



# Milton Road Project Update

WSP

June 2017

# MILTON ROAD PROJECT OBJECTIVES

As agreed by the City Deal Executive Board:

- Comprehensive priority for buses in both directions wherever practicable;
- Safer and more convenient routes for cycling and walking, segregated where practical and possible;
- Enhance the environment, streetscape and air quality;
- Additional capacity for sustainable trips to employment/education sites;
- Increased bus patronage and new services; and
- Maintain or reduce general traffic levels.

## CITY DEAL BOARD DESIGN REQUIREMENTS

The City Deal Board issued the following design requirements for the Milton Road Design:

- An avenue of mature trees as a core design element along Milton Road, the provision of grass verges and planting and effective wider public realm and landscaping
- Preference for a design that avoids the need for double bus lanes on any stretch of road including the section from Hurst Park Avenue to Oak Tree Avenue so that this stretch would have a maximum of three motorised lanes
- Remove all of the 'Do Something' banned turning movements from Gilbert Road, Arbury Road and King's Hedges Road junctions

## LLF ENGAGEMENT

- Over the last year there has been extensive and valuable engagement with the LLF.
- Workshops resulted in the development of a ‘Do Optimum’ scheme by MRRA, HPERA and Cam Cycle.
- The ‘Do Optimum’ scheme contains important design aspirations and principles which strongly influence the design concepts going forward.
- The ‘Do Optimum’ scheme has been used as a new basis for design development of an engineered and modelled Concept Design (**detailed design still to be undertaken**).
- Assessment of ‘Do Optimum’ has identified the need for some modifications which are outlined and explained within this presentation.

## DO OPTIMUM DESIGN DEVELOPMENT

In development of an engineered design concept we have taken the core design principles of 'Do Optimum' while also:

- Providing sufficient infrastructure to improve bus journey times and reliability;
- **Allocating bus lanes on one side of the road only, at any given section;**
- Maintaining options that consider both the retained access or closure of Highworth Ave access at the Elizabeth Way Junction (*further detailed assessment to be undertaken*);
- **Retaining a tree planting scheme along the length of Milton Road;**
- Providing a junction solution that does not require the closure of Union Lane;
- **Achieving optimal junction operation; and**
- Fitting within highway boundaries and with consideration of existing drive accesses;

## DO OPTIMUM DESIGN DEVELOPMENT - TREES

Key considerations on Trees and landscaping:

- **The delivery of any scheme will result in damage to existing trees and their root systems. Therefore it is proposed that the current trees are replaced with a fully considered and developed tree planting design along the length of Milton Road;**
- Exact future number of trees is not yet known due to a final design not being finalised, however the aim will be to replace all trees lost;
- **Improved planting technology for the trees which means more successful trees in the long term and less disruption to highway structures;**
- Officer Landscaping advice is that initial planting of trees no larger than 16-18cm girth which in plant size equates to 3-5m high;
- **At that size the tree planting will still have a ‘presence’ along the road but will have a better chance of successfully establishing.**

## DO OPTIMUM DESIGN DEVELOPMENT - TREES

Example of proposed establishing tree planting size, as recently planted along Coldhams Lane



# DESIGN CONSIDERATION EXAMPLES

Driveways and current access points (Elizabeth Way)





# DESIGN CONSIDERATION EXAMPLES

Driveways and current access points



## DO OPTIMUM DESIGN DEVELOPMENT

In taking on all of these considerations we seek to deliver a design concept that:

- Improves on the urban realm
- Provides the transport infrastructure improvements needed to meet the Milton Road project objectives, for all modes.

An idea of what this might look like is provided in the following BEFORE (Current) and AFTER (Proposed) visualisations.

# Milton Road

## Current - Outbound North of George St



# Milton Road

# Proposed - Outbound North of George St

## DRAFT CONCEPT



# Milton Road

## Current - Outbound North of Ascham Rd



# Milton Road

# Proposed - Outbound North of Ascham Rd

## DRAFT CONCEPT



## Milton Road

## Current - Outbound North of Downhams Lane



## Milton Road

# Proposed - Outbound North of Downhams Lane

**DRAFT CONCEPT**





## Milton Road

# Current - Outbound North of Ramsden Square



# Milton Road

# Proposed - Outbound North of Ramsden Square

DRAFT CONCEPT



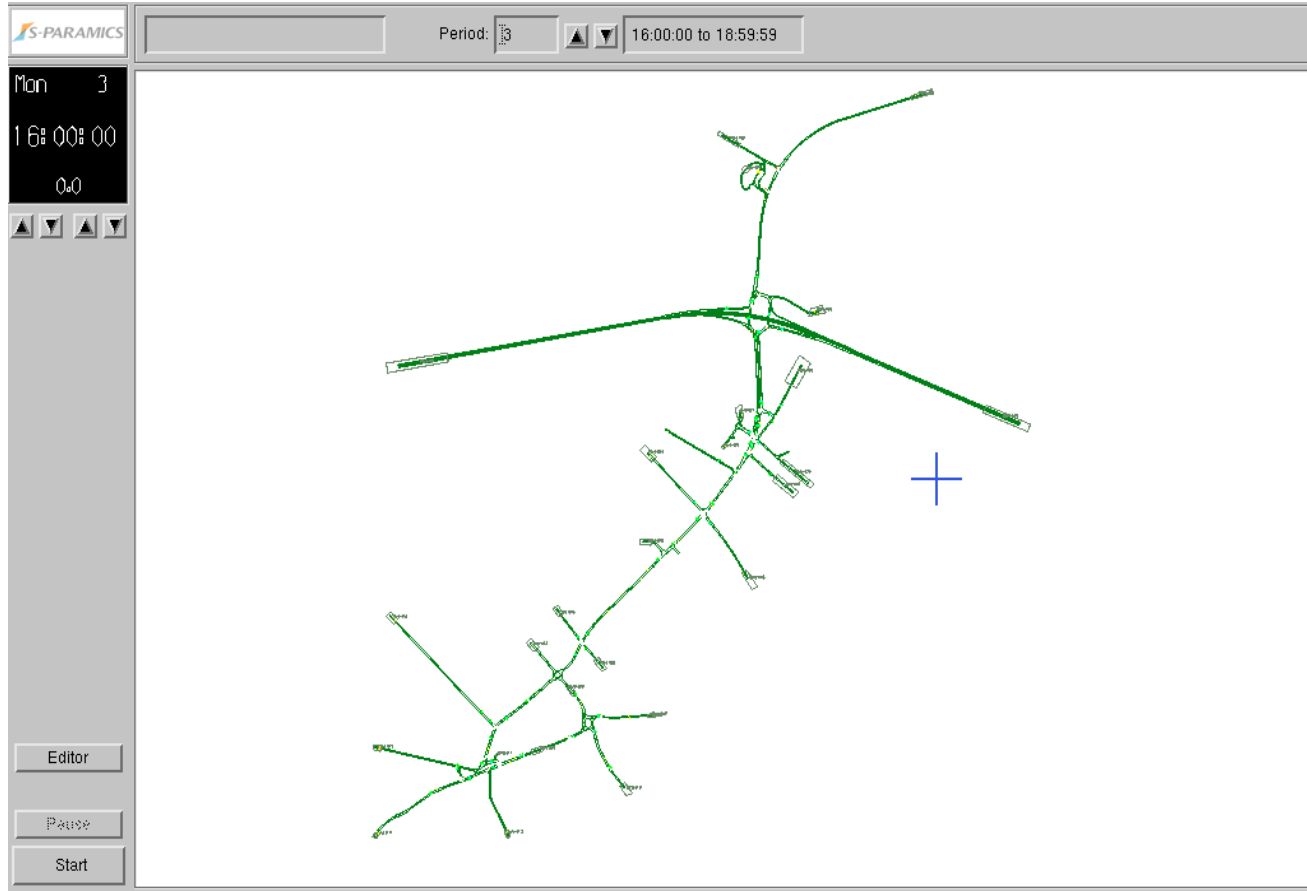
# VISUALISATION LOCATIONS



# ASSESSMENT & MODIFICATION OF 'DO OPTIMUM'

# 'Do Optimum' – ASSESSMENT OF DESIGN

## 'Do Optimum' – Modelled within 2016 validated PARAMICS model



- Model Validated to 2016 traffic conditions
- Industry standard software for highway modelling
- Model run multiple times and average of results taken
- Ability to calculate interaction and traffic movement through and between junctions
- Results focus on AM Peak (8am-9am) and PM Peak (5pm-6pm) periods

# 'Do Optimum' – ASSESSMENT OF DESIGN

'Do Optimum' – Conversion to engineering design to enable assessment



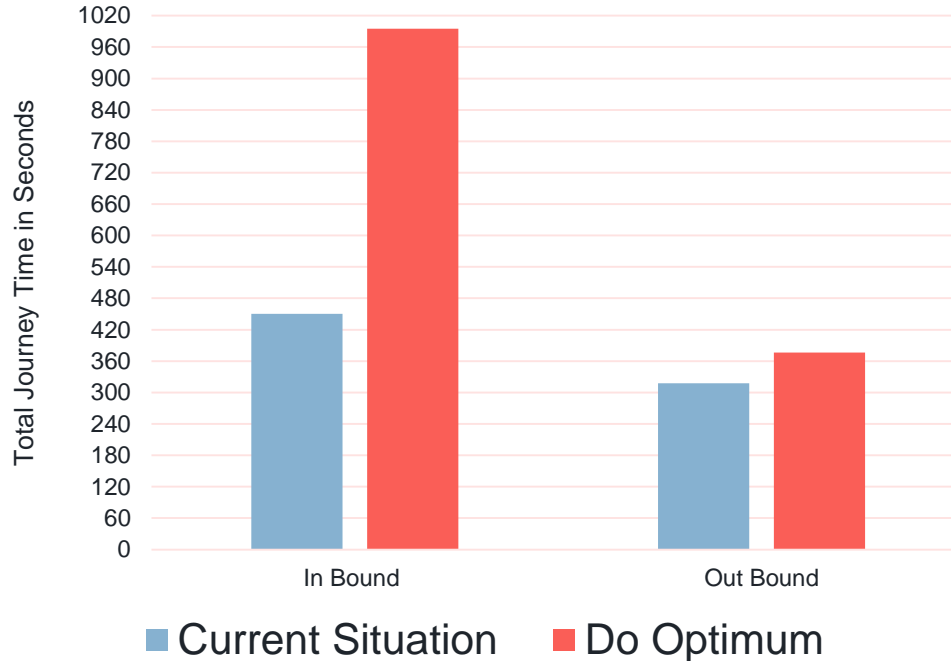
## 'Do Optimum' – TRAFFIC MODELLING UNDERTAKEN

Key outputs from the modelling undertaken, include:

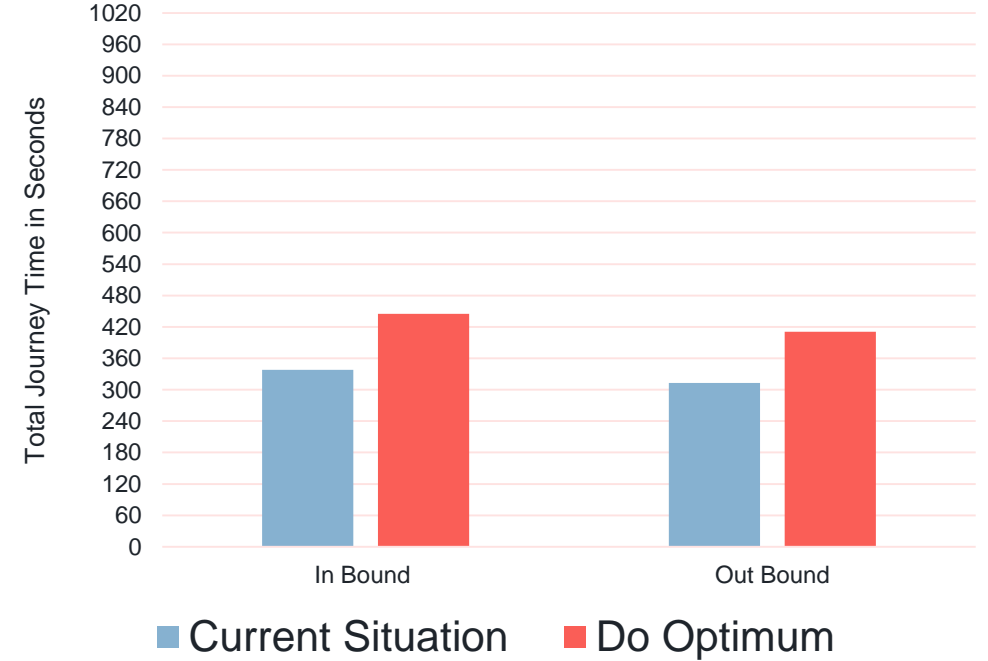
- Journey times for whole route
- Average bus journey times and reliability
- Performance of key junctions, relative to queuing and delay (Gilbert Road, Elizabeth Way, Arbury Road, King's Hedges Road)
- Comparison with the existing scenario - initially based on 2016 flows (*2031 to follow*)

# 'Do Optimum' - MILTON RD JOURNEY TIME SUMMARY

### AM Peak Journey Time Summary



### PM Peak Journey Time Summary



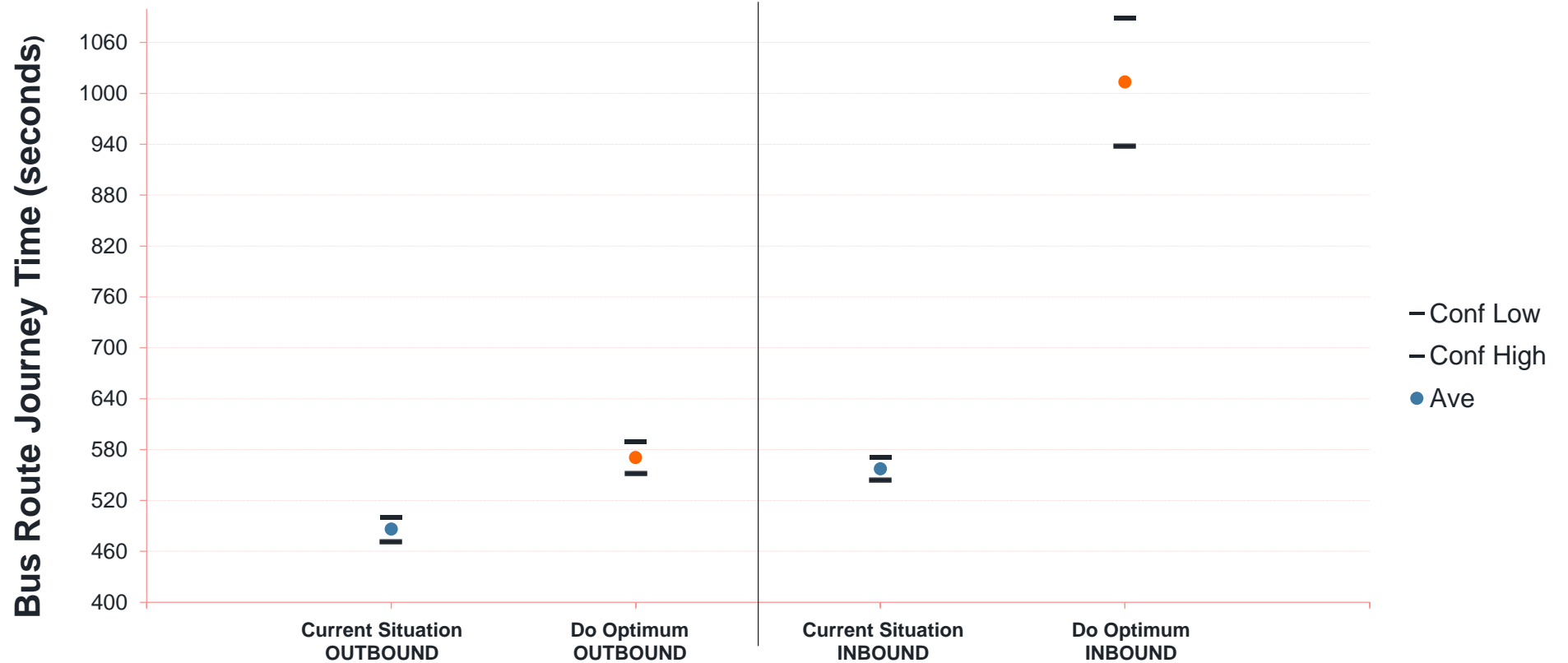
- **AM Peak** the 'Do Optimum' proposal is estimated to more than double the current journey times into Cambridge from 7.5 mins to 16.6 mins. Outbound would increase by 1 minute from 5.3 mins to 6.3 mins.
- **PM Peak** the 'Do Optimum' proposal is estimated to increase the current journey times into Cambridge by 1.8 minutes from 5.6 to 7.4 mins. Outbound would increase by 1.6 minute from 5.2 mins to 6.8 mins.





# 'Do Optimum' – MILTON ROAD BUS RELIABILITY

## AM Peak – Express A - Bus Reliability



- **AM Outbound** 'Do Optimum' bus reliability similar to current but average journey times are 1.4 min longer. Reliability similar due to little difference in bus lane configuration.
- **AM Inbound** 'Do Optimum' bus reliability much worse than current with average journey times being 7.6 minutes longer and more variable.

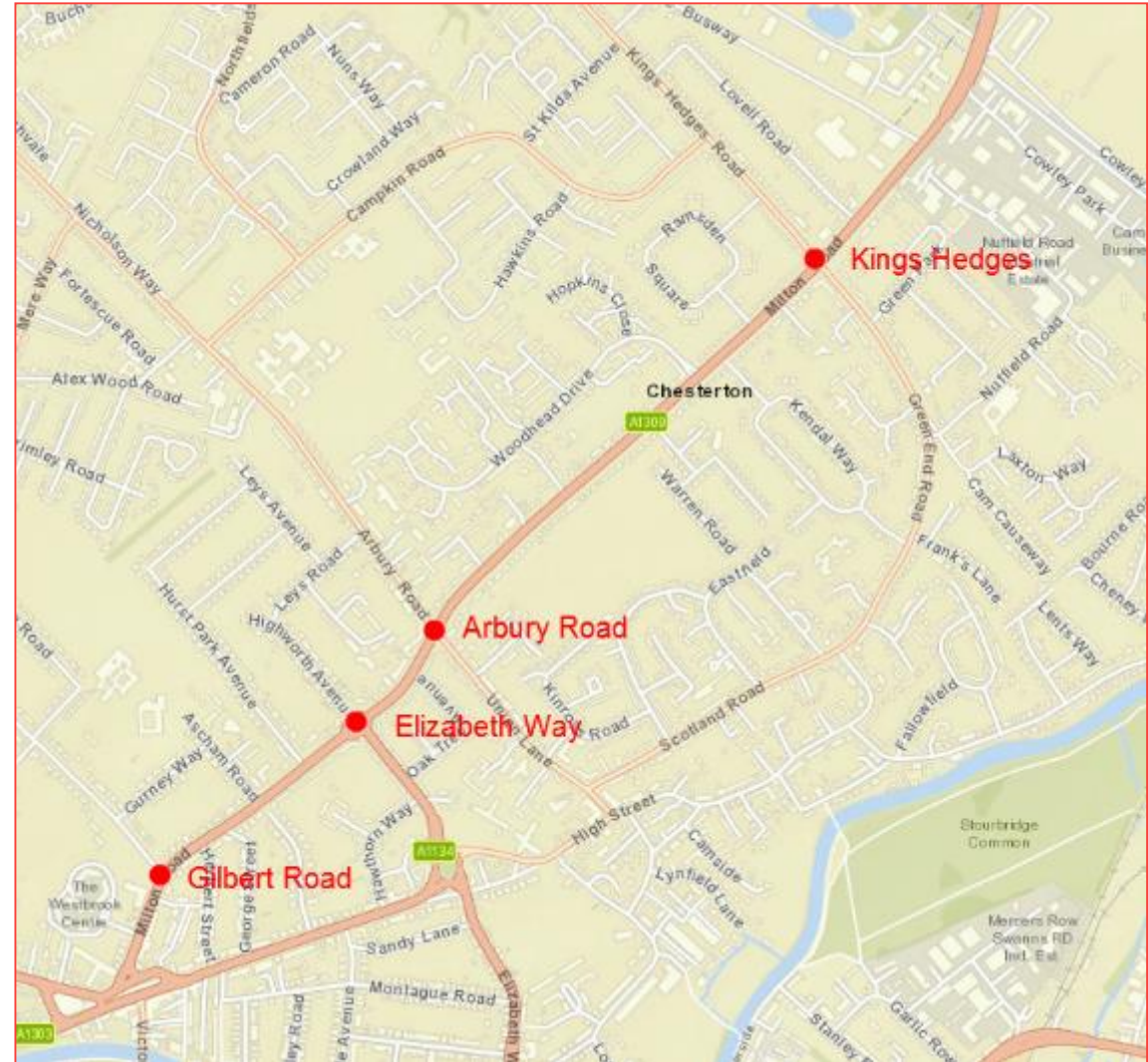
## **'Do Optimum' – TRAFFIC MODELLING UNDERTAKEN**

Reviewing of this information has led us to:

- Review and test alternative junction designs to balance vehicle journey times along Milton Road, while maintaining 'Do Optimum' ideas for pedestrian and cycle accessibility;
- Identify optimum location of bus priority measures.
- Maximise landscaping and tree planting opportunities

# 'Do Optimum' – JUNCTION MODELLING

1. Gilbert Road
2. Elizabeth Way
3. Arbury Road
4. Kings Hedges



# ‘Do Optimum’ – GILBERT ROAD JUNCTION

“Do Optimum”



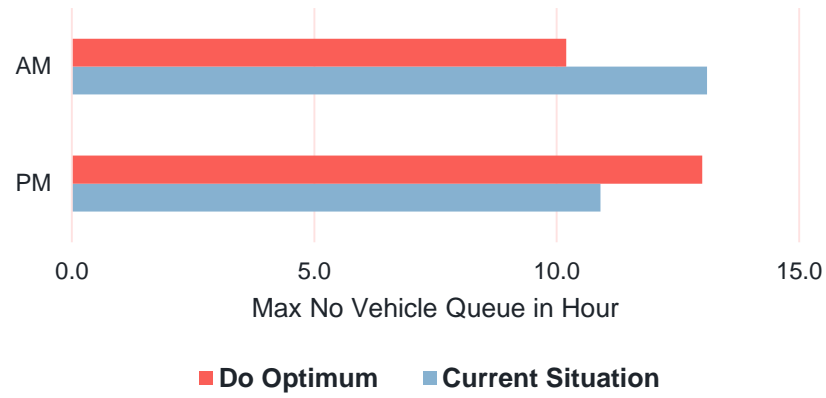
“Current Situation”



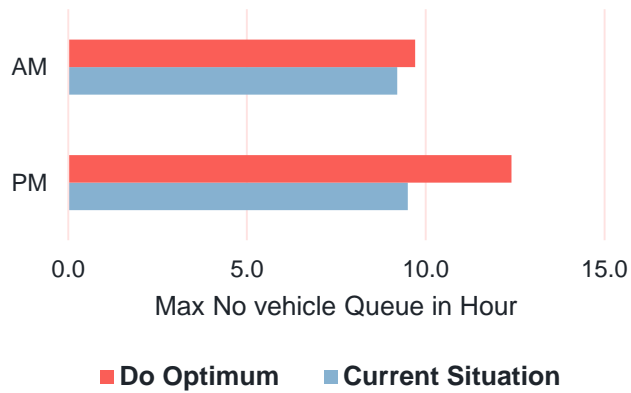
- Tighter Radius on junction can slow traffic movements (however current design too tight for large vehicles to manoeuvre)
- Signal Staging assumed to be very similar in ‘Current’ and ‘Do Optimum’ situation

# 'Do Optimum' - GILBERT ROAD JUNCTION

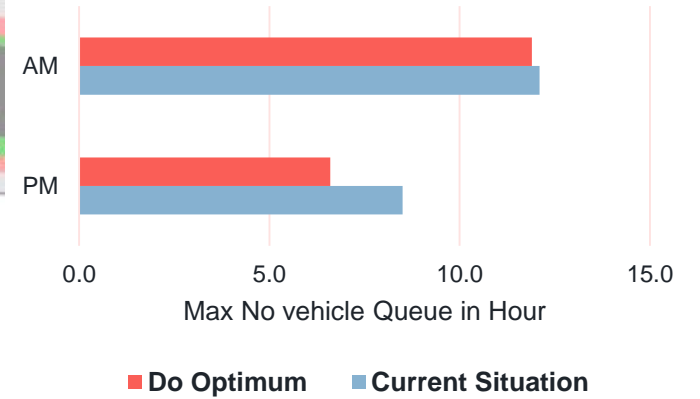
Gilbert Road



Milton Road Outbound



Milton Road Inbound



# 'Modified Do Optimum' – GILBERT ROAD JUNCTION

"Do Optimum"

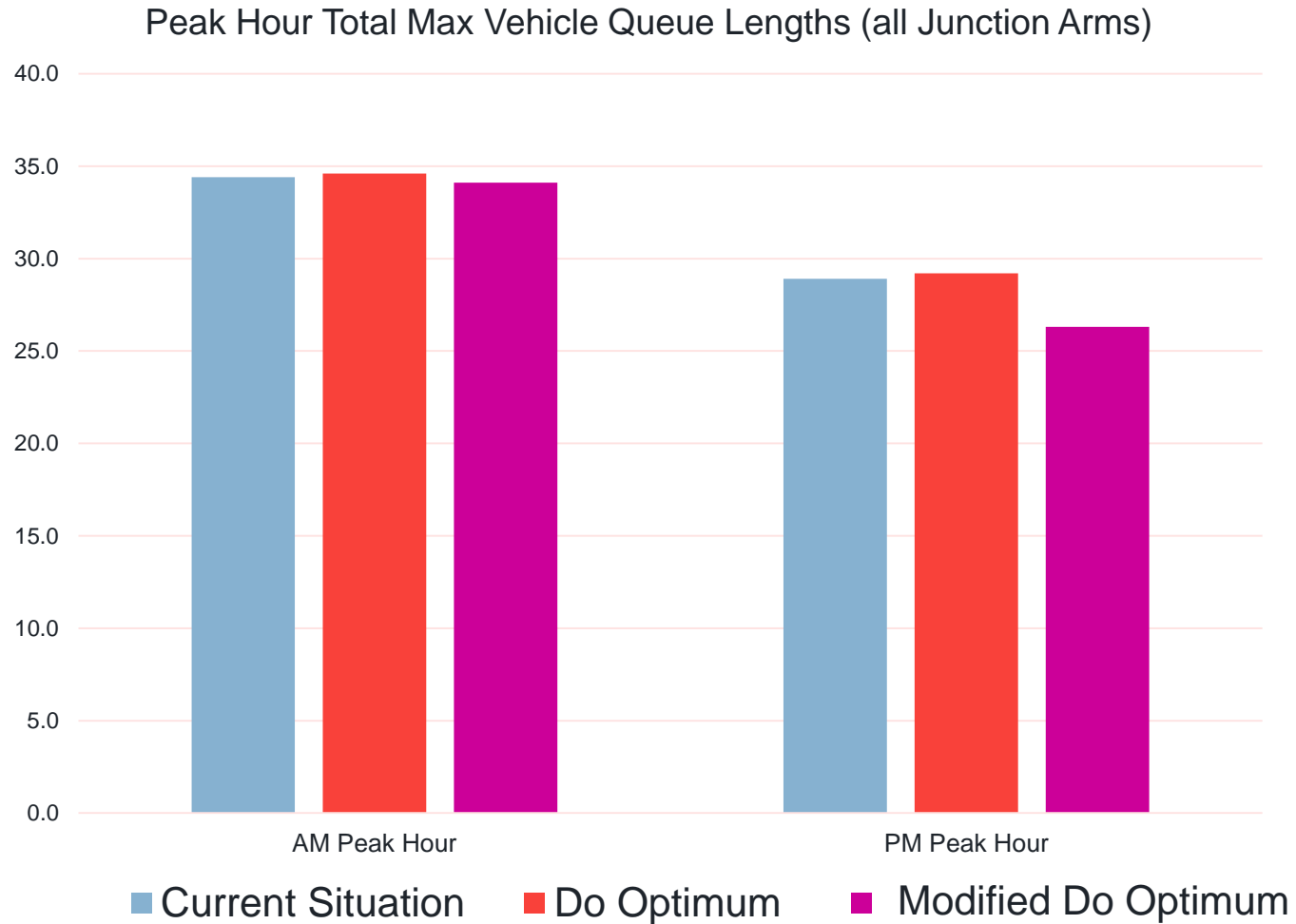


"Modified Do Optimum"



- **Generous provision for cyclists at the junction despite the tight space constraints as per the do optimum**
- **No fully dedicated right turn lane to help optimise junction phasing and reduce footprint to enable more space for cycling, walking and potentially planting**
- **High priority and maximum space for pedestrian movements and crossings**

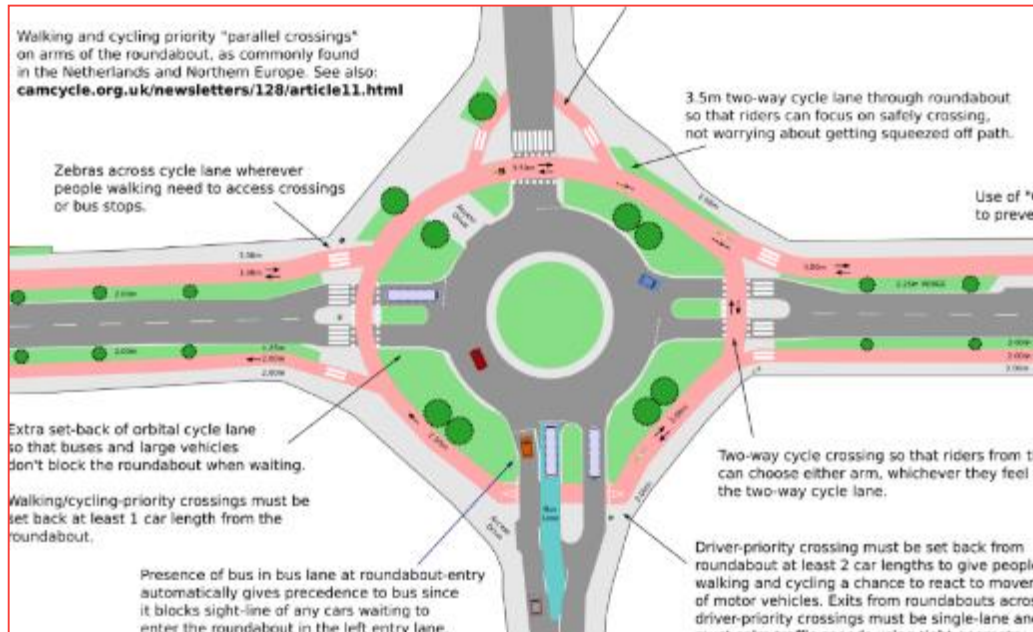
# 'Modified Do Optimum' – GILBERT ROAD JUNCTION



- **'Modified Do Optimum' aims to maintain high priority for cyclists and pedestrians of while better enhancing signal optimisation**

# ‘Do Optimum’ – ELIZABETH WAY JUNCTION

## “Do Optimum”



## “Current Situation”



- Cars will need to slow speed to view priority of cyclist and then other vehicles on the roundabout
- The reduced roundabout radius slows traffic speed and circulatory capacity



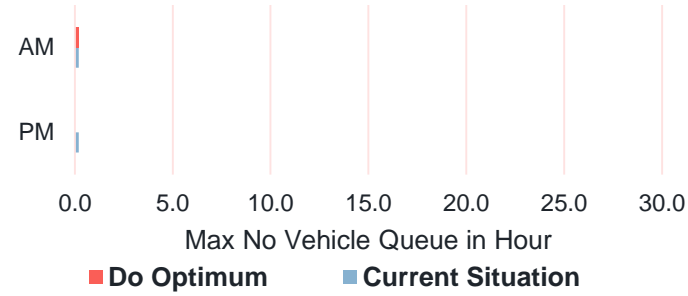
# 'Do Optimum' - ACCIDENT ANALYSIS

## Elizabeth Way

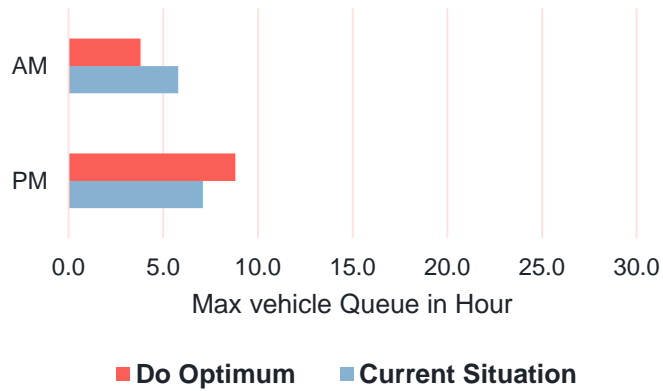


# 'Do Optimum' - ELIZABETH ROAD JUNCTION

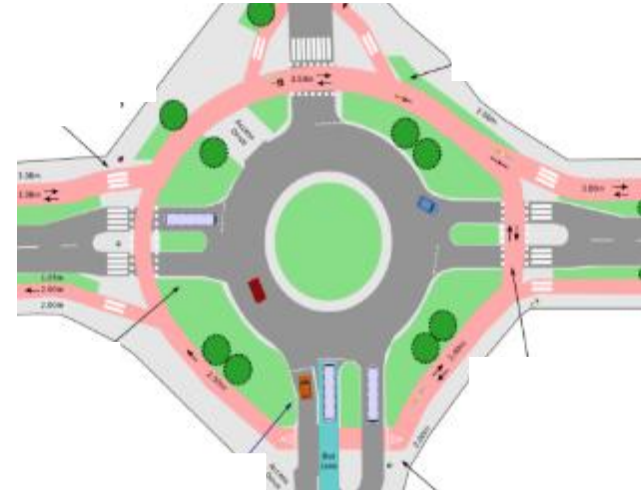
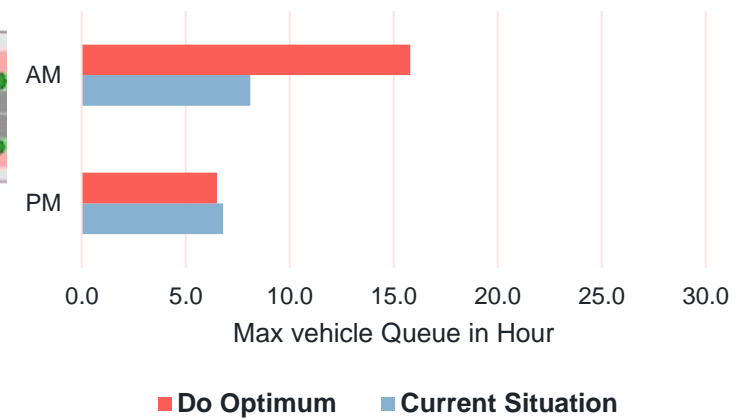
Highworth Ave



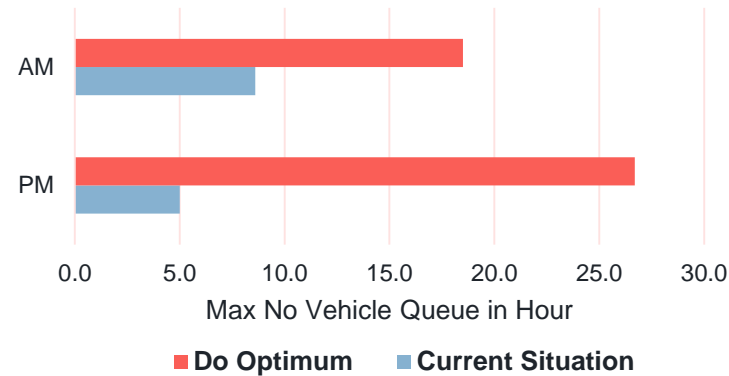
Milton Road Outbound



Milton Road Inbound

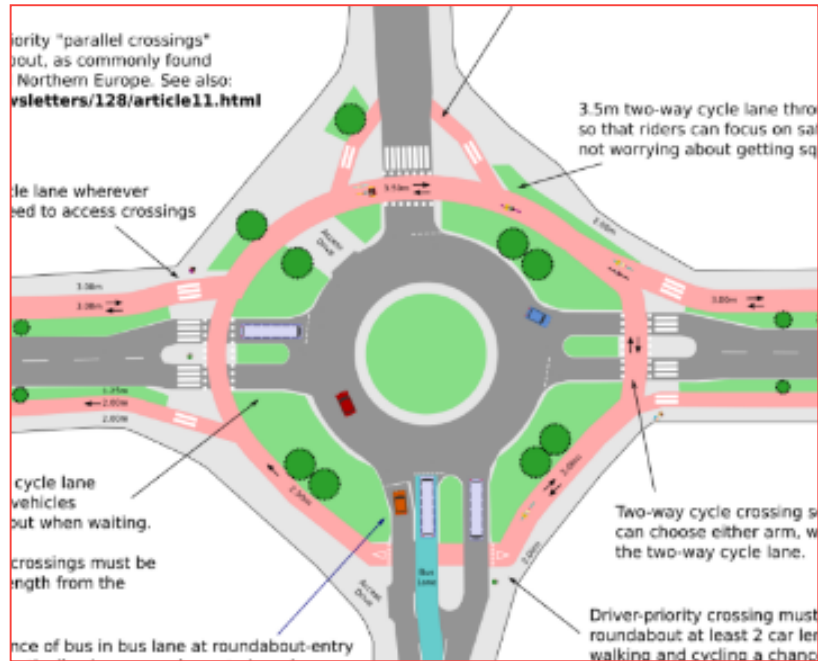


Elizabeth Way

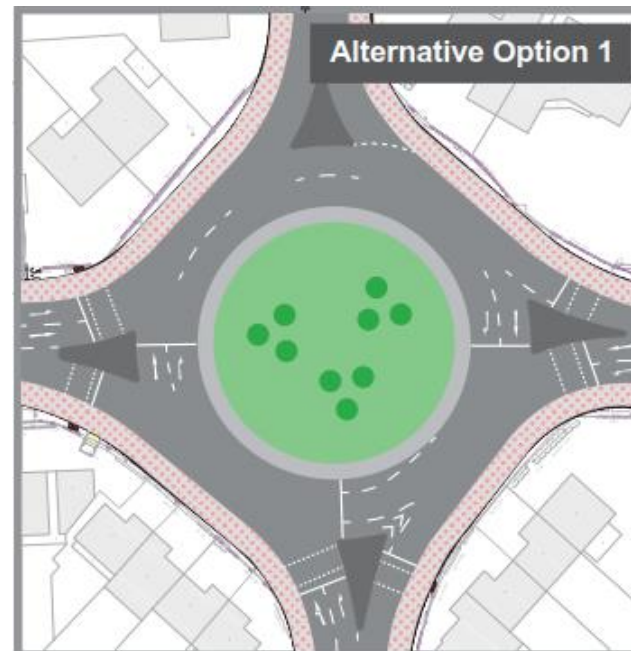


# 'Modified Do Optimum' - ELIZABETH WAY JUNCTION

"Do Optimum"



"Modified Do Optimum (RB Sig)"



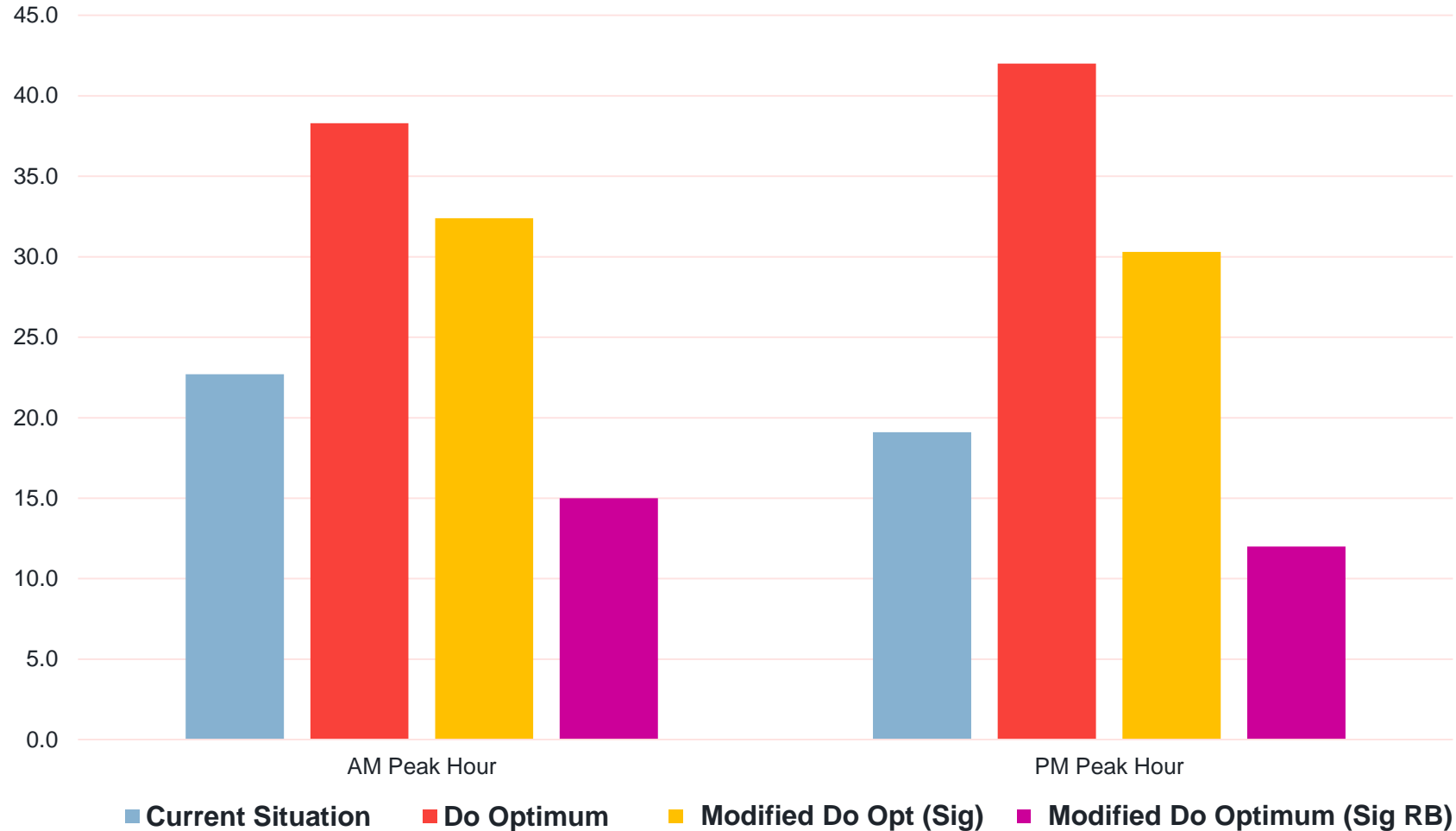
"Modified Do Optimum (Sig)"



- Incorporate off street cycle lanes
- Crossing on each arm
- Aimed to maintain maximum landscaping potential within both alternative designs

# 'Modified Do Optimum' - ELIZABETH WAY JUNCTION

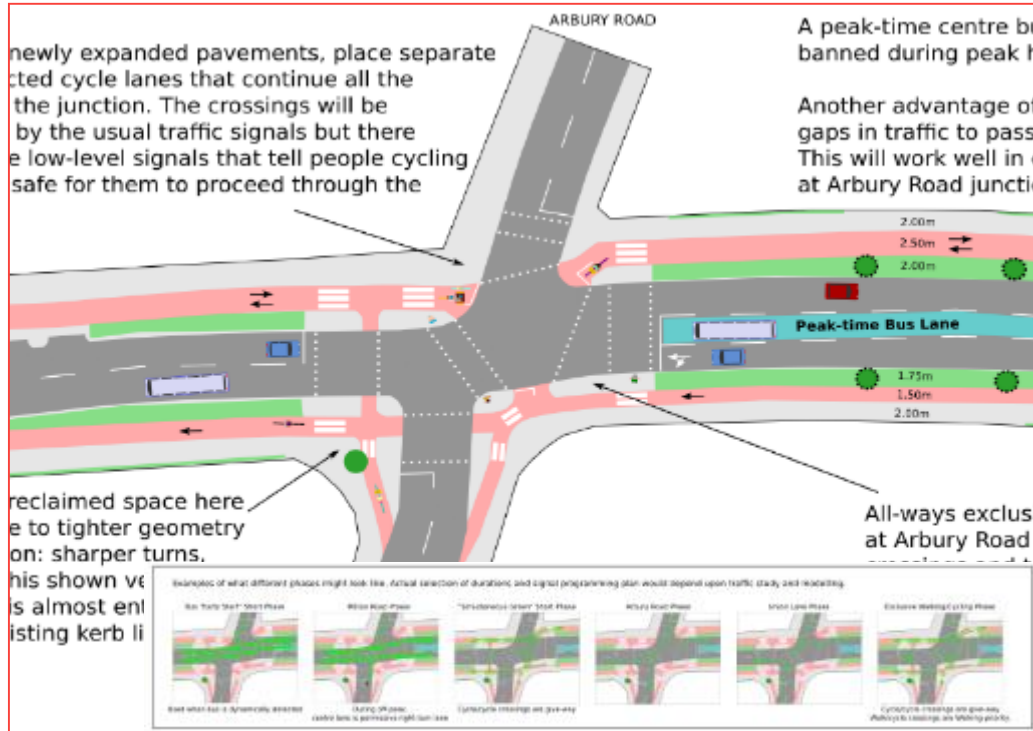
Peak Hour Total Max Vehicle Queue Lengths (all Junction Arms)



- 'Modified Do Optimum' with signalised roundabout, which would include no closure of Highworth Ave, looks to be the most balanced solution tested at this junction

# 'Do Optimum' - ARBURY ROAD JUNCTION

"Do Optimum"



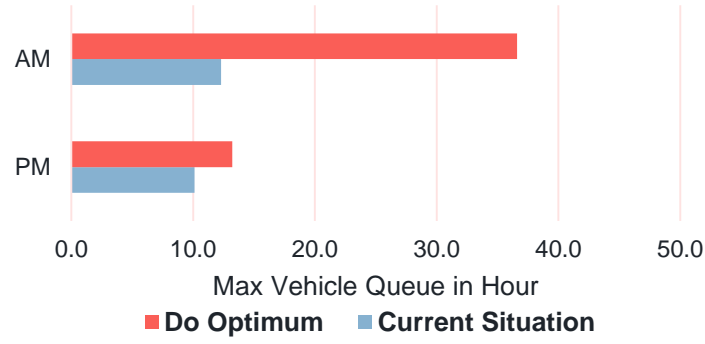
"Current Situation"



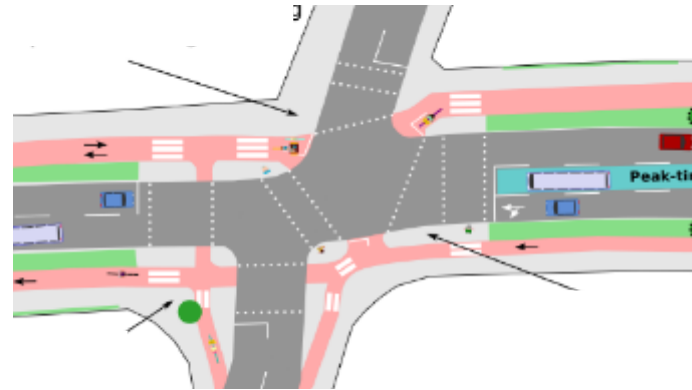
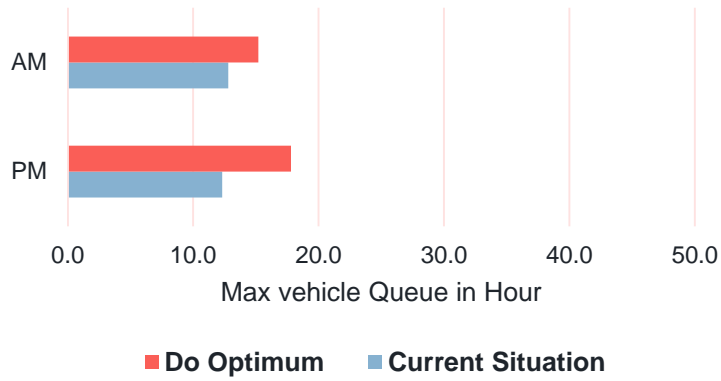
- Signal Staging suggested within the 'Do Optimum' proposal has been used.
- During peak (and during operation of bus lane shown) potential safety and signing issues associated with right turn into Arbury Road in 'Do Optimum' proposal
- Staggering of junction would not be possible to achieve to the degree shown in proposal due to safety issues of vehicle manoeuvring.

# 'Do Optimum' - ARBURY ROAD JUNCTION

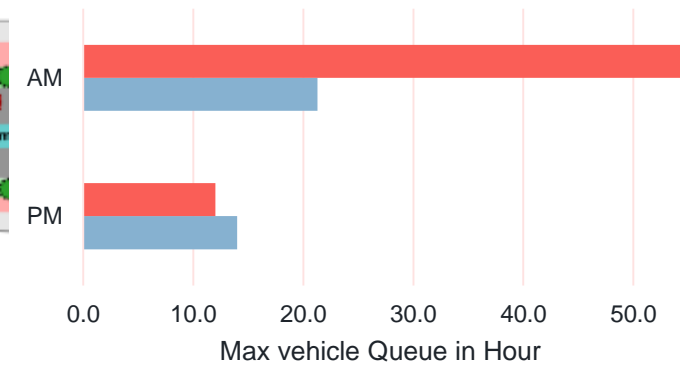
Arbury Road



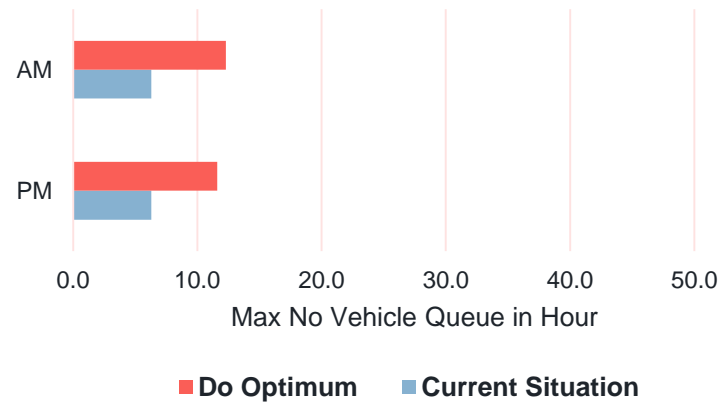
Milton Road Outbound



Milton Road Inbound

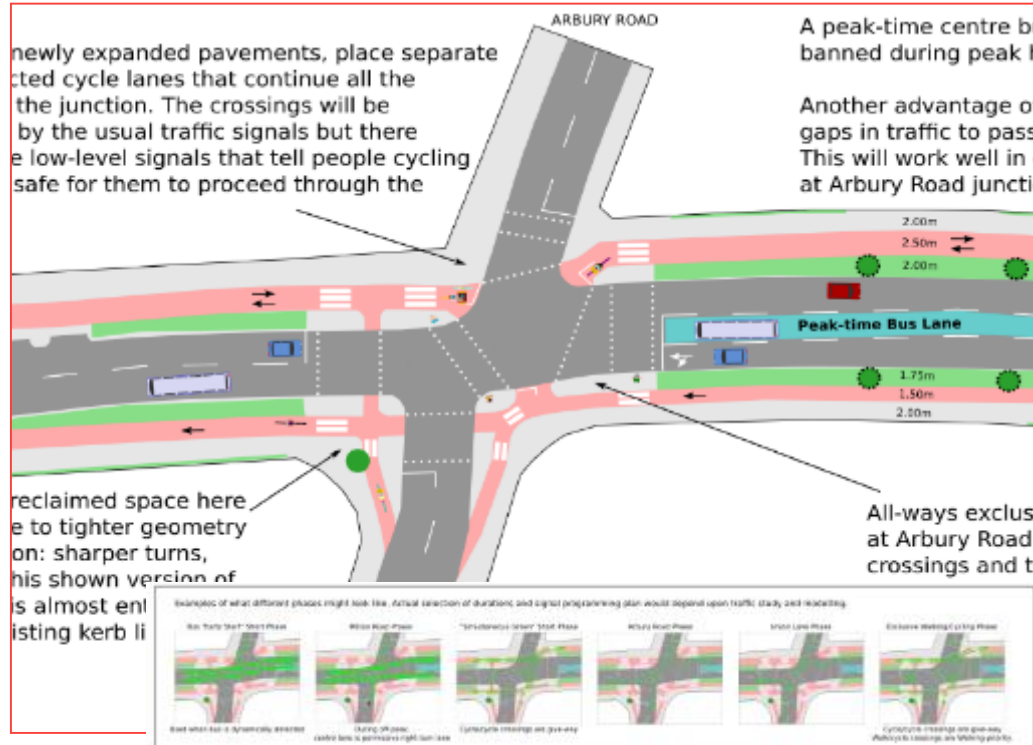


Union Lane



# 'Modified Do Optimum' – ARBURY ROAD JUNCTION

“Do Optimum”

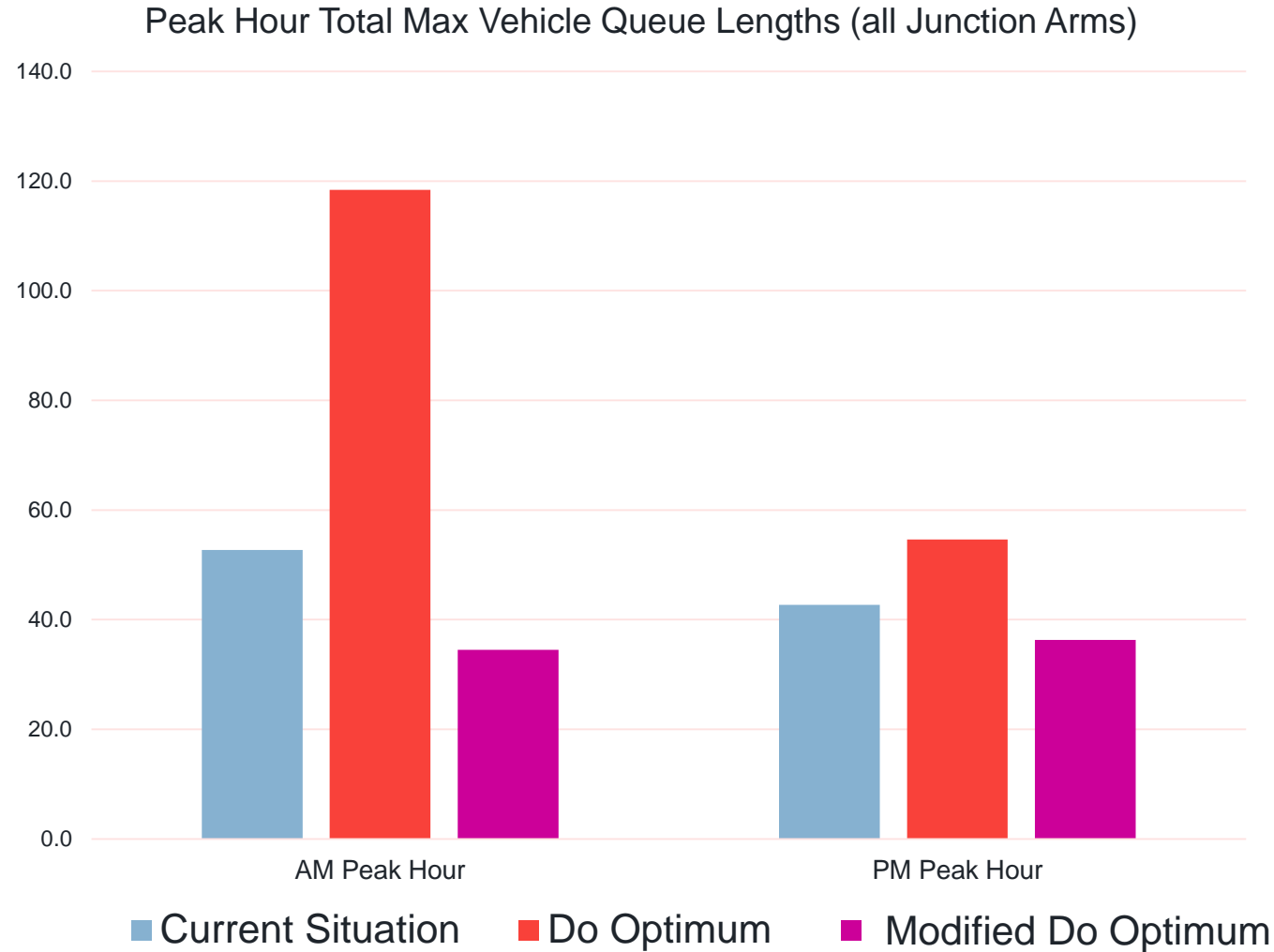


“Modified DO Optimum”



- Left turn from Union Lane (for vehicles) is banned to enable pedestrian movements to occur during the Union Lane vehicle stage, to improve optimisation.
- Inbound bus lane has been set back to enable more space for cycle lanes and planting.
- Shared use allocation outbound, plus on carriageway cycle facilities

# 'Modified Do Optimum' – ARBURY ROAD JUNCTION



- **'Modified Do Optimum' with no closure of Union Lane, only banning of left turns out of Union Lane, identified as the best solution tested at this junction**



# 'Do Optimum' - KINGS HEDGES JUNCTION

"Do Optimum"

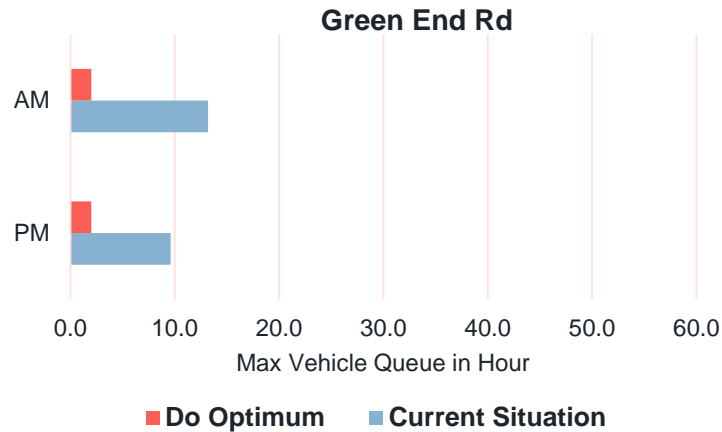
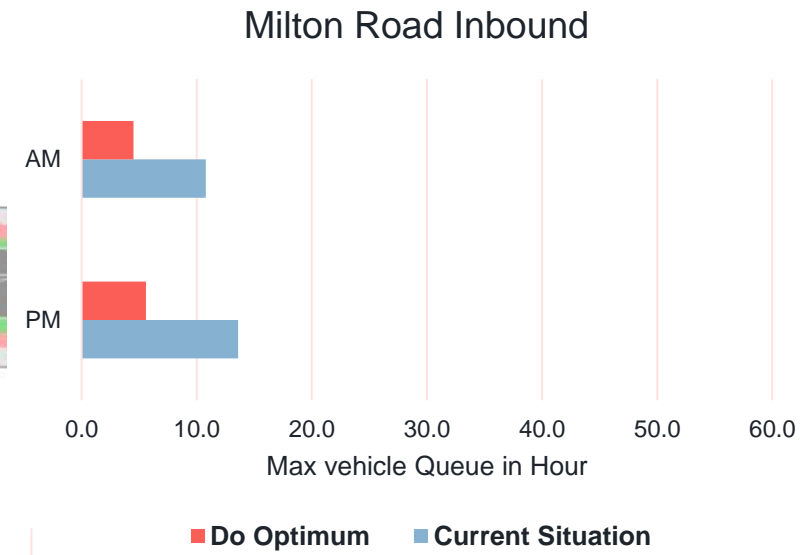
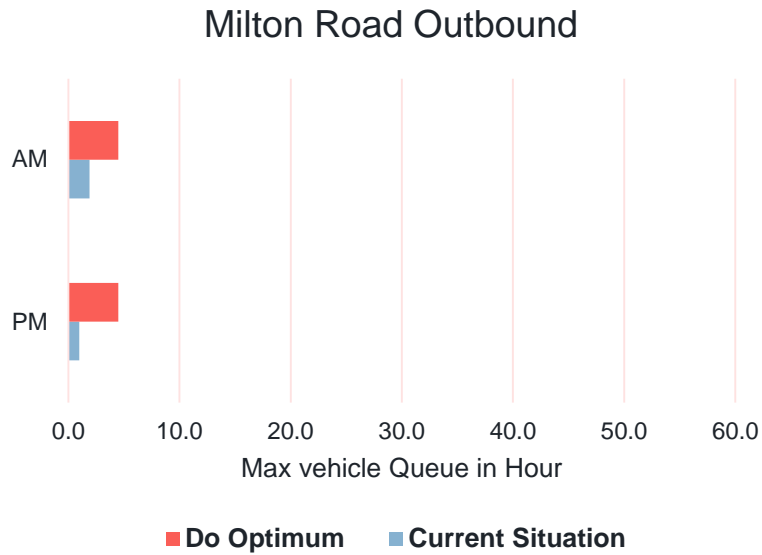
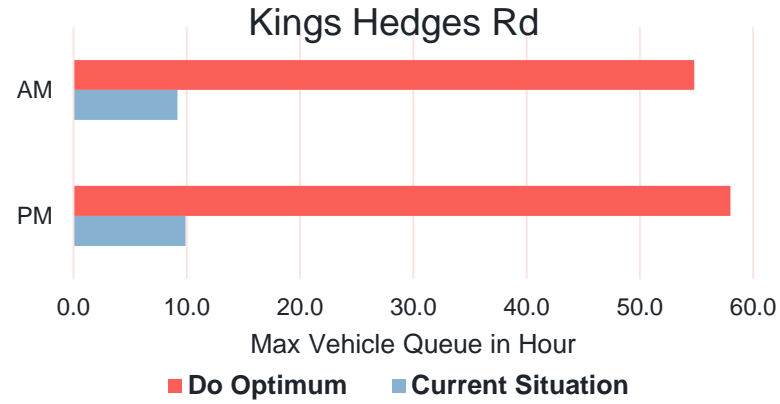


"Current Situation"



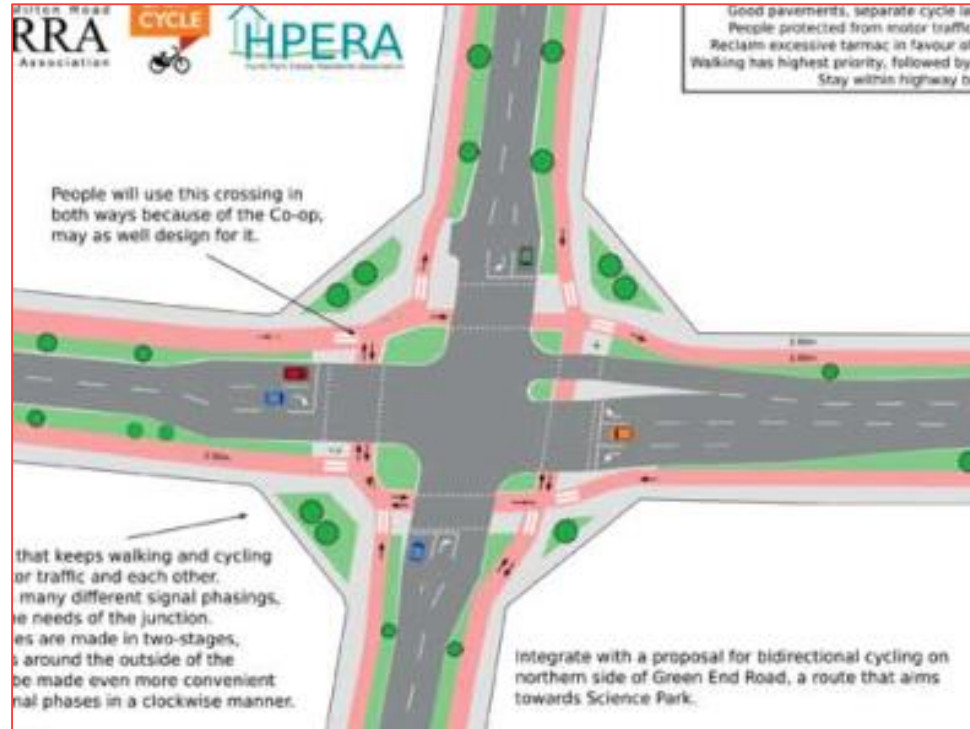
- Cars will need to slow speed to view priority of cyclist and then other vehicles on the Roundabout
- The reduced roundabout radius slows traffic speed and circulatory capacity
- Turning the Junction back into a Roundabout can lead to unbalanced flows and excess queueing on specific arms due to being less balanced

# 'Do Optimum' - KINGS HEDGES JUNCTION



# 'Modified Do Optimum' – KINGS HEDGES JUNCTION

“Do Optimum”



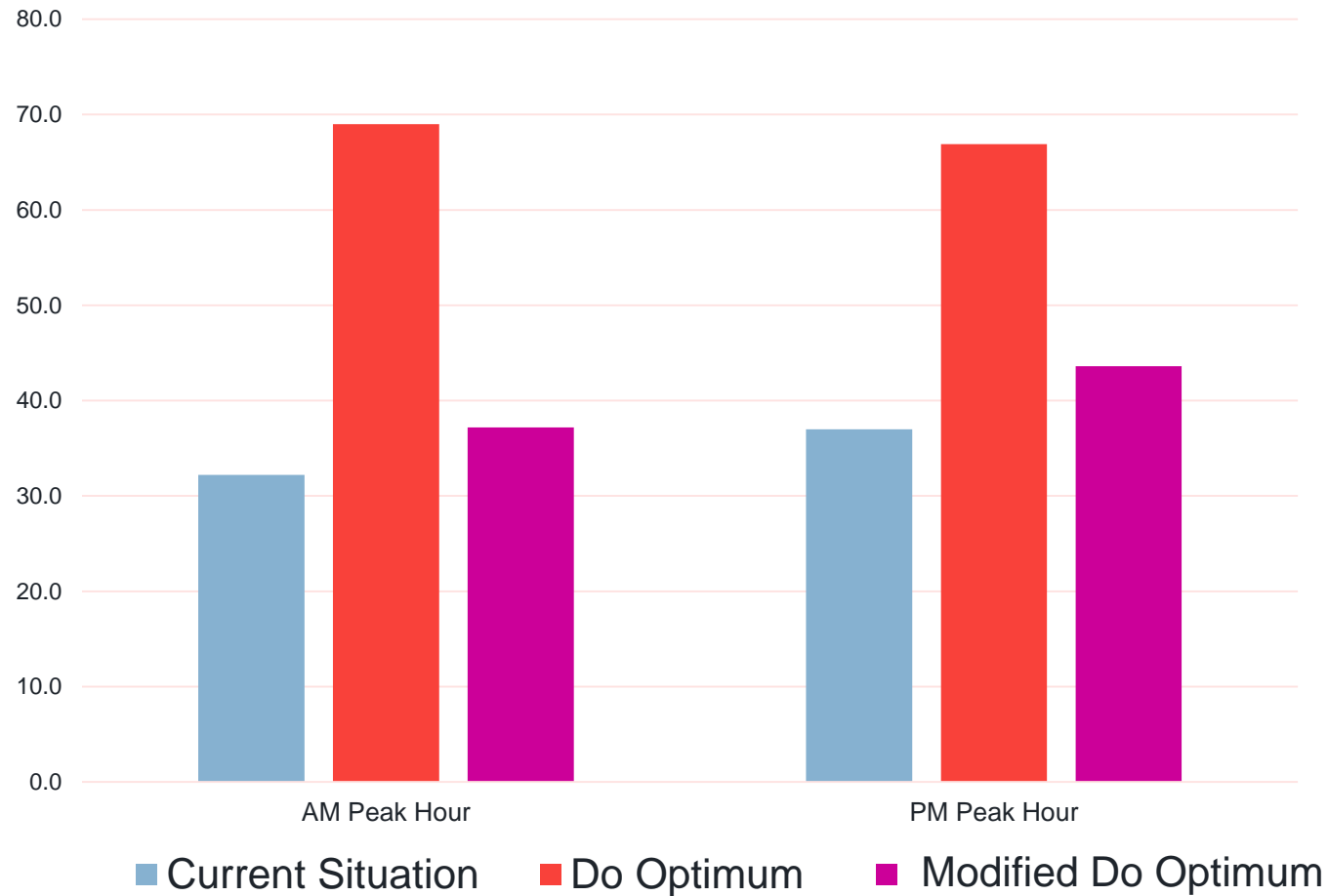
“Modified Do Optimum”



- The signals design has full pedestrian stage, rather than staggered, to assist pedestrians
- Design aims to increase ability to accommodate off street cycle lanes and landscaping as per 'Do Optimum' while still maintaining vehicle capacity

# 'Modified Do Optimum' – KINGS HEDGES JUNCTION

Peak Hour Total Max Vehicle Queue Lengths (all Junction Arms)

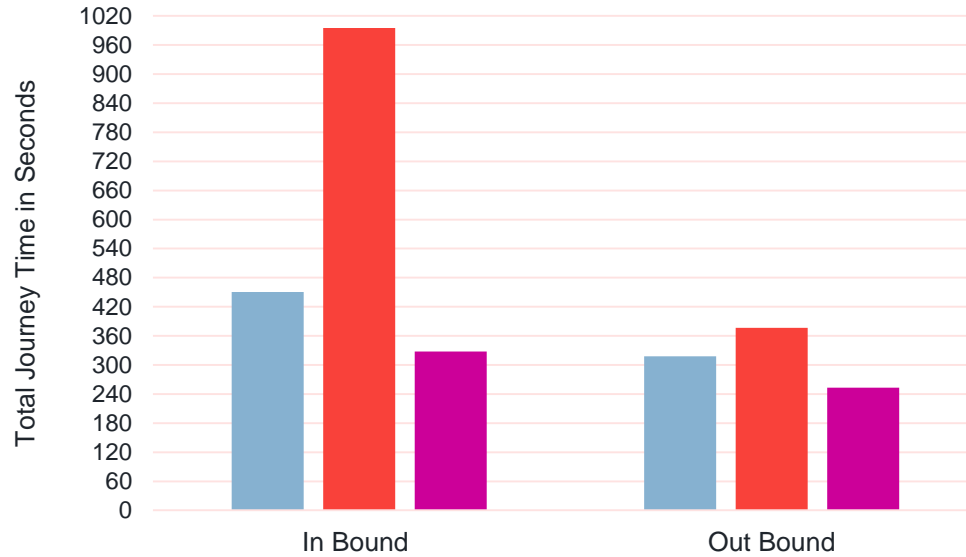


- **'Modified Do Optimum' strikes a better balance between providing off street cycle movements, improved pedestrian crossing facilities (resulting in slightly higher queues than the current situation due to longer all red stage) but still maintaining sizable vehicle capacity**

# 'Modified Do Optimum' - MILTON RD JOURNEY TIME SUMMARY

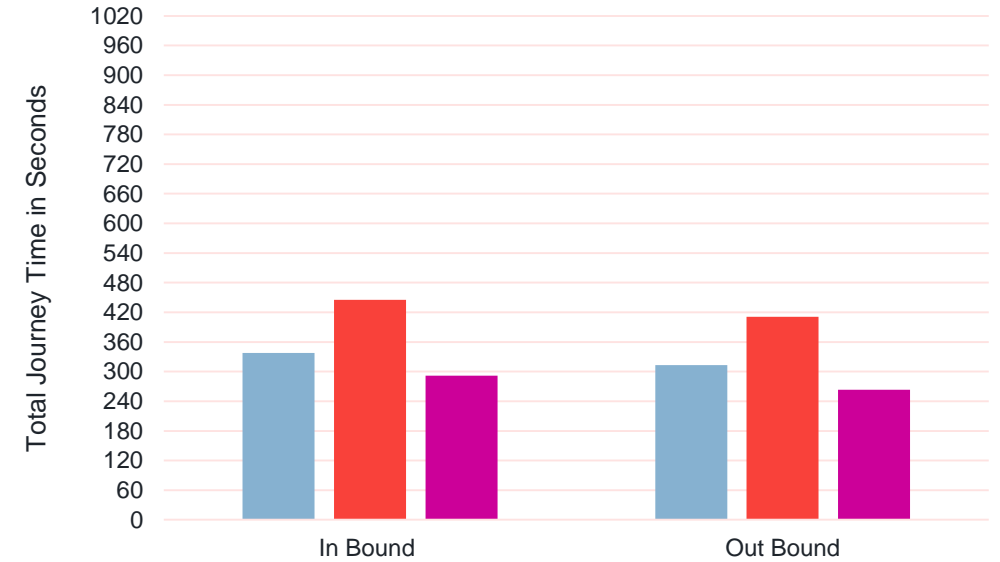


### AM Peak Journey Time Summary



■ Current Situation ■ Do Optimum ■ Modified Do Optimum

### PM Peak Journey Time Summary



■ Current Situation ■ Do Optimum ■ Modified Do Optimum

- The 'Modified Do Optimum' proposal is estimated to improve journey times for all vehicles in both the AM and PM peaks, improving on both the 'Do Optimum' and the existing situation.

## 'Modified Do Optimum' – BUS LANES

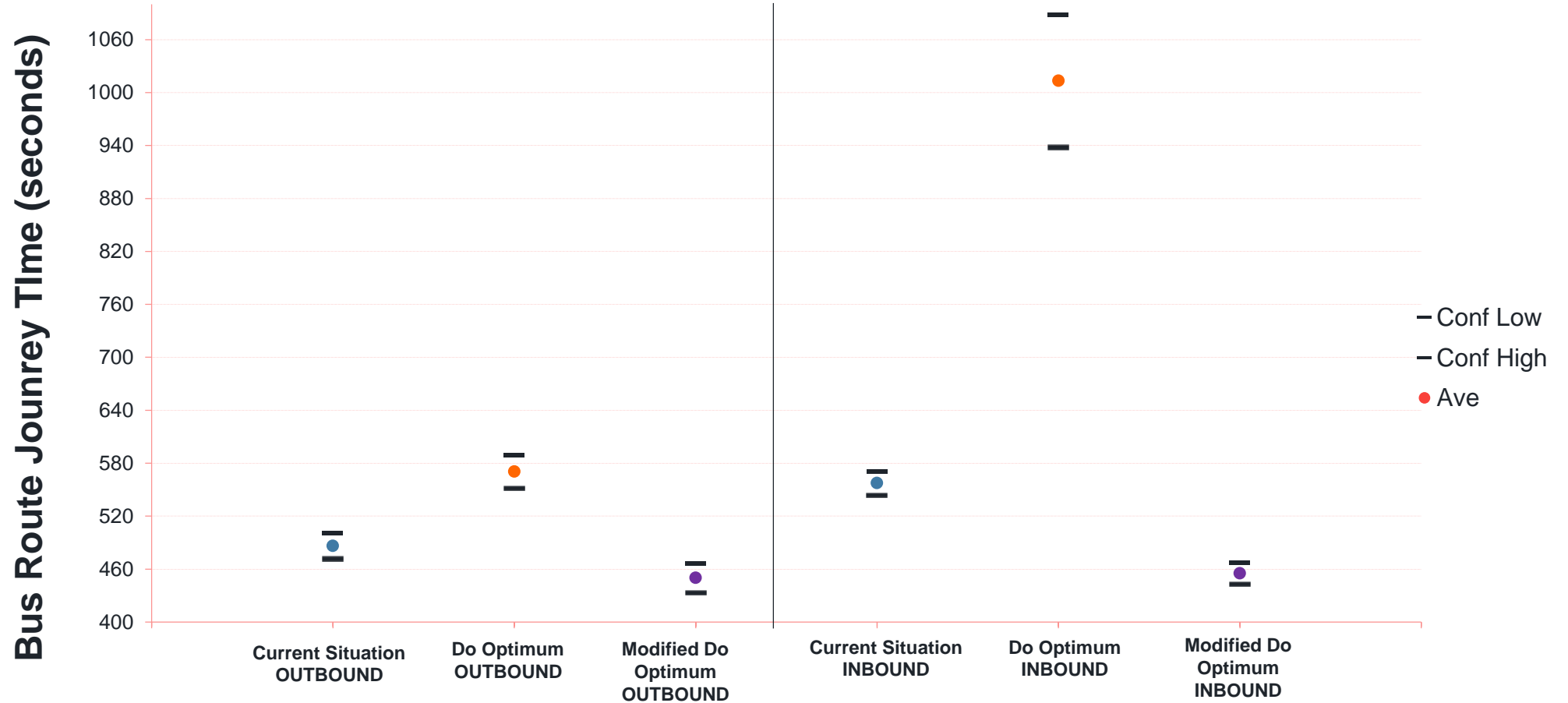
- In comparison between the 'Modified Do Optimum' scheme and the 'Current Situation' the table below shows that bus lanes distance remain at a similar level

BUS LANE DIRECTION	Current Situation	Modified Do Optimum	Difference
OUTBOUND	110m	430m	+320m
INBOUND	1015m	935m	- 80m
<b>TOTAL</b>	<b>1125m</b>	<b>1365m</b>	<b>+240m</b>

- Benefits are derived from better location and division between inbound and outbound bus priority needs, rather than extensive new amounts of bus Lane.
- As per the City Deal Boards Design Principles, no bus lanes run in parallel inbound and outbound along the same stretch of Milton Road.
- **Modelling does not currently include for bus hurry calls at junction so bus journey times should be even better than currently shown in 'Modified Do Optimum' but that this will increase non-bus journey times to a degree.**

# 'Modified Do Optimum' - BUS RELIABILITY

## AM Peak - Express A - Bus Reliability



- **AM Outbound** bus reliability is similar to existing but average bus journey times are improved over current 2016 situation by 36 seconds per bus (*likely to be much greater in 2031*)
- **AM Inbound** bus reliability is much improved over 'Do Optimum' with average journey times being 103 seconds faster than existing 2016 situation, per bus (*again likely to be much greater in 2031*)

# Modified Do Optimum – Meeting Design Requirements

DESIGN CONSIDERATION	Modified Do Optimum
Does the design meet to all the project objectives	✓
Does the design provide sufficient infrastructure to improve bus journey times and reliability?	✓
Would the design perform safely?	✓
Is it compatible with design guidance and standards?	✓
Are the key junction layouts the most suitable to achieve the right balance between traffic delays and improved bus journey times?	✓
Does the design fit within highway boundaries and with existing drive accesses?	✓



‘MODIFIED DO OPTIMUM’  
DRAFT CONCEPT

## ‘MODIFIED DO OPTIMUM’ – CONCEPT PLANS

The following slides set out concept plans for a ‘Modified Do Optimum’ design, which enables clear comparison with the original ‘Do Optimum’.

Please note the ‘Modified Do Optimum’ plans show a preferred **DESIGN CONCEPT only** and should not be considered as a detailed or final design.

If agreement of this concept is given by the City Deal Board. Detailed design based around this design concept will be worked up with input from LLF and stakeholders later in the year.

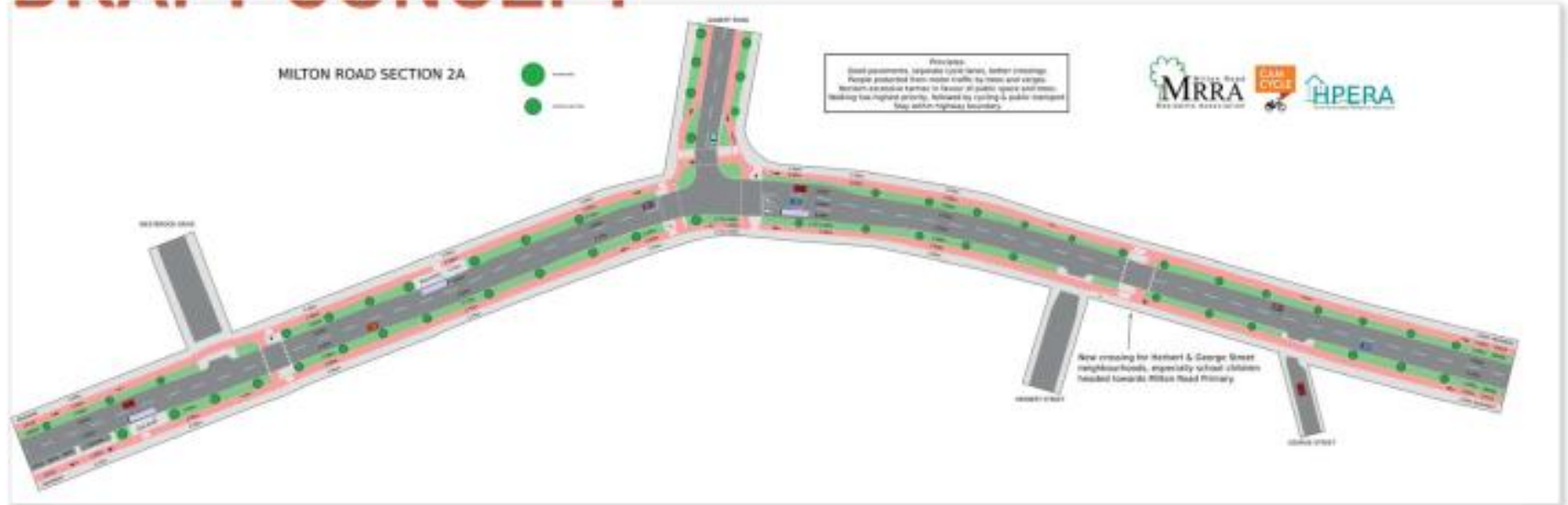
Please note the following areas of design have not been included at this time and will be designed (and located) in consultation with the LLF and key stakeholders:

- Bus stop locations
- Additional pedestrian crossings outside of the junction designs
- Detailed planting schemes

# 'Modified Do Optimum' - Mitchams Corner to Ascham Rd



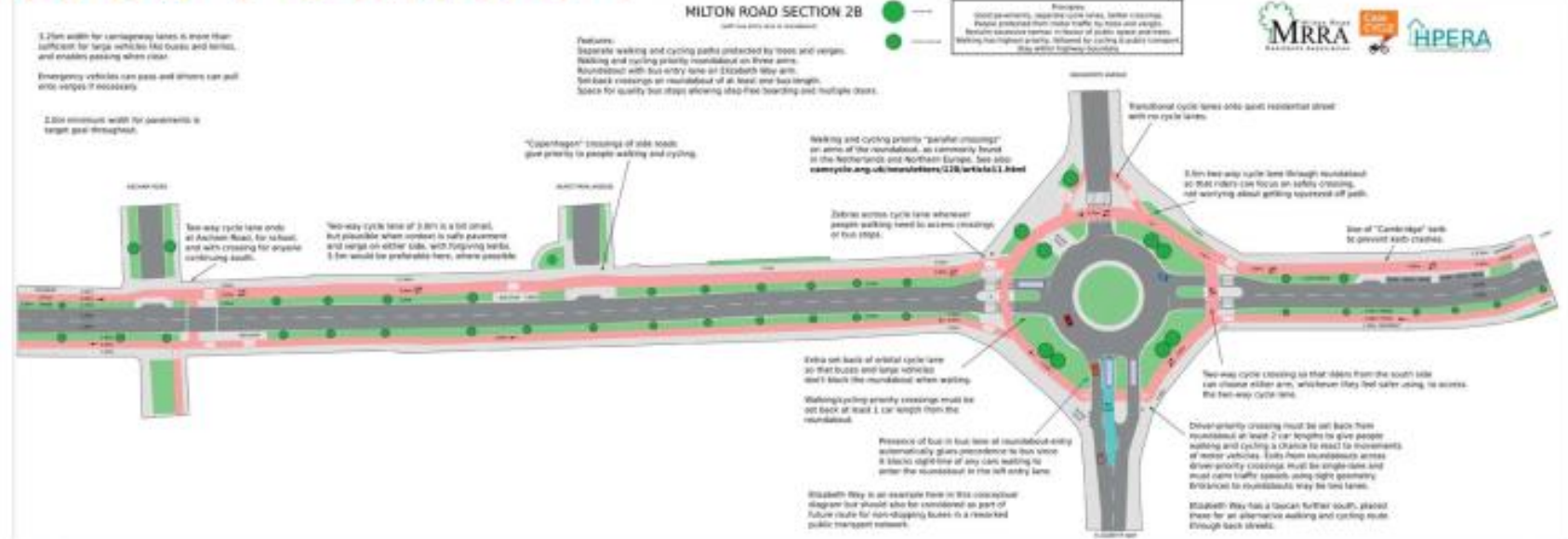
**DRAFT CONCEPT**



# 'Modified Do Optimum' - Ascham Rd to Oak Tree Ave



## DRAFT CONCEPT



# 'Modified Do Optimum' - Oak Tree Ave to Birch Close



## DRAFT CONCEPT

**MILTON ROAD SECTION 3A**  
with 'Simultaneous Green' junction and peak time 'break-jump' bus lane

**2.5m** two-way cycle lane is subterranean with, but worth considering where coordinated, if context is safe pavement and verge on either side.

Just an example of one possible configuration of space in front of shops. Bus stop locations are suggestions, as is crossing and loading bay. Diversions planned where there are always and existing access to site project might be trying to take up these access points through common agreement of the land owners.

Most of the reclaimed space here is clearly due to tighter spacing at the junction: staggered turns, less spiky. The shared verge of Union Ln is almost entirely set within its existing foot-line.

**2.25m** width for carriageway lanes is more than sufficient for larger vehicles, like buses and lorries, and enables passing when clear.

Emergency vehicles can pass and drivers can pull onto verges, if necessary.

**2.0m** minimum width for pavements is target goal throughout.

**3.0m** cycle lane can be narrower (down to 1.5m) for one-way for short sections such as behind bus stops, where there should also always be a 2.0m.

**Peak-time centre bus 'break-jump' lane** can be used as a right-turn lane off-peak. When bus is detected the traffic controller will schedule a bus early 'break-jump' at its next green phase.

A peak-time centre bus lane also regularly allows that right-turn into Arbury Road is banned during peak hours.

Another advantage of a centre bus lane is that buses further north can use gaps in traffic to pass other cars and enter the bus lane from a slip further up. This will work well in combination with an exclusive walking & cycling phase at Arbury Road junction.

All-ways exclusive walking & cycling phase used at Arbury Road junction in order to allow diagonal crossings and to simplify signal programming cycle.

The all-ways exclusive walking & cycling phase is also supplemented with another, shorter phase called 'Simultaneous Green' for cycling. It is an all-ways exclusive cycling phase that can be inserted in between any other phase at a short interval (less than 10 seconds).

Because people cycling clear junction quickly, and regulate crossing gaps naturally (e.g. at Midsummer Common, the short interval 'Simultaneous Green' can be used more than once each signal cycle in order to separate people cycling from motor vehicles entirely while still providing reasonable waiting times.

'Simultaneous Green' is effectively a shorter version of the all-ways exclusive walking & cycling phase that can be used where there is nobody waiting to walk across the junction.

Below, all every place on the cycle lane where people are expected to be walking across to access a crossing or a bus stop.

Examples of what different phases might look like. Actual selection of durations and signal programming will still depend upon traffic study and modelling.

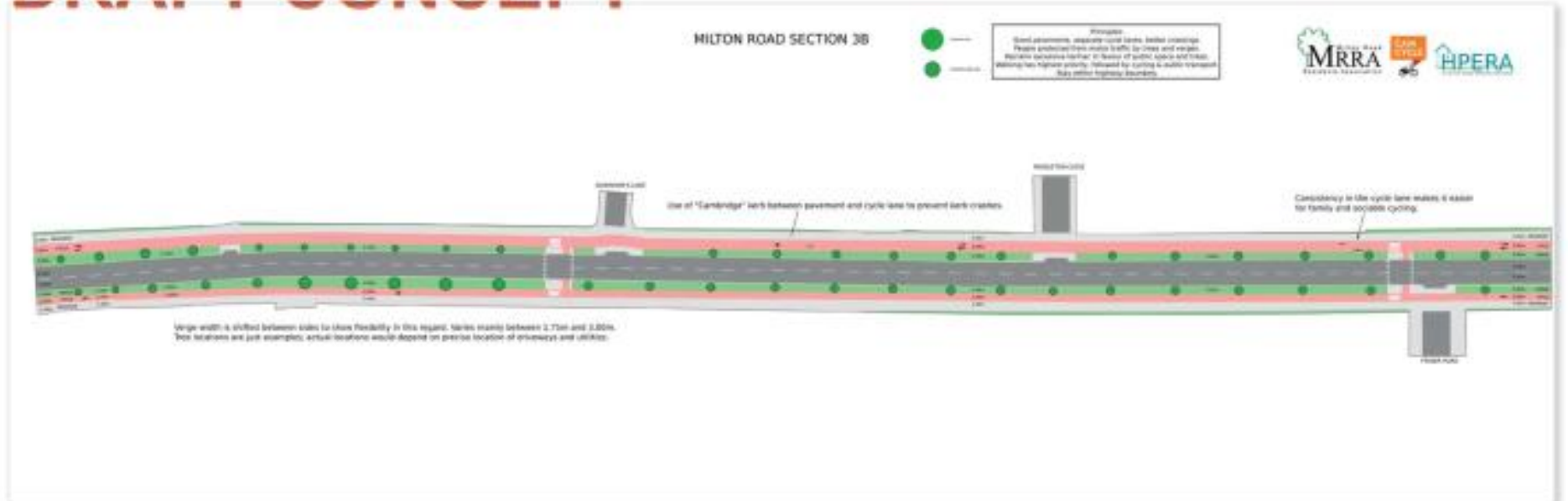
Bus Stop Lane Phase  
All-ways Green Phase  
Simultaneous Green Bus Lane Phase  
All-ways Green Phase  
Cycle Lane Phase  
Exclusive Walking & Cycling Phase

**MRRA** Milton Road Regeneration Authority  
**Cam Cycle**  
**HPERA** Hertfordshire Partnership Authority

# 'Modified Do Optimum' - Birch Close to Fraser Rd



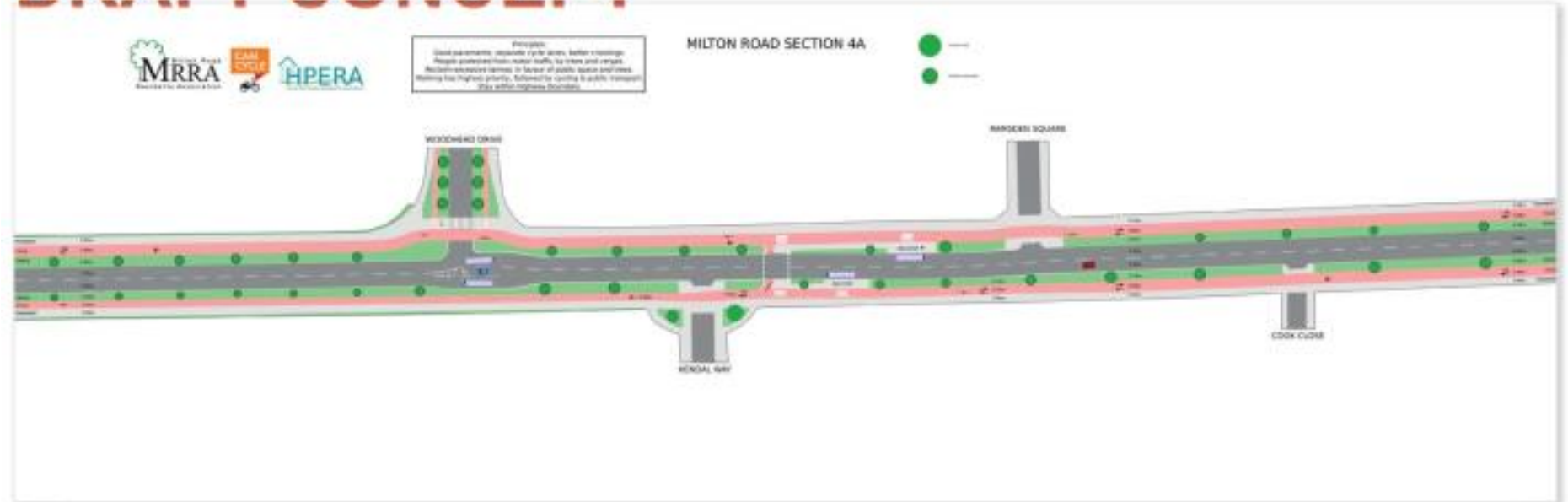
## DRAFT CONCEPT



# 'Modified Do Optimum' - Fraser Rd to Cook Close



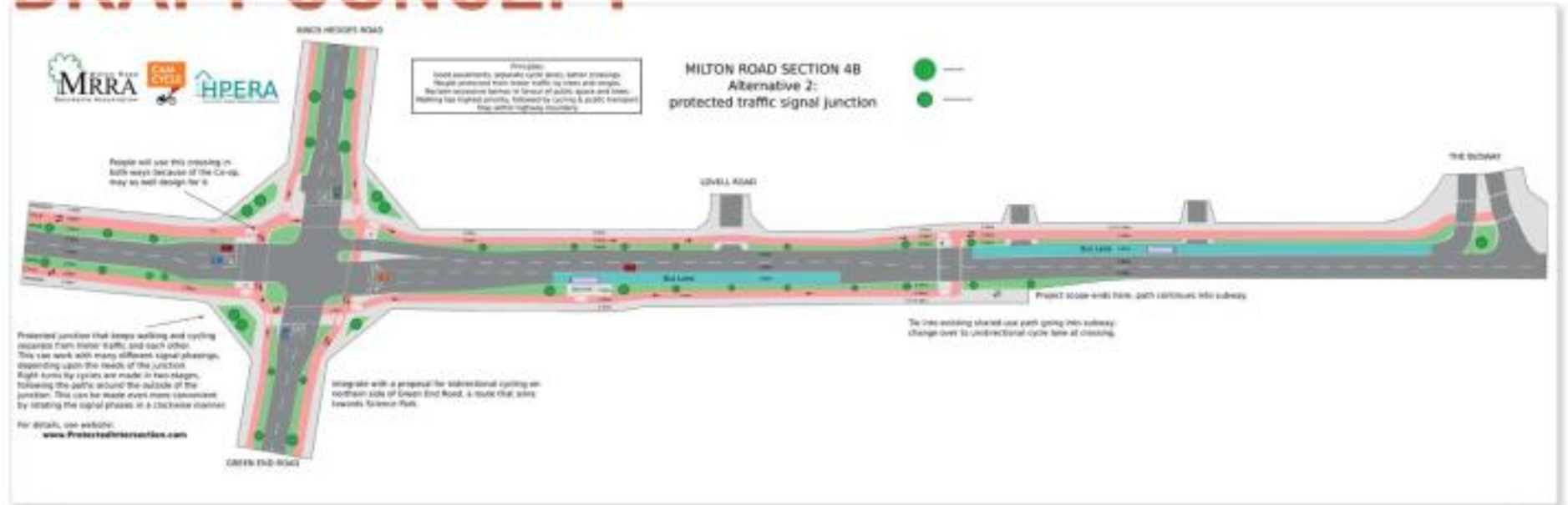
## DRAFT CONCEPT



# 'Modified Do Optimum' - Cook Close to The Busway



## DRAFT CONCEPT





Milton  
Road

# FUTURE PROGRAMME

wsp

# FUTURE PROGRAMME AND LLF ENGAGEMENT

## Future Engagement June / July 2017



### Summer / Autumn 2017

- LLF Design Workshop Trees to inform Detailed Design
- LLF Design Workshop Bus Stops and Crossings to inform Detailed Design
- Further LLF meetings as required to inform/influence emerging detailed design

### Early 2018

- Executive Board to consider detailed design
- **Full Public Consultation on approved detailed design**

Milton  
Road

Thank you

*wsp.com*

wsp