

**Title: STAGE 1 ROAD SAFETY AUDIT**

**For;**

**R132 Connectivity Project.**

**Client: DBFL Consulting Engineers.**

**Date: February 2021**

**Report reference: 0774R02 Rev 2**

**VERSION: FINAL (April 2021)**

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## 1.0 Introduction

This report was prepared in response to a request from Mr. Robert Kelly of DBFL Consulting Engineers for a Stage 1 Road Safety Audit of the proposed R132 Connectivity Project in Swords, Co. Dublin.

The Road Safety Audit Team comprised of;

Team Leader: **Norman Bruton**, BE CEng FIEI, Cert Comp RSA.

**TII approval number:** NB 168446

Team Member: **Mark Kelly**, BA BAI MSc CEng MIEI.

**TII approval number:** MK279758

The Road Safety Audit comprised an examination of the information provided and a site visit by the Audit Team, together on the 4<sup>th</sup> June 2020 and again by the Audit Team Leader on the 7<sup>th</sup> January 2021 and on the 26<sup>th</sup> March 2021.

The weather at the time of the site visit was dry and the road surface was dry.

This Stage 1 Road Safety Audit has been carried out in accordance with the requirements of TII Publication Number GE-STY-01024, dated December 2017.

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. 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 for road users.

If any of the recommendations within this safety audit report are not accepted, a written response is required, stating reasons for non-acceptance. Comments made within the report under the heading of Observation are intended to be for information only. Written responses to Observations are not required.

The information supplied is listed in **Appendix A**.

A problem location map is contained in **Appendix B**.

The feedback form to be completed by the Design Team Leader is contained in **Appendix C**.

A draft road safety audit was carried out on an initial set of junction layouts by the same Audit Team in June 2020. The current proposals have been reaudited.

## 2.0 Background

It is proposed to replace three of the four existing roundabouts on the R132 from Pinnock Hill to the Estuary Road with signalised junctions. Pinnock Hill roundabout will be upgraded as part of the future bus connects proposals. The existing links which have a bus lane and two traffic lanes will be converted to segregated footway/cycleway along with a bus lane and single traffic lane in both directions.

This work is to be carried out in advance of MetroLink but also to provide appropriate pedestrian and cycling facilities along the corridor on the basis of the changing environment that is expected with the development of Swords as a whole and specifically lands to the east of the R132 which will generate additional desire for east-west movements.

The R132 is a dual carriageway with a mainline speed limit of 80km/h reduced to 60km/h at the roundabouts. The sideroads generally have speed limits of 60km/h and 50km/h.

The existing pedestrian overbridges will be removed as part of the MetroLink.

The proposals for the Malahide Road junction include stopping up of Drynam Road.

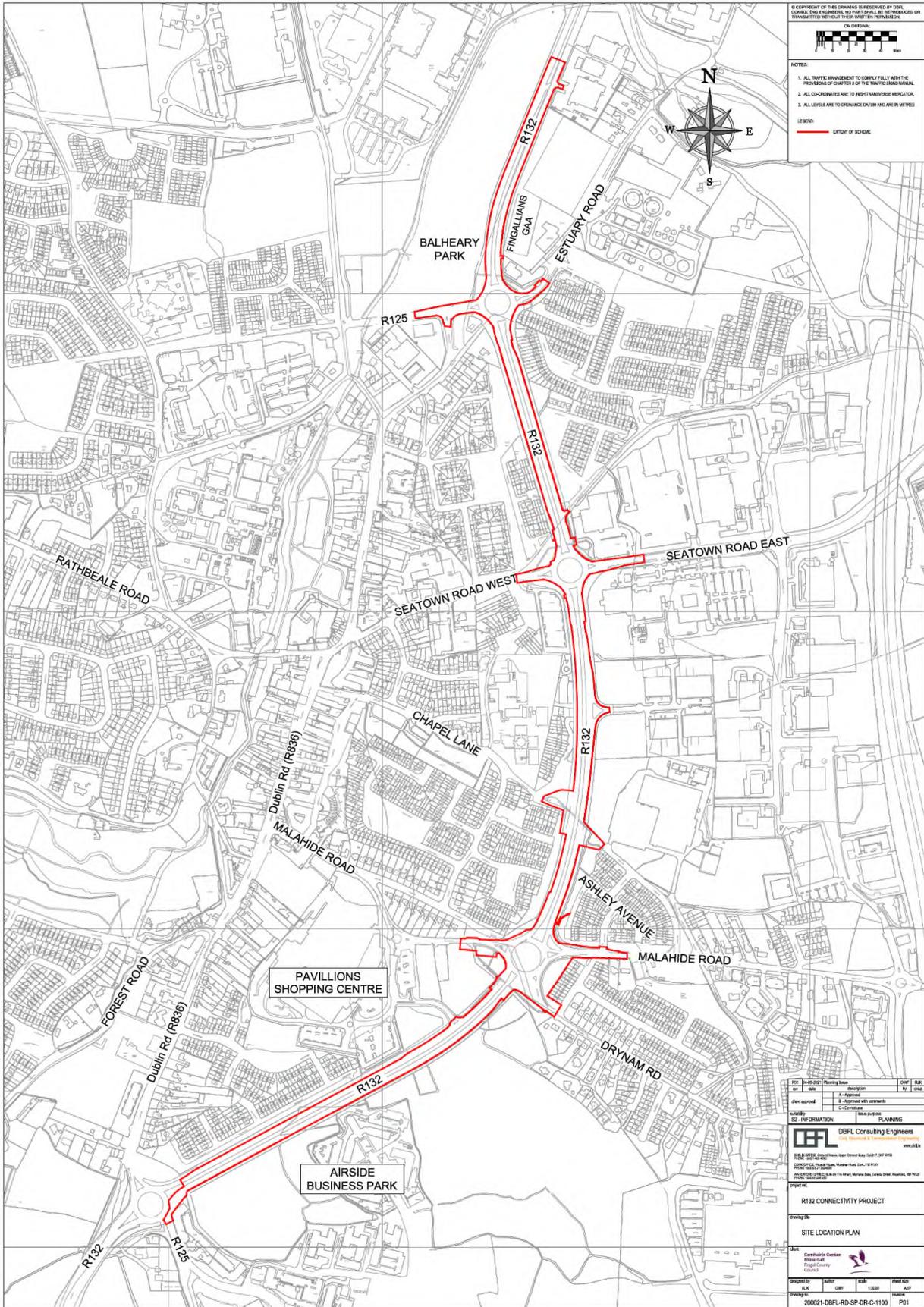
Subsequent to issue of the first draft of this report the Audit Team were furnished with some additional drawings which included some additional design elements including;

- A left turn only link to the R106 Malahide Road from Drynam Road.
- signal controlled facilities for u-turns north of Malahide Road Estuary roundabouts to serve existing desire lines from industrial facilities that currently use the roundabouts.

These additional design elements have been reviewed and problems raised have been provided in Section 3.6 of this Rev 1 report.

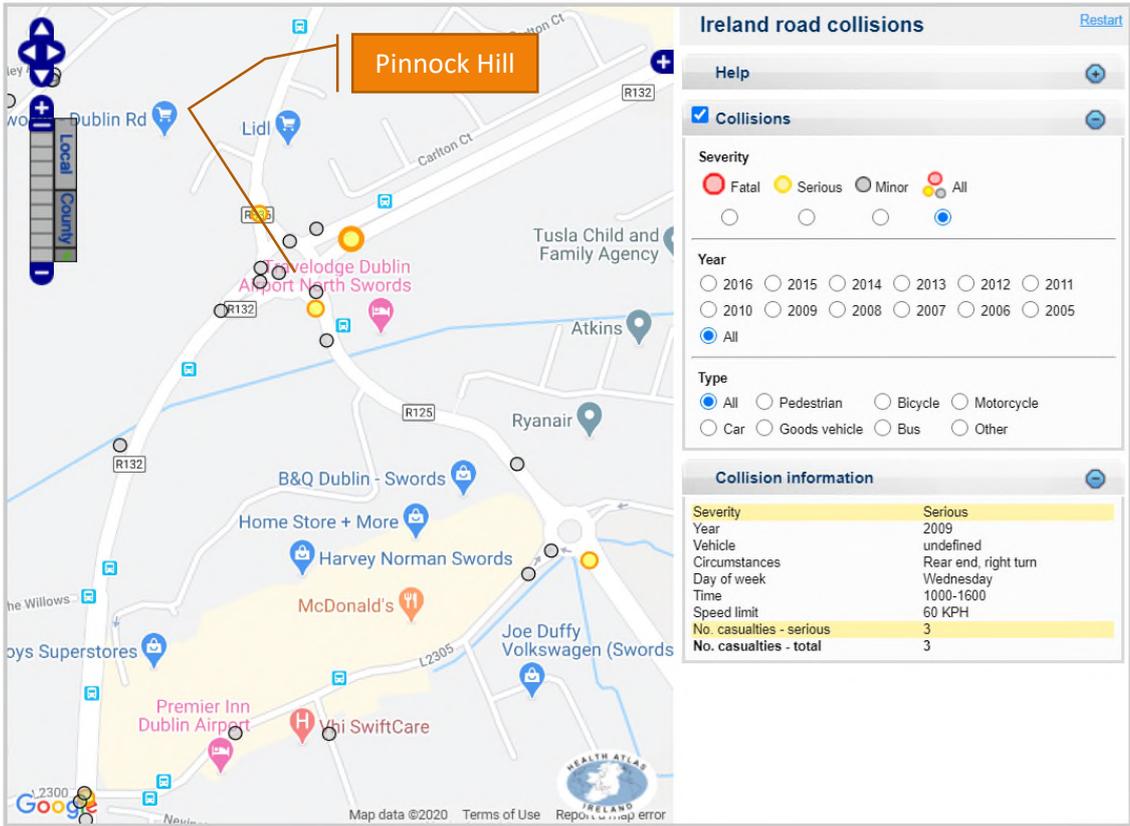
Some of the additional drawings received had modifications based on the initial draft report however the problems raised remain in this report for record purposes and by way of informing future stage road safety audits.

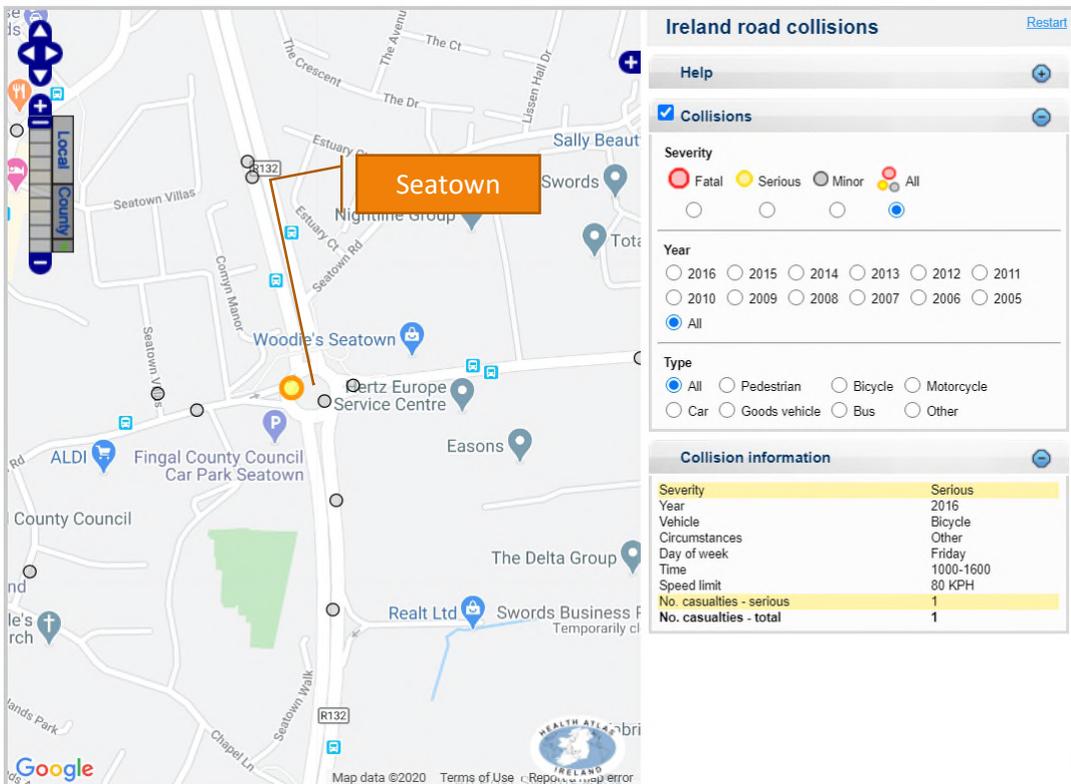
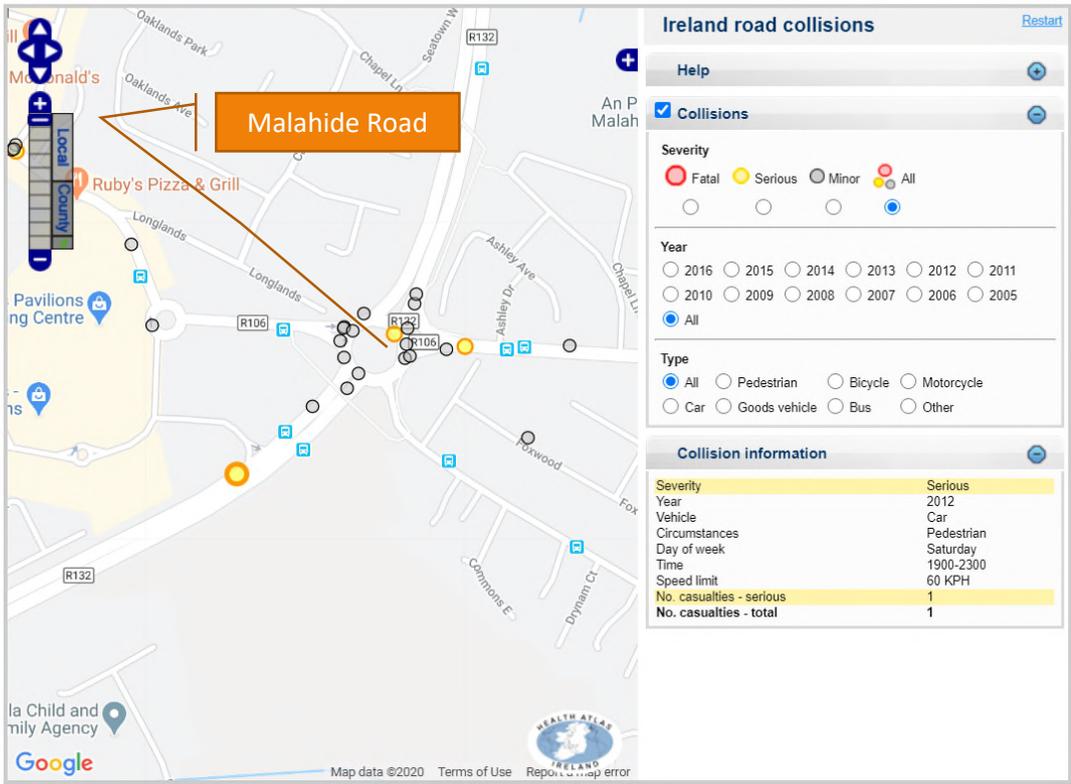
A site location map is provided below.

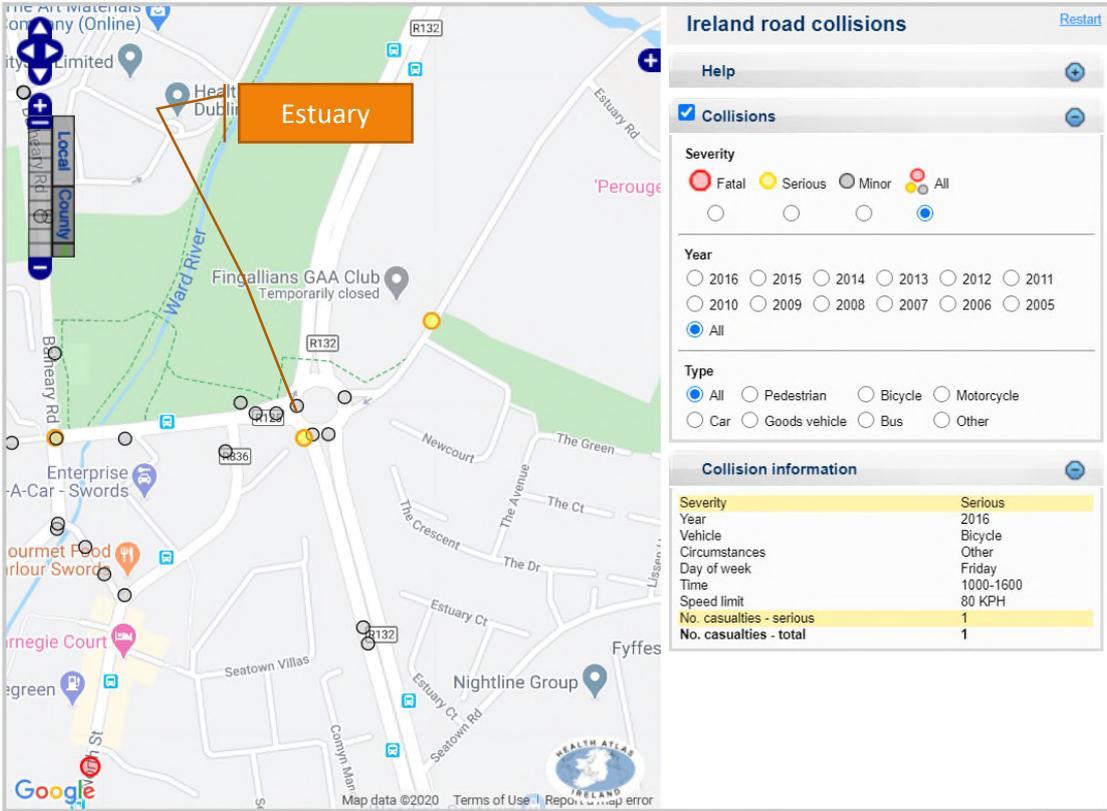


Site Location Map

The Road Safety Authority’s website [www.rsa.ie](http://www.rsa.ie) shows the recorded injury collisions between 2005 and 2016. These collisions included numerous collisions with pedestrians and cyclists.







## 3.0 Main Report

### 3.1 Pinnock Hill Tie-in to Seatown Road Junction Link.

#### 3.1.1 Problem

##### LOCATION

Drawing 200021-DBFL-RD-ST-SK-C-1911 Rev P01

##### PROBLEM

There is a sudden termination of the cycleway at the northern verge of the R125 along the boundary of the Travelodge. It is unclear how cyclists should continue their journey south on the R132 or how they should transition to on-road on the R125. The lack of provision of facilities for cyclists could lead to collisions with pedestrians in confined spaces or to cyclists entering the carriageway unexpectedly leading to collisions with passing vehicles.



##### RECOMMENDATION

It is recommended that the transition of cyclists at the Pinnock Hill Roundabout be developed independently of the future BusConnects programme.

#### 3.1.2 Problem

##### LOCATION

Drawing 200021-DBFL-RD-ST-SK-C-1911 Rev P01

##### PROBLEM

In the interim period until the Pinnock Hill junction is upgraded there will be a single traffic lane at the pedestrian crossing leading to three lanes south of the crossing including a dedicated left turning lane for the R125. There is a risk of side swipe collisions between buses continuing southbound on the R132 and vehicles turning left into the R125.



**RECOMMENDATION**

It is recommended that the approach to the roundabout to be reduced to two lanes in the interim period and that the bus lane be open for left turning traffic and straight ahead buses.

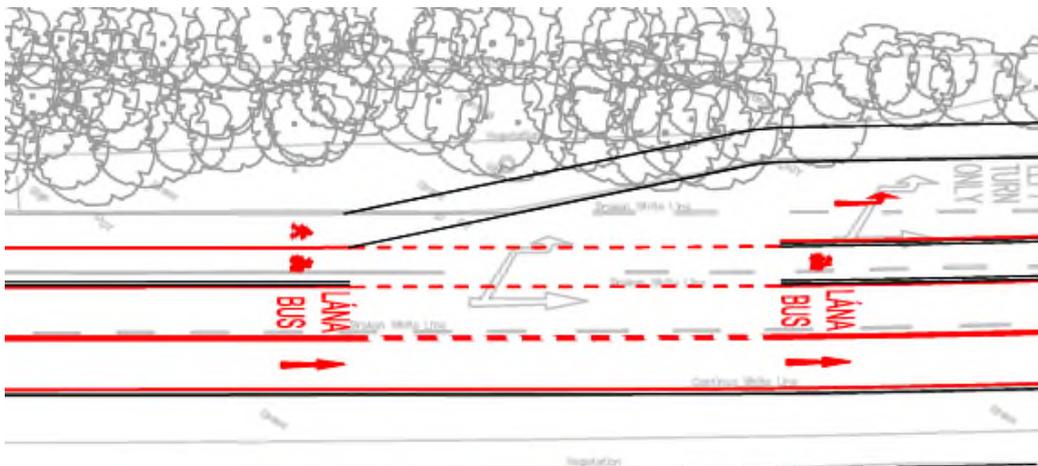
**3.1.3 Problem**

**LOCATION**

Drawing 200021-DBFL-RD-ST-SK-C-1912 Rev P01

**PROBLEM**

It is proposed that northbound diverging traffic into the Pavilions will cross the bus lane and the cycleway. This could lead to collisions with cyclists that may not been seen by turning drivers due to the presence of buses. This could lead to collisions with cyclists.



**RECOMMENDATION**

It is recommended that the cycleway is brought behind the diverge lane similar to the footway.

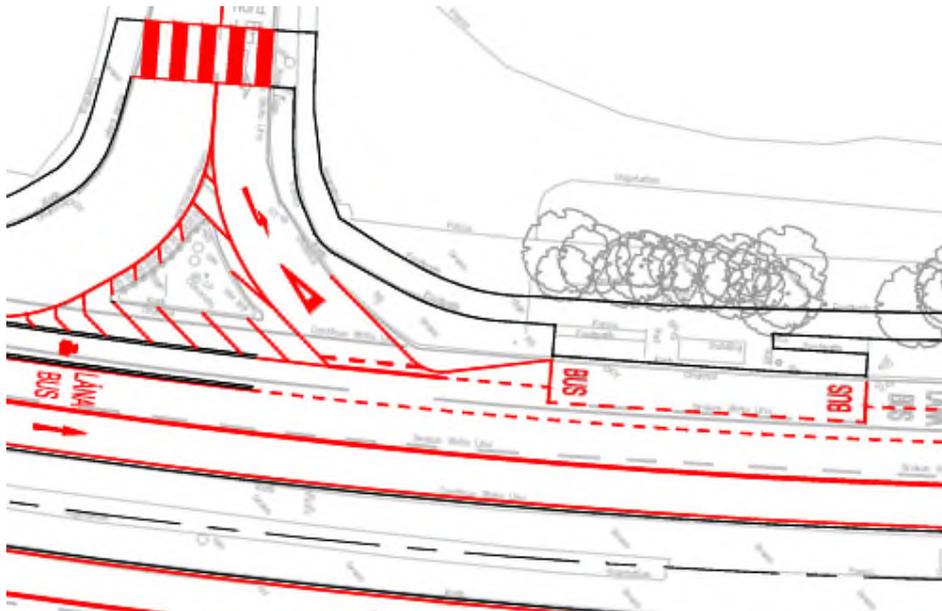
### 3.1.4 Problem

#### LOCATION

Drawing 200021-DBFL-RD-ST-SK-C-1913 Rev P01

#### PROBLEM

It is proposed to provide a bus stop immediately upstream of the left-out junction of the pavilions shopping centre. Drivers exiting the junction will have a significant amount to check before exiting including, cyclists, weaving and slowing buses and through traffic. There is a risk that during peak traffic periods that drivers will be tempted to accept smaller gaps than required leading to collisions. This may be compounded by the acute angle of the merge which may lead to some mobility impaired drivers not being able to properly see approaching cyclists and vehicles.



#### RECOMMENDATION

It is recommended that the Pavilions junction be signalised taking bus movements into account.

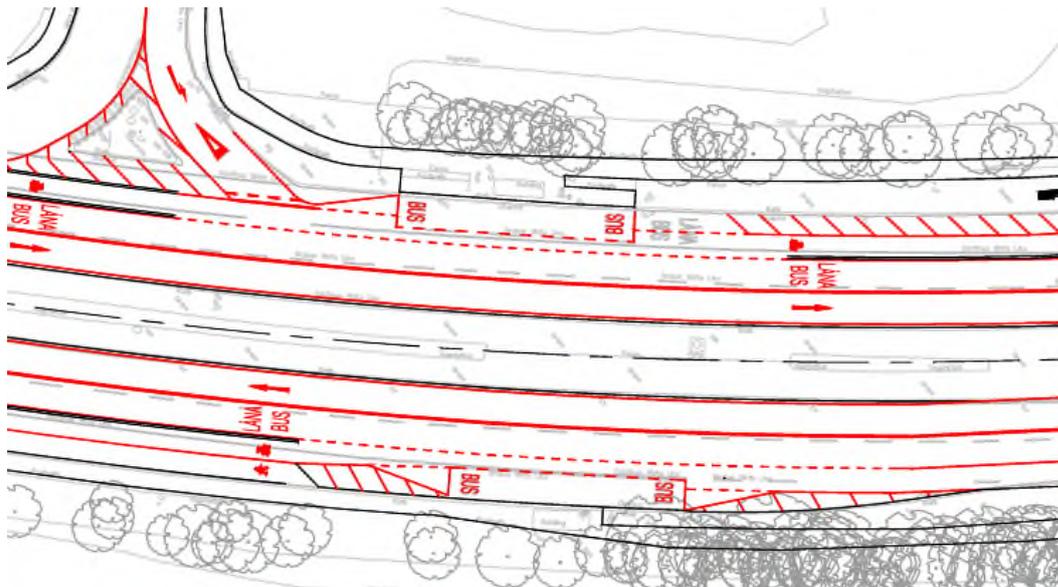
### 3.1.5 Problem

#### LOCATION

Drawing 200021-DBFL-RD-ST-SK-C-1913 Rev P01

#### PROBLEM

It is proposed to provide a bus stop on each side of the R132 adjacent to the Pavillions junction. There will be a desire line for bus users across the median as the signalised crossing will be deemed too far away to walk. This could lead to collisions between crossing pedestrians and through traffic.



**RECOMMENDATION**

It is recommended that the bus stops be relocated closer to the Malahide Road Junction, that a controlled pedestrian crossing of the R132 be provided or that the median fencing provision be increased to prevent pedestrian movements.

**3.1.6 Problem**

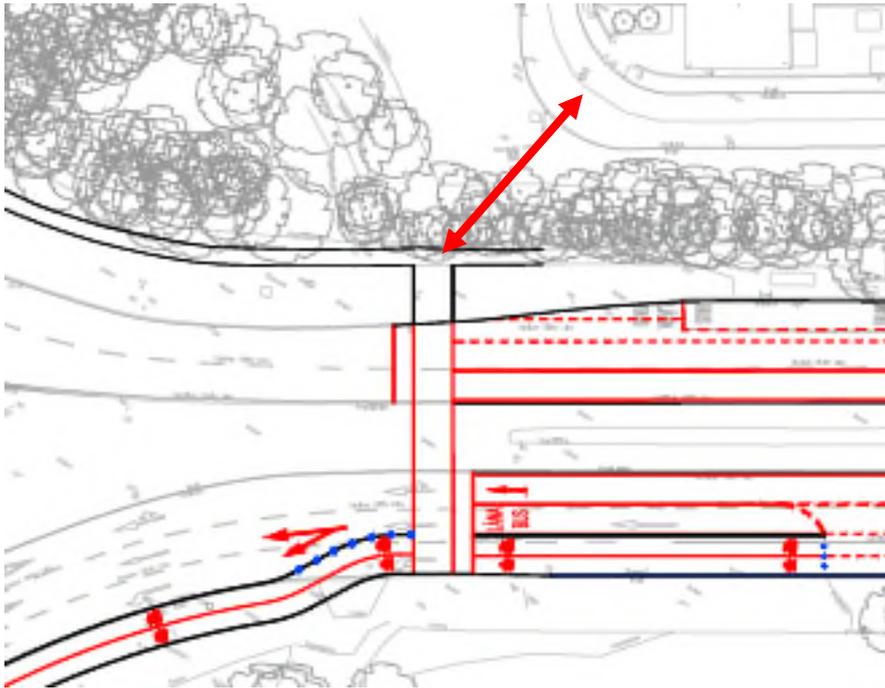
**LOCATION**

Drawing 200021-DBFL-RD-ST-SK-C-1911 Rev P01

**PROBLEM**

There is a pedestrian desire line from Carlton Court to the proposed Toucan Crossing close to the Pinnock Hill Junction. This is through an unpaved area with a steep section which could lead to slips and trips especially in wet conditions.





*RECOMMENDATION*

It is recommended that a pedestrian and cyclist link from Carlton Court be provided to the facilities on the R132.

### 3.2 Malahide Road Junction

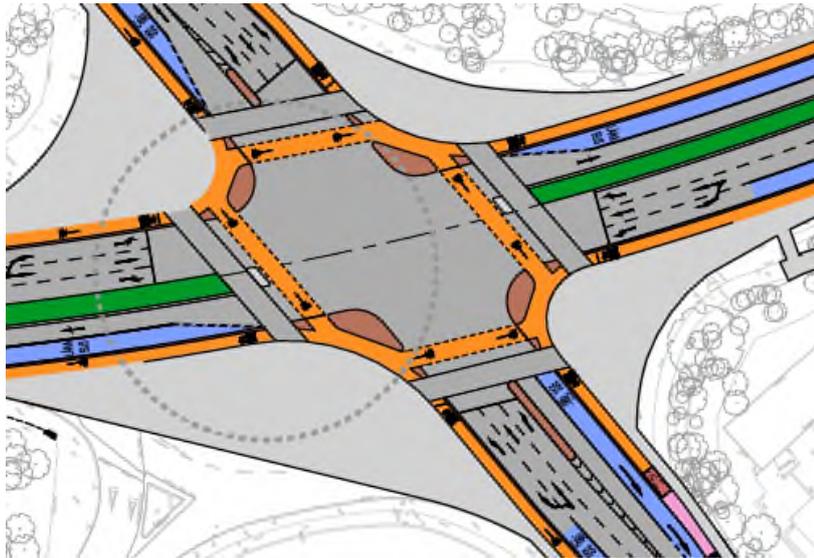
#### 3.2.1 Problem

*LOCATION*

Drawing 200021-DBFL-RD-ST-SK-C-1913 Rev P01

*PROBLEM*

The junction is a skewed junction and it is unclear if the acute angles will enable left turning by all classes of vehicles. Without adequate space the trailing wheels of larger vehicles could overrun the cyclist protection islands causing material damage and possible collisions with cyclists.



*RECOMMENDATION*

It is recommended that a swept path analysis is carried out to ensure all planned vehicle movements can be readily accommodated.

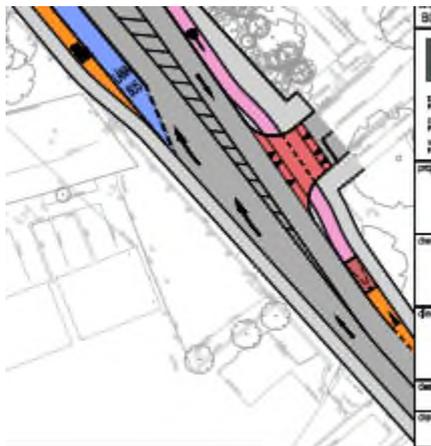
3.2.2 Problem

*LOCATION*

Drawing 200021-DBFL-RD-ST-SK-C-1913 Rev P01

*PROBLEM*

There is an existing on-street bus stop on the Malahide Road at or close to the proposed cycle lane taper. Pedestrians wishing to exit/enter the bus may have to cross a cycle lane which could lead to trips and falls due to the level difference or could lead to collisions with cyclists. In addition, cyclists may lose control if they try to transition from off-road to on-road upstream of a parked bus where there is a level difference between the cycle track and the carriageway.



*RECOMMENDATION*

It is recommended that the design includes the bus stop and suitable treatment for cyclists at that location.

3.3 Malahide Road Junction to Seatown Road Junction Link.

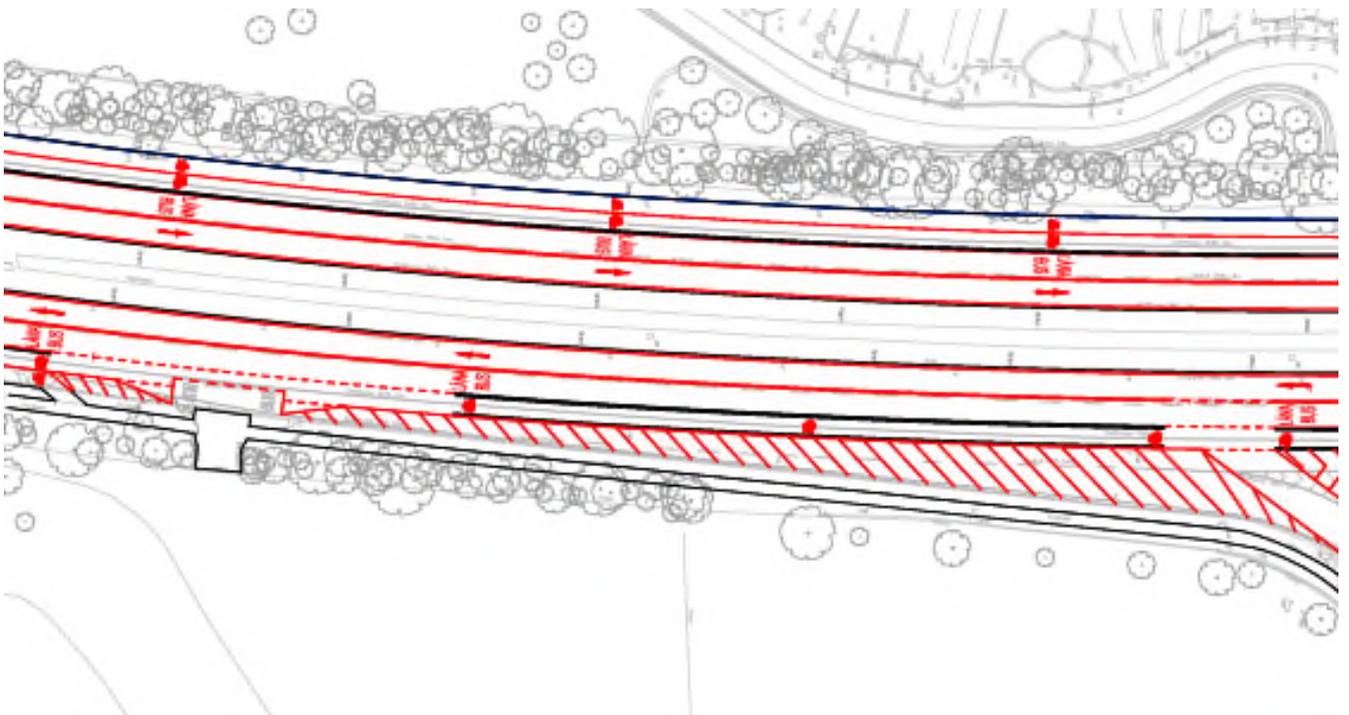
3.3.1 Problem

*LOCATION*

Drawing 200021-DBFL-RD-ST-SK-C-1914 & 1915 Rev P01

*PROBLEM*

There is a large hatched area associated with the left-in left-out business park (Scheneker). There is a risk that the hatched road markings will become worn over time and the exit from the junction will not be clearly defined. This could lead to drivers using the hatched area as an acceleration lane. This could lead to higher speeds and possible collisions with cyclists.



*RECOMMENDATION*

It is recommended that the area where vehicles are not to travel is made clearer by providing hard standing, landscaping or bollards.

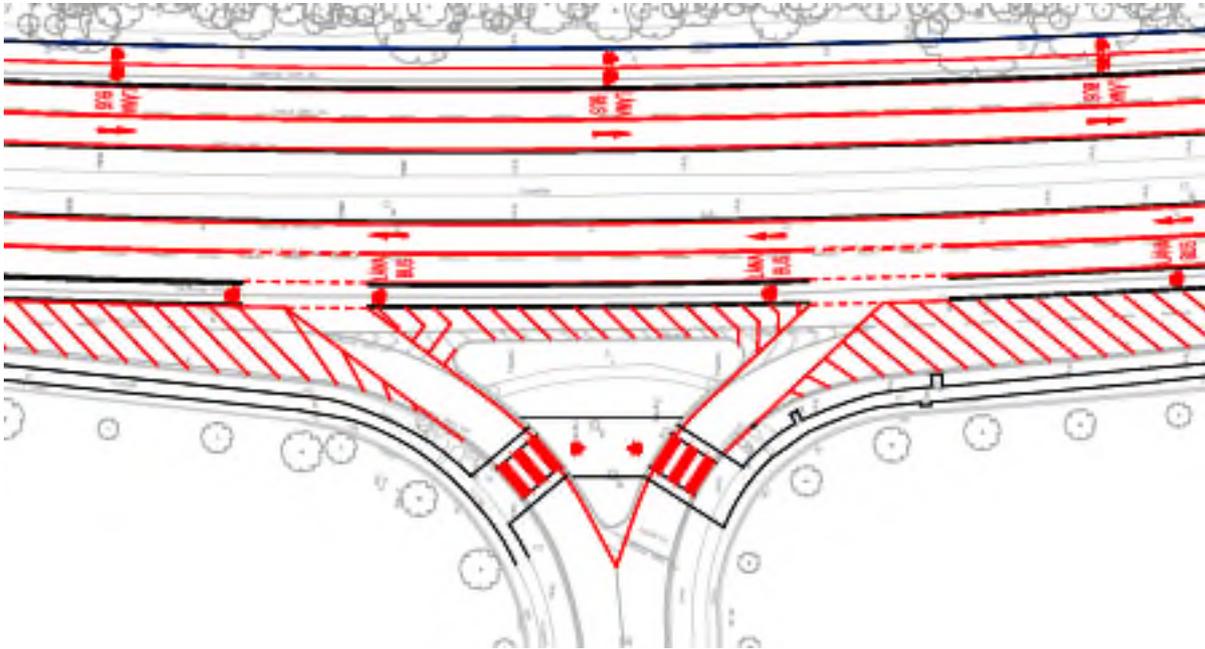
3.3.2 Problem

*LOCATION*

Drawing 200021-DBFL-RD-ST-SK-C-1915 Rev P01

*PROBLEM*

It is proposed that southbound diverging traffic into the business park will cross the bus lane and the cycleway. This could lead to collisions with cyclists that may not be seen by turning drivers due to the presence of buses.



*RECOMMENDATION*

It is recommended that the cycleway is brought behind the diverge lane similar to the footway.

3.4 Seatown Road Junction to Estuary Road Junction Link.

3.4.1 Problem

*LOCATION*

Drawing 200021-DBFL-RD-ST-SK-C-1916 Rev P01

*PROBLEM*

There is a hatched area associated with the bus stop and Seatown Road access onto the R132 . There is a risk that the road markings will fade with time and the route for traffic will not be clear. There also appears to be a discontinuity in the footway between the junction and the link. Left turning into Seatown Road by general traffic will result in crossing of the bus lane and cycleway which could lead to collisions with cyclists if they are not clearly visible. There is a risk that drivers' visibility will be obscured as buses (and possible other vehicles) queue in the bus lane when the signals are red at Seatown Junction.



*RECOMMENDATION*

It is recommended that the layout be modified such that the hatched areas are converted to solid buildouts/widening of the footway. Cyclists should be brought behind the junction mouth.

3.5 Estuary Road Junction to M1 Link.

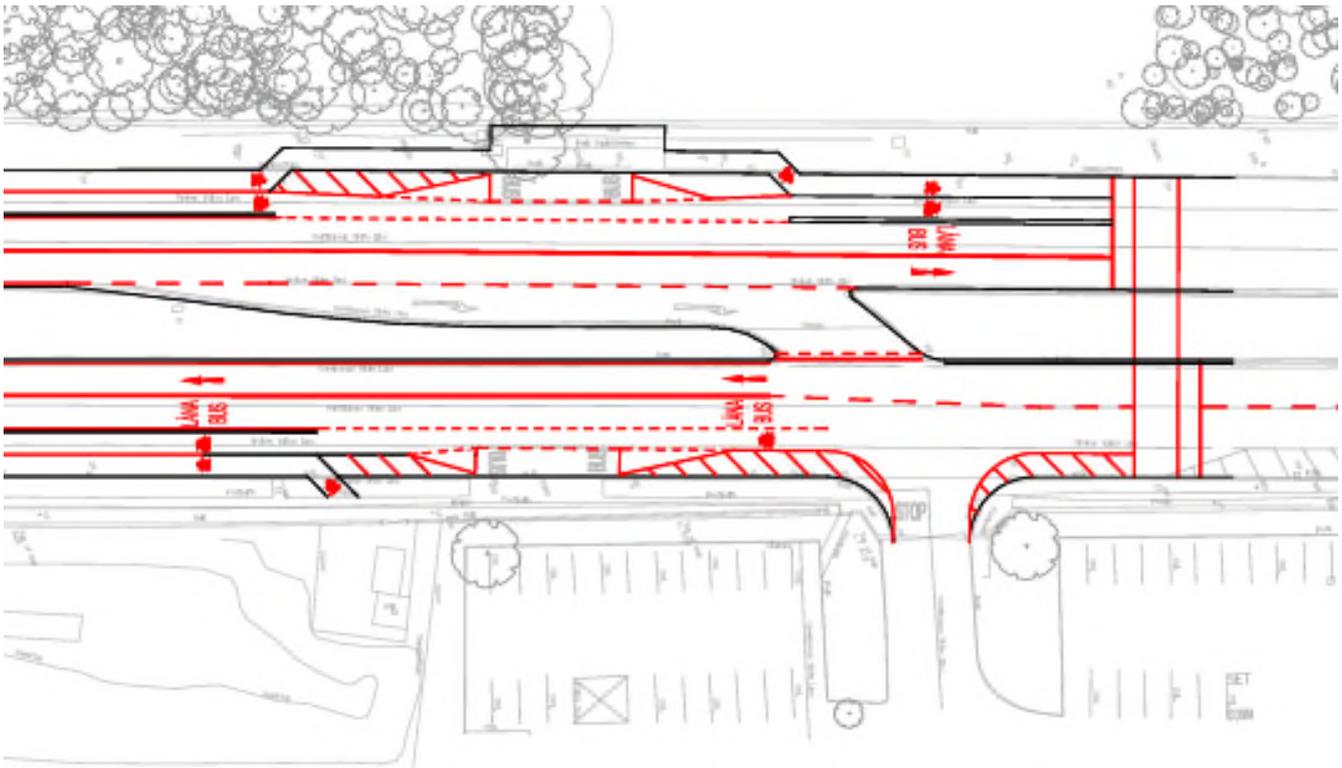
3.5.1 Problem

*LOCATION*

Drawing 200021-DBFL-RD-ST-SK-C-1918 Rev P01

*PROBLEM*

It is proposed to retain the right turning lane in the median at the Bostik industrial premises. It is proposed to provide a signalised pedestrian/toucan crossing immediately north of the right turn lane. There is a risk that right turning vehicles may start to turn when the signals are red for traffic to take advantage of the gap in the traffic. They may not complete the manoeuvre however and the traffic might start to flow in the southbound lane on the R132 and not expect conflicting turning traffic. This could lead to head-on collisions or rear end collisions if drivers have to stop suddenly after starting at the signals.



*RECOMMENDATION*

It is recommended that the right turning lane be incorporated into the signals.

3.6 Additional Design Elements Provided in February 2021.

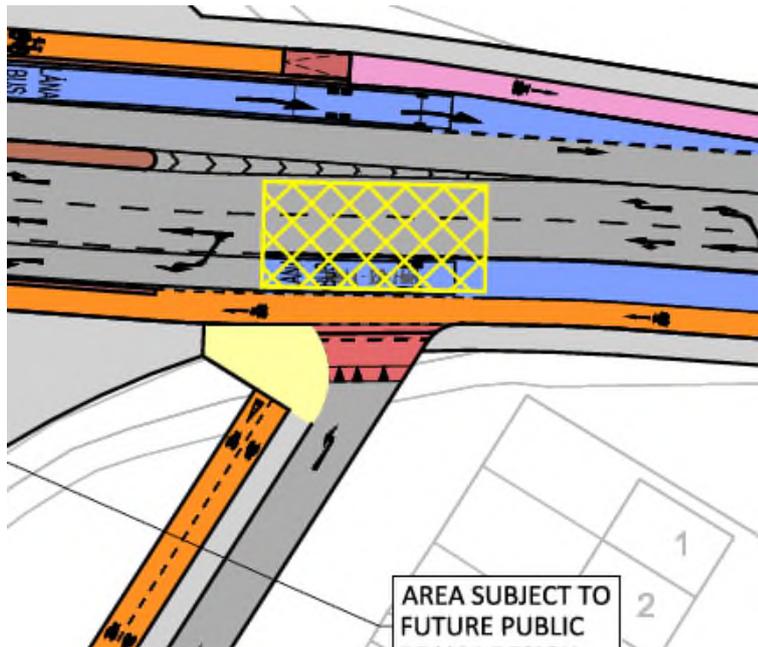
3.6.1 Problem

*LOCATION*

Drawing 200021-DBFL-RD-SP-DR-C-1013 Rev P01

*PROBLEM*

There is a risk that some drivers may turn right at the R106 to use the proposed link as a 'rat run'. This may lead to crossing of 4 lanes including the bus lane. The demand for such a movement may however be low since there are nearby alternative routes for Drynam Road traffic to travel eastbound on the R106.



*RECOMMENDATION*

It is recommended that if there could be a demand for drivers to turn right, that the splitter island on the R106 be extended to beyond the kink to physically prevent right turn movements.

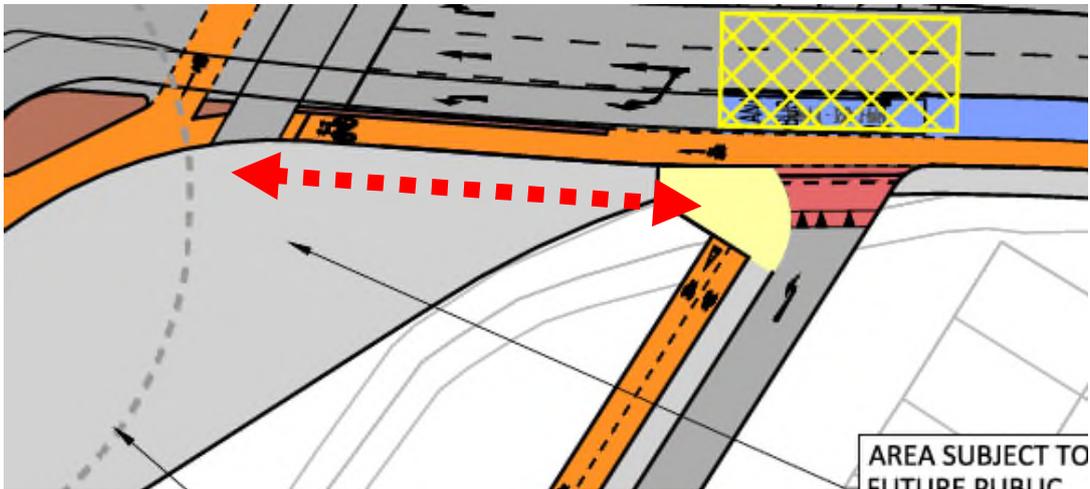
3.6.2 Problem

*LOCATION*

Drawing 200021-DBFL-RD-SP-DR-C-1013 Rev P01

*PROBLEM*

It is proposed to provide a two way cycle track along the Drynam Road link. There is however only a one way cycle track from the main signalised junction to the proposed link. This could lead to cyclists travelling contra flow along the R106 section.



*RECOMMENDATION*

It is recommended that a section of two way cycle track be provided from the junction to the link.

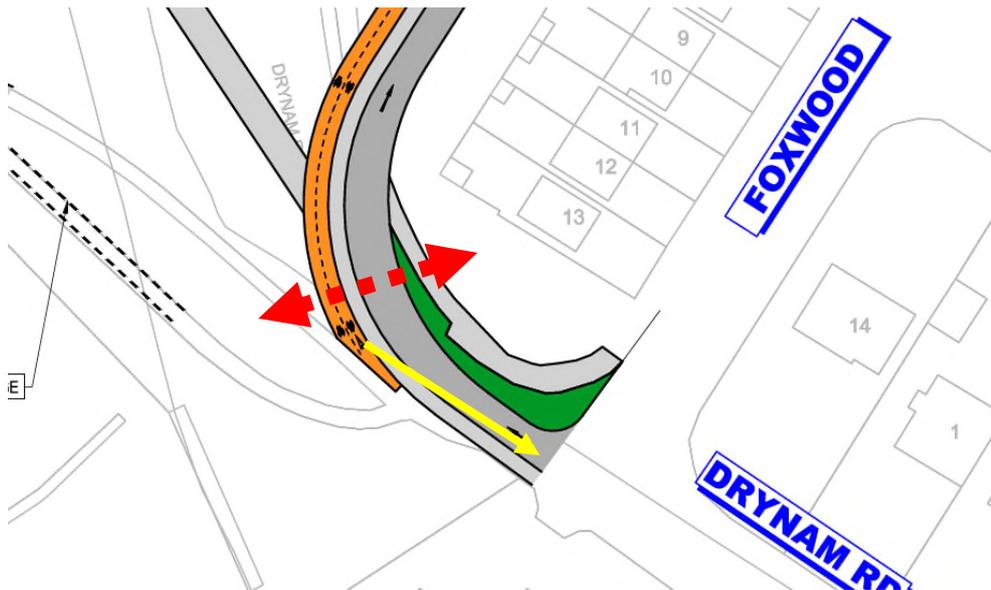
### 3.6.3 Problem

#### LOCATION

Drawing 200021-DBFL-RD-SP-DR-C-1013 Rev P01

#### PROBLEM

There is an existing controlled crossing of Drynam Road adjacent to the Foxwood residential area. Such a crossing is not shown on the proposed link. There is a number of footpaths that are not connected and the westbound cyclists would have to travel contraflow on a short section of the one-way Drynam Road Link.



#### RECOMMENDATION

It is recommended that the layout be reconfigured to have suitable crossing area for cyclists and pedestrians and without the need for cyclists to travel in a contraflow direction to vehicular traffic after the dedicated cycle facility terminates.

### 3.6.4 Problem

#### LOCATION

Drawing 200021-DBFL-RD-SP-DR-C-1013 Rev P01

#### PROBLEM

Drynam Road is part of an existing bus route. It is unclear if the link road is designed to cater for buses and if the left only turn will facilitate effective bus routes.

#### RECOMMENDATION

It is recommended that the design takes bus movements into account.

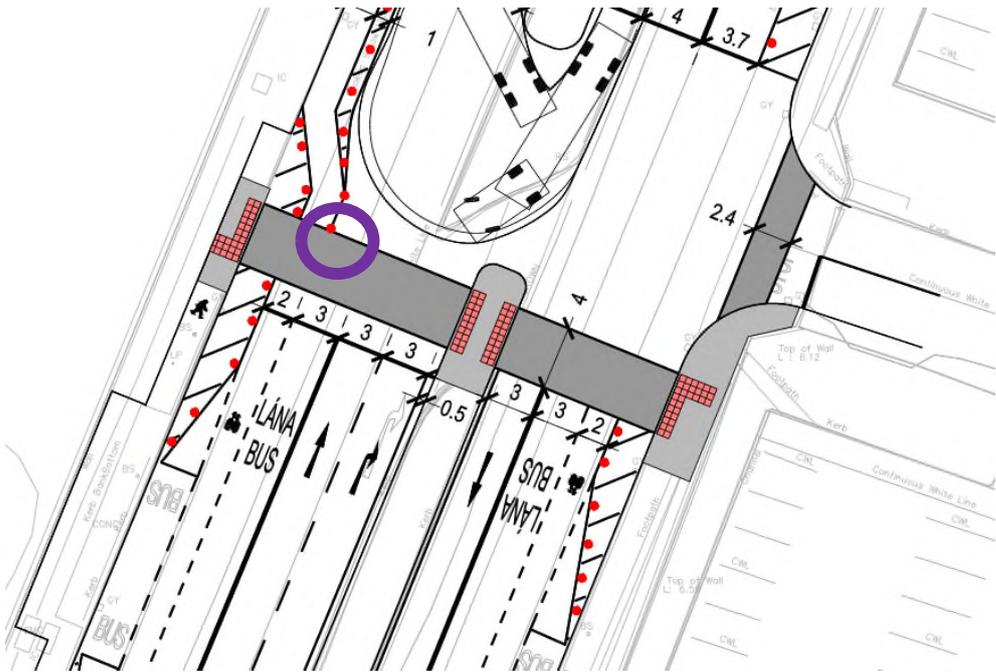
### 3.6.5 Problem

*LOCATION*

Drawing 200021-DBFL-RD-SP-SK-C-1082 Rev P0

*PROBLEM*

There is a risk that the flexible bollard at outside of the cycle lane north of the toucan crossing will be struck by passing buses. This could lead to a lack of guidance for future cyclists.



*RECOMMENDATION*

It is recommended that the cycle lane be tapered to the left to the kerb after the bus stop and prior to the toucan crossing and that the buffer zone between the cycle lane and bus lane be hatched.

## 4.0 Observations

### 4.1 Observation

The proposed road markings have not generally been commented upon as it is expected that they will be provided in greater details at the Stage 2 Road Safety Audit.

### 4.2 Observation

The bus stop on the southbound carriageway on approach to the Seatown Junction is a relatively long way from the signalised pedestrian crossing. There does not appear to be another bus stop close to the Estuary junction.

## 5.0 Audit Statement

We certify that we have examined the information provided and the site on the 4<sup>th</sup> June 2020. The examination has been carried out with the sole purpose of identifying any features of the design which 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. The audit has been carried out by the persons named below who have not been involved in any design work on this scheme as a member of the Design Team.

**Norman Bruton**                      Signed: *Norman Bruton*  
**(Audit Team Leader)**              Dated: 26/3/2021

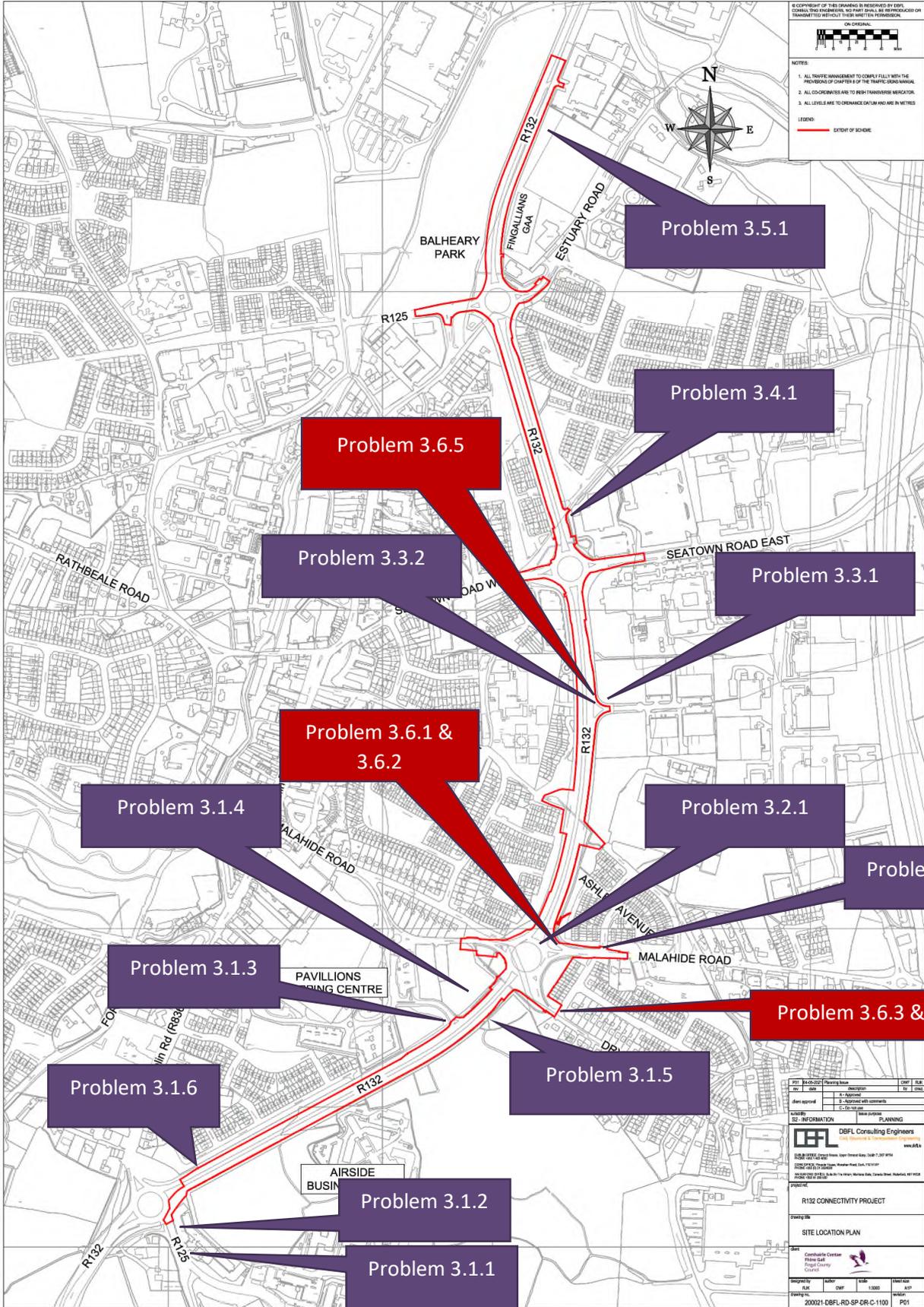
**Mark Kelly**                         Signed: *Mark Kelly*  
**(Audit Team Member)**             Dated: 26/3/2021

## Appendix A

### List of Material Supplied for this Stage 1 Road Safety Audit;

- Drawing 200021-DBFL-RD-ST-SK-C-1911 Rev P01
- Drawing 200021-DBFL-RD-ST-SK-C-1912 Rev P01
- Drawing 200021-DBFL-RD-ST-SK-C-1913 Rev P01
- Drawing 200021-DBFL-RD-ST-SK-C-1914 Rev P01
- Drawing 200021-DBFL-RD-ST-SK-C-1915 Rev P01
- Drawing 200021-DBFL-RD-ST-SK-C-1916 Rev P01
- Drawing 200021-DBFL-RD-ST-SK-C-1917 Rev P01
- Drawing 200021-DBFL-RD-ST-SK-C-1918 Rev P01
- Drawing 200021-DBFL-RD-SP-DR-C-1010 Rev P01
- Drawing 200021-DBFL-RD-SP-DR-C-1011 Rev P01

## Appendix B – Problem Location Plans.



## Appendix C

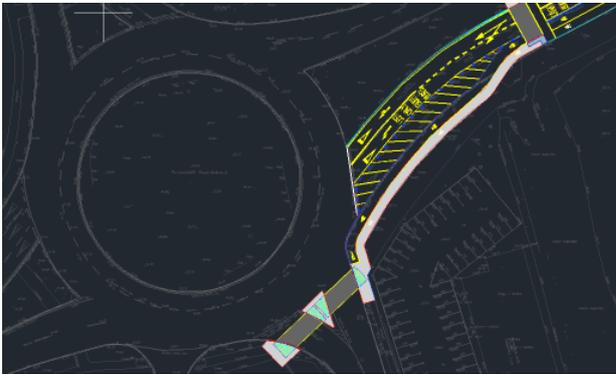
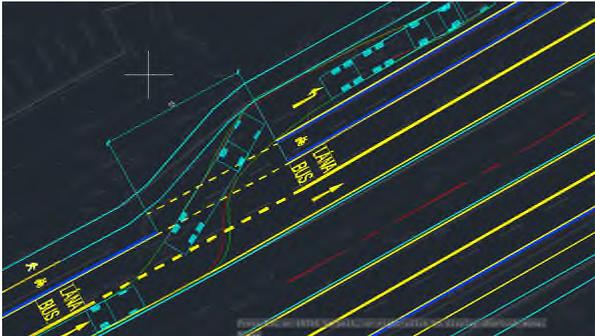
### Feedback Form

**SAFETY AUDIT FORM – FEEDBACK ON AUDIT REPORT**

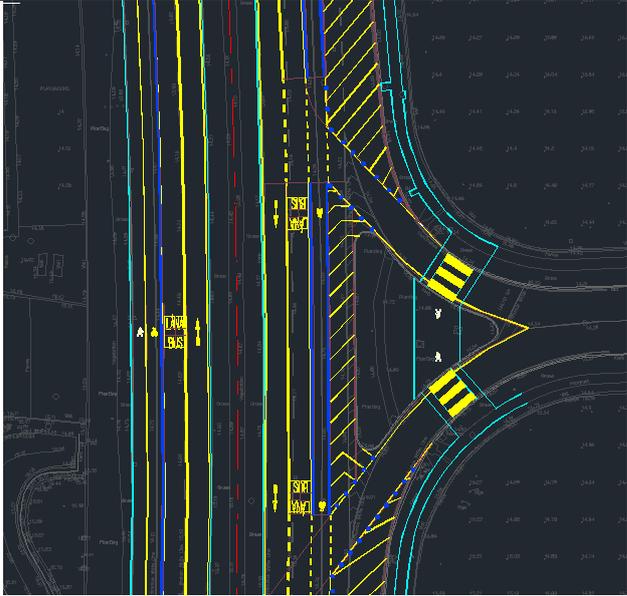
Scheme: R132 Connectivity Project.

Stage: 1 Road Safety Audit

Date Audit (Site visit) Completed: 4<sup>th</sup> June 2020

Paragraph No. in Safety Audit Report	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Alternative measures (describe)	Alternative measures accepted by Auditors (Yes/No)
3.1.1	Y	Y	<p>The section of footway/cycle track has been extended to a courtesy crossing of the R125 which could be implemented if the R132 Connectivity Scheme precedes the upgrade of the Pinnock Hill roundabout.</p> 	
3.1.2	Y	Y		
3.1.3	Y	N	<p>Relocation of the cycleway to behind diverge lane will result in a longer diversion for cyclists and it is felt that cyclists will choose to remain on road in the Bus Lane. The relocation of the cycleway will also require crossing of the entry and exit lanes to/from Pavilions as well as potential for conflict with pedestrians crossing here.</p> <p>The opening for left turning vehicles crossing the cycleway has been reduced to limit potential exposure/conflict.</p> 	Yes

Paragraph No. in Safety Audit Report	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Alternative measures (describe)	Alternative measures accepted by Auditors (Yes/No)
3.1.4	Y	N	It is proposed to signalize this junction in the medium term subject to the development of private lands on the eastern side of the R132.	Yes
3.1.5	Y	Y	Bus stops will be relocated as part of the Metrolink works. In the meantime, fencing will be installed to prevent pedestrian movements between the stops.	
3.1.6	Y	N	The formalization of this link is not proposed as part of the R132 Connectivity Scheme. FCC will be made aware of the issue and can consider as part of a future scheme if there is local interest.	Yes
3.2.1	N	Y	Swept path analysis drawings provided with this response.	Yes
3.2.2	Y	N	The scheme will now end with a Shared space crossing of Ashley Avenue. FCC will develop cyclist connections eastward as part of a future scheme connecting Swords & Malahide. See updated drawing	Yes
3.3.1	Y	Y		
3.3.2	Y	N	Relocation of the cycleway to behind diverge lane will result in a longer diversion for cyclists and it is felt that cyclists will choose to remain on road in the Bus Lane. The relocation of the cycleway will also require crossing of the entry and exit lanes to/from the industrial facility as well as potential for conflict with pedestrians crossing here.  The opening for left turning vehicles crossing the cycleway has been reduced to limit potential exposure/conflict.	Yes

Paragraph No. in Safety Audit Report	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Alternative measures (describe)	Alternative measures accepted by Auditors (Yes/No)
				
3.4.1	Y	Y	Yellow box to be provided to prevent blocking of Seatown Road. Hatched areas will be defined with additional kerbing.	
3.5.1	Y	Y	This junction will be fully signalised to facilitate all movements including U-turns on the R132. See enclosed drawing.	
3.6.1	Y	Y		
3.6.2	Y	N	Westbound cyclists will be permitted to use the emergency access route connecting the southbound cycle lane on the R132 to Drynam Road. This will reduce the potential for conflict with pedestrians on the south western corner of the Malahide Road junction which would be difficult to achieve if a 2 way cycle track was introduced.	Yes
3.6.3	Y	Y	The existing crossing will be upgraded to a toucan crossing to bring westbound cyclists safely across the one way section of Drynam Road.	
3.6.4	N	N	Bus routes are to be moved from Drynam Road to Malahide Road under the BusConnects network redesign	Yes
3.6.5	Y	N	The realignment of the cycle track to the kerb side is difficult to achieve within the space available. The	Yes

Paragraph No. in Safety Audit Report	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Alternative measures (describe)	Alternative measures accepted by Auditors (Yes/No)
			<p>footpath/pedestrian waiting area has been extended eastwards to provide further definition for the northbound bus movement while one of the bollards has been removed immediately north of the toucan crossing. A reflective/keep left bollard will be used to further reduce the potential for buses colliding with the bollards. Red surfacing of the cycle track could also be used to serve the same purpose.</p>	

Signed..... *Robert Kelly*  
Design Team Leader

Date 18.02.21

Signed..... *Norman Bruton*  
Audit Team Leader

Date: ...26/3/2021.....

Signed...   
Employer

Date: 26/03/2021