

Chapter 04
Proposed
Scheme
Description

Contents

| | | |
|-----------|---|----------|
| 4. | Proposed Scheme Description | 1 |
| 4.1 | Introduction | 1 |
| 4.2 | Proposed Scheme Overview | 1 |
| 4.3 | Design Iteration | 3 |
| 4.4 | Design Principles | 3 |
| 4.5 | Description of the Proposed Scheme by Section | 4 |
| 4.5.1 | Section 1: Liffey Valley to Le Fanu Road | 4 |
| 4.5.2 | Section 2: Le Fanu Road to Sarsfield Road | 12 |
| 4.5.3 | Section 3 – Sarsfield Road to City Centre | 19 |
| 4.6 | Key Infrastructure Elements | 29 |
| 4.6.1 | Mainline Cross-Section | 29 |
| 4.6.2 | Pedestrian Provision | 30 |
| 4.6.3 | Cycling Provision | 31 |
| 4.6.4 | Bus Priority Provision | 33 |
| 4.6.5 | Accessibility for Mobility Impaired Users | 38 |
| 4.6.6 | Integration | 38 |
| 4.6.7 | Junctions | 46 |
| 4.6.8 | Structures | 46 |
| 4.6.9 | Other Street Infrastructure | 47 |
| 4.6.10 | Pavement | 48 |
| 4.6.11 | Parking and Loading | 50 |
| 4.6.12 | Landscape and Urban Realm | 50 |
| 4.6.13 | Lighting | 56 |
| 4.6.14 | Utilities | 57 |
| 4.6.15 | Drainage | 57 |
| 4.6.16 | Maintenance | 61 |
| 4.6.17 | Safety and Security | 61 |
| 4.6.18 | Land Use and Accommodation Works | 61 |
| 4.7 | References | 62 |

4. Proposed Scheme Description

4.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) provides a description of the Liffey Valley to City Centre Core Bus Corridor (CBC) Scheme (hereafter referred to as the Proposed Scheme).

Article 5(1)(a) of the EIA Directive¹ 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 will commence on the Fonthill Road at the tie in point with the new Liffey Valley Shopping Centre Bus Interchange and Road Improvement Scheme. The Proposed Scheme will continue along Fonthill Road where it will turn left onto Coldcut Road and continues to the bridge over the M50, subsequently turning right onto Ballyfermot Road. The Proposed Scheme will travel through Ballyfermot Village and continue onto Sarsfield Road, whilst city bound general traffic will be diverted via Le Fanu Road and Kylemore Road.

The Proposed Scheme will continue along Sarsfield Road, turning right at the junction with Con Colbert Road before turning right again onto Grattan Crescent. The Proposed Scheme will then turn left onto Emmet Road and will continue along Old Kilmainham, Mount Brown, James's Street and Thomas Street. At Cornmarket, the Proposed Scheme will turn right onto High Street. At the junction with Nicholas Street and Winetavern Street the Proposed Scheme will tie into the existing traffic management regime in the City Centre. The route of the Proposed Scheme is shown in Image 1.1 in Chapter 1 (Introduction).

The Proposed Scheme includes an upgrade of the existing bus priority and cycle facilities. The scheme includes a substantial increase in the level of bus priority provided along the corridor, including the provision of additional lengths of bus lane resulting in improved journey time reliability. Throughout the Proposed Scheme bus stops will be enhanced to improve the overall journey experience for bus passengers and 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.

Moreover, pedestrian facilities will be upgraded and additional signalised crossings be provided. In addition, urban 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 Ballyfermot Roundabout.

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))

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 | 9.2km | |
|--|----------------|----------------------|
| Bus Priority | Existing (km) | Proposed Scheme (km) |
| Bus Lanes | | |
| Inbound | 2.3 | 6.5 |
| Outbound | 1.9 | 5.9 |
| Bus Priority through Traffic Management | | |
| Inbound | 0 | 2.7 |
| Outbound | 0 | 3.3 |
| Total Bus Priority (both directions) | 4.2 | 18.4 (+338%) |
| Bus Measures | | |
| Proportion of Route with Bus Priority Measures | 22% | 100% |
| Cycle Facilities – Segregated | | |
| Inbound | 1.4 | 6.4 |
| Outbound | 0.8 | 6.4 |
| Cyclist Facilities – Non-segregated | | |
| Inbound | 2.9 | 0 |
| Outbound | 2.6 | 0.5 |
| Cyclist Facilities - Overall | | |
| Total Cyclist Facilities (both directions) | 7.7 | 13.3 (+72%) |
| Proportion Segregated (including Quiet Street Treatment) | 12% | 72% |
| Other Features | | |
| Number of Pedestrian Signal Crossings | 71 | 102 |
| Number of Residential Properties with Land Acquisition | Not applicable | 3 |

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 |
|--|---------------------------------------|
| BCIDB-JAC-SPW_ZZ-0007_XX_00-DR-CR-9001 | Site Location Plan |
| BCIDB-JAC-GEO_GA-0007_XX_00-DR-CR-9001 | General Arrangement |
| BCIDB-JAC-GEO_HV-0007_ML_00-DR-CR-9001 | Mainline Plan and Profile |
| BCIDB-JAC-GEO_CS-0007_XX_00-DR-CR-9001 | Typical Cross Sections |
| BCIDB-JAC-ENV_LA-0007_XX_00-DR-LL-9001 | Landscaping General Arrangement |
| BCIDB-JAC-PAV_PV-0007_XX_00-DR-CR-9001 | Pavement Treatment Plans |
| BCIDB-JAC-SPW_BW-0007_XX_00-DR-CR-9001 | Fencing and Boundary Treatment |
| BCIDB-JAC-TSM_GA-0007_XX_00-DR-CR-9001 | Traffic Signs and Road Markings |
| BCIDB-JAC-LHT_RL-0007_XX_00-DR-EO-9001 | Street Lighting |
| BCIDB-JAC-TSM_SJ-0007_XX_00-DR-TR-9001 | Junction System Design |
| BCIDB-JAC-DNG_RD-0007_XX_00-DR-CD-9001 | Proposed Surface Water Drainage Works |
| BCIDB-JAC-UTL_UD-0007_XX_00-DR-CU-9001 | IW Foul Sewer Asset Alterations |
| BCIDB-JAC-UTL_UE-0007_XX_00-DR-CU-9001 | ESB Asset Alterations |
| BCIDB-JAC-UTL_UG-0007_XX_00-DR-CU-9001 | GNI Asset Alterations |
| BCIDB-JAC-UTL_UW-0007_XX_00-DR-CU-9001 | IW Water Asset Alterations |
| BCIDB-JAC-UTL_UX-0007_XX_00-DR-CU-9001 | Telecommunications Asset Alterations |
| BCIDB-JAC-UTL_UC-0007_XX_00-DR-CU-9001 | Combined Existing Utility Records |
| BCIDB-JAC-LHT_RL-0007_XX_00-DR-EO-9001 | Structures General Arrangement |

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 design along Ballyfermot Road between Markievicz Park and St Laurence's Road was amended to reduce land take following concerns raised by the public in relation to the impact on the park boundary, existing trees and residential properties;
- The design of Landen Road junction was refined to remove land take from the residential properties. A short section of westbound bus lane was removed and signal controlled priority was used to provide bus priority;
- The design along Grattan Crescent was amended following concerns raised by the public in relation to the impact on the mature trees. This design modification resulted in the retention of the mature trees, while also providing bus priority along this section, improved footways and a new pedestrian crossing;
- Following concerns raised during the public consultation regarding access to Mount Brown, Old Kilmainham, St James's Hospital and the local area, the design was refined to reduce these impacts. The bus gate on Mount Brown was amended with the eastbound bus gate being relocated to the James's Street entrance to the hospital campus. The westbound bus gate location was retained but the length was shortened. The operational hours were also refined with the eastbound bus gate operating in the AM and the westbound bus gate operating in the PM. This revised arrangement for the bus gate will allow access at all times to Ceannnt Fort, the Children's Hospital, Adult hospital, and local area from all directions;
- Following further engagement with local community in the Mount Brown and Brookfield Road area, the proposed reversal of the existing one-way system on Brookfield Road will not be progressed and the existing one-way system will remain unchanged. This will reduce the amount of traffic that would travel along Brookfield Road;
- The design along James's Street and Thomas Street was amended following concerns raised by the public in relation to the stop start nature of the cycling provision. The design was refined to provide continuous cycle tracks on both sides of the road along this section; and
- 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 Kylemore Road and Fonthill Road.

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) (National Transport Authority (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 urban 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);
- Transport Infrastructure Ireland (TII) National Road Design Standards;
- The Traffic Signs Manual (TSM) (Department of Transport 2019);
- Guidance on the Use of Tactile Paving Surfaces (UK Department for Transport (DfT) 2007);

- Building for Everyone: A Universal Design Approach (National Disability Authority (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 Ballyfermot Road / Kylemore 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.

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. 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 Proposed Scheme.

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 DfT 2005), Guidance on the Use of Tactile Paving Surfaces (UK DfT 2007), and BS8300-1:2018 Design of an Accessible and Inclusive Built Environment - External Environment – Code of Practice (British Standards Institute (BSI) 2018). Accessibility is also addressed in Chapter 12 of the PDGB. 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 by Section

The Proposed Scheme runs along the Fonthill Road, R833 Coldcut Road, R833 Ballyfermot Road through Ballyfermot Village and continues onto the Sarsfield Road, Grattan Crescent, Emmet Road, Old Kilmainham, Mount Brown and James's Street. From here the Proposed Scheme continues along Thomas Street, Cornmarket and along High Street. The Proposed Scheme will join the prevailing City Centre traffic management regime at the junction with Nicholas Street and Winetavern Street.

For the purposes of describing the Proposed Scheme it has been split into three sections as follows:

- Section 1: Liffey Valley to Le Fanu Road;
- Section 2: Le Fanu Road to Sarsfield Road; and
- Section 3: Sarsfield Road to City Centre.

4.5.1 Section 1: Liffey Valley to Le Fanu Road

4.5.1.1 General Overview of the Proposed Scheme

The Proposed Scheme commences on Fonthill Road at the tie in with the Liffey Valley Shopping Centre Bus Interchange and Road Improvement Scheme. Between Fonthill Road and the junction with Coldcut Road, it is proposed to provide a continuous bus lane, cycle tracks and an improved footway in each direction. These proposals can be provided by widening into the central median, modifying the existing junctions and utilising existing green space adjacent to the road.

Two existing roundabouts on the Fonthill Road will be developed into signalised junctions and provide improved infrastructure for cyclists and pedestrians.

Temporary land acquisition is required for the Construction Compound on land adjacent to the Fonthill Road. Reinstatement of the proposed Construction Compound will be required in this area following completion of the works.

Either side of the M50 bridge on Coldcut Road, it is proposed to provide a continuous bus lane, cycle tracks and an improved footway in each direction. As Coldcut Road crosses over the M50, the carriageway width is restricted. To overcome this restriction and maintain bus priority over this section, it is proposed to provide Signal Controlled Priority on both sides of the bridge crossing. The traffic signals at this location will be sequenced to ensure bus priority. To accommodate these changes, it is proposed to encroach on the green space to the east of the existing structure.

It is proposed to modify the Cloverhill Road and Kennelsfort Road junctions to provide improved facilities for cyclists and pedestrians. To accommodate these changes, it is proposed to utilise limited land take along the green space adjacent to Palmers Walk, Palmers Court and Palmers Drive.

On Ballyfermot Road, it is proposed provide a bus lane, general traffic lane, cycle track and footway in both directions. To accommodate this improved infrastructure, it will be necessary to acquire limited land take at the following locations:

- Cherry Orchard Industrial Estate;
- Cherry Orchard Hospital;
- Entrance Cherry Orchard Filling Station; and
- At junction with Le Fanu Road.

It is also proposed to amalgamate the main Ballyfermot Road and the access roads. This would provide sufficient space to improve the existing public transport infrastructure. Urban Realm works, additional tree planting and provision for parallel parking are proposed where the access road will be modified.

4.5.1.2 Deviations from Standard Cross Sections

The width of the cross-sectional elements as outlined in Section 4.6.1 have been reduced (from published guidance, e.g. DMURS), at a number of constrained locations along the Proposed Scheme. The deviations within Section 1 – Liffey Valley to Le Fanu Road are detailed in Table 4.3.

Table 4.3: Reduced Standard Cross Sections on Section 1 of the Proposed Scheme

| Location | Design Element | DMURS / NCM | Design | Justification |
|-------------------|------------------------|-------------|--------|---|
| Ch. B2100- B2175 | Cycle Track (outbound) | 2.0m | 1.5m | Providing a standard width would require breaking out of existing kerbline on southern side of junction and encroach on proposed footway width. |
| Ch. B2110 – B2135 | Footway (inbound) | 2.0m | 1.85m | Providing a standard width would require additional land take, impacting the adjacent private property. |
| Ch. B2250 – B2370 | Cycle Track (outbound) | 2.0m | 1.5m | Providing a standard width would require additional land take, impacting the adjacent private property. |

4.5.1.3 Bus Lane Provision

An overview of the bus lane provision as part of the Proposed Scheme is provided in Section 4.6.4. As outlined within that section, full bus priority through the use of dedicated bus lanes is not possible at all locations, and Signal Controlled Priority is used in one area in Section 1 of the Proposed Scheme as listed in Table 4.4.

Table 4.4: Proposed Signal Controlled Priority Junctions

| Junction Location | Reason for Signal Priority |
|---|---|
| M50 overbridge; buses travelling in either direction. | Major works to the existing structure or a new bridge would be needed to facilitate extra lanes over the M50. Approx. Chainage B183 to B325, in both directions. |

4.5.1.4 Bus Stops

The different types of bus stop (island, shared landing area and inline) are described in Section 4.6.4. 13 of the 16 proposed bus stops within this Section of the Proposed Scheme are Island Bus Stops. The bus stop locations and types are outlined in Table 4.5 and shown in the General Arrangement series of drawings (BCIDB-JAC-GEO_GA-0007_XX_00-DR-CR-9001) in Volume 3 of this EIAR. Further details of bus stop design is included in the PDGB (NTA 2021) – Appendix A4.1 in Volume 4 of this EIAR.

Table 4.5: Proposed Bus Stop Locations

| Inbound / Outbound | Bus Stop Name | Bus Stop Number | Chainage | Bus Stop Type | Bus Shelter |
|--------------------|------------------------------|-----------------|----------|---------------------|----------------------------------|
| Inbound | Liffey Valley Retail Park | N/A | A230 | Island | New standard bus shelter |
| Inbound | Sports Club | 2686 | B71 | Island | Replacement standard bus shelter |
| Inbound | Cloverhill Road | 7510 | B385 | Island | New standard bus shelter |
| Inbound | Coldcut Road | N/A | B665 | Island | New standard bus shelter |
| Inbound | Cherry Orchard Hospital | 2205 | B1040 | Island | Replacement standard bus shelter |
| Inbound | Cleggan Park | 2688 | B1470 | Island | Replacement standard bus shelter |
| Inbound | Blackditch Drive | 2689 | B1840 | Island | Replacement standard bus shelter |
| Inbound | Ballyfermot Road | 2696 | B2210 | Shared Landing Area | Replacement standard bus shelter |
| Outbound | Ballyfermot | 2656 | B2225 | Island | Replacement standard bus shelter |
| Outbound | Ballyfermot Community Centre | 2668 | B1845 | Island | Replacement standard bus shelter |
| Outbound | Cleggan Park | 2672 | B1490 | Shared Landing Area | New slimline bus shelter |
| Outbound | Cherry Orchard Hospital | 2206 | B1050 | Island | New standard bus shelter |
| Outbound | Coldcut Road | 4798 | B665 | Island | Replacement standard bus shelter |
| Outbound | Cloverhill Road | N/A | B350 | Shared Landing Area | New slimline bus shelter |
| Outbound | Dublin Bus Sports | 2674 | B60 | Island | Replacement standard bus shelter |
| Outbound | Liffey Valley Retail Park | N/A | A220 | Island | New standard bus shelter |

4.5.1.5 Cycling Provision

The specific proposals for cycling facilities in Section 1 of the Proposed Scheme are described below. Provision for cyclists at the signal-controlled junctions are described in Section 4.6.3.5.

New segregated cycle tracks will be provided in both directions along the whole of this section of the Proposed Scheme, except on the bridge over the M50, where there will be a shared surface for cyclists and pedestrians across the bridge. These cycle tracks follow the GDA Cycle Network Plan Primary Route number 7A. At several areas along this section of the Proposed Scheme there are existing cycle tracks (e.g. a two-way cycle track on one side of Fonthill Road and intermittently on both sides of Ballyfermot Road), however these will be reconfigured and upgraded to the arrangement set out in the PDGB (including 120mm upstand kerb between cycle track and traffic lane).

A tie-in is provided to a Secondary Route within the GDA Cycle Network Plan at the Cloverhill Road / Coldcut Road junction (Route 8C1). At the junction between Coldcut Road / Ballyfermot Road / Kennelsfort Road Upper, cycle tracks on each side of the road are proposed onto Kennelsfort Road Upper, aligning with a Feeder Route identified in the GDA Cycle Network Plan. Similarly cycle track tie-ins are proposed on to Drumfinn Road and on to Le Fanu Road from Ballyfermot Road, aligning with two other Feeder Routes identified in the GDA Cycle Network Plan.

4.5.1.6 Junction Information

An overview of the approach to junction review and design is provided in Section 4.6.6.4.2. The major and moderate junctions (signalised) within Section 1 – Liffey Valley to Le Fanu Road of the Proposed Scheme are outlined in Table 4.6.

Table 4.6: Major and Moderate Junctions (Signalised) within Section 1 of the Proposed Scheme

| Junction Location | Description |
|---|--|
| Major Junctions (Signalised) | |
| Fonthill Road Liffey Valley Shopping Centre Liffey Valley Retail Park | Removal of existing roundabout junction to facilitate upgrade to a signal control junction that includes pedestrian, cycle, and bus infrastructure |
| Fonthill Road to Coldcut Road Fonthill Road to east Fonthill Road to west | Removal of existing roundabout junction to facilitate upgrade to a signal control junction that includes pedestrian, cycle, and bus infrastructure |
| Coldcut Road Fonthill Road | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| Moderate Junctions (Signalised) | |
| Coldcut Road Cloverhill Road | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| Coldcut Road Ballyfermot Road Kennelsfort Road Upper | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| Ballyfermot Road Ballyfermot Primary Care Centre | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| Ballyfermot Road Clifden Road | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| Ballyfermot Road Drumfinn Road | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| Ballyfermot Road Le Fanu Road | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |

4.5.1.7 Parking and Loading Bays

Changes to the parking and loading provisions along Section 1 - Liffey Valley to Le Fanu Road as a result of the Proposed Scheme are shown in Table 4.7.

Table 4.7: Section 1 – Liffey Valley to Le Fanu Road: On-Street Parking Change Impact Summary

| Location | Type of Parking | Existing | Proposed | Change |
|---|-----------------|----------|----------|--------|
| Ballyfermot Road (including local access roads) | Informal | 147 | 112 | -35 |
| | Paid | 38 | 17 | -21 |
| | Disabled | 1 | 0 | -1 |
| Approximate adjacent informal parking within 200-250m | | 1,680 | 1,680 | 0 |
| Total | | 1,866 | 1,809 | -57 |

4.5.1.8 Landscape and Urban 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 urban realm design works in Section 1 of the Proposed Scheme.

4.5.1.8.1 Fonthill Road

The proposed design involves kerb realignments on both sides to the eastern part of this section in the lead up to Coldcut Road Bridge but no other significant changes. The design proposes in-situ materials including poured

concrete and asphalt with concrete kerbs to match existing where kerb realignments occur. Sustainable Drainage System (SuDS) treatments are proposed in green spaces and medians. This has been determined by the amount of space available but will typically be integrated as part of new tree pits for proposed street trees. New native planting to mitigate tree loss is proposed on the approach to the bridge along with edge planting management.

4.5.1.8.2 Coldcut Road Bridge to Cloiginn Park

The proposed design includes asphalt with concrete kerbs for the footways for most of the section. East of the hospital the footway material changes to poured concrete with concrete kerbs to match existing. Replacement fencing is proposed where land take occurs to reinstate the visual screening. New tree planting and species rich grassland is proposed for the green spaces near Kennelsfort Road Upper junction. SuDS treatment proposed in two locations close to the Kennelsfort Road Upper junction. Hedge boundary planting and boundary will be reinstated along the hospital fence. SuDS treatment is proposed within the green space in the Cherry Orchard Hospital site. Proposed trees and reinstated boundary at the junction near the service station is proposed to mitigate change in boundary treatment.

4.5.1.8.3 Cloiginn Park to Ballyfermot Village Centre

This section features a significant realignment of the road edge adjacent to the residential area with minor kerb realignments by the park. The proposed design includes poured concrete footways with concrete kerbs along the western edge which transitions to concrete paving slabs with concrete kerbs as the route approaches the Ballyfermot Community Civic Centre. The carriageway proposal is to change the entire junction to a raised table with a coloured asphalt. The intent is to physically and visually slow vehicle speeds through this urban centre. New tree planting has been proposed where practicable in the residential area (subject to utilities). The forecourt of the medical centre will be enhanced with high quality concrete paving and wide granite kerbs. Cycle racks will be provided along the frontage to the Civic Centre. Along the park interface, existing trees will be retained and enhanced with new ground cover shrub planting. See Image 4.1 and Image 4.2.

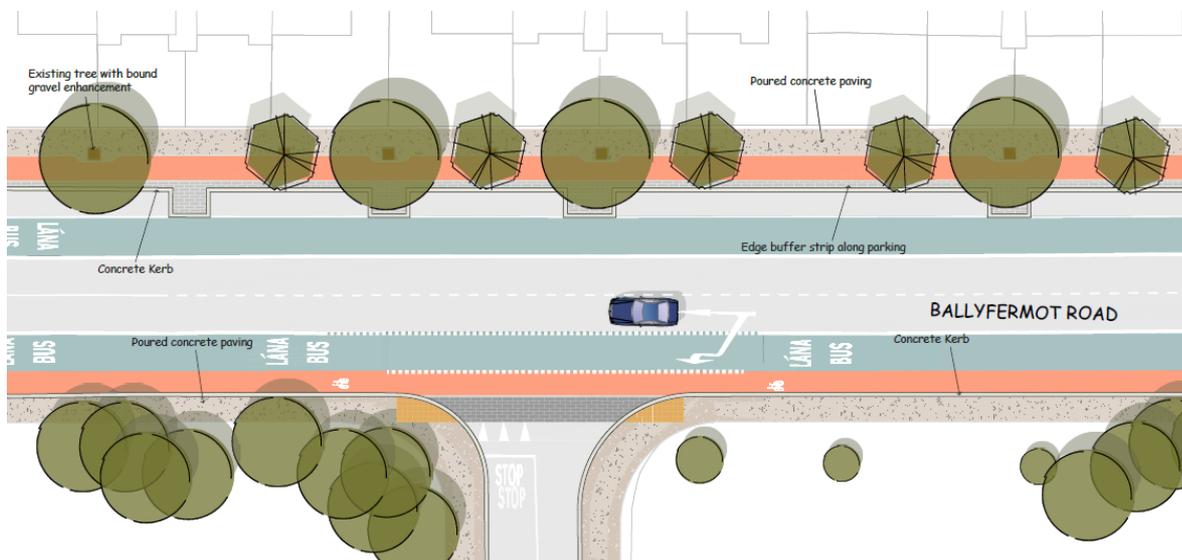


Image 4.1: Re-arranged Parking and Cycle Track to Front of Residential Properties East of Cloiginn Park

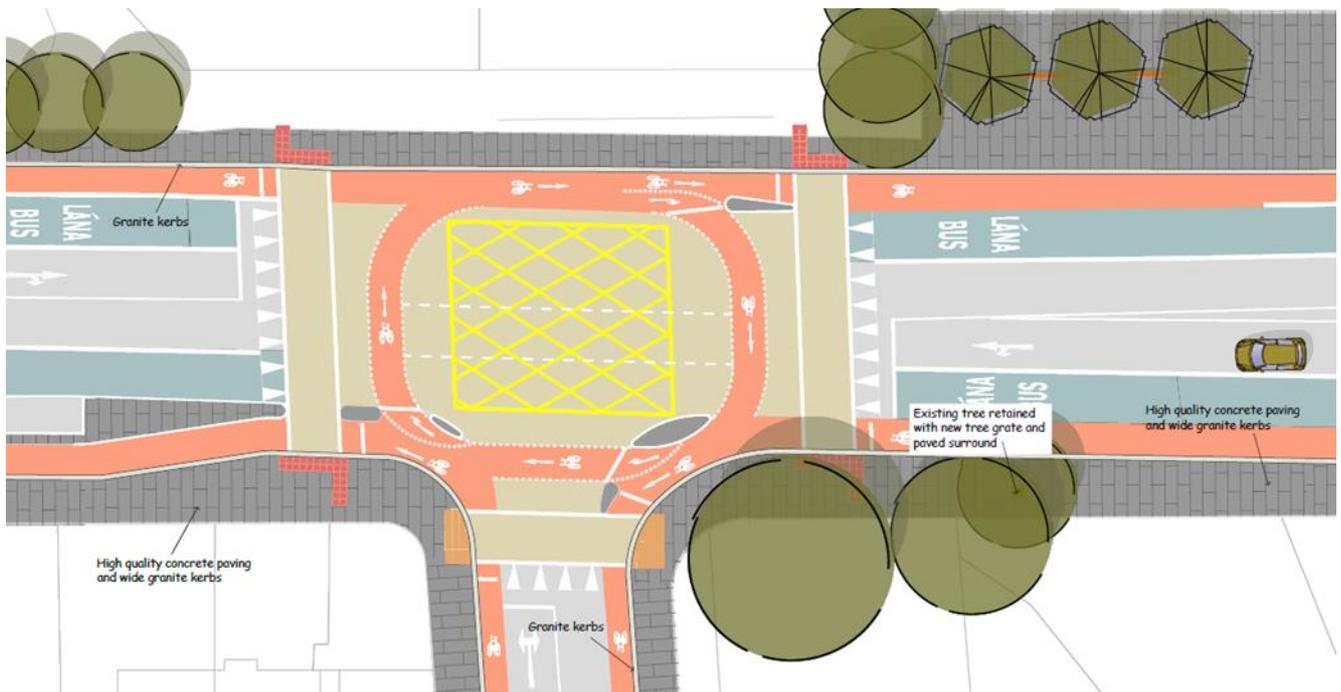


Image 4.2: Raised Table at Junction and Urban Realm Upgrade Along Footway in Front of Ballyfermot Community Civic Centre

The service road along the residential area west of Le Fanu Road junction is proposed to have some minor adjustments in order to retain the majority of the existing established avenue of trees. A gap in the centre of this tree line will be created to connect the bus stops through to the service road. The existing railings will need to be set back to suit the new back of footway alignment. Concrete paving with concrete kerbs are proposed along the footways adjacent to the new cycle lane to enhance the approach into the retail centre. Raised tables across side streets are proposed to enhance pedestrian priority.

The urban realm materials at the shopping parade just west of Le Fanu Road junction will be enhanced with concrete paving and concrete kerbs for the footways. New street trees are proposed on the east side of the junction where the footways are quite wide. An overall de-clutter and tidy up of the footways will enhance the approach into Ballyfermot Retail Centre.

See Image 4.3, Image 4.4 and Image 4.5 for illustrations of these measures.

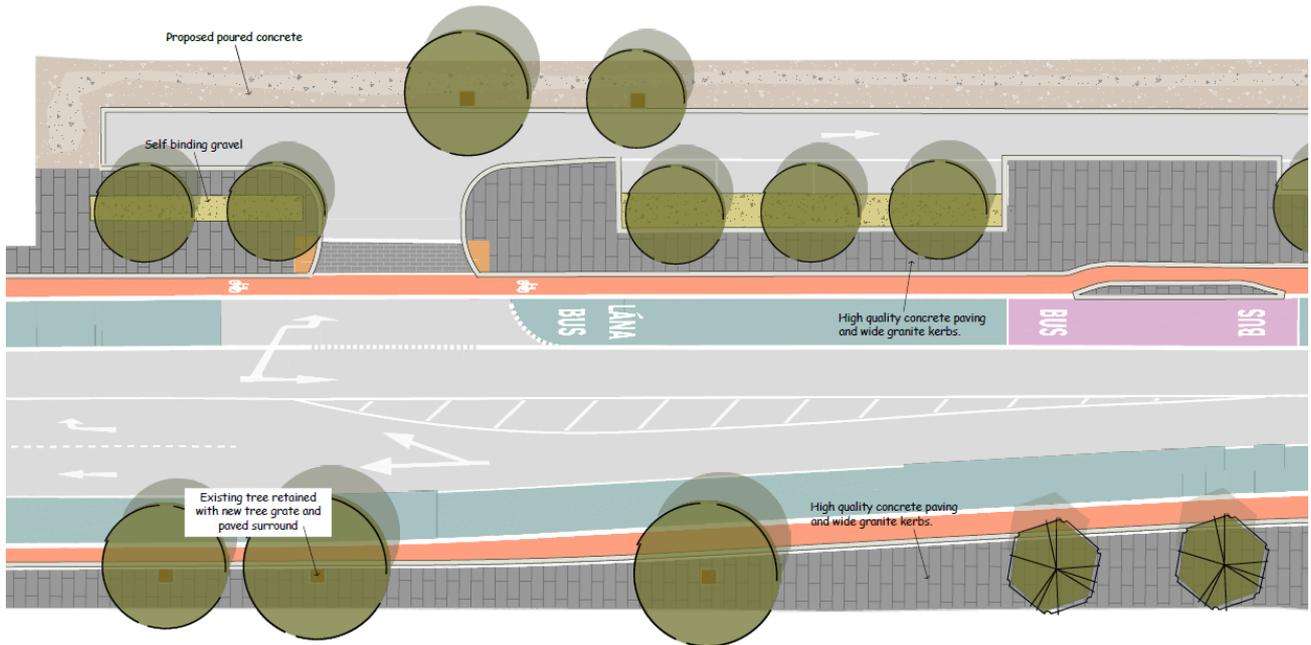


Image 4.3: House No. 388 to No. 370 Ballyfermot Road

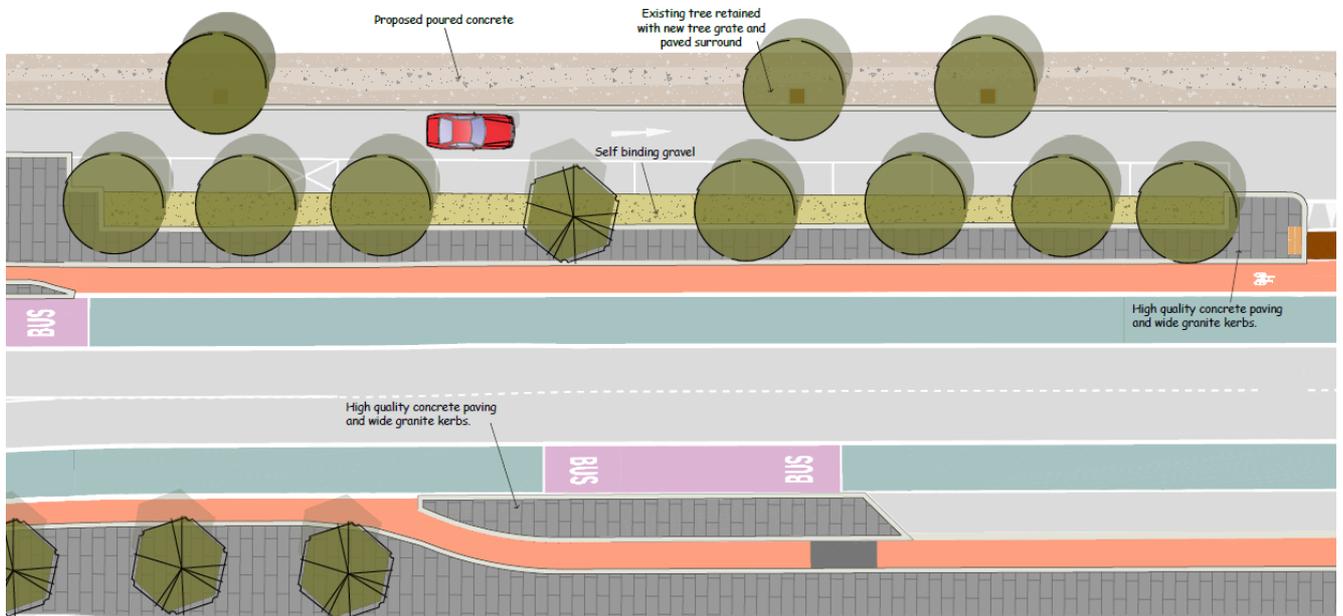


Image 4.4: House No. 370 to No. 352 Ballyfermot Road

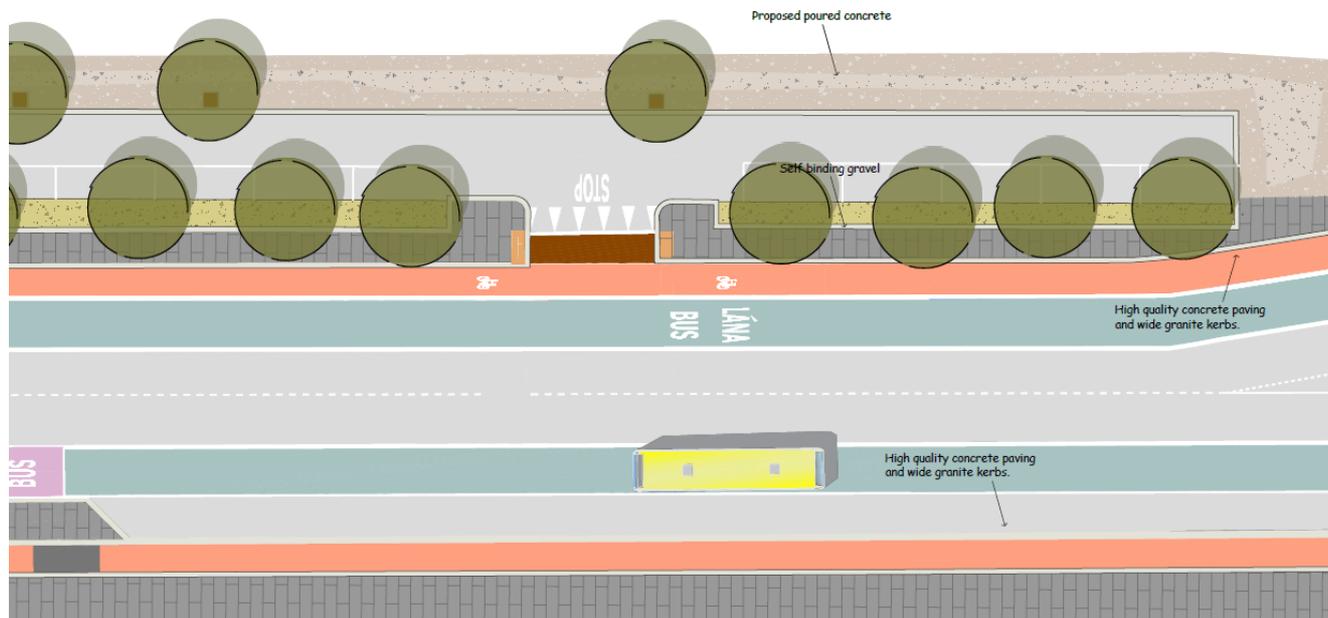


Image 4.5: House No. 352 to No. 340 Ballyfermot Road

4.5.1.9 Land Acquisition and Use

Temporary land acquisition is required within this Section at various locations. For construction compounds, plots at Fonthill Road and Coldcut Road will be required. To facilitate works, including drainage connections and reconfiguration of footpaths and cycle tracks, land will be acquired on Fonthill Road, at Liffey Valley Retail Park (including at the B&Q Warehouse), along Coldcut Road, Cherry Orchard Industrial Estate, land along Ballyfermot Road, land at the Cherry Orchard Service Station, and the car park at 336-338 Ballyfermot Road. All temporary land acquisition is to be reinstated once works are completed.

Permanent land acquisition is also required within this Section in order to allow for cross-section widening at all of the locations listed above. There are also areas to be acquired permanently for the installation of drainage features on the Fonthill Road, in Liffey Valley Retail Park, on Coldcut Road and on Ballyfermot Road. Additionally, some land is permanently required for an island bus stop on Ballyfermot Road.

The impacts on residential amenity arising from land acquisition in Section 1 of the Proposed Scheme 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).

4.5.1.10 Rights of Way

Table 4.8 outlines the locations where existing rights of way will be affected by the Proposed Scheme.

Table 4.8: Existing Rights of Way Affected

| Location | Chainage | Existing Situation | Proposed Change |
|---------------|----------|--|---|
| Fonthill Road | A175 | Existing roundabout which has a stub arm and two existing footway / cycleway linking the crossings to the north / south Boulevard. | The roundabout is being converted to a signalised junction. The existing stub arm will be removed and a new footway and cycleway connection will be constructed linking the new junction with the north / south boulevard. Access will be retained throughout the construction works and will continue to operate once complete. |
| Coldcut Road | B100 | There is an existing easement on land adjacent to the Coldcut Road. | As part of the Proposed Scheme, it is proposed to widen the road at this location resulting in a temporary and permanent interference with the easement. |
| Coldcut Road | B500 | There are existing utility cabinet in the grass verge at the Cloverhill Road / Coldcut Road junction. | As part of the Proposed Scheme, it is proposed to widen the road at this location which will impact the existing access to the utility cabinets. Access to the site will be retained throughout the construction works and will continue to operate as before once complete. |

4.5.2 Section 2: Le Fanu Road to Sarsfield Road

4.5.2.1 General Overview of the Proposed Scheme

At the Le Fanu Road junction, it is proposed to divert city bound traffic on to Le Fanu Road. The section of Ballyfermot Road between Le Fanu Road and Kylemore Junction will be restricted to one bus lane in both directions and one outbound general traffic lane. Local access on Ballyfermot Road between La Fanu Road and Colepark Road has been maintained. City bound traffic will be redirected along Le Fanu Road and Kylemore Road where it will then re-join the corridor at Ballyfermot Road. It is intended to provide cycle tracks and footways in both directions on this section of the Ballyfermot Road and on Kylemore Road.

It is proposed to upgrade the existing roundabout at Kylemore Road / Ballyfermot Road to a signalised junction. Between Kylemore Road and Markievicz Park, 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. To accommodate this, some areas of land acquisition will be required at the following locations:

- Limited green space from St. Raphael's and St. Gabriel's Primary School;
- Ballyfermot Resource Centre; and
- Limited green space from the former De La Salle National School / Mount La Salle.

To reduce the impact on Markievicz Park and the adjacent residential properties, it is proposed to provide Signal Controlled Bus Priority for citybound buses with the traffic signals sequenced to ensure full bus priority. The citybound bus lane would then be reintroduced at St. Laurence's Road. To accommodate the revised arrangements, it is intended to close the junction of O'Hogan Road and Ballyfermot Road as part of the implementation of the Signal Controlled Bus Priority on Ballyfermot Road. O'Hogan Road can still be accessed via Garryowen Road and Decies Road. Dedicated cycle tracks and footpath facilities will be provided through this section. The proposals will require land take at the following locations:

- Limited land take at Markievicz Park;
- Boundary lands at the Steeples Estate;
- Private frontages between O'Hogan Road and St. Laurence's Road;
- Boundary lands on Longmeadows Pitch and Putt / Longmeadows Park; and
- Private frontages between First Avenue and Saint Mary's Avenue West.

Between Sarsfield Road and Chapelizod Bypass it is proposed to extend the proposed cycle track to tie into the proposed cycle infrastructure that forms part of the Lucan to City Centre CBC Scheme. If the cycling infrastructure proposed as part of the Lucan to City Centre CBC Scheme is not in place when the Proposed Scheme is being implemented, cyclist have an alternative route to the City Centre via Sarsfield Road, Inchicore Road, Kilmainham Lane and Bow Lane where they will re-join the Proposed Scheme.

4.5.2.2 Deviations from Standard Cross Sections

The width of the cross-sectional elements as outlined in Section 4.6.1 have been reduced (from published guidance, e.g. DMURS), at a number of constrained locations along the Proposed Scheme. The deviations within Section 2 – Le Fanu Road to Sarsfield Road are detailed in Table 4.9.

Table 4.9: Reduced Standard Cross Sections on Section 2 – Le Fanu Road to Sarsfield Road

| Location | Design Element | DMURS / NCM | Design | Justification |
|-------------------|------------------------|-------------|-------------|--|
| Ch. B2410 – B2510 | Cycle Track (inbound) | 2.0m | 1.5m | Providing a standard width would require additional land take, impacting the adjacent private property. |
| Ch. B2410 – B2470 | Cycle Track (outbound) | 2.0m | 1.5m | Providing a standard width would require additional land take, impacting the adjacent private property. |
| Ch. B2730 – B2830 | Cycleway (citybound) | 2.0m | 1.9m – 1.5m | Providing a standard width would require additional land take, impacting the footway around Ballyfermot Shopping Village and the church. |
| Ch. B3370 – B3760 | Cycleway (outbound) | 2.0m | 1.9m – 1.5m | Providing a standard width would require additional land take, impacting the adjacent Markievicz Park. |
| Ch. B3450 – B3730 | Footway (outbound) | 2.0m | 1.8m – 1.9m | Providing a standard width would require additional land take, impacting the adjacent private properties and Markievicz Park. |
| Ch. B3430 – B3775 | Cycleway (citybound) | 2.0m | 1.9m – 1.5m | Providing a standard width would require additional land take, impacting the adjacent private properties. |
| Ch. B3430 – B3675 | Footway (citybound) | 2.0m | 1.8m | Providing a standard width would require additional land take, impacting the adjacent private properties. |
| Ch. B3675 | Footway (citybound) | 2.0m | 1.25m | 2m long section of narrowing required to accommodate the existing ESB substation. |
| Ch. B3675 – B3770 | Footway (citybound) | 2.0m | 1.8m | Providing a standard width would require additional land take, impacting the adjacent private properties. |

4.5.2.3 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 through the use of dedicated bus lanes is not possible at all locations, and Signal Controlled Priority is used in one area in Section 2 of the Proposed Scheme as listed in Table 4.10.

Table 4.10: Proposed Signal Controlled Priority Junctions Within Section 2 – Le Fanu Road to Sarsfield Road

| Junction Location | Reason for Signal Priority |
|---|---|
| Between Markievicz Park and St Laurence's Road; buses travelling eastbound. <i>Note: to facilitate bus priority on this section, it is also proposed to close the junction of O'Hogan Road and Ballyfermot Road.</i> | Avoids impacting the existing retaining wall at St Laurence's Glen. Acquiring front gardens from residential properties along this section would remove private parking which cannot be relocated. Significantly reduces the land acquisition through this section of the route. Approx. Chainage B3476 to B3850 |

4.5.2.4 Bus Stops

The different types of bus stop (island, shared landing area and inline) are described in Section 4.6.4. Six of the 12 proposed bus stops within this Section of the Proposed Scheme are Island Bus Stops. The bus stop locations and types are outlined in Table 4.11 and shown in the General Arrangement series of drawings (BCIDB-JAC-GEO_GA-0007_XX_00-DR-CR-9001) in Volume 3 of this EIAR. Further details of bus stop design is included in the PDGB (NTA 2021) – Appendix A4.1 in Volume 4 of this EIAR.

Table 4.11: Proposed Bus Stop Locations Within Section 2 – Le Fanu Road to Sarsfield Road

| Inbound / Outbound | Bus Stop Name | Bus Stop Number | Chainage | Bus Stop Type | Bus Shelter |
|--------------------|-------------------------------|-----------------|----------|---------------------|----------------------------------|
| Inbound | Ballyfermot Parade | 2697 | B2590 | Island | Replacement standard bus shelter |
| Inbound | Convent Lawns | 5007 | D215 | Island | Replacement standard bus shelter |
| Inbound | St Gabriel's School | 2713 | B2990 | Island | Replacement standard bus shelter |
| Inbound | Markievicz Park | 2714 | B3300 | Island | Replacement standard bus shelter |
| Inbound | Sarsfield Road | 2716 | B3800 | Shared Landing Area | New slimline bus shelter |
| Inbound | St. Mary's Avenue | 2718 | B4140 | Island | New standard bus shelter |
| Outbound | Sarsfield Medical Centre | 2644 | B4360 | Shared Landing Area | New standard bus shelter |
| Outbound | Longmeadows | 2709 | B3800 | Shared Landing Area | New slimline bus shelter |
| Outbound | Markievicz Park | 2711 | B3380 | Shared Landing Area | Replacement slimline bus shelter |
| Outbound | St. Raphael's National School | 2712 | B2930 | Shared Landing Area | New slimline bus shelter |
| Outbound | Convent Lawns | 4414 | D275 | Island | New standard bus shelter |
| Outbound | Ballyfermot Parade | 2655 | B2615 | Shared Landing Area | Replacement standard bus shelter |

4.5.2.5 Cycling Provision

The specific proposals for cycling facilities in Section 2 of the Proposed Scheme are described below. Provision for cyclists at the signal-controlled junctions are described in Section 4.6.3.5.

New segregated cycle tracks will be provided in both directions along the whole of this section of the Proposed Scheme. These cycle tracks continue to follow the GDA Cycle Network Plan Primary Route number 7A. Along the majority of this section there are existing cycle tracks and advisory cycle lanes, however these will be reconfigured and upgraded to the arrangement set out in the PDGB (including 120mm upstand kerb between cycle track and traffic lane).

Tie-ins are provided to two Secondary Routes within the GDA Cycle Network Plan, namely at the Ballyfermot Road / Kylemore Road junction (Route SO4), and at the Sarsfield Road / Con Colbert Road junction (Route 6A). There are no tie-ins to any Feeder Routes on the GDA Cycle Network Plan along this section of the Proposed Scheme.

4.5.2.6 Junction Information

An overview of the approach to junction review and design is provided in Section 4.6.6.4.2. The major and moderate junctions (signalised) within Section 2 – Le Fanu Road to Sarsfield Road of the Proposed Scheme are outlined in Table 4.12.

Table 4.12: Major and Moderate Junctions (Signalised) Within Section 2 of the Proposed Scheme

| Junction Location | Summary |
|---|---|
| Major Junctions (Signalised) | |
| Ballyfermot Road Kylemore Road | Proposed new signalised junction to replace the existing roundabout to provide improved bus priority, pedestrian, and cycle infrastructure. |
| Moderate Junctions (Signalised) | |
| Ballyfermot Road Le Fanu Road | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| Le Fanu Road Kylemore Road Chapelizod Hill Road | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| Ballyfermot Road Ballyfermot Commercial Centre | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |

4.5.2.7 Parking and Loading Bays

Changes to the parking and loading provisions along Section 2 - Le Fanu Road to Sarsfield Road as a result of the Proposed Scheme are shown in Table 4.13 and Table 4.14 respectively.

Table 4.13: Section 2 – Le Fanu Road to Sarsfield Road: On-Street Parking Change Impact Summary

| Location | Type of Parking | Existing | Proposed | Change |
|---|-----------------|----------|----------|--------|
| Ballyfermot Road | Disabled | 2 | 2 | 0 |
| | Informal | 23 | 26 | +3 |
| | Paid | 86 | 76 | -10 |
| | Taxi | 5 | 5 | 0 |
| Kylemore Road | Informal | 44 | 44 | 0 |
| Sarsfield Road | Informal | 27 | 20 | -7 |
| Approximate adjacent informal parking within 200-250m | | 690 | 690 | 0 |
| Total | | 877 | 863 | -14 |

Table 4.14: Section 2 – Le Fanu Road to Sarsfield Road: Existing and Proposed Loading Bays

| Location | Type of Parking | Existing | Proposed | Change |
|---|-----------------|----------|----------|--------|
| Ballyfermot Parade, Le Fanu Road, Kylemore Road | Loading Bay | 4 | 4 | 0 |
| Total | | 4 | 4 | 0 |

4.5.2.8 Landscape and Urban Realm

For an overview of the landscape design principles and approach reference should be made to Section 4.6.12. The following sections provide a description of specific landscape and urban realm design in Section 2 of the Proposed Scheme.

4.5.2.8.1 Ballyfermot Retail Centre, Kylemore Road & Ballyfermot Roundabout

A high quality urban realm scheme is proposed to support the retail centre and includes concrete paving combined with natural stone sett bands of paving with wide granite kerbs. The feature banding will continue across Ballyfermot Road for visual connectivity. Loss of poor quality trees through the Ballyfermot retail area will be acknowledged and replacement tree planting is proposed in the upgrade to the associated urban realm areas. A new suite of street furniture is proposed including feature seating to provide a resting and meeting place in the retail core. The service road surface will be coloured to visually calm traffic and to enhance pedestrian priority. Equally, the pedestrian crossing across Ballyfermot Road will be coloured to visually calm traffic. Proposed raised tables across side streets are to be finished in concrete setts with asphalt ramps to enhance pedestrian priority. Poured concrete footways to match existing are proposed where kerb realignments occur along Kylemore Road. New trees are proposed along the wide section of footway along Kylemore Road. Footway surface materials will transition to concrete paving at the bottom of Kylemore Road close to the existing roundabout. See Image 4.6.

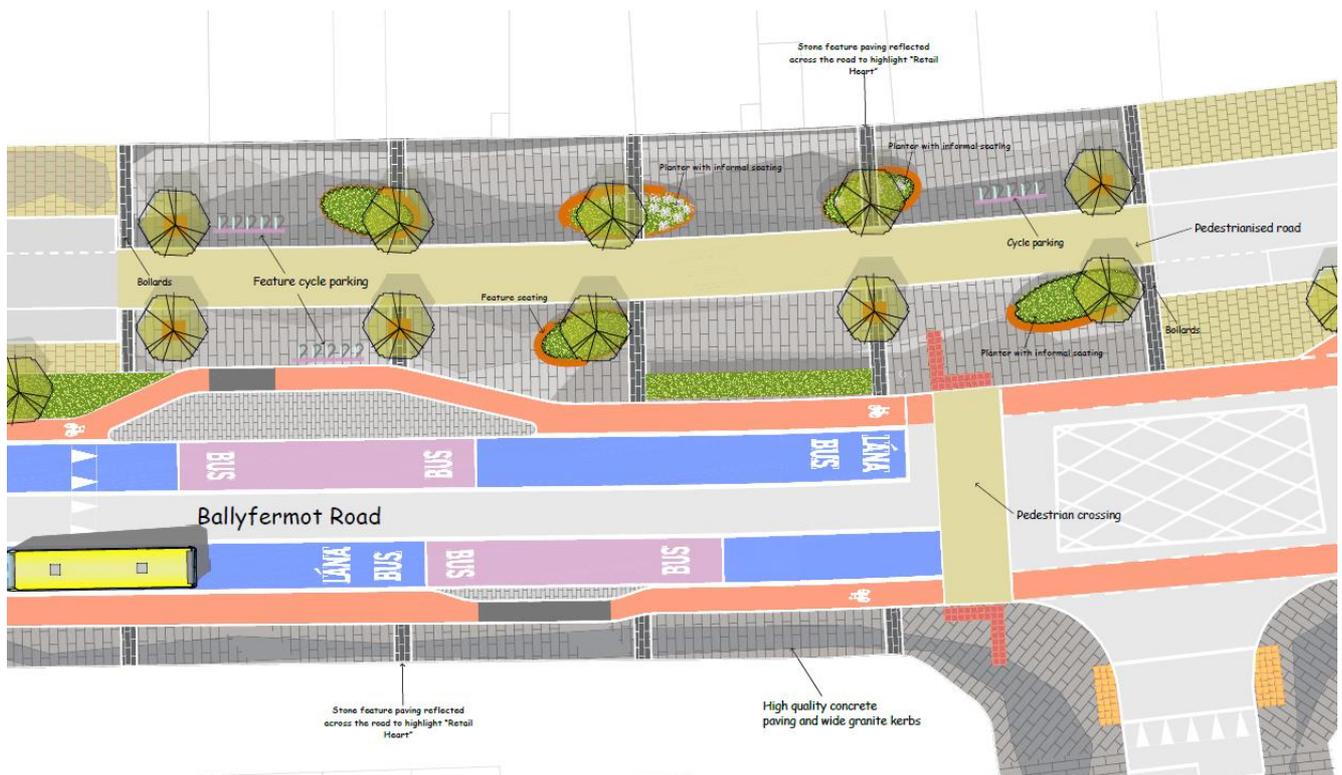


Image 4.6: High Quality Urban Realm Scheme to Support the Ballyfermot Retail Centre

The existing Ballyfermot roundabout acts as the eastern gateway into the retail centre and will be developed as a high-quality urban realm scheme with community spaces to be created as a result of converting the existing roundabout to a signalised junction. The central green space within the roundabout will be reallocated as four distinctly designed quadrants that are more accessible to the community. Outside the Church, a new green space, re-arranged parking area and revised vehicular access will be provided which also includes the relocated statue and welcome sign from the roundabout. New tree planting, seasonal planting, seating and feature paving in high quality concrete with granite kerbs will create an attractive and engaging community oriented public space in this quadrant.

The north-eastern quadrant will feature species rich grassland and new tree planting to enhance the school area. Compensatory tree planting is proposed within the school ground and the boundary will be reinstated with a rendered wall with railings.

New pocket parks, trees and parking are proposed on the south eastern and western quadrants adjacent to the residential properties facing the junction. These spaces will incorporate seating areas with small urban play spaces as community enhancements to complement the residential areas. See Image 4.7 and Image 4.8.

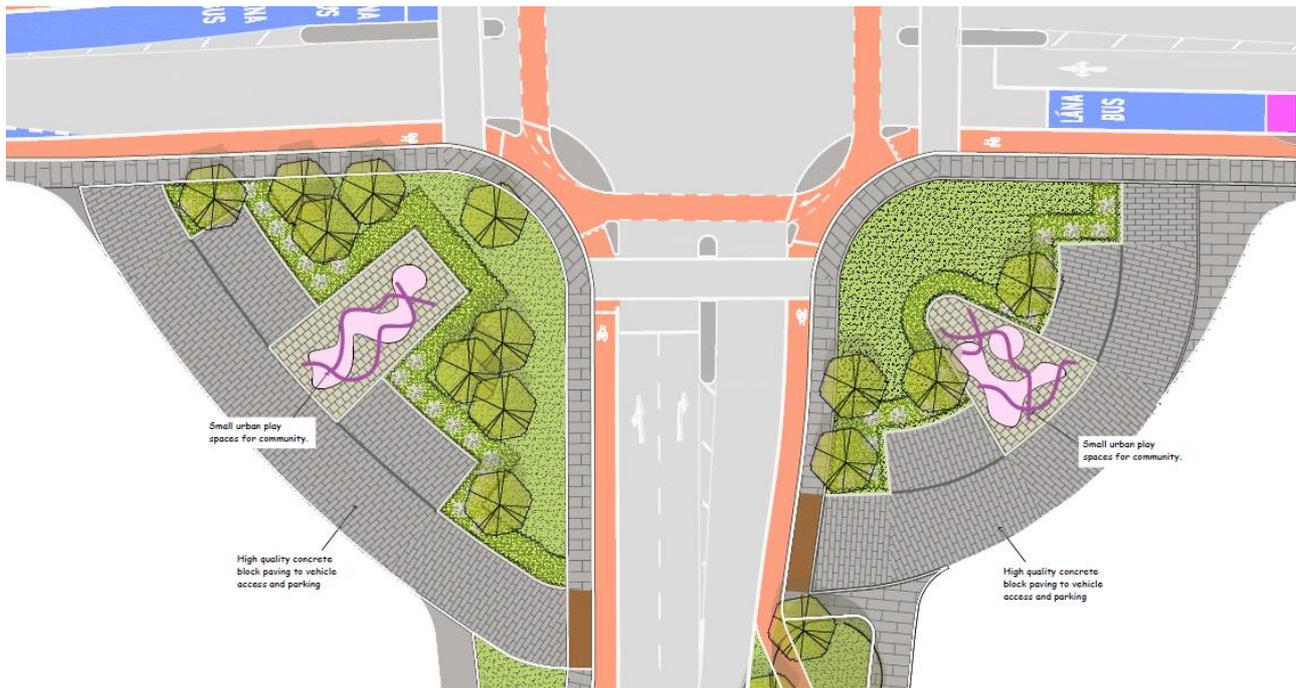


Image 4.7: Ballyfermot Roundabout South Quadrant, Residents Parking and Pocket Parks



Image 4.8: Pocket Parks in the South-Western and South-Eastern Quadrants

4.5.2.8.2 Ballyfermot Roundabout to St. Lawrence's Road

Kerb realignments to the northern side of Ballyfermot Road will result in tree loss and impacts to boundaries of the school sites. Compensatory tree planting is proposed within the school grounds and boundaries will be reinstated with rendered walls with railings to match the existing. A poured concrete finish is proposed to realigned footways along the northern edge while the existing footway is retained along the southern edge. A SuDS treatment is proposed in the former De La Salle National School site.

The closing of the northern end of O'Hogan Road creates an opportunity for a small-scale local intervention featuring good quality concrete paving, a proposed tree, ornamental planting and a curved feature bench (see Image 4.9). This enhancement will complement the park and residential setting while retaining filtered permeability for cycling into O'Hogan Road. Apart from the north end of O'Hogan Road, the eastern end of this section of Ballyfermot Road will feature poured concrete footways where kerb realignments occur.

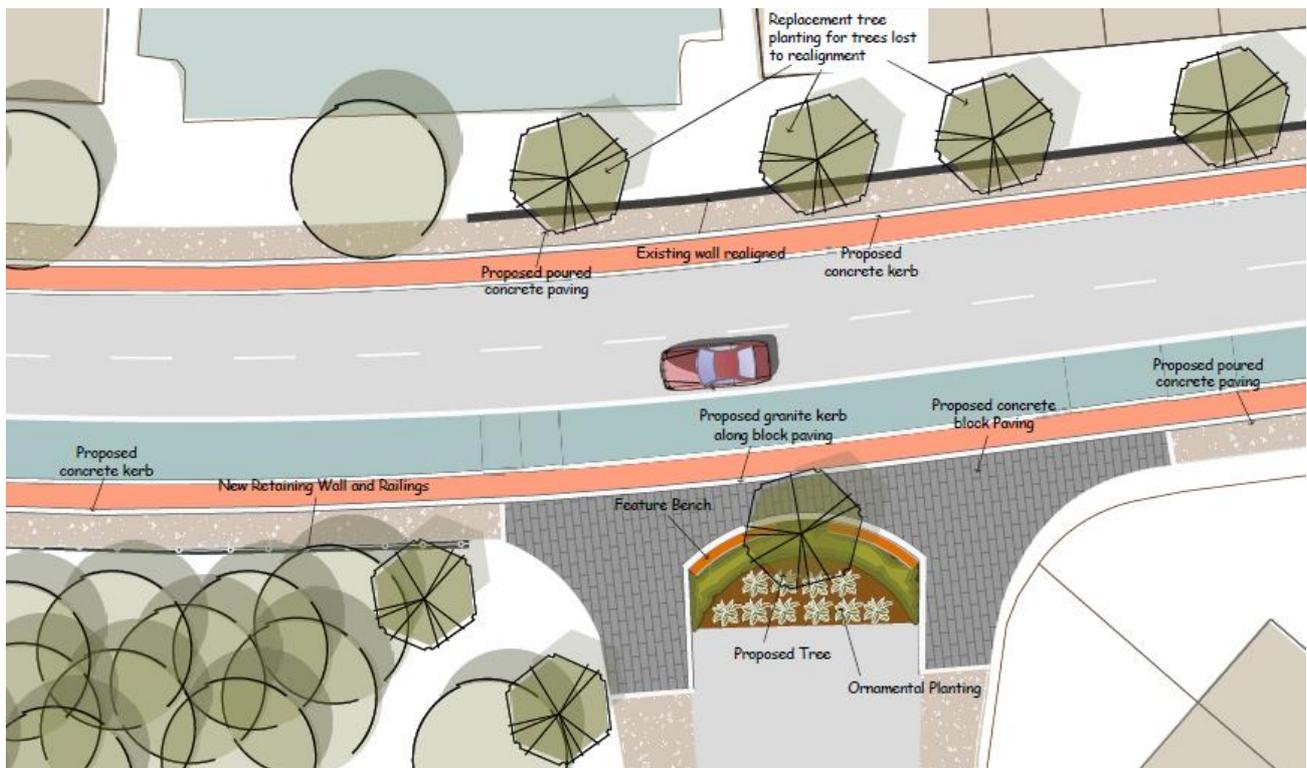


Image 4.9: Road Closure at End of O'Hogan Road with Local Enhancement

4.5.2.8.3 St. Lawrence's Road to Chapelizod Bypass

Poured concrete footways are proposed where kerb realignments occur. A minor local intervention is proposed near Ruby Finnegan's and the shops where land take occurs featuring concrete paving and concrete kerbs with a low brick wall boundary treatment to match existing. The existing boundary along Longmeadows Pitch and Putt is proposed to be replaced with a stone clad retaining wall with railings to replace the palisade fence and enhance the local setting. A SuDS treatment opportunity is proposed within an area of Long Meadows Park at the junction with Saint Laurence Road.

4.5.2.9 Land Acquisition and Use

Temporary land acquisition is required within this Section at various locations. For a construction compound, an area at the north side of Con Colbert Road will be required. To facilitate works, land will be acquired at St. Gabriel's Primary School, Ballyfermot Resource Centre, the former De La Salle National School and Markiewicz Park, The Steeples on St. Laurence's Road, along Ballyfermot Road, St. Laurence Court (7-9 Ballyfermot Road), 5 Ballyfermot Road, 3 Ballyfermot Road, St. Laurence Glen, Longmeadows Pitch & Putt Course, the car park in front of 1/1a First Avenue and Meadow View. All temporary land acquisition is to be reinstated once works are completed.

Permanent land acquisition is also required within this Section in order to allow for cross-section widening at all of the locations listed above.

The impacts on residential amenity arising from land acquisition in Section 2 of the Proposed Scheme are addressed in Chapter 10 (Population). Similarly, the impacts on landscape amenity arising from land acquisition in Section 2 of the Proposed Scheme are addressed in Chapter 17 (Landscape (Townscape) & Visual).

4.5.2.10 Rights of Way

Table 4.15 outlines the locations where existing rights of way will be affected by the Proposed Scheme.

Table 4.15: Existing Rights of Way Affected

| Location | Chainage | Existing Situation | Proposed Change |
|------------------|----------|---|---|
| Ballyfermot Road | B1200 | There is an existing easement on land adjacent to the Ballyfermot Road | As part of the Proposed Scheme, it is proposed to widen the road at this location resulting in a temporary and permanent interference with the easement. Access to the site will be retained throughout the construction works and will continue to operate as before once complete. |
| Ballyfermot Road | B1425 | There is an existing easement on land adjacent to the Ballyfermot Road | As part of the Proposed Scheme, it is proposed to widen the road at this location resulting in a temporary interference with the easement. Access to the site will be retained throughout the construction works and will continue to operate as before once complete. |
| Ballyfermot Road | B2850 | There is an existing vehicular access to the church grounds from Ballyfermot Road / Kylemore Road roundabout. | As part of the Proposed Scheme, it is proposed to close this access directly off the roundabout to vehicular traffic (except bicycles). Following the implementation of the Proposed Scheme, vehicular traffic will be able to use the revised access from Kylemore Road. |
| O'Hogan Road | B3570 | There is an existing vehicular junction at Ballyfermot Road and O'Hogan Road | As part of the proposed scheme, it is proposed to close the junction to vehicular traffic (except bicycles). Access to O'Hogan Road will still be available via the surrounding road network. |
| Ballyfermot Road | B3600 | ESB have an existing easement to a substation in The Steeples | As part of the Proposed Scheme, it is proposed to widen the road at this location which will impact the easement. Access to the site will be retained throughout the construction works and will continue to operate as before once complete. |
| Sarsfield Road | B3780 | ESB have an existing easement to a substation in St Laurence's Glen | As part of the Proposed Scheme, it is proposed to widen the road at this location which will impact the easement. Access to the site will be retained throughout the construction works and will continue to operate as before once complete. |
| Sarsfield Road | B4150 | There is an existing easement on land adjacent to the Sarsfield Road | As part of the Proposed Scheme, it is proposed to widen the road at this location resulting in private rights over this land being acquired. |

4.5.3 Section 3 – Sarsfield Road to City Centre

4.5.3.1 General Overview of the Proposed Scheme

It is proposed to change Memorial Road from one way to two way for general traffic. Eastbound traffic will also be able to turn right from the Chapelizod Bypass to Memorial Road. It is intended to provide a cycle track in both directions on Memorial Road. On Inchicore Road, between Memorial Road and Grattan Crescent, it is proposed to retain the existing lane configuration. The junction of Grattan Crescent / Sarsfield Road / Inchicore Road will be upgraded to provide better walking and cycling facilities. The improved cycle facilities at this junction also facilitate the primary cycle route 7A which travels along Sarsfield Road and Inchicore Road and provides an alternative quiet street cycle route to the city centre before re-joining the corridor at Bow Lane.

On Grattan Crescent, it is proposed to provide bus lanes in both directions and one general traffic lane in a southbound direction. Northbound traffic will be permitted up to the junction with the Córas Iompair Éireann (CIÉ) Inchicore Works to maintain local access. The existing footway will be widened, and a new crossing will be provided between Grattan Crescent Park and Inchicore National School and the existing mature trees will be retained. Several of the car parking spaces adjacent to the entrance to Grattan Park will be retained. This design has been implemented following feedback received as part of the Non-Statutory Public Consultation carried out on the Emerging Preferred Route (EPR) published in January 2019 where the local community raised concerns with the proposals to widen Grattan Crescent and remove the mature trees.

At the junction of Emmet Road and Tyrconnell Road, general traffic turning right from Emmet Road to Grattan Crescent will be for access to the CIÉ Inchicore Works only.

Between St. Vincent's Street West and South Circular Road, it is proposed to reconfigure Emmet Road to provide a bus lane and general traffic lane in both directions. To facilitate this wider road configuration some local on-street parking will need to be removed, but the focus has been to retain as much of the existing parking as possible.

To maintain bus priority on Old Kilmainham / Mount Brown, it is proposed to provide a Bus Gate. Following concerns raised during the Non-Statutory Public Consultation regarding access to Mount Brown, Old Kilmainham, St James's Hospital and the local area, the design was refined to reduce these impacts. The Bus Gate was amended with the eastbound Bus Gate being relocated to the James's Street entrance of the hospital campus. The westbound Bus Gate location was retained but the length was shortened. The operational hours were also refined with the eastbound Bus Gate operating in the AM and the westbound Bus Gate operating in the PM. This revised arrangement for the Bus Gate will allow access at all times to Ceannt Fort, the Children's Hospital, Adult hospital, and local area from all directions.

Between the St. James's Adult Hospital Entrance and the Junction with Bow Lane West, it is proposed to retain the existing road layout. From Bow Lane West to High Street, it is intended to provide continuous cycle tracks, a bus lane where possible and general traffic lane in both directions. The existing footways along this section are being retained. Bus priority is provided via a combinations of bus lanes, signals controlled priority and by the reduction in general traffic in the area as a result of the Bus Gate in Mount Brown.

At the Cornmarket junction the priority has been changed from High Street / Thomas Street to High Street / Bridge Street Upper. The junction has also been refined to remove the existing islands and provide improved walking and cycling facilities. The Proposed Scheme will join the City Centre traffic management regime at the junction with Nicholas Street and Winetavern Street.

4.5.3.2 Deviations from Standard Cross Sections

The width of the cross-sectional elements as outlined in Section 4.6.1 have been reduced (from published guidance, e.g. DMURS), at a number of constrained locations along the Proposed Scheme. The deviations within Section 3 – Sarsfield Road to City Centre are detailed in Table 4.16.

Table 4.16: Reduced Standard Cross Sections on Section 3 – Sarsfield Road to City Centre

| Location | Design Element | DMURS / NCM | Design | Justification |
|-------------------|--------------------------|-------------|--------------|---|
| Ch. B4180 – B4270 | Footway (citybound) | 2.0m | 1.8m | Providing a standard width would require additional land take, impacting the adjacent private properties. |
| Ch. B4120 – B4265 | Cycleway (outbound) | 2.0m | 1.9m | Providing a standard width would require additional land take, impacting the adjacent private properties. |
| Ch. B4205 – B4260 | Footway (outbound) | 2.0m | 1.8m | Providing a standard width would require additional land take, impacting the adjacent private properties. |
| Ch. B4160 – B4260 | Cycleway (citybound) | 2.0m | 2.0m – 1.5m | Providing a standard width would require additional land take, impacting the adjacent private properties. |
| Ch. E0 – E464 | Footway (each direction) | 2.0m | 1.6m – 2m | Existing kerb line and footway to be retained. |
| Ch. B6575 – B6690 | Footway (outbound) | 2.0m | 2m – 1.3m | Existing kerb line and footway to be retained. |
| Ch. B6680 – B6685 | Footway (citybound) | 2.0m | 2m – 1.3m | Existing kerb line and footway to be retained. |
| Ch. B6690 – B6695 | Footway (citybound) | 2.0m | 2m – 1.3m | Existing kerb line and footway to be retained. |
| Ch. B6700 | Footway (citybound) | 2.0m | 1.5m | Existing kerb line and footway to be retained. |
| Ch. B6950 | Footway (outbound) | 2.0m | 1.5m | Existing kerb line and footway to be retained. |
| Ch. B7110 – B7120 | Footway (outbound) | 2.0m | 1.35m – 1.8m | Existing kerb line and footway to be retained. |
| Ch. B7890 – B7990 | Cycleway (citybound) | 2.0m | 2m – 1.4m | Existing kerb line and footway to be retained. Existing mature trees in the central median creates a pinch point. |
| Ch. B8120 – B8130 | Cycleway (outbound) | 2.0m | 1.9m – 1.95m | Existing kerb line and footway to be retained. |
| Ch. B8180 – B8185 | Footway (outbound) | 2.0m | 1.9m – 1.75m | Existing kerb line and footway to be retained. |

| Location | Design Element | DMURS / NCM | Design | Justification |
|-------------------|----------------------|-------------|--------------|--|
| Ch. B8165 | Footway (citybound) | 2.0m | 1.55m | Existing kerb line and footway to be retained. |
| Ch. B8535 – B8630 | Cycleway (outbound) | 2.0m | 1.5m – 2.0m | Existing kerb line and footway to be retained. Limited road space available through this section. |
| Ch. B8520 – B8620 | Cycleway (citybound) | 2.0m | 2.0m - 1.4m | Existing kerb line and footway to be retained. Limited road space available through this section. |
| Ch. B8750 – B8780 | Cycleway (outbound) | 2.0m | 1.5m – 2.0m | Existing mature trees in the central median creates a pinch point. |
| Ch. B8800 – B8880 | Cycleway (citybound) | 2.0m | 2.0m - 1.5m | 19m Additional space required on the footway to accommodate the Dublin Bikes docking station. |
| Ch. B8970* 9017 | Cycleway (citybound) | 2m | 2.0m - 1.5m | The start of the cycleway ties into the junction with Nicolas Street / Winetavern Street. Gradual widening to standard from this point to tie into the edge of the carriageway on High Street. |
| Ch. B8975– B9017 | Cycleway (outbound) | 2.0m | 2.0 m – 1.6m | The start of the cycleway ties into the junction with Nicolas Street / Winetavern Street. Gradual widening to standard from this point to tie into the edge of the carriageway on High Street. |

4.5.3.3 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 through the use of dedicated bus lanes is not possible at all locations, and Signal Controlled Priority is used in two areas in Section 3 of the Proposed Scheme as listed in Table 4.17.

Table 4.17: Proposed Signal Controlled Priority Junctions Within Section 3 – Sarsfield Road to City Centre

| Junction Location | Reason for Signal Priority |
|--|--|
| Emmet Road at St Vincent Street West; buses travelling westbound. | The existing building line on both sides of the road do not allow for more than 2 lanes through this section. Approx. Chainage B5840 to 5730 |
| Multiple locations along James's Street and Thomas Street West; buses travelling in both directions. | The Bus Gate in Mount Brown reduces the number of vehicles travelling along Mount Brown, Old Kilmainham, James's Street and Thomas Street which in turn facilities bus priority along this section. The existing road corridor along Mount Brown and Old Kilmainham is narrow due to the existing building lines which limits the ability to provide bus lanes. Approx. Chainage B7920 to B8750, intermittent in both directions. |

4.5.3.4 Bus Stops

The different types of bus stop (island, shared landing area and inline) are described in Section 4.6.4. There are 24 proposed bus stops within this Section of the Proposed Scheme, with the majority being either shared landing or inline bus stops. The bus stop locations and types are outlined in Table 4.18 and shown in the General Arrangement series of drawings (BCIDB-JAC-GEO_GA-0007_XX_00-DR-CR-9001) in Volume 3 of this EIAR. Further details of bus stop design is included in the PDGB (NTA 2021) – Appendix A4.1 in Volume 4 of this EIAR.

Table 4.18: Proposed Bus Stop Locations Within Section 3 – Sarsfield Road to City Centre

| Inbound / Outbound | Bus Stop Name | Bus Stop Number | Chainage | Bus Stop Type | Bus Shelter |
|--------------------|-------------------------|-----------------|----------|---------------------|--|
| Inbound | Woodfield Place | 2719 | E371 | Inline | No shelter proposed as this location due to the narrow footway and the private gardens behind the shelter. |
| Inbound | Camac Close | 1989 | B5789 | Inline | New standard bus shelter |
| Inbound | Myra Cottages | 1990 | B6055 | Inline | New slimline bus shelter |
| Inbound | Inchicore Library | 1992 | B6460 | Inline | New standard bus shelter |
| Inbound | Old Kilmainham | 1993 | B6757 | Inline | New slimline bus shelter |
| Inbound | Mount Brown | 1994 | B7122 | Inline | New slimline bus shelter |
| Inbound | Basin Street Lower | 1995 | B7575 | Inline | New slimline bus shelter |
| Inbound | James's Street | 1996 | B7900 | Shared Landing Area | New standard bus shelter |
| Inbound | Thomas Street | 1997 | B8100 | Shared Landing Area | New standard bus shelter |
| Inbound | Bridgefoot Street | 1998 | B8426 | Shared Landing Area | New slimline bus shelter |
| Inbound | Francis Street Junction | 1999 | B8689 | Shared Landing Area | New standard bus shelter |
| Inbound | High Street | 2001 | B8925 | Shared Landing Area | New standard bus shelter |
| Outbound | High Street | 1937 | B8970 | Shared Landing Area | New slimline bus shelter |
| Outbound | Thomas Street | 1938 | B8680 | Shared Landing Area | New standard bus shelter |
| Outbound | Bridgefoot Street | 1939 | B8437 | Shared Landing Area | New slimline bus shelter |
| Outbound | James's Street | 1940 | B8070 | Shared Landing Area | New standard bus shelter |
| Outbound | Steven's Lane | 1941 | B7840 | Shared Landing Area | New standard bus shelter |
| Outbound | St. James's Hospital | 1942 | B7466 | Inline | New standard bus shelter |
| Outbound | Mount Brown | 1943 | B7200 | Inline | New slimline bus shelter |
| Outbound | Old Kilmainham | 1944 | B6842 | Inline | New standard bus shelter |
| Outbound | Emmet Road | 1945 | B6422 | Inline | New standard bus shelter |
| Outbound | Richmond Park | 1946 | B5983 | Inline | New standard bus shelter |
| Outbound | Camac Close | 1947 | B5740 | Inline | New standard bus shelter |
| Outbound | Sarsfield Road | 2643 | E310 | Inline | New slimline bus shelter |

4.5.3.5 Cycling Provision

The specific proposals for cycling facilities in Section 3 of the Proposed Scheme are described below. Provision for cyclists at the signal-controlled junctions are described in Section 4.6.3.5.

Due to space constraints, there are several areas along this section of the Proposed Scheme where it is not possible to provide segregated cycling facilities. The proposed cycle track on Sarsfield Road will continue until its junction with Con Colbert Road, where it would tie into the Lucan to City Centre CBC Scheme. This connection will offer an alternative cycle route to the city centre. If the cycling infrastructure proposed as part of the Lucan to City Centre CBC Scheme is not in place, cyclist have an alternative route to the City Centre via Sarsfield Road, Inchicore Road, Kilmainham Lane and Bow Lane where they will re-join the Proposed Scheme. Continuous segregated cycle tracks are provided along James's Street, Thomas Street and High Street. There is also a Quiet Street Treatment proposed along Newington Lane, Basin View, St James's Avenue, Grand Canal Place and Echlin Street which provide an alternative route for westbound cyclists which avoids the Luas tracks. The route continues to largely follow the GDA Cycle Network Plan Primary Route number 7A, except for the section along Grattan Crescent (Secondary Route 7D) and Emmet Road (not designated). Along the majority of this section of the Proposed Scheme there are no existing segregated cycle facilities, with only intermittent advisory cycle lanes in some places.

The short section of segregated cycle track on Memorial Road is part of the NO6 Greenway Route. There is a tie-in with another GDA Cycle Network Plan Primary Route (SO1) at the junction with South Circular Road. There are a number of Secondary Routes which interface with this section of the Proposed Scheme (SO2, C3 SE to West, and Long Lane) with tie-ins shown where possible.

4.5.3.6 Junction Information

An overview of the approach to junction review and design is provided in Section 4.6.6.4.2. The major and moderate junctions (signalised) within Section 3 – Sarsfield Road to City Centre of the Proposed Scheme are outlined in Table 4.19.

Table 4.19: Major and Moderate Junctions (Signalised) within Section 3 of the Proposed Scheme

| Junction Location | Summary |
|---|--|
| Major Junctions (Signalised) | |
| N/A | N/A |
| Moderate Junctions (Signalised) | |
| Sarsfield Road Landen Road | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| Sarsfield Road (dual carriageway) Con Colbert Road (dual carriageway) Sarsfield Road (single carriageway) | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| Inchicore Road Memorial Road | Proposed pedestrian, and cycle infrastructure at the existing junction |
| Sarsfield Road Inchicore Road Grattan Crescent | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| Grattan Crescent Tyrconnell Road Emmet Road | Proposed bus priority and pedestrian infrastructure, at the existing junction |
| Emmet Road Old Kilmainham South Circular Road | Proposed bus priority and pedestrian infrastructure, at the existing junction |
| James's Street St James's Hospital | Existing junction layout retained |
| James's Street west arm James's Street east arm Bow Lane West arm Bow Lane West east arm St. Patrick's Hospital access Unnamed north arm | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| James's Street Thomas Street Watling Street | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| Thomas Street Bridgefoot Street Thomas Court exit only | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| Thomas Street Meath Street | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| Thomas Street Cornmarket St. Augustine Street Francis Street exit only | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |
| Cornmarket Bridge Street Upper High Street | Proposed bus priority, pedestrian, and cycle infrastructure at the existing junction |

4.5.3.7 Parking and Loading Bays

Changes to the parking and loading provisions along Section 3 - Sarsfield Road to City Centre as a result of the Proposed Scheme are shown in Table 4.20 and Table 4.21 respectively.

Table 4.20: Section 3 – Sarsfield Road to City Centre: On-Street Parking Change Impact Summary

| Location | Type of Parking | Existing | Proposed | Change |
|---|-----------------|----------|----------|--------|
| Grattan Crescent | Paid | 18 | 5 | -13 |
| | Disabled | 3 | 3 | 0 |
| Emmet Road | Paid | 128 | 93 | -35 |
| | Disabled | 1 | 1 | 0 |
| Old Kilmainham / Mount Brown | Paid | 45 | 45 | 0 |
| | Disabled | 1 | 1 | 0 |
| James's Street / Bow Lane West | Paid | 13 | 0 | -13 |
| Thomas Street / High Street | Paid | 22 | 0 | -22 |
| | Disabled | 3 | 1 | -2 |
| | Taxi | 7 | 7 | 0 |
| Quiet Route (Newinton Lane / Basin Street Lower / Saint James's Avenue / Grand Canal Place / Echlin Street) | Informal | 99 | 95 | -4 |
| Approximate adjacent informal parking within 200-250m | | 1,580 | 1,580 | 0 |
| Total | | 1,920 | 1,831 | -89 |

Table 4.21: Section 3 – Sarsfield Road to City Centre: Existing and Proposed Loading Bays

| Location | Type of Parking | Existing | Proposed | Change |
|--------------------------------|-----------------|----------|----------|--------|
| Grattan Crescent | Loading Bay | 3 | 3 | 0 |
| Emmet Road | Loading Bay | 1 | 1 | 0 |
| James's Street / Bow Lane West | Loading Bay | 1 | 0 | -1 |
| Thomas Street / High Street | Loading Bay | 15 | 3 | -12 |
| Total | | 20 | 7 | -13 |

4.5.3.8 Landscape and Urban Realm

For an overview of the landscape design principles and approach reference should be made to Section 4.6.12. The following sections provide a description of specific landscape and urban realm design in Section 3 of the Proposed Scheme.

4.5.3.8.1 Sarsfield Road and Chapelizod Bypass

Poured concrete footways with concrete kerbs are proposed along footways to match the existing materials where kerb realignments occur near Sarsfield Road junction. The existing footways are retained along the rest of the section.

4.5.3.8.2 Grattan Crescent and Memorial Road

Mature trees are to be retained along Grattan Crescent. High quality urban realm is proposed in front of the school with an improved pedestrian crossing between the school and the park. Granite paving with granite kerbs are proposed at this location.

A new meeting place is proposed outside the school with existing tree surrounds incorporating timber seating to reflect the timber cladding material of the school. Parallel parking bays along the park edge will be finished with granite setts. All existing trees are to be retained and protected with enhanced tree pits. Paving at the park gate is to be enhanced with granite setts. New tree planting is proposed near the park entrance gate. The western side of Grattan Crescent includes accessible parking provision as an inset bay with concrete blocks that match footway colour and provides a wider footway space when not in use. See Image 4.10 and Image 4.11.

Memorial Road contains an avenue of trees leading towards the Irish National War Memorial Park that are to be retained. Where practicable a root bridge system will be provided to avoid further damage to pavement from tree

roots. High quality concrete paving and wide granite kerbs are proposed to enhance this avenue and well used pedestrian corridor.

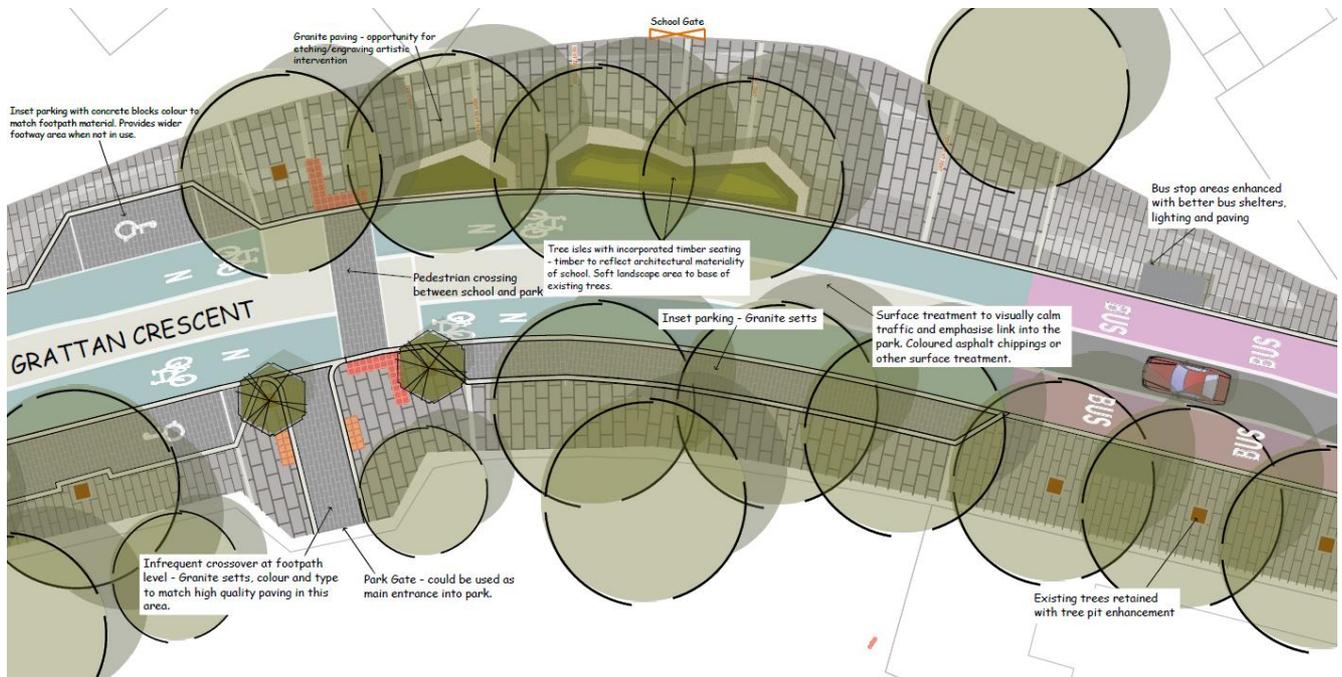


Image 4.10: High Quality Urban Realm Proposed to Enhance School and Park Interface



Image 4.11: Indicative Visualisation of the Grattan Crescent Scheme

4.5.3.8.3 Grattan Crescent and Emmet Road Village Centre

Village Centre footways are proposed to be enhanced and unified in terms of materials and details with high quality concrete paving and wide granite kerbs. More space given to pedestrians and a general de-clutter of street furniture is proposed.

4.5.3.8.4 Emmet Road Village Centre to South Circular Road

Footways with kerb realignments will be finished in poured concrete to match the existing surface material. A raised pedestrian crossing is proposed leading to St. Michael's Church with the immediate footways to both sides upgraded with concrete paving. New street trees are proposed where footways are wide enough and below ground services allow. A small urban realm improvement opposite Inchicore College will feature a new street tree and shrub planting adjacent to a re-organised row of asphalt parking bays with concrete setts to the rear. The existing rear access to properties will be retained. Pedestrian priority raised tables are proposed at side streets to enhance pedestrian movement and priority. See Image 4.12.

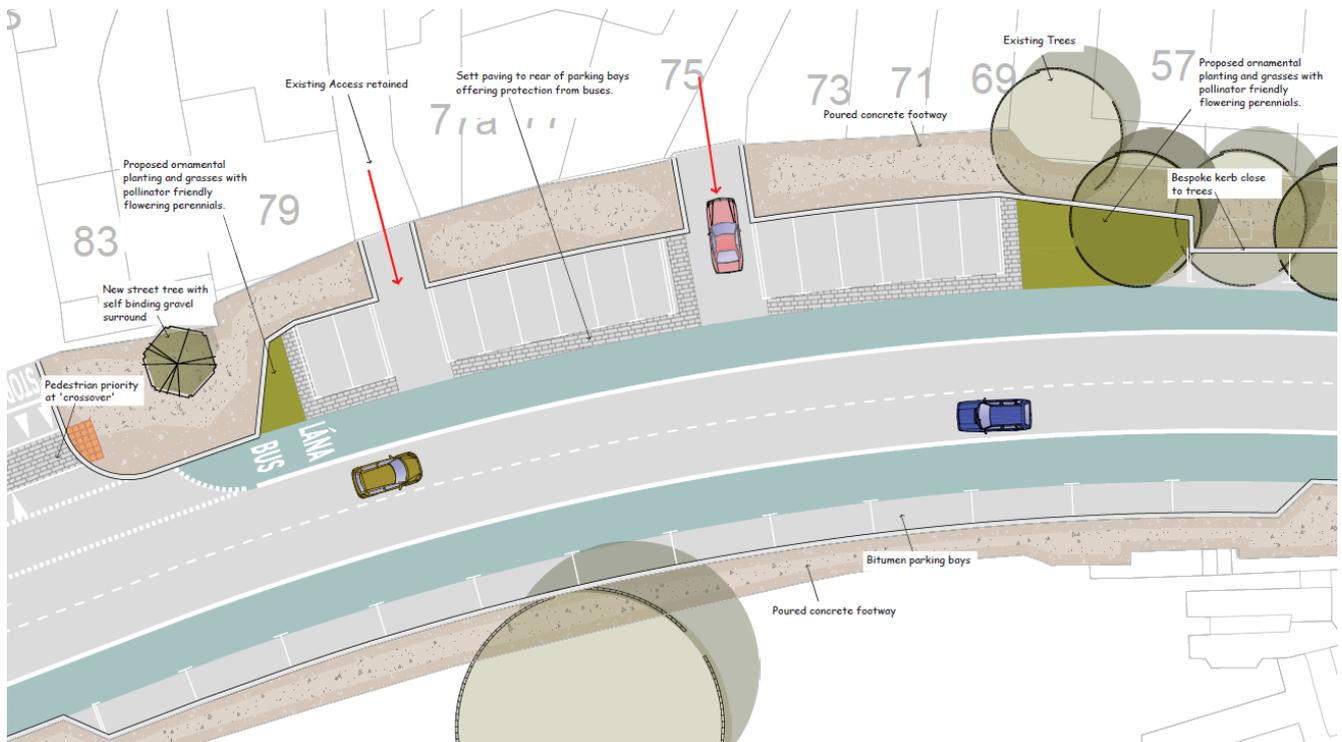


Image 4.12: Emmet Road Local Enhancement

4.5.3.8.5 South Circular Road to St James's Hospital

All footways between South Circular Road and St James's Hospital are proposed to be retained as existing. Localised repairs are proposed as needed in poured concrete to match existing.

4.5.3.8.6 St James's Hospital to the Obelisk Fountain

This area does not have significant kerb realignments proposed. Local footway repairs will be undertaken where needed with granite kerbs retained and footway materials to match existing.

4.5.3.8.7 The Obelisk Fountain to Crane Street

A significant sized urban realm enhancement is proposed at the Obelisk Fountain area (see Image 4.13). Granite kerbs and granite paving to enhance the overall setting of the Obelisk Fountain, are proposed for the 'island'. High-quality concrete paving and granite kerbs are proposed for the adjoining footways. Adjacent to the island, the carriageway along Bow Lane West and the short connecting road to James's Street will be raised and surfaced in setts to enhance the pedestrian use and aesthetic of this space. The existing mature trees are to be retained, and tree surrounds enhanced with a more open self-binding gravel. New seating and three planting will encourage pedestrians to stop and sit. James's Street and Thomas Street does not have kerb realignments proposed but will have new cycle tracks implemented along the carriageway.

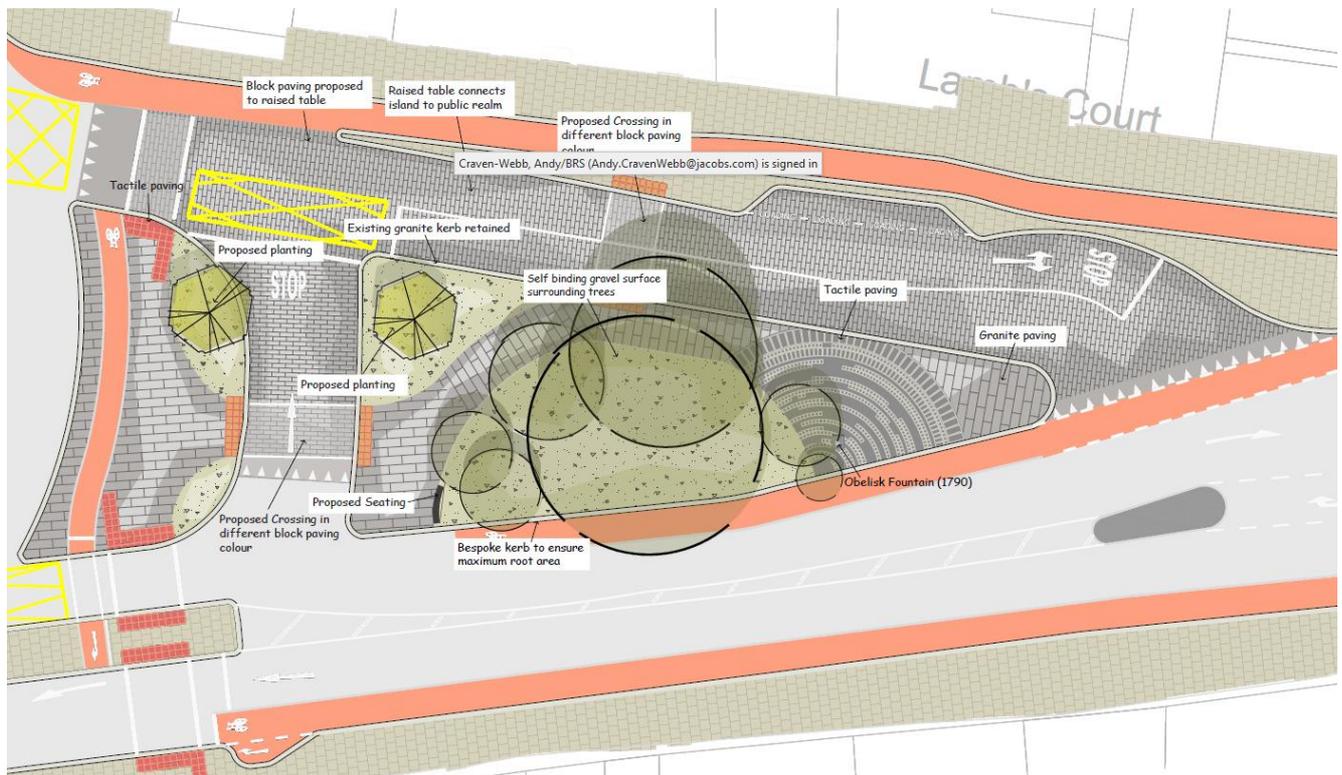


Image 4.13: Urban Realm Enhancement at the Obelisk Fountain Area

4.5.3.8.8 Crane Street to John's Lane Church

This part of James's Street will not have kerb realignments but will have new cycle tracks implemented along the carriageway.

4.5.3.8.9 John's Lane Church to High Street (End of Proposed Scheme)

High quality urban realm is proposed at Cornmarket junction with significant junction redesign that will create additional space for the pedestrian environment (see Image 4.14). High quality granite paving with wide granite kerbs and a coordinated banding feature to visually tie both sides of the junction together are proposed. The outline of the historic city wall will be interpreted through a granite band on either side of the road. The south side of the junction will see a widened area of footway creating a shady plaza incorporating seating integrated with raised planters and new tree planting. Existing trees are to be retained and, along with new wayfinding, cycle racks and street furniture, will enhance this area of urban realm and tourist route.

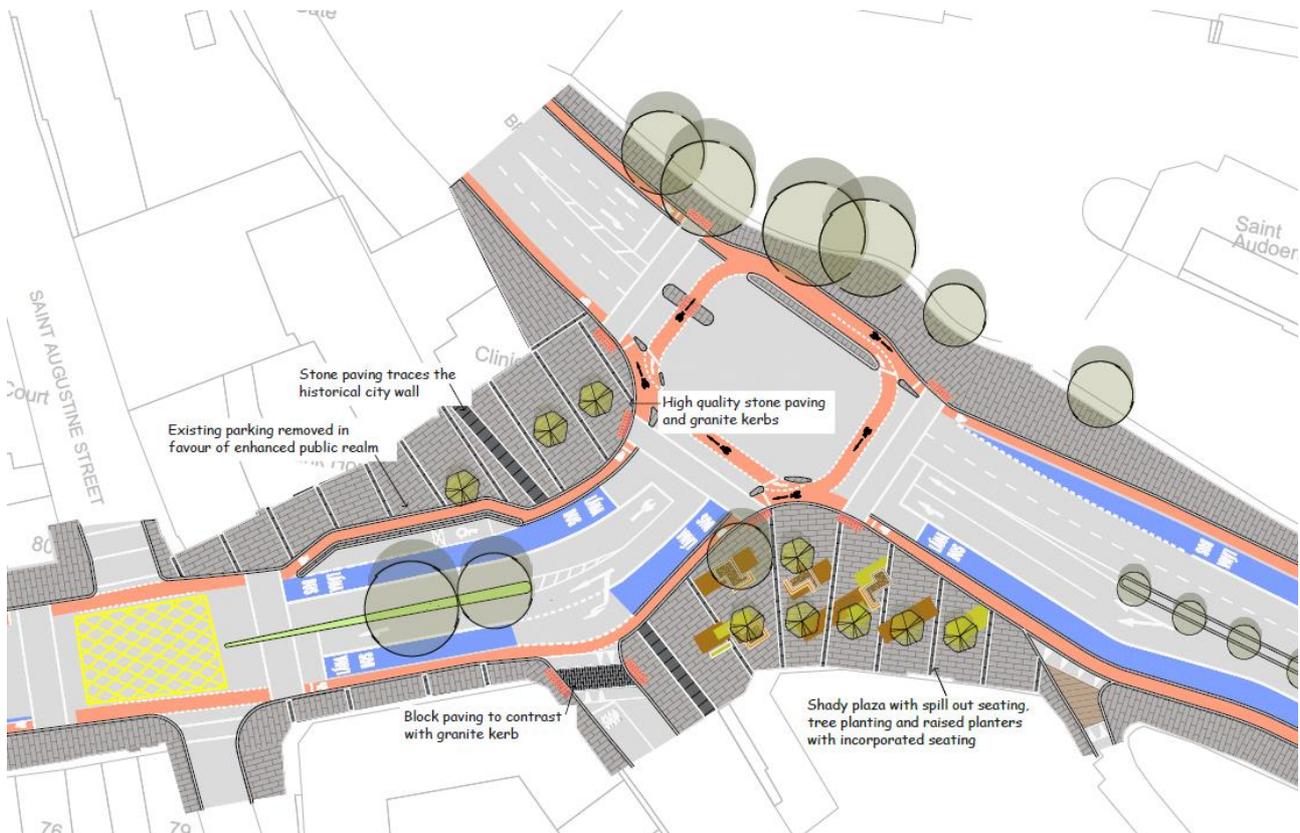


Image 4.14: High Quality Urban Realm Proposed at Cornmarket Junction

4.5.3.9 Land Acquisition and Use

Temporary land acquisition is required within this Section at the National Children’s Hospital in order to facilitate works. All temporary land acquisition is to be reinstated once works are completed.

Permanent land acquisition is also required at the same location in order to allow for cross-section widening and in order to provide access to the hospital, avoiding the Bus Gate.

The impacts on residential amenity arising from land acquisition in Section 3 of the Proposed Scheme are addressed in Chapter 10 (Population). Similarly, the impacts on landscape amenity arising from land acquisition in Section 3 of the Proposed Scheme are addressed in Chapter 17 (Landscape (Townscape) & Visual).

4.5.3.10 Rights of Way

Table 4.15 outlines the locations where existing rights of way will be affected by the Proposed Scheme.

Table 4.22: Existing Rights of Way Affected

| Location | Chainage | Existing Situation | Proposed Change |
|------------|----------|--|--|
| Emmet Road | B6050 | There are existing utility cabinets at the back of a private landing on Emmet Road. | As part of the Proposed Scheme, it is proposed to widen the road at this location resulting in private rights over this land being acquired. Access to the cabinets will be retained throughout the construction works and will continue to operate as before once complete. |
| Cornmarket | B8800 | Currently, vehicular traffic heading from Thomas St to Bridge Street Upper can use the slip lane to turn left. | As part of the Proposed Scheme the existing Cornmarket junction is being amended, Following the implementation of the Proposed Scheme, vehicular traffic (except bicycles and authorised vehicles) would no longer be able to use this slip lane to turn left. |

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 urban realm encapsulated in the PDGB as outlined in Section 4.4.

4.6.1 Mainline Cross-Section

Traffic lane widths 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.

Traffic lane widths of 2.75m are permissible but not desirable and should only be permitted on straight road sections with very low heavy goods vehicle (HGV) percentages 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 4.15.

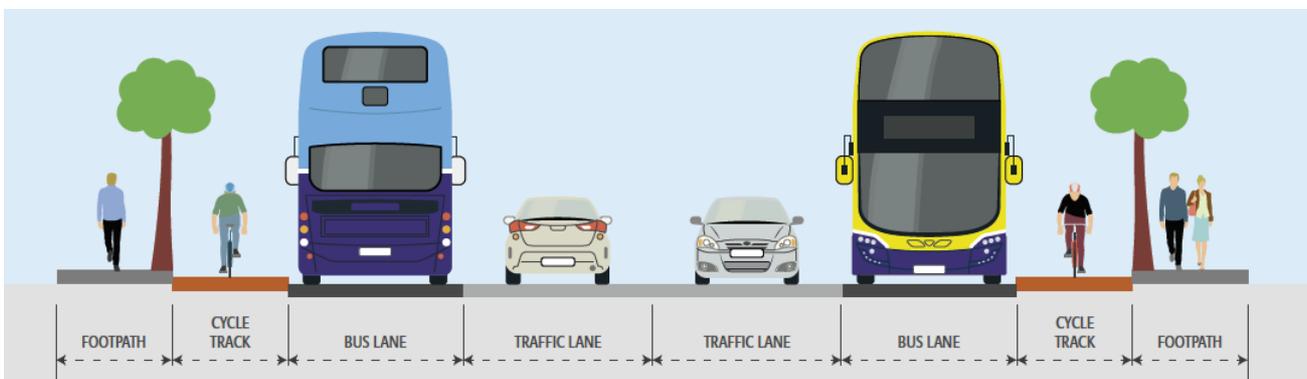


Image 4.15: Typical BusConnects Road Layout (PDGB)

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 4.23.

Table 4.23: 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 (one-way) | 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) |
| Cycle Track (two-way) | 3.25m + 0.5m (buffer) | Refer to NCM Width Calculator 0.3m (buffer) | Reduced at bus stops. |
| Bus Lane | 3.0m | 3.0m | N/A |
| Traffic Lane | 3.0m (<60kph) | 3.0m | 2.75m (low HGV flow) |

For the Proposed Scheme the width of the bus lanes and traffic lanes have not been reduced below 3.0m. The width of the cross-sectional elements detailed in Table 4.23 have been reduced at a number of constrained locations across the Proposed Scheme. These deviations from the standards are outlined for each section of the Proposed Scheme in Section 4.5 above.

4.6.2 Pedestrian Provision

4.6.2.1 Footpath Widths

The desirable minimum width for a footpath is 2.0m. 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 where practicable.

Throughout the Proposed Scheme, footpath widths of two metres or wider have been proposed, however where this has not been achieved, deviations from standard have been required as outlined in Section 4.5.

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 applied across the Proposed Scheme is 19m. 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. Where a refuge island is provided, straight crossings are desirable, and the refuge island has been designed to be 4m wide or more. At a staggered crossing, islands of less than 4m in width may be provided, and these have been designed to have a minimum effective width of 2m between obstacles such as signal poles.

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 (BCIDB-JAC-ENV_LA-0007_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 (BCIDB-JAC-ENV_LA-0007_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 2m. 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 9.2km long and includes 12.8km of segregated cycle tracks compared with an existing provision of just 2.2km of cycle track, and 5.4km 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 4.16 taken from the PDGB.

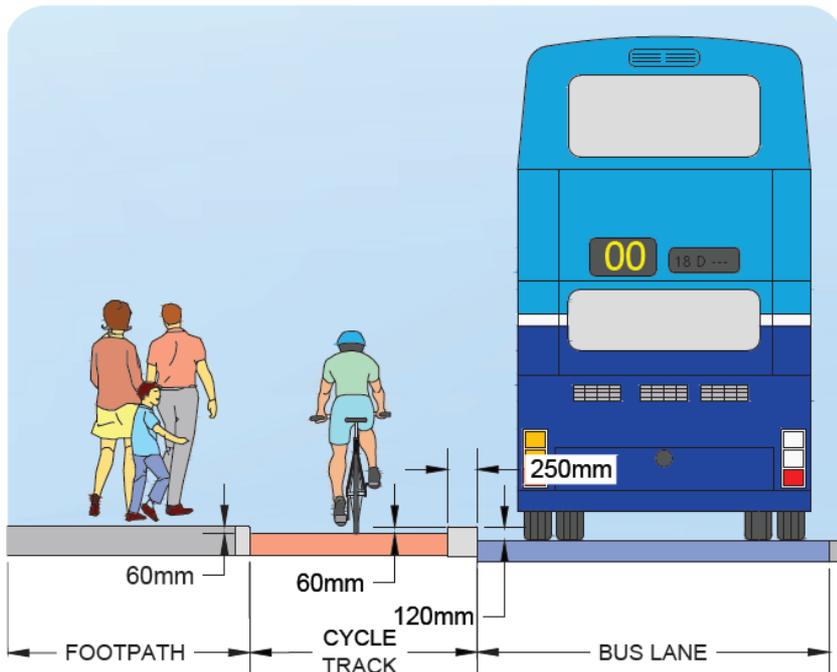


Image 4.16: Fully Segregated Cycle Track

Segregated cycle tracks have been provided in each direction at the following locations:

- Fonthill Road;
- Coldcut Road;
- Ballyfermot Road;
- Sarsfield Road;
- Kylemore Road; and
- Memorial Road
- High Street.

At grade cycle tracks (as per NCM Section 4.3.4) have been utilised in order to maintain the existing kerblines as the route approaches the City Centre. The cycle tracks will be at carriageway level and segregated from general traffic. At-grade cycle tracks have been proposed in the following locations:

- James's Street; and
- Thomas Street.

4.6.3.2 Cycle Lanes

Cycle lanes are designated lanes on the carriageway that are reserved either exclusively or primarily for the passage of cyclists. Standard cycle lanes include Mandatory Cycle Lanes and Advisory Cycle Lanes. Mandatory Cycle Lanes are marked by a continuous white line which prohibits motorised traffic from entering the lane, except for access. Parking is not permitted on mandatory cycle lanes. Mandatory Cycle Lanes are 24-hour unless time plated in which case they are no longer cycle lanes. Advisory Cycle Lanes are marked by a broken white line which allows motorised traffic to enter or cross the lane. They are used where a Mandatory Cycle Lane leaves insufficient residual road space for traffic, and at junctions where traffic needs to turn across the cycle lane.

Parking is not permitted on Advisory Cycle Lanes other than for set down and loading. Advisory Cycle Lanes are 24-hour unless time plated.

Cycle tracks are the preferred cycling infrastructure proposed along the length of the Proposed Scheme. Where necessary the use of cycle lanes have been limited to the following locations typically along the route:

- Transitions to existing cycle lanes, typically on side roads of the main corridor alignment; and
- For side road crossings where the cycle track is locally reduced to road level.

4.6.3.3 Quiet Street Treatment

Where the Proposed Scheme 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 cycle route is proposed for westbound cyclists to avoid the Luas tracks via Echlin Street to connect St James's Hospital and James's Street, as shown in the General Arrangement Drawings (BCIDB-JAC-GEO_GA-0007_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 will be required. All locations where substandard widths are required have been recorded and presented in each of the sections of the Proposed Scheme as described in Section 4.5.

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 BusConnects Infrastructure team 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 (BCIDB-JAC-GEO_GA-0007_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 widths 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 (BCIDB-JAC-GEO_GA-0007_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 4.17 illustrates a schematic operation of SCP.



Image 4.17: Signal Controlled Priority Schematic Operation (Source: PDGB)

Locations within the Proposed Scheme where SCP provisions will result in buses and general traffic sharing a lane are described below:

- Buses travelling in either direction across the M50 overbridge;
- Buses travelling eastbound between Markievicz Park and St Laurence's Road. To facilitate bus priority on this section it is also proposed to close the junction of O'Hogan Road and Ballyfermot Road;
- Buses travelling westbound on Emmet Road at St Vincent Street West; and
- Multiple locations along James's Street and Thomas Street for buses travelling in both directions.

Sections of the Proposed Scheme where signal controlled priority at multiple traffic signal junctions are proposed are described further in Section 4.5.

4.6.4.3 Bus Gates

A Bus Gate is a sign-posted short length of stand-alone bus lane. This short length of road is restricted exclusively to buses, taxis, cyclists and emergency vehicles. It facilitates bus priority by removing general through traffic along

the overall road where the bus gate is located. General traffic is directed by signage to divert towards other roads before it arrives at the Bus Gate.

The hours of operation of the bus gates will be subject to on-going review based on prevailing traffic conditions and the goal of achieving the project objectives. The NTA and local authorities will co-operate in good faith to address any issues with the hours of operation that may arise during the lifetime of the Proposed Scheme.

It is proposed to provide two Bus Gates on the Proposed Scheme:

- Mount Brown – National Children’s Hospital (outbound); and
- James’s Street – St James’s Hospital Entrance (inbound).

Mount Brown and Old Kilmainham are constrained due to the narrow nature of the existing road and the fact that buildings front onto the road on both sides which limit the options to provide bus priority. As a result, a Bus Gate has been proposed in order to provide bus priority along this section of the Proposed Scheme.

It is proposed to provide a Bus Gate in the westbound direction at the proposed entrance to National Children’s Hospital underground car park which will operate in the PM period as the traffic analysis has indicated this period to have the greatest impact on westbound bus journey times. It is also proposed to provide a Bus Gate in the eastbound direction at the James’s Street entrance to the hospital campus which will operate in the AM period as the traffic analysis has indicated this period to have the greatest impact on eastbound bus journey times. This Bus Gate will prevent general through-traffic using Old Kilmainham / Mount Brown. By staggering the Bus Gate, there will be no impact on access to the local area including the Children’s Hospital and the Adult hospital at the St James’s Hospital campus.

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 lanes should reduce 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, where practicable.

4.6.4.5 Bus Stops

To improve the efficiency of the bus service along the Proposed Scheme the position and amount of bus stops have been reviewed as part of a bus stop assessment.

The basic 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 interchange stops;
- Where ideally there is space for a bus shelter;
- Location in pairs, ‘Tail to Tail’ on opposite sides of the road;
- Close to (and on exit side of) pedestrian crossings;
- Away from sites likely to be obstructed; and
- Adequate footway 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 the route, dropping to approximately 250m in urban centres.

It is important that bus stops are located close to pedestrian crossings where practicable as pedestrians will tend to take the quickest route, which may be hazardous. Locations with no or indirect pedestrian crossing will be avoided.

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

Further detail on the design and locations of bus stops along the Proposed Scheme are described in Section 4.5.

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 / cyclist conflict, a pedestrian priority crossing point is provided for pedestrians accessing the bus stop area. Part-time signals will enable controlled crossing. Visually impaired pedestrians may call for a fixed green signal when necessary and the cycle signal will change to red. The cycle track will narrow from 2.0m to 1.5m for single file cycling through the bus stop, as overtaking is not required in this area.

An example of an island bus stop is shown in Image 4.18.

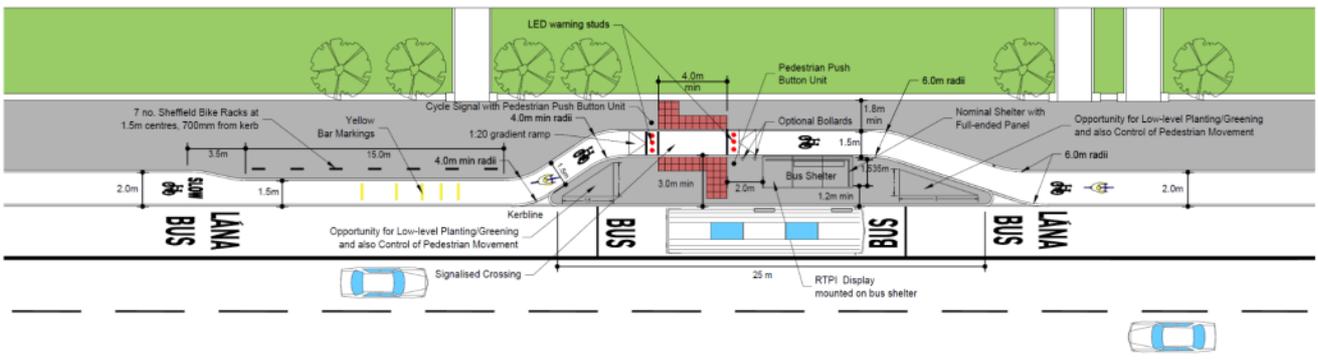


Image 4.18: Island Bus Stop

Island Bus Stops are proposed at a number of locations along the Proposed Scheme. These locations are outlined per Proposed Scheme section in Section 4.5.

4.6.4.5.2 Shared Landing Area Bus Stops

Where space constraints do not allow for an Island Bus Stop, an option consisting of a Shared Landing Area Bus Stop 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 4.19.

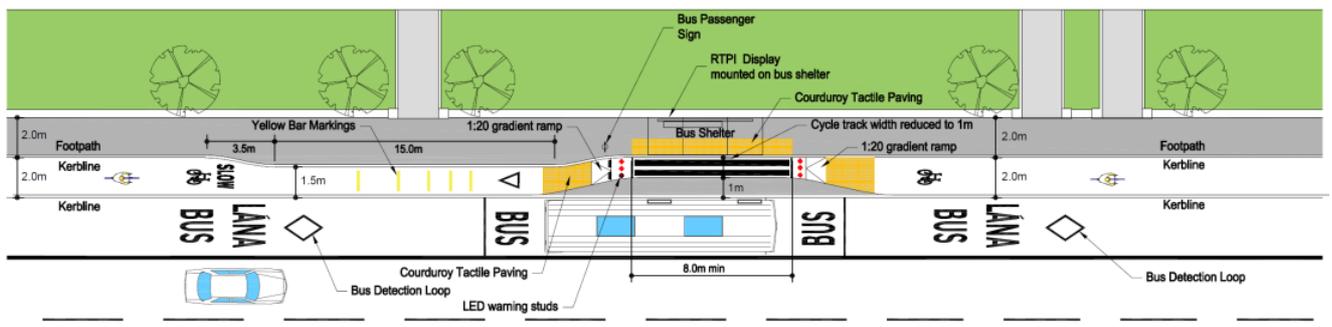


Image 4.19: Shared Landing Area Bus Stop

The location of Shared Landing Bus Stops, which are used in a number of locations on the Proposed Scheme, are described in Section 4.5.

4.6.4.5.3 Inline Bus Stops

Where there are no cycle tracks provided, Inline Bus Stops are used, where the users departing the bus exit straight on to the footpath. Inline Bus Stops are used on the Proposed Scheme due to the presence of offline cycle facilities. These locations are outlined 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 2021);
- 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) 2020);
- UK DfT Inclusive Mobility (UK DfT 2005);
- UK DfT Guidance on the use of tactile paving surfaces (UK DfT 2007); and
- BS8300-1:2018 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 mobility impaired users. An Accessibility Audit of the existing environment and the proposed draft preliminary design for the corridor was undertaken. The Audit provided a description of the key accessibility features and potential barriers to persons with disabilities 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, where possible, 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 Interchange 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:

- Luas Stop at St James's Hospital;
- Liffey Valley Bus Interchange;
- Existing Dublin Bus services at numerous locations along the route, including routes 18, 40, 76, 239, 79, 79a, 68, 123 and 13;
- Future bus service proposals, including Spine G, associated with the Proposed Dublin Bus Network Re-Design;
- Greater Dublin Area Cycle Network Plan (GDACNP) (NTA 2013); and
- Future rail public transport proposals such as DART+.

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 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

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

- **Liffey Valley Bus Interchange:** The Liffey Valley Bus Interchange and Road Improvement Scheme is being delivered by the Liffey Valley Shopping Centre and will tie in with the Proposed Scheme on the Fonthill Road. The scheme has received planning approval and is currently under construction.
- **Liffey Valley Shopping Centre Developments:** The proposed expansion of the Liffey Valley Shopping Centre which has received planning approval (SDCC Planning Reference SD20A/0089);
- **Ballyfermot People's Park Improvements:** Improvements to the existing park adjacent to the Proposed Scheme in Ballyfermot are proposed. This project is currently under construction;
- **New amalgamated secondary school in Ballyfermot:** St John's College, Caritas College and St Dominic's College are planning for the amalgamation of the three schools into one secondary school with the proposed opening date in September 2022. The proposed school will be located at the St John's College site on Le Fanu Road. The existing layout on Le Fanu Road is has been retained as part of the Proposed Scheme, however the school's plans should consider access arrangements, including cycle facilities, footpaths and pedestrian road crossings, as well as drop-off areas near the school entrance. Providing connecting cycle tracks from the school entrance back to the cycle tracks that will be installed on Ballyfermot Road under the Proposed Scheme plans, should be an objective of the planning for the development of the school;
- **De La Salle / Mount La Salle:** A new development is planned on the former grounds of De La Salle / Mount La Salle on Ballyfermot Road, including 927 new homes. The developer has lodged a planning application for the development with An Bord Pleanála (Reference TA29S.313320). The developer has taken account of the Proposed Scheme design in the De La Salle / Mount La Salle proposals; and
- **St Michael's Estate, Emmet Road:** DCC have plans for a major regeneration of the St Michaels estate. The project is currently undergoing consultation.

4.6.6.4 Integration with Other Adjacent BusConnects Core Bus Corridor Schemes

As part of the design of the Proposed Scheme, consideration has been given to the potential coordination required in relation to other schemes within the BusConnects CBC Infrastructure Works. This section outlines potential interactions of the Proposed Scheme with adjacent schemes and identifies any procedures within the construction

strategies that may be required in order to account for various sequencing scenarios in the construction of the schemes.

The Lucan to City Centre CBC Scheme (the Lucan Scheme), interfaces with the Proposed Scheme at Con Colbert Road, Memorial Road and Inchicore Road. The Tallaght / Clondalkin to City Centre CBC Scheme (the Tallaght / Clondalkin Scheme), also interfaces with the Proposed Scheme at the High Street / Winetavern Street junction. The BusConnects Infrastructure Team has coordinated the design tie-ins at all locations to ensure a holistic design has been achieved, so that each scheme can be implemented, and integrated, regardless of the sequencing of their construction.

Those two CBC Schemes are subject to separate planning processes, the timing of which is independent of that of the Proposed Scheme, and as such no exact sequencing of construction works can be determined at this stage.

4.6.6.4.1 Con Colbert Road

The Proposed Scheme intends to tie-in with the Lucan Scheme at Con Colbert Road in order to provide a cycling connection between the Proposed Scheme and the Lucan Scheme. This cycling connection will provide an alternative segregated cycling facility to the City Centre. Image 4.20 shows an extract of the preliminary design of the Proposed Scheme on the Con Colbert Road tie in with the existing layout.

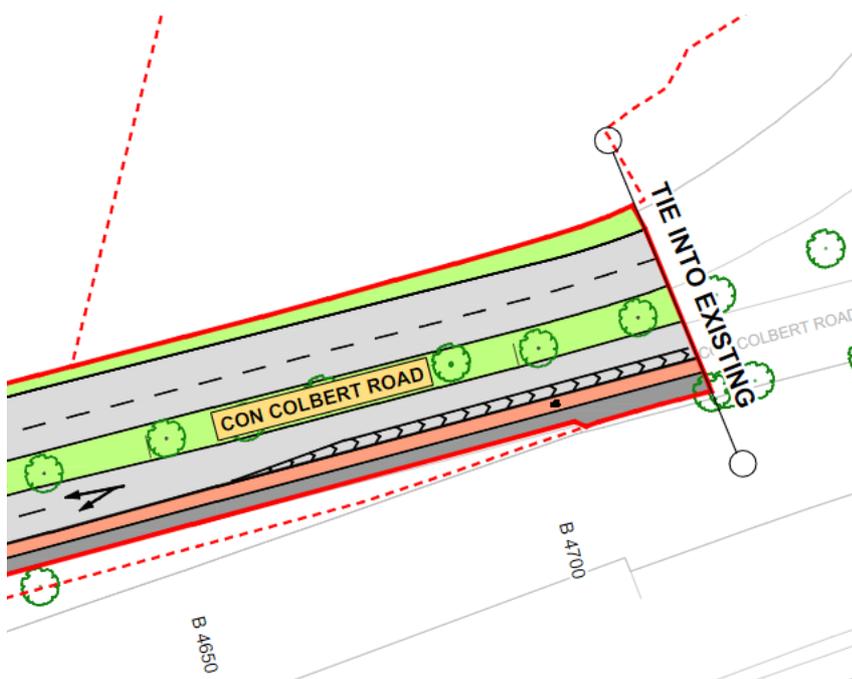


Image 4.20: Preliminary Design of the Proposed Scheme Tie-In with the Lucan to City Centre Core Bus Corridor Scheme

Image 4.21 shows an indicative coordinated design of the expected overall arrangement in a scenario in which both schemes have been implemented.

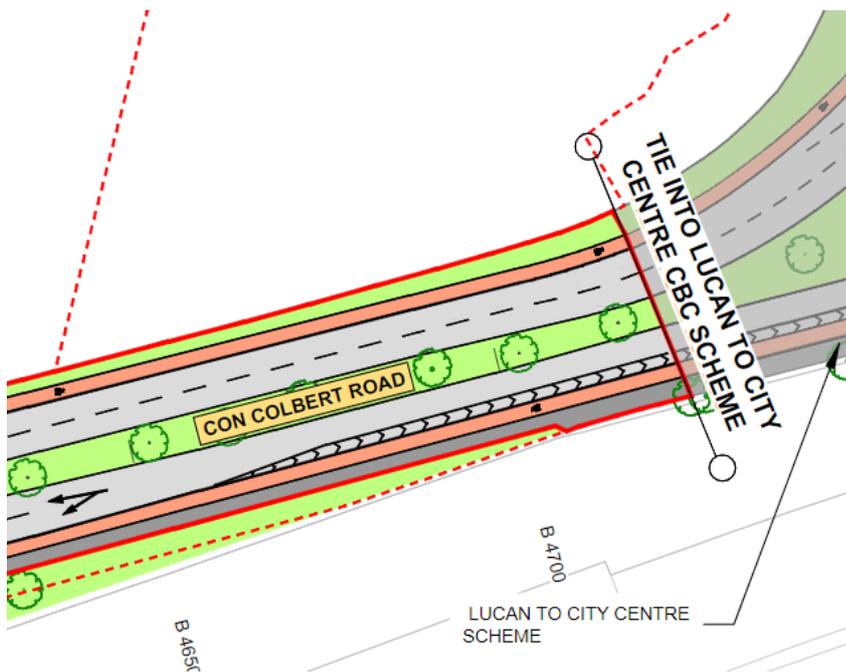


Image 4.21: Preliminary Design of the Lucan to City Centre Core Bus Corridor Scheme at Con Colbert Road

Table 4.24 presents a matrix of potential interactions and impacts associated with various potential sequencing scenarios in relation to construction and operation of both schemes.

Table 4.24: Matrix of Potential Interactions and Impacts Associated with Different Sequencing Scenarios

| | Lucan Scheme: Not Yet Commenced | Lucan Scheme: Under Construction | Lucan Scheme: Completed |
|-------------------------------------|--|--|---|
| Proposed Scheme: Not Yet Commenced | N/A | Construction of the proposed Lucan Scheme shall be carried out in accordance with the Construction Strategy within that scheme's planning application, without any potential interaction with works associated with the Proposed Scheme. | The Lucan Scheme shall be in full operation, designed in accordance with its planning application which will allow for the Liffey Valley Scheme to tie in at a future date. |
| Proposed Scheme: Under Construction | Construction of the Proposed Scheme will be carried out in accordance with the Construction Strategy within that scheme's planning application, without any potential interaction with works associated with the Lucan Scheme. | It is not envisaged that both schemes will be under construction at the same time at this location. | The Lucan Scheme will be completed and the Proposed Scheme will tie into the revised layout on the Con Colbert Road. The proposed cycling connection to the Lucan Scheme will be implemented. |
| Proposed Scheme: Completed | The Proposed Scheme shall be in full operation, designed in accordance with its planning application as per Image 4.20 which will allow for the Lucan Scheme to tie in at a future date. | The Proposed Scheme will have been completed and the Lucan Scheme will tie into the revised layout on the Con Colbert Road which will provide a cycling connection between the two schemes. | The arrangement will be as per Image 4.21 |

4.6.6.4.2 Liffey Gaels Park

It is intended that land as Liffey Gaels Park will be acquired on a temporary basis as a Construction Compound for the Proposed Scheme. It is intended that the same parcel of land will be used on a temporary basis for the same purpose on the Lucan Scheme. It is intended that the Construction Phases of the two schemes will not overlap. Depending on the respective timing of the proposed schemes, the area may continue to be used uninterrupted as a Construction Compound if the second scheme commences construction within a relatively short period of time after the first scheme finishing construction. Alternatively, in the eventuality that there is likely to be a substantial time period (e.g. greater than one year) between the Construction Phases of the two schemes, the NTA in discussion with the Local Authority will identify the most appropriate interim use of the area. When the

area has ceased to be used as a construction compound it will be returned to its original condition by the appointed contractor for the second scheme.

4.6.6.4.3 Memorial Road

The Proposed Scheme intends to tie-in to the Lucan Scheme at the Chapelizod Bypass in order to provide a right turn lane to accommodate the revised two way layout on Memorial Road. Image 4.22 shows an extract of the preliminary design of the Proposed Scheme at the Chapelizod Bypass which ties in with the existing layout.

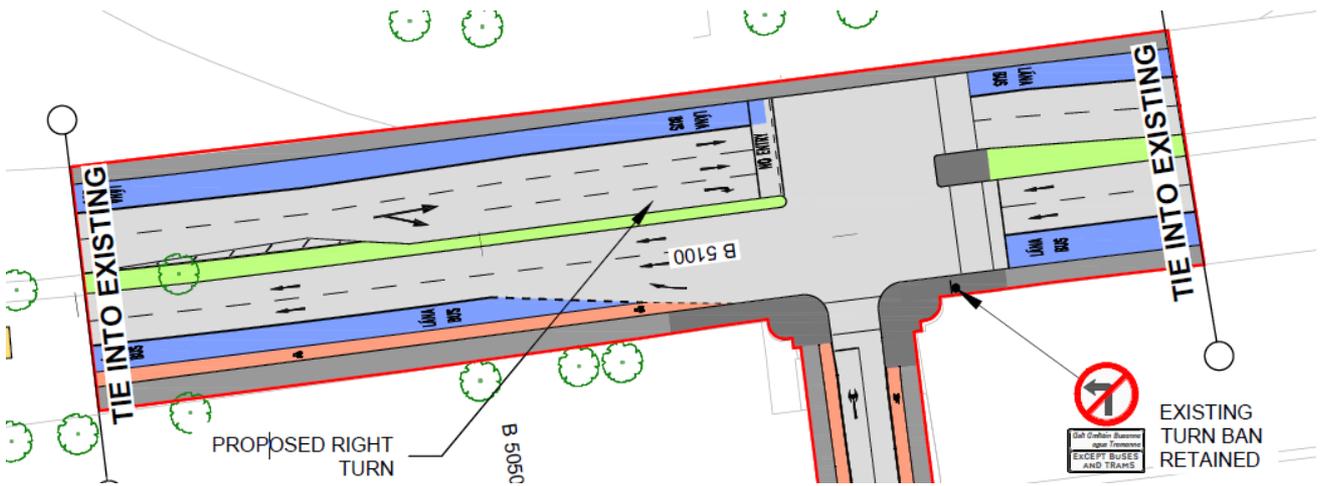


Image 4.22: The Preliminary Design of the Proposed Scheme at the Chapelizod Bypass which Ties in with the Existing Layout

Image 4.23 shows an indicative coordinated design of the expected overall arrangement in a scenario in which both schemes have been implemented.

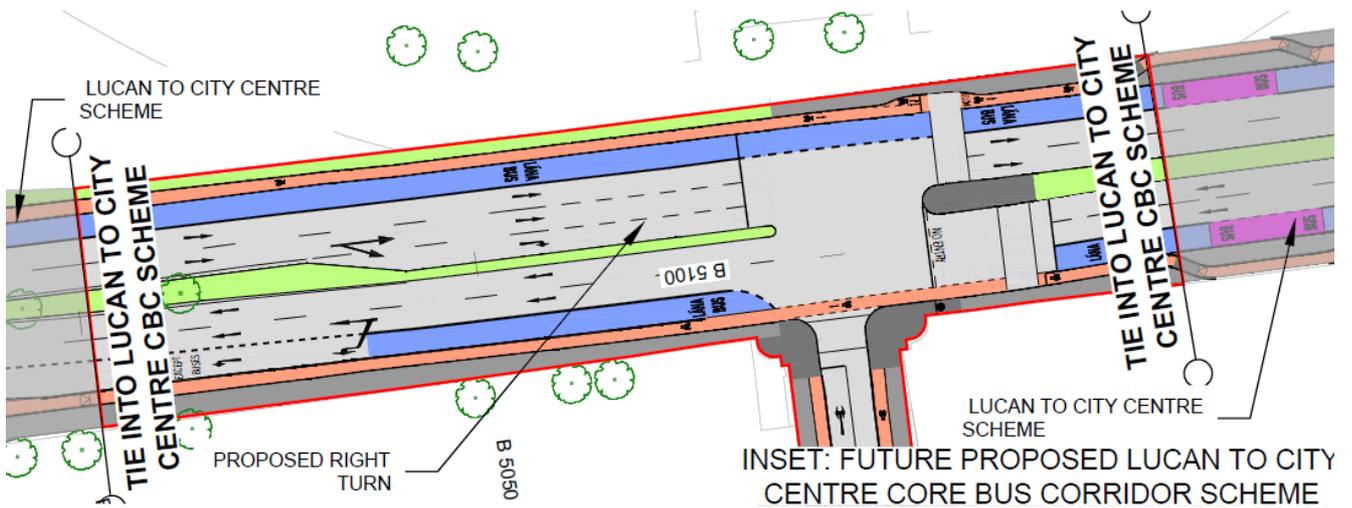


Image 4.23: Indicative Coordinated Design of the Expected Overall Arrangement in a Scenario in which Both Schemes have Been Implemented

Table 4.25 presents a matrix of potential interactions and impacts associated with various potential sequencing scenarios in relation to construction and operation of both schemes.

Table 4.25: Matrix of Potential Interactions and Impacts Associated with Different Sequencing Scenarios

| | Lucan Scheme: Not Yet Commenced | Lucan Scheme: Under Construction | Lucan Scheme: Completed |
|-------------------------------------|---|--|---|
| Proposed Scheme: Not Yet Commenced | N/A | Construction of the proposed Lucan Scheme shall be carried out in accordance with the Construction Strategy within that scheme's planning application. The right turn lane and associated works on the Chapelizod Bypass will be constructed but hatched out with road markings. | The Lucan Scheme shall be in full operation, designed in accordance with its planning application which will allow for the Liffey Valley Scheme to tie in a at a future date. The right turn lane and associated works on the Chapelizod Bypass will be completed but hatched out with road markings. |
| Proposed Scheme: Under Construction | Construction of the Proposed Scheme will be carried out in accordance with the Construction Strategy within that scheme's planning application, as shown in Image 4.22. | It is not envisaged that both schemes will be under construction at the same time at this location. | The Lucan scheme will be completed, and the Proposed Scheme will make the right turn lane on the Chapelizod Bypass operational. |
| Proposed Scheme: Completed | The Proposed Scheme shall be in full operation, designed in accordance with its planning application as per Image 4.22. | The Proposed Scheme will have been completed and the Lucan Scheme will tie into the revised layout. | The arrangement will be as per Image 4.23. |

4.6.6.4.4 Island Bridge

The Proposed Scheme intends to tie-in to the Lucan Scheme at Island Bridge in order to provide a right turn lane which will provide an alternative route to the City Centre which avoids the Mount Brown bus Gate. Image 4.24 shows an extract of the preliminary design of the Proposed Scheme at Island Bridge which ties in with the existing layout.

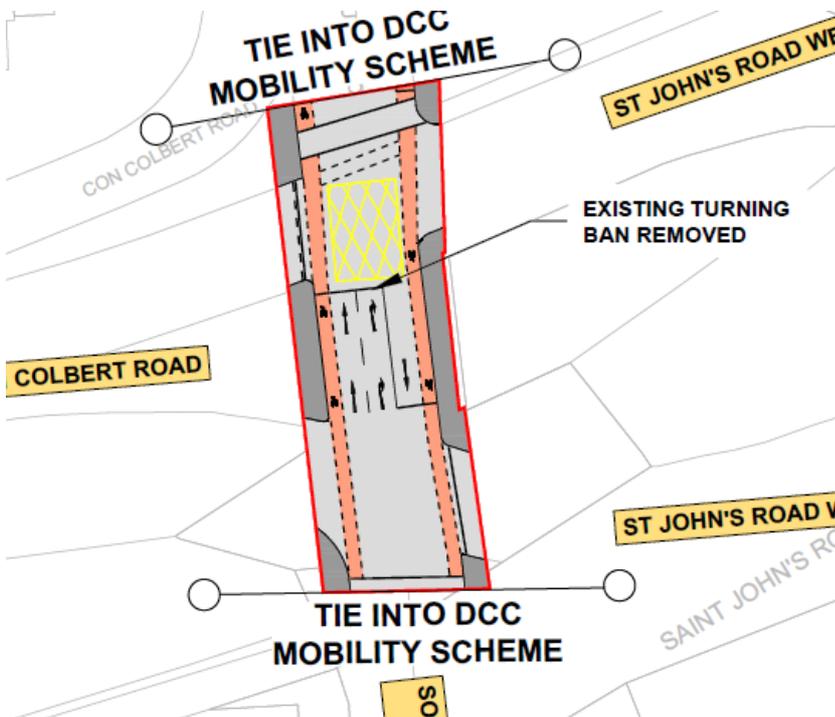


Image 4.24: The Preliminary Design of the Proposed Scheme at Island Bridge which Ties in with the Existing Layout

Image 4.25 shows an indicative coordinated design of the expected overall arrangement in a scenario in which both schemes have been implemented.

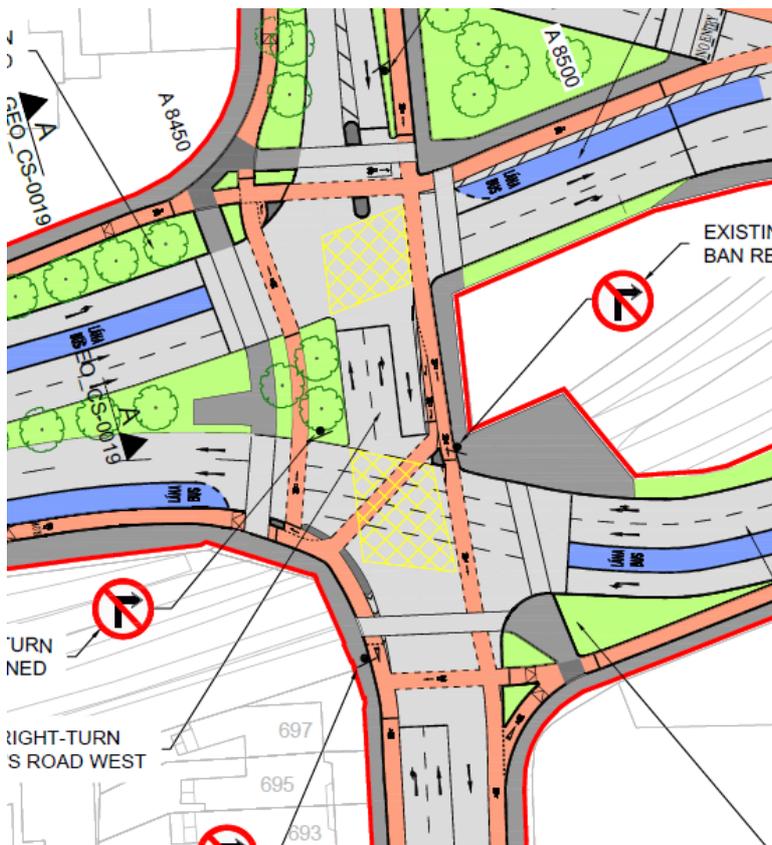


Image 4.25: Expected Overall Arrangement in a Scenario in which Both Schemes Have Been Implemented

Table 4.26 presents a matrix of potential interactions and impacts associated with various potential sequencing scenarios in relation to construction and operation of both schemes.

Table 4.26: Matrix of Potential Interactions and Impacts Associated with Different Sequencing Scenarios

| | Lucan Scheme: Not Yet Commenced | Lucan Scheme: Under Construction | Lucan Scheme: Completed |
|-------------------------------------|---|--|--|
| Proposed Scheme: Not Yet Commenced | N/A | Construction of the proposed Lucan Scheme shall be carried out in accordance with the Construction Strategy within that scheme's planning application. The right turn lane and associated works at Island Bridge will be implemented therefore no works will be required as part of the Proposed Scheme. | The Lucan Scheme shall be in full operation, designed in accordance with its planning application. The right turn lane and associated works at Island Bridge will be implemented therefore no works will be required as part of the Proposed Scheme. |
| Proposed Scheme: Under Construction | Construction of the Proposed Scheme will be carried out in accordance with the Construction Strategy within that scheme's planning application, as shown in Image 4.24. | N/A | The Lucan Scheme will be completed and the right turn lane will be implemented, therefore no works will be required as part of the Proposed Scheme. |
| Proposed Scheme: Completed | The Proposed Scheme shall be in full operation, designed in accordance with its planning application as per Image 4.24. | The Lucan Scheme will tie into the revised layout. | The arrangement will be as per Image 4.25. |

4.6.6.4.5 High Street / Winetavern Street Junction

The Proposed Scheme intends to tie-in to the Tallaght / Clondalkin Scheme at the junction of High Street and Winetavern Street. Image 4.26 shows an extract of the preliminary design of the Proposed Scheme at the junction of High Street and Winetavern Street with the existing layout.

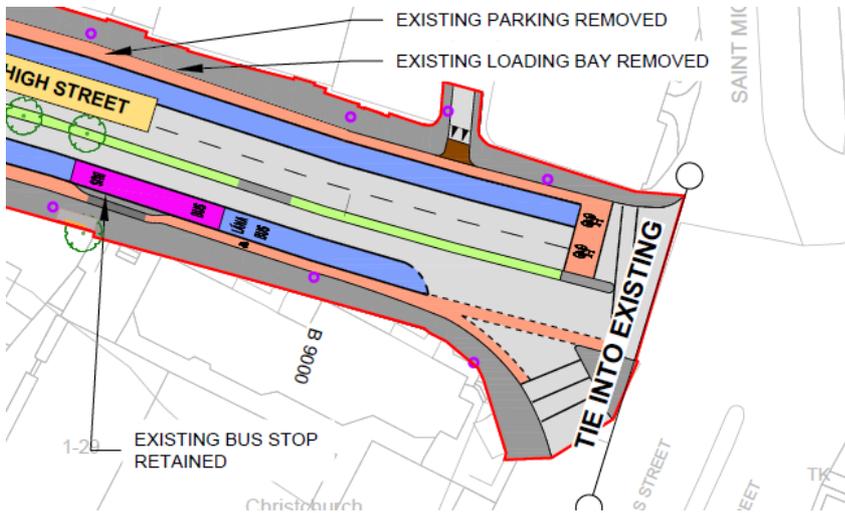


Image 4.26: The Preliminary Design of the Proposed Scheme at the Junction of High Street and Winetavern Street with the Existing Layout

Image 4.27 shows an indicative coordinated design of the expected overall arrangement in a scenario in which both schemes have been implemented.

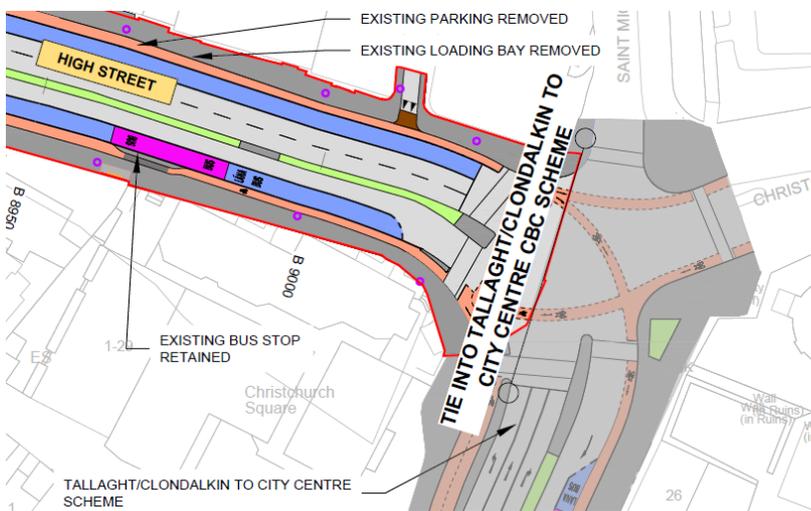


Image 4.27: Indicative Coordinated Design of the Expected Overall Arrangement in a Scenario in which Both Schemes Have Been Implemented

Table 4.27 presents a matrix of potential interactions and impacts associated with various potential sequencing scenarios in relation to construction and operation of both schemes.

Table 4.27: Matrix of Potential Interactions and Impacts Associated with Different Sequencing Scenarios

| | Tallaght / Clondalkin Scheme: Not Yet Commenced | Tallaght / Clondalkin Scheme: Under Construction | Tallaght / Clondalkin Scheme: Completed |
|-------------------------------------|--|--|---|
| Proposed Scheme: Not Yet Commenced | N/A | Construction of the proposed Tallaght / Clondalkin Scheme shall be carried out in accordance with the Construction Strategy within that scheme's planning application. | The Tallaght / Clondalkin Scheme shall be in full operation, designed in accordance with its planning application which will allow for the Liffey Valley Scheme to tie in at a future date. |
| Proposed Scheme: Under Construction | Construction of the Proposed Scheme will be carried out in accordance with the Construction Strategy within that scheme's planning application, as shown in Image 4.26. | It is not envisaged that both schemes will be under construction at the same time at this location. | The Tallaght / Clondalkin Scheme will be completed, and the Proposed Scheme will tie into the revised layout at the junction. |
| Proposed Scheme: Completed | The Proposed Scheme shall be in full operation, designed in accordance with its planning application as per Image 4.26 which will allow for the Tallaght / Clondalkin Scheme to tie in at a future date. | The Proposed Scheme will have been completed and the Tallaght / Clondalkin Scheme will tie into the revised layout. | The arrangement will be as per Image 4.27. |

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 (Signalised);
- Moderate Junctions (Signalised);and
- Minor and Priority Junctions.

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 in 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.

4.6.8.1 Retaining Walls

Retaining walls with a retained height greater than 1.5m are classified as principal structures. Those retaining walls that have a retained height less than 1.5m are classified as minor retaining walls. Table 4.28 provides a summary of all of the proposed retaining structures on the Proposed Scheme.

Table 4.28: Summary of Retaining Structures

| Wall Reference | Structure Type | Retained Height (m) | | | Chainage Start | Chainage End | Length (m) |
|----------------|-----------------------------|---------------------|-----|-----|----------------|--------------|------------|
| R7-RW013 | Precast Reinforced Concrete | Varies | 1 | Max | B0295 | B0395 | 100 |
| R7-RW008 | Precast Reinforced Concrete | Varies | 1 | Max | B3495 | B3555 | 60 |
| R7-RW009 | Precast Reinforced Concrete | Varies | 1 | Max | B3800 | B3820 | 20 |
| R7-RW010 | Precast Reinforced Concrete | Varies | 3 | Max | B3840 | B3910 | 70 |
| R7-RW011 | Precast Reinforced Concrete | Varies | 2.5 | Max | B3920 | B4180 | 160 |

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.

Prior to assessing the requirements for individual signs, a review was carried out on the impact that proposed traffic restrictions and changes to the road layout will have on the key traffic routes in the vicinity of the Proposed Scheme. Three sections of the route were identified as undergoing significant design changes and these changes will be applied to the road layouts and imposed road restrictions, causing change to existing traffic routes:

- The citybound traffic diversion along Le Fanu Road and Kylemore Road;
- The conversion of Grattan Crescent to one-way for southbound general traffic; and
- The proposed Bus Gate on Mount Brown.

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 Markings

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 (NCM) with particular attention given to junctions. Advance Stacking Locations (ASLs) have been designed where practicable to provide a safer passage for cyclists at signal-controlled junctions 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 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 bus-lanes, general traffic lanes, cycle lanes and specific trafficked areas (e.g. off-line bus stops, bus terminals, off-line parking and loading bays).

Kerbs, Footways and Paved Areas (KFPA) assets along the Proposed Scheme comprise kerbs, footpaths and cycle tracks.

For the purpose of design, the pavement assets are categorised into two networks. The primary network refers to the bus corridor under consideration, while the secondary network refers to the roads impacted by the re-routing of existing traffic from the Proposed Scheme 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. off-line parking and loading bays);
- New pedestrian areas including footpaths; and
- New cycle ways.

Pavements are designed and constructed in accordance with TII's publications, international standards and relevant Local Authority standards.

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 (BCIDB-JAC-PAV_PV-0007_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 preliminary design of pavement assets is based on the following standards:

- DN-PAV-03021 (Dec. 2010) – Pavement and Foundation Design;
- DN-PAV-03023 (Jun. 2020) – Surfacing Materials for New and Maintenance Construction for use in Ireland;
- AM-PAV-06050 (Mar. 2020) – Pavement Assessment, Repair and Renewal Principles;
- PE-SMG-02002 (Dec. 2010) – Traffic Assessment;
- CC-SPW-00600 (Mar. 2013) – Specification for Road Works Series 600 – Earthworks;
- CC-SPW-00700 (Jan. 2016) – Specification for Road Works Series 700 – Road Pavements – General;
- CC-SPW-00800 (Mar. 2013) – Specification for Road Works Series 800 – Road Pavements – Unbound and Cement Bound Mixtures; and
- CC-SPW-00900 (Sep. 2017) – Specification for Road Works Series 900 – Road Pavements – Bituminous Materials.

The preliminary design of KFPA assets is based on the following standards:

- DN-PAV-03021 (Dec. 2010) – Pavement and Foundation Design;
- DN-PAV-03026 (Jan. 2005) – Footway Design;
- Construction Standards for Road and Street Works in Dublin City Council (May 2016) – Revision 1;
- PE-SMG-02002 (Dec. 2010) – Traffic Assessment;
- CC-SPW-00600 (Mar. 2013) – Specification for Road Works Series 600 – Earthworks;
- CC-SPW-00700 (Jan. 2016) – Specification for Road Works Series 700 – Road Pavements – General;
- CC-SPW-00800 (Mar. 2013) – Specification for Road Works Series 800 – Road Pavements – Unbound and Cement Bound Mixtures;
- CC-SPW-00900 (Sep. 2017) – Specification for Road Works Series 900 – Road Pavements – Bituminous Materials;
- CC-SPW-01000 (Mar. 2013) – Specification for Road Works Series 1000 – Road Pavements – Concrete Materials;
- CC-SPW-01100 (Feb. 2012) – Specification for Road Works Series 1100 – Kerbs, Footways and Paved Areas; and
- BS 7533 series of standards (1999 –2021) – Pavement Constructed with Clay, Natural Stone or Concrete Pavers.

4.6.10.3 Pavement Rehabilitation Strategy

At Specimen Design stage, different pavement strategies will be developed for:

- Areas to be widened or fully reconstructed; and
- Areas to be rehabilitated (do minimum, intermediary strategies, fully reconstruct).

Additional testing requirements in line with AM-PAV-06050 will be specified for the appointed contractor to complete the Detailed Pavement Design.

The risk of tar contaminated material presence in the existing pavement is expected to be mitigated at Specimen Design stage with the delivery of the Ground Penetrating Radar (GPR) survey through the testing of the calibrating cores for tar.

In order to estimate the waste quantities and the carbon emissions from the Proposed Scheme pavement works, the following assumptions were made:

- Where full depth reconstruction is anticipated (e.g. widening, traffic island relocation...), a conservative fully flexible pavement design is assumed: 350mm of bituminous mixtures on top of 150mm of subbase material and 400mm of capping material;
- Where the existing pavement is anticipated to only require rehabilitation, the assumed materials and associated depths depend on the Pavement Surface Condition Index (PSCI) for the pavement design:
 - Fully flexible carriageway;
 - PSCI ≥ 7 : no works;
 - PSCI = 5 or 6: 50mm bituminous inlay;
 - PSCI = 3 or 4: 200mm bituminous inlay;
 - PSCI = 1 or 2: 350mm bituminous inlay + 150mm subbase inlay + 400mm capping inlay;
 - Rigid carriageway;
 - PSCI ≥ 5 : no works; and
 - PSCI ≤ 4 : 200mm concrete inlay.

The appropriate pavement structures for footways and cycle tracks will be defined at Specimen Design stage.

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 and loading bays were counted along the Proposed Scheme, and the proposed losses of these parking spaces and loading bays 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.

Changes to the parking and loading provisions along each section of the Proposed Scheme are described further in Section 4.5. 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 Urban Realm

Urban 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 urban 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 urban 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 urban realm proposals are derived from analysis of the existing urban 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. The Landscaping General Arrangement drawings (BCIDB-JAC-ENV_LA-0007_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 footpath** - 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 urban 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 urban realm. The use / reuse of granite kerbs where appropriate will further enhance the urban realm. This type of material use is mostly employed in non-inner-city urban realm enhancements;
- **Natural stone paving** - Employed for high quality urban 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 urban 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:

- The re-use of existing high-quality and natural stone kerbs to maintain streetscape character, reduce construction costs and maximise sustainability;
- Pedestrian crossings at side streets will be raised where possible and will be distinguished using stone or concrete setts as appropriate to the locality;
- In some locations, existing street trees have disturbed or broken footpath surfaces. The footpath around such trees will be replaced where appropriate with self-binding gravel to improve the vitality of the trees and ensure accessible pedestrian facilities;
- Informal footpaths through landscaped areas that are set back from the main carriageway will be formed using self-binding gravel as an alternative to asphalt or concrete;
- Where private or commercial property boundaries are realigned, boundary walls and railings will be reinstated to match the existing and may be extended to other properties along the same street to enhance streetscape character; and

- Existing street furniture such as seating will be relocated within the revised streetscape and new street furniture will be provided at locations where opportunity sites have been identified to establish or enhance public spaces.

4.6.12.3 Softscape

Soft landscape design proposals include the following components that provide mitigation for loss of trees, ecological benefits and visual enhancements to the urban realm:

- New tree planting;
- Native hedgerows;
- Native planting;
- Ornamental planting;
- Amenity grass areas; and
- Species rich grasslands.

Attenuation ponds and SuDS treatments are proposed throughout the length of the route. Tree loss is kept at a minimum in areas where these drainage and SuDS treatments have been provided and mitigation planting has been considered where tree losses do occur. Where required and is feasible, multiple tree pits are to be integrated and linked together as SuDS system.

4.6.12.3.1 Planting Strategy

The planting strategy has been developed to meet the needs of the South Dublin County Development Plan 2016-2022 (SDCC 2016), Dublin City Tree Strategy (DCC 2015b) and the Dublin City Biodiversity Action Plan (DCC 2015a) 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 South Dublin County Development Plan 2016-2022 and 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 have been developed. These are discussed further below.

4.6.12.5.1 New Street Trees

A variety of new tree species and sizes appropriate for their location are to be planted in urban tree pit systems to allow for protection of the soil structure and allow for good root development (see example Image 4.28).



Image 4.28: Example of New Tree Planting in an Area of Urban Realm

4.6.12.5.2 Central Median Planting

Central median planting varies depending on the context of the landscape character and road. Dual carriageways or wide roads to the edge of settlements are more likely to have wider central medians where tree planting and grass verges can be found. A combination of tree and shrub / or species rich grassland is possible to create a formalised corridor of planting within wide a wide section of road. An example of this can be seen on Fonthill Road.



Image 4.29: Example of Tree Planting within Species Rich Grassland

4.6.12.5.3 Native Planting / Tree Planting

In some locations, edges of existing wooded and native planted areas have been encroached by road widening. There will be replanting of native trees and understorey shrubs to repair these woodland edges (see example Image 4.30). An example of this can be seen on Ballyfermot Road.



Image 4.30: Example of Native Planting Group on Highway Verge

4.6.12.5.4 Boundary Planting Associated with Commercial and Community Land Use

The interfaces with these types of land use vary across the Proposed Scheme from verges adjacent to industrial units, retail frontages, schools, medical centres, churches, and golf course boundaries. The primary function of planting along these boundaries is to enhance the visual setting of these buildings and spaces whilst creating containment and a buffer between adjacent functions. Proposed planting includes linear tree belts, tree avenues and more informal tree groupings in combination with species rich grassland and SuDS features (see example Image 4.31).



Image 4.31: Example of Commercial Boundary Planting

4.6.12.5.5 Residential Interface and Garden Re-instatement

There are no private residential gardens affected along this Proposed Scheme, however where any limited encroachment by widening does occur on residential properties such as apartment block and housing estates, the proposals will replace 'like for like'. Ornamental shrubs and trees of a suitable size can contribute to the greening of the road corridor.

4.6.12.5.6 Key Areas of Urban Realm

Intermittently throughout the Proposed Scheme there are several key community and civic spaces where small landscape interventions are proposed. These spaces contain formal planting arrangements including large semi mature street trees, raised planting beds, seating, public art and play spaces (see example Image 4.32).

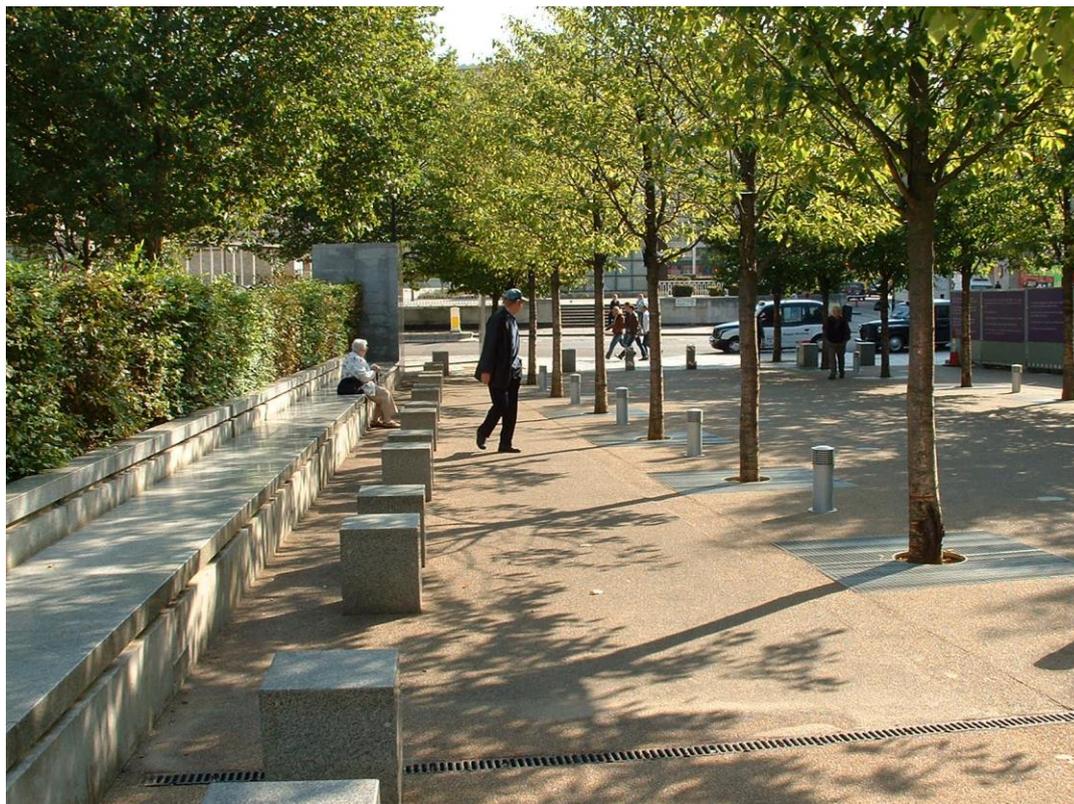


Image 4.32: Example of Key Urban Realm Spaces

4.6.12.6 Urban Realm Design

The urban realm design is presented on the Landscaping General Arrangement drawings (BCIDB-JAC-ENV_LA-0007_XX_00-DR-LL-9001) in Volume 3 of this EIAR. Separate descriptions and (illustrative) drawings for each section of the Proposed Scheme are provided in Section 4.5 to further illustrate the proposals.

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 (BCIDB-JAC-LHT_RL-0007_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 to eliminate conflict with pedestrians, 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;
- Replacing existing luminaires with approved LED heritage luminaires; and
- Ensuring the electrical installation is compliant with the latest version of the National Rules for Electrical Installations (I.S. 10101).

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 5489-1:2020 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
- Institutes of Lighting Professionals – GN01 Guidance Notes for Reduction of Obtrusive Light.

Lighting schemes will comply with the Guidance Notes for the Reduction of Light Pollution (Institute of Lighting Professionals 1992).

4.6.13.1.2 Lighting at Bus Stops

The design will 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.

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

4.6.15.1 Existing Drainage Description

The design basis was developed taking account of 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, South Dublin County Council and Irish Water where applicable.

4.6.15.2 Existing Watercourses and Culverts

The Proposed Scheme crosses the Camac and Poddle Rivers. Both watercourses are in culvert where they pass beneath the existing road. No works are proposed to change the width of the road at either crossing; therefore, the existing culverts will be retained without modification.

4.6.15.3 Existing Drainage Description

The existing road along the Proposed Scheme is served by both surface water and foul / combined drainage networks. Flows are typically collected in standard gully grates and routed via a gravity network to outfall. There are no SuDS / attenuation measures on the existing drainage networks to treat or attenuate runoff from the existing road.

The existing drainage network along the Proposed Scheme can be split into the three catchment areas based on topography and the existing pipe network supplied by Irish Water as summarised in Table 4.29. 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 (BCIDB-JAC-DNG_RD-0007_XX_00-DR-CD-9001) in Volume 3 of this EIAR.

Table 4.29: Proposed Scheme Existing Drainage

| Existing Catchment Reference | Approx. Drainage Catchment Area (km ²) | Existing Network Type | Existing Outfalls |
|------------------------------|--|---|---|
| Catchment 1 | 1.514 | Surface Water (Storm) | Network outfalls to the Quarryvale Stream |
| Catchment 2 | 12.96 | Surface Water (Storm) | Network outfalls to the River Liffey |
| Catchment 3 | Ringsend WwTP Catchment | Surface Water (Storm) and Combined Sewer (Foul and Storm) | Some stormwater network outfalls to the River Camac. Foul / combined network drains to Ringsend WwTP with sewer overflows to the River Liffey |

Catchment 1 covers the Proposed Scheme where it runs adjacent to the Liffey Valley Shopping Centre. This area is served by a surface water network, which discharges to the Quarryvale Watercourse, a small tributary of the River Liffey. The approximate total network catchment area is 1.5km².

Catchment 2 covers the scheme from the Liffey Valley Shopping Centre to Kilmainham. This area is served by a surface water network, which discharges to River Liffey via 12 outfalls. The total network catchment area is 13km².

Catchment 3 encompasses the inner city. This area is mainly drained by the foul / combined sewer network, which discharges to the Ringsend WwTP.

4.6.15.4 Proposed Drainage / Runoff

The principles for the preliminary 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, drainage structures for existing paved areas are assumed to have been 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 set out in the Drainage Design Basis. SuDS are provided to ensure no increase on existing runoff rates from new or existing paved areas;
- Due to the largely impermeable nature of soils across Dublin, infiltration rates were assumed to be zero for calculating the required attenuation volumes of any 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 need to be completed so that infiltration rates can be considered in a future design stage;
- All run-off from road pavement or any other paved areas is collected in a positive drainage system. Over-the-edge discharges are not permitted; and
- Narrow filter drains or fin drains are not expected for inner city roads that are typical of the Liffey Valley Scheme.

Each catchment area has been broken down into sub-catchments in order 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 a 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 in Table 4.30. The following table contains a column entitled 'Net Change' which takes account of the change of use from impermeable to permeable areas and vice versa.

Table 4.30: Summary of Increased Permeable and Impermeable Areas

| Existing Catchment Reference | Approx. Drainage Catchment Area (km ²) | Road Corridor Area (m ²) | Change of use to Impermeable Areas (m ²) | Change of Use to Permeable Areas (m ²) | Net Change (m ²) | Percentage Change (%) |
|------------------------------|--|--------------------------------------|--|--|------------------------------|-----------------------|
| Catchment 2 | A00+200 – A00+400 | 11278 | 1174.9 | 22.8 | 1152.1 | 10.22% |
| Catchment 2 | A00+200 – B00+200 | 11849 | 3271.3 | 484.8 | 2786.5 | 23.52% |
| Catchment 2 | B00+300 - B00+700 | 6320 | 1802.6 | 350.7 | 1451.9 | 22.97% |
| Catchment 2 | B00+700-B01+100 | 7183 | 1791.2 | 98.5 | 1692.7 | 23.57% |
| Catchment 2 | B01+100 - B01+500 | 6607 | 796.1 | 52.8 | 743.3 | 11.25% |
| Catchment 2 | B01+900 - B02+200 | 5203 | 133 | 179.4 | -46.4 | -0.89% |
| Catchment 2 | B02+200 - B02+600 | 5901 | 123 | 216.4 | -93.4 | -1.58% |
| Catchment 2 | D00+000 - D00+400 | 3340 | 0 | 0 | 0 | 0.00% |
| Catchment 2 | B02+600 – B02+900 | 11563 | 1435.5 | 1391.5 | 44 | 0.38% |
| Catchment 2 | B02+900 – B03+300 | 5654 | 1184.3 | 419.7 | 764.6 | 13.52% |
| Catchment 2 | B03+300 – B03+700 | 5328 | 1054.9 | 0 | 1054.9 | 19.80% |
| Catchment 2 | B03+700 – B04+100 | 4811 | 1831.9 | 0 | 1831.9 | 38.08% |
| Catchment 2 | B04+100 – B04+400 | 6089 | 25.8 | 0 | 25.8 | 0.42% |
| Catchment 2 | B04+400 – B04+800 | 8474 | 571.3 | 926.2 | -354.9 | -4.19% |
| Catchment 3 | B04+800 – B05+400 | 6778 | 0 | 0 | 0 | 0.00% |
| Catchment 3 | B05+400 – B06+000 | 7233 | 0 | 0 | 0 | 0.00% |
| Catchment 3 | B06+000 – B06+400 | 5236 | 0 | 0 | 0 | 0.00% |
| Catchment 3 | B06+400 – B06+700 | 4079 | 0 | 0 | 0 | 0.00% |
| Catchment 3 | B06+700 – B07+100 | 4381 | 0 | 0 | 0 | 0.00% |
| Catchment 3 | B07+100 – B07+500 | 4761 | 0 | 0 | 0 | 0.00% |
| Catchment 3 | B07+500 – B07+900 | 7474 | 0 | 0 | 0 | 0.00% |
| Catchment 3 | B07+900 – B08+300 | 6365 | 0 | 0 | 0 | 0.00% |
| Catchment 3 | B08+300 – B08+700 | 7117 | 0 | 0 | 0 | 0.00% |
| Catchment 3 | B08+700 – B09+000 | 10666 | 0 | 0 | 0 | 0.00% |

4.6.15.5 Proposed Drainage System

The principal objectives of drainage design are as follows:

- To drain surface water from existing and proposed pavement areas throughout the Proposed Scheme and maintain the existing standard of service;
- To maintain existing run-off rates from existing and newly paved surfaces using Sustainable Urban Drainage Systems (SuDS);
- To minimise the impact of the runoff from the carriageway on the surrounding environment using SuDS and/or silt traps;
- No drainage features like gullies or manholes will be located at, or any ponding will be allowed to occur at, pedestrian cross-walk locations or at bus-stop locations. Where any such drainage features currently exist at such locations, they will be relocated. Drainage of newly paved areas includes SuDS measures to treat and attenuate any additional run-off. These measures ensure that there is:
 - No increase in existing run-off rates from newly paved areas; and
 - The provision of appropriate treatment to ensure run-off quality.

- A hierarchical approach to the selection of SuDS measures has been adopted with 'Source' type measures e.g. tree pits implemented in preference to catchment type measures e.g. attenuation tanks.

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 (BCIDB-JAC-DNG_RD-0007_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;
- Attenuation Ponds are provided for the short-term detention and treatment of stormwater runoff from the completed Proposed Scheme which allows a controlled releases from the structure downstream;
- Underground Stormwater Attenuation Tanks collect and store excess surface water run-off from the large storm events and releases it at a controlled rate, usually by a flow control device, into a local watercourse minimising the risk of localised flooding;
- Grass Surface Water Channels & Swales are provided as road edge channels. These receive flows from the sealed pipe network and are designed to convey, attenuate and treat runoff prior to discharge; and
- Filter Drains are provided as road edge channels. These comprise a perforated pipe with granular surround and are designed to convey, attenuate and treat runoff prior to discharge.

SuDS measures are included for each catchment where there is an increase in the impermeable drainage area to ensure no increase in run off and provision is made for treatment.

For catchments where there is no change in the impermeable surface area, the existing sealed pipe network will be retained with new gully connections provided as appropriate. As for any new drainage network, the gullies will be located in the kerb line between the cycle-track and the bus lane and/or the footpath and the cycle track depending on the road profile. For catchments where there is no change in the impermeable surface area and no change to the kerb line the current drainage will remain unchanged.

4.6.15.6 Runoff Attenuation and Sustainable Drainage Systems (SuDS)

SuDS measures and/or attenuation systems 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 and attenuation systems was based on the incoming flows and existing discharge rates for each catchment. A range of storm durations was tested for each catchment from 30-minutes to 24 hours to ensure that the proposed measures are sufficient.

4.6.15.7 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 the TII Publications (Standards), namely DN-DNG-03022 Drainage Systems for National Roads (TII 2015a), DN-DNG-03066 Design of Earthworks Drainage, Network Drainage, Attenuation & Pollution Control (TII 2015b) and DN-DNG-03065 Road Drainage and the Water Environment (TII 2015c).

The proposed road drainage system is shown in the Proposed Surface Water Drainage Works drawings (BCIDB-JAC-DNG_RD-0007_XX_00-DR-CD-9001) in Volume 3 of this EIAR. The proposed 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 DN-DNG-03066 (TII 2015b) and CIRIA 142 Control of Pollution from Highway Drainage Discharges (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 significant 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 including junctions 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 (BCIDB-JAC-TSM_SJ-0007_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 the permanent land acquisition required temporarily for construction of the Proposed Scheme is shown on the General Arrangement Drawings (BCIDB-JAC-GEO_GA-0007_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:

- Three Residential Properties;
- 18 Commercial Properties;
- One School;
- Two Hospitals; and
- Local authority property.

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.

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.

4.7 References

British Standards Institute (2012). BS 5837:2012 Trees in Relation to Design, Demolition and Construction

British Standards Institute (2014). BS EN 13201-1-5 Road Lighting

British Standards Institute (2018). BS 8300-1:2018 Design of an accessible and inclusive built environment. External Environment – Code of Practice.

British Standards Institute (2020). BS 5489-1:2020 Design of road lighting - Lighting of roads and public amenity areas. Code of practice

Construction Industry Research & Information Association (CIRIA) (1994). CIRIA Report 142 - Control of Pollution from Highway Drainage Discharges

Construction Industry Research & Information Association (CIRIA) (2015). CIRIA C753 The SuDS Manual.

Department of Transport (DoT) (2019). Traffic Signs Manual. [Online] <https://www.trafficsigns.ie/current-traffic-signs-manual>

Dublin City Council, Dún Laoghaire-Rathdown County Council, Fingal County Council, Kildare County Council, Meath County Council, South Dublin County Council & Wicklow County Council (2012). Greater Dublin Regional Code of Practice for Drainage Works. Version 6.0

Dublin City Council (DCC) (2015a). Dublin City Biodiversity Action Plan 2015-2020.

Dublin City Council (DCC) (2015b). Dublin City Tree Strategy 2016 – 2020.

Dublin Drainage Consultancy (2005). Greater Dublin Strategic Drainage Study

- Electro-Technical Council of Ireland (2003). ET 211:2003 Code of Practice for Public Lighting Installations in Residential Areas
- Government of Ireland (2013). Design Manual for Urban Roads and Streets (DMURS).
- Institute of Hydrology (1994). Institute of Hydrology Report No. 124 Flood Estimation for Small Catchments Method.
- Institute of Lighting Professionals (1992). Guidance Notes for the Reduction of Light Pollution (Institute of Lighting Professionals)
- Institute of Lighting Professionals (2020). GN01 Guidance Notes for the Reduction of Obtrusive Light
- Irish Water (2005). The Greater Dublin Strategic Drainage Study (GDSDS).
- Irish Wheelchair Association (IWA) (2020). Best Practice Guidelines, Designing Accessible Environments.
- National Disability Authority (NDA) (2012). Shared Space, Shared Surfaces and Home Zones from a Universal Design Approach for the Urban Environment in Ireland.
- National Disability Authority (NDA) (2015). How Walkable is Your Town?
- National Disability Authority (NDA) (2020). Building for Everyone: A Universal Design Approach.
- National Roads Authority (NRA) (2013). NRA Manual of Contract Documents for Road Works
- National Standards Authority of Ireland (2013). IS EN 40-3-1:2013 Lighting Columns. Design and Verification. Specification for Characteristic Loads
- National Transport Authority (NTA) (2011). National Cycle Manual.
- National Transport Authority (NTA) (2013). Greater Dublin Area Cycle Network Plan.
- National Transport Authority (NTA) (2021). Preliminary Design Guidance Booklet for BusConnects Core Bus Corridors.
- South Dublin County Council (SDCC) (2016). South Dublin Development Plan 2016-2022
- Transport Infrastructure Ireland (TII) (2005). Footway Design
- Transport Infrastructure Ireland (TII) (2010a). DN PAV-03021 Pavement & Foundation Design (NRA HD 25-26/10)
- Transport Infrastructure Ireland (TII) (2010b). PE-SMG-02002 Traffic Assessment (HD 24/06)
- Transport Infrastructure Ireland (TII) (2011a). CC-SPW-01300 Specification for Road Works Series 1300 – Road Lighting Columns and Brackets
- Transport Infrastructure Ireland (TII) (2011b). CC-SPW-01400 Specification for Road Works Series 1400 – Electrical Work for Road Lighting and Traffic Signs
- Transport Infrastructure Ireland (TII) (2012). CC-SPW-01100 Specification for Road Works Series – Kerbs, Footways and Paved Areas
- Transport Infrastructure Ireland (TII) (2013). CC-SPW-01200 Specification for Road Works Series 1200 – Traffic Signs and Road Markings

Transport Infrastructure Ireland (TII) (2013). CC-SPW-00600 Specification for Road Works Series 600 – Earthworks

Transport Infrastructure Ireland (TII) (2013). CC-SPW-00800 Specification for Road Works Series 800 – Road Pavements – Unbound and Cement Bound Mixtures

Transport Infrastructure Ireland (TII) (2015a). DN-DNG-03022 Drainage Systems for National Roads

Transport Infrastructure Ireland (TII) (2015b). DN-DNG-03066 Design of Earthworks Drainage, Network Drainage, Attenuation & Pollution Control

Transport Infrastructure Ireland (TII) (2015c). DN-DNG-03065 Road Drainage and the Water Environment (including Amendment No. 1 dated June 2015)

Transport Infrastructure Ireland (TII) (2016). CC-SPW-00700 Specification for Road Works Series 700 – Road Pavements - General

Transport Infrastructure Ireland (TII) (2017). CC-SPW-00900 Specification for Road Works Series 900 – Road Pavements – Bituminous Materials

Transport Infrastructure Ireland (TII) (2019). DN-STR-03001 Technical Acceptance of Road Structures on Motorways and Other National Roads

Transport Infrastructure Ireland (TII) (2020). DN-PAV-03023 Surfacing Materials for New and Maintenance Construction for use in Ireland

Transport Infrastructure Ireland (TII) (2020a). AM-PAV-06050 Pavement Assessment, Repair and Renewal Principles.

Transportation Research Laboratory (TRL) (1984). TRL Report LR1132, The structural design of bituminous roads.

Transportation Research Laboratory (TRL) (1999). TRL Report 250: Design guide and specification for structural maintenance of highway pavements by cold in-situ recycling

Transport Research Laboratory (TRL) (2004a). TRL Report 611: Guide to the use and specification of cold recycled materials for the maintenance of road pavements

Transport Research Laboratory (TRL) (2004b). TRL Report 615: Development of a more versatile approach to flexible and flexible composite pavement design.

United Kingdom Department for Transport (UK DfT) (2005). Inclusive Mobility.

United Kingdom Department for Transport (UK DfT) (2007). Guidance on the use of tactile paving surfaces.

Guidance and Legislation

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

Disability Act 2005 (as amended)

Roads Act 1993 (as amended)