The background is a vibrant red color. It features several abstract geometric shapes: a large teal semi-circle in the top-left corner, a blue semi-circle in the top-right corner containing a white circle, a dark blue horizontal bar in the top-right corner, a teal semi-circle in the bottom-right corner, and a blue semi-circle in the bottom-left corner containing a white circle. There are also smaller white circles and shapes in the bottom-left and bottom-right corners.

Appendix M

Road Safety Audit

The background is a vibrant red color. It features several abstract geometric shapes: a large teal semi-circle in the top-left corner, a blue semi-circle in the top-right corner containing a white circle, a dark blue horizontal bar in the top-right, a teal semi-circle in the bottom-right, and a blue vertical shape in the bottom-left containing a white circle. There are also smaller white circles and curved lines scattered throughout the design.

Appendix M1
Road Safety Audits
- Stage 1



Jacobs

BusConnects Dublin Core Bus Corridor Infrastructure Works – Package B

Road Safety Audit Stage 1

20/04/2022



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1. Introduction

This report results from a Stage 1 Road Safety Audit of the Liffey Valley to City Centre Core Bus Corridor scheme.

The Audit has been prepared in accordance with TII Publication GE-STY-01024 (HD 19/15) Road Safety Audit. The Audit Team has examined and reported on only the road safety implications of the scheme and has not examined or verified the compliance of the design to any other criteria.

The Audit Team was as follows:

G. Turley Team Leader	MEng, HDip PM, H Dip H'ways & Geo, CEng MIEI, Senior Associate Director, Merrion House, Merrion Road, Dublin
G Hingerty Team Member	BSc ME CEng MIEI Transport Engineer, Merrion House, Merrion Road, Dublin

The Audit was carried out between Monday 16th November and Monday 10th December 2020.

Weather conditions during the site visit were overcast with periods of mist.

The Design Team and Employer (Client) is reminded that the Road Safety Audit Designers Response (separate document accompanied with this audit) shall be completed and returned to the Road Safety Audit Team Leader for sign off.

2. Site Specific Problems Identified

2.1 General

2.1.1 Problem

The Drawings indicate the provision of a cycle track throughout the scheme. The drawings do not indicate where the cycle track changes to an on-road cycle lane on the approach to pedestrian crossings, accesses or junctions.

Recommendation

The Design Team should ensure that the drawings differentiate between cycle lanes and cycle tracks and show clearly where the cycle track ramps up and ramps down.

2.1.2 Problem

The Drawings provided are not clear or consistent on the approach to driveways/ commercial premises as to whether the footpath/ cycle track will continue through the junction (through a dished or bevel kerb) or whether the cyclist/ pedestrian is to cross the mouth of an access, and the motorist has priority.

Recommendation

The Design Team should ensure that where appropriate, the footpath and cycle lane continue across an access to provide an increased sense of priority for cyclists and pedestrians.

2.1.3 Problem

The Audit Team noted evidence of potential ponding of water in the carriageway at various locations. The widening of the carriageway to facilitate additional lanes may increase the risk of ponding of water increased the risk of loss of control type collision due to ice during cold conditions.



Figure 2.1 Pedestrian Crossing at Liffey Valley SC

Recommendation

The Design Team should ensure the drainage design is sufficient to positively drain the carriageway and that gullies are provided upstream of pedestrian crossings.

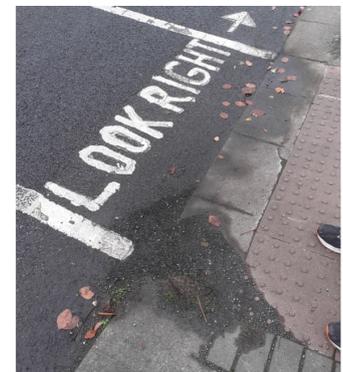


Figure 2.2 Pedestrian Crossing on Con Colbert Rd (Chainage B4550)

2.1.4 Problem

The Drawings identify all traffic signal heads having green arrows. This does not follow the junction layout where full aspects would be more appropriate and avoid driver confusion.

Recommendation

The Design Team should ensure the signal head and phasing design appropriately aligns with the proposed physical layout of the junctions.

2.1.5 Problem

The Audit Team note that there are multiple pedestrian phases across the junctions. The Audit team are unclear how the audio tactile push buttons will operate where poles are in close proximity. There is a risk of confusion for some pedestrians as a result.

Recommendation

The Design Team should ensure that appropriate consideration is given to this element to ensure the pedestrians do not become confused with the audio indication from different phases of pedestrian crossing.

2.1.6 Problem

The Audit Team note that some properties have their entrance doors located below finished road surface (e.g. Chainage B6620), particularly along the Inchicore to Kilmainham parts of the corridor. This results in the adjacent footways being below the road surface level. These areas show evidence of water ponding and collection of silt resulting in an increased risk of slips and falls by pedestrians.

Recommendation

The Design Team should ensure the drainage provision is adequate.



Figure 2.3 No 47 Old Kilmainham

2.1.7 Problem

It is noted that the bus lanes on the proposed scheme will be used on a part time basis (0700-1900 Mon-Sat). It is unclear if they are intended for general traffic use or parking outside these times. The Audit Team are concerned that members of the public will use these lanes, including gaining priority from bus gates (Chainage B200 – Coldcut Road or B3500 Ballyfermot Rd) outside designated hours resulting in driver frustration/ indiscipline leading to an increased risk of collision. The use of bus lanes by general traffic during off peak hours may also impact upon cyclists in the bus lane where no cycle facilities are available (Emmet Road)

Recommendation

The Design Team should review the operation times of the bus lanes.

2.1.8 Problem

The Audit Team note that there are areas of cracked and damaged footway along the scheme resulting in slipping and tripping hazards.

Recommendation

Where footways are being retained, the design team should ensure that damaged sections should be repaired as appropriate.

2.1.9 Problem

The Audit Team note that large sections of the existing route feature two general traffic lanes with traffic calming measures (e.g. Speed ramps - Ballyfermot Road Chainage B1000 to B1800/ traffic island chicane B1800 to B2000 and table junctions). This is to be replaced with 2 general traffic lanes and 2 bus lanes, i.e. a much wider cross-section with an increased risk of higher speed particularly in the off-peak period.

Recommendation

The Design Team should consider including traffic calming measures to encourage a low speed and pedestrian/cyclist friendly environment.

3. General Arrangement Drawings

3.1 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0004)

3.1.1 Problem

It is noted there is a right turn filter lane for traffic from the north. The tie-in at this location assumes 3 lanes of traffic entering the scheme and at-grade cycle ways. The existing scenario, and that proposed by the adjacent designed scheme features 2 lanes of traffic (plus bus lane) and cycle tracks. It is unclear how the transition from 2 lanes to 3 at this location occurs.

Recommendation

The Design Team should review tie-in at this location.

3.1.2 Problem

It is noted that the left turn (from the south) into Liffey Valley Retail Park features a relatively tight radius compared to the existing scenario. The Audit Team is concerned that there is insufficient space for an articulated lorry to make this left turn without mounting the kerb. There is an increased risk of conflict with vulnerable road users.

Recommendation

The design team should carry out a swept path analysis for this left turn movement.

3.1.3 Problem

The Audit Team note that on the north-eastern approach to the junction that there are 2 lanes of traffic at the tie in and at the Stop lane. The existing road layout, just outside the scheme extents at the tie-in has an abrupt road widening into 2 lanes. This abrupt widening with missing kerbing may lead to an increased risk driver confusion (Figure 3.2).

Recommendation

The design team should review the tie-in to include the appropriate taper from 1-lane to 2 lanes on the approach to this junction.

3.1.4 Problem

The Audit Team note that there is no provision for pedestrian movement across the western arm of the junction at chainage A450. This poses the risk of pedestrians having to cross the road between large vehicles in an uncontrolled manner in conflict with turning vehicles.

Recommendation

The design team should make provision for controlled pedestrian movements across this arm.

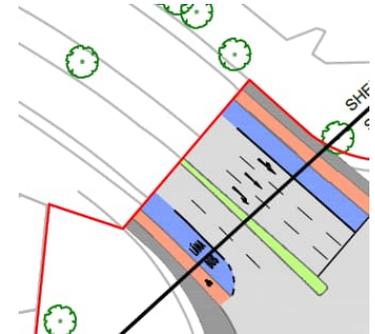


Figure 3.1 Northwest scheme tie in



Figure 3.2 Missing kerb on approach to junction

3.1.5 Problem

The Audit Team note that there is no provision for right turning cyclists at the junction at chainage A450. This poses a risk of cyclists making hazardous movements through the junction, in the absence of any appropriate facility.

Recommendation

The design team should provide facilities for right turning cyclists at the junction though toucan crossings or jug turn road markings.

3.1.6 Problem

At chainage A200, on either side of the road, there are differing approaches in the design to the interfaces between cyclists and pedestrians with respect to priority which may result in cyclists/pedestrian confusion leading to an increased risk of collisions. The layout on the GA drawings vary from those proposed on the road markings and systems drawings. It is also not clear how pedestrians/cyclist transition to/from the scheme and the existing cycle track tie-in to the north.

Recommendation

The Design Team should review this tie-in with existing pedestrian/ cycle track and cycle/pedestrian provision throughout the junction through provision of appropriate road markings and signage.

3.1.7 Problem

The Audit Team note the lack of road markings in lanes on approaches to the junction, this may lead to driver confusion resulting in rear-shunt or sideswipe type collisions.

Recommendation

The Design Team should review the scheme proposals to include road markings on each junction approach to ensure clarity for all road users.

3.2 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0005)

3.2.1 Problem

It is noted that there is a left turn access for Liffey Valley Fitness (Figure 3.3). The Audit Team is concerned that motorists from the north wishing to access this facility may conflict with a bus mid junction resulting in a sideswipe type collision.

Recommendation

The Design Team should review this movement and consider removing this left turn or separating the general traffic and bus lanes from the same phase in the systems design.

3.2.2 Problem

It is noted that there is a transition between the 1-way and 2-way cycle tracks at chainage A100. The Audit Team is concerned about the lack of clarity at this transition and the potential for user confusion causing an increased risk of head on collisions by cyclists.

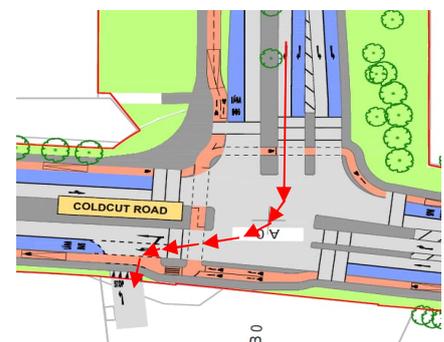


Figure 3.3 Access to Fitness Centre

Recommendation

The Design Team should review the provision of cycle track at this location in association with the cycle desire lines in this area.

3.2.3 Problem

It is noted that there are proposed footway and cycle track in each direction over the M50 overbridge. The proposed cycle track and footpath widths are 2.75m and the Audit Team are concerned that these widths may be below desirable minimum levels resulting in an increased risk of conflict between pedestrians and cyclists.

Recommendation

The design team should review the dimensions of the footway and cycle track for appropriateness.

3.2.4 Problem

It is noted that there are no left arrow traffic signs, chevrons or kerbing to direct motorists to the left at chainage B190. The Audit Team are concerned that this may result in head on collisions with approaching eastbound traffic.

Recommendation

The design team should review the signage and guidance for clarity for motorists.

3.2.5 Problem

The Audit Team note that there is an existing uncontrolled crossing at chainage A110, which is representing an existing pedestrian desire line between shopping areas. It is not clear from the proposed road design if this is to be maintained or if this desire line has been facilitated elsewhere. With carriageway widening proposed, there is an increased risk of vehicular/ pedestrian conflicts.

Recommendation

The design team should review the existing pedestrian desire line at this location and determine if a controlled crossing is warranted.

3.2.6 Problem

The Audit Team is concerned that due to narrowing of the carriageway to 6.0m, buses exiting the nearside bus lanes will have to cross the central line to straighten up on the bridge leading to an increased risk of head on collisions or mounting the kerb in conflict with cyclists

Recommendation

The design team should review the swept path analysis at this location to ensure that longer vehicles can pass one another safely across the bridge.

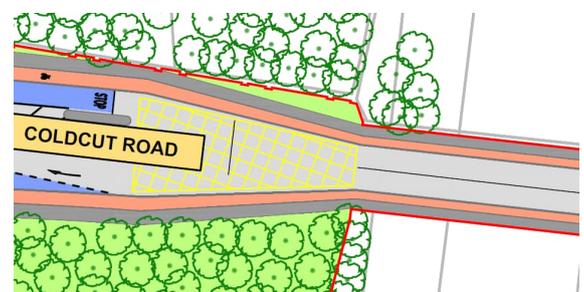


Figure 3.4 M50 Overbridge

3.2.7 Problem

The Audit Team note that there is an existing Bus Gate west of Chainage B0 on Coldcut road. The proposed scheme provides for the bus lane to be extended up to the western arm of the junction. There is a risk of driver confusion if the existing infrastructure is made redundant due to the proposed scheme.

Recommendation

The design team should consider whether this gate should be removed as part of the proposed scheme.

3.3 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0006)

3.3.1 Problem

It is noted that there are no road markings on the southern arm of the junction (Cloverhill Road) which may result in driver confusion causing an increased risk of side swipe type collisions.

Recommendation

The design team should provide appropriate road markings at this location.

3.3.2 Problem

At the new island bus stop at chainage B680, its noted that the footway at this location has been moved to the roadside of the green space from the rear in the existing scenario. There is an existing formal pedestrian walkway facilitating a desire line to the adjacent residential development through. The Audit Team is concerned of an increased risk of trips and falls from pedestrians walking in the grassed area.



Figure 3.5 Pedestrian desire line

Recommendation

The design team should maintain access between the bus stop and the residential development.

and

3.4 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0007)

3.4.1 Problem

It is noted that on the northern arm of the junction at chainage B750, there are two lanes; straight ahead and right turning. On the corresponding arm of the junction for these straight-ahead movements there are two exiting lanes; one for general traffic and one bus lane requiring these straight-ahead vehicles to move over one lane while transitioning through the junction. The Audit Team is concerned that straight-ahead motorists may collide with right turning motorists through the junction causing side-swipe type collisions.

Recommendation

The Design Team should consider appropriate road markings to mitigate this risk.

3.4.2 Problem

It is noted that the northbound bus lane on the southern arm of the proposed signalised junction is for left turn movements only. The Audit Team is concerned that there is insufficient advanced warning of this layout for taxis and private coaches which may use the bus lane and wish to continue straight. There is an increased risk of vehicles performing sudden lane-changing manoeuvres leading to side swipe or rear shunt type collisions due to late breaking.

Recommendation

The Design Team should provide advance warning signs and road markings are provided to inform buses and taxis to join the main traffic lanes in order to make a straight-ahead. movement.

3.4.3 Problem

It is noted that there is a box turn across the northbound general traffic lane and bus lane. The Audit Team is concerned that, as the box turn doesn't cover the southbound general traffic lane as is currently the case, driver frustration may result in motorists making erratic movements resulting in sideswipe collisions.

Recommendation

The Design Team should extend the box junction across the inbound traffic lane.

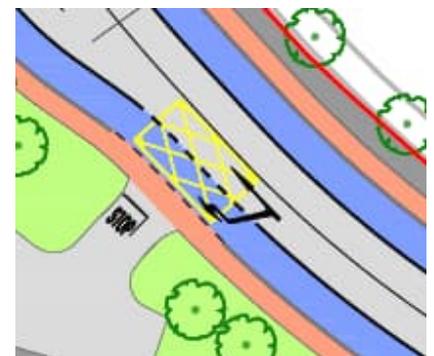


Figure 3.6 Box Junction

3.5 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0008)

3.5.1 Problem

The Audit Team notes that the traffic exiting the general traffic lane on the eastern arm may not have adequate guidance through the junction in the absence of traffic islands, to mitigate against head-on collisions with traffic waiting in the right turn lane on the opposite arm.

Recommendation

The design team should review the junction design to remove this risk using guidance lines and/or traffic islands.

3.5.2 Problem

The Audit Team notes that there is a proposed speed hump sign at chainage B1450. There doesn't appear to be any speed deterrents in the vicinity of the sign on the drawing which may cause drivers to speed in other locations where speed deterrents do exist causing the potential for divers to lose control of their vehicles.

Recommendation

The design team should review the signage at this location to ensure it is representative of the proposed street arrangement.

3.6 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0009)

3.6.1 Problem

The Audit Team note the westbound cycle lane before Blackditch Drive is set back from the carriageway and transitions back to immediately adjacent to the bus lane across the apron of Blackditch drive junction, a priority junction. It is not clear who has the level of priority here and. As the upstream cycle track is set behind the trees and parallel parking bays, motorists and cyclists may be confused as to who has priority here resulting in an increased risk of motorist/ cyclist conflicts (Figure 3.7).

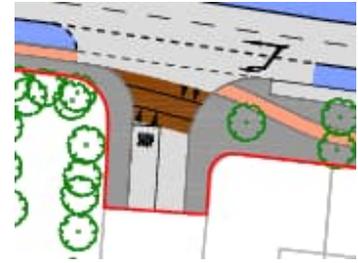


Figure 3.7 Cycle track transition

Recommendation

The design team should review this junction's design and road markings to ensure its operation is safe for cyclists and priority is clear.

3.6.2 Problem

The Audit Team note that between chainage B1450 and B1850, a parallel access road providing entry to existing driveways is to be removed and vehicles will access their driveways directly from the main carriageway by crossing footpaths, cycle lane and parallel on street parking bays. The Audit Team is concerned that:

- Cars parked in the parallel parking bays may hinder visibility of oncoming cyclists/ pedestrians by motorists accessing their driveways;
- Cars may undertake three point turns within the footpath/ cycle track area in conflicts with oncoming pedestrians and cyclists;
- The removal of the parallel access road may result in car reversing out onto the bus lane with visibility blocked by parked vehicles;
- Parked cars may block access to driveways leading to driver frustration.

Recommendation

The Design Team should consider the following measures

- Remove the parallel parking bays if existing accesses are to be maintained
- Ensure the parking bays are delineated so to ensure driveways are not blocked.

3.6.3 Problem

The Audit Team note there is vehicular access, albeit it narrow, to numbers 1-11B Cleggan road from the scheme but it is not clear how motorists will still access this safely across the transitioning cycle track (Figure 3.8).

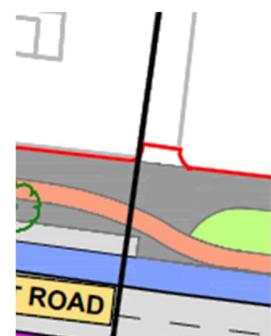


Figure 3.8 Cycleway transition

Recommendation

The Design Team should ensure safe, formal access to this laneway or remove vehicular access.

3.6.4 Problem

The Audit Team note there is a vehicular entrance to St. Mathews church at chainage B1710. It is not clear how this vehicular entrance has been maintained as the cycle track ramp is immediately across the bellmouth of the junction. This may cause an increased risk of driver/cyclist confusion.

Recommendation

The design team should relocate the ramp away from the entrance.

3.6.5 Problem

The Audit Team note there is a vehicular entrance to a private dwelling no 459 at chainage B1800. It is not clear how this vehicular entrance has been maintained as the cycle track ramp is immediately across the driveway. This may cause an increased risk of driver/cyclist confusion.

Recommendation

The design team should relocate the ramp away from the entrance.

3.7 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0010)

3.7.1 Problem

Granite steps along the front of the Community Civic Center are noted at chainage B2010. As the general paving area is level, and the carriageway slopes inbound (figure 3.09), there is a gradual creation of steps across the front of the civil area outside the centre. The Audit Team is concerned this creates a tripping hazard. There is also uneven surface increasing tripping hazard adjacent to the steps. (Figure 3.10)



Figure 3.9 Steps - Tripping hazard



Figure 3.10 Steps - Tripping hazard

Recommendation

The design team should ensure a safe footway for all users and highlight the hazard to the visually impaired through provision of appropriate tactile paving.

3.7.2 Problem

The Audit Team note that there is evident deflection through the junction at B2010. With the proposed phasing operation at this location, the Audit Team is concerned that there is the potential for sideswipe type collisions

through the junction in the absence of guidance lines, particularly where eastbound buses and cars will run in the same phase.

Recommendation

The design team should include guidance lines, or separate different modes of traffic through phasing at this location.

3.7.3 Problem

It is noted there are two signalised T-junctions less than 100m apart. The Audit Team observed the stacking capacity of the carriageway in both directions being exhausted resulting in drivers jumping the lights and blocking pedestrian crossings which then became operational. The Audit Team is concerned of an increased risk of conflict between vehicles and visually impaired pedestrians.

Recommendation

The design team should consider measures to minimize queuing of traffic between the two junctions.

3.7.4 Problem

The Audit Team note the cycle track diverges away from the main carriageway at chainage B2150. At this point the cycle track ramps up but, in the absence of a raised table here, it is not clear at what level the cyclist crosses the private access. The Audit Team are concerned that the abrupt level difference will be imperceptible to vehicle approaching. (Figure 3.11).

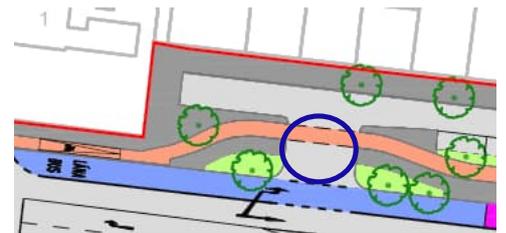


Figure 3.11 Cycle lane raised across private access

Recommendation

The design team should review cyclist safety at this junction and include a raised table.

3.7.5 Problem

The Audit Team note the parallel access road from B2150 eastbound is being narrowed from 2 lanes to 1 with parking. In the absence of associated signage and road marking, the Audit Team are concerned that this is not clear to motorists who currently use this as a 2-way access road with an associated risk for head on collisions with motorists or cycles at the aforementioned raised table.

Recommendation

The design team should provide signage and road markings at this location to provide clarity to all users of the one-way system.

3.8 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0011)

3.8.1 Problem

The Audit Team are concerned that there is insufficient advanced warning ahead of the closure of Ballyfermot Rd to city bound traffic to junction, and diversion of traffic onto Le Fanu Rd. The Audit Team are concerned that motorists may see proposed warning signage late, resulting in sudden lane changes and the potential for sideswipe type collisions.

Recommendation

The design team should enhance the signage provision at this location to give ample warning of the proposed traffic management measures.

3.8.2 Problem

The Audit Team are concerned that westbound general traffic at chainage B2400 may misconstrue the road layout ahead due to the absence of a traffic island resulting in an increased risk of head-on type collision with the right turning lane on the western arm.

Recommendation

The Design Team should review the movements through this junction and add splitter islands or guidance lines where required.

3.8.3 Problem

At chainage B2450, the Audit Team note the presence of accesses where a kerbed cycle track is proposed. There is a risk of loss of control type collisions due to having to mount the kerb to access the property.

Recommendation

At detailed design stage, the Design Team should consider a consistent approach to access whether using a bevel kerb or dished crossing.

3.9 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0012)

3.9.1 Problem

The Audit Team note that the proposed cycle tracks along Kylemore Road have no defined tie-in and end abruptly before the edge of the scheme. The signalised crossings at the junction are not Toucan crossings. It is not clear how cyclists will progress through the junction here and the Audit Team are concerned that cyclists and pedestrians will interact in an uncontrolled manner here resulting in collisions.

Recommendation

The design team should review the end of the cycle track and provide a clear, distinguished tie-in for cyclists to progress beyond this point. (Figure 3.12)

3.9.2 Problem

The Audit Team note that, in the context of the Junction Intervisibility Zone, that drivers at some of the stop lines at the junction in Figure 3.12 above will not be able to fully see the stop lines on other arms of the junction. This compromises visibility and safety of vulnerable road users resulting in the potential for injury by being struck by a vehicle.



Figure 3.12 Cycle tie on Kylemore Rd

Recommendation

The design team should review the need for the compromised Junction Intervisibility zone and move pedestrian crossing closer to the centre of the junction.

3.9.3 Problem

It is noted that the western arm of the Le Fanu Rd/ Kylemore Rd junction, a single eastbound in proposed but two eastbound lanes are indicated on the proposed signal layout drawings. The Audit Team is concerned that, given the high volume of right turners expected here due to the diversion of city bound traffic onto Le Fanu Rd, there is a risk of driver frustration/ indiscipline if significant queues develop.

Recommendation

The design team should review proposed lane arrangement and phasing in the context of anticipated right turners at this junction (from traffic modelling).

3.10 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0013)

3.10.1 Problem

A raised table is indicated between chainage B2570 and B2750. Within the raised table, ramped cycle tracks are proposed. In the absence of drainage drawings, the Audit Team is concerned that water will pond between the raised table and adjacent ramps for cycle track causing a slipping hazard during cold conditions.

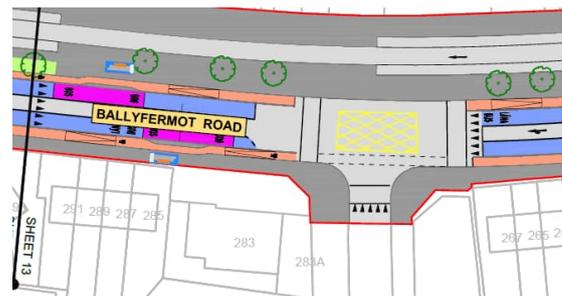


Figure 3.13 Raised Table

Recommendation

The design team should review the proposed junction layout here in the context of drainage, cycle track ramps and intended drainage layouts.

3.10.2 Problem

The Audit Team note that the scheme interface with Colepark Drive is being change from 2-way to 1-way. The Audit Team are concerned that, in the absence of any no-right turn signs on the mainline carriageway, that motorists will still make this movement into Colepark Drive creating the risk for head-on collisions.

Recommendation

The design team should review the full implications and operation of this change to a 1-way street and implement appropriate signage and road markings as required.

3.10.3 Problem

It is noted that the replacement of a roundabout with a signalised junction at chainage B2900 creates the need for access roads to properties facing on the existing roundabout. The access point to these access roads is, in some cases, immediately adjacent to a cycle track ramp (western side of Kylemore Rd). The Audit Team is concerned that there is an increased risk of driver/ cyclist confusion as a result.

Recommendation

The design team should relocate the cycle track ramps.

3.11 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0014)

3.11.1 Problem

A bus stop is proposed outside numbers 193/195 Ballyfermot Rd (Figure 3.14). In the absence of any detail pertaining to kassel kerbs, the Audit Team are unclear how existing vehicular access will be maintained to these properties and are concerned that motorists trying to access these properties may injure pedestrians, cyclists while mounting the kassel kerbs.



Figure 3.14 Bus Stop

Recommendation

The Design Team should review the location of this bus stop in the context of maintaining access to these properties.

3.11.2 Problem

The Audit Team note that a signalised crossing is proposed outside number 171 Ballyfermot Rd. The Audit Team is concerned that the locations of the ramps, with regard to vehicular accesses on the southern side of Ballyfermot Rd and proximity to the island bus stop at the north may result in an increased risk tripping hazards for pedestrians or difficulties for motorists in accessing driveways.

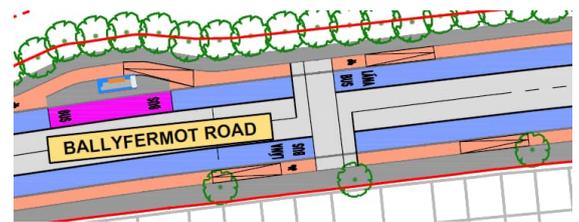


Figure 3.15 crossing and cycle track ramps

Recommendation

The Design Team should review the desire lines at this location and either consider a raised table crossing to remove the cycle track ramps or relocate the ramps appropriately.

3.12 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0015)

3.12.1 Problem

The Audit Team are concerned that the existing signalised crossing at chainage B3590 has been omitted from the drawing proposals and that pedestrian desire lines are not being catered for between chainage B3300 and B3700

Recommendation

The Design Team should review the pedestrian desire lines along this stretch of road, particularly in the context of bus stop access.

3.12.2 Problem

The cessation of the inbound bus lane at chainage B3470 is noted. It is not clear how this merge will work in the absence of any signal detail and yellow flexi-cone in the centre of the 2 merging lanes (with no traffic island). The Audit Team are concerned that the current road arrangement will pose the risk of driver confusion resulting in sideswipe incidents at this location.

Recommendation

The Design Team should review the existing proposal, in the context of how this merge will operate, and provide appropriate signage and signals as required.

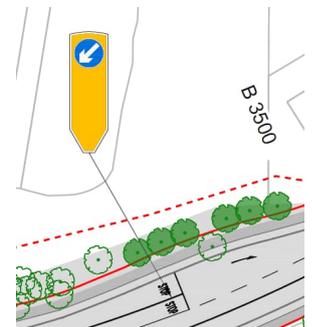


Figure 3.16 Flexi-cone

3.12.3 Problem

It is noted that the proposed cycle track ramps down in front of the proposed bus stopping area. The Audit Team are concerned that this will cause confusion to visually impaired bus passengers when using this area resulting in a tripping hazard.

Recommendation

The Design Team should revise the cycle track ramps in this location.

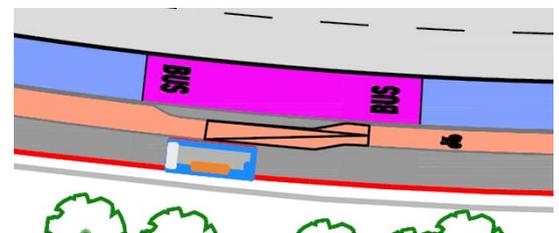


Figure 3.17 Bus stop ramp

3.12.4 Problem

An existing underground car park access point is noted at chainage B3670 (Figure 3.18). Due to the road widening at this location, it is not clear if there will be any impact on the dwell gradient of the existing access ramp or the visibility splay. The Audit Team is concerned that the road widening will result in a sudden change in gradient at this location or compromised visibility splay resulting in compromised sightlines for drivers.

Recommendation

The Design Team should review the gradient of this ramp in the context of road widening and visibility splays.



Figure 3.18 Car park access

3.13 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0016)

3.13.1 Problem

The Audit Team are concerned that the proposed cycle track ramps may hinder access to the existing petrol station on the southern side of Ballyfermot Rd at chainage B3950 increasing the risk of conflict between cyclists and motorists.

Recommendation

The Design Team should review the proposed access arrangements to the petrol station in this location in the context of the proposed crossing and cycle track ramps.

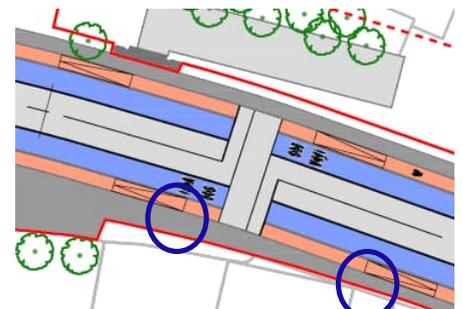


Figure 3.19 Petrol Station Access

3.14 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0017)

3.14.1 Problem

A staggered pedestrian crossing is proposed at chainage B4300. The Audit Team are concerned that the stagger is arranged in such a way that pedestrians on the island are facing away from the direction from which traffic is coming on the crossing they are about to encounter.

Recommendation

The Design Team should review this staggered crossing and replace it with a single crossing the full width of the road.

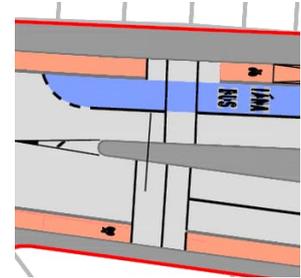


Figure 3.20 Staggered Crossing

3.14.2 Problem

A cycle track ramp is noted immediately outside the front of Ruby Finnegan's Pub (Chainage B4200) at the front of the existing vehicular entrance. The Audit Team are concerned that this may cause driver confusion for those accessing the car park resulting in injury to a pedestrian or cyclists.

Recommendation

The Design Team should review the access arrangement to this car park and revise the proposed cycle track ramp.

3.14.3 Problem

It is noted that the existing right turn pocket at chainage B4350 has been removed. The Audit Team is concerned that the lack of road marking and signage may cause an increased risk of driver confusion resulting in right turn/side impact type collisions.

Recommendation

The Design Team should ensure that road marking and signage is adequate.

3.14.4 Problem

It is noted that the proposed phasing arrangement assumes left turning westbound buses onto Landen Road at the signalised junction. Given the proposed tightened kerb radii and in the absence of any swept path analysis information, the Audit Team is concerned that there is an increased risk of side swipe collisions or a bus mounting the kerb in conflict with pedestrians.

Recommendation

The Design Team should review this left turning movement and the minor arm stop line and recess as required.

3.15 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0018)

3.15.1 Problem

The Audit Team are concerned that there is no advanced warning on Con Colbert of the height restrictions on Sarsfield Road due to the existing rail bridge which could reduce the risk of a bridge strike for unsuspecting drivers of larger vehicles or cause vehicular collisions.

Recommendation

The Design Team should provide advanced warning signage on Con Colbert Rd of height restrictions on Sarsfield Road.

3.15.2 Problem

It is noted that the existing footway under the rail bridge on the eastern side is too narrow for a pushchair or wheelchair. The drawings indicate that the footpath on the eastern side is to be widened and the western footpath narrowed. The Audit Team are concerned that pedestrians on the western side of the footpath will be stranded due to the footpath width and be forced to enter the carriageway in conflict with oncoming motorists.

Recommendation

The Design Team should consider closing the western footpath and directing pedestrian onto to the eastern footpath at chainage E50 and E110.

3.15.3 Problem

Site observation indicated surface water emerging from adjacent retaining walls, blocked gullies under the bridge and the existing/proposed slippery road surface sign. The Audit Team are concerned about the existence of water regularly flowing and ponding in the area causing a slipping hazard for pedestrians and increased risk of loss of control type collisions (Figure 3.21).

Recommendation

The Design Team should ensure the footpath and carriageway drainage is sufficient.

3.15.4 Problem

The Audit Team note that the existing access to East Timor park at B4570 has not been provided for in the proposed footway. The Audit Team are concerned that pedestrians will use the grass verge or cycle track at this point to access the park resulting in a slipping hazard or potential to be knocked down by a cyclist respectively.



Figure 3.21 Water Flowing along Sarsfield Rd



Figure 3.22 Park Gate

Recommendation

The Design Team should provide a footpath to this location.

3.15.5 Problem

It is noted that the cycle track at the end of the scheme along Con Colbert Road does not tie-in to the adjacent road layout. The Audit Team are concerned that this may result in cyclist confusion and increased risk of conflict with motorists.

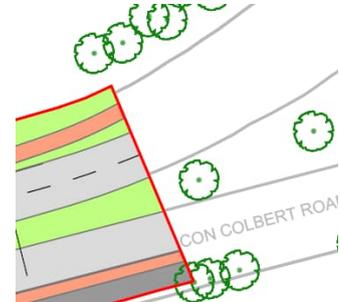


Figure 3.23 Cycle Scheme Tie-in

Recommendation

The Design Team should provide an appropriate cycle track tie-in.

3.15.6 Problem

Site observations indicated the buildup of detritus/ moss on the northern footpath along Con Colbert Road which could lead to an increased risk of slips/ falls by mobility impaired pedestrians.



Figure 3.24 Con Colbert Rd Footpath

Recommendation

The Design Team should highlight the issue to the Local Authority for resolution.

3.16 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0019)

3.16.1 Problem

It is noted that existing yellow box road markings for a 'lollipop-lady' crossing at chainage E360 has been omitted. The Audit Team are concerned that this desire line has not been maintained and mobility impaired pedestrians and school children wishing to use this crossing may get struck by a moving car while trying to cross the road.



Figure 3.25 Inchicore National School

Recommendation

The Design Team should reinstate the existing road markings and provide dished kerbs.

3.16.2 Problem

The Audit Team note the absence of a pedestrian crossing on the Grattan Crescent arm of the junction at chainage E440. The Audit Team are concerned that a desire line exists resulting in an increased risk of pedestrians crossing Grattan Crescent in an uncontrolled manner in conflict with motorists.

Recommendation

The design team should make provision for a pedestrian crossing across the Grattan Crescent arm of this junction.

3.16.3 Problem

The Audit Team note the retained tree line along Memorial road. With the inclusion of a new cycle lane, the footway has been pushed between the trees and the red line boundary. The Audit Team are concerned that, given the undulating root-induced surface adjacent to the trees, this will result in a tripping hazard for pedestrians.

Recommendation

The Design Team should consider flexible pavements or footway realignment.

3.16.4 Problem

The Audit Team note that the proposed design does not include access/egress points to/from Con Colbert House (East and West) and this will create conflict with proposed cyclist and pedestrian movements at this access resulting in potential pedestrian/cyclist injury.

Recommendation

The Design Team should ensure access/ egress is maintained.

3.16.5 Problem

It is noted that Memorial Rd is being changed from 1-way to 2-way and interfaces with another BusConnects scheme. In the absence of swept-path analysis or signal phasing arrangements for the junction with Con Colbert Rd, it is unclear if this junction has been adequately considered and the Audit Team are concerned that vulnerable road users will be impacted upon resulting in conflict with vehicles.

Recommendation

The Design Team should include this junction and its operation in the scheme.

3.16.6 Problem

It is noted that the cycle tracks at the end of the scheme along Memorial Road do not tie-in to the adjacent street layout. The Audit Team are concerned that this may result in cyclist confusion and cyclists leaving the cycle track abruptly in conflict with oncoming vehicles.

Recommendation

The Design Team should provide an appropriate cycle track tie-in.



Figure 3.26 Cycle Scheme Tie-in

3.16.7 Problem

It is noted that currently there is a 2-way cycle lane just east of the Memorial Rd/ Inchicore Rd junction at B5220. This is not on the proposed drawings and it is unclear how the proposed scheme will tie into these existing cycle lanes. The Audit Team are concerned this will lead to an increased risk of driver/cyclist confusion.

Recommendation

The Design Team should provide an appropriate tie-in to the existing cross section.



Figure 3.27 Existing 2way Cycleway

3.17 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0020)

3.17.1 Problem

It is noted the proposed pedestrian crossing on the western side of the junction at B5800 ties into a steep gradient of existing footway, protected by railings. The Audit Team are concerned that the existing levels may lead to an increased risk of trips and falls for mobility impaired pedestrians

Recommendation

The Design Team should review the appropriateness of installing a pedestrian crossing at this location.



Figure 3.28 Proposed Crossing

3.17.2 Problem

It is noted that there is an existing designated disabled parking space outside 167 Emmet Road. The Audit Team is concerned that its omission will mean disabled motorists/passengers will be unable to access their homes or destinations.

Recommendation

The Design Team should determine if a disabled parking space is to be maintained at this location. If retained, it should be designed in accordance with BusConnects design guidance.

3.17.3 Problem

It is noted that the existing uncontrolled crossing, including tactile paving and pedestrian build-outs and raised table, has been omitted from the proposed design at chainage B5950. The Audit Team are concerned that the removal of pedestrian facilities at this desire line, in conjunction with a widened road, will result in an increased risk of pedestrian/ motorist conflicts.

Recommendation

The Design Team should make provision for a pedestrian crossing, including traffic calming, at this location to maintain the existing desire line.

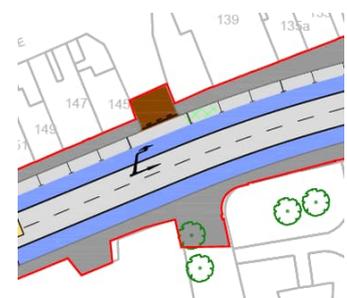


Figure 3.29 Removed Crossing

3.17.4 Problem

It is noted that there are on street parking bays immediately adjacent to the junction with Camac Close (Chainage 5930). As this is an unsignalised junction, the Audit Team are concerned that parked vehicles (particularly high sided vehicles) will compromise the visibility splay for vehicles exiting Camac Close onto an already widened road. The lack of visibility exiting the junction may lead to an increased risk of collision.

Recommendation

The Design Team should make provision for increased visibility splay, as per DMURS guidance, at this location or signalise this junction in conjunction with any signalised pedestrian crossing as per Problem 3.18.3.

3.17.5 Problem

The Audit Team is concerned that the lack of a taper to introduce the disabled parking bay at Chainage B5500 may lead to increased risk of loss of control type collision due to mounting of the kerb.

Recommendation

The Design Team should ensure that a taper is provided to introduce the disabled parking bay.

3.17.6 Problem

The Audit Team is concerned that the ponding of water on the footpath at chainage B5600 may lead increased the risk of slips and falls due to ice during cold conditions

Recommendation

The Design Team should ensure the drainage provision is adequate.



Figure 3.30 Ponding of water

3.18 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0021)

3.18.1 Problem

It is noted that there are on street parking bays close to the junction with Bulfin Road. As this is an unsignalised junction, the Audit Team are concerned that parked vehicles (particularly high sided vehicles) will compromise the visibility splay for vehicles exiting Bulfin Road leading to an increased risk of head on/ side impact type collisions.

Recommendation

The Design Team should provide an appropriate visibility splay at this location or signalize this junction in conjunction.



Figure 3.31 Impact on Bulfin Rd Visibility Splay

3.18.2 Problem

It is noted that the existing right turning pocket for eastbound traffic entering Bulfin Road has been removed and traffic will have to cross two lanes of traffic in an uncontrolled manner. The Audit Team are concerned that traffic will build up behind right turners and lead to an increased risk of driver frustration resulting in appropriate right turning movements.

Recommendation

The Design Team should include traffic calming (table ramp) at this junction to ensure consistency of approach.

3.18.3 Problem

It is noted that existing traffic calming features at chainage B6230 but is omitted from any proposed designs. In the absence of any proposed traffic calming measures or speed limit signs on a wider street cross-section at this location, the Audit Team are concerned that excessive speed will result in side-swipe or head-on type collisions at this location.

Recommendation

The Design Team should consider traffic calming measures at this location.

3.18.4 Problem

It is noted that there are perpendicular parking spaces at Chainage B6200. The Audit Team are concerned resident entering/exiting these spaces won't have ample sightlines, particularly where parked next to a high sided vehicle. This could result in an increased risk of conflict between cars and vehicles in the bus lane.

Recommendation

The Design Team should consider replacing these spaces with diagonal spaces to improve visibility.

3.18.5 Problem

It is noted that there are on street parking bays close to the junctions with both Luby Road and Turvey Avenue. As these are unsignalised junctions, the Audit Team are concerned that parked vehicles (particularly high sided vehicles) will compromise the visibility splay for vehicles exiting these streets on an already widened road, leading to an increased risk of head on/ side impact type collisions.

Recommendation

The Design Team should make provision for increased visibility splays, as per DMURS guidance, at this location.

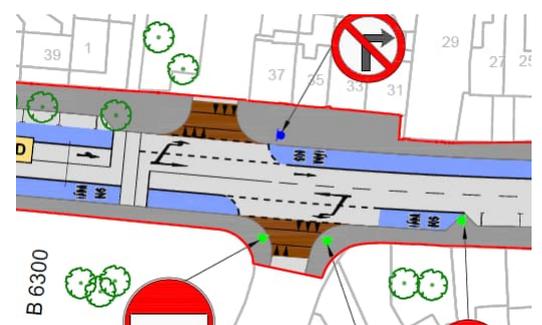


Figure 3.32 Visibility Splays

3.18.6 Problem

It is noted that there is no left turn onto Luby Road for westbound traffic respectively. There are a street signs outlining no access / no left turn however the road markings indicate a left turn. The Audit Team are concerned this may result in driver confusion resulting in the risk of head-on type collisions.

Recommendation

The Design Team should review road markings at this location and amend as appropriate.

3.19 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0022)

3.19.1 Problem

It is noted that the junction at chainage B6570 has a small fillet radius in the south east corner and it was observed that turning trucks cannot turn from the eastern arm onto the southern arm without crossing the existing stop line on the southern arm. The Audit Team are concerned that this may result in an increased risk of trucks mounting the kerb or conflicts with cyclists in the Advanced Stacking Lane.

Recommendation

The Design Team should review all movements at this junction in conjunction with swept path analysis and recess stop lines as required.

3.19.2 Problem

The Audit Team is concerned that the road markings approaching the stop line for general traffic on Emmet Road contradict the proposed signals arrangement with respect to right turning traffic.

Recommendation

The Design Team should ensure the road markings are appropriate.

3.20 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0023)

3.20.1 Problem

It is noted that a new pedestrian crossing is proposed at chainage B6850 which is at a narrow bend in the road with compromised sightlines. The Audit Team are concerned that the primary signal head on the northern side of the street may not be visible to eastbound traffic as it is on the inside of the bend and the footway is narrow. This may lead to pedestrians crossing the street being struck by cars.



Figure 3.33 Pedestrian Crossing

Recommendation

The Design Team should review sightlines at this location and consider installing a cantilever secondary signal on the southern side of the road to enhance driver visibility of the signals for eastbound traffic (similar to the existing pedestrian crossing arrangement at B5770).

3.20.2 Problem

It is noted that the existing entrance at B7115 has no proposed raised table across its apron. The Audit Team are concerned that the lack of traffic calming may encourage higher speeds increasing the likelihood of a pedestrian being struck at this location.

Recommendation

The Design Team should provide a raised table at this location.

3.20.3 Problem

The Audit Team is concerned that the sloped part of the ramp at chainage 7040 is within the desire line of pedestrians on the footway may lead to an increased risk of slips for pedestrians crossing the road.

Recommendation

The Design Team should ensure the tabletop ramp is sufficiently wide to cover the pedestrian desire lines.

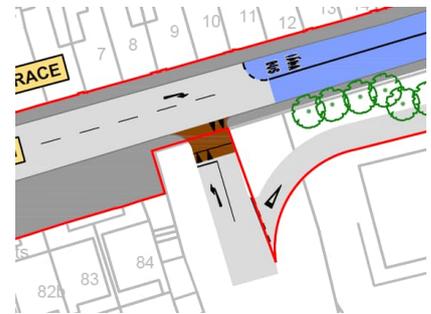


Figure 3.34 Narrow Raised Table

3.21 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0025)

3.21.1 Problem

It is noted that the existing cycle track across the island between the Luas and vehicular entrances to St James hospital has been removed. The Audit Team are concerned that a reduced level of priority across this island for both pedestrians and cyclists will result in an increased risk of conflict with pedestrians.

Recommendation

The Design Team should review pedestrian and cyclist movements through this junction to ensure appropriate separation.



Figure 3.35 Cycle Desire Line

3.21.2 Problem

The orientation of the staggered pedestrian crossing on James's Street at chainage B7550 will result in pedestrians being forced to turn their back on the traffic stream which they are about to cross. This may result in pedestrians stepping off the footway into approaching traffic.

Recommendation

The Design Team should consider replacing the staggered crossing with a straight crossing to align with the natural desire line.

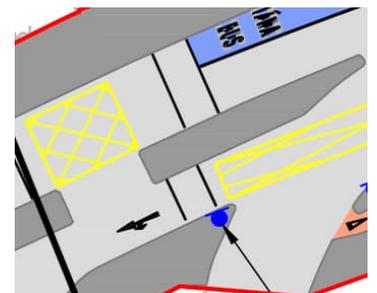


Figure 3.36 Staggered Crossing

3.21.3 Problem

It is noted that a cycle track is proposed on the island at B7730 adjacent to the existing Luas line. It is not clear as to the direction of travel of the cycle or what the exact desire line is to access this is relative to vehicles and/or tram tracks or if signaling priority has been provided to access it. The Audit Team are concerned that there is a risk of:

1. Cyclists making dangerous maneuvers to access this with associated risks of being struck by a vehicle;
2. Cyclists striking the ill-positioned 'Tram Only' pole on entry;
3. Cyclists getting stuck in the parallel recessed tram tracks trying to enter the new cycle track;
4. Pedestrians using the existing pedestrian crossing over the Tram Lane to the west of this island may be struck by cyclists.

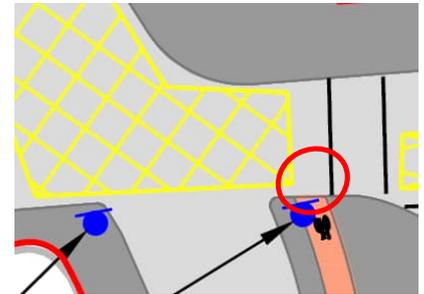


Figure 3.37 New Cycle Track

Recommendation

The Design Team should consider how cyclist will traverse the junction and approach this new cycle track.

3.21.4 Problem

It is noted that there are currently two unsignalised pedestrian crossings across the tram tracks at B7710. It is not clear how pedestrians using these will then traverse the new cycle track. The Audit Team is concerned that there is an increased risk of conflict between pedestrians and cyclists.

Recommendation

The Design Team should consider how the interaction between pedestrians and cyclists will occur on this island.

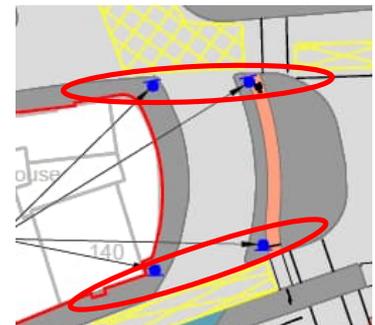


Figure 3.38 Unsignalised Crossings

3.21.5 Problem

It is noted that there is a new inbound unprotected cycle lane from Bow Lane West, replacing existing parking at B7750. It is not clear how the immediate tie in with the surrounding streetscape will facilitate this cycle lane or how it will stop vehicles parking here. The Audit Team are concerned this will result in cyclists making sudden maneuvers to access this or avoid parked cars posing the risk of cyclists being hit by a car.

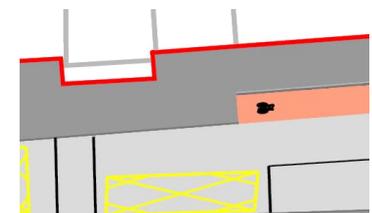


Figure 3.39 Cycle Lane Tie-

Recommendation

The Design Team should consider the cycle lane tie in and how parking may be prohibited at this location.

3.21.6 Problem

It is noted that the existing 2-way link east of the tram tracks, at B7750, is to be replaced with a 1-way route. The northern end of this link does not have associated road markings and road signs outlining this. The Audit Team are concerned that existing traffic turning into this link will be unaware leading to an increased risk of head-on collisions.

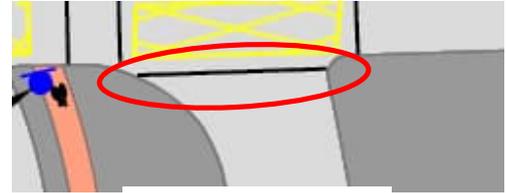


Figure 3.40 No Entry

Recommendation

The Design Team should include road markings and signage to notify this movement is barred.

3.21.7 Problem

It is noted that there is a merge between 2 inbound cyclists at chainage B7800. It is not clear from the drawings which lane has priority or where pedestrians are to cross. The Audit Team are concerned that there is an increased risk of conflict between cyclists and pedestrians.

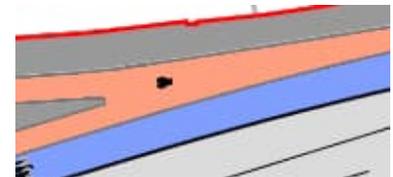


Figure 3.41 Cycle Merge

Recommendation

The Design Team should ensure the needs of both cyclists and pedestrians (including mobility impaired pedestrians) are addressed in this location.

3.21.8 Problem

It is noted that there is a new inbound cycle lane at B7750. In the absence of swept path analysis, it is not clear if vehicles (particularly buses) can adequately navigate past the commencement of the cycle lane. The Audit Team are concerned that cyclists may be sideswiped by buses.

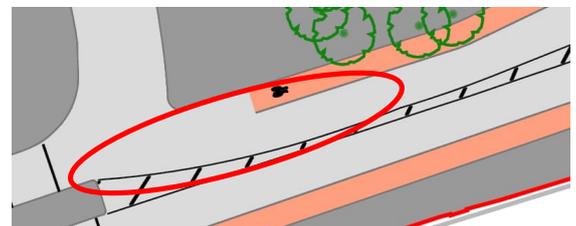


Figure 3.42 Vehicle Swept Path

Recommendation

The Design Team should review this cycle lane in terms of vehicle swept path and overall lane widths at this cross section.

3.21.9 Problem

It is noted that there are a number of inline bus stops proposed between Chainage B7850 to 8700 (Sheets 25 to 27). In the absence of further detail, it is not clear if passengers should board/alight from the bus on the cycleway. The Audit Team are concern this will result in an increased risk of conflict between pedestrian/passengers and cyclists.

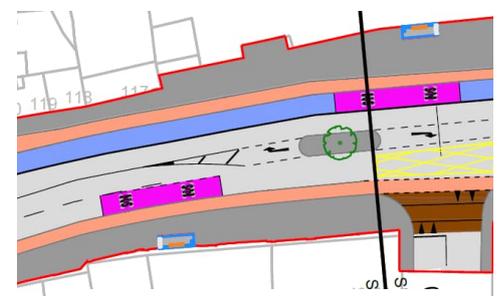


Figure 3.43 In-line Bus Stops

Recommendation

The Design Team should review pedestrian/passenger and cyclist interaction at the bus stops between Chainage B7850 and 8700.

3.22 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0026)

3.22.1 Problem

It is noted that the existing yellow box-junction across Crane Street has not been maintained in the proposed drawings. The Audit Team are concerned that right turners will experience difficulty in undertaking the manoeuvre during peak periods, leading to an increased risk of driver frustration and head on/ side impact type collisions.

Recommendation

The Design Team should reinstate the yellow box at this location.

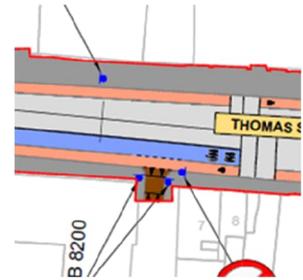


Figure 3.44 Box Junction

3.23 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0027)

3.23.1 Problem

It is noted that the western end of the junction is much narrower than the eastern end. Due to abrupt change in alignment and lack of central islands, the Audit Team are concerned that westbound buses will either overrun the cycle lane leading to an increased risk of bus/ cyclist conflicts or sideswipe collisions with vehicles in the general traffic lane.

Recommendation

The Design Team should review the swept path of vehicles through the junction



Figure 3.45 Pinchpoint

3.23.2 Problem

It is noted that the southern arm of this junction has no pedestrian crossing provision. The Audit Team are concerned that pedestrians will step out between gaps in the traffic and may be struck by a vehicle.

Recommendation

The Design Team should consider including a pedestrian crossing here and including it into the phasing arrangement.



Figure 3.46 Pedestrian Crossing

3.24 General Arrangement Drawing (BCIDB-JAC-GEO_GA-0002_XX_00-DR-CR-0028)

3.24.1 Problem

It is noted that the existing pedestrian crossing at B8750 has a very narrow central island which appears to be retained in the proposed drawings. During the site visit it was established that there is a single strip of tactile paving as shown. The Audit Team are concerned that visually impaired pedestrians crossing this will either step over it or be confused about its purpose.



Figure 3.47 Central Island

Recommendation

The Design Team should review this crossing and ensure it is fit for purpose for universal access.

3.24.2 Problem

At chainage B8740, the Audit Team is concerned that the width of the pedestrian crossing (>4 lanes) may result in vulnerable road users having insufficient time to cross the carriageway.

Recommendation

The Design Team should ensure that sufficient green time is provided to allow vulnerable road user to cross the road in a single movement.

3.24.3 Problem

It is noted that there is a right turn only bus lane on the Thomas St approach to the junction at B8800. The Audit Team are concerned that taxis, private buses etc. may try to make a left turn at this junction and as there is no signal stage for this movement or available geometry, leading to an increased risk of driver confusion and sudden changes in lane leading to side swi pe collisions.

Recommendation

The Design Team should consider advanced warning signage to ensure motorists appreciate the road layout ahead.

3.24.4 Problem

It is noted that there is a general traffic lane for left and right turners. In the absence of swept path analysis, the Audit Team are concerned that left turning larger vehicles here may over run the protected cycle way resulting in cyclists being sideswiped and injured.

Recommendation

The Design Team should review the swept path analysis for left turning movement for larger vehicles to ensure it does not impact upon proposed concrete islands.

3.24.5 Problem

It is noted that the tie-in at the end of the scheme at B9017 shows protected cycle lanes, but it is not clear how the existing street network of lanes will tie tie-in these will tie-in to the surrounding street network

Recommendation

The Design Team should provide a suitable tie in with the existing cross section.

4. System Design Drawings

4.1 BCIDB-JAC-TSM_SJ-0007_XX_00-DR-TR-0001

4.1.1 Problem

The Audit Team note that the phasing diagram for the system design drawings is the same for the junctions at A450 (Fonthill Rd/Retail Shopping Centre) and A180 (Fonthill Rd). As such the phasing diagram for the junction at A450 has not been included in this Audit and thus cannot be audited from a safety perspective.

Recommendation

The Design Team should revise the phasing diagram on the drawings associated with the junction at A450 (Fonthill Rd/Retail Shopping Centre) to the correct phasing diagram.

4.2 BCIDB-JAC-TSM_SJ-0007_XX_00-DR-TR-0002

4.2.1 Problem

It is noted that there is a left turn only bus lane from the south. It is not clear from the Systems drawings, or otherwise, how bus/ taxi drivers using this lane and wanting to turn right can do so as there will be a conflicting movement with right turning buses from the west (Figure 4.1). This may cause bus driver error resulting in head-on/ side impact type collisions.

Recommendation

The Design Team should create a separate phase for right turning buses/ taxis or give ample warning that right turning buses/ taxi should use the general traffic lane at this location.

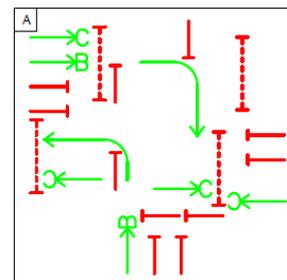


Figure 4.1 Phase A arrangement

4.2.2 Problem

The Audit Team is concerned that right turning bus on Fonthill Rd eastbound will conflict with westbound cyclists moving straight through the junction

Recommendation

The Design Team should create a separate phase for these two traffic movements indicated in Phase A of the signals.

4.3 BCIDB-JAC-TSM_SJ-0007_XX_00-DR-TR-0003

4.3.1 Problem

The Audit Team note that, with respect to cyclists crossing the eastern and western arms of the junction, there is provision for cyclists crossing only one half of the arm at a time (i.e. Phase B and C). This would insinuate that it is the designer's intention to have cyclists staking on the central island at some point in the cycle. The Audit Team is concerned that there may not be ample queuing capacity in the island resulting in cyclists partly stopping in the traffic lane and potentially being struck by a moving vehicle causing cyclist injury.

The design team should review the queuing capacity across this junction for cyclists in the context of intended cyclist signaling and priority.

4.3.2 Problem

The orientation of the staggered pedestrian crossing on the eastern arm of the junction will result in pedestrians being forced to turn their back on the traffic stream which they are about to cross. This may result in pedestrians stepping off the footway into approaching traffic.

Recommendation

The Design Team should review the staggered crossing on the eastern arm and replace it with a single crossing the full width of the road. The signal green time should be sufficient to allow cyclists to cross the full carriageway.

4.4 BCIDB-JAC-TSM_SJ-0007_XX_00-DR-TR-0004

4.4.1 Problem

It is noted that on the eastern side of the bridge, there is no island separating the general traffic lane and bus lane and consequently there are no signal heads between the two lanes. As such, motorists may not be able to see the signal head for the bus lane and may get confused as to their priority and may pull away resulting in a sideswipe type collision. (Figure 4.2).

Recommendation

Where it is not possible to provide a splitter island due to cross section constraints, the Design Team should consider putting in overhead gantry signals for both lanes.

4.5 BCIDB-JAC-TSM_SJ-0007_XX_00-DR-TR-0005

4.5.1 Problem

It is noted that in Phase A of the signal phases, it is proposed to have westbound cyclist and bus movements through the junction simultaneously. The Audit Team are concerned that left turning buses/taxis using the bus lane during this phase may conflict with cyclists, leading to an increased risk of collision.

Recommendation

The Design Team should review operation of this junction to remove the possibility of this conflict occurring.

4.6 BCIDB-JAC-TSM_SJ-0007_XX_00-DR-TR-0006

4.6.1 Problem

It is noted that signal phase C permits the bus lane and general traffic lane to perform left turns simultaneously, resulting in an increased risk of side swipe collisions.



Figure 4.2 M50 Overbridge east

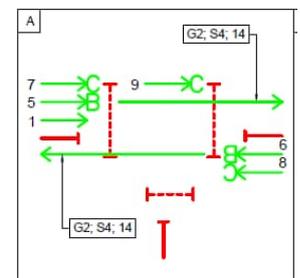


Figure 4.3 Phase A Arrangement

Recommendation

The Design Team should consider separating these two movements or undertake swept path analysis/ provide lane guidance line markings for the two left turn lanes.

4.7 BCIDB-JAC-TSM_SJ-0007_XX_00-DR-TR-0010

4.7.1 Problem

The phasing arrangement proposes to have westbound cars (straight ahead and left) in the same phase as westbound cyclists crossing the junction. The Audit Team are concerned that this will result in an increased risk of driver/cyclist conflicts.

Recommendation

The Design Team should review the signal operations at this location to provide clarity and separate the cyclist and vehicular movements.

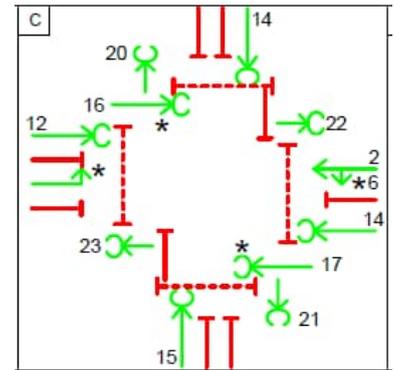


Figure 4.4 Phase C Arrangement

4.8 BCIDB-JAC-TSM_SJ-0007_XX_00-DR-TR-0013

4.8.1 Problem

It is noted that in the case of the northern southern and eastern arms, the phasing arrangement proposes to have straight ahead and left turning vehicular movements in the same phase as cyclists crossing the respective left turning arms. The Audit Team is concerned that this will result in an increased risk of vehicle/ cyclist conflicts.

Recommendation

The Design Team should review the signal operations at this location to provide clarity and separate the cyclist and vehicular movements.

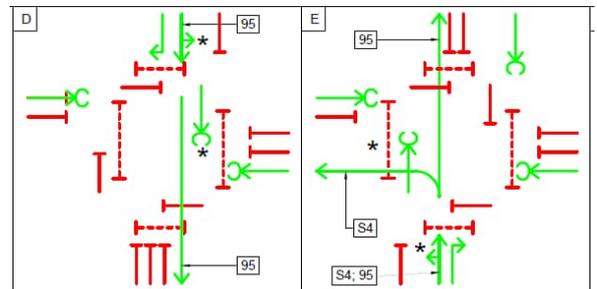


Figure 4.5 Phase D&E Arrangement

4.9 BCIDB-JAC-TSM_SJ-0007_XX_00-DR-TR-0015

4.9.1 Problem

The Audit Team note that there is no provision for right turning buses from the west at the junction outlined. It appears that this stage has been fully omitted from Phase E (and is red in all other phases) so the Audit Team assume that it is intended to be provided in this phase. If so, this will not be compatible with the right turning buses from the underpass and result in side impact type collisions.

Recommendation

The Design Team should review provision of right turning buses from the west and from the bridge underpass and ensure all of these stages have been separated.

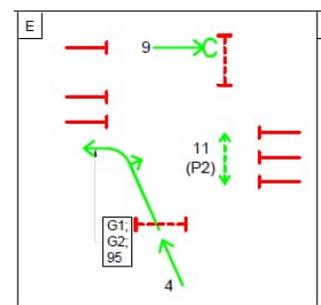


Figure 4.6 Phase E Arrangement

4.9.2 Problem

The Audit Team are concerned that due to the proximity between the Con Colbert Rd junction and the proposed signals under the rail bridge, there is the increased risk of vehicle queues backing up onto Con Colbert Rd and impacting upon cyclist/ pedestrian signal phases and causing driver frustration/ aggressive behaviour.

Recommendation

The design team should consider measures to minimize queuing of traffic between the two junctions.

4.10 BCIDB-JAC-TSM_SJ-0007_XX_00-DR-TR-0016

4.10.1 Problem

The Audit Team is concerned that the junction's intervisibility zone may be hindered by existing boundary treatments leading to a risk of unsafe manoeuvres/ conflict with pedestrians once the driver has entered the junction Intervisibility zone.

Recommendation

The junction layout should be reviewed to ensure that an appropriate intervisibility zone can be provided, with a distance of 2.5m back from all stops lines on each arm to be visible to vehicles waiting at all other stop lines throughout the junction. Intervisibility between motorists and VRUs attempting to cross at any of the crossings should also be clear and unobstructed at all times.

4.10.2 Problem

It is noted that the phasing arrangement for the junction at B5220 does not feature signalisation for all intended cycle movements through this junction. In the absence of this information, the Audit team are concerned that this will result in cyclist and driver confusion posing the risk of cyclists being struck by cars or pedestrians being struck by cyclists using the footway and pedestrian crossings.

Recommendation

The design team should review signal operations at this location to facilitate all intended cyclist movements through this junction or install signage to outline they are barred movements.

4.11 BCIDB-JAC-TSM_SJ-0007_XX_00-DR-TR-0017

4.11.1 Problem

The Audit Team are concerned that it may be unclear as to whether straight ahead manoeuvres are permitted for cyclists/coach/ taxi movements from Grattan Crescent onto Inchicore Road which could conflict with the bus right turn from Sarsfield Rd onto Grattan Crescent. There is an increased risk of inappropriate movements leading to collisions.

Recommendation

The Design Team should review signal phasing operations at this location and provide clear road marking and signage as to the permitted turning movements.

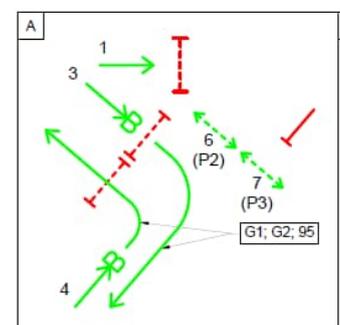


Figure 4.7 Phase A Arrangement

4.12 BCIDB-JAC-TSM_SJ-0007_XX_00-DR-TR-0022

4.12.1 Problem

The Audit Team is concerned that there are no primary or secondary signal heads proposed on the junction arm shown in Figure 4.9. There is an increased risk of vehicles overshooting the junction leading to vehicular collision.

Recommendation

The design team should signalise this arm of the junction, ensuring it is clear as to what turning movements are permitted.

4.12.2 Problem

The Audit Team is concerned that signal drawings indicate a straight-ahead movement, where a left and right turn is possible. The proposed road markings may increase the risk of driver confusion.

Recommendation

The design team should ensure that the road markings approaching the junction are appropriate.

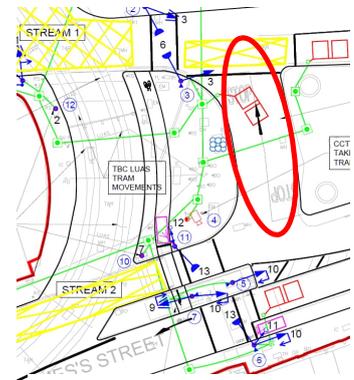


Figure 4.8 Lack of proposed signals

5. Traffic Signs and Road Markings

5.1 BCIDB-JAC-TSM_GA-0007_XX_00-DR-CR-0004

5.1.1 Problem

The Audit Team is concerned there are insufficient 'keep left' bollards approaching the concrete islands at Chainage B200 and B300 respectively. There is a risk of drivers being unaware of the road layout ahead leading to loss of control type collisions.

Recommendation

The Design Team should ensure appropriate warning signage is provided.

5.2 BCIDB-JAC-TSM_GA-0007_XX_00-DR-CR-0005

5.2.1 Problem

The Audit Team note that the existing 'Keep Clear' road marking at chainage B110 has been omitted from the proposed design. The Audit Team is concerned that right turners leaving this access point will have reduced priority leading to an increased risk of driver frustration and inappropriate turning movements.

Recommendation

The Design Team should reinstate the yellow box in their design at this location or ban right turning traffic exiting.

5.3 BCIDB-JAC-TSM_GA-0007_XX_00-DR-CR-0008

5.3.1 Problem

The Audit Team is concerned that a W130 Road Hump warning sign is proposed B1450. It unclear from the drawings provided, the requirement for this sign and that eastbound traffic only are notified.

Recommendation

The Design Team should ensure the warning signage is appropriate to the road layout ahead.

5.4 BCIDB-JAC-TSM_GA-0007_XX_00-DR-CR-0012

5.4.1 Problem

The Audit Team is concerned that there is insufficient warning signage along Kylemore road to advise motorists of the pedestrian crossings (Chainage D 80 and D 340) the signalised junction and proximity to Ballyfermot College and St Michaels National School.

Recommendation

The Design Team should ensure the warning signage is appropriate to the road layout ahead.

5.5 BCIDB-JAC-TSM_GA-0007_XX_00-DR-CR-0014

5.5.1 Problem

The Audit Team is concerned that there is insufficient warning signage along Ballyfermot Road to advise motorists of the pedestrian crossings (Chainage B 3020 and B 3230) and proximity to Raphael's National School and De La Salle National School.

Recommendation

The Design Team should ensure the warning signage is appropriate to the road layout ahead.

5.5.2 Problem

'YIELD' road markings are proposed on the minor approaches on Lynch's Lane. There is a risk that motorists in the absence of a 'STOP' sign, will not come to a complete stop and come into conflict with cyclists and pedestrians on Ballyfermot Rd.

Recommendation

It is recommended that a consistent approach is implemented and 'STOP' signage and road markings are provided at T junctions.

5.6 BCIDB-JAC-TSM_GA-0007_XX_00-DR-CR-0015

5.6.1 Problem

The Audit Team is concerned that a keep left bollard is proposed at Chainage B3470 in the absence of a traffic island. There is an increased risk that this warning sign will be struck by passing vehicles.

Recommendation

The Design Team should ensure the warning signage can be positioned safely to advise motorists of the road layout ahead.

5.6.2 Problem

'YIELD' road markings are proposed on the minor approaches on St Laurence's Road. There is a risk that motorists in the absence of a 'STOP' sign, will not come to a complete stop and come into conflict with cyclists and pedestrians on Sarsfield Road.

Recommendation

It is recommended that a consistent approach is implemented and 'STOP' signage and road markings are provided at T junctions.

5.7 BCIDB-JAC-TSM_GA-0007_XX_00-DR-CR-0018

5.7.1 Problem

The Audit Team note the proposal of 'Yield' signs in the area. Due to the proposed signalisation of the underpass, this yield sign may cause driver confusion resulting in rear shunt or head on type collisions.

Recommendation

The Design Team should remove the proposed yield sign in this area and replace with a signals warning sign.

5.7.2 Problem

The Audit Team is concerned that pedal cycle only – End sign is proposed along Inchicore Terrace North (Chainage E 60). This sign may cause confusion to cyclists.

Recommendation

The Design Team should ensure the information signs proposed are appropriate to the proposed layout.

5.8 BCIDB-JAC-TSM_GA-0007_XX_00-DR-CR-0019

5.8.1 Problem

It is noted that signage drawing indicate that a cyclist can proceed straight through the junction at Chainage 5220. The Audit Team is concerned that there is insufficient road markings and signals to indicate that a cyclist is permitted to proceed straight through the junction and increased risk of vehicular and cyclist conflict.

Recommendation

The Design Team should provide an appropriate cycle lane desire line through the junction here including infrastructure, signage and signal priority.

5.9 BCIDB-JAC-TSM_GA-0007_XX_00-DR-CR-0021

5.9.1 Problem

It is noted that Yield signs are proposed for traffic leaving Myra Close and Turvey Avenue. The Audit Team are concerned that these do not give enough priority to vulnerable road users resulting in the potential for these road users, particularly those with vision impairment, could be struck by vehicles.

Recommendation

The Design Team should replace the Yield Signs with Stop signs.

5.9.2 Problem

The Audit Team note that no "STOP" sign is proposed on Bulfin Rd leading to an increased risk of the vehicles overshooting the junction.

Recommendation

The Design Team should ensure that appropriate warning signage is provided.

5.10 BCIDB-JAC-TSM_GA-0007_XX_00-DR-CR-0022

5.10.1 Problem

It is noted that the junction at chainage B6570 features large, purple directional signage. Due to the footpath widths, the Audit Team is concerned that these signs may be struck by vehicles.

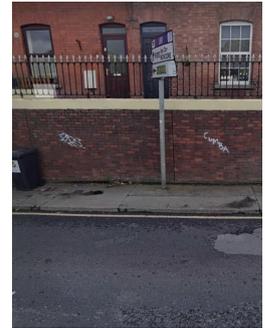


Figure 5.1 Evidence of struck signage

Recommendation

The Design Team should review all signs at this location and ensure they are set back a sufficient distance from the carriageway.

5.10.2 Problem

It is noted that the junction at B6550 features no advanced warning to motorists about the new proposed Mount Brown bus gate. The Audit Team is concerned that this may result in motorists doing last minute 3-point turns on a narrow street at the bus gate increasing the risk of pedestrians and cyclists being struck by a turning vehicle.

Recommendation

The Design Team should make provision for advanced warning signage of the bus gate on all approaches to this junction.

5.11 BCIDB-JAC-TSM_GA-0007_XX_00-DR-CR-0023

5.11.1 Problem

The Audit Team note that no “STOP” sign is proposed on Brookfield Rd leading to an increased risk of the vehicles overshooting the junction.

Recommendation

The Design Team should ensure that appropriate warning signage is provided.

5.12 BCIDB-JAC-TSM_GA-0007_XX_00-DR-CR-0026

5.12.1 Problem

The Audit Team note that no “STOP” sign is proposed on Echlin Street leading to an increased risk of the vehicles overshooting the junction.

Recommendation

The Design Team should ensure that appropriate warning signage is provided.

6. General Comments

- No detailed landscaping proposals were provided to the Audit Team. Landscaping proposals may inhibit visibility of pedestrian crossings, traffic signals and warning/ regulatory signage both in the edge of carriageway and central reserve. The design team should ensure that landscaping proposals are adequate.
- No lighting information has been provided, this information is required at Stage 2 Road Safety Audit to ensure all proposed facilities are adequately lit to prevent areas of darkness, which can contribute to collisions. Lighting columns should be placed at the back of the footpath/ cycle lane preventing any potential shadowing caused by high frequency double-decker bus services.
- It is noted at multiple locations that inbound and outbound bus stops at the one location are immediately opposite one another. Where lighting is located on the nearside of a double decker occupying each stop, this may cast an overbearing shadow on the central are of the road between the 2 vehicles.
- Clear visibility splays shall be maintained at all junctions;
- Advanced Stacking Lanes (ASLs) should be provided to facilitate right turn for cyclists. The ASL should be "fed" by a cycle lane to ensure that cyclists can pass stationary traffic and get to them. This should be applied in locations such as Inchicore Road
- Use of Kassel Kerbs at Bus Stops.
- STOP signs and markings shall be included at all on-site junctions
- Clear forward visibility splays shall be maintained around alignment radii on the site;
- Drainage gullies should be located on the upstream side of the dished kerbs to prevent water flowing across the low kerbs and depositing loose debris underfoot of pedestrians;
- Drainage gullies should be located on the upstream side of the dished kerbs to prevent water flowing across the low kerbs and depositing loose debris underfoot of pedestrians;
- Accesses in close proximity to junctions should have "KEEP CLEAR" markings utilised to allow traffic turning right into these premises access while the arm is on a red Phase.
- It is noted that in certain locations, e.g. chainage A180, the different sets of drawings (i.e. General arrangement, signage, systems etc.) did not reflect one another in terms of the proposed junction and street arrangements.

7. Audit Team Statement

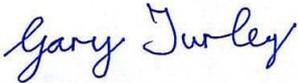
We certify that we have examined the drawings and documents listed in the appendices to this report.

The examination and subsequent report was made with the sole purpose of identifying any features of the scheme that could be removed or modified in order to improve the safety of the proposals.

The problems identified have been noted in this report together with associated safety improvement suggestions, which we recommend should be studied for implementation.

No one on the Audit Team has been involved in any way with the scheme design.

Audit Team Leader

Name:	G Turley	Signed:
	MEng HDip H'ways & Geo, HDip PM, CEng MIEI	
Position:	Associate Director	Dated: 10 th December 2020
Organisation:	Jacobs Engineering	
Address:	Merrion House, Merrion Road, Dublin	

Audit Team Member

Name:	Glenn Hingerty	Signed:
	BSc ME CEng MIEI	
Position:	Transport Engineer	Dated: 10 th December 2020
Organisation:	Jacobs Engineering	
Address:	Merrion House, Merrion Road, Dublin	

8. Supplementary Audit

In February 2022, the Design Team requested a supplementary Road Safety Audit on the Drawings listed in Appendix D, which were updated following a round of Public Consultation on the proposed scheme and internal design updates

The Audit Team was as follows:

G. Turley Team Leader	MEng, HDip PM, H Dip H'ways & Geo, CEng MIEI, Senior Associate Director, Merrion House, Merrion Road, Dublin
S Alvey Team Member	BEng Hons MIEI, Senior Engineer, Merrion House, Merrion Road, Dublin
F McDonnell Observer	CEng MIEI Senior Highways Engineer, Merrion House, Merrion Road, Dublin

The audit was carried out between Tuesday 8th March and 20th April 2022.

Weather conditions during the site visit were overcast with some showers.

9. Supplementary Audit - Site Specific Problems

9.1 General Problems

9.1.1 Problem

At a number of locations throughout the scheme, vehicles travelling in the bus lane which wish to turn left must merge into normal traffic on the right, so that they may complete the left turn manoeuvre. Where this manoeuvre is required, bespoke "merge to turn left" road markings are proposed, along with yellow box provision and M 101 Deflection Arrows. Such road markings are typically located a short distance from junctions, where they may be obscured by queuing traffic. A failure to observe these road markings may lead to vehicles attempting to turn left from the bus lane, which is not accommodated by the proposed signal phasing.



Figure 9-1 - Lack of signage re: merging to turn left

Recommendation

The Design Team should ensure that the proposed road markings are accompanied by appropriate road warning signage to explain the required manoeuvre.

9.1.2 Problem

At the following locations, vehicles were observed to be illegally parked in pedestrian and cyclist facilities.,

Location 1 – Chainage B1325 - The access road adjacent Ballyfermot Primary Care Centre (Fig 9.2)

Location 2 – Chainage D 50 – D 350 Kylemore Rd (both sides) (Fig 9.3)

Location 3 – Chainage B3775 Ballyfermot Road Eastbound

Location 4 – Chainage 4300 Sarsfield Road Eastbound

Location 5 – Chainage 7275 Mount Brown Eastbound

Location 6 – Chainage 7425 James's Street Eastbound

Recommendation

The Design Team should consider the use of physical infrastructure such as deformable bollards to prevent illegal parking.



Figure 9-2- Ballyfermot Primary Care Centre



Figure 9-3 – Kylemore Road

9.1.3 Problem

At the following locations, parallel parking is proposed to run across existing private accesses and driveways. This may result in persons having their accesses obstructed by parked vehicles.

Location 1 – Chainage B1450 – B1990 (Both sides), B2250 – B2350 Ballyfermot Road (south side)

Location 2 – Chainage D200 (east side) Kylemore Rd

Recommendation

The Design Team should remove on street parking which conflicts with existing private access and driveways.

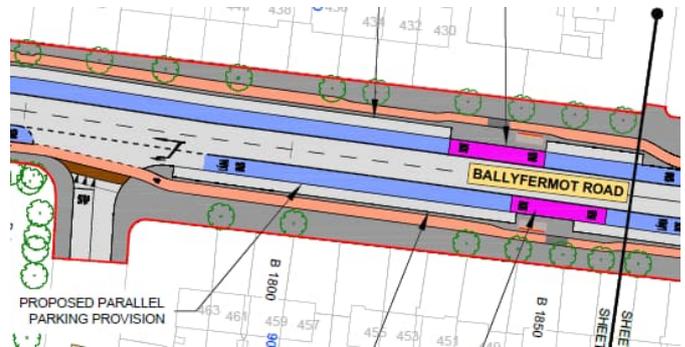


Figure 9-4 - Ballyfermot Road Parallel Parking Across Existing Driveways

9.1.4 Problem

Throughout the scheme, the arrangement for side roads shows the pedestrian crossing provision to be at footpath level via raised tables. On the side road approach to the raised table “shark tooth” markings are proposed but none are shown on the main road side of the raised table. On the main road side of the raised table, it is not clear where the ramp between road level and the raised table is to be located but could be interpreted as being located within the cycle provision.

Recommendation

The Design Team should clarify ramp arrangements for raised tables, which may need relocation away from the mainline so that there is sufficient space to reach raised table level without interfering with cycle provision.

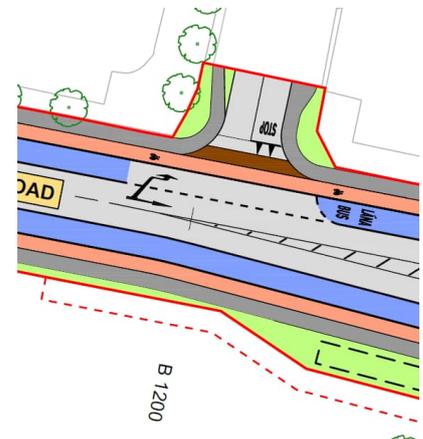


Figure 9-5 - Raised Table for pedestrian / cyclist

9.1.5 Problem

The provision of yellow box road markings at side road junctions is inconsistent throughout the scheme, including a number of locations where yellow box markings are currently provided and are not shown on the proposed design. e.g. intersection of Cloiginn Park and Ballyfermot Road.

Recommendation

The Design Team should review the approach to yellow box provision across the scheme, particularly where yellow box markings are currently provided.

9.1.6 Problem

At a number of locations throughout the scheme, parallel parking is provided parallel to raised adjacent cycling provision. When vehicles are parked close to side road junctions, intervisibility between motorists and cyclists will be poor, increasing the risk of conflict between motorists and cyclists. E.g. Junction of Blackditch Drive and Ballyfermot Road (Chainage B 1770).

Recommendation

The Design Team should shorten the proposed length of parallel parking away from side road junctions to promote intervisibility between cyclists and motorised vehicles.



Figure 9-6 - Impact of parallel parking on junction intervisibility splay (Blackditch Dr/ Ballyfermot Rd)

9.1.7 Problem

At a number of proposed crossing facilities throughout the scheme, no provision for cyclist waiting areas is proposed. A lack of such facilities may lead to an increased risk of conflict between crossing cyclists and those continuing straight on and of conflict between pedestrians and cyclists. E.g. at B1725 on Ballyfermot Road.

Recommendation

The design team should provide cyclist waiting areas or shared pedestrian and cyclist areas in the vicinity of crossings where cycle lanes are being provided throughout the scheme.



Figure 9-7 - Lack of Cyclist Waiting Area

9.1.8 Problem

Throughout the scheme, F 360 and RUS 028 signage is proposed wherever bus and cycle lane facilities are to be provided, regardless of whether cyclists are intended to use the bus lane or where an adjacent cycling facility is being provided.

Recommendation

The design team should remove the cycle symbol from proposed bus lane signage, where it is not intended for cyclists to share the bus lane facility.



Figure 9-8 - Bus signage where segregated cycle lane provision (Coldcut Rd Ch B 50)

9.1.9 Problem

At several locations within the scheme, vehicles turning left on flashing amber are required to cross the cycle track. This may lead to driver confusion regarding right of way and result in conflict between vehicles and cyclists going straight ahead. Cyclists may also be obscured behind a waiting bus between the motor vehicle and the cyclist.

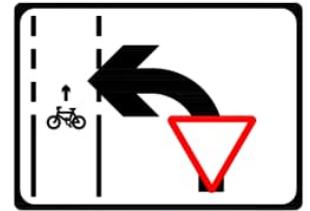


Figure 40: Proposed Bespoke Left-turn Yield Signage

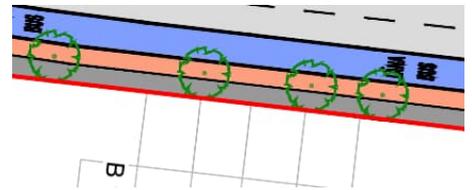
Recommendation

The design team should include additional bespoke warning signage as per Figure 40 in the NTA Preliminary Design Guidance Booklet or approved equivalent for turning left on flashing amber.

Figure 9-9 - Proposed Bespoke Left-turn Yield Signage

9.1.10 Problem

At a number of locations within the scheme, trees are shown within the proposed cycle facility on the drawings. This could lead to conflict between cycle lane kerb and cyclists swerving to avoid the trees.



Recommendation

The design team should ensure locations of trees will not obstruct pedestrian or cyclist facilities.

Figure 9-10 - Existing tree may inhibit cyclists/ pedestrians (Ch B 1475 on Ballyfermot Rd)

9.1.11 Problem

At a number of locations along the scheme, where new raised tables are being added at side road entrances, the STOP road markings are being moved further from the junction. These changes will impact on existing parallel parking on the side road. It is not clear from the drawings provided if new road marking will be provided outside the scheme tie-in point to delineate the new parking layout. This is particularly pertinent where the reduced parking is a loading bay. Confusion as to the location of the end of the permitted parking bays, or a reduced/insufficient space for vehicles loading/unloading may lead to parked vehicles encroaching on the junction, leading to conflicts with vehicles entering and existing the side road.



Figure 9-11 - Existing Loading Bay impacted upon by proposed road markings

Recommendation

The design team should ensure existing parking/ loading bay facilities at side road tie-ins are amended appropriately.

10. Supplementary Audit - General Arrangement Drawings

10.1 BCIDB-JAC-GEO_GA-0007_XX_00-DR-CR-0004

10.1.1 Problem

At the three arm junction of Fonthill Road, cyclists approaching from the east and wishing to turn right onto the two way cycle track north of the junction, will be required to wait for two signal phases in order to complete their manoeuvre. This may result in cyclists instead crossing at the pedestrian crossing, travelling a short distance against the direction of travel on the north side of the junction before continuing north on the cycle facility. This will increase the risk of conflict between cyclists and between cyclists and pedestrians.



Figure 10-1 - Scope for 2-way facility

Recommendation

The Design Team should consider the provision of a Toucan crossing on the eastern arm of Fonthill Road and a short length of bi-directional cycle facility on the north side of this junction, to accommodate the movement described above.

10.1.2 Problem

At the eastern arm of the Fonthill Road junction, the proposed pedestrian and cycle facilities do not match the existing arrangement at the tie in point. This may lead to conflict between pedestrians and cyclists.



Figure 10-2 - Existing cross section has footpath adjacent to verge and two way cycle lane on the outside

Recommendation

The Design Team should ensure there is a smooth tie-in to the existing pedestrian and cycle facilities.

10.2 BCIDP-JAC-GEO_GA-0007 XX 00 DR-CR-0005

10.2.1 Problem

There is currently an uncontrolled pedestrian crossing at chainage A110 between two opposite pedestrian accesses on Fonthill Road, which is proposed to be removed as part of the design. This may lead to pedestrians crossing where no facilities have been provided. This problem was previously raised as a Problem 3.2.5 in the original RSA.

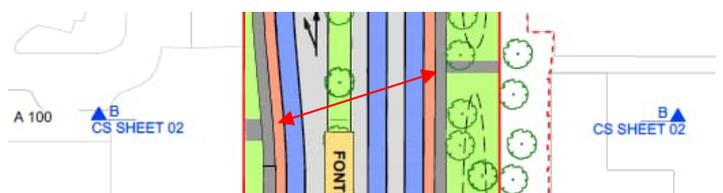


Figure 10-3 - Existing desire line/ existing uncontrolled crossing

Recommendation

The Design Team should consider the retention of crossing facilities at this location.

10.2.2 Problem

It is proposed that cyclists and pedestrians will share the existing footpath where the Coldcut Road crosses the M50, as per the current situation. The existing footpath on the bridge appears narrow for a shared pedestrian and cyclist facility, particularly on the northern side of the bridge where the available width is further constrained by the presence of two lighting columns located within the footpath. This leads to a risk of conflict between pedestrians and cyclists or cyclists swerving into trafficked lanes. This problem was previously raised as Problem 3.2.3 in the original RSA.

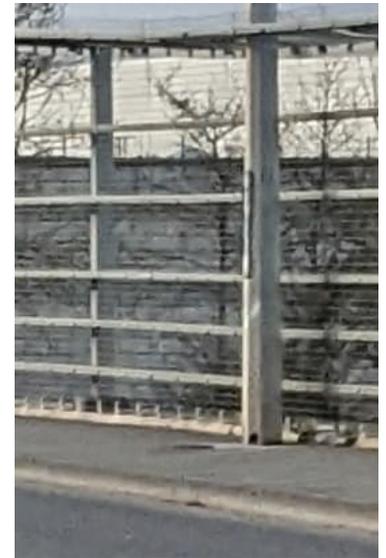


Figure 10-4 - Existing Public Lighting Configuration

Recommendation

The Design Team should consider the relocation of these lighting columns or provision of an alternative lighting design to ensure the maximum width is provided for pedestrians and cyclists across this pinch point.

10.2.3 Problem

Finding 3.2.1 from the original RSA was agreed in the original feedback form (Appendix C) to be designed out, however does not appear to be addressed in the revised drawings.

Recommendation

The Design Team should review this movement and consider removing this left turn or separating the general traffic and bus lanes from the same phase in the systems design, as agreed by Design Team in the original feedback form.

10.3 BCIDP-JAC-GEO_GA-0007 XX 00 DR-CR-0006

10.3.1 Problem

The existing grassed area in the Southeast corner of the junction of Coldcut Road and Ballyfermot Road show an existing pedestrian desire line cutting the corner across the grass, leading to a risk of trips and slips for pedestrians crossing this area during wet conditions.



Figure 10-5 - Pedestrian Desire Line

Recommendation

The Design Team should formalise this desire line through provision of a paved footpath.

10.4 BCIDP-JAC-GEO_GA-0007 XX 00 DR-CR-0007

10.4.1 Problem

The proposed arrangement for the junction between Ballyfermot Road and Coldcut Road includes for a Bus Lane, a Left Turn Only Lane and a Straight Ahead Only lane on the Ballyfermot Road Northbound Arm. There appears to be an inconsistent approach compared to adjacent junction, whereby left turning taxi/ coaches in the bus lane are not requested to merge with the general traffic lane if turning left, which may lead to driver confusion and an increased risk of collision.

Recommendation

The Design Team should clarify the Bus Lane as also being for left turning vehicles only.

10.4.2 Problem

The existing informal pedestrian link between Ballyfermot Road and Cherry Orchard Industrial Estate (B 1050) is uneven and insufficient width for users. This leads to an increased risk of trips and slips for pedestrians crossing this area and forces vulnerable road users to make a longer detour.

Recommendation

The Design Team should formalise this desire line through provision of a formal footpath.

10.4.3 Problem

The existing boundary wall adjacent to the footpath on Ballyfermot Road is damaged with loose blocks at various locations. This could lead to an increased risk of trips and slips for pedestrians.

Recommendation

The design team should ensure the repair and renewal of existing boundary infrastructure.

10.4.4 Problem

Its noted that a Cyclist Waiting Area Detail has been provided for eastbound cyclists turning right, but westbound cyclists wishing to turn right towards Cherry Orchard Industrial Estate are not catered for, leading to a risk of conflicts with pedestrians due to cyclists mounting the footpath

Recommendation

The design team should provide a consistent approach for right turning cyclists.

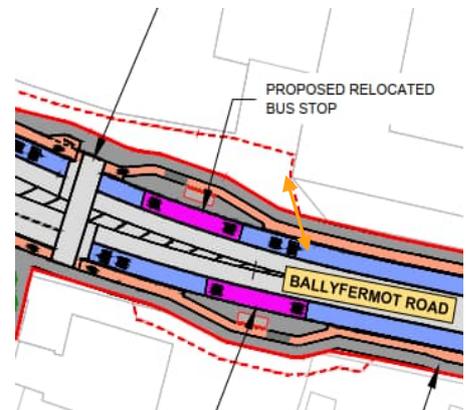


Figure 10-6 - Insufficient pedestrian provision



Figure 10-7 - Damaged boundary wall

10.5 BCIDP-JAC-GEO_GA-0007 XX 00 DR-CR-0011

10.5.1 Problem

The proposed carriageway cross section on Le Fanu Road, north of the Ballyfermot Road junction appears narrow, which could lead to cars encroaching on the proposed advisory cycle track, causing side swipe conflict between cyclists and vehicles.

Recommendation

The design team should widen the road cross section to allow full lane width adjacent to a mandatory cycle lane.



Figure 10-8 - Damaged boundary wall

10.5.2 Problem

At an existing car park access on Le Fanu Rd, the footpath kerb crosses the bellmouth giving a higher priority to pedestrians. The proposed situation provides a break in the footpath giving the vehicles entering/exiting the car park priority over pedestrians.

Recommendation

The design team should revert to the existing layout and give priority to pedestrians.

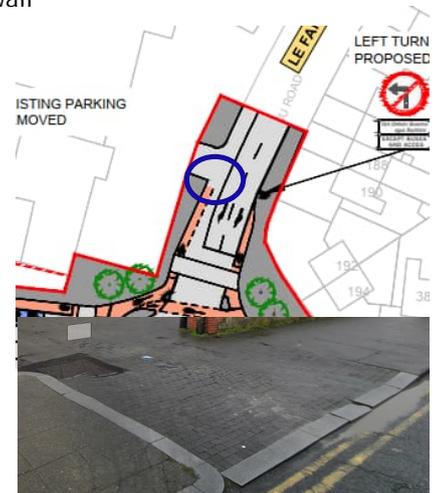


Figure 10-9 – Reduction in pedestrian priority

10.6 BCIDP-JAC-GEO_GA-0007 XX 00 DR-CR-0015

10.6.1 Problem

The proposed bus stop road marking on Ballyfermot Road, north of Markiewicz Park, does not align with the location of the proposed bus shelter (Chainage B 3300). This could lead to confusion as to where the bus should stop and conflict between pedestrians waiting/alighting from the bus, and cyclists.

Recommendation

The design team should review provision at this location, so that the proposed bus stop road marking is in line with the proposed bus shelter.



Figure 10-10 - Misalignment of Bus Shelter with Bus Stop Road Markings

10.6.2 Problem

There is currently a controlled pedestrian crossing of Ballyfermot Road to the northeast of Markiewicz Park (Chainage B 3600), which is proposed to be removed as part of the design. This may lead to pedestrians going to or from the park from the northeast crossing where no facilities have been provided.

Recommendation

The Design Team should consider the retention of a crossing facilities at this location.



Figure 10-11 - Existing formal crossing removed as part of proposed scheme

10.7 BCIDP-JAC-GEO_GA-0007 XX 00 DR-CR-0016

10.7.1 Problem

The cycle track provision on the beginning of St. Laurences Road ends with no "End of Cycle Track" Road signage being proposed, increasing the risk of conflict between cyclists and motorists.

Recommendation

The Design Team should provide "Cycle Track Ends" signage RUS 009 with Supplementary Plate P 010 and appropriate yield road markings at this location.

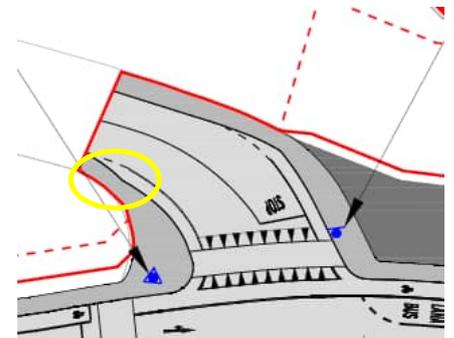


Figure 10-12 - Lack of signage for end of cycle facility

10.8 BCIDP-JAC-GEO_GA-0007 XX 00 DR-CR-0018

10.8.1 Problem

The design proposes to retain the existing pedestrian infrastructure beneath the railway bridge over Sarsfield Road, while directing all pedestrian traffic to the southern footpath. This is a significant pinch point with an increased risk of conflict between cyclists and motorised vehicles due to the lack of proposed cyclist provision. East of the bridge, the footpath on the northern side is retained, which could result in pedestrians being stranded and crossing the road at an inappropriate location in conflict with oncoming vehicles.

Recommendation

The Design Team should include for the removal of the existing limited footpath provision on the northern side of the Sarsfield Road beneath the railway bridge and investigate whether there is sufficient width to provide for cycle infrastructure in an eastbound direction through the pinch point.



Figure 10-13 - Pinch Point beneath Sarsfield Rd Bridge

10.8.2 Problem

A controlled pedestrian crossing is indicated at chainage E100 from the road markings proposed but no signal details are provided.

Recommendation

The Design Team should provide signal details at this location and detail how signal phasing will coordinate with the proposed phasing at the Con Colbert Road/ Floraville/ Sarsfield Rd Junction.

10.9 BCIDP-JAC-GEO_GA-0007 XX 00 DR-CR-0019

10.9.1 Problem

The design at the junction of Con Colbert Road and Memorial Road includes for a crossing on the eastern approach of Con Colbert Road, replacing the existing crossing on the western approach. It is not clear whether the proposed crossing will be a Toucan crossing, to accommodate cycle movements requiring crossing of Con Colbert Road, e.g. turning right into Memorial Road or turning right from Memorial Road.

Recommendation

The Design Team should ensure that appropriate crossing facilities are provided to accommodate cyclist movements at this location.



Figure 10-14 - Existing signage indicates cyclists eastbound approaching junction

10.9.2 Problem

The proposed design at the junction of Con Colbert Road and Memorial Road includes a number of new traffic movements, however a proposed Junction Systems design drawing has not been provided to demonstrate the changes to the junction arrangement. Inappropriate traffic signalling will lead to multiple conflict points between vehicles using the junction.

Recommendation

The Design Team should provide a suitable Junction Systems drawing for the new junction arrangement.

10.10 BCIDP-JAC-GEO_GA-0007 XX 00 DR-CR-0020

10.10.1 Problem

The junction of Grattan Crescent and Inchicore Terrace (Chainage B 5500) is a sharp hairpin turn onto the narrow cross section of Inchicore Terrace. During the site visit HGV traffic was observed to block Inchicore Terrace while waiting to turn onto Grattan Crescent, preventing other waiting vehicles from accessing Inchicore Terrace.



Figure 10-15 - HGV blocking access

Recommendation

The Design Team should conduct swept path analysis to ensure that the proposed stop line location on Inchicore Terrace is set back sufficiently from the junction, to safely accommodate vehicle manoeuvres between Grattan Crescent and Inchicore Terrace.

10.10.2 Problem

The proposed eastern approach to the junction of Emmet Road with St. Vincents Street West consists of a shared cycle and bus lane facility. The signal phasing at this location does not include for any left turn movement from the shared bus and cycle lane, which may result in conflict from bus, taxi or cyclists wishing to turn left onto St. Vincents Street West.

Recommendation

The Design Team should ensure that the arrangement for left turns onto St. Vincents Street is clear to all road users and that taxi/ coaches are given advance warning to merge with general traffic if they wish to turn left .

10.11 BCIDP-JAC-GEO_GA-0007 XX 00 DR-CR-0021

10.11.1 Problem

New "STOP" road marking is proposed at an existing dual HGV access off Emmet Road. The road marking extends close to an existing wall separating the two entrances, making it difficult for a vehicle exiting from the right-hand property to manoeuvre safely over to the left-hand side before the start of the marking. The addition of this new road marking may leave vehicles entering the site to believe they have a larger designated entrance area, leading to side-on collisions with the vehicles exiting from the right.



Figure 10-16 - Proximity of two adjacent entrances

Recommendation

The design team should ensure that any new "STOP" road marking is suitable for the premises or leave the existing arrangement in place.

10.12 BCIDP-JAC-GEO_GA-0007 XX 00 DR-CR-0025

10.12.1 Problem

The design includes a proposed "Quiet Street" route for cyclists along Ewington Lane (B 7550), St. James's Avenue, Grand Canal Place and Echlin Street, in place of cyclists using James's Street. The design does not appear to include any advanced directional signage advising cyclists to take this route, which may result in them staying on James's Street, where no provision for cyclists is proposed.

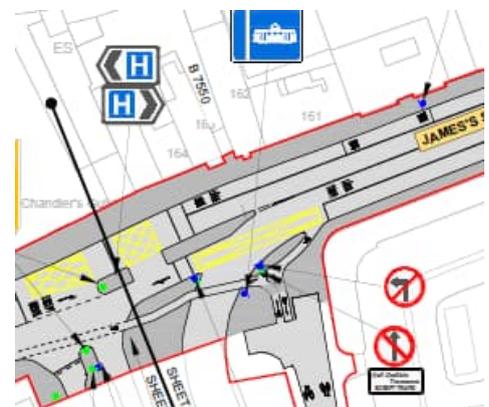


Figure 10-17 - Lack of signage for "quiet street" route

Recommendation

The Design Team should ensure the “Quiet Street” route is adequately signed.

10.12.2 Problem

The design includes a proposed “Quiet Street” route for cyclists along Newington Lane, St. James’s Avenue, Grand Canal Place and Echlin Street, in place of cyclists using James’s Street. The existing road pavement along this route is patchy and broken with numerous potholes. If the proposed alternative route is not attractive to cyclists they are unlikely to use it, travelling instead along James St where no cycle facilities have been provided, increasing the risk of conflict between cyclist and other vehicles using James St.



Figure 10-18 - Poor condition of existing road surface along proposed quiet street

Recommendation

The Design Team should improve the condition of the existing road pavement along the proposed Quiet Route to encourage cyclists use it.

10.12.3 Problem

The design includes a proposed “Quiet Street” route for cyclists along Newington Lane, St. James’s Avenue, Grand Canal Place and Echlin Street, in place of cyclists using James’s Street. It was observed on site that cars were parked on both sides of Newington Lane. The remaining available carriageway width was not sufficient for a cyclist to pass an approaching car safely, and no room available for the cyclist to pull in out of the way, leading to possible head on collisions.



Figure 10-19 - Ad hoc parking along Newington Lane

Recommendation

The design team should restrict parking on one side of Newington Lane and consider measures to enforce parking restrictions.

10.12.4 Problem

The Design Team noted Bow Lane West would be the preferred route for cyclists heading west from James St. However, it is unclear from the drawings what the proposed cycle route through the junction is from James St to Bow Lane West. There is a single cycle lane through the junction island heading from north to south but no provision is planned from south to north. There is no cycle lane or crossing facility from the central island to Bow Lane West across the LUAS tracks. A lack of clarity for cyclists on the correct route and lack of cycle track facilities through the junction may lead to cyclists making unsafe manoeuvres where there are no facilities provided, leading to risk of conflict between cyclists and vehicles.

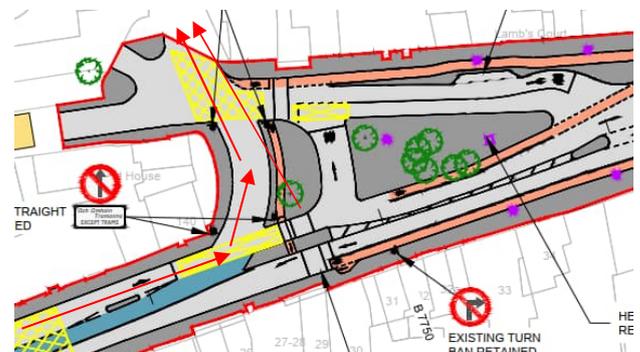


Figure 10-20 - Insufficient Cycle provision to cater for desire lines

Recommendation

The Design Team should revise the design to ensure safe cycle facilities are provided through the junction.

10.12.5 Problem

The proposed design at the junction of Echlin Street and James's Street does not include for crossing facilities on the western approach to the junction. Crossing facilities are also proposed at the junction with the Luas tracks at Bow Lane West but these do not align to the desire line of pedestrians wishing to travel to / from James's Street further east. A lack of crossing facilities in this location may result in pedestrians crossing where no facilities are to be provided (which was observed on site where pedestrians utilised traffic islands on James St), increasing the risk of conflict between pedestrians and vehicles.

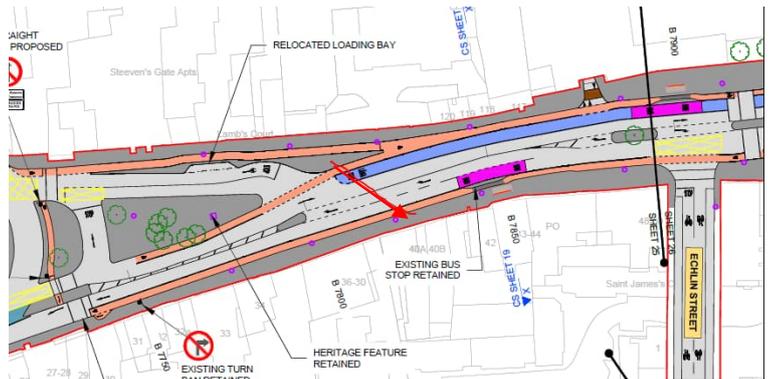


Figure 10-21 - Observed Desire Line shown in red

Recommendation

The Design Team should review crossing facilities at this location and whether additional controlled crossings are warranted.

10.12.6 Problem

The LUAS tracks turning from James's Street towards Heuston Station (by Bow Lane West), cut across the traffic lane in a curve. Where cyclists are using the traffic lane (not taking the "Quiet Street" option), there is a risk that bicycle wheels may get trapped in the LUAS rails, causing cyclists to lose control.

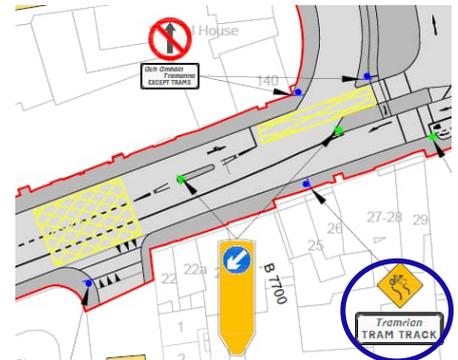


Figure 10-22 - Lack of Tram Track Signage Eastbound compared to westbound cyclists

Recommendation

The Design Team should include appropriate signage to warn cyclists of the LUAS tracks when travelling eastbound on James's Street, as is already proposed for westbound cyclists.

10.12.7 Problem

At the junction of Ewington Lane and James's Street, a bi-directional cycle facility merges with the start of the westbound cycle lane on the south side of James's Street. It is not clear which of these facilities has right of way over the other, resulting in an increased risk of conflict between cyclists.

Recommendation

The Design Team should include yield markings on one of the two stretches of cycle facilities described above.

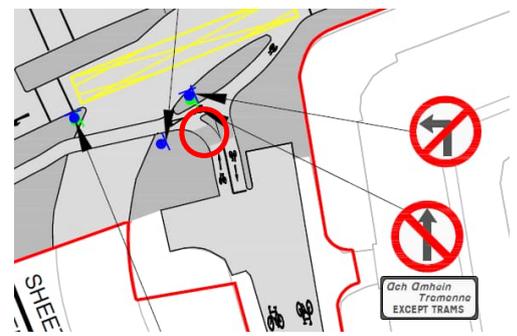


Figure 10-23 - Lack of road markings to indicate who has priority

11. Supplementary Audit – Traffic Signs and Road Markings Drawings

11.1 BCIDP-JAC-TSM_GA-0007 XX 00 DR-CR-0013

11.1.1 Problem

The proposed arrangement at the Kylemore Road/Ballyfermot Road junction shows a number of domestic accesses combined into one access on the southwest and southeast corners of the proposed junction. No provision has been made for yellow boxes on Kylemore Road to facilitate the entrance/exit of vehicles into/out of these combined accesses. In particular vehicle turning right into the accesses in the southwest quadrant could lead to waiting traffic backing up onto the junction, causing conflicts with vehicles travelling through the junction.

Recommendation

The design team should include a yellow box on approach to the junction opposite the two combined accesses to facilitate vehicles exiting onto Kylemore Road.

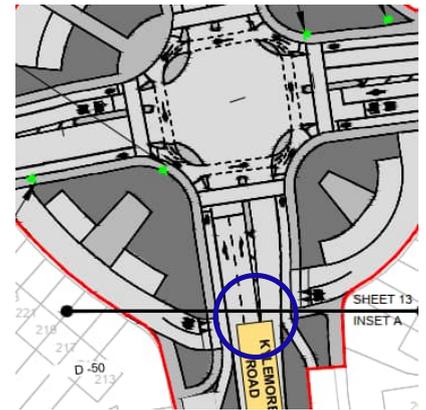


Figure 11. 1 Lack of Yellow Box

11.2 BCIDP-JAC-TSM_GA-0007 XX 00 DR-CR-0017

11.2.1 Problem

Junction visibility from the proposed STOP road marking location on First Avenue is blocked by the existing wall to the west of the junction. This may lead to unsafe turning movements and side on collisions with traffic on Sarsfield Road.

Recommendation

The design team should move the STOP road marking closer to the junction and ensure full junction visibility from First Avenue onto Sarsfield Road.

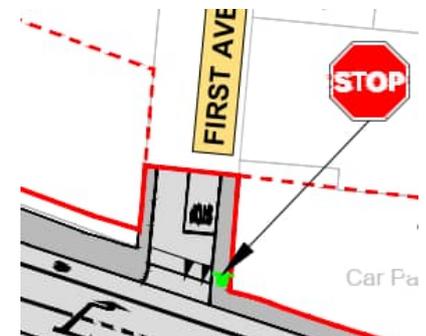


Figure 11. 2 Lack of sightline from stop location

11.3 BCIDP-JAC-TSM_GA-0007 XX 00 DR-CR-0023

11.3.1 Problem

The proposed Kearns Place/Old Kilmainham Road junction does not show a STOP line road marking on the Kearns Place arm of the junction. This could lead to vehicles over running the junction, leading to side on collisions.

Recommendation

The design team should include STOP road marking at this junction.

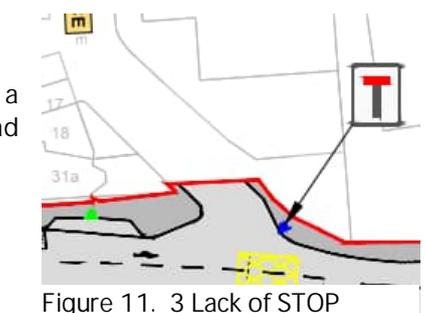


Figure 11. 3 Lack of STOP markings

12. Supplementary Audit – Junction Systems Design Drawings

12.1 BCIDP-JAC-TSM_SJ-0007 XX 00 DR-CR-0002

12.1.1 Problem

System diagrams A and B are missing the eastbound cycle movement onto Fonthill Road. Lack of specific signalling for this movement could lead to conflict between cyclists and pedestrians.

Recommendation

The design team should update system diagrams A and B to include all appropriate movements.

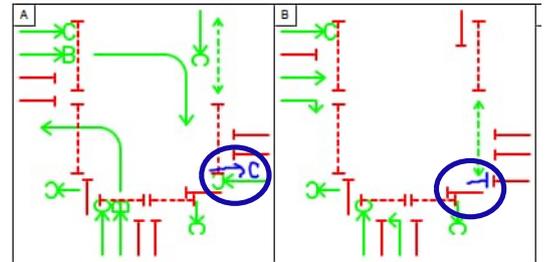


Figure 12. 1 Cycle phases missing from diagram

12.2 BCIDP-JAC-TSM_SJ-0007 XX 00 DR-CR-0003

12.2.1 Problem

System diagram C shows bus lane right turn and general traffic right turn from Fonthill Road onto Coldcut Road at the same time. This could lead to conflict between car and bus where vehicles making left turn across bus lane into access at southeast corner of junction. This problem was previously raised as a Problem 3.2.1 in the original RSA

Recommendation

The design team should stagger the bus right turn and the general traffic right turn to avoid conflict.

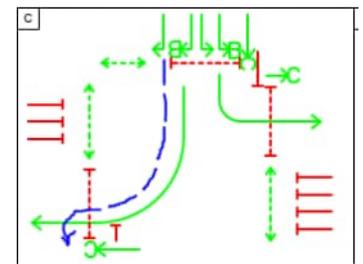


Figure 12. 2 Crossing movements

12.3 BCIDP-JAC-TSM_SJ-0007 XX 00 DR-CR-0005

12.3.1 Problem

System diagram E shows staggered pedestrian crossing with central island over the eastern Coldcut Road arm of the junction, but lighting sequence does not stagger the crossings. Two audio tactile push buttons in close proximity to each other could lead to confusion for visually impaired users.

Recommendation

The design team should remove the central island and the create single movement across junction arm, for consistency across junction arms.

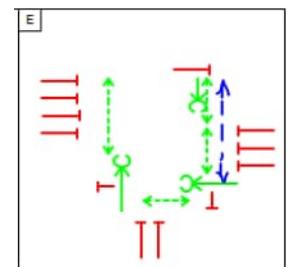


Figure 12. 3 Diagram does not match proposals

12.4 BCIDP-JAC-TSM_SJ-0007 XX 00 DR-CR-0008

12.4.1 Problem

System diagram B and C does not show any * on the right turning movement for traffic from Ballyfermot onto Clifden Road. Lack of flashing amber on the right turn movement will not alert right turning traffic to be aware of cyclist or vehicles continuing straight on Ballyfermot Road in a westbound direction

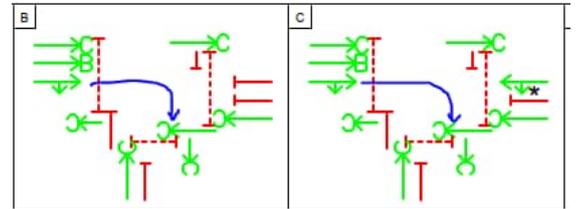


Figure 12. 4 Lack of flashing amber

Recommendation

The design team should stagger the right turn movement to avoid conflict with straight ahead vehicles and cyclists. Or if low traffic numbers allow, the flashing amber right turn arrow should be used.

12.5 BCIDP-JAC-TSM_SJ-0007 XX 00 DR-CR-0009

12.5.1 Problem

System diagram E shows a straight-ahead movement for cyclists travelling eastbound along Ballyfermot Road, while also showing the pedestrian crossing movement on the eastern arm of the junction. This could lead to conflict between cyclists and pedestrians.

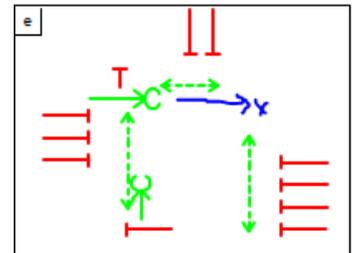


Figure 12. 5 Conflicting pedestrian & cycle movements during same phase

Recommendation

The design team should stagger the movements to avoid conflict.

12.6 BCIDP-JAC-TSM_SJ-0007 XX 00 DR-CR-0011

12.6.1 Problem

System diagram B shows a right turn movement for vehicle travelling eastbound from Le Fanu Road onto Kylemore Rd, while also showing all movements from vehicles emerging from Kylemore Rd. This could lead to conflict during this phase.

Recommendation

The design team should stagger the movements to avoid conflict.

12.7 BCIDP-JAC-TSM_SJ-0007 XX 00 DR-CR-0013

12.7.1 Problem

System diagram A shows a straight-ahead movement for buses travelling westbound along Ballyfermot Road, while also showing the bus movement from Ballyfermot Road turning right onto Kylemore Road. This could lead to conflict between buses.

Recommendation

The design team should stagger the movements to avoid conflict.

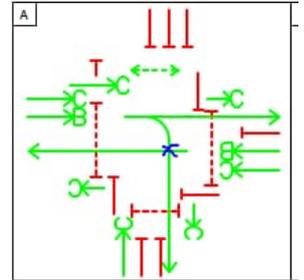


Figure 12.6 Conflicting movements during same phase

12.8 BCIDP-JAC-TSM_SJ-0007 XX 00 DR-CR-0014

12.8.1 Problem

System diagram E shows staggered pedestrian crossing with central island over the eastern Sarsfield Road arm of the junction, but lighting sequence does not stagger the crossings. Two audio tactile push buttons in close proximity to each other could lead to confusion for visually impaired users.

Recommendation

The design team should remove the stagger at the central island and create single movement across junction arm, for consistency across junction arms.

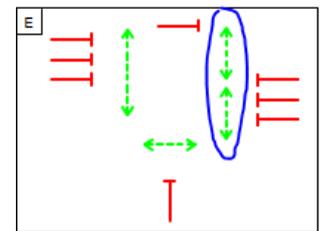


Figure 12.7 Staggered movements on same phase

12.9 BCIDP-JAC-TSM_SJ-0007 XX 00 DR-CR-0019

12.9.1 Problem

System diagrams A and B do not show any signal for the right turn movement from Emmet Road onto St Vincent Street West. This could lead to vehicles turning right at unsafe times, leading to conflict with oncoming vehicles.

Recommendation

The design team should ensure all junction movements are catered for within the system design diagrams.

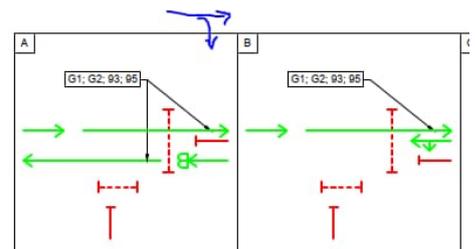


Figure 12.8 Right turn movement not shown

12.10 BCIDP-JAC-TSM_SJ-0007 XX 00 DR-CR-0021

12.10.1 Problem

System diagrams C shows the right turn movement onto James's St stopping mid-junction at the pedestrian crossing. This could lead to rear end shunt collisions, or failure to stop with risk of conflict between vehicles and pedestrians.

Recommendation

The design team should stagger the right turn movement and the pedestrian crossing movement to reduce the risk of conflict.

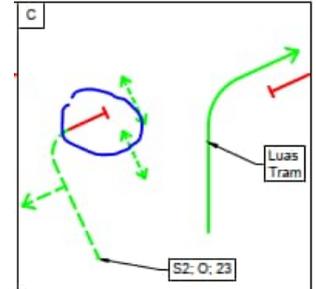


Figure 12. 9 Right turn movement conflicting with pedestrians

13. Audit Team Statement

We certify that we have examined the drawings and documents listed in the appendices to this report.

The examination and subsequent report was made with the sole purpose of identifying any features of the scheme that could be removed or modified in order to improve the safety of the proposals.

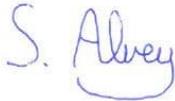
The problems identified have been noted in this report together with associated safety improvement suggestions, which we recommend should be studied for implementation.

No one on the Audit Team has been involved in any way with the scheme design.

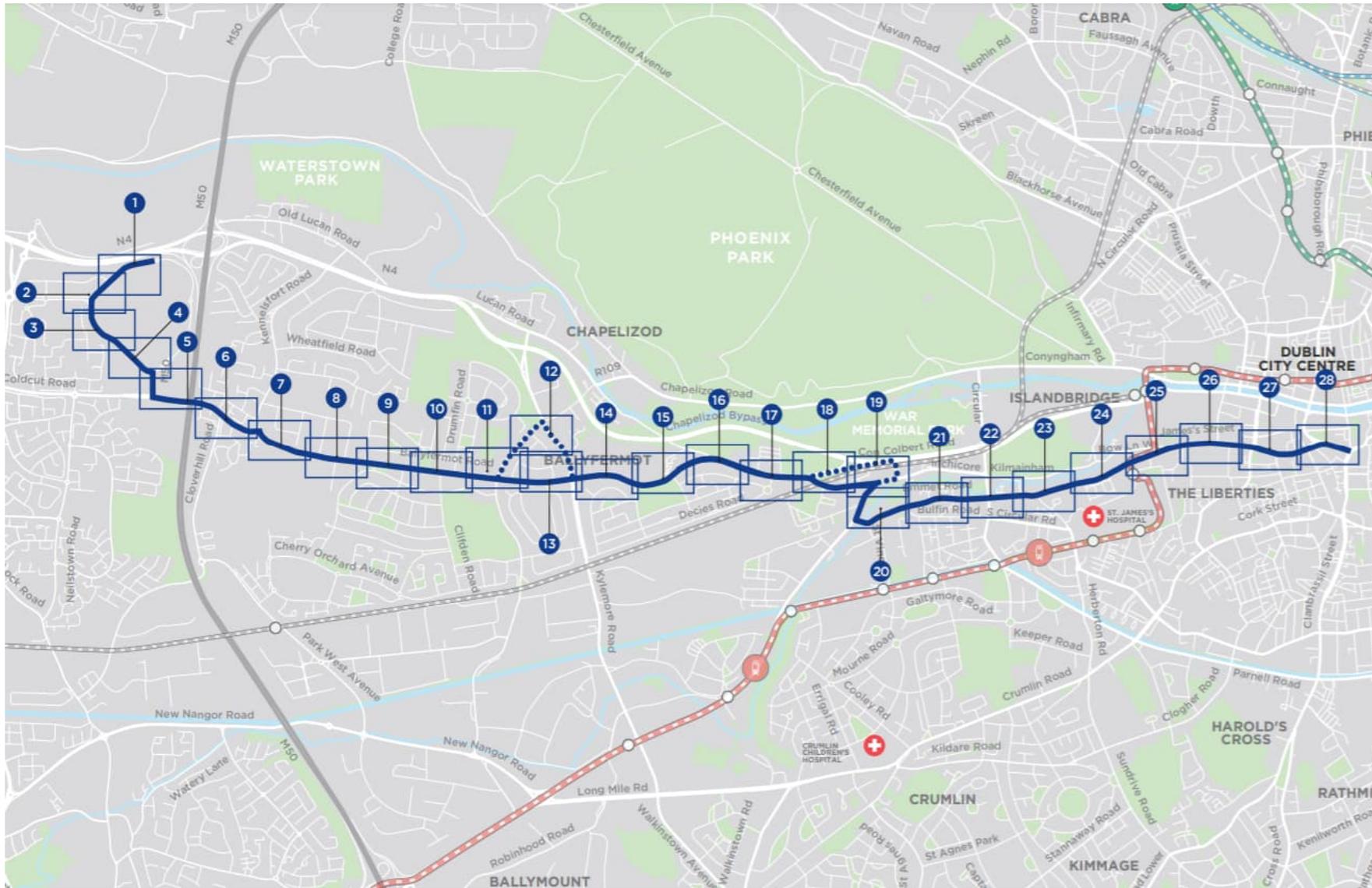
Audit Team Leader

Name:	G Turley	Signed:
	MEng HDip H'ways & Geo, HDip PM, CEng MIEI	
Position:	Senior Associate Director	Dated: 20 th April 2022
Organisation:	Jacobs Engineering	
Address:	Merrion House, Merrion Road, Dublin	

Audit Team Member

Name:	Simon Alvey	Signed:
	BEng (Hons) MIEI	
Position:	Senior Engineer	Dated: 20 th April 2022
Organisation:	Jacobs Engineering	
Address:	Merrion House, Merrion Road, Dublin	

Appendix A. Location Maps



Appendix B. Drawings & Documents Supplied

Drawings			
Series	Dwg No	Rev	Drawing Title
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-GEO_GA-0007_X-X_00-DR-CR-0001 to 0028	L01	General Arrangement Plan Sheets 1 to 28
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM_GA-0007_X-X_00-DR-CR-0001 to 0028	L01	Traffic Signs & Road Markings Sheets 1 to 28
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-SPW_BW-0007_X-X_00-DR-CR-0001 to 0028	L01	Fencing & Boundary Treatment Sheets 1 to 28
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0001	L01	Systems Design - Fonthill Rd/ Retail Pk Shopping Centre
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0002	L01	Systems Design –Fonthill Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0003	L01	Systems Design – Coldcut Rd/ Fonthill Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0004	L01	Systems Design – M50 Bus Gate
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0005	L01	Systems Design - Coldcut Rd/Cloverhill Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0006	L01	Systems Design – Coldcut Rd/ Kennelsfort Rd/ Upper Ballyfermot Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0007	L01	Systems Design - Ballyfermot Rd/ Primary Health Care
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0008	L01	Systems Design - Ballyfermot Rd/ Clifden Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0009	L01	Systems Design - Ballyfermot Rd/ Drumfinn Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00010	L01	Systems Design - Ballyfermot Rd/ Le Fanu Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00011	L01	Systems Design - Le Fanu Rd/ Kylemore Rd/ Chapelizod Hill
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00012	L01	Systems Design - Ballyfermot Rd/ Commercial Centre
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00013	L01	Systems Design - Ballyfermot Rd/ Kylemore Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00014	L01	Systems Design – Sarsfield Rd/ Landen Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00015	L01	Systems Design - Sarsfield Rd/ Con Colbert Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00016	L01	Systems Design – Inchicore Rd/ Memorial Rd

CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00017	L01	Systems Design – Sarsfield Rd/ Inchicore Rd/ Grattan Crescent
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00018	L01	Systems Design – Emmet Rd/ St Vincent St West
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00019	L01	Systems Design – Grattan Crescent/ Tyrconnell Rd/ Emmet Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00020	L01	Systems Design – Emmet Rd/ South Circular Rd/ old Kilmainham
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00021	L01	Systems Design – James St/ St James Hospital
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00022	L01	Systems Design - James St/ Bow Lane West
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00023	L01	Systems Design - James St/ Thomas St/ Watling St Junction
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00024	L01	Systems Design - Thomas St/ Bridgefoot St/ Thomas Court Jtn
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00025	L01	Systems Design - Thomas St/ Cornmarket St/ Augustine St/ Francis St
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00026	L01	Systems Design - Cornmarket St/ High Street/ Bridge St Upper Jtn

Appendix C. Road Safety Feedback Form

ROAD SAFETY AUDIT FEEDBACK FORM

Scheme: CBC07 LIFFEY VALLEY TO CITY CENTRE
 Audit Stage: Road Safety Audit Stage 1
 Date Audit Completed: 10th December 2020

Paragraph No. in Report	To Be Completed by the Design Team			To Be Completed by the Audit Team
	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Comment	Problem accepted (yes/no)
2.1.1	Yes	Yes		
2.1.2	Yes	Yes	To be considered at detailed design stage.	
2.1.3	Yes	Yes		
2.1.4	Yes	Yes		
2.1.5	Yes	Yes		
2.1.6	Yes	Yes		
2.1.7	Yes	Yes		
2.1.8	Yes	Yes	To be considered at detailed design stage.	
2.1.9	Yes	Yes		
3.1.1	Yes	Yes		
3.1.2	Yes	Yes		
3.1.3	Yes	Yes		
3.1.4	Yes	Yes		
3.1.5	Yes	Yes		
3.1.6	Yes	Yes		
3.1.7	Yes	Yes		
3.2.1	Yes	Yes		
3.2.2	Yes	Yes		
3.2.3	Yes	Yes		

Paragraph No. in Report	To Be Completed by the Design Team			To Be Completed by the Audit Team
	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Comment	Problem accepted (yes/no)
3.2.4	Yes	Yes		
3.2.5	Yes	Yes		
3.2.6	Yes	Yes		
3.2.7	Yes	Yes		
3.3.1	Yes	Yes		
3.3.2	Yes	Yes		
3.4.1	Yes	Yes		
3.4.2	Yes	Yes	This will be incorporated in the detailed design.	
3.4.3	Yes	Yes		
3.5.1	Yes	Yes		
3.5.2	Yes	Yes		
3.6.1	Yes	Yes		
3.6.2	No	No	This layout is as per the existing and has been agreed with the local community.	Yes
3.6.3	Yes	Yes	This informal access at Cleggan Lane is being stopped up by DCC as part of the park redevelopment.	
3.6.4	Yes	Yes		
3.6.5	Yes	Yes		
3.7.1	Yes	Yes		
3.7.2	Yes	Yes		
3.7.3	Yes	Yes		
3.7.4	Yes	Yes		
3.7.5	Yes	Yes		
3.8.1	Yes	Yes	Advance signage is provided warn drivers of the closure. Additional	Yes

Paragraph No. in Report	To Be Completed by the Design Team			To Be Completed by the Audit Team
	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Comment	Problem accepted (yes/no)
			signed can be considered as part of the detailed design.	
3.8.2	Yes	Yes		
3.8.3	Yes	Yes		
3.9.1	Yes	Yes		
3.9.2	Yes	Yes	This will be reviewed as part of the detailed design.	
3.9.3	Yes	Yes		
3.10.1	Yes	Yes		
3.10.2	Yes	Yes		
3.10.3	Yes	Yes		
3.11.1	Yes	Yes		
3.11.2	Yes	Yes		
3.12.1	No	No	A new signalised pedestrian crossing has been provided just to the west of this location. This crossing has been removed as part of the implementation of the signal controlled bus priority along this section.	Yes
3.12.2	Yes	Yes		
3.12.3	Yes	Yes		
3.12.4	Yes	Yes		
3.13.1	Yes	Yes		
3.14.1	No	No	The design has been refined at this location. The existing staggered	Yes

Paragraph No. in Report	To Be Completed by the Design Team			To Be Completed by the Audit Team
	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Comment	Problem accepted (yes/no)
			layout has to removed due existing driveways being located either side.	
3.14.2	Yes	Yes	This will be considered as part of the detailed design.	
3.14.3	Yes	Yes	This will be considered as part of the detailed design.	
3.14.4	Yes	Yes		
3.15.1	Yes	Yes		
3.15.2	Yes	Yes		
3.15.3	Yes	Yes		
3.15.4	Yes	Yes		
3.15.5	Yes	Yes		
3.15.6	Yes	Yes		
3.16.1	Yes	Yes		
3.16.2	Yes	Yes		
3.16.3	Yes	Yes		
3.16.4	Yes	Yes		
3.16.5	Yes	Yes		
3.16.6	Yes	Yes		
3.16.7	Yes	Yes		
3.17.1	Yes	Yes		
3.17.2	Yes	Yes		
3.17.3	Yes	Yes		

Paragraph No. in Report	To Be Completed by the Design Team			To Be Completed by the Audit Team
	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Comment	Problem accepted (yes/no)
3.17.4	Yes	Yes	The visibility splay will be refined if required as part of the detailed design.	
3.17.5	Yes	Yes		
3.17.6	Yes	Yes		
3.18.1	No	No	There is adequate space between the junction and the parking spaces to provide the required visibility splay. Raised tables are also provide at the side roads which will slow down traffic. The visibility splay will be refined if required as part of the detailed design.	Yes
3.18.2	Yes	Yes		
3.18.3	Yes	Yes	This will be considered as part of the detailed design.	
3.18.4	No	No	The design team have reviewed the proposed layout and are satisfied that the proposed layout is safe. Additional buffer space has been provided between the bus lane and parking space to allow drivers to see vehicles in the bus lane.	Yes
3.18.5	No	No	There is adequate space between the junction and the parking spaces to provide the required visibility splay. Raised tables are also provide at the side roads which will slow down traffic. The visibility splay will be refined if required as part of the detailed design.	Yes
3.18.6	Yes	Yes		

Paragraph No. in Report	To Be Completed by the Design Team			To Be Completed by the Audit Team
	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Comment	Problem accepted (yes/no)
3.19.1	Yes	Yes	This will be reviewed as part of the detailed design.	
3.19.2	Yes	Yes		
3.20.1	Yes	Yes	The detailed design of the crossing will ensure there is adequate sight lines to the signal heads from all directions.	
3.20.2	Yes	Yes		
3.20.3	Yes	Yes		
3.21.1	Yes	Yes	The detailed design of the crossing will ensure there is adequate sight lines to the signal heads from all directions.	
3.21.2	No	No	This is an existing crossing that is being retained. It is not possible to straighten the crossing as it would affect tram access on the outbound and access to the existing apartment block, inbound.	Yes
3.21.3	Yes	Yes	The design has been refined to resolve this issue. A new northbound cycling crossing has been provided which removes the need for cyclists to use the central island.	
3.21.4	Yes	Yes	The design has been refined to resolve this issue. The cycle track has been removed from the central island.	
3.21.5	Yes	Yes		
3.21.6	Yes	Yes		

Paragraph No. in Report	To Be Completed by the Design Team			To Be Completed by the Audit Team
	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Comment	Problem accepted (yes/no)
3.21.7	Yes	Yes	The design has been refined to resolve this issue. A stop line for cyclists travelling to James's Street has been added. Pedestrians will cross at the pedestrian	
3.21.8	Yes	Yes		
3.21.9	Yes	Yes		
3.22.1	Yes	Yes	A yellow box at this location has been added to the design.	
3.23.1	Yes	Yes		
3.23.2	Yes	Yes		
3.24.1	Yes	Yes		
3.24.2	Yes	Yes		
3.24.3	Yes	Yes	This will be incorporated in the detailed design.	
3.24.4	Yes	Yes		
3.24.5	Yes	Yes		
4.1.1	Yes	Yes		
4.2.1	Yes	Yes	Signal heads show left turn only for buses. Add left turn marking in lane. Other movements must be from other lanes.	
4.2.2	Yes	Yes		
4.3.1	Yes	Yes	Cycles cross in single movement.	
4.3.2	No	No	Push buttons and pedestrian heads make user look towards traffic they conflict with. Distance too great for a single movement crossing.	Yes

Paragraph No. in Report	To Be Completed by the Design Team			To Be Completed by the Audit Team
	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Comment	Problem accepted (yes/no)
			Layout reduces intergreens and gives increased crossing opportunities.	
4.4.1	No	No	General traffic does not need to see bus lane heads, only those for their lane and vice-versa.	Yes
4.5.1	No	No	Cycle movements are only specified to run alongside bus movements where a signal indication stating "ahead only" has been provided for the bus lane movement. A taxi or other vehicle wishing to turn left would be breaking traffic regulations under these scenarios and would, therefore, be expected to move into the adjacent lane prior to the junction stop line in order to make a legal left turn movement. This strategy is as per the BusConnects Design Guide. Where bus movements are allowed to turn left, cycle movements will be separated in the Phasing strategy.	Yes
4.6.1	Yes	Yes	Movements now separated.	
4.7.1	No	No	Flashing amber left turn arrow manages vehicle-cycle conflict.	Yes Appropriate Warning signage should be considered at Detailed Design Phase along with Driver/ Cyclist Awareness programmes to reinforce the existing road regulations and

Paragraph No. in Report	To Be Completed by the Design Team			To Be Completed by the Audit Team
	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Comment	Problem accepted (yes/no)
				ensure road users proceed with caution
4.8.1	No	No	Flashing amber left turn arrows manage vehicle-cycle conflicts.	Yes Appropriate Warning signage should be considered at Detailed Design Phase along with Driver/ Cyclist Awareness programmes to reinforce the existing road regulations and ensure road users proceed with caution
4.9.1	Yes	Yes		
4.9.2	Yes	Yes	Signals removed from under bridge. Priority for eastbound.	
4.10.1	No	No	Intervisibility zone deemed to be adequate. Stop lines dictated by swept paths.	Yes
4.10.2	Yes	Yes	Cycle facilities enhanced.	
4.11.1	Yes	Yes	Straight ahead is permitted and accounted for in the design.	
4.12.1	No	No	Stop line provide. Vehicles will be under signal control once they pass the stop line and will have visibility to the signal heads.	Yes
4.12.2	Yes	Yes		

Paragraph No. in Report	To Be Completed by the Design Team			To Be Completed by the Audit Team
	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Comment	Problem accepted (yes/no)
5.1.1	Yes	Yes		
5.2.1	Yes	Yes		
5.3.1	Yes	Yes	Sign has been removed.	
5.4.1	Yes	Yes		
5.5.1	Yes	Yes		
5.5.2	Yes	Yes		
5.6.1	Yes	Yes		
5.6.2	Yes	Yes	A stop sign has been added.	
5.7.1	Yes	Yes		
5.7.2	Yes	Yes		
5.8.1	Yes	Yes		
5.9.1	Yes	Yes		
5.9.2	Yes	Yes		
5.10.1	Yes	Yes		
5.10.2	Yes	Yes		
5.11.1	Yes	Yes		
5.12.1	Yes	Yes		

Signed: ...James BurkeDesigner

Signed:Employer

Signed: *Gary Turley*Audit Team Leader

Appendix D. Supplementary Audit Drawings & Documents Supplied

Drawings			
Series	Dwg No	Rev	Drawing Title
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-GEO_GA-0007_X-X_00-DR-CR-0001 to 0028	L06	General Arrangement Plan Sheets 1 to 28
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM_GA-0007_X-X_00-DR-CR-0001 to 0028	L06	Traffic Signs & Road Markings Sheets 1 to 28
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0001	M01	Systems Design - Fonthill Rd/ Retail Pk Shopping Centre
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0002	M01	Systems Design –Fonthill Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0003	M01	Systems Design – Coldcut Rd/ Fonthill Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0004	M01	Systems Design – M50 Bus Gate
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0005	M01	Systems Design - Coldcut Rd/Cloverhill Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0006	M01	Systems Design – Coldcut Rd/ Kennelsfort Rd/ Upper Ballyfermot Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0007	M01	Systems Design - Ballyfermot Rd/ Primary Health Care
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0008	M01	Systems Design - Ballyfermot Rd/ Clifden Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-0009	M01	Systems Design - Ballyfermot Rd/ Drumfinn Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00010	M01	Systems Design - Ballyfermot Rd/ Le Fanu Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00011	M01	Systems Design - Le Fanu Rd/ Kylemore Rd/ Chapelizod Hill
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00012	M01	Systems Design - Ballyfermot Rd/ Commercial Centre
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00013	M01	Systems Design - Ballyfermot Rd/ Kylemore Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00014	M01	Systems Design – Sarsfield Rd/ Landen Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00015	M01	Systems Design - Sarsfield Rd/ Con Colbert Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00016	M01	Systems Design – Inchicore Rd/ Memorial Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00017	M01	Systems Design – Sarsfield Rd/ Inchicore Rd/ Grattan Crescent

CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00018	M01	Systems Design – Grattan Crescent / Tyrconnel Rd / Emmet Rd
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00019	M01	Systems Design – Emmet Rd/ St Vincent St West
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00020	M01	Systems Design – Emmet Rd/ South Circular Rd/ old Kilmainham
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00021	M01	Systems Design – James St/ St James Hospital
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00022	M01	Systems Design – James St/ Bow Lane West
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00023	M01	Systems Design - James St/ Thomas St/ Watling St Junction
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00024	M01	Systems Design - Thomas St/ Bridgefoot St/ Thomas Court Jtn
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00025	M01	Systems Design - Thomas St/ Meath St
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00026	M01	Systems Design - Thomas St/ Cornmarket St/ Augustine St/ Francis St
CBC 07 LIFFEY VALLEY TO CITY CENTRE	BCIDB-JAC-TSM-SJ-0007_X-X_00-DR-TR-00027	M01	Systems Design - Cornmarket St/ High Street/ Bridge St Upper Jtn

Appendix E. Road Safety Feedback Form

ROAD SAFETY AUDIT FEEDBACK FORM

Scheme: CBC07 LIFFEY VALLEY TO CITY CENTRE
 Audit Stage: Supplementary Road Safety Audit Stage 1
 Date Audit Completed: 20th April 2022

Paragraph No. in Report	To Be Completed by the Design Team			To Be Completed by the Audit Team
	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Comment	Problem accepted (yes/no)
9.1.1	Yes	Yes		
9.1.2	Yes	Yes		
9.1.3	No	No	This layout is as per the existing and has been agreed with the local community.	Yes
9.1.4	Yes	Yes	The design arrangement is as per the detail in the PDGBM and the design team consider this appropriate for this location.	
9.1.5	Yes	Yes		
9.1.6	Yes	Yes		
9.1.7	Yes	Yes	Cycle waiting facilities have been provide where space permits. An alternative design detail is used as per the PDBGM where space is constrained.	
9.1.8	Yes	Yes		
9.1.9	Yes	Yes		
9.1.10	Yes	Yes		
9.1.11	Yes	Yes		
10.1.1	No	No	Providing a two way direction cycle crossing at this location would lead to confusion, would be difficult to signal and would lead to and additional conflict point with pedestrians. The proposed layout offers a safe segregated facility.	Yes

Paragraph No. in Report	To Be Completed by the Design Team			To Be Completed by the Audit Team
	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Comment	Problem accepted (yes/no)
10.1.2	Yes	Yes		
10.2.1	No	No	A new signalised crossing facility had been provided 30m to the north of this location.	Yes The design team should consider measures to direct pedestrians towards the controlled crossing and discourage jay walking
10.2.2	No	No	The existing carriageway over the bridge is being narrowed and the shared footway / cycle way is being widened. The existing lighting can remain in place with the widened shared facility.	Yes
10.2.3	No	No	The design team have reviewed this and deemed it to be low risk given the low number of vehicles entering this private access. Drivers wishing to turn into the access will be along the bus and can give way to the bus before making the manoeuvre to turn into the access.	Yes
10.3.1	Yes	Yes	This can be considered as part of detailed design.	
10.4.1	Yes	Yes		
10.4.2	Yes	Yes		
10.4.3	Yes	Yes		
10.4.4	Yes	Yes	Cycle waiting facilities have been provide where space permits. An alternative design detail is used as per the PDBGM where space is constrained.	
10.5.1	Yes	Yes	Design has been amended	
10.5.2	Yes	Yes	Design has been amended	

Paragraph No. in Report	To Be Completed by the Design Team			To Be Completed by the Audit Team
	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Comment	Problem accepted (yes/no)
10.6.1	Yes	Yes	Design has been amended	
10.6.2	No	No	A new signalised pedestrian crossing has been provided just to the west of this location to align with the revised location of the bus stops and with the revised desire line.	Yes
10.7.1	Yes	Yes		
10.8.1	Yes	Yes	The footway on the south side is being widened and the footway the north is being closed.	
10.8.2	Yes	Yes		
10.9.1	Yes	Yes		
10.9.2	Yes	Yes		
10.10.1	Yes	Yes		
10.10.2	Yes	Yes		
10.11.1	Yes	Yes		
10.12.1	Yes	Yes		
10.12.2	Yes	Yes		
10.12.3	Yes	Yes		
10.12.4	Yes	Yes		
10.12.5	No	No	A signalised crossing has been provided to the east and west of this location. The existing layout is being retained along this section.	Yes The Design Team should consider measure to discourage crossing in an uncontrolled fashion as is observed at present
10.12.6	Yes	Yes		

Paragraph No. in Report	To Be Completed by the Design Team			To Be Completed by the Audit Team
	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Comment	Problem accepted (yes/no)
10.12.7	Yes	Yes		
11.1.1	Yes	Yes		
11.2.1	Yes	Yes		
11.3.1	Yes	Yes		
12.1.1	Yes	Yes		
12.2.1	No	No	<p>This movement is going to be very low, and vehicles turning into the entrance will position themselves in the junction accordingly with an appropriate speed which should be obvious to the bus driver.</p> <p>Splitting the movements will reduce capacity of the junction with an additional stage.</p>	Yes
12.3.1	No	No	<p>The pedestrian crossing is a single stage crossing which only appears in Stage E.</p> <p>Where possible, central islands are used as this eliminates the need for mast arms.</p>	Yes
12.4.1	No	No	All right turning traffic will gap accept.	Yes
12.5.1	Yes	Yes		
12.6.1	Yes	Yes		
12.7.1	No	No	All right turning vehicles will gap accept.	Yes
12.8.1	No	No	<p>The single stage crossing only runs in Phase E with no other conflicts, with adequate time for all road users to get from one side to the other in one movement.</p> <p>Crossing cannot be aligned due to existing third-party off-street</p>	Yes

Paragraph No. in Report	To Be Completed by the Design Team			To Be Completed by the Audit Team
	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Comment	Problem accepted (yes/no)
			parking which would cause conflicts at the crossing points.	
12.9.1	No	No	All right turning traffic will gap accept. The RA + Green ahead arrow signal heads on poles 4 & 1 will be switched to full RAG heads to accompany the right turn gap acceptance principles.	Yes
12.10.1	Yes	Yes		

Signed: *James Burke*.....Designer

Signed:Employee

Signed: *Gary Turley*.....Audit Team Leader

The background is a vibrant red color. It features several abstract geometric shapes: a large teal semi-circle in the top-left corner, a blue semi-circle in the top-right corner containing a white circle, a dark blue horizontal bar in the top-right, a teal semi-circle in the bottom-right, and a blue vertical shape in the bottom-left containing a white circle. There are also smaller white circles and curved lines in blue and dark blue scattered throughout the design.

Appendix M2
Road Safety Audits
- Stage F

Clifton Scannell Emerson & Associates

Liffey Valley to City Centre Core
Bus Corridor

Desktop Safety Review

Clifton Scannell Emerson & Associates

Liffey Valley to City Centre Core Bus Corridor

Desktop Safety Review

Document Ref: P18-083-PSW1-RP-001

Rev	Prepared By	Reviewed By	Approved By	Issue Date	Reason for Revision
1.0	PJM	NB	PJM	2 nd Nov. 2018	Draft Report

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1 Introduction

1.1 General

This report results from a Desktop Safety Review of the proposed Liffey Valley to City Centre Core Bus Corridor carried out at the request of Mr Geoff Emerson of Clifton Scannell Emerson & Associates.

The members of the Safety Review Team are independent of the design team, and include: -

Mr. Peter Monahan

(BE MSc CEng FIEI RSACert)
Safety Review Team Leader

Mr. Norman Bruton

(BE RSACert CEng FIEI MSoRSA)
Safety Review Team Member

The Desktop Safety Review took place during November 2018 and comprised an examination of the documents provided by the designers (see Appendix B).

Where problems are relevant to specific locations these are shown on drawing extracts within the main body of the report. Where problems are general to the proposals sample drawing extracts are included within the main body of the report where considered necessary.

This review has been carried out broadly following the requirements for a Stage F (Part 2) Road Safety Audit as set out in the document "Road Safety Audit" (Ref: GE-STY-01024), contained on the Transport Infrastructure Ireland (TII) Publications website. However, no site visit was undertaken as part of this safety review.

The scheme has been examined and this report compiled in respect of the consideration of those matters that have an adverse effect on road safety and considers the perspective of all road users. It has not been examined or verified for compliance with any other standards or criteria. The problems identified in this report are considered to require action in order to improve the safety of the scheme and minimise collision occurrence.

2 Project Description

The proposed Core Bus Corridor (CBC) commences on Ballyowen Road at its junction with Willsbrook Road, and extends eastwards to the junction of High Street & Nicholas Street at Christchurch Cathedral, and extends along the: -

- Ballyowen Road;
- St Lomans Road;
- Liffey Valley distributor roads;
- Coldcut Road;
- Ballyfermot Road;
- Sarsfield Road;
- Emmet Road;
- Old Kilmainham Road;
- Thomas Street; and
- High Street.

The proposed improvements generally consist of the provision of bus lanes and cycle facilities in both directions over the route length.

3 Main Report

3.1 General

3.1.1 Problem

Location: Throughout the Project

Summary: Impact of change in traffic flows and removal of currently permitted manoeuvres along route and on adjacent road network could give rise to safety issues

The proposals, including the removal of currently permitted turning manoeuvres (e.g. from Davitt Road to Grattan Crescent), the introduction of proposed bus gates (e.g. on Coldcut Road and old Kilmainham Road) and the removal of roadside parking (e.g. along Ballyfermot Road), will result in significant changes to traffic capacity, traffic flows & patterns along the proposed route extending for some distance into the surrounding area. In addition, the provision of a high-quality public transport corridor may attract additional parking to the adjacent road network.

No details have been provided to the Review Team of an assessment of the likely effects on traffic along the route and on the surrounding road network. Some of these effects could have safety implications (e.g. where unsafe parking takes place, or where capacity issues arise leading to driver frustration, unsafe manoeuvres and/or rat-running within residential areas where there are high volumes of vulnerable road users).

There is a particular concern about the likely increase in traffic along Kilmainham Lane & Bow Lane, where no improvements are proposed and where significant additional traffic volumes are likely to arise as a result of the proposals giving rise to significant safety risks due to the poor horizontal & vertical alignment of the existing roads coupled with a narrow cross section & significant on-street parking.

Recommendation

Undertake an assessment of the effects of the proposals on traffic and parking along the route and on the adjacent road network. Where necessary incorporate measures to address any issues which may arise as a result of the proposals, including any safety measures which may be necessary.

3.1.2 Problem

Location: Throughout the Project

Summary: Unclear if adequate footpath width is proposed at all locations along the route, and in particular at proposed bus stop locations.

It is unclear from the information provided whether adequate footpath width is proposed at all locations along the route. In particular at proposed bus stop locations where waiting bus passengers, bus shelters and signage (e.g. RTPI signs) may reduce the effective footpath width.



Recommendation

Ensure that adequate footpath width has been provided at all locations along the route to cater for the expected volumes of pedestrians and taking account of the likely items of roadside furniture to be provided (e.g. bus shelters, signage, etc.).

3.1.3 Problem

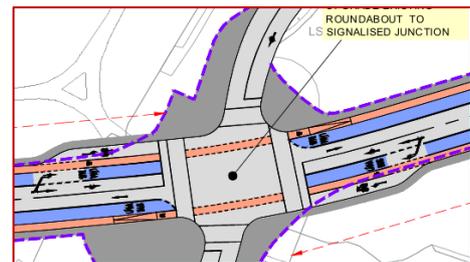
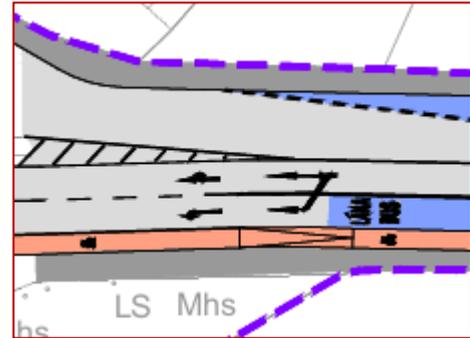
Location: Throughout the Project

Summary: Inconsistent junction treatment for left-turning manoeuvres could result in inappropriate, or unsafe, manoeuvres resulting in collisions between vehicles and cyclists.

Two different junction treatments are proposed throughout the project to cater for left-turning vehicles. One of the proposed arrangements consists of developing a dedicated left-turn lane on the nearside of the straight-ahead cycle lane, with left-turning cyclists and vehicles sharing this lane.

The alternative arrangement consists of left-turning drivers turning across the cycle lane from the bus lane. This proposed layout presents a particular risk to cyclists wishing to proceed straight-ahead or turn right at the junction.

The lack of consistency in the junction layouts along the bus corridor route could lead to inappropriate, or unsafe, manoeuvres by left-turning drivers, in particular those unfamiliar with the route.



Recommendation

Adopt and implement a consistent layout at the junctions along the route. Should the chosen layout consist of left-turning vehicles crossing the straight-ahead cycle lane then measures will be required to ensure that cyclists are not put at risk of being struck by turning vehicles. Some guidance is available in Section 4.5 of the National Cycle Manual.

3.1.4 Problem

Location: Throughout the Project

Summary: Absence of provision for right-turning cyclists at junctions.

No measures have been indicated to cater for cyclists wishing to turn right at the many of the junctions along the route. A failure to cater for right-turns by cyclists will lead to cyclists undertaking precarious manoeuvres as they leave/join the route and a consequent increased risk of these vulnerable road users being struck by a vehicle.

Recommendation

Amend the proposals to include measures to cater for right-turning cyclists at the junctions along the route. Some guidance is available in Section 4.6 of the National Cycle Manual.

3.2 Problems at Specific Locations

3.2.1 Problem

Location: Drawing Sheet 1 - Ballyowen Road

Summary: Proposed location of bus stop may impede visibility for drivers exiting from nearby side road and/or impede visibility for drivers approaching the signalised pedestrian crossing immediately downstream.

A bus stop is proposed on the northern side of the Ballyowen Road, east of Ballyowen Drive. There is a risk that stationary buses at this bus stop could impede visibility to the left for drivers exiting from Ballyowen Drive, resulting in unsafe exiting manoeuvres and side-on collisions.



In addition, stationary buses at this bus stop may impede visibility of eastbound drivers in the adjacent traffic lane towards the signals at the pedestrian crossing immediately downstream, resulting in approaching drivers being unaware of the need to stop, leading to a failure to stop and overshoot into the crossing resulting in possible vehicular/pedestrian collisions.

Recommendation

Relocate the proposed bus stop.

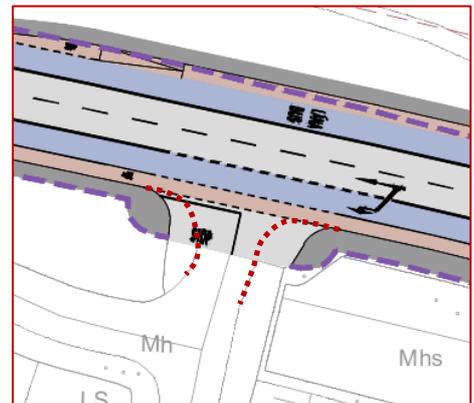
3.2.2 Problem

Location: Drawing Sheet 1 - Ballyowen Road & Larkfield Avenue Junction

Summary: Wide junction mouth results in lengthy crossing for pedestrians without pedestrian refuge, and lack of continuity of footpath at junction.

The proposed layout of the junction of Larkfield Avenue with the Ballyowen Road will result in pedestrians travelling east/west along the Ballyowen Road undertaking a lengthy carriageway crossing at the junction mouth increasing their exposure to vehicles, and consequently increase the risk of vehicular/pedestrian collisions.

In addition, the proposed layout does not tie in with the existing footpaths on Larkfield Avenue, which will require pedestrians to enter the carriageway as they travel to/from Larkfield Avenue and the Ballyowen Road.



Recommendation

Amend the proposed road layout to reduce the width of the junction mouth and to provide connectivity between the footpath on Larkfield Avenue and the proposed footpath on the Ballyowen Road.

3.2.3 Problem

Location: Drawing Sheets 4, 5, 6 & 7 – Roundabout Junctions

Summary: Proposed retention & modification of existing roundabout junctions will increase junction complexity for all road users leading to an increased likelihood of collisions, in particular between vehicles and vulnerable road users.

The proposed layouts of the series of roundabout junctions along the route between the Fonthill Road and the Coldcut Road will be difficult to navigate for vulnerable road users, in particular cyclists.

In order to progress along the route cyclists will have to undertake lengthy detours in order to access the proposed signalised crossings on the roundabout arms, where these are provided.

Many cyclists may choose to try to navigate the multi-lane roundabout circulating carriageways rather than undertake these lengthy detours placing them at significant risk of being struck by a vehicle.

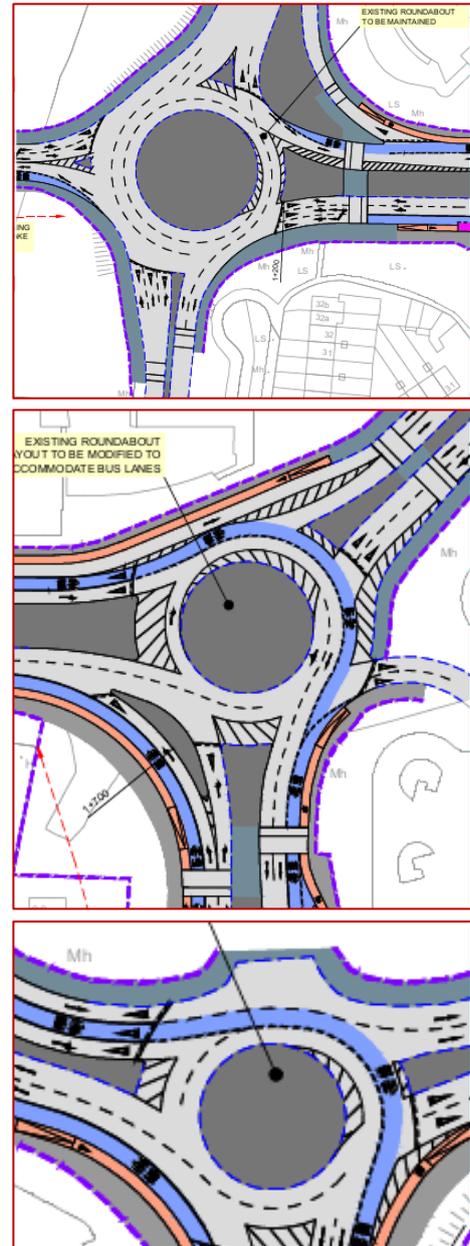
Where signalised crossings are not proposed on the arms of these roundabouts cyclists will have to enter the circulating carriageway and attempt navigate the roundabout alongside vehicles, and pedestrians must undertake uncontrolled crossings.

The introduction of a third lane, e.g. bus lane, on existing two-lane roundabouts also increases the complexity for drivers with a resulting increased likelihood of inappropriate or unsafe lane-change manoeuvres on the entry or exit of these roundabouts leading to side-swipe collisions with vehicles in the adjacent lane.

Where the addition of the bus lane consists of a right-turn through the junction the resulting complex road layout may not be readily understood by many, indeed most, drivers resulting in driver hesitation and shunt collisions or driver confusion and inappropriate or late manoeuvres leading to side-swipe collisions.

The proposed location of pedestrian or toucan signalised crossings immediately downstream from the roundabout exits could result in drivers, particularly those on dedicated left-turn lanes at the roundabouts, being insufficiently aware of the upcoming crossing as their attention would have been focused on other traffic as they exit the roundabout, leading to a failure to stop, overshoot incidents and possible collisions with crossing pedestrians.

In addition, the retention of these roundabout junctions is inconsistent with the proposed treatment elsewhere along the route, both to the west and east, where existing roundabouts are proposed to be replaced by signalised junctions.



Recommendation

Provide signalised junctions at these locations.

3.2.4 Problem

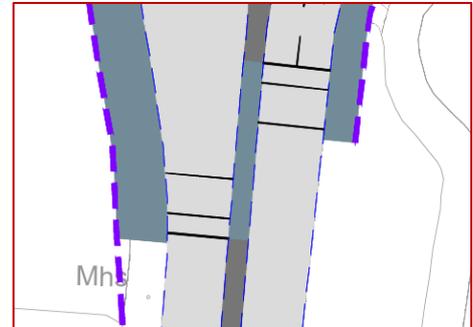
Location: Drawing Sheet 4 - Fonthill Road

Summary: Unclear if refuge island within the signalised crossing is of adequate width to cater for the likely volumes of pedestrians/cyclists at this location.

A signalised crossing, presumably a toucan crossing, has been indicated on the Fonthill Road south of its junction with the Ballyowen Road.

It is unclear if the refuge island within this crossing is of adequate width to cater for the likely volumes of pedestrians and to/or cyclists likely to use this crossing, in particular when items of roadside furniture had been placed within the island.

Insufficient width of refuge can increase the likelihood of pedestrians or cyclists within the refuge being struck by part of a passing vehicle.



Recommendation

Ensure that adequate width is provided within refuges proposed as part of the project.

3.2.5 Problem

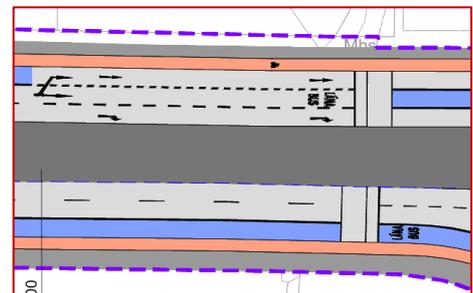
Location: Drawing Sheet 5

Summary: Continuous cycle track indicated at signalised pedestrian crossing.

The cycletracks on the road to the west of the roundabout are indicated as being continuous through the signalised pedestrian crossing, which could result in collisions between cyclists and pedestrians waiting to cross at this location.

Recommendation

Either provide a discontinuity in the cycletrack at this location, with cyclists required to stop on a red signal, or create a shared surface to facilitate cyclists and pedestrians mixing along this section of road.



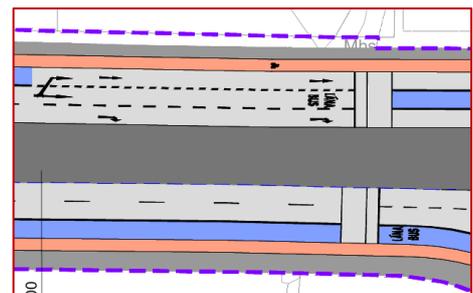
3.2.6 Problem

Location: Drawing Sheet 5

Summary: Proposed weaving length on the immediate approach to signalised crossing could result in overshoot incidents and vehicular/pedestrian collisions.

A weaving length has been indicated on the eastbound approach to the signalised pedestrian crossing, where buses must move right in order to turn right at the roundabout further downstream, and where traffic wishing to proceed straight-ahead at the roundabout must move left.

The length of this weaving section is relatively short, and it is located on the immediate approach to a pedestrian crossing.



Drivers undertaking weaving manoeuvres may be insufficiently aware of the status of the signals at the pedestrian crossing, resulting in a failure to stop leading to overshoot incidents and collisions with crossing pedestrians.

In addition, many drivers may not be aware of the need to move left in order to proceed straight-ahead at the upcoming roundabout junction, resulting in late lane-change manoeuvres on the immediate approach to the signalised pedestrian crossing and possible side-swipe collisions.

Recommendation

Relocate the weaving length to a point further upstream of the signalised crossing so that all lane change manoeuvres are completed well in advance of the crossing. During the design development ensure that adequate signage & roadmarkings are provided to clearly advise drivers of the lane to adopt in order to achieve their intended destination.

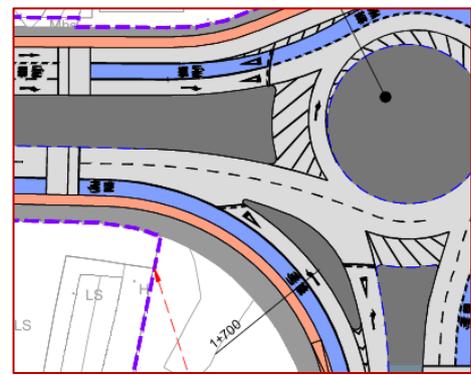
3.2.7 Problem

Location: Drawing Sheet 5

Summary: Signalised pedestrian crossing indicated immediately downstream of dedicated left-turning lane resulting in possible overshoot by left-turning vehicles into the crossing.

A signalised pedestrian crossing has been indicated immediately downstream of a dedicated left-turn lane at the roundabout.

Drivers exiting from the left-turning lane will have their focus primarily to the right, towards other vehicles exiting from the nearby roundabout, and may be insufficiently aware of the status of the signals at the pedestrian crossing resulting in a failure to stop and overshoot into the crossing, leading to vehicular/pedestrian collisions.



Recommendation

Either relocate the signalised pedestrian crossing so that there is a greater distance between the left-turning lane and the crossing to allow drivers sufficient distance/time to be sufficiently aware of the crossing, or replace the proposed roundabout junction with a signalised junction with the pedestrian crossings incorporated into it.

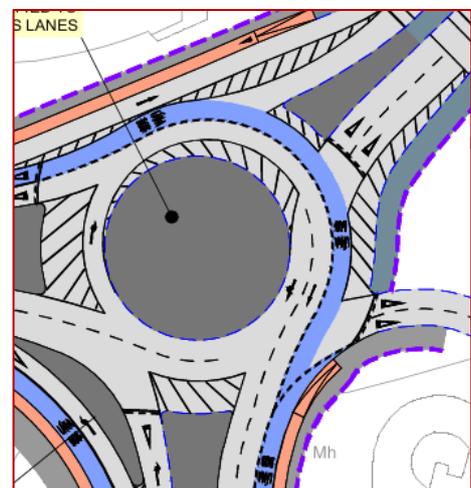
3.2.8 Problem

Location: Drawing Sheet 5

Summary: Hatched roadmarkings at roundabout junction will fade over time rendering the layout indistinct leading to unsafe manoeuvres and collisions.

A significant amount of hatched roadmarkings are proposed at the roundabout junction to guide drivers.

These hatched markings will fade/wear-off over time, and the layout may become indistinct and insufficiently clear, resulting in unsafe manoeuvres and side-swipe collisions.



Recommendation

Amend the proposed junction layout to replace at roadmarkings with kerbed build-outs/islands.

3.2.9 Problem

Location: Drawing Sheet 5

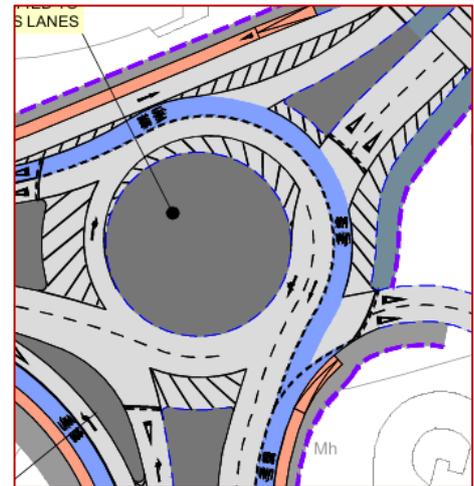
Summary: Complex roundabout junction layout may lead to delays resulting in rash/unsafe manoeuvres and collisions.

The proposed roundabout layout is complex and some of the entry arms may encounter significant delays (e.g. exit from car park), leading to lengthy queues forming.

These queues may, in turn, lead to driver frustration and rash/unsafe manoeuvres resulting in collisions.

Recommendation

Signalise this junction.



3.2.10 Problem

Location: Drawing Sheet

Summary: Resulting size of splitter island likely to be insufficient to act as a pedestrian refuge while accommodating the required signage.

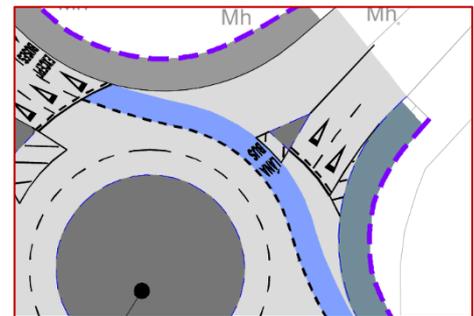
In order to include the proposed bus lane within the existing roundabout the splitter islands on the arms to the north-east and south-west have been curtailed.

The resulting size of these splitter islands are unlikely to be sufficient to act as a pedestrian refuge while accommodating necessary signage.

Insufficient size of refuge can increase the likelihood of pedestrians or cyclists within the refuge being struck by part of a passing vehicle.

Recommendation

During the design development ensure that the splitter islands at all of the roundabout junctions are capable of functioning as a pedestrian refuge while accommodating all of the required signage.

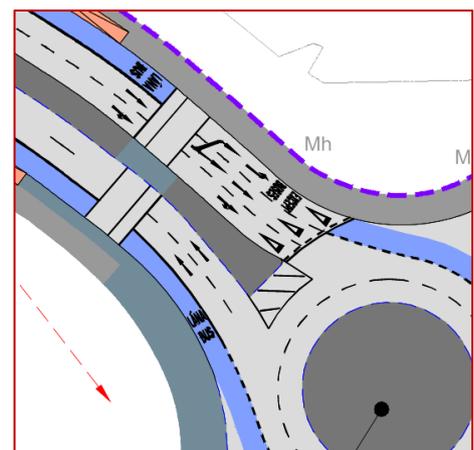


3.2.11 Problem

Location: Drawing Sheets 5 & 6

Summary: Queues forming at signalised crossings located immediately downstream of roundabout exits may extend upstream into the roundabout circulating carriageway creating congestion, leading to driver frustration and resulting in rash manoeuvres.

Signalised pedestrian crossings have been indicated immediately downstream of a number of roundabouts within the Liffey Valley area.



The proximity of these signalised crossings to the roundabouts could result in queues at the signalised crossings extending back into the upstream circulating carriageway, leading to congestion and obstructions to drivers attempting to enter the roundabout from the other arms. This could lead to driver frustration and rash/unsafe manoeuvres.

Recommendation

If the signalised pedestrian crossings were located to points further downstream of the roundabout exits, this could address this issue, but the crossings may then no longer be on the likely pedestrian desire line resulting in unsafe pedestrian crossing.

Therefore, it is recommended that the roundabouts be replaced by signalised junctions with pedestrian crossings incorporated within them.

3.2.12 Problem

Location: Drawing Sheet 8

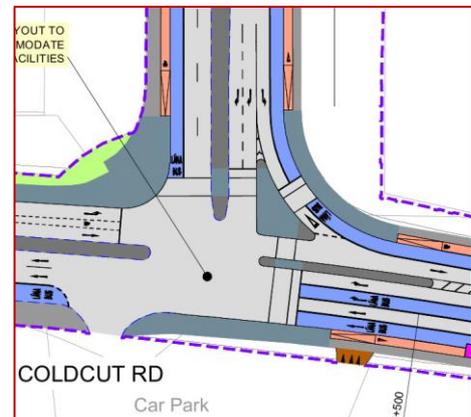
Summary: Absence of facilities to cater for right-turning cyclists at signalised junction increases the risk of vehicular/cyclist collisions.

No measures are proposed to facilitate cyclists wishing to turn right at the Liffey Valley/Coldcut Road junction.

This will result in cyclists having to mingle with vehicular traffic, and in some cases weave across multiple traffic lanes, in order to turn right placing them at an increased risk of being struck by a vehicle.

Recommendation

Amend the proposed junction layout to include measures to facilitate right-turning cyclists.



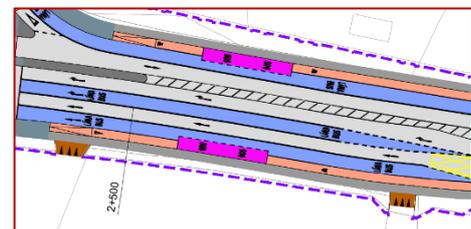
3.2.13 Problem

Location: Drawing Sheet 8 – Coldcut Road

Summary: Development of numerous lanes over short distance may lead to late lane-change manoeuvres and side-swipe collisions.

The proposed road layout on Coldcut Road is relatively complex, and includes the development of a number of lanes over short distance west of the M50 Overbridge on the approach to the signalised junction with Liffey Valley.

The number of different lanes developed over this short section is likely to lead to driver confusion and late lane-change manoeuvres resulting in possible side-swipe collisions.



Recommendation

Rationalise the number of lanes being developed over this short section of road to minimise driver confusion and promote compliance with the road layout.

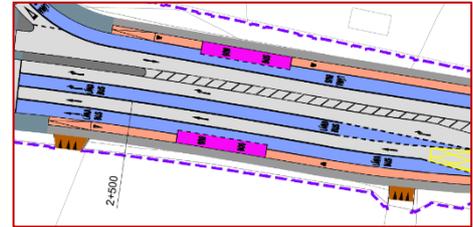
3.2.14 Problem

Location: Drawing Sheet 8 – Coldcut Road

Summary: Unsafe manoeuvres arising from driver frustration showed queuing vehicles from signalised junction block straight-ahead traffic.

The proposed road layout on Coldcut Road is relatively complex, and includes the development of a number of lanes over short distance west of the M50 Overbridge on the approach to the signalised junction with Liffey Valley.

Queuing vehicles at the signalised junction may extend back to the overbridge and block access to the straight-ahead lanes, which could give rise to straight-ahead drivers entering the adjacent cycle track or placing two wheels on the kerb in order to pass queuing vehicles in order to enter the straight-ahead lanes.



These manoeuvres could result in collisions with vulnerable road users on the adjacent footpath, shared-use path or cycle track.

Recommendation

During the design development ensure that the signal phasing does not result in lengthy queues forming.

The provision of a queue-length detector loop may be required which would trigger a signal phase to dissipate excessive queues.

It may also be necessary to coordinate the signals at this junction with the bus-gate signals either side of the M50 Overbridge, and possibly with the signals at the Cloverhill Road junction to the east of the overbridge, to limit the number of vehicles permitted to travel west so that excessive queues are not formed at the Coldcut Road/Liffey Valley junction.

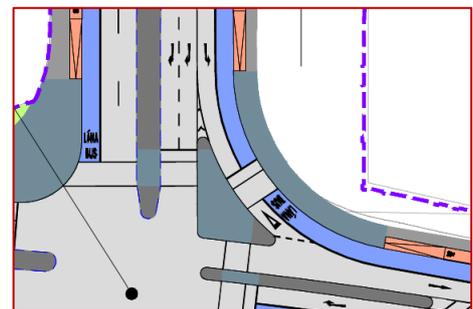
3.2.15 Problem

Location: Drawing Sheet 8 – Coldcut Road/Liffey Valley Junction

Summary: Unclear if adequate lane width provided where two lanes turn left to accommodate the swept path of large vehicles.

Two lanes are indicated turning left from Liffey Valley onto the Coldcut Road eastbound. It is unclear if any lane widening has been provided within these two left turning lanes.

Should no lane widening be provided there is a risk that the lanes will be insufficient to accommodate the swept path of large vehicles/buses, resulting in encroachment into the adjacent lane and possible side-swipe collisions with vehicles in the adjacent lane.



Recommendation

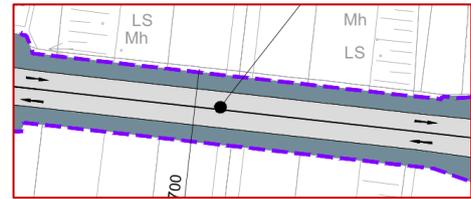
During the design development undertake a swept-path analysis of the turning movements at this junction and ensure that adequate lane widths are provided to accommodate the swept path of large vehicles/buses turning left.

3.2.16 Problem

Location: Drawing Sheet 8 – Coldcut Road

Summary: Unclear if existing bridge parapets are adequate to restrain an errant bus or cyclist.

It is unclear if the existing parapets on the Coldcut Road overbridge, which crosses over the M50, are adequate for the amended road layout/use, for example capable of restraining an errant bus or of a height to restrain an errant cyclist.



Recommendation

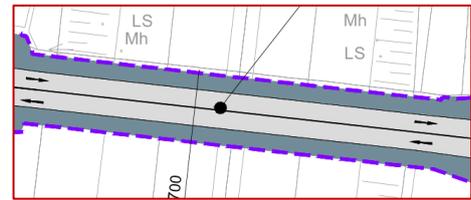
These should be reviewed during the design development and if necessary replaced with appropriate parapets.

3.2.17 Problem

Location: Drawing Sheet 8 – Coldcut Road

Summary: Unclear if sufficient width is available on the existing Coldcut Road overbridge for the proposed shared-use paths.

It is unclear if the existing Coldcut Road overbridge is of adequate width to accommodate the proposed road layout, in particular the shared-use paths on either side of the bridge, once the existing/future road side furniture (e.g. public lighting columns) is taken into account.



Recommendation

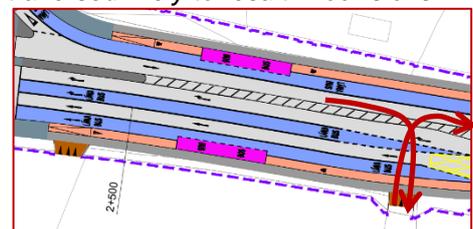
Ensure that adequate effective width of shared-use paths is provided.

3.2.18 Problem

Location: Drawing Sheet 8 – Coldcut Road

Summary: Right-turning manoeuvres requiring multiple lanes to be traversed likely to result in collisions.

Two private accesses have been indicated on the southern side of the Coldcut Road where a relatively complex road layout is proposed. Vehicles attempting to turn right into, or right out of, these accesses will have to cross a cycle lane, two bus lanes & two traffic lanes.



These manoeuvres would be difficult to complete due to the number of different traffic streams a right-turning driver would have to be aware of, and take account of, in order to complete this manoeuvre safely.

It is considered likely that right-turns into, or out of, these accesses would result in side-on collisions.

Recommendation

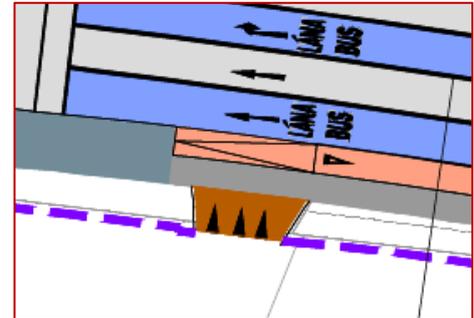
Replace the proposed hatching between opposing traffic directions on this section of Coldcut Road with a solid island, and limit access/egress to/from these private accesses to left-in or left-out only.

3.2.19 Problem

Location: Drawing Sheet 8 – Coldcut Road

Summary: Private access indicated at same location as transition from on-road cycle lane to off-road shared-use path.

A private access has been indicated at the same location where a proposed cycle facility transitions from an on-road cycle lane to an off-road shared-use facility, immediately east of the Liffey Valley/Coldcut Road junction. This will result in vehicles entering/exiting from this private access traversing a section of carriageway with varying height kerbs.



Recommendation

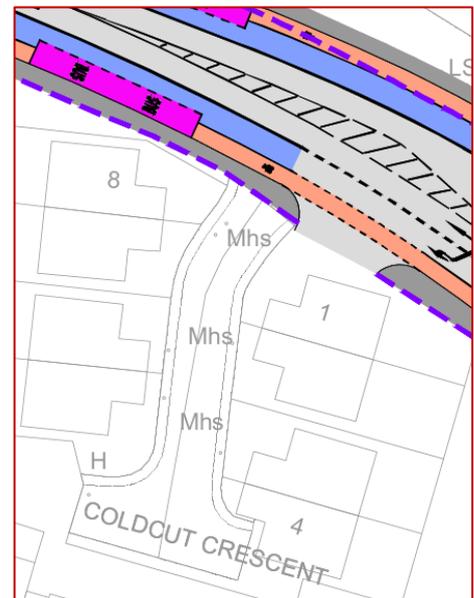
Either relocate the proposed access or relocate the cycle lane transition.

3.2.20 Problem

Location: Drawing Sheet 9 - Coldcut Road/Coldcut Crescent Junction

Summary: Stationary buses at proposed bus-stop may block visibility for exiting side road drivers resulting in unsafe exiting manoeuvres and side-on collisions stop

The access to Coldcut Crescent is shown incorrectly on the drawings provided. When this junction location is corrected, presumably during subsequent design development phases, the location of the proposed bus stop could result in stationary buses at the bus stop blocking visibility for drivers exiting from Coldcut Crescent and wishing to turn right onto Coldcut Road, leading to unsafe exit manoeuvres and possible side-on collisions.



Recommendation

Ensure that adequate visibility is available for exiting side road drivers from Coldcut Crescent, and that it is not obstructed by stationary buses at the proposed bus-stop.

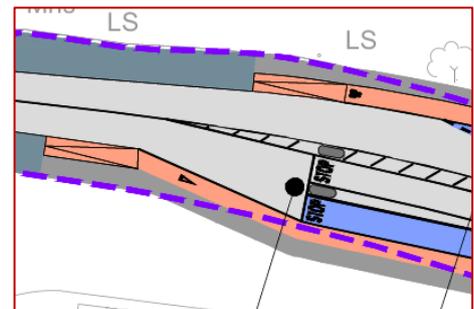
3.2.21 Problem

Location: Drawing Sheet 9 - Coldcut Road

Summary: Buses encroaching into cycle lane will present hazards to cyclists.

A transition from an on-road cycle lane to an off-road shared-use path is shown immediately downstream (west) of the bus gate on Coldcut Road.

There is a risk that buses proceeding west from the bus gate may cut across the corner at this transition, encroaching into the cycle facility and presenting a hazard to cyclists.



Recommendation

Amend the proposed road layout to bring cyclists off the carriageway upstream of the bus gate. Undertake a swept-path analysis to ensure that the proposed road layout can accommodate westbound buses at this location without encroachment into either the cycle facility or the opposing traffic lane.

3.2.22 Problem

Location: Drawing Sheet 9 - Coldcut Road/Cloverhill Road Junction

Summary: Lengthy pedestrian crossing may result in pedestrians being stranded mid-crossing and having to complete the crossing manoeuvre outside of the dedicated pedestrian phase, with a resulting increased risk of being struck by a vehicle or cyclist.

The pedestrian crossing on the eastern side of the Coldcut Road/Cloverhill Road junction is lengthy, and it appears that it is to be completed in a single crossing. The length of the crossing is such that pedestrians could become stranded mid-crossing.

The splitter island at this location would appear to be insufficient to act as a pedestrian refuge, with a resulting risk of pedestrians within the island at risk of being struck by passing vehicles.

Pedestrians could become stranded mid-crossing may attempt to complete the crossing outside of the dedicated pedestrian phase, with a resulting risk of being struck by a vehicle or cyclist.



Recommendation

Provide a two-stage pedestrian crossing with a pedestrian refuge of adequate width/size and a push button located within the pedestrian refuge to enable pedestrians to call a subsequent crossing phase.

3.2.23 Problem

Location: Drawing Sheet 10 - Kennelsfort Road Upper/Coldcut Road Junction

Summary:

Two right-turning lanes are indicated from Coldcut Road onto Ballyfermot Road. It is unclear if the proposed junction layout can accommodate the swept-path of two turning traffic lanes at this location. If insufficient space exists within the junction layout to accommodate two traffic streams turning simultaneously this could lead to side swipe collisions.

An absence of guidance markings for these right-turning lanes could result in some drivers drifting into the adjacent lane leading to side by side collisions.



Recommendation

Undertake a swept-path analysis to ensure that adequate space is available to accommodate two-turning traffic streams at this location. Include guidance markings to assist right-turning drivers from Coldcut Road.

3.2.24 Problem

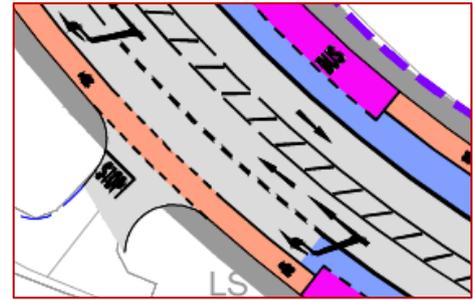
Location: Drawing Sheet 10

Summary: Right-turning manoeuvres from priority junctions where drivers are required to cross multiple bus, traffic & cycle lanes could result in unsafe exiting manoeuvres and side-on collisions.

It is proposed to retain existing uncontrolled (priority) junctions at two locations on Ballyfermot Road south-west of the junction with Coldcut Road (e.g. service road and hospital entrance).

Drivers exiting from these side roads wishing to turn right will have to cross multiple lanes, including cycle lanes. It will be difficult for right-turning drivers to identify safe gaps in the approaching traffic in order to complete a right-turning manoeuvre, possibly leading to unsafe manoeuvres and side-on collisions.

In addition, exiting drivers from the hospital entrance wish to turn right may be insufficiently aware of the status of the signals at the signalised pedestrian crossing immediately downstream of the entrance, resulting in overshoot into the crossing and possible collisions with pedestrians.



Recommendation

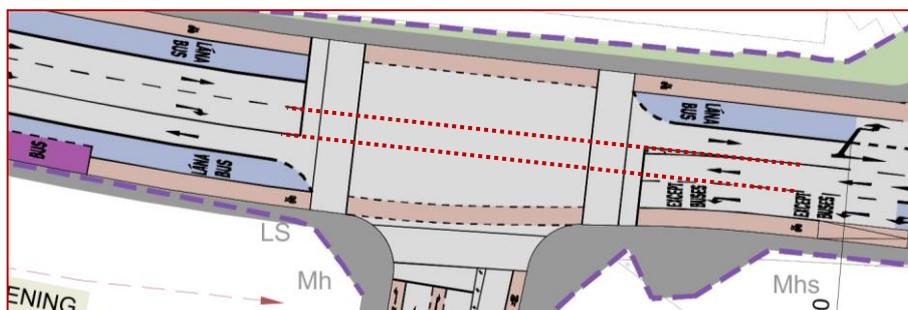
Amend the permitted manoeuvres at the service road junction to be left-in/left-out only.

Signalise the hospital entrance and incorporate the pedestrian crossing into the junction arrangement.

3.2.25 Problem

Location: Drawing Sheet 11 -

Summary:



The straight-ahead lane on Ballyfermot Road westbound at the junction with the entrance to Cherry Orchard Hospital is in line with the eastbound right-turning lane. This could result in westbound drivers inadvertently entering the opposing right-turn lane leading to late correction manoeuvres and side-swipe collisions, or to log-speed head-on collisions with oncoming vehicles.

Recommendation

Amend the junction layout to ensure that traffic lanes on the approach to, and at, the junction are not aligned with opposing traffic lanes.

3.2.26 Problem

Location: Drawing Sheets 12 & 13

Summary: Removal of existing traffic calming measures may lead to increased speeds and increased likelihood of collisions or increased injury severity outcomes for collisions occur.

It is proposed to remove the existing traffic calming measures along Ballyfermot Road. It is unclear if the removal of these measures will lead to increased speeds. Should vehicle speeds increase there is an increased likelihood of collisions, or an increased injury severity outcome when collisions occur.

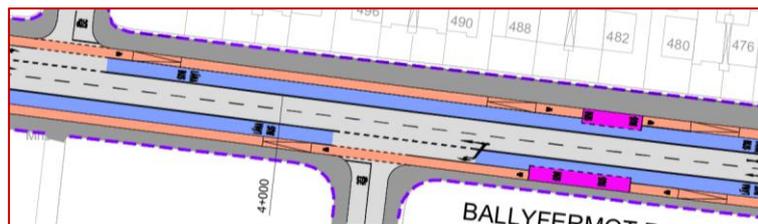
Recommendation

During the design development assess the likelihood of increased speeds following removal of existing traffic calming measures. Should increased speeds be considered likely then measures to ensure adherence to speed limits should be included in the proposals.

3.2.27 Problem

Location: Drawing Sheet 12

Summary: Absence of controlled pedestrian crossing at location where likely pedestrian desire line across Ballyfermot Road will exist could lead to uncontrolled crossings and vehicular/pedestrian collisions.



No pedestrian crossing has been indicated in the vicinity of the Ballyfermot Road/Blackditch Road junction. There is a likely pedestrian desire line to cross Ballyfermot Road at this location, given the proximity of the side roads to the north and south of Ballyfermot Road and the proposed bus stops nearby.

The absence of a signalised pedestrian crossing could result in uncontrolled pedestrian crossing manoeuvres, with pedestrian crossing two traffic lanes, two bus lanes and two cycle lanes, with a resulting increased risk of vehicular/pedestrian collisions.

Recommendation

Provide signalised pedestrian crossing at this location. (The inclusion of an additional signalised crossing at this location may assist in moderating vehicle speeds)

3.2.28 Problem

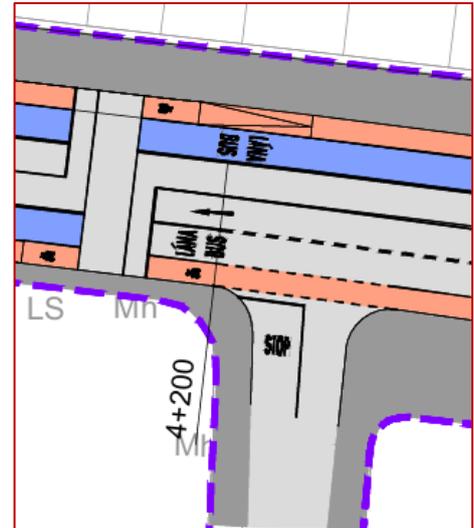
Location: Drawing Sheet 12 - Ballyfermot Road/Blackditch Drive Junction

Summary: Proximity of signalised pedestrian crossing to priority junction may result in left-turning side road drivers being insufficiently aware of the status of the signals resulting in overshoot into the crossing and vehicular/pedestrian collisions.

The proximity of the signalised pedestrian crossing to the west of the priority junction between Blackditch Drive and Ballyfermot Road may result in left-turning drivers exiting Blackditch Drive being insufficiently aware of the status of the signals resulting in overshoot into the crossing and vehicular/pedestrian collisions.

Recommendation

Relocate the signalised pedestrian crossing away from the priority junction, or signalise this junction and incorporate the pedestrian crossing into the junction layout.



3.2.29 Problem

Location: Drawing Sheet 14

Summary: Absence of controlled pedestrian crossing at location where likely pedestrian desire line will exist across Ballyfermot Road could lead to uncontrolled crossings and vehicular/pedestrian collisions.

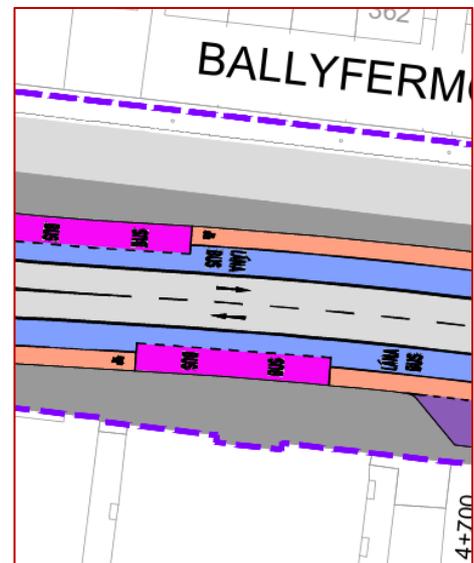
No pedestrian crossing has been indicated in the vicinity of the proposed bus stops on Ballyfermot Road near the old Gala Cinema. There is an existing signalised pedestrian crossing at this location at present.

There is a likely pedestrian desire line across Ballyfermot Road at this location to/from the proposed bus stops on either side of Ballyfermot Road and to/from the retail/shopping on the southern side of the road and the residential areas on the northern side of the road.

The absence of a signalised pedestrian crossing could result in uncontrolled pedestrian crossing manoeuvres, with pedestrian crossing two traffic lanes, two bus lanes and two cycle lanes, with a resulting increased risk of vehicular/pedestrian collisions.

Recommendation

Provide signalised pedestrian crossing at this location.



3.2.30 Problem

Location: Drawing Sheet 14 - Ballyfermot Road/Le Fanu Road Junction

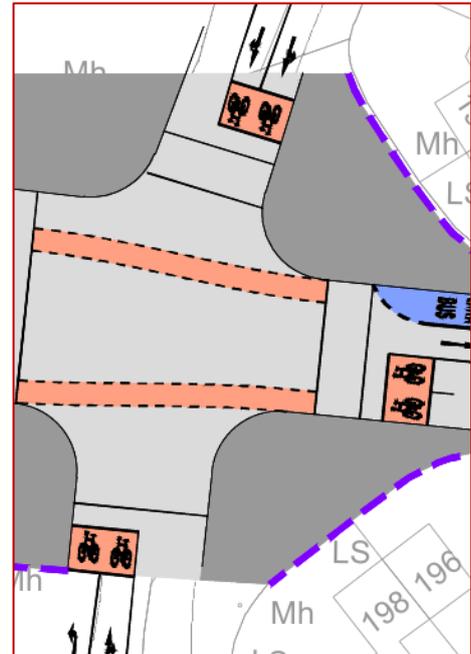
Summary: Side-swipe collisions arising from two southbound straight-ahead lanes entering junction, but only a single traffic lane on the exit.

Two straight-ahead lanes have been indicated on Le Fanu Road southbound approach to its junction with Ballyfermot Road, however only a single traffic lane is provided on the Le Fanu Road southbound exit from the junction.

This could result in side-swipe collisions as two traffic lanes attempting to merge into a single traffic lane on the exit from the junction.

Recommendation

Amend the proposed road layout to provide a single southbound straight-ahead lane on Le Fanu Road entering its junction with Ballyfermot Road.



3.2.31 Problem

Location: Drawing Sheet

Summary:

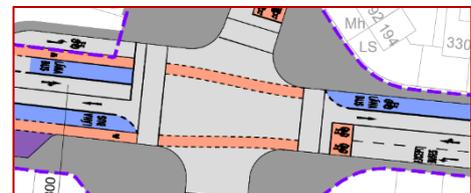
Straight-ahead and right-turning manoeuvres are permitted from the same lane on the east & westbound Ballyfermot Road approaches to its junction with Le Fanu Road.

Right-turning vehicles on either approach will impede straight-ahead traffic, resulting in straight-ahead traffic entering the adjacent left-turning or bus lane leading to possible side-swipe collisions.

In addition, right-turning drivers will now need to identify a gap in multiple approach lanes (e.g. westbound right-turning traffic will need to identify gaps in the opposing straight-ahead traffic lane, bus lane, cycle lane and left-turning lane). This may prove difficult to achieve, leading to driver frustration and rash manoeuvres resulting in side-on collisions.

Recommendation

During the design development ensure that the signal phasing at this junction permits right-turning vehicles to proceed unopposed.

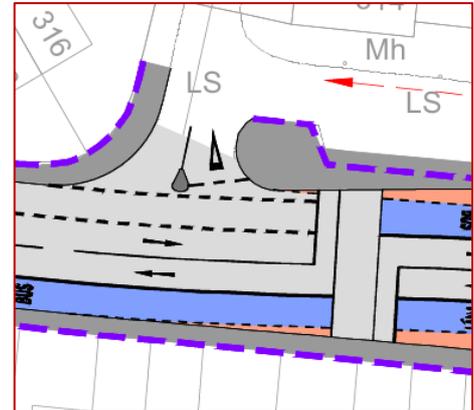


3.2.32 Problem

Location: Drawing Sheet 14 – Colepark Road

Summary: Proximity of signalised pedestrian crossing to priority junction may result in left-turning side road drivers being insufficiently aware of the status of the signals resulting in overshoot into the crossing and vehicular/pedestrian collisions.

The proximity of the signalised pedestrian crossing to the east of the priority junction between Colepark Road and Ballyfermot Road may result in left-turning drivers exiting Colepark Road being insufficiently aware of the status of the signals resulting in overshoot into the crossing and vehicular/pedestrian collisions.



Recommendation

Relocate the signalised pedestrian crossing away from the priority junction, or signalise this junction and incorporate the pedestrian crossing into the junction layout.

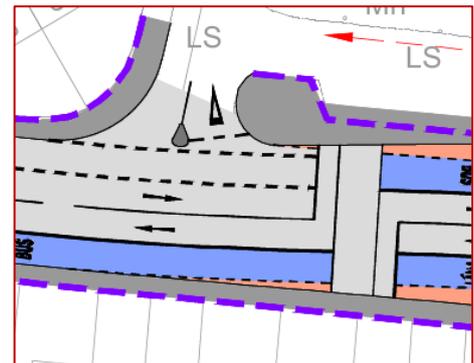
3.2.33 Problem

Location: Drawing Sheet 14 – Colepark Road

Summary: Right-turning manoeuvres from priority junction where drivers are required to cross multiple lanes could result in unsafe turning manoeuvres and side-on collisions.

It is proposed to remove the existing island at the junction of Colepark Road and Ballyfermot Road, which prohibits right-turning manoeuvres out of Colepark Road.

Drivers exiting from Colepark Road and wishing to turn right will have to cross multiple lanes. It will be difficult for right-turning drivers to identify safe gaps in the approaching traffic lanes in order to turn right, possibly leading to unsafe manoeuvres and side-on collisions.



Recommendation

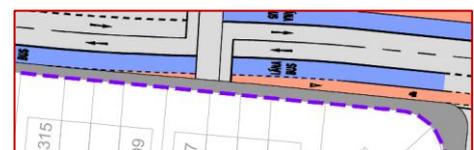
Either amend the permitted manoeuvres at the Colepark Road junction to be left-in/left-out only, or signalise the junction and incorporate the pedestrian crossing into the junction arrangement.

3.2.34 Problem

Location: Drawing Sheet 14

Summary: Possible bus/cyclist collisions where eastbound cycle lane ends on Ballyfermot Road downstream of Ballyfermot Parade junction.

The proposed arrangement where the eastbound cycle lane on Ballyfermot Road ends, west of the Ballyfermot Parade junction, with a gradual taper could result in cyclists being struck by buses.



Recommendation

Amend the proposed layout at the termination of the cycle track to remove the risk of cyclists being struck by buses. This may require terminating the cycle track at a point further upstream and bringing cyclists into the bus lane at a well-defined transition.

3.2.35 Problem

Location: Drawing Sheet 15 - Kylemore Road Junction

Summary: Absence of measures for right-turning cyclists will result in cyclists mingling with traffic and crossing multiple traffic lanes in order to turn right, with a resulting increased risk of being struck by a vehicle.

No measures have been indicated to facilitate right-turns by cyclists at the Kylemore Road junction. Advance stop lines have been indicated on three of the four arms at the junction, however these do not readily cater for right-turning cyclists who approach when the signals are green.

In the absence of measures catering for right-turning cyclists, cyclists may attempt to weave across multiple traffic lanes in order to enter the right-turning lane where they are at increased risk of being struck by a vehicle.



Recommendation

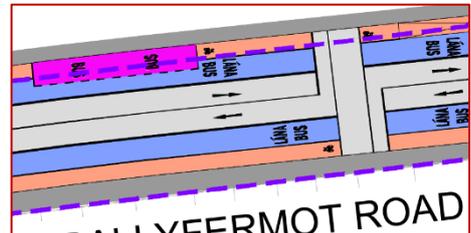
Provide “box-turns” to cater for right-turning cyclists at this junction.

3.2.36 Problem

Location: Drawing Sheet 16

Summary: Proposed location of bus stop may impede visibility for drivers approaching the signalised pedestrian crossing immediately downstream.

A bus stop is proposed on the northern side of the Ballyfermot Road, east of the Kylemore Road junction. There is a risk that stationary buses at this bus stop could impede visibility for eastbound drivers in the adjacent traffic lane towards the signals at the pedestrian crossing immediately downstream, resulting in approaching drivers being unaware of the need to stop, leading to a failure to stop and overshoot into the crossing resulting in possible vehicular/pedestrian collisions.



Recommendation

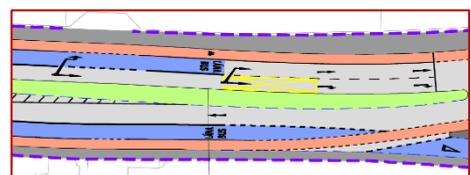
Relocate the proposed bus stop or pedestrian crossing and ensure that adequate forward visibility to the signals is available for approaching drivers on all lanes.

3.2.37 Problem

Location: Drawing Sheet 20 – Sarsfield Road Junction

Summary: Road layout which requires straight-ahead drivers to change lane on the immediate approach to signalised junction may not be readily understood, leading to late lane-change manoeuvres and side-swipe collisions.

The eastbound traffic lane on Sarsfield Road becomes a right-turn only lane at the Sarsfield Road signalised junction. Drivers wishing to proceed straight-ahead, towards the N4, must move left into the trafficked lane created following the termination of bus lane.



The requirement to move left in order to proceed straight-ahead may not be obvious to some drivers, in particular those unfamiliar with this route, leading to late lane-change manoeuvres and possible side-swipe collisions.

Recommendation

Amend the proposed road layout on the eastbound approach to the Sarsfield Road junction so that straight-ahead drivers can remain in the same lane on the approach to the junction, and drivers wishing to turn right must move right to turn right.

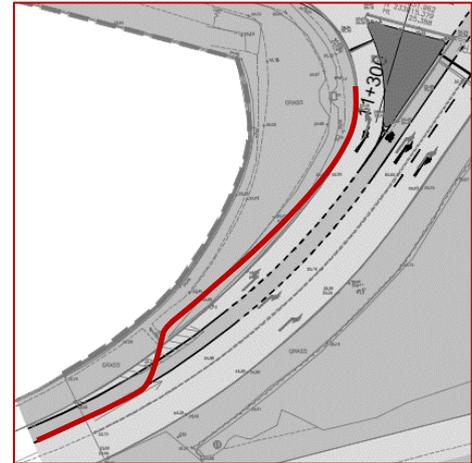
3.2.38 Problem

Location: Drawing Sheet 20 – Con Colbert Road Junction

Summary: Lengthy taper for development of left-turn lane will result in stationary left-turning vehicles encroaching into cycle lane.

The proposed layout of the dedicated left-turning lane on Con Colbert Road on the approach to its junction with the N4 Chapelizod Bypass is such that left-turning vehicles will cross the cycle lane at a shallow angle, increasing the distance over which they will interact with the cycle lane.

Similarly, the full width of the left-turning lane does not appear to be provided until closer to the splitter island, with the result that vehicles in the left-turning lane may protrude into the adjacent cycle lane and present an obstruction to cyclists who may move into the adjacent traffic lane in order to pass with a resulting increased risk of being struck by a vehicle.



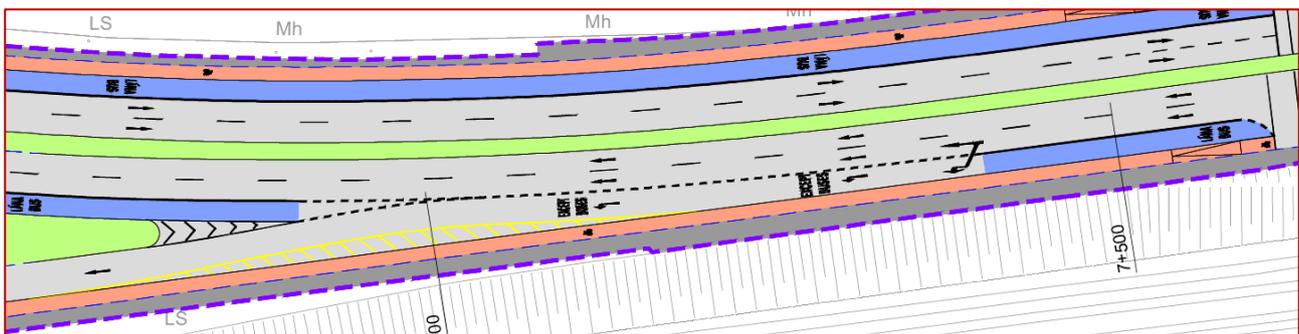
Recommendation

Provide a left-turning lane with a shorter, more well defined, entry taper and with a full lane width over its extents beyond the taper such that left-turning traffic will not protrude into the adjacent cycle lane.

3.2.39 Problem

Location: Drawing Sheet 21

Summary: Increased injury severity outcomes likely should collisions occur between vehicles and cyclists due to higher speeds by left-turning/diverging westbound vehicles at junction of Con Colbert Road & Chapelizod Bypass.



The proposed arrangement for westbound diverging traffic at the Con Colbert Road junction with the Chapelizod Bypass could give rise to high speeds for exiting traffic. The provision of the proposed hatched roadmarkings adjacent to the cycle lane are unlikely to be observed by all drivers, placing cyclists in close proximity to high-speed vehicles with a resulting increased risk of serious injuries should a collision occur.

Recommendation

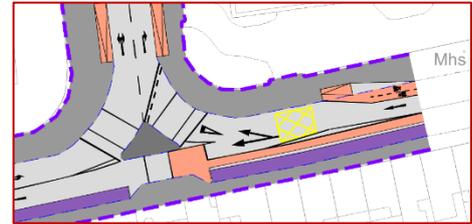
Retain the existing layout at this location.

3.2.40 Problem

Location: Drawing Sheet 21

Summary: Cyclists weaving across traffic lane are an increased risk of being struck on the Inchicore Road westbound approach to the Memorial Road junction.

There is an existing two-way cycle track along the northern side of the Inchicore Road between Kilmainham and Memorial Road. It is unclear how westbound cyclists on this two-way cycle track are intended to access the westbound cycle track indicated on the southern side of Inchicore Road on its approach to the Memorial Road junction.



A failure to provide an adequate and safe means for cyclists to travel between the two cycle facilities on Inchicore Road will result in cyclists having to weave across vehicular traffic with an increased risk of being struck.

Recommendation

Amend the proposed road layout to provide a safe route for westbound cyclists on Inchicore Road approaching, and at, the Memorial Road junction.

3.2.41 Problem

Location: Drawing Sheet 21

Summary: Proposed cycle facilities on Memorial Road do not adequately interface/integration with cycle facilities on the adjacent road network leading to unsafe manoeuvres by cyclists.



It is unclear how the proposed cycle lanes on Memorial Road interface with the cycle lanes on the adjacent road network, and in particular, how cyclists travel to/from the cycle facilities on the adjacent roads and those on Memorial Road.

Given the permitted vehicular turning movements at the northern end of Memorial Road, at its junction with Con Colbert Road, it is unclear how cyclists, in particular right-turning cyclists, can complete the manoeuvre safely. It is considered likely that cyclists will opt to remain within the traffic lane on approach to this junction, increasing the risk of vehicular/cyclist collisions.

Recommendation

Review the proposed cycle facilities on Memorial Road.

It may be preferable to provide a two-way cycle facility along the eastern side of Memorial Road which connects with the existing two-way cycle track on Inchicore Road along with toucan crossings and advanced stop lines to facilitate cyclists at the Con Colbert Road junction.

3.2.42 Problem

Location: Drawing Sheet 21

Summary: Absence of signalised pedestrian crossing of Grattan Crescent along likely pedestrian desire line may result in uncontrolled, and unsafe, pedestrian crossings.

The route for pedestrians wishing to cross Grattan Crescent immediately west of its junction with Sarsfield Road & Inchicore Road is lengthy and may not coincide with the pedestrian desire line at this location.

This could result in pedestrians undertaking uncontrolled crossings of Grattan Crescent with a resulting increased risk of vehicular/pedestrian collisions. This issue is exacerbated by the proximity of the nearby national school, with high numbers of schoolchildren expected to cross at this location.



Recommendation

Provide a signalised crossing of Grattan Crescent at the junction with Sarsfield Road & Inchicore Road.

3.2.43 Problem

Location: Drawing Sheet 24

Summary:

It is proposed to provide a bus gate on Old Kilmainham Road which will significantly alter the existing turning volumes at the South Circular Road junction with Emmet Road & Old Kilmainham Road.

In particular it is likely that the majority of traffic on Emmet Road will now turn left onto the South Circular Road, however the length of the left-turn lane at this location appears relatively short. This could result in significant queues forming, possibly extending into the bus lane thus negating the benefit of the bus lane provision.



Eastbound buses on Emmet Road are likely to wish to proceed straight ahead at the South Circular Road junction, onto Old Kilmainham Road. To do this they must change lane from the bus lane into the straight-ahead lane on the immediate approach to the junction, a manoeuvre that is likely to be compromised should extensive queues form within the left-turning lane on this approach.

This could result in weaving manoeuvres concentrated within a short distance on the immediate approach to the signalised junction with a resulting increased risk of side-swipe collisions.

Recommendation

Amend the proposed road layout on the Emmet Road eastbound approach to the junction with the South Circular Road to better reflect the expected turning volumes at the junction.

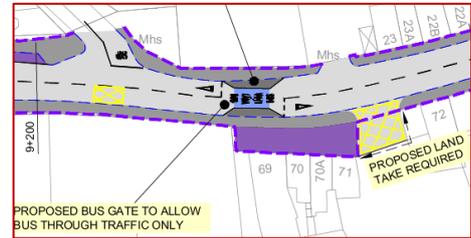
3.2.44 Problem

Location: Drawing Sheet 25

Summary: Absence of u-turn facilities at bus gate on Old Kilmainham Road could result in unsafe u-turn manoeuvres, in particular by large vehicles, with a resulting risk of collisions with other road users.

It is proposed to provide a bus gate on Old Kilmainham Road. No measures have been indicated to facilitate u-turn manoeuvres by vehicles, in particular large vehicles, who inadvertently travel along Old Kilmainham Road as far as the bus gate.

This could result in unsafe u-turn manoeuvres with resulting risks to other road users, and in particular to vulnerable road users.



Recommendation

Either provide facilities catering for u-turn manoeuvres at this location, or during the design development ensure that adequate signs and markings are provided advising all drivers, in particular those entering Old Kilmainham Road from side roads, that there is no through-route in the direction of the proposed bus gate.

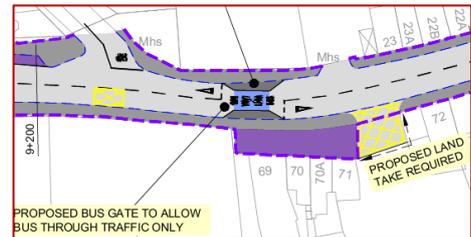
3.2.45 Problem

Location: Drawing Sheet 25 - Old Kilmainham Road

Summary: Absence of cycle route through proposed bus gate could lead to bus/cyclist collisions.

It is proposed to provide a bus gate on Old Kilmainham Road. No measures have been indicated to facilitate cyclists proceeding eastbound for westbound through the bus gate.

This could result in cyclists entering the bus gate when it is unsafe to do so resulting in them being struck by a bus travelling in either the same direction as the cyclist, or in the opposing direction.



Recommendation

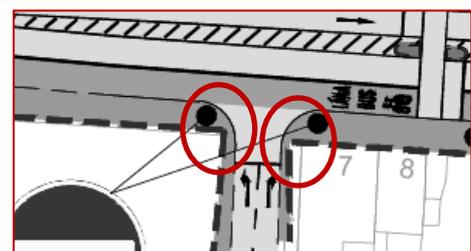
Provide a cyclist “bypass” of the bus gate in both directions.

3.2.46 Problem

Location: Drawing Sheet 28 & 29 – Thomas Street

Summary: Insufficient width of footpaths could result in pedestrians stepping into the carriageway and being struck by a passing cyclist or vehicle.

The proposed footpath widths at a number of locations along Thomas Street are narrow and may not be of sufficient width to cater for the expected volumes of pedestrians at these locations. This could result in pedestrians stepping into the adjacent cycle lane/bus lane and being struck by a passing cyclist or vehicle.



Recommendation

Ensure that adequate width of footpath is provided at all locations along the route.

3.2.47 Problem

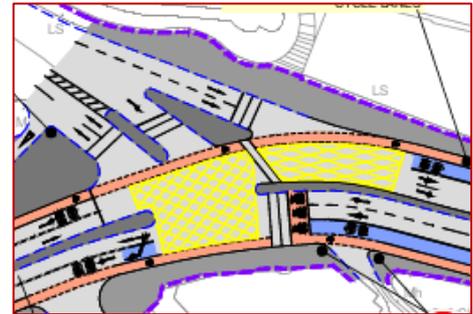
Location: Drawing Sheet 30 - Bridge Street/High Street Junction

Summary: Possible side-swipe collisions where two lanes turn right.

Two lanes turn right from High Street onto Bridge Street. There is a risk of drivers in one of the right turning lanes drifting into the adjacent lane while turning resulting in side-swipe collisions.

Recommendation

Provide guidance roadmarkings through the junction for the two right-turning lanes at this location.



3.2.48 Problem

Location: Drawing Sheet 30 - Bridge Street/High Street Junction and High Street/Nicolas Street Junction

Summary: Absence of measures for right-turning cyclists will result in cyclists mingling with traffic and crossing multiple traffic lanes in order to turn right, with a resulting increased risk of being struck by a vehicle.

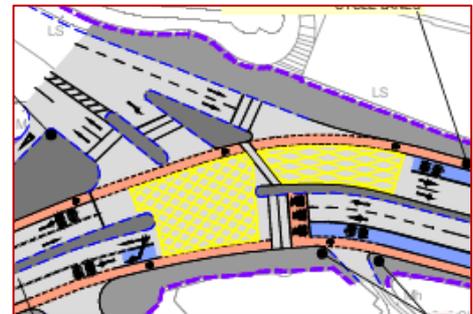
No measures have been indicated to facilitate right-turns by westbound cyclists on High Street at the Bridge Street junction or for eastbound cyclists wishing to turn right from High Street onto Nicolas Street.

Advance stop lines have been indicated on these approaches to the junctions, however these do not readily cater for right-turning cyclists who approach when the signals are green.

In the absence of measures catering for right-turning cyclists, cyclists may attempt to weave across multiple traffic lanes in order to enter the right-turning lane(s) where they are at increased risk of being struck by a vehicle. This is exacerbated by the provision of two right turning lanes at these locations.

Recommendation

Amend the proposed junction layout to provide measures catering for right-turning cyclists at this junction.

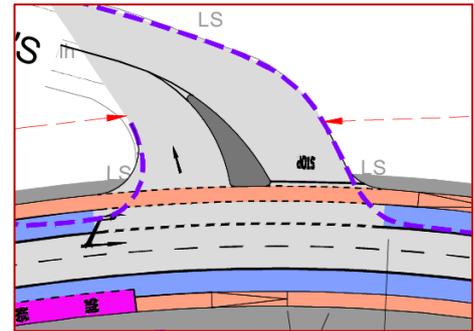


4 Observations

- 5.1 The proposed road layout on St Laurence's Road at its junction with Ballyfermot Road appears to be incorrect, as it does not tie in with the existing carriageway edges and does not show the existing footpaths which it is assumed are to be retained.

It has been assumed that this is a draughting error which will be corrected during subsequent design phases.

Should this assumption be incorrect the Audit Team should be advised, and the audit report amended.



5 Road Safety Review Team Statement

We certify that we have examined the drawings referred to in this report. The examination has been carried out with the sole purpose of identifying any features of the design that could be removed or modified in order to improve the safety of the scheme.

The problems identified have been noted in this report together with associated safety improvement suggestions, which we would recommend should be studied for implementation.

No one on the Road Safety Review Team has been involved with the design of the scheme.

ROAD SAFETY AUDIT TEAM LEADER

Peter Monahan Signed: _____

Dated: _____

ROAD SAFETY AUDIT TEAM MEMBER

Norman Bruton Signed: _____

Dated: _____

Appendix A – Documents Submitted to the Road Safety Review Team

DOCUMENT/DRAWING TITLE	DOCUMENT/DRAWING NO.	REVISION
Liffey Valley to City Centre	Key Plan	-
Liffey Valley to City Centre	Sheet 1 of 30	-
Liffey Valley to City Centre	Sheet 2 of 30	-
Liffey Valley to City Centre	Sheet 3 of 30	-
Liffey Valley to City Centre	Sheet 4 of 30	-
Liffey Valley to City Centre	Sheet 5 of 30	-
Liffey Valley to City Centre	Sheet 6 of 30	-
Liffey Valley to City Centre	Sheet 7 of 30	-
Liffey Valley to City Centre	Sheet 8 of 30	-
Liffey Valley to City Centre	Sheet 9 of 30	-
Liffey Valley to City Centre	Sheet 10 of 30	-
Liffey Valley to City Centre	Sheet 11 of 30	-
Liffey Valley to City Centre	Sheet 12 of 30	-
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Liffey Valley to City Centre	Sheet 14 of 30	-
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Liffey Valley to City Centre	Sheet 29 of 30	-
Liffey Valley to City Centre	Sheet 30 of 30	-