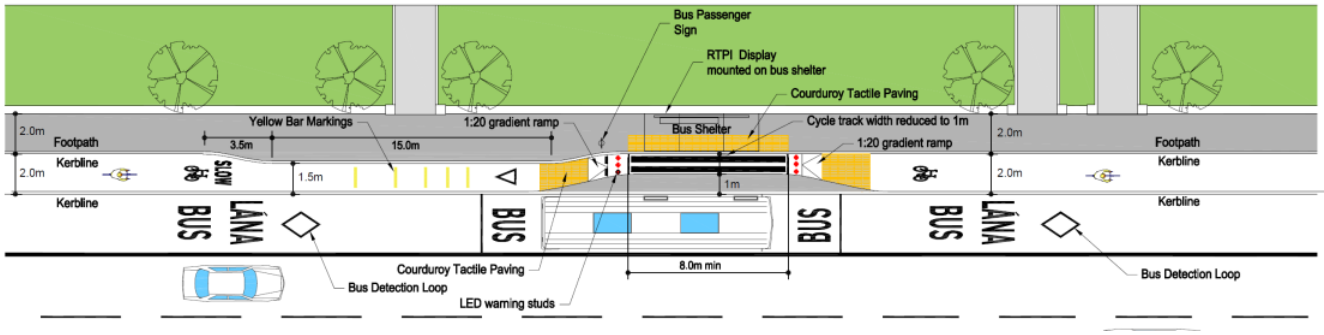

Image 4.12: Shared Bus Stop Landing Zone Arrangement

4.6.4.5.3 Inline Bus Stop

Where there are no cycle tracks provided, inline bus stops are used, where the users departing the bus exit straight on to the footpath. There are no inline bus stops included in the Proposed Scheme.

4.6.4.5.4 Layby Bus Stop

Layby bus stops can provide an effective solution for coaches with long dwell times at bus stops, allowing other buses to pass the stopped bus. These are important on routes where the frequency of buses is high and where bunching can occur if inline bus stops are provided along the entire length of the scheme.

An example of a layby bus stop arrangement is shown in Image 4.13.

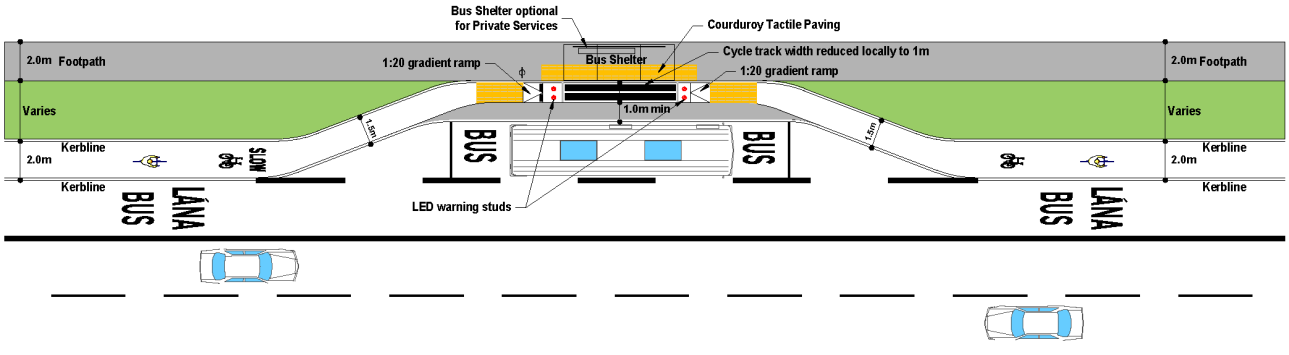

Image 4.13: Layby Bus Stop Arrangement

A Layby bus stop is proposed at one location on the Proposed Scheme, at Marino Crescent. This will allow for unimpeded traffic flow at this location, despite the potential for longer dwell times. This location is outlined in Section 4.5.

As a general policy, shelters will be provided at all bus stops on the Proposed Scheme. This will improve the comfort of passengers waiting for a bus during poor weather, as well as providing shade on sunny days. In some locations, such as those designated as Architectural Conservation Areas, it may however not be appropriate to provide a bus shelter in front of a building of heritage value to minimise visual impact. Such deviations from the standard arrangement are noted in Section 4.5.

4.6.5 Accessibility for Mobility Impaired Users

The aim of the Proposed Scheme is to provide enhanced walking, cycling and bus infrastructure along the corridor. In achieving this aim, the Proposed Scheme has been developed using the PDGB and in accordance with the principles of DMURS and Building for Everyone: A Universal Design Approach (NDA 2020).

The following non-exhaustive list of relevant standards and guidelines have informed the approach to Universal Design in developing the Proposed Scheme:

- Preliminary Design Guidance Booklet for BusConnects Core Bus Corridors (NTA 2020);
- Building for Everyone: A Universal Design Approach (NDA 2020);
- How Walkable is Your Town? (NDA 2015);
- Shared Space, Shared Surfaces and Home Zones from a Universal Design Approach for the Urban Environment in Ireland (NDA 2012);
- Best Practice Guidelines, Designing Accessible Environments. Irish Wheelchair Association (IWA) (IWA 2020);
- UK DfT Inclusive Mobility (UK DfT 2005);
- UK DfT Guidance on the use of tactile paving surfaces (UK DfT 2007); and
- BS8300:2018 Volume 1 Design of an accessible and inclusive built environment. External Environment- code of practice (BSI 2012).

The Disability Act 2005 (as amended) places a statutory obligation on public service providers to consider the needs of disabled people. A Disability Audit of the existing environment and proposed draft preliminary design for the corridor was undertaken. The Audit provided a description of the key accessibility features and potential barriers to disabled people based on the Universal Design standards of good practice. The Audit was undertaken in the early design stages with the view to implementing any key measures identified as part of the design development process.

In achieving the enhanced pedestrian facilities there has been a concerted effort made to provide clear segregation of modes at key interaction points along the Proposed Scheme which was highlighted as a potential mobility constraint in the Audit. In addressing one of the key aspects to segregation, the use of the 60mm set down kerb between the footpath and the cycle track is of particular importance for guide dogs, whereby the use of white line segregation is not as effective for establishing a clear understanding of the change of pavement use and potential for cyclist/pedestrian interactions.

One of the other key areas that was focused on was the interaction between pedestrians, cyclists, and buses at bus stops. The Proposed Scheme has prioritised the use of island bus stops, including signal call button for crossing of cycle tracks, to manage the interaction between the various modes with the view to providing a balanced safe solution for all modes.

4.6.6 Integration

4.6.6.1 Integration with Existing and Proposed Public Transport Network

One of the objectives of the Proposed Scheme is to enhance interchange between the various modes of public transport operating in the city and wider metropolitan area. The Proposed Scheme facilitates improved existing and new interchange opportunities with other transport services including:

- DART stations along the route, notably Clongriffin and Clontarf Road Stations;

- Existing bus services at numerous locations along the route, including routes 14, 15, 27, 27a, 27b, 27X 42, 43;
- Future Bus service proposals including Spine D, etc. associated with the Proposed Dublin Bus Network Re-Design;
- Future Rail public transport services including DART+ and MetroLink; and
- Greater Dublin Area Cycle Network Plan (GDACNP) (NTA 2013).

4.6.6.2 Integration with Other Road Users

General traffic flow and local access will be maintained along the Proposed Scheme corridor although there will be impacts on vehicle capacity along the route due to the reallocation of road space to bus priority and cycle tracks and the introduction of turning movement restrictions. The provision of bus priority and segregated cycling facilities will result in more efficient movement of increased numbers of people overall along the route, without removing the option for general traffic to use the route. It is recognised that there is dependence by some on cars or business vehicles. Through the provision of bus priority and improved cycling and pedestrian facilities all road users get better equitable choices and associated more efficient use of the road space for people movement. The improvement provided to more reliable sustainable travel options is being balanced against the general traffic flow impacts.

4.6.6.3 Integration with Other Infrastructure Projects

Several infrastructure projects are planned within the vicinity of the Proposed Scheme which will interface with the proposals. These are outlined below:

Belmayne Main Street and Belmayne Avenue Scheme

The Belmayne Main Street and Belmayne Avenue Scheme, to be delivered by Dublin City Council, ties in at the northern end of this Proposed Scheme at Mayne River Avenue and Malahide Road Junction. This scheme is to include the construction of a new main street, complete with bus and cycle lane infrastructure which will link the Proposed Scheme to the Clongriffin DART Station.

Dublin Port to Dublin Airport New Aviation Fuel Pipeline Project

The New Aviation Fuel Pipeline Project is planned to run between Dublin Port to Dublin Airport. Fuel will be pumped from existing tanks within the Port via a new inlet station direct to a new reception station at the Airport where the pipeline will terminate. The proposed pipeline will be within a section of the Proposed Scheme along the R107 Malahide Road between the junction with Copeland Avenue and the Northern Cross (R139). Measures will be in place to ensure protection of this asset during the Proposed Scheme Construction Phase. Further information on this can be found in Chapter 5 (Construction) and Chapter 19 (Material Assets).

Clontarf to City Centre Cycle & Bus Priority Project

The Clontarf to City Centre Cycle & Bus Priority Project, being delivered by Dublin City Council, ties in at the southern end of the Proposed Scheme at Clontarf Road and Malahide Road Junction. Integration with this scheme will facilitate safe onward travel to the City Centre for both bus passengers and cyclists via the high quality dedicated facilitates that are proposed as part of that scheme.

4.6.7 Junctions

The design and modelling of junctions has been an iterative process to optimise the number of people (rather than vehicles) that can pass through each junction, with priority given to pedestrian, cycle, and bus movements. The design for each junction within the Proposed Scheme was developed to meet the underlying objectives of the Proposed Scheme.

Junctions have been designed to ensure a high level of comfort and priority for sustainable modes of travel e.g., walking, cycling and public transport, by prioritising the space and time allocated to these modes within the

operation of a junction, and subsequently to accommodate the forecasted future year traffic volumes as safely and efficiently as possible within the remaining space and time. This has allowed the design to maximise the number of people moving through each junction and to prioritise these sustainable modes of travel.

Junction design on the Proposed Scheme falls into four categories, namely:

- Major Junctions;
- Moderate Junctions;
- Minor and Priority Junctions; and
- Roundabouts.

The categorisations are based on:

- Size;
- The extent of physical work required to establish them; or
- The degree of change compared to the existing layout.

The junction locations along the Proposed Scheme route and the layouts that will be implemented at these locations are presented Section 4.5.

4.6.8 Structures

Where the route interfaces with an existing structure, a visual inspection has been carried out to identify the current condition of the structure and any repair/maintenance works required. Where alterations to the existing carriageway lines, kerbs lines and verge widths are proposed to the superstructure of an existing structure a structural assessment has been carried out to ensure the structural capacity is fit-for-purpose for the revised arrangement. The existing structures are detailed in Section 4.5.

4.6.8.1 Summary of Proposed Structures

The only structures proposed as part of the Proposed Scheme are low-level retaining walls.

4.6.8.2 Retaining Walls

Only low-level existing retaining walls have been identified as being impacted by the Proposed Scheme, and three new low-level retaining walls are proposed as described in Section 4.5.1 and Section 4.5.2.

4.6.9 Other Street Infrastructure

There are a number of other elements of street infrastructure included as part of the design of the Proposed Scheme. These elements include signage, road markings and communications infrastructure. Signage and road markings will be provided along the extents of the Proposed Scheme to clearly communicate information, both regulatory and safety messages, to the road user. In addition, the existing communication equipment along the Proposed Scheme has been reviewed and proposals developed to upgrade where necessary.

4.6.9.1 Traffic Signs and Road Markings

4.6.9.1.1 Traffic Sign Strategy

A preliminary Traffic Sign design has been undertaken to identify the requirements of the Proposed Scheme, whilst allowing for further design optimisation at the detailed design phase. A combination of Information, Regulatory, and Warning signs, have been assessed taking consideration of key destinations/centres; intersections/decision points; built and natural environment; other modes of traffic; visibility of signs and viewing angles; space available for signs; existing street furniture infrastructure; and existing signs. In line with DMURS, the signage proposals have been '*kept to the minimum requirements of the [Traffic Signs Manual] TSM (DoT 2019), particularly where place values are very high*'.

A review of the existing regulatory and warning signs in the vicinity of the route was carried out to identify unnecessary repetitive and redundant signage to be removed. This includes rationalising signage structures by better utilising individual sign poles and clustering signage together on a single pole.

As stated in TSM Chapter 1, in urban areas the obstruction caused by posts located in narrow pedestrian footpaths should be minimised. Therefore, where practicable, signs are to be placed on single poles, or larger signs will be cantilevered from a post at the back of the footpath using H-frames where necessary. Passively safe posts will be introduced where possible to eliminate the need for vehicle restraint systems.

4.6.9.1.2 Gantry Signage

No gantry signage exists along the route, and the Proposed Scheme has no requirement for any new gantry signage.

4.6.9.1.3 Road Marking

A preliminary design of road markings has been undertaken in accordance with TSM Chapter 7. This exercise also included the preliminary road marking design of the following items:

- Bus lanes;
- Cycle tracks: the pavement will be marked according to best practice guidelines such as DMURS and the National Cycle Manual with particular attention given to junctions. Advance Stacking Locations (ASLs) have been designed where possible to provide a safer passage for cyclists at signal-controlled junction for straight ahead or right turn movements; and
- Pedestrian crossings have been incorporated throughout the design to connect the network of proposed and existing footpaths. Wider pedestrian crossings have been provided in locations expected to accommodate a relatively high number of pedestrians. DMURS classifies pedestrian crossing widths in areas of low to moderate pedestrian activity as 2.5m and areas of moderate to high pedestrian activity as 3m.

4.6.10 Pavement

Pavement assets along the Proposed Scheme comprise highway carriageway including bus-lanes, general traffic lanes, and on-road cycleways.

For the purpose of design, the pavement assets are categorised into two networks. The primary network refers to the bus routes under consideration along the scheme while the secondary network refers to the roads impacted by the re-routing of existing traffic from the bus route to the nearby road network.

As part of the Proposed Scheme, varying pavement works will be undertaken. These works will comprise the following:

- Widening of the existing carriageways;
- Carriageway realignment;
- Rehabilitation and strengthening of the existing carriageways;
- Other specific trafficked areas (e.g. bus lay-bys, off-line parking and loading bays); and
- New cycle ways.

New pavements are designed and constructed in accordance with TII's publications and relevant Local Authority standards, with special attention to ride-quality for buses and cyclists including replacement of inline drains with curb gully systems, and elimination of utility covers from wheel-track areas, where practicable.

4.6.10.1 Design Requirements

The Proposed Scheme pavement design will include new pavement, pavement strengthening or rehabilitation works where the existing pavement will be disturbed by construction works, as indicated in the Pavement Treatment Plans (BCIDA-ACM-PAV_PV-0001_XX_00-DR-CR-9001) included in Volume 3 of this EIAR. Special

attention to addressing problems associated with wheel-track rutting and ensuring that ponding will not arise at bus-stops and pedestrian/cycle crossings will be a key focus.

The prevailing principle being followed by the Proposed Scheme pavement design is the provision of a high-quality pavement construction. Therefore, the Proposed Scheme pavement must provide sufficient durability, longevity, and strength, to be able to withstand repetitive wheel track loading on a frequent basis. The pavement design strategy includes for minimising ongoing maintenance requirements along the route to minimise impact on continuity of bus service operations.

4.6.10.2 Design Standards

The principal standards and manuals used throughout the carriageway pavement assessment and design include the following:

- Preliminary Design Guidance Booklet for BusConnects Core Bus Corridors (NTA 2021);
- TII AM-PAV-06050 Pavement Assessment, Repair and Renewal Principles (TII 2020a);
- TII AM-PAV-06045, Management of Skid Resistance (TII 2020b);
- Irish Pavement Asset Group (IPAG). Pavement Asset Management Guidance. (IPAG 2014);
- DN PAV-03021 Pavement & Foundation Design. Volume 7 Section 2 Part 2A. (TII 2010a);
- Construction Standards for Roads and Street Works in Dublin City Council (CSRSW);
- Urban Flexible Roads Manual – Pavement Surface Condition Index (DTTAS 2013a);
- Urban Concrete Roads Manual – Pavement Surface Condition Index" (DTTAS 2013b);
- TII PE-SMG-02002 Traffic Assessment (HD 24/06) (TII 2010b);
- TRL Report 615. Development of a more versatile approach to flexible and flexible composite pavement design (TRL 2004);
- TRL Report LR1132, The structural design of bituminous roads (TRL 1984);
- TII road pavement standards details;
- DN-PAV-03026 (Jan. 2005) – Footway Design;
- TII footway standard details; and
- TII Specification for Roadworks Series 600, 700, 800, 900, 1000, 1100.

4.6.10.3 Pavement Rehabilitation Strategy

New pavement, as indicated in Pavement Treatment Plans (BCIDA-ACM-PAV_PV-0001_XX_00-DR-CR-9001) included in Volume 3 of this EIAR, including widening and new on-road cycle tracks, has been designed as fully flexible full depth asphalt pavement in accordance with DN-PAV-03021 for location specific different design traffic. Pavement foundation has been designed in accordance with DN-PAV-03021 for fully flexible pavements.

A worst-case long-term design subgrade California Bearing Ratio (CBR) of 2.5% has been assumed for design. Subgrade of <2.5% would be excavated and improved by material replacement.

Due to the requirement to ensure drainage continuity between new and existing pavement foundations, proposed foundation layer depths may need to be locally increased upon confirmation of existing pavement construction. This is a particular issue where a new bus layby is being constructed and because of boundary constraints the existing channel is being retained and the lay-by is to fall back into the channel. The foundation layers would continue to fall to new subgrade drainage provision at the new carriageway edge.

Rehabilitation design for existing pavements is based upon available network level data. The design considers the 'worst-case' treatment for each area of pavement – i.e., the most significant intervention that might be required to achieve the Proposed Scheme objectives, based on the available information.

4.6.11 Parking and Loading

As part of the design of the Proposed Scheme, an assessment has been carried out into the impact on existing parking.

The number and type of parking spaces were counted along the Proposed Scheme, and the proposed losses of these spaces has been quantified. Mitigation measures have been identified to reduce the impact of the Proposed Scheme in so far as is reasonably practicable, by incorporating some parking provision, and providing enhanced cycle parking facilities.

There will be changes to the parking and loading provisions along the Malahide Road as a result of the Proposed Scheme. This will result in impacts on commercial and residential parking in this area as follows:

- In the Northern Cross area, existing access locations to car parks of businesses will be modified by the new scheme;
- In the Coolock area, the Proposed Scheme designates residential parking which is expected to reduce the amount of informal parking that obstructs pedestrians and cyclists;
- In the Artane area customer parking will be reduced from 7 adjacent parking spaces, 1 disabled parking space and 10 informal parking spaces across the road to 5 parking spaces and 1 disabled parking space in a designated parking area adjacent to the commercial units;
- In the Donnycarney area, 11 informal residential and commercial parking spaces will be replaced with 6 designated parking spaces; and
- 14 designated paid parking spaces will be removed along the Malahide Road at the junction to Marino Mart which serves business along the road.

Reference should be made to Chapter 6 (Traffic & Transport) for further information on the impacts on parking as a result of the Proposed Scheme.

4.6.12 Landscape and Public Realm

Public realm refers to the everyday street spaces that are used by people to shop, socialise, play, and use for activities such as walking, exercise, or commute to/from work. The public realm encompasses all streets, squares, junctions, and other rights-of-way, whether in residential, commercial, or civic use. When well designed and laid out with care in a community setting, it enhances the everyday lives of residents and those passing through. It typically relates to all open-air parts of the built environment where the public has free access. It would include seating, trees, planting, and other aspects to enhance the experience for all. Successful public realms or public open space tend to have certain characteristics. These include:

- they have a distinct identity;
- they are safe and pleasant;
- they are easy to move through; and
- they are welcoming.

4.6.12.1 Landscape and Character Analysis

The landscape and public realm proposals are derived from analysis of the existing public realm, including existing character, any heritage features, existing boundaries, existing vegetation and tree planting, and existing materials. For each section of the route, the design took a broad overview of typical dwelling age and style, extents of vegetation and tree cover. The predominant mixes of paving types, appearance of lighting features, fencing, walls, and street furniture was considered. The purpose of this analysis was to assess the existing character of the area and how the Proposed Scheme may alter this. The outcome of the analysis allowed the designers to consider appropriate enhancement opportunities along the route. The enhancement opportunities include key nodal locations which focus on locally upgrading the quality of the paving materials, extending planting, decluttering of streetscape and general placemaking along the route. Where possible, a SuDS approach has been taken to assist with drainage along the route.

4.6.12.2 Hardscape

4.6.12.2.1 Typical Material Typologies

Through the process of developing the Proposed Scheme, a typology and palette of proposed materials was developed to create a consistent design response for various sections of the route. The proposed materials were based on the existing landscape character, existing materials, historical materials while also identifying areas for betterment through the use of higher quality surface materials. Impervious surface areas were reduced by incorporating plots for vegetation, wildflowers, and trees. The Landscaping General Arrangement drawings (BCIDA-ACM-ENV_LA-0001_XX_00-DR-LL-9001) in Volume 3 of this EIAR illustrate these elements.

The material typologies employed in the preliminary design are:

- **Poured in situ concrete pavement**. - Used extensively on existing footpaths. Concrete pavements can be laid without a kerb, can have neatly trowelled edges and textured surface for a clean, durable, slip resistant surface;
- **Asphalt footpath**. - Widely used on existing footpaths and will tie in with other sections of public realm. Laid with a road kerb, can have a smooth finish or textured aggregate surface, provides a strong flexible slip resistant surface. Opportunities to retain good quality kerbs have been explored and tie-in points considered;
- **Precast concrete unit paving**. - Either concrete paving slabs or concrete block, there is a very wide variety of sizes and colours available to provide an enhanced public realm. The use/reuse of granite kerbs where appropriate will further enhance the public realm. This type of material use is mostly employed in non-inner-city public realm enhancements;
- **Natural stone paving**. - Employed for high quality public realm areas, mostly in city centre locations. This typology represents natural stone surface treatments such as granite and are used to create enhanced public spaces for major public realm interventions;
- **Stone or Concrete setts**. - Proposed for distinguishing pedestrian crossing points either on raised table or at road level;
- **Self-binding gravel.** - Proposed for pedestrian paths set away from the road expected to see less traffic. Used for natural areas, for example, paths through wildflower meadows. They provide a defined informal route as an alternative to asphalt or concrete; and
- **No change**. - In addition to areas with proposed material changes, there were also areas identified where no change in materials would be required. For example, where pavement has recently been laid and is in good condition. The design also explores opportunities where good quality kerbs such as granite kerbs could be reused, which would have both cost and sustainability advantages.

Other design responses include:

- **Boundary treatments** to both commercial and residential properties. The best examples of existing boundary treatment will be reinstated, while improving other sections of the road frontage. This is illustrated in the Photomontages Appendix A17.2 included in Volume 3 of this EIAR;
- **Tree pit enhancements** will be undertaken, using materials such as self-binding gravel. Where practicable, construction of tree pits may include in-ground root protection systems to improve both the vitality of the trees and the life span of the pavements; and
- **Street furniture** is mostly confined to replacing or relocating existing furniture, there is opportunity at the 'Focal Points' to provide additional street furniture where it would most enhance the communal spaces**.**

4.6.12.3 Softscape

4.6.12.3.1 Planting Strategy

The planting strategy has been developed to meet the needs of the Dublin City Tree Strategy and the Dublin Biodiversity Action Plan as follows:

- Where possible the initial conservation of existing biodiversity has been considered.

- Opportunities have been identified to enhance biodiversity through green infrastructure;
- Promote the role of street trees planting consistent with the recommendations of the Dublin City Tree Strategy; and
- Develop the role of SuDS opportunities within the Proposed Scheme to ideally reduce impervious areas for drainage management benefit.

4.6.12.4 Arboricultural Survey

4.6.12.4.1 Scope of Assessment

An Arboricultural Impact Assessment (AIA) Report (Appendix A17.1 in Volume 4 of this EIAR), identifies the likely direct and indirect impacts to trees of the Proposed Scheme along with suitable mitigation measures, as appropriate to allow for the successful retention of significant trees, or to compensate for trees to be removed.

4.6.12.5 Typical Planting Typologies

Several typologies were developed. These are discussed further below.

4.6.12.5.1 New Street Trees

As noted on the Landscaping General Arrangement (BCIDA-ACM-ENV_LA-0001_XX_00-DR-LL-9001) in Volume 3 of this EIAR, large canopy trees will be provided, with 4.5m clear stem planted in urban tree pit systems to allow for protection of the soil structure and good root development. An example of this can be seen on Sheet 6 of the Landscaping General Arrangement, north of Clarehall Avenue.

Image 4.14: *Tillia cordata* (Semi Mature tree)

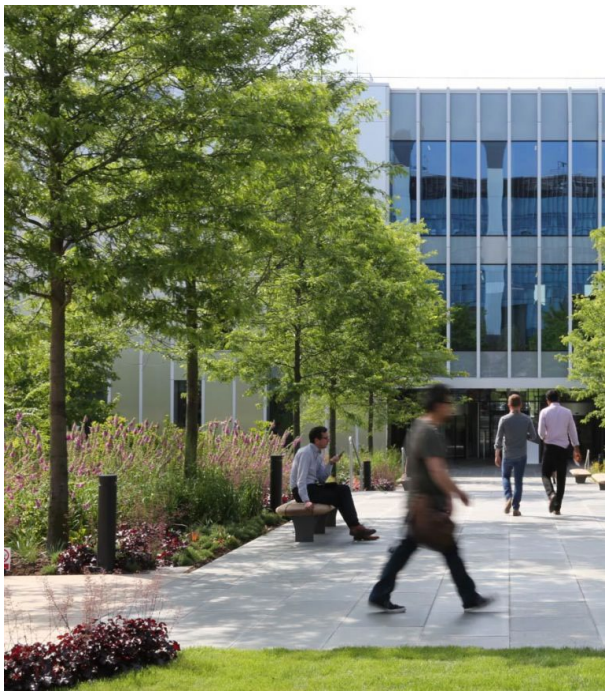

Image 4.15: Semi Mature Street Trees

4.6.12.5.2 Central Median Screen Planting

A combination of tree and shrub planting will reduce headlight glare where appropriate and add a corridor of planting. An example of this can be seen on Sheet 10 of the Landscaping General Arrangement, north of Greencastle Road.

Image 4.16: Malahide Road Existing Dense Planting to Median

4.6.12.5.3 Replacement Planting to Boundaries

The design includes direct replacement of trees and hedgerows lost to road widening, or the introduction of hedgerows to soften fence lines. The species to be planted will be considered for long term sustainability, disease resistance and enhanced biodiversity, with typical specifications shown in the Landscaping General Arrangement (BCIDA-ACM-ENV_LA-0001_XX_00-DR-LL-9001) in Volume 3 of this EIAR.

Image 4.17: Replacement of Boundaries (Example Opposite the Hilton Hotel on the Malahide Road)

4.6.12.5.4 Native Planting / Tree Planting (Woodland Copses)

Small clusters of planting will be introduced in spaces not readily accessible at junctions or wider verges. This promotes native trees with understorey planting, long grass, and swathes of bulbs.

Image 4.18: Woodland Copses

4.6.12.5.5 Ornamental or Formal Planting

Small landscape interventions will be made at local community spaces with a combination of street trees, raised beds, seating and more formal planting arrangements, for example at the Gracefield Road junction on Sheet 14 of the Landscaping General Arrangement. These exist at certain intervals and are often picked up as 'Focal Points'.

Image 4.19: Example of Focal Point at Donnycarney

4.6.12.5.6 Residential Boundary Planting

Residential boundaries vary greatly along the Proposed Scheme, and mitigation will largely replace like with like, but where opportunities for sections of streets to be visually upgraded have been identified, they have been integrated into the design.

Image 4.20: Residential Boundaries Replaced with Like for Like Hedgerows

4.6.12.5.7 Commercial Boundary Planting

Commercial boundaries vary greatly, and opportunities have been taken for introduction of new green infrastructure in hedgerows and boundary trees. This will provide an immediate visual improvement to the appearance of these areas while also improving biodiversity.

4.6.12.6 Public Realm Design

The public realm design is presented on the Landscaping General Arrangement drawings (BCIDA-ACM-ENV_LA-0001_XX_00-DR-LL-9001) in Volume 3 of this EIAR. Separate (illustrative) drawings are provided in Sections 4.5.1.7 and 4.5.2.7 to further illustrate proposals within the Proposed Scheme.

Much of the route along the Malahide Road already has a priority bus lane in place, lined with mature trees, and a planted median. The overall aim is to enhance the tree-lined route and improve open spaces.

4.6.13 Lighting

A review of the existing lighting provision along the extent of the route has been carried out to understand the impact of the Proposed Scheme on lighting columns and associated infrastructure. Several existing columns are proposed to be relocated or replaced to accommodate the Proposed Scheme, as shown on the Street Lighting drawings (BCIDA-ACM-LHT_RL-0001_XX_00-DR-EO-9001) in Volume 3 of this EIAR.

Light Emitting Diode (LED) lanterns will be the light source for any new or relocated public lighting provided. The lighting design will involve works on functional, heritage and contemporary lighting installations on a broad spectrum of lighting infrastructure along the Proposed Scheme. This will include, but not exclusively, luminaires supplied by underground and overhead cable installations and those located on ESB infrastructure.

In locations where road widening and/or additional space in the road margin is required, it is proposed that the public lighting columns will be replaced and relocated to the rear of the footpath, where practicable, eliminating pedestrian obstruction. For existing columns that have specific aesthetic requirements, the intent for the replacement (where applicable) of such columns will include:

- Replacing the existing heritage columns and brackets with identical replica columns and brackets; and
- Replacing existing luminaires with approved LED heritage luminaires.

4.6.13.1.1 New Lighting

All new public lighting will be designed and installed in accordance with the requirements of the relevant National Standards and guides, including but not limited to:

- Local Authority Guidance Specifications
- EN 13201: 2014 Road Lighting (all sections);
- ET211:2003 ‘Code of Practice for Public Lighting Installations in Residential Areas’
- BS 5489-1 ‘Code of practice for the design of road lighting’
- Volume 1 - NRA Specification for Road Works, Series 1300 & 1400;
- Volume 4 - NRA Road Construction Details, Series 1300 & 1400;
- IS EN 40 – Lighting Columns; and
- Institution of Lighting Professionals “GN01 Guidance Notes for Reduction of Obtrusive Light”.

Lighting schemes shall comply with the ‘Guidance notes for the Reduction of Light Pollution’ issued by the Institution of Lighting Professionals (ILP).

4.6.13.1.2 Lighting at Bus Stops

The design shall include for the standards and requirements for lighting at bus stops.

4.6.14 Utilities

There are a number of measures proposed to protect existing utilities during the Construction Phase of the Proposed Scheme. These are specifically outlined in Chapter 5 (Construction) and Chapter 19 (Material Assets). Where there are clashes between the existing utility infrastructure, measures are proposed to either protect the infrastructure in place or divert the utility infrastructure as required.

The utility design strategy included the analysis of records provided by all utility providers associated with the Proposed Scheme corridor. The analysis included desktop reviews including review of topographic surveys together with site reconnaissance. In locations where critical assets were identified and the risk of interference was considered high, Ground Penetrating Radar surveys were undertaken to inform the design.

4.6.14.1 Utility Diversions

Due to the extensive nature of the Proposed Scheme, there are certain areas along the route which will require utility diversions, due to localised conflicts. Identified service conflicts and recommended diversions are described and assessed in Chapter 19 (Material Assets).

4.6.15 Drainage

The design basis statement was developed whilst taking the Greater Dublin Regional Code of Practice (GDRCoP), Greater Dublin Strategic Drainage Study (GDSDS), Planning requirements of Local Authorities within the Dublin region, Transport Infrastructure Ireland (TII) requirements and international best practices such as CIRIA The SuDS Manual (C753) (CIRIA 2015). Agencies consulted include Dublin City Council and Irish Water where applicable.

4.6.15.1 Existing Watercourses and Culverts

The location of existing watercourses and culverts has been identified from survey. Table 4.10 shows where the Proposed Scheme crosses the existing watercourses and culverts.

Table 4.10: Existing Watercourses and Culverts

Watercourse	Chainage	Crossing Detail
Santry River	A4895	Bridge
Wad River	A7220	Culvert

4.6.15.2 Existing Drainage Description

Based on the information received from Irish Water, the existing highway along the Proposed Scheme is served by both surface water and combined drainage networks. The surface water drainage system is managed by the local authority, whilst the combined sewer systems are managed by Irish Water. Flows are typically collected in standard gully grates and routed via a gravity network to outfall points. There are no SuDS/attenuation measures on the existing drainage networks to treat or attenuate runoff from the existing highway.

The existing drainage network along the scheme can be split into the nine catchment areas based on topography and the existing pipe network supplied by Irish Water. The approximate catchment areas, existing sewer networks, outfalls and watercourses are shown on the existing catchment drawings, refer to the Proposed Surface Water Drainage Works drawings (BCIDA-ACM-DNG_RD-0001_XX_00-DR-CD-9001) in Volume 3 of this EIAR. The existing catchments are summarised below in Table 4.11.

Table 4.11: Summary of Existing Catchments

Existing Catchment Reference	Approx. Drainage Catchment Area (km^2)	Existing Network Type	Existing Outfalls
R01-01.1	1.146	Surface Water (Storm)	Network Outfalls to Mayne River
R01-01.2	0.815	Surface Water (Storm)	Network Outfalls to North Bull Island
R01-01.3	1.125	Surface Water (Storm)	Network Outfalls to Mayne River
R01-02	0.707	Surface Water (Storm)	Network Outfalls to Mayne River
R01-03	1.030	Surface Water (Storm)	Network Outfalls to North Bull Island

Existing Catchment Reference	Approx. Drainage Catchment Area (km^2)	Existing Network Type	Existing Outfalls
R01-04	2.144	Surface Water (Storm)	Network Outfalls to Santry River
R01-05	1.265	Surface Water (Storm)	Network Outfalls to Naniken River at St Anne's Park
R01-06	2.759	Surface Water (Storm)	Network Outfalls to Tolka Estuary
R01-07	1.410	Surface Water (Storm)	Network Outfalls to Tolka Estuary

4.6.15.3 Proposed Scheme Drainage / Runoff

Whilst in some areas the Proposed Scheme will increase the impermeable areas, additional permeable areas are also provided by the softening of public realm along the routes. The drainage design aims to sustain flow levels within the existing pipe network after a rainfall event by controlling the discharge rate within each catchment. Flows will be controlled by the implementation of SuDS techniques, where practicable. One of the principal objectives of the road drainage system is to minimise the impact of the runoff from the roadways on the surrounding environment via the position of: filter drains, swales, bio-retention areas, tree pits, oil/petrol interceptors, silt traps and attenuation features if necessary.

Each catchment area has been broken down into sub-catchments to define the change in impermeable surface area as a result of the proposed scheme. Where there is a net increase in impermeable surface area, a form of attenuation will be required prior to discharge. Where there is no net change or net decrease, then no form of attenuation will be required prior to discharge. A summary list of the sub-catchments, the associated chainage, and impermeable surface area differential is given below.

The permeability factors have been applied to the impermeable and permeable areas. These factors are required due to the difference in the calculated runoff rate from an impermeable surface, such as a road, when compared with a permeable surface, such as a verge. Table 4.12 contains a column entitled "Net change" which takes account of the applicable permeability factors and the change of use from impermeable to permeable areas and vice versa.

Table 4.12: Summary of Increased Permeable and Impermeable Areas

Existing Catchment Reference	Approx. Drainage Catchment Area (km^2)	Road Corridor	Change of use to impermeable areas (m^2)	Change of use to permeable areas (m^2)	Net Change (m^2)	Percentage Change (%)
R01.01.3	A3000 – A3650	5,674	411	274	137	2.41
R01-02	A3000 – A3650	16,250	1,090	954	136	0.84
R01-03	A3650 - A4450	34,808	4,749	3,343	1,406	4.04
R01-04	A3650 – A5550	44,363	1,809	2,306	-498	-1.12
R01-05	A5550 – A6455	37,408	2,680	2,338	343	0.92
R01-06	A6455 – A7550	28,617	885	574	311	1.09
R01-07	A7550 - End	59,540	19	141	-122	-0.20

4.6.15.4 Proposed Drainage System

The principles for the drainage design are as follows:

- All drainage structures for newly paved areas are designed with a minimum return period of no flooding in 1:30 years with a 20% climate change allowance. Unless informed otherwise via hydraulic models or anecdotal advice, drainage structures for existing paved areas are designed with a return period of no flooding in 1:5 years;

- A SuDS drainage design has been developed for all newly paved areas in accordance with the SuDS hierarchy. SuDS are provided to ensure no increase on existing runoff rates from new or existing paved areas where practicable;
- Infiltration rates were assumed to be zero for calculating the required attenuation volumes for SuDS measures. This is a conservative approach and ensures SuDS measures are not knowingly undersized at this stage of the design. Where necessary, permeability tests will be completed so that infiltration rates can be considered in further design; and
- All run-off from road pavement or any other paved areas is collected in a positive drainage system.

The following drainage types are proposed for the Proposed Scheme catchments comprising newly paved and combined existing / newly paved areas, as indicated on the Proposed Surface Water Drainage Works (BCIDA-ACM-DNG_RD-0001_XX_00-DR-CD-9001) in Volume 3 of this EIAR:

- Sealed Drainage, with gullies and sealed pipes will be located within the kerb line mostly between the cycle track and bus lane and/or the footpath and the cycle track depending on the highway profile;
- Grass Surface Water Channels and Swales are provided. They will provide treatment and can provide attenuation if required;
- Perforated pipes with granular surround are provided, designed to convey, attenuate, and treat runoff prior to discharge;
- Tree pits are provided near the road. These receive flows from the sealed pipe network and are designed to convey, attenuate, and treat runoff prior to discharge; and
- Attenuation Tanks/Oversized Pipes/Ponds – Where there is insufficient attenuation volume provided by the proposed SuDS drainage measures, a pond /oversized pipe/ attenuation tank is required to provide the required storage volume.

4.6.15.5 Runoff Attenuation & Sustainable Drainage Systems

SuDS measures will be provided to ensure no increase in existing run off rates from newly paved and combined existing / newly paved catchment areas. The capacity of the proposed SuDS measures was based on the incoming flows and permitted discharge for each catchment.

A range of storm durations was tested for each catchment from 30-minutes to 24 hours to ensure that the proposed SuDS measures have sufficient capacity to cater for high intensity, short duration storms and longer duration, low intensity storms where the total run off volumes are greater. This hierarchy promotes the concept of a SuDS Management Train, where measures are proposed as a sequence of components to collectively manage catchment runoff. A schematic of the SuDS Management Train is provided in Table 4.13.

Table 4.13: The SuDS Management Train (CIRIA SuDS Manual 2015)

Scale	SuDS Management Train
Source	**Rainwater Harvesting** – capture and reuse within the local environment
	Pervious Surfacing Systems – structural surfaces that allow water to penetrate the ground reducing discharge to a drainage system e.g., pervious pavement
Site	**Infiltration Systems** – structures which encourage infiltration into the ground e.g., Bioretention Basins
	Conveyance Systems – components that convey and control the discharge of flows to downstream storage components e.g., Swales
Regional	**Storage Systems** – components that control the flows before discharge e.g., attenuation ponds, tanks, or basins

Source scale solutions have been specified where reasonably practicable. Where Source type solutions cannot fully address an increase in runoff from a development, residual flows are discharged to be managed at the Site and then Regional scales.

4.6.15.6 Pollution Control

One of the principal objectives of the road drainage system is to minimise the impact of the runoff from the roadways on the surrounding environment via the provision of:

- Filter drains;
- Swales;
- Tree pits;
- Oil / petrol interceptors;
- Silt traps; and
- Attenuation features as necessary.

Pollution Control measures from the proposed road development will be designed in accordance with HA 33/15 (TII 2015), HD 33/15 (TII 2015) and HD 45/15 (TII 2015) of the DMRB.

The proposed road drainage system is shown in the Proposed Surface Water Drainage Works drawings (BCIDA-ACM-DNG_RD-0001_XX_00-DR-CD-9001) in Volume 3 of this EIAR. The system incorporates a variety of drainage measures including, kerb and gully drainage, carrier drains, tree pits, sealed pipes, swales / carrier drains, filter drains, attenuation areas and pollution control as required in accordance with the above design standards. Pollution Control will be achieved during the conveyance of the road runoff to the attenuation features along the gullies and pipes to grassed swales / carrier drains and filter drains where the drainage is allowed filter through the vegetation and filter medium.

The attenuation ponds will include a forebay and oil / petrol interceptor at each outfall location. Any section of drainage where there are no swales or filter drains will also have an oil / petrol interceptor installed at the outfall.

The oil / petrol interceptors will be designed as per DMRB HD 33/15 (TII 2015) and CIRIA 142 (CIRIA 1994). A minimum class 2 bypass interceptor will be installed where required. Where there is treatment by filtration in a swale, tree pit or filter drain an oil / petrol interceptor will not be required.

4.6.16 Maintenance

All traffic signal, CCTV, and communications equipment are designed based on long-term maintenance requirements. All equipment will be accessible without significantly disrupting pedestrian, bicycle, or vehicle traffic.

Apparatus have been designed and located to allow for easy access and the safe maintenance of the Proposed Scheme into the future. This included provision, where practicable, of:

- Use of retention sockets, where applicable, for the erection of Traffic Signal, CCTV, Above Ground Detection, and other equipment mounting poles to allow for the ease of installation, maintenance and replacement;
- The use of lightweight equipment poles, where appropriate, such as cantilever signal poles. Products that allow for maintenance activities to be undertaken from ground level, where practicable, such as tilt down poles or poles with wind-down mechanisms;
- Placement of poles and retention sockets within 7m of chambers to provide ease of installation and replacement of cables;
- Location of chambers away from pedestrian desire lines, and areas of tactile paving;
- Chambers to be placed at 180m centres, where practicable, on longitudinal duct runs to allow for the ease of installation and replacement of cables;
- Safe areas for the access and parking of maintenance vehicles, where practicable; and
- Controller, and other, cabinets located in positions that allow for safe access and clear visibility of the operation of an adjacent road junction.

4.6.17 Safety and Security

In addition to public lighting, it is proposed to install traffic monitoring cameras at key locations to enable the monitoring of traffic flows along the Proposed Scheme and provide rapid identification of any events that are causing, or are likely to cause, disruption to bus services on the route and to road users in general. Junctions System Design information is included in the drawings BCIDA-ACM- TSM_SJ-0001_XX_00-DR-TR-9001 in Volume 3 of this EIAR.

These will be high-definition digital cameras with a digital communications network providing transmission of video and camera monitoring/control functionality.

4.6.18 Land Use and Accommodation Works

The Proposed Scheme has retained as far as practicable the existing horizontal and vertical layout along the route to minimise the amount of land acquisition required. However, in order to construct the Proposed Scheme, it is necessary to compulsorily acquire individual plots of land along sections of the route.

The extent of permanent land acquisition and land required temporarily for the construction of the Proposed Scheme is shown on the General Arrangement Drawings (BCIDA-ACM-GEO_GA-0001_XX_00-DR-CR-9001) included in Volume 3 of this EIAR.

Mitigation accommodation works are proposed in the affected locations, including reconstruction of boundary walls and fences, as required, as outlined in Section 4.6.18.1.

Construction of the Proposed Scheme requires land acquisition from several different parties, as outlined below:

- 80 residential properties;
- 8 commercial properties and non-residential land; and
- Local authority property.

There is no requirement for the demolition of any existing properties along the extents of the Proposed Scheme, but some walls and boundaries will be removed and/or reconstructed.

4.6.18.1 Summary of Accommodation Works and Boundary Treatment

There are a number of areas along the extents of the route where the Proposed Scheme will result in the requirement for accommodation works and boundary treatments. Specific accommodation works are considered on a case-by-case basis.

To maintain the character and setting of the Proposed Scheme, the approach to undertaking the new boundary treatment works along the corridor is replacement on a ‘like for like’ basis in terms of material selection and general aesthetics, unless a section of street can benefit from urban improvement appropriate to the area.

Modifications to driveways and entrances will be guided by DCC’s Parking Cars in Front Gardens Advisory Booklet (DCC 2011).

Existing gates will be reused where possible however considerations will be required for the use of bifold gates, or other appropriate alternatives to mitigate impacts on parking in driveways. All gates will be hung such that they will open inwards onto the property, where practicable.

4.7 References

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Guidance and Legislation

Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU

S.I. No. 600/2001 – Planning and Development Regulations (2001)