Appendix L
Junction Design Report

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BusConnects - Core Bus Corridor Project

Scheme 1: Clongriffin to City Centre Junction Design and Modelling Report

December 2021

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	30-07-21	Rev 1	SG	Shaun Grima	Associate Director
2	20-12-21	Rev 2	MB	Martin Boran	Associate Director

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1. Introduction

This report has been prepared to document the evolution of the design of key junctions along the Clongriffin to City Centre Scheme (hereafter referred the Proposed Scheme). In addition, the report presents the junction assessment results for the final scheme design which demonstrate the expected operation of the junction.

Finally, a theoretical assessment has been carried out to demonstrate the capacity of the junctions for all modes. The methodology adopted is elaborated upon in the following sections.

2. Methodology

2.1 Junction Design Evolution

The proposed scheme has been designed over the course of a number of years, and during this period the design principles have evolved to improve the movement of people through the junctions for all modes. The final design principles which guided the junction design are documented in the BusConnects Preliminary Design Guidance Booklet. This document sets out the four typical junction arrangements adopted on the project as follows:

- Junction Type 1 – Both bus lanes are dedicated lanes up to the junction stop line and general straight ahead and left-turning traffic is restricted to one lane;
- Junction Type 2 – As per Junction Type 1 but with left turning traffic crossing the bus lane into a dedicated left turn lane in advance of the stop line;
- Junction Type 3 – Bus lanes are terminated just short of the junction to allow left-turners to turn left from a short left-turn pocket in front of the bus lane. Buses can continue straight ahead from this pocket where a receiving bus lane is proposed; and
- Junction Type 4 – Similar to the CYCLOPS junction in Manchester, U.K. the pedestrian crossings are located on the inside of the cycle lanes on all arms of the junction. This assists to minimise pedestrian crossing distances. Signalised pedestrian crossings are proposed across the cycle tracks to allow the pedestrian to cross from the footpath to the pedestrian crossing landing areas, thus avoiding any uncontrolled pedestrian-cyclist conflict. Bus lanes are terminated just short of the junction to allow left turners to turn left from a short left-turn pocket in front of the bus lane. Buses can continue straight ahead from this pocket where a receiving bus lane is proposed.

In addition to the evolution of the design principles, the design has been positively influenced through engagement with the public at various points in the design process. The evolution of the design is documented in this report with a clear rationale provide for the changes at key points in the project as follows:

- Concept Design;
- Emerging Preferred Routes (EPR);
- Second Public Consultation (PC2);
- Third Public Consultation (PC3); and
- Final Proposed Scheme.

2.2 Transport Modelling

Transport modelling has been a key input to the scheme design throughout the project. Given the complexity of the scheme proposals and changes to existing traffic regimes, the design went through an iterative process which was incorporated in the multi-tiered transport modelling approach consisting of strategic, local, and microsimulation modelling. The overall modelling methodology and information flow is summarised in **Figure 2-1**.

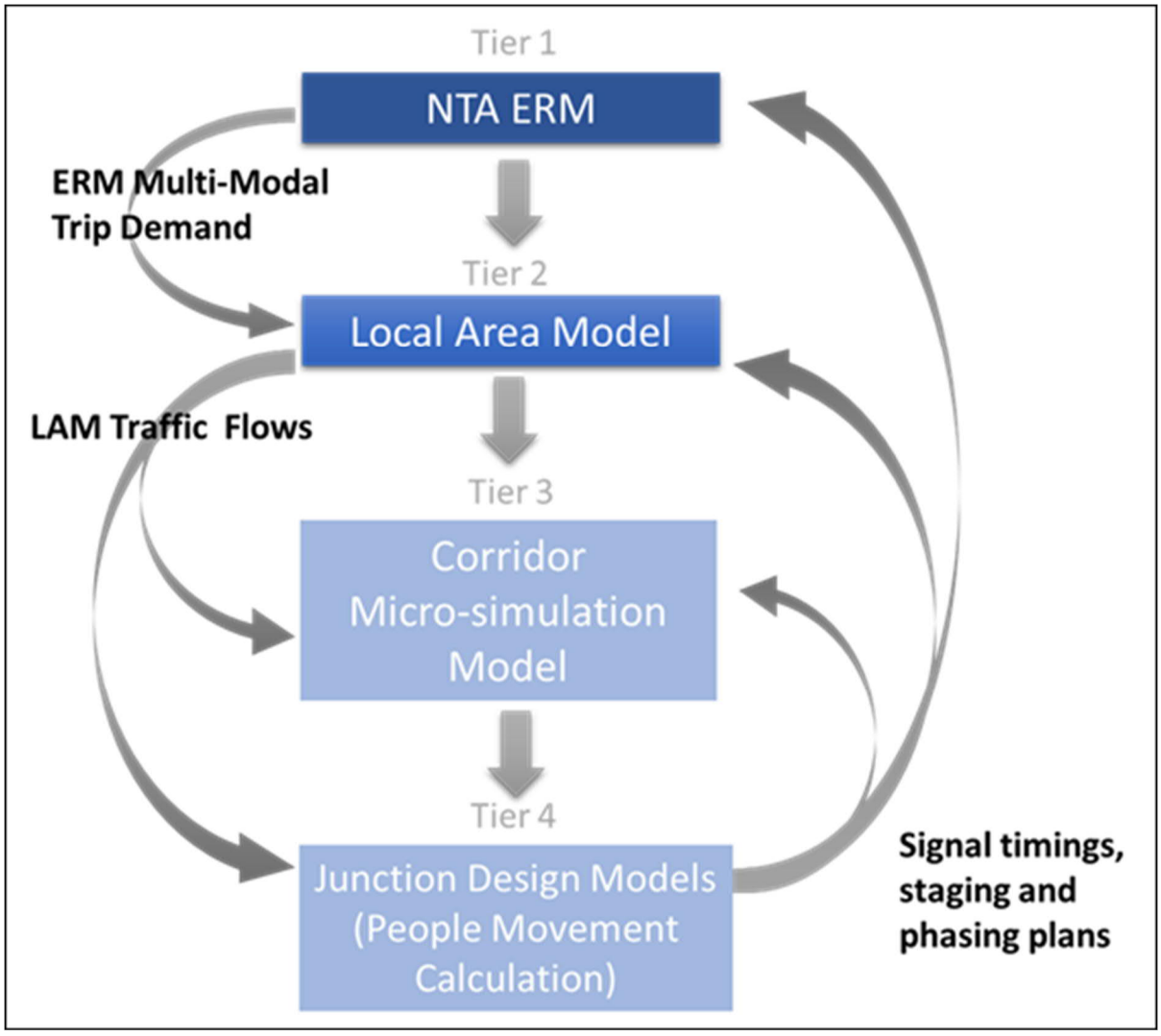


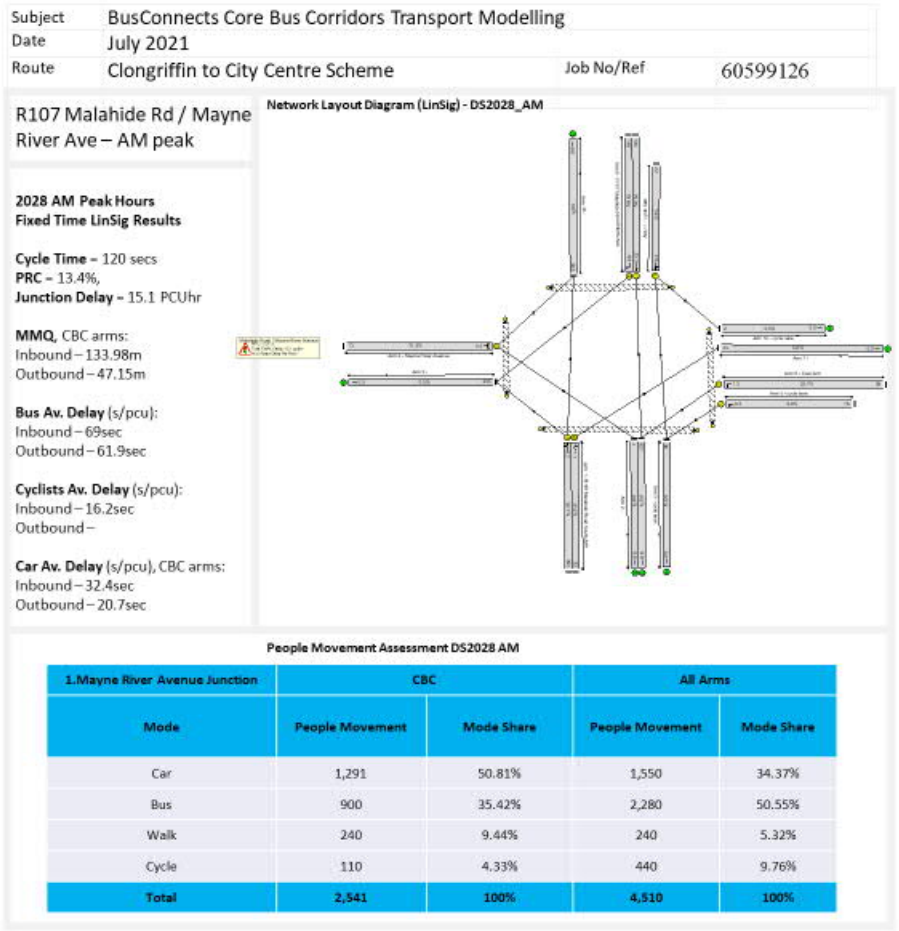
Figure 2-1: Transport Modelling Methodology and Information Flow

As shown above, there are four tiers in the transport modelling hierarchy that were used for the purposes of assessing the proposed scheme:

- East Regional Model (ERM): the primary tool that provides the strategic multi-modal demand outputs for the proposed forecast;
- Local Area Model (LAM): a more refined road network model used to provide consistent road-based outputs to inform the TIA, EIAR, microsimulation model, junction design models and traffic management plan testing;
- Microsimulation Model: represents the end-to-end corridor model of the proposed scheme to assist in the operational validation of proposed designs with the visualisation of the potential proposed scheme impacts and benefits; and

- Local Junction Models: each junction along the proposed CBC were modelled individually to support local junction design development.

For the purposes of the Junction Design and Modelling Report (JDR), results from the local junction models were extracted, which used LinSig, an industry-standard software that provides comprehensive assessment and design of a junction or a network of junctions. The local junction models were used to inform junction design considerations and 'proof of concept' demonstration of the preferred design for the CBC. The signal staging, timing and phasing from LinSig were incorporated into the three tiers of transport modelling hierarchy and it should be noted that this was an iterative approach throughout the design process of BusConnects. **Figure 2-2** presents an example of the local junction modelling results from LinSig presented in this report. A description of the images follows.



1.Mayne River Avenue Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,291	50.81%	1,550	34.37%
Bus	900	35.42%	2,280	50.55%
Walk	240	9.44%	240	5.32%
Cycle	110	4.33%	440	9.76%
Total	2,541	100%	4,510	100%

Figure 2-2: Example of a junction modelling results in the JDR

A shows the junction layout in LinSig and the results per lane, which are the following:

- **Number of PCUs arriving at the Stop Line** – this is the number located at the back of the lane in Figure 2-2 and reflects the traffic flows on its respective lane;
- **Degree of Saturation (%)** – this is the number located in the middle of the lane in Figure 2-2 and is the ratio of Flow to Capacity per lane. The theoretical capacity of a junction is 90% and anything less than this assumes that the junction is within theoretical capacity; and
- **Mean Max Queue (PCU)** – this is the number located at the front of the lane in Figure 2 and is maximum queue (per lane) within a typical cycle.

B shows the following Network Summary Results:

- **Cycle** (seconds) – Cycle time in seconds;
- **PRC** (%) – Practical Reserve Capacity, which is the available spare capacity at a junction (i.e. negative PRC = over-capacity; positive PRC = spare capacity);
- **MMQ** (meters) - maximum queue (CBC arms) within a typical cycle;
- **Junction Delay** (PCUhr) – the total aggregate delay on all lanes controlled by each Stage Stream;
- **Bus Av. Delay** (s/pcu) – the average bus delay per direction on the CBC per junction;
- **Cyclists Av. Delay** (s/pcu) - the average cyclist delay per direction on the CBC per junction; and
- **Car Av. Delay** (s/pcu) - the average car delay per direction on the CBC per junction.

C shows the tabulated information on the People Movement Assessment for the Do-Something 2028 scenario during the peak hours.

It should be noted that modelling bus priority signals is not possible in LinSig due to its dynamic nature. However, this was modelled in the microsimulation model and is reported in the Environmental Impact Assessment Report (EIAR).

2.3 People Movement

An assessment has been carried out to determine the people movement potential the proposed scheme will generate. This adopts a policy led approach to the design of junctions, which prioritises the movement of people as opposed to private modes and maximisation of sustainable modes i.e. walking, cycling and bus are considered in advance of management of general traffic movements at junctions. The outputs of the calculator provide an estimate of people movement per mode per junction and the respective percentage mode share. **Figure 2-3** illustrates the People Movement Formulae.

People Movement Formulae	
Cyclists	$\sum\left(\frac{Green\ Time}{headway}\right)\left(\frac{3600}{Cycle\ Time}\right)\left(\frac{CT\ Width}{1.5}\right)$
Buses	$\sum(No.of\ Buses)(Occupancy)(\ Direction)$
General Traffic	$\sum LinSig\ PCU\ Capacity\ Outputs$
Pedestrians	$\sum(Green\ Time)\left(\frac{Walking\ Speed}{Ped.Walking\ Buffer}\right)\left(\frac{Crossing\ Width}{2}\right)\left(\frac{3600}{Cycle\ Time}\right)(No.Crossing\ Points)$

Figure 2-3 People Movement Formulae

The emerging proposed designs were inputted to the People Movement Calculation tool including the junction geometry, junction type and the signal staging, which produced initial people movement outputs and indicative green times per mode. The results provided an initial starting point to facilitate a review of the junction designs, where necessary pedestrian, cyclist and bus infrastructure was optimised accordingly to facilitate additional capacity. The revised designs were then added into the LAM to facilitate traffic modelling.

The LAM outputs provided traffic flows for the opening year (2028) and opening year +15 (2043). The traffic flows were fed into the LinSig models to facilitate a detailed analysis of the proposed junction operation. The LinSig and DLAM analysis required traffic modelling iterations. The people movement results were also re-evaluated during the iteration process, the results were also used to inform the projected number of cyclists in the operational year in the Cycle Quantification assessment.

Below is a sample **Table 2-1** of People Movement results, which captures the People Movement Assessment for Do-Something 2028 scenario for all modes during the morning peak hours at the R107 Malahide Road / Greencastle Road junction.

Table 2-1: People Movement Assessment

Greencastle Junction	CBC		All Arms	
Mode	**People Movement**	**Mode Share**	**People Movement**	**Mode Share**
Car	1,234	32%	1,697	37%
Bus	1,980	51%	1,980	43%
Walk	271	7%	271	6%
Cycle	430	11%	692	15%
Total	**3,915**	**100%**	**4,640**	**100%**

3. Junctions Assessed

A total number of 14 junctions in the Proposed Scheme are presented in this report which are as follows:

1. Mayne River Avenue / R107 Malahide Road;
2. “Hilton” R107 Malahide Road / R139
3. Clarehall Shopping Centre / R107 Malahide Road;
4. Blunden Drive / R107 Malahide Road;
5. Greencastle Road / R107 Malahide Road;
6. Tonlegee Road / R107 Malahide Road;
7. Ardlea Road / R107 Malahide Road;
8. Kilmore Road / R107 Malahide Road;
9. Killester Avenue / R107 Malahide Road;
10. Elm Mount Road / R107 Malahide Road;
11. R103 Collins Avenue / R107 Malahide Road;
12. Casino Park / R107 Malahide Road;
13. Griffith Avenue / R107 Malahide Road; and
14. Clontarf Road / R107 Malahide Road.

The junctions design, modelling commentary and results are presented in the same order as above in the next section.

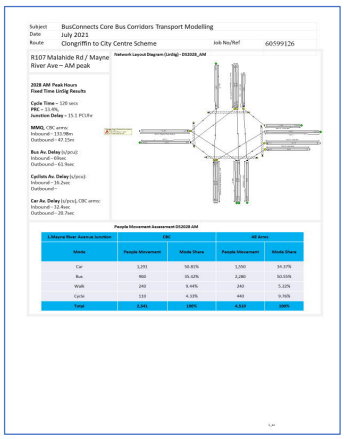
Contents

Current Proposal

- Proposed Design;
- Pedestrian Infrastructure;
- Cyclists Infrastructure; and
- Bus Priority.

Design Evolution

- Existing;
- Concept Design;
- Emerged Preferred Route;
- Public Consultation 2 (PC2);
- Public Consultation 3 (PC3); and
- Current Proposal.



Transport Modelling

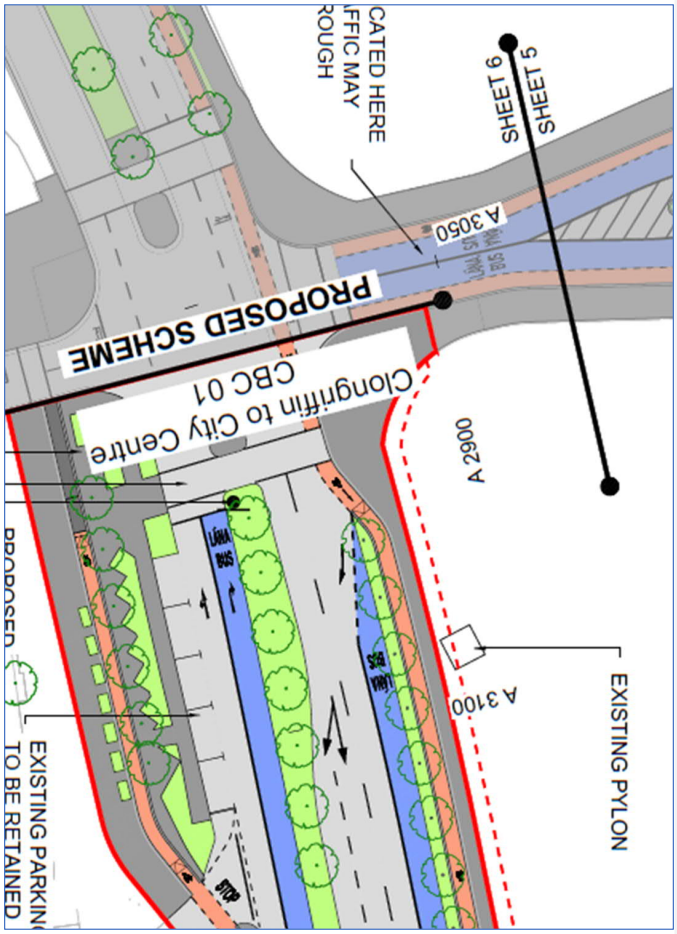
- LinSig Network outputs;
- People Movement; and
- Indicative Method of Control.

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Junction: Mayne River Avenue / R107 Malahide Road

EXISTING

FINAL DESIGN



Summary

The Mayne River Avenue junction is being upgraded as part of the DCC Belmayne Avenue and Belmayne Main Street scheme which will provide connectivity to Clongriffin DART Station for buses, cyclists and pedestrians.

The design intent is for the BusConnects Clongriffin to City Centre scheme to tie into this junction.

Pedestrian Infrastructure

CBC :
- In comparison with the existing layout and the concept designs, the proposal allows pedestrians to cross the street in a more direct way;
- The new direct crossings will assist in enhancing connectivity onto Mayne River Avenue junction; and
- A wrap around pedestrian staging with 6 seconds green-time and inter-green time of 17 seconds.

Side Roads:
- Direct crossings in a single movement are shown on both side arms.

Cyclists Infrastructure

- The proposed scheme will tie into the design being proposed by DCC for the Belmayne Avenue scheme. Cyclists from Belmayne will connect onto the proposed cycle tracks along Malahide Road.
- A toucan crossing is proposed to cater for cyclists crossing Malahide Road.

Bus Priority Infrastructure

Junction Type 1 proposed outbound where the bus lane extends to the stop line. As part of the DCC Belmayne scheme, a bus gate is proposed to be introduced on the eastern arm.

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

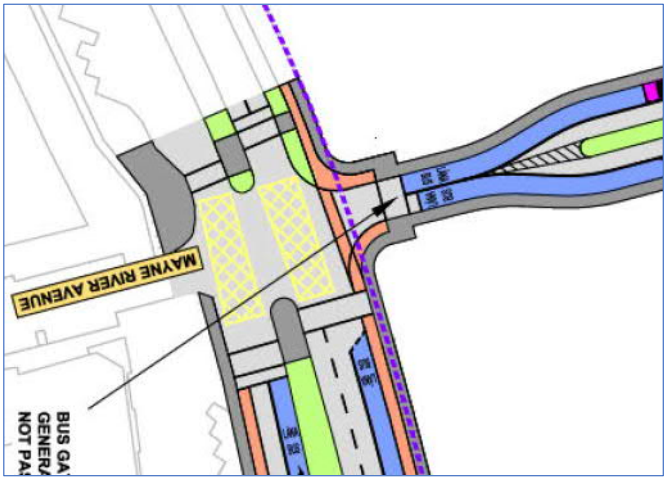
Design Evolution

The proposed junction design has evolved on the BusConnects project from initial Concept Design, Emerging Preferred Route, Public Consultation 2, Public Consultation 3 up to the Current Design. The junction design iterations have been undertaken to optimise pedestrian, cyclist and bus priority infrastructure on the scheme.

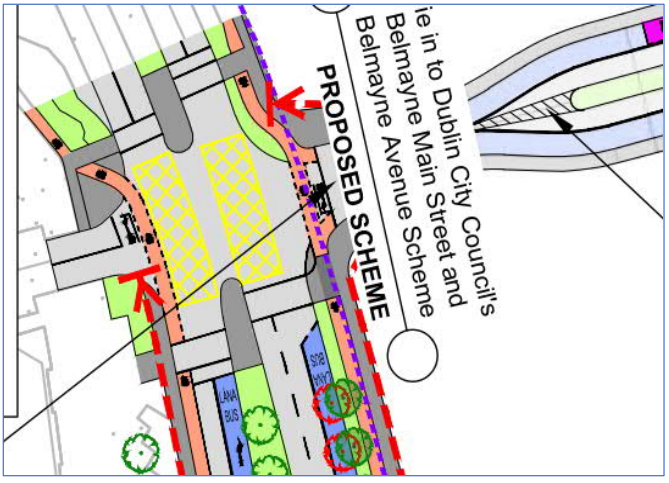
Existing

Concept Design Drawing

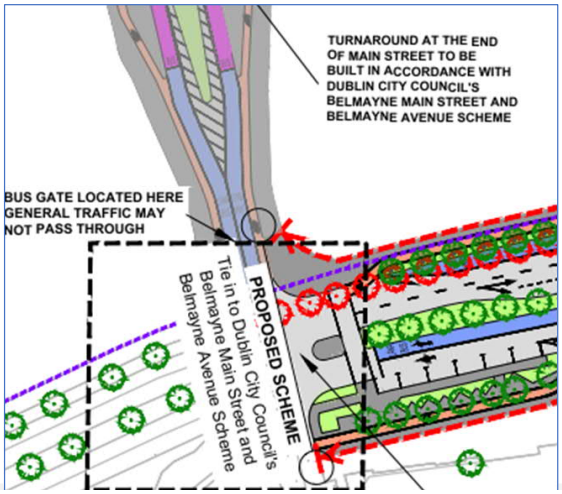
Emerging Preferred Route



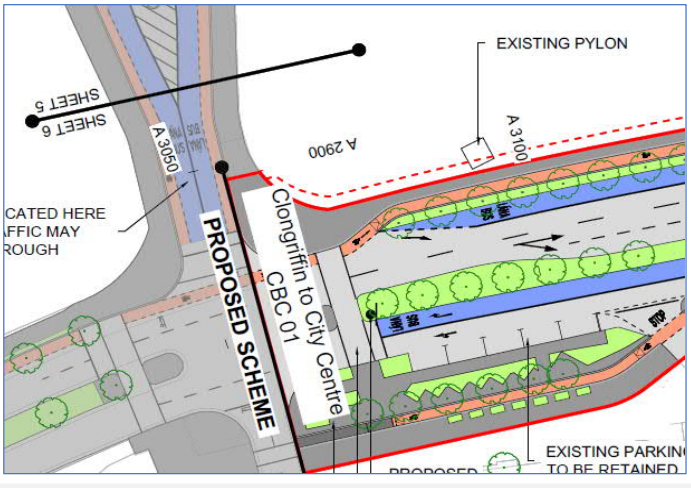
Public Consultation 2



Public Consultation 3



Final Preliminary Design



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Mayne River Ave – AM peak

2028 AM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = 13.4%,
Junction Delay = 15.1 PCUhr

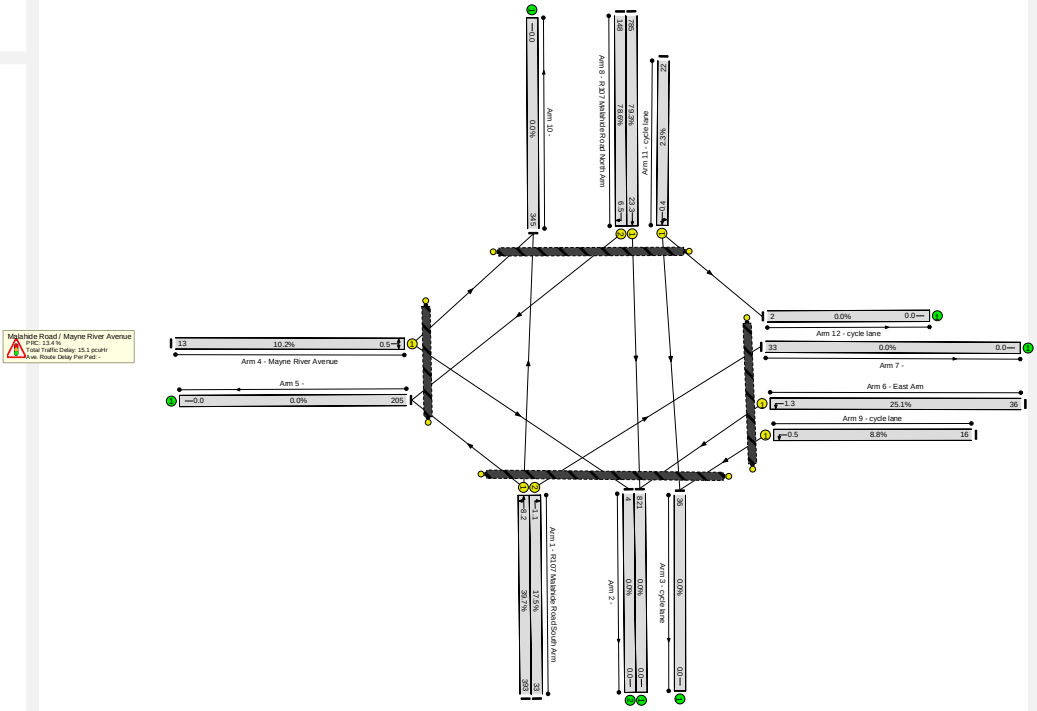
MMQ, CBC arms:
Inbound – 133.98m
Outbound – 47.15m

Bus Av. Delay (s/pcu):
Inbound – 69sec
Outbound – 61.9sec

Cyclists Av. Delay (s/pcu):
Inbound – 16.2sec
Outbound – n/a

Car Av. Delay (s/pcu), CBC arms:
Inbound – 32.4sec
Outbound – 20.7sec

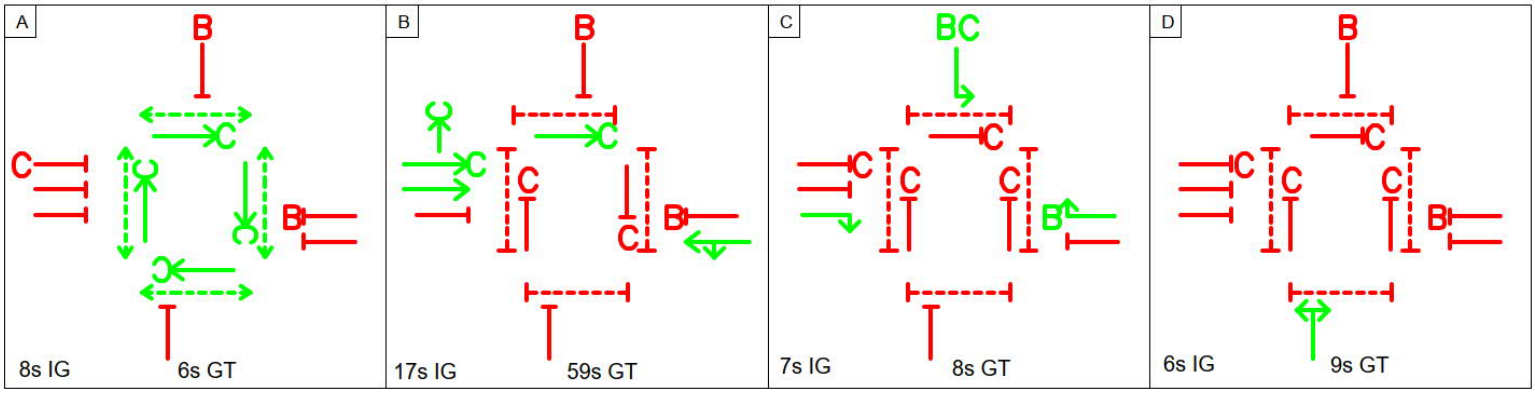
Network Layout Diagram (LinSig) - DS2028_AM



People Movement Assessment DS2028 AM

1.Mayne River Avenue Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,291	49%	1,550	34%
Bus	900	34%	2,280	50%
Walk	240	9%	240	5%
Cycle	180	7%	510	11%
Total	2,611	100%	4,580	100%

INDICATIVE METHOD OF CONTROL



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Mayne River Ave – PM peak

2028 PM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = 2.6%,
Junction Delay = 20.3 PCUhr

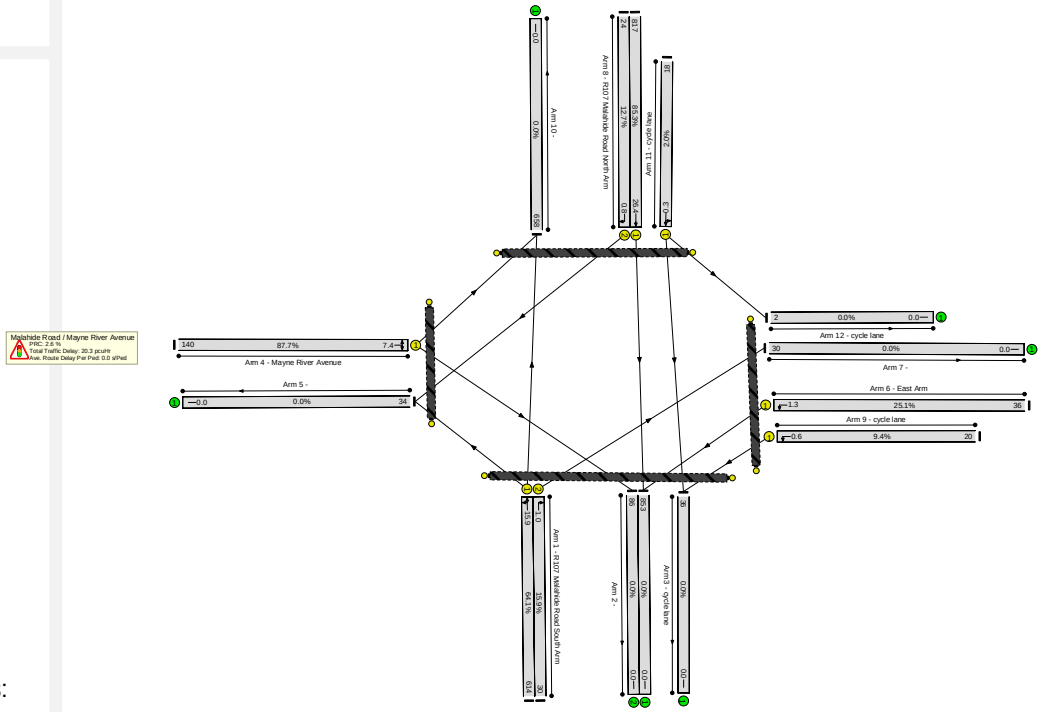
MMQ, CBC arms:
Inbound – 151.8m
Outbound – 91.43m

Bus Av. Delay (s/pcu):
Inbound – 69sec
Outbound – 61.7sec

Cyclists Av. Delay (s/pcu):
Inbound – 17.3sec
Outbound –

Car Av. Delay (s/pcu), CBC arms:
Inbound – 38.5sec
Outbound – 27.3sec

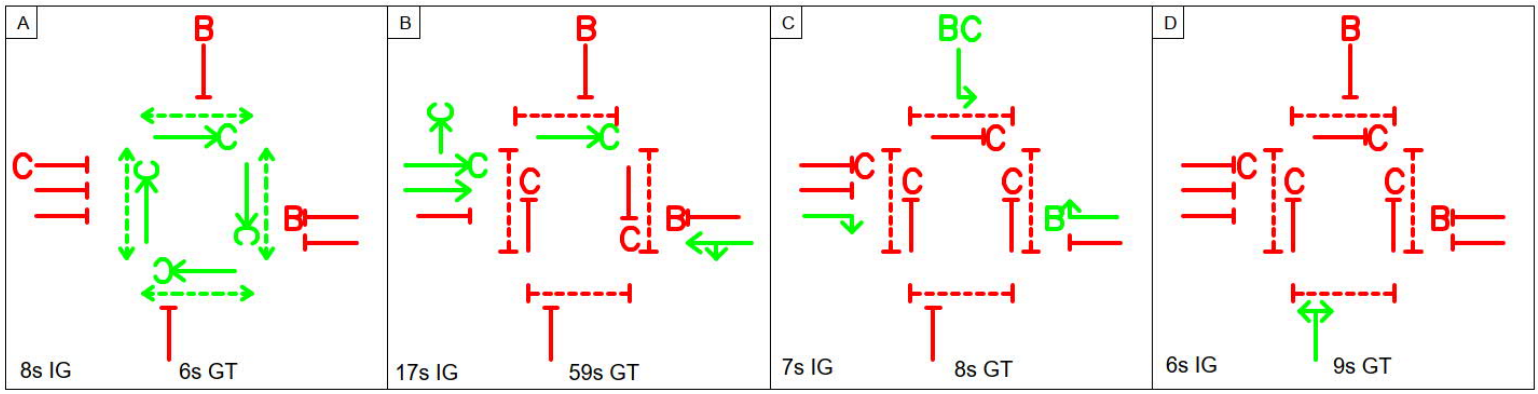
Network Layout Diagram (LinSig) - DS2028_PM



People Movement Assessment DS2028 PM

1.Mayne River Avenue Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,654	57%	1,903	46%
Bus	840	29%	1,440	35%
Walk	240	8%	240	6%
Cycle	180	6%	590	14%
Total	2,914	100%	4,173	100%

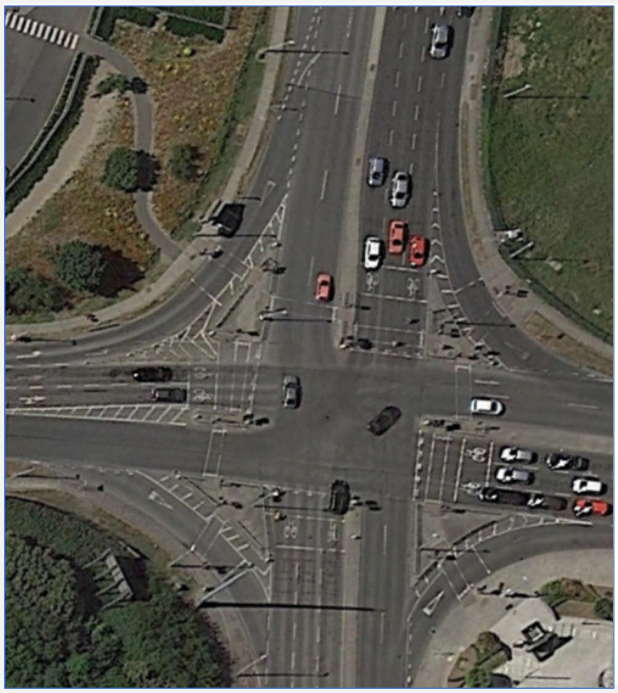
INDICATIVE METHOD OF CONTROL



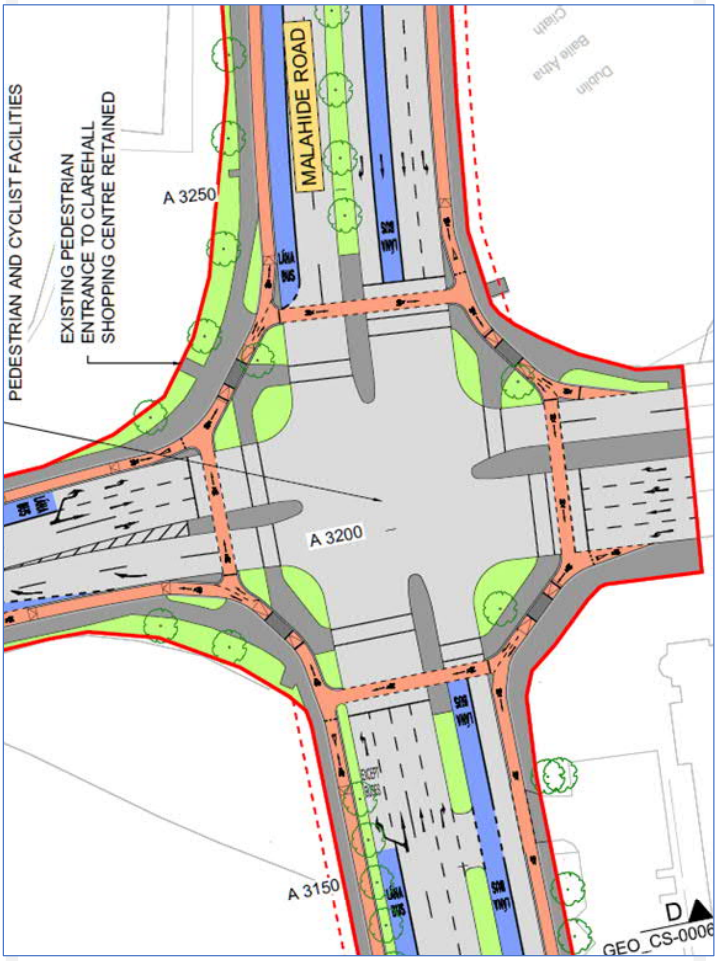
Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Junction: "Hilton" R107 Malahide Road / R139

EXISTING



FINAL DESIGN



Summary

The existing 4 arm signalised junction is proposed to be upgraded as per the BusConnects Preliminary Design Guidance Booklet to enhance pedestrian, cyclist and bus priority. In particular, the design proposes to remove the existing left turn slip lanes, to reduce the number of pedestrian crossings and to introduce segregated cycling facilities whilst balancing the traffic context to mitigate against excessive traffic dispersion. The Proposed Scheme also seeks to lower the speed limit along the Malahide Road through this junction from 60km/h to 50km/h.

Pedestrian Infrastructure

- The proposed design comprises staggered pedestrian crossings with refuge islands on 3 arms of the junction including Malahide Road arms and the R139 western arm. The existing pedestrian refuge islands have been widened on all arms to provide an improved facility for pedestrians.
- The proposal introduces landscaping and verges to channel pedestrians and cyclists to the controlled crossings in lieu of pedestrian barriers, the arrangement will also assist to segregate pedestrians and cyclists where practical at road crossings.
- Straight, single movement crossings were explored, however staggered crossings are the preferred design as a straight-across would result in a crossing distance of greater than 19m as such the overall junction performance and people movement would be reduced by introducing direct single stage crossings on all arms which is not desirable at this location, similarly the staggered arrangement will facilitate additional pedestrian storage.
- The R139 eastern arm is likely to be the busiest arm for pedestrian movements as this caters for the desire line towards Clarehall Shopping Centre from the future high density mixed use Belmayne District Centre, as such a straight crossing is more desirable at this location. The crossing distance is less than 19m (other arms typically 24m), however traffic modelling indicated that a single movement was not favourable for this junction, thus a two stage crossing with a suitably sized island has been proposed. The proposed staging arrangement also considers 3 out of 5 phases being active for pedestrians on this arm, reducing delay and storage requirements for pedestrians. The use of louvres is also recommended to mitigate against potential see through of pedestrian signals.
- A Junction Type 4 is proposed at this location whereby the road crossing distance for pedestrians is optimised (no road crossing of cycle lanes is required therefore reducing crossing distance by ~4m per arm). Controlled crossings are proposed across the cycle tracks to mitigate potential conflict with oncoming cyclists.

Cyclists Infrastructure

- The proposed junction is based on Junction Type 4, which provides a segregated facility for cyclists with a direct single movement crossing for cyclists and fully segregated right turn facility.
- Junction Types 1-3 were considered at this location, however due to the high volume of traffic at this junction in particular larger HGVs, it is felt cyclists should be fully segregated from general traffic i.e. not running cyclists with a left turn flashing amber.

Bus Priority Infrastructure

- Inbound direction, the bus lane is proposed to be curtailed approximately 20m prior to the junction stop line to facilitate left turning traffic in lane 1. This is the optimum arrangement from a junction capacity perspectivity by facilitating left turners in lane 1, whilst a review of the traffic flow data indicates the volume of left turners using lane 1 will have a minimal impact upon bus priority.
- In the outbound direction, the bus lane is proposed to be in lane 3 to segregate through buses from the left turn towards the M50 and to assist buses heading towards the Mayne River Avenue junction where buses will turn right onto Mayne River Avenue and continue towards Clongriffin DART Station.

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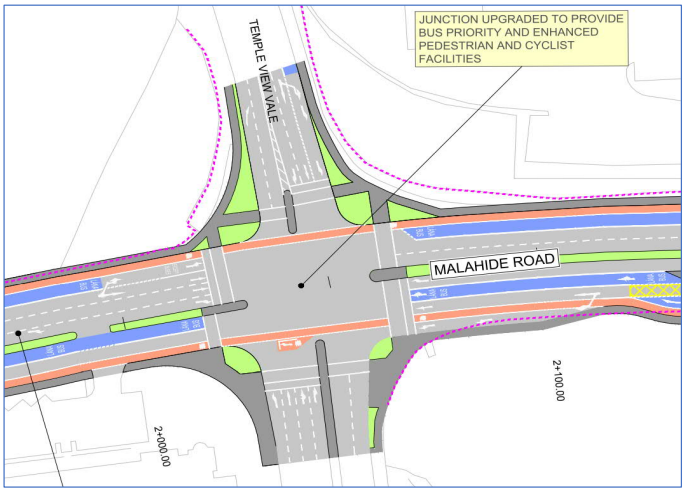
Design Evolution

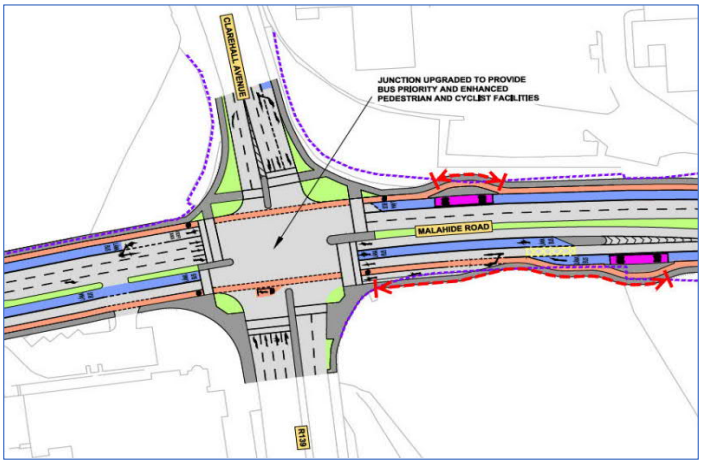
The proposed junction design has evolved on the BusConnects project from initial Concept Design, Emerging Preferred Route, Public Consultation 2, Public Consultation 3 up to the Current Design. The junction design iterations have been undertaken to optimise pedestrian, cyclist and bus priority infrastructure on the scheme.

Existing

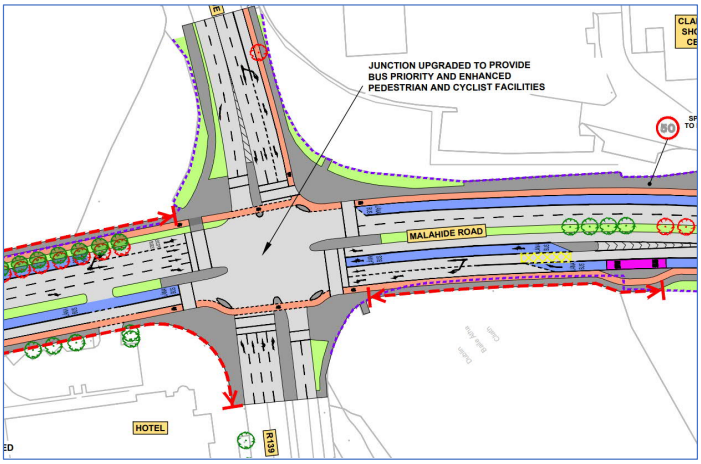
Concept Design Drawing



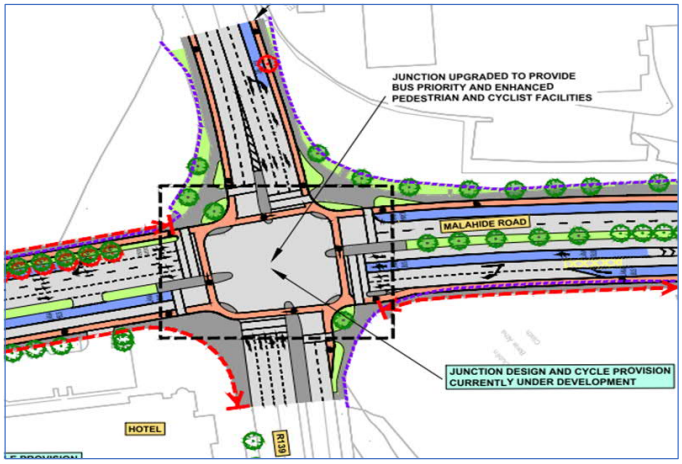
Emerging Preferred Route



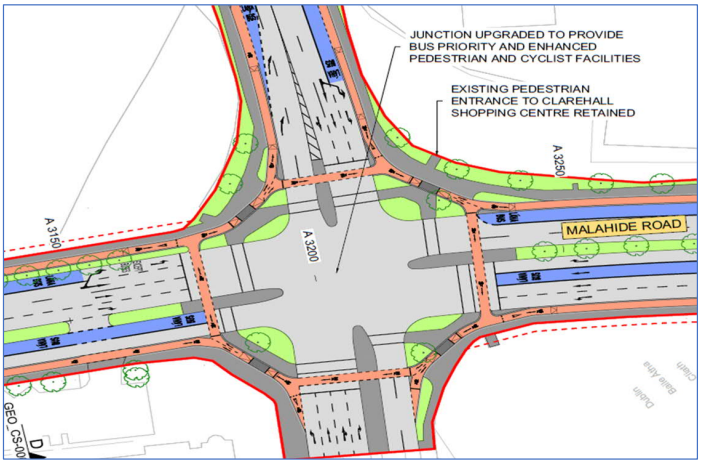
Public Consultation 2



Public Consultation 3



Final Preliminary Design



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / R139– AM peak

2028 AM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = -4.9%,
Junction Delay = 69.8 PCUhr

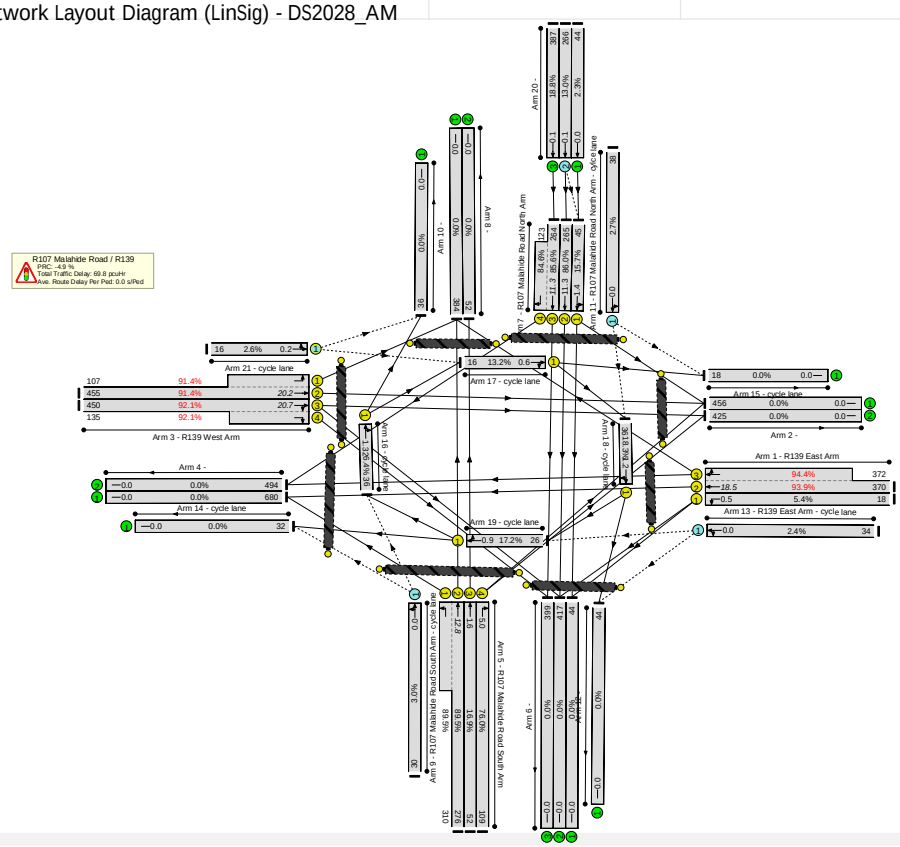
MMQ, CBC arms:
Inbound – 64.98m
Outbound – 73.6m

Bus Av. Delay (s/pcu):
Inbound – 51.9sec
Outbound – 51.5sec

Cyclists Av. Delay (s/pcu):
Inbound – 1.3sec
Outbound - 1.8sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 86.7sec
Outbound – 58.3sec

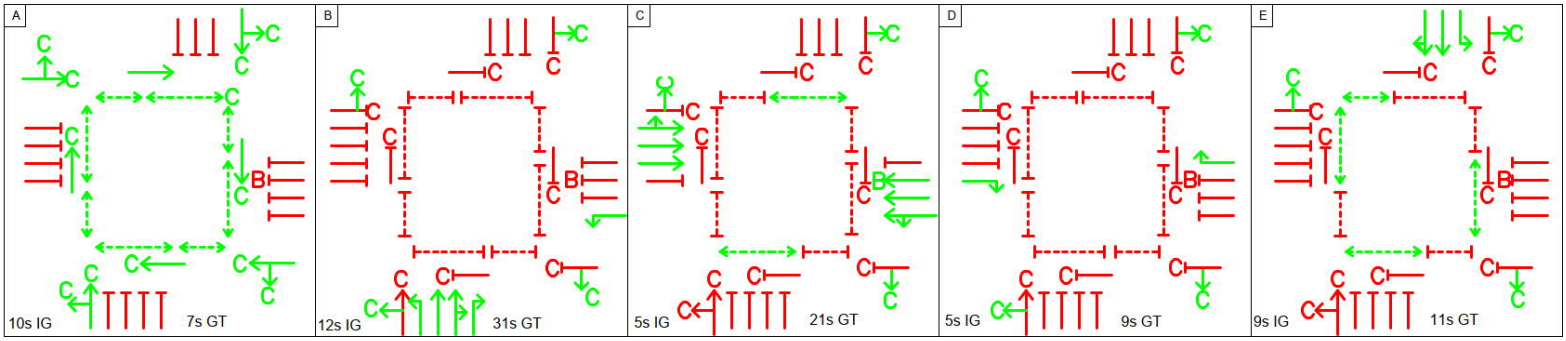
Network Layout Diagram (LinSig) - DS2028_AM



People Movement Assessment DS2028 AM

2. Northern Cross Jun.	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	966	26%	3,906	55%
Bus	1,920	51%	1,920	27%
Walk	577	15%	577	8%
Cycle	300	8%	720	10%
Total	3,763	100%	7,123	100%

INDICATIVE METHOD OF CONTROL



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / R139– PM peak

2028 PM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = -15.1%,
Junction Delay = 120.2 PCUhr

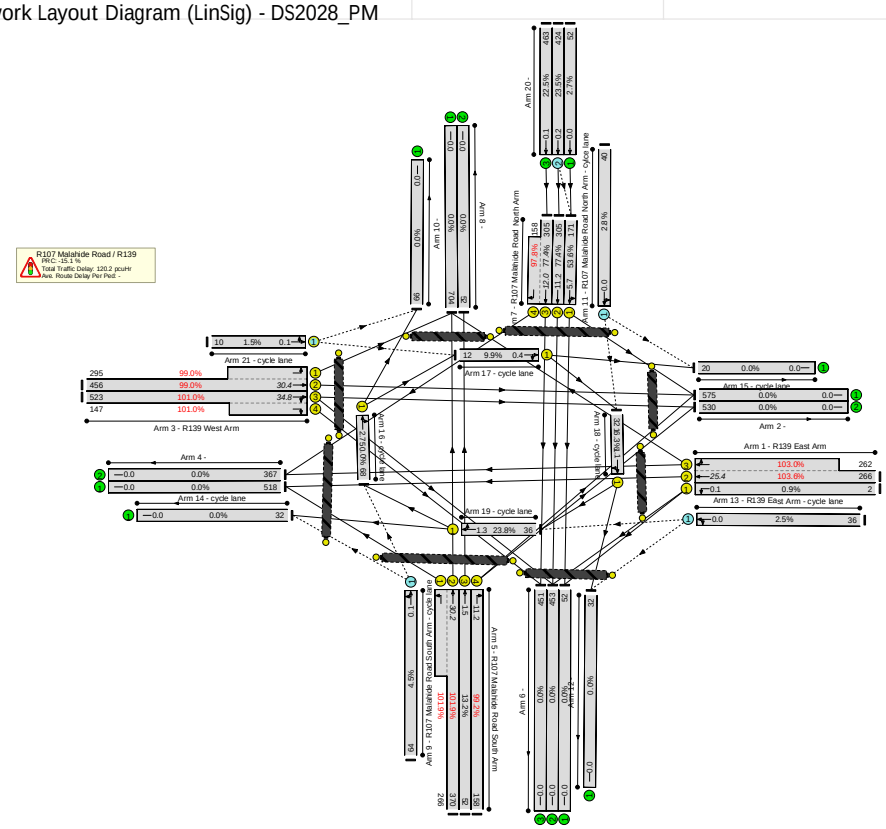
MMQ, CBC arms:
Inbound – 69m
Outbound – 173.6m

Bus Av. Delay (s/pcu):
Inbound – 55.7sec
Outbound – 45.5sec

Cyclists Av. Delay (s/pcu):
Inbound – 1.3sec
Outbound – 1.4sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 67.6sec
Outbound – 128.9sec

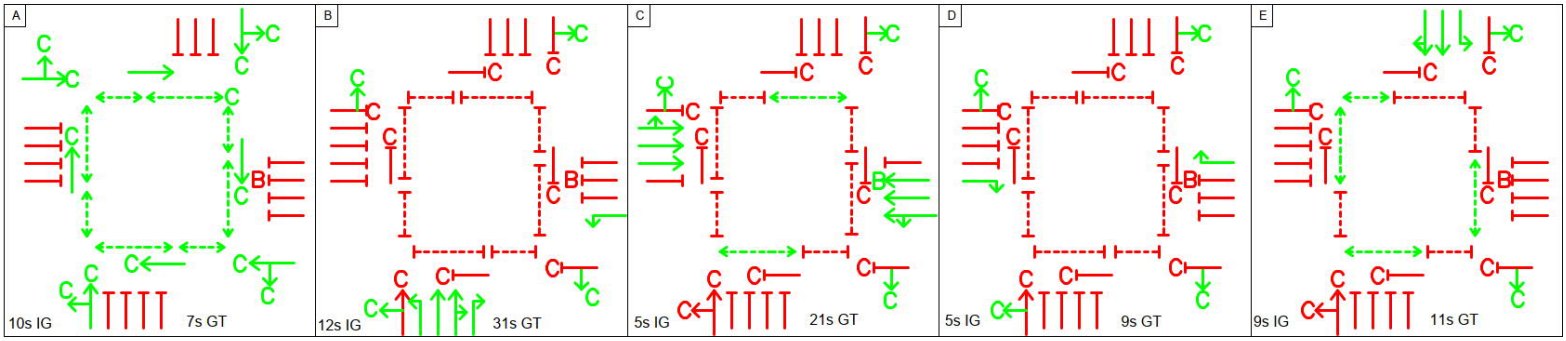
Network Layout Diagram (LinSig) - DS2028_PM



People Movement Assessment DS2028 PM

2. Northern Cross Jun.	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,176	26%	4,358	53%
Bus	2,100	46%	2,100	26%
Walk	900	20%	900	11%
Cycle	350	8%	830	10%
Total	4,526	100%	8,188	100%

INDICATIVE METHOD OF CONTROL

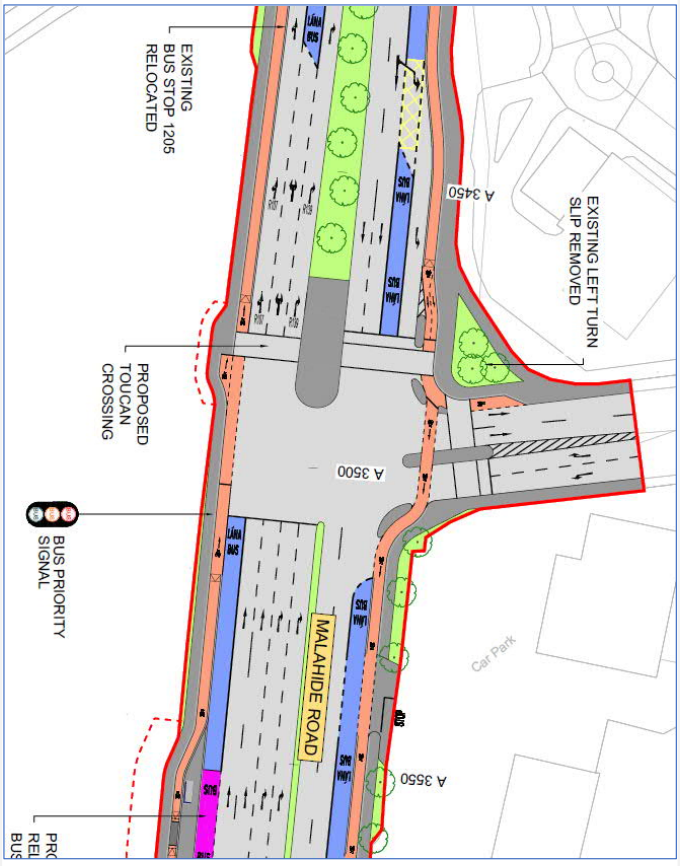


Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Junction: Clarehall Shopping Centre / R107 Malahide Road

EXISTING

FINAL DESIGN



Summary

The existing 3 arm signalised junction is proposed to be upgraded by introducing segregated cycle tracks in both inbound and outbound directions, removal of the existing left turn slip into the shopping centre to create a more compact junction, with reduced number of crossings for pedestrians and cyclists.

The key design rationale was to provide protected cycle infrastructure and crossing facilities, whilst improving bus priority. The existing twin right turn lanes on the southern arm have been retained to facilitate entry to Clarehall Shopping Centre. The northern arm lane arrangement also allows for a potential 'hold the left' scenario which could be configured to further enhance pedestrian/cycle movements on the side arm outside of peak hours.

Pedestrian Infrastructure

- The removal of the left turn slip lane within the existing layout will allow pedestrians to cross the Malahide Road in a more direct manner.
- The existing signal controlled pedestrian crossings have been redesigned with a reduced crossing distance and a more compact design which cater for the desire lines towards Clarehall Shopping Centre.
- The staggered pedestrian crossing on the Malahide Road northern arm has been redesigned to a straight ahead two stage crossing in the current proposal utilising the existing wide refuge island. Pedestrian louvres are recommended to mitigate against potential see through of signals.
- The staggered pedestrian crossing on the eastern arm has been redesigned to provide a straight single movement crossing.
- The existing pedestrian crossing on the southern arm was reviewed in light of the dominant pedestrian desire line to Clarehall Shopping Centre. Pedestrians would be required to cross two arms to access the shopping centre i.e. Malahide Road and the Shopping Centre arm. The toucan crossing on the northern arm, enables pedestrians and cyclists to cross one arm only, providing a more direct alignment into the shopping centre.

Cyclists Infrastructure

- Alternative entrance ~100m to the north of the junction likely to be more used as a the primary entry/exit point to Clarehall Shopping Centre for cyclists coming from the north.
- The existing inbound "Orphan" cycle lane is proposed to be replaced by a segregated cycle facility up to the shopping centre junction, where cyclists can either turn left into the shopping centre or travel ahead onto the inbound cycle track.
- Inbound cyclists will be able to cross the junction whilst the left turners are held on red, thus segregating cyclists and left turning vehicles at this location.
- In the outbound direction, the existing cycle lane is proposed to be upgraded to a cycle track. A toucan crossing will facilitate cyclists crossing Malahide Road towards the shopping centre.

Bus Priority Infrastructure

- Inbound, a Junction Type 2 proposed, where the bus lane continues up to the stop line. 30m back from the stop line, there is a yellow box to allow left-turners to cross the bus lane to enter a dedicated left-turn pocket to facilitate left turners into the shopping centre.
- A review of the traffic flow data indicates less than 100 vehicles turning left during the morning and evening peak hours respectively. Based on a 120s cycle time, the proposed left turn lane will accommodate the projected volume of left turners thus having no significant impact upon bus priority;
- Outbound direction, a bus lane is proposed up to the junction stop line. The proposed operation of the junction is envisaged to facilitate an early start for buses to enable outbound buses to manoeuvre after the junction from lane 1 into lane 2, which will assist buses to get in lane for the Northern Cross junction.

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

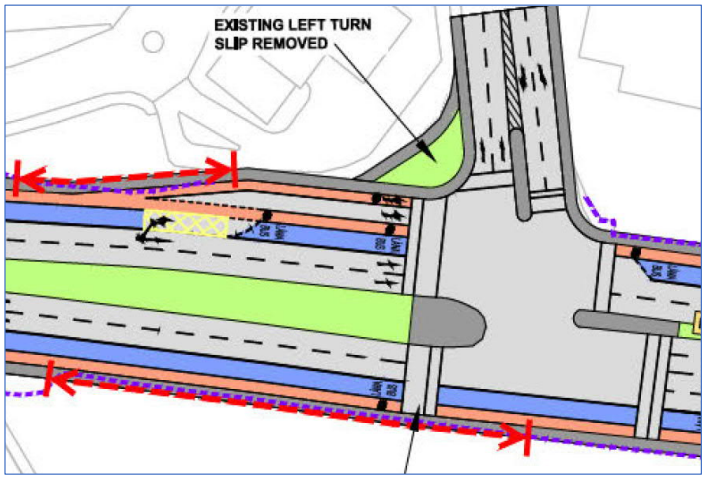
Design Evolution

The proposed junction design has evolved on the BusConnects project from initial Concept Design, Emerging Preferred Route, Public Consultation 2, Public Consultation 3 up to the Current Design. The junction design iterations have been undertaken to optimise pedestrian, cyclist and bus priority infrastructure on the scheme.

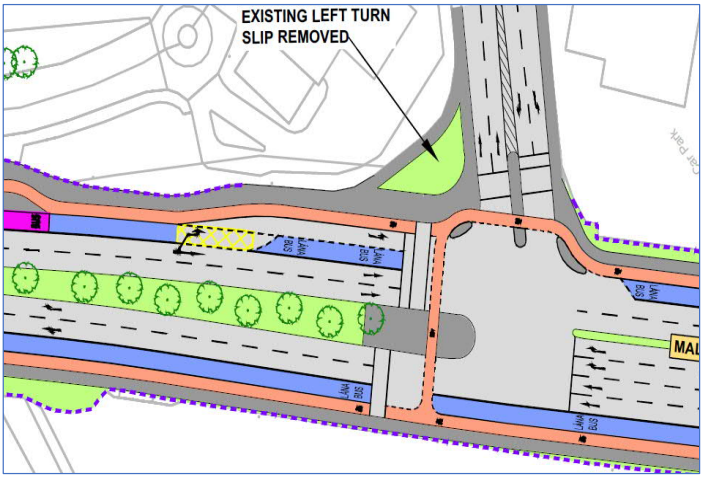
Existing

Concept Design Drawing

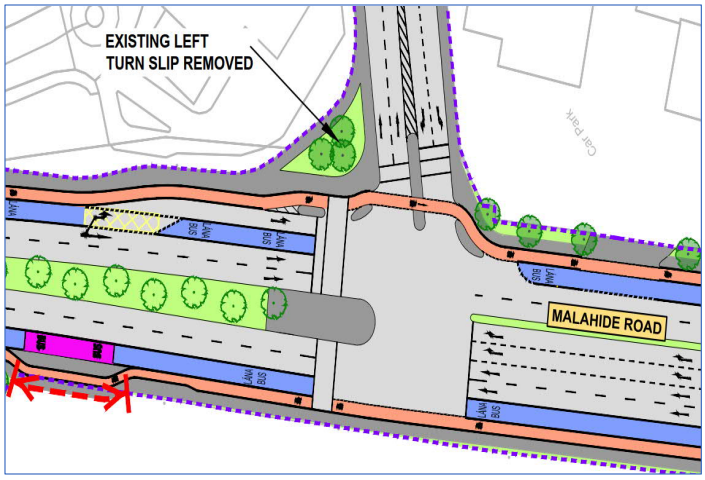
Emerging Preferred Route



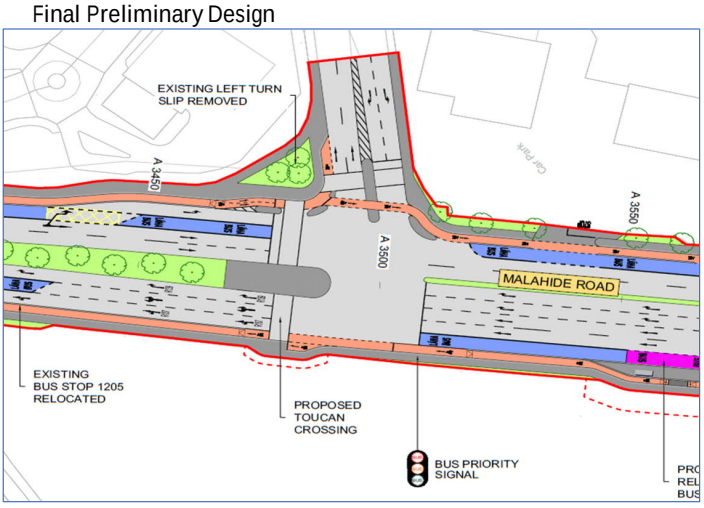
Public Consultation 2



Public Consultation 3



Final Preliminary Design



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Clarehall– AM peak

2028 AM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = 135.3%,
Junction Delay = 9.97 PCUhr

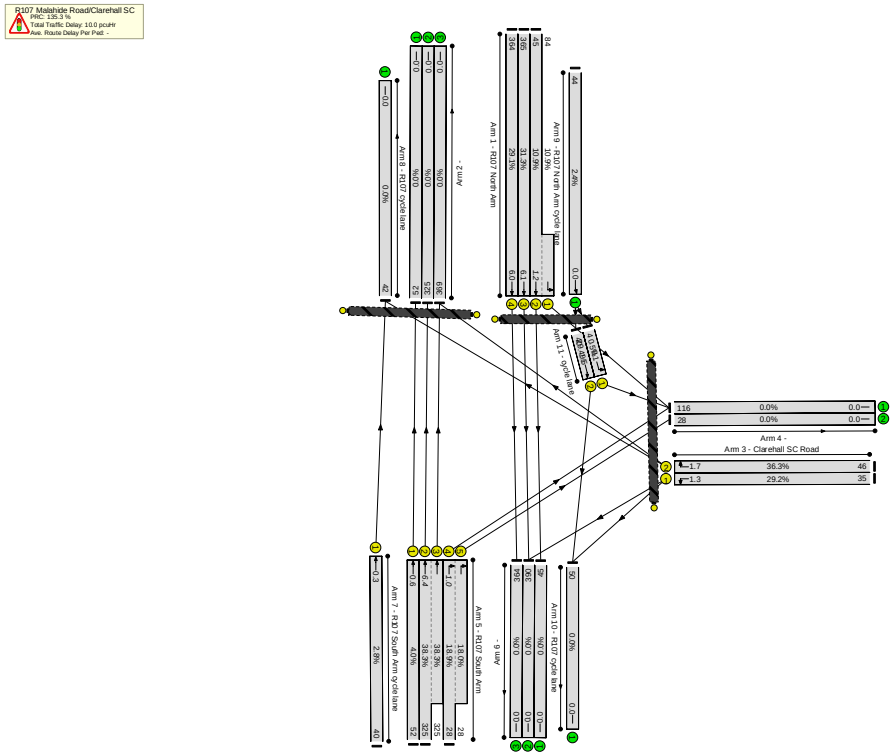
MMQ, CBC arms:
Inbound – 35.08m
Outbound – 36.8m

Bus Av. Delay (s/pcu):
Inbound – 11.3sec
Outbound – 8.0sec

Cyclists Av. Delay (s/pcu):
Inbound – 1.0sec
Outbound - 4.0sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 13.6sec
Outbound – 18.0sec

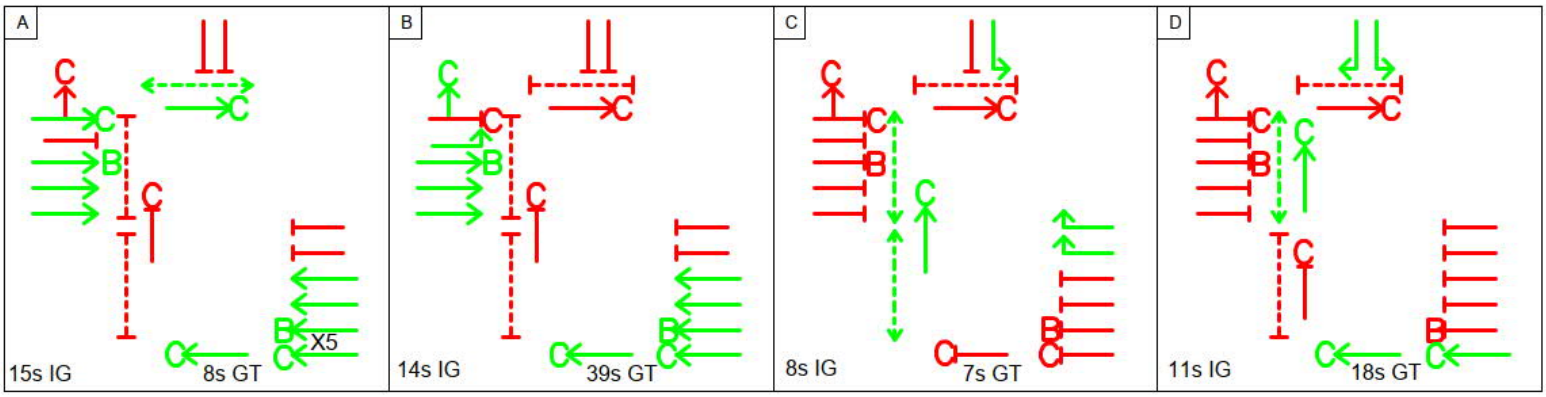
Network Layout Diagram (LinSig) - DS2028_AM



People Movement Assessment DS2028 AM

3. Clarehall SC Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,655	38%	1,906	40%
Bus	1,920	44%	1,920	41%
Walk	394	9%	394	8%
Cycle	400	9%	495	11%
Total	4,368	100%	4,714	100%

INDICATIVE METHOD OF CONTROL



X5 denotes Advance 5 seconds Start for Cyclists and Buses

Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Clarehall– PM peak

2028 PM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = 96.3%,
Junction Delay = 14.47 PCUhr

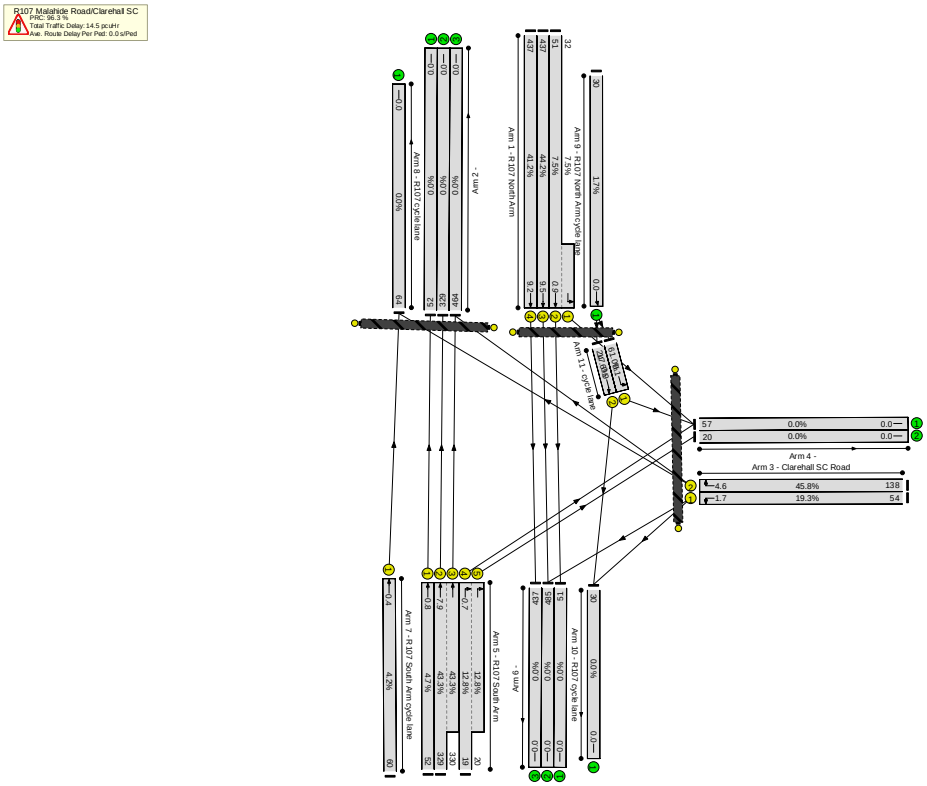
MMQ, CBC arms:
Inbound – 54.63m
Outbound – 45.43m

Bus Av. Delay (s/pcu):
Inbound – 16.2sec
Outbound – 12.4sec

Cyclists Av. Delay (s/pcu):
Inbound – 1.0sec
Outbound - 4.0sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 21.4sec
Outbound – 25.4sec

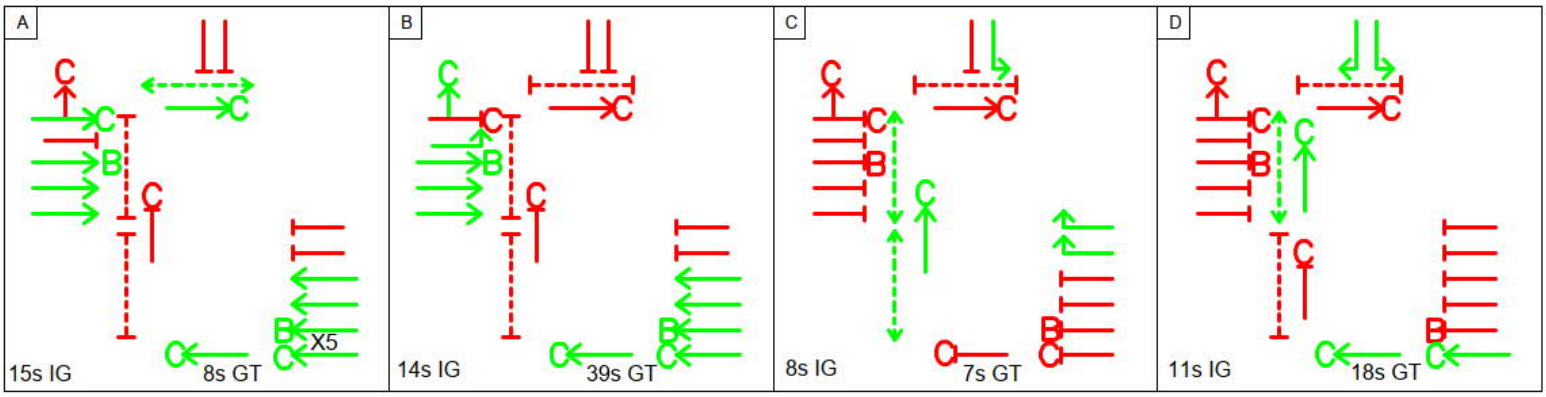
Network Layout Diagram (LinSig) - DS2028_PM



People Movement Assessment DS2028 PM

3. Clarehall SC Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,840	36%	2,143	38%
Bus	2,040	40%	2,040	36%
Walk	836	16%	836	15%
Cycle	420	8%	570	10%
Total	5,136	100%	5,590	100%

INDICATIVE METHOD OF CONTROL

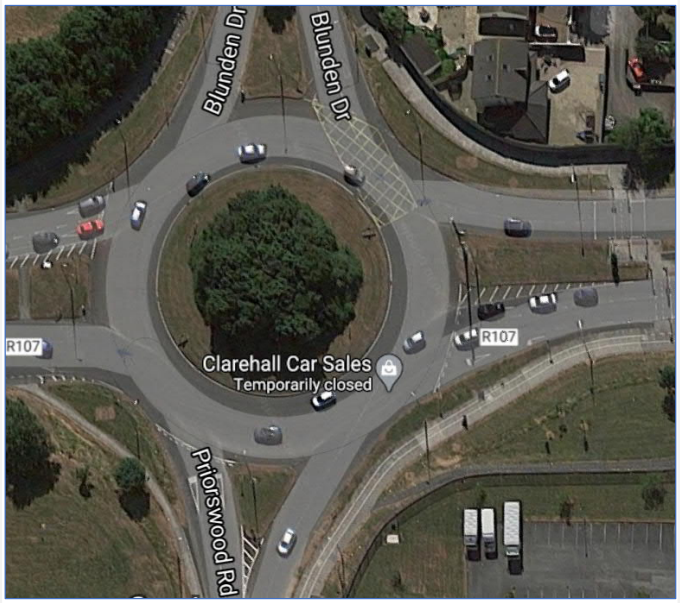


X5 denotes Advance 5 seconds Start for Cyclists and Buses

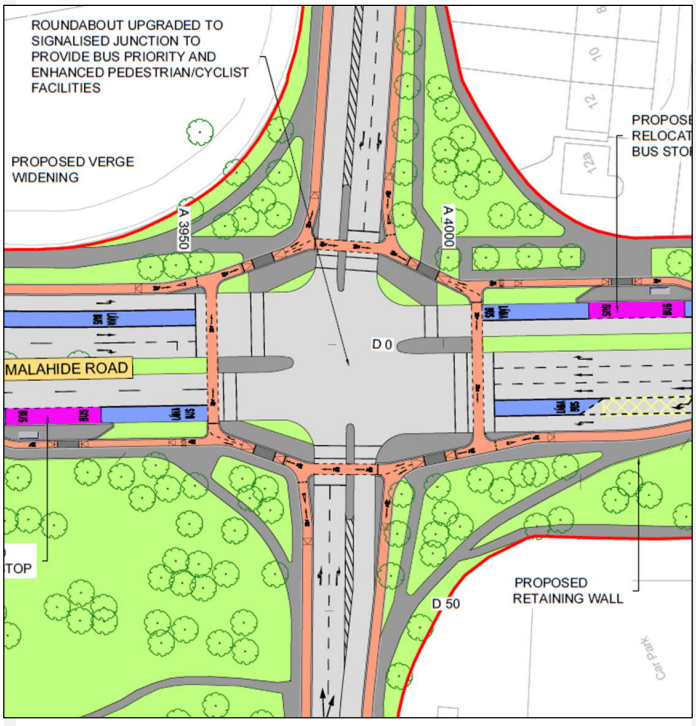
Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Junction: Blunden Drive / R107 Malahide Road

EXISTING



FINAL DESIGN



Summary

The existing roundabout is proposed to be upgraded to a 4 arm signalised junction. The key design rationale is to introduce pedestrian crossing facilities on all arms of the junction, provide protected cycle infrastructure and crossing facilities, whilst improving bus priority. The proposed junction arrangement will provide a more compact junction, reducing crossing distances for pedestrians and cyclists through the junction.

The provision of dedicated left turn lanes on the CBC arms allows for a 'hold the left' scenario which could be configured to enhance pedestrian/cycle movements on the side arms outside of peak hours.

Pedestrian Infrastructure

- A staggered pedestrian crossing has been adopted across Malahide Road to optimise the amount of green time within the typical cycle of 120 seconds such that the throughput of people within the junction can be maximised;
- In comparison with the existing roundabout, the proposed design allows pedestrians to cross the street in a more direct manner;
- A straight single movement crossing was considered along the CBC arms but it would result in a crossing distance greater than 19m. The staging has been designed to facilitate pedestrians crossing with traffic, providing more frequent pedestrian crossing opportunities. A straight crossing with a 4m central island was considered across Malahide Road, however due to alignment constraints for the lane design. Staggered crossings are also preferred for pedestrian storage within the island.
- On the Blunden Drive arm a straight pedestrian crossing has been proposed; and
- A Junction Type 4 is proposed at this location whereby the crossing distance for pedestrians is optimised (no road crossing of cycle lanes is required therefore reducing crossing distance by ~4m per arm)
- Controlled crossings are proposed across the cycle tracks to mitigate potential conflict with oncoming cyclists.

Cyclists Infrastructure

- The proposed junction is based on Junction Type 4, which provides a segregated facility for cyclists with a direct single movement crossing for cyclists and fully segregated right turn facility.
- The existing cycle track provision for the left-turning cyclists inbound from Malahide Rd to Blunden Drive has been replaced by a dedicated cycle lane up to the junction, where cyclists can then turn left and re-join the existing facilities; and
- Bus stop islands have been incorporated on both inbound and outbound direction, which removes the conflict in the existing situation between buses and the on-street cycle lane.

Bus Priority Infrastructure

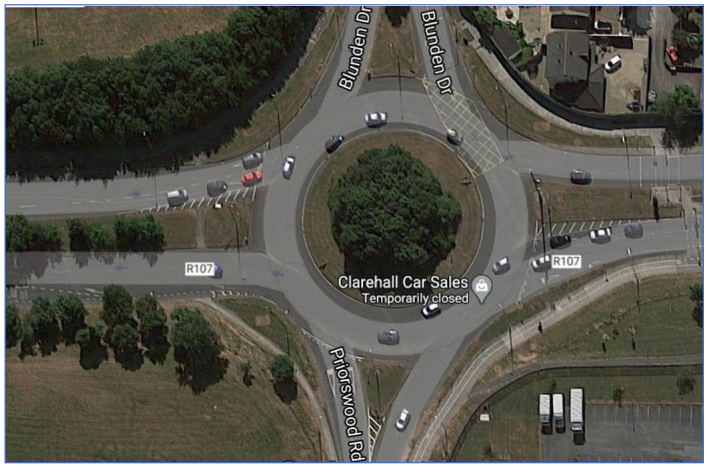
- The bus infrastructure is akin to Junction Type 2 where a dedicated left turn lane is located inside the bus lane. There is a yellow box proposed to allow left turners to cross the bus lane to enter a dedicated left turning pocket.
- The left turn lane is proposed due to the traffic flow data indicating approximately 300 left turning movements during the peak hours. Therefore, this design will provide left turning lanes to cater for anticipated demand.

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

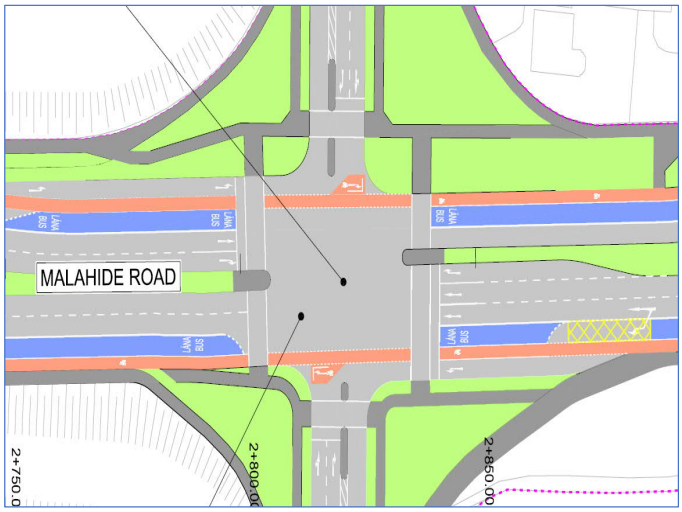
Design Evolution

The proposed junction design has evolved on the BusConnects project from initial Concept Design, Emerging Preferred Route, Public Consultation 2, Public Consultation 3 up to the Current Design. The junction design iterations have been undertaken to optimise pedestrian, cyclist and bus priority infrastructure on the scheme.

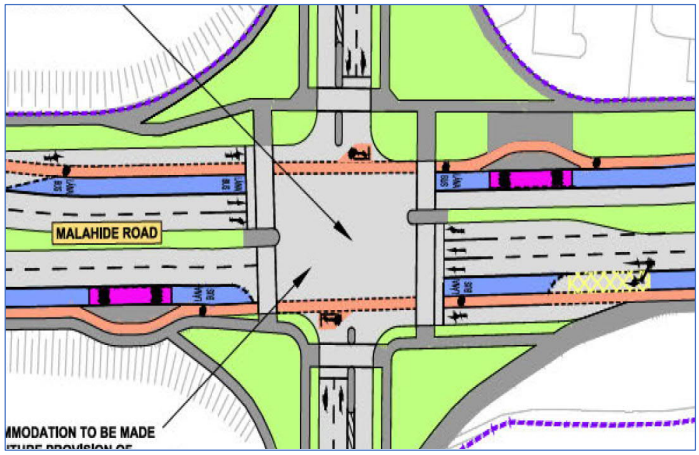
Existing



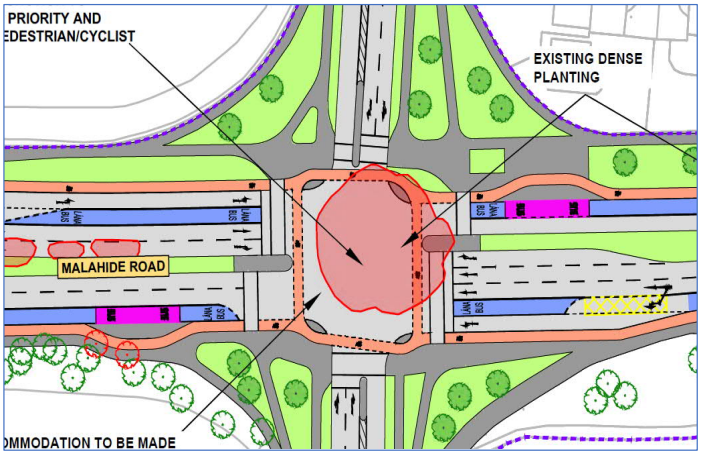
Concept Design Drawing



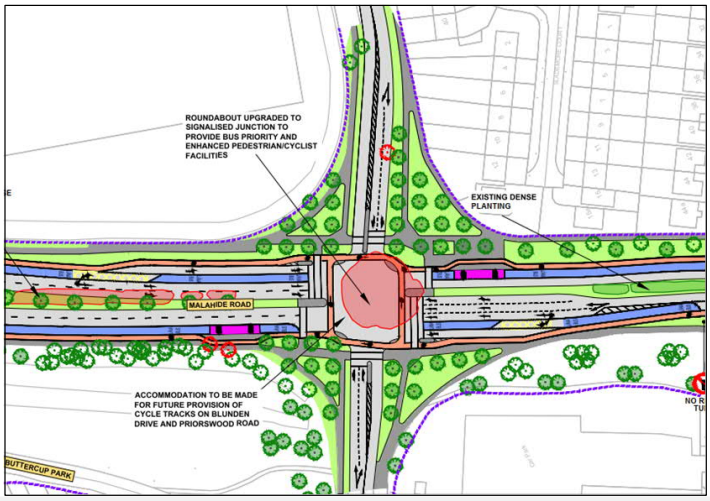
Emerging Preferred Route



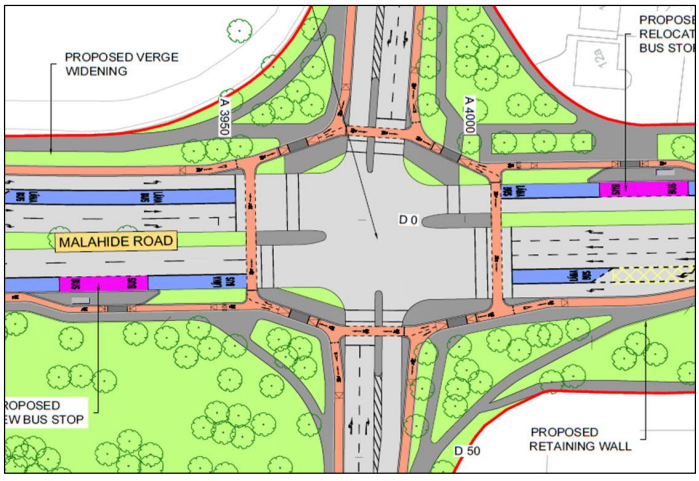
Public Consultation 2



Public Consultation 3



Final Preliminary Design



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Blunden Dr– AM peak

2028 AM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = 13.7%,
Junction Delay = 30.4 PCUhr

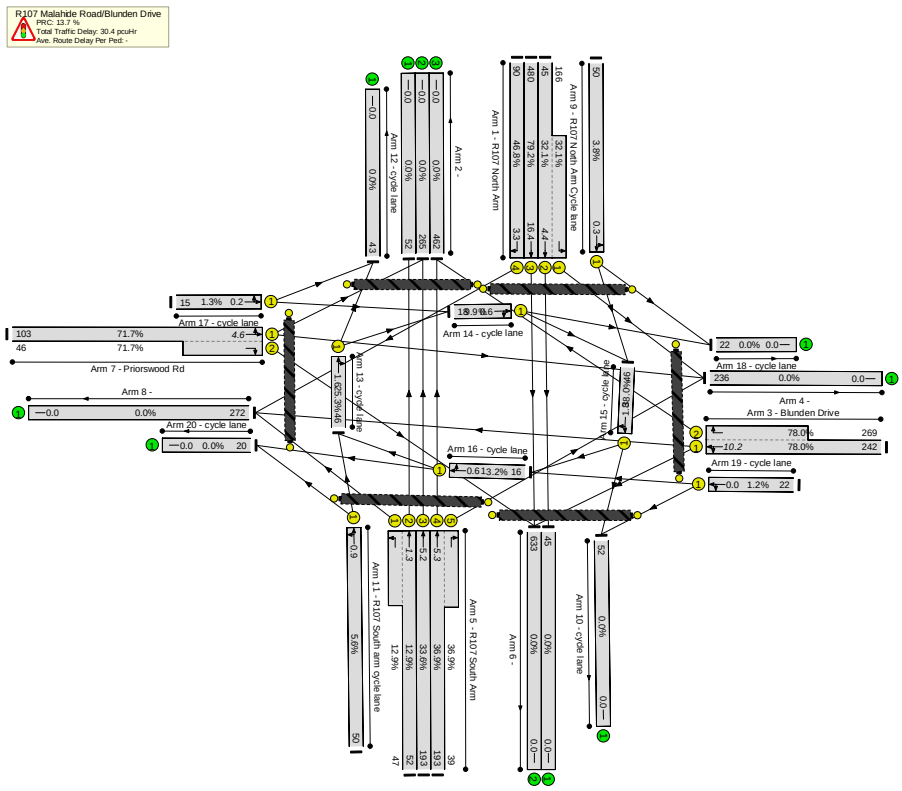
MMQ, CBC arms:
Inbound – 94.3m
Outbound – 30.48m

Bus Av. Delay (s/pcu):
Inbound – 34.6sec
Outbound – 33.0sec

Cyclists Av. Delay (s/pcu):
Inbound – 3.7sec
Outbound - 18.1sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 51.2sec
Outbound – 40.1sec

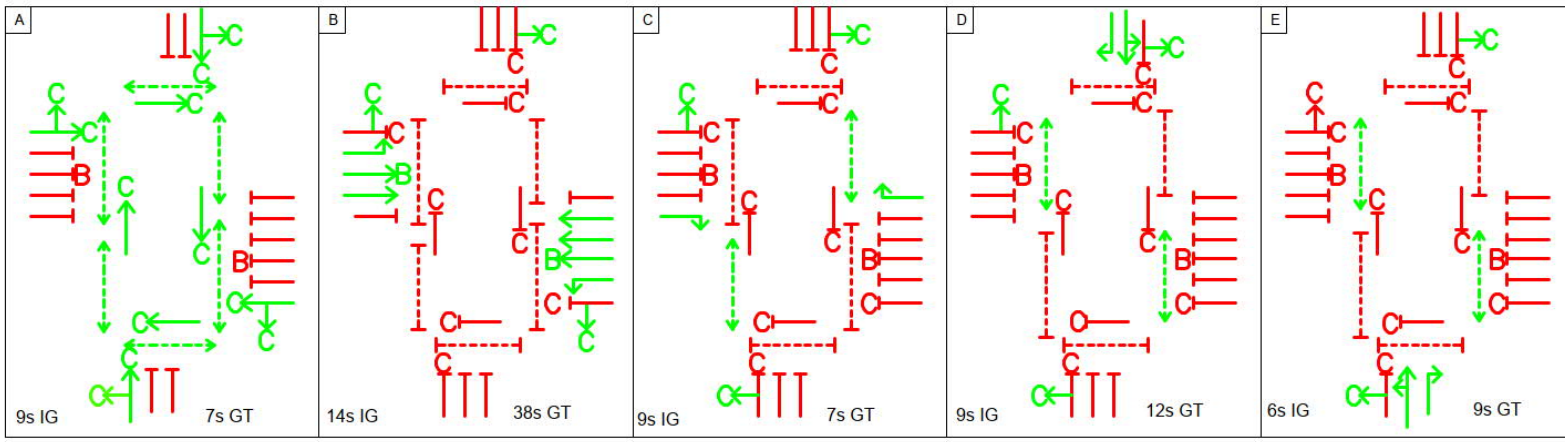
Network Layout Diagram (LinSig) - DS2028_AM



People Movement Assessment DS2028 AM

4.Blunden Drive Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,039	26%	2,242	41%
Bus	1,920	48%	1,920	35%
Walk	685	17%	685	12%
Cycle	320	8%	685	12%
Total	3,964	100%	5,532	100%

INDICATIVE METHOD OF CONTROL



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Blunden Dr– PM peak

2028 PM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = 22.6%,
Junction Delay = 29.4 PCUhr

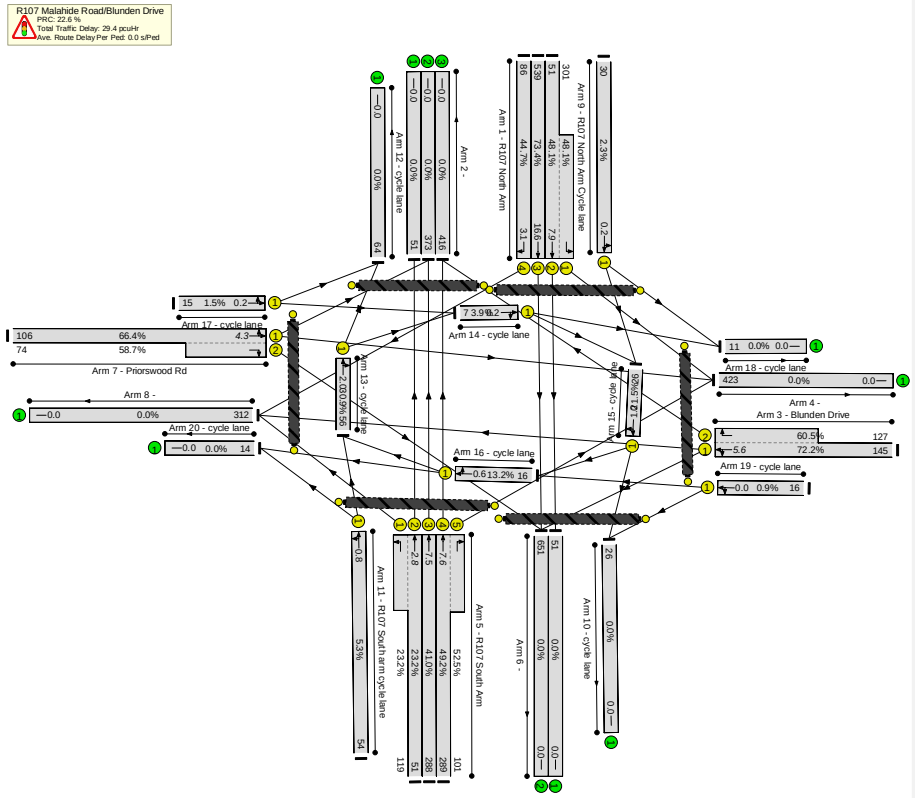
MMQ, CBC arms:
Inbound – 95.45m
Outbound – 43.7m

Bus Av. Delay (s/pcu):
Inbound – 31.8sec
Outbound – 28.8sec

Cyclists Av. Delay (s/pcu):
Inbound – 3.8sec
Outbound - 14.0sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 40.9sec
Outbound – 38.9sec

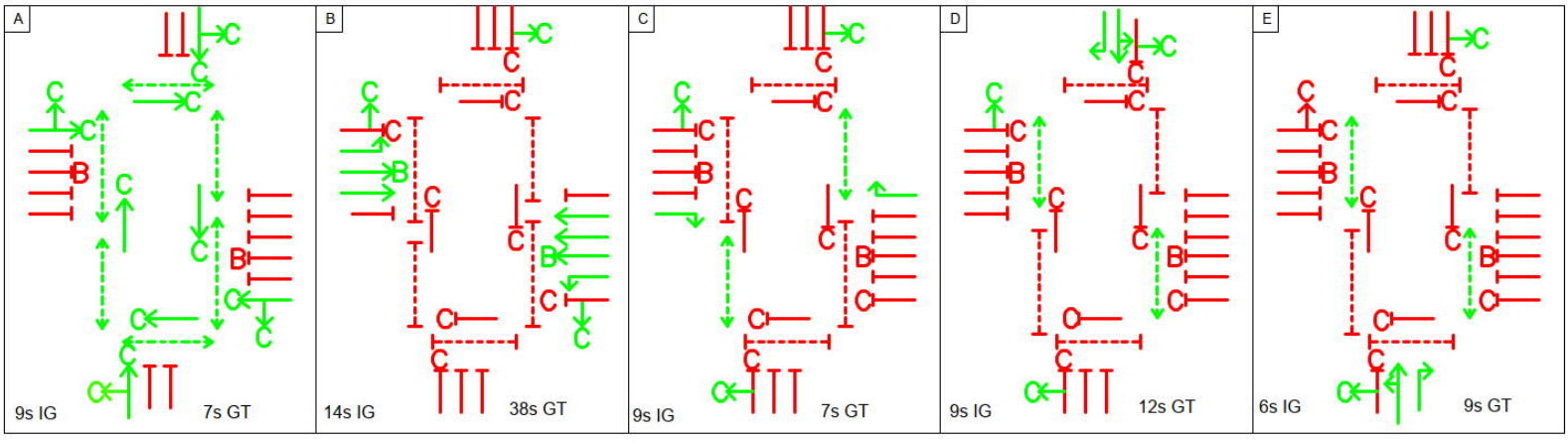
Network Layout Diagram (LinSig) - DS2028_PM



People Movement Assessment DS2028 PM

4.Blunden Dr. Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,339	30%	2,610	44%
Bus	2,040	46%	2,040	34%
Walk	727	16%	727	12%
Cycle	320	7%	610	10%
Total	4,426	100%	5,987	100%

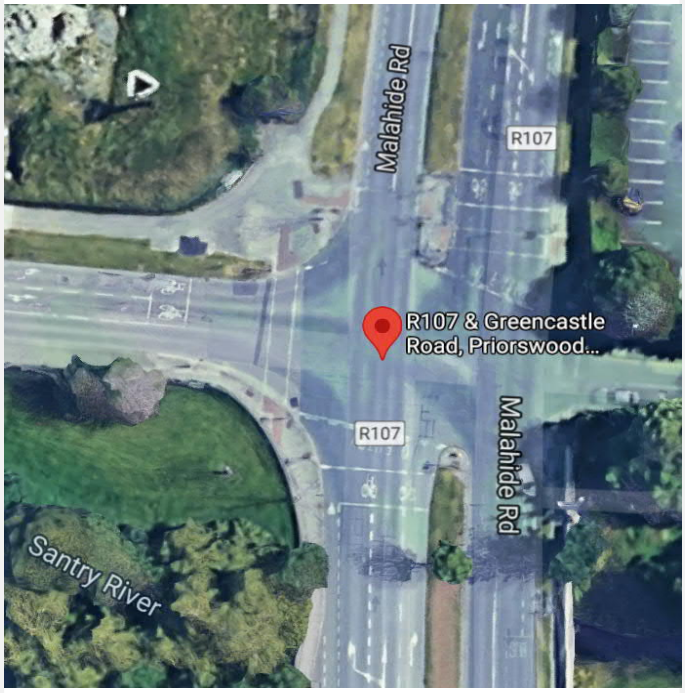
INDICATIVE METHOD OF CONTROL



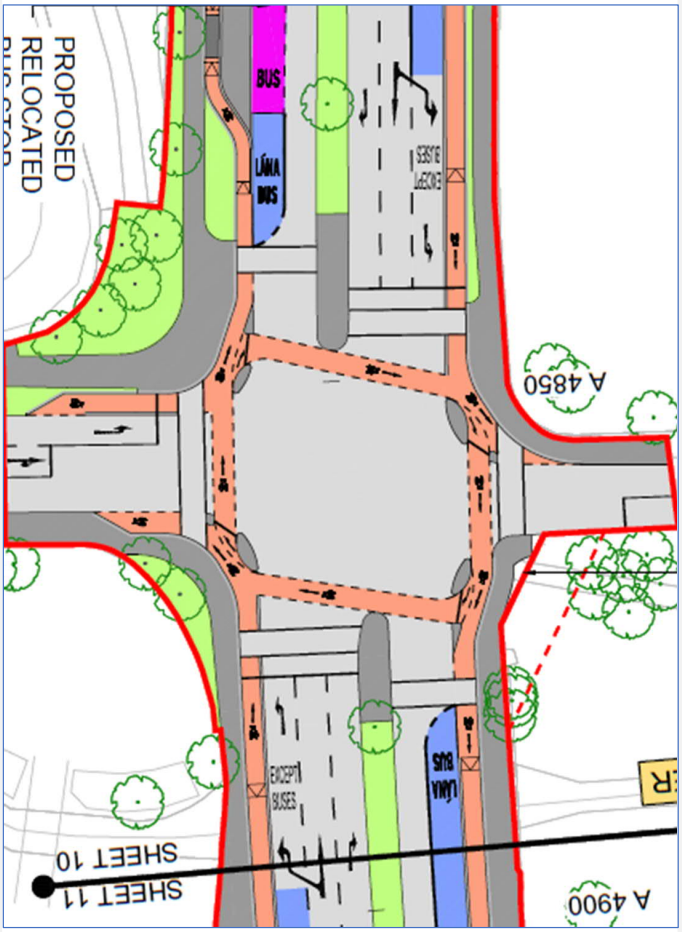
Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Junction: Greencastle Road / R107 Malahide Road

EXISTING



FINAL DESIGN



Summary

The existing 4 arm signalised junction is proposed to be upgraded as per the BusConnects Preliminary Design Guidance Booklet to enhance pedestrian, cyclist and bus priority infrastructure. The key design rationale was to introduce pedestrian crossing facilities on all arms of the junction, provide protected cycle infrastructure and crossing facilities, whilst improving bus priority.

Pedestrian Infrastructure

CBC :

- A new staggered pedestrian crossing on the southern arm of the junction. A straight single movement crossing was considered across Malahide Road on both CBC arms, but was discounted due to the crossing distance being in excess of 19m. A straight crossing was also considered with a 4m refuge island, but discounted due to potential land take in the southern arm and the northern arm was also discounted due to the associated alignment issues to accommodate traffic through the junction. The staggered arrangement will also assist with pedestrian storage on the island.
- The proposed staggered crossing arrangement on the southern arm is consistent with the existing staggered crossing on the northern arm of this junction. The new southern crossing will assist in enhancing connectivity onto the future Santry River Greenway.

Side Roads:

- Direct single movement crossings are proposed on both side arms similar to the existing;
- The corner radii have been minimized so the crossing is more compact and reduced crossing distances for pedestrians.

Cyclists Infrastructure

CBC:

- Alternative entrance ~170m to the north of the junction likely to be more used as a the primary entry/exit point to Coolock Leisureplexe for cyclists coming from the north.
- Cycle tracks are proposed up to the junction, with a protected junction design to enable cyclists to travel through the junction;
- A dedicated right-turn cycle lane facility / advanced position stop line proposed to cater for cyclists crossing two arms of the junction;
- An early start of 5s is proposed to enable cyclists to advance before general traffic. Cyclists then run with left turning general traffic on a left turn flashing amber arrangement.

Side Roads:

- Entry and exit cycle lanes proposed on Greencastle Road to assist cyclists accessing and exiting the junction.
- The introduction of entry and exit cycle lanes on the Coolock Leisureplex arm of the junction was explored however due to the carriageway constraints, this is not feasible. Widening of the Leisureplex arm was considered to facilitate cycle lanes, but this would likely impact and require the removal of existing trees. Also it is noted that cyclists exiting Coolock Leisureplex can avail of the existing path (or future Santry River Greenway) along the Santry River to access Malahide Road and join the proposed BusConnects cycletrack.

Bus Priority Infrastructure

CBC

Junction Type 3 proposed on both CBC arms where the bus lane is shared with left-turning traffic for approx. 20m prior to the stop line. This junction type has been selected on the basis of:

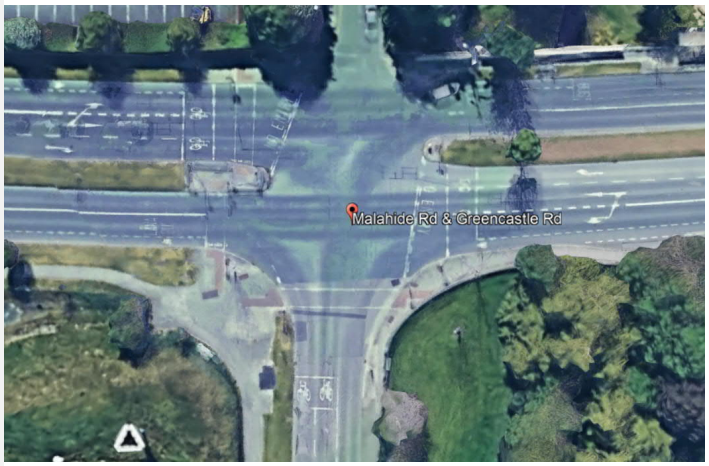
- A review of the traffic flow data indicates below 100 vehicles turning left during the morning and evening peak hours respectively. Based on a 120s cycle time, this will result in less than typically 4 left-turning vehicles per cycle which will have a minimal impact upon bus priority;
- The bus lane has been allocated approx. 40s to allow for both left turning traffic and buses to get through the junction per cycle;
- The LinSig and People Movement results indicated that the Junction Type 3 was more favourable to junction performance and capacity at this location in comparison to a junction type 1.

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

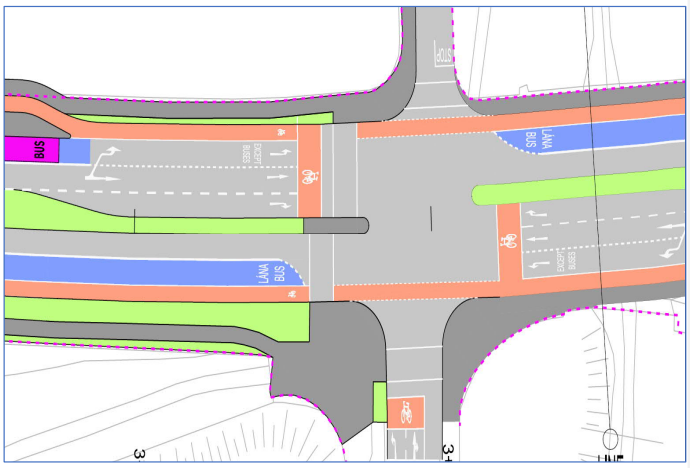
Design Evolution

The proposed junction design has evolved on the BusConnects project from initial Concept Design, Emerging Preferred Route, Public Consultation 2, Public Consultation 3 up to the Current Design. The junction design iterations have been undertaken to optimise pedestrian, cyclist and bus priority infrastructure on the scheme.

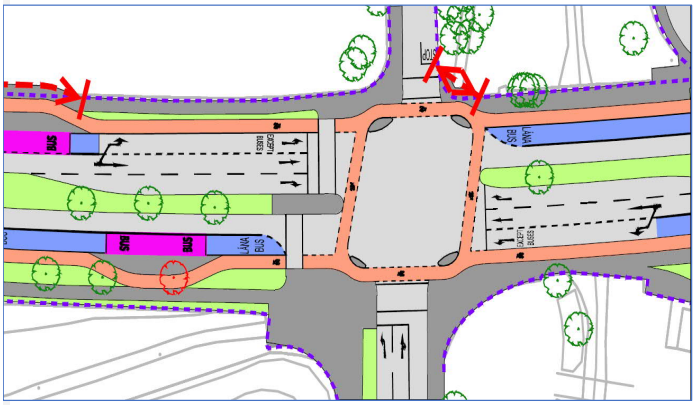
Existing



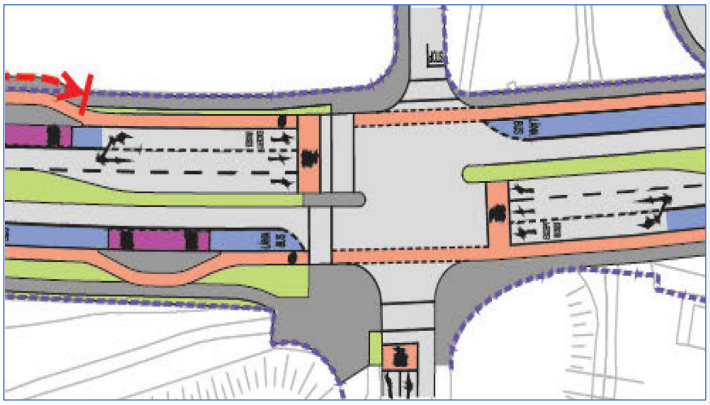
Concept Design Drawing



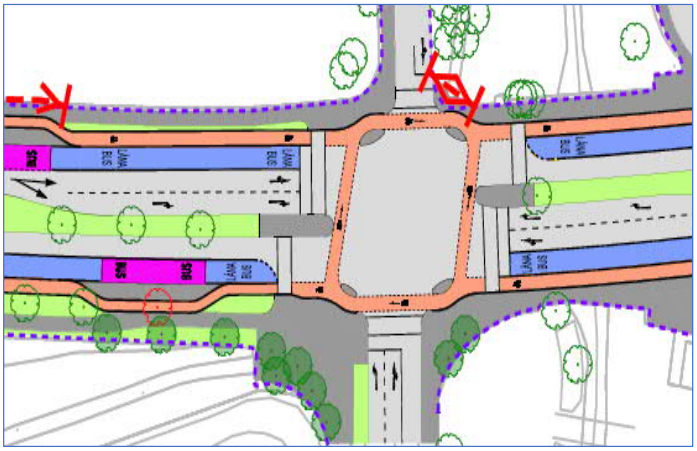
Emerging Preferred Route



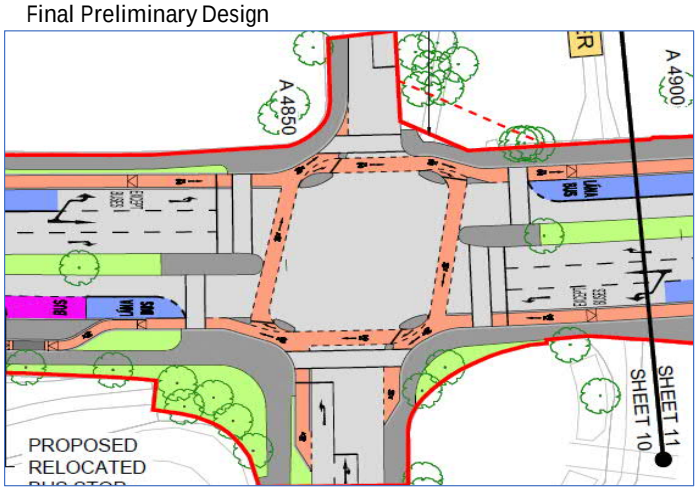
Public Consultation 2



Public Consultation 3



Final Preliminary Design



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Greencastle Rd – AM peak

2028 AM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = 32.5%,
Junction Delay = 20.6 PCUhr

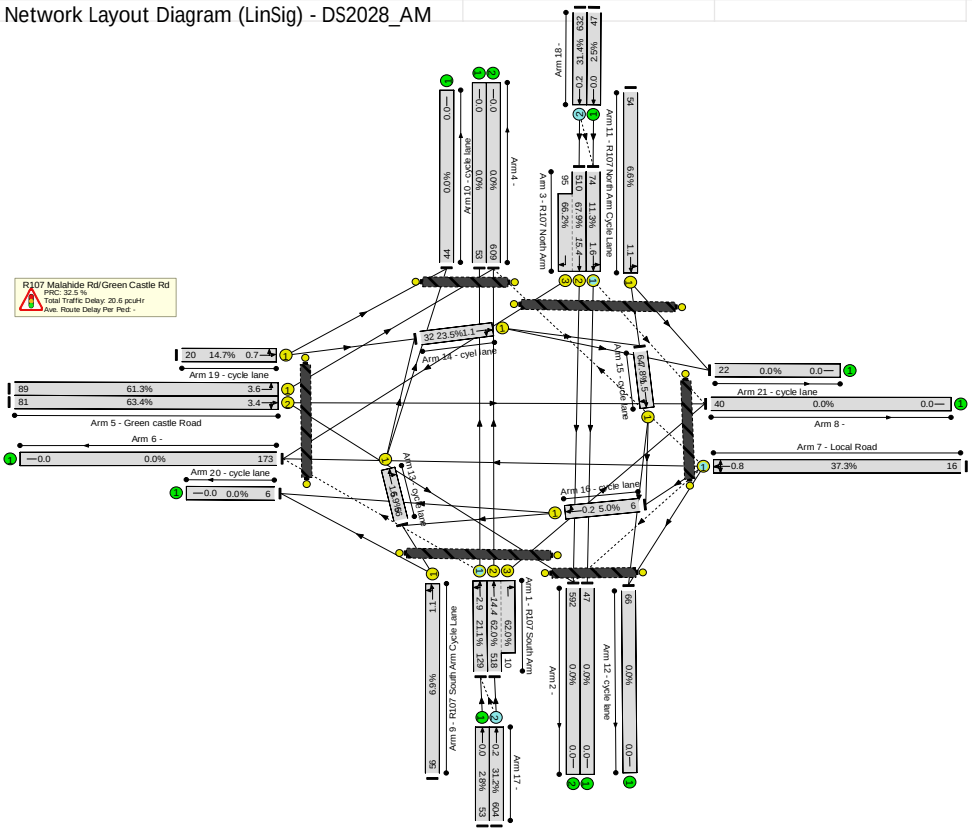
MMQ, CBC arms:
Inbound – 88.55m
Outbound – 82.8m

Bus Av. Delay (s/pcu):
Inbound – 25.1sec
Outbound – 26.8sec

Cyclists Av. Delay (s/pcu):
Inbound – 21.1sec
Outbound - 21.1sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 38.3sec
Outbound – 34.1sec

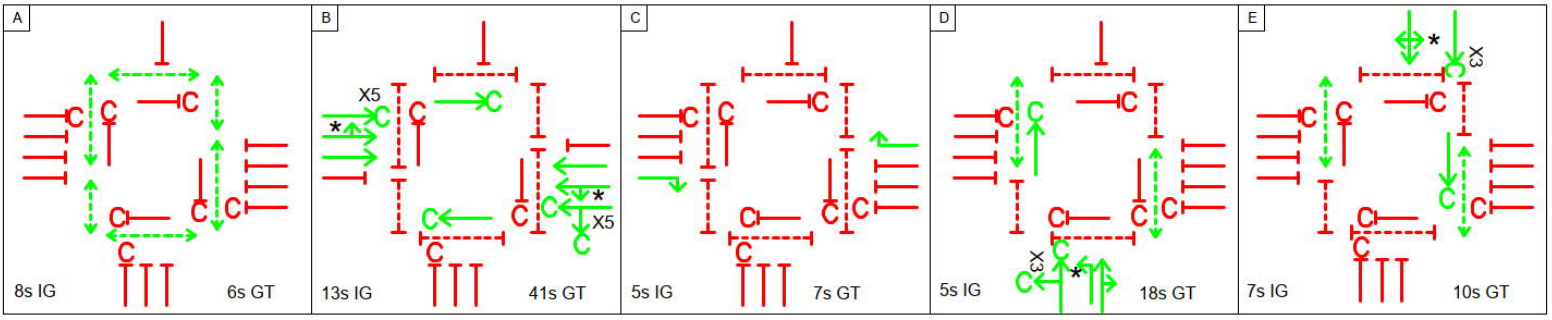
Network Layout Diagram (LinSig) - DS2028_AM



People Movement Assessment DS2028 AM

5. Greencastle Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,234	32%	1,697	37%
Bus	1,980	51%	1,980	43%
Walk	271	7%	271	6%
Cycle	430	11%	692	15%
Total	3,915	100%	4,640	100%

INDICATIVE METHOD OF CONTROL



* denotes Flashing Amber
X5 denotes Advance 5 seconds Start for Cyclists
X3 denotes Advance 3 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Greencastle Rd – PM peak

2028 PM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = 3.2%,
Junction Delay = 31.1 PCUhr

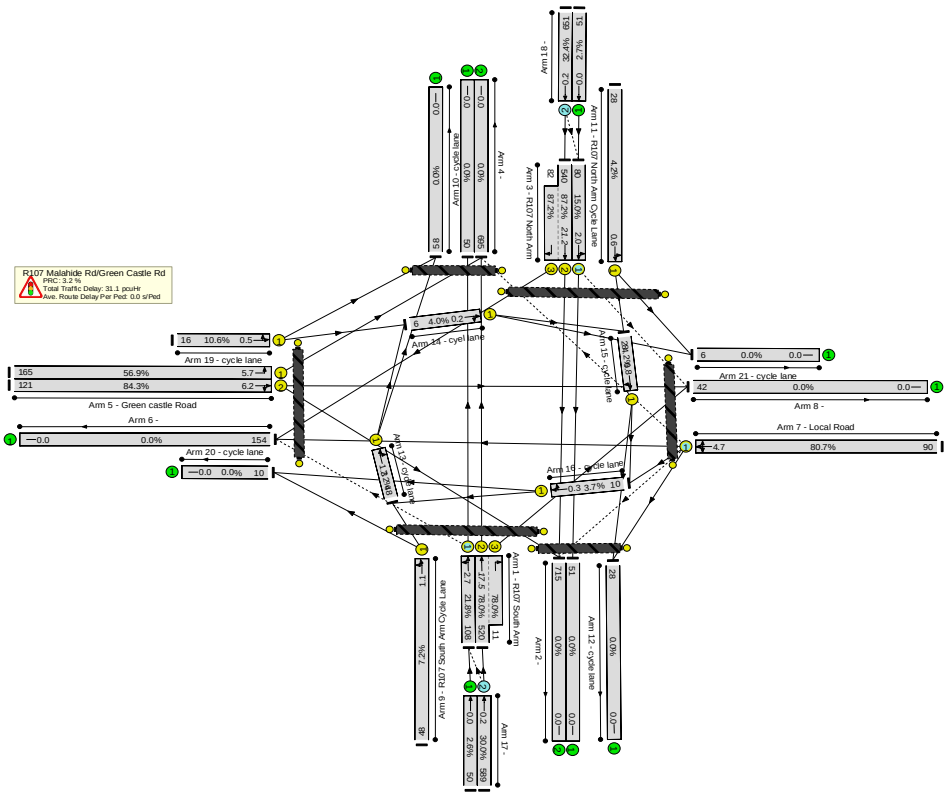
MMQ, CBC arms:
Inbound – 121.9m
Outbound – 100.6m

Bus Av. Delay (s/pcu):
Inbound – 32.7sec
Outbound – 34.1sec

Cyclists Av. Delay (s/pcu):
Inbound – 27.3sec
Outbound - 27.6sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 58.1sec
Outbound – 48.7sec

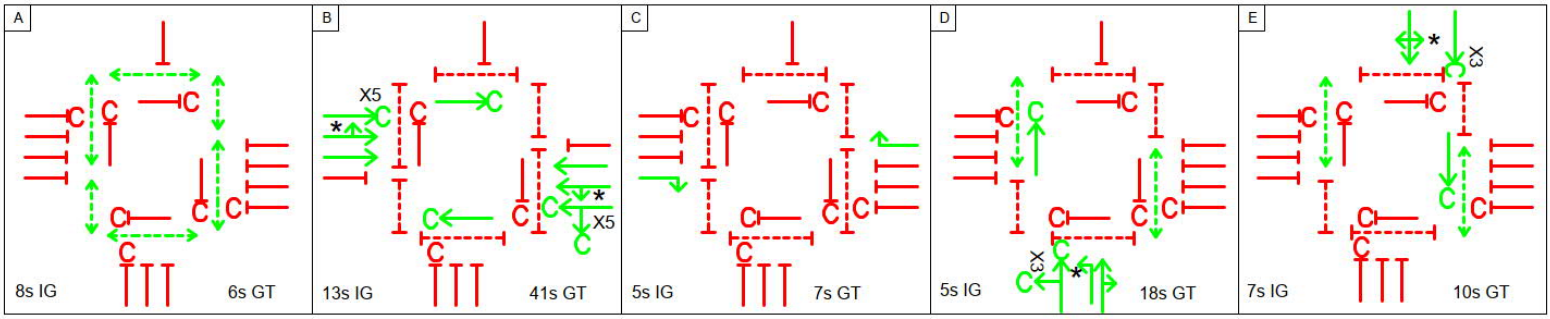
Network Layout Diagram (LinSig) - DS2028_PM



People Movement Assessment DS2028 PM

5. Greencastle Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,272	31%	1,927	39%
Bus	2,040	50%	2,040	41%
Walk	440	11%	440	9%
Cycle	320	8%	510	10%
Total	4,072	100%	4,918	100%

INDICATIVE METHOD OF CONTROL



* denotes Flashing Amber
X5 denotes Advance 5 seconds Start for Cyclists
X3 denotes Advance 3 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Junction: Tonlegee Road / R107 Malahide Road

EXISTING

FINAL DESIGN

Summary

The existing 4 arm signalised junction is proposed to be upgraded as per the BusConnects Preliminary Design Guidance Booklet to enhance pedestrian, cyclist and bus priority infrastructure.

The key design rationale was to introduce pedestrian crossing facilities on all arms of the junction, remove existing left turn slip lanes, provide protected cycle infrastructure and crossing facilities, whilst improving bus priority. The provision of dedicated left turn lanes on the CBC arms allows for a 'hold the left' scenario which could be configured to enhance pedestrian/cycle movements on the side arms outside of peak hours.

Pedestrian Infrastructure

CBC :

- Staggered pedestrian crossings are proposed across Malahide. A single movement straight crossing was considered across Malahide Road, but was discounted due to the crossing distance being in excess of 19m. A straight across crossing in one movement would result in a long intergreen time for pedestrians to complete the movement, approx. 22s, as opposed to the current arrangement of 14s. The additional intergreen would significantly reduce the capacity at the junction, given that the AM is already operating marginally above capacity.
- A 4m central island was considered to facilitate a straight crossing in two stages, but this resulted in alignment issues for the general traffic along Malahide Road. A staggered crossing arrangement will also provide for pedestrian storage within the island.

Side Roads:

- It is proposed to upgrade the existing pedestrian crossing's on Tonlegee and Oscar Traynor Road. The existing Tonlegee arm has 3 pedestrian crossings and the Oscar Traynor arm has 2 pedestrian crossings;
- The proposal is for direct crossings on both side arms, creating a direct single stage crossing for pedestrians.
- The corner radii have been minimized so the crossing is more compact and crossing distances for pedestrians are reduced.

Cyclists Infrastructure

CBC:

- Protected junction design to enhance cyclist protection;
- A protected right-turn facility proposed to cater for cyclists crossing two arms of the junction; and
- It is proposed to allocate a 5s early start for cyclists to enable platooning cyclists to advance before general traffic and thus minimise conflict with left turning traffic on a flashing amber.

Side Roads:

- Entry and exit cycle lanes proposed on Tonlegee Road to assist cyclist access into the junction; and
- A 3s early start for cyclists is also proposed and a subsequent 'flashing amber' for left turning vehicles. The 3s early start at this junction is to enable cyclists to enable platooning cyclists to advance before general traffic and thus minimise conflict with left turning traffic on a flashing amber.

Bus Priority Infrastructure

Junction Type 2 proposed on the CBC arms where both bus lanes are proposed up to the junction stop line. There is a yellow box to allow left-turners to cross the bus lane to enter a dedicated left-turn pocket. This junction type has been selected on the basis of:

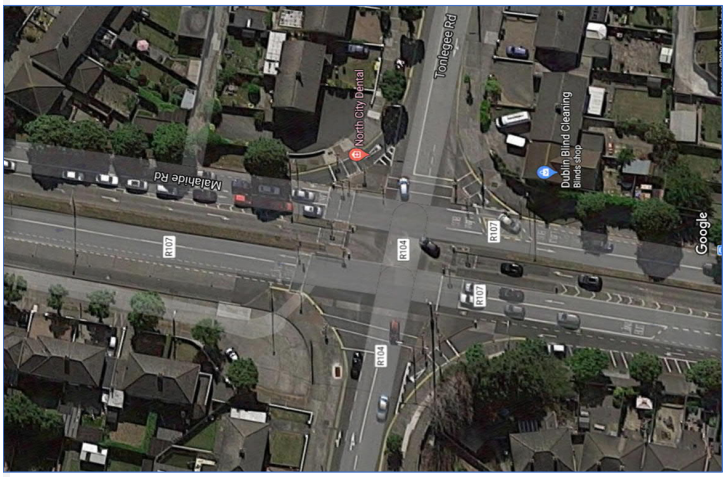
- This has been incorporated into the design to allow an extended period of green time for the buses
- Space is available for a dedicated left-turning lane; and
- The traffic flow data indicates approx. 148-166PCUs turning left during the peak hours, the left turn lanes will therefore provide additional capacity for general traffic at the junction, thus minimising any delay to bus priority.

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

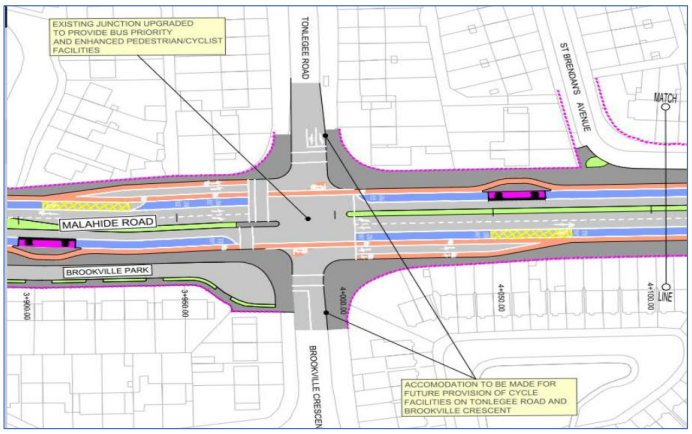
Design Evolution

The proposed junction design has evolved on the BusConnects project from initial Concept Design, Emerging Preferred Route, Public Consultation 2, Public Consultation 3 up to the Current Design. The junction design iterations have been undertaken to optimise pedestrian, cyclist and bus priority infrastructure on the scheme.

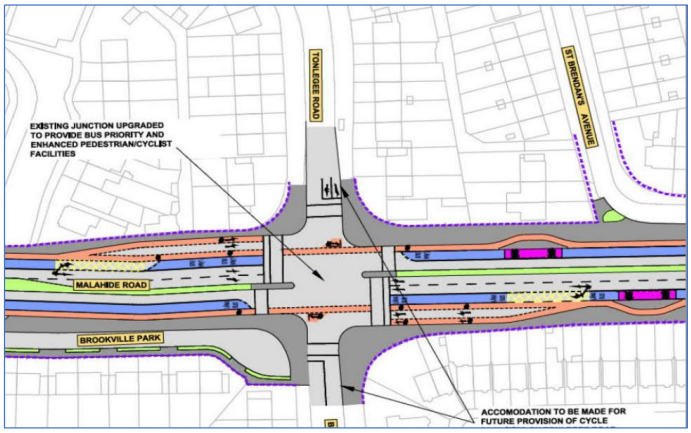
Existing



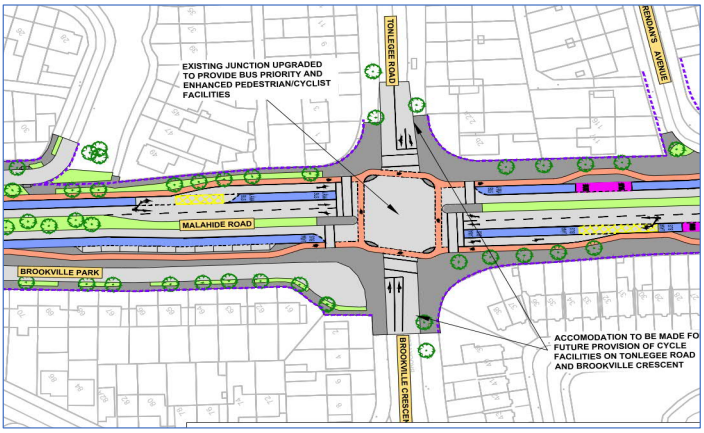
Concept Design Drawing



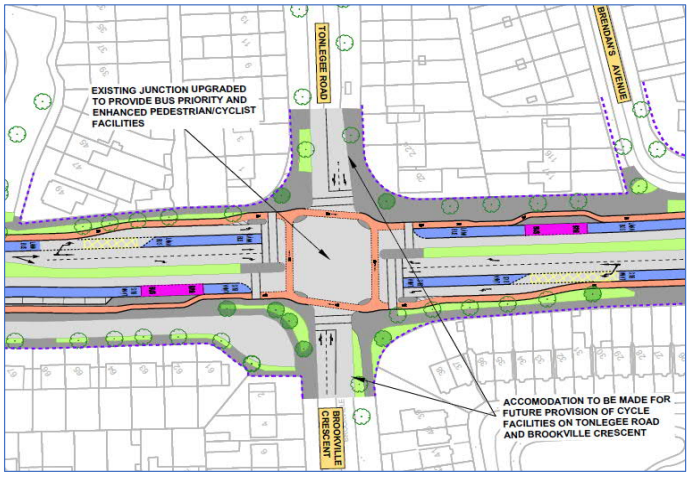
Emerging Preferred Route



Public Consultation 2



Public Consultation 3



Final Preliminary Design

Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Tonlegee Rd– AM peak

2028 AM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = -15.3%,
Junction Delay = 48.8 PCUhr

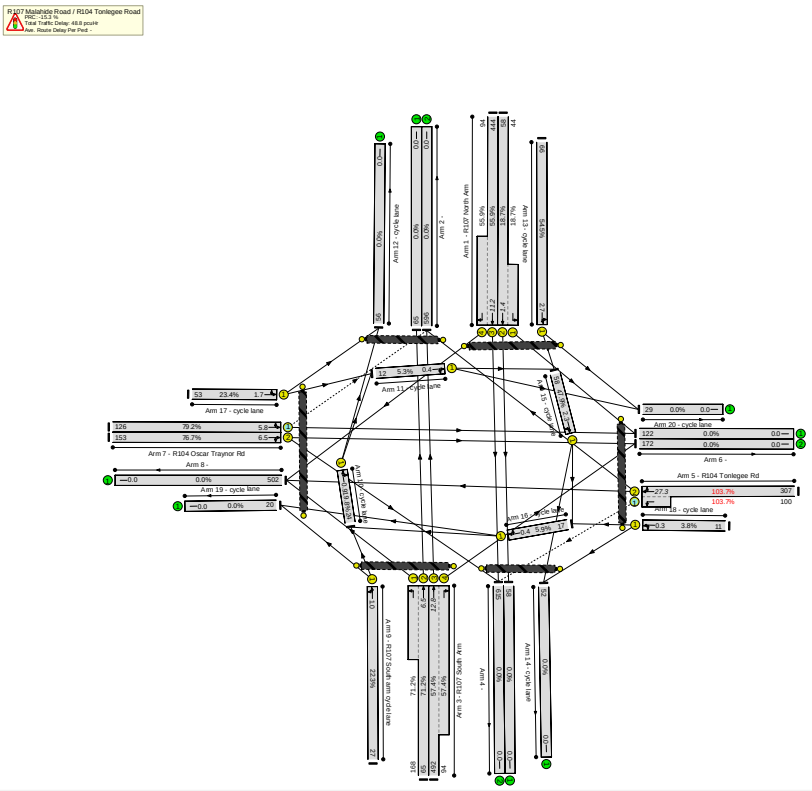
MMQ, CBC arms:
Inbound – 64.4m
Outbound – 73.6m

Bus Av. Delay (s/pcu):
Inbound – 34.9sec
Outbound – 59.7sec

Cyclists Av. Delay (s/pcu):
Inbound – 86.3sec
Outbound - 72.2sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 33.4sec
Outbound – 33.6sec

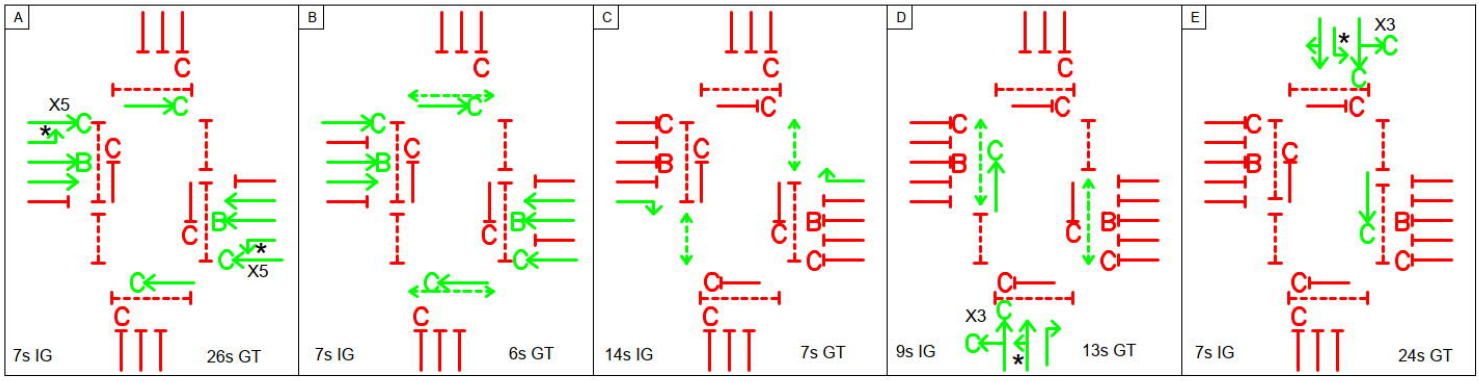
Network Layout Diagram (LinSig) - DS2028_AM



People Movement Assessment DS2028 AM

6.Tonlegee Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,123	27%	2,426	41%
Bus	2,460	59%	2,460	41%
Walk	312	8%	312	5%
Cycle	255	6%	785	13%
Total	4,150	100%	5,983	100%

INDICATIVE METHOD OF CONTROL



* denotes Flashing Amber
X3 denotes Advance 3 seconds Start for Cyclists
X5 denotes Advance 5 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Tonlegee Rd– PM peak

2028 PM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = 4.7%,
Junction Delay = 38.1 PCUhr

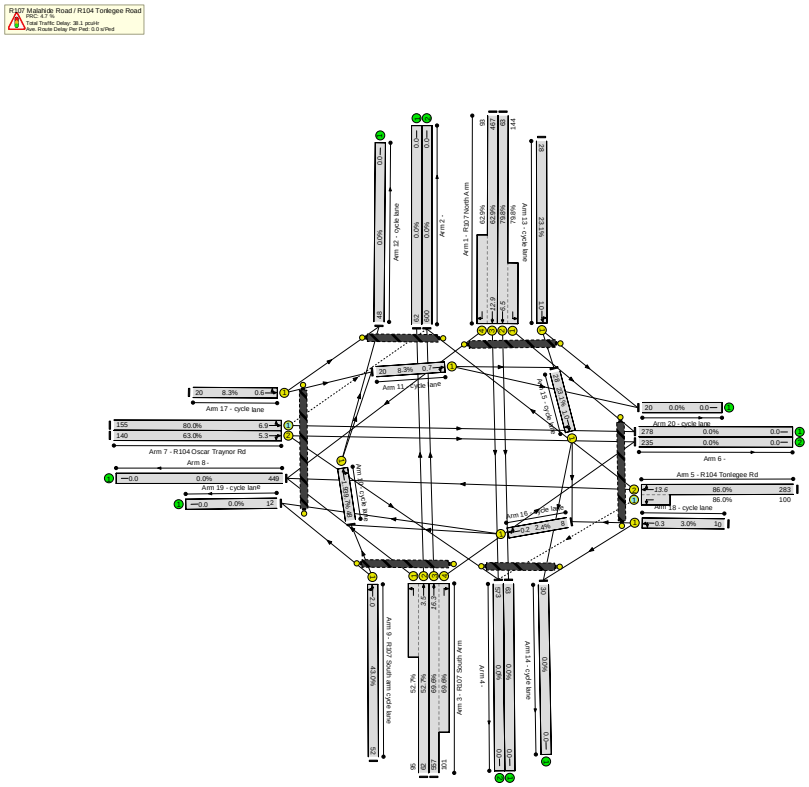
MMQ, CBC arms:
Inbound – 74.18m
Outbound – 93.73m

Bus Av. Delay (s/pcu):
Inbound – 75.3sec
Outbound – 52.1sec

Cyclists Av. Delay (s/pcu):
Inbound – 72.4sec
Outbound – 79.6sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 37.2sec
Outbound – 39.2sec

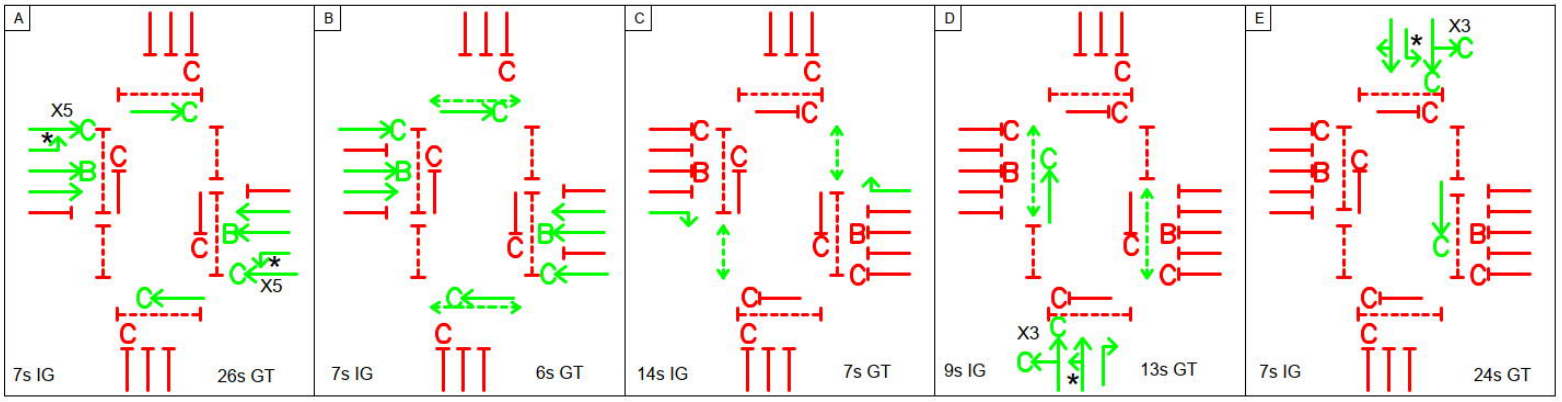
Network Layout Diagram (LinSig) - DS2028_PM



People Movement Assessment DS2028 PM

6.Tonlegee Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,229	29%	2,562	43%
Bus	2,520	59%	2,520	42%
Walk	258	6%	258	4%
Cycle	270	6%	630	11%
Total	4,277	100%	5,970	100%

INDICATIVE METHOD OF CONTROL



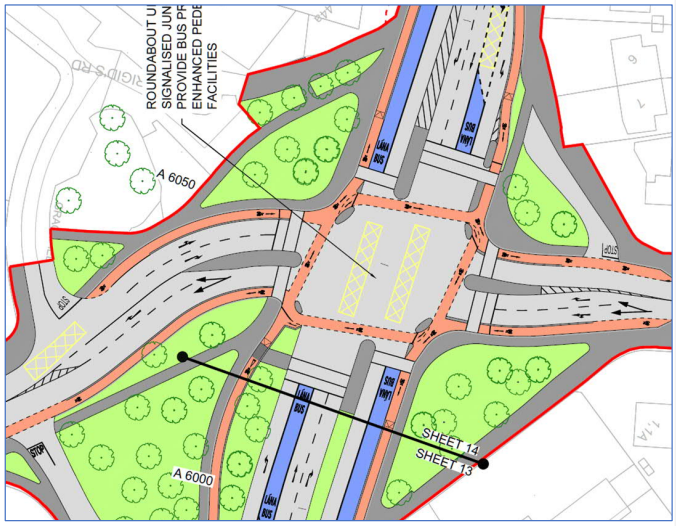
* denotes Flashing Amber
X3 denotes Advance 3 seconds Start for Cyclists
X5 denotes Advance 5 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Junction: Ardlea Road / R107 Malahide Road

EXISTING

FINAL DESIGN



Summary

The existing roundabout is proposed to be upgraded to a 4 arm signalised junction as per the BusConnects Preliminary Design Guidance Booklet to enhance pedestrian, cyclist and bus priority infrastructure.

The design rationale was to introduce more direct and compact pedestrian crossing facilities on all arms of the junction, provide protected cycle infrastructure and crossing facilities, whilst improving bus priority. The provision of dedicated left turn lanes on the CBC arms allows for a 'hold the left' scenario which could be configured to enhance pedestrian/cycle movements on the side arms outside of peak hours.

Pedestrian Infrastructure

CBC :

- Staggered pedestrian crossings are proposed on the CBC arms. A straight single movement crossing was considered across Malahide Road, but was discounted due to the crossing distance being in excess of 19m. A straight crossing in one movement would result in a long intergreen time for pedestrians to complete the movement, approx. 22s, as opposed to the current arrangement of 11s. The additional intergreen would significantly reduce the capacity at the junction.
- A straight crossing with a 4m island was considered but due to alignment constraints, a staggered crossing is proposed which will also provide pedestrian storage.

Side Roads:

- On the side roads (Ardlea Rd and R108) a straight-across pedestrian crossing in two stages has been proposed. A direct two stage crossing with suitably sized island has been proposed at this location to allow walk with traffic reducing delay and storage requirements for pedestrians. The use of louvres is also recommended to mitigate against potential see through of pedestrian signals. Similarly the use of nearside & farside signals should be considered for legibility.
- The corner radii have been minimized so the crossing is more compact and crossing distances are reduced for pedestrians.

Cyclists Infrastructure

CBC:

- A protected junction design to enhance cyclist safety through the junction;
- Early start of 5s proposed for cyclists and a subsequent 'flashing amber' for left turning vehicles.
- A dedicated right-turn cycle lane facility proposed to cater for cyclists crossing two arms of the junction; and

Side Roads:

- Entry and exit cycle lanes proposed on Ardlea Road to assist cyclist access into the junction; and
- A 3s advanced start for cyclists is also proposed and a subsequent 'flashing amber' for left turning vehicles, which is as per the BusConnects guidelines

Bus Priority Infrastructure

Junction Type 2 is proposed on the CBC arms where both bus lanes are dedicated lanes up to the junction stop line. At approximately 30m back from the stop line, there is a yellow box to allow left-turners to cross the bus lane to enter a dedicated left-turn pocket. This junction type has been selected on the basis of:

- Space is available for a dedicated left-turning lane which allows for a 'hold the left' configuration in off peak hours; and
- High volumes of left-turning traffic on the CBC arms. Traffic flow data indicates approx. 146PCUs turning left during the peak hours.
- The design therefore provides greater capacity and operational flexibility in comparison to Junction Type 1.

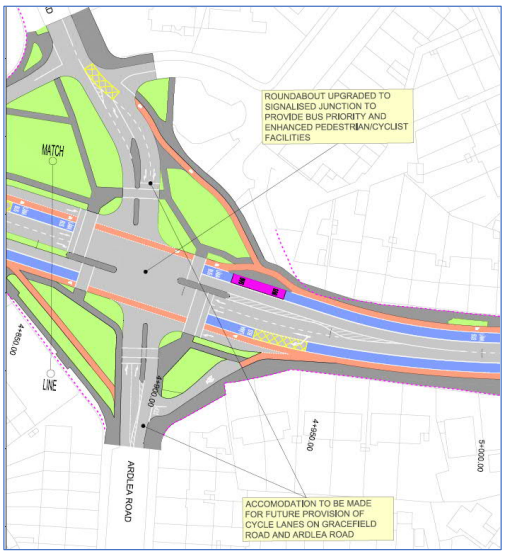
Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Design Evolution

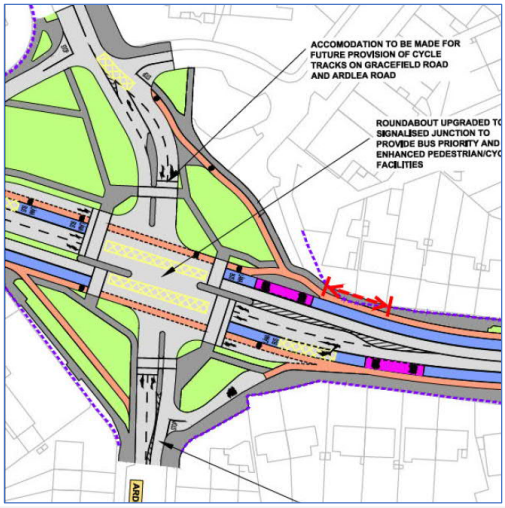
The proposed junction design has evolved on the BusConnects project from initial Concept Design, Emerging Preferred Route, Public Consultation 2, Public Consultation 3 up to the Current Design. The junction design iterations have been undertaken to optimise pedestrian, cyclist and bus priority infrastructure on the scheme.

Existing

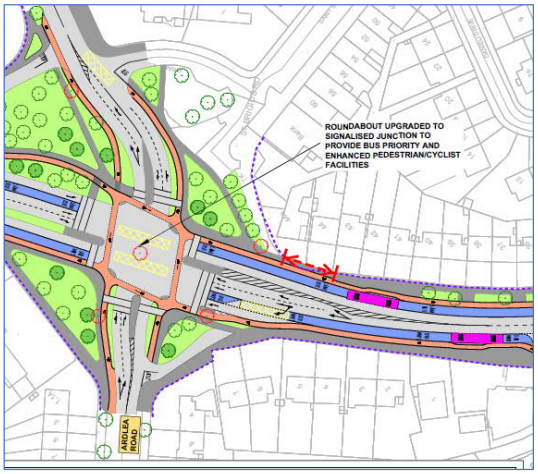
Concept Design Drawing



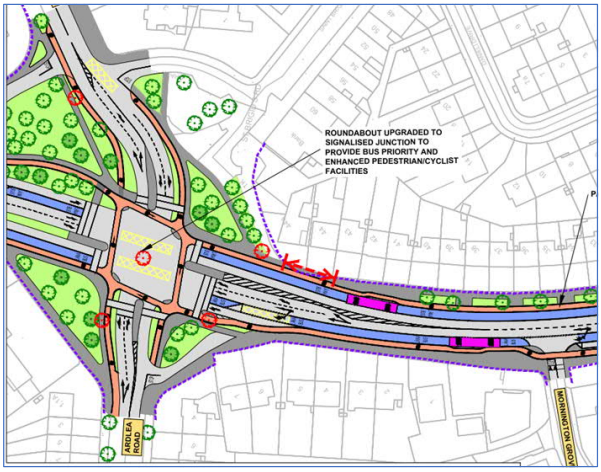
Emerging Preferred Route



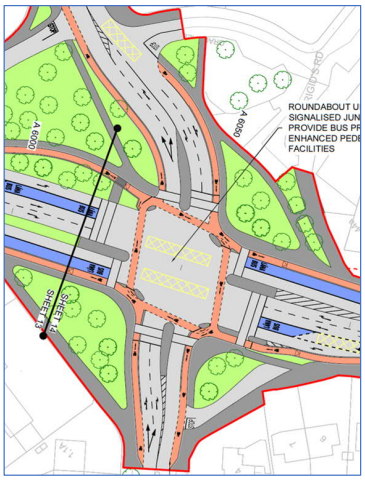
Public Consultation 2



Public Consultation 3



Final Preliminary Design



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Ardlea Rd– AM peak

2028 AM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = 10.6%,
Junction Delay = 31.5 PCUhr

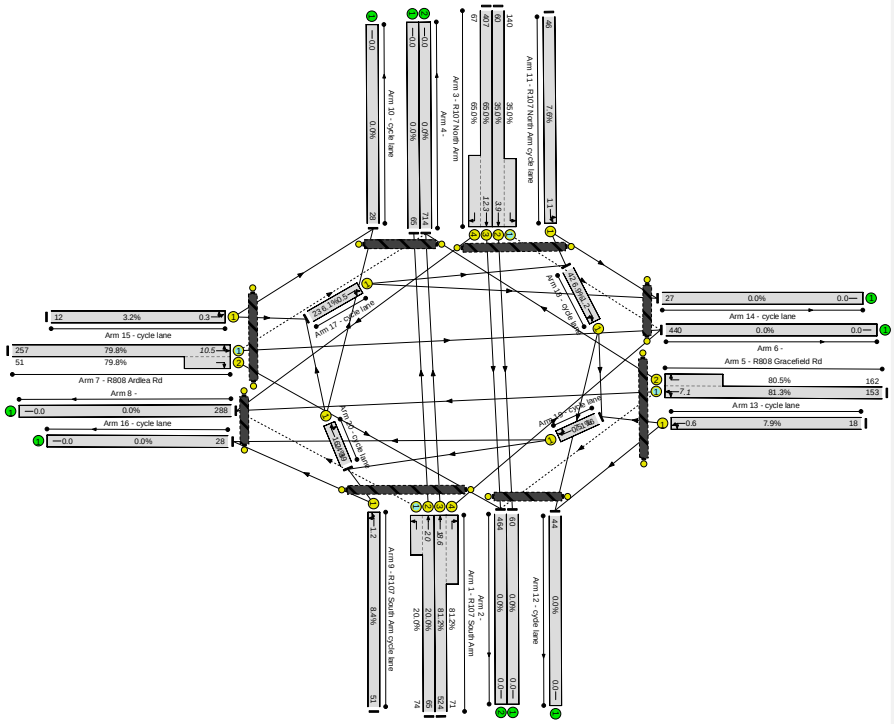
MMQ, CBC arms:
Inbound – 70.73m
Outbound – 106.95m

Bus Av. Delay (s/pcu):
Inbound – 36sec
Outbound – 32.1sec

Cyclists Av. Delay (s/pcu):
Inbound – 30.6sec
Outbound – 30.7sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 41.1sec
Outbound – 48.7sec

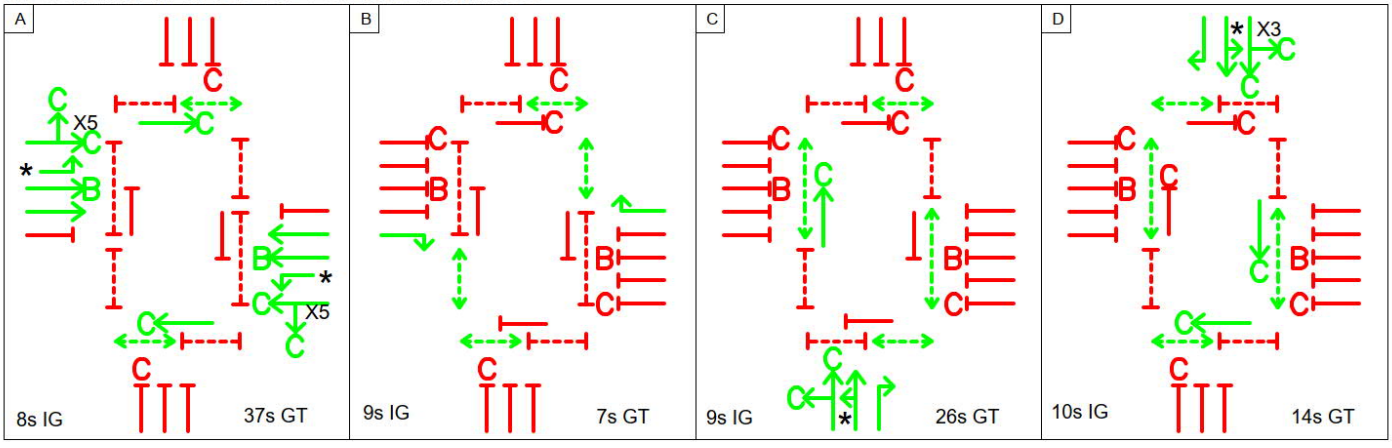
Network Layout Diagram (LinSig) - DS2028_AM



People Movement Assessment DS2028 AM

7.Ardlea Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,117	23%	2,287	36%
Bus	2,520	52%	2,520	39%
Walk	955	20%	955	15%
Cycle	240	5%	665	10%
Total	4,832	100%	6,427	100%

INDICATIVE METHOD OF CONTROL / TIMINGS



* denotes Flashing Amber
X3 denotes Advance 3 seconds Start for Cyclists
X5 denotes Advance 5 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Ardlea Rd– PM peak

2028 PM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = 4.3%,
Junction Delay = 35.2 PCUhr

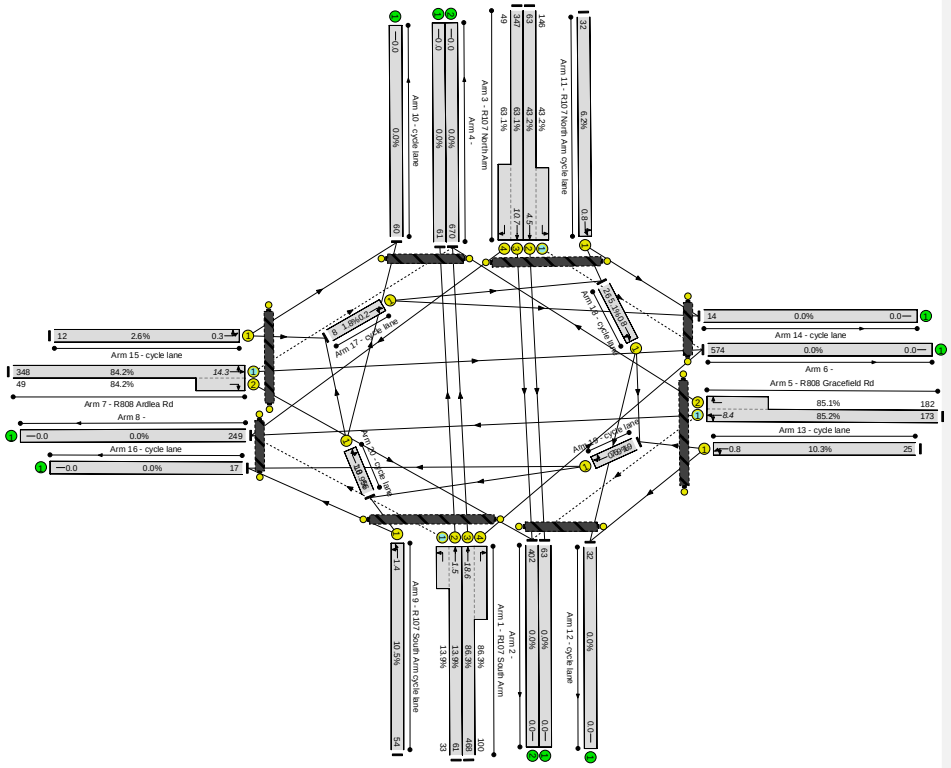
MMQ, CBC arms:
Inbound – 61.53m
Outbound – 106.95m

Bus Av. Delay (s/pcu):
Inbound – 42.4sec
Outbound – 34.9sec

Cyclists Av. Delay (s/pcu):
Inbound – 35.2sec
Outbound – 35.7sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 44.6sec
Outbound – 59.2sec

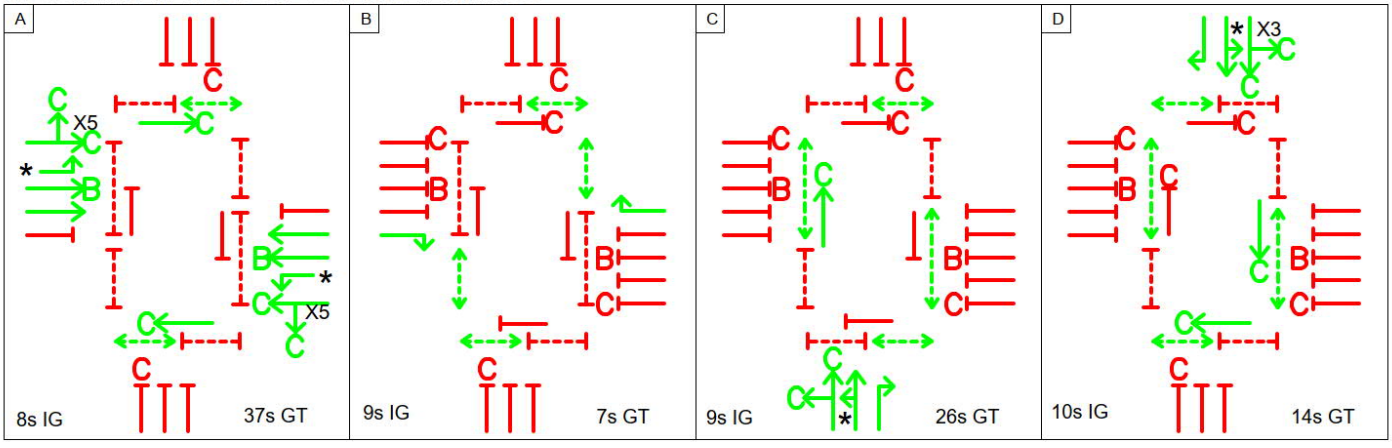
Network Layout Diagram (LinSig) - DS2028_PM



People Movement Assessment DS2028 PM

7.Ardlea Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	978	21%	2,274	36%
Bus	2,460	52%	2,460	39%
Walk	968	21%	968	15%
Cycle	300	6%	650	10%
Total	4,706	100%	6,352	100%

INDICATIVE METHOD OF CONTROL / TIMINGS



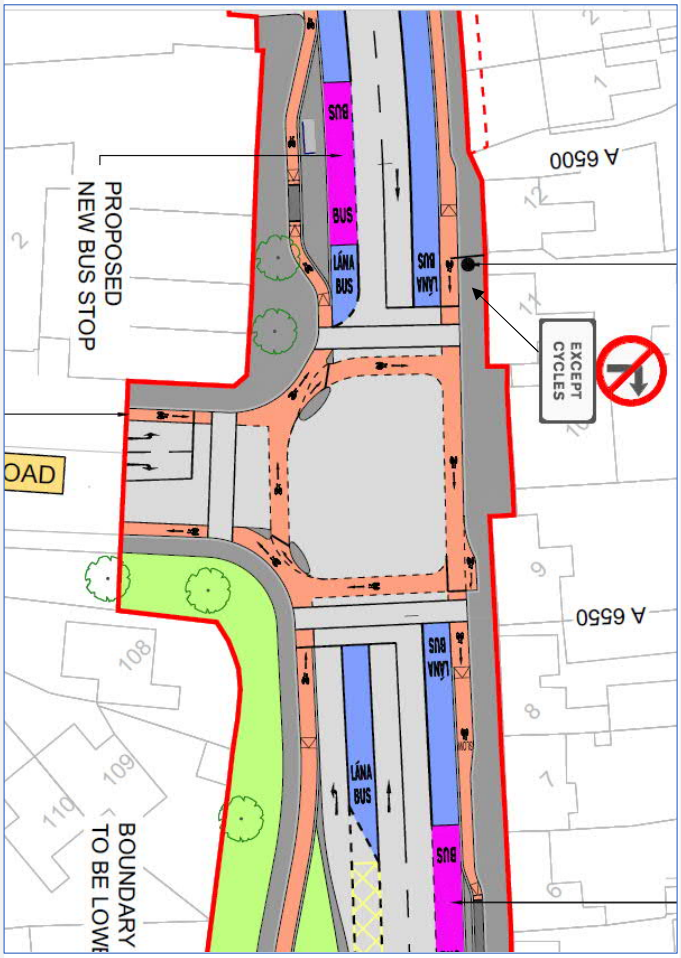
* denotes Flashing Amber
X3 denotes Advance 3 seconds Start for Cyclists
X5 denotes Advance 5 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Junction: Kilmore Road / R107 Malahide Road

EXISTING

FINAL DESIGN



Summary

The existing 3 arm signalised junction is proposed to be upgraded as per the BusConnects Preliminary Design Guidance Booklet to enhance pedestrian, cyclist and bus priority infrastructure.

The key design rationale was to introduce pedestrian crossing facilities on all arms of the junction with a new crossing on the southern arm, provide protected cycle infrastructure and crossing facilities, whilst improving bus priority. The provision of dedicated left turn lane on the southern CBC arm allows for a 'hold the left' scenario which to enhance pedestrian/cycle movements on the side arm.

Pedestrian Infrastructure

- The proposed drawings introduce a new pedestrian crossing across Malahide Road on the southern arm to cater for the proposed inbound bus stop;
- In the existing conditions, the outbound stop is located over 100m from the junction, therefore it has been relocated closer to the junction as per the bus stop guidelines;
- Both pedestrian crossings are proposed to be straight-across to facilitate direct crossing for pedestrians; and
- It is noted that the crossing length on the Malahide Road southern arm is proposed at approx. 19m crossing distance, which is at the maximum distance recommended as per the BusConnects guidance.
- The existing left turn slip from Malahide Road to Kilmore Road is proposed to be removed, to facilitate a more compact pedestrian crossing on Kilmore Road.

Cyclists Infrastructure

CBC:

- Protected junction design is proposed to enhance cyclist protection with the removal of the existing 'orphan' cycle lane on the southern arm;
- A segregated stage of 7s proposed for outbound cyclists to avoid a conflict with heavy left-turning flows into Kilmore Road. The inbound cyclists can run with inbound general traffic due to no left turn conflict;
- A dedicated right-turn cycle lane facility has been proposed to cater for cyclists crossing two arms of the junction;
- Bus stop islands are proposed on the downstream end of the junction for both inbound and outbound directions, which removes the existing conflict between buses and cyclists and minimises adaptive operational constraints with stopping buses upstream of junctions.

Side Roads:

- Entry and exit cycle lanes proposed on Greencastle Road to assist cyclist access into the junction.
- A short 3s early start is proposed to enable cyclists to receive a more advanced position before general traffic.

Bus Priority Infrastructure

Junction Type 1 and 2 proposed along CBC arms where the bus lane extends to the stop line. This junction type has been selected on the basis of:

- A left turn lane is proposed to the inside of the bus lane outbound. This has been incorporated into the design due to the traffic flow data indicating a high (<200pcus) left turning movements during the morning peak hour; and
- Space is available for a dedicated left-turning lane outbound.

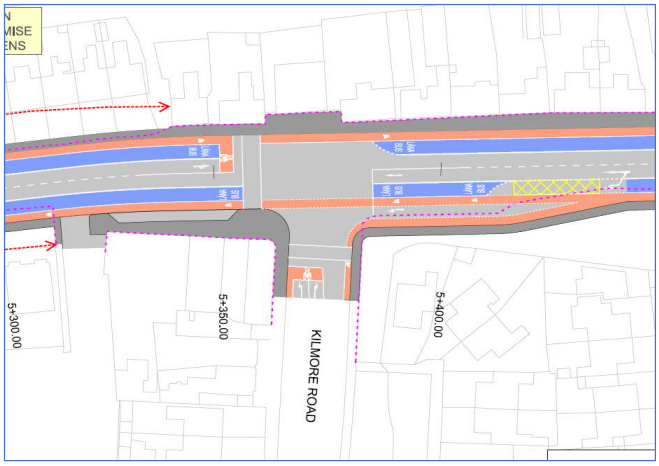
Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Design Evolution

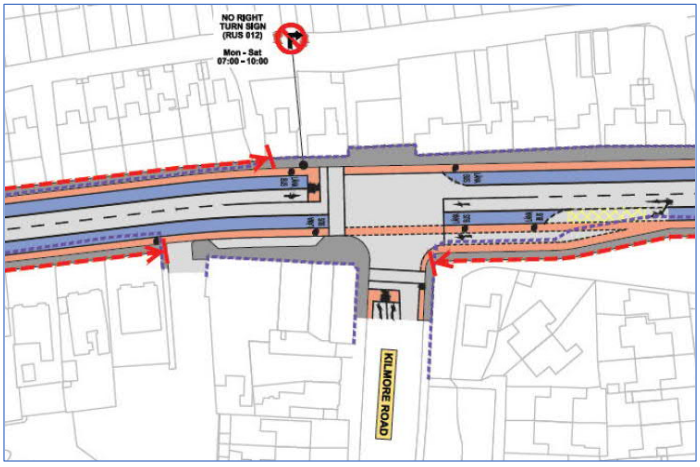
The proposed junction design has evolved on the BusConnects project from initial Concept Design, Emerging Preferred Route, Public Consultation 2, Public Consultation 3 up to the Current Design. The junction design iterations have been undertaken to optimise pedestrian, cyclist and bus priority infrastructure on the scheme.

Existing

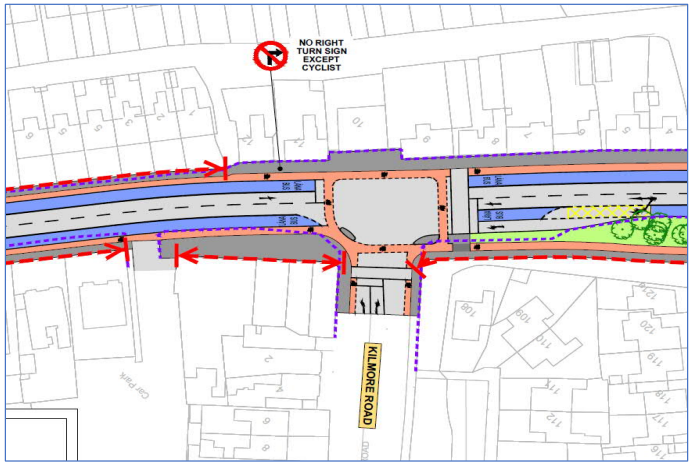
Concept Design Drawing



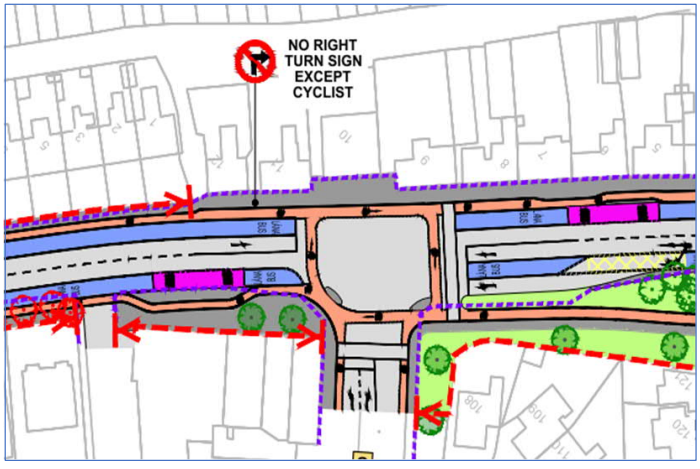
Emerging Preferred Route



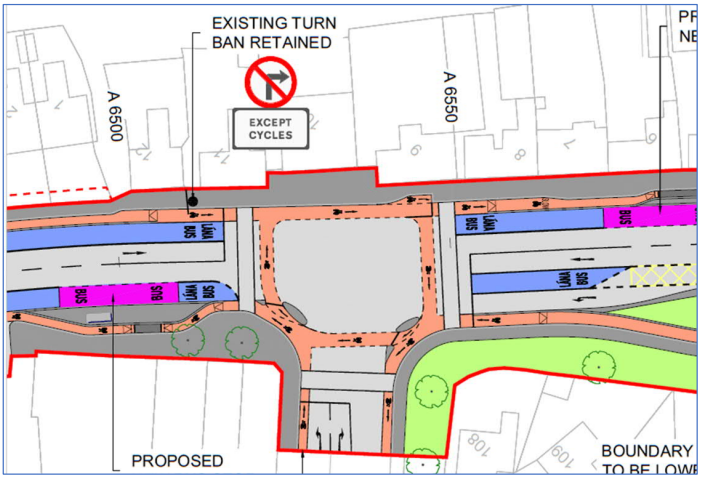
Public Consultation 2



Public Consultation 3



Final Preliminary Design



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Kilmore Rd– AM peak

2028 AM Peak Hours
Fixed Time LinSig Results

Cycle Time = 100 secs
PRC = 46%,
Junction Delay = 15.1 PCUhr

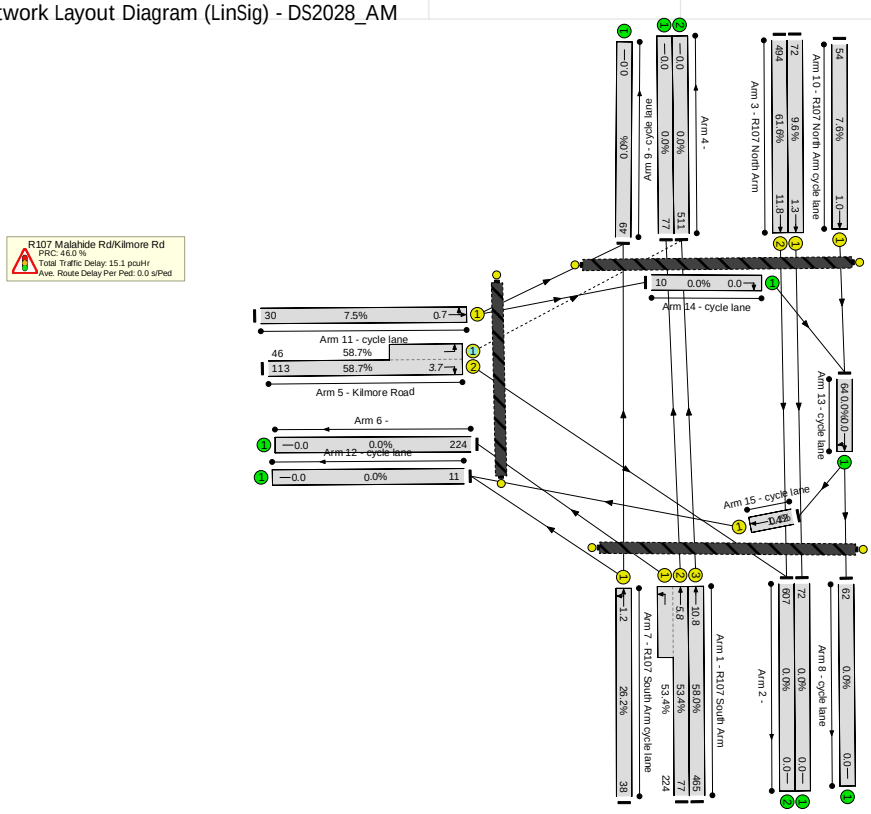
MMQ, CBC arms:
Inbound – 67.85m
Outbound – 62.1m

Bus Av. Delay (s/pcu):
Inbound – 22.0sec
Outbound – 34.6sec

Cyclists Av. Delay (s/pcu):
Inbound – 21.9sec
Outbound - 60sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 30.3sec
Outbound – 29.4sec

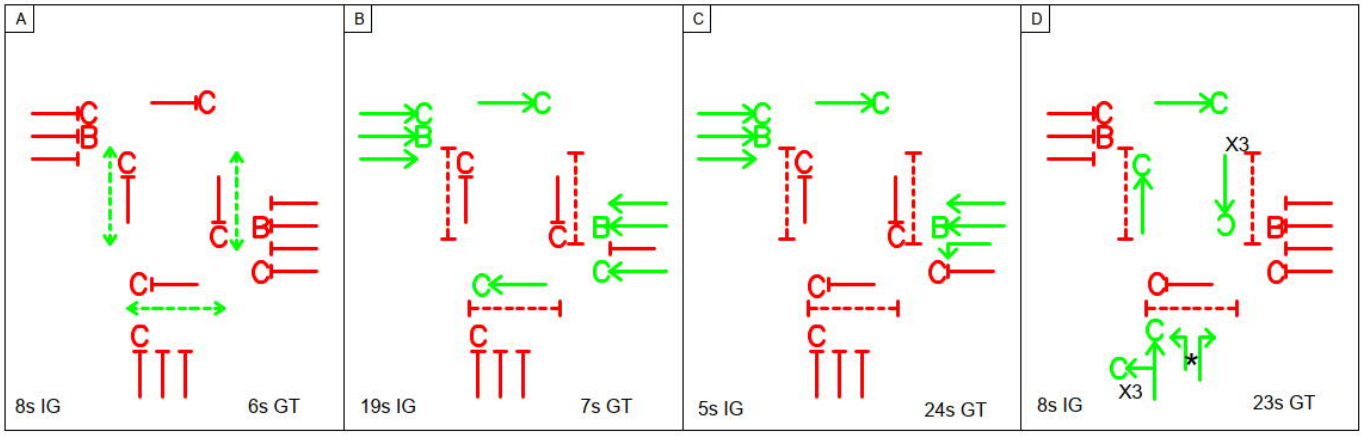
Network Layout Diagram (LinSig) - DS2028_AM



People Movement Assessment DS2028 AM

8.Kilmore Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,151	23%	1,610	29%
Bus	3,000	61%	3,000	53%
Walk	398	8%	398	7%
Cycle	405	8%	610	11%
Total	4,954	100%	5,619	100%

INDICATIVE METHOD OF CONTROL



* denotes Flashing Amber
X3 denotes Advance 3 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Kilmore Rd– PM peak

2028 PM Peak Hours
Fixed Time LinSig Results

Cycle Time = 100 secs
PRC = 29.2%,
Junction Delay = 19.1 PCUhr

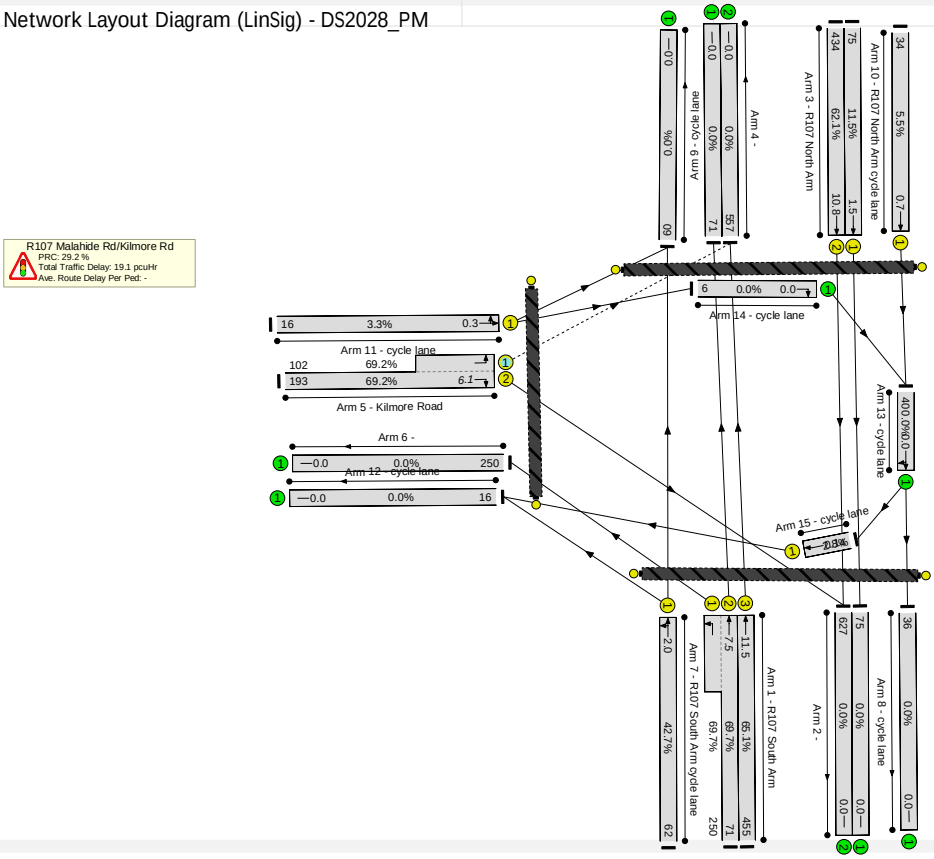
MMQ, CBC arms:
Inbound – 62.1m
Outbound – 66.13m

Bus Av. Delay (s/pcu):
Inbound – 25.8sec
Outbound – 45.5sec

Cyclists Av. Delay (s/pcu):
Inbound – 25.3sec
Outbound - 65.3sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 34.4sec
Outbound – 35.3sec

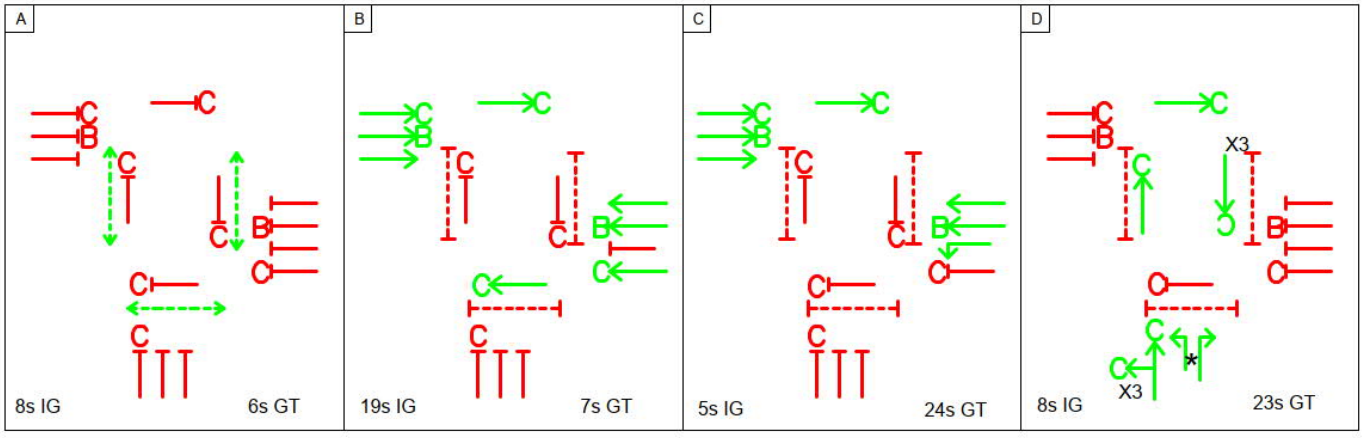
Network Layout Diagram (LinSig) - DS2028_PM



People Movement Assessment DS2028 PM

8.Kilmore Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,067	21%	1,721	28%
Bus	2,940	57%	2,940	48%
Walk	785	15%	785	13%
Cycle	400	8%	620	10%
Total	5,192	100%	6,066	100%

INDICATIVE METHOD OF CONTROL



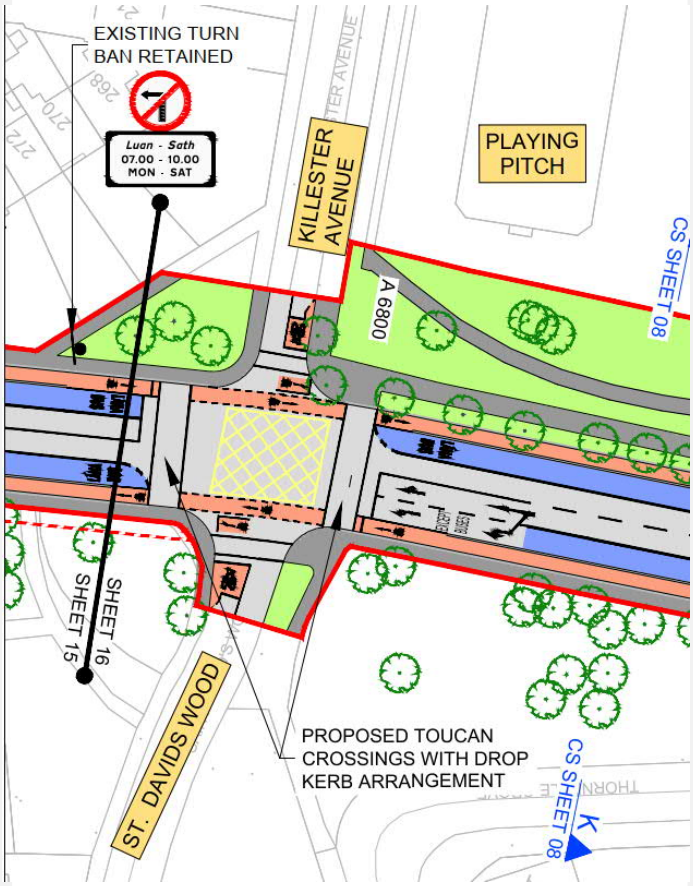
* denotes Flashing Amber
X3 denotes Advance 3 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Junction: Killester Avenue / R107 Malahide Road

EXISTING

FINAL DESIGN



Summary

The existing 4 arm signalised junction is proposed to be upgraded as per the BusConnects Preliminary Design Guidance Booklet to enhance pedestrian, cyclist and bus priority infrastructure.

The key design rationale was to introduce pedestrian crossing facilities on all arms of the junction, provide cycle infrastructure on all arms and to improve bus priority. The existing morning peak turn ban has been retained to mitigate against potential 'rat running' of traffic on local roads. New footpaths and landscaping in Maypark are also proposed to improve pedestrian footpaths

Pedestrian Infrastructure

CBC :

- Straight ahead pedestrian crossings have been adopted across both CBC arms in comparison with the existing layout to facilitate pedestrians; and
- A wrap-around pedestrian crossing stage has been proposed with 6sec green time and 15sec of intergreen to cater for pedestrian movements on a 120sec cycle time.

Side Roads:

- Direct crossings (less than 19m) are proposed on both side arms similar to the existing; and
- The corner radii have been minimized so the crossing is more compact and reduced crossing distances for pedestrians.

Cyclists Infrastructure

CBC:

- The existing ASL's have been removed and toucan crossings with drop kerb arrangements have been shown on the CBC arms to facilitate cyclists crossing at this location.
- An early start of 5 seconds is proposed for cyclists on Malahide Road to enable platooning cyclists to advance before general traffic and thus minimise conflict with left turning traffic on a flashing amber.

Side Roads:

- Entry and exit cycle lanes proposed on Killester Avenue to assist cyclist access into the junction; and
- An ASL (Advanced Stop Line) is proposed on the side roads to enable a more advanced position for cyclists.
- A 3 seconds early start is proposed to enable platooning cyclists to advance before general traffic and thus minimise conflict with left turning traffic on a flashing amber.

Bus Priority Infrastructure

CBC

This Junction is a combination of Junction Type 3 and Type 1 where the inbound bus lane is continuous up to the stop line and the outbound bus lane is shared with left-turning traffic for approx. 20m prior to the stop line. This junction type has been selected on the basis of:

- For Inbound arm, a review of the traffic flow data indicates below 111 vehicles turning left during the evening peak hour. A type 3 junction was considered here however for continuity and legibility with the AM peak turn ban a type 1 junction was deemed more suitable.
- For the outbound arm, a review of the traffic flow data indicates around 7 vehicles turning left during the evening peak hour. It was considered that this will have a minimal impact on the bus priority.

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

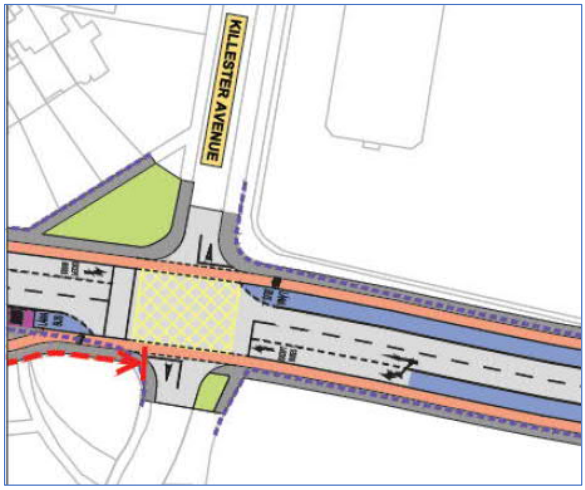
Design Evolution

The proposed junction design has evolved on the BusConnects project from initial Concept Design, Emerging Preferred Route, Public Consultation 2, Public Consultation 3 up to the Current Design. The junction design iterations have been undertaken to optimise pedestrian, cyclist and bus priority infrastructure on the scheme.

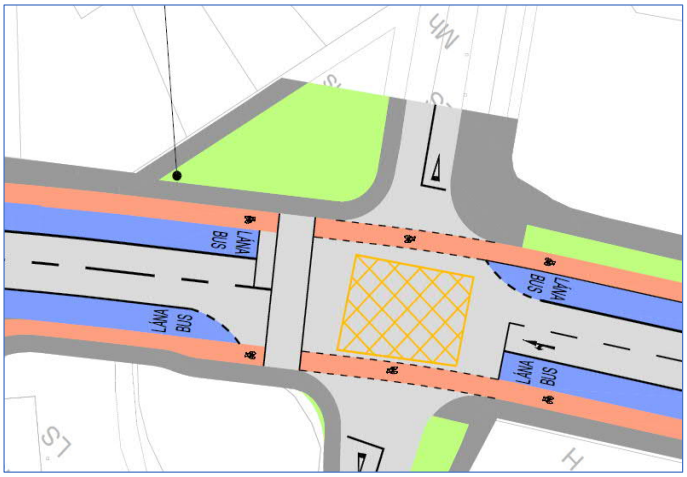
Existing

Concept Design Drawing

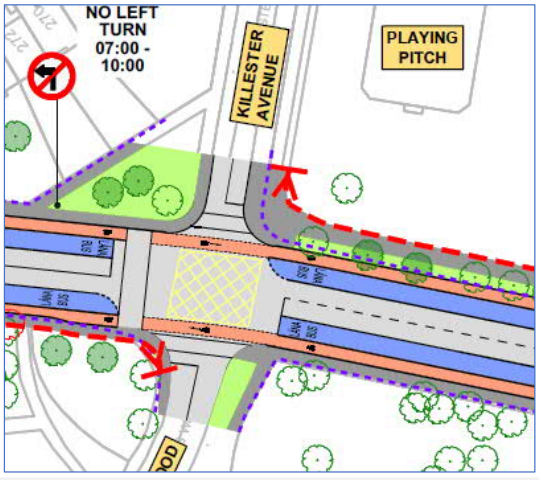
Emerging Preferred Route



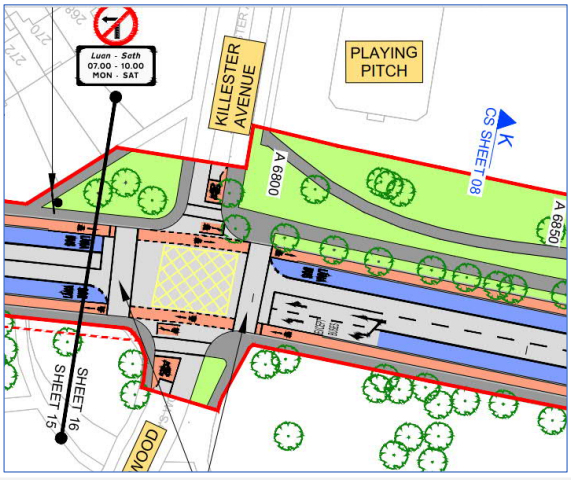
Public Consultation 2



Public Consultation 3



Final Preliminary Design



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Killester Ave– AM peak

2028 AM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = -1.2%,
Junction Delay = 21.6 PCUhr

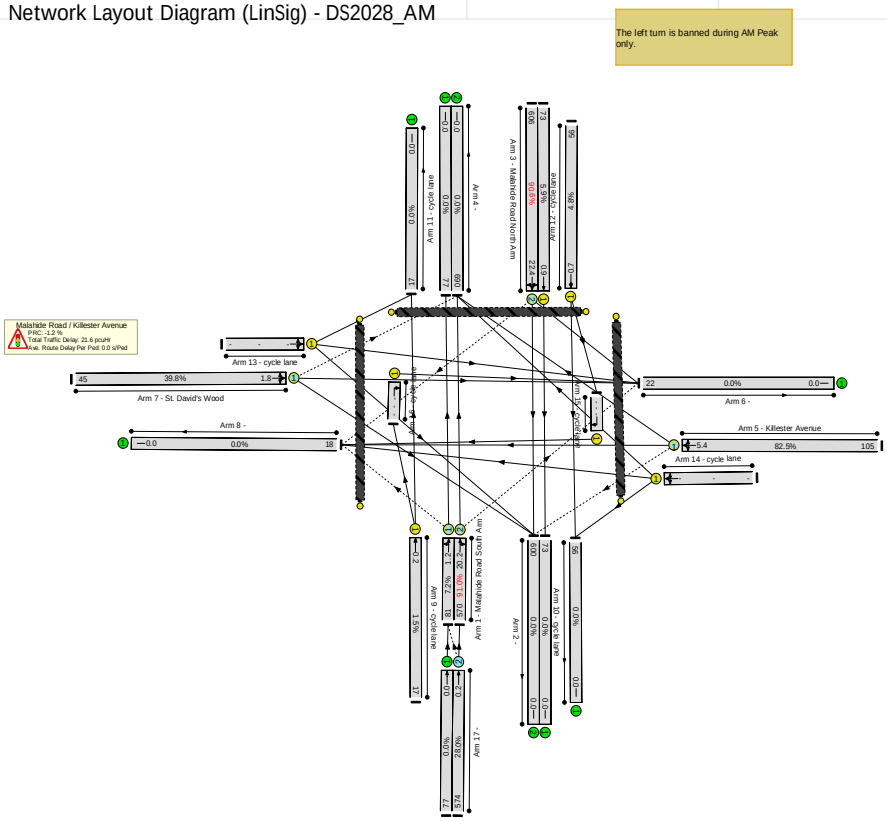
MMQ, CBC arms:
Inbound – 128.8m
Outbound – 116.15m

Bus Av. Delay (s/pcu):
Inbound – 9.6sec
Outbound – 11.8sec

Cyclists Av. Delay (s/pcu):
Inbound – 9.6sec
Outbound - 9.5sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 48.2sec
Outbound – 50.8sec

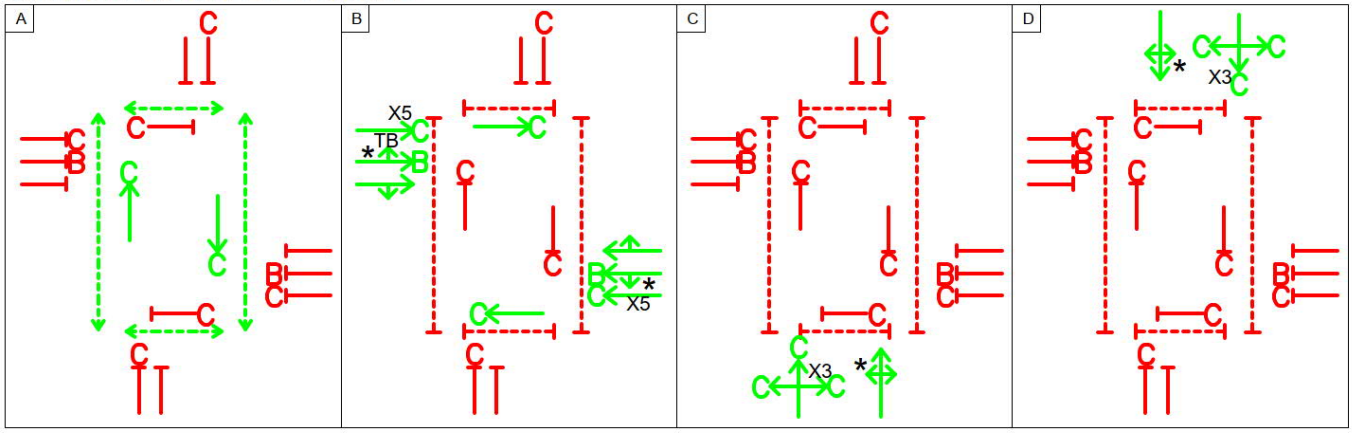
Network Layout Diagram (LinSig) - DS2028_AM



People Movement Assessment DS2028 AM

9.Killester Av. Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,376	26%	1,596	28%
Bus	3,000	57%	3,000	53%
Walk	438	8%	438	8%
Cycle	490	9%	590	10%
Total	5,304	100%	5,624	100%

INDICATIVE METHOD OF CONTROL



* denotes Flashing Amber
TB denotes Turn Ban during AM Peak Hour
X5 denotes Advance 3 seconds Start for Cyclists
X3 denotes Advance 3 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Killester Ave– PM peak

2028 PM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = -42.7%,
Junction Delay = 105.6 PCUhr

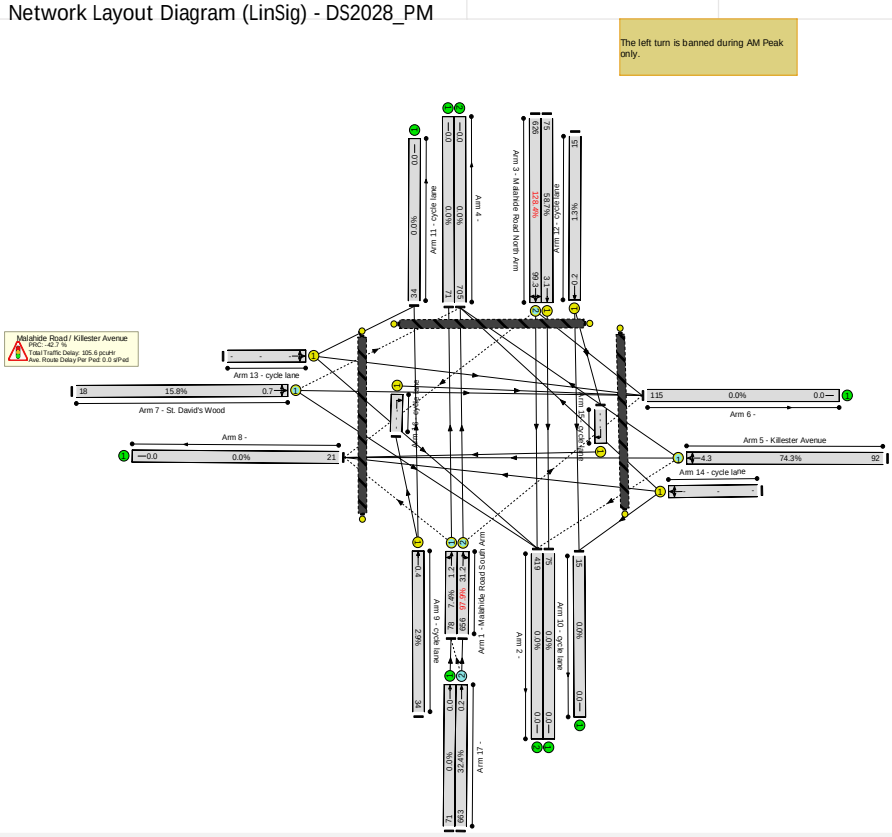
MMQ, CBC arms:
Inbound – 570.97m
Outbound – 179.4m

Bus Av. Delay (s/pcu):
Inbound – 87.7sec
Outbound – 13.6sec

Cyclists Av. Delay (s/pcu):
Inbound – 9.4sec
Outbound - 9.5sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 484.9sec
Outbound – 86.3sec

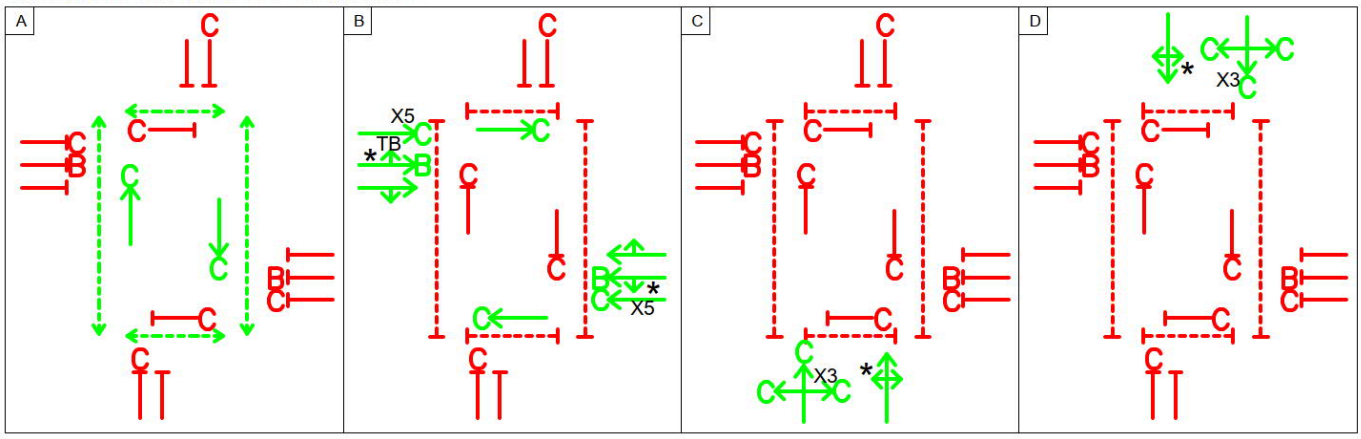
Network Layout Diagram (LinSig) - DS2028_PM



People Movement Assessment DS2028 PM

9.Killester Av. Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,354	27%	1,679	30%
Bus	2,940	58%	2,940	52%
Walk	407	8%	407	7%
Cycle	400	8%	580	10%
Total	5,100	100%	5,606	100%

INDICATIVE METHOD OF CONTROL



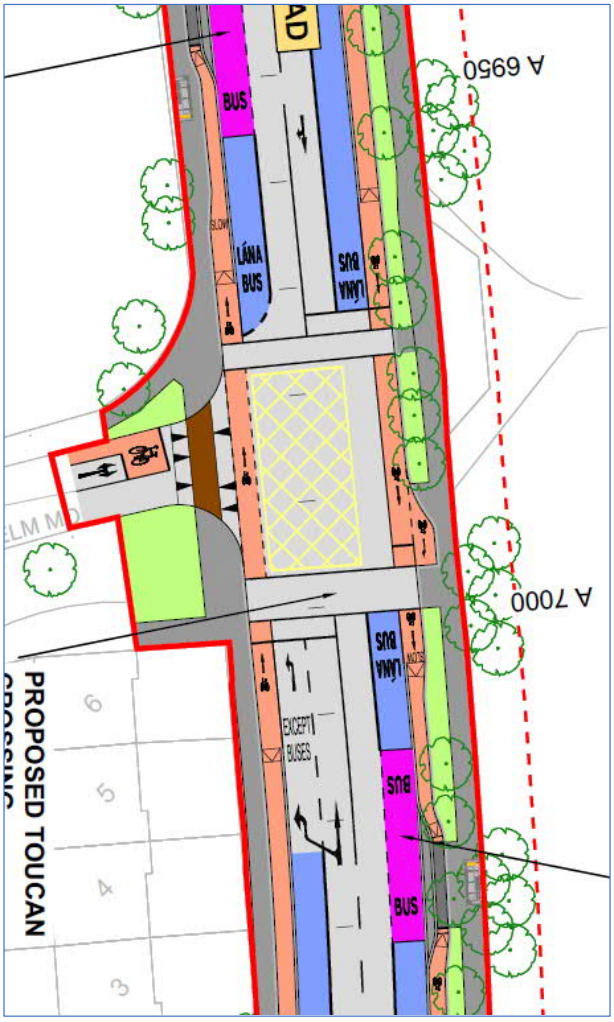
* denotes Flashing Amber
TB denotes Turn Ban during AM Peak Hour
X5 denotes Advance 3 seconds Start for Cyclists
X3 denotes Advance 3 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Junction: Elm Mount Road / R107 Malahide Road

EXISTING

FINAL DESIGN



Summary

The existing 3 arm signalised junction is proposed to be upgraded as per the BusConnects Preliminary Design Guidance Booklet to enhance pedestrian, cyclist and bus priority infrastructure.

The key design rationale is to introduce pedestrian crossing facilities on all arms of the junction, design a more compact junction with reduced corner radii to reduce crossing distances for sustainable modes, enhance cycle infrastructure and crossing facilities, whilst improving bus priority.

The design improves accessibility for walking and cycling travelling to Mayfield Park from Malahide Road and Elm Mount Road.

Pedestrian Infrastructure

CBC:

- Straight ahead pedestrian crossings have been adopted across both CBC arms in comparison with the existing layout to facilitate road users; and
- A wrap-around pedestrian crossing stage has been proposed with 6seconds of green time and 15sec of intergreen to cater for pedestrian movements.

Side Roads:

- Direct crossings are proposed across Elm Mount Rd to facilitate pedestrians crossing in a single stage; and
- The corner radii have been minimized so the crossing is more compact and reduced crossing distances for pedestrians.

Cyclists Infrastructure

CBC:

- Inbound cyclists are protected from motorised traffic on a segregated cycle track.;
- Right-turning cyclists from Malahide Road inbound to Elm Mount Road can utilise the proposed crossing toucan facility which ties into a jug turn which can accommodate stacking cyclists while permitting straight ahead cyclists to continue through.
- An outbound cycle track is proposed along Malahide Road.

Side Roads:

- An entry cycle lane is proposed on Elm mount Road to assist cyclist access to the junction; and
- An Advanced Stopping Line (ASL) is proposed on the side roads to ensure that cyclists could navigate through the junction more easily.
- An early start for cyclists is not considered necessary on Elm Mount Road due to the low volume of vehicles (estimated to be less than 4 PCU per cycle) along Elm Mount Road in conjunction with the existing low speed limit along Elm Mount Road (30km/h). The proposed ASL will also assist cyclists to advance before general traffic.

Bus Priority Infrastructure

Junction Type 1 proposed inbound and Junction Type 3 outbound where the bus lane is shared with left-turning traffic for approx. 20m prior to the stop line. The Junction Type 3 layout has been selected for the outbound on the basis of:

- A review of the traffic flow data indicates below 42 vehicles turning left during the peak hours. Based on a 100s cycle time, this will result in less than 2 left-turning vehicles per cycle. It was considered that this will have a minimal impact upon bus priority;
- The bus lane has been allocated approx. 59s to allow for both left turning traffic and buses to get through the junction per cycle;

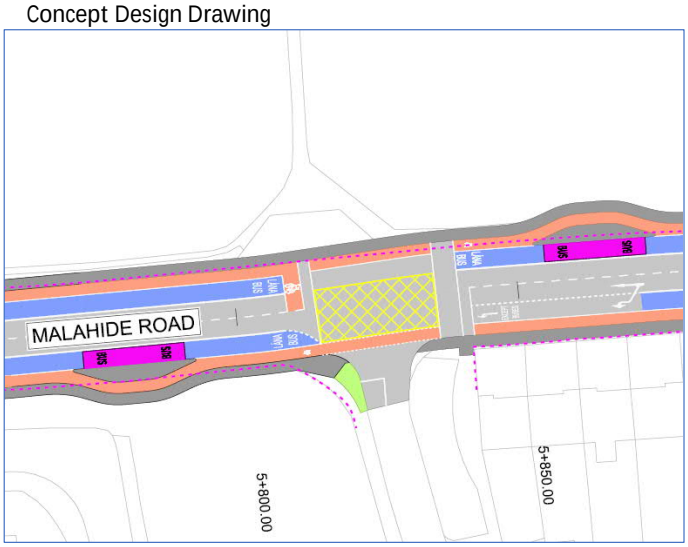
Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Design Evolution

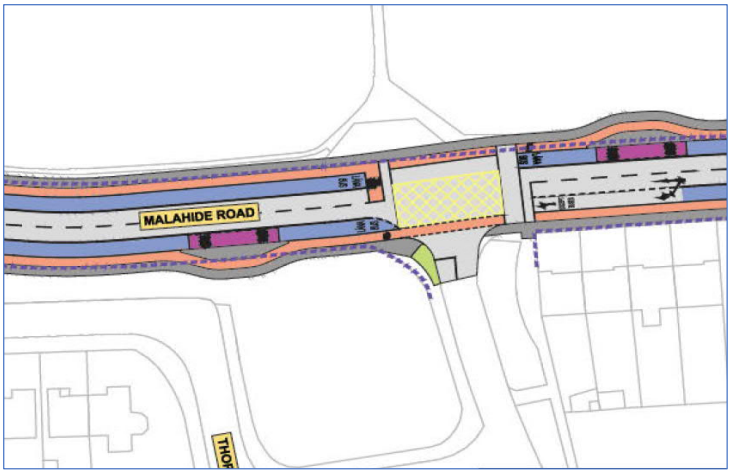
The proposed junction design has evolved on the BusConnects project from initial Concept Design, Emerging Preferred Route, Public Consultation 2, Public Consultation 3 up to the Current Design. The junction design iterations have been undertaken to optimise pedestrian, cyclist and bus priority infrastructure on the scheme.

Existing

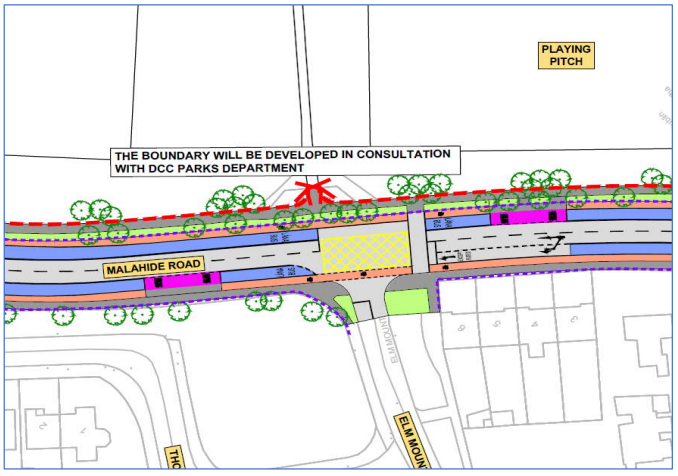
Concept Design Drawing



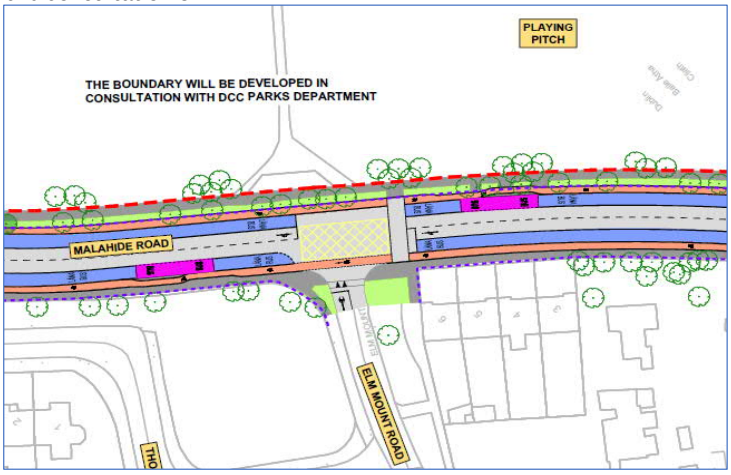
Emerging Preferred Route



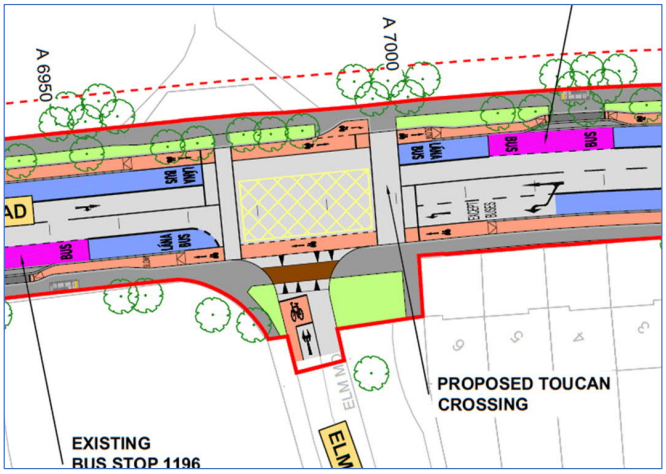
Public Consultation 2



Public Consultation 3



Final Preliminary Design



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Elm Mount Rd – AM peak

2028 AM Peak Hours
Fixed Time LinSig Results

Cycle Time = 100 secs
PRC = 15.4%,
Junction Delay = 11.7 PCUhr

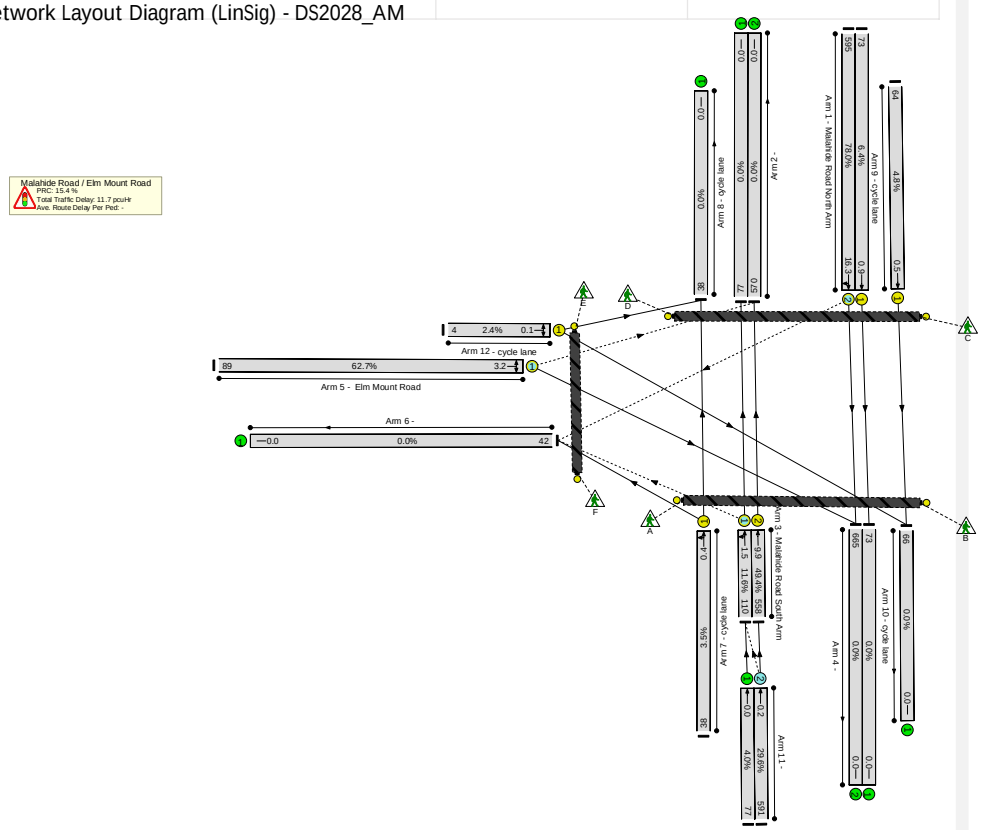
MMQ, CBC arms:
Inbound – 93.73m
Outbound – 56.93m

Bus Av. Delay (s/pcu):
Inbound – 10sec
Outbound – 13sec

Cyclists Av. Delay (s/pcu):
Inbound – 5.2sec
Outbound - 6.6sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 36.6sec
Outbound – 17sec

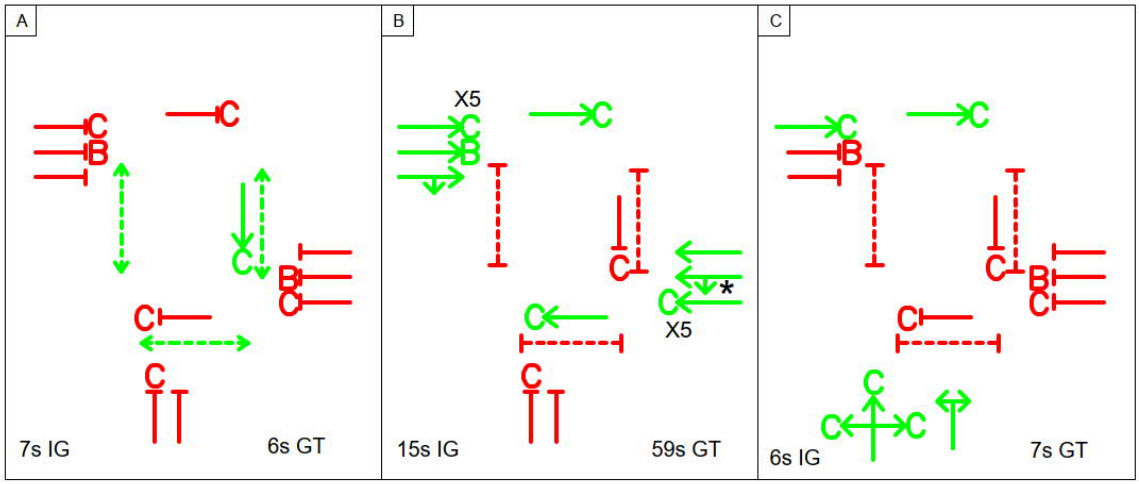
Network Layout Diagram (LinSig) - DS2028_AM



People Movement Assessment DS2028 AM

10.Elm Mount Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,375	27%	1,530	28%
Bus	3,000	58%	3,000	56%
Walk	300	6%	300	6%
Cycle	490	9%	540	10%
Total	5,165	100%	5,370	100%

INDICATIVE METHOD OF CONTROL



* denotes Flashing Amber
X5 denotes Advance 5 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Elm Mount Rd - PM peak

2028 PM Peak Hours
Fixed Time LinSig Results

Cycle Time = 100 secs
PRC = 12.4%,
Junction Delay = 11.3 PCUhr

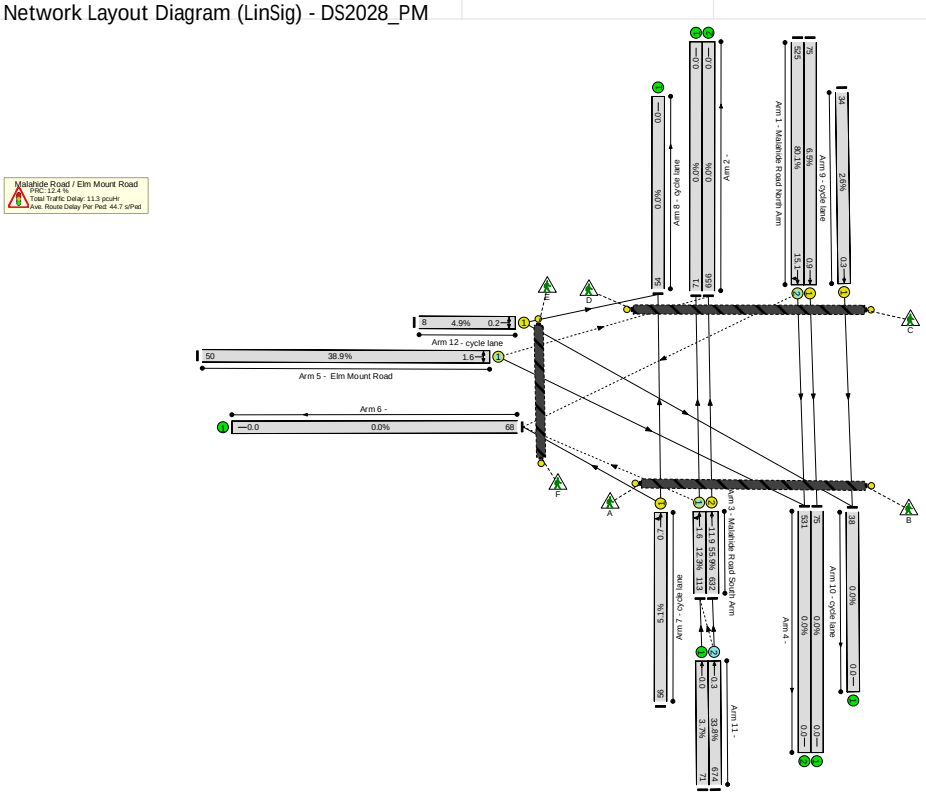
MMQ, CBC arms:
Inbound – 86.83m
Outbound – 68.43m

Bus Av. Delay (s/pcu):
Inbound – 10sec
Outbound – 13.1sec

Cyclists Av. Delay (s/pcu):
Inbound – 5.2sec
Outbound - 10.0sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 41.1sec
Outbound – 18.2sec

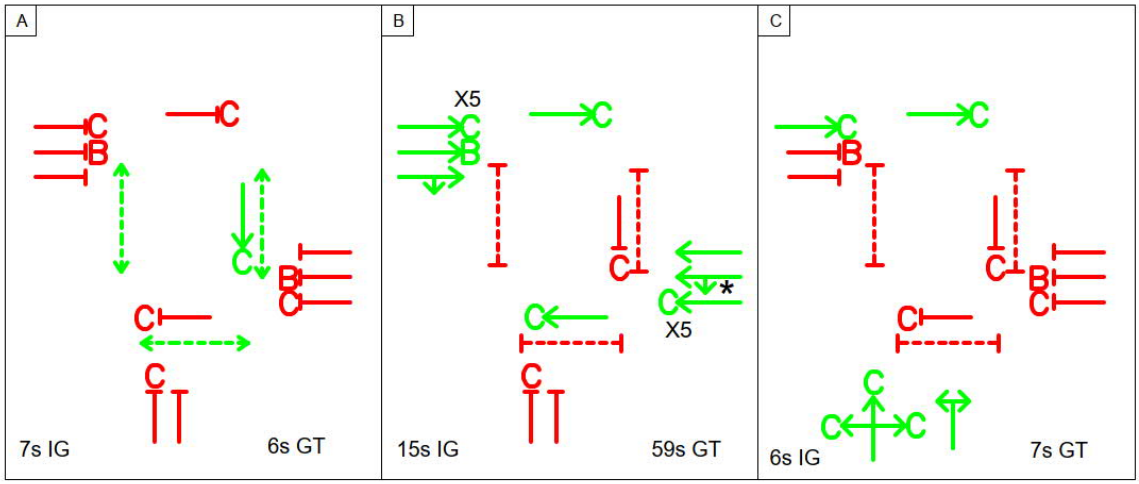
Network Layout Diagram (LinSig) - DS2028_PM



People Movement Assessment DS2028 PM

10.Elm Mount Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,364	27%	1,499	28%
Bus	2,940	59%	2,940	56%
Walk	300	6%	300	6%
Cycle	400	8%	550	10%
Total	5,004	100%	5,289	100%

INDICATIVE METHOD OF CONTROL



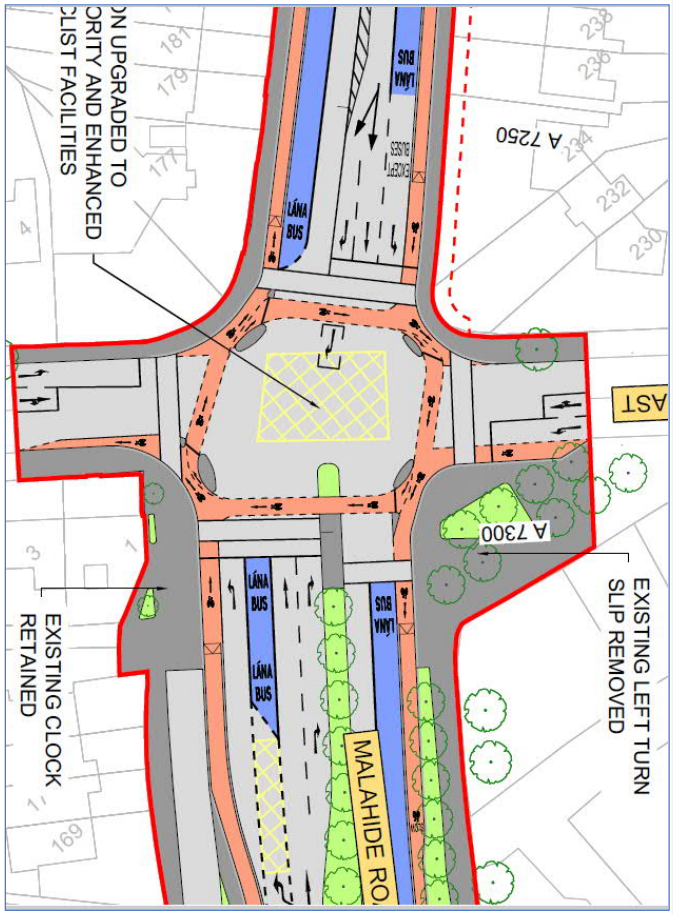
* denotes Flashing Amber
X5 denotes Advance 5 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Junction: Collins Avenue / R107 Malahide Road

EXISTING

FINAL DESIGN



Summary

The key design rationale was to introduce pedestrian crossing facilities on all arms of the junction with a new crossing on the northern arm and eastern arm, provide a more compact junction which reduced crossing distances and removal of left turn slip lane on eastern arm, provide protected cycle infrastructure and crossing facilities, whilst improving bus priority. The overall junction turning area has been increased from the existing arrangement to allow for opposing right turn lanes from the side arms and a new right turn lane on the northern arm to allow for separately signalled right turn movements. A right turn box has been provided in the junction marginally increase storage requirements and improve legibility for right turning vehicles, particularly in the morning peak. The provision of dedicated left turn lanes on the southern arm allows for a 'hold the left' scenario which could be configured to enhance pedestrian/cycle movements on the side arms outside of peak hours.

Pedestrian Infrastructure

CBC :

- A new direct pedestrian crossing is proposed on Malahide Road northern arm. The new northern crossing will assist in enhancing connectivity across Collins junction.
- On the southern arm, a staggered crossing is proposed. A single crossing was considered across Malahide Road southern arm but was discounted due to the crossing distance being in excess of 19m. A 4m wide refuge island with a straight across arrangement for pedestrians was also considered, but discounted due to potential land take in the southern arm and the associated alignment issues through the junction. The staggered arrangement will also facilitate pedestrian storage on the island.

Side Roads:

- A new pedestrian crossing is proposed on Collins Avenue East arm of the junction. The existing left turn slip from Collins Avenue East to Malahide Road is proposed to be removed to facilitate a direct single stage crossing for pedestrians.
- Direct crossings are proposed on both side arms of the junction;
- The corner radii have been minimized so the crossing is more compact and reduced crossing distances for pedestrians.

Cyclists Infrastructure

CBC:

- Protected junction design is proposed to enhance cyclist protection;
- An early start of 5s proposed for cyclists on Malahide Road;
- Cyclists then running with left turning general traffic on a Flashing Amber.
- A dedicated right-turn cycle lane facility / advanced stop line proposed to cater for cyclists crossing two arms of the junction;

Side Roads:

- An early start is proposed for cyclists of 3seconds on both side roads.
- Entry cycle lane proposed on Collins Avenue East to assist cyclist access into the junction.
- A cycle entry lane was considered on Collins Avenue, but due to carriageway constraints, it was not feasible at this location.

Bus Priority Infrastructure

Junction Type 3 proposed inbound where the bus lane is shared with left-turning traffic for approx. 20m prior to the stop line and Type 2 outbound with the bus lane extending to the Stop line. This layout has been selected inbound on the basis of:

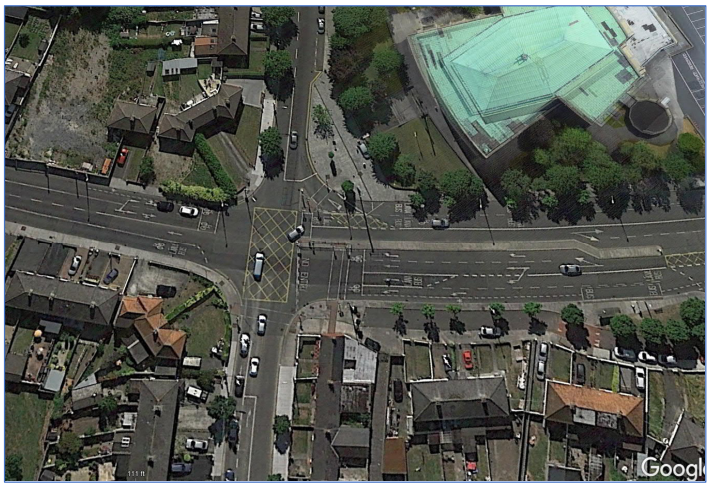
- Inbound: a review of the traffic flow data indicates below 44 vehicles turning left during the morning and evening peak hours respectively. Based on a 120s cycle time, this will result in less than 2 left-turning vehicles per cycle. It was considered that this will have a minimal impact upon bus priority;
- The bus lane has been allocated approx. 40s to allow for both left turning traffic and buses to get through the junction per cycle;

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

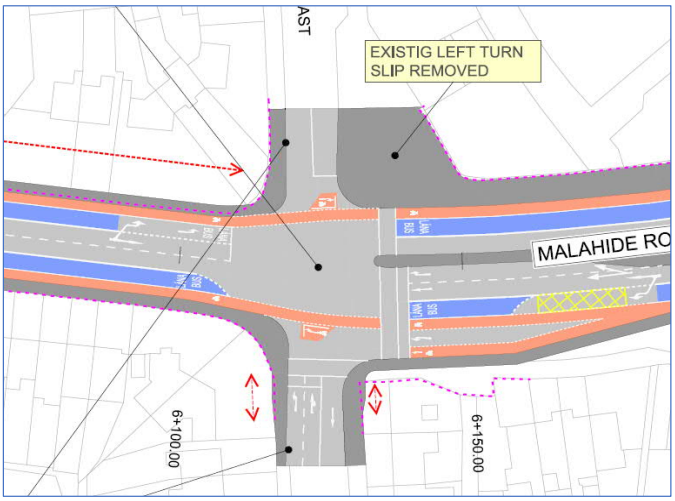
Design Evolution

The proposed junction design has evolved on the BusConnects project from initial Concept Design, Emerging Preferred Route, Public Consultation 2, Public Consultation 3 up to the Current Design. The junction design iterations have been undertaken to optimise pedestrian, cyclist and bus priority infrastructure on the scheme.

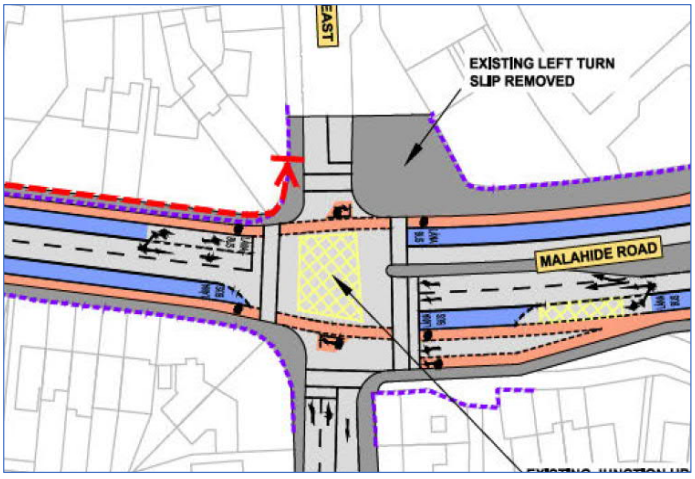
Existing



Concept Design Drawing

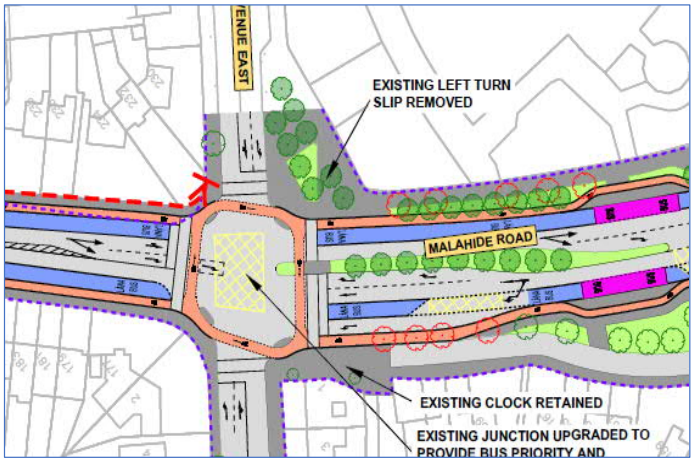


Emerging Preferred Route

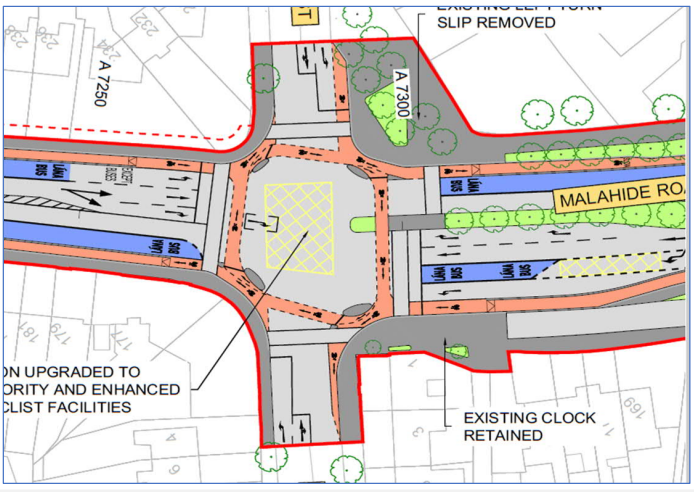


Public Consultation 2

Public Consultation 3



Final Preliminary Design



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Collins Ave – AM peak

2028 AM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = -11.9%,
Junction Delay = 47.9 PCUhr

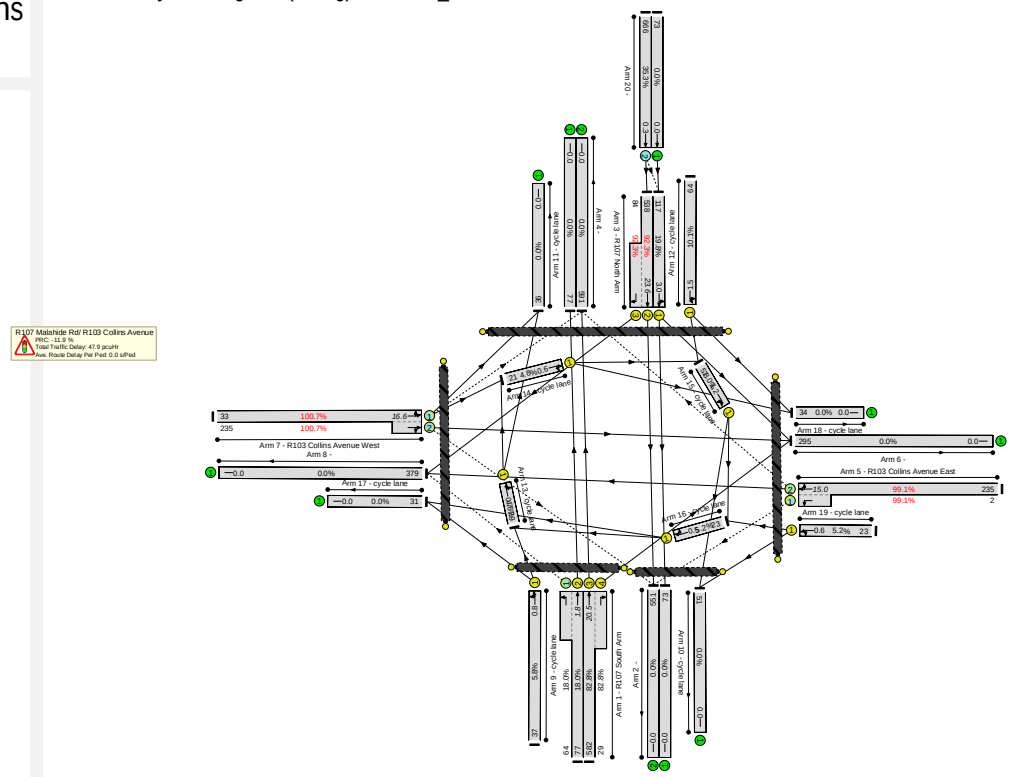
MMQ, CBC arms:
Inbound – 135.7m
Outbound – 117.87m

Bus Av. Delay (s/pcu):
Inbound – 34.4sec
Outbound – 30.8sec

Cyclists Av. Delay (s/pcu):
Inbound – 29.4sec
Outbound - 28.9sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 70.4sec
Outbound – 49.9sec

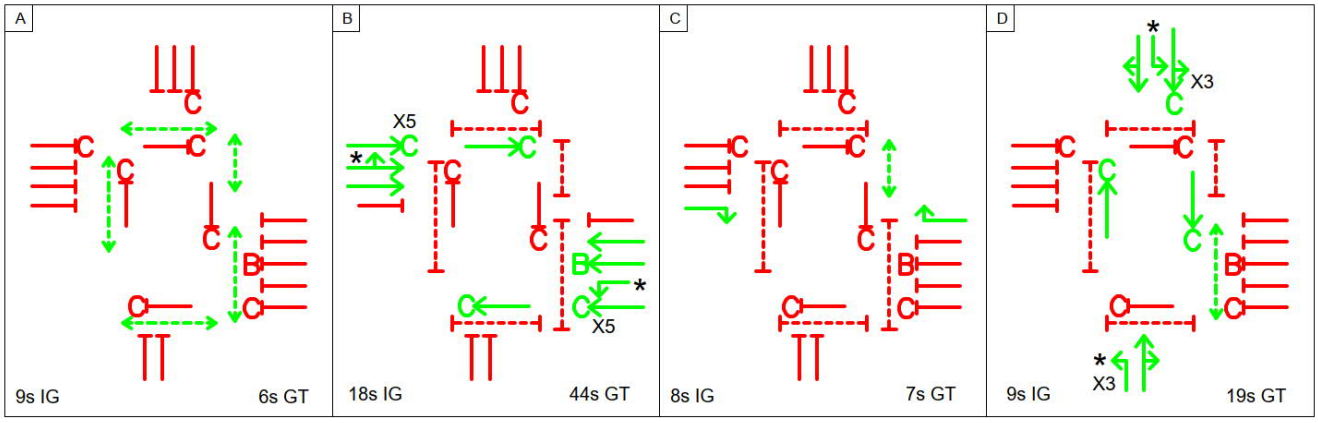
Network Layout Diagram (LinSig) - DS2028_AM



People Movement Assessment DS2028 AM

11.Collins Av. Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,344	25%	2,182	33%
Bus	3,000	57%	3,000	45%
Walk	748	14%	748	11%
Cycle	200	4%	760	11%
Total	5,292	100%	6,689	100%

INDICATIVE METHOD OF CONTROL



* denotes Flashing Amber
X5 denotes Advance 5 seconds Start for Cyclists
X3 denotes Advance 3 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Collins Ave- PM peak

2028 PM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = 0.8%,
Junction Delay = 30.0 PCUhr

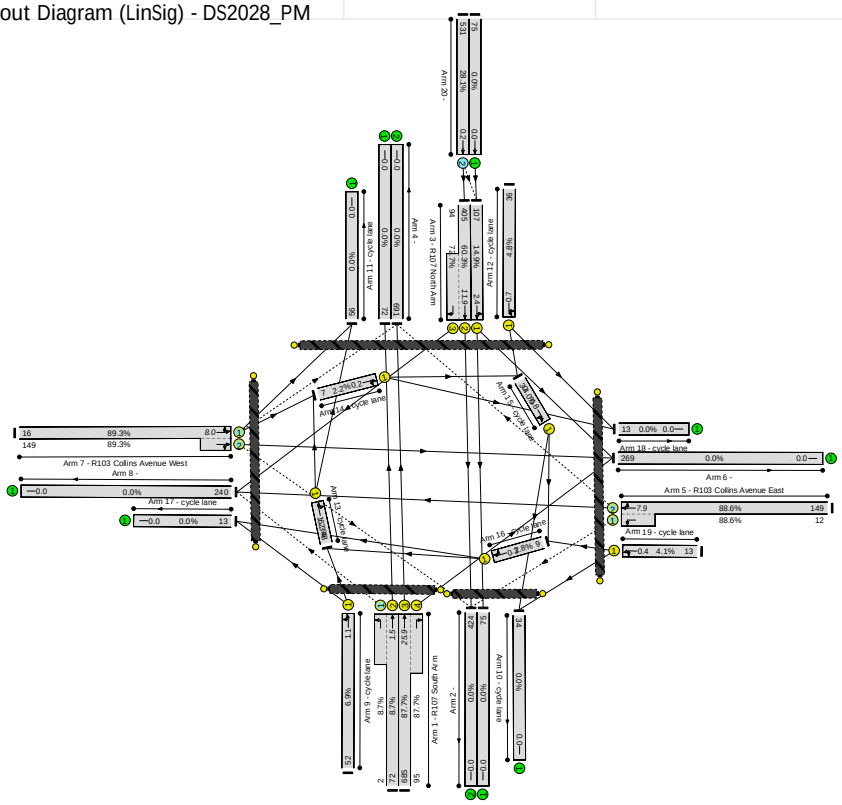
MMQ, CBC arms:
Inbound – 68.43m
Outbound – 148.93m

Bus Av. Delay (s/pcu):
Inbound – 27.8sec
Outbound – 23.6sec

Cyclists Av. Delay (s/pcu):
Inbound – 23.4sec
Outbound - 23.6sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 40sec
Outbound – 49.6sec

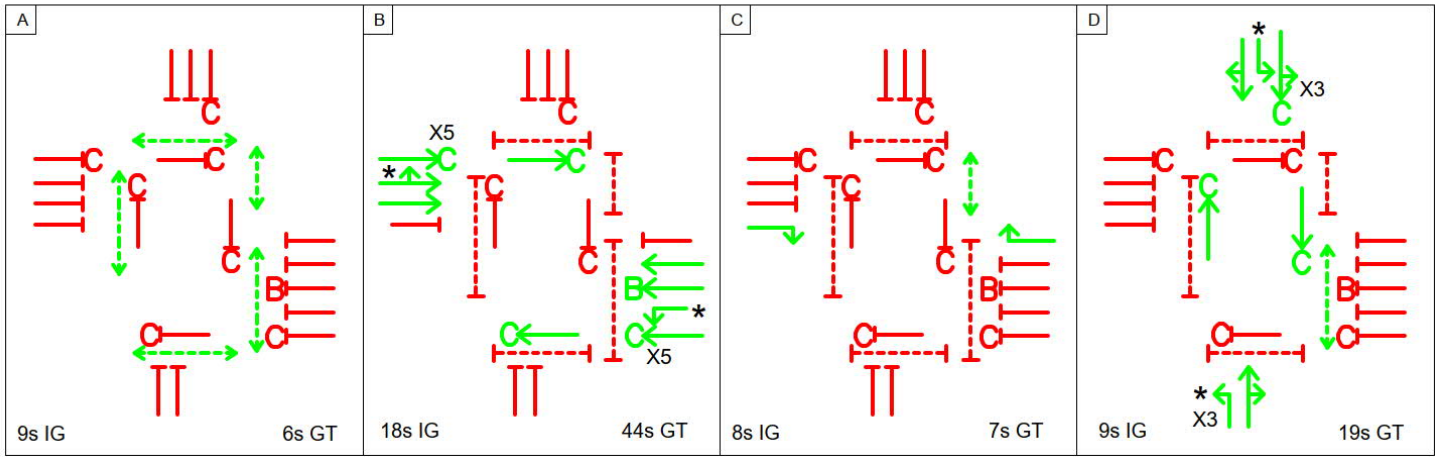
Network Layout Diagram (LinSig) - DS2028_PM



People Movement Assessment DS2028 PM

11.Collins Av. Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,308	25%	1,949	32%
Bus	2,940	57%	2,940	48%
Walk	590	11%	590	10%
Cycle	320	6%	615	10%
Total	5,158	100%	6,094	100%

INDICATIVE METHOD OF CONTROL



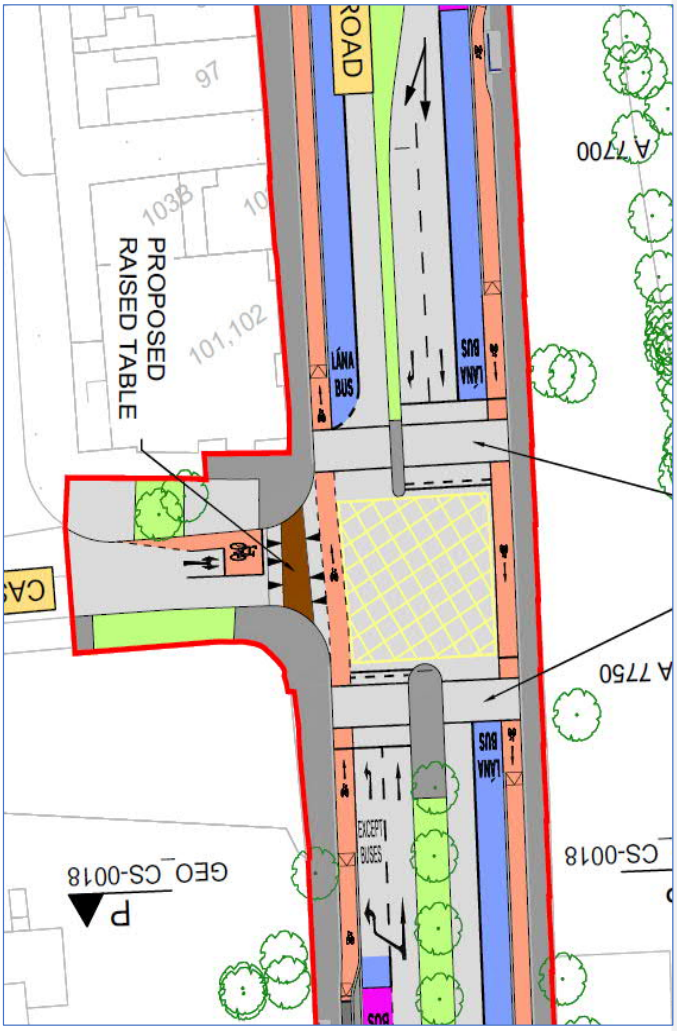
* denotes Flashing Amber
X5 denotes Advance 5 seconds Start for Cyclists
X3 denotes Advance 3 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Junction: Casino Park / R107 Malahide Road

EXISTING

FINAL DESIGN



Summary

The existing 3 arm signalised junction is proposed to be upgraded as per the BusConnects Preliminary Design Guidance Booklet to enhance pedestrian, cyclist and bus priority infrastructure.

The key design rationale was to introduce pedestrian crossing facilities on all arms of the junction including new crossings on the northern and western arms, provide cycle infrastructure and crossing facilities, whilst improving bus priority.

Pedestrian Infrastructure

CBC:
- Straight pedestrian crossings are proposed across both CBC arms in comparison with the existing layout to facilitate pedestrians; and
- A wrap-around pedestrian crossing stage has been proposed with 6sec green time and 19 sec of intergreen to cater for pedestrian movements.
- The proposal will significantly enhance pedestrian crossing accessibility into Casino Park.

Side Roads:
- A new raised table, direct crossing is proposed across Casino Park to facilitate pedestrians;
- The corner radii have been minimized so the crossing is more compact and reduced crossing distances.

Cyclists Infrastructure

CBC:
- A proposed cycle track inbound will ensure cyclists are protected from motorised traffic on a segregated cycle lane while crossing trough the junction; and
- Right-turning cyclists from Malahide Road would utilise the proposed toucan crossing facilities with drop kerb arrangements.
- Outbound cyclists will be able to utilise a new cycle track which continues through the junction on road to permit left turning cyclists into Casino Park.

Side Roads:
- Entry cycle lane proposed on Casino Park to assist cyclist access into the junction; and
- An Advanced Stopping Line (ASL) is proposed on the side road to ensure cyclists could easier navigate through the junction.
- An early start for cyclists is not considered necessary on Casino Park Road due to the low volume of vehicles (estimated to be less than 5 PCU per cycle) along Casino Park in conjunction with the existing low speed limit along Casino Park. The proposed ASL will also assist cyclists to advance before general traffic.

Bus Priority Infrastructure

Junction Type 1 proposed inbound and Junction Type 3 outbound where the bus lane is shared with left-turning traffic for approx. 20m prior to the stop line. This layout has been selected outbound on the basis of:
- A review of the traffic flow data indicates below 68 vehicles turning left during the peak hours. Based on a 110s cycle time, this will result in less than 2 left-turning vehicles per cycle. It was considered that this will have a minimal impact upon bus priority;
- The bus lane has been allocated approx. 48s to allow for both left turning traffic and buses to get through the junction per cycle;

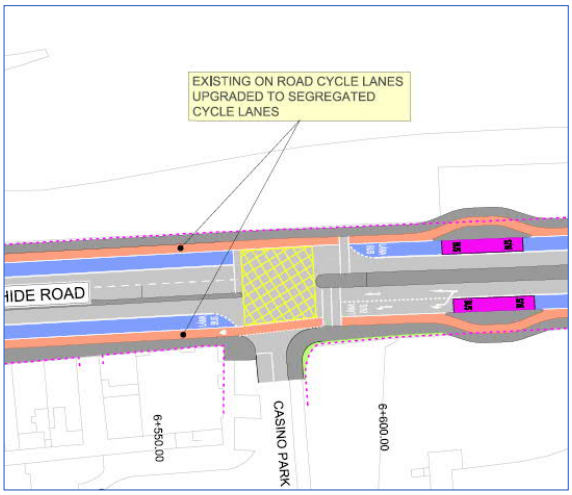
Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Design Evolution

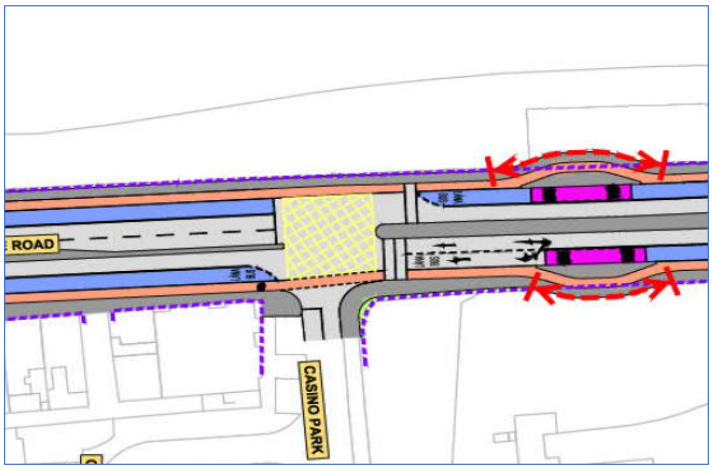
The proposed junction design has evolved on the BusConnects project from initial Concept Design, Emerging Preferred Route, Public Consultation 2, Public Consultation 3 up to the Current Design. The junction design iterations have been undertaken to optimise pedestrian, cyclist and bus priority infrastructure on the scheme.

Existing

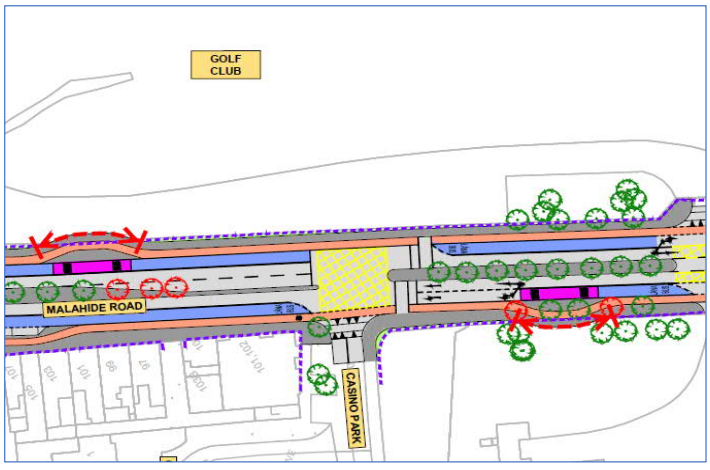
Concept Design Drawing



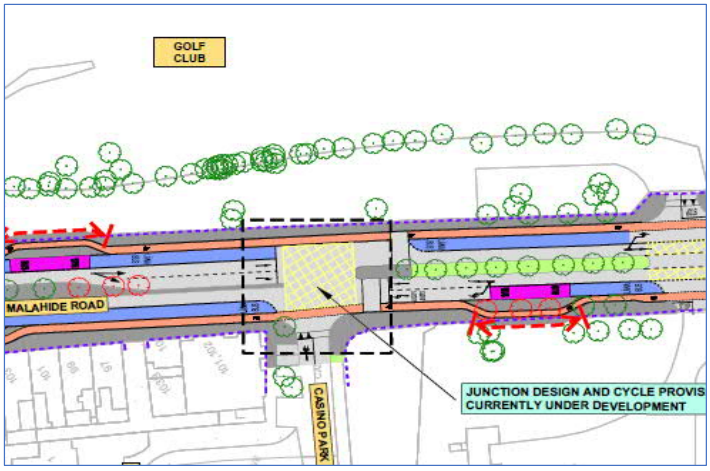
Emerging Preferred Route



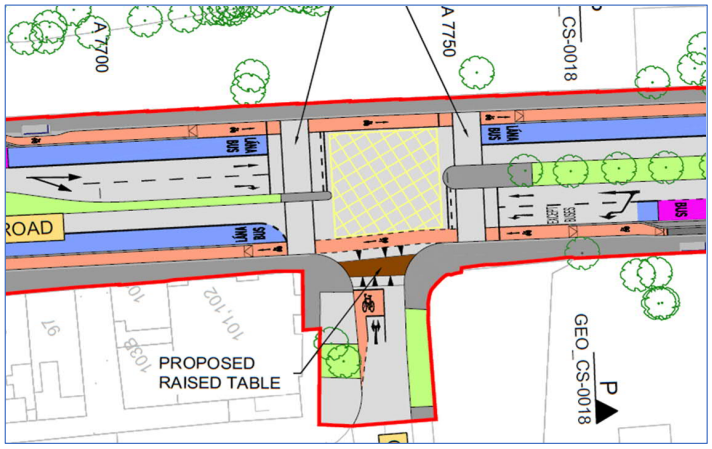
Public Consultation 2



Public Consultation 3



Final Preliminary Design



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Casino Park – AM peak

2028 AM Peak Hours
Fixed Time LinSig Results

Cycle Time = 110 secs
PRC = 49.3%,
Junction Delay = 11.2 PCUhr

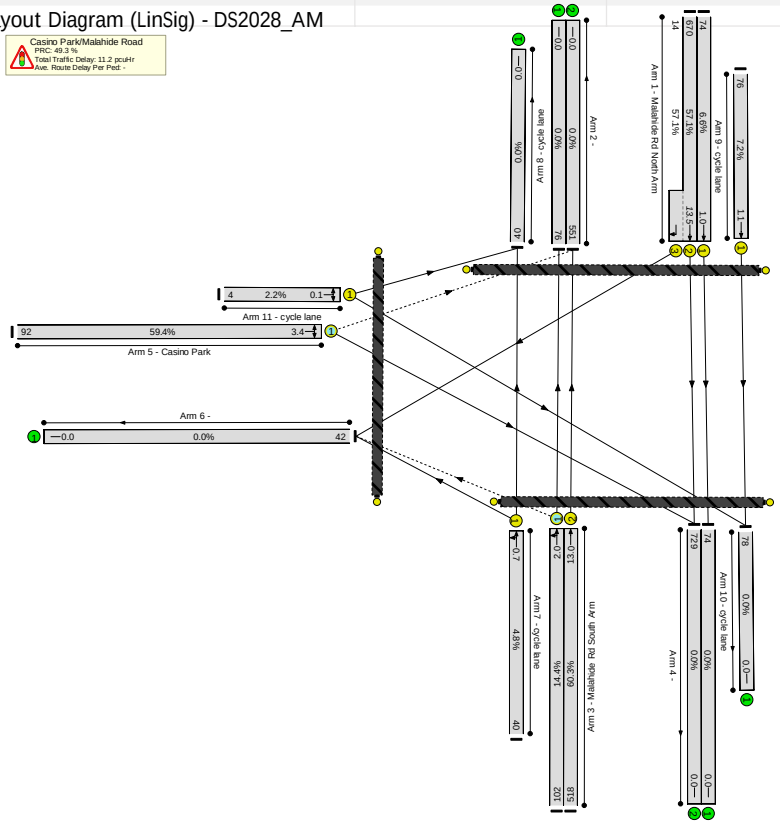
MMQ, CBC arms:
Inbound – 77.63m
Outbound – 74.75m

Bus Av. Delay (s/pcu):
Inbound – 11.7sec
Outbound – 22.8sec

Cyclists Av. Delay (s/pcu):
Inbound – 11.9sec
Outbound - 18.5sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 18.5sec
Outbound – 30.1sec

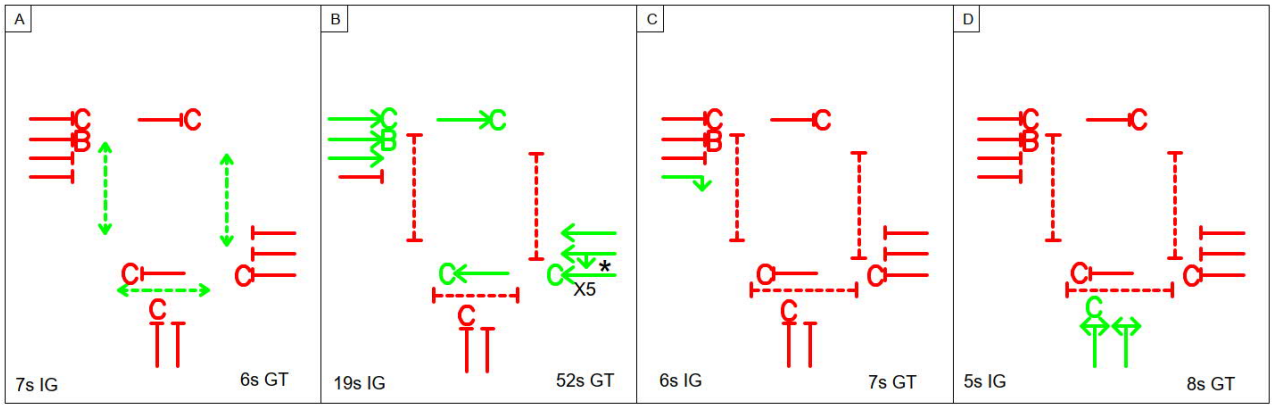
Network Layout Diagram (LinSig) - DS2028_AM



People Movement Assessment DS2028 AM

12.Casino Park Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,426	25%	1,584	27%
Bus	3,000	53%	3,000	51%
Walk	727	13%	727	12%
Cycle	560	10%	600	10%
Total	5,713	100%	5,911	100%

INDICATIVE METHOD OF CONTROL



* denotes Flashing Amber
X5 denotes Advance 5 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Casino Park- PM peak

2028 PM Peak Hours
Fixed Time LinSig Results

Cycle Time = 110 secs
PRC = 7.7%,
Junction Delay = 13.4 PCUhr

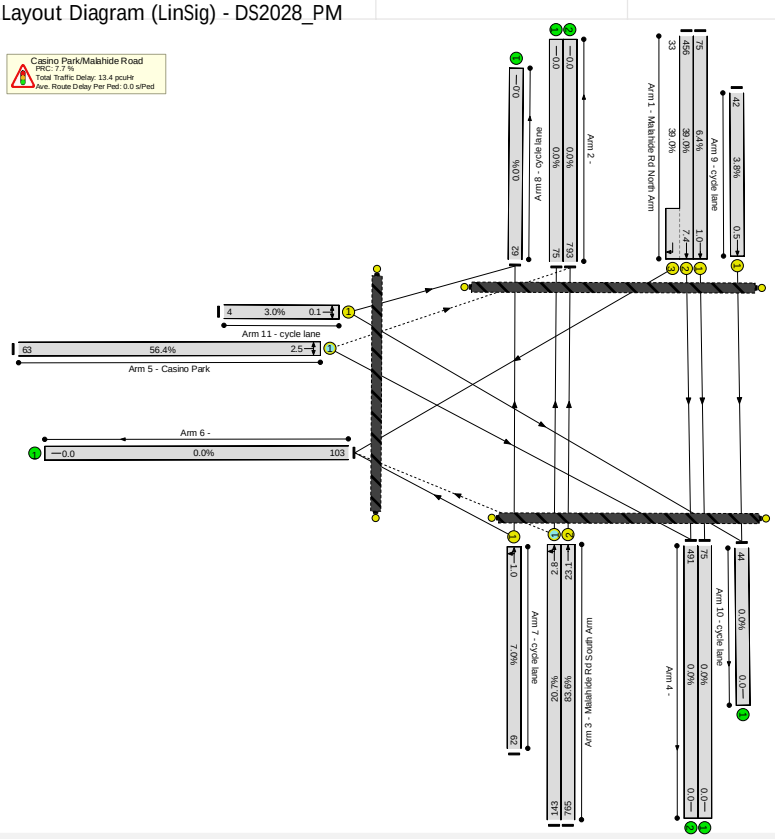
MMQ, CBC arms:
Inbound – 42.55m
Outbound – 132.83m

Bus Av. Delay (s/pcu):
Inbound – 10.4sec
Outbound – 21.9sec

Cyclists Av. Delay (s/pcu):
Inbound – 10.3sec
Outbound - 16.9sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 15.7sec
Outbound – 38.5sec

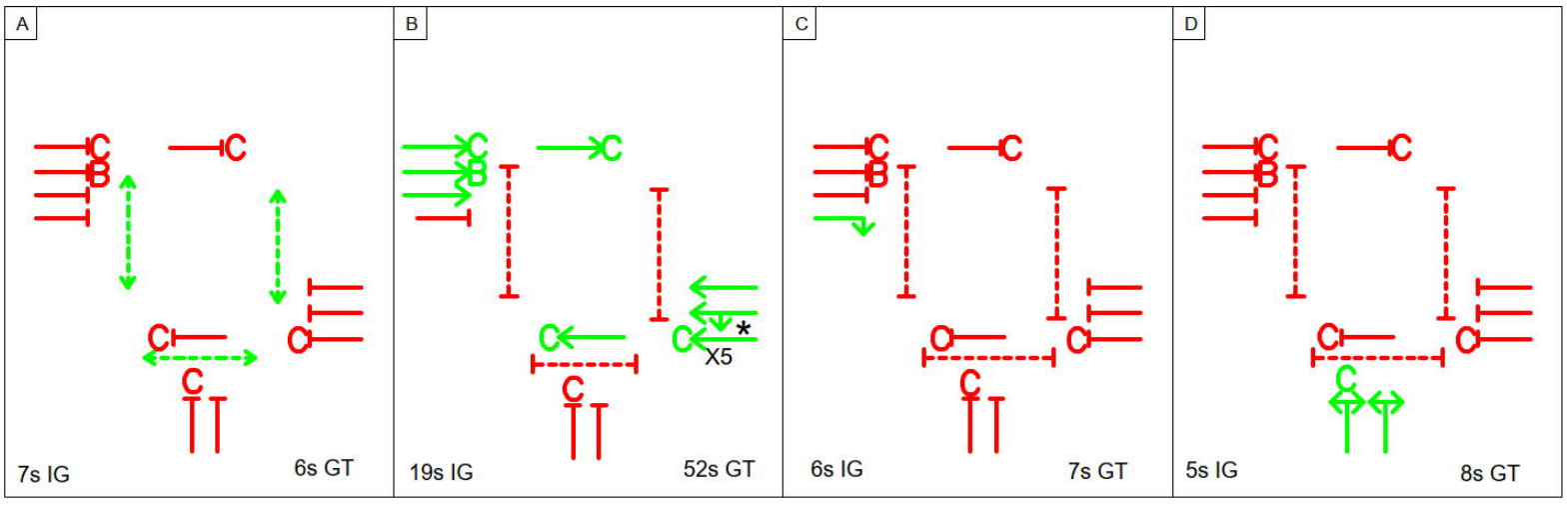
Network Layout Diagram (LinSig) - DS2028_PM



People Movement Assessment DS2028 PM

12.Casino Park Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,465	27%	1,662	29%
Bus	3,000	55%	3,000	52%
Walk	497	9%	497	9%
Cycle	500	9%	590	10%
Total	5,462	100%	5,749	100%

INDICATIVE METHOD OF CONTROL



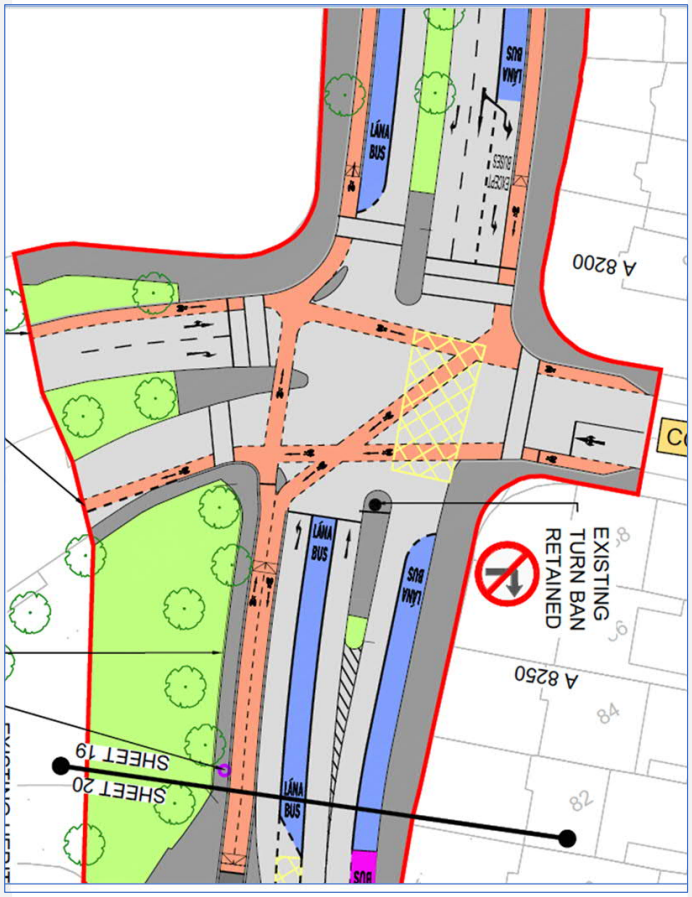
* denotes Flashing Amber

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Junction: Griffith Avenue / R107 Malahide Road

EXISTING

FINAL DESIGN



Summary

The existing 4 arm signalised junction is proposed to be upgraded as per the BusConnects Preliminary Design Guidance Booklet to enhance pedestrian, cyclist and bus priority infrastructure.
The key design rationale was to introduce pedestrian crossing facilities on all arms of the junction where practical, provide more compact crossings, provide protected cycle infrastructure and crossing facilities, whilst improving bus priority.
The proximity of this junction to nearby schools identified the need for high quality pedestrian and cycle infrastructure to promote sustainable modes in particular for more vulnerable users.

Pedestrian Infrastructure

CBC :

- A staggered pedestrian crossing is proposed on the northern arm of the junction across Malahide Road, akin to the existing arrangements. A single crossing was considered on the northern arm, but was discounted due to the crossing distance being in excess of 19m. A straight two staged crossing with a 4m central refuge island was also considered at this location but this option was difficult to achieve due to the alignment and existing road boundary extents, and therefore was discounted.
- A pedestrian crossing is not proposed on the southern arm (as per existing scenario) of the junction for the following reasons: 1) No immediate desire line identified. 2) the proposed design seeks to segregate interaction with the two-way cycle track. 3) the crossing distance would be in excess of 19m which would compromise overall people movement capacity within the junction due to lengthy intergreen periods.

Side Roads:

- Direct crossing (less than 19m) is proposed on the eastern arm similar to the existing. The corner radii have been minimized so the crossing is more compact and reduced crossing distances for pedestrians.
- On the Griffith Avenue arm, the existing refuge island is proposed to be retained, a direct crossing has not been implemented as this would result in a crossing distance greater than the desired 19m maximum. A straight crossing with a 4m central island was considered, but this would require the crossing to be set back further from the junction to accommodate a 4m island, thus would not cater for the pedestrian desire line. Similarly the proposed arrangement allows for pedestrian storage on the island.

Cyclists Infrastructure

CBC:

- The existing on road cycle lanes have been replaced with an off-road cycle track on both inbound and outbound directions along Malahide Road. The protected layout is proposed from Griffith Avenue to Malahide Road outbound. An early start is proposed for outbound cyclists to enable platooning cyclists to advance before general traffic and thus minimise conflict with left turning traffic on a flashing amber.
- Inbound cyclists are proposed to cross the junction in a dedicated cyclist crossing stage, connecting onto a proposed two way cycle track.

Side Roads:

- Entry and exit cycle lanes proposed on the side roads to assist cyclist access into the junction.

Bus Priority Infrastructure

Junction Type 3 is proposed inbound where the bus lane is shared with left-turning traffic for approx. 20m prior to the stop line and Junction Type 2 outbound with the bus lane extending up to the stop line.
Junction Type 2 inbound is proposed on the basis of:

- A review of the traffic flow data indicates below 77 vehicles turning left during the peak hours. Based on a 120s cycle time, this will result in two to three left-turning vehicle per cycle. It was considered that this will have a minimal impact upon bus priority;
- The LinSig capacity results indicated significantly reduced performance during the peak hours with a Type 1 design. Similar results were observed in overall people movement.

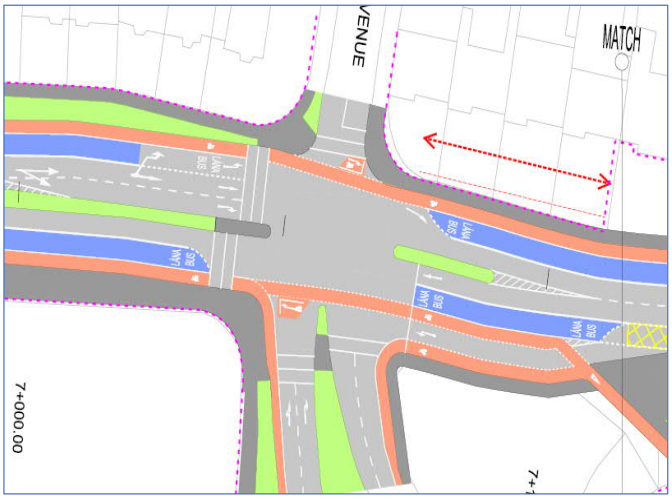
Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Design Evolution

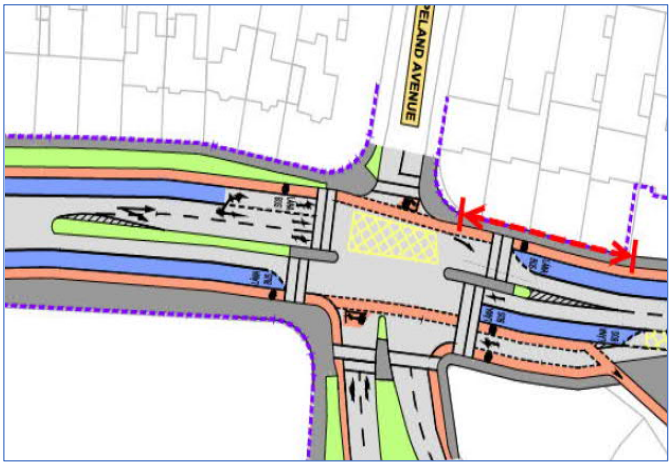
The proposed junction design has evolved on the BusConnects project from initial Concept Design, Emerging Preferred Route, Public Consultation 2, Public Consultation 3 up to the Current Design. The junction design iterations have been undertaken to optimise pedestrian, cyclist and bus priority infrastructure on the scheme.

Existing

Concept Design Drawing

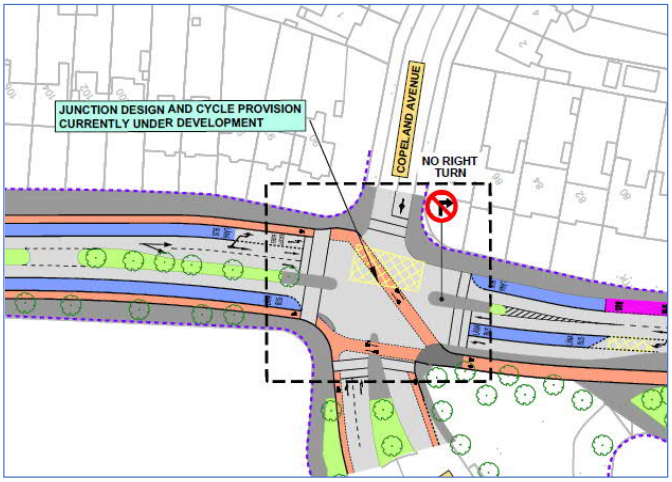


Emerging Preferred Route

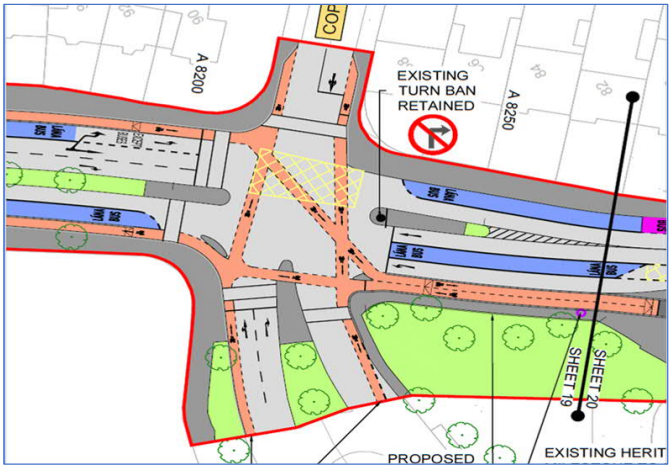


Public Consultation 2

Public Consultation 3



Final Preliminary Design



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Griffith Ave– AM peak

2028 AM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = -10.7%,
Junction Delay = 49.3 PCUhr

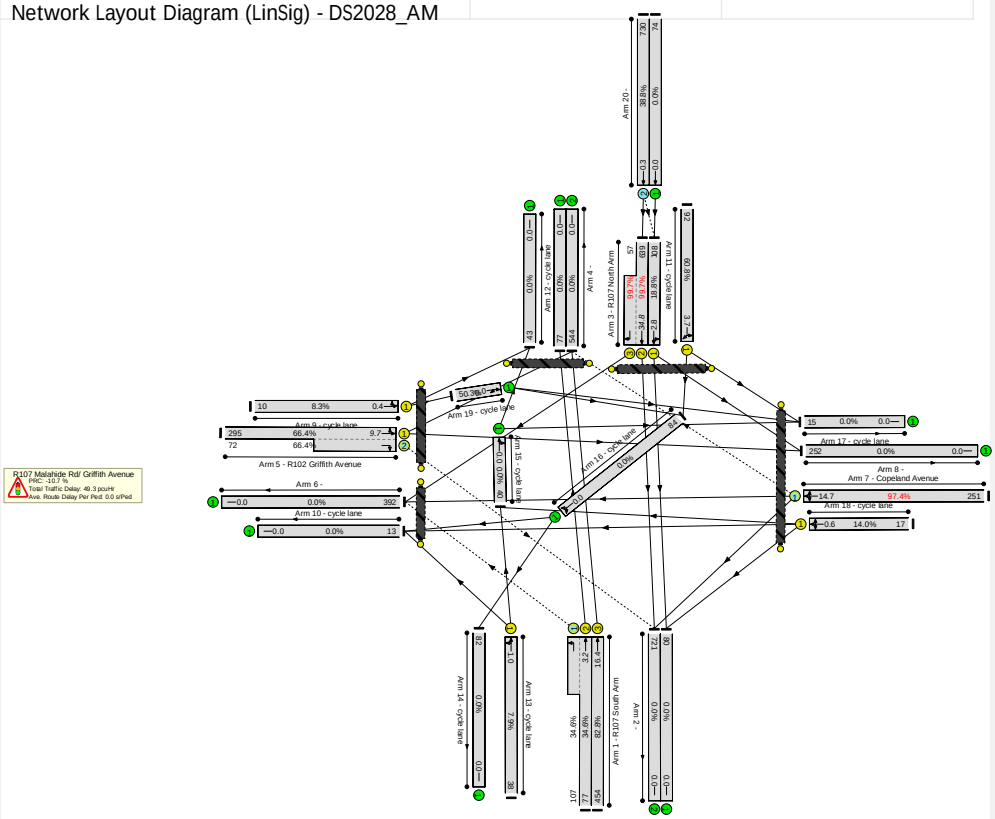
MMQ, CBC arms:
Inbound – 200.1m
Outbound – 94.3m

Bus Av. Delay (s/pcu):
Inbound – 35.0sec
Outbound – 41.9sec

Cyclists Av. Delay (s/pcu):
Inbound – 82.7sec
Outbound - 37.0sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 106.1sec
Outbound – 59.7sec

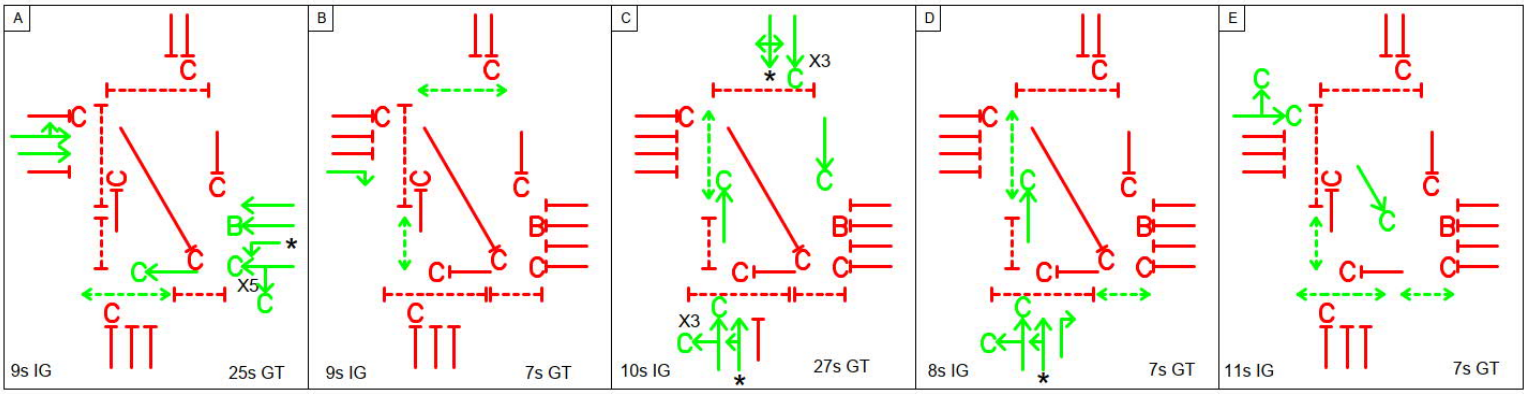
Network Layout Diagram (LinSig) - DS2028_AM



People Movement Assessment DS2028 AM

13.Griffith Av. Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,312	22%	2,342	32%
Bus	3,000	50%	3,000	41%
Walk	1,108	18%	1,108	15%
Cycle	580	10%	795	11%
Total	5,999	100%	7,245	100%

INDICATIVE METHOD OF CONTROL



* denotes Flashing Amber
X5 denotes Advance 5 seconds Start for Cyclists
X3 denotes Advance 3 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Griffith Ave PM peak

2028 PM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = -17.9%,
Junction Delay = 61.1 PCUhr

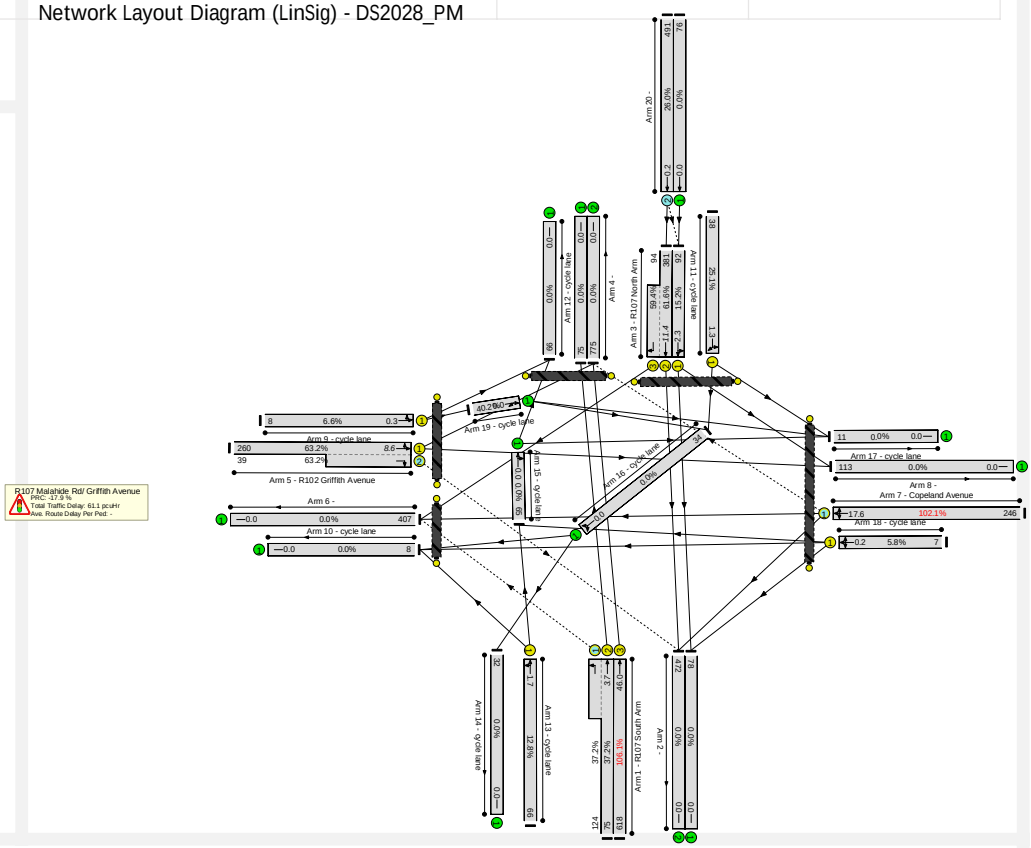
MMQ, CBC arms:
Inbound – 65.55m
Outbound – 264.5m

Bus Av. Delay (s/pcu):
Inbound – 32.9sec
Outbound – 41.0sec

Cyclists Av. Delay (s/pcu):
Inbound – 67.4sec
Outbound - 36.0sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 42sec
Outbound – 196.5sec

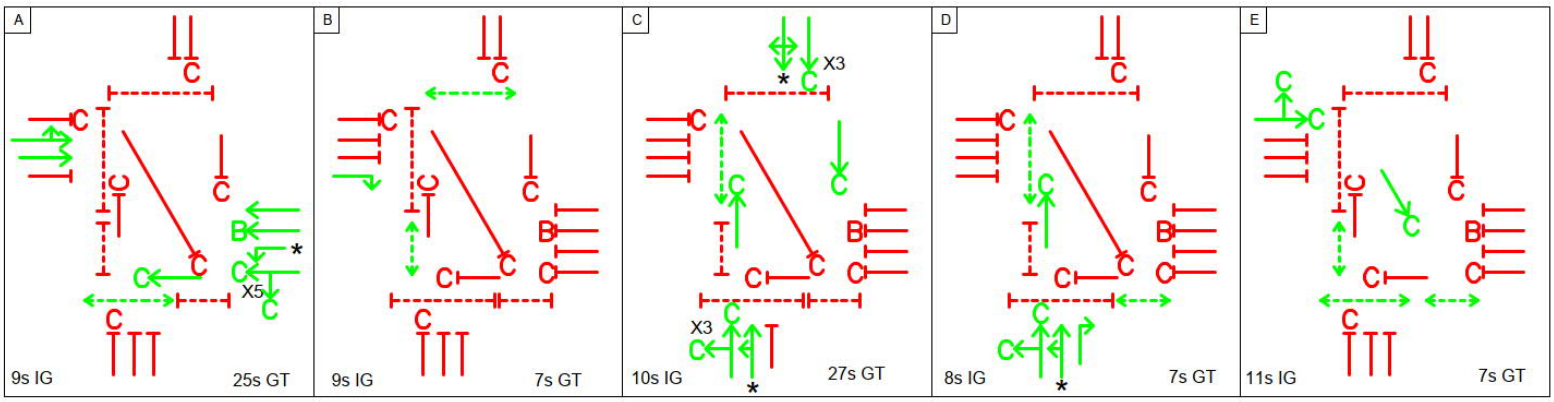
Network Layout Diagram (LinSig) - DS2028_PM



People Movement Assessment DS2028 PM

13.Griffith Av. Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,199	23%	2,134	34%
Bus	3,000	57%	3,000	47%
Walk	574	11%	574	9%
Cycle	450	9%	660	10%
Total	5,222	100%	6,367	100%

INDICATIVE METHOD OF CONTROL



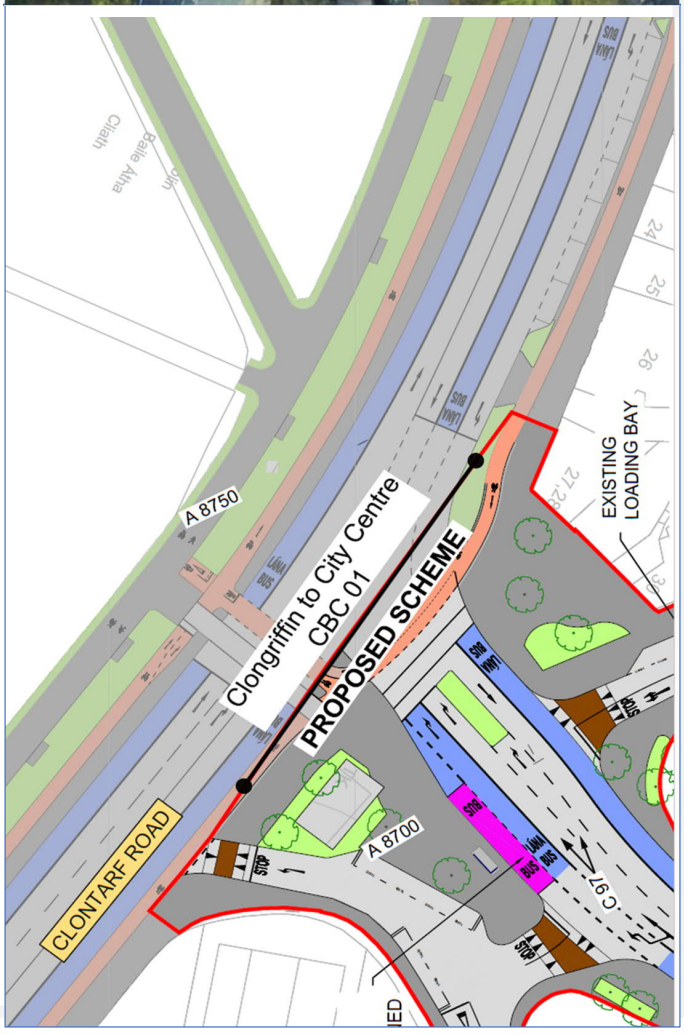
* denotes Flashing Amber
X5 denotes Advance 5 seconds Start for Cyclists
X3 denotes Advance 3 seconds Start for Cyclists

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Junction: Clontarf Road / R107 Malahide Road

EXISTING

FINAL DESIGN



Summary

The Clongriffin to City Centre CBC Scheme ties in with the Clontarf to City Centre Cycle and Bus Priority project, which is due to commence construction in 2022.

The key design rationale is to introduce pedestrian crossing facility along Malahide Road, provide cycle infrastructure and crossing facilities, whilst improving bus priority, whilst tying into the Clontarf to City Centre project.

Pedestrian Infrastructure

CBC :

- The existing staggered pedestrian crossing on the Malahide Road is to be replaced with a direct single stage crossing. A direct crossing was preferred at this location given the proximity of Marino Crescent Park and the existing shops along Marino Mart, which attract high volumes of pedestrians. The proposed single stage direct crossing is also less than 19m.
- The corner radius of the junction has been reduced to provide more compact junction and to reduce crossing distances. A reduced corner radius will also assist to reduce vehicular speeds through the junction, thus further enhancing safety for vulnerable users.

Side Roads:

- Raised table crossings are are proposed on the local streets junctions to facilitate pedestrian movements (St Aidan's Park Road, Marino Crescent);

Cyclists Infrastructure

The Proposed scheme seeks to divert inbound/outbound cyclists from Malahide Road to run through the designated quiet streets to the west (Brian Road, Carleton Road, Haverty Road). A cycle track was considered along Malahide Road at this location however due to physical constraints to the north of the junction, this was deemed unfeasible due to the required additional land take and therefore has been discounted.

Bus Priority Infrastructure

Junction Type 1 is proposed with the inbound bus lane stopping at the junction stop line. An offline bus stop is proposed adjacent to the junction which is an improvement on existing inline arrangement which will allow for more flexibility in adaptive signalling and bypassing of boarding/alighting buses.

Subject	BusConnects Core Bus Corridors Junction Design Report		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

Design Evolution

The proposed junction design has evolved on the BusConnects project from initial Concept Design, Emerging Preferred Route, Public Consultation 2, Public Consultation 3 up to the Current Design. The junction design iterations have been undertaken to optimise pedestrian, cyclist and bus priority infrastructure on the scheme.

Existing

Concept Design Drawing

This junction is not part of the Concept Design

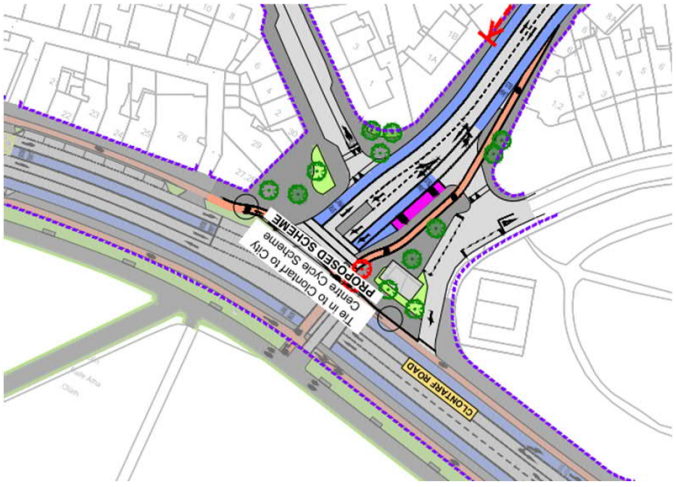
Emerging Preferred Route

This junction is not part of the Emerging Preferred Route

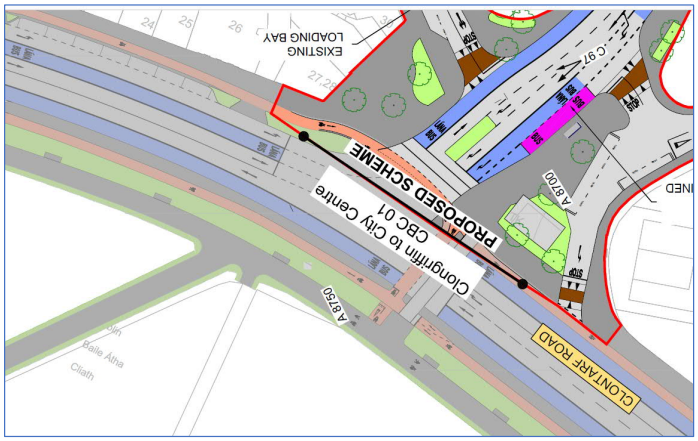
Public Consultation 2

This junction is not part of the Public Consultation 2

Public Consultation 3



Final Preliminary Design



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Clontarf Rd– AM peak

2028 AM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = 12.7%,
Junction Delay = 24.2 PCUhr

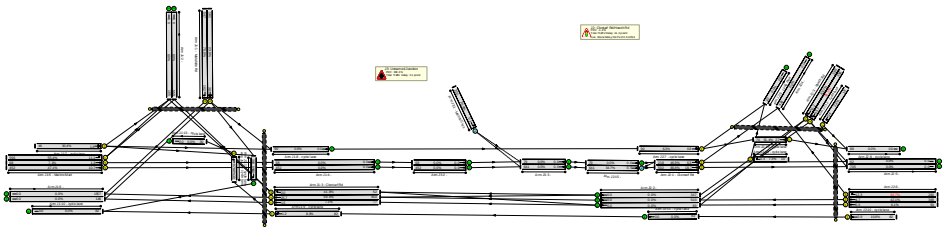
MMQ, CBC arms:
Inbound – 61.53m
Outbound – 147.78m

Bus Av. Delay (s/pcu):
Inbound – 19.7sec
Outbound – 13.7sec

Cyclists Av. Delay (s/pcu):
Inbound – 68.8sec
Outbound - 12.7sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 25.4sec
Outbound – 32.3sec

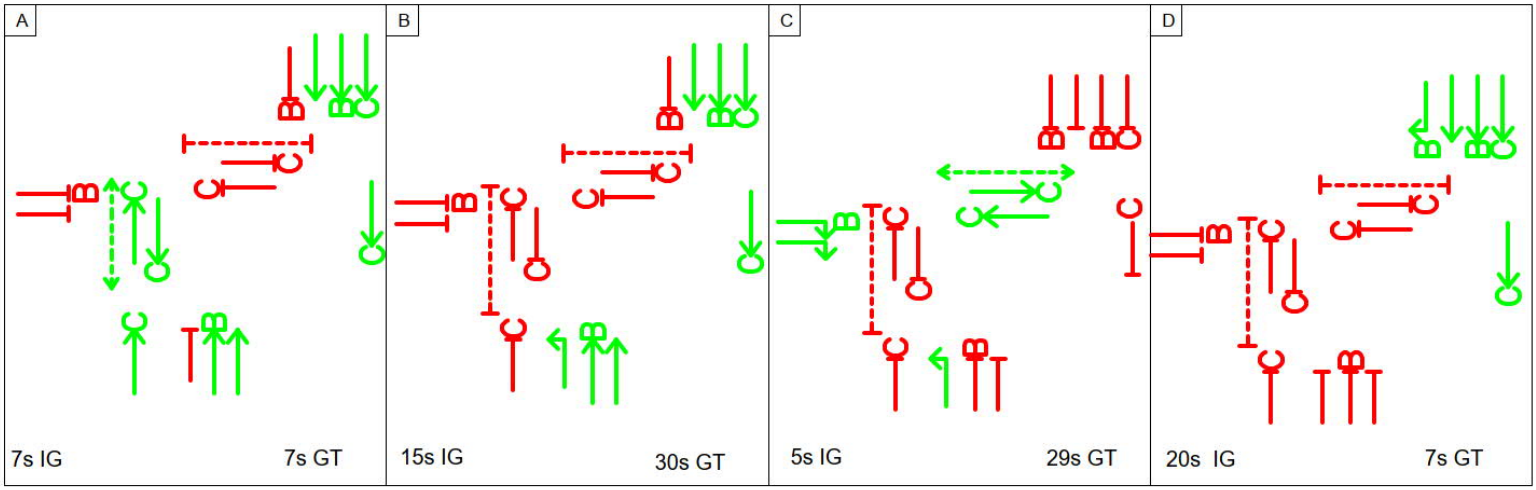
Network Layout Diagram (LinSig) - DS2028_AM



People Movement Assessment DS2028 AM

14.Clontarf Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,514	23%	2,927	24%
Bus	2,880	43%	6,120	51%
Walk	1,723	26%	1,723	14%
Cycle	520	8%	1,200	10%
Total	6,638	100%	11,970	100%

INDICATIVE METHOD OF CONTROL



Subject	BusConnects Core Bus Corridors Transport Modelling		
Date	December 2021		
Route	Clongriffin to City Centre Scheme	Job No/Ref	60599126

R107 Malahide Rd / Clontarf Rd - PM peak

2028 PM Peak Hours
Fixed Time LinSig Results

Cycle Time = 120 secs
PRC = 13.8%,
Junction Delay = 25.5 PCUhr

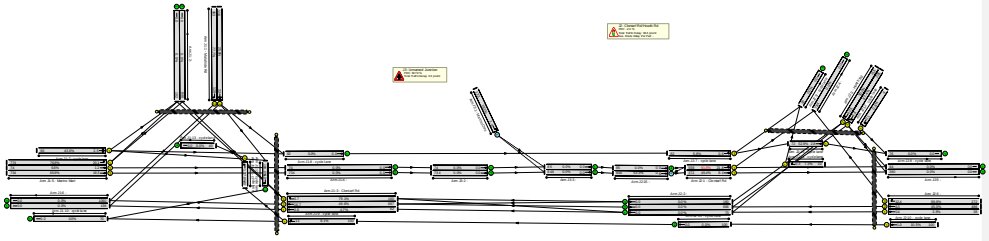
MMQ, CBC arms:
Inbound – 105.23m
Outbound – 96.03m

Bus Av. Delay (s/pcu):
Inbound – 14.8sec
Outbound – 6.9sec

Cyclists Av. Delay (s/pcu):
Inbound – 73.3sec
Outbound - 7.8sec

Car Av. Delay (s/pcu), CBC arms:
Inbound – 24.3sec
Outbound – 14.6sec

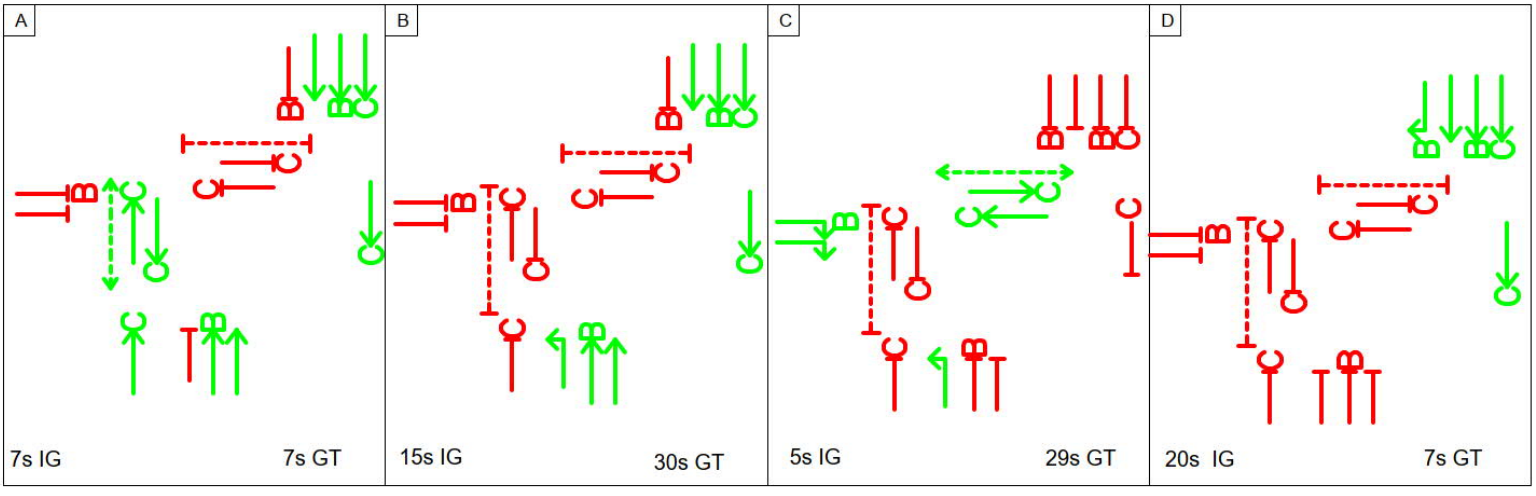
Network Layout Diagram (LinSig) - DS2028_PM



People Movement Assessment DS2028 PM

14.Clontarf Junction	CBC		All Arms	
Mode	People Movement	Mode Share	People Movement	Mode Share
Car	1,717	26%	3,168	31%
Bus	2,700	42%	4,500	44%
Walk	1,518	23%	1,518	15%
Cycle	560	9%	1,030	10%
Total	6,495	100%	10,216	100%

INDICATIVE METHOD OF CONTROL



NTA

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