

Fassaroe Phase 1 Planning Application

Fassaroe Phase 1 Engineering Planning Report for
Roads, Traffic, Transport and Geotechnical

Cosgrave Property Group

Spring 2022

Roads, Traffic, Transport & Geotechnical Engineering Report



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1. Introduction

This report details the design development of the roads traffic and transport engineering and geotechnical elements associated with the works as included within this application for Phase 1 of the Fassaroe Development.

This Engineering Report specifically deals with issues relating to Roads, Traffic and Transport (chapters 1-13) and Geotechnical (chapter 14). A separate Engineering Report (Atkins REF 5186693DG0104) dealing with water and utilities has also been prepared and is submitted with this planning application.

The proposed development comprises the following:

- Road link (2.4km) connecting N11 to Ballyman Road (with westerly connection to Ballyman Road already in place)
- Pedestrian / cycle route including bridge across the N11 to Dargle Road Upper
- 15.3ha of District Park / Active Open Space
- 650 No. residential units comprising 241 no. houses and 409 no. apartments
- 3 No. pocket park areas comprising a total of 0.43ha.
- 733sq.m approx. crèche with capacity for approx. 138 no. childcare spaces
- Retail unit / kiosk (108sq.m.) in district park
- Neighbourhood Centre Phase 1 comprising:
 - 1,035sq.m. retail
 - 360sq.m. café,
 - 480sq.m community concierge (serving entire Fassaroe community)
 - 414sq.m. residential ancillary uses for residents of the neighbourhood centre apartments (residents lounge 256sq.m., residents' gym 90sq.m., and resident's concierge 68sq.m.)
- Demolition of an existing dwelling at Berryfield Lane
- Rerouting and undergrounding of overhead ESB lines (110kV and 38kV lines) across site and into existing ESB Substation
- Site development / ground works on future development areas to ensure sustainable cut and fill balances across the lands
- Water supply, foul and surface water drainage proposals
- Provisions for public bus services in line with demand towards Bray (DART and Bray bus interchange) and towards the Luas at Cherrywood / Brides Glen
- Remediation of 5 no. historic landfill sites in line with Certificates of Authorisation issued to Wicklow County Council by the EPA in 2019

A detailed description of the development is included in Chapter 2 Project Description of the EIAR included with this planning application.

The proposed application site forms part of a larger designated new development area under the Bray Municipal District Local Area Plan 2018 -2024 (LAP). These wider development lands are identified as an 'Action Area' in the LAP. The lands lie on the western side of Bray. The general location of the site is shown on Figure 1-1.

Figure 1-1 – General Site Location Plan



1.1. Background

The proposed roads, traffic and transport design has been developed in close consultation with the relevant authorities including Wicklow County Council, the National Transport Authority (NTA) and Transport Infrastructure Ireland (TII).

Ongoing consultation has been undertaken between the applicant’s design team and relevant stakeholders including Wicklow County Council (WCC), National Transport Authority (NTA) and Transport Infrastructure Ireland (TII) to ensure the proposed design incorporates both local and regional requirements. It is proposed to maintain consultation through the planning process and subsequent detail design and construction phases of the scheme.

1.2. Principal Design Considerations

During the design development of the proposed works included within this planning application, the design team took cognisance of the following key considerations/ documents for roads, traffic and transport aspects of the development:

- National Planning Framework; Project Ireland 2040 Our Plan 2022 – 2027;
- National Development Plan 2018-2027;
- National Development Plan 2021-2027
- Regional Spatial and Economic Strategy for the Eastern and Midland Region ((RSES) 2019-2031
- Department of Transport Tourism and Sport (DTTAS) *The Traffic Signs Manual (2010)*;
- Department of Transport Tourism and Sport - *The Design Manual for Roads and Bridges (DMRB)*;
- *The Design Manual for Urban Roads and Streets (DMURS) (DTTAS, 2013)*;

- Transport Infrastructure Ireland (TII) Publications: Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated, and compact grade separated junctions) (June 2017)
- National Transport Authority (NTA) -Transport Strategy for the Greater Dublin Area 2016-2035
- Smarter Travel – A Sustainable Transport Future (DTTAS) 2009-2020
- Spatial Planning and National Roads – Guidelines for Planning Authorities DoECLG (2012)
- National Transport Authority (NTA) Greater Dublin Area Transport Strategy 2016 – 2035;
- National Transport Authority (NTA) Draft Transport Strategy for the Greater Dublin Area 2022-2042
- Smarter Travel: A Sustainable Transport Future 2009 – 2020;
- National Cycle Policy Framework: 2009 – 2020;
- Wicklow County Development Plan 2016 – 2022;
- Draft Wicklow County Development Plan 2021-2027;
- Wicklow County Council - Bray Environs Municipal District Local Area Plan (LAP) 2018-2024;
- National Transport Authority & TII, WCC & DLRCC - Bray Environs Transport Study (BETS) 2019
- Fassaroe Proposed Action Area Plan (2020), MCORM

2. Design Deliverables – Drawing Content

This report should be read in conjunction with the list of drawings outlined in Table 2-1. The planning engineering design drawings are standardised and consist of the following elements:

- Title page;
- Contents page; and
- A set of scheme design drawings for the engineering related extents of the scheme.

Drawings have a standardised title block for each series showing the details discussed below. Chainages are indicated at appropriate intervals along road alignments. Scales are shown within the title block and are in accordance with the Planning Regulations.

Below is a list of the Engineering Drawings (Roads Traffic and Transport) as submitted as part of this planning application.

Table 2-1 - Engineering Drawing Schedule

Drawing Number	Drawing Name	Revision
5186693/HTR/01/ 0000	COVER SHEET	-
5186693/HTR/01/ 0001	SITE LOCATION MAP 01	-
5186693/HTR/01/0101	ROAD PLAN LAYOUT - SHEET 1 OF 14	-
5186693/HTR/01/0102	ROAD PLAN LAYOUT - SHEET 2 OF 14	-
5186693/HTR/01/0103	ROAD PLAN LAYOUT - SHEET 3 OF 14	-
5186693/HTR/01/0104	ROAD PLAN LAYOUT - SHEET 4 OF 14	-
5186693/HTR/01/0105	ROAD PLAN LAYOUT - SHEET 5 OF 14	-
5186693/HTR/01/0106	ROAD PLAN LAYOUT - SHEET 6 OF 14	-
5186693/HTR/01/0107	ROAD PLAN LAYOUT - SHEET 7 OF 14	-
5186693/HTR/01/0108	ROAD PLAN LAYOUT - SHEET 8 OF 14	-
5186693/HTR/01/0109	ROAD PLAN LAYOUT - SHEET 9 OF 14	-
5186693/HTR/01/0110	ROAD PLAN LAYOUT - SHEET 10 OF 14	-
5186693/HTR/01/0111	ROAD PLAN LAYOUT - SHEET 11 OF 14	-
5186693/HTR/01/0112	ROAD PLAN LAYOUT - SHEET 12 OF 14	
5186693/HTR/01/0113	ROAD PLAN LAYOUT - SHEET 13 OF 14	
5186693/HTR/01/0114	ROAD PLAN LAYOUT - SHEET 14 OF 14	
5186693/HTR/01/0115	STREET TYPOLOGY – KEY PLAN SHEET 1 OF 4	-
5186693/HTR/01/0116	STREET TYPOLOGY SHEET 2 OF 4	
5186693/HTR/01/0117	STREET TYPOLOGY SHEET 3 OF 4	
5186693/HTR/01/0118	STREET TYPOLOGY SHEET 3 OF 4	
5186693/HTR/01/0119	JUNCTION LAYOUT KEY PLAN SHEET 1 OF 5	
5186693/HTR/01/0120	JUNCTION LAYOUT SHEET 2 OF 5	
5186693/HTR/01/0121	JUNCTION LAYOUT SHEET 3 OF 5	
5186693/HTR/01/0122	JUNCTION LAYOUT SHEET 4 OF 5	
5186693/HTR/01/0123	JUNCTION LAYOUT SHEET 5 OF 5	
5186693/HTR/01/0124	JUNCTION VISIBILITY KEY PLAN – SHEET 1 OF 5	

5186693/HTR/01/0125	JUNCTION VISIBILITY SHEET 2 OF 5	
5186693/HTR/01/0126	JUNCTION VISIBILITY SHEET 3 OF 5	
5186693/HTR/01/0127	JUNCTION VISIBILITY SHEET 4 OF 5	
5186693/HTR/01/0128	JUNCTION VISIBILITY SHEET 5 OF 5	
5186693/HTR/01/0129	VEHICLE TRACKING SHEET 1 OF 3	
5186693/HTR/01/0130	VEHICLE TRACKING SHEET 2 OF 3	
5186693/HTR/01/0131	VEHICLE TRACKING SHEET 3 OF 3	
5186693/HTR/01/0132	TYPICAL CROSS SECTION KEY PLAN	
5186693/HTR/01/0133	TYPICAL CROSS SECTION SHEET 1 OF 3	
5186693/HTR/01/0134	TYPICAL CROSS SECTION SHEET 2 OF 3	
5186693/HTR/01/0135	TYPICAL CROSS SECTION SHEET 3 OF 3	
5186693/HTR/01/0136	ROAD LONG SECTIONS - SHEET 1 OF 5	
5186693/HTR/01/0137	ROAD LONG SECTIONS - SHEET 2 OF 5	
5186693/HTR/01/0138	ROAD LONG SECTIONS - SHEET 3 OF 5	-
5186693/HTR/01/0139	ROAD LONG SECTIONS - SHEET 4 OF 5	-
5186693/HTR/01/0140	ROAD LONG SECTIONS - SHEET 5 OF 5	-
5186693/HTR/01/0141	MASTERPLAN CYCLE PROVISION	-
5186693/HTR/01/0142	VEHICLE TRACKING – BLOCK 1 & 2	
5186693/HTR/01/0143	VEHICLE TRACKING – NEIGHBOURHOOD CENTRE	
5186693/HTR/01/0144	VEHICLE TRACKING – BUS MOVEMENT 1 OF 2	
5186693/HTR/01/0145	VEHICLE TRACKING – BUS MOVEMENT 2 OF 2	
5186693/HTR/SK/1704	PROPOSED BRIDGE	
5186693/HTR/SK/1705	PROPOSED BRIDGE SECTION	
5186693/HTR/01/DR/0605	LANDFILL SLIPPAGES PLAN	
5186693/HTR/01/DR/0606	GROUND IMPROVEMENTS FOR ROAD IN LANDFILL SITE 3B	
5186693/HTR/01/DR/0607	GROUND IMPROVEMENTS FOR ROAD IN LANDFILL SITE 2 SHEET 1 OF 2	
5186693/HTR/01/DR/0608	GROUND IMPROVEMENTS FOR ROAD IN LANDFILL SITE 2 SHEET 2 OF 2	
5186693/HTR/01/DR/0609	LANDFILL / SLIPPAGES SLOPE STABILISATION SHEET 1 OF 3	
5186693/HTR/01/DR/0610	LANDFILL / SLIPPAGES SLOPE STABILISATION SHEET 2 OF 3	
5186693/HTR/01/DR/0611	LANDFILL / SLIPPAGES SLOPE STABILISATION SHEET 3 OF 3	

3. Roads and Streets

3.1. Background

The proposed roads and streets design and overall transport network have been developed in close consultation with the relevant authorities including Wicklow County Council Roads and Traffic Department and through pre-application discussions with An Bord Pleanála, the National Transport Authority and Transport Infrastructure Ireland. Relevant technical aspects of the road’s infrastructure elements are incorporated on the road and street infrastructure drawings within this report.

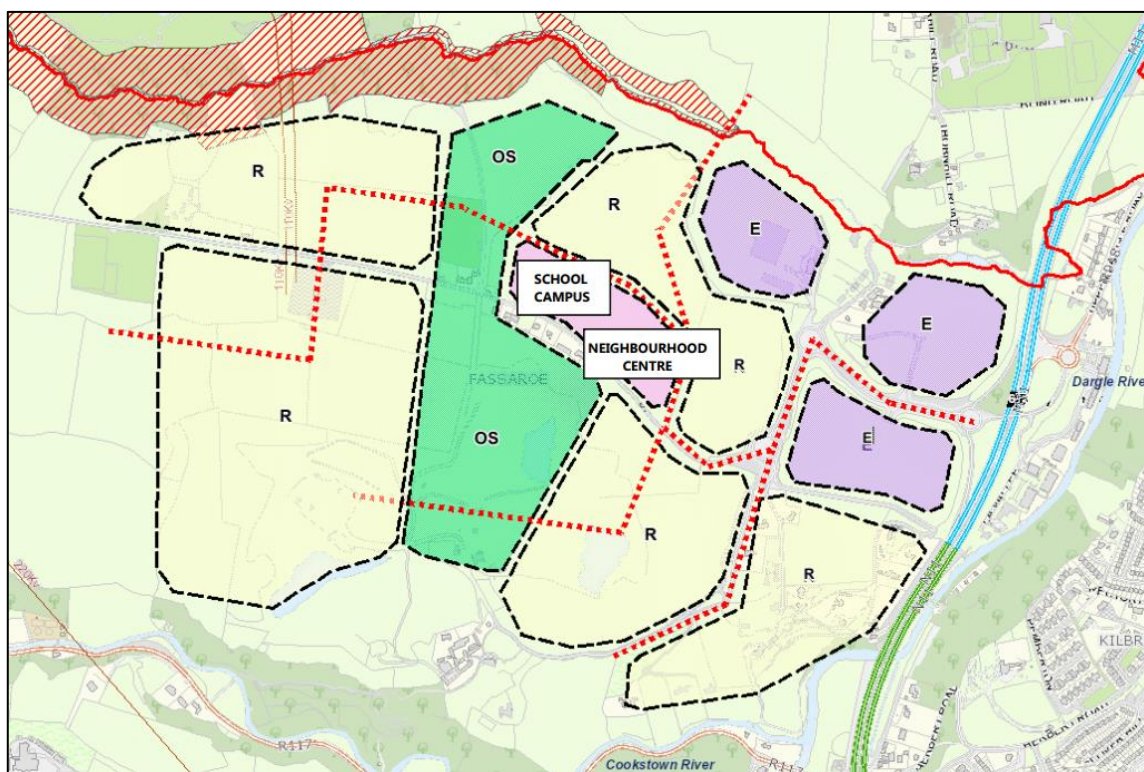
3.2. Roads and Street Design

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

Enclosed with the application is a masterplan drawing by MCORM Architects which presents a proposed development masterplan layout for all of the Cosgrave Property Group lands at Fassaroe, of which the current application site forms part. The roads strategy for the lands as Fassaroe has been developed with regard to the requirements of the full future build out of the ‘Masterplan’ lands in the ownership of CPG and not just for this initial Phase 1 application. Some of the information presented in this report accordingly refers to the wider ‘masterplan’ lands and is not only confined to the Phase 1 proposals.

As part of the planning design stage of the project, the road alignment design has been developed, in general, based on the Fassaroe Masterplan and Bray Municipal District Local Area Plan 2018 as shown in Figure 3-1.

Figure 3-1 – Concept Plan for Fassaroe – showing zoning and road alignment



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

Generally, horizontal alignments of the roads in this application follow the road alignment as set out in the Concept Plan for Fassaroe as shown in Figure 3-1 and is in accordance with the relevant design standards.

One of the key objectives for road layout is to reduce the generation of cul-de-sacs via the use of looped streets which encourages permeability as well as taking cognisance of the requirements of DMURS to ensure that this is achieved. The horizontal alignment defines the roads horizontal geometry and chainage. The developed alignment design sets parameters for development of other design elements such as drainage, determination of earthworks, etc.

The vertical alignment of the proposed roads conforms to gradient recommendations as set out in appropriate design standards including DMURS and the National Cycle Manual. Both the horizontal and vertical alignment are fully coordinated with the architect and landscape architect layouts.

As part of the alignment design process, vertical design has been optimised to follow the existing ground profile where possible, minimise the earthworks as much as possible as well as facilitating the drainage design on the basis of the gravity led system (for foul and surface water) where feasible. The proposed road network ties-in to existing features such as Thornhill Road roundabout, Berryfield Lane and the more recently completed road construction at the Ballyman Road junction.

A Digital Terrain Model (DTM) has been prepared based on a 3D topographical survey of the existing ground which covers the majority of the study area, remaining sections have been included in the DTM based on Lidar survey in the form of contours.

The specific level requirements and locations applied in the design are:

- Fassaroe Avenue (section from N11 to Berryfield Lane) ties into the existing level at the Thornhill Road roundabout (ref Drwg No: 5186693/HTR/01/DR/0112);
- Fassaroe Avenue follows the levels of the existing road along CH0 to Ch180 (ref Drwg No: 5186693/HTR/01/DR/0112 TO 5186693/HTR/01/DR/0111)
- Proposed Berryfield Avenue (main through road within area of proposed new development linking the N11 to Ballyman Road) ties into existing levels at the crossing of Berryfield Lane at CH420 (ref Drwg No: 5186693/HTR/01/DR/0111)
- Berryfield Avenue ties into Berryfield Lane at the western edge of the site at CHO2460 (ref Drwg No: 5186693/HTR/01/DR/0101)
- Western extent of Berryfield Avenue ties into the already constructed section at the Ballyman Road junction at CH2630 (ref Drwg No: 5186693/HTR/01/DR/0101)

3.3. Compliance with DMURS Principles

The street layout has been developed to deliver a high place function wherein the streets and open spaces form part of the social fabric and are appropriately used for congregation and leisure pursuits. Achievement of this function is greatly facilitated by developing a self-regulating residential street environment wherein vehicular movement function should be limited, as much as is practicable, and a desirable design speed of 20-30kph should be achieved within the residential street layouts.

The street layout accommodates high levels of permeability for pedestrians and cyclists throughout the masterplan lands as well as the provision of facilities on external linkages towards Bray town centre and DART station. External connections to the east into Bray are provided via a Pedestrian/Cyclist Bridge provided across the M11 and to the west along Berryfield Avenue to the R117 Ballyman Road. A lesser but appropriate level of permeability for vehicular traffic has been accommodated. The filtered permeability of the road and street layout ensures that pedestrian and cyclist movement is accommodated along all key desire lines. Vehicular traffic permeability is appropriately accommodated facilitating a generally even distribution of relatively low traffic flow volumes at low speeds across the residential street network.

The road and street layout has been developed to take account of the following elements as recommended in DMURS:

- Street Networks (DMURS Chapter 3);
 - Permeability and Legibility (section 3.3);
- Street Design (DMURS chapter 4);
 - Movement, Place and Speed (section 4.1);
 - Streetscape (section 4.2);
 - Pedestrian and Cyclist Environment (section 4.3); and
 - Carriageway Conditions (section 4.4).

3.4. Street Networks

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

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

The proposed street layout for the masterplan for the lands in the ownership of Cosgrave Property Group essentially consists of five types of street typology:

- Boulevard;
- Link Street;
- Local Street;
- Home Zone; and
- Berryfield lane.

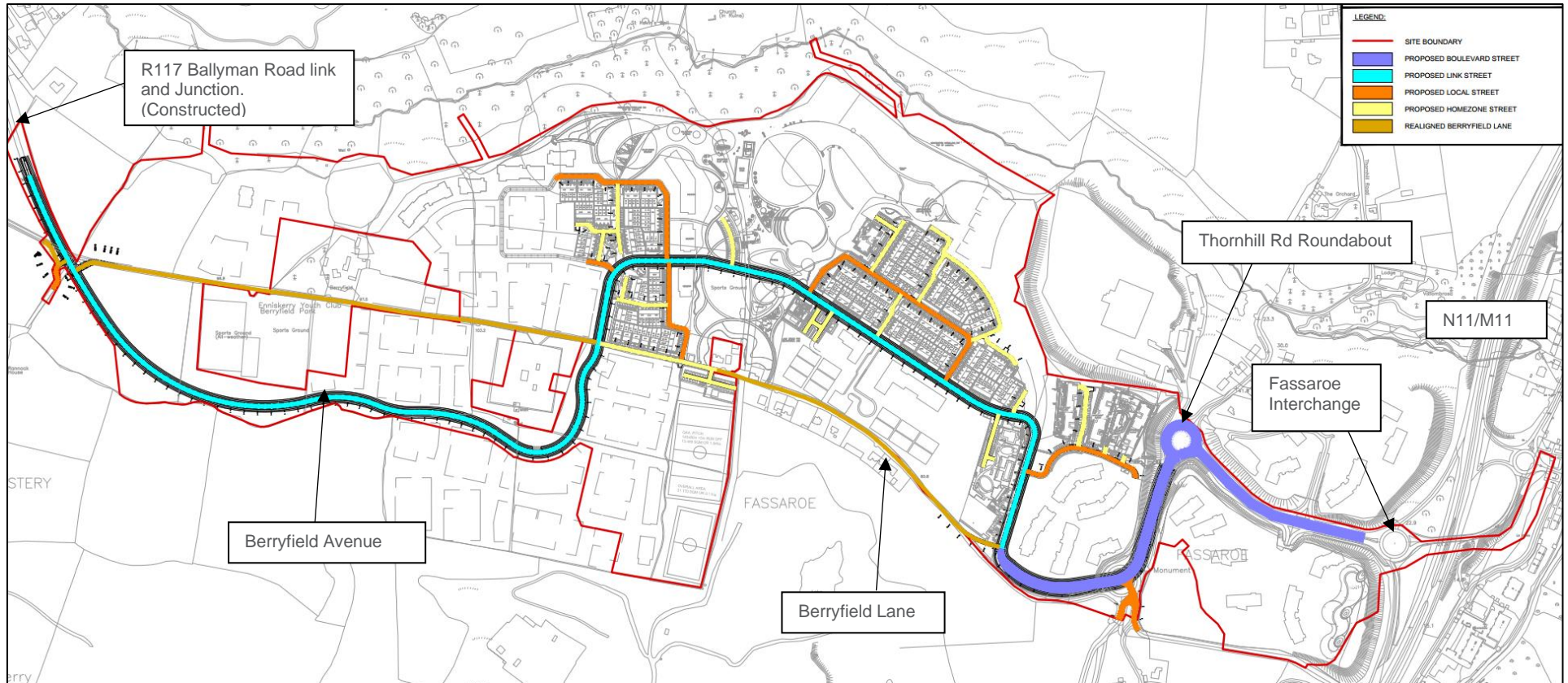
The masterplan layout showing the location of these street types is shown in Figure 3-2. Additional details are shown on drawings 5186693/HTR/DR/0115 to 0118.

DMURS recommends that the Street Design should be reflective of the road hierarchy and movement and functionality of the street network. One of the most successful ways of managing this is by designing self-regulating streets *that balance the functional needs of different users, enhance the sense of place and manage speed in a manner that does not rely on excessive regulation controls of physically intrusive measures for enforcement (DMURS 4.1.2).*

Some of the critical elements of achieving self-regulating streets and compliance with DMURS Street Design are:

- Horizontal radius / curvature (DMURS 4.4.6);
- Gradients (DMURS 4.4.6);
- Carriageway widths (DMURS 4.4.1) and
- Junction radii (DMURS 4.3.3).

Figure 3-2 - Street Typology and layout



The design criteria for the street typologies are detailed in Table 3-1 below, based on the recommended criteria in DMURS for the associated street types.

Table 3-1 - Street Design Criteria

Design Criteria	Boulevard Street	Link Street	Local Street	Home Zone Street	Berryfield Lane
DMURS Recommended Design Speed	30-50km/h	30-50km/h	10-30km/h	10-30km/h	10-30km/h
Adopted Design Speed	50km/h	50km/h	20km/h	20km/h	20km/h
Minimum Horizontal Radius	46m	26m	11m	11m	11m
Maximum Gradient	5%	5%	5%	5%	5%
Minimum Gradient	0.5%	0.5%	0.5%	0.5%	0.5%
Carriageway Width	2No. 6.5m road carriageway with 2.5m Median.	6.5m	5.5m	4.8m	Varies
Junction Radii	6m	6m	4.5m	3m	3m
Junction Approach Gradient	2%	2%	2%	2%	2%

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

Table 3-2 - Public Transport, Pedestrian and Cycling Provision

Provision	Boulevard Street	Link Street	Local Street	Home Zone Street	Boreen (Berryfield Lane)
Public Transport Bus Infrastructure	Bus route, including bus lane with existing (upgraded) bus stops	Bus route with new in-line bus stops	No bus infrastructure Designed to be within 400m – 800m of a bus stop on link street	No bus infrastructure Designed to be within 400m – 800m of a bus stop on link street	No bus infrastructure
Pedestrian Provision	footpaths both sides	footpaths both sides	footpaths both sides	1.2m pedestrian comfort strip	Integrated Shared Street Provision, pedestrian shares carriageway with vehicles in low traffic speed and very low traffic volume environment
Cyclist Provision	Segregated cycle paths both sides and in some cases dual track on one side only.	Segregated cycle paths both sides	Integrated Shared Street Provision, cyclist shares carriageway with vehicles in low traffic speed and low traffic volume environment	Integrated Shared Street Provision, cyclist shares carriageway with vehicles in low traffic speed and low traffic volume environment	Integrated Shared Street Provision, cyclist shares carriageway with vehicles in low traffic speed and very low traffic volume environment

Note: the maximum gradient (5%) as detailed in Table 3-1 is within the maximum gradient provision for cyclists as set out in DMURS. Electric bikes and e-scooters provide additional assistance for users travelling up gradients or longer distances.

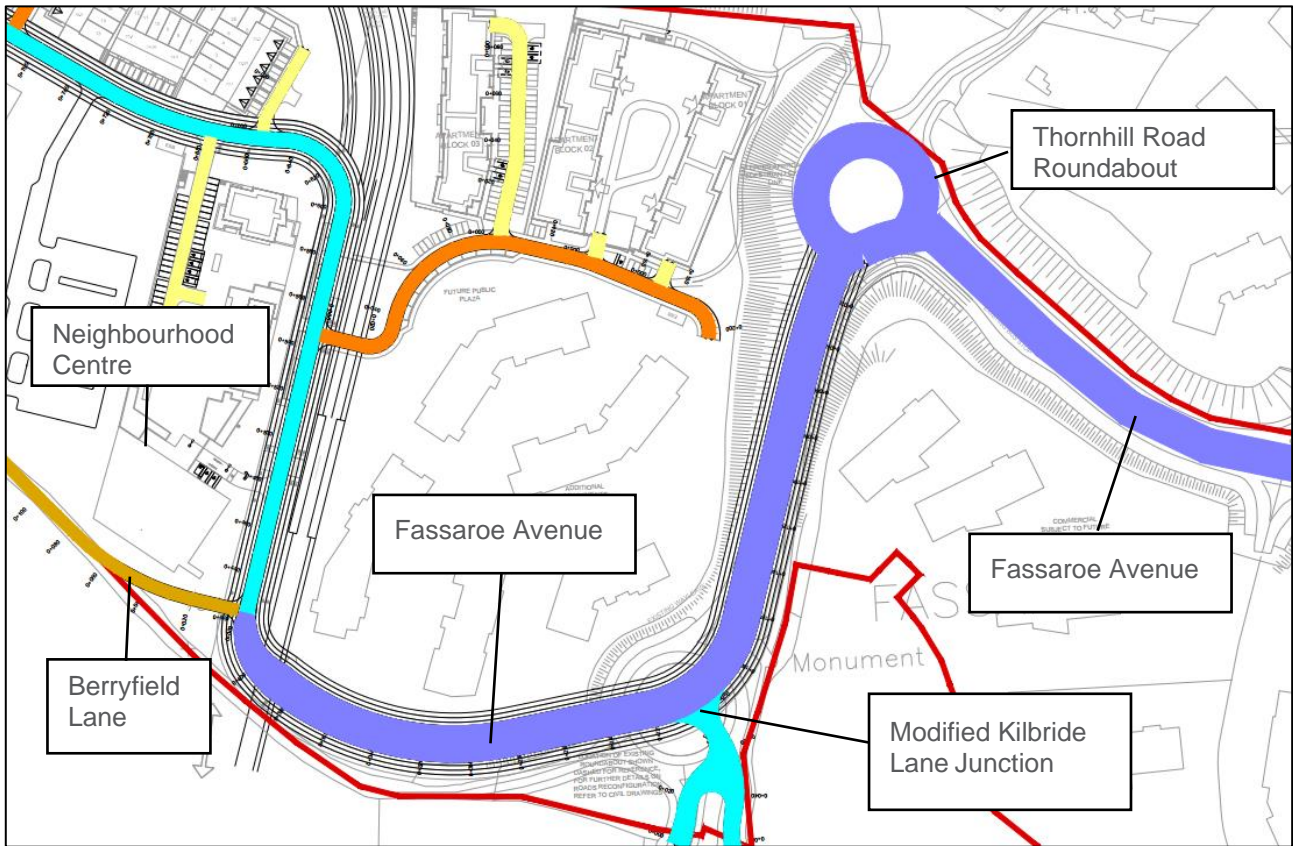
The proposed alignment and associated cross-sections have been developed in accordance with the necessary DMURS design standards for roads, streets and homezone areas of this nature. Further details of the above provision are outlined in the sections below.

3.4.1. Boulevard Street

The Boulevard Street, referred to as Fassaroe Avenue, links the development with the N11 junction 6 Fassaroe Interchange western roundabout as shown in Figure 3-3. The Boulevard will follow along the existing road from the existing Thornhill Road roundabout toward the existing roundabout at the junction with Berryfield Lane and Kilbride Lane which is proposed to be removed and replaced with a new junction arrangement as detailed in Section 4.1.3. From this location the Boulevard Avenue will continue up to the point where it becomes the proposed future Link Street which will serve as the future main access route for the entire Fassaroe development lands. There will also be a new junction configuration with Berryfield Lane at this location.

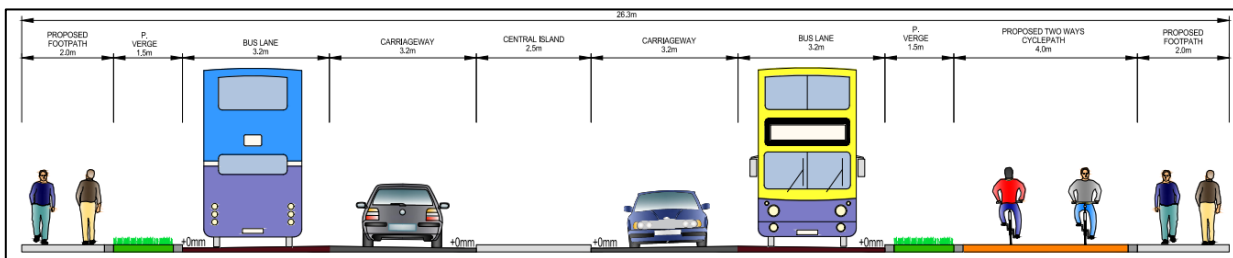
There are 3 signal controlled crossings proposed along Fassaroe Avenue located at key points that equates to desire lines that provides safe comfortable crossing facilities for all active travel users that links them to key infrastructure such as bus stops and dual cycle track facilities. There are two existing bus stops on Fassaroe Avenue, which are proposed to be redesigned to accord with the latest best practice design and in the case of the bus stop on the northern side of Fassaroe Avenue relocated further westward to ensure better connectivity to the development. Further details of bus infrastructure are set out in Section 7 of this report.

Figure 3-3 - Boulevard Street - Extents



The typical cross section layout of the Boulevard Street (Fassaroe Avenue) is detailed in Figure 3-4 and shown in Atkins drawing 5186693/HTR/01/DR/0134.

Figure 3-4 - Boulevard Street (Fassaroe Avenue) typical cross section



A 2m footpath width is proposed along both sides of the Boulevard with a 1.5m planted verge providing extra screening and protection from the carriageway. A 4m two-way segregated cycle path is proposed on the south-eastern side to separate vehicles from cyclists and provide comfort for cyclists on the approach to and from the pedestrian and cyclist bridge across the N11. This is proposed to tie in with the existing layout / cyclist facilities that were previously constructed here by the Cosgrave Property Group.

A dual carriageway of 3.2m each way is provided along the Boulevard in this section. On the Boulevard Street the nearside lane in both direction will be a bus lane to provide bus priority facilities for the planned bus services to operate through the development. The other running lane (3.2m) is for general traffic accessing and egressing the site. The road's layout is appropriately designed at junctions to facilitate vehicle turning movements whilst maintaining appropriate priority for pedestrians and cyclists. The Boulevard Street reduces to two single lanes, one in each direction before the junction with Berryfield Lane and the Link Street, known as Berryfield Avenue.

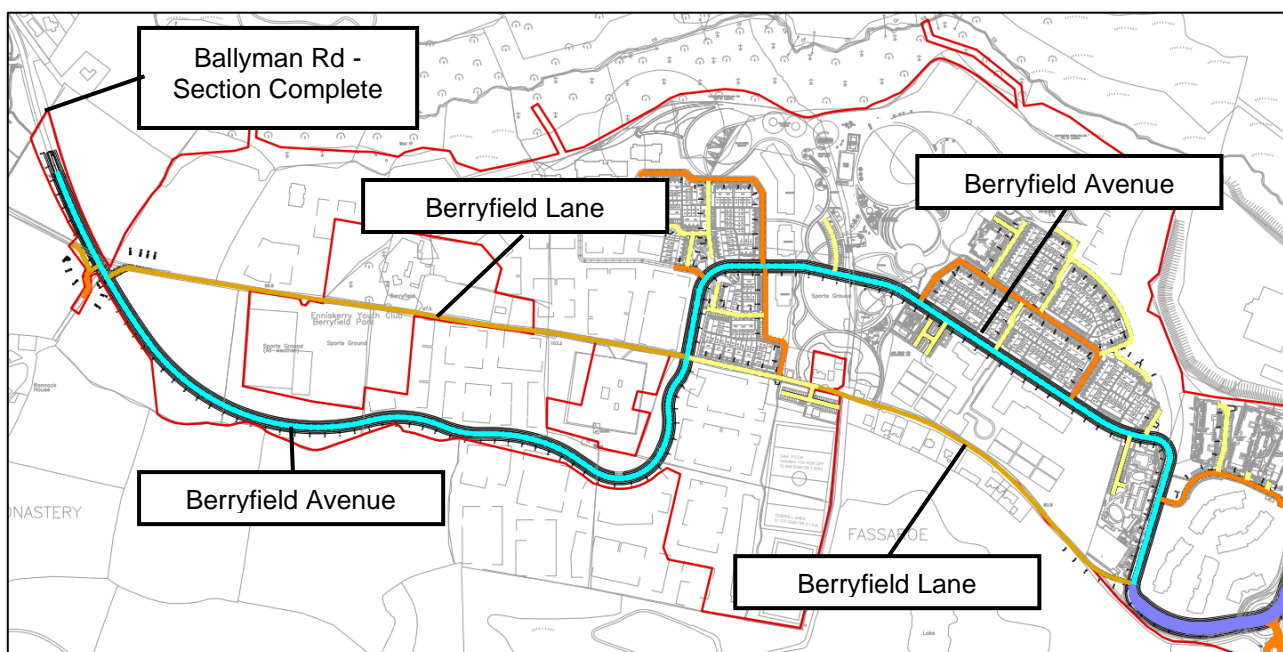
3.4.2. Link Street

The Link Street, referred to in this application as Berryfield Avenue, provides the main connection through the development from the Boulevard to the previously upgraded junction with the R117 Ballyman Road. The alignment of the Link Street as shown in Figure 3-5 accords principles set out in both the Bray Environs Municipal District Local Area Plan and Fassaroe Proposed Action Area Plan (MCORM). The route heads northwards from the Boulevard past the Neighbourhood Centre and then west before traversing south to cross the existing Berryfield Lane before continuing to westward to join up with the completed section of the Link Street where it intersects with Ballyman Road.

Berryfield Avenue is the link street that provides the primary access to the Neighbourhood Centre, residential neighbourhoods, District Park and creche. There are numerous junctions located along the extent of Berryfield Avenue that provide these connections, the location and frequency of which have been designed to optimise permeability but not adversely impact on the traffic movement function of the Link Street.

Berryfield Avenue will also facilitate bus services running through the development with a number of bus stops strategically located to ensure residents are within easy walking distance of a bus service. There are numerous formal (controlled), and informal (uncontrolled) crossing facilities located along Berryfield Avenue that provide safe comfortable locations for pedestrians and cyclists to cross. These are located at key desire line locations.

Figure 3-5 - Link Street - Berryfield Avenue, extents



A section of road and the priority junction with the R117 Ballyman Road was previously granted by An Bord Pleanála under Wicklow County Council planning application reference 1715. The construction of this link is now effectively complete as shown in Figure 3-6. Final works, including signing and lining will be completed prior to the occupation of the first units in this application.

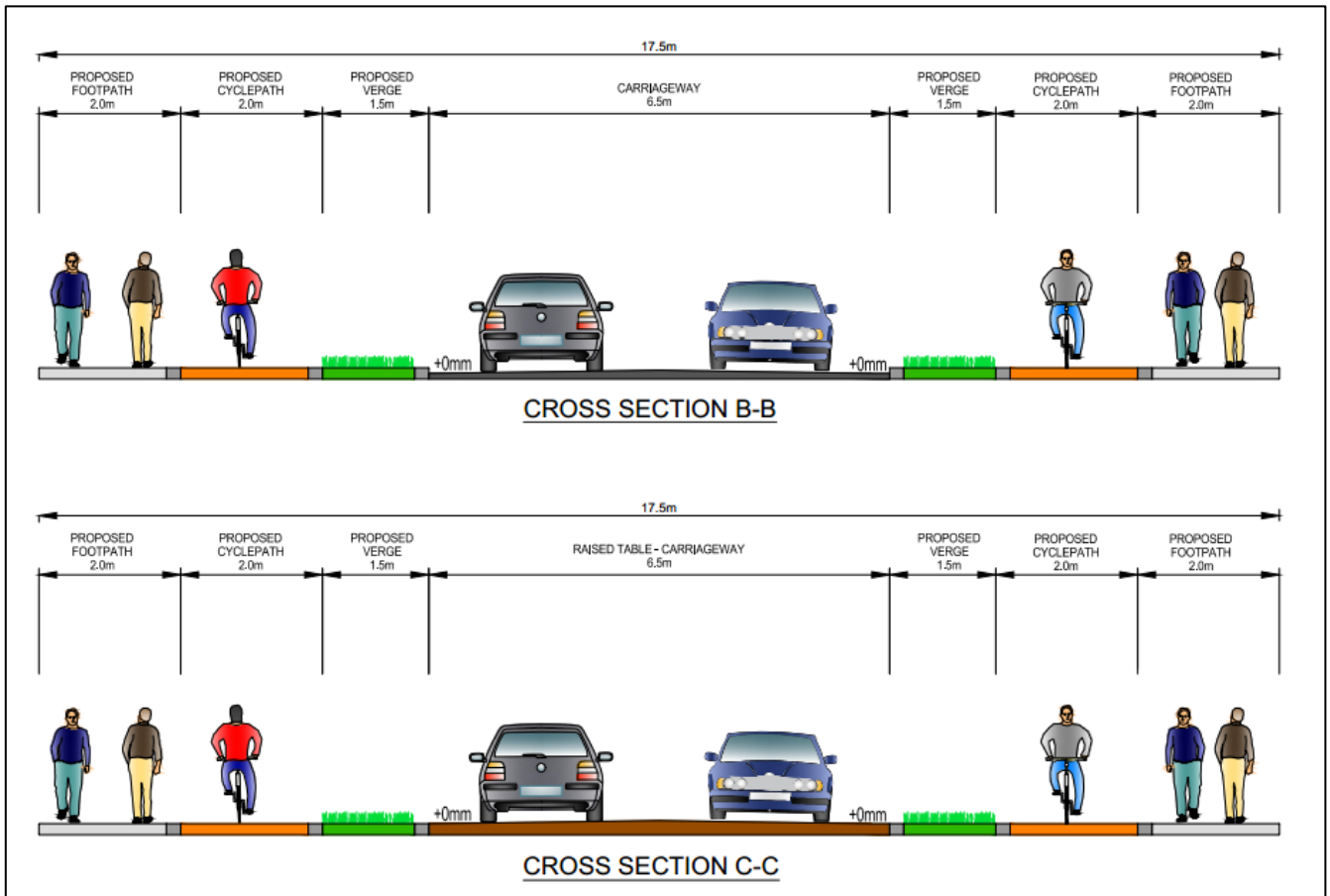
Figure 3-6 - Section of Link Street complete at Ballyman Road



The typical cross section of the Link Street is detailed in Figure 3-7 and shown in Atkins drawing 5186693/HTR/01/DR/0133. Section BB is located approximately 30metres south of the intersection with Berryfield Lane and Section CC is located along the section fronting the District Park. The location of the sections is shown in Atkins drawing 5186693/HTR/01/DR/0132 – Typical Cross Section Key Plan.

Due to the extent of Berryfield Avenue there are some local variations to this cross section. A 2m footpath width is proposed along both sides of this section of Berryfield Avenue with a 1.5m planted verge providing extra screening and protection from the carriageway. A 2m segregated cycle paths is proposed along both sides of this section of Berryfield Avenue. Two traffic lanes of 3.25m each way are also provided along this section of Berryfield Avenue. These are of an appropriate width to facilitate bus services. The road's layout is appropriately designed at junctions to facilitate vehicle turning movements whilst maintaining appropriate priority for pedestrians and cyclists.

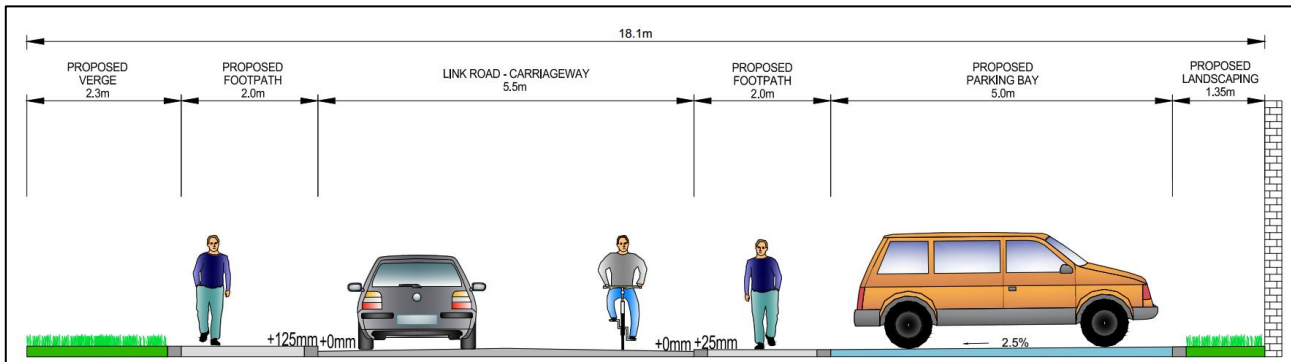
Figure 3-7 - Link Street – cross sections



3.4.3. Local Streets

The local streets provide access to the residential areas off the Link Street. A 2m footpath width is proposed along one side or both sides of the residential streets as required. Local Streets have been designed to be low traffic speed and low traffic volume environments that are suitable for cyclists to share the street carriageway with general traffic in a safe manner and therefore no segregated cyclist paths have been proposed. Local Streets have a carriageway of 5.5m wide consisting of two traffic lanes of 2.75m running each direction. In curtilage perpendicular car parking and on-street parallel car parking is provided on Local Streets. The typical cross section layout of the Local Street is detailed in Figure 3-8 and is shown in Atkins drawing 5186693/HTR/01/DR/0135.

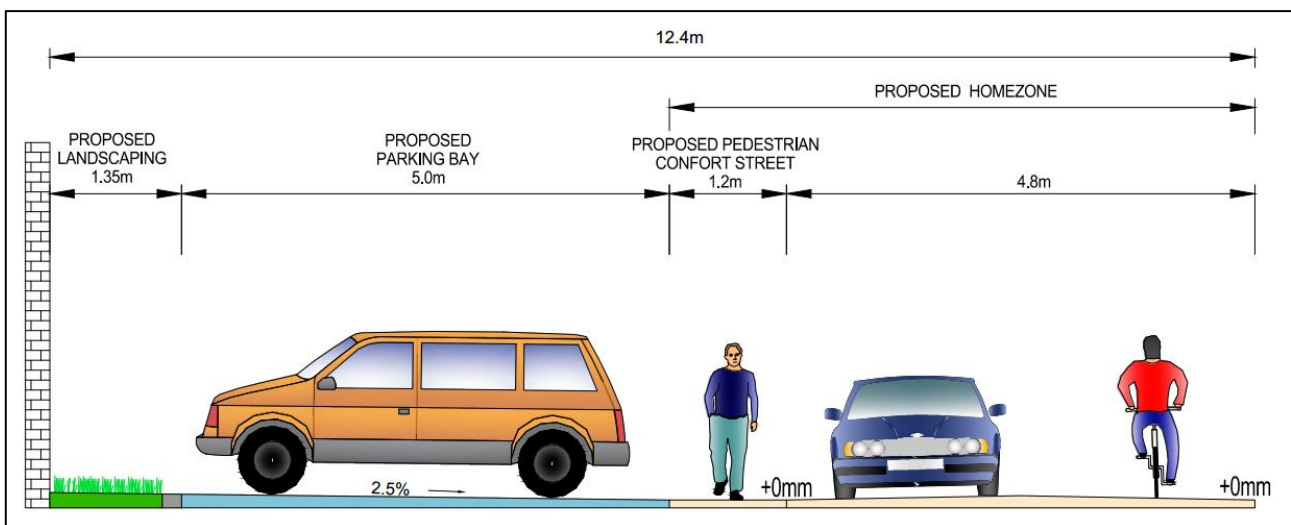
Figure 3-8 - Local Street – cross section



3.4.4. Homezone Streets

Homezone streets are designed as shared space streets for pedestrians, cyclists and vehicular traffic. The shared spaces will be central to the social fabric of the area as an informal space wherein children can play and the community can congregate, directly adjacent to their residences. This shared space provision will be fundamentally established in the context of very low volumes of traffic movements taking place at very low self-regulating traffic speeds. The typical cross section layout of the Homezone Street is detailed in Figure 3-9 and is shown in Atkins drawing 5186693/HTR/01/DR/0135. The pedestrian comfort strip facilitates pedestrians to step off the shared street should this be necessary. Typically, residential car parking is provided perpendicular to the Homezone Street.

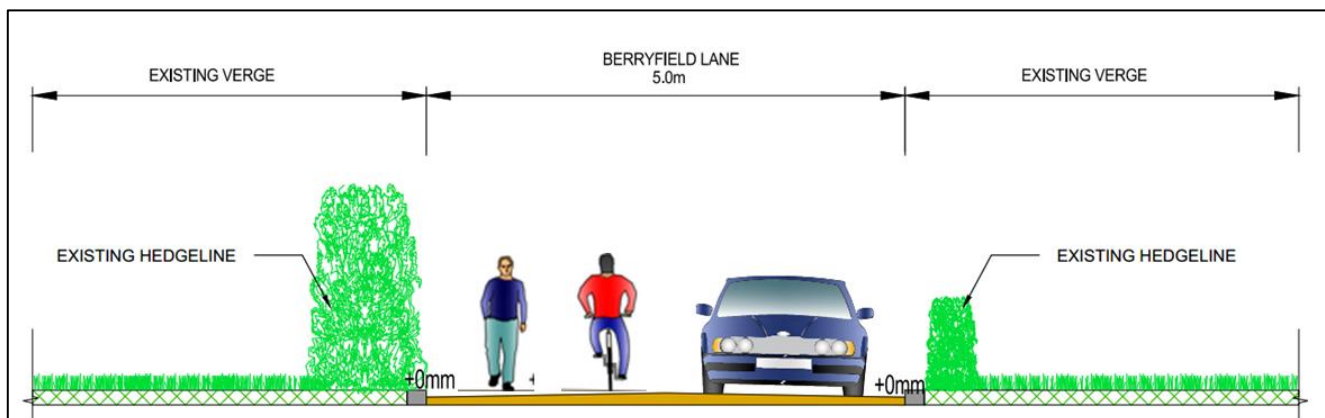
Figure 3-9 - Homezone Street – cross section



3.4.5. Berryfield Lane

Berryfield Lane is a boren typology street, specific to Fassaroe, incorporating the retention of the existing alignment and boren character of Berryfield Lane. The laneway will form a main spine pedestrian and cycle link through the development site. To maintain the boren character of Berryfield Lane footpaths and segregated cycle paths are not proposed. This street will carry very low levels of traffic catering only for local access for residents to a very limited number of residential properties. The typical cross-section of Berryfield Lane is shown in Figure 3-10 and is shown in Atkins drawing 5186693/HTR/01/DR/0135.

Figure 3-10 - Berryfield Lane – cross section



3.5. Designing for Safety

A Quality Audit incorporating a Stage 1 Roads Safety Audit was undertaken for the proposed scheme and is set out in Atkins document Ref 5186693DG0105. Problems and comments identified in the audit have been addressed and the proposed design revised where appropriate. Some issues identified will be appropriately addressed during detailed design of the scheme.

3.6. Design Speed

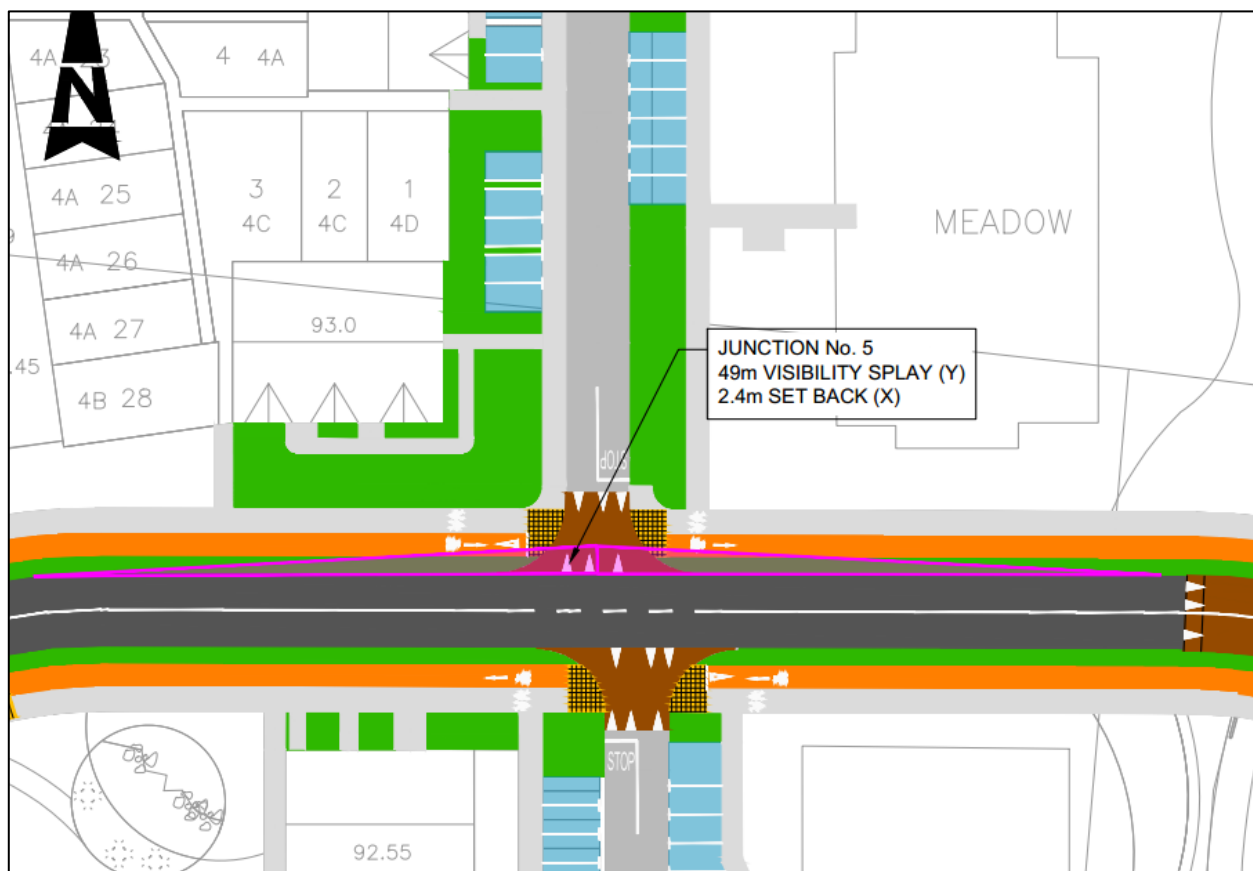
The design speed for the various road types is shown in Table 3-1. A 30km/h speed limit zone as required on residential streets is promoted via the combination of the design elements below:

- Horizontal and vertical alignment designed to 20-30km/h;
- Carriageway widths in line with DMURS requirement for street type;
- Constrained junction radii in line with DMURS requirement; and
- Provision of Raised Tables at Junctions.

3.7. Visibility

Visibility at junctions throughout the masterplan lands accords with the Stopping Sight distances requirements of DMURS and TII DNGEO-03031 where required. Junctions onto Berryfield Avenue, the main link street, have been designed with a visibility splay of 2.4m x 49m, representing the required “x” and “y” distances for a design speed of 50km/h along the link street which is a bus route. The required visibility splay is shown on drawings 5186693/HTR/01/0124 to 5186693/HTR/01/0128. An example of the visibility splay is shown in Figure 3-11.

Figure 3-11 - Example of required Visibility Splay at junction onto Link Street



Elsewhere within the masterplan layout visibility splays have been provided that accord with the lower design speeds in the residential areas of 20kmh- 30kmh.

Landscaping has been proposed so as not to create 'blind spots' and ensure that inter-visibility is maintained between pedestrians, cyclists and motorists at junctions along the main link street, Berryfield Avenue. However, at other locations where the movement function is less such as at local streets and homezone landscaping has been used to encourage lower traffic speeds as recommended in DMURS 4.2.7 *Planting*.

3.8. Streetscape

The masterplan accord with DMURS 4.2 Streetscape through the design approach outlined in Table 3-3.

Table 3-3 – Compliance with DMURS Streetscape Guidance

DMURS Section	DMURS Details	Compliance
4.2.1	Building Height and Street Width	Streets are defined and fronted by buildings that provides a sense of enclosure and overlooking
4.2.2	Street Trees	Street trees form and integral part of the street design approach with (appropriate) trees located on all streets on the masterplan layout
4.2.3	Active Street Edges	All streets have active frontages appropriate to the land uses. The Neighbourhood Centre is lined with active frontages. Residential dwellings overlook residential streets including buildings that turn corners.
4.2.4	Signage and Line Markings	Signage in the development will be in accordance with required regulations ((<i>Traffic Signs Manual – (TSM)</i>)) for mandatory signage. In accordance with Section 1.1.10 of the TSM <i>Signs should only be erected where there is a demonstrable need, because unnecessary, incorrect or inconsistent signs detract from the effectiveness of those that are required and tends to lead to disrespect for all signage</i>
4.2.5	Street Furniture	A wide range of street furniture will be provided throughout the masterplan including appropriate levels of lighting and seating
4.2.6	Material and Finishes	The material palette for the masterplan is robust, easily maintained and appropriate to its locations and intended use and will enhance legibility.
4.2.7	Planting	Planting is provided throughout the Masterplan lands appropriate to the location context.

4. Junction Design

The design of the junctions included in this planning application are designed to the standards outlined below. Junction design detail such as junction radii are set out in Table 3-1. Vehicle path analysis has been utilised to ensure all junctions are appropriately designed to accommodate typical vehicle movements. As recommended by DMURS junctions are not oversized to accommodate occasional movements by larger vehicles which result in large junction radii that adversely impact on pedestrian and cyclist movements and safety. Vehicle tracking has been undertaken for larger vehicles such as refuse to demonstrate that these vehicles can appropriately and safely manoeuvre through the proposed masterplan junctions. These are shown on drawings 5186693/HTR/01/0129 to 5186693/HTR/01/0131.

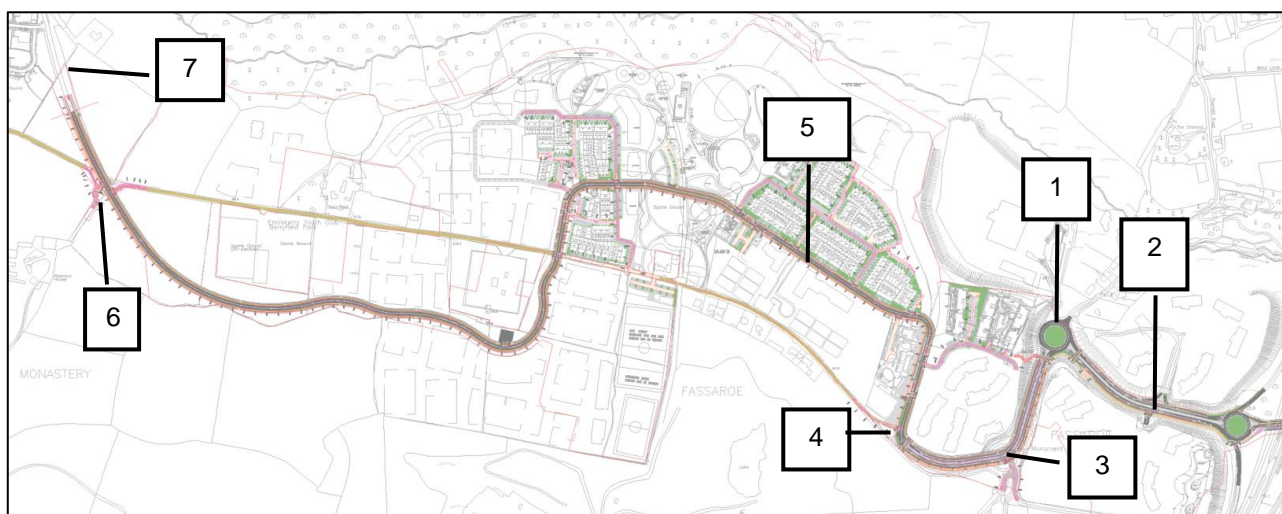
4.1. Design Details

The following junctions are discussed in additional detail:

1. Thornhill Road roundabout;
2. Employment Zoned Lands Access;
3. Kilbride Lane / Roadstone Junction;
4. Berryfield lane Junction at Neighbourhood Centre;
5. Various residential road junctions (including District Park Carpark Junction) onto Berryfield Avenue;
6. Berryfield Avenue Berryfield Lane western junction; and
7. Berryfield Avenue Ballyman Road tie in.

The location of the above junction is shown in Figure 4-1.

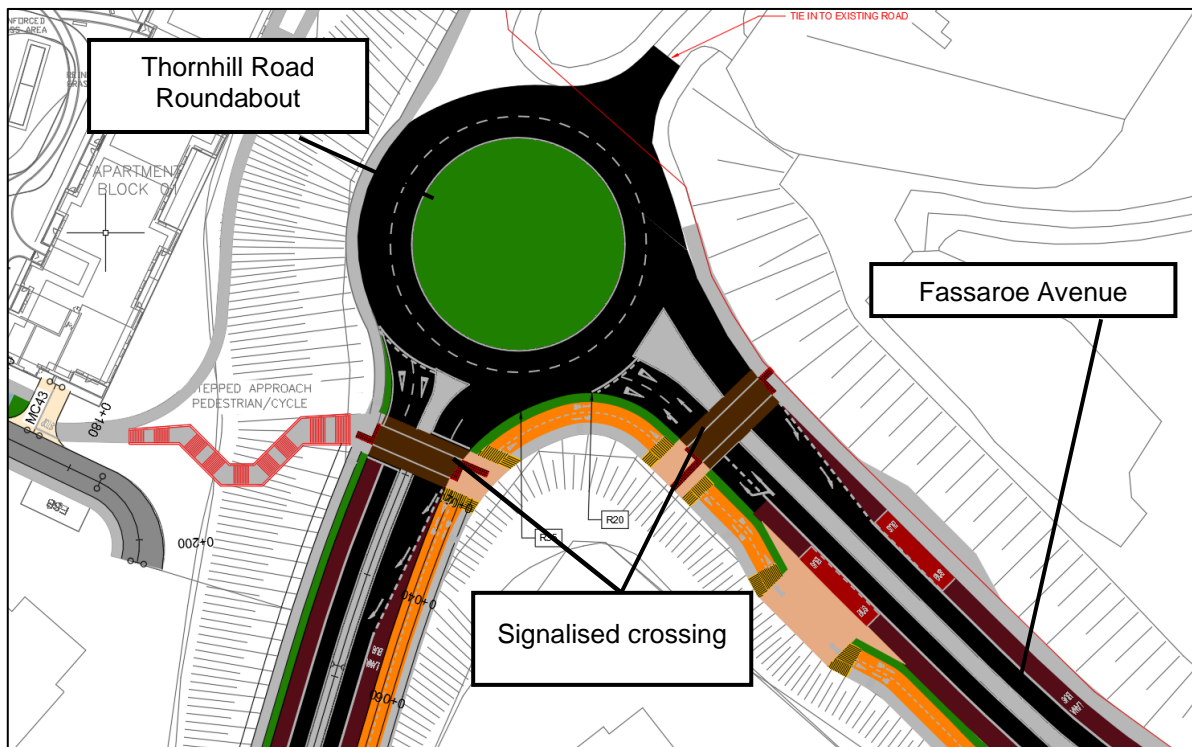
Figure 4-1 - Junction locations



4.1.1. Thornhill Road Roundabout

The existing roundabout arm on Thornhill Road roundabout will be upgraded to incorporate the proposal to introduce dual lanes in each direction along Fassaroe Avenue up to the junction with Berryfield Lane and the southwestern extents of the Neighbourhood Centre. Two signalised crossings are provided across Fassaroe Avenue providing a safe means to cross the road that align with desire lines to the bus stops on Fassaroe Avenue. A bi-directional cycle track is located on the southern side of Fassaroe Avenue providing connections between the proposed development and Bray via the proposed pedestrian and cycle bridge over the N11. The proposed junction and road are shown Figure 4-2.

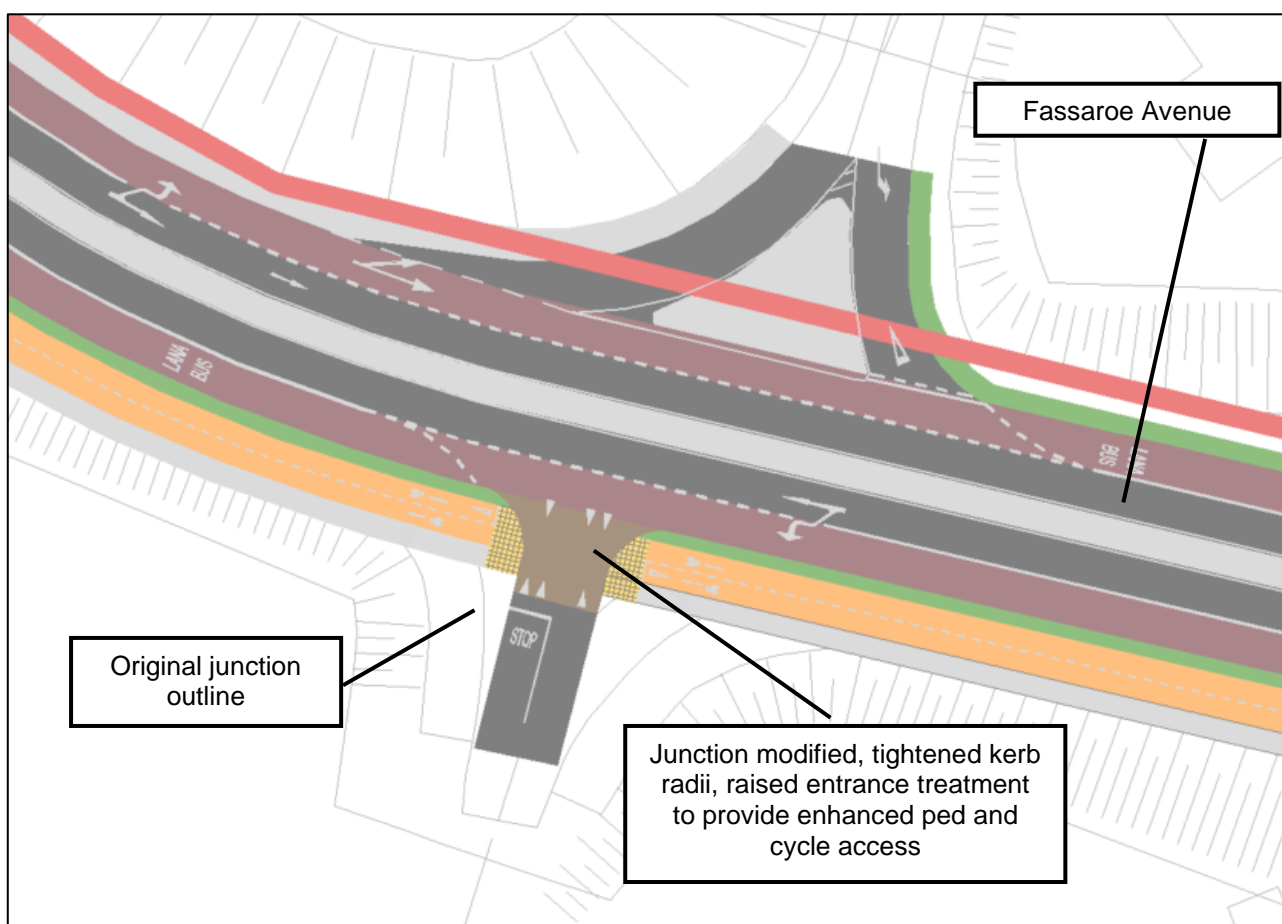
Figure 4-2 - Thornhill Road Roundabout



4.1.2. Employment Zoned Lands Access Southern side of Fassaroe Avenue

A future access to the employment zoned lands on the southern side of Fassaroe Avenue has been modified and simplified to provide enhanced pedestrian and cycle crossing facilities and reduce vehicle dominance at this junction. The proposed junction is shown in Figure 4-3. The junction radii have been reduced to 6m in accordance with DMURS recommendations (*Section 4.3.3 Corner Radii*). The tighter radii along with a raised entry treatment across the junction mouth provides pedestrian and cycle priority at this location. The junction geometry will still provide the necessary level of access for the future development parcel and will operate as originally designed on a 'left in and left out only' basis.

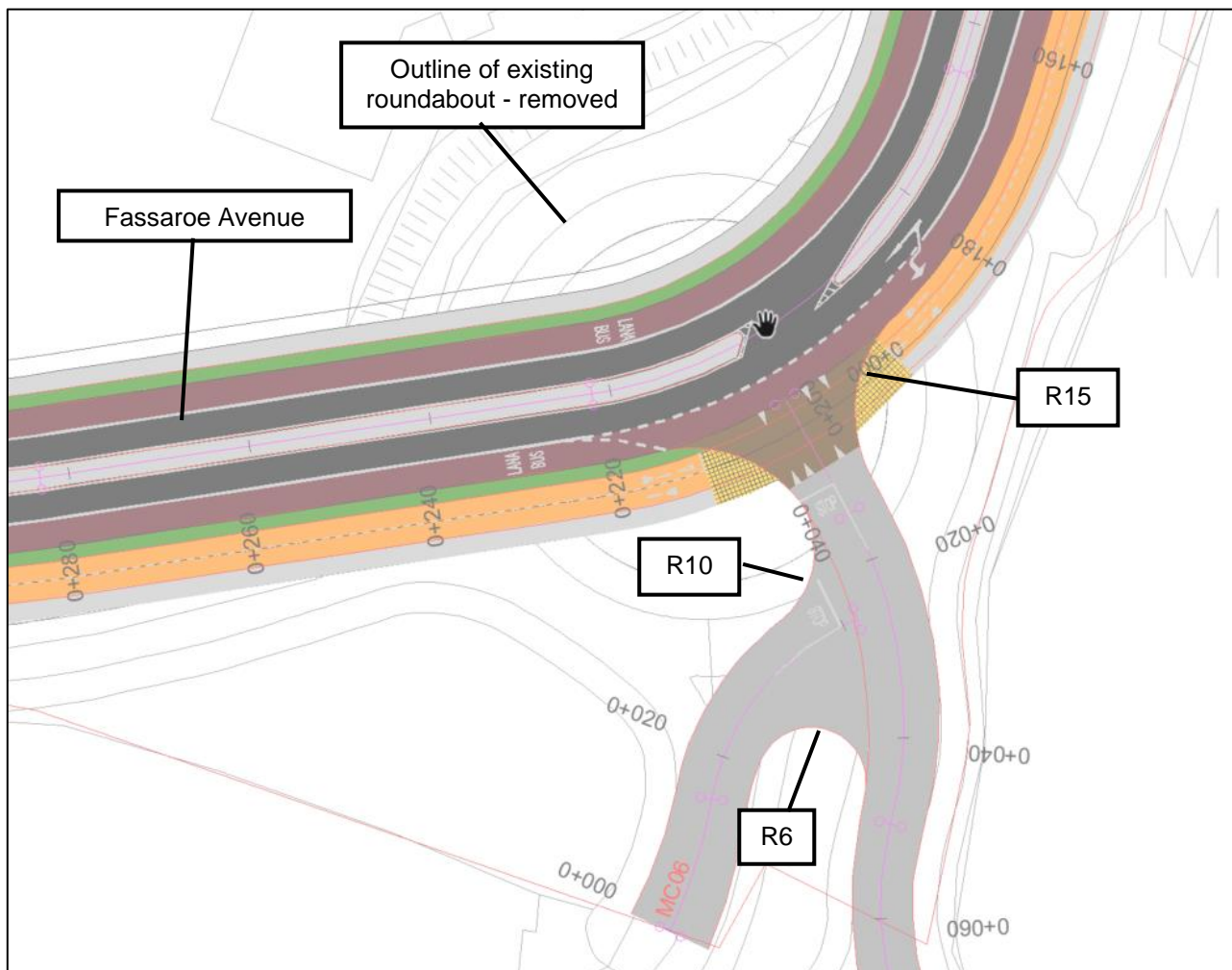
Figure 4-3 - Modified junction to Future Phase



4.1.3. Kilbride Lane / Roadstone junction

The existing roundabout which accesses Kilbride Lane and Roadstone is proposed to be replaced with a T-junction arrangement. The proposed junction layout is shown in Figure 4-4 The T-junction layout has been designed based on the requirements of design standards DMURS and TII DNCEO03060.

Figure 4-4 - Kilbride - Berryfield Lane Junction



Junction radii of 10m are recommended in DMURS (*Section 4.3.3 Corner Radii*) to accommodate regular commercial vehicle accessing the commercial site of Roadstone. Vehicle path analysis has been carried out at the junction to ensure that the junction can accommodate the largest expected vehicles.

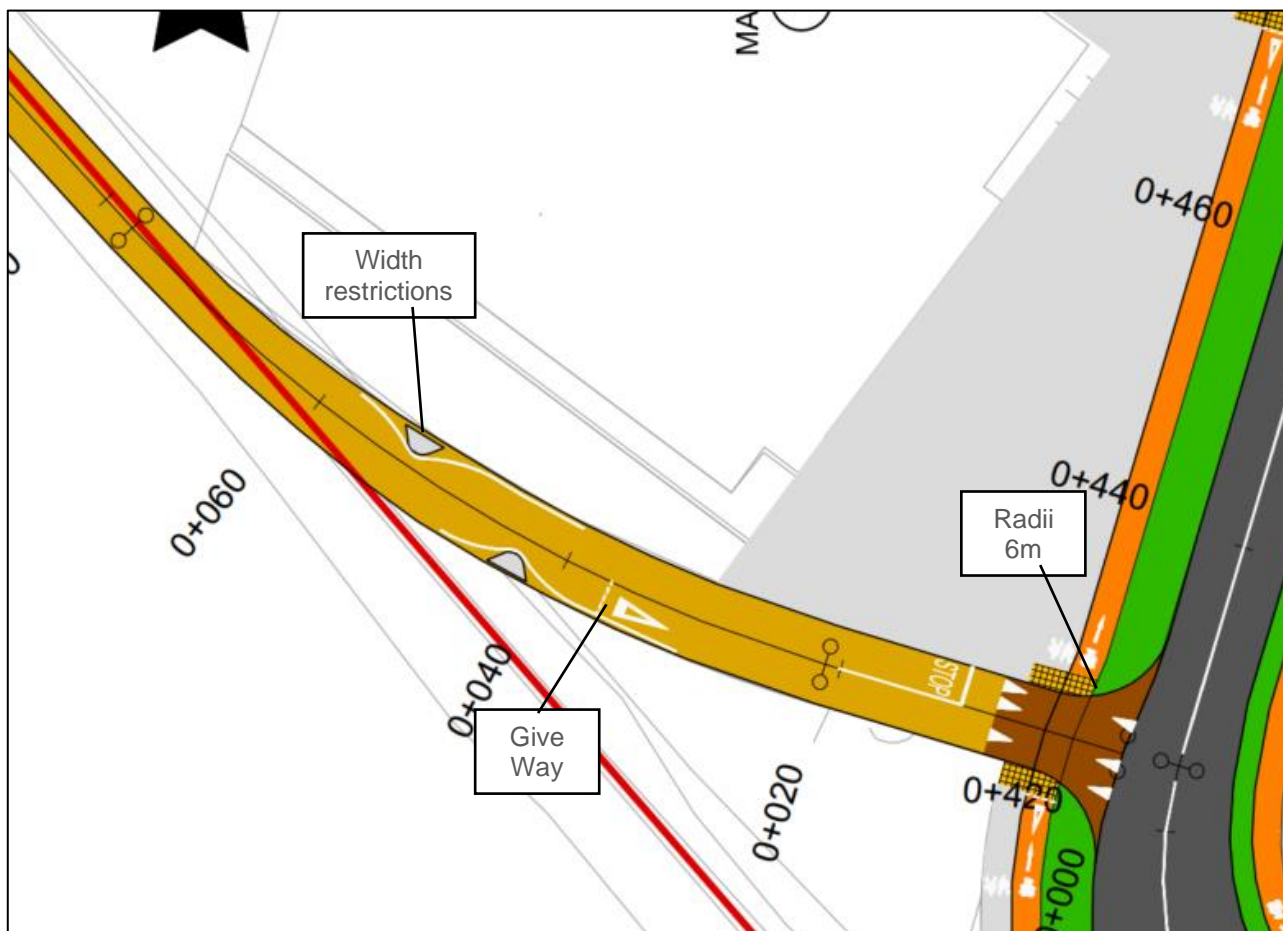
The junction radii between Kilbride Lane and Fassaroe Avenue are designed to 15m to accommodate large vehicles entering Roadstone. The access junction into Roadstone off Fassaroe Lane has a proposed 10m radius towards Fassaroe Avenue which will be the predominant traffic movement and 6m towards Kilbride Lane which will be the minor traffic movement. The restriction to 6m is in line with the recommended radius in DMURS where there are occasional large vehicles.

A break in the central reserve has been designed to allow vehicles heading towards the N11 to turn right from exiting Kilbride Lane onto Fassaroe Avenue, then through Thornhill Road Roundabout onto the N11 via junction 6. No right turn will be permitted into Kilbride Lane. Such traffic will use The Thornhill Road Roundabout to U-turn and then turn left into Kilbride Lane.

4.1.4. Berryfield Lane – Neighbourhood Centre Junction

The realigned Berryfield Lane is proposed to be accessed via a new T-junction off the proposed Berryfield Avenue to the south of the Neighbourhood Centre Site. The proposed junction layout is shown in Figure 4-5. The T-junction layout has been designed based on the requirements of design standards DMURS. It is anticipated that Berryfield Lane will have limited vehicular traffic and the junction design is reflected of this with junction radii of 6m and a raised cross to provided pedestrian priority across this junction.

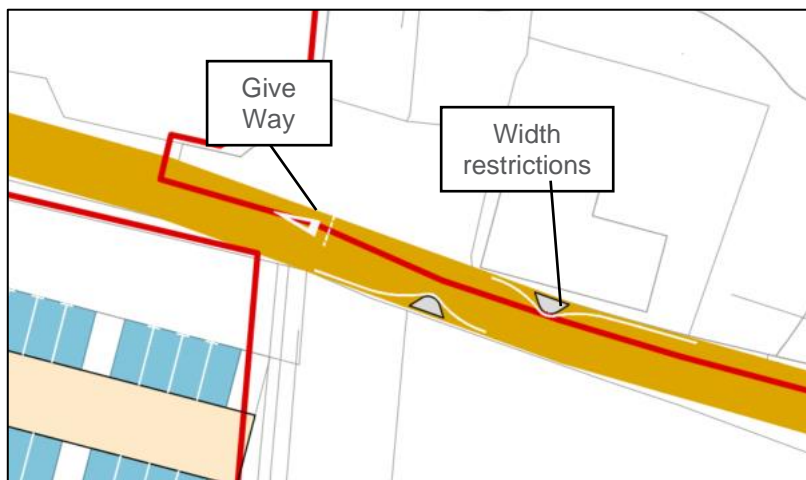
Figure 4-5 - Berryfield Lane - Neighbourhood Centre Junction



In order to discourage non-residential traffic from accessing Berryfield Lane, a 'give way' width restriction has been placed to the west of the access off Berryfield Avenue as shown in Figure 4-5. Signage will be placed to discourage through traffic including the introduction of give way markings at the width restriction to indicate priority to exiting vehicles.

A similar feature is to be provided further west on Berryfield Lane, to the south of the active play car park, where Berryfield Lane again intersects with Berryfield Avenue. At this location priority is provided for vehicles heading in a westerly direction as shown in Figure 4-6.

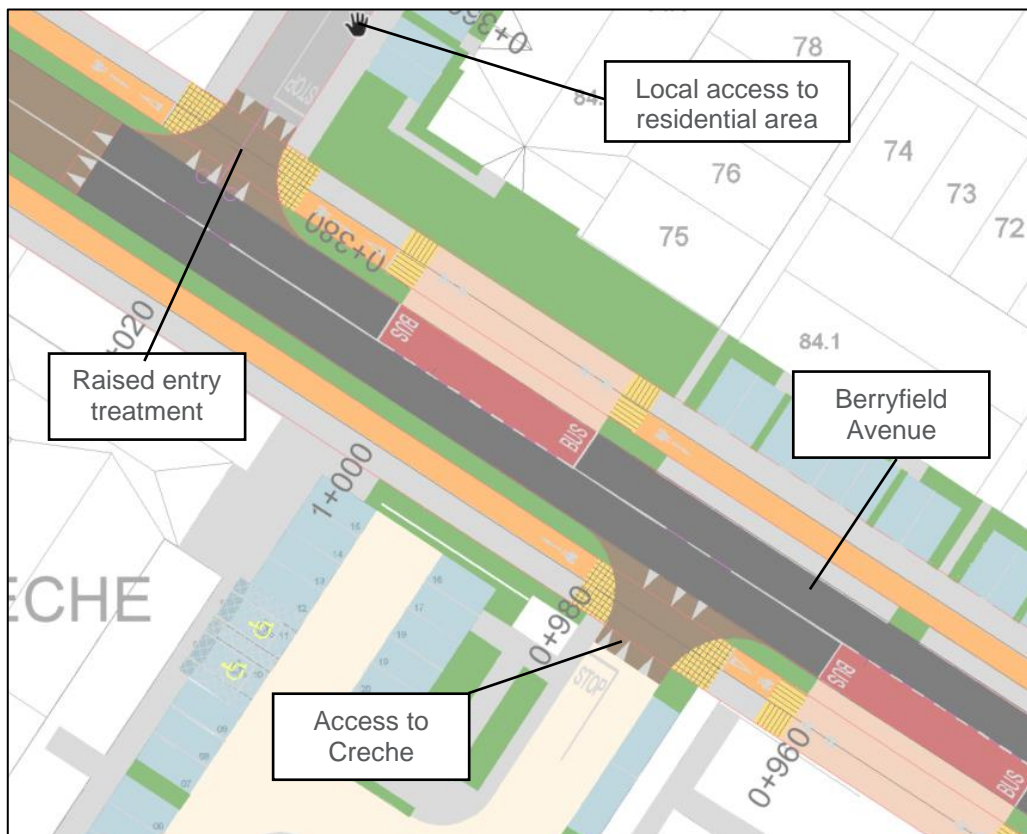
Figure 4-6 - Vehicle restriction & priority Measures on Berryfield Lane



4.1.5. Various junctions onto Berryfield Avenue

There are a number of junctions proposed onto Berryfield Avenue from the lands uses fronting this including residential areas, access to the creche and the district park. These junctions are proposed to be priority T-Junctions with traffic from the minor arm giving way to traffic on main arm, Berryfield Avenue. An example of these typical junctions is illustrated in Figure 4-7. This shows a junction to a local street and creche junctions onto Berryfield Avenue. Pedestrian and cycle priority is maintained across the junction mouth via a raised entry treatment.

Figure 4-7 - Typical T-Junction onto Berryfield Avenue

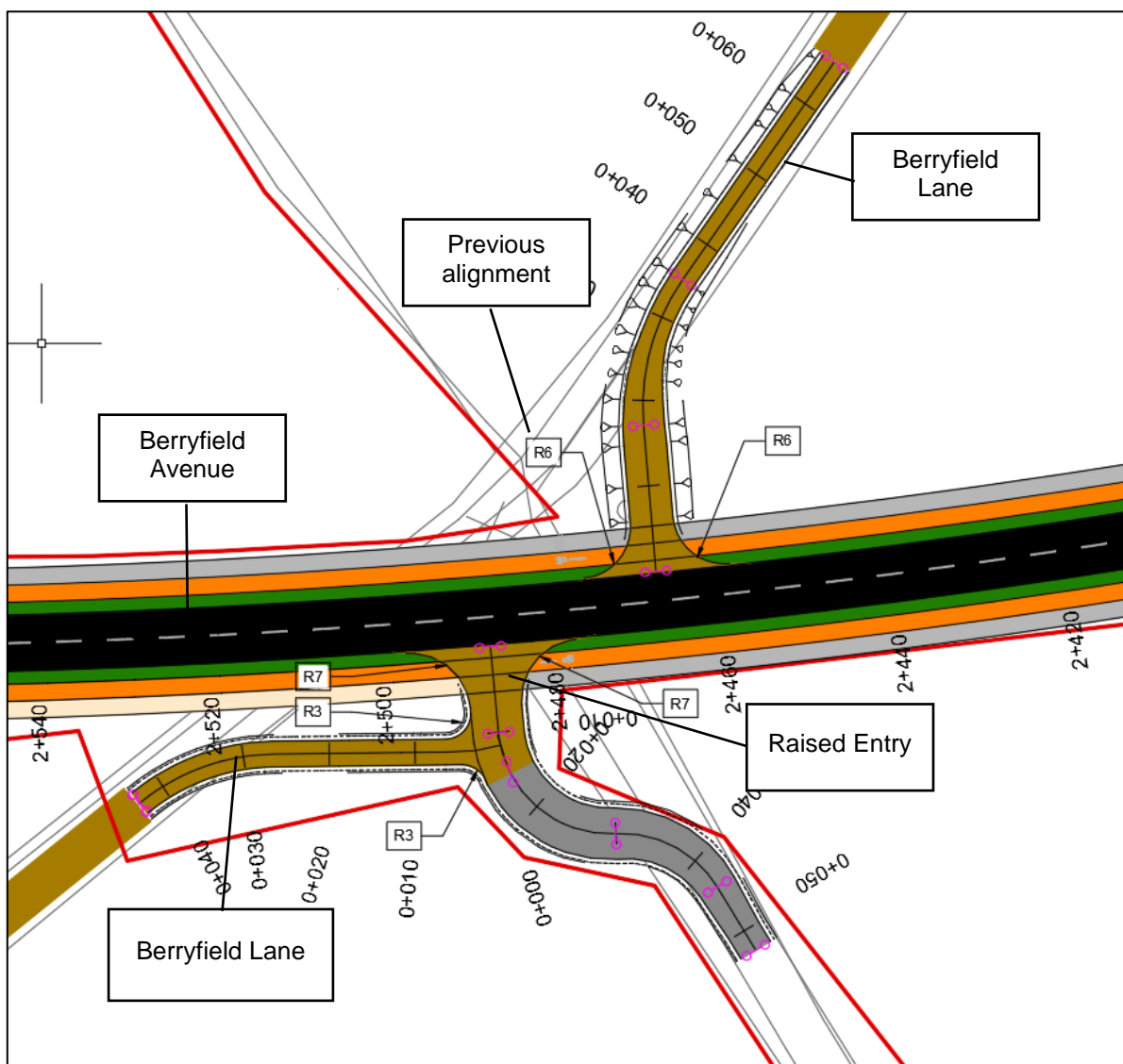


The T-junction layout has been designed based on the requirements of design standards DMURS and the National Cycle Manual. The junction radii between the residential roads and Berryfield Avenue are 6m as recommended in DMURS for occasional large vehicles and to ensure that large vehicles don't cross the centre line of the intersecting road.

4.1.6. Berryfield Avenue – Berryfield Lane Western Junction

Where Berryfield Lane is proposed to be crossed by Berryfield Avenue to the west of the development a new junction is proposed as shown in Figure 4-8.

Figure 4-8 - Berryfield Avenue - Berryfield Lane Western Junction



The junction designed based on the requirements of design standards DMURS as a set of staggered T-junctions aligned at right angles to Berryfield Avenue. Raised entry treatments are proposed across both new junction mouths to provide pedestrian and cycle priority in accordance with DMURS and NCM recommendations.

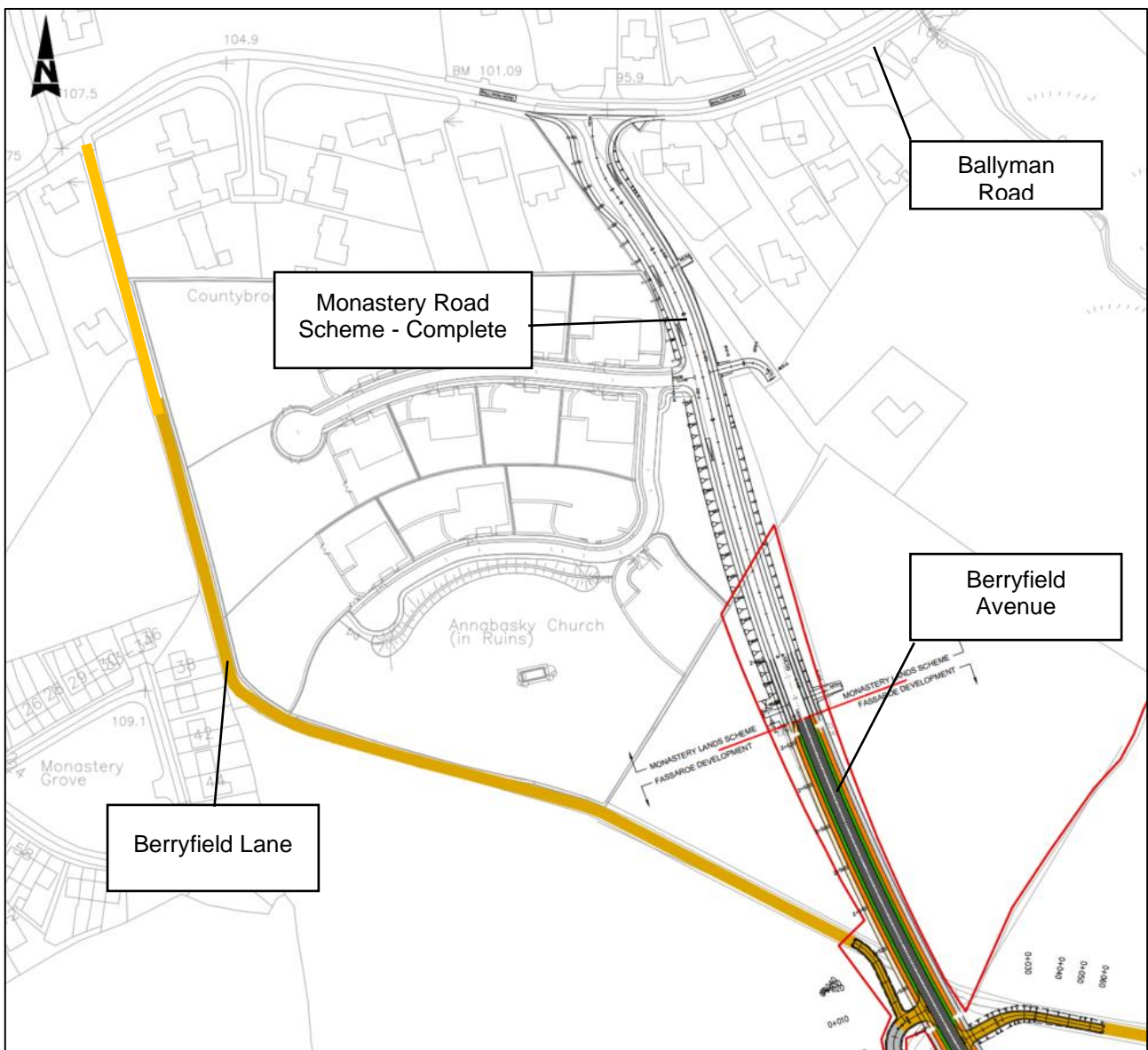
On the eastern arm of the junction the junction radii of 6m are provided in accordance with DMURS. Vehicle path analysis has been carried out at the Local Access Road junction to ensure that the junction can accommodate the largest expected vehicles and the junction radii have been designed to 7m to accommodate the largest expected vehicles. Once Berryfield Avenue is opened and connects with Ballyman Road it is

expected that the vast majority of traffic will travel through Fassaroe along this route, and this will result in very limited traffic volumes on Berryfield Lane.

4.1.7. Berryfield Avenue – Ballyman Rd junction Tie In

Berryfield Avenue will tie into the completed Monastery Road scheme at the western extend of the CPG lands as shown in Figure 4-9. The previously constructed Monastery Road scheme includes pedestrian footpaths and segregated cycle tracks along its length to the junction with Ballyman Road. This ensures a continuity of pedestrian and cycle facilities from the west at Ballyman Road junction, along Berryfield Avenue and Fassaroe Avenue, over the N11 via the new active travel bridge and onto Upper Dargle Road.

Figure 4-9 - Berryfield Avenue tie into Ballyman Rd link



The Monastery Road scheme ties into the Ballyman Road via a new junction as shown in Figure 4-10.

Figure 4-10 - Ballyman Road Junction



4.2. Internal Junction Design

Internal junction radii are designed in accordance with the design criteria outlined in Table 3-1. Sight lines are to provide a visibility splay of 23m commensurate with a design speed of 20-30km/h at a setback of 2.4m for junctions of Local Streets and Link Streets and a visibility splay of 14m commensurate with a design speed of 20km/h at a setback of 2.0m for junctions on Local Streets and Homezone Streets.

5. Pedestrian and Cycle Facilities

The delivery of pedestrian and cycling infrastructure within the site and onward connections to Bray is a central facet of this development. The development of the lands at Fassaroe accords with the '15-minute neighbourhood' principles in that the range of residential units, commercial uses, leisure, amenity and employment (later phases) uses will provide residents and users with all necessary facilities on their door step that will encourage walking and cycling and minimise the need to travel short distances by private car.

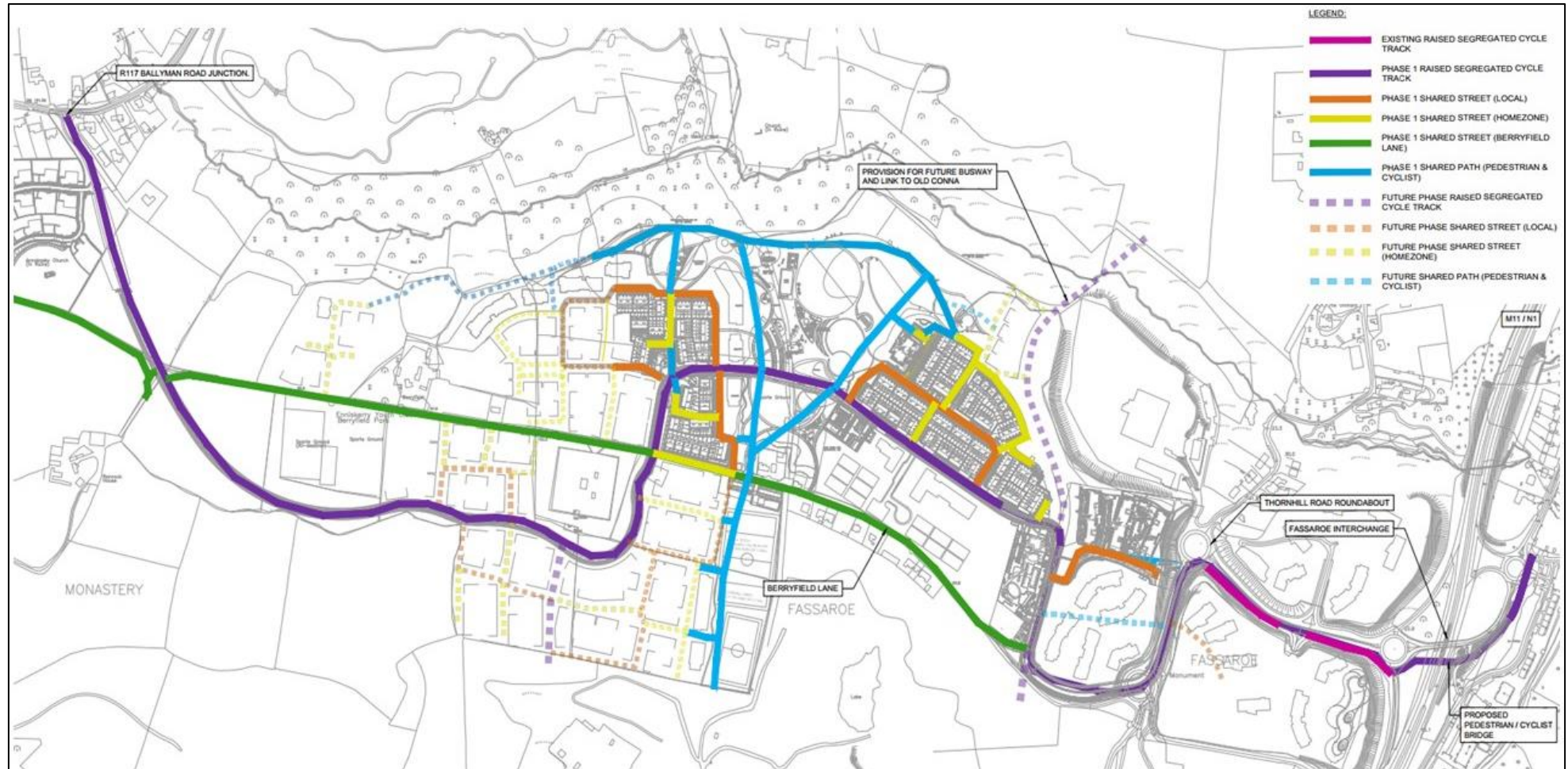
The masterplan for the CPG lands has been developed to maximises connectivity and permeability across and through the site through a network of walking and cycling paths and tracks that provide direct overlooked linkages to and from all major destinations including public transport facilities. The range of pedestrian and cyclists' facilities includes:

- Footpaths adjoining the external and internal road network;
- Internal pedestrian and cycle only routes;
- Segregated cycle tracks along Berryfield Avenue & Fassaroe Avenue;
- Shared on-road cycle provision on low traffic low speed environment such as local street and Homezones;
- Segregated pedestrian and cycle links from the site across the N11 to Upper Dargle Road;
- Pedestrian and cycle paths within the District Park; and
- Paths directly linking the Thornhill Road Roundabout to the main site adjacent Blocks 1,2 & 3.

The proposed pedestrian and cyclist provision for the street typologies are detailed in Table 3-2 and accords with DMURS guidance and an overview of pedestrian and cyclist facilities within the masterplan is shown in is shown in Figure 5-1.

Raised crossing are provided at junctions along Link Street typologies to provide priority to cyclists and pedestrians crossing these side road junctions. In addition, shared pedestrian and cycle links are proposed through all of the open spaces within the development.

Figure 5-1 - Pedestrian and Cycle Facilities within the Masterplan



5.1. Pedestrian and Cyclist Crossing

There is a range of crossing facilities proposed within the CPG masterplan lands, including controlled signalised crossing in the form of TOUCANs, uncontrolled crossing, raised tables and dropped kerbs (as recommend in DMURS, section 4.3.2 **Pedestrian Crossings**). In general, the design of pedestrian and cycle crossing will follow best practice guidance and the requirements of necessary guidance including the National Cycle Manual (NCM) where appropriate. They are:

- Formal / Signalised crossing – located on Fassaroe and Berryfield Avenue. Signal crossing in the development are one-stage crossings to allow pedestrians and cyclists to cross the street in one movement;
- Courtesy Crossing – generally defined by change in material and or vertical deflection – located in lower speed environments where formal controlled crossing is not required; and
- **Dropped kerbs – located on local streets and areas where traffic is very light.**

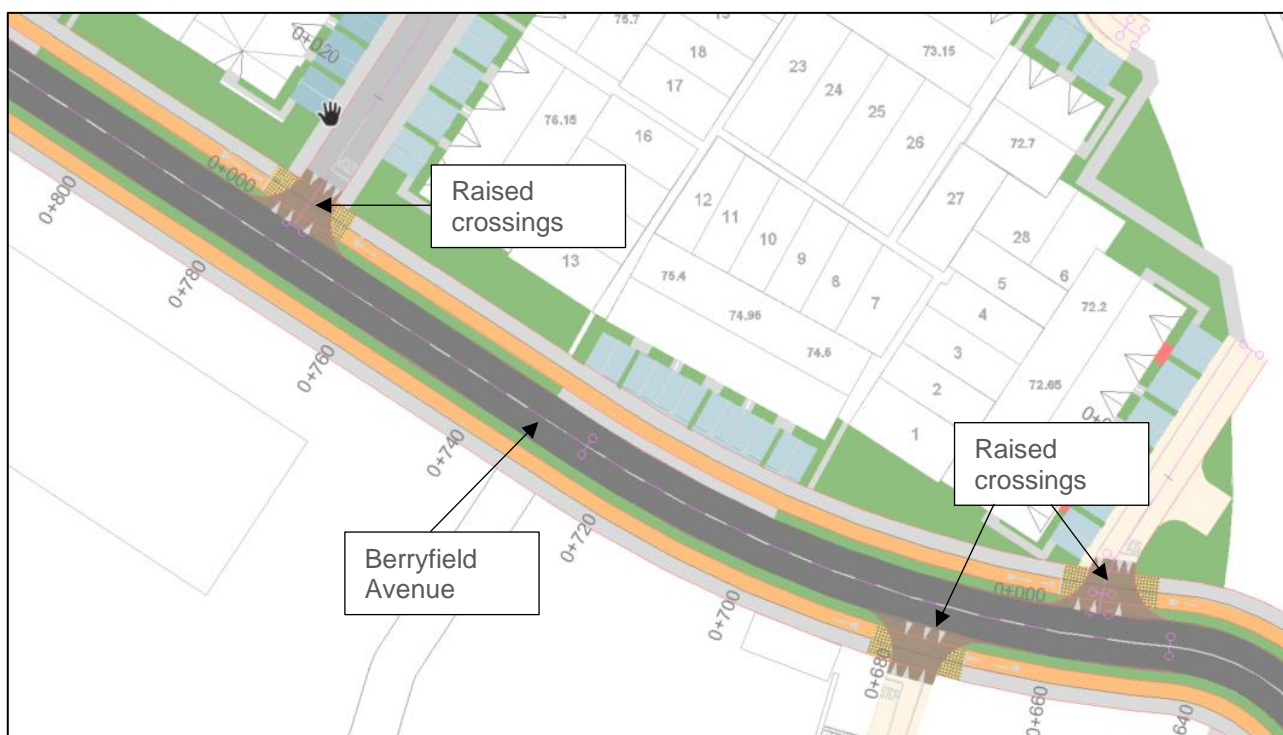
The type of crossing provided at a specific location has been determined by a number of factors including, safety, demand, traffic flow (volumes and speeds) and land uses.

As recommended in DMURS - 4.3.2 *pedestrian Crossings* where crossing have been provided, they are:

- Provide pedestrian crossing facilities at junctions and on each arm of the junction;
- Minimise corner radii so that crossing points are located closer to corners on pedestrian desire lines;
- Provide regular mid-block crossings in areas of higher pedestrian activity, such as Neighbourhood centres; and
- Locate mid-block crossings at strategic locations where pedestrians are likely to cross, such as adjacent to bus stops.

Raised crossing with tactile paving is provided at the majority of side road junctions along Berryfield Avenue and Fassaroe Avenue. An example of a raised crossing is shown in Figure 5-2.

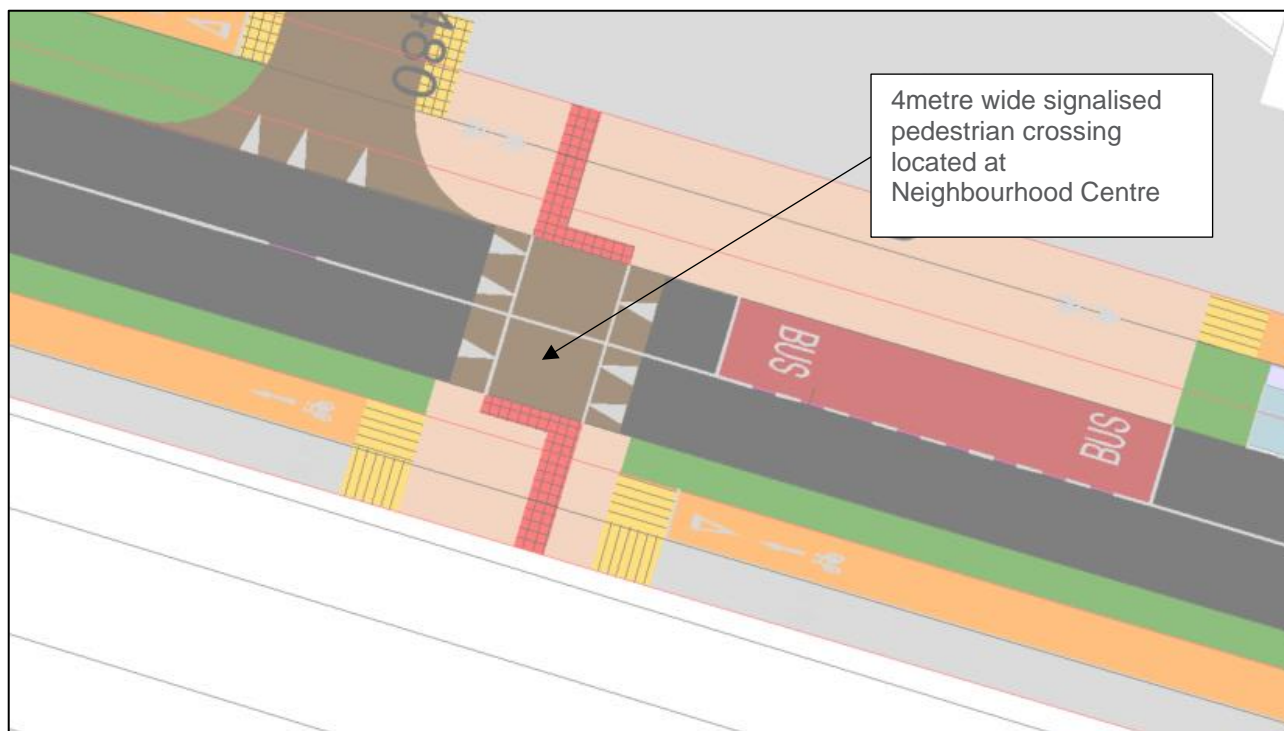
Figure 5-2 - Example of a Typical Raised Crossings Along Berryfield Avenue



Controlled crossings are provided at areas where there is expected to be a high demand and to facilitate the safe crossing of busier traffic streets such as along the frontage of the Neighbourhood Centre and along Fassaroe Avenue to access facilities such as bus stops and two-way segregated cycle facilities. The location / example of a typical controlled crossing is shown in Figure 5-3.

Signal controlled crossing has been designed to accord with Traffic Signs Manual Section 7.16 *Pedestrian crossings*.

Figure 5-3 - Typical Controlled Crossing detail



Raised crossings across Berryfield Avenue are located at a number of locations within the masterplan lands as a means of traffic calming and reinforcing pedestrian priority at key nodes. The design and location accord with the recommendation in DMURS - 4.3.2 *pedestrian Crossings* and Traffic Management Guidelines Chapter 6 – Traffic Calming.

One such location is where Berryfield Avenue intersects the District Park. A continuous raised platform will be created across the frontage to create a physical and visual link and gateway between the two parts of the District park that prioritises pedestrian activity. The road surface will be treated with a different material to further reinforce this location as a pedestrian priority area. The gateway will be further enhanced by dense tree planting along the park edge creating a different feel to the road edge and also contributing to the traffic calming of this road section. The continuous crossing is a continuation of the main pathway network and therefore its design creates a seamless link between either side of the park.

There is one location in the proposed development, on Berryfield Avenue, where private entrances and driveways cross over footpaths and cycle tracks. Where this has occurred, it has been designed to ensure that pedestrians and cyclists have priority over any traffic accessing or egressing the property. Vehicles will be able to safely enter and exit the property, without compromising the cycling or pedestrian function. The cycle and footpath facility will be continuous across the access, not dipping at the crossover point. Where the cycle track is immediately adjacent to the carriageway, the vehicular ramp will be provided by a bevelled kerb. This is shown in Figure 5-4.

Figure 5-4 - Treatment of Private Entrances



5.2. External Pedestrian and Cycle Connections

In addition to extensive internal pedestrian cycle facilities the development provides external connections from the site, in particular towards Bray. Extensive pre-application discussions and engagement between the clients Design Team, Wicklow County Council and other stakeholders has taken place to develop appropriate external connections. One of the key strategies is the delivery of the Greater Dublin Area Cycle Network facilities as identified in the Bray and Enniskerry Area, namely route W2a, as shown in Figure 5-5.

Figure 5-5 - GDA Cycle Network in Bray Fassaroe Area



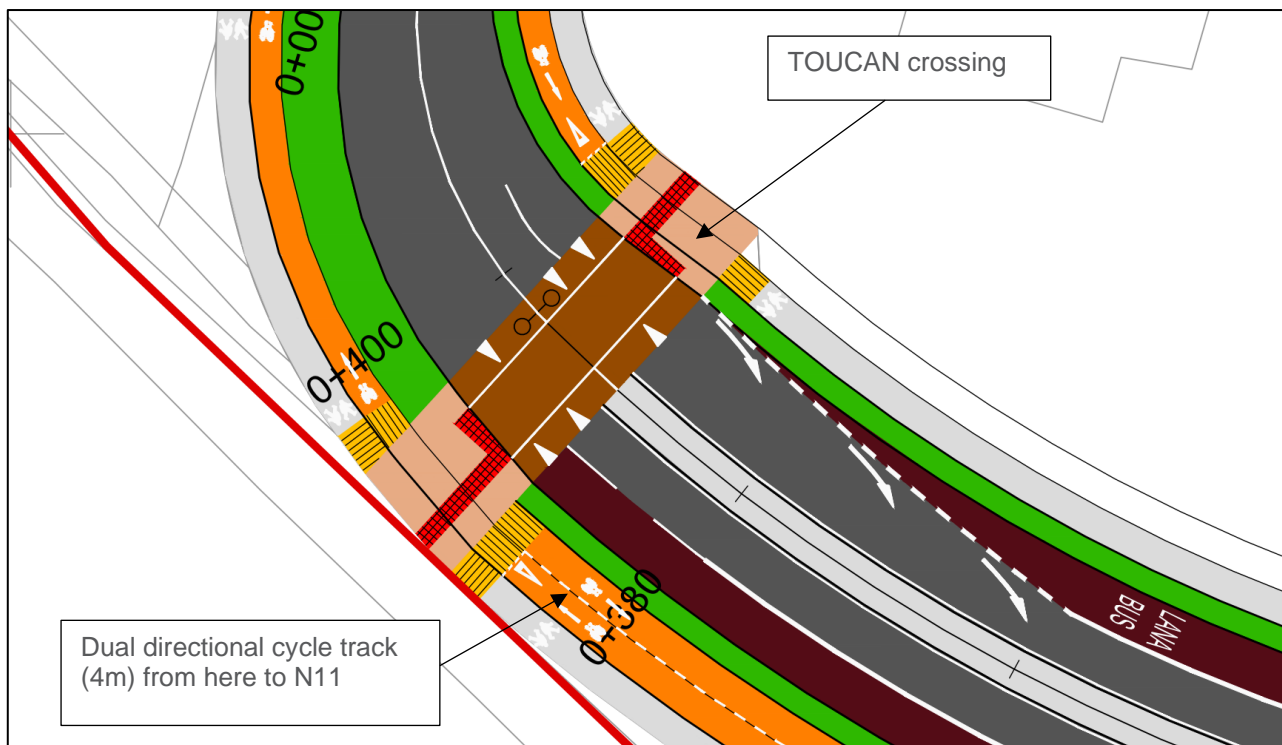
Cycle Route W2a will be provided by the developer and completed as part of the Phase 1 development, while cycle route BG1 will be provided by Wicklow County Council. As noted above a fully segregated off road cycle track is proposed on Berryfield Avenue to a location at the southern end of the Neighbourhood Centre where it meets the Berryfield Lane junction. The following section details the cycle and pedestrian facilities provided for in this application from this point to W2a at La Vallee at Upper Dargle Road. This section is shown in Figure 5-6. Detailed drawings of this section of the pedestrian and cyclist facilities are provided in drawings 5186693/HTR/01/0112 to 5186693/HTR/01/0114.

Figure 5-6 W2a route from Neighbourhood Centre to La Vallee / Upper Dargle Road



After the junction with Berryfield Lane the cycle track proposed on the northern side terminates, with a dual direction segregated cycle track proposed on the southern side of the Boulevard Street from this point onwards towards the N11 crossing. A TOUCAN crossing has been provided at this location to provide safe easy crossing facilities onto the dual cycle track. The TOUCAN crossing design accords with National Cycle Manual Section 4.7.2 *Controlled Crossing* and the Traffic Signs Manual Section 7.16 *Pedestrian crossings*. The detail of this is shown in Figure 5-7.

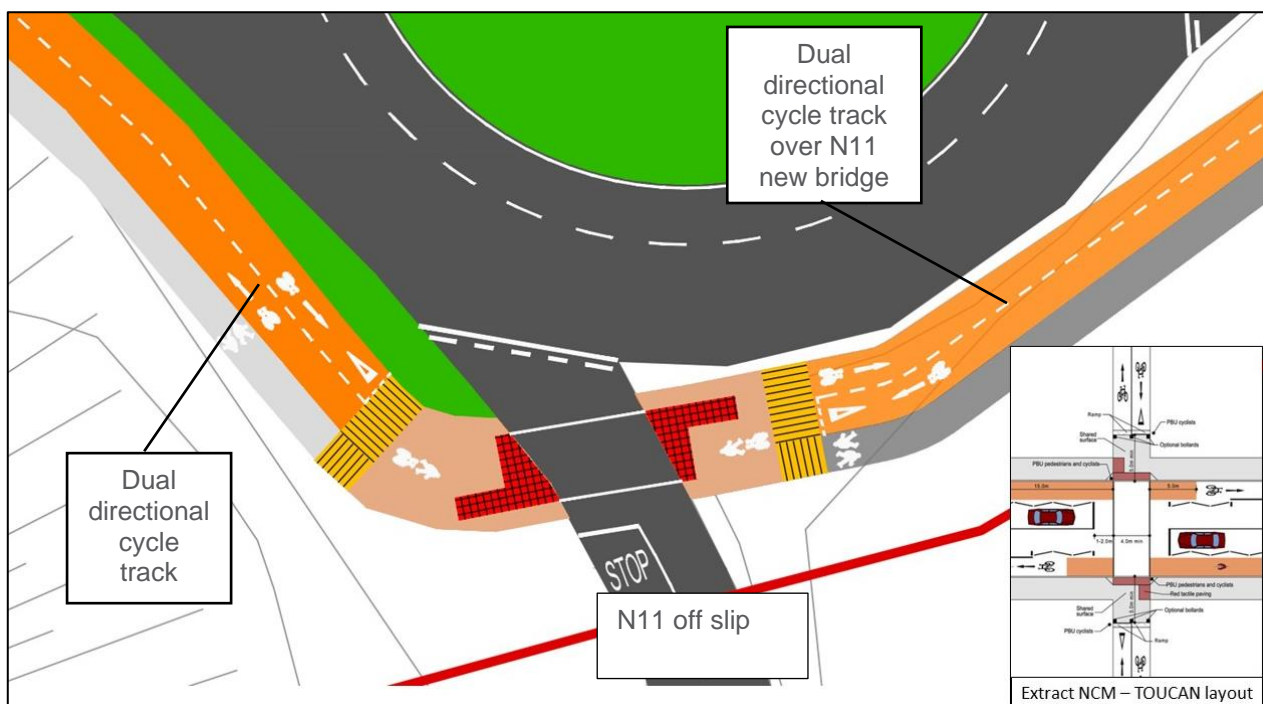
Figure 5-7 - TOUCAN Crossing to dual cycle track on southern side of Fassaroe Avenue



The dual directional cycle track and pedestrian facilities on the southern side of Fassaroe Avenue joins with existing dual cycle track and footpath (approx. 700m) which continues to the N11 junction. The dual direction cycle track design accords with Section 4.3.4 *Standard Cycle Tracks* of the National Cycle Manual.

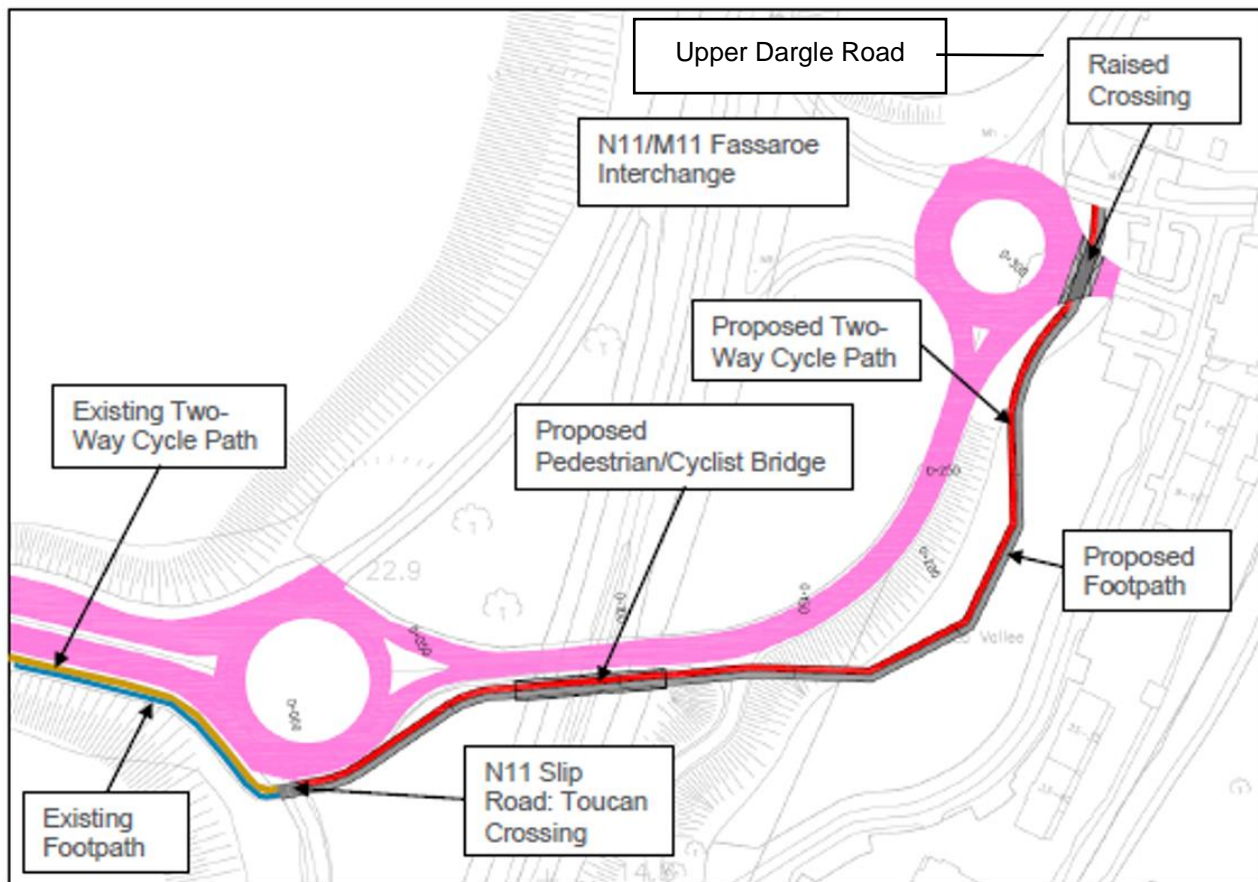
A toucan crossing is proposed across the northbound slip road of the N11/M11. A toucan crossing is proposed as it will provide pedestrians and cyclists with appropriate priority to cross onto the proposed pedestrian and cycle bridge across the N11. The proposed schematic layout of the toucan crossing is detailed in Figure 5-8.

Figure 5-8 - Toucan Crossing across the N11 north bound off-slip



This new path will run alongside the roundabout to the new proposed pedestrian cycle bridge over the N11 running in parallel to the existing vehicle only overbridge. Further details of this are provided in the Section 6. From the new bridge the path will continue along the southern / eastern side of the R918 to connect up to the Junction 6 eastern roundabout at La Vallee. The route of this path adjacent to the La Vallee development is within the ownership of the Applicant. A raised crossing facility is proposed over the entrance into the La Vallee development thereby connecting to Upper Dargle Road as shown in Figure 5-9 and to the proposed BG1 cycle / pedestrian route.

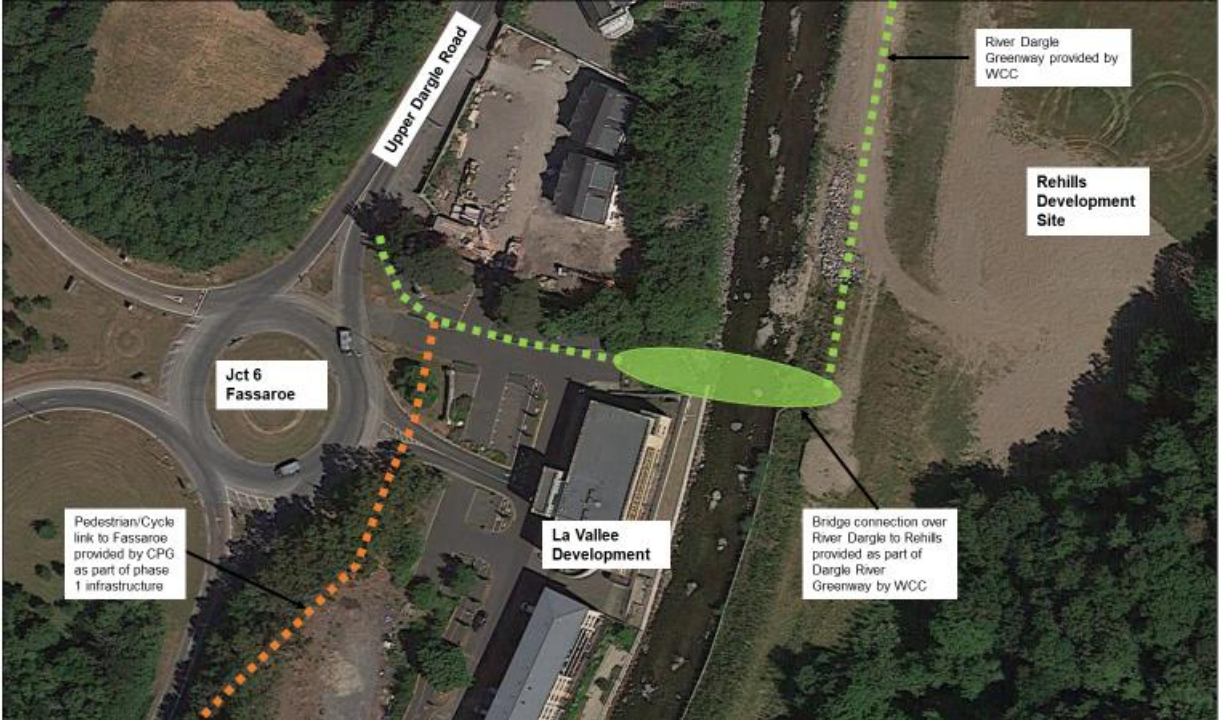
Figure 5-9 - Pedestrian and Cycle link over N11 from Fassaroe to Upper Dargle Road



The NTA's cycle infrastructure for BG1 is being provided by Wicklow County Council as the Dargle River Greenway. According to WCC's programme the Scheme will be completed by Q2 2023. W2a, delivered under this current SHD application, and BG1 will connect via a new bridge over the Dargle River to the Rehills site in the ownership of WCC. The exact location of the bridge will be determined as part of the Dargle River Greenway Scheme by WCC. Figure 5-10 shows the layout of the W2a and BG1 connection.

This connection will be from the endpoint of the pedestrian and cycle path proposed under the current application at the La Vallee entrance, via an existing pedestrian and cycle path along the northern boundary of the La Vallee site across the proposed bridge by WCC to the Rehills site.

Figure 5-10 - Connecting route between W2a and BG1

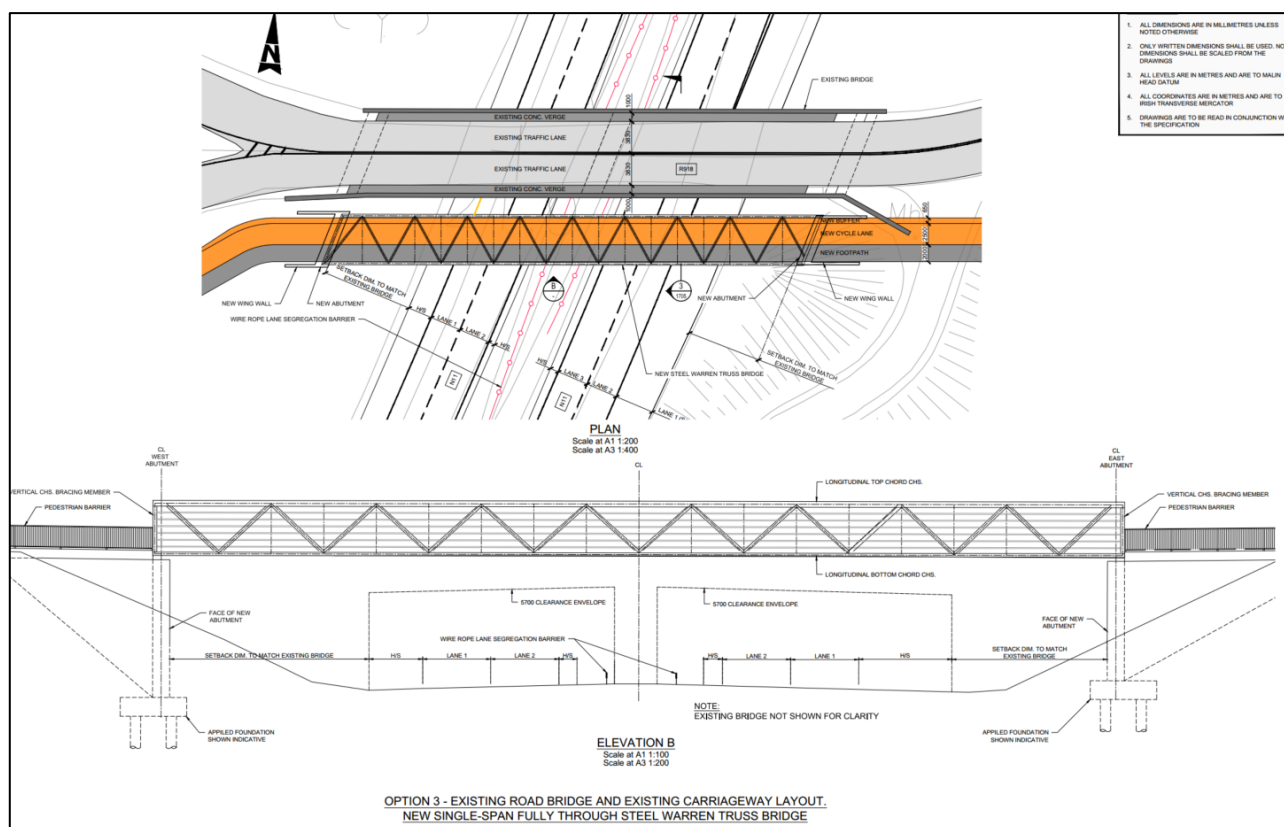


6. N11 Pedestrian and Cycle Bridge

To facilitate pedestrian / cycle path connection from Fassaroe to Bray it is proposed to construct a pedestrian/cyclist bridge on the southern side of the existing Fassaroe interchange overbridge.

A number of design options were considered for the design of the bridge as set out in N11 Pedestrian and Cycle Technical Note attached in appendix A. The preferred option which now forms part of this current application is Option 3 of a total of 3 No. options considered. It consists of a fully through steel warren truss with longitudinal top and bottom chords formed with circular hollow sections. Vertical inclined sections will be provided to transmit loading between these top and bottom chords. Transverse bracing will also be provided between the top and bottom chords to limit the effects of lateral torsional buckling along the length of the truss. This proposed bridge is detailed on drawings 5186693/HTR/SK/1704 REV_ and 5186693/HTR/SK/1705 REV. An extract is shown Figure 6-1.

Figure 6-1 – Proposed Pedestrian / Cycle Bridge Design



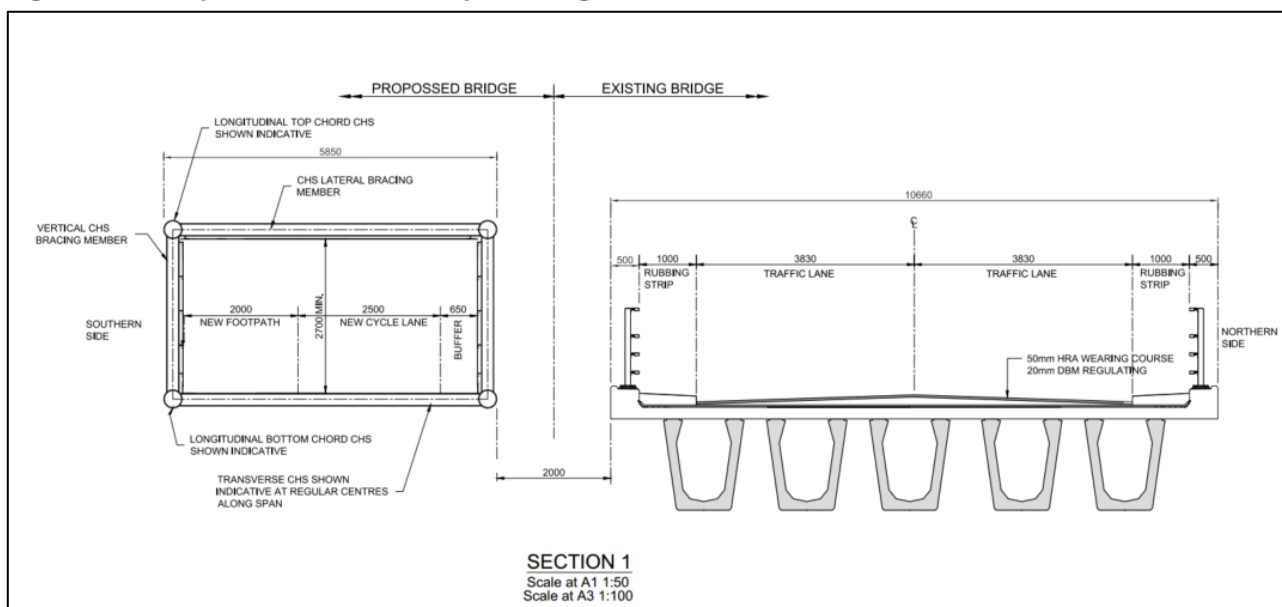
A steel deck plate is proposed along the length of the truss supported off the transverse bracing. The steel deck will be finished with a combined water proofing and surfacing layer. The proposed new bridge will be supported on two reinforced concrete abutments constructed on the N11 cutting slopes. No central supports will be required within the N11 central reserve. It is envisaged that due to the structural form and material, the use of bridge bearings and expansion joints will be required. The choice of a through truss offers the advantage of providing a built-in, fully contained pedestrian parapet railing supported via the vertical bracing members. The fully contained parapet system also reduces the potential for anti-social behaviour on the bridge.

The cross section of the proposed bridge is detailed in Table 6-1 and will provide a 2.0m wide pedestrian footpath and a 3.15m wide cycle lane over the N11. The bridge will be 5.85m in width from external face to external face (see Figure 6-2).

Table 6-1 – Proposed Pedestrian / Cycle Bridge Cross Section dimensions

Section	Width (m)
Truss Structure	0.35
Cycle Lane	3.15 (2.50 + 0.65 buffer)
Footpath	2.00
Truss Structure	0.35
Total	5.85m

Figure 6-2 - Proposed Pedestrian / Cycle Bridge Cross Section



An internal vertical clearance of 2.7m will be provided along the entire length of the new bridge. The overall structural depth of the new bridge will be 3.3m (approx.) from upper face of top longitudinal cord to bottom of the bottom cord. The structure dimensions will be confirmed at preliminary design stage. A similar superstructure is in use to the south of the proposed bridge location where a 3-span warren truss carries pedestrians and cyclists over the N11. The structure is painted green which helps it to blend into the environment. A similar paint system will be specified for the proposed bridge.

The bridge will comprise a main span of approximately 45m across the N11 which will be capable of accommodating future widening of the N11 by an extra lane in each direction, if required, as part of the N11 / M11 Junction 4 to Junction 14 Improvement Scheme. The bridge alignment and general arrangement is shown in drawing 5186693/HTR/01/0114.

The bridge construction will be undertaken by the applicant in consultation with Wicklow County Council and Transport Infrastructure Ireland. This bridge will serve the full build out of Fassaroe and will form a key link on cycle route W2a between Bray, Fassaroe and Enniskerry as set out in the Greater Dublin Area Cycle Network Plan. This cycle route will be fully completed through Fassaroe in the first phase of development. The bridge will be completed and open for use in advance of the occupation of dwellings in Phase 1.

7. Public Transport Infrastructure Proposals

The public transport infrastructure proposals included in this Planning Application are based on extensive pre-application discussion and agreement with the National Transport Authority (NTA), Transport Infrastructure Ireland (TII), Wicklow County Council (WCC) and the clients design team. The Public Transport Access Strategy (PTAS) (Ref 5186693DG0086) submitted with this Planning Application outlines the proposed strategy to provide public transport services in the form of bus services to and from the development from its opening year. The PTAS has been agreed with the NTA.:

This Public Transport Access Strategy incorporates the following elements:

- Provision of a new public bus service from Enniskerry via Fassaroe to Bray town centre, Bray DART station, and Bray DART Station Transport Interchange;
- Provision of a new public bus service from Enniskerry via Fassaroe to the Luas at Bride's Glen / Cherrywood;
- That the provision of the above Public Service Obligation (PSO) bus services will increase in frequency in line with demand;
- The provision of a developer operated dedicated primary school educational bus service from Fassaroe;
- Efficient and improved bus infrastructure including bus priority along the proposed routes to ensure services can operate within minimal delay; and
- Ongoing Monitoring, Evaluation and Awareness to ensure the Strategy continues to meet demand.

7.1. Proposed Bus Services

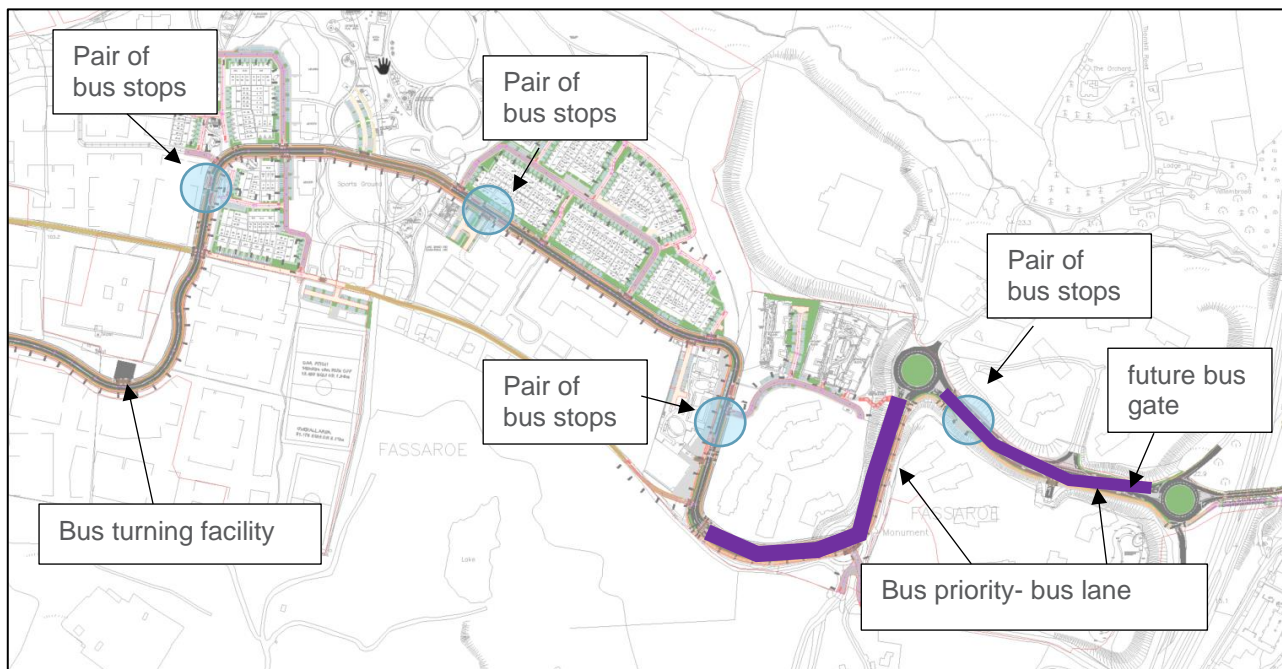
The proposed Phase 1 development will be serviced by direct bus services providing access to the existing Bray urban area, Bray DART and Bray bus interchange with onward services to Dun Laoghaire and Dublin City Centre. In addition to this the Phase 1 development will be served by an express bus service to Luas at Cherrywood / Brides Glen that will provide onward connections along the Luas Green Line corridor serving destinations including Sandyford, Dundrum and Dublin City Centre. The details of bus services are set out in detail in the Public Transport Access Strategy (REF) that accompanies this planning application. Appropriate bus infrastructure to facilitate bus services is provided within the development as outlined in the following sections.

7.1.1. Bus Infrastructure

In order to facilitate the bus services outlined in the Public Transport Access Strategy the following bus infrastructure is proposed within the development. An outline of bus infrastructure within the development is shown on Figure 7-1.

The location of bus infrastructure takes cognisance of the DMURS -3.4.3 *Bus Services* in that bus services are directed on arterial and link streets, being Fassaroe Boulevard and Berryfield Avenue in the context of this development.

Figure 7-1 – Bus and Luas Masterplan Infrastructure



7.1.2. Road Design and Bus Movement

The proposed bus services will operate along the main link street through the development from Ballyman Road junction in the west along the proposed avenue past the Neighbourhood Centre and onto the Boulevard Street of Fassaroe Avenue before connecting to the east to junction 6 of the N11 where bus services either continue towards Bray and Bray DART Station or onto the N11 for onward connections to the Luas services at Cherrywood. The road widths have been designed to accommodate bus movements with a minimum lane width of 3.25m as detailed in Section **Error! Reference source not found.**. A vehicle track on drawing (REF 5186693/HTR/01/0144 and 5186693/HTR/01/0145) shows that bus movements can be accommodated on the road network as outlined above.

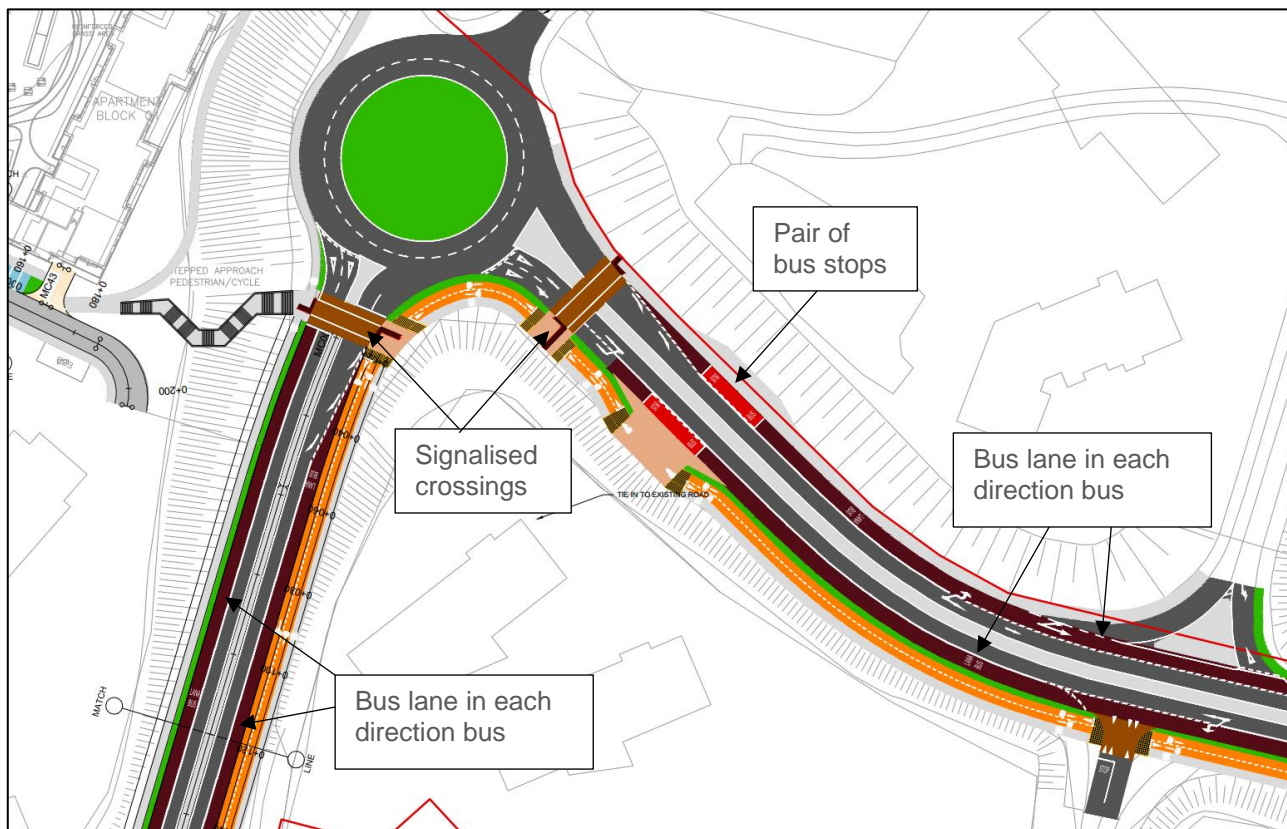
7.1.3. Bus Priority Measures

Internally within the development bus priority measures will be provided to ensure that the proposed bus services operate with minimal delay to ensure journey time reliability and therefore viability of services through patronage. Bus priority measures incorporated into the current application proposals include:

- A bus lane in each direction from the south-eastern end of the Neighbourhood Centre through to Junction 6 roundabout with the N11;
- Potential future bus gate on approach to Junction 6 on Fassaroe Avenue

The location of these facilities is shown in Figure 7-2 and is further detailed on Atkins Drawings 5186693/HTR/01/0112 to 0114.

Figure 7-2 - Bus Priority Facilities

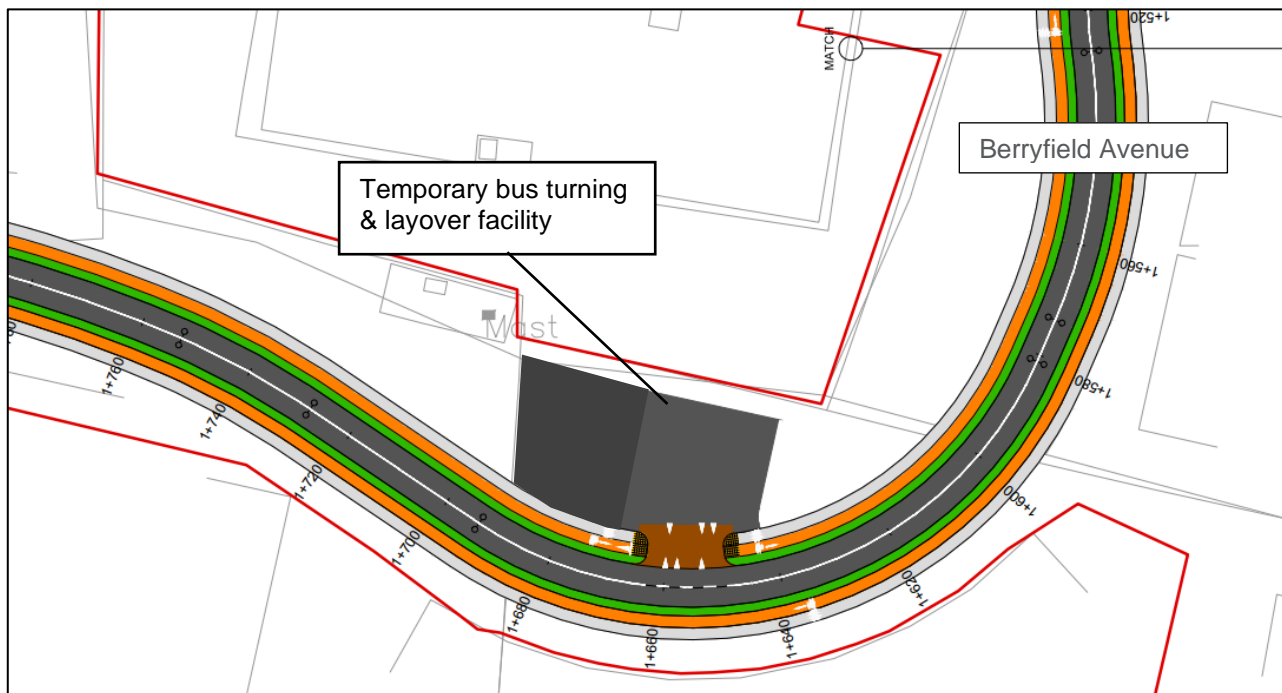


The bus lanes have been designed in accordance with best practice guidance documents including Section 5.1 – *Bus Stops*, of the National Cycle Manual

If required by a later phase the design can incorporate a bus gate on Fassaroe Avenue that would prioritise bus movements at the western roundabout of junction 6 N11. Temporary Bus Turnaround facility

The Phase 1 plans have incorporated a temporary bus turnaround facility in case it is required for operation and regulation of services as detailed in the PTAS. The location is shown in Figure 7-3, to the south of the ESB sub-station on an area of land that will not be developed for future phases of development so that if required this temporary turning could be a more permanent facility. Further details are shown on Atkins drawings 5186693/HTR/01/0101 The design of the bus turning facility has been developed using auto-tracking to ensure that all necessary buses can turn and manoeuvre safely with the designated space. The junction design and visibility splay accords with DMURS recommendations for this type of road and facility and ensure pedestrian and cycle safety is maintained. The facility can accommodate bus layover facilities are per the NTA's requirements.

Figure 7-3 - Temporary Bus Turnaround Facility



7.1.4. Bus Stops

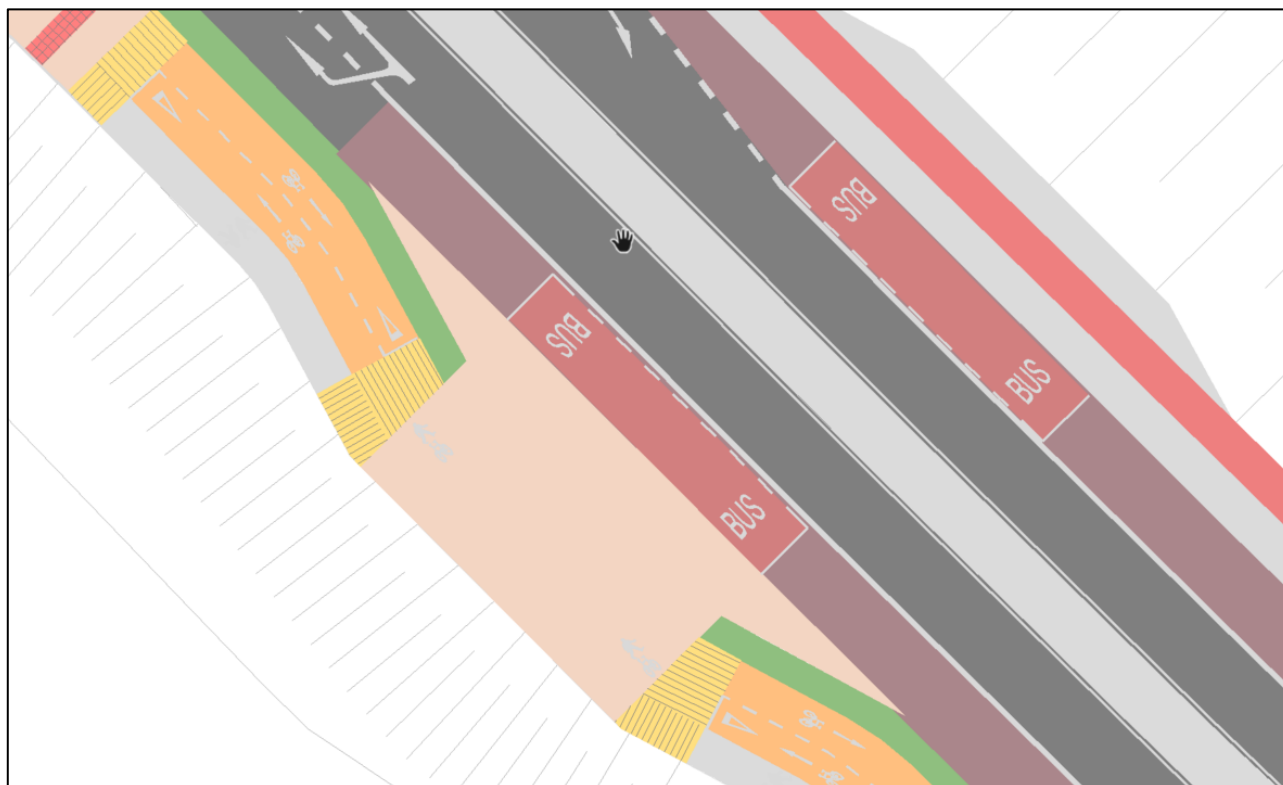
Berryfield Avenue has been designed to include appropriately located bus stops. The criteria applied to the location of the bus stops are:

- To ensure that all residential and other land use catchment are located within 400 - 800m distance of a bus stop(s);
- Proximity to key attractor/generator of bus trips such as schools, retail (neighbourhood centre), and potential future Luas stops; and
- Where bus stops are provided appropriate crossing facilities are provided to facilitate safety and ease of access.

A total of 4 new pairs of bus stops (8 No.stops in total) are proposed within the development, the locations of which are shown in Figure 7-1. Moving from west to east, two bus stops are located at the western extent of the Phase 1 development with a further two stops located adjacent to the District Park / crèche / Future school site representing a key destination, while a further two stops are located at the Neighbourhood Centre and the final two stops located on Fassaroe Avenue. The latter pair of stops are existing stops that have been relocated and redesigned to accord with current design standards and to integrate better with the proposed development.

In accordance with NTA guidance all bus stops are in-line facilities to ensure ease of bus services re-joining vehicle traffic following pick up or drop off. The bus stops are designed based on guidance in the National Cycle Manual in order to accommodate the through movement of cyclists adjacent the boarding and alighting areas for bus passengers. An example of the typical design is shown in Figure 7-4.

Figure 7-4 - Bus Stop - Fassaroe Avenue Details



Bus stops will be of a 'raised' design to assist mobility impaired passengers in boarding / alighting the vehicle and bus shelters will be sited and designed with due cognisance of both the needs of the bus users and bus routes and the visual sensitivity of the location. Bus shelters will be constructed of mainly transparent materials and will be lit with environmentally friendly lighting. The interface between bus stops and pedestrian and cycle facilities will be carefully designed so as not to interfere with any pedestrian and cycle movements. The general arrangement shown in Figure 7-4 accords with the details recommend in NCM. The detailed design of the bus shelters and final arrangement of the bus stops will be agreed with NTA to take account of new layout designs currently being developed by the NTA.

7.2. Future Luas Provision

While there is uncertainty around the possible future Luas connection to Fassaroe based on the latest NTA strategy for the Greater Dublin Area, it is recognised that a Luas connection to and from Fassaroe is an objective within the Wicklow County Development Plan (2016-2022)

WCC Development Plan Transport Objectives TR2

To promote the development of transport interchanges and 'nodes' where a number of transport types can interchange with ease. In particular..... to promote the linkage of the LUAS extension or other mass transit to Bray town centre, Bray train station and Fassaroe;

WCC Development Plan Transport Objective TR5

To facilitate, through both the zoning of land and the tie-in of new facilities with the development of land and the application of supplementary development contributions, the extension of the LUAS or other mass transit to Bray town centre, Bray train station and Fassaroe.

In accordance with the above objectives provision has been made in the CPG lands masterplan to accommodate the Luas extension to Fassaroe if required. The potential Luas corridor is shown in Figure 7-5.

The proposed Luas stop is located adjacent the Neighbourhood Centre and adjacent to bus stops and bus services running along Berryfield Avenue in order to provide a potential future transport hub that allows for seamless interchange between public transport modes.

Figure 7-5 – Potential LUAS Stop and alignment at Neighbourhood Centre



The scheme design therefore as presented in the application facilitates the potential southerly extension of the LUAS Green (Luas Line B2 Extension) line serving the Fassaroe Masterplan lands. The potential alignment of the LUAS line is to follow the proposed future road connection from old Connaught, through the future development lands before crossing Berryfield Avenue, where space for a possible future LUAS stop is provided for, adjacent the neighbourhood centre.

The space for the potential future LUAS stop at the proposed neighbourhood centre will facilitate a Luas stop based on the TII Luas Design Guidelines. This alignment is initially designed as a landscaped strip which can either be maintained in perpetuity or redeveloped as Luas track and stop in the future.

If the Luas extension to Fassaroe does not occur then the reserved lands and transport corridor provided for in the CPG masterplan lands will be incorporated as a public transport and active travel link providing a connection from Fassaroe to Old Conna over the Ballyman Glen, as set out in the Bray Environs Transport Study. This link will be provided at a later phase in the development of the Fassaroe lands.

8. Signage and Road Markings Design

All traffic signs, including information, regulatory and warning signs will be designed in accordance with the Traffic Signs Manual. The location of traffic signs, mounting heights and orientation will be designed in accordance with the Traffic Signs Manual. Road markings shall be designed in accordance with Chapter 7 of the Traffic Signs Manual.

9. Emergency, Refuse and Delivery Access

The masterplan layout has been designed to cater for servicing and emergency access. The layout has been developed to minimise cul de sac type roads that tend to require turning areas. In accordance with DMURS guidance junctions have not been over designed to cater for occasional service and emergency access that ensures pedestrian and cyclist priority and safety are maintained.

Specific loading and service areas are provided within the Neighbourhood Centre to cater for the more frequent deliveries associated with this use. Auto-Tracking or refuse and emergency vehicles has been undertaken to show that the proposed strategy works. These drawings are shown on drawings 5186693/HTR/01/0130 to 5186693/HTR/01/0131.

10. Car Parking

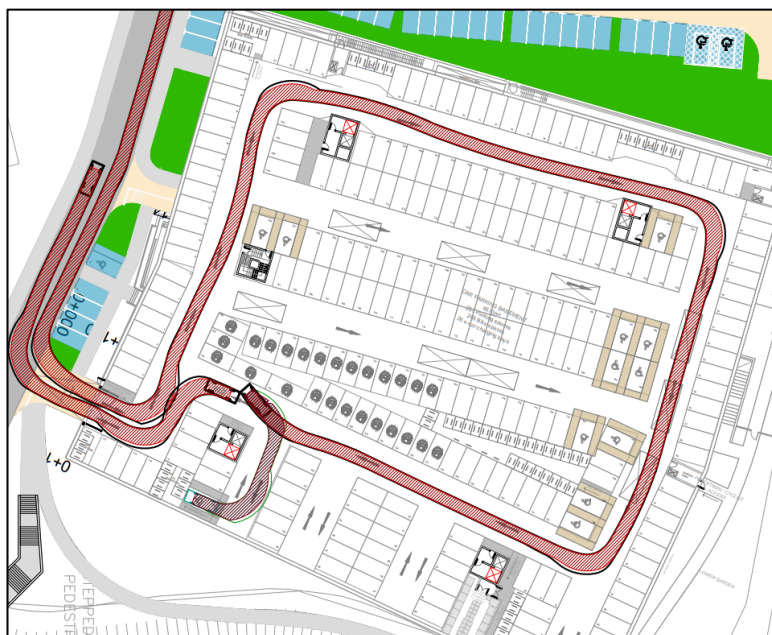
A range of parking solutions is proposed across the development including in curtilage private parking at the houses, parking bays perpendicular to streets, parking plots and basement car parking. As recommended by best practice guidance such as DMURS and the Wicklow County Council Development Plan car parking provisions have been designed so that they do not dominate the visual character of the surrounding environment. In general, car parking numbers have been provided within the development in accordance with Sections 1 and 7, Volume 3 CDP Appendices of the Wicklow County Council Development Plan 2016-2022.

10.1. Residential Car Parking

All houses are provided with 2 No. spaces – either in curtilage or within parking bays adjacent to houses. In curtilage spaces are typically 5m x 2.5m. On all streets there is a minimum drop back from a car parking space of 6m to facilitate cars to access and egress car parking spaces in a safe manner. In the case of homezones this is provided by way of the 1.2m pedestrian comfort strip which when combined with the 4.8 share surface provides the required 6 metre drop back space.

Where residential car parking is provided for in basements or undercroft facilities, such as Blocks 1,2 and 3, the design of these facilities accords with best practice guidance as set out in Institution of Structural Engineers *Design recommendations for multi-storey and underground car parks* (4th Edition) March 2011. Vehicle tracking has been used to inform the basement/ undercroft design as shown in drawings (REF 5186693/HTR/01/0142). An extract of one of these drawings is shown in Figure 10-1.

Figure 10-1 - Auto-track basement car park Block 1 & 2



10.2. Neighbourhood Centre Car Parking

Parking at the Neighbourhood Centre is provided within the undercroft / basement area as well as at surface/podium level. The design of the basement / undercroft car parking accords with best practice guidance as set out in Institution of Structural Engineers, *Design recommendations for multi-storey and underground car parks* (4th Edition). Vehicle tracking has been used to inform the basement/ undercroft design as shown in drawings (REF 5186693/HTR/01/0143). An extract of one of these drawings is shown in Figure 10-2.

Figure 10-2 - Neighbourhood Centre - Basement and Tracking



10.3. Other Car Parking

Car parking for the creche and the District Park and the Active Open Space lands has been provided to cater for visitors and users. The location of these car parking spaces is shown in Figure 10-3.

Figure 10-3 - Location and Layout of Other car parks



10.4. Electrical Vehicle Charging Provisions

The strategy for Electric Vehicle Charging (EVC) provisions at Fassaroe is in accordance with the requirement set out in Wicklow County Council Development Plan, Volume 3 – Appendix 1 – Development Design Standards Section 7 below in respect of the different elements of the development. As required under the Development Plan *Electric vehicles shall be provided in accordance with IEC 61851 Standard for Electric Vehicle Conductive Charging Systems*¹.

Housing Areas: The developer will provide cabling to in curtilage parking and parking bays serving the proposed houses. This will allow easy installation of car charging points for residents in the future as required.

Apartment Buildings: When being constructed basement parking areas (and surface parking spaces in the cases of Blocks 3 and 4) will be cabled to allow for installation of car charging points at each parking space as required in the future. The electricity supply to these charging points will be from the landlord supply and managed by an interface system such as ‘Randridge’ to manage usage and payment for use at any given charging point.

Neighbourhood Centre: It is proposed to provide 2 No. EVC spaces within the car parking areas serving the retail / commercial use.

Other Car Parks It is proposed to provide one EVC facility within both the district and active open space car parks.

Further details of the EV charging strategy for the CPG Masterplan lands is set out in the report “Multiple Occupancy building car charging strategy for Fassaroe SHD” by McElligott Consulting Engineers.

11. Cycle Parking

For the residential apartments secure sheltered and accessible cycle parking will be provided for both residents and visitors in accordance with guidance set out in Section 5.5 – *Bicycle Parking* of the National Cycle Manual. There is a range of on street cycle parking facilities provided for visitors at key locations such as the Neighbourhood Centre, District Park, Active Open Space and creche as well as location with residential areas and close to the entrances to the apartments. The location of cycle parking is presented on the architects’ drawings.

¹ Or equivalent relevant standard at the time of delivery

12. Road Construction Details

The minimum road construction details are detailed below. These will be agreed at compliance stage with Wicklow County Council.

Boulevard Street (Fassaroe Avenue)

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

Link Street (Berryfield Avenue)

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

Local Street

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

Homezone Street – Carriageway

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

Homezone Street – Parking/Footway Areas (Permeable)

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

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

13. Temporary Traffic Management

While it will be the responsibility of the appointed contractor to determine the details of the proposed traffic management, the following sections detail the high level temporary traffic management strategy during construction of the proposed scheme.

The aim of the temporary traffic management proposed as part of the Fassaroe Phase 1 development is to minimise the impact of the works on the surrounding road network and road users, particularly on the N11 junction 6.

Construction vehicles will enter and exit the site from the N11. To exit the site and return to the N11, vehicles will follow the same roads they used to enter the site. It is anticipated that minimal construction access will be provided via the Ballyman Road given the limited access to the strategic road network from the west of the site.

At all times one lane in each direction on Fassaroe Avenue for access and egress from the N11 junction 6 will be maintained during construction.

A number of residential areas, including Berryfield Lane and Thornhill Road will be temporarily impacted by temporary traffic management during construction at the site.

It is likely that Temporary traffic management will be required for the upgrade and re-alignment of Fassaroe Avenue and the change of the Roadstone/Kilbride Lane roundabout to a T-junction arrangement.

Disruption to Berryfield Lane and Thornhill Road residents will be minimised by keeping maintaining access for residents at all times .

Temporary traffic management drawings will be prepared by the Contractor and submitted to WCC for approval prior to the commencement of works on site. In all cases measures will be put in place and agreed to minimise any adverse impacts during construction.

14. Geotechnical Proposals

As outlined in the various landfill remediation documentation by RPS that accompanies this planning application, landfill sites are present within the confines of the Phase 1 development and require remediation and/or engineering measures for construction in areas with waste. The proposed main road of the proposed development will cross 2 landfill sites (site 2 and site 3B) and slope instability is reported on the edge of the landfill site 2 on the periphery of the development adjacent to the Ballyman Glen. Evidence of slope failure and potentially unstable slope were also reported and/or noted during site visits.

In addition, signs of slope failure and potential slope instability outside the footprint of the landfill sites were also noted during site visits along the northern boundary of the development above the Ballyman Glen and are also dealt with in this section.

An overview of the different slope stabilisation measure locations are shown on drawing 5186693/HTR/01/DR/0605 with the location of the landfill sites in relation to the proposed road in the inset.

The proposed solutions for the construction of road over landfill sites and to stabilise the slope in landfill or natural ground are outlined in the paragraphs below.

14.1. Site 3B – road construction – 5186693/HTR/01/DR/606

The road will cross this landfill site for a distance of approximately 70m where it will run in a cut approximately 0.7 to 2.4m deep. The waste body is approximately 5m deep at this location.

The excavation of the cutting along this stretch of road will allow for the road construction thickness (pavement and capping) and for a landfill capping system to a minimum thickness of 1.3m below. Waste would however remain below the road and would result in long term settlement. Measures are therefore required to mitigate this impact (e.g. rigid platform, piles, ground replacement).

As most of the waste will be excavated to reach the required levels, the option of excavating the remaining waste and replacing it with acceptable material to the base of the road construction is proposed. Landfill capping will be required on the slope of the cutting and above existing ground level outside the earthworks footprint and this is as detailed within RPS's landfill report.

Additional excavation beneath the road into the natural ground underlying the waste will be required to place a layer of granular material. This layer is to allow the current migration/flow of gas and leachate to continue taking place in the same direction but below the road and avoid a damming effect which in turn would require pumping of leachate. The gas and leachate geocomposite membranes which are part of the landfill capping proposed on the cut slope as mentioned above will be extended below the road at the top of this granular layer.

A surface water drainage geocomposite will also be provided from under the shoulder of the cutting slope at the level of the landfill capping geocomposite layers to the drainage network at the toe of the cutting.

14.1.1. Site 2 – road construction

The road will cross landfill site 2 over a length of approximately 80m at a level of approximately 3m to 4m above the level of the existing waste. At this location, the waste is up to 7m to 9m deep and will cause excessive settlement if no measures are taken. Due to the depth of the waste, ground replacement is not considered economical and the following options are proposed to avoid excessive settlement.

14.1.2. Option 1: Piled Raft with reinforced concrete slab. – 5186693/HTR/01/DR/607

Landfill capping is not required beneath the road and embankment construction as a reinforced concrete slab will provide adequate mitigation regarding the infiltration of water and gas migration.

The piles will be constructed from the existing ground following levelling, which may involve the stripping of the topsoil and locally the upper part of the existing landfill capping. A temporary platform may also be required to provide adequate bearing resistance to support the required plant (cranes, piling rigs) and construction traffic/deliveries. If it is required, it will be designed by the contractor and will have to take into account all Health & Safety and environmental constraints and requirements for working on landfill.

It is expected that due to environmental constraints, bored piles will be required, and measures will have to be implemented to avoid creating a migration path for the contamination from the waste to the underlying strata.

A reinforced concrete slab would then be cast at the top of the piles and the embankment constructed over the slab. The landfill capping required in the landfill area adjacent to the road will be extended over the toe of the new embankment on the slab to meet the slope.

14.1.2.1. Option 2: Piled Raft with reinforced earth load transfer platform – 5186693/HTR/01/DR/608

This option is similar to the above option 2 but the piles will have an enlarged head. A load transfer platform would then be constructed over the piles with geogrid layers and selected granular fill and then the embankment above it.

As the load transfer platform will be constructed with granular material (permeable to gas and water), landfill capping will be required with this option. The landfill capping layer will be placed at the base of the embankment fill over the load transfer platform, continuing from the adjacent land.

14.1.2.2. Site 1 & 2 – Capping requirement at landfill perimeter - 5186693/HTR/01/DR/0605 (plan), 609, 610 & 611

Where construction of the landfill capping system is to occur at the perimeter of the waste and the existing slope is at a gradient of 1(V):5 (H) or steeper, the capping material will require benching into the existing slope.

Due to land take constraints, slope height and gradients, a reinforced earth slope may be required. As the slopes are densely overgrown, this measure is based on estimated ground profiles from existing LIDAR surveys (with limitations due to the vegetation) and site observations. The extent will depend on the actual topography of the area. The typical cross-section detail for the edge of capping on slopes is shown in Section E-E on drawing 5186693/HTR/01/DR/0611.

14.1.2.3. Site 1 & 2 – Slope stabilisation – 5186693/HTR/DR/0605 (plan), 609, 610 & 611

Remedial measures are proposed to stabilise slope failures or potential slope failures reported at two locations (Section A & B) within the landfill site and visible at Section C (located outside the extent of the waste indicated in RPS's Environmental Risk Assessment Report). Section D is also outside the waste area indicated in this report but as it is close to the landfill area and shows signs of potential instability, it is also included in the stabilisation measures proposal.

As the slopes are densely overgrown, these measures are based on estimated ground profiles from existing LIDAR surveys (with limitations due to the vegetation) and site observations. The extent of each measure will depend on the actual topography of the area. The proposed solutions are as follows:

14.1.2.4. Section A (Geophysics profile R15 approximately) Slope regrading

Potential landslip in the waste material was reported in the geophysics report included in RPS's Environmental Risk Assessment Report.

Stabilisation will involve excavating all the material above the slip surface and filling with new acceptable fill material to a gradient of 1(V):3(H). The toe of the new slope will be slightly further toward the river than the assumed existing. The top of the shoulder of the existing slope will be cut to provide a shallower gradient at 1(V): 4(H) which could then be considered part of the park. The option is given to place more fill at the top of the remedial proposal.

The new fill will have to be benched into the existing slope at 1(V):5(H) and/or into the newly formed slopes at 1(V):5(H) or steeper following the removal of material on the existing slope.

Landfill capping will have to be provided at the base of the new fill above the waste material and the membrane option will be preferred over the layer of impermeable clay layer for slope stability reasons.

14.1.2.5. Section B (Geophysics profile R2 approximately) – Slope regrading and reinforced earth slope

Stabilisation will consist of regrading the lower half of the slope with acceptable fill to 1(v):3(H) after excavation of the slipped material similarly to Section A. According to the geophysical profile, the material underlying the slip surface should be natural sand/gravel but some of the slip material could be waste and all material to be removed may have to be treated as waste and will be dealt with accordingly.

At mid slope, due to land take constraints, slope height and gradients, a reinforced earth slope will be constructed at 2(V):1(V) and 5m - 6m high. Fill will then be placed with a 1(V):3(H) slope above it to join the level of the top of the landfill capping to be provided in the park area. All material above the slip surface will be excavated.

The new fill will have to be benched into the existing slope at 1(V):5(H) and/or into the newly formed slopes at 1(V):5(H) or steeper following the removal of material on the existing slope as described above.

Landfill capping will be provided at the base of the new fill above the waste material for the upper half of the slope and if required (if waste encountered) on the lower part. The membrane option will be preferred over the layer of impermeable clay for slope stability reason.

Drainage/leachate collection will be installed if required for environmental reasons and/or slope stability.

14.1.2.6. Section C (top of farm tack) – Slope regrading

The proposed remedial measure consists of regrading the slope as described for Section A with a new slope at 1(v):2.5(H) approximately. The material to be excavated to the base of the slip surface will consist of natural ground and landfill capping may therefore not be required.

14.1.2.7. Section D (presumed former Sand and gravel quarry/pit) – Slope regrading

It is proposed to regrade the slope at 1(V): 2(H). The existing slope will have to be benched prior to placing acceptable fill. A wedge of coarse granular material/boulders is proposed at the toe as a scour protection due to the proximity of the river and the relatively flat ground on the riverbank.

Appendix A. N11/ M11 Pedestrian and Cycle Bridge

Technical note

Project:	Planning Application at Fassaroe	To:	Cosgrave Property Development Ltd
Subject:	N11 Bridge Options Technical Note	From:	Robert Morgan (Atkins)
Date:	24 Oct 2021	cc:	Kieran Boyle (Atkins) Peter Foley (Atkins)

1. Introduction

Fassaroe Phase 1 Development is the first development of a zoned land bank that forms the western extension of the Bray urban area to the west of the N11. Located immediately adjacent to the N11 in close proximity to existing public transport bus and rail corridors, the development is planned to form an integral part of the Bray and wider urban area.

As set out in the Bray Municipal District Local Area Plan (LAP) 2018-2024 the lands at Fassaroe could accommodate up to 60% of the new housing needs (4,000 units) and 3,000 new jobs for the Bray settlement together with the provision of supporting social and community infrastructure to meet the needs of the future occupiers. The LAP sets out that the delivery of development at Fassaroe would be linked to the delivery of new transport infrastructure ensuring integration with the existing and proposed public transport, walking, cycling and road network to produce a sustainable development.

The Fassaroe lands are planned to be developed on a phased bases that will incorporate appropriate transport interventions that will support the sustainable development of the lands in tandem with the introduction of the appropriate infrastructure in the wider regional area. In this context the development of the lands, and the subsequent phases of development, will be integrated with the delivery of transport infrastructure by the relevant authorities and agencies, as set out in the Transport Strategy for the Greater Dublin Area 2016-2035 and the Bray Environs Transport Study (BETS) 2019.

The BETS Transport Infrastructure Requirements for the full development of the lands at Fassaroe are set out in Section 2.3.1 of the BETS. They are:

- Fassaroe development roads
- N11 Cycle and Pedestrian Bridge;
- N11/M11 Junction 4 to 14 Improvement Scheme;
- Delivery of Wicklow County Part 8 N11 capacity and safety upgrades, as approved;
- Busway from Fassaroe to Old Connaught over County Brook at Ballyman Glen;
- Traffic Management Measures at Fassaroe Interchange to protect strategic function of the N/M11; and
- Commitment to a phased introduction of bus and enhanced rail services in line with increased demand.

This Technical Note evaluates 3 no. Options for the proposed N11 Cycle and Pedestrian Bridge. The new bridge will be located within the TII road network.

2. Site and Location

2.1. Existing Bridge

The proposed N11 Cycle and Pedestrian Bridge will be located on the R918 Regional Road. It will be parallel and adjacent to the existing Dargle Road Interchange Bridge (TII ref. WW-N11-063.00). The existing bridge is a two-span reinforced concrete structure carrying the R918 over the N11 dual-carriageway at Junction 6 (ITM co-ordinates: 724708.483, 717830.08). At this location the N11/M11 is designated with a 120km/h (northbound) and a 100km/h (southbound) speed limit. The Annual Average Daily Traffic (AADT) between Junction 5 and 6 is 57,097 (2021 TII traffic figures).

The overall length of the existing bridge is 53.42m. Span 1 and Span 2 are 26.46m and 26.96m respectively.

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3. Description of Proposed Structure and Options

The proposed N11 Cycle and Pedestrian Bridge would be designed in accordance with the Transport Infrastructure Ireland (TII) suite of Design Standards for Roads and Bridges, the Design Manual for Urban Roads and Streets (DMURS) and the NTA's National Cycle Manual. The new pedestrian/cycle bridge will provide a safe non-motorised user connection along the R918 between the lands for the proposed Development (i.e. to the west of the N11) and the settlement of Bray (i.e. to the east of the N11).

The area to the west side of the proposed bridge is generally rural / arable land and includes the areas that are proposed for development. The area immediately to the east side is woodland set in a sub-urban environment. The Dargle River is located 150m (approx.) to the east of the proposed bridge location.

The new bridge would be located on the south side of the existing Dargle Road Interchange Bridge. This will allow the existing pedestrian and cyclist facilities on the south side of the R918 (on west side of N11) to be connected to the new structure.

All bridge Options include a multi-span reinforced concrete viaduct which would provide connectivity from the east side of the new bridge to the Upper Dargle Road. The point of connection would be at the roundabout on the north-west side of the Junction 6. Please refer to Appendix A for drawings of the proposed viaduct structure.

The following section presents a summary of the bridge options considered along with the appraisal process undertaken to determine the preferred option to provide pedestrian and cycle connectivity between Fassaroe and Upper Dargle Road / Lavelle area via a bridge over the N11. Three options have been identified that could provide the appropriate connectivity.

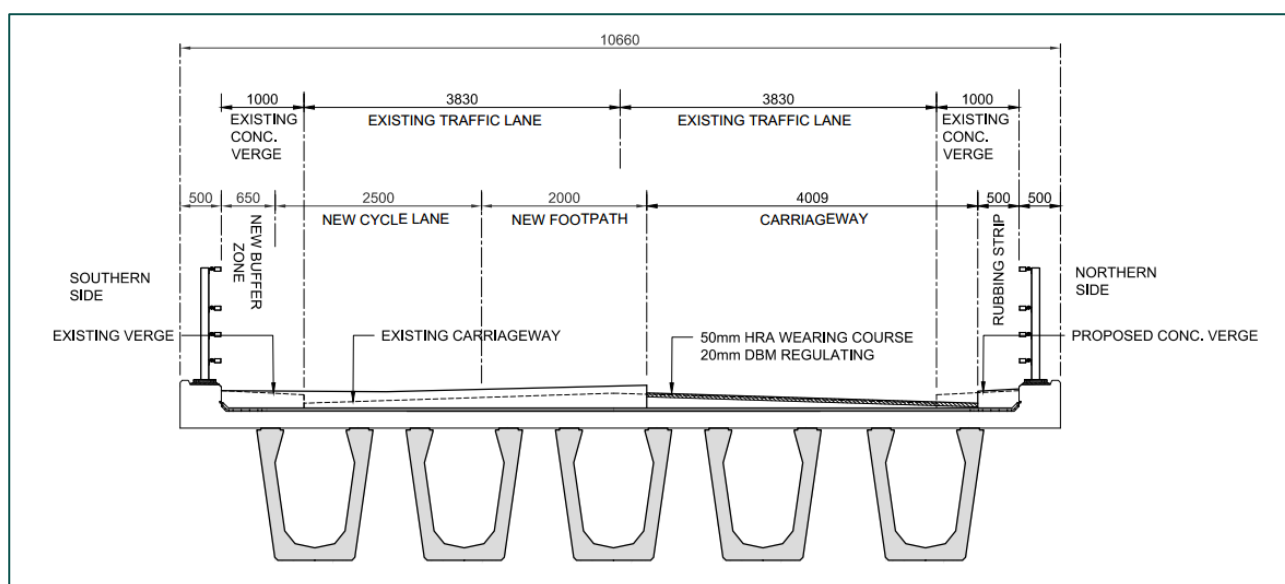
A high level multi-criteria analysis (MCA) was undertaken on the three options based on the following criteria

- Technical
- Economic Evaluation
- Construction and Buildability

Each option was ranked on a 3-point scale against each of the criterion and the highest scheme overall is considered the preferred option to be brought forward for further development and appraisal.

3.1. Options Considered

3.1.1. Option 1 – Provision of Cycling Facilities on Existing Bridge



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Figure 3-1 Option 1 Cross-Section

Option 1 proposes to reconfigure the carriageway layout on the existing road bridge to provide segregated pedestrian and cycling facilities. This option also requires an existing parapet to be increased in height from 1.16m (existing min.) to 1.45m to make it suitable for cyclists. Option 1 is shown on drawing 5186693/HTR/SK/1701 REV_.

It is clear from the cross-section shown in Figure 3-1 that the width of the existing bridge is insufficient. It is not possible to include a 2.0m footpath and 3.15m cycle path without removing 1 no. carriageway lane. This would remove the current access provision in both directions and is therefore not deemed feasible. This option will not be progressed.

Table 3.1 Proposed Bridge Cross-Section

Section	Width (m)
Parapet upstand	0.50
Cycle Lane	3.15 (2.50 + 0.65 buffer)
Footpath	2.00
Carriageway	4.01 (i.e. 1 no. single traffic lane only)
Rubbing Strip	0.50
Parapet upstand	0.50
Total	10.66

3.1.2. Option 2 – New 2-span Pedestrian / Cycle Bridge

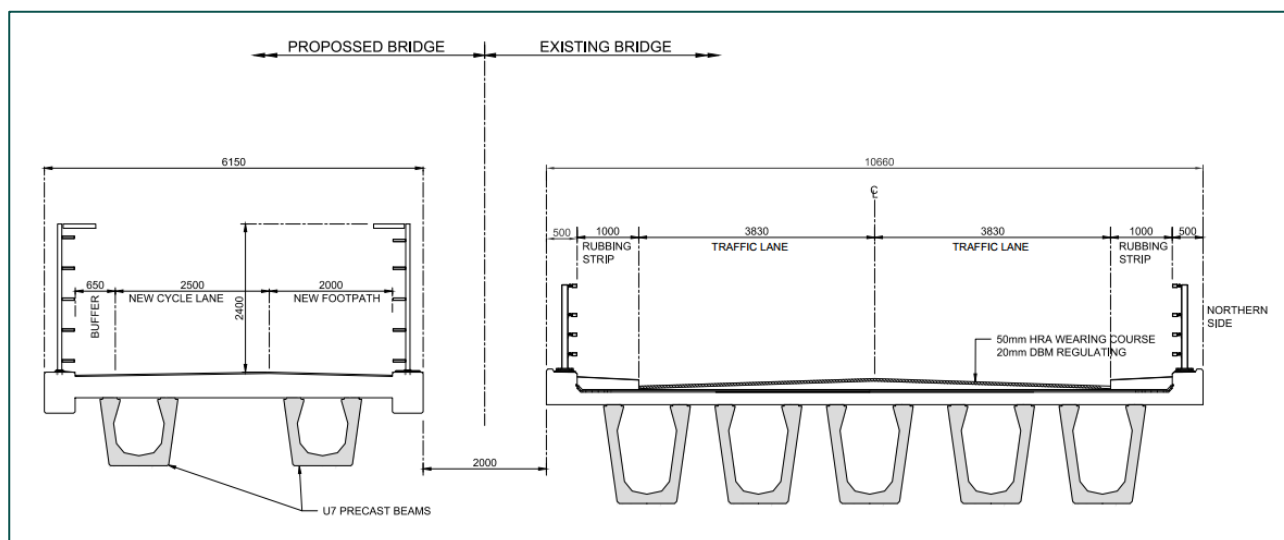


Figure 3-2 Option 2 Cross-Section

Option 2 proposes a new 2-span RC integral bridge. The bridge would include RC cast in-situ abutments, central support, crossbeam, diaphragms and bridge deck slab. Bridge beams would be supported on the abutments and central support. The bridge deck would be designed to be continuous over the central support with the introduction of a crossbeam and in-situ diaphragm. This would allow an integral connection between the bridge deck and diaphragms avoiding the need for bridge bearings and expansion joints. The central support would be situated within the central reserve of the N11 and in line with the existing bridge pier. The inclusion of precast bridge beams would also permit the use of offsite fabrication allowing concurrent

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construction of the substructure and superstructure elements and therefore reducing the overall construction time. Option 2 is shown on drawings 5186693/HTR/SK/1702 REV_ and 5186693/HTR/SK/1703 REV_.

The cross section of the proposed bridge would provide a 2.0m wide pedestrian footpath and a 3.15m wide cycle lane over the N11. The bridge would be 6.15m in width from external face to external face (see Figure 3-2). The proposed spans would be similar to the existing adjacent bridge. The structural depth of the new bridge would be 1.35m (approx.). Each span would be composed of 2 no. YE5 beams (1.1m deep) and a 0.25m thick reinforced concrete deck. The optimum beam type and depth would be confirmed at preliminary design stage. The design working life of the bridge would be a minimum of 120 years in accordance with TII standard DN-STR-03012 (Design for Durability).

A minimum vertical clearance of 5.7m (min.) would be provided to the N11 carriageways in accordance with DN-GEO-03036 (TII Road Cross-Sections and Headroom Standard). The clearance to the existing road bridge is 6.01m (min). The vertical alignment over the new bridge would be a crest curve. The horizontal alignment would be straight and parallel to the existing bridge. The new bridge would incorporate a partial enclosure of the bridge with parapet heights of 2.4m. In accordance with TII publication DN-STR-03005 Design Criteria for Footbridges, a minimum horizontal offset of 2.0m would be provided between the new and existing bridge to deter attempts by persons to cross between the structures.

Abutment setbacks similar to the existing bridge would be provided for the new bridge and a suitable vehicle restraint system (VRS) if needed / within the clear zone. The existing VRS in the central reserve would be utilised to prevent impact loading to the new central support.

Table 3.2 Proposed Bridge Cross-Section

Section	Width (m)
Parapet upstand	0.50
Cycle Lane	3.15 (2.50 + 0.65 buffer)
Footpath	2.00
Parapet upstand	0.50
Total	6.15

3.1.3. Option 3 – New Single-Span Pedestrian / Cycle Bridge

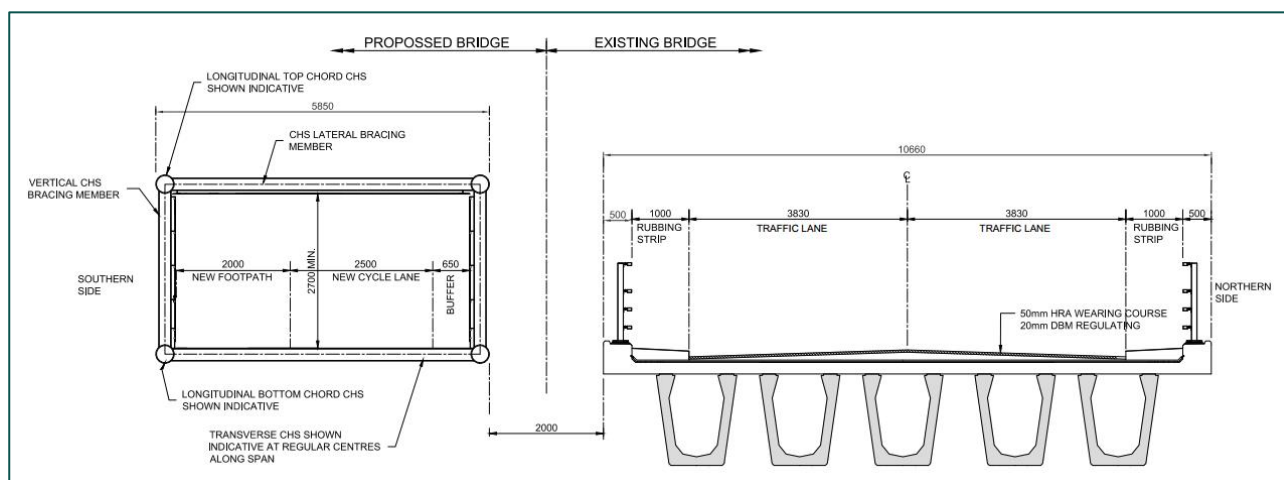


Figure 3-3 Option 3 Cross-Section

Option 3 also proposes a new pedestrian/cycle bridge located adjacent to the existing Dargle Road Interchange Bridge (see Figure 3-3). The pedestrian/cycle bridge would be designed as a fully through steel warren truss with longitudinal top and bottom chords formed with circular hollow sections. Vertical inclined

Technical note

sections would be provided to transmit loading between these top and bottom chords. Transverse bracing would also be provided between the top and bottom chords to limit the effects of lateral torsional buckling along the length of the truss. Option 3 is shown on drawings 5186693/HTR/SK/1704 REV_ and 5186693/HTR/SK/1705 REV_.

A steel deck plate would be provided along the length of the truss supported off the transverse bracing. The steel deck would be finished with a combined water proofing and surfacing layer. The new bridge would be supported on two reinforced concrete abutments constructed on the N11 cutting slopes. No central supports would be required within the N11 central reserve. It is envisaged that due to the structural form and material, the use of bridge bearings and expansion joints would be required. The choice of a through truss offers the advantage of providing a built-in, fully contained pedestrian parapet railing supported via the vertical bracing members. The fully contained parapet system also reduces the potential for anti-social behaviour on the bridge.

The cross section of the proposed bridge would provide a 2.0m wide pedestrian footpath and a 3.15m wide cycle lane over the N11. The bridge would be 5.85m in width from external face to external face (see Figure 3-3). The proposed span would be similar to the existing bridge. The abutment setback, abutment VRS, vertical clearance to structure, structure skew, off-set from existing structure and minimum design life would all be as per Option 2.

An internal vertical clearance of 2.7m would be provided along the entire length of the new bridge. The overall structural depth of the new bridge would be 3.3m (approx.) from upper face of top longitudinal cord to bottom of the bottom cord. The structure dimensions would be confirmed at preliminary design stage.

A similar superstructure is in use 800m (approx.) to the south of the proposed bridge location where a 3-span warren truss carries pedestrians and cyclists over the N11. The structure is painted green which helps it to blend into the environment. A similar paint system would be specified for Option 3.

Table 3.3 Proposed Bridge Cross-Section

Section	Width (m)
Truss Structure	0.35
Cycle Lane	3.15 (2.50 + 0.65 buffer)
Footpath	2.00
Truss Structure	0.35
Total	5.85

4. Economic Evaluation

The cost of all options will vary considerably and will be dependent on the developments of the preliminary design. The traffic management, span length, structural form and material will have a major impact on the total construction cost of the bridge. The economic evaluation assumes that the bridge will not be considered a landmark structure and will be low key in nature. At preliminary design stage, the choice of materials and quality of finish may have a large effect on the cost of the bridge. Rates provided for each option have been generated in line with Spon's Civil Engineering and Highway Works Price Book 2020. As the design is not sufficiently developed at this stage, it is recommended that an "all-in" construction rate per m² is used as detailed in the tables below. It is assumed the steel options will implement painted steel solutions rather than stainless or weathered steel options. Note that cost estimates below are for the new N11 bridge structure only.

4.1. Option 2 Economic Evaluation

Table 4-1 Option 2 Economic Evaluation

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Description	Quantity	Unit	Rate (€)	Amount (€)
Precast Concrete Beams	329	m ²	4,675	1,538,075
N11 Central Reserve Traffic Management	40	days	4,000	160,000
N11 Hard Shoulder Traffic Management	80	days	1,000	80,000
Bridge Lifts Traffic Management	2	days	10,000	20,000
R918 Road Traffic Management	20	days	1,000	20,000
Total Construction Cost				1,818,075
Professional Consultancy Fee (10%)				181,808
Overall Total Cost				1,999,883

4.2. Option 3 Economic Evaluation

Table 4-2 Option 3 Economic Evaluation

Description	Quantity	Unit	Rate (€)	Amount (€)
Precast Concrete Beams	313	m ²	4,510	1,411,630
N11 Hard Shoulder Traffic Management	80	days	1,000	80,000
Bridge Lifts Traffic Management	1	days	20,000	20,000
R918 Road Traffic Management	15	days	1,000	15,000
Total Construction Cost				1,526,630
Professional Consultancy Fee (10%)				152,663
Overall Total Cost				1,679,293

5. Construction and Buildability

Construction works should seek to limit impacts on the N11, R918 and the public in general. To do this the bridge should seek to remove and minimise interactions between construction works and the adjoining infrastructure.

5.1. Temporary Works

Temporary works would be required at numerous stages of the construction progress to enable safe site works to continue. Temporary works required for each feasible bridge option is considered below;

5.1.1. Option 2

The following items have been identified as potential temporary work designs required during the construction of the new pedestrian/cycle bridge.

- Temporary work would be required during establishment of a site compound for items such as safety fences and hoarding.
- Temporary work to support the construction of the central support cross beam may be required.
- Piling to the abutment on each embankment (if required) would require the design of piling platforms.

5.1.2. Option 3

The following items have been identified as potential temporary work designs required during the construction of the new pedestrian/cycle bridge.

- Temporary work would be required during establishment of a site compound for items such as safety fences and hoarding.

Technical note

- Piling of the abutment on each embankment (if required) would require the design of piling platforms.
- Two crane platforms may be required for erection of the steel truss bridge.

5.2. Traffic Management

The use of traffic management would be required for all bridge options both within the N11 and along the R918. The extent of traffic management on both routes would vary between each option. The extent of traffic management for each option is considered below.

5.2.1. Option 2

Option 2 proposes the construction of a central support within the central reserve of the N11. This would include piling and pile cap, central supports and crosshead construction within the central reserve. The extent of these works would require extensive traffic management on the N11. During construction of the central support the existing hard shoulders would be utilised with all northbound and southbound carriageways moving outwards creating a safe construction area. This area would encompass the existing northbound Lane 2, southbound Lane 2 and the central reserve. It is envisaged that traffic management restrictions within the central reserve of the N11 would be required for a period of approximately 40 days to allow construction of the central supports.

On completion of construction works within the central reserve, the construction area would be moved to the embankments with all north and south bound carriageways transferred back to the existing carriageway layout. The existing hard shoulders would be occupied for the construction area of the abutments and vehicle restraint systems (if required). It is envisaged that the traffic management restrictions within the N11 hard shoulders would be required for approximately 80 days to allow construction of the end supports.

Full closure of the N11 carriageways would be required for the lifting and erection of the precast bridge beams. These closures would be carried out during night-time and weekends. It is envisaged that the duration of beam lifts could be limited to two nights reducing the effects on the N11. The bridge design would ensure the beam erection sequence can be staggered so that simultaneous closures of the N11 carriageways in both directions is avoided. Closure of all lanes in one direction would be required during the lifting of beams for its associated span, with lanes in the opposite direction remaining open.

Traffic management would be required along R918 for access and egress to the abutment locations.

5.2.2. Option 3

This option proposes construction of in-situ concrete abutments within the embankments on either side of the N11 carriageway. During construction, traffic management would be required within the hard shoulders of the N11 to create a safe working zone.

The existing hard shoulders would be occupied for the construction area of the abutments and safety barriers (if required). It is envisaged that the traffic management restrictions within the N11 hard shoulders would be required for approximately 80 days to allow construction of the end supports.

It is likely that the truss would be prefabricated and then spliced together on site. This would require significant space to execute. It is assumed that this can be carried out in a compound adjacent to the N11 and then transported locally before being lifted into place.

Full closure of the N11 would be required during lifting of the truss into position. These closures would be limited to night-time and weekend closures to limit the effects on the N11. As this option assumes a single span structure full closure of the northbound and southbound lanes would be required simultaneously. It is anticipated that a one-night closure would be required for the erection of the truss.

Traffic management would be required along the R918 for access and egress to the abutment locations.

5.3. Construction Traffic

Consideration would need to be given to the safe movement of pedestrians, cyclists and vehicles in the area during construction. The transport and erection of the beams/truss would require significant space and

Technical note

coordination of traffic flow within the area. The construction planning would need to prioritise minimal construction within and over the carriageways, limiting the need for traffic management measures on the N11.

Permission to transport prefabricated beams or truss sections to the site or site compound would need to be granted by An Garda Síochána by applying for a permit for movement of an abnormal load. An Garda Síochána would set out the allowable route, time and speed limits for the loaded vehicle and may need to provide an escort to the transporting vehicle to ensure maximum safety to other road users. It is assumed that the beams would be classed as an abnormal load as set out by the Road Traffic (Construction and Use of Vehicles) Regulations 2013, S.I. 5 of 2003. Abnormal loads covered under the remit of the aforementioned permit must not exceed size restrictions as set out by the Road Traffic (Permits for Specialised Vehicles) Regulations 2009. The load must not exceed 4.65m in height, 4.3m in width and 27.4m in length.

5.4. Pedestrian and Cyclist Traffic

To minimise the impact of construction works on the public the existing bridge should be maintained fully functional for pedestrians and cyclists until the new bridge is complete. Site compounds and site access routes should account for pedestrian and cyclist access and safety around the existing bridge.

6. Conclusions & Recommendations

Based on the above criterion the high level multi-criteria analysis results are shown on Table 4-2.

Table 4-2 Option Selection Analysis

Assessment Criteria	Option 1 – Provision of Cycling Facilities on Existing Bridge	Option 2 – New 2-span Pedestrian/ Cycle RC Bridge	Option 3 – New Single Span Pedestrian/ Cycle Truss Bridge
Technical	Not Possible		
Economic			
Construction & Buildability	Not Possible		

- Technical – Option 1 is not possible as there is insufficient room on the existing bridge to incorporate a pedestrian footway and cycle-track while maintaining 2-way traffic. Of the remaining options, Option 2 provides the most efficient design solution in terms of complexity of design, resources and time required. Option 3 has increased design requirements.
- Economic – Option 3 was found to be the most economical option when compared to the other Options considered.
- Construction & Buildability – Option 3 maximises the advantages provided by off-site fabrication as well as limiting the impact of construction works on the N11 (no work in central reserve).

Option 3 is the most favourable option when compared to the alternatives and is therefore the emerging preferred bridge option.

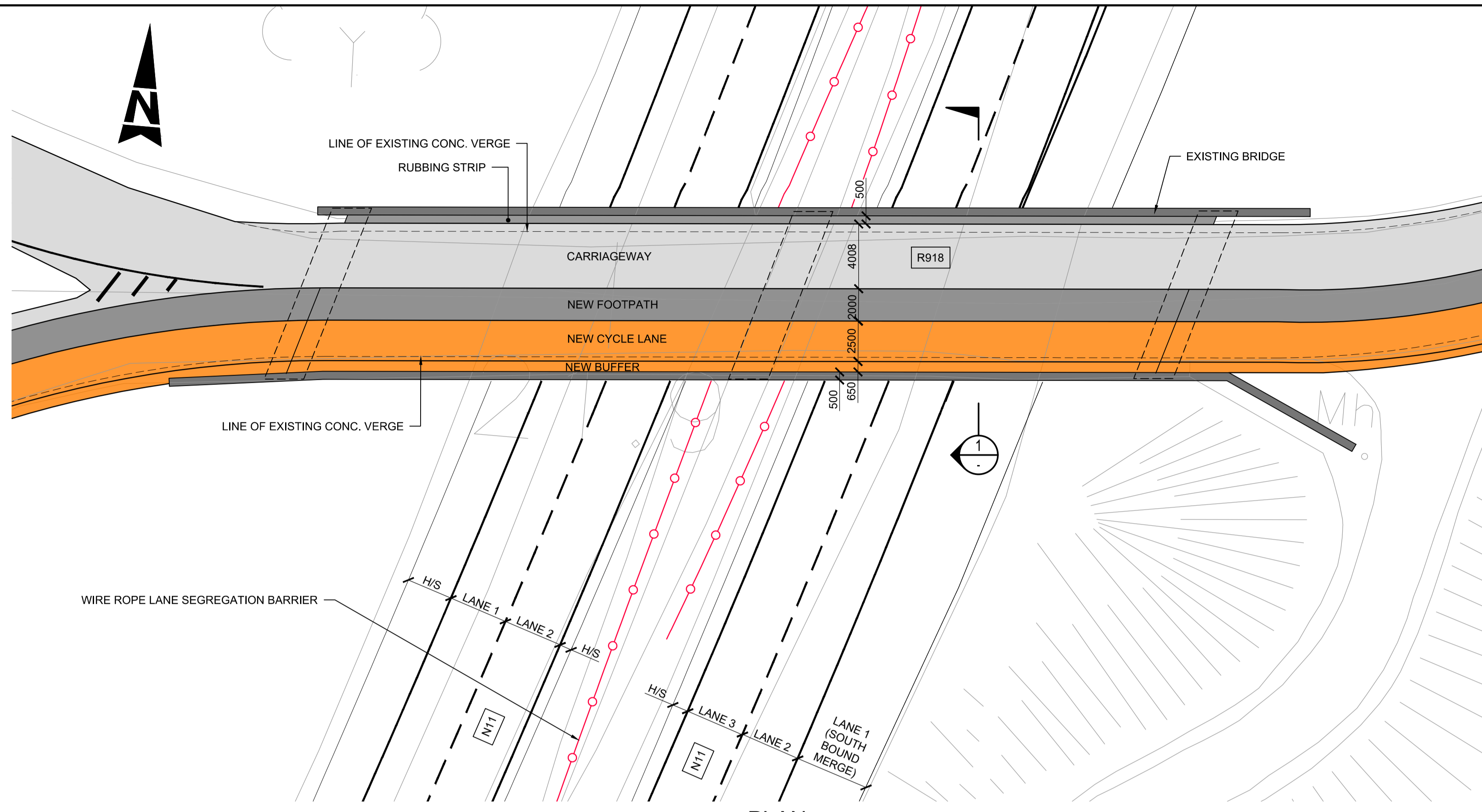
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Appendix A – Option Drawings

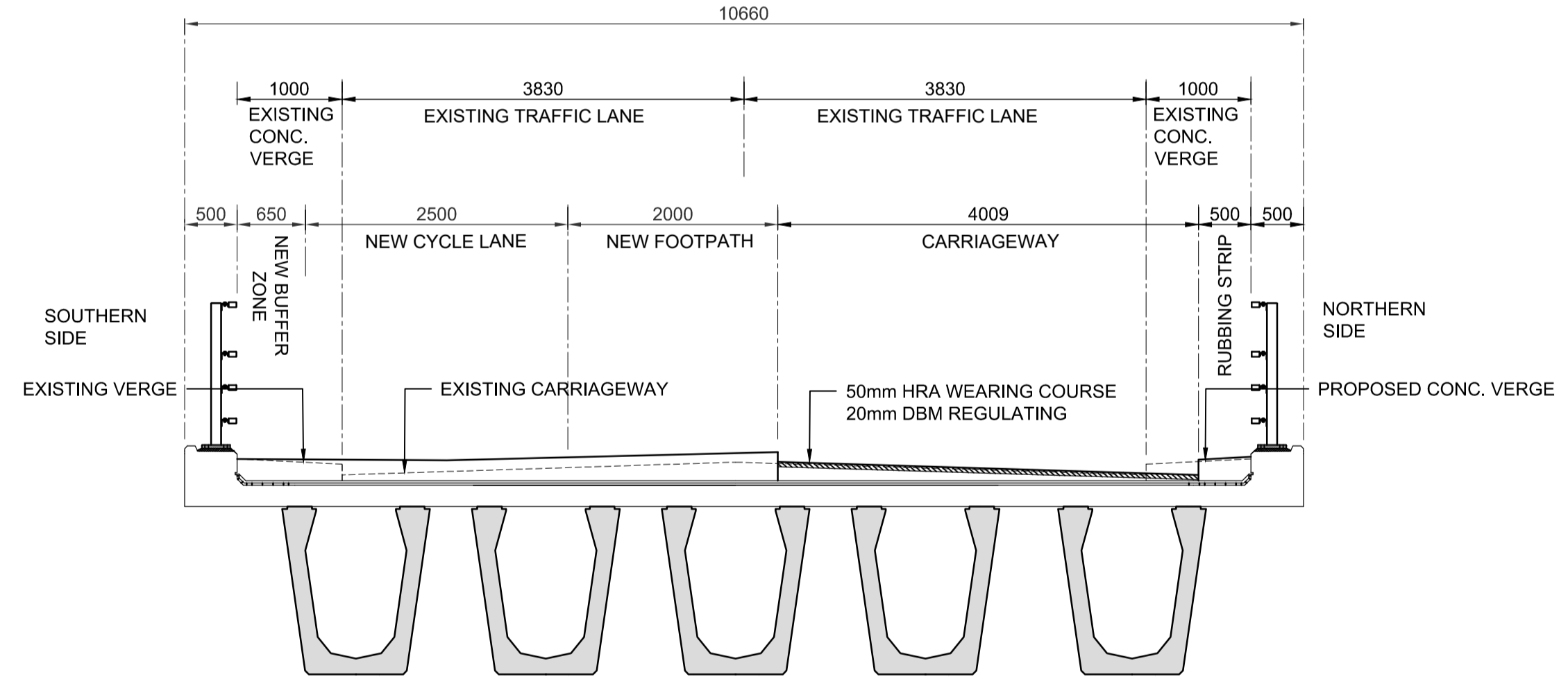
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PLAN
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Scale at A3 1:400



SECTION 1
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OPTION 1 - EXISTING BRIDGE WITH NEW CARRIAGEWAY LAYOUT TO INCLUDE CYCLE / PEDESTRIAN LANE.

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

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Purpose		PLANNING			
Title		PROPOSED BRIDGE OPTION 1			
Original Scale	Design/Drawn	Checked	Authorized		
AS SHOWN	RG	RM	KB		
Status	Date	Date	Date		
P	05.11.21	05.11.21	05.11.21		
Drawing Number		Rev			
5186693 / HTR / SK / 1701		-			

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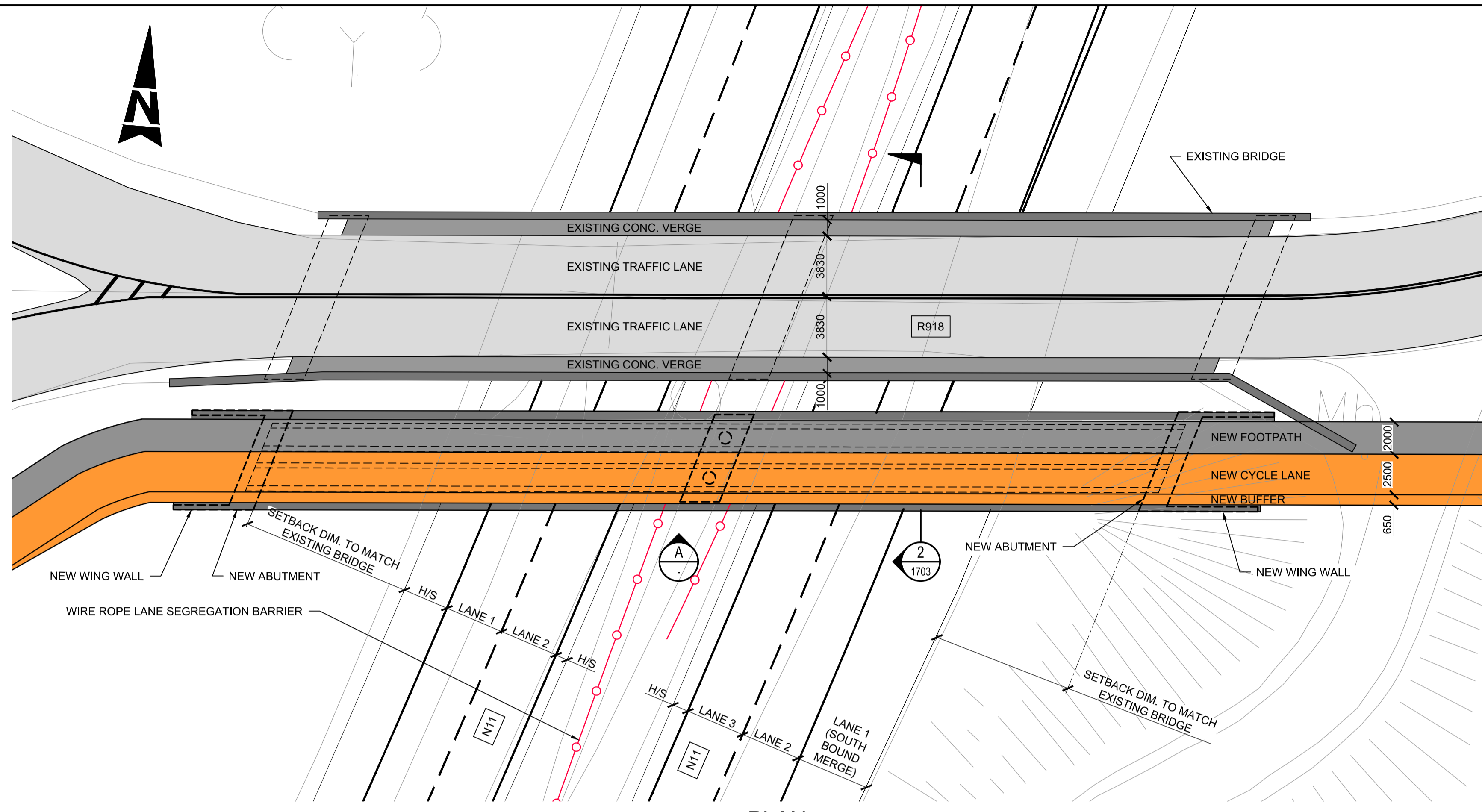
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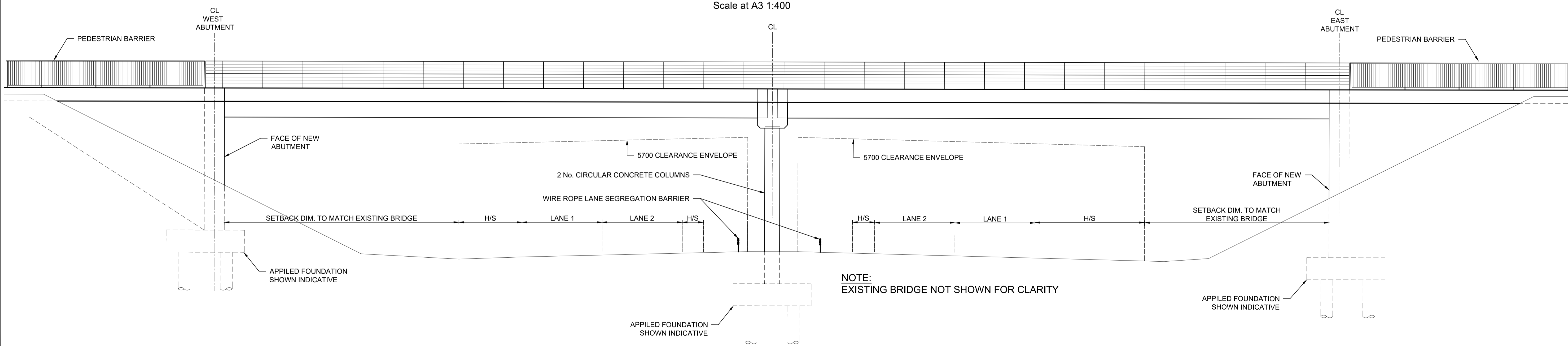
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PLAN
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Scale at A3 1:400



ELEVATION A
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**OPTION 2 - EXISTING ROAD BRIDGE AND EXISTING CARRIAGEWAY LAYOUT.
NEW 2-SPAN PRESTRESSED BEAM AND CONCRETE DECK BRIDGE**

- GENERAL NOTES**
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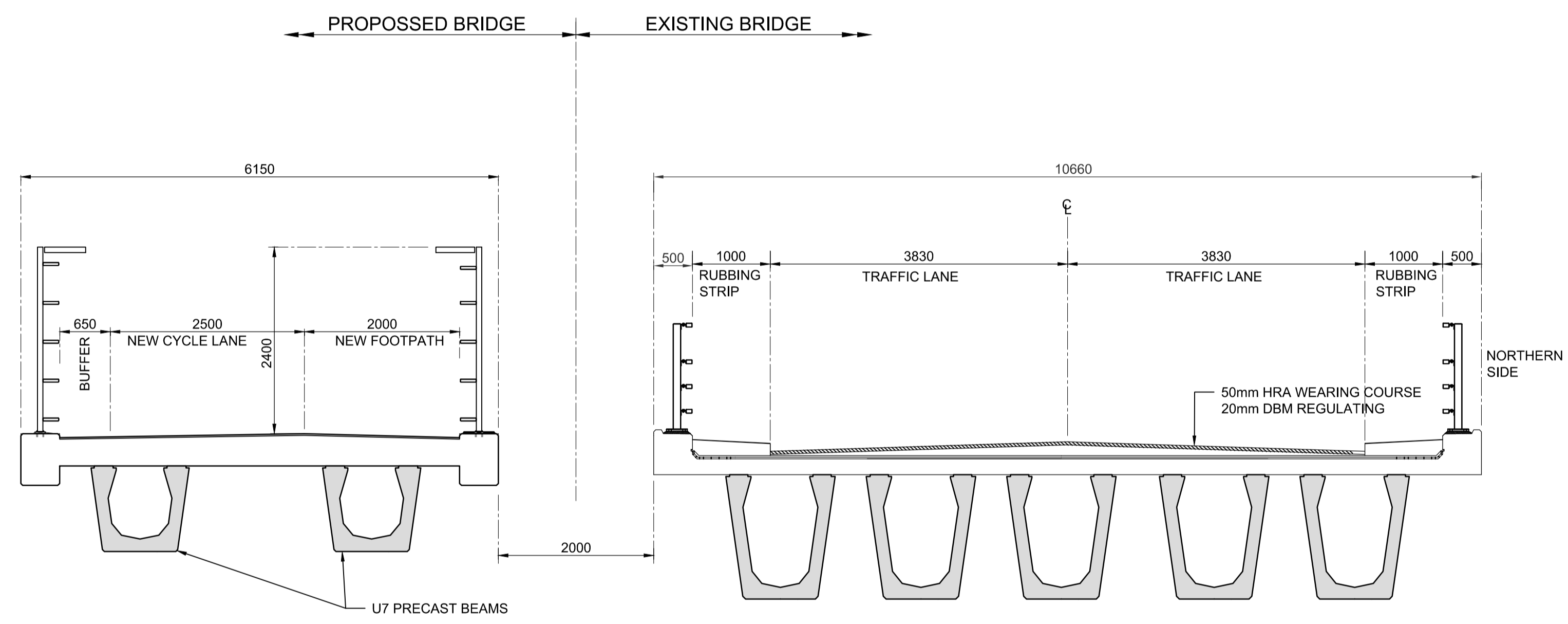
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Client: **Cosgrave**

Project: **FASSAROE DEVELOPMENT**

Purpose: PLANNING	
Title: PROPOSED BRIDGE OPTION 2 - SHEET 1 OF 2	
Original Scale: AS SHOWN	Design/Drawn: RG
Checked: RM	Authorized: KB
Date: 05.11.21	Date: 05.11.21
Date: 05.11.21	Date: 05.11.21
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Rev: -	

- GENERAL NOTES**
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SECTION 2
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Scale at A3 1:100

**OPTION 2 - EXISTING ROAD BRIDGE AND EXISTING CARRIAGEWAY LAYOUT.
NEW 2-SPAN PRESTRESSED BEAM AND CONCRETE DECK BRIDGE**

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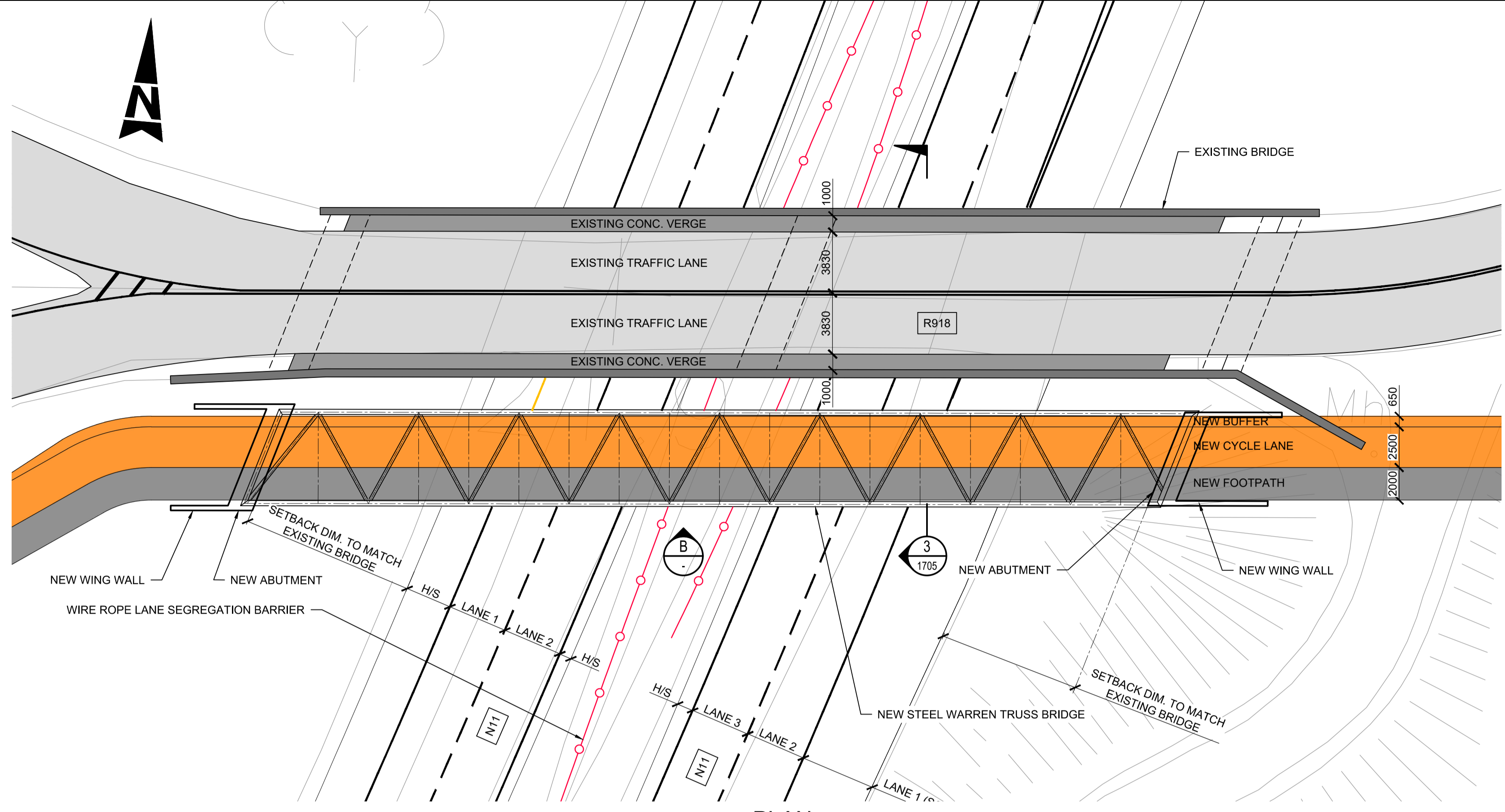
Client: **FASSAROE DEVELOPMENT**

Purpose		PLANNING			
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AS	SHOWN	RG	RM	KB	
Date	05.11.21	Date	05.11.21	Date	05.11.21
Status	Drawing Number		Rev		
P	5186693 / HTR / SK / 1703		-		

A1

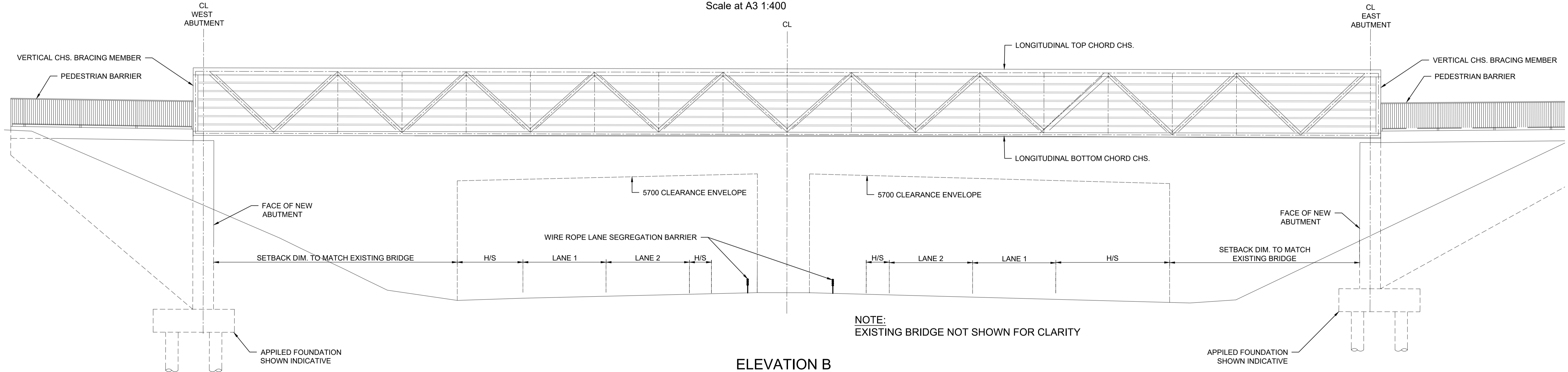
DO NOT SCALE

File: 5186693_HTR_SK_1704_1705.dwg
Date: Nov 17, 2021 - 1:10pm
Plotted by: RGeography



PLAN
Scale at A1 1:200
Scale at A3 1:400

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



ELEVATION B
Scale at A1 1:100
Scale at A3 1:200

OPTION 3 - EXISTING ROAD BRIDGE AND EXISTING CARRIAGEWAY LAYOUT.
NEW SINGLE-SPAN FULLY THROUGH STEEL WARREN TRUSS BRIDGE

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Rev	Description	By	Date	Chkd	Auth
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Client: **Cosgrave**

Project: **FASSAROE DEVELOPMENT**

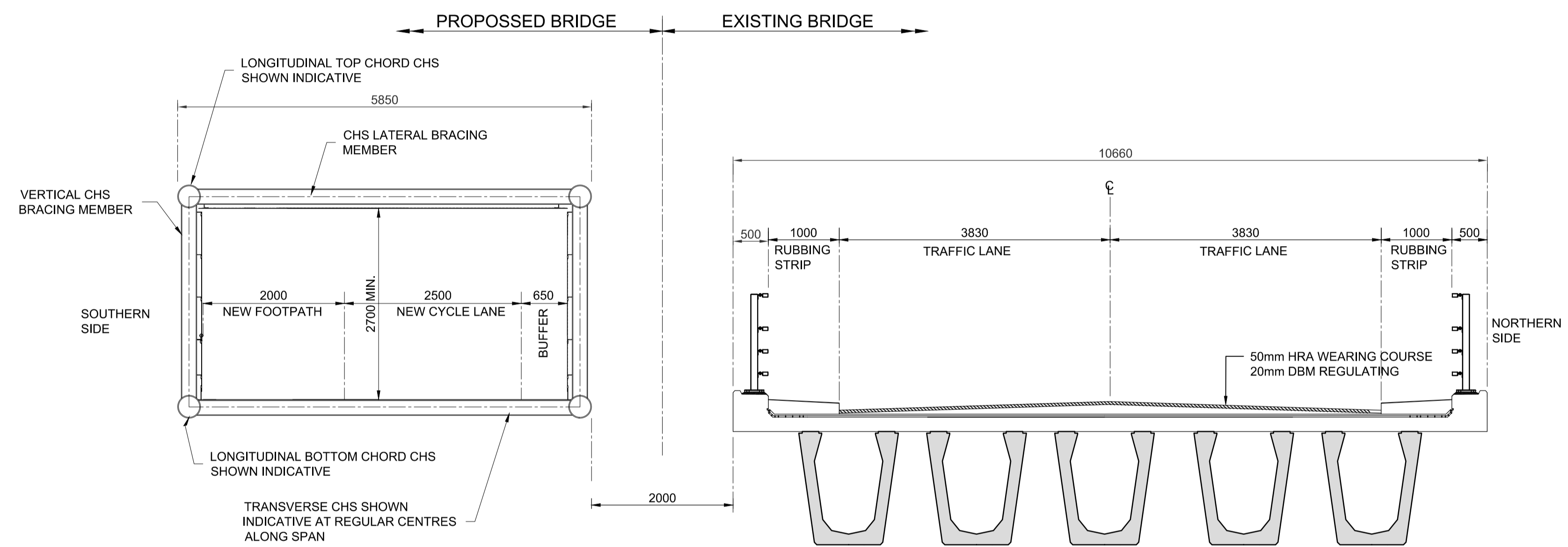
Purpose: PLANNING	
Title: PROPOSED BRIDGE OPTION 3 - SHEET 1 OF 2	
Original Scale: AS SHOWN	Design/Drawn: RG
Checked: RM	Authorized: KB
Date: 05.11.21	Date: 05.11.21
Date: 05.11.21	Date: 05.11.21
Status: P	Drawing Number: 5186693 / HTR / SK / 1704
Rev: -	

A1

DO NOT SCALE

File: 5186693_HTR_SK_1704_1705.dwg
Date: Nov 17, 2021 - 1:00pm
Plotted by: RGeraghty

- GENERAL NOTES**
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE
 2. ONLY WRITTEN DIMENSIONS SHALL BE USED. NO DIMENSIONS SHALL BE SCALED FROM THE DRAWINGS
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SECTION 1
Scale at A1 1:50
Scale at A3 1:100

**OPTION 3 - EXISTING ROAD BRIDGE AND EXISTING CARRIAGEWAY LAYOUT.
NEW SINGLE-SPAN FULLY THROUGH STEEL WARREN TRUSS BRIDGE**

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-	ISSUE FOR PLANNING	RG	12.11.2021	RM	KB

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Client: **Cosgrave**

Project: **FASSAROE DEVELOPMENT**

Purpose: PLANNING			
Title: PROPOSED BRIDGE OPTION 3 - SHEET 2 OF 2			
Original Scale: AS SHOWN	Design/Drawn: RG Date: 05.11.21	Checked: RM Date: 05.11.21	Authorised: KB Date: 05.11.21
Status: P	Drawing Number: 5186693 / HTR / SK / 1705		Rev: -