

Contact us
+353 1 5242060
info@ors.ie
www.ors.ie

2024

Pre-Stage 1 Road Safety Audit
N11/M11 Bus Priority Interim Scheme

ENGINEERING A SUSTAINABLE FUTURE

Pre-Stage 1 Road Safety Audit
N11/M11 Bus Priority Interim Scheme

Document Control Sheet

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1. Introduction

This report documents the findings of a Pre-Stage 1 Road Safety Audit (RSA) carried out on the N11/M11 Bus Priority Interim Scheme prepared by Arup on behalf of Transport Infrastructure Ireland (TII) as the Approving Authority, Wicklow County Council (WCC) as lead Local Authority and Sponsoring Agency, Dún-Laoghaire Rathdown County Council (DLRCC) and the National Transport Authority (NTA). Kildare National Roads Office (KNRO) as Project Manager is responsible for the delivery of the scheme

The site visit was conducted on the 20th of October 2021 and the 16th of September 2022. The audit was carried out in the offices of ORS on the 22nd of October 2024 due to a series of revised design iterations.

The audit team comprised of the following people:

Audit Team Leader:
David McCormack: BEng (Hons), Dip Eng., CEng, MIEI

Audit Team Member:
Adam Price BEng (Hons), CEng, MIEI

During the site visits, the road conditions were wet on one occasion and dry on another. The traffic levels were noted to be consistent across the audit period.

The audit team reviewed the following drawings and documents provided by Arup.

(1) 265455-ARP-HGN-BIS-DR-CH-1100-1120 - Scheme Layout.
(2) 265455-ARP-HGN-BIS-DR-CH-1100 – P01 - Scheme Layout
(3) 265455-ARP-HGN-BIS-DR-CH-1101 – P01 - Scheme Layout
(4) 265455-ARP-HGN-BIS-DR-CH-1102 – P01 - Scheme Layout
(5) 265455-ARP-HGN-BIS-DR-CH-1103 – P01 - Scheme Layout
(6) 265455-ARP-HGN-BIS-DR-CH-1104 – P01 - Scheme Layout
(7) 265455-ARP-HGN-BIS-DR-CH-1105 – P01 - Scheme Layout
(8) 265455-ARP-HGN-BIS-DR-CH-1106 – P01 - Scheme Layout
(9) 265455-ARP-HGN-BIS-DR-CH-1107 – P01 - Scheme Layout
(10) 265455-ARP-HGN-BIS-DR-CH-1108 – P01 - Scheme Layout
(11) 265455-ARP-HGN-BIS-DR-CH-1109 – P01 - Scheme Layout
(12) 265455-ARP-HGN-BIS-DR-CH-1110 – P01 - Scheme Layout
(13) 265455-ARP-HGN-BIS-DR-CH-1111 – P01 - Scheme Layout
(14) 265455-ARP-HGN-BIS-DR-CH-1112 – P01 - Scheme Layout
(15) 265455-ARP-HGN-BIS-DR-CH-1113 – P01 - Scheme Layout
(16) 265455-ARP-HGN-BIS-DR-CH-1114 – P01 - Scheme Layout
(17) 265455-ARP-HGN-BIS-DR-CH-1115 – P01 - Scheme Layout
(18) 265455-ARP-HGN-BIS-DR-CH-1115 – P01 - Scheme Layout
(19) 265455-ARP-HGN-BIS-DR-CH-1117 – P01 - Scheme Layout
(20) 265455-ARP-HGN-BIS-DR-CH-1118 – P01 - Scheme Layout.

Documents/Information not supplied

- Speed Survey
- Traffic Count Data
- Departures from Standards

The terms of reference / procedure for the Audit were as per the relevant sections of the **Transport Infrastructure Ireland Road Safety Audit Standard GE-STY-01024**. The audit examined only those issues within the design relating to the road safety implications of the scheme and has therefore not examined or verified the compliance of the designs to any other criteria. The Road Safety Audit should not be treated as a design check.

The problems identified and described in this report are considered by the Audit Team to require action to improve the safety of the development and minimise accident occurrence.

All comments, references and recommendations in this safety audit are in respect of the review of information supplied by Arup on behalf of Wicklow County Council and Kildare Road Design Office (KRDO) as project managers appointed by Transport Infrastructure Ireland (TII), the Approving Authority.

2. Description of the Proposed Development

The proposal put forward by Arup on behalf of Wicklow County Council and Kildare Road Design Office (KRDO) as project managers appointed by Transport Infrastructure Ireland (TII), the Approving Authority aims to deliver bus priority measures along the N11/M11 by using a widened hard shoulder for bus running. As part of these works, it proposed to close a number of minor junctions and accesses along the route, including the R117 Enniskerry Road, Herbert Road and a number of commercial/residential accesses. Alternative linkages and segregated service roads are proposed to cater for changes in traffic movements. A significant upgrade of Junction 7 (Bray South) is also proposed, which includes the provision of improved grade separation and new merge and diverge layouts. On the all-purpose N11, new active travel facilities are proposed.

The section is approximately 11.6km in length from Loughlinstown roundabout to the north to Junction 9 (Glenview) south. The section traverses two Local Authority boundaries, Wicklow County Council (WCC) and Dún Laoghaire-Rathdown Local Authority.

This report is part of Phase 2 (Option Selection) as per TII Project Managements Guidelines. As the proposed scheme will follow the existing route the Road Safety Audit will be conducted as a Pre-Stage 1 audit as per instruction from TII.

The proposed scheme objectives as per the TII Project Appraisal Guidelines (PAG) and Department of Transport, Tourism and Sport (DTTaS) Common Appraisal Framework include the following criteria:

- Economy, including, increased capacity and a practical interim transport solution
- Safety, including a clearly delineated bus priority measures without impacting on safety of all road users
- Environment; including a more sustainable transport solution
- Accessibility and social inclusion, including increased bus patronage and access to all transport users
- Integration; including integration of other modes of transport such as Active Travel measures.

The proposal includes the widening of the existing dual carriageway and motorway to accommodate a Hard Shoulder Bus Priority Measure (HSBPM) on both the north and southbound carriageway, closure of private / direct accesses and intermediate junctions, through Junction Running of the hard shoulder bus priority measures proposed at major junctions and retaining structures parallel to the carriageway. The speed limit varies along N11/M11 from 100kph within Sub-Scheme B and Sub-Scheme C on dual carriageway sections to 120kph within Sub-Scheme A on motorway sections.

The Project Safety Objectives as per the Pre-Stage 1 Brief outlines the following objectives:

- Deliver bus priority measures which are clearly delineated and understood by general road users and bus drivers in the environment of an inter-urban route.
- Ensure bus priority can be delivered without impacting on the safety of all road users

- To enhance the operational safety of the N11/M11 corridor.

Please refer to **Figure 2.1** below for the location of the proposed scheme

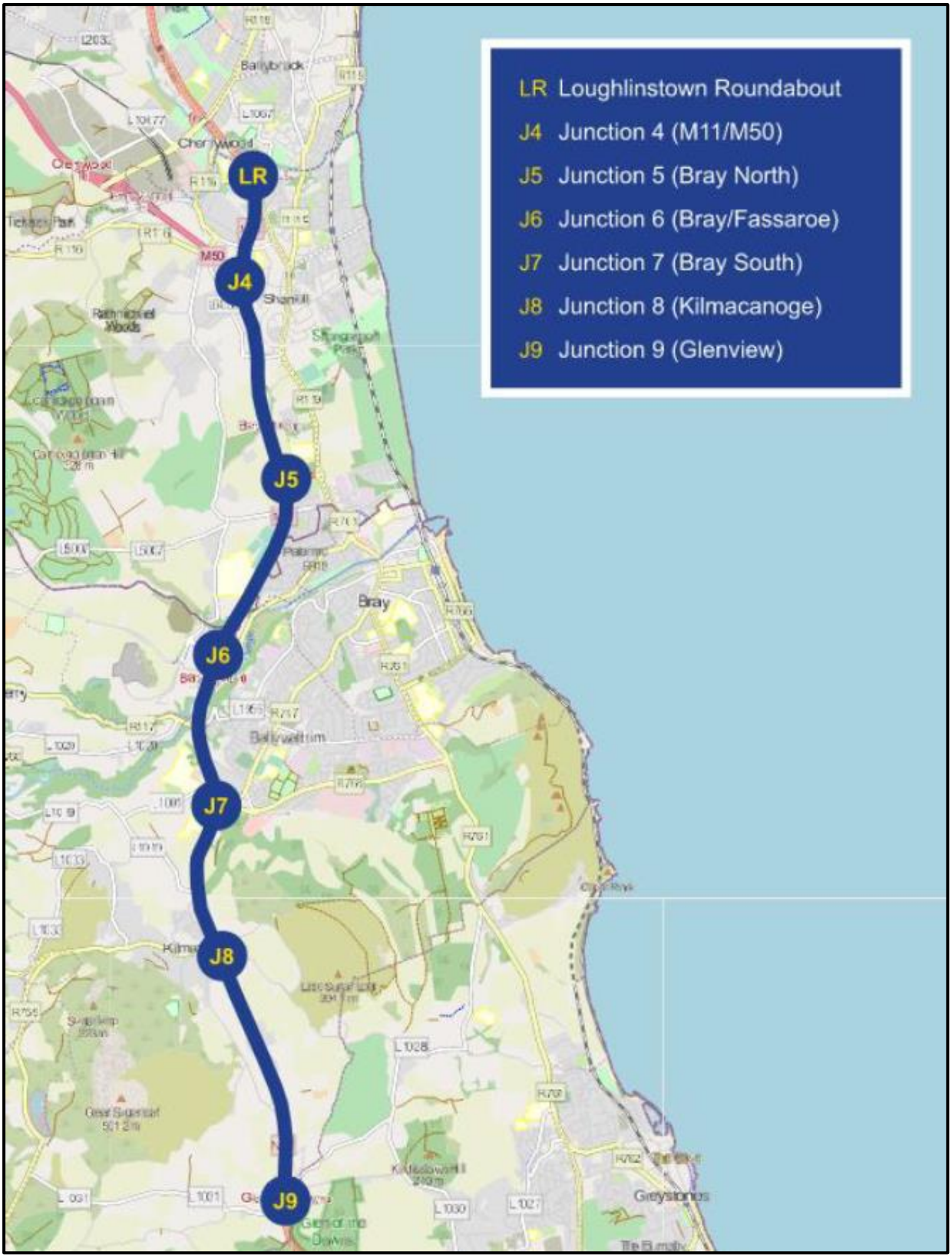


Figure 2.1 – Location Plan (Source: ARUP)

3. Problems Raised from the Road Safety Audit

The following are problems and recommendations to address the safety issues associated with the proposal. The recommendations are proposed to the designer of the scheme to reduce any safety risks associated with it.

3.1 General Comments and Observations

Due to the limited level of design detail available at this stage of design, the following items have not been included as part of this safety audit report:

- Signage and road markings
- Drainage
- Lighting
- Road cross section and lane width dimensions
- Secondary effects on surrounding road network.

3.2 General Problems Identified on the Scheme

Problem No.01: Proposed Vehicle Restraint Systems
Details of the proposed vehicle restraint systems at the new retaining wall sections, underpasses and bridge piers/abutments in close proximity to the widened carriageway edge, has not been specified. Information of the existing system is not available. Selection and implementation of inappropriate vehicle restraint systems can result in a lack of vehicle containment leading to subsequent collisions including loss-of-control type collisions and deflection into opposing traffic. The choice of specific vehicle restraint systems also influences the required spatial extent of such systems, including for example, approach lengths in advance of an identified hazard and also terminal lengths.

Recommendation:
The design team should ensure that details of any proposed vehicle restraint systems are detailed along sections where the clear zone has been reduced and where new structures are proposed within clear zones.

Problem No.02 Bus and Vehicle Merge/Diverge Flows at Intersections and Junctions
The frequency of existing junctions and accesses vary throughout the scheme. Vehicles are required to perform merge/diverge manoeuvres onto the Hard Shoulder Bus Priority Measure (HSBPM) to enter and exit intersections and junctions. The proposed HSBPM is therefore fragmented and requires increased navigation at intersection approaches which may cause confusion for all road users. The number of vehicle merge/diverge interactions increase the risk of vehicle-bus collisions resulting in injury to occupants.

Recommendation:
The design team should ensure that additional details on merge/diverge sections are provided that will ensure safe integration with other road users.

Problem No. 03: Existing Vulnerable Road Users (VRUs) Provision

Due to the limited level of design detail available at this stage of design, it is unclear how pedestrians and cyclists' access will be facilitated, particularly at existing bus stops. The lack of, or inappropriate/inadequate provision of facilities for VRUs will result in an increased risk of conflict between VRUs and vehicular traffic, which in turn increases the risk of a collisions and risk of injury.

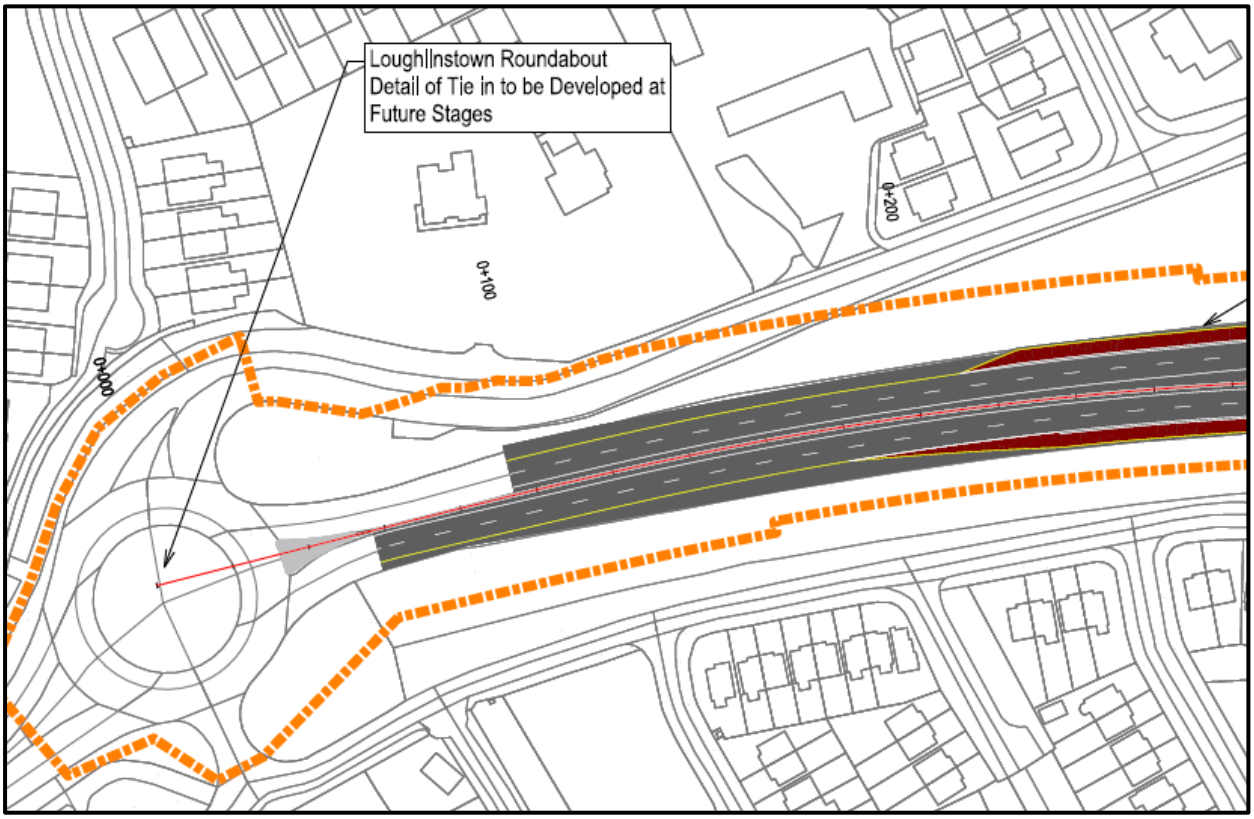
Recommendation:

The design team should ensure that measures are provided to facilitate vulnerable users along the scheme and in particular at existing bus stops.

3.3 Potential Problems Identified in Sub-Scheme Sections

3.3.1 Sub-Scheme A

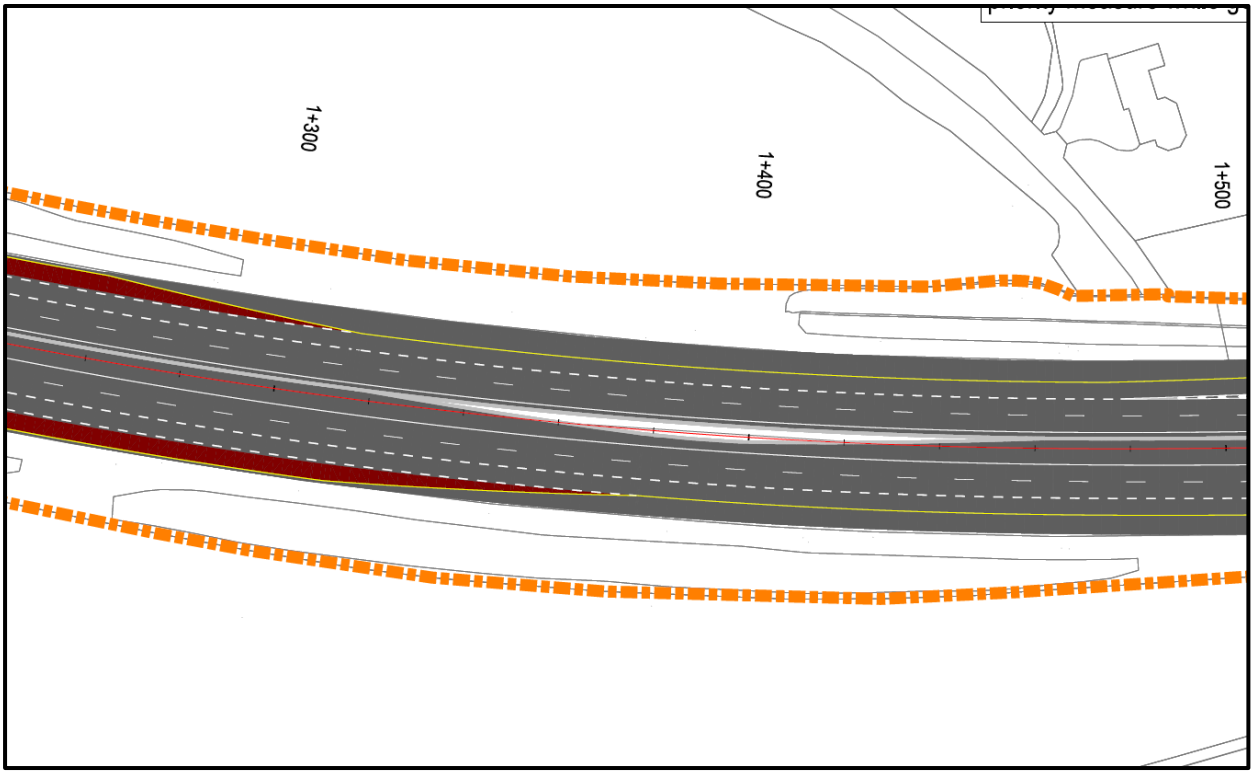
Problem No.4: Tie-in with Existing Loughlinstown Roundabout.
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1101
No horizontal or vertical alignment details of the HSBPM have been provided to the audit team of the proposed tie-in to the existing Loughlinstown Roundabout. Inappropriate horizontal and/or vertical alignment and inadequate egress/forward visibility splays can lead to a wide range of collision types.



Recommendation:
The design team should ensure that appropriate tie-in details are provided for at this location.

Problem No.5: Hard Shoulder Bus Priority Measure Merge at Intersection Approach
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1105

The HSBPM is proposed to merge with the auxiliary lane in advance of the intersection which will result in buses merging from the hard shoulder lane and vehicles diverging from the main carriageway lanes within a short merge window which increases the potential for conflicts.

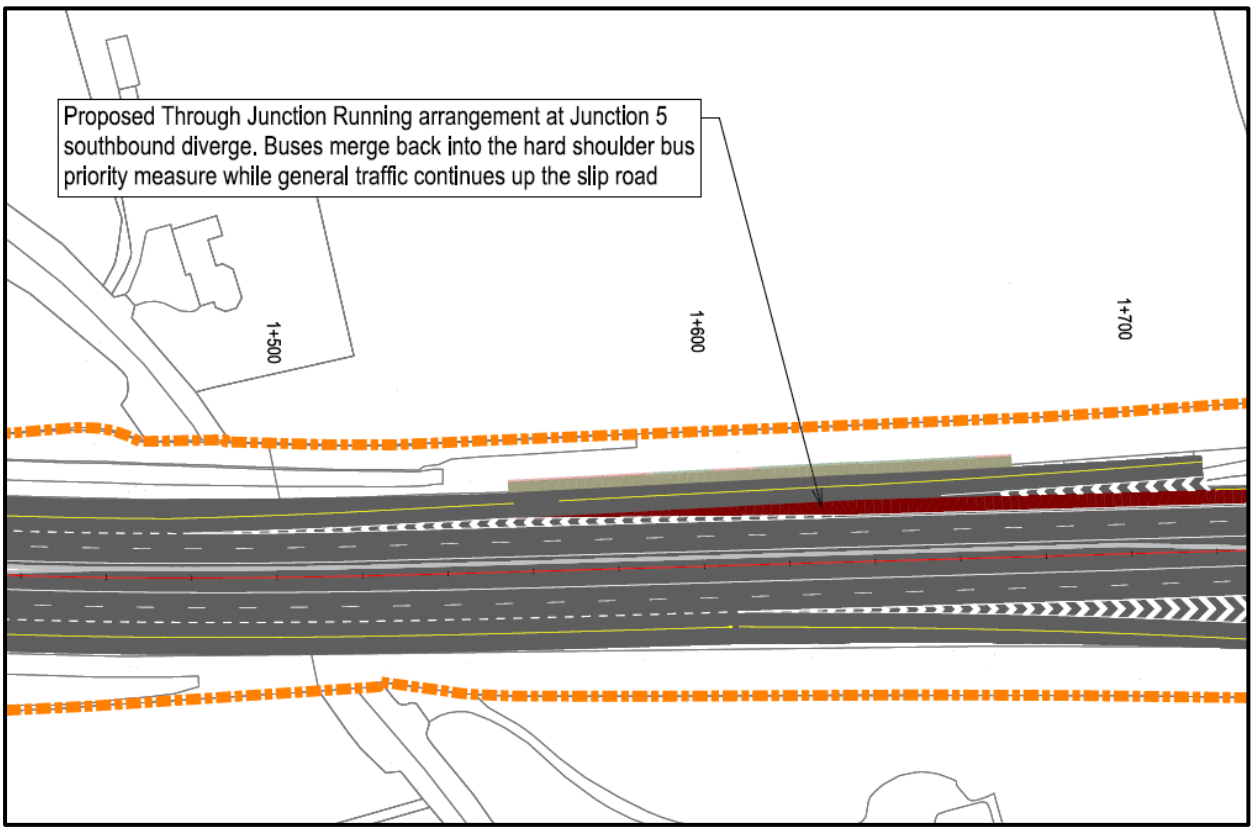


Recommendation:

The design team should ensure that buses merge into the auxiliary lane sooner to reduce the safety risk and ensure that adequate advanced warning is provided for motorists to alert them of the oncoming hazard.

Problem No.6: Knowledge of Through Running Arrangement at Intersection
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1105

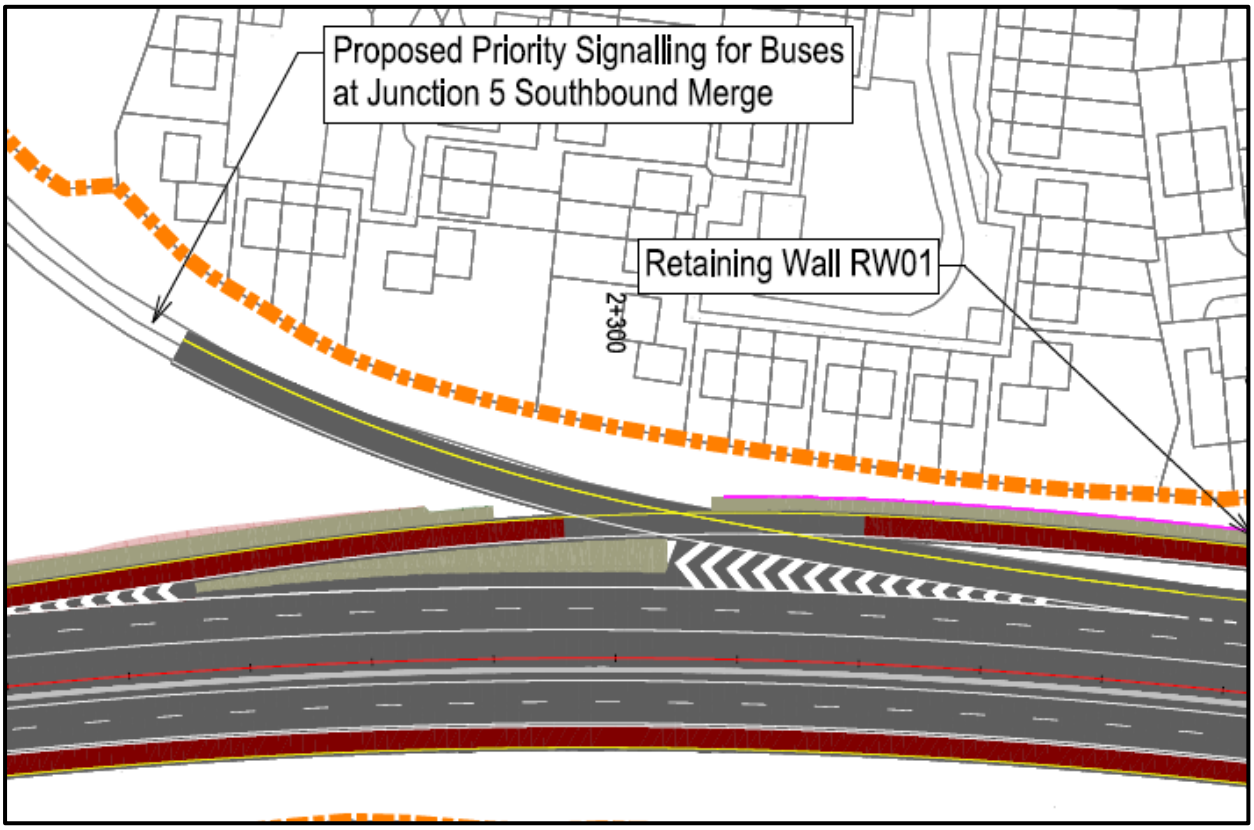
The audit team is concerned that the new through running lane will create confusion for buses who wish to continue past the junction as buses will have to use the intersection exit lane before continuing straight through the intersection. This will create confusion among bus drivers who would not be familiar with this layout and could result in buses merging into main carriageway traffic to continue past the intersection which could result in erratic manoeuvres which could result in potential collisions with vehicles on the main carriageway.



Recommendation:

The design team should ensure that measures are provided to instruct buses to stay in lane to continue through the intersection.

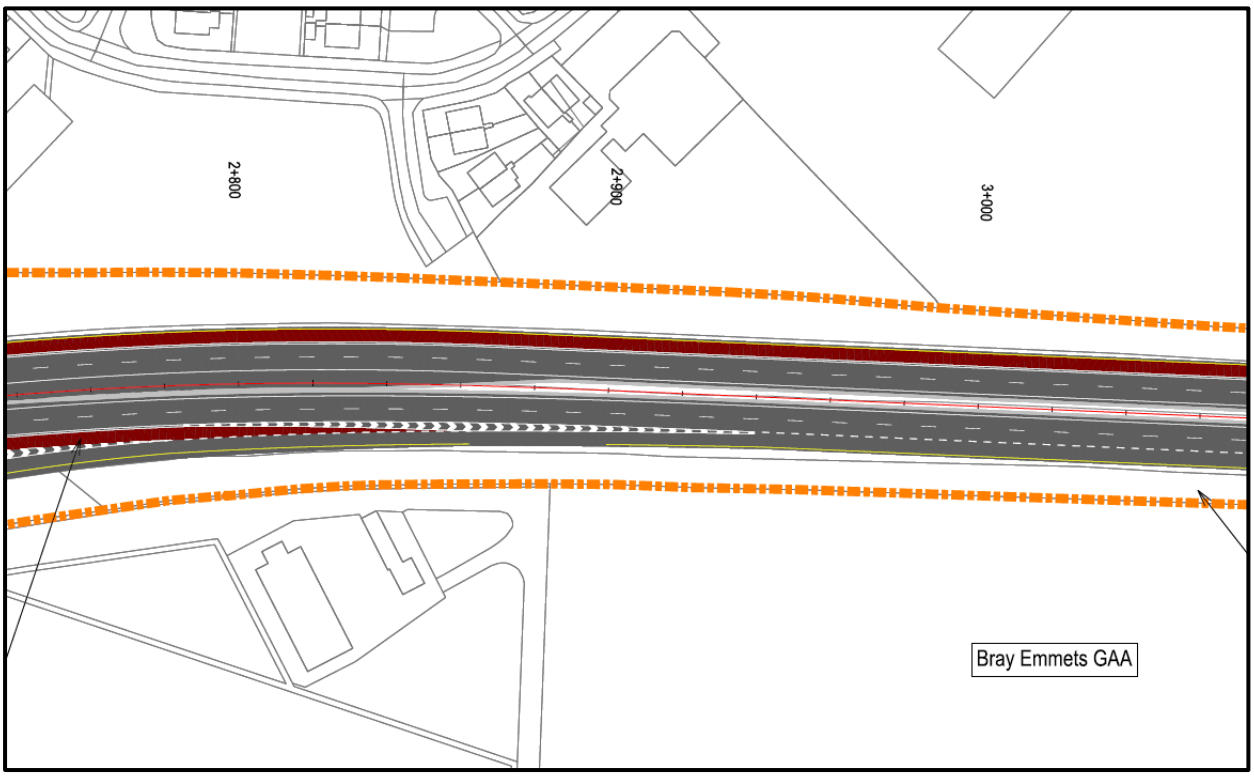
Problem No.7: Control Arrangements on the Intersection
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1106
The audit team note that it is intended to provide traffic signals to control traffic merging from the southbound merge. However, there are no details provided of the controls for the through running bus lane. The audit team is unsure of how traffic will be managed at the conflict point and as such would have safety concerns in relation to the proposed arrangement.



Recommendation:
The design team should ensure that control measures are provided at the crossing point for the through lane and southbound merge lane at the intersection.

Problem No.8: Knowledge of Through Running Arrangement at Intersection
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1107

The audit team is concerned that the new through running lane will create confusion for buses who wish to continue past the junction as buses will have to use the intersection exit lane before continuing straight through the intersection. This will create confusion among bus drivers who would not be familiar with this layout and could result in buses merging into main carriageway traffic to continue past the intersection which could result in erratic manoeuvres which could result in potential collisions with vehicles on the main carriageway.

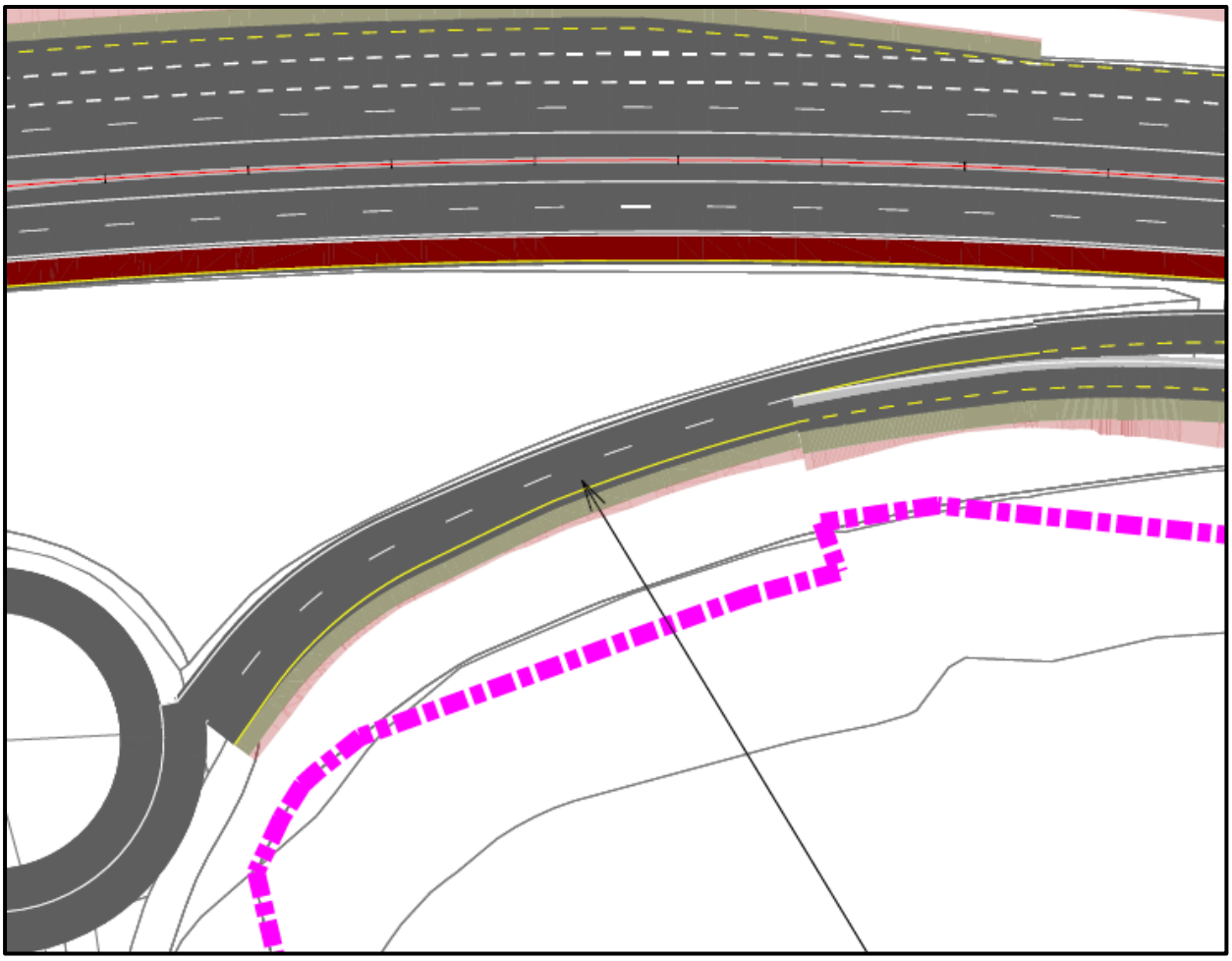


Recommendation:

The design team should ensure that measures are provided to instruct buses to stay in lane to continue through the intersection.

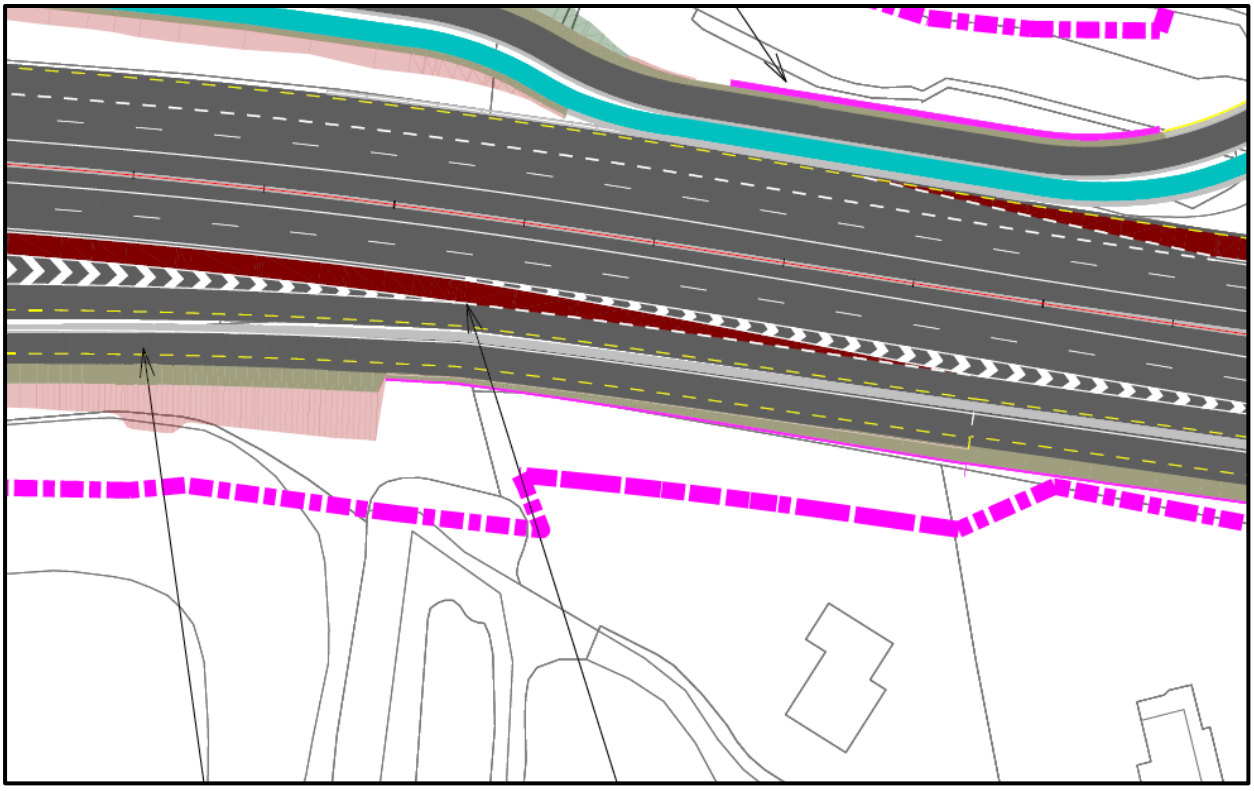
3.3.2 Sub-Scheme B

Problem No.9: Length of Northbound Diverge
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1109
The audit team is concerned that the length of the proposed diverge as a result of the proposed central island could result in vehicles being left with minimal time and space to change lanes in advance of the roundabout. The audit team is concerned that this will lead to erratic or last-minute lane changes which could increase the likelihood of potential conflicts.



Recommendation:
The design team should reduce the central island length to increase the distance vehicles have to merge into the appropriate lanes in advance of the roundabout.

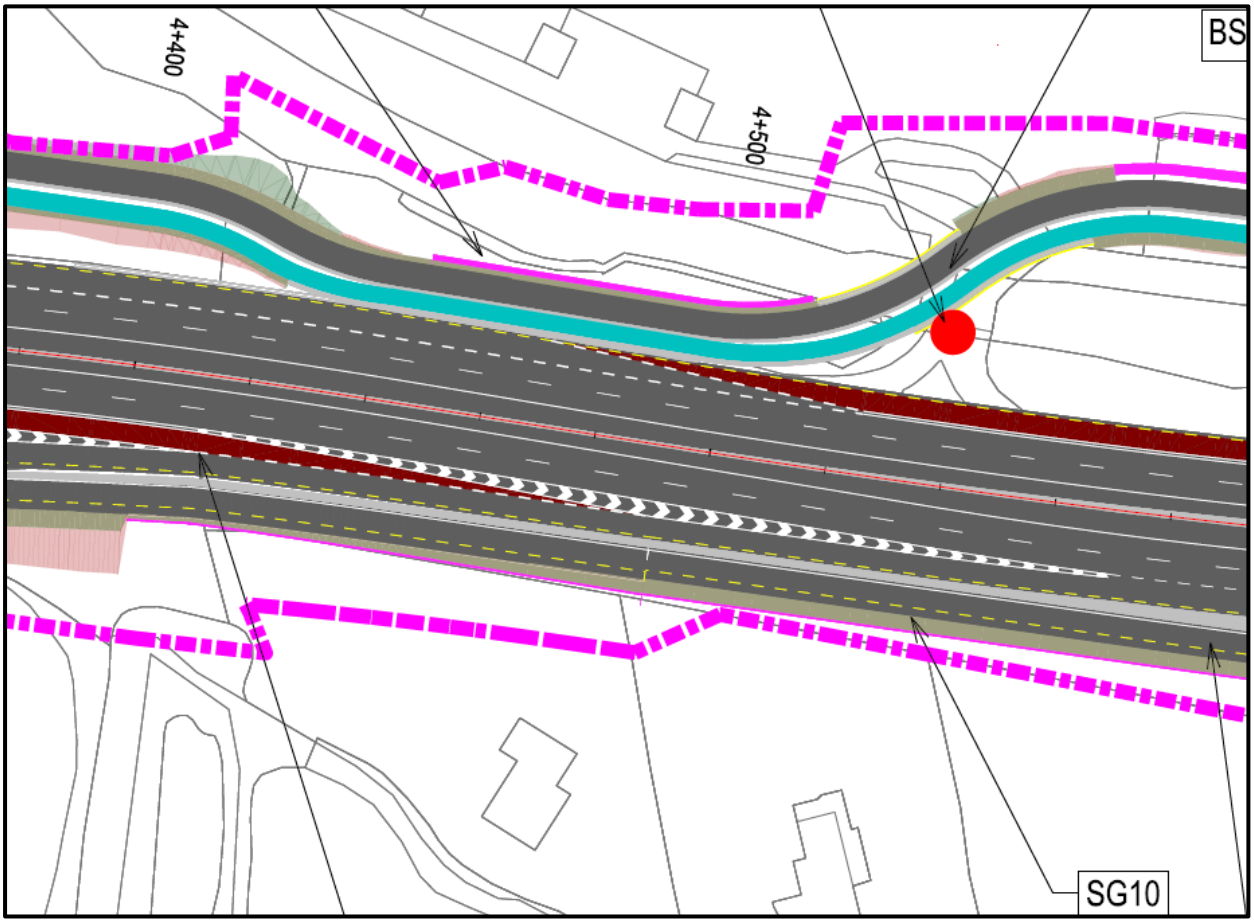
Problem No.10: Visibility of Central Island
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1109 & 1110
The audit team note that the central island proposed could be difficult for motorists to see particularly in low light conditions and times of heavy rainfall. This could result in potential vehicles strikes with the central island.



Recommendation:
The design team should ensure that measures such as bollards are provided on the island to ensure it is clearly visible for motorists.

Problem No.11: Knowledge of Through Running Arrangement at Intersection
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1109

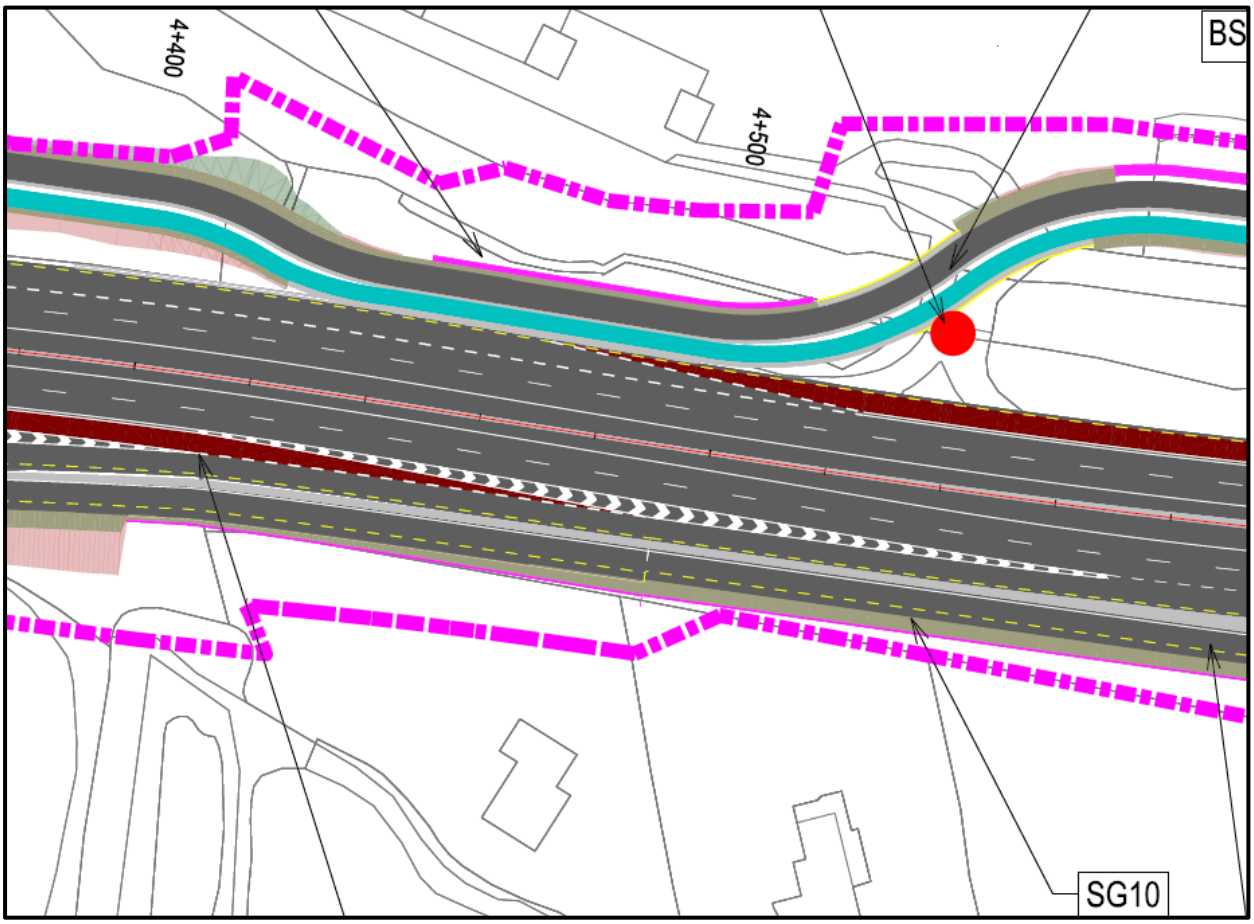
The audit team is concerned that the new through running lane will create confusion for buses who wish to continue past the junction as buses will have to use the intersection exit lane before continuing straight through the intersection. This will create confusion among bus drivers who would not be familiar with this layout and could result in buses merging into main carriageway traffic to continue past the intersection which could result in erratic manoeuvres which could result in potential collisions with vehicles on the main carriageway.



Recommendation:

The design team should ensure that measures are provided to instruct buses to stay in lane to continue through the intersection.

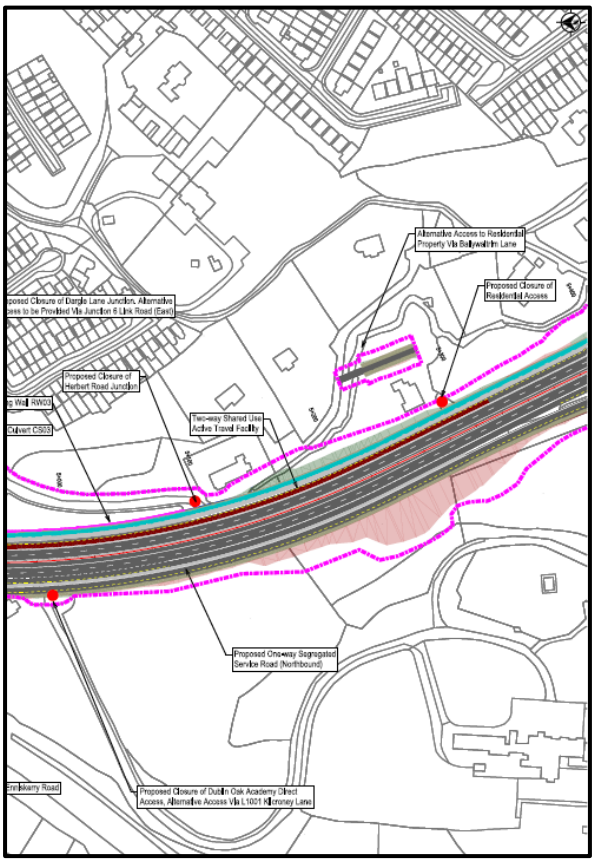
Problem No.12: Active Travel Separation Measures
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1109
The audit team is concerned that the new active travel measures appear to run up close to the main carriageway hard shoulder with no details provided of the separation measures to be proposed. The audit team is concerned that vulnerable users will potentially be exposed to fast moving traffic on the main carriageway which increases the safety risk considerably for vulnerable users.

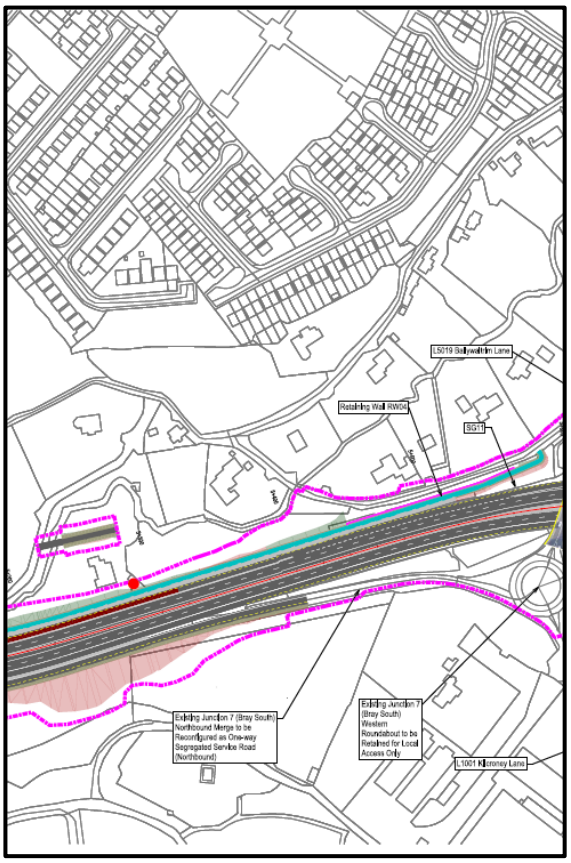


Recommendation:
The design team should ensure that appropriate safety measures are put in place to ensure that vulnerable users will not be at risk of vehicle strikes or strikes from deflecting barriers in the event of a collision. The audit team should also look at the possibility of pushing the active travel measure further from the carriageway to mitigate the risk.

Problem No.13: Active Travel Separation Measures
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1110 & 1111

The audit team is concerned that the new active travel measures appear to run up close to the main carriageway hard shoulder with no details provided of the separation measures to be proposed. The audit team is concerned that vulnerable users will potentially be exposed to fast moving traffic on the main carriageway which increases the safety risk considerably for vulnerable users.



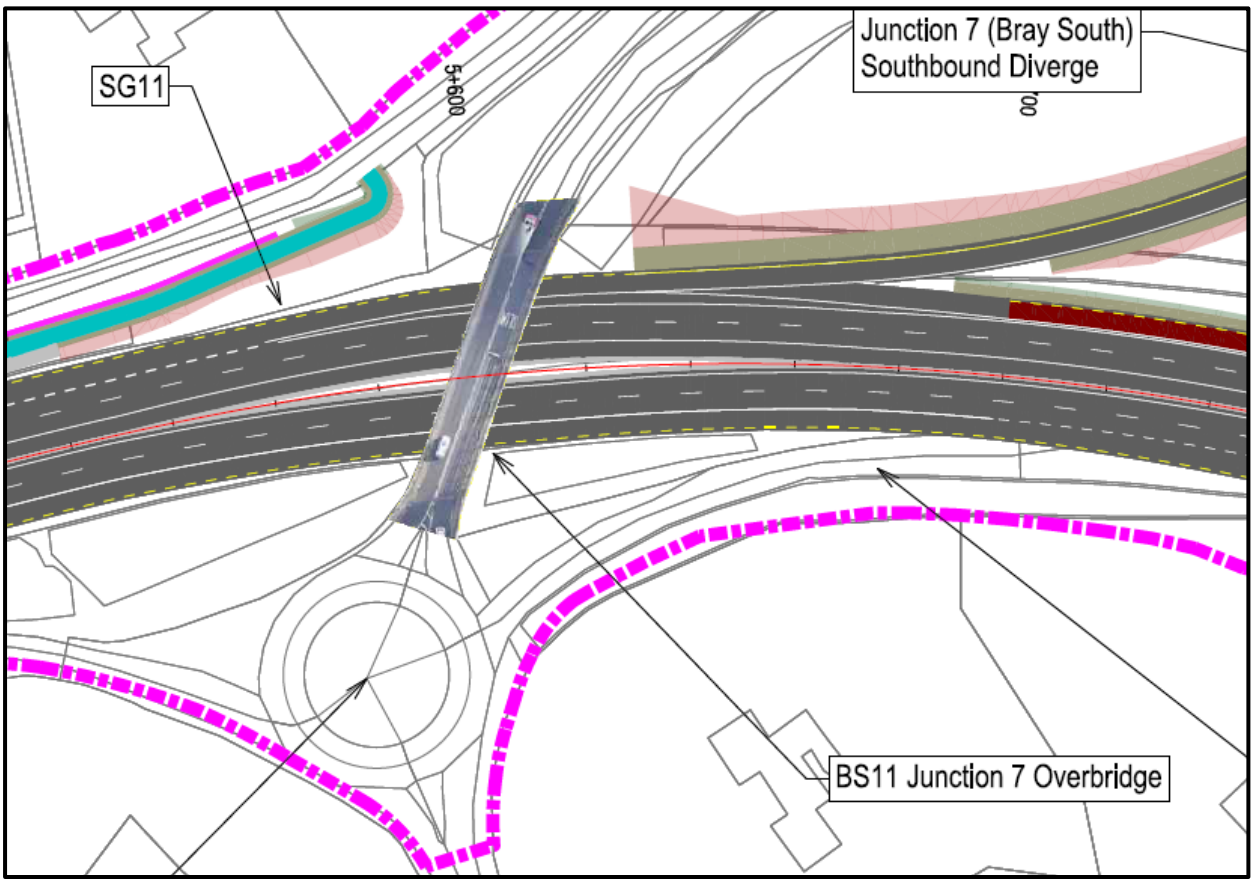


Recommendation:

The design team should ensure that appropriate safety measures are put in place to ensure that vulnerable users will not be at risk of vehicle strikes or strikes from deflecting barriers in the event of a collision. The audit team should also look at the possibility of pushing the active travel measure further from the carriageway to mitigate the risk.

Problem No.14: Knowledge of Through Running Arrangement at Intersection
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1111

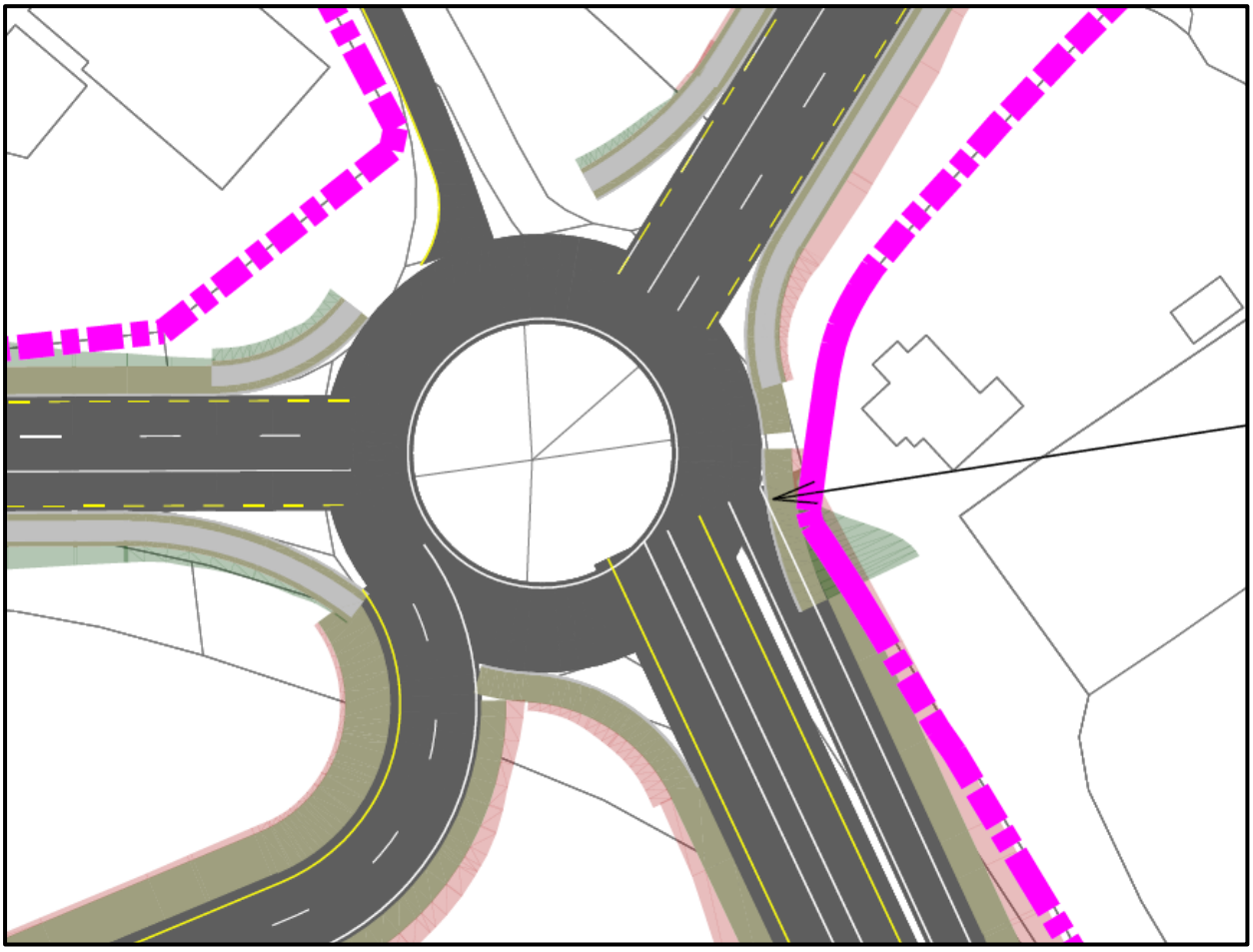
The audit team is concerned that the new through running lane will create confusion for buses who wish to continue past the junction as buses will have to use the intersection exit lane before continuing straight through the intersection. This will create confusion among bus drivers who would not be familiar with this layout and could result in buses merging into main carriageway traffic to continue past the intersection which could result in erratic manoeuvres which could result in potential collisions with vehicles on the main carriageway.



Recommendation:

The design team should ensure that measures are provided to instruct buses to stay in lane to continue through the intersection.

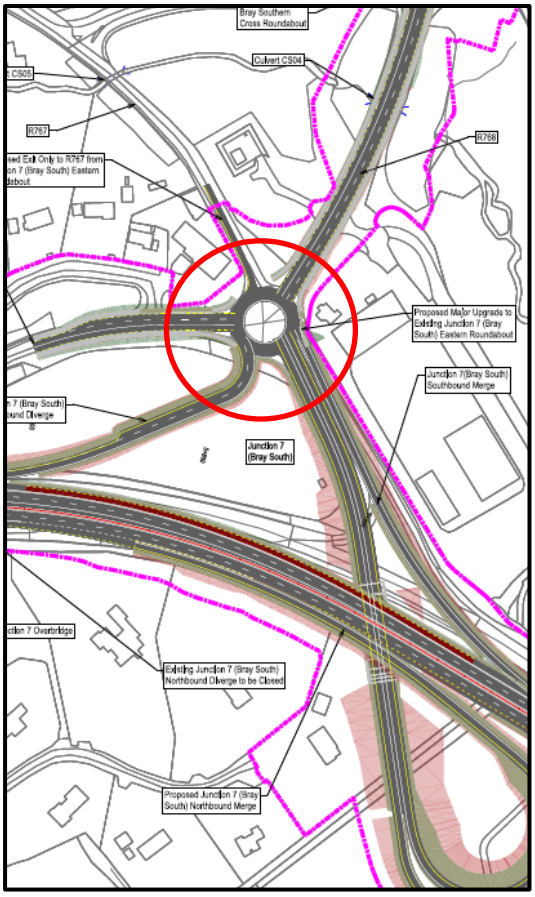
Problem No.15: Geometry of Roundabout
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1111
The audit team note that the proposed geometry of the roundabout does not appear to be appropriately designed. The audit team is concerned the approach slip lane is entering the roundabout at an unusual angle which could give the impression that vehicles entering from the southbound slip lane have priority into the roundabout which could result in potential conflicts. The audit team also note that the design of the roundabout including carriageways and vulnerable user provisions is unfinished and as such the audit team cannot fully comment of the safety implications of the proposed arrangement.

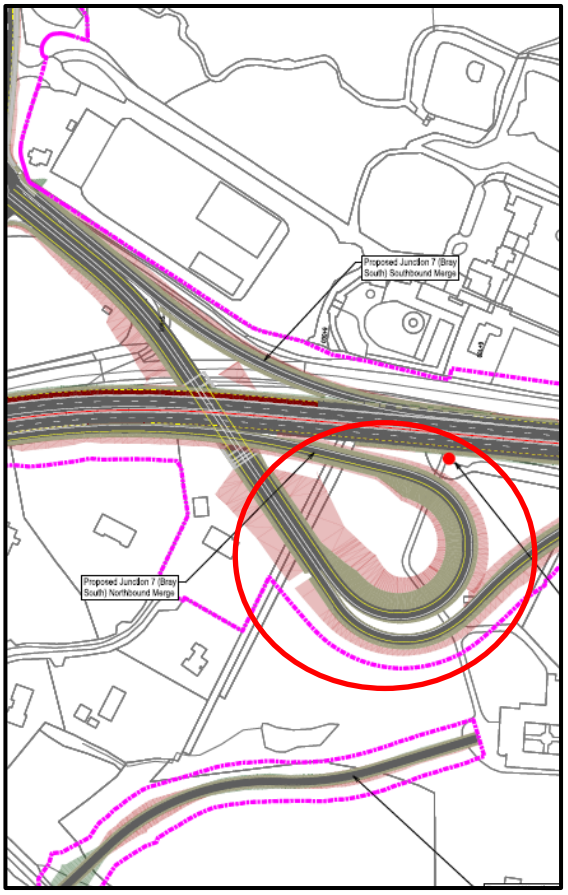


Recommendation:
The design team should ensure that the proposed intersection is appropriately detailed in advance of the Stage 1 RSA.

Problem No.16: Design Speed of Roundabout & Merge/Diverge Lanes (Loop's)
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1111 & 1112

The audit team note that the proposed geometry of the roundabout and approaching merge and diverge loop lanes appear tight, and the audit team is concerned that approach speeds to the above could result in potential loss of control due to high-speed approaches.

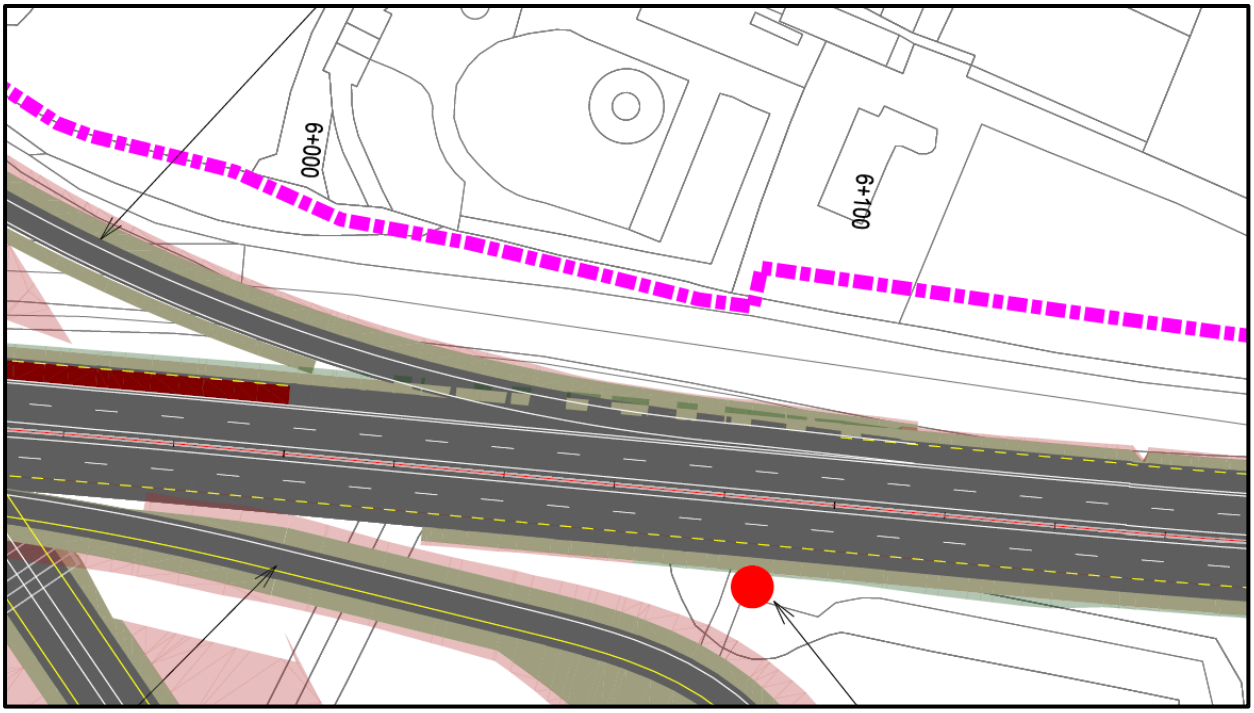




Recommendation:

The design team should ensure that an appropriate design speed is proposed for the identified locations and that appropriate speed control measures are proposed to reduce vehicle speeds on approach.

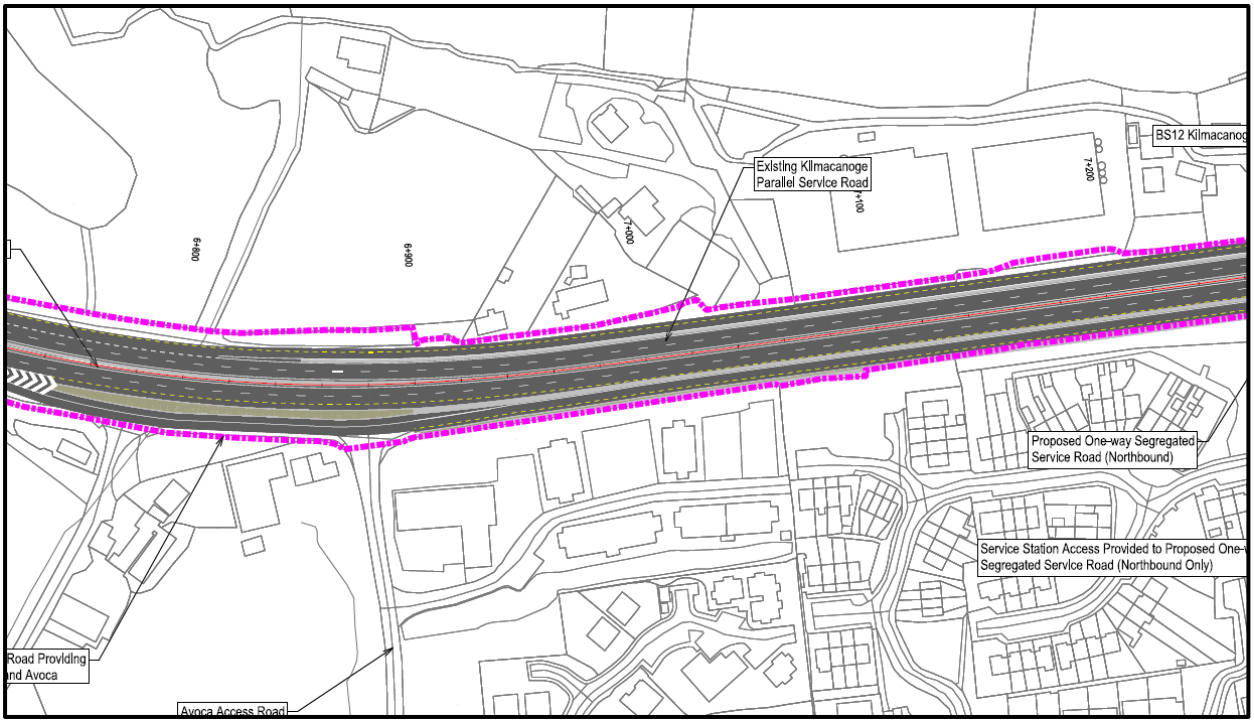
Problem No.17: Priority at Junction 7 Southbound Merge
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1112
The audit team note that there is no detail on priority at the identified merge. The audit team is concerned that the proposed arrangement will lead to conflicts between merging traffic and through running vehicles on the main carriageway.



Recommendation:
The design team should indicate who has priority at the merge point and to provide traffic control measures if required.

Problem No.18: Visibility of Island Between Auxiliary Lane & Main Carriageway
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1113 & 1114

The audit team note that the central island proposed could be difficult for motorists to see particularly in low light conditions and times of heavy rainfall. This could result in potential vehicles strikes with the central island.

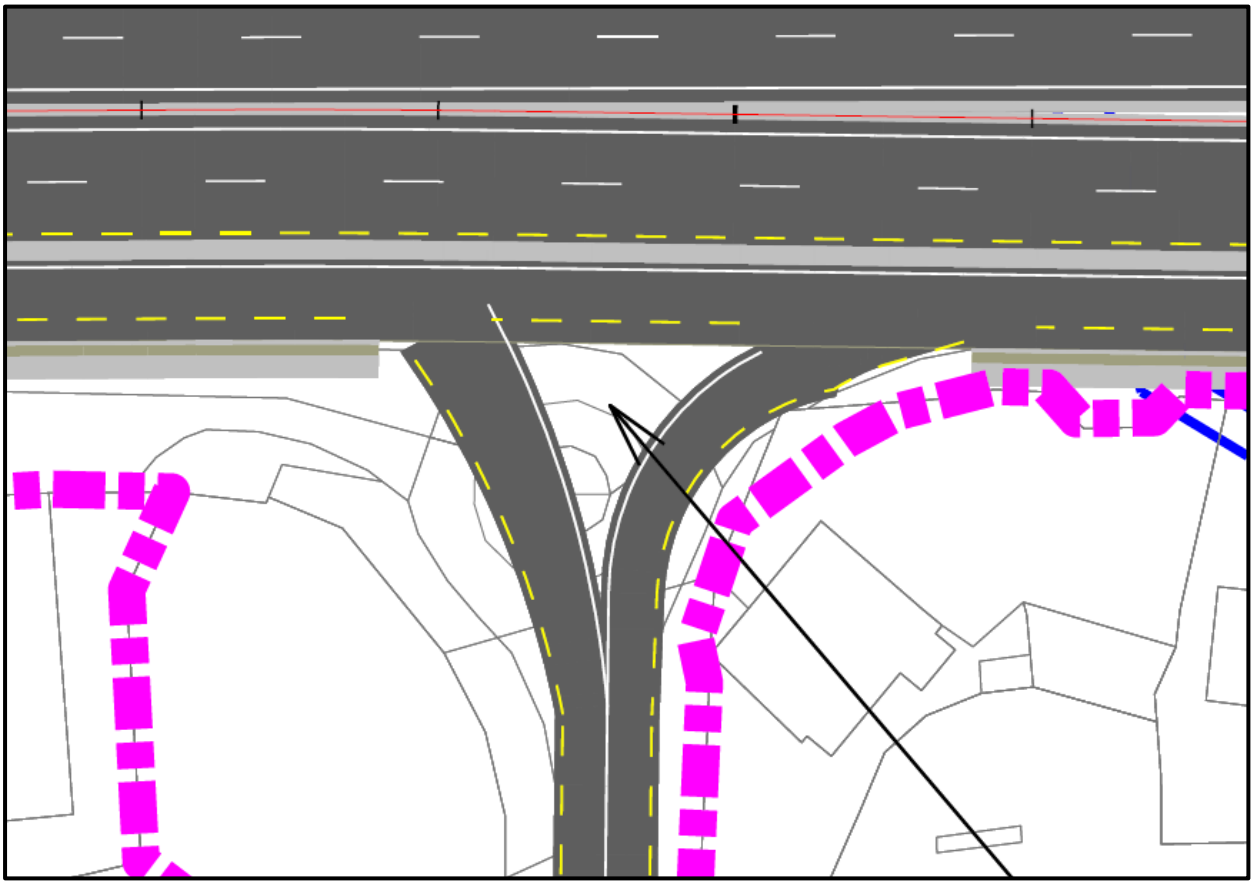


Recommendation:

The design team should ensure that measures such as bollards are provided on the island to ensure it is clearly visible for motorists.

Problem No.19: Speed on Approach to the Identified Junction
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1114

The audit team note that the new layout to the identified junction will encourage higher speeds on approach from the N11 in particular due to the curved nature of the entry lane. The increase in vehicular speeds could result in an increased likelihood of vehicle conflicts.

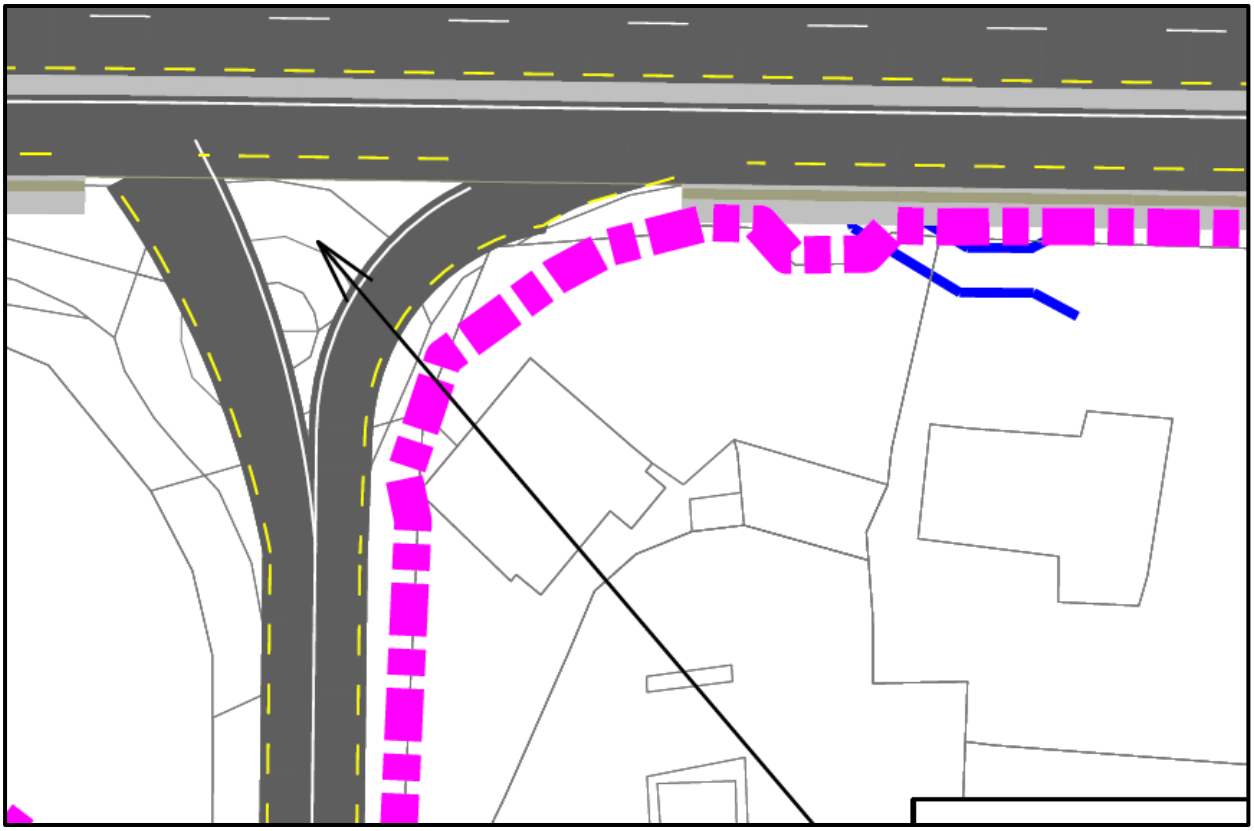


Recommendation:

The design team should ensure that the junction is tightened to reduce vehicle speeds. The design team should also ensure that speed control measures are provided on the approach to the reconfigured junction.

Problem No.20: Existing Private Accesses
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1114

The audit team note that there are existing private accesses at the reconfigured junction which do not appear to be closed off or relocated. The audit team are concerned that the new measures will result in increased speeds in the area as vehicles no longer have to yield at the roundabout. There is a risk of potential conflict with vehicles exiting these private accesses due to the increased speeds and the limited visibility from these access points increases the risk further.



Recommendation:

The design team should review each existing access point that will be impacted by the proposed re-configuration of the junction to ensure they can be accessed and exited from safely.

Problem No.21: Access & Egress of Service Station
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1114

The audit team note that there are no measures to improve safety along the frontage of the existing service station. The audit team is concerned that the open nature of the existing service station coupled with potential increased speeds could result in additional risk of conflict at the service station.

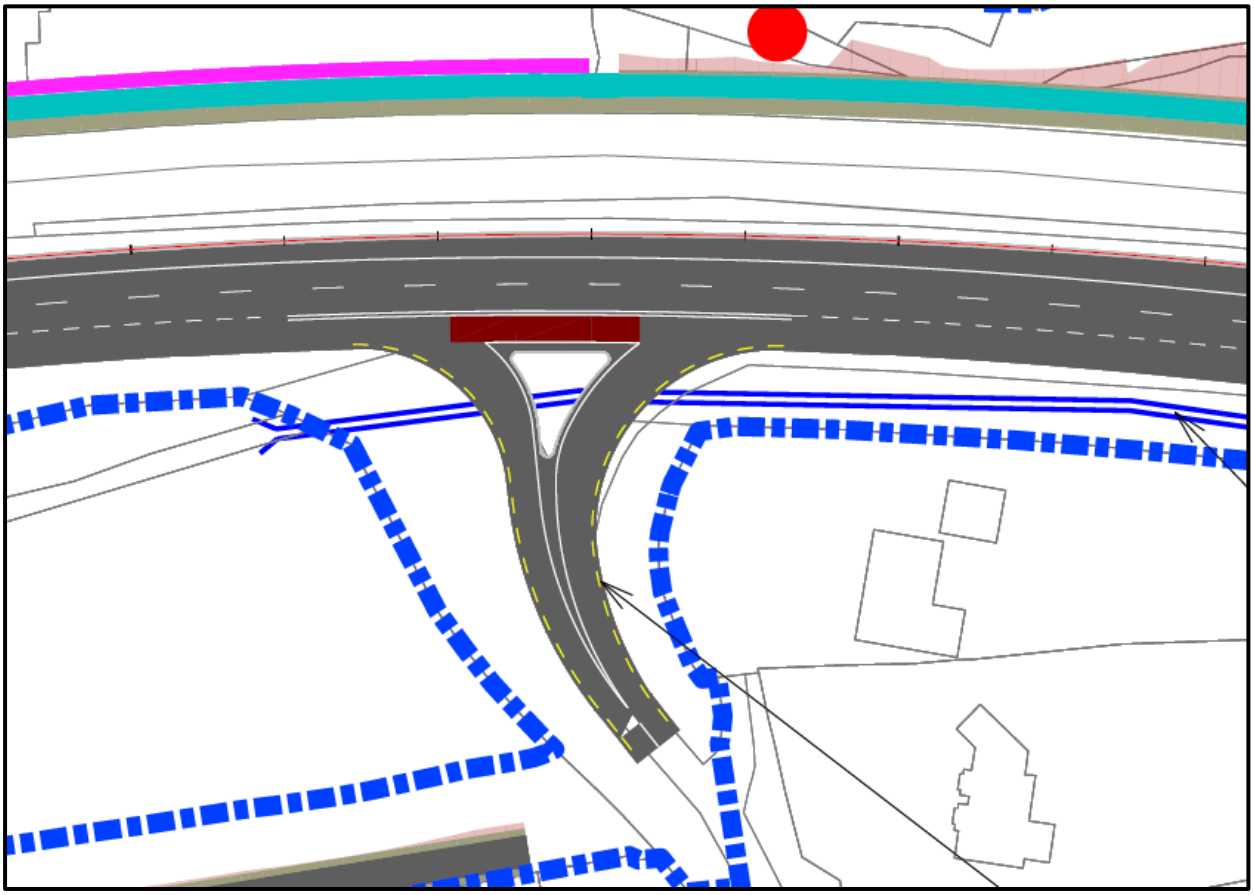


Recommendation:

The design team should review the frontage of the service station and provide measures to tackle the open nature of the service station frontage to mitigate the safety risk identified.

3.3.3 Sub-Scheme C

Problem No.22: Short 1.7km HSBPM Measure
Location: DRG 265455-ARP-HGN-BIS-DR-CH-1115 - 1117
The audit team note that it is intended to provide a short HSBPM from chainage 7.9 to chainage 9.7 which is a relatively short section to be provided, and the audit team would query the benefit of providing this short section particularly when it creates an additional conflict risk with vehicles exiting the Quill Road with no control measures proposed. The audit team is concerned that the provision of this short section of HSBPM will reduce safety along the stretch for motorists.



Recommendation:
The design team should remove the HSBPM along this section to mitigate the safety risk identified.

4. Ranking of Scheme Sections

The audit team carried out a preliminary safety assessment for the scheme based on the guidance set out in the TII Project Appraisal Guidelines Unit 7.0. The safety issues identified within the Pre-Stage 1 audit have been reviewed in the context of the three sub-schemes defined within the overall interim scheme. Table 4.1 has identified the number of problems identified within each sub-scheme.

	General Problem	Specific Problem	Total
Sub scheme A	3	5	8
Sub scheme B	3	13	16
Sub scheme C	3	1	4

Table 4.1 – Number of problems identified

Sub-Scheme A did not contain as many interchanges as sub-scheme B but did contain more potential areas of vehicular conflict than sub-scheme C. In this context, the audit team applied an impact score of 4 (Not significant or Neutral).

Sub-Scheme B contained a number of safety problems which were identified in the audit, and these were mostly associated with through running lanes, merge & diverge at intersections, geometry at junctions, concrete island visibility, design speeds, speed at reconfigured junctions, private access treatment, service station frontage and active travel separation. In our opinion the safety problems identified can be addressed in future design development.

Sub-Scheme C contained the least amount of interchange, merges/ diverges and interactions with compact junctions compared to the other sub-schemes. The audit team concluded that in comparison with the other sub-schemes there are less safety risks associated with sub-scheme C.

Table 4.2 highlights the impact scores applied from the audit team's safety assessment of each sub-scheme proposed by the designers.

	Impact Level Score
Sub scheme A	4 – Not significant or neutral
Sub scheme B	5 – Minor or slightly positive
Sub scheme C	5 – Minor or slightly positive

Table 4.2 – Impact Score for each sub-scheme

5. Audit Team Statement

We certify that we have examined the drawings listed in Appendix A and examined the site by means of a site visit. 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 issues that we have identified have been noted in the report, together with suggestions for improvement, which we recommend should be studied for implementation.

Audit Team Leader: David McCormack: BEng (Hons), Dip Eng., CEng, MIEI
ORS

Signed: 

Date: 22nd October 2024

Audit Team Member: Adam Price: BEng (Hons), CEng, MIEI
ORS

Signed: 

Date: 22nd October 2024

Appendix A – Inspected Documents

The audit team reviewed the following drawings and documents provided by Arup on behalf of Wicklow County Council and Kildare Road Design Office (KRDO) as project managers appointed by Transport Infrastructure Ireland (TII), the Approving Authority.

(1) 265455-ARP-HGN-BIS-DR-CH-1100 – P01 - Scheme Layout
(2) 265455-ARP-HGN-BIS-DR-CH-1101 – P01 - Scheme Layout
(3) 265455-ARP-HGN-BIS-DR-CH-1102 – P01 - Scheme Layout
(4) 265455-ARP-HGN-BIS-DR-CH-1103 – P01 - Scheme Layout
(5) 265455-ARP-HGN-BIS-DR-CH-1104 – P01 - Scheme Layout
(6) 265455-ARP-HGN-BIS-DR-CH-1105 – P01 - Scheme Layout
(7) 265455-ARP-HGN-BIS-DR-CH-1106 – P01 - Scheme Layout
(8) 265455-ARP-HGN-BIS-DR-CH-1107 – P01 - Scheme Layout
(9) 265455-ARP-HGN-BIS-DR-CH-1108 – P01 - Scheme Layout
(10) 265455-ARP-HGN-BIS-DR-CH-1109 – P01 - Scheme Layout
(11) 265455-ARP-HGN-BIS-DR-CH-1110 – P01 - Scheme Layout
(12) 265455-ARP-HGN-BIS-DR-CH-1111 – P01 - Scheme Layout
(13) 265455-ARP-HGN-BIS-DR-CH-1112 – P01 - Scheme Layout
(14) 265455-ARP-HGN-BIS-DR-CH-1113 – P01 - Scheme Layout
(15) 265455-ARP-HGN-BIS-DR-CH-1114 – P01 - Scheme Layout
(16) 265455-ARP-HGN-BIS-DR-CH-1115 – P01 - Scheme Layout
(17) 265455-ARP-HGN-BIS-DR-CH-1115 – P01 - Scheme Layout
(18) 265455-ARP-HGN-BIS-DR-CH-1117 – P01 - Scheme Layout
(19) 265455-ARP-HGN-BIS-DR-CH-1118 – P01 - Scheme Layout

Appendix B – Designer Response Form

Job: 211081: N11/M11 Bus Priority Interim Scheme

Stage of Audit: Pre-Stage 1 Road Safety Audit

Date Audit Completed: 22/10/2024

Problem Reference in Safety Audit Report	To Be Completed by the Designer			To be Completed Audit Team Leader
	Problem Accepted (Yes/No)	Recommendation Accepted (Yes/No)	Alternative Option (Describe) (Only complete if recommendation not accepted)	Alternative Option Accepted by Auditors (Yes/No)
P1	Yes	Yes	Noted, this it to be addressed in Phase 3.	
P2	Yes	Yes	The proposed Through Junction Running layout is as per DN-GEO-03087. Signage will also be provided in accordance with the standard to notify drivers of start and end points, at merges and diverges and following other intermediate junctions/accesses. Additionally, bus drivers will be trained in the operation of the bus priority measures at junctions.	
P3	Yes	Yes	Noted – further consideration for Vulnerable Road Users to be provided in Phase 3 as the design is developed in further detail.	
P4	Yes	Yes	Noted – further geometric detail on tie-ins to be provided in Phase 3. Notwithstanding, it is proposed to essentially maintain the existing horizontal/vertical alignment of the M11 Mainline on approach to Loughlinstown Roundabout.	
P5	Yes	Yes	It was considered necessary to merge the HSBPM into the auxiliary lane in advance of the diverge area given the lane drop configuration on the M11. The proposed detail allows buses to proceed towards the diverge in line with diverging traffic, thereby avoiding a scenario where buses shift across the diverge slip road in a late manoeuvre to access the TJR lane. The potential for conflict between buses merging and general traffic diverging is acknowledged (the HSBPM merge point was set ~200m in advance of the diverge to provide space for both movements). This 200m length can be increased, if necessary, which can be examined in Phase 3.	

			Further mitigation will be provided through the provision of appropriate signage as per DN-GEO-03087, to highlight the termination of the HSBPM.	
P6	Yes	Yes	The proposed Through Junction Running layout is as per DN-GEO-03087. Signage will also be provided in accordance with the standard to notify drivers of start and end points, at merges and diverges and following other intermediate junctions/accesses. Additionally, bus drivers will be trained in the operation of the bus priority measures at junctions. The geometry of the arrangement allows width to be built up for a ghost island, and 'fork diverge' in advance of the physical nose. This ensures a constant flare for the diverge movement is maintained, and general traffic is not required to make any reverse curve steering movements. Buses would however be required to make a deliberate steering manoeuvre to enter the bus lane downstream of the nose. This approach aims to mitigate the risk of general traffic erroneously entering the bus lane downstream of the diverge. Chevron marking of the ghost island is proposed. Signage will also be provided in accordance with the standard to notify drivers of start and end points, at merges and diverges and following other intermediate junctions/accesses. It should be noted that the TJR treatment adopted will involve some discontinuity of the bus lane at merges and diverges. The detail is in accordance with the DN-GEO-03087 standard and considered appropriate for use on the scheme.	
P7	Yes	Yes	The proposal to provide bus priority signalling at the merge is aligned with the requirements of DN-GEO-03087. Traffic modelling has indicated that merging volumes are high at this location, resulting in queuing within the merge area which would impede bus priority and present a safety issue. At this stage (Phase 2), it is proposed that the bus priority signals will be in the form of loop triggered signals placed in advance of the merge to detect buses using the HSBPM. Once detected, buses will then be afforded priority through the junction as signals withhold general traffic on the merge. Details of the exact signalling arrangement	

			have not been developed at this stage (Option Selection) and will be further developed in Phase 3.	
P8	Yes	Yes	The proposed Through Junction Running layout is as per DN-GEO-03087. Signage will also be provided in accordance with the standard to notify drivers of start and end points, at merges and diverges and following other intermediate junctions/accesses. Additionally, bus drivers will be trained in the operation of the bus priority measures at junctions. The geometry of the arrangement allows width to be built up for a ghost island, and 'fork diverge' in advance of the physical nose. This ensures a constant flare for the diverge movement is maintained, and general traffic is not required to make any reverse curve steering movements. Buses would however be required to make a deliberate steering manoeuvre to enter the bus lane downstream of the nose. This approach aims to mitigate the risk of general traffic erroneously entering the bus lane downstream of the diverge. Chevron marking of the ghost island is proposed. Signage will also be provided in accordance with the standard to notify drivers of start and end points, at merges and diverges and following other intermediate junctions/accesses. It should be noted that the TJR treatment adopted will involve some discontinuity of the bus lane at merges and diverges. The detail is in accordance with the DN-GEO-03087 standard and considered appropriate for use on the scheme.	
P9	Yes	Yes	Noted – the design of the diverge on approach to roundabout will be reviewed in Phase 3 to optimise the available length for weaving movements.	
P10	Yes	Yes	Noted – measures to improve visibility of island to be implemented.	
P11	Yes	Yes	The proposed Through Junction Running layout is as per DN-GEO-03087. Signage will also be provided in accordance with the standard to notify drivers of start and end points, at merges and diverges and following other intermediate junctions/accesses. Additionally, bus drivers will be trained in the operation of the bus priority measures at junctions. The geometry of the arrangement allows width to be built up for a ghost island, and	

			'fork diverge' in advance of the physical nose. This ensures a constant flare for the diverge movement is maintained, and general traffic is not required to make any reverse curve steering movements. Buses would however be required to make a deliberate steering manoeuvre to enter the bus lane downstream of the nose. This approach aims to mitigate the risk of general traffic erroneously entering the bus lane downstream of the diverge. Chevron marking of the ghost island is proposed. Signage will also be provided in accordance with the standard to notify drivers of start and end points, at merges and diverges and following other intermediate junctions/accesses. It should be noted that the TJR treatment adopted will involve some discontinuity of the bus lane at merges and diverges. The detail is in accordance with the DN-GEO-03087 standard and considered appropriate for use on the scheme.	
P12	Yes	Yes	Noted – the design will be reviewed at this location with a view to providing increased separation between the Mainline and Active Travel Facility. Separation Measures will be included and detailed in the Phase 3 design.	
P13	Yes	Yes	Noted – the design will be reviewed at this location with a view to providing increased separation between the Mainline and Active Travel Facility. Separation Measures will be included and detailed in the Phase 3 design.	
P14	Yes	Yes	The proposed Through Junction Running layout is as per DN-GEO-03087. Signage will also be provided in accordance with the standard to notify drivers of start and end points, at merges and diverges and following other intermediate junctions/accesses. Additionally, bus drivers will be trained in the operation of the bus priority measures at junctions. The geometry of the arrangement allows width to be built up for a ghost island, and 'fork diverge' in advance of the physical nose. This ensures a constant flare for the diverge movement is maintained, and general traffic is not required to make any reverse curve steering movements. Buses would however be required to make a deliberate steering manoeuvre to enter the	

			bus lane downstream of the nose. This approach aims to mitigate the risk of general traffic erroneously entering the bus lane downstream of the diverge. Chevron marking of the ghost island is proposed. Signage will also be provided in accordance with the standard to notify drivers of start and end points, at merges and diverges and following other intermediate junctions/accesses. It should be noted that the TJR treatment adopted will involve some discontinuity of the bus lane at merges and diverges. The detail is in accordance with the DN-GEO-03087 standard and considered appropriate for use on the scheme.	
P15	Yes	Yes	Full details of the roundabout geometry and tie-ins have not been developed in Phase 2. Further geometric detail on tie-ins and provision for vulnerable road users to be provided in Phase 3.	
P16	Yes	Yes	Full details of the roundabout geometry, alignment, and tie-ins have not been developed in Phase 2. Further geometric detail on tie-ins to be provided in Phase 3. Noted – appropriate speed control measures along the Junction 7 diverge loop will be developed in future design stages. Appropriate advance warning signage and linemarking will notify drivers of the upcoming diverge loop and roundabout.	
P17	Yes	Yes	It is proposed at this location that the HSBPM will terminate upstream of the junction merge point. Appropriate advance warning signage and linemarking will delineate the termination of the bus priority measures and notify the bus driver they must merge into the nearside general traffic lane.	
P18	Yes	Yes	Noted – measures to improve visibility of island to be implemented.	
P19	Yes	Yes	Noted – further tightening of the junction alignment can be implemented as part of Phase 3 design development. Note also that operational speed limit of 50km/h expected to be implemented on service road, with adequate entry transition to reduce speeds on approach to left in – left out junction. Appropriate advance warning signage and linemarking will notify drivers of the 50km/h speed limit on the service road.	

			Appropriate advance warning signage will notify drivers of the upcoming Left in Left out Junction, and the access before the Junction.	
P20	Yes	Yes	Noted – existing access onto the R755 Junction currently proposed be closed, with the access onto the 50km/h service road remaining open.	
P21	Yes	Yes	Noted – Details of the Access & Egress of Service Station will be developed in more detail in Phase 3.	
P22	No	No	It is proposed at this location to set back the existing channelising island to enable the bus to pass through the junction area and avoid merging back into the traffic lanes. The coloured surfacing is intended to indicate that general traffic is not permitted to run through this area. More detailed road markings will be developed throughout the scheme in Phase 3 to ensure that bus priority is understood by all road users. Appropriate advance warning signage will notify drivers of the upcoming Left in Left out Junction. Additionally, signage and road marking will notify drivers that through junction running is permitted for bus only. For vehicles exiting the Quill Road junction, it is expected that a yield (or stop) system will apply and adequate visibility from the junction is provided.	Yes

Signed:… …… **Designer** **Date:** 05/12/2024……

Signed:… …… **Audit Team Leader** **Date:** 27/11/2024……

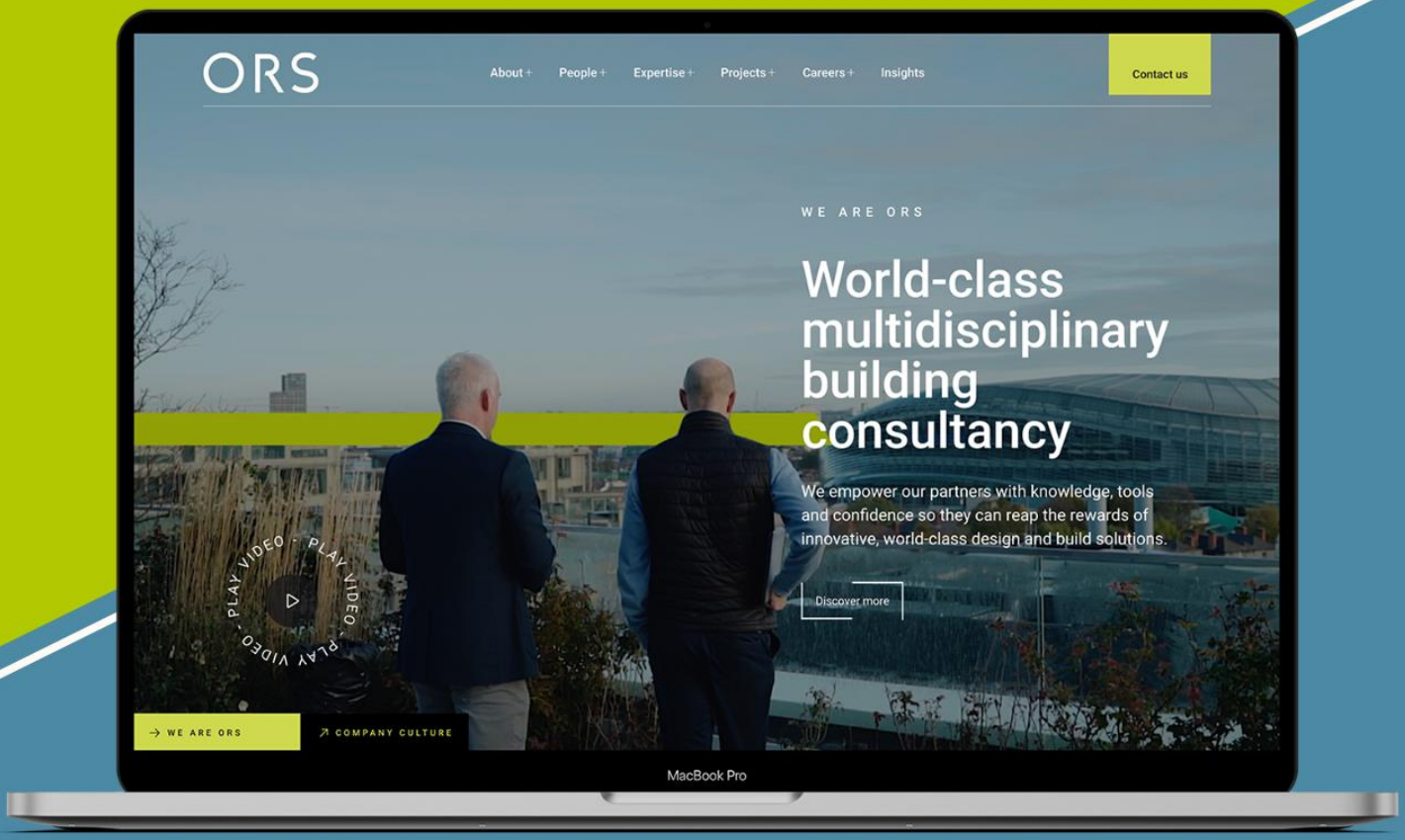
Signed:… …… **Employer** **Date:** 06/12/2024……

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Donegal Town, Co. Donegal,
Ireland, F94 KT35

Office 4, Spencer House,
High Road, Letterkenny,
Co. Donegal,
Ireland, F92 PX8N

NSQ2,
Navigation Square,
Albert Quay, Cork
Ireland, T12 W351