Wicklow County Council

Bray Sustainable Transport Bridge

Part 8 Application Report

RDPTB-ARUP-ZZZ-ZZZ-RP-ZZ-0001

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Executive Summary

Bray is the largest town in County Wicklow. It is an important transport and economic hub for the surrounding area and is situated within the Dublin Metropolitan area. Transport links in Bray include the Dart and other train services, several bus services and access to the N11/M11. Despite this, the town centre often experiences traffic congestion at peak times, particularly along Main Street and over Fran O'Toole Bridge, which is currently the only trafficked bridge over the River Dargle in the town centre. This bridge lies to the north of the town centre and accommodates bus, private vehicle, pedestrian and cyclist traffic in and out of Bray.

In the coming years Bray's population is expected to increase significantly, placing greater demand on the town's already stretched transport infrastructure. It is imperative that Bray's infrastructure is improved to keep up with the demand of a growing population, however it is also crucial that new transport links encourage a modal shift away from private vehicles and encourage road-users to adopt public transport, cycling and walking as viable, cleaner forms of transport.

The proposed Bray Sustainable Transport Bridge (BSTB) and associated link road is a development that will have an immediate and lasting impact on Bray town centre. The bridge will cross the Dargle near the mouth of the river and connect the Bray station area with Dublin Road. This will greatly reduce the congestion that is currently experienced on Main Street by providing an alternative route in and out of Bray.

The proposed bridge and link road will provide a two-lane 'public transport only' road and river crossing as well as cyclist and pedestrian passage. Private vehicles will not be permitted to use the proposed link, encouraging a modal shift toward walking, cycling and public transport. Such a link will allow bus service providers to increase their service offering, while servicing current and future residents north of the river.

The carriageway will comprise two 3.25m wide bus lanes and variable width pedestrian (2.0 m min.), cyclist (2.0 m min.) and shared path facilities (3.0 m min. to match existing, 4.0 m min. on the bridge) depending on the site constraints. A new pedestrian boardwalk is proposed along the southern riverbank wall to link the existing walkway to the bridge crossing.

The bridge will be structurally 'futureproofed' such that it can accommodate the loading associated with the future Luas B2 line extension, which would connect Bray station with Cherrywood, and on to the existing Luas green line. This is a crucial design consideration, given Bray's strategic location within the Metropolitan area and its anticipated population increase. The design includes a theoretical Luas alignment, however, this does not form part of the application. The Luas alignment is included in this application to illustrate that the proposed road and bridge geometry can accommodate a viable Luas alignment.

The bridge itself will be of architectural significance within Bray and will sit in a highly visible landmark location.

For this purpose, an experienced bridge architect was engaged to provide design input into the form, functionality and detail for the bridge.

Both Appropriate Assessment and EIA Screening reports were conducted as part of the pre-application works.

The Appropriate Assessment Screening report, compiled by Arup, recommended that likely significant impacts on any Natura 2000 sites can be ruled out. Following this, Wicklow County Council as the competent authority, has determined that an Appropriate Assessment is not required for this project.

Similarly, the EIA Screening report, compiled by Arup, concluded that there is no real likelihood of significant effects on the environment arising from the proposed development. Wicklow County Council, as the competent authority, has determined that an EIA is not required for this project.

The proposed link road will cross the river via a single span bridge structure. The soffit of the bridge will be above the level of the existing flood defences and will not have any permanent supports in the waterway. Hence, this bridge will not have any hydraulic impact on the waterway once completed. To enable the bridge to be constructed, temporary works within the waterway will be required. These will comprise a rock-fill working platform and temporary support towers. A flood risk assessment for the proposed bridge and link road has been carried out for this project.

Due to the confined corridor to the south, the proposed works will encroach on the lands currently used by Irish Water for Bray Pumping Station. The proposed works do not encroach on the Irish Railway lands to the east.

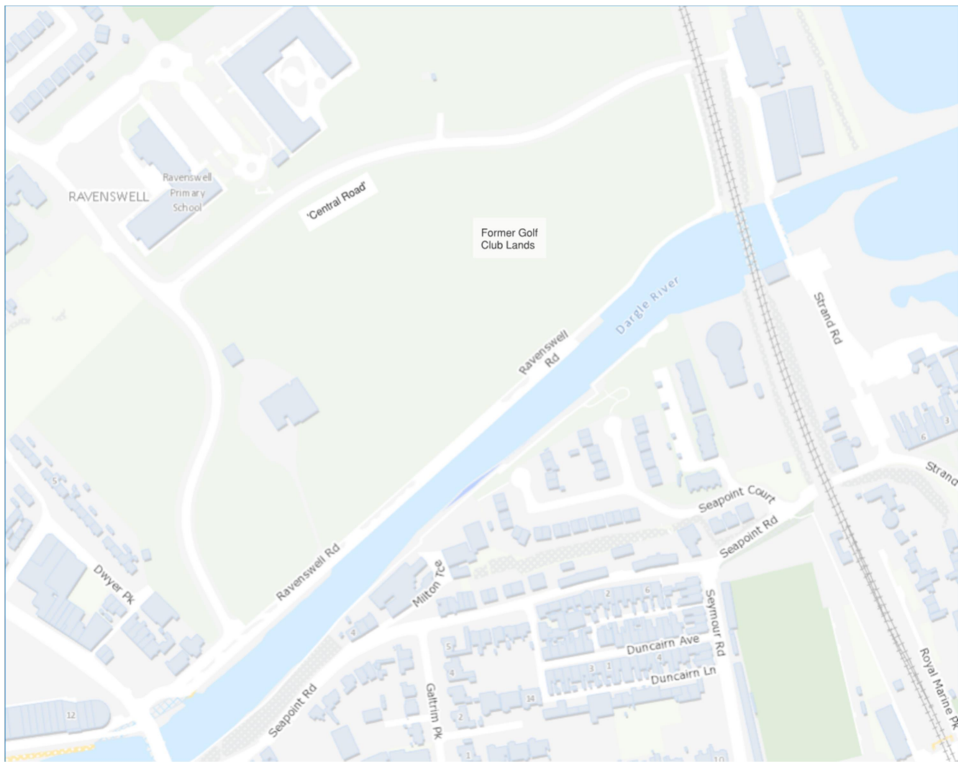
A host of existing utilities run parallel to the northern riverbank wall. Where necessary, these services will be relocated prior to construction. A relocation package for this suite of services will be provided during detailed design. The bridge will not impact on the existing services on the southern bank associated with the Bray Pumping Station, with foundations located to span these critical services.

1 Introduction

Wicklow County Council (WCC) is seeking a Part 8 approval to carry out the design and construction of a Public Transportation Link connecting the recently constructed Central Road with Seapoint Road, allowing for a transport link between Dublin Road and Bray DART Station, through the former Golf Club lands.

The scheme requires a bridge over the River Dargle near the mouth of the river at Bray Harbour. The road will provide pedestrians and cyclists with access across the river as well as upgrading a crucial piece of public transportation infrastructure by connecting Bray station to the main road to Dublin with a dedicated public transport route out of Bray. Currently there is no dedicated public transport traffic lane through Bray town centre.

Figure 1: Location Plan



As part of the scheme, a single span bridge is proposed to span the river, as well as a number of support structures to tie into existing pedestrian and cycleway infrastructure. The bridge will be constructed so as to accommodate the possible future Luas B2 Line Extension, linking Bray station with the existing Luas Green Line via Cherrywood.

This document has been prepared in accordance with Part 8 of the Planning and Development Regulations, 2001 as amended. The report should be read in conjunction with the Part 8 drawings.

2 Project Scope

2.1 Planning and Policy History

In June 2005 Pizarro Developments made a total of 4 No. planning applications for a mixed use development at the former golf club lands site. 2 applications were submitted to Bray Town Council and 2 applications were submitted to Dun Laoghaire-Rathdown County Council. As part of the application, ancillary works were applied for, along with the multiple business and residential developments proposed for the site. These ancillary works included

- Improvements to and Pedestrianisation of Ravenswell Road
- Rehabilitation of the River Dargle along its channel and northern and southern banks including the provision of a flood defence scheme and river habitat improvement works from Bray Bridge to the railway bridge
- Provision of a new pedestrian/cycle route incorporating a new bridge over the River Dargle linking the south-eastern corner of the Bray Golf Club lands with the eastern end of Seapoint Road.

In May 2006, both Bray Town Council and Dun Laoghaire-Rathdown County Council granted permission for the 4 No. planning applications.

Furthermore, a development proposal was brought forward by Pizarro Developments which facilitated the inclusion of the bridge and associated road network as part of the proposal. The development proposal was approved by An Bord Pleanála (ABP) in 2010 with a 10-year permission that remains valid until October 2020 (BTC/WCC 07/194 ABP PL39.230246).

Since then, Ravenswell Road has been improved and pedestrianised and a flood defence scheme has been installed. As well as this, multiple other infrastructure developments mentioned in the original planning application have been completed. The execution of the proposed link road and bridge aligns with the previously approved planning applications to Bray Town Council, Dun Laoghaire-Rathdown County Council, and An Bord Pleanála and will complement other infrastructure in the area that has been developed since the original planning application was submitted.

The Public Transportation Link from Dublin Road to Bray DART station is identified in the Bray Municipal District Local Area Plan 2018-2024 as an essential link. This scheme forms part of a phased solution which will deliver a new public transportation route (available for public transport, cyclists and pedestrians only) with a bridge over the River Dargle linking up with Seapoint Road.

2.2 Need for the Scheme

Bray is the largest town in County Wicklow. It is situated c. 17km south of Dublin city centre and is located within the Dublin Metropolitan Area.

The town has strong transport links, with access to the N/M11 (including M50), DART/rail line and a quality bus service. Despite this, the town centre often experiences traffic congestion at peak times, particularly along Main Street and over Fran O'Toole Bridge, which is currently the only trafficked bridge over the River Dargle in the town centre. This bridge lies to the north of the town centre and accommodates bus, private vehicle, pedestrian and cyclist traffic in and out of Bray. Population targets for Bray are provided in the Core Strategy of the Wicklow County Development Plan which identifies population increase from 29,624 in 2016 to 36,237 in 2022 and to 40,000 in 2028.

With an expected population increase of 33% over a 12-year period, it is essential that Bray's public transportation network be expanded and upgraded, not only to accommodate the increased demand posed by population increase, but also to encourage a greater proportion of commuters in Bray to use public transport links.

2.3 Identifying a Solution

The Public Transportation Route linking Dublin Road to Bray DART station was first proposed in the '*North Bray & Environs Land Use and Transportation Study*', July 2006, commissioned jointly by Dun Laoghaire Rathdown County Council (DLRCC), WCC & Bray Town Council. In 2006 the Railway Procurement Agency progressed the design of Luas Line B2, which is the extension of Luas from Cherrywood to Bray. The emerging preferred route corridor included the route of the Public Transportation Link to Bray Dart Station through the Former Golf Club Lands.

A development proposal brought forward by the owners of the Former Golf Club Lands facilitated the Public Transportation Link by including road infrastructure through the Golf Club Lands as well as a bridge over the Dargle as part of the planning design for the scheme. The development proposal was approved by An Bord Pleanála (ABP) in 2010 with a 10-year permission that remains valid until 26th October 2020 (BTC/WCC 07/197). While the majority of the development proposal has not progressed, a significant portion of the road infrastructure has been implemented as part of a separate planning approval for the recently completed school's development on the Former Golf Club Lands.

2.4 Project Objectives

The public transportation link between Bray Station and the Dublin Road will be a key piece of strategic infrastructure for the town of Bray when completed. As well as providing a new high-quality public transport route in and out of Bray, the road will also service pedestrians and cyclists, as well as future residential and business properties on the site of the former golf club which is currently undeveloped.

This application presents the road link between the recently constructed Central Road and Seapoint Road, with a bridge spanning the River Dargle.

The scheme must improve travel times in and out of Bray and should contribute to a reduction in traffic congestion in Bray town centre.

The link will accommodate sustainable modes of transport and should therefore encourage residents of Bray to use public transport by providing a service that is faster and more comfortable than alternative means. By providing a high quality, safe pedestrian and cyclist route, the link road should facilitate a modal shift towards these modes of transport and away from private vehicle use.

The link road and associated structures must be aesthetically pleasing. The site upon which the road will be built is likely to be developed in the coming years into a multiuse public amenity space. It must be serviced by a suitably high-quality infrastructure link. The bridge, which will carry the link road over the River Dargle, will be highly visible to those entering Bray, both by rail passengers and those entering along Main Street. Hence, it is the intention of Wicklow County Council that the opportunity to build a landmark structure in a highly visible location is taken.

All design work must be carried out to the highest standard. It is an objective of WCC that the bridge conforms to design standards as defined by TII Publications (Standards), structures comply with Eurocodes and the scheme is designed to Luas design standards including loading arrangements. The design is to support sustainable transport systems as far as is practicable.

It is an objective of Wicklow County Council, that the integrity of the Dargle River be maintained and the capacity of the river - with regard to flood defences - should not be compromised by the works. The design should take cognisance of the design solution adopted in the recently completed River Dargle Flood Defence Scheme.

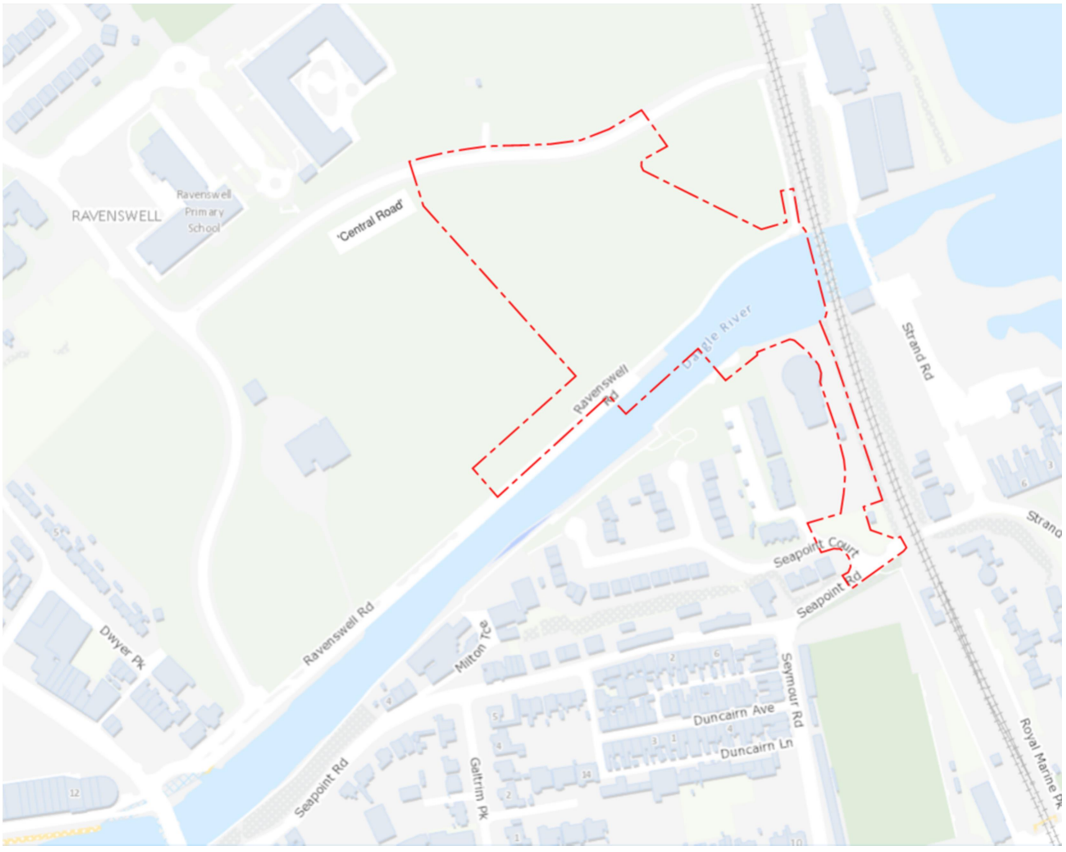
3 Location and Site Context

The proposed transport link will be developed on a green field site to the north of Bray town centre. The link must connect to and be incorporated into existing infrastructure. The following is a summary of existing transport infrastructure that the proposed transport link will interface with, as well as a brief statement on the existing situation for each transport mode.

3.1 Location

The site for the proposed transport link is in Bray, County Wicklow, near the border with South County Dublin. The proposed transport link will pass through the currently undeveloped former Golf Club lands to the north of the River Dargle, tying into the existing 'Central Road' which provides the connection to Dublin Road to the north. South of the river, the proposed link will cross the River Dargle and run along the confined corridor between the railway line and Bray Pumping Station, tying into the existing Seapoint Road Junction.

Figure 2: Location Plan with Red Line Boundary



There is a narrow corridor of land through which the proposed transport link will travel before connecting into Seapoint Road. This corridor is flanked by Irish Rail lands to the East and Bray Pumping Station to the west.

- **Railway Lands** – The railway lands are a key constraint in the design of both the bridge and link road alignment. The road alignment has been designed to minimise the impact on the existing railway boundary.
- **Bray Pumping Station -** The main structure of the pumping station comprises a circular reinforced concrete building, approximately 12m high, with additional building structures extending off it to the south. A standalone electrical housing structure is located further south. Pipes extend off from the main building structure, noticeably the two rising mains leading to the Shanganagh Wastewater Treatment Plant (refer to drawing RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9025). Additional underground pipelines include the long- and short-sea outfalls, which run from the main structure eastwards towards the sea.

3.2 Existing Roads & Junctions

The following existing roads to the north of the river interface with the proposed link road:

- **'Central Road'** – Newly constructed road that begins at the junction between Dublin Road and Chapel Lane before splitting, with one arm connecting the primary school to the sea front under the railway line and the other arm continuing south to tie in with Ravenswell Road.
- **Ravenswell Road** – Local road that runs alongside the River Dargle's north banks. The road has been pedestrianised and provides pedestrian and cyclist access between Castle Street and the Railway Line, running alongside the railway embankment and finally connecting with Central Road.

The following existing roads to the south of the River Dargle will also interface with the new link road.

- **Seapoint Road –** Two-lane road that runs from the Main Street in Bray under the DART railway bridge before curving south onto Strand Road. There is one traffic lane in each direction.
- **Seapoint Court –** Residential estate that feeds out on to Seapoint Road, providing access and egress to residents. The estate diverges into 3 individual cul-de-sac roads that all end at the south bank of the River Dargle.
- **Seapoint Court/Seapoint Road Junction –** The junction provides local access to residents of Seapoint Court, as well as a road link to Bray town centre to the west, or toward Bray Harbour and Station to the east and south. The junction also provides access to Bray Pumping Station. Approximately 40m to the East of the junction, Seapoint Road passes under the Dart line via a low clearance masonry arch bridge.

3.3 Public Transport

Public Transport in the area consists of Dublin Bus services and the Dart line, which services Dublin to the north and Greystones to the south. The rail line network operates on a single line between Bray and Greystones. Expanding the capacity of the Dart is limited by the physical constraints of the railway corridor.

The 145 route is the main bus route through the town centre. There is no dedicated, continuous priority bus lane through the town centre, which is often congested during peak times. Other, less frequent bus routes terminate at Bray station

According to the Greater Dublin Transport Strategy 2016 - 2035, private vehicles account for a 70% modal share of transport patterns, with just 11% attributed to public transport.

The Bray and Environs Transport Study (2019) envisages “significant growth in the Study Area. Between the Old Connaught and Fassaroe development areas, an additional population of c.16,000 is catered for either by land use zonings or by stated long-term aims of the local authorities”. Given the projected population increase in Bray in the coming years, it is imperative that the public transport network is upgraded to allow for a greater modal share to be attributed to public transport in the future. Following any development of the Old Connaught and Fassaroe areas, the proposed transport link will cater for the population of these areas west of the M11, in particular, following the Luas Extension to Bray.

3.4 Pedestrian and Cyclist Facilities

The preferred strategy of the NTA in the ‘Bray and Environs Transport Study’ includes the Public transport, pedestrian and cycle bridge from the Golf Club Lands to Bray Dart station for future use by Luas, The Bray Municipal District Local Area Plan 2018 - 2024 prioritises the enhancement of pedestrian and cycling infrastructure within settlements and between settlements where possible, including the development of ‘green routes’.

3.5 River Dargle

The river is approximately 57m wide at the site location and is flanked by flood defence walls either side. The location of the crossing is within the tidal zone of the waterway, approximately 100m from its outlet into Bray Harbour.

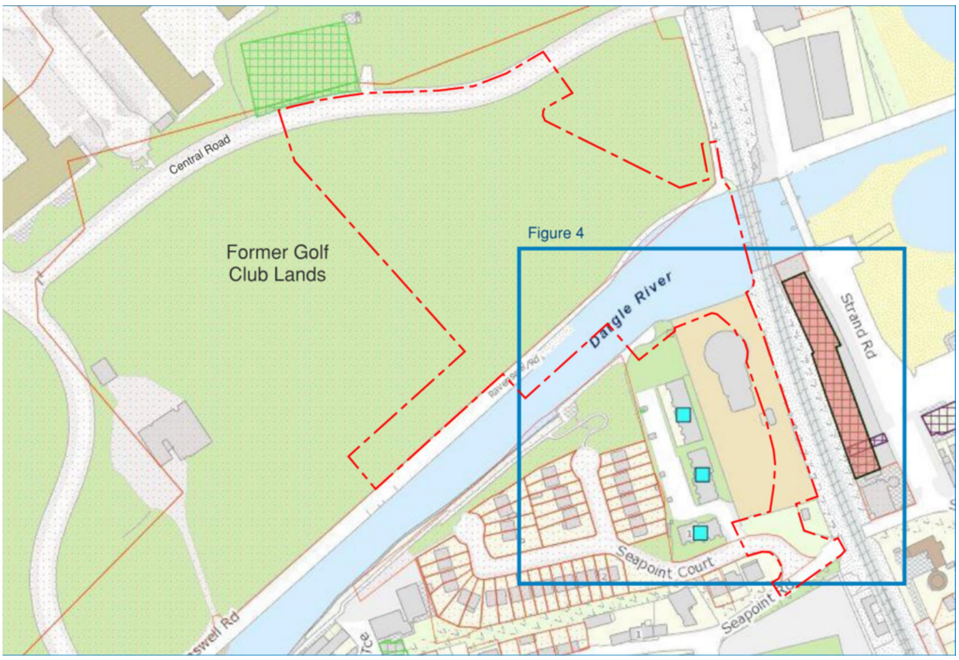
Refer to Section 4.8 for further information related to the waterway.

3.6 Boundary Constraints

The project extents are flanked by Central Road to the north and Seapoint Road to the south, with the alignment of the proposed link road influenced and constrained by the surrounding boundaries. Refer to Figure 3 below for a screenshot of the property boundaries in the vicinity.

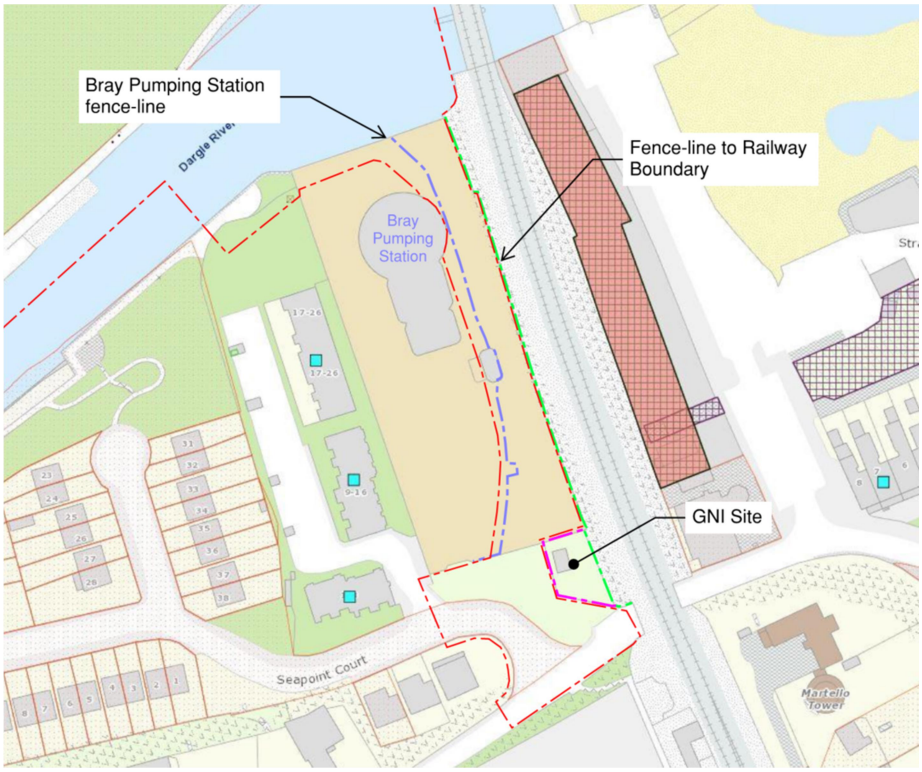
The proposed link road north of the river will be within the former Golf Club Lands. Works within the Former Golf Club Lands is by agreement. No compulsory purchase order of lands is proposed north of the river.

Figure 3: Property boundaries at site location



To the south, the proposed link road alignment is highly constrained by Bray Pumping Station and the railway boundary. A Gas Networks Ireland site is also located to the south, adjacent the junction with Seapoint Road. These boundary constraints create a confined corridor through which the proposed link road must pass, impacting on the available space to accommodate both pedestrian and cycle paths alongside the proposed carriageway.

Figure 4: Confined southern corridor



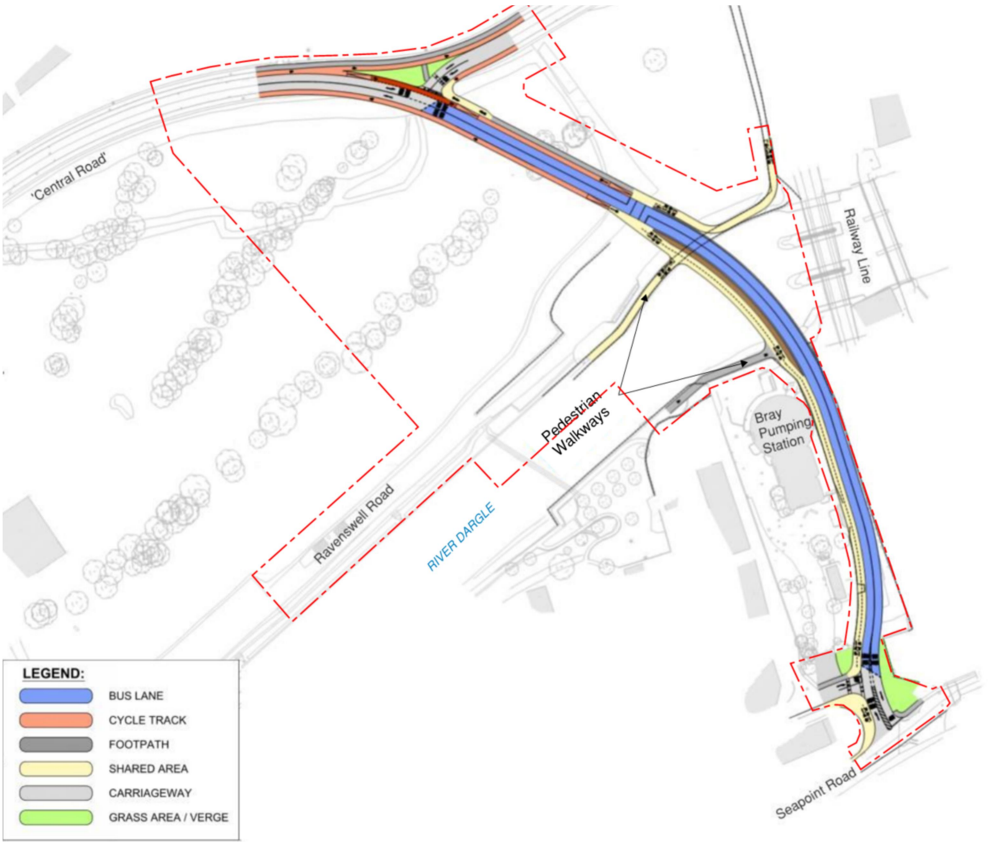
Bray Pumping Station is operated by Irish Water. It is however situated on land that is currently registered with Wicklow County Council. While the fence line comprises a constraint in this area, encroachment of works beyond the current fence line will be by agreement with Irish Water. No compulsory purchase order of lands is proposed south of the river.

4 Proposed Project

4.1 General Description of Scheme

The scheme comprises a public transport, cyclist and pedestrian link between the recently constructed Central Road to the north and Seapoint Road to the south. This proposed link will be approximately 460m long and comprise a single carriageway and a shared pedestrian/cycleway. The road will be carried over the River Dargle by a single-span bowstring arch bridge. Pedestrian walkways will tie into the bridge at both north and south abutments, connecting into existing pedestrian infrastructure on Ravenswell Road on the North bank, and the pedestrian walkway on the south bank. The proposed link will extend as far south as Seapoint Road where it will form a new junction with Seapoint Road and Seapoint Court.

Figure 5: Proposed scheme layout



4.2 Principal Design Considerations

During the development of the design presented in this report, the design team took cognisance of the following key considerations.

- The Bray Municipal District Local Area Plan 2018 - 2024
- Existing development proposal, approved by An Bord Pleanála (ABP) in 2010 with a 10-year permission (BTC/WCC 07/194

- Design Manual for Urban Roads and Streets
- Design Manual for Roads and Bridges
- Track Alignment - Tramway Clearances, (Railway Procurement Agency)
- Appropriate design specifications, standards, codes and guidelines, to ensure that best practice is achieved

4.3 Link road

4.3.1 Alignment Design

The horizontal alignment is constrained by the tie-in with Central Road to the north and the confined corridor south of the river between the railway boundary and Bray Pumping Station.

In addition to this, the Gas Networks Ireland site, located to the south, presents a further constraint to the alignment on its approach to the junction with Seapoint Road.

As part of the preliminary design process, the vertical alignment design has been optimised to accommodate a number of constraints. This was required to ensure a feasible solution was developed. The following aspects needed careful consideration when determining a suitable vertical alignment for the link road:

- Tie in with existing road levels either end of the works
- Clearance above design flood levels over the river
- Vertical profile that accommodated the potential future Luas B2 extension
- Limit cutting into existing ground levels adjacent the Bray Pumping Station to avoid impacting on existing sub-surface structure in the vicinity.
- Reduce fill embankments adjacent the existing railway embankment to avoid impact on the existing railway.
- Vertical profile of bridge to enhance aesthetics

Hence the proposed alignment design for the link road, both horizontal and vertical, is heavily influenced by the constraints of the site.

The geometry for the proposed link road is designed with reference to the Design Manual for Urban Roads and Streets (DMURS).

A design speed of 50km/h has been selected for the design of the road.

The link road has been designed to accommodate public transport, with 3.25m wide bus lanes selected in accordance with the requirements set out in DMURS. The width of the traffic lanes over the bridge have been widened to 3.5m to space-proof the bridge structure to accommodate the potential future Luas alignment. This includes the addition of 0.6m raised verges either side to allow for the necessary clearances adjacent to the bridge barriers.

The bridge's futureproofing does not include the provision of tracks within the deck or the laying of underground services and overhead electrical lines associated with LUAS.

The width of the pedestrian and cycle paths vary depending on the site-specific constraints and tie-ins. To the north, where space permits, the pedestrian and cycleways have been separated and aligned to tie in with existing arrangements. Due to the boundary constraints to the south, a shared path has been adopted for the pedestrian and cycle paths along this length.

Figure 6 shows the proposed cross section between CH 0+000.000m and CH 0+200.000m, North of the River Dargle. This configuration is consistent with the existing Central Road configuration, where the proposed road will tie in.

Figure 6: Cross section between CH 0+000.000m and CH 0+200.000m

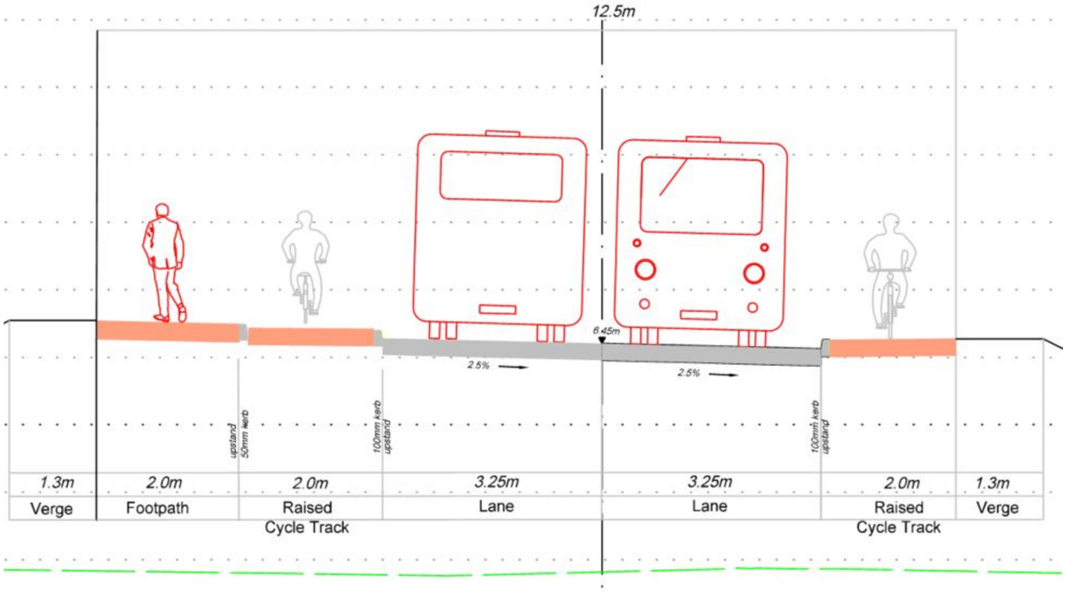


Figure 7 defines the typical alignment cross section between CH 0+200.000m and CH 0+300.000m. This depicts the cross section through the bridge, which includes a 2.0m structural zone to accommodate a central barrier and the support for the cables, which hang from the arch structure to support the deck.

Figure 7: Cross section between CH 0+200.000m and CH 0+300.000m

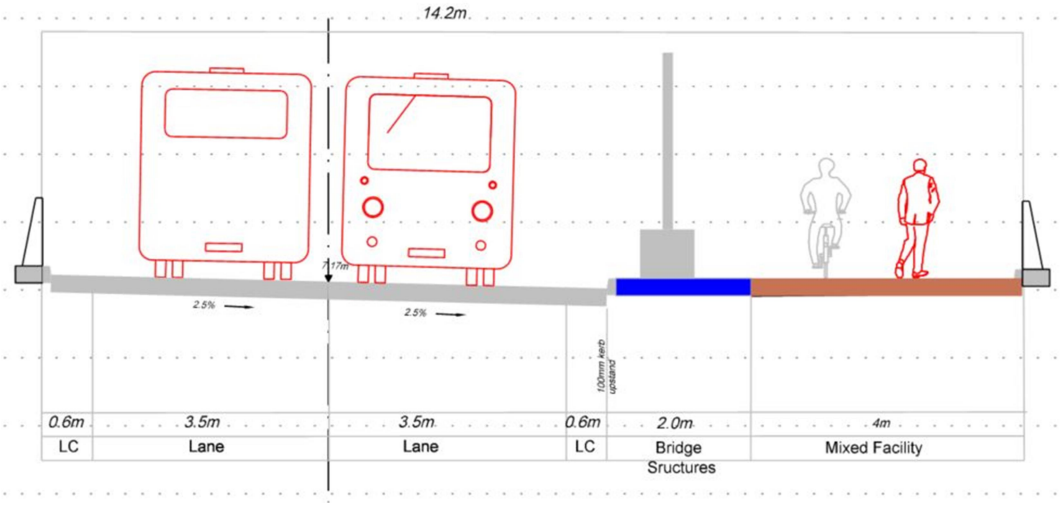
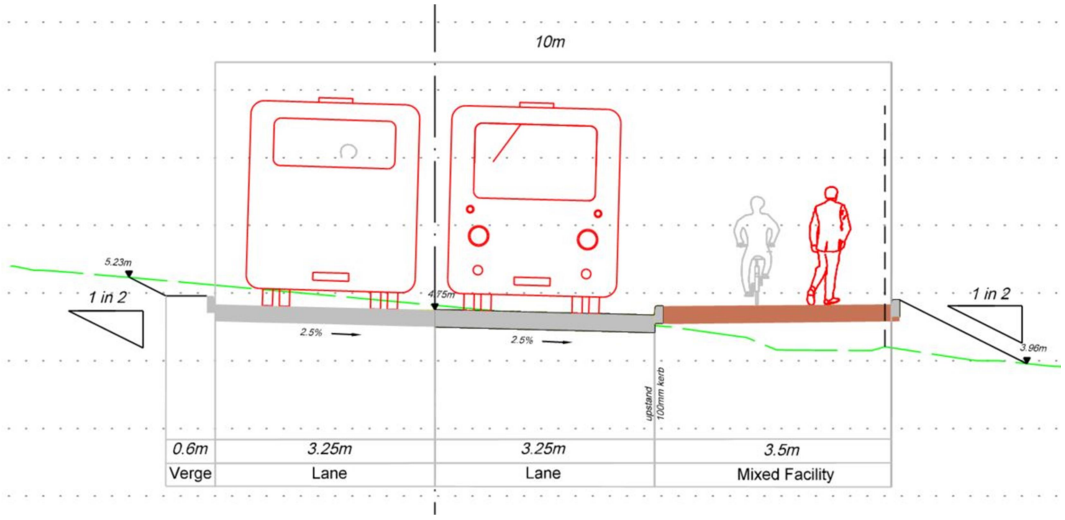


Figure 8 defines the alignment cross section between CH 0+300.000m and CH 0+457.900m to where the link road ties in to the junction at Seapoint Road. This narrower configuration is due to the boundary constraints caused by the railway line and Bray Pumping Station.

Figure 8: Cross section between CH 0+300.000m and CH 0+457.900m



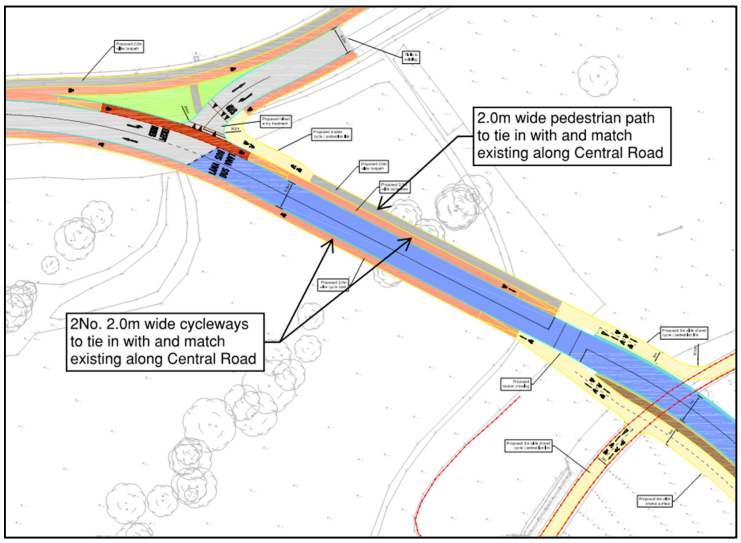
4.3.2 Pedestrian and Cycleway Links

The pedestrian and cycleway links have been provided to tie-in with, and further enhance the existing links in the area. The proposal makes use of the river crossing to link together the pathways on both sides of the river as well as promote pedestrian/cycleway linkages towards Bray Station.

The layout of the pedestrian and cycleway paths vary depending on the tie-in requirements and constraints.

To the north, the layout of the pedestrian and cycleways are arranged to tie in with the existing configuration on Central Road. Both pedestrian and cycleways are 2.0m wide to match the existing situation.

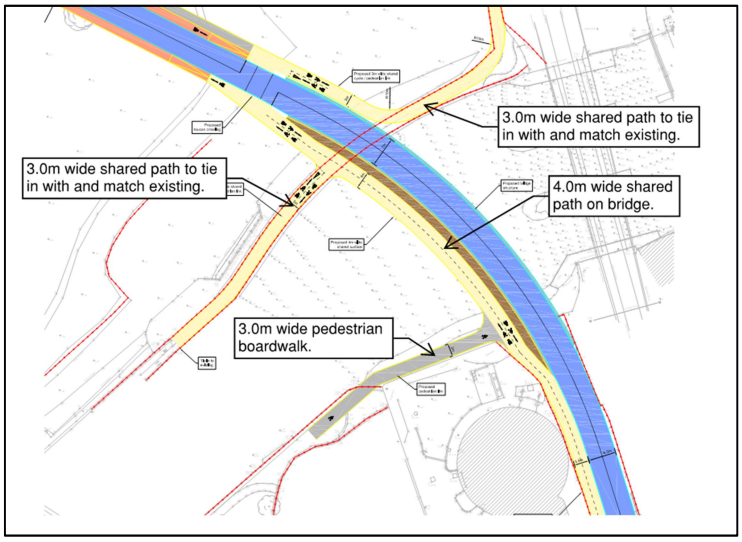
Figure 9: Pedestrian and cycleway links to the north



Over the bridge, the shared path is extended to 4.0m wide to provide more space and encourage vistas upstream towards Main Street. The shared path tie-ins along the northern bank maintain the same widths as existing, being 3.0m wide.

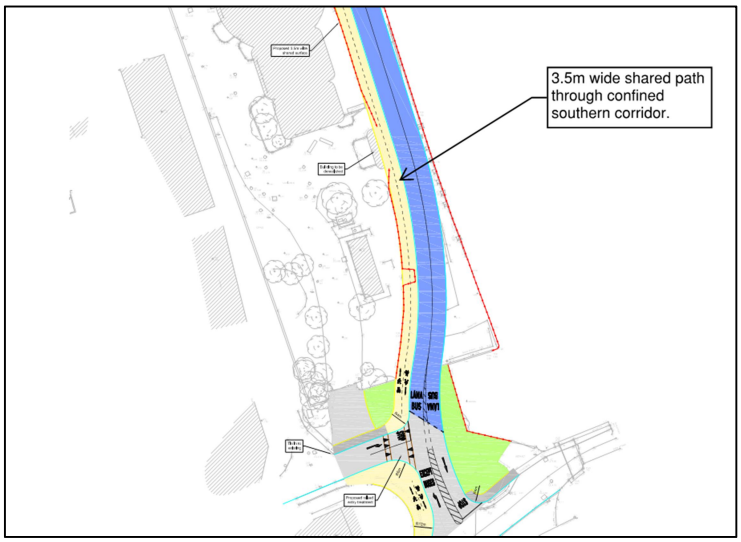
Along the southern bank, a new 3.0m wide pedestrian boardwalk is proposed. This provides connectivity from the southern bank walkway to the bridge crossing and also links the walkway up with the new access to Seapoint Road, completing the linkages in this region.

Figure 10: Pedestrian and cycleway links over the river



Due to constraints through the southern corridor, a 3.5m wide shared pedestrian/cycleway passage is proposed. The combined footway/cycleway is required to extend connectivity through this corridor and prevent the carriageway from encroaching into the rail boundary. This access then links in with the junction as shown on the figure below.

Figure 11: Pedestrian and cycleway links to the south



4.3.3 Potential Future Luas Extension

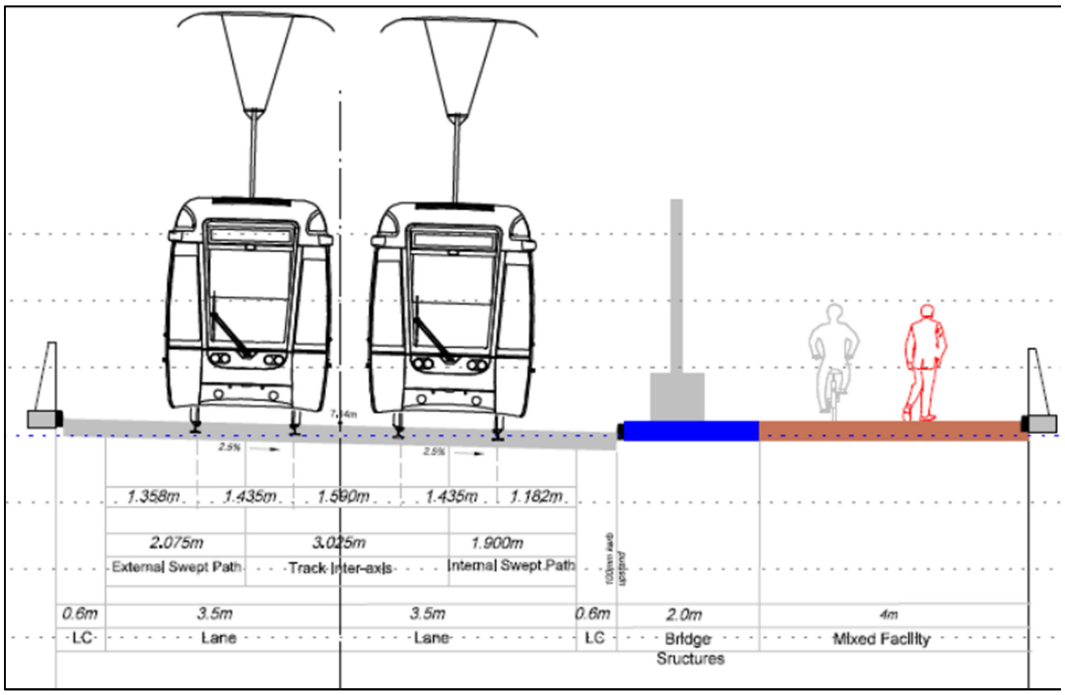
The Railway Procurement Agency (RPA) is progressing the design of Luas Line B2, which is the extension of the Luas from Cherrywood to Bray. While the details of the RPA scheme at this location are still in their infancy, the emerging preferred route corridor includes a crossing of the River Dargle at this location. Hence, as part of the Bray Sustainable Transport Bridge Project, the bridge is required to be future-proofed to accommodate the proposed Luas.

While a design for the Luas alignment is not within the remit of this project, a suitable rail alignment design has been carried out to ensure future compatibility between the Luas and the proposed bridge. Refer drawings RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9070 to -9072 in the Appendices for details on the rail alignment design. This design represents a viable option to demonstrate that the proposed road link can accommodate a Luas alignment. This Luas alignment is included for information purposes only and does not from part of the Part 8 Application.

The carriageway width over the bridge has been widened from 6.5m to 7.0m to accommodate the spatial requirements for the potential future Luas. Additional 0.6m lateral clearances to the bridge parapets have also been included either side. These widths are in accordance with the RPA document titled “Trackway Alignments Tramway Clearances”.

Figure 12 depicts the carriageway width provided over the bridge and the dimensions necessary to accommodate the future proposed Luas.

Figure 12: Carriageway width on bridge to accommodate potential future Luas



4.3.4 Lighting

Public lighting will be provided along the entire length of the proposed scheme, catering for both motorists and cyclists/pedestrians. The public lighting design will cater for the new lighting of the proposed junctions, entrances and access roads in addition to any lighting being provided to ensure a continuity of illumination. The lighting design and installation shall be in accordance with the specific lighting items set out in the appropriate European and national standards. Refer to drawings RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9110 and -9111 in the appendices for details on the lighting design.

Architectural lighting will be incorporated into the bridge in order to highlight the structure at night, in particular, the arch and cables. This will greatly contribute to achieving the objective of producing a structure suitable for its landmark and highly visible location as specified by WCC.

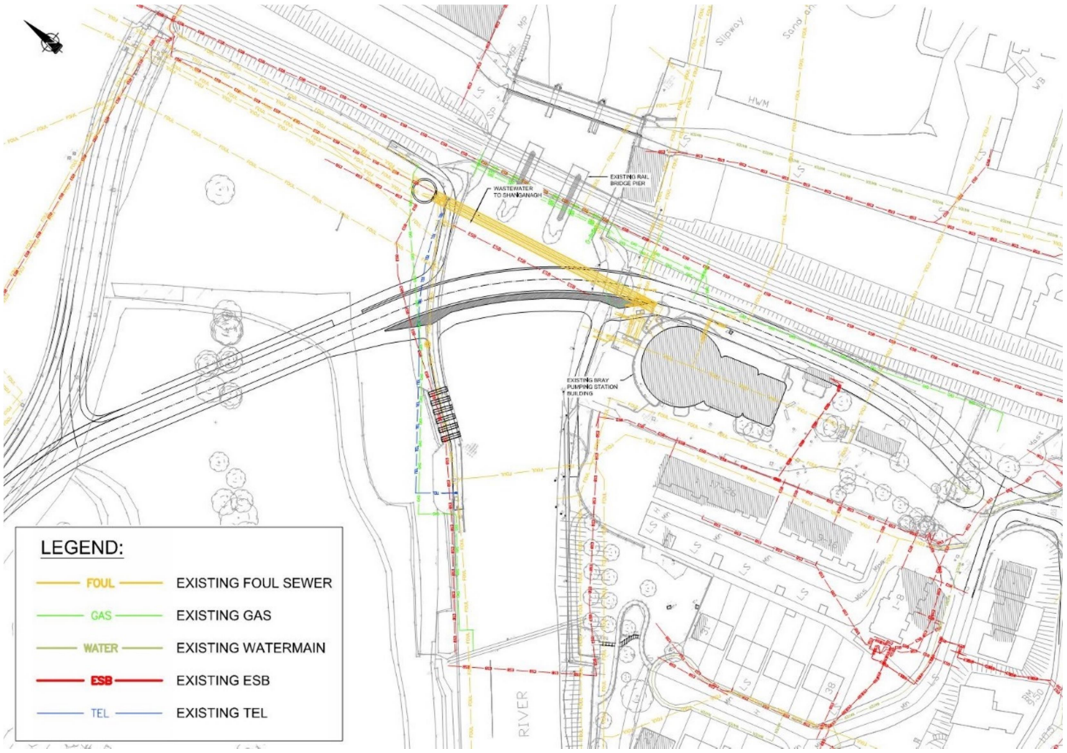
4.3.5 Utilities

There are a number of existing utilities that cross the project site. These include:

- Foul
- Water

- ESB
- Gas
- Telecoms

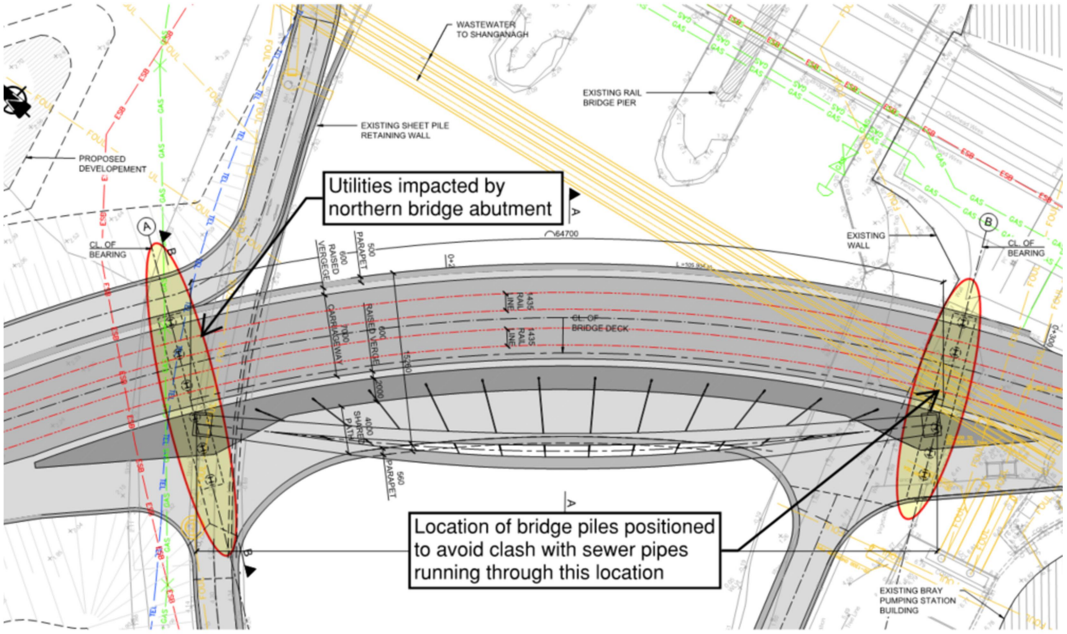
Figure 13: Existing utilities



A host of services run parallel to the northern bank, comprising foul, ESB, gas and telecoms. These services will be impacted by the bridge foundations on this bank and will require diversion. Details of this will form part of the utilities relocation package. It is not feasible to avoid the services on this bank without substantially increasing the span of the bridge.

Services along the south bank comprise a number of foul service pipes associated with Bray Pumping Station. These services are particularly difficult to relocate due to their size, depth and critical operational requirements. Therefore, these services will not be diverted. Fortunately, their alignment allows the bridge foundations to be positioned to avoid these services at this location.

Figure 14: Utilities interfacing with bridge foundations



Additionally, the road alignment to the south interacts with gas, ESB and water main services.

Discussion with the utility providers is still ongoing, with details to be finalised during the detailed design stage.

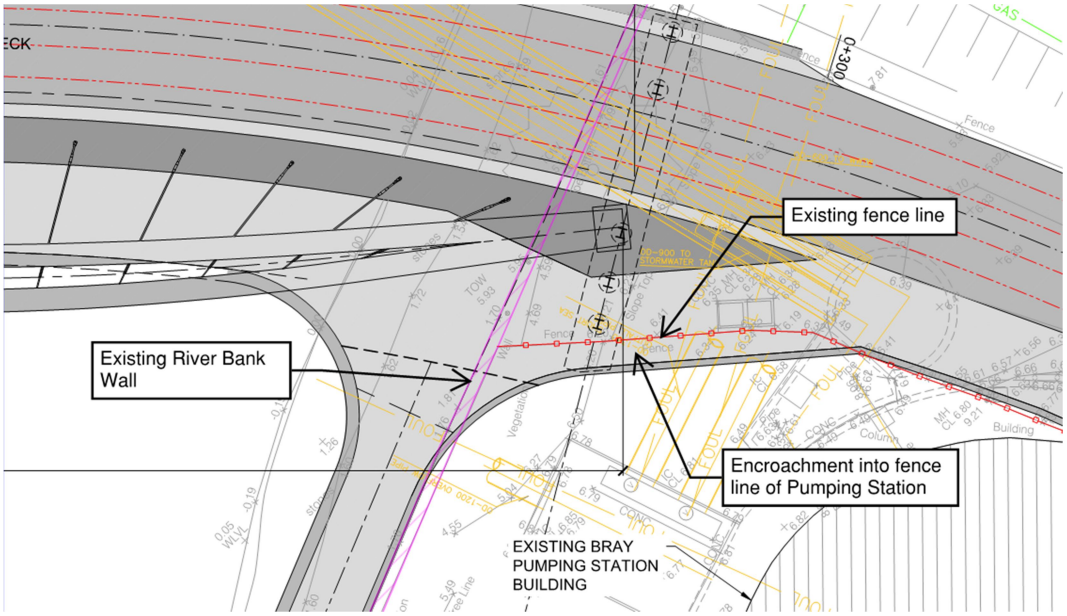
4.3.6 Encroachment into the Bray Pumping Station Lands

The proposed link road south brings the alignment close to the existing fence line of the Bray Pumping Station. As mentioned previously, Bray Pumping Station is operated by Irish Water, however the land is registered with Wicklow County Council.

Due to the highly confined corridor through this region, it is not possible to avoid encroaching beyond the existing fence line completely. This occurs at a number of distinct locations as described below. Encroachment of works beyond the current fence line will be by agreement with Irish Water. No compulsory purchase order of lands is proposed.

To provide a compliant road geometry that aligns with the southern corridor and provides pedestrian/cycleway connectivity, the southern approach to the bridge encroaches into the Pumping Station fence line at this location. Refer to Figure 15 below.

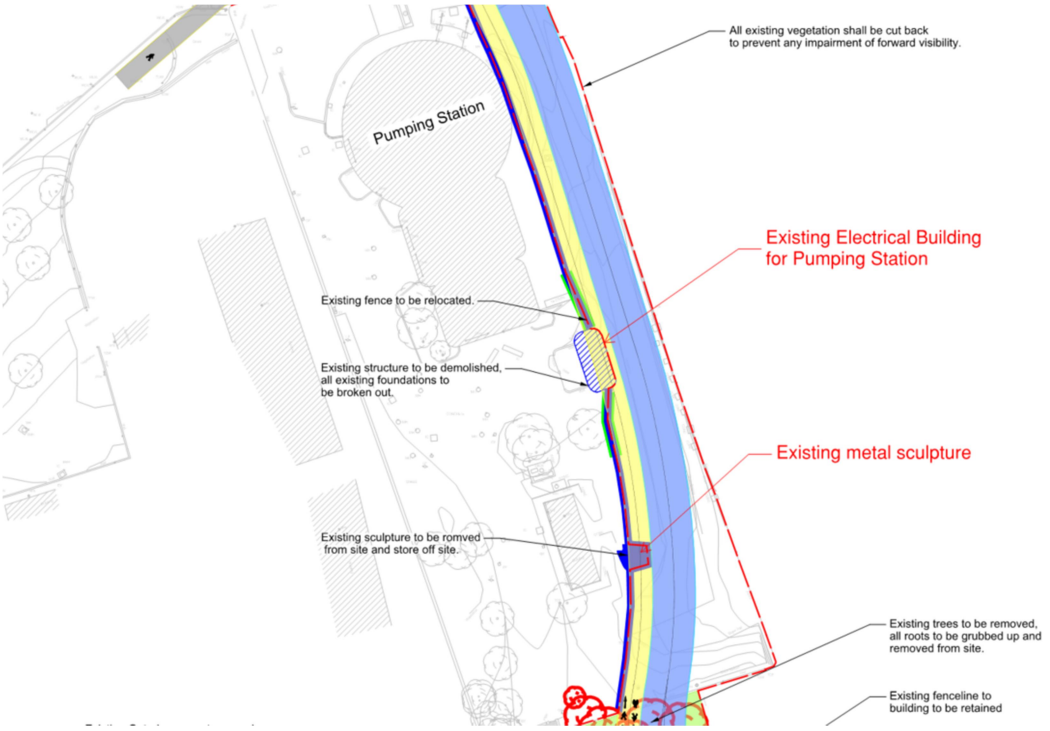
Figure 15: Boundary encroachment at southern approach to bridge



An electrical building which services the pumping station presents a pinch-point in the alignment. It is not possible to provide access past this structure without impacting significantly on the shared path at this location. This building will be relocated to allow for functional passage in his location.

Further south, the fence line is aligned around an existing metal sculpture. This feature will also be removed as part of these works.

Figure 16: Boundary encroachment along southern corridor



4.4 Bridge

This section should be read in conjunction with the Bray Sustainable Transport Bridge Preliminary Design Report (RDPTB-ARUP-ZZZ-BRD-RP-CB-0003), included as an appendix to this report. A detailed description of the proposed bridge structure, the constraints that have been considered in producing the design, as well as design drawings are all included in the preliminary design report.

To determine the most appropriate bridge structure for a crossing of the river at this site, an options report was developed. This report took cognisance of a comprehensive array of issues including the need for a landmark structure in a highly visible location, avoiding a negative impact on the recently completed flood defence scheme, environmental considerations, impact on existing services and constructability, among others. Four bridge options were taken through for comparison and scored against a number of criteria, with the single span bow string arch structure shown below emerging as the preferred bridge option at this site.

Following agreement with Wicklow County Council on the preferred option, the preliminary design of this bridge structure was progressed and is documented in the Preliminary Bridge Design Report (Appendix B).

Figure 17: Photomontage of the proposed bridge

4.5 Architectural Considerations

One of the key objectives from the outset of the project was to provide a landmark bridge structure in a highly visible location. For this purpose, the services of Seán Harrington Architects were employed to provide highly experienced architectural design input into the form, functionality and detail for the bridge.

A number of workshops were held during the conceptual stage of the project in which a variety of structural forms were considered for a bridge crossing at this location.

These were reviewed in context with the topography, site constraints, surrounding buildings (both existing and proposed), pedestrian interconnectivity and visual impact.

A single span bow-string arch bridge, with a centred geometric form over the river and a presence that physically holds its own amongst the surrounding infrastructure, emerged as the preferred form.

Refer to the Architectural Design Statement (RDPTB-SHA-ZZZ-BRD-RP-AX-0002) included as an appendix to this report for a comprehensive discussion on the architectural aspects of the bridge.

4.6 Environment

Environmental considerations have been central throughout the design process. A new, high quality public transportation, cyclist and pedestrian link road will encourage a modal shift away from private vehicles and toward these other, more sustainable modes of transport. Future-proofing the link road and bridge to accommodate the potential Luas extension will further contribute to a modal shift.

A key constraint during the design of the Bray Sustainable Transport Bridge has been ensuring that any construction, and subsequent operational works do not have any adverse impact on the flora and fauna in the project area.

An Appropriate Assessment Screening was carried out during the preliminary design stage to assess the potential impact on any nearby Natura 2000 sites. Refer to the Appropriate Assessment Screening Report (RDPTB-ARUP-ZZZ-ZZZ-RP-LE-0001) for details. Based on the information provided in this report and its recommendations, Wicklow County Council as the competent authority has determined that an Appropriate Assessment is not required for this project.

Additionally, an Environmental Impact Assessment (EIA) Screening was undertaken. Refer to the Environmental Impact Assessment Screening Report (RDPTB-ARUP-ZZZ-ZZZ-RP-LE-0002) for details. Based on the information provided in this report and its recommendations, Wicklow County Council as the competent authority has determined that an EIA is not required for this project.

These screening reports along with the council's determinations are included as appendices to this report.

4.7 Surface Water Drainage

The surface water design has been undertaken to confirm the layout and sizing of the primary surface water infrastructure required to service the new road. The basis of this design is described below and is to be read in conjunction with Arup plan view drawing numbers RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9080 and -9081.

4.7.1 Design Criteria

The surface water design criteria for the proposed road is outlined in the table below:

Table 1: Surface Water Design Criteria

Parameter	Value	Reference
Pipe Design	1 in 1 year – no surcharge 1 in 30 year – no flooding (site critical duration) 1 in 100 year – flooding contained on site (site critical duration)	Greater Dublin Strategic Drainage Study
Standard Annual Average Rainfall	982mm	Rainfall Maps
M5-60	16.400	Flood Studies Report Maps
Ratio r	0.263	Flood Studies Report Maps
SOIL Type	Type 2	WRAP Map from HR Wallingford Procedure
SPR	0.30	HR Wallingford Procedure
Climate Change	20%	Current best practice. GDSDS requirement is 10%.
Cv Roads	0.9	GDSDS
Cv Grassed Areas	0.1	GDSDS

4.7.2 Network Layout

Surface water from the proposed road will be collected in a new drainage network.

The gradient of the road generally falls away in both a north and south direction from a high point approximately in the centre of the bridge. As such the scheme includes two drainage catchments; one to the north and one to the south of the high point on the bridge.

It is noted the majority of the new road is superelevated and as such the combined kerb drainage and trapped road gullies are located on the west side of the road.

Also, the existing and proposed drainage networks have been modelled in Microdrainage design software to confirm the sizing, gradients and capacity of the drainage network.

The drainage networks proposed for the north and south catchments are similar in design and are completely independent of one another and are described below.

Northern Catchment

Surface water from the bridge area of the northern catchment enters a combined kerb drainage system on the west side of the road. The combined kerb drainage system extends to the pedestrian crossing to the north of the bridge where it enters the piped network beneath the road pavement.

Surface water from the northern link road leading towards the bridge drains to trapped gullies on the west side of the road.

Double gullies are provided at a localised low point at approximately chainage 0+180m. The surface water is then conveyed northwards in a carrier pipe where it passes through a catchpit manhole which will remove any silt and debris, and then bypass separator which will remove any oils and hydrocarbons from the runoff.

The new surface water drainage network connects to the existing drainage network where the new road will intersect with the recently constructed road to the north. The surface water will ultimately drain to the River Dargle via an existing 600mm dia. pipe which outfalls adjacent to the existing railway bridge.

Southern Catchment

Surface water from the bridge area of the southern catchment enters a combined kerb drainage system on the west side of the road. The combined kerb drainage system extends to approximately chainage 0+310m where it enters the piped network beneath the road pavement.

Surface water from the southern link road leading towards the bridge drains into trapped gullies on the west side of the road. Double gullies are provided at a localised low point at approximately chainage 0+415m. The surface water is then conveyed to the south in a carrier pipe and passes through a catchpit manhole and bypass separator.

The new surface water network will be connected to the existing 375mm dia. combined sewer on Seapoint Road. As this is a surface water sewer connecting to a combined sewer, the last manhole on the surface water network includes an interceptor trap to prevent foul odours from entering the surface water network.

The existing 375mm dia. pipe connects to an existing 1350mm combined sewer trunk main at the junction of Seapoint Road and Strand Road, from where the flows are conveyed to the Bray Pumping Station, and then onwards to the Shanganagh Wastewater Treatment Plant.

4.7.3 Surface Water Quality

Northern Catchment

Surface water from the northern catchment will discharge to the River Dargle as described in Section 4.7.2 above. As the area in which the surface water discharges to the river is tidally influenced and approximately 300m from the entrance to Bray Harbour, it is considered appropriate to not provide stormwater attenuation for the northern catchment.

This approach is consistent with the drainage regime in the wider area. The recently constructed roads providing access to the new Ravenswell Primary School and former Bray Golf Club lands do not include any attenuation measures.

Some drainage features have been included that will improve the quality of surface water discharging from the scheme. Surface water runoff from the on-grade road sections will drain to trapped road gullies which will remove some silt and debris contained in the runoff.

The surface water will be routed through a catchpit manhole and bypass separator which combined will remove silt, debris, oils and hydrocarbons from the water.

Southern Catchment

Surface water from the southern catchment will discharge into the existing 375mm dia. combined sewer on Seapoint Road. Flows in this pipe will be conveyed to the Bray Pumping Station as described in Section 4.7.2.

Like the northern catchment, some drainage features have been included that will improve the quality of surface water discharging from the scheme. Surface water from the on-grade road sections will drain to trapped road gullies which will remove some silt and debris contained in the runoff.

The surface water will be routed through a catchpit manhole and bypass separator which combined will remove silt, debris, oils and hydrocarbons from the runoff. The new drainage network in the southern catchment will connect to the existing combined sewer network in Seapoint Road and runoff from this catchment will ultimately be treated at the Shanganagh Wastewater Treatment Plant.

4.8 Flood Risk

The proposed link road crosses the River Dargle via a single span bridge structure. The crossing at this location is adjacent the existing railway bridge, near the outlet to Bray Harbour.

Flood defence works were undertaken along the length of the river as part of the River Dargle Flood Defence Scheme. Works at the location of the bridge site were completed in 2017, comprising the raising and re-alignment of the northern riverbank wall and scour protection works around the existing railway bridge.

The proposed bridge comprises a single span structure without any supports in the waterway. The abutment foundations are located behind the existing flood defence walls on either bank. The bridge superstructure is aligned such that the soffit of the deck is above the design flood levels at this location. Hence, the proposed bridge will not have an impact on the hydraulic performance of the waterway once constructed.

A Flood Risk Assessment has been carried out for the bridge crossing at this location and is included as an appendix to this report. The proposed bridge is a clear-span structure with a minimum soffit level of 4.60m OD. This is 300mm above the flood defence level (4.30m OD), 0.85m above the worst-case flood level according to the Physical Model Study (HR Wallingford) and 1.06m above the design flood level applied in the construction of the River Dargle Flood Defence Scheme. The proposed bridge is therefore not at risk of flooding in the current scenario.

The pedestrian boardwalk along the southern bank is supported on columns that are founded within the waterway. These comprise small diameter columns orientated parallel to the southern riverbank wall and are assessed to have an insignificant impact on the displaced volume of water. Refer to the Flood Risk Assessment for further details.

Construction of the bridge will require temporary works within the waterway. This will comprise a rock platform for access within the waterway, including a number of temporary culverts to allow a crossing of the waterway. Temporary towers will be required to support the bridge superstructure prior to completion of the supporting arch.

A Section 50 application for the bridge crossing has been submitted to OPW.

4.9 Geotechnical Considerations

A geotechnical desktop study was carried out to assess available information and determine overall geology of the region. The geology of the area typically comprises made ground above relatively weak layers of gravel and silt, with bedrock located approximately 20m below existing ground level. The Maulin Formation underlays the site.

Piled foundations are proposed to support the bridge structure, comprising bored concrete piles socketed into the underlying bedrock.

Further geotechnical site investigation works have recently been carried out along the proposed link road and at the bridge site to confirm ground conditions and determine parameters for use in the design.

4.10 Third-Party Landowners

There are several stakeholders involved in the execution of the Bray Sustainable Transport Bridge and associated link road. One of the principal stakeholders is the owners of the former Golf Club lands. A number of meetings have been held with Wicklow County Council and representatives for the former Golf Club Lands including pre-planning meetings in relation to an SHD planning application (Ref ABP 308291-20). While the subject scheme has been designed to the existing road network, it can also be adapted to the above referenced scheme should it be granted permission in the future. These meetings steered the design and ensured there was consensus between key stakeholders.

Irish water operates the Pumping Station to the south of the river, although it is noted that the land is registered to Wicklow County Council. The proposed link road and bridge interface with this land. There are a number of significant service lines which run from this pumping station through the proposed site. In addition to this, the road alignment will encroach into the existing land holdings as described above in Section 4.3.6. Irish Water are a key third-party interface which has been regularly consulted with throughout the preliminary design stage in the lead up to this application.

The railway boundary to the east of the project site forms another constraint to the alignment. No encroachment into the existing railway land holding is proposed. However, consultation with Irish Rail will be undertaken due to the vicinity of the works to their boundary.

No compulsory purchase order of lands is proposed.

5 Accompanying Drawings and Documents

5.1 Drawings

Below is a list of the drawings that form part of this application.

Table 2: List of Drawings

Drawing No.	Drawing Title
Civil Drawings	
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9001	Location Plan
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9002	Layout Plan
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9010	Site Boundary – Sheet 1 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9011	Site Boundary - Sheet 2 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9020	Existing Topographical Survey - Sheet 1 out of 3
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9021	Existing Topographical Survey - Sheet 2 out of 3
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9022	Existing Topographical Survey - Sheet 3 out of 3
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9025	Existing Utility Layout - Sheet 1
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9030	Site Clearance Plan - Sheet 1 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9031	Site Clearance Plan - Sheet 2 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9040	General Arrangement Drawing Plan - Highway - Sheet 1 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9041	General Arrangement Drawing Plan - Highway - Sheet 2 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9060	Highway Plan and Profile CH: 0+000 to CH:0+100 - Sheet 1 out of 3
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9061	Highway Plan and Profile CH: 0+100 to CH:0+350 - Sheet 2 out of 3
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9062	Highway Plan and Profile CH: 0+350 to CH:0+457 - Sheet 3 out of 3
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9070	Rail Plan and Profile CH: 0+000 to CH:0+250 - Sheet 1 out of 3
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9071	Rail Plan and Profile CH: 0+250 to CH:0+500 - Sheet 2 out of 3
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9072	Rail Plan and Profile CH: 0+500 to CH:0+610.701 - Sheet 3 out of 3

Drawing No.	Drawing Title
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9080	Proposed Drainage Plan - Highway - Sheet 1 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9081	Proposed Drainage Plan - Highway - Sheet 2 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9090	Proposed Cross Section - Highway - CH: 0+000 to CH: 0+125 - Sheet 1 out of 3
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9091	Proposed Cross Section - Highway - CH: 0+150 to CH: 0+275 - Sheet 2 out of 3
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9092	Proposed Cross Section - Highway - CH: 0+300 to CH: 0+450 - Sheet 3 out of 3
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9100	Proposed Cross Section - Rail
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9110	Proposed Street Lighting Plan - Sheet 1 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9111	Proposed Street Lighting Plan - Sheet 2 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9120	Proposed Kerbing Plan - Highway - Sheet 1 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9121	Proposed Kerbing Plan - Highway - Sheet 2 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9140	Swept Path - Highway -Sheet 1 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9141	Swept Path - Highway -Sheet 2 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9150	Visibility Splay - Sheet 1 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9151	Visibility Splay - Sheet 2 out of 2
RDPTB-ARUP-ZZZ-ZZZ-DR-CH-9160	Vertical Visibility Drawing
Bridge Drawings	
RDPTB-ARUP-ZZZ-ZZZ-SK-CB-9000	Site Location Plan
RDPTB-ARUP-ZZZ-ZZZ-SK-CB-9001	General Arrangement Sheet 1
RDPTB-ARUP-ZZZ-ZZZ-SK-CB-9002	Northern Abutment Approach Works General Arrangement Sheet 1
RDPTB-ARUP-ZZZ-ZZZ-SK-CB-9003	Northern Abutment Approach Works General Arrangement Sheet 2
RDPTB-ARUP-ZZZ-ZZZ-SK-CB-9004	Southern Abutment Approach Works General Arrangement Sheet 1
RDPTB-ARUP-ZZZ-ZZZ-SK-CB-9005	Southern Abutment Approach Works General Arrangement Sheet 1
RDPTB-ARUP-ZZZ-ZZZ-SK-CB-9010	Construction Sequence Sheet 1

Drawing No.	Drawing Title
RDPTB-ARUP-ZZZ-ZZZ-SK-CB-9011	Construction Sequence Sheet 2
RDPTB-ARUP-ZZZ-ZZZ-SK-CB-9012	Construction Sequence Sheet 3
RDPTB-ARUP-ZZZ-ZZZ-SK-CB-9015	Bridge Photomontage

5.2 Reports

Below is a list of reports that accompany this application.

Table 3: List of Accompanying Reports

Report Number	Report Title
RDPTB-ARUP-ZZZ-BRD-RP-CB-0003	Preliminary Bridge Design Report
RDPTB-SHA-ZZZ-BRD-RP-AX-0002	Architectural Design Statement
RDPTB-ARUP-ZZZ-ZZZ-RP-LE-0001	Appropriate Assessment Screening Report
RDPTB-ARUP-ZZZ-ZZZ-RP-LE-0002	Environmental Impact Assessment Screening Report
RSM/MOB/130320/DARGLE BRIDGE-RSA1	Stage 1 Road Safety Audit
RDPTB-ARUP-ZZZ-ZZZ-RP-FL-0001	Flood Risk Assessment

Appendix A

Drawings

- Civil Drawings
- Bridge Drawings

A1

Appendix B

Preliminary Bridge Design Report

B1

Appendix C

Architectural Design Statement

C1

Appendix D

Appropriate Assessment Screening

D1

Appendix E

WCC AA Screening Determination

E1

Appendix F

EIA Screening

F1

Appendix G

WCC EIA Screening Determination

G1

Appendix H

Flood Risk Assessment

H1

Appendix I

Road Safety Audit

I1

Appendix J

Micro Drainage Outputs

J1