Appendix I

Road Safety Audit

Road Safety Matters

Road Safety Audit

Stage 1

for

BRAY SUSTAINABLE TRANSPORT BRIDGE

BRAY, CO WICKLOW

Date: September 2020

Report produced for: Arup

Report produced by: Road Safety Matters Ltd

Reference: RSM/MOB/130320/DARGLE BRIDGE-RSA1

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BACKGROUND INFORMATION

The report which follows is the Road Safety Audit (RSA) Stage 1 for a proposed bridge over the River Dargle in Bray, Co Wicklow, based on the information supplied to the RSA Team as detailed below. The proposals will involve construction of a new bridge and approximately 350m of single carriageway link road, with new junctions at each end, with inclusion of facilities for pedestrians and cyclists.

Table 1: Information Supplied

Item		Supplied	Comment
A	Plans / Drawings	Y	Project Outline.pdf
			River Dargle Bridge – Road Layout_DRAFT FOR DISCUSSION.pdf[1]
			Site Location Plan
			Drg No RDPTB-ARUP-ZZZ-ZZZ-SK-CU-0001 Rev P01: EXISTING UTILITY LAYOUT SHEET 1
			Drg No RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0001 Rev 0: Location plan
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0010 Rev 0: Site Boundary Sheet 1 out of 2
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0011 Rev 0: Site Boundary Sheet 2 out of 2
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0020 Rev 0: Existing Topographical Survey, Sheet 1 out of 3
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0021 Rev 0: Existing Topographical Survey, Sheet 2 out of 3
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0022 Rev 0: Existing Topographical Survey, Sheet 3 out of 3
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0030 Rev 0: Site Clearance Highway, Sheet 1 out of 2
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0031 Rev 0: Site Clearance Highway, Sheet 2 out of 2
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0040 Rev 0: General Arrangement Drawing Plan Highway Sheet 1 out of 2
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0041 Rev 0: General Arrangement Drawing Plan Highway Sheet 2 out of 2
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0060 Rev 0: Plan and Profile Highway CH: 0+000 to CH: 0+100 Sheet 1 out of 3
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0061 Rev 0: Plan and Profile Highway CH: 0+100 to CH: 0+350 Sheet 2 out of 3
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0062 Rev 0: Plan and Profile Highway CH: 0+350 to CH: 0+457.752 Sheet 3 out of 3
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0070 Rev 0: Plan and Profile Rail CH: 0+000 to CH: 0+250 Sheet 1 out of 3[2]

[1] Includes Keyplan and three design plans (see Appendix D)

[2] Excluded from Scope of Stage 1 RSA

Table 1 Contd…			
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0072 Rev 0: Plan and Profile Rail CH: 0+500 to CH: 0+610.701 Sheet 3 out of 3[2]
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0080 Rev 0: Proposed Drainage Plan Highway Sheet 1 out of 2
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0081 Rev 0: Proposed Drainage Plan Highway Sheet 2 out of 2
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0090 Rev 0: Proposed Cross Section Highway CH: 0+000 to 0+125 Sheet 1 out of 3
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0091 Rev 0: Proposed Cross Section Highway CH: 0+150 to 0+275 Sheet 2 out of 3
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0092 Rev 0: Proposed Cross Section Highway CH: 0+300 to 0+450 Sheet 3 out of 3
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0100 Rev 0: Proposed Cross Section Rail[2]
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0110 Rev 0: Proposed Street Lighting Plan Highway Sheet 1 of 2
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0111 Rev 0: Proposed Street Lighting Plan Highway Sheet 2 of 2
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0120 Rev 0: Proposed Street Lighting Plan Highway Sheet 1 of 2
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0121 Rev 0: Proposed Street Lighting Plan Highway Sheet 2 of 2
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0140 Rev 0: Swept Path Highway Sheet 1 out of 2
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0150 Rev 0: Visibility Splay Highway Sheet 1 out of 2
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0151 Rev 0: Visibility Splay Highway Sheet 2 out of 2
			RDPTB-ARUP-ZZZ-ZZZ-DR-CH-0160 Rev 0: Vertical Visibility Drawing
B	Traffic Volume Information	N	
C	Speed Count Data	N	
D	Collision Data	N	
E	Departures from Standards	N	
F	Audit Brief	Y	Stage 1 Road Safety Audit
G	Other Data / Documents	N	

TABLE OF CONTENTS

1. INTRODUCTION

1.1 This report results from a Stage 1 Road Safety Audit (RSA) on a proposed bridge over the River Dargle in Bray, Co Wicklow, carried out at the request of Arup Consulting Engineers. This Audit examines the road safety implications associated with the Bray Sustainable Public Transport Bridge, which includes construction of a new bridge immediately to the West of the existing DART bridge over the River Dargle. The project will also include construction of a proposed single carriageway link road over a distance of approximately 350m with new junctions at each end, which are highlighted in figure 1, with inclusion of facilities for pedestrians and cyclists on the cross section along the link. The site location has been illustrated in Figure 1. The design package included plans and sections for a proposed Rail Alignment, however the rail design and plans are outside the scope of this Stage 1 RSA design, and should be subject to separate auditing procedures, particularly in the vicinity of Junction 2.

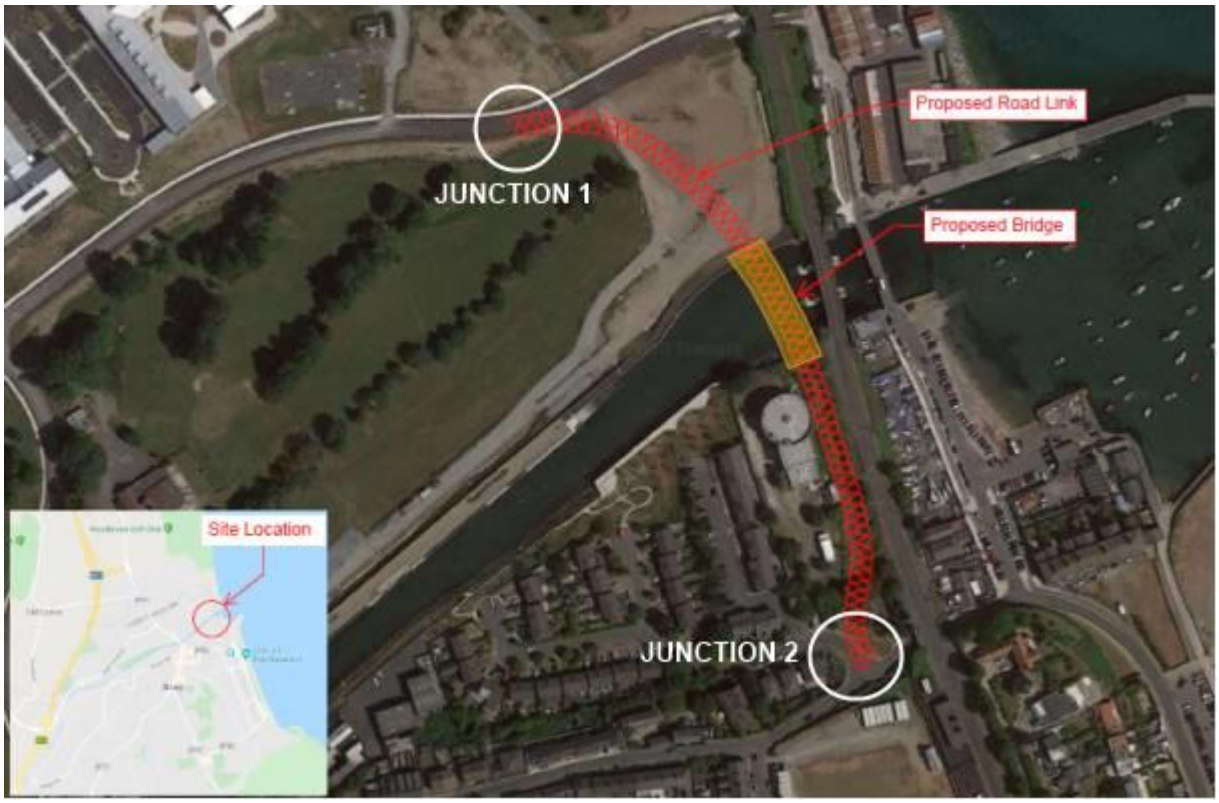


Figure 1: Site Location Plan

1.2 The RSA was carried out during March and April 2020, and included a site visit on Friday 13th March during daylight hours. Traffic volumes were light on the existing links surrounding the site

at the time of the site visits, and VRU (Vulnerable Road User – pedestrians and cyclists) activity was low. The weather at the time of the site visits was fine and dry, and the surface of the road was dry.

1.5 The Audit Team Membership was as follows;

Team Leader:	Miriam O'Brien – BE (Civil) FIHE MIEI MCIHT SoRSA CoC
Team Member:	Eileen O'Neill – C Eng, MIEI

1.6 The Audit took place at the offices of Road Safety Matters Ltd in March and April 2020 following the site visit by the Audit Team. The Audit was undertaken in accordance with the Design Team's Audit Brief, and comprised an examination of the plans provided by the Design Team, as listed in Background Information, Table 1.

1.7 The terms of reference of the Audit are as described in TII GE-STY-01024 December 2017. The team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria.

1.8 Section 2 of this report contains issues raised by the Stage 1 RSA together with recommendations to be considered. Section 3 contains the Auditor Team Statement. Most issues raised in Section 2 can be cross-referenced with the scheme drawings (**Appendix C)** and photographs taken on the site visit which are included within the report where necessary, and within **Appendix B**.

2. ISSUES RAISED BY THE STAGE 1 ROAD SAFETY AUDIT

2.1 GENERAL

2.1.1 The designers have not advised of any departures from standard. The vertical visibility drawing provided indicates that the link has been designed in accordance with DMURS, which has significantly reduced visibility and stopping sight distance (SSD) requirements, typically applicable for a low speed urban environment in a built-up area such as a town centre or residential housing estate. The Audit Team considered that the new link road is serving an undeveloped area of land, and appears to be an Urban Relief Road to provide an alternative uncongested route for public transport vehicles, to avoid the current congestion on the R761 Main Street through Bray. The standard DN-GEO-03031 typically applies for single carriageway Urban Relief Roads, which has a desirable minimum SSD of 90m for a 60 km/hr design speed.

2.1.2 No information was provided on any existing collision statistics in the vicinity of the site. As the majority of the proposed link will be a new road, there is no collision history. A review of the Road Safety Authority (RSA) online collision database indicates that 1 serious collision and 3 minor collisions were recorded on the surrounding road network adjacent to Junctions 1 and 2, between 2005 and 2016 inclusive, as shown in Figure 2. It was noted that 3 of these collisions involved pedestrians, which demonstrates a relatively high collision rate involving VRUs, within an urban environment. The other recorded collision was a single vehicle collision on Seapoint Road to the west of Junction 2. It was noted that this section of Seapoint Rd is on a downhill gradient eastbound, with a relatively narrow cross section, and solid continuous hazards located immediately adjacent to the carriageway.

There were significant collision clusters noted along the R761 Main Street through Bray at present. The Audit Team considered it likely that the collision risk may be displaced onto the new link road once the alternative route is made available to traffic, and there may be a risk that the link will be used as a rat run, with potential for high vehicle speeds, particularly for those wishing to access the schools to the north of the site, from the direction of the strand and promenade area.

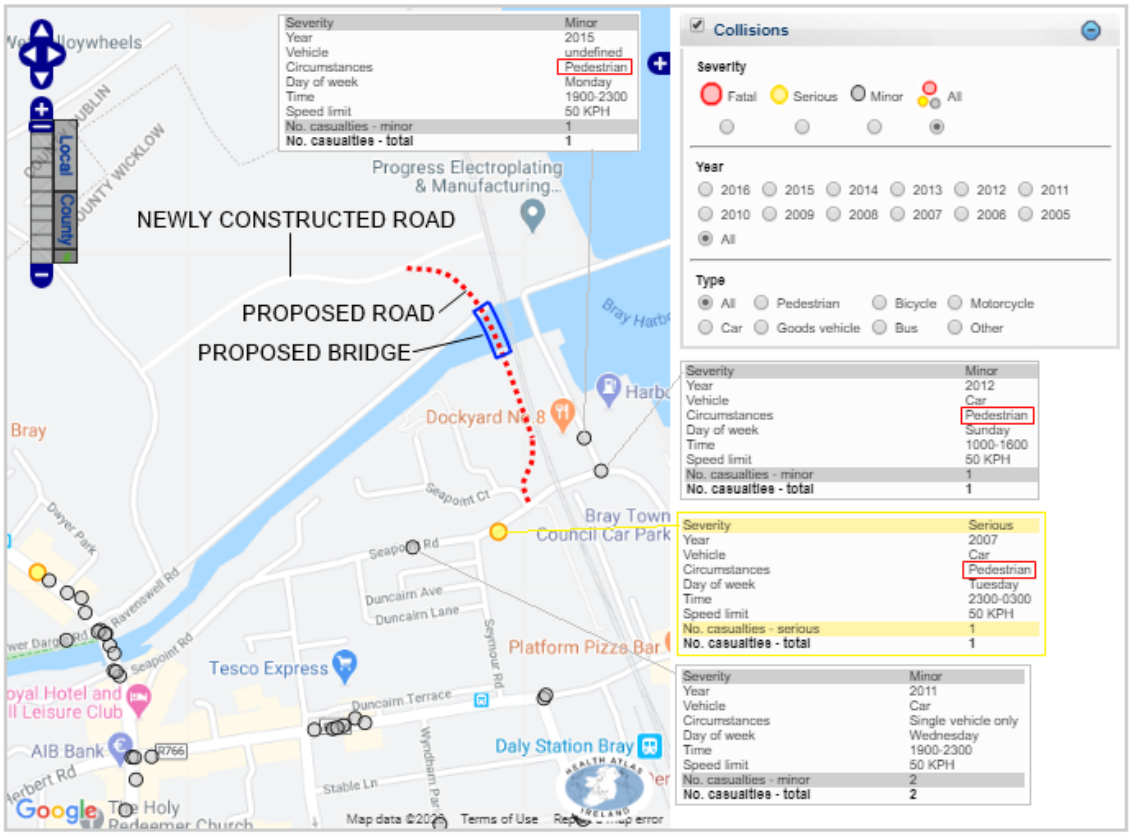


Figure 2: Collision Plot for Surrounding Road Network

It should be noted that the RSA database is not a comprehensive record of collisions, and does not include damage only collisions or any collisions recorded since 2016 (or before 2005), hence should be reviewed in conjunction with the Local Authority / Gardaí records for the site. In respect of Junction 1, this will be a newly constructed junction at the intersection of the new Dargle Bridge Link and the recently constructed Dublin Road Link. As the Dublin Road link is relatively new infrastructure provided to service the new schools and the golf club lands, there are no known validated collision records available for this infrastructure to date. The overall level of collision risk on the link should therefore be expected to increase in proportion to increased traffic volumes in the future, as the surrounding lands are further developed and opened to traffic, and once the proposed River Dargle Public Transportation Project is completed.

2.1.3 Problem – Design Speed and Inconsistent Speed Limits

The current speed limit posted at the site varies between 50 km/hr on the new Dublin Road connection at Junction 1 to 30 km/hr on entry to the Seapoint Court residential development adjacent to Junction 2, as shown in figures 3 and 4. Links which are subject to differing speed limits can lead to confusion and misinterpretation by road users leading to an increased risk of inappropriate speeds and resultant collision risks for motorists and VRUs. The vertical visibility drawing indicates a design speed of 50 km/hr. Design speeds usually reflect a speed higher than the proposed speed limit to allow for some margin of error in respect of vehicles exceeding posted speed limit, which is commonplace, particularly on links where there is no provision for physical traffic calming measures, and where there is a risk the link may be used as a rat run to avoid congestion on alternative routes.

Figure 3: 30 km/hr speed limit posted adjacent to Junction 2

Figure 4: 30 km/hr speed limit posted adjacent to Junction 2

Recommendations

A suitable and consistent speed limit should be provided for the full extent of the new link and tie-ins, taking into account the entry to a residential area at Junction 2 and the proximity of a number of schools to the west of Junction 1. Suitable traffic calming measures should also be considered along the link or on entry to the link at each end, to ensure DMURS reduced SSD and lower design speed can be applied, and that vehicles adjust speeds accordingly. Traffic calming measures should particularly be considered on approaches to the proposed toucan crossing to encourage low vehicular speeds, and the crossing should ideally be raised to prioritise VRU movements, with provision for high friction surfacing for a sufficient distance in advance of the stop lines to minimise the risk of vehicular/VRU conflict.

2.1.4 Problem – Drainage

Blocked and sunken gullies were noted adjacent to Junction 2 at the scheme tie-ins, as shown in figures 5 and 6, which could impact on the effectiveness of surface water runoff on the new layout. Blocked or sunken gullies can present a hazard for all road users, particularly two-wheeled vehicles. Poor surface condition was also noted adjacent to Junction 2, as shown in figure 7, which can contribute towards ponding.

Figure 5: Sunken Gully at Location of Kerb Setback, Junction 2

Figure 6: Blocked gully at scheme tie-in, Junction 2

Figure 7: Poor existing surfacing at scheme tie-in

Recommendations

The condition of existing drainage at tie-ins should be reviewed. All new or displaced gullies should be flush with the surrounding surface, and kept out of the desire line for two wheeled vehicles and pedestrians. Surface condition should also be reviewed at scheme tie-ins with pavement renewal and repair where necessary, and with new or displaced manhole covers to be flush with the surrounding surface and kept outside the desire lines for VRUs where possible.

2.1.5 Problem – Fencing and Boundary Treatment

There were no details provided in respect of treatment of the edges of the cross section for the proposed road in terms of fencing or retaining walls, particularly adjacent to VRU facilities at locations where significant level differences will arise between the carriageway level and the adjacent land. The site clearance plans indicate that fencing will be removed from approximate ch 35-70m, as indicated in figure 8, and there is no provision for replacement fencing. Existing fencing at this location is shown in figure 9, which prevents pedestrians, including children, from accessing the embankments and exposed water hazards.

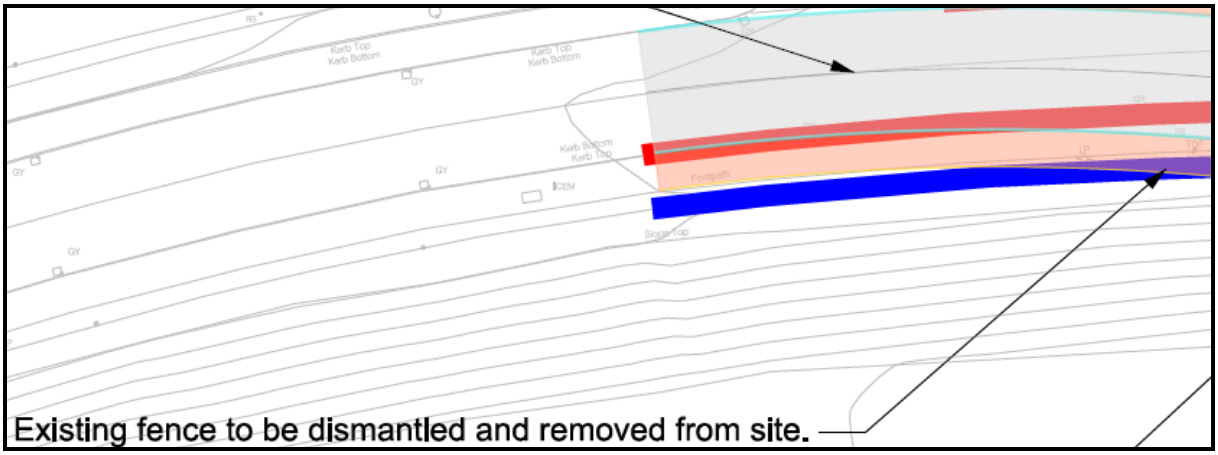


Figure 8: Fencing removed adjacent to embankment

Figure 8: Existing Fencing on Dublin Road Link

Elsewhere along the proposed link, fencing and boundaries will be located very close to the carriageway edges, where there is an increased risk of being struck by passing vehicles. At Junction 2, there are proposals to set back the existing kerb which will impact on levels and an existing retaining wall at this location, which is shown in figure 9, and the final levels and all proposals have not been shown.

Figure 9: Dwarf Retaining Wall to be removed

Recommendations

Detailed design should include provision for fencing proposed boundaries where necessary along both sides of the proposed route, at a sufficient offset from the carriageway edge. All boundary heights on approaches to junctions to be provided at levels below 1.05m to ensure visibility and SSD are not compromised. Details of any new or relocateed retaining walls should also be provided at detailed design stage.

2.1.6 Problem - Earthworks and Hazards in Clearzone

Earthworks have been shown on the plans and the cross sections adjacent to the proposed public transport link, with relatively steep embankment slopes and cut slopes in close proximity to the carriageway, which may present an overturning hazard to errant vehicles. Embankment Slopes where the slope is steeper than 1:3 and the height of the embankment is greater than 0.5m are considered to be hazards within the clearzone. The railway embankment is located immediately adjacent to the carriageway on the outside of a horizontal curve, where the risk of vehicular loss of control is higher, at approximate ch 290m+, and the provision for vehicle containment parallel to the railway line is not clear. A number of relatively tight horizontal curves were noted on the proposed alignment. The required clearzone width increases for tighter radii,

even on lower design speeds. Additional solid continuous linear hazards were noted in close proximity to the carriageway edge, which would also present a hazard to errant vehicles within the clearzone.

Recommendations

Embankments should be flattened where possible to remove hazards presented by earthworks within the Clear Zone. Hazards located within the Clear Zone should be mitigated where practical, with sufficient Clear Zone to be provided in accordance with Table 3.1 of DN-GEO-03036 May 2019. Where hazards cannot be removed, provision of VRS to protect errant vehicles from hazards within the Clear Zone may be necessary. Safety barriers and vehicle containment should be provided in accordance with DN-REQ-03034 and/or DNREQ-03079.

2.1.7 Observation – Traffic Volumes

There was no information provided on anticipated bus volumes and frequencies, or details on the location of the nearest proposed bus stops and the likely pedestrian desire lines to and from the bus stops. There was no information provided on anticipated volumes of pedestrians and cyclists using the VRU facilities along the link. Parking was noted in close proximity to proposed Junction 1 at the time of the site visit, and it was considered that a relatively high demand for on street parking is likely to arise in this locality at school drop off and pick up times. The preliminary design layout does not include provision for parking restrictions at any of the junctions within the scheme. Vehicles parked in close proximity to junctions may restrict visibility and may compromise vehicle turning movements and safe two-way flow.

Recommendations

Details of anticipated bus frequency, volumes, bus stop locations, configuration and passenger demands and required dwell areas should be considered as the site design progresses. The cumulative parking demand for the link should also be considered, with suitable parking restrictions to be provided at the junctions to prevent vehicles parking at hazardous locations.

2.2 JUNCTION LAYOUT AND ALIGNMENT

2.2.1 Problem – Proposed Geometry at Junction 1

Swept path analysis has been provided for an articulated vehicle, which shows significant encroachment into the opposing traffic lane at Junction 1, presenting a head on or side swipe collision risk. Whilst it was considered that vehicles of this size are likely to be infrequent, presenting a relatively low level of risk, it is unclear if the proposed geometry will operate safely with more frequent vehicle types, to facilitate two-way traffic movement at all times. Figure 10 shows the restrictive geometry at Junction 1.

The provision for road user continuity to the east of Junction 1 is unknown, and vehicles are prevented from travelling underneath the railway bridge at present due to the presence of gates, as shown in figure 11. There is no provision for a suitable turning circle and cul de sac signage as necessary at this location to prevent vehicles proceeding in error and having to make multiple reverse manoeuvres at a location where there is likely to be a high proportion of VRUs circulating on the footway/cycle track network, particularly at school start and finish times.

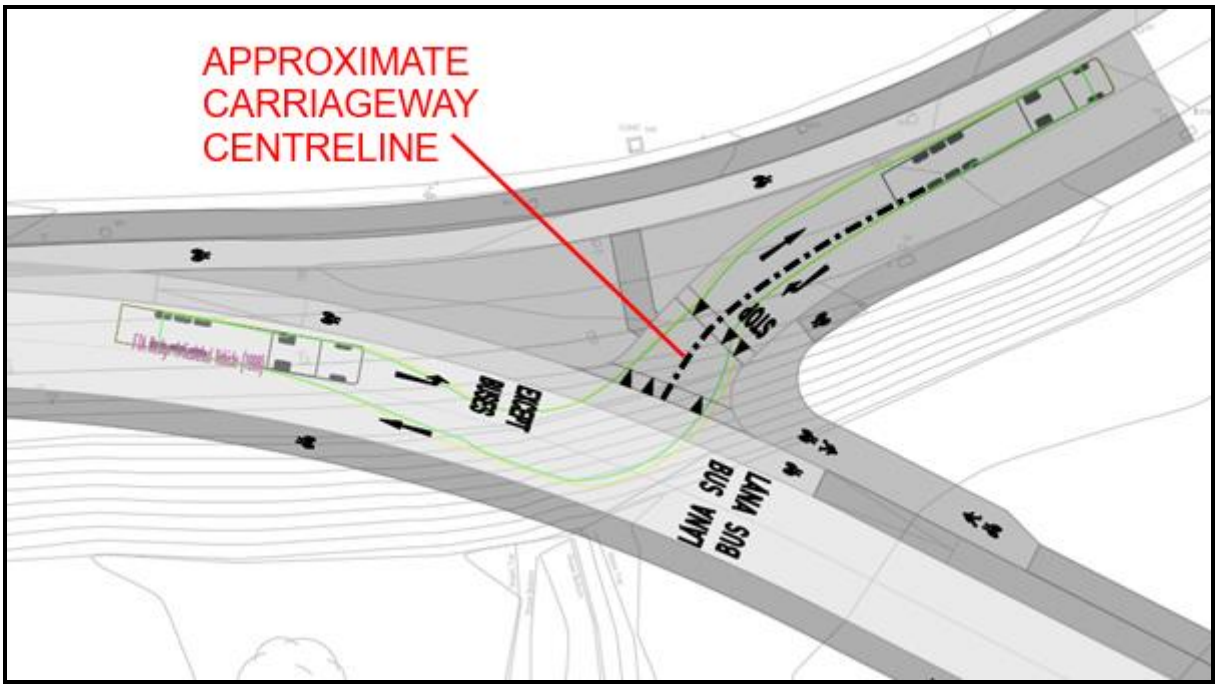


Figure 10: Restrictive geometry at Junction 1

Figure 11: Continuity restricted to northeast of Junction 1

Recommendations

The swept path analysis should demonstrate that the geometry of the proposed junctions will accommodate the turning movements of all anticipated vehicle sizes with adequate margins of safety, and should demonstrate that vehicles waiting to turn out of the minor roads will not obstruct entry for vehicles turning in. The demand for access to the minor road to the northeast of Junction 1 should be clarified, with suitable signage to be provided to restrict access, or provision made for a suitable turning circle as necessary, particularly for larger vehicles, due to the current height restriction on the railway bridge, as shown in figure 12.

Figure 12; Cul de Sac with Height Restriction

2.2.2 Problem – Proposed Geometry at Junction 2

At the Seapoint Rd Junction, there is very little margin of error for articulated vehicles to access the gated entrance to the pump house, as shown in figure 13, and the vehicle turning left from Seapoint Road must encroach almost fully onto the opposing side of the carriageway in order to make the turn. Vehicle encroachment onto the adjacent footways is considered likely, which increases risks to VRUs, including pavement damage and trip hazards. There are a number of existing bollards located immediately adjacent to the entrance, as shown in figure 14, with limited clearance to the swept path, increasing the risk that these bollards will be struck. It was noted that the gates into the pump house do not appear to be set back a sufficient distance from the carriageway to enable the entering vehicle (16.5m articulated vehicle) to wait safely off the carriageway for the gate to be opened, without obstructing pedestrians on the footway, as well as passing vehicles. This risk may arise at present, however pedestrian flows on this section of footway are likely to increase as a direct result of the new link and bridge construction, which will increase the inherent level of risk.

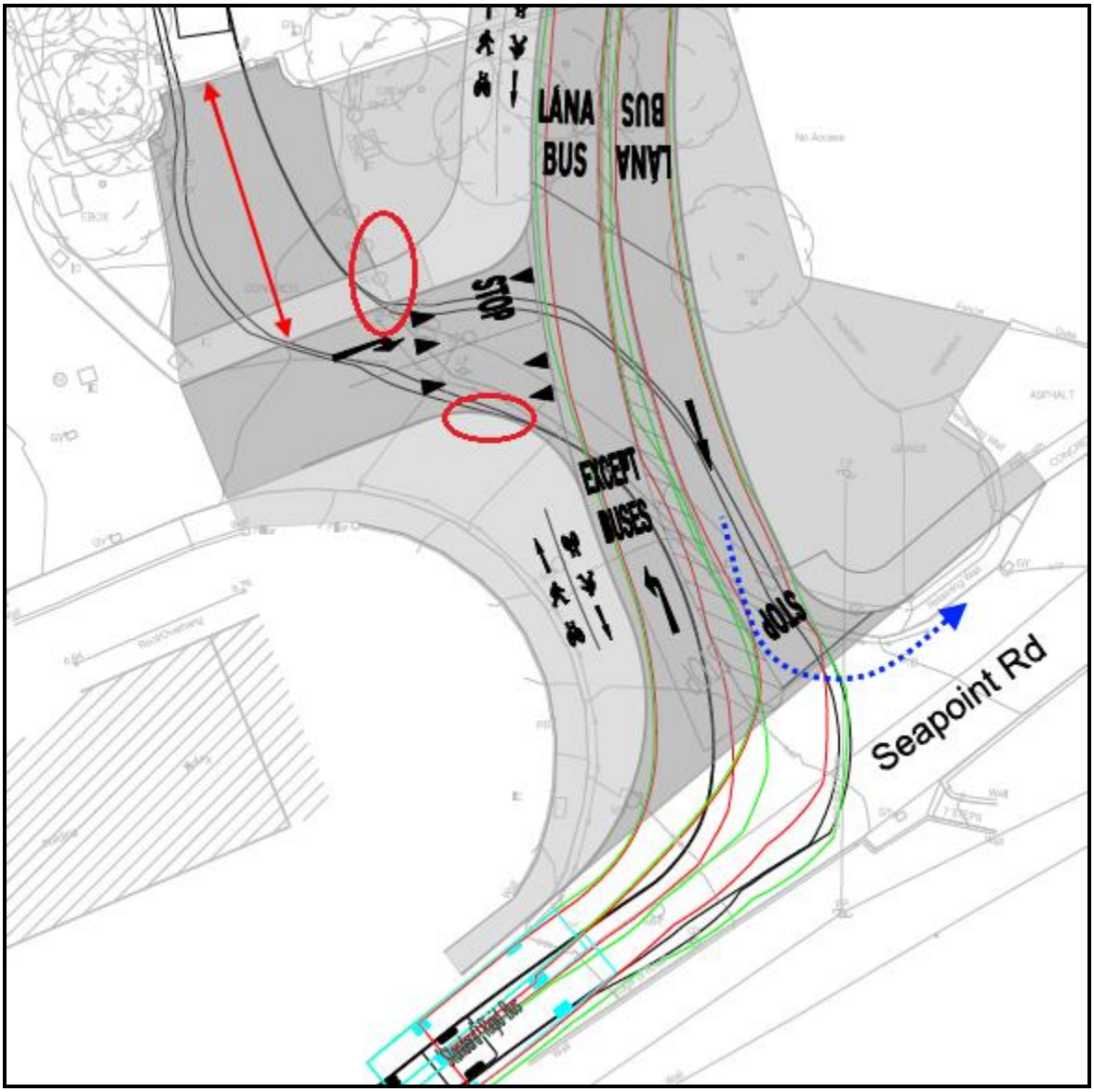


Figure 13: Restrictive geometry at Junction 2

Figure 14: Bollards at Pumphouse Access

Figure 15: Existing Gate and Bollards at Pumphouse Access

At the intersection with Seapoint Road, there is no swept path shown for the left turn movement out of the junction, which is the most restrictive movement at this junction due to the tight radius. The topographic survey terminates abruptly on the southwestern side, however it appears the existing cross section on Seapoint Road will not safely accommodate two-way movement for buses, with significant overlapping noted on the swept path analysis, as shown in figure 16, and no safe clearance to solid continuous walls which present a linear hazard along the southern

side of the carriageway, as shown in figure 17. Two wheeled vehicles would also be more vulnerable on this narrow cross section as a result of increased volumes of buses arising from demands to use the new public transportation bridge.

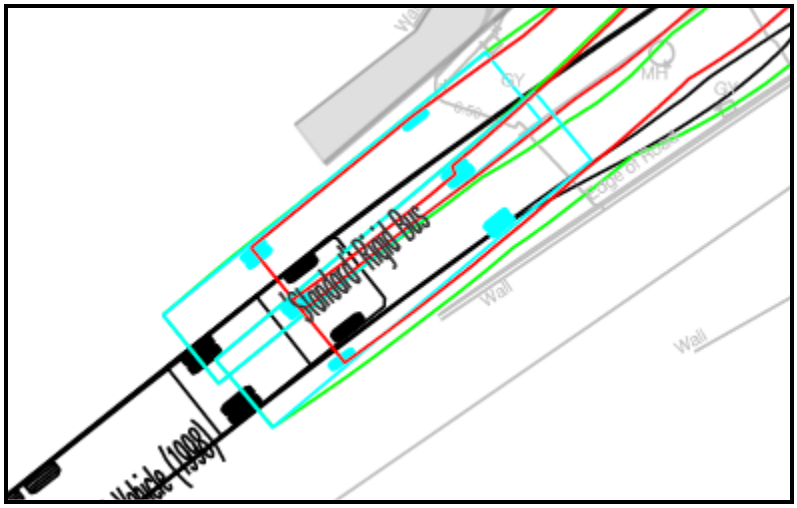


Figure 16: Overlapping two-way movement for buses.
(Note Sudden Topo Survey termination)

Figure 17: Narrow cross section with hazard immediately adjacent to carriageway

It was also noted in respect of the geometry at Junction 2 that there is insufficient dwell area provided on approach to the stop line, as shown in the photo in figure 18. Inappropriate

gradients on approaches to junctions can increase the risk of pulling out type incidents and right angled collisions, and can also increase overturning risks for larger vehicles, including double decker buses, particularly in wet and icy conditions.

Figure 18: Rising levels and insufficient dwell area on approach to Seapoint Rd Junction

Recommendations

The proposed geometry should accommodate the swept paths and turning movements of all anticipated vehicle sizes within the proposed layout with adequate margins of safety. The location of the gate at the access to the pumping station should ensure vehicles can waiting safely off the carriageway without obstructing pedestrians or motorists. The existing cross section on Seapoint Rd should be reviewed to ensure safe two way movement of buses can be accommodated as necessary, with suitable clearance to be provided to hazards adjacent to the carriageway (minimum advisable 600mm to solid continuous hazards). Gradients should also be reviewed on approaches to all junctions, particularly the approach to Seapoint Rd at junction 2, with a level dwell area to be provided for a minimum 15m back from the channel line.

2.2.3 Problem – Visibility at Junction 2

It was noted that existing visibility to the left and right at the intersection with Seapoint Rd at Junction 1 is poor, with obstruction in visibility to and from the right arising from current boundary treatment, as shown in figures 19 - 21.

Figure 19: Poor visibility to right at Junction 2

Figure 20: Poor visibility to right at Junction 2

Figure 21: Current visibility on downhill approach to Junction 2

The minor road access into the Seapoint Court residential area will be realigned to accommodate the new bridge and public transport link visibility to the right from this location is also obstructed by the existing boundary treatment at this location, as shown in figure 22, which is taken from the location of a pedestrian wishing to cross the junction mouth, which will increase the risk of pedestrian/vehicular conflict. Visibility to and from waiting vehicles will also be compromised, even taking into account the significantly reduced visibility requirements of DMURS, as indicated in figure 23. Obstructions in visibility splays increases the risk of pulling out incidents and right angled collisions, as well as potential rear shunt collision risks, which would be exacerbated by the potential for vehicles being obstructed by the restrictive geometry, as outlined in paragraph 2.2.2 (see figure 13).

Figure 22: Intervisibility between pedestrians and Motorists constrained

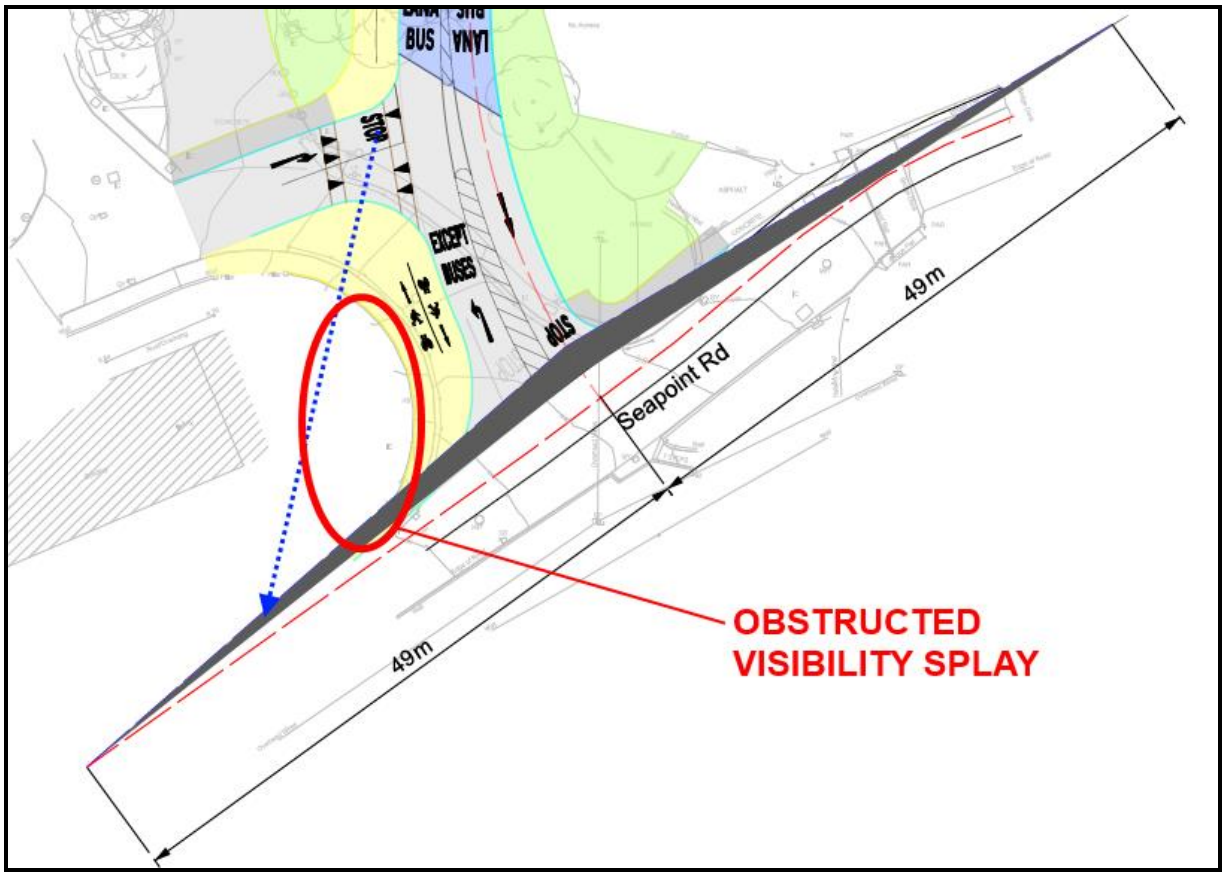


Figure 23: Significant obstructions in visibility splay to right from new minor rd junction

It was noted in respect of the visibility splay drawings provided, that there was no visibility splay drawing provided for the minor road access into the Seapoint Court residential area. Visibility splays have been shown for Junction 1 and Junction 2 at the intersection of Seapoint Rd, however the y dimension appears to be taken to the centreline of the carriageway rather than the channel line, and the x distance has not been taken from the centreline of the minor roads, as shown in figures 23 and 24, which is the typical methodology used to demonstrate visibility. The x-dimension is also not shown.

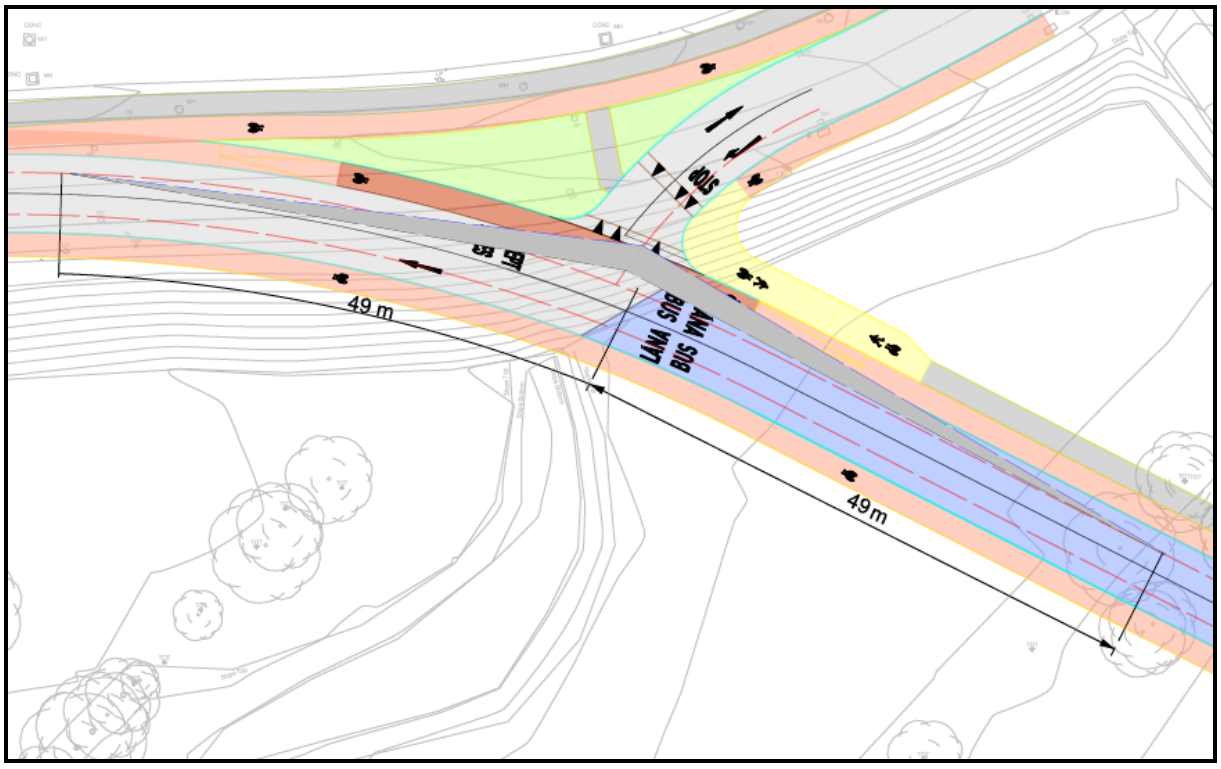


Figure 24: Visibility Splay Provided for Junction 1

Recommendations

Visibility Splays should be provided for all junctions, and should clearly show x and y dimensions, with the y dimension taken to the channel line on the major road in each direction, or the major road centreline for the y dimension to the left, where a solid centreline has been provided to prevent overtaking manoeuvres. Visibility splays should be clear and unobstructed at all times in accordance with traffic speeds, and sufficient traffic calming measures should be provided to demonstrate reduced vehicle speeds to enable reduced

DMURS SSD values to be applicable. Clear and unobstructed intervisibility should also be provided at all controlled and uncontrolled VRU crossing points, with pedestrians to be clearly visible from a point 2m back from the kerbline.

2.2.4 Problem – Horizontal and Vertical Alignment Issues

There were a number of observations made on potential safety issues with the proposed horizontal and vertical design for the scheme, with the main issues being summarised as follows:

2.2.4.1 The horizontal radii used on the proposed bridge and link alignment appear low at a number of locations, as shown in figures 25, 26 and 27. Collision rates are higher on lower radii and on consecutive curves with low radii, with collision rates increasing significantly on curves with radii lower than 250m, particularly head on or side swipe collisions on single carriageways, with collision risk increasing significantly in proportion to curve frequency. Low radii may also increase the risk of vehicular loss of control on the outside of a bend, particularly in wet and icy conditions, and may also increase passenger discomfort on buses, with an increased risk of sudden breaking when negotiating tight radii.

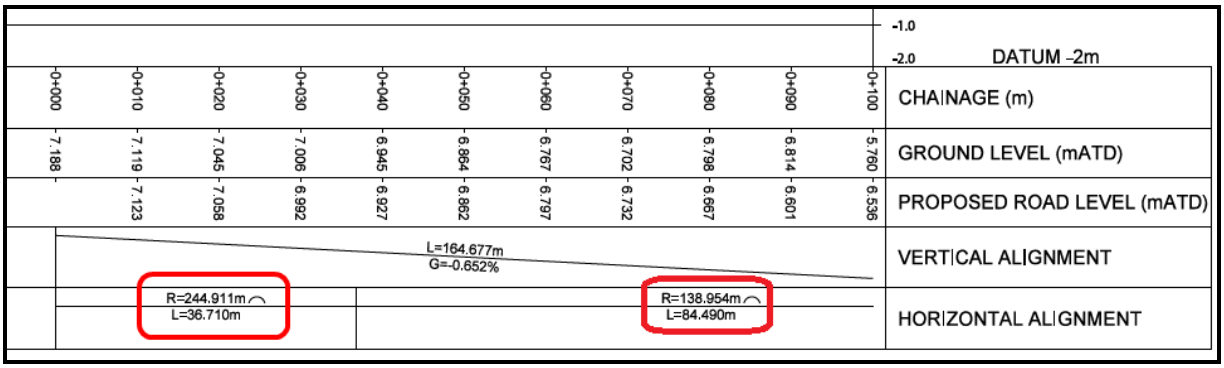


Figure 25: Successive curves with low radii and no transition length

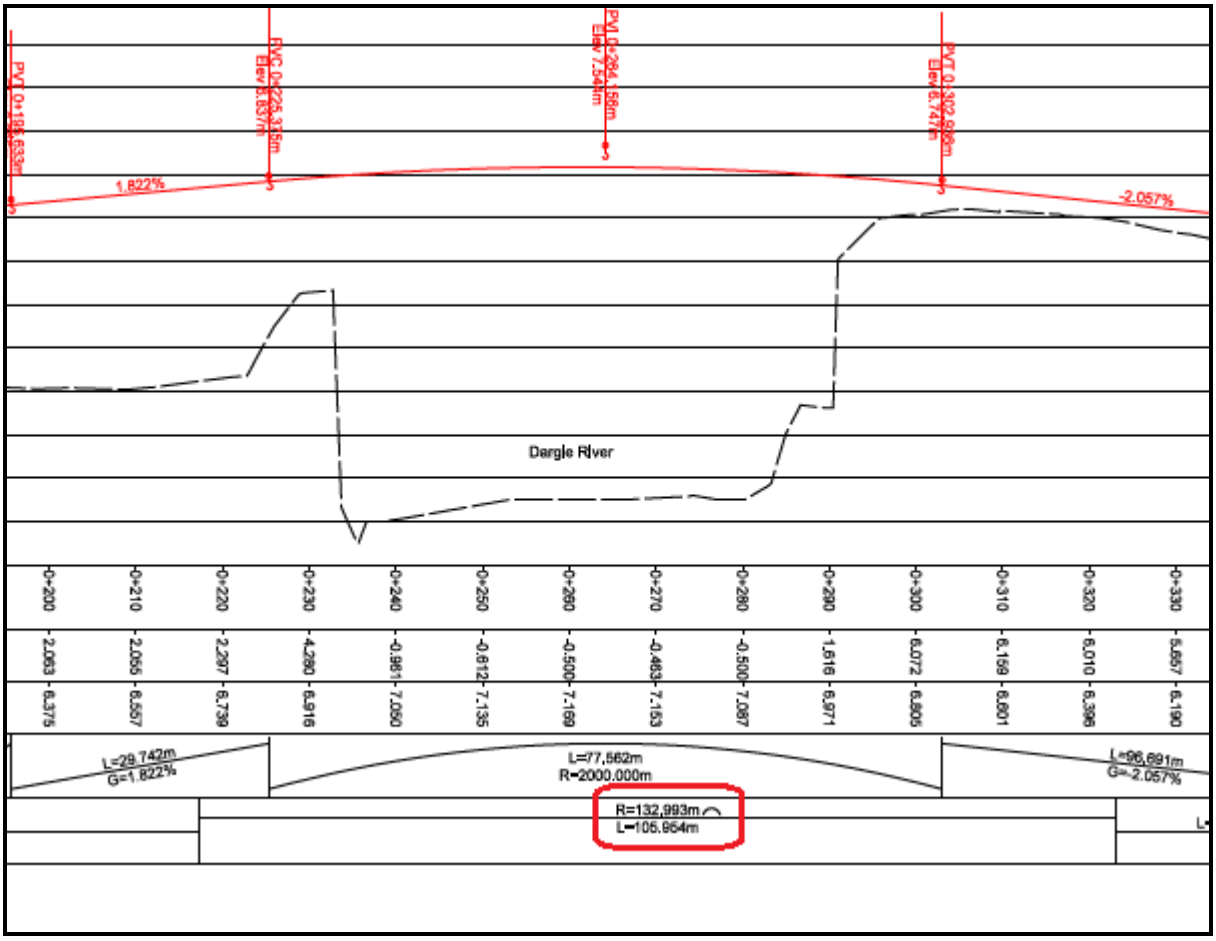


Figure 26: Low radius curve on bridge

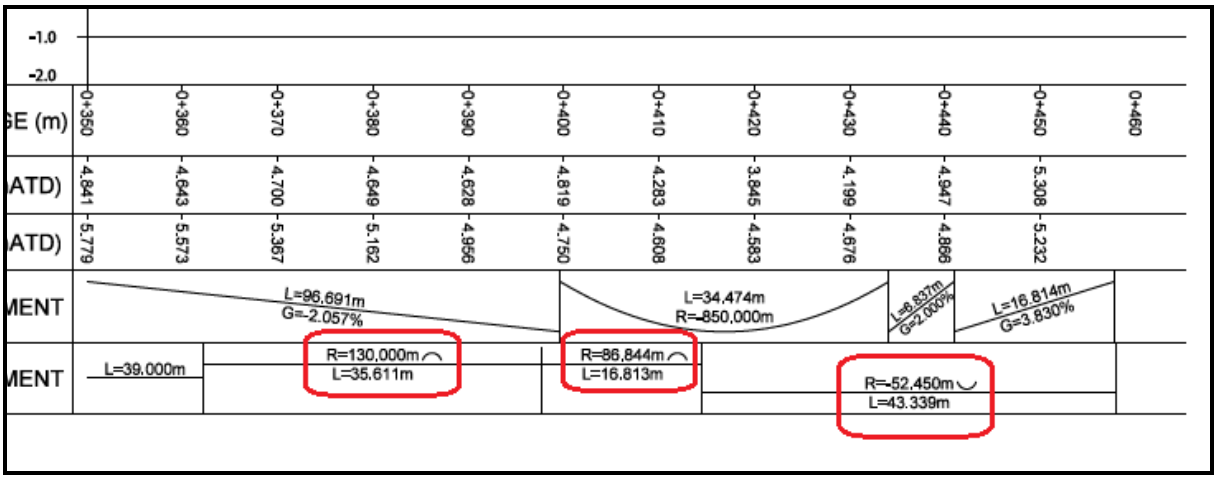


Figure 27: Successive curves with low radii and no transition length

Recommendations

The curve radii should be increased to include suitable transition curves, with radii lower than 250m to be avoided, in the absence of suitable traffic calming measures. The transition to sharper curves should be carried out by progressive reduction of radii along sequential curves, and overtaking should not be permitted on approaches to low curve radii, where the likelihood of limited SSD is increased. The alignment should also be reviewed to avoid locating the bridge on a curved horizontal alignment if possible.

2.2.4.2 The required clearzone widths are also higher for lower radii curves, to ensure a forgiving roadside in the event of vehicular loss of control. The clearzone requirements do not appear to be satisfied by the proposed alignment and cross section, with a number of high risk locations identified along the extent of the proposed route and bridge, including the bridge parapets and structure, and solid continuous walls and fencing immediately adjacent to the carriageway.

Recommendations

The required Clear Zone should be provided to each side of the carriageway along the extent of the new link, to provide a forgiving roadside, particularly in areas where low radii curves have been provided. Where the full required Clear Zone cannot be provided, with all identified hazards removed, provision should be made for suitable speed control measures to ensure all vehicles on the link can only travel at low speeds, to minimise the risks arising. Consideration should also be given to the provision of suitable vehicle containment at high risk locations, with reference to the requirements of DN-REQ-03079 for guidance in relation to VRS in urban settings. Delineation markers and high containment kerbs may also be required to minimise the risk of vehicles striking hazards located too close to the carriageway edge.

2.2.4.3 Relatively sharp curves have also been used on the proposed vertical design, e.g. at approximate chainage 400-434m, where a radius of 850m has been used over a short length, and at ch 399-434m and ch 165-195m. In some cases, the sag curves appear to be lower than one step below the desirable minimum, including on the approach to Junction 2. Such relaxations are not typically permitted on approaches to junctions. At some of these locations the short, relatively sharp vertical curves are coinciding with low radii horizontal curves, including on the bridge and on the approach to Junction 2, as shown in figure 28. The coincidence of a horizontal and a crest vertical curve may, under certain conditions, lead to significant limitation of

the available sight distance and prevent the prompt perception of the curve, leading to an increased risk of loss of control. An inefficient combination of horizontal and vertical alignment may lead to road safety problems, even when the horizontal and the vertical alignment comply separately with all relevant design standard and guidelines. Poor coordination of horizontal and vertical alignments can create locations where the available sight distance drops below the required sight distance. It is therefore unclear if there is sufficient SSD over the crest curve on the bridge on the westbound approach towards the proposed toucan crossing at approximate chainage 200m, to ensure clear intervisibility between approaching motorists and pedestrians waiting to cross, including small children. Further details on potential intervisibility obstructions at this location have been outlined in section 2.3 of this Stage 1 RSA report.

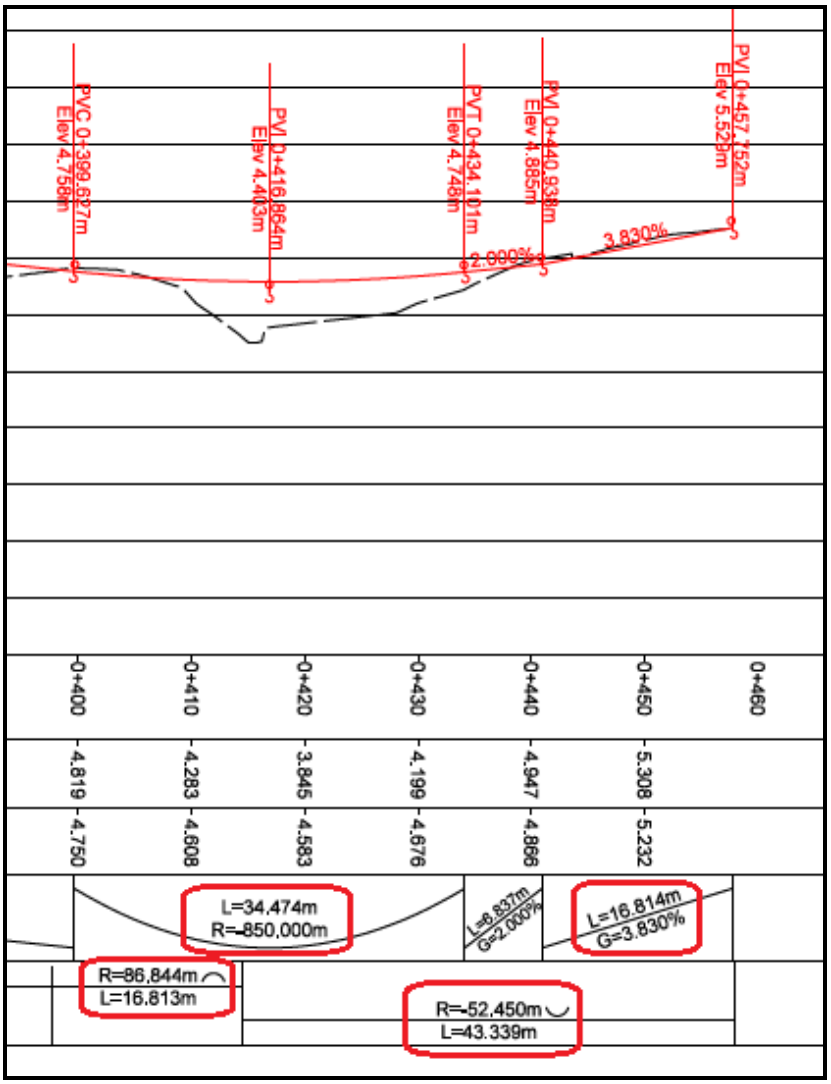
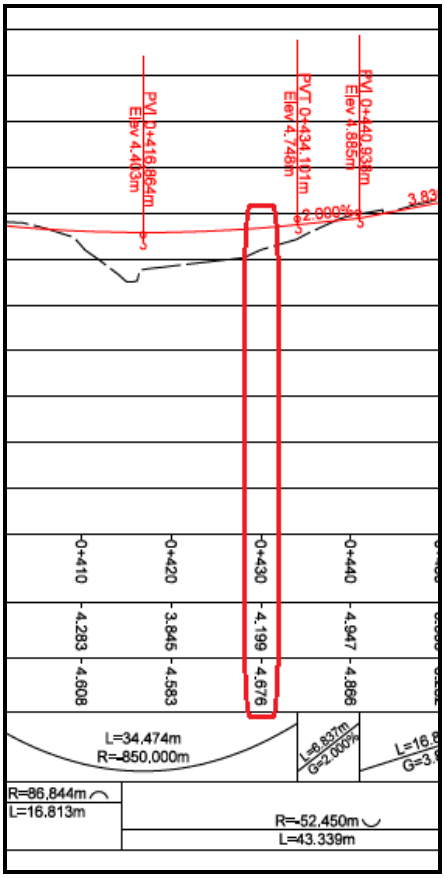
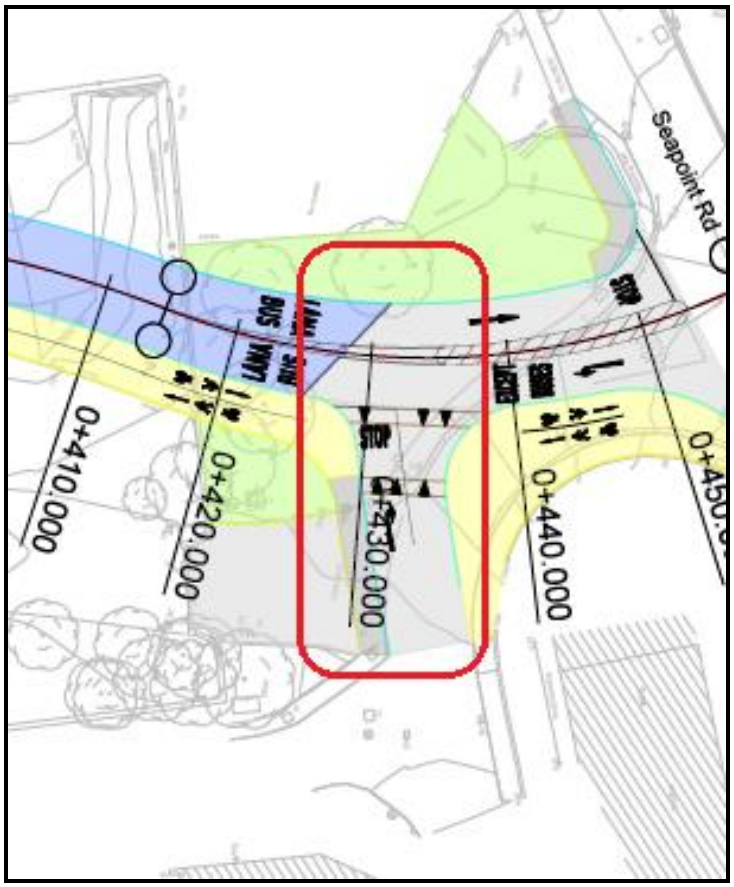


Figure 28: Coincidental sharp horizontal and vertical curvature

Figure 28 also highlights a steep gradient of 3.83% over a distance of almost 17m at the southern scheme tie in at junction 2. This coincides with a location where geometry is already restrictive, as outlined previously in paragraph 2.2.2. The vertical design at this location also appears to indicate a level difference of almost half a metre at the tie-in with the access road to Seapoint Court, which is at chainage 430m, as shown in figures 29 and 30. Inappropriate gradients and uneven carriageway levels on approaches to junctions can increase risks, including overturning risks for larger vehicles particularly in wet and icy conditions.





Figures 28 & 29: Significant level differences and gradients at Junction 2

Recommendation

Forward visibility and SSD should be clear and unobstructed at all times in accordance with traffic speeds, particularly on approaches to VRU crossing points, where VRU priority and safety should be maximised. The vertical design for the scheme should be reviewed taking into account all issues raised above, with the design to be amended where possible to provide flatter gradients, taking into account drainage requirements to minimise the risk of standing water.

Relaxations from minimum required should be isolated from other relaxations, on both the horizontal and vertical planes. Final design should ensure there are no sudden changes in level particularly at junctions and locations where vehicles will be turning within a relatively confined space, and where the risk of overturning is higher. Detailed design contours should be checked at this location, and at all others throughout the scheme, to ensure surface water is adequately drained and that ponding will not occur within the carriageway, leading to an increased risk of loss of control during wet and icy conditions.

2.2.5 Problem – Cross Section Variation and Constraints

Significant variations in cross section were noted over relatively short distances. Cross sections show that the carriageway width reduces from 8.2 (7m plus lateral clearance of 600mm to each side) to 6.5 on each side between ch 200 and 225m, and also reducing from 8.2 to 7.8m from 275-300m, and from 7.8m to 6.5m between ch 300m and 325m. Sudden changes in cross section and lane widths, particularly without sufficient warning, or at locations which coincides with relatively sharp curvature, or locations where forward visibility may be restricted, can lead to an increased head on or side swipe collision risk, or an increased risk of mounting the pavement or striking hazards in close proximity to the carriageway.

Insufficient clearance has been provided to the continuous linear hazard presented by the fence/wall at approximate chainage 300m, as shown in figures 30 and 31, where a lateral clearance of only 0.2m is indicated. The plan shows no clearance to the bridge structure, as shown in figure 32, between approximate chainage 210m-300m

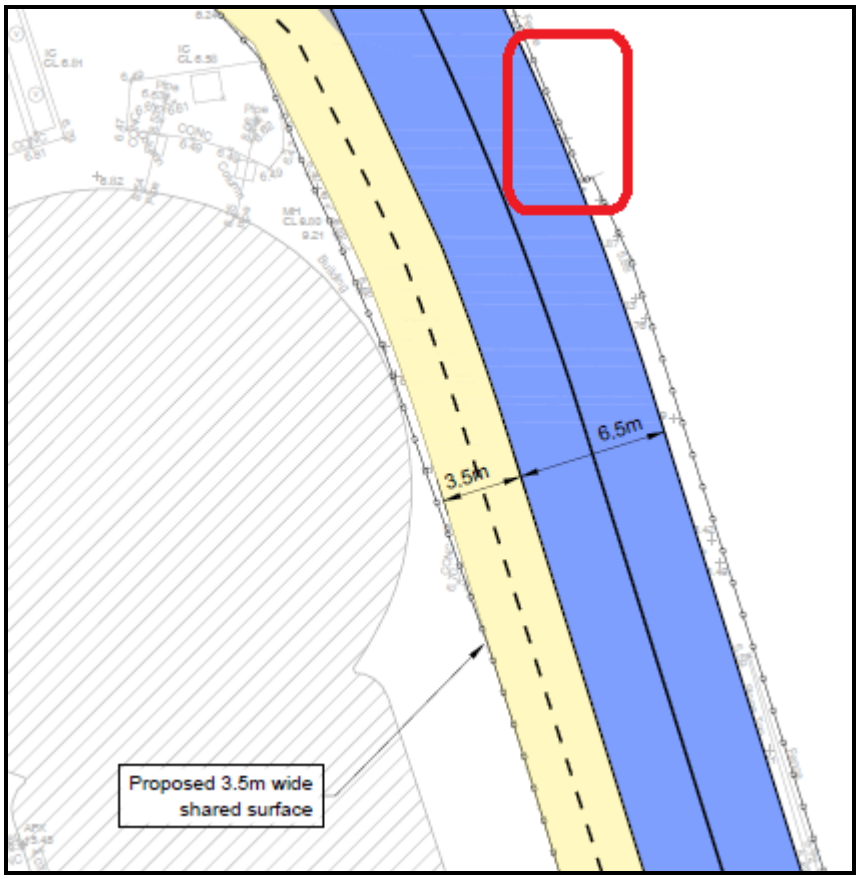


Figure 30: Minimal Clearance between boundary and carriageway

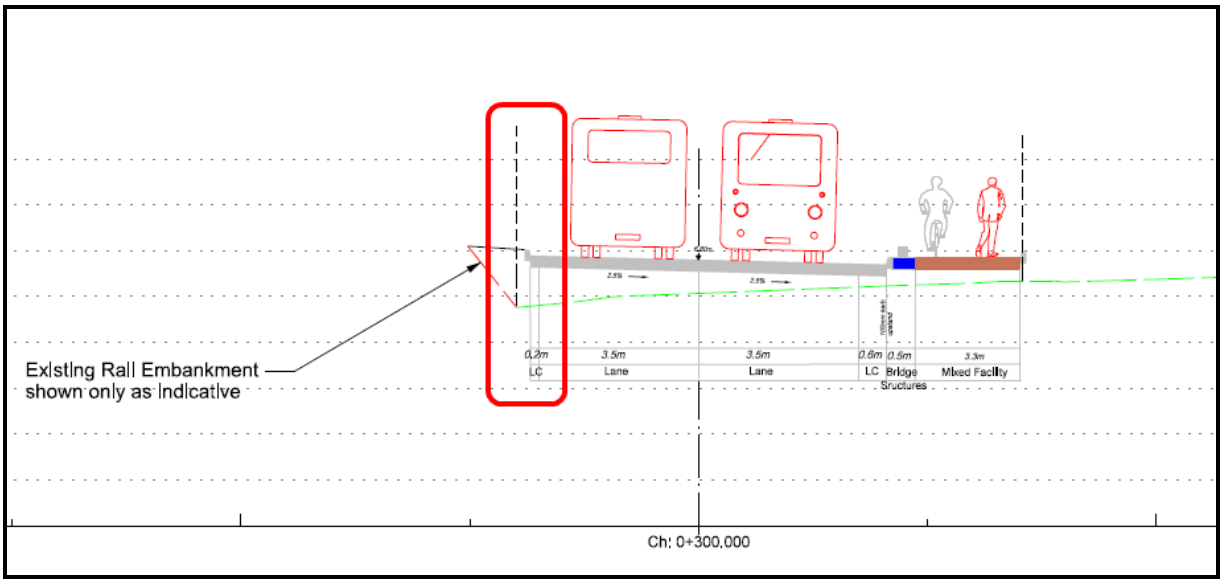


Figure 31: Minimal Clearance between boundary and carriageway

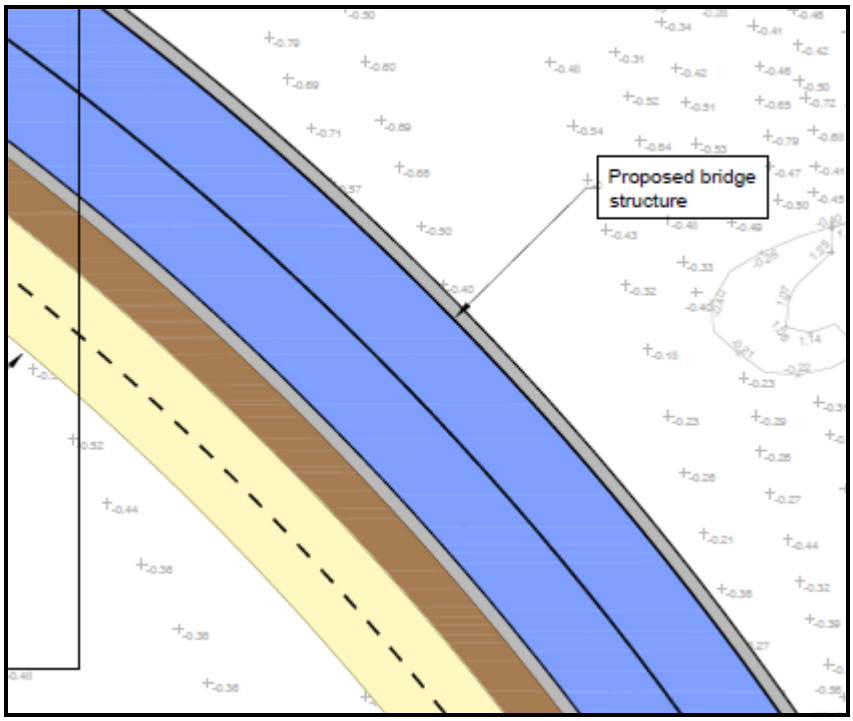


Figure 32: No Clearance to Bridge Structure

The cross sections show that continuous crossfall or superelevation of 2.5% has been applied across the full cross section from the more northerly channel. It was noted that chainage 320-360m approximately is located on a straight section of horizontal alignment, however superelevation/crossfall has been shown across the full cross section, rather than from the centreline of the carriageway to assist with positive drainage and to minimise overturning risks for higher vehicles. The same was noted on the cross sections for the straight alignment from chainage 120-220m approx. It was also noted that the cross section at ch 450m, which is shown in figure 33, does not reflect the widened carriageway with central hatching or the wider shared surface and verge at this location.

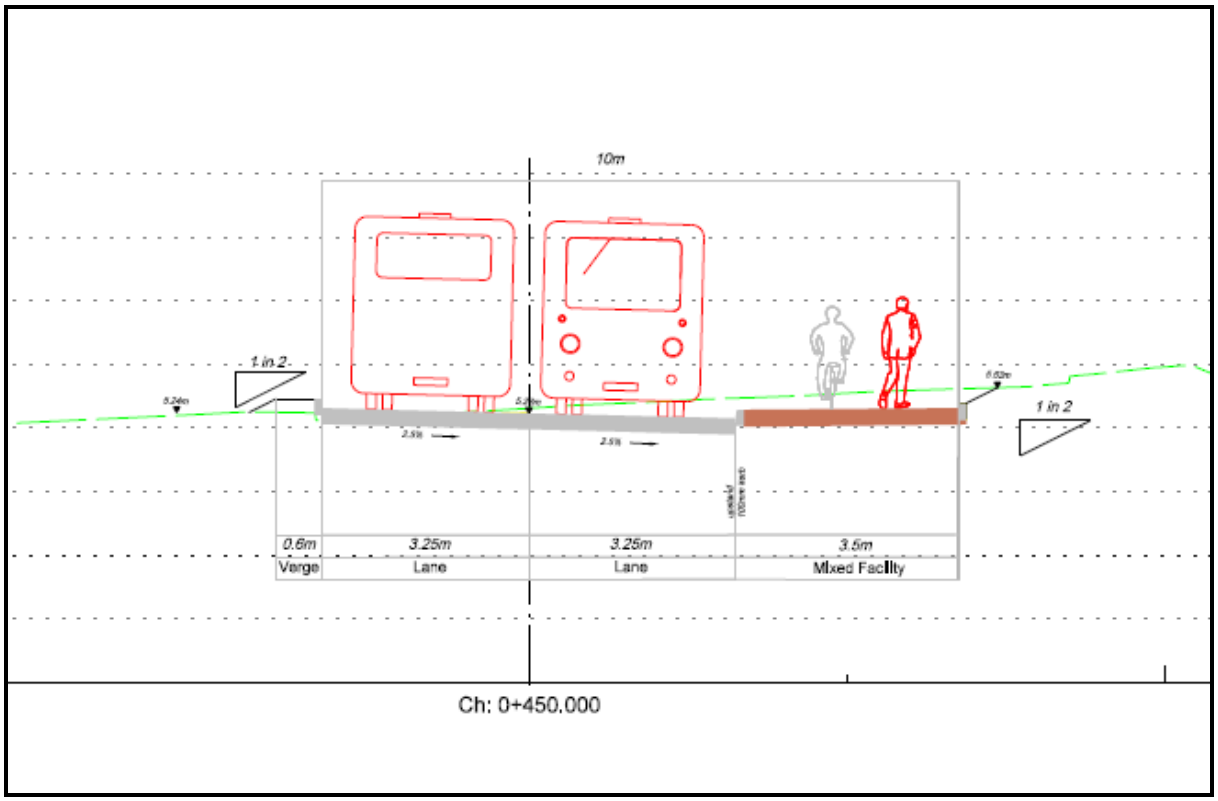


Figure 33: Cross section differing to plan proposals at ch 450m

Recommendations

Sufficient safe clearance should be provided between the carriageway edges and all street furniture and potential hazards along the length of the route. Any changes to cross section width should be implemented gradually, with sufficient advance warning regarding the narrowing ahead to ensure drivers can adjust their speed accordingly. Conservative SSD should also be applied on any locations where combinations of horizontal and vertical curvature may lead to reduced forward visibility in advance of hazards such as a reduction in carriageway width.

2.2.6 Problem – Inappropriate kerb heights

It was noted from the kerb drawings that a full height kerb has been provided at the private driveway access at Junction 2, which is shown in figures 34 and 35, which may present difficulties for safe access and egress at this location.

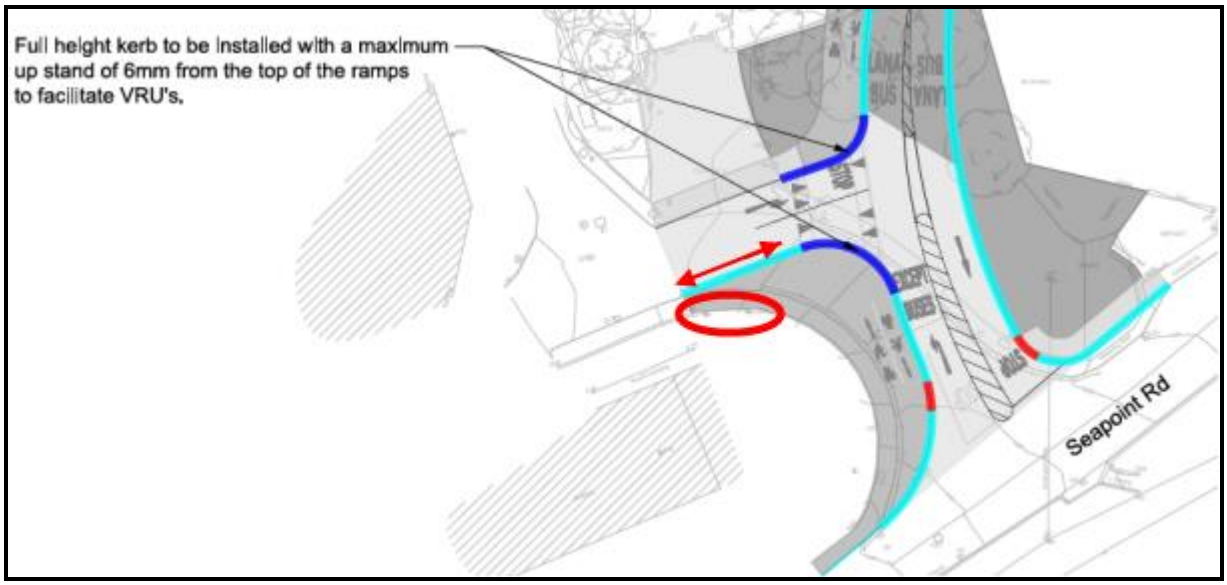


Figure 34: High Kerbs at private drive access

Figure 35: Existing dropped kerbs at private drive access

Recommendations

Suitable dropped kerbs should be provided to facilitate access and egress to and from the driveway at this location and at all other locations where vehicular access will be required. A maximum kerb upstand of 6mm should be provided on all pedestrian desire lines.

2.3 NON-MOTORISED USER PROVISION

2.3.1 Problem – Cyclist Facilities

There was no information provided on anticipated cyclist volumes and desire lines, however the route will be constructed on the outskirts of Bray town in a section of undeveloped land between the town centre and a number of newly constructed schools, hence VRU volumes are likely to be relatively high, and VRU safety and accessibility should be prioritised on the link. Potential safety issues which should be considered as the design progresses have been summarised in sections 2.3.1.1 – 2.3.1.3.

2.3.1.1 The proposed route will provide a segregated off-road cyclist facility, which will safely accommodate one-way cyclist movement along the link, however the facility is provided on one side of the carriageway only, and it does not appear to be sufficiently wide to accommodate two-way cycling movements along the entire length of the proposed link, particularly on the narrower sections of shared space. There is no provision on the design for a verge or separation distance between the VRU facility and the carriageway. When cycle/pedestrian facilities follow the route of a road, a separation distance should be provided between the road and the cycle track through the provision of a grassed verge. A minimum grassed verge width of 1m is usually required to improve safety for VRUs. Figure 36 shows 3m wide shared facilities, including on approaches to the proposed toucan crossing, which would only safely accommodate one-way cycling movement alongside pedestrians. Figure 37 shows a narrow shared facility with hazards immediately adjacent to the VRU facility on both sides, which would normally warrant increased widths on the VRU facility.

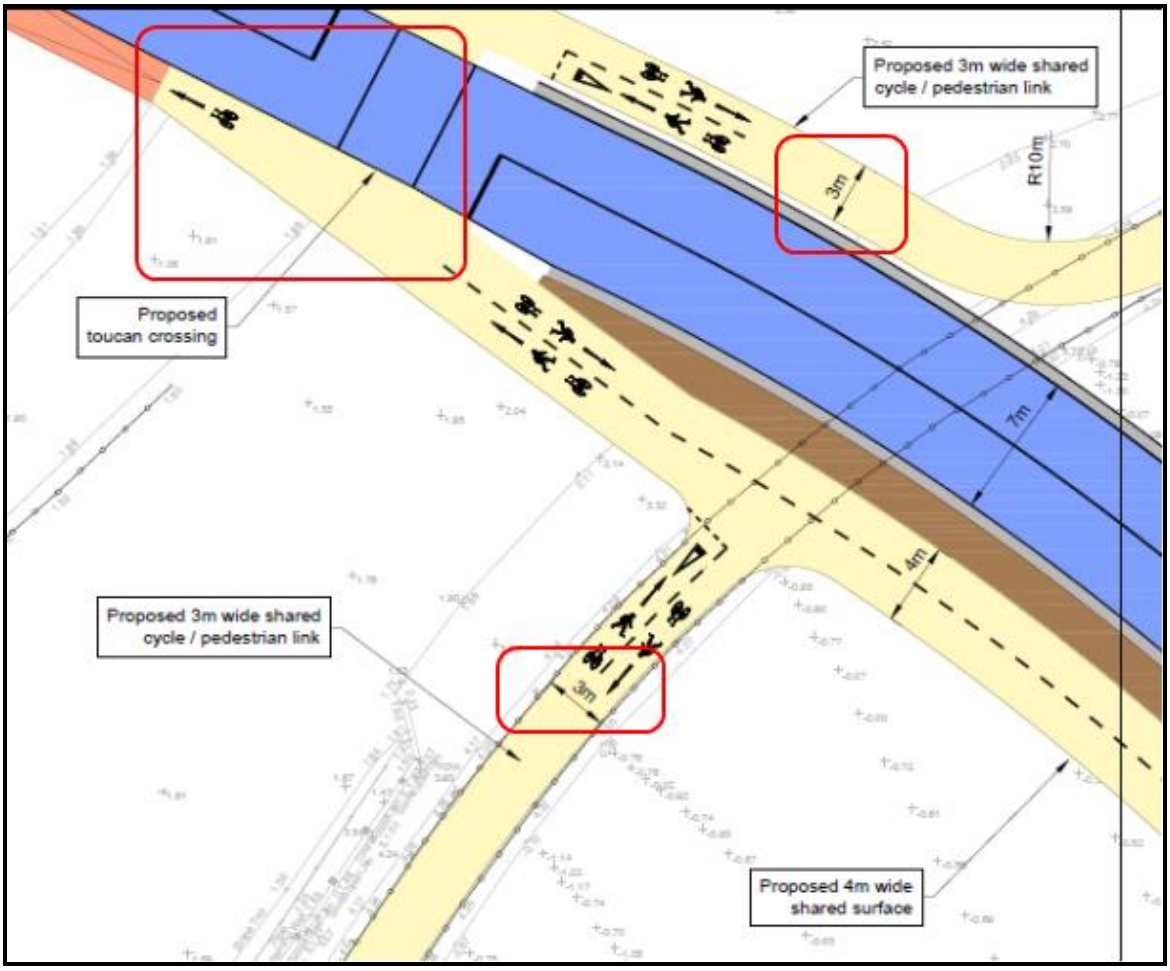


Figure 36: Narrow Shared Facilities

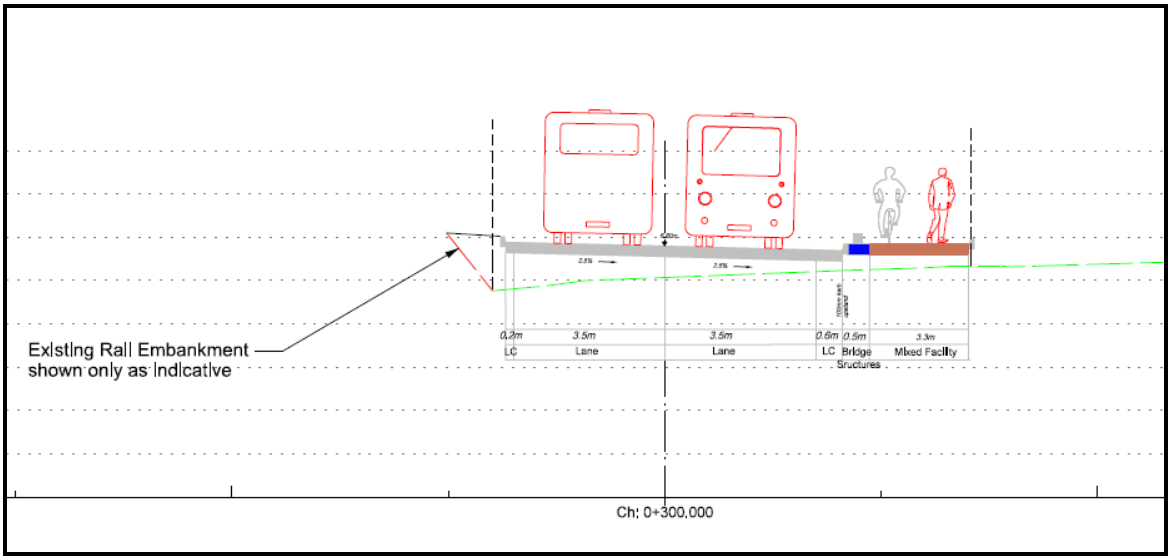


Figure 37: Narrow Shared Facilities

Recommendations

Likely cyclist volumes and desire lines should be considered in provision of safe continuous facilities along the route, with provision for suitable separation distance as necessary, and sufficient width to be provided to minimise the potential for conflict between cyclists and pedestrians. Where the cycling and pedestrian routes are segregated by a kerb, a minimum width of 2m is recommended for the pedestrian side, and a 2m effective width for the cycle side (one way). The effective width of the cycleway should be measured from the back of kerb and not the running edge of the carriageway. A width of 3 metres is the preferred two-way minimum width on a cycling route which is not shared with pedestrians, but only where the route is not bounded by vertical features. Where a significant amount of two-way cycling is expected, additional width should be provided, depending on anticipated user flows. Additional width should also be provided for spaces which are to be shared with pedestrians on the same level.

If vertical objects such as a wall, a fence or items of street furniture such as lighting columns are located immediately adjacent to a cycle facility, the effective width of the cycle facility will be reduced. A minimum lateral clearance of 0.5m shall be provided to vertical objects where they are located adjacent to cycle facilities. The need for two-way cycleway provision or otherwise should be clarified, with widths of all facilities increased where necessary subject to maintenance of safe two-way traffic movement on the carriageway. Shared facilities next to vehicular traffic should have a recommended combined width of 4m with the absolute minimum combined width of 3m acceptable in locations which cater for just one-way direction of travel for cyclists. All cycling facilities should have a design speed of 30 km/h and suitable intervisibility should be provided at all intersection points with a reduced design speed of 10 km/h acceptable (over short distances) on approaches to junctions.

2.3.1.2 There were no details provided for the bridge deck, and no clearances shown between the bridge and the VRU route below, however significant level differences were noted on the long section. The photo in figure 40 shows current levels adjacent to the track at this location. It is unclear how the levels and gradients will work for the connection between the existing two-way cycle track parallel to the river and the new shared surface and toucan crossing adjacent to the bridge, and the scope for direct safe connectivity of the cycling route underneath the bridge is

unclear, which would prevent the need for diverting from the direct desire line and crossing the carriageway in direct conflict with vehicles.

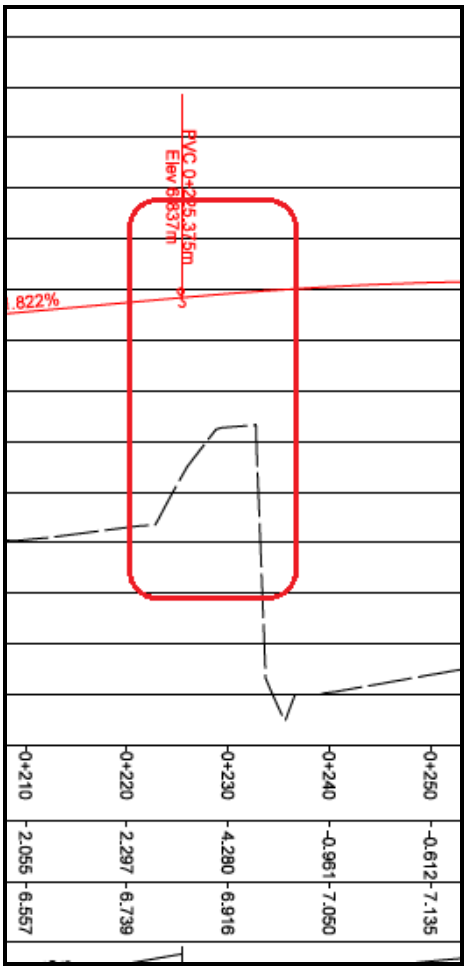


Figure 38: Level Differences at northern side of bridge

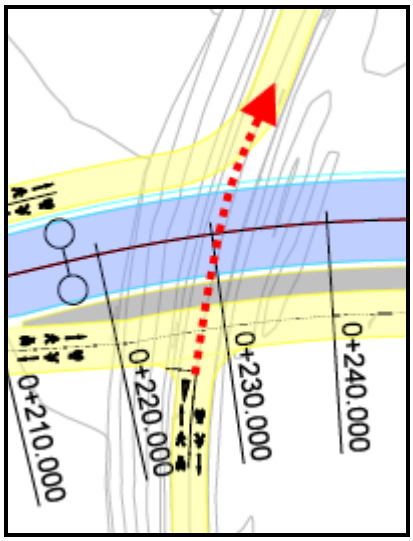


Figure 39: Scope for Direct Connectivity underneath Bridge?

Figure 40: Existing Levels on Cycletrack

A significant level difference was also noted on the southern side of the bridge at approximate chainage 290m, where the tie-in details and gradients for the proposed footway are unclear, as shown in figures 41 and 42.

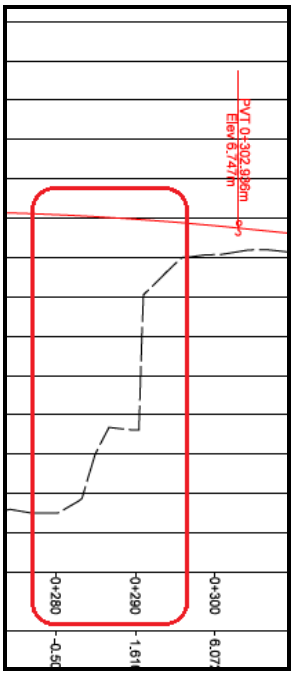


Figure 41: Level differences at proposed footway

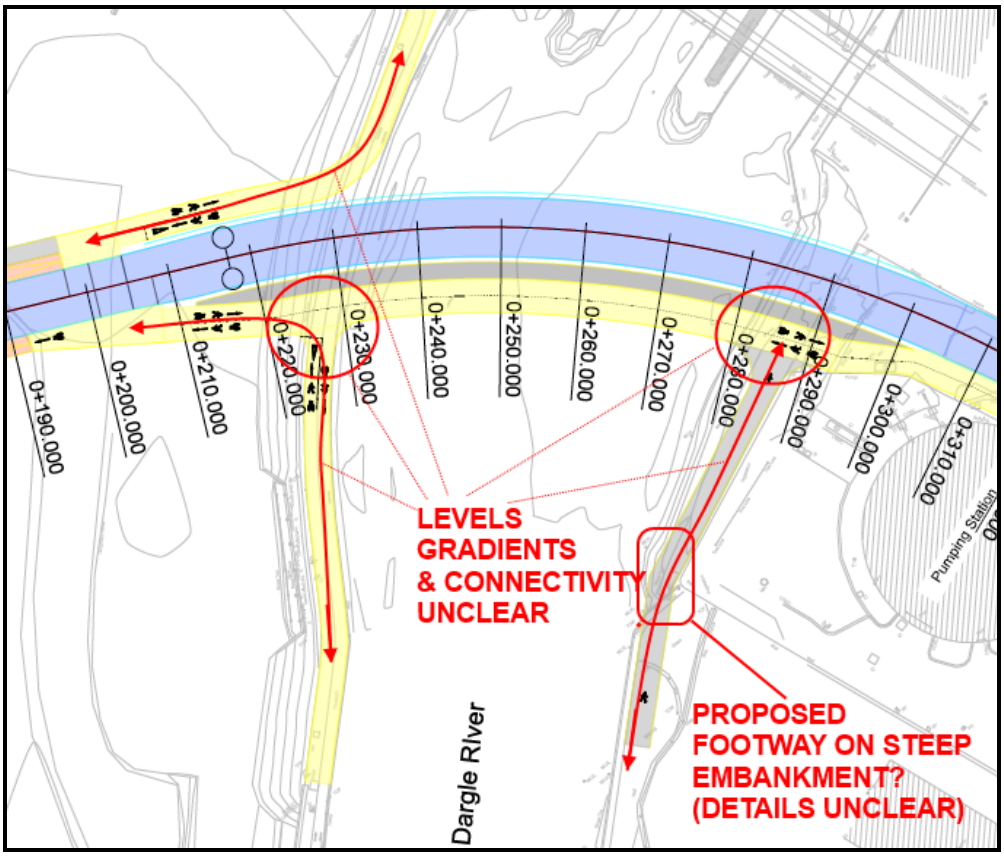


Figure 42: Connectivity/Levels at Tie-ins and Gradients unclear

Recommendations

The connectivity and gradients of the shared facilities should be clarified. A desirable maximum gradient of 3% should be provided on the cycling facilities, with a maximum gradient of 5% on the footways. Safe segregated VRU facilities are preferred to those which require travel across the path of motorised vehicles, at a location where intervisibility may be compromised, as outlined in paragraph 2.3.3, or on sections of route which may have potentially steep gradients, which could present difficulties for some road users, particularly elderly and mobility impaired pedestrians, and particularly n wet and icy conditions. Consideration should be given to continuity of the existing VRU route underneath the bridge, with headroom standards to be provided in accordance with DN-GEO-03040. The desirable minimum headroom along cycle facilities is 2.7 metres, however over short distances a reduced head height of 2.4 metres is acceptable.

2.3.1.3 It was noted that the proposed shared footway/cycleway terminates abruptly at Junction 2, where there is no provision for dropped kerbs to facilitate transfer from on to off road facilities, and there is insufficient space on the narrow existing footway at the tie-in to facilitate safe shared use. The restrictive geometry at Junction 2, as outlined in previous sections of this report, will present risks for cyclists at this location. Two wheeled vehicles, including motorcyclists, are particularly vulnerable in narrower lanes at and on approaches to junctions, with insufficient space to queue and move alongside larger vehicles. Narrow lanes can also increase the risk of sudden braking and rear shunt collisions, as well as side swipes and kerb collisions.

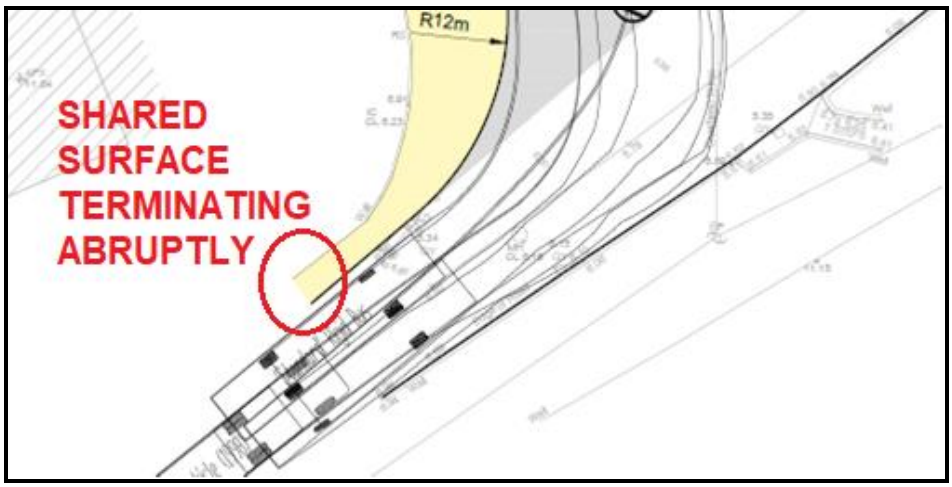


Figure 42: Cyclists vulnerable on narrow cross section

Recommendations

The safe continuity of the new cycling infrastructure should be considered at the southern scheme tie-in on Seapoint Road. Clear signage should be provided regarding the start and end of all facilities on the cycling network, to be included on plans at detailed design stage. Safe transitions from off to on road facilities will also need to be provided at the southern scheme tie-in, along with suitable warning signage to alert drivers to the potential presence of cyclists in the carriageway. All lane widths on the links at the tie-in points should be sufficiently wide to cater for safe cyclist movement.

2.3.2 Problem – Pedestrian Facilities

There was no information provided on anticipated cyclist volumes and desire lines, and there were low levels of pedestrian activity noted on the existing network adjacent to Junction 1 and 2 at the time of the site visit however the location of the route and likely demand for high pedestrian accessibility to and from the schools should be taken into consideration with VRU movements and accessibility to be prioritised. Low vehicle speeds should also be encouraged[3], with sufficient SSD to be provided in advance of all potential pedestrian desire lines to cross the carriageway, to include sufficient margins of error particularly on downhill gradients, where SSD is typically higher for heavier vehicles such as buses. Other potential safety issues which should be considered as the design progresses, have been summarised in sections 2.3.2.1 – 2.3.2.4.

2.3.2.1 Existing footway widths are narrow along the northern side of Seapoint Road, and there is no footway at present along the southern side, which contradicts the aspirations of DMURS in respect of VRU priority in a built up urban environment, which is applicable to this section of the scheme.

[3] Studies have shown that at an impact speed of 45-50 km/hr a pedestrian will have an estimated 27% chance of survival. At an impact speed of 60 km/hr or more the chance of survival is less than 1%. A reduction of 10 km/hr in travel speed reduces collision risk by 21% and fatality rates by 50%

Figure 43: Existing footway narrow on cross section

Recommendations

The existing cross section should be reviewed at the southern scheme tie-in with boundary treatment to be reviewed on both sides of the carriageway to enable greater priority to be given to VRU movements where possible.

2.3.2.2 A wide crossing distance was noted at the intersection with Seapoint Road, with no provision for a pedestrian refuge, to minimise the crossing distance, particularly for older and mobility impaired pedestrians. Pedestrians, particularly the mobility impaired and elderly are more vulnerable on crossing distances exceeding 10m without provision for refuge. VRUs will be particularly vulnerable at this location, where a high proportion of larger turning vehicles, i.e. buses, will be turning as a result of the proposed new bridge and link road. The footway on the eastern side of the junction also terminates abruptly, with no provision for safe crossing to the footway on the opposite side of the carriageway, and no provision for dropped kerbs and tactile paving for the benefit of visually and mobility impaired pedestrians. The crossing distance will be somewhat shortened by the proposed kerb buildout on western side, however this will impact on existing utilities, and it was noted that chamber covers will be located within pedestrian desire line, where they may present a slip hazard.

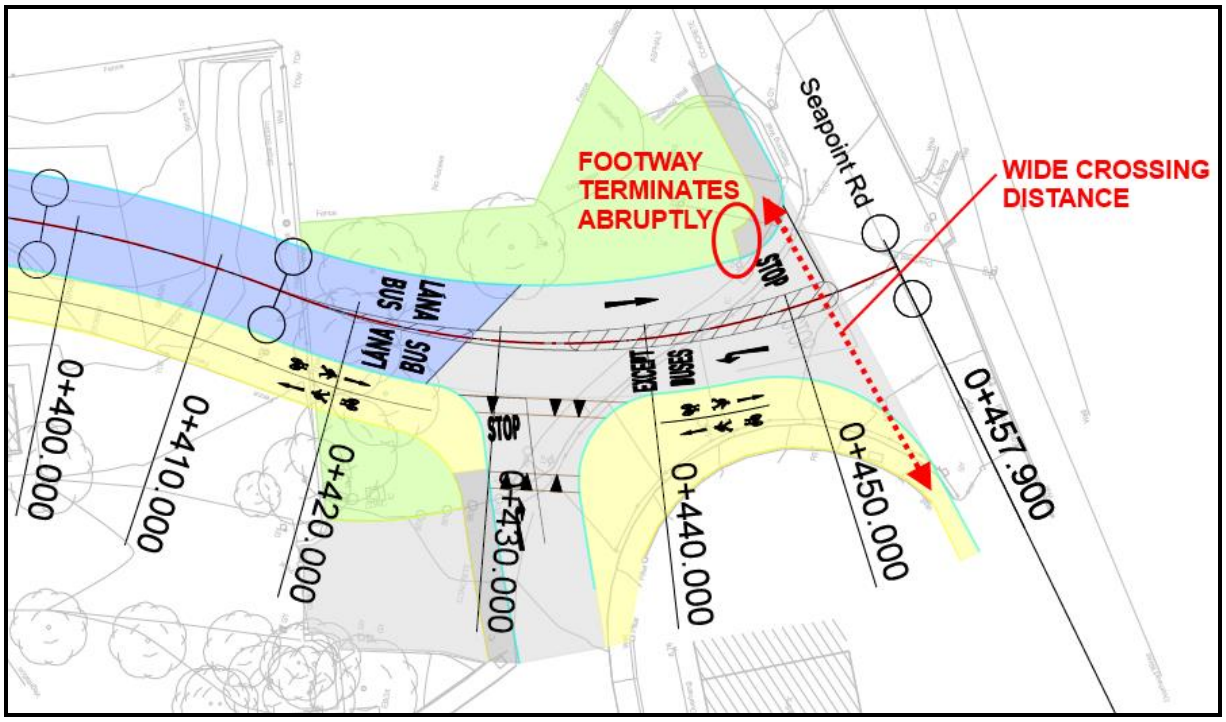


Figure 44: Wide crossing distance

Figure 45: Wide crossing distance with utilities within desire line

Figure 46: Wide crossing distance

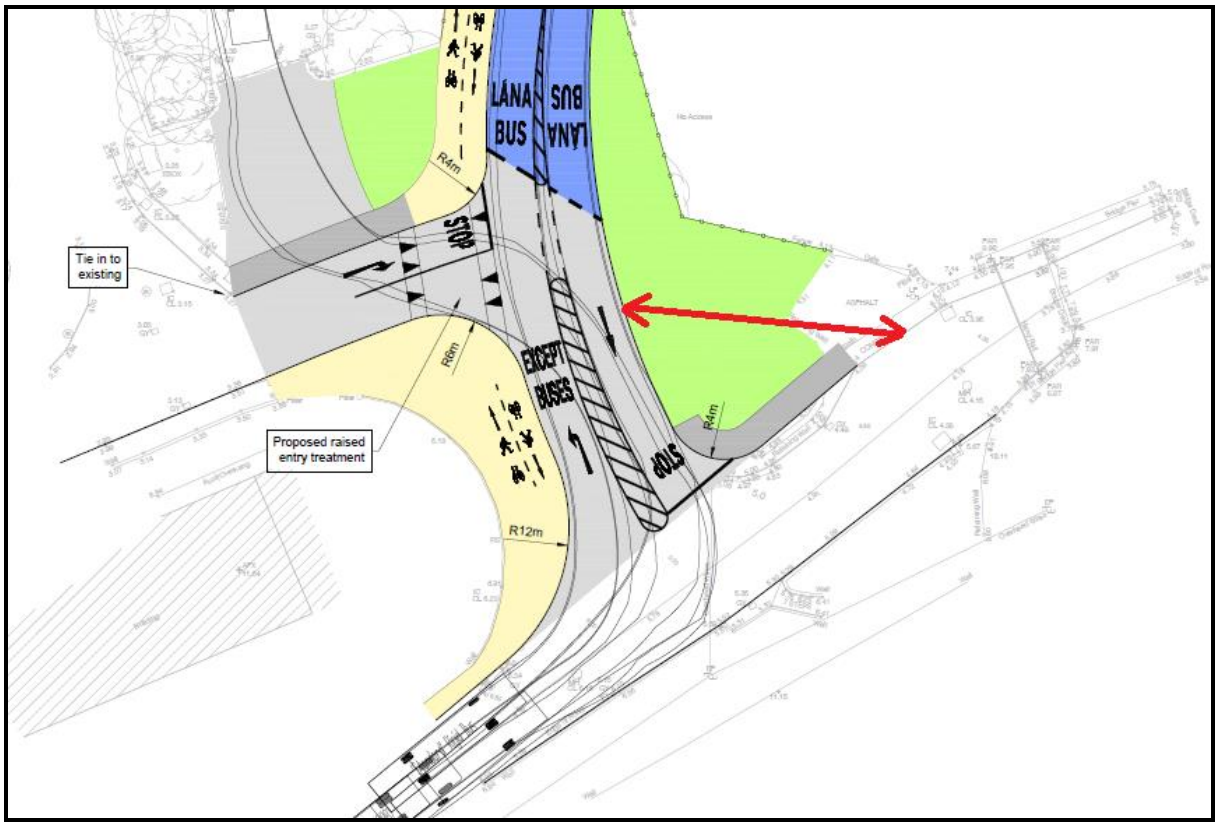
Recommendations

Crossing distances should be less than 10m. Where VRUs must cross the carriageway in one movement exceeding 10m wide, a minimum refuge of 1.5m should be provided, subject to swept path analysis, with provision for prohibited movements and HGV/3T limits if necessary, to ensure VRU accessibility and safety is prioritised. Footways should be continuous, and should not terminate abruptly without provision for safe crossing o the opposing side of the carriageway at a safe location.

2.2.3.3 A pedestrian desire was noted on site at Junction 2, as shown in figures 47, 48 and 49, which has not been catered for on the proposed layout.

Figure 47: Pedestrian desire Line at Junction 2

Figure 48: Pedestrian desire Line at Junction 2



Figures 49: Pedestrian desire Line at Junction 2

Recommendation

Continuous footways with a minimum width of 2m should be provided on all likely pedestrian desire lines, on the most direct route.

2.2.3.4 A shared VRU facility has been provided to each side of the proposed toucan crossing, however the pedestrian facility terminates abruptly on the southwestern side of the carriageway, as shown in figure 50, which may bring pedestrians into conflict with cyclists. The shared facility also terminates abruptly at Junction 1.

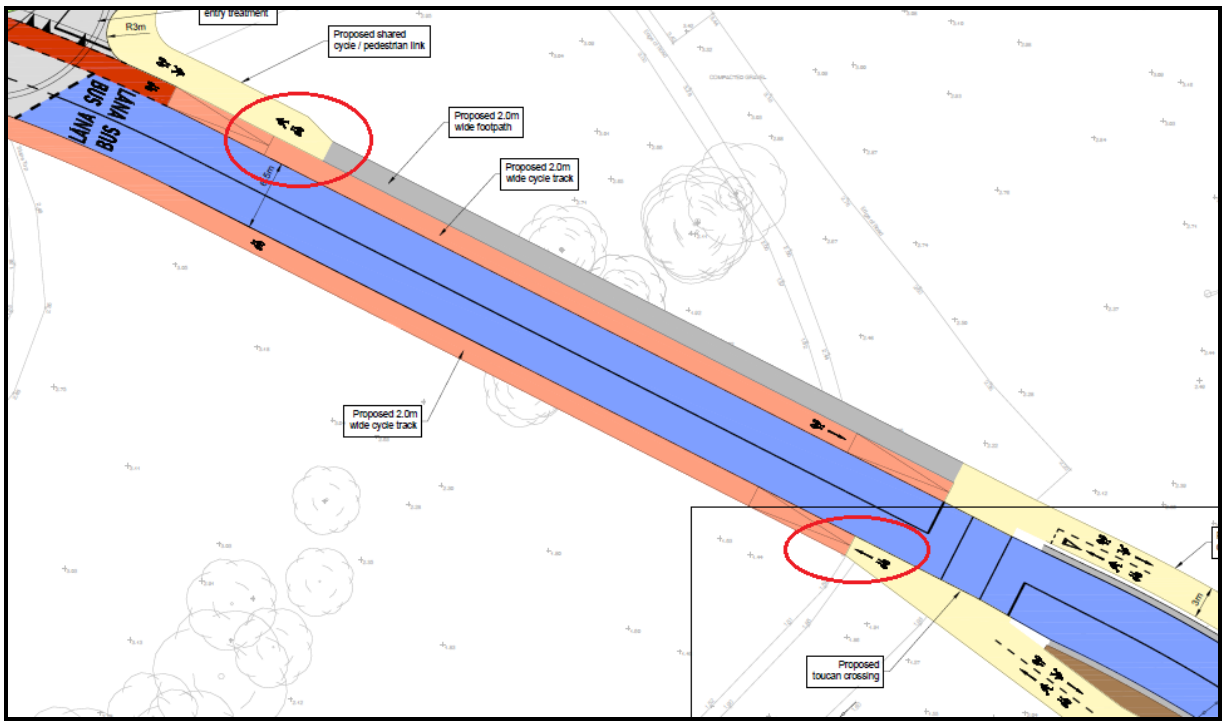


Figure 50: Shared Routes terminating suddenly

Recommendations

The continuity of the shared facilities shodul be considered in the context of kerb heights and potential trip hazards, and facilities should not terminate abruptly without suitable signing and lining guidance or provision for safe crossing facilities or transition kerbs. Consideration should also be given to the extension of the shared facilities and relocation of the roposed toucan crossing to a position further away from the proposed bridge.

2.3.3 Problem – Location of Proposed Toucan Crossing

The proposed toucan crossing is located on a downhill gradient after a crest curve which coincides with a horizontal curve, which may present reduced visibility towards the crossing in the northbound direction. A vertical visibility drawing has been provided, based on an SSD of 49m, which allows little or no margin of error for large vehicles, potentially travelling at speed and needing to break suddenly on a downhill gradient, including in wet and icy conditions, where there is no provision for the standard 50m anti-skid surfacing which is required in advance of a controlled crossing in an urban environment. There was no horizontal visibility drawing provided,

and the combination of horizontal and vertical curvature can lead to further reductions in forward visibility and SSD. It was noted that the location of the bridge abutment on the eastern side and the high bridge structure on the western side, which is highlighted in the cross section in figure 51, and on the plan in figure 52, will further restrict intervisibility at this location, and lead to an increased risk of failure to stop, and VRU/vehicular conflict at the crossing.

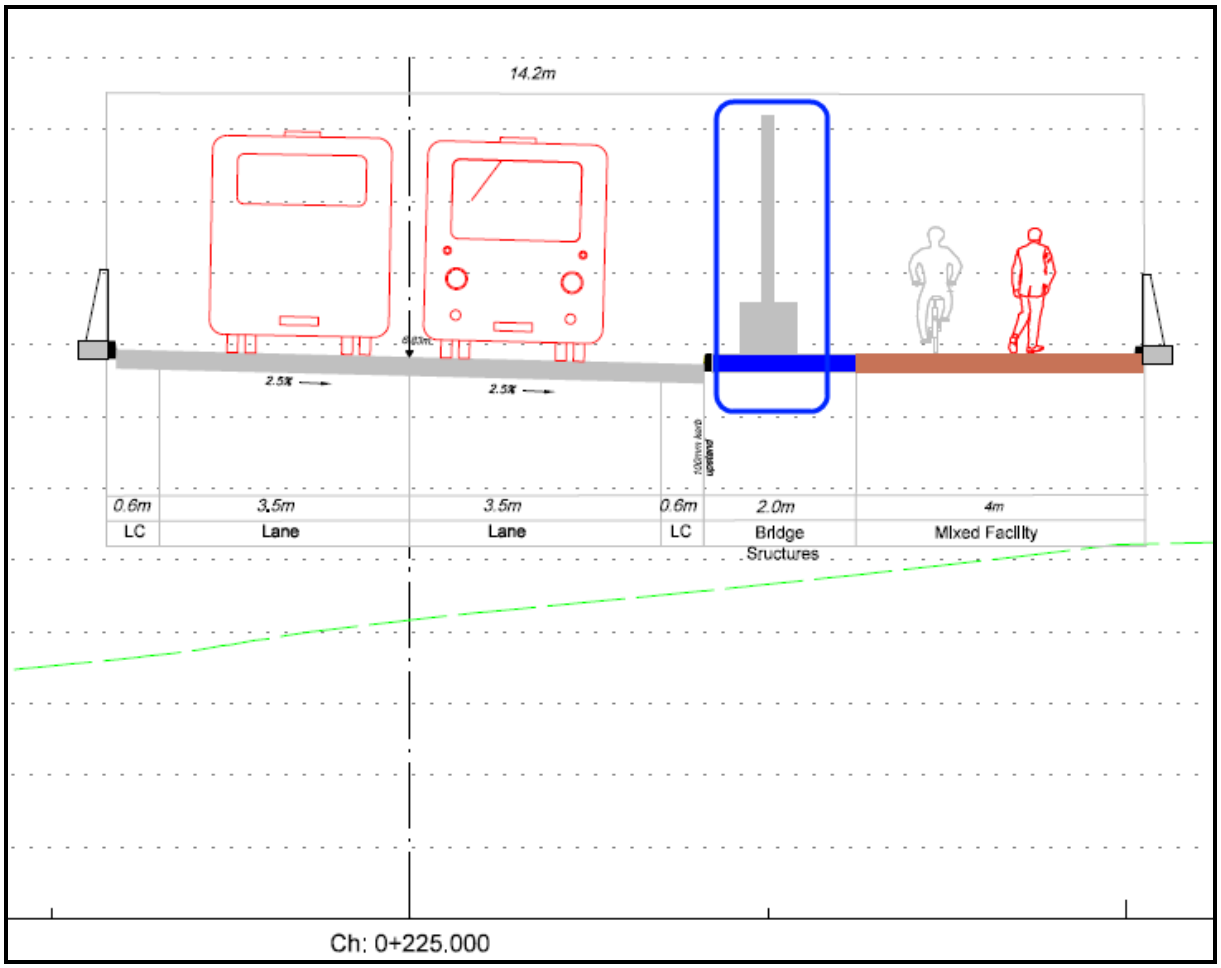


Figure 51: Bridge Structure Height and Location will compromise Intervisibility

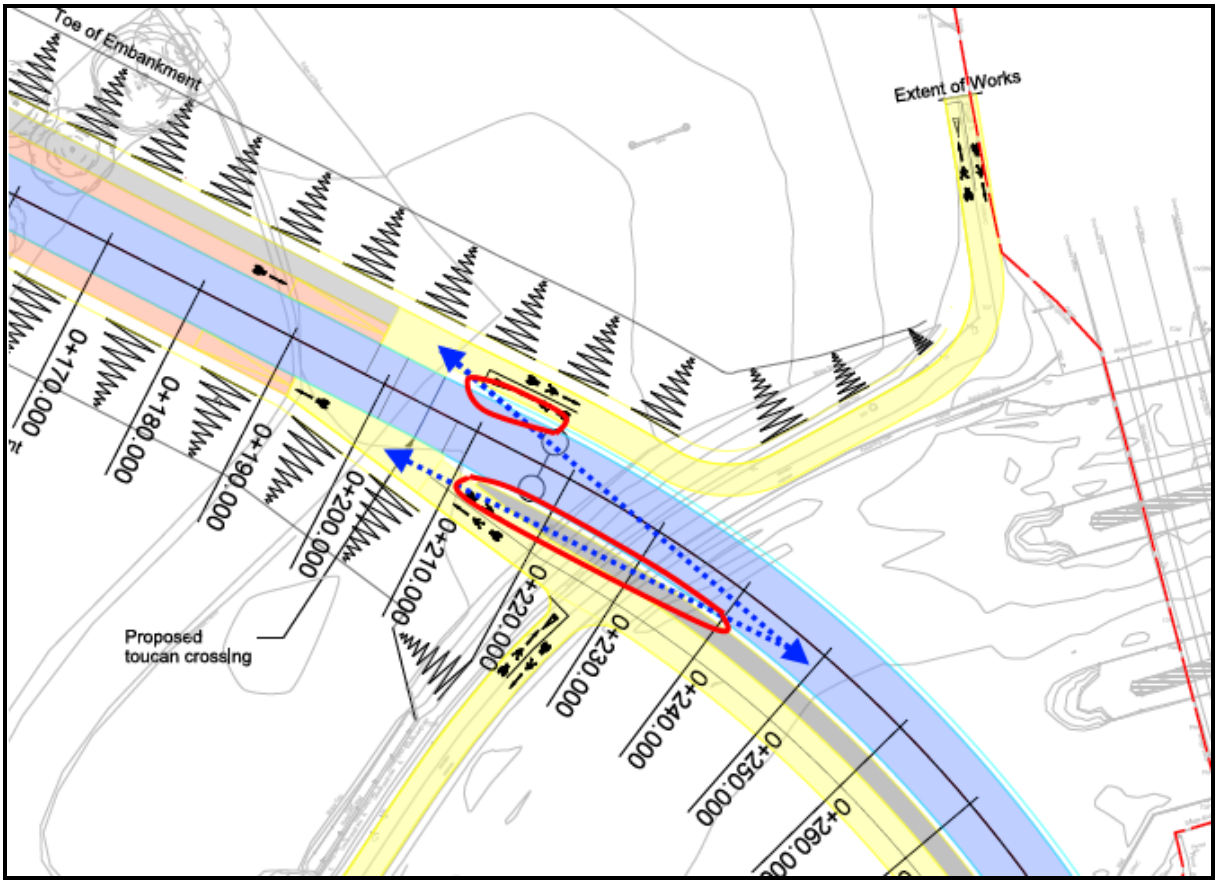


Figure 52: Potenital intervisibility obstuctions

Recommendations

Pedestrians and cyclists waiting to cross should be clearly visible from a point 2m back from the kerbline on both sides of the crossing, and both primary and secondary signal head aspects should also be clearly visible on apprahces. Obstructions to clear intervisibility between VRUs and motorists should be removed, or the toucan relocated to a position which is further away from the crest curve and the bridge structure. Provision should be made for anti skid surfacing for a minimum 50m distance back from the stop lines on approaches to the crossing, and the crossing should ideally be raised to assist with traffic calming and maintaining low speeds on the link.

2.3.4 Problem – Provision for Mobility and Sensory Impaired Road Users

There is no provision for tactile paving at the proposed toucan crossing or at a number of informal crossing points throughout the scheme, or for ladder and tramline tactile paving at potential conflict points with cyclists, with an example of a potential conflict point shown in

figure 53, where there is no direct connectivity along the pedestrian desire line, and pedestrians will need to cross across cycle path.

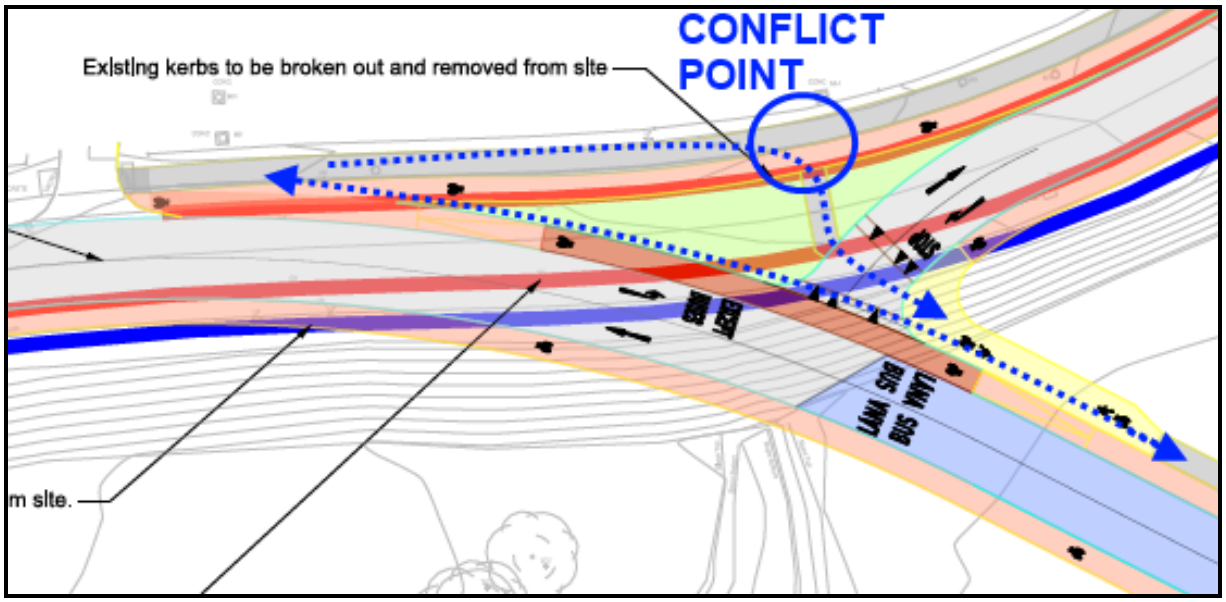


Figure 53: No Tactile at Conflict point between peds/cyclists or at junction

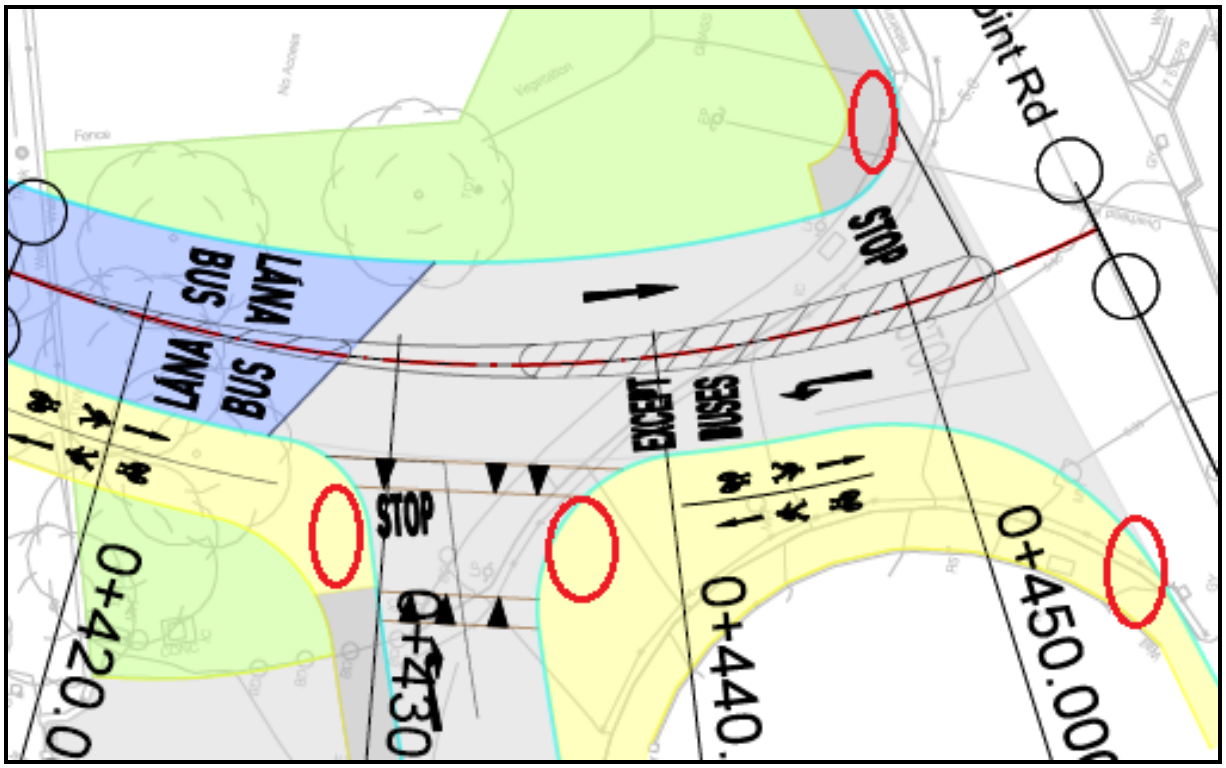


Figure 54: No provision for dropped kerbs and tactile paving at mouth of junctions

Recommendations

Suitable tactile paving should be provided at all controlled and uncontrolled crossings throughout the scheme in accordance with standard requirements, to be accompanied by a suitable width dropped kerb with a maximum kerb upstand of 6mm. Details of proposed tactile paving (ladder and tramline) and signage and road markings at conflict points between pedestrians and cyclists at crossings should also be provided at detailed design stage. The location of all proposed street furniture, including signage and signal head poles, should ensure safe unimpeded movement is maintained for VRUs. Chamber covers should also be located away from pedestrian desire lines where possible, with finished levels to be flush with the surrounding pavement.

2.4 ROAD SIGNS, MARKINGS AND LIGHTING

2.4.1 Problem – Lighting Generally

Lighting columns are provided on one side of the carriageway only along the length of the scheme. There may be a need for additional lighting on both sides of the toucan crossing to enhance the conspicuity of VRUs waiting to cross, during the hours of darkness. It was noted that existing lighting columns will be displaced at a number of locations, which should be included on the site clearance plans at detailed design stage.

Recommendations

Lighting proposals should be reviewed in the vicinity of the crossing, with additional lighting to be provided as necessary. A minimum clearance of 450mm should be provided from the edge of traffic lanes to all lighting columns and all street furniture, with lighting columns ideally located to the rear of footway to minimise obstruction of VRU movements, particularly the mobility impaired, and away from the desire lines for cyclists.

2.4.2 Problem – Lining and Signing Generally

There was no signing and lining schedule provided to accompany the preliminary design proposals. Suitable Road Markings and Signing will be required to provide guidance to all road

users and to minimise risks arising from the scheme proposals. The following summarises some of the issues to be considered in development of signing and lining proposals for the scheme:

- Suitable unambiguous speed limit signage and signage regarding the prohibition of access for all vehicles aside from buses/taxis will be required on entry to the link from each direction

- Clear signing and lining guidance will be required on the permissible direction of travel for cyclists, the extent of shared facilities, and the start and end of all facilities, as well as at locations where cyclists will be obliged to dismount to minimise the risk of conflict with pedestrians.

- Suitable warning should be provided in respect of all potential hazards ahead along the route, including warning signs for the minor roads and the toucan crossing, on approaches from each direction.

- Solid centrelines should be provided to discourage overtaking manoeuvres along the length of the scheme.

- Inconsistent stop line positioning was noted at the two junctions with ramps, one showing a stop line set back prior to the commencement of the ramp, the other showing the stopline on the ramp. A consistent and predictable layout should be provided for all junctions along the link, with stop line to be positioned such that VRU movement is not obstructed, whilst also maximising visibility to and from oncoming vehicles on the major road. Stop signs should be also be provided at a suitable safe locations at the minor roads at Junctions 1 and 2 to accompany the stop lines and road markings.

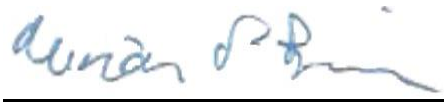
- Suitable closure/cul de sac signs should be provided on entry to the minor road at Junction 1 to ensure motorists are informed regarding the lack of through route, unless it is intended that the gate should be opened, and a through route provided in the future.

Recommendations

A signing and lining schedule should be produced at detailed design stage, taking into account all issues raised above as well as any other signing and lining issues. The schedule should include details of proposed sign sizes and line widths, along with suitable mounting heights for signs to minimise hazards to VRUs. The impact on all existing and proposed road markings and signage should also be clearly shown on detailed design drawings, with redundant signs and road markings to be removed. All new signage should be provided in a location clearly visible to motorists and at a location which does not obstruct VRU movement. The edge of all sign faces should be located at a minimum offset of 450mmfrom the carriageway edges. Visibility towards both primary and secondary signal heads should be clear and unobstructed at all times at the proposed toucan crossing, hence all final sign locations should take into account signal head location and clear forward visibility in accordance with traffic speeds, and under all traffic conditions. All signs and lines to have high reflectivity specification to enhance conspicuity during the hours of darkness

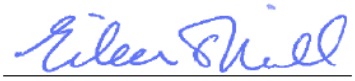
3. AUDIT TEAM STATEMENT

We certify that we have visited the site and examined the drawings and information supplied. This examination has been carried out with the sole purpose of identifying any features of the design that could be removed or modified to improve the safety of the scheme. The problems identified have been noted within the report, together with suggestions for improvements which are recommended to be studied for implementation. No one on the Audit Team has been otherwise involved with the design of the measures audited. This audit has been carried out in accordance with TII GE-STY-01024 December 2017.

Signed: 

Date: 4/9/20

MIRIAM O'BRIEN

Signed: 

Date: 4/9/20

EILEEN O'NEILL

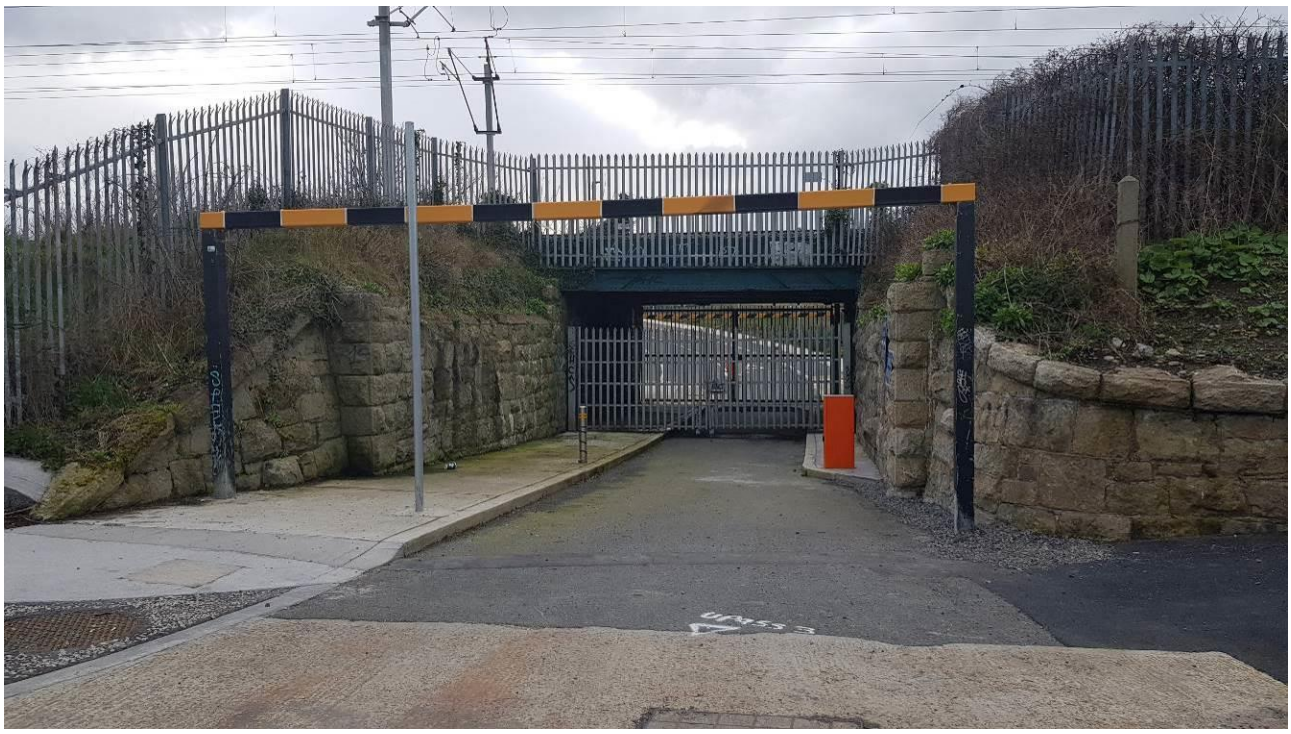
APPENDIX A – ROAD SAFETY AUDIT BRIEF CHECKLIST

Have the following been included in the audit brief?: (*if 'No', reasons should be given below)*

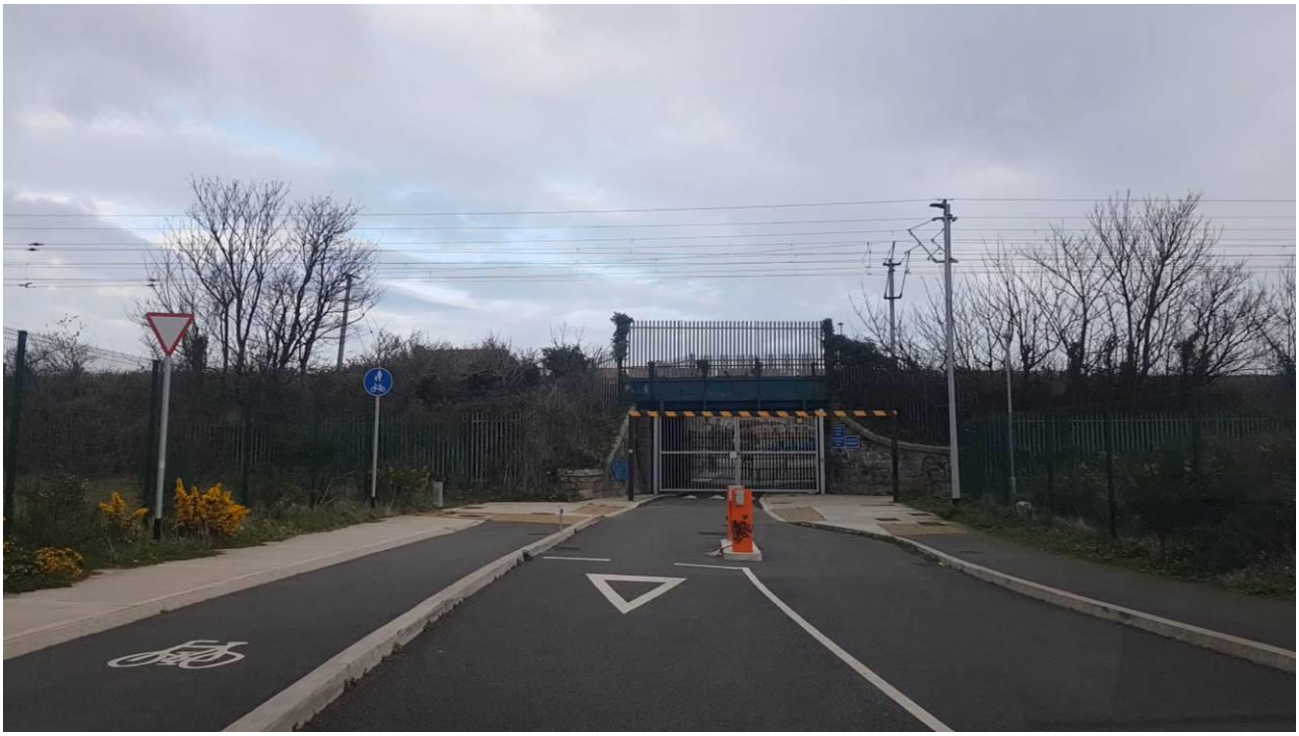
	Yes	No
1. The Design Brief	☑	☐
2. Departures from Standard	☐	☑
3. Scheme Drawings	☑	☐
4. Scheme Details (e.g. signs schedules, traffic signal staging)	☐	☑
5. Collision data for existing roads affected by scheme	☐	☑
6. Traffic surveys	☐	☑
7. Previous Road Safety Audit Reports and Designer Responses/Feedback Form	☐	☑
8. Previous Exception Reports	☐	☑
9. Start date for construction and expected opening date	☑	☐
10. Any elements to be excluded from audit	☐	☑
Any other information?	☐	☑

Re 1. The Designers (Arup) were commissioned by Wicklow County Council to develop a public transportation link over the River Dargle adjacent to the existing railway bridge. The brief requires the link road and bridge to be developed through to Part 8 Application. Once the application has been granted, detailed design will progress for the bridge only, with the road element of the link to be commissioned under a separate contract. A Stage 1 RSA is therefore considered most appropriate for this stage of the design process. Re 9: Estimated dates as follows - Start Construction: Q1 2022, Road Opening: Q1 2023

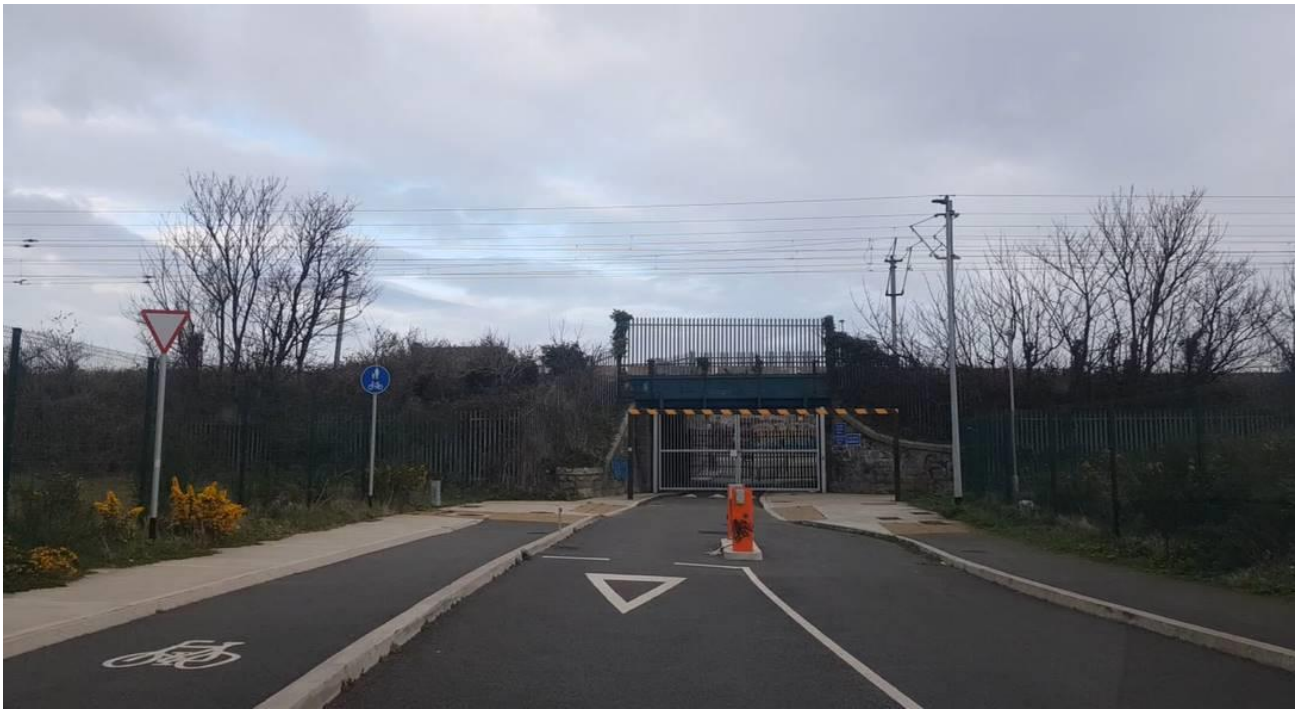
APPENDIX B – SITE PHOTOGRAPHS



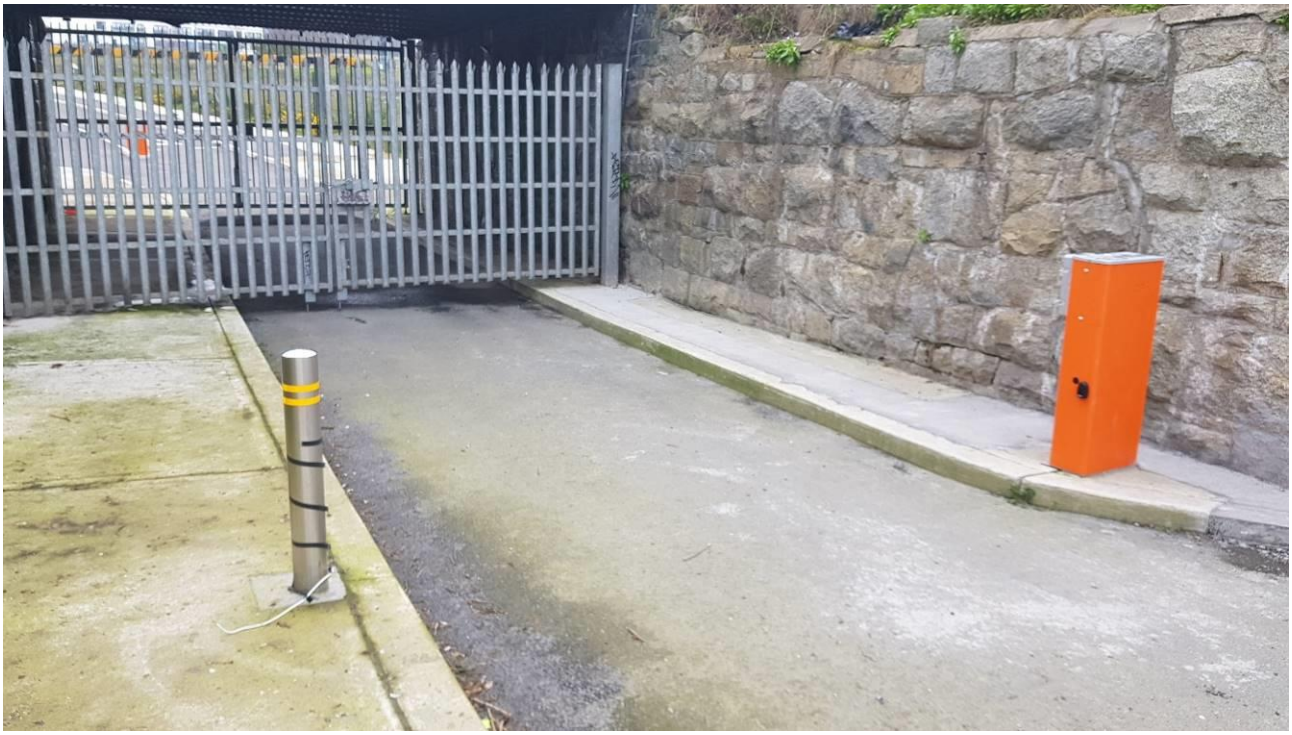

10'4"
3.15m
ENTRANCE




HARBOUR




NO DOG
FOULING



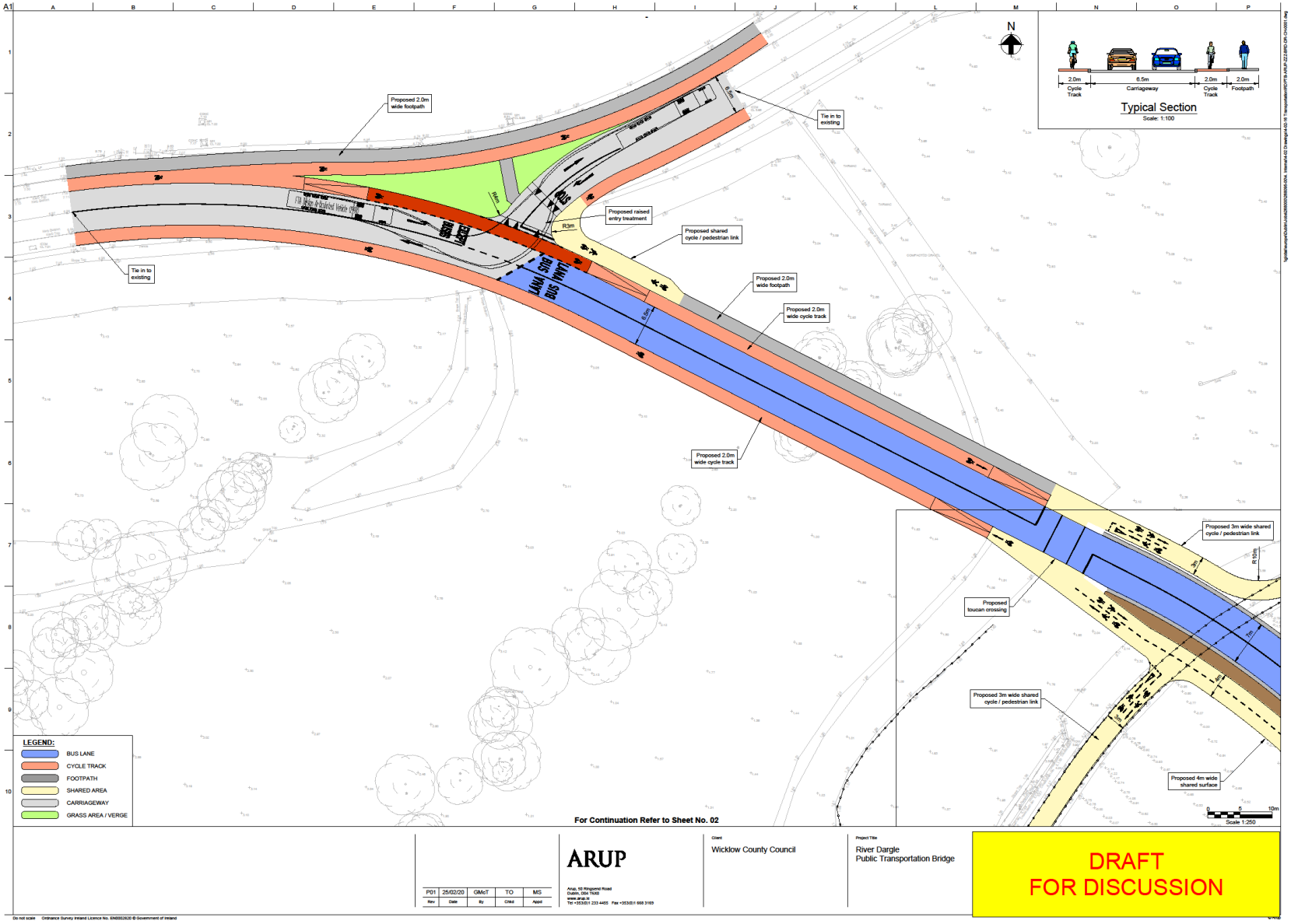

CITATION

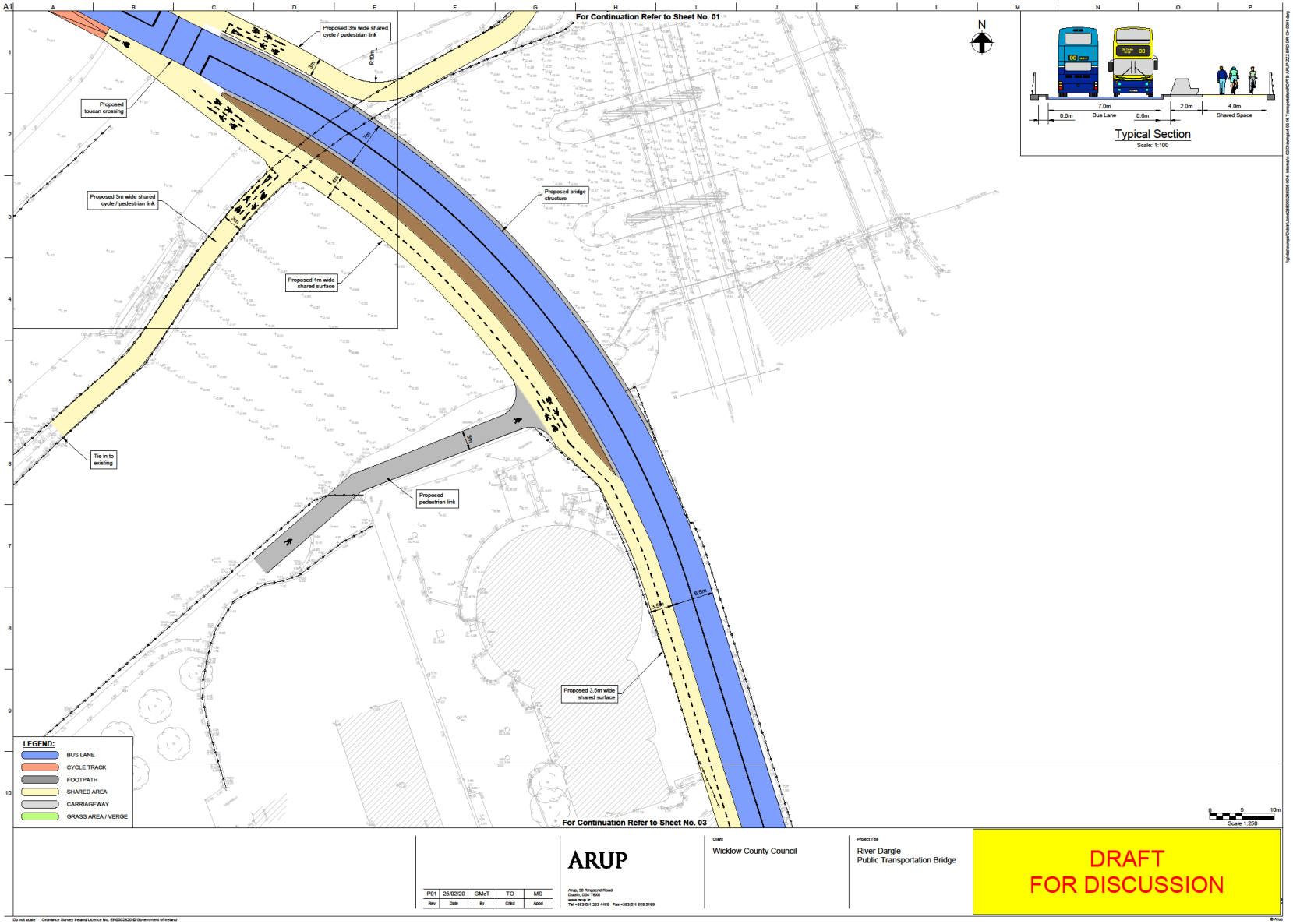

CYCLISTS
DISMOUNT

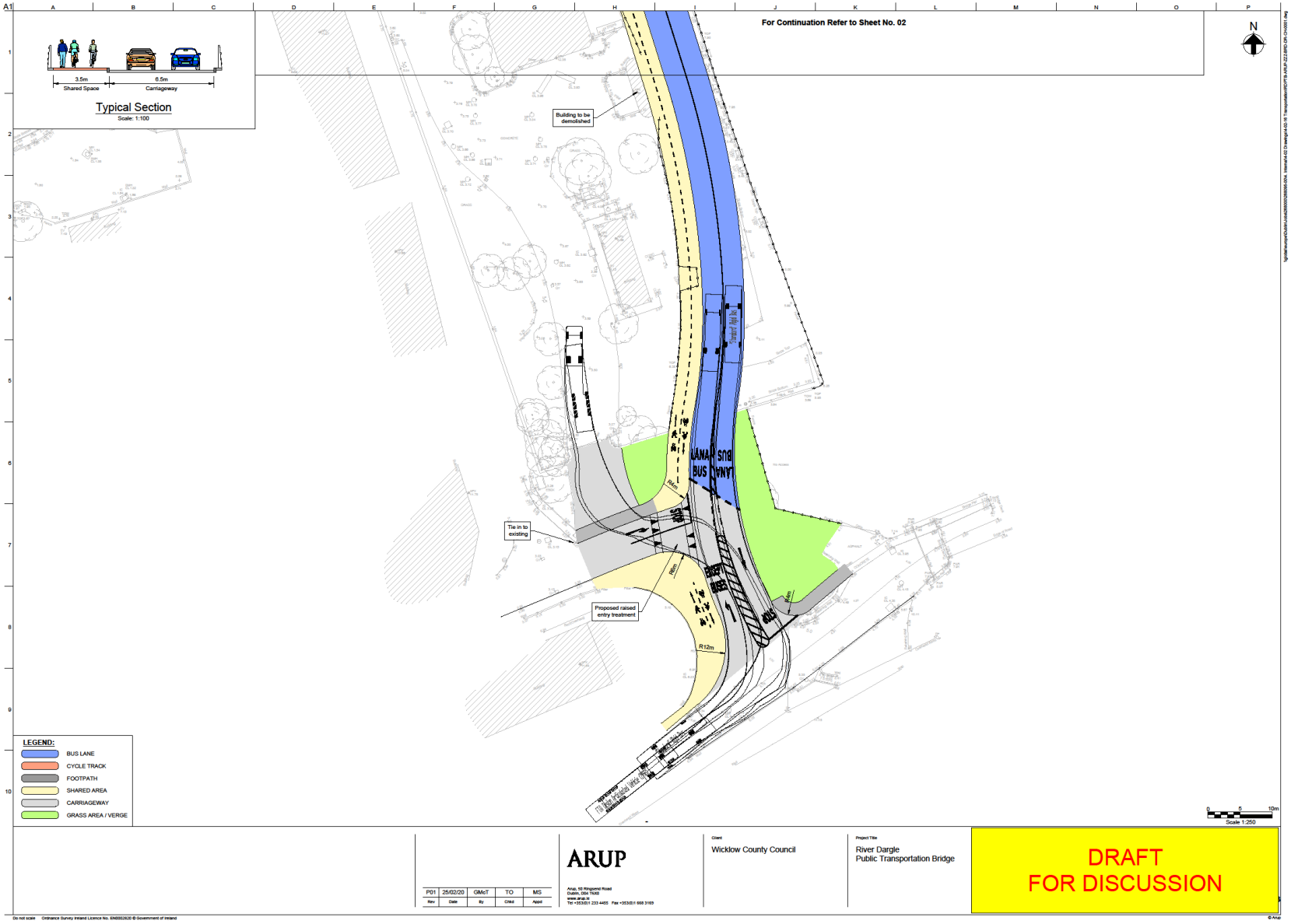
APPENDIX C – SCHEME DRAWING(S)

Road Safety Matters Ltd
Urlingford Rd, Johnstown
Kilkenny, Ireland E41 W721
Tel +353 (0)56 883 8428
mobrien@roadsafetymatters.net
www.roadsafetymatters.net

Company Registration No 657952 VAT No IE 3649269UH


Typical Section
Scale: 1:100
2.0m Cycle Track
6.5m Carriageway
2.0m Cycle Track
2.0m Footpath
Proposed 2.0m wide footpath
Tie in to existing
Proposed raised entry treatment
Proposed shared cycle / pedestrian link
Proposed 2.0m wide cycle track
Proposed 3m wide shared cycle / pedestrian link
Proposed toucan crossing
Proposed 4m wide shared surface
LEGEND:
BUS LANE
CYCLE TRACK
FOOTPATH
SHARED AREA
CARRIAGEWAY
GRASS AREA / VERGE
For Continuation Refer to Sheet No. 02
Scale 1:250
ARUP
Wicklow County Council
River Dargle
Public Transportation Bridge
DRAFT
FOR DISCUSSION


For Continuation Refer to Sheet No. 01
Proposed 3m wide shared cycle / pedestrian link
Proposed toucan crossing
Proposed 3m wide shared cycle / pedestrian link
Proposed 4m wide shared surface
Proposed bridge structure
Tie in to existing
Proposed pedestrian link
Proposed 3.5m wide shared surface
For Continuation Refer to Sheet No. 03
N
7.0m
0.6m
Bus Lane
0.6m
2.0m
4.0m
Shared Space
Typical Section
Scale: 1:100
LEGEND:
BUS LANE
CYCLE TRACK
FOOTPATH
SHARED AREA
CARRIAGEWAY
GRASS AREA / VERGE
Scale 1:250
ARUP
Wicklow County Council
River Dargle
Public Transportation Bridge
DRAFT
FOR DISCUSSION


For Continuation Refer to Sheet No. 02
N
3.5m
Shared Space
6.5m
Carriageway
Typical Section
Scale: 1:100
Building to be demolished
Tie in to existing
Proposed raised entry treatment
R12m
BUS LANE
LEGEND:
BUS LANE
CYCLE TRACK
FOOTPATH
SHARED AREA
CARRIAGEWAY
GRASS AREA / VERGE
Scale 1:250
ARUP
Wicklow County Council
River Dargle
Public Transportation Bridge
DRAFT
FOR DISCUSSION

Road Safety Audit Feedback Form

Scheme: Proposed River Dargle Bridge, Bray, Co Wicklow

Route No. N/A

Audit Stage: 1

Date Audit Completed: September 2020

Paragraph No. in Safety Audit Report	To be completed by Designer			To be completed by Audit Team Leader
	Problem accepted (Y/N)	Recommended measure accepted (Y/N)	Describe alternative measures. Give reason for not accepting recommendation.	Alternative measures or reasons accepted by auditor (Y/N)
2.1 General				
2.1.3	Y	Y	N/A	
2.1.4	Y	Y	N/A	
2.1.5	Y	Y	N/A	
2.1.6	Y	Y	N/A	
2.1.7	Y	Y	N/A	
2.2 Junction Layout and Alignment				
2.2.1	Y	Y	N/A	
2.2.2	Y	Y	N/A	
2.2.3	Y	Y	N/A	
2.2.4.1	Y	Y	N/A	
2.2.4.2	Y	Y	N/A	
2.2.4.3	Y	Y	N/A	
2.2.5	Y	Y	N/A	
2.2.6	Y	Y	N/A	
2.3 Non-Motorised User Provision				
2.3.1.1	Y	Y	N/A	
2.3.1.2	Y	Y	N/A	
2.3.1.3	Y	Y	N/A	
2.3.2.1	Y	Y	N/A	
2.3.2.2	Y	Y	N/A	
2.3.2.3	Y	Y	N/A	
2.3.2.4	Y	Y	N/A	
2.3.3	Y	Y	N/A	
2.3.4	Y	Y	N/A	
			N/A	

2.4 Road Signs, Markings and Lighting				
2.4.1	Y	Y	N/A	
2.4.2	Y	Y	N/A	

Signed: _____ **Designer** **Date** 12/08/2020

Signed: _____ **Audit Team Leader** **Date** 12/8/20

Signed: _____ **Employer** **Date** 1/09/2020.