

Report To: Greater Cambridge Partnership
Executive Board

26 July 2017

Lead Officer: Chris Tunstall – Interim Transport Director

**Milton Road and Histon Road: Bus, Cycling and Walking Improvements
Delivery Priorities, Local Liaison Process and Design Principles**

Purpose

1. To:
 - (a) Consider future delivery priorities and project timelines;
 - (b) Review the outcomes from a Local Liaison Forum (LLF) workshop process for Milton Road; and
 - (c) Determine a design layout to inform the preparation of a detailed design and outline business case for Milton Road.

Unless stated otherwise, all background papers and materials referenced in this report are available here: <https://www.greatercambridge.org.uk/transport/transport-projects/milton-road/>

Context

2. The Greater Cambridge Partnership is a unique opportunity to support economic growth of the Greater Cambridge region and to enhance quality of life for people in Cambridge and South Cambridgeshire. The Greater Cambridge Partnership aims to invest £1 billion in the infrastructure we need to connect new homes and jobs, so our city region can grow in a sustainable way, benefitting those who live, work, and study and visit it.
3. Milton Road and Histon Road projects support the priority of achieving efficient and reliable movement between key existing and future housing and employment sites and are being delivered as part of the Tranche 1 infrastructure programme. In particular, the projects will support the delivery of new housing at Northstowe, Waterbeach and on the northern fringe of Cambridge and will provide improved links with employment sites such as the Science Park and Cambridge North Station, benefitting residents, commuters and business
4. The projects aim to provide improved infrastructure for buses to improve service reliability and journey times and encourage greater patronage. They also aim to significantly enhance the quality and safety of cycling and walking facilities whilst also enhancing the quality of the streetscape and public realm areas and the environment.
5. In August 2016, an LLF for the Milton Road project was established. Following extensive debate and discussion, the LLF has set out a number of resolutions and following a series of workshops developed a design option referred to as 'Do Optimum'.

6. The Milton Road LLF 'Do Optimum' proposal has provided a good basis for the development of the 'Final Concept' design. Officers will continue to work closely with the LLF to ensure that in the process of taking this concept to a fully detailed design, further aspects of the 'Do Optimum' will be carefully considered and incorporated where practical. As set out later in this report further workshops with the LLF are proposed to influence and inform the emerging detailed design with regard to bus stop location, pedestrian crossings, and trees / landscaping.
7. Subject to Board support for the concept set out in this report, over the coming months a detailed scheme design will be prepared along with an initial business case. The LLF should be fully engaged with this design process.

Recommendations

8. The Board is recommended to:
 - (a) Note the prioritisation of delivery of the Milton Road project ahead of the Histon Road scheme;
 - (b) Note the Milton Road Local Liaison Forum resolutions set out in Appendix B and agree the responses set out therein;
 - (c) Agree the 'Final Concept' design shown in Appendix D as a basis for detailed design work and the preparation of an interim business case to facilitate further public and statutory consultation;
 - (d) Note that wherever highway space permits, opportunities to adopt further aspects of the 'Do Optimum' design will be taken as part of the detailed design process;
 - (e) Support further engagement with the Milton Road LLF to help inform the detailed design process;
 - (f) Support discussions with relevant property owners to explore interest in a joint funding approach to potential streetscape and public realm improvements on land outside the public highway outside local shops along Milton Road; and
 - (g) Note the revised project timelines shown in Appendix H and the next steps in project delivery set out in this report.

Reasons for recommendations

9. A general design layout for Milton Road needs to be determined to facilitate a detailed design process and creation of a business case leading to a further public and statutory consultation process in 2018. The recommended design layout will provide a balanced approach to the delivery of the key objectives of the scheme, already approved by the Executive Board and the extensive work undertaken by the LLF in relation to the Do Optimum proposal.
10. Continued engagement with the Milton Road LLF will help support the development of a detailed design and provide local input into scheme mitigation measures.
11. The public realm aspects of the Milton Road scheme could be enhanced by collaborative working with landowners to provide streetscape improvements outside local shops. As this would involve the use of land outside the highway boundary, this could be approached on a joint funding basis, subject to the agreement of relevant landowners.

Delivery Priorities

12. Milton Road and Histon Road are both high priority schemes for the Greater Cambridge Partnership's programme and a key proposal within the Local Transport Plan 2011-2026. To avoid creating undue pressure on the road network in Cambridge it was planned that the projects would be constructed consecutively rather than concurrently.
13. In strategic terms the Milton Road scheme has a stronger case for early delivery. Whilst the planned developments at Northstowe (up to 10,000 homes), Waterbeach (up to 10,500 homes) and Ely (2,000+ homes) all have the potential to increase bus service provision on both routes, Milton Road is expected to experience the greatest growth in bus patronage and to cater for more of the additional bus trips generated by these major development sites. The influence of Cambridge North station is also likely to be greater on Milton Road.
14. It is planned that a similar report on the delivery of the Histon Road project will be considered at the November 2017 Executive Board meeting.

Background

Milton Road project objectives

15. As approved by the Executive Board on 9th June, 2016, the Milton Road project has the following key objectives, (in no particular order):
 - (a) Comprehensive priority for buses in both directions wherever practicable;
 - (b) Additional capacity for sustainable trips to employment/education sites;
 - (c) Increased bus patronage and new services;
 - (d) Safer and more convenient routes for cycling and walking, segregated where practical and possible;
 - (e) Maintain or reduce general traffic levels; and
 - (f) Enhance the environment, streetscape and air quality.

Executive Board considerations

16. At its meeting on 9th June 2016, the Executive Board considered a report on consultation feedback and resolved to;
 - Take forward the initial ideas in the 'Do Something' option for further design work including the Union Lane closure and Elizabeth Way roundabout ideas and 'floating bus stops', where highway space permitted, but excluding the ideas for banned turns at the Gilbert Road, Arbury Road and King's Hedges Road junctions;
 - Support development of traffic management measures to mitigate displaced traffic and parking for the purposes of further consultation; and
 - Note the important role of the Local Liaison Forum in involving local Councillors and stakeholder groups in the development of the detailed layout plans for consultation.

The Milton Road 'Do Something' concept plans are available in Appendix C of the Draft Options Report which is available here:

https://www.greatercambridge.org.uk/download/1780/Milton_Road_Histon_Road_Draft_Options_Report_22.09.15.pdf?type=inline

Engagement

17. In August 2016 a Local Liaison Forum (LLF) for the Milton Road project was established, with terms of reference agreed covering its remit and operation, in line with guidance provided by the Executive Board. Following its formation, the LLF submitted some initial resolutions to the Executive Board concerning the need for external expertise in public realm design, the approach to tree planting and need to avoid bus lanes on both sides of the road. The full response to these resolutions issued by the Executive Board is shown in Appendix A. The guidance given by the Executive Board in its resolution response has been considered carefully as the part of ongoing engagement and design work.
18. Between September and December 2016 a series of workshops were undertaken with the aim of facilitating local feedback on the preferred 'Do Something' option and exploring alternative ways of delivering the scheme objectives. Stakeholder participation at the workshops was agreed with the LLF. In response to the Executive Board's request, Kieron Perkins from spatial design agency, 5th Studio, was appointed to provide independent advice on streetscape design and public realm at the workshops.
19. Initially, the agenda for the workshops was targeted at assessing the pros and cons of the 'Do Something' option, considering key aspects that stakeholders wished to challenge and reflecting on the need for mitigation measures. As the process unfolded the workshops determined that more time should be spent on developing an alternative design which the LLF has called 'Do Optimum'.
20. The presentations given at the workshops and the workshop summary reports, along with the minutes of the LLF meetings and details of the 'Do Optimum' alternative proposal are available as background material.

LLF Resolutions

21. Having reflected on the outcomes from the various workshops, the LLF has prepared 12 resolutions many of which relate directly to the 'Do Optimum' alternative design, whilst others focus on measures to tackle congestion and delays in Cambridge. The resolutions are set out in full in Appendix B along with officer comments.
22. In assessing the resolutions to determine how these could be taken forward in future design work, officers have worked on an assumption that the resolutions should be adopted unless they conflict with or compromise significantly individual project objectives, established design guidance and standards or road safety needs.

Assessment of the 'Do Optimum' Design

23. Camcycle and local residents' associations put considerable and very good consideration into preparing the 'Do Optimum' conceptual scheme design that the LLF has endorsed. Officers have assessed this design against the original project objectives. The 'Do Optimum' concept provides high quality infrastructure for pedestrians and cyclists and allows for major enhancement to the urban realm and the environment along Milton Road. However, the 'Do Optimum' design does impact on the capacity for vehicular movement on Milton Road and on the ability to achieve significant bus priority measures. Officers have looked into how the design might be accommodated within existing highway boundaries as well as considering any engineering issues that would emerge if the design were taken forward for more detailed consideration.

Traffic modelling

24. To support the assessment of the 'Do Optimum' design and, in particular, the effects on traffic flows in peak periods, microsimulation traffic modelling has been undertaken using industry standard software (Paramics) to assess and compare the 'Do Optimum' against a 'Do Nothing' scenario. The key outputs from the modelling which is based on assumed 2031 traffic flows include bus and non-bus journey times and the expected peak hour queue lengths along the whole length of the proposed scheme. The results focus on the AM peak (8am-9am) and PM peak (5pm-6pm). The variations in bus journey times have been assessed to also provide an indication of how bus journey reliability would be affected within each scenario. Appendix C provides further details on the officer assessment and a summary of the modelling results.

Modelling results and conclusions (2031)

25. Compared with a 'Do Nothing' scenario, in the AM peak modelling of the 'Do Optimum' proposal shows a tripling of the current average vehicular journey times into Cambridge. Outbound journeys would more than double. In the PM peak inbound and outbound trips are both expected to increase significantly.
26. In 2031, bus reliability in the 'Do Optimum' scenario is worse in both directions in each peak when compared to the 'Do Nothing' scenario. Average journey times are also significantly longer.
27. In conclusion, whilst the 'Do Optimum' solution contains many concepts that should be taken forward in the final design, the modelling assessment demonstrates that this design concept, if taken forward without modification to junction design and bus lane length, would disadvantage vehicular movement and more significantly, result in a further deterioration of bus journey times and reliability.

Development of a 'Final Concept' design

28. In considering how best to develop the 'Do Optimum' design into one which could meet all of the key objectives of this scheme, alternative junction designs have been assessed with a view to balancing vehicle journey times along Milton Road whilst maintaining as many as possible of the 'Do Optimum' ideas for pedestrians, cyclists and landscaping. The length and position of bus lanes has also been optimised to enable the required element of bus priority whilst also maximising the opportunities for landscaping and tree planting.
29. In order to undertake a full assessment of the proposed modifications to junctions and bus lanes, Paramics and other individual junction modelling has been used to provide a direct comparison with the 'Do Nothing' and 'Do Optimum' scenarios. Further LLF meetings were held in May and June 2017 to seek feedback on the emerging modelling results and to test the initial ideas. The presentations given at these meetings and the minutes are available here:
<https://www.greatercambridge.org.uk/transport/transport-projects/milton-road/milton-road-llf/>

This further work and engagement has led to a 'Final Concept' design that better meets project objectives whilst also incorporating many of the positive elements of the 'Do Optimum' design and taking into account the concerns and ideas from local residents.

Final Design Concept

30. The plans in Appendix D compare, section by section, the 'Do Optimum' design with the 'Final Concept' design. It is recommended that the 'Final Concept' design should form the basis of future detailed design work and the preparation of an interim business case to facilitate further public and statutory consultation. **However, it needs to be highlighted that these plans only show a concept and it is emphasised that once detailed design work is undertaken it may be possible to accommodate more aspects of the 'Do Optimum' design, particularly for segregated cycling facilities at key junctions.** The LLF will be closely involved in this work to ensure that every opportunity to retain more 'Do Optimum' design details is fully considered.
31. Appendix C provides a comparison of the journey times, queueing and bus reliability for the 'Do Nothing', 'Do Optimum' and the 'Final Concept' design. The 'Final Concept' provides only 190 metres of additional bus lane to current levels as shown in Appendix F. However, these sections of bus lane are allocated more evenly between inbound and outbound bus travel in comparison to the 'Do Nothing' scenario which focuses bus lanes on inbound bus travel. The 2031 'Final Concept' bus reliability results show improved bus reliability for both directions of travel, improving average bus journey times inbound (even with a reduction of bus lanes on this side of the road in comparison to 'Do Nothing') and significantly improving outbound average bus journey times in comparison to 'Do Nothing' through increasing bus lanes on this side of the road. Further bus priority measures at traffic signals have not yet been applied in the 'Final Concept' scenario which has the ability to further reduce bus journey times but may lengthen non-bus journey times. To give an impression of how the final design would fit, images based on generic cross sections are provided in Appendix E along with before and after visualisations at various points along the route

Bus Design Aspects

32. The 'Final Concept' design provides the improved provision for buses where it is most needed. This will effectively improve both inbound and outbound journey times and reliability. There could also be scope to derive further benefits through the use of strategically placed bus gates, and bus hurry calls at the junctions. These options will be investigated further at the detailed design stage.
33. Whilst bus priority is a key scheme objective, the Board has acknowledged the need to ensure the length of bus lanes is balanced with other project objectives by seeking to avoid bus lanes on both sides of the carriageway at any point along the route.
34. The exact length of bus lanes required on each section will be influenced by how effectively the key junctions are designed to reduce the delays which generate the queues and slow moving traffic. **The 'Final Concept' design therefore shows the maximum length of bus lane that may be required to effectively achieve bus priority. The length of these bus lanes will be considered further in the detailed design with a view to reducing them where possible.** The queue lengths indicated by the modelling work will help to inform decisions on the lengths of bus lane required but the delays to bus movements arising from slow moving traffic conditions where stationary queues don't necessarily form also need to be allowed for to optimise bus journey times.

Cycling and Pedestrian Design Aspects

35. The 'Final Concept' design advocates using planting areas to separate the carriageway and cycleway and it is recommended that this design approach be adopted where space permits, subject to a minimum segregated cycleway width of 2 metres to allow for overtaking. Where width considerations would not allow for a 2 metre wide cycle lane, the cycle lane has been relocated adjacent to bus lanes to create more opportunity for those cyclists travelling at speed to overtake using a bus lane rather than choosing to use the pedestrian footway.
36. The design includes segregated crossing points at major junctions with the ability for both cyclists and pedestrians to cross in a single movement avoiding the need to cross via traffic islands in two stages. This approach provides better segregation of cycling and traffic movements at junctions and a more user friendly design and should be adopted wherever possible.
37. Local residents have expressed strong support for coherent two way cycling provision to be provided on the north-west (outbound) side of Milton Road between Ascham Road and Ramsden Square. This has been incorporated into the 'Final Concept' design but in some areas will compromise the width of verge that can be accommodated.
38. The 'Final Concept' design promotes the use of Copenhagen style crossings at side roads which give priority to pedestrians and cyclists over vehicles entering and exiting these roads. This design idea is taken directly from the 'Do Optimum' concept.

Gilbert Road junction

39. The 'Final Concept' design proposes to maintain something similar to the existing junction layout and that the signal staging should include a main road and side road vehicle stage along with an all-round pedestrian phase. In considering layout changes the need to avoid delays arising from motor vehicles turning right into the side road without compromising inbound cycle movements on the main road has been taken in to account.
40. There are concerns that there is insufficient space available for fully segregated cycle movements at this junction therefore provision for cyclists has been made by providing advanced stop lines. Further detailed design work needs to be undertaken to assess whether or not it is possible to achieve something nearer the level of segregation that is proposed in the 'Do Optimum' concept for this junction.

Elizabeth Way junction

41. The 'Do Optimum' design promotes the use of a Dutch style roundabout at this junction. While officers agree that this would provide enhanced facilities for pedestrians and cyclists, the modelling of this approach suggests that the single lane roundabout design would severely compromise vehicular capacity and would also have an adverse impact on achieving bus priority. The approach that consultants WSP-Parsons Brinckerhoff have taken to modelling the Dutch Style roundabout has been peer reviewed by consultants, Royal Haskoning DHV, who have specific expertise in this field. Royal Haskoning DHV has confirmed that the modelling outcomes are broadly in line with their expectations. The review report is available as a background document: <https://citydeal-live.storage.googleapis.com/upload/www.greatercambridge.org.uk/transport/MiltonRoad/Documents/Milton%20Road%20background.pdf>

42. The modelling work shows that replacing the existing roundabout with a signalised junction design would enable more effective traffic management and would provide greater opportunity to prioritise bus movements and allow coordination with the Arbury Road junction through linked signal timings to optimise the progression of buses; this could be achieved by creating a signalised two lane roundabout or through a signalised 'T' junction or crossroads. As set out in Appendix C, each of these design options has relative strengths and weaknesses. Whilst it would be feasible to take forward both design options for further detailed consideration, further engagement with the LLF has made it clear that there is much greater local support for the retention of a roundabout at this location.
43. Therefore, the 'Final Concept' design provides a conceptual design for a two lane signalised roundabout with fully segregated pedestrian and cycling facilities. The roundabout would retain two lanes in order to maintain capacity for vehicular movements. There is the need for further detailed design work to inform the final concept and it is proposed that Royal Haskoning DHV be commissioned to support this.

Arbury Road junction

44. In response to feedback from the LLF on previous design iterations which included restrictions on motor vehicles accessing or egressing Union Lane to reduce main road delays, the 'Final Concept' design for this junction proposes to maintain the existing junction signal operation of the junction with further consideration to be given to the segregation of cycling movements as part of detailed design work. This will include an all-round crossing stage for pedestrians and cyclist across all arms of the junction.
45. There may also be the opportunity to enhance traffic flows along Milton Road by limiting the Union Lane stage to every other sequence. This will be tested in the detailed design stage.

King's Hedges Road junction

46. The 'Final Concept' design aims to incorporate all of the aspirations of the 'Do Optimum' design option for a signalised cross road. Cyclists are fully segregated from the traffic, and the cycle / pedestrian crossing facilities are continuous. It is considered that this solution provides the best balance in terms of allowing effective traffic management while also providing enhanced infrastructure for pedestrians and cyclists.

Landscaping Design Aspects

47. The delivery of the 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 taking into account relevant design guidance, in particular that developed by the Tree Design Advisory Group (TDAG) <http://www.tdag.org.uk/about-tdag.html> the key aspects of which are also set out in Appendix G. Initial officer landscaping advice suggests the planting of trees with a girth no larger than 16-18cm which in size equates to 3-5m high. At that size the tree planting will have a 'presence' along the road and will have a better chance of becoming successfully established. Improved planting technology with purpose built tree pits will support this. Whilst the final concept design indicates areas of verge, some narrow areas may be hard landscaped where their width is less than 1 metre, in line with TDAG guidance.

Additional Streetscape

48. In line with LLF resolutions, it is recommended that consideration should be given to streetscape improvements outside local shops. As this would involve the use of land outside the highway boundary, this could be approached on a joint funding basis, subject to the agreement of relevant landowners.
49. As part of the detailed design work it is also recommended that consideration is given to the introduction of rain gardens in verge areas to help manage surface water run off as an element of sustainable drainage.

Project Mitigation

50. The need for parking mitigation measures has been considered at the design workshops and concerns have been raised through the LLF resolutions over the impact on residents parking and the lack of visitor parking resulting from commuter parking. The need for measures to address through traffic movements on some side roads was also raised but a clear idea of the scope and type of measure that might be required has yet to be established. Further work will be required on this and the LLF and residents will be closely involved. Further surveys are planned to assess the amount of through traffic currently using side roads along the route.

Next Steps

Design and Business Case

51. Subject to Board support, a detailed scheme design will be prepared over the coming months along with an initial business case. A 'drive through' visualisation of the detailed design will also be developed to give an impression of how the design would look at street level. The design work will also focus on developing public realm design aspects. Kieron Perkins will be invited to work alongside designers from the project design consultants, WSP/Parsons Brinckerhoff, and officers from the City Council's Streets and Open Space Team. It is envisaged that the detailed design will be available for final Board approval in early 2018.

Mitigation Measures

52. Consideration would be given to traffic management measures to address local concerns over through traffic movements on routes directly adjacent to the scheme that have a history of 'rat running', namely Ascham Road/Gurney Way, Ramsden Square and Lovell Road. A package of mitigation measures will be developed for consideration by the Executive Board when it also considers approving a detailed design for public and statutory consultation.
53. Greater Cambridge partnership is providing funding to allow further residents' parking schemes to be delivered across Cambridge and the area surrounding the lower section of Milton Road (the city centre side of Arbury Road and Union Lane) has been identified for early consideration. The measures that emerge from this process will include accommodating the parking needs of Milton Road residents who do not have off-street parking or garaging which would be displaced from Milton Road. The streets bordering Milton Road to the north would be considered later in the roll-out of residents' parking schemes but the intention is that alternative parking provision for any residents' parking displaced by the Milton Road project would be in place prior to the commencement of construction work.

54. Consultations on residents parking are expected to commence later this year and a survey of Milton Road residents parking needs will be undertaken prior to this, as advocated by the LLF.

Engagement

55. The LLF and the local community will be closely involved in the fine detail of the design through further workshops and forum meetings. The project team will continue to engage with the LLF on detailed design matters to take on board local feedback to build support for the emerging design. As well as referring significant matters to the full LLF, a smaller working group of representatives from the LLF to work alongside the project team would be useful to facilitate day to day discussions on local design aspects to keep things moving forward, expeditiously. Discussions would cover such matters as construction materials, tree planting, sustainable drainage measures, street furniture and the emerging ideas for streetscape and public realm improvements. The LLF would also be asked to support the development of residents' parking measures in the side roads adjacent to Milton Road.

Procurement

56. The Board has previously supported the delivery of the project through the Eastern Highways Alliance Framework based on a design and build contract. Towards the end of 2017 the process of appointing a contractor to develop the detailed layout plan into a full engineering design will begin.

Programme

57. Based on the recommendations set out in this report, a revised project timeline has been prepared which is shown in Appendix H. Particular attention is drawn to the assumptions set out in the timeline which have the potential to impact on the delivery timetable. The timeline will be developed in more detail as clarity over the detailed design emerges.
58. Subject to the completion of detailed design work and the further associated traffic modelling, to underpin the scheme design, and an initial business case to demonstrate the benefits for the project, it is proposed to include the statutory consultation on draft traffic regulation orders as part of the next public consultation, thereby shortening the delivery timetable.

Officer Delegation

59. The Board resolutions passed on **9th June 2016** included giving delegated powers to the Executive Director (ETE) to approve a scheme design for the purposes of consultation. Given the change in the programme set out above, it is no longer necessary to exercise this delegation and the detailed design that emerges from the work over the autumn/winter period will be considered and agreed by the Board, prior to any decision on further public and statutory consultation.

Implications

60. In the writing of this report, taking into account financial, legal, staffing, risk management, equality and diversity, climate change, community safety and any other key issues, the following implications have been considered: -

Financial and other resources

61. The scheme development and implementation is funded from the GCP funding.

Legal

62. No significant legal implications have been identified at this stage although they may emerge as the project moves towards the statutory process stage.

Staffing

63. Project management is undertaken by Cambridgeshire County Council. Design work would be undertaken by consultants WSP-Parsons Brinckerhoff. All schemes are worked up in collaboration with the District Councils.

Risk Management

64. A full project risk register forms part of the Project Plan.

Equality and Diversity

65. There are no equality or diversity implications in this report.

Climate Change and Environmental

66. The proposed measures have the potential to reduce congestion and improve air quality in the longer term through encouraging a shift towards sustainable transport modes.

Community Safety

67. The measures being developed on Milton Road will help reduce road casualties and improve road safety.

Consultation responses and Communication

68. This report sets out a plan for further formal public and statutory consultation. The Local Liaison Forum and further informal stakeholder meetings, ahead of further formal consultation, will also help facilitate engagement on the project.

Background Papers

As set out in the report.

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Appendix A

EXECUTIVE BOARD LLF RESOLUTIONS RESPONSE - 14th September 2016

Councillor Jocelynn Scutt
Chair- Milton Road Local Liaison Forum
Councillor Roger Hickford
Chair, Greater Cambridge City Deal Joint Assembly
cc Greater Cambridge City Deal Joint Assembly

Dear Roger and Jocelynn

PROPOSALS FOR MILTON ROAD

I am writing on behalf of the City Deal Board, as I committed to do within a fortnight of our meeting on Thursday 1st September, to address three key inter-linked issues on the City Deal proposals for Milton Road and respond to the Milton Road Local Liaison Forum (LLF), petitioners and the City Deal Assembly.

We welcome the input from residents, the work begun by the Milton Road LLF and the consideration given by the Assembly. The LLF discussions and the forthcoming workshops will make a crucial contribution in influencing the shape of the final scheme design on the Milton Road proposals.

On the first issue raised, independent external consultants with expertise in public realm, landscaping, trees and verges will be appointed as part of the Milton Road project, and will attend the Milton Road LLF and workshops. We will confirm the detailed arrangements with the Chair of the LLF, and ensure that their advice enables different design and public realm options to be considered including proposals from the LLF.

The Board, like the City Deal Assembly, is committed to a successful future design for Milton Road that achieves and integrates the following three core objectives in the final design for Milton Road

- increased bus reliability and improved journeys, leading to new services, increased frequency and reduced congestion
- high-quality cycling infrastructure and pedestrian provision
- high-quality design and public realm linked to wider measures to cut peak-time congestion, and other elements of the City Deal transport strategy.

Therefore, on the second and third issues raised on the Milton Road proposals

a we want to be clear as a Board that we support an avenue of mature trees as a core design element along Milton Road, and also the provision of grass verges and planting, and effective wider public realm and landscaping

b we also state that the Board's preference will be for a design, as was said by Board members at its earlier June meeting, that avoids the need for double bus lanes on any stretch of the road including the section from Hurst Park Avenue to Oak Tree Avenue, so that this stretch would have a maximum of three motorised lanes.

On the detail of both, as on other aspects of the proposed Milton Road design and future journey projections, we ask the LLF to give these issues and tree choice careful consideration, and look forward to seeing your recommendations in your final report, consistent with achieving the three core objectives of the scheme.

We also ask the LLF to consider tree provision for sections of the road, such as the southern end from Mitcham's Corner to Highworth Avenue, where provision is currently low and can be improved.

We look forward to seeing the LLF final report and conclusions later. Board members will also want to meet the chair and vice chair of the Milton Road LLF, as we will for Histon Road and for all LLFs, to discuss their final reports. The Board and Assembly will then consider the LLF recommendations and wider analysis before reaching conclusions.

Yours sincerely

Councillor Lewis Herbert Chair – Greater Cambridge City Deal Executive Board

Appendix B

MILTON ROAD LLF RESOLUTIONS AND OFFICER RESPONSES

LLF Resolution	Officer Commentary
<p>Alternative proposal</p> <p>The Milton Road LLF has considered the alternative proposal for the layout of Milton Road developed by local residents' associations together with Camcycle known as the 'Do-Optimum' design, details of which are provided separately. The design incorporates feedback received during the workshops on cross-sections, allocation of space, major junction layouts and landscaping. It offers a great opportunity for Cambridge to pioneer a welcoming, best-in-class, tree-lined gateway into the city that will transform the way people choose to travel, because it will provide a safe and calming environment for all modes of use. From the evidence of the workshops it is very likely to attract majority support from local stakeholders, and the LLF believes that it meets the objectives of the City Deal Board to a greater degree than the 'Do-Something' proposals.</p> <p>R1. Accordingly, the Milton Road LLF requests the Board to direct officers to develop the Do-Optimum proposal, which is consistent with the Board's remit.</p>	<p>When assessed against the project objectives, the 'Do Optimum' proposal achieves a significant improvement in the quality of the streetscape and meets the objectives set for improving walking and cycling trips.</p> <p>However, it provides limited measures to improve bus journeys, which is a key scheme objective. Traffic modelling has shown that some of the junction layouts included as part of the 'Do Optimum' proposal will significantly increase delays for buses rather than reduce them. Therefore, changes need to be made to the concept to better respond to the key objective of improving bus journey times and reliability.</p> <p>Recommended response: note the resolution and confirm that future design work will use the 'Do Optimum' as a base but with modifications to better address the needs of bus trips</p>
<p>Union Lane/Milton Road</p> <p>The proposal to close Union Lane was rejected on at least two previous occasions before the large-scale redevelopments of the former Chesterton Hospital and Pye factory sites were completed. Union Lane gives access to and from schools and shops in Chesterton and Arbury/Kings Hedges. The alternative route is via the roundabout at the junction of Chesterton High Street and Elizabeth Way which already operated at 167% of design</p>	<p>The longer the delays on the approach to the Arbury Road/Union Lane junction, the longer the bus lanes need to be to allow buses to bypass traffic queues. Rationalising the layout of the junction to reduce main road delays will allow the lengths of approaching bus lanes to be reduced, thereby providing more room for other elements of the highway cross section such as verges and tree planning areas.</p> <p>Whilst closing the Union Lane arm of the junction to motorised traffic would provide an improved layout for cycle movements as well as additional space for landscaping improvements the impact on local accessibility is recognised.</p>

<p>capacity when last measured some time before the year 2000. The Milton Road LLF considers that the proposed closure of Union Lane will make that situation even worse and put unacceptable traffic pressure on to Green End Road and the High Street within and through East Chesterton as well as some secondary routes, and is likely to result in an increase in journey time for bus passengers on routes within East Chesterton. Union Lane is also used as an important link into the community health/out-of-hours services at Chesterton Medical Centre.</p> <p>R2. The Milton Road LLF therefore requests the Board to reject the closure of Union Lane junction as proposed and to direct officers to investigate alternative ideas for the junction, and to consider mitigation measures such as double yellow lines on the South-West side of Union Lane from the junction down to Pearl Close.</p>	<p>Inevitably, allocating more road space and capacity to sustainable transport modes, such as closing off access to Union Lane, will result in longer journey times for car based trips using other parts of the road network but this has to be set against the benefits the Milton Road scheme will provide. If no changes are made at the junction, delays will continue to grow which may also lead to more traffic using roads through East Chesterton as an alternative route.</p> <p>Rationalising the operation of the junction signals to provide more green time for the main road is considered an important part of the scheme design. However, it is recognised that the potential to displace traffic on to other roads through a close of the Union Lane arm is of local concern, as is the impact on overall accessibility of the East Chesterton area by motor vehicle.</p> <p>Officers have considered two further options that keep open the Union Lane arm:</p> <ul style="list-style-type: none"> A) With the left turn from Union Lane prohibited for motor vehicles B) Running the Union Lane signal stage only every other cycle <p>However, whilst these also help manage main road delays they have detrimental impacts on local accessibility and environmental conditions through displaced traffic and longer queuing in Union Lane.</p> <p>Recommended response: note the resolution and proceed with a detailed design on the basis of retaining the current signal operation but with layout changes to enhance cycling and pedestrian movements and incorporating the ideas for double yellow lines.</p>
<p>Elizabeth Way/Highworth Roundabout</p> <p>The workshops revealed a strong consensus for retention of a roundabout at this junction but redesigned with additional safety features. There was also agreement that any congestion that sometimes occurs is due to the traffic lights at the Arbury Road junction and the poor location of bus-stops in that area.</p>	<p>The 'Dutch' style roundabout design included within the 'Do Optimum' proposal would deliver improved conditions and safety for walking and cycling. However, a roundabout layout would perpetuate the current problem whereby the heavy outbound Elizabeth Way traffic flow has priority over outbound Milton Road traffic in the evening peak period which is to the detriment of outbound bus movements on Milton Road.</p> <p>Traffic modelling suggests that traffic delays would increase very significantly,</p>

<p>R3. The Milton Road LLF calls on the Board to take forward a roundabout design based on that in the ‘Do-Optimum’ scheme, which also includes vehicular access to Highworth Avenue.</p>	<p>consequently reducing bus journey times and reliability.</p> <p>Modelling suggests that signalisation of the junction would facilitate priority for buses and allow better co-ordination with the Arbury Road junction as well as improving road safety.</p> <p>Recommended response: note the resolution and proceed with a detailed design exercise based on the concept of a signalised roundabout with segregated pedestrian and cycle facilities with access/egress for Highworth Avenue retained.</p>
<p>Two-Way Cycling Lanes The Milton Road LLF considers that the density of cycle traffic, particularly involving school children at peak times, requires that two-way cycle lanes should be established.</p> <p>R4. The LLF requests the Board to require that any plans carried forward for Milton Road should incorporate two-way cycling safety features at the following locations:</p> <ul style="list-style-type: none"> • between Ascham Road and the Kings Hedges Road junction on the N-West side where the majority of schools, pubs, shops, library and community hubs are located; • between Herbert Street and the Ascham Road toucan crossing on the S-East side or, alternatively, by providing a two-way crossing between Herbert Street and George Street. 	<p>The key design challenge for the scheme has been trying to accommodate all the desired elements of the road cross section within the space available between highway boundaries. In some sections such as between Gilbert Road and Ascham Road, the highway width does not provide sufficient room to accommodate a two way cycling facility on the north west side and all the other elements necessary to deliver the scheme objectives. However, on other sections it may be possible to cater for bi-directional cycle movements on one side.</p> <p>Wherever possible pedestrians would be segregated from other transport modes but in some sections where highway width is more limited, compromises would need to be made and some sections of shared use cycle/footway may be a more viable solution to cater for two way cycle movements on one side of the road.</p> <p>The desire to cater for two way cycling movements on the north west side to avoid young and less confident cyclists from needing to cross the road, particularly for school related trips, is understandable. The scheme design could seek to provide for this where road space permits.</p> <p>Recommended response: note the resolution and the desire to cater for two-way cycle movements on the north west side and support the development of a design that caters for bi-directional cycling on one side where space permits</p>

<p>Walking and Cycling Safety There was strong consensus in the workshops on the need for improved walking and cycling safety along Milton Road.</p> <p>R5. The LLF urges the Board to instruct officers to implement segregation of pedestrians and cyclists from motor traffic by trees and grass verges on both sides of the road in any new design, consistent with the Board's letter of 14th September 2016.</p>	<p>The Executive Board has previously indicated its expectation that the scheme design would include bus lanes to achieve priority for bus movements but that the design should avoid bus lanes on both sides at any point.</p> <p>Once space is allocated for a bus lane where required there is not sufficient room available within the highway to accommodate tree planting on both sides of the road on all sections of Milton Road.</p> <p>Segregating cycling movements from the carriageway by using trees and verges would create a more pleasant environment for cyclists but from a safety perspective this could be a double edged sword.</p> <p>Conflict with passing traffic would obviously be reduced although a combination of higher cycling speeds on high quality segregated cycle lanes with a landscaping buffer adjacent to the traffic lane might create greater risk of conflict with drivers turning into private drives as cyclists may be less conspicuous. This aspect would need to be considered carefully through the safety audit process but, on balance, this design approach should be taken on board where highway space permits.</p> <p>Where a cycleway is bounded by a footway and a landscaped area a minimum cycleway width of 2metres is recommended to cater for overtaking and avoiding the risk of faster cyclists abandoning the cycleway in favour of bus or traffic lanes.</p> <p>Recommended response: support the resolution subject to a minimum segregated cycleway width of 2 metres</p>
<p>Priorities at Minor Road Junctions</p> <p>R6. The Milton Road LLF considers that walking and cycling would be enhanced if footpaths and cycle lanes were to have priority over vehicle traffic at all minor road junctions not controlled by traffic lights, and the LLF requests the Board to require that any plans carried forward for Milton Road should</p>	<p>The scheme design should seek to redesign all minor side road junctions to provide as much priority for walking and cycling movements as possible and to enhance their safety. The suggested 'Copenhagen' style design would be a good starting point upon which to base future design work.</p> <p>Recommended response: support the resolution for the purposes of future design work</p>

<p>incorporate safety features at minor junctions such as Copenhagen crossings, and that this should also incorporate intermediate level changes as an aid to persons with a visual impairment.</p>	
<p>Parking outside the shops near Arbury Road</p> <p>The Milton Road LLF believes that the prosperity of the shops on Milton Road near the Arbury Road junction depends on the retention of the short-term parking close to their premises.</p> <p>R7. The LLF requests the Board to ensure that cycle and short-term car parking is properly catered for adjacent to the shopping areas of Milton Road near the Arbury Road junction and enter into negotiations with shop owners with a view to improving the quality of the streetscape.</p> <p>R7a. The LLF requests the Board to ensure that cycle and short-term car parking is properly catered for adjacent to the shopping areas of Milton Road in the vicinity of Mitcham's Corner and to enter into negotiations with shop owners with a view to improving the quality of the streetscape.</p>	<p>Given the space constraints on the section approaching Mitcham's Corner, there is limited scope for any significant streetscape improvements outside the parade of shops but the Board may wish to include the private forecourt areas in front of the shops within the scope of the scheme.</p> <p>The forecourt area outside the shops on the Arbury Road approach offers a significant opportunity for enhancing the quality of the streetscape and public realm. However, it lies outside the highway boundary and the Executive Board would need to take a view on whether it is prepared to invest funds in improving land in private ownership, albeit an area the public have always had access to.</p> <p>If it were possible to relocate parking for the shops to within the private forecourt area, as part of a streetscape improvement, this would free up highway space for landscaping, the servicing of shops and cycling and pedestrian needs.</p> <p>Provided there was an interest from the land owners, it would be worthwhile considering a joint funding approach to allow the whole area to be improved and integrated into the scheme design, thereby providing an 'added value' aspect.</p> <p>Recommended response: support the resolutions for the purposes of future design work</p>
<p>Parking on Milton Road</p> <p>The Milton Road LLF believes that the presence of free parking on Milton Road encourages non-essential motor traffic to enter the area which exacerbates congestion and air pollution. The vast majority of residential properties along the road already have access to off-road parking spaces. The few that do not should be catered for by provision of a limited number of spaces and/or vehicular</p>	<p>Removing parking along Milton Road would create more opportunities to balance the conflicting needs for highway space. Alternative spaces would need to be provided to cater for any residential properties without off-street parking.</p> <p>The favoured location to provide alternative spaces would be in neighbouring side roads as providing residents' parking spaces on the main road would conflict with the continuity of other design elements given highway space constraints. This could be linked with measures to prioritise parking in side roads for local needs and</p>

<p>access for trades vehicles (e.g. Nos.168-172)</p> <p>R8. The LLF requests the Board to instruct officers to carry out an audit of residential properties without off-road parking spaces and make suitable provision for them.</p>	<p>to prohibit long stay and commuter parking.</p> <p>Whilst parking surveys along Milton Road and in the side roads have already been undertaken, direct contact with all Milton Road frontagers to determine those properties without off-street parking and/or a reliance on on-road parking would be a useful step.</p> <p>The design process will also consider the scope for providing 'servicing' areas along the route to cater for deliveries but on some sections this will be difficult without compromising the continuity of other design elements.</p> <p>Recommended response: support the resolution</p>
<p>Bus Stops</p> <p>The Milton Road LLF considers that bus stops should be sited between trees, becoming in effect floating bus stops but without the disadvantages of the Hills Road variety, and that they should not be clad with illuminated advertisements which are a major source of irritation to residents. The safety of pedestrians, particularly children and those with disabilities, is of the utmost importance, so step-free boarding should be incorporated.</p> <p>R9. The Milton Road LLF requests the Board to direct officers to observe the design principles set out in the preamble to this resolution when siting bus stops on Milton Road and to provide the following at or near every bus-stop</p> <p>a) a zebra crossing across the adjacent cycle path; and</p> <p>b) a toucan crossing across Milton Road</p>	<p>Providing laybys at bus stops would impact significantly on the continuity of other design elements, particularly those for cycling, given the highway width constraints. Therefore, the scheme design would focus on kerb side bus stops taking into account the layout design advocated in the 'Do Optimum' proposal where practical and possible.</p> <p>The idea of providing a toucan crossing at each bus stop location would add significantly to scheme costs and would be difficult to justify at some stops based on likely use. However, current crossing and bus stop locations will be reviewed to ensure that controlled facilities are available within a reasonable walking distance to cater for crossing movements associated with bus stops.</p> <p>Recommended response: note the resolution and confirm that the layout design advocated in the 'Do Optimum' proposal would be taken into account where practical and possible</p>
<p>Other Design Requirements</p> <p>The workshops revealed considerable dissatisfaction with the current layout, safety and operation of the Golden</p>	<p>A 'Dutch' style roundabout layout would increase delays significantly and do nothing to improve bus journey times and reliability. However, the 'Do Optimum' signal design should be given further consideration during the detailed design work</p>

<p>Hind junction. There were also concerns about the current location of bus-stops, the lack of crossings along Milton Road, drainage and the needs of children and persons with a physical or visual disability.</p> <p>R10. The LLF urges the Board to consider new design options for the Golden Hind junction using protected crossings for both pedestrians and cyclists based on a continental-style roundabout or signalised crossing (see ‘Do-Optimum’ designs) and to consider locating a toucan crossing close to the Fraser Road junction.</p>	<p>to achieve the best segregation of cycling and pedestrian movements at the junction.</p> <p>Crossing movements between Fraser Road and Woodhead Drive are catered for by a traffic island but the need to provide a controlled crossing is recognised. Future design work would include a review of crossing facilities on the section between Downham’s Lane and Kendall Way with a view to providing more controlled crossing facilities in the most useful locations.</p> <p>The scheme design will respond to the needs of those with mobility impairment and other disabilities, in accordance with current design guidance and standards.</p> <p>Highway drainage can be enhanced by incorporating sustainable drainage features such as rain gardens within landscaping areas.</p> <p>Recommended response: support the resolution and confirm that:</p> <ol style="list-style-type: none"> I. future design work at the Golden Hind junction would retain signal control but incorporating the ideas for crossing points contained in the ‘Do Optimum’ design II. consideration would be given to the provision of a toucan crossing close to Fraser Road
<p>Traffic Reduction Measures</p> <p>The Milton Road LLF believes that a major reduction in traffic density would be achieved if city-wide controlled parking schemes were introduced (ideally without imposing a financial set-up charge on householders). This would eliminate non-essential commuter parking and associated traffic and is likely in itself to negate the need for other measures to speed up bus journeys.</p> <p>R11. The Milton Road LLF urges the Board to use its influence with the County Council to a) remove the charges at Milton Park and Ride site and</p>	<p>The County Council is considering the future of the parking charge at Park & Ride sites.</p> <p>The GCP’s 8-point plan being developed to tackle congestion in Cambridge includes proposals to tackle commuter parking.</p> <p>If the Milton Road scheme design requires the removal of on-street parking then alternative parking spaces will need to be provided for main road residents without off-street parking, potentially in neighbouring side roads.</p> <p>As part of this work the opportunity could be taken to develop wider parking controls in the neighbouring areas to remove commuter parking and introduce further residents parking schemes as envisaged in the GCP’s 8-point plan.</p>

<p>b) work together with Milton Road residents and residents of the Milton Road neighbourhood to tackle problems arising out of commuter parking in residential streets in this area and</p> <p>c) further to b), where necessary and with agreement of residents, through the introduction of residents' parking schemes and</p> <p>d) take this resolution into account in respect of all Park and Ride sites and problems of commuter parking throughout Cambridge.</p>	<p>Recommended response:</p> <ul style="list-style-type: none"> a) note the resolution and bring to the attention of the County Council b) support the resolution c) support the resolution d) note the resolution and consider in the context of the City Access study
<p>Alternative Traffic Routes</p> <p>Ideas developed during the workshops included re-routing of traffic flows around the inner ring road to avoid clogging the inner radial routes – possibly creating a one-way system.</p> <p>7</p> <p>R12. The Milton Road LLF requests the City Centre Access and Congestion Team to consider the ideas developed during the workshops, including re-routing of traffic flows around the inner ring road to avoid clogging the inner radial routes - possibly creating a one-way system as part of their work in tackling congestion.</p>	<p>The GCP's 8-point plan for tackling congestion in Cambridge includes various measures to tackle delays including traffic management measures to deter through traffic movements on the inner ring road (East Road-Gonville Place-Lensfield Road) whilst maintaining local accessibility and improving bus accessibility. Creating a one-way system does not form part of the plan.</p> <p>One-way systems have the potential to improve traffic flow which can generate rather than discourage car based trips. They also tend to increase total motor vehicle network mileage and also increase vehicle speeds as well as acting as a barrier to two-way cycle and bus movements unless contraflow measures can be provided.</p> <p>Recommended response: note the resolution and draw to the attention of the City Access Team the idea for a one-way system</p>

Appendix C

MODELLING RESULTS, 'DO NOTHING', 'DO OPTIMUM', 'FINAL CONCEPT' 2016 & 2031

Camcycle and local residents' associations have put considerable effort into preparing the 'Do Optimum' alternative scheme design that the LLF has endorsed. When compared against the project objectives, it has various strengths and weaknesses. Officers have assessed how well the design compares with a 'Do Nothing' scenario based on current 2016 and predicted 2031 traffic flows. Based on the results on this analysis officers have looked into how the design might be accommodated within existing highway boundaries as well as considering any engineering issues that would emerge if the design was taken forward for more detailed consideration.

In considering how best to develop the 'Do Optimum' design into one which could meet all of the key objectives of this scheme, alternative junction designs have been assessed with a view to balancing vehicle journey times along Milton Road whilst maintaining as many as possible of the 'Do Optimum' ideas for pedestrians, cyclists and landscaping. Inclusion and optimisation of bus lanes has also been considered within the analysis to enable a required element of bus priority whilst also maximising the opportunities for landscaping and tree planting. The conclusion of this analysis is a 'Final Concept' which is the officers recommended design concept to be taken forward into detailed design.

The following sections set out in detail the results of the modelling work that has been undertaken comparing, the 'Do Nothing' scenario with 'Do Optimum' and the 'Final Concept' design. The modelling results set out in the remainder of this Appendix relate to comparison of results against a validated 2016 baseline scenario and against an estimated 2031 'Do Nothing' future scenario.

Traffic Modelling

To support this process, peak period microsimulation traffic modelling has been undertaken using industry standard software (Paramics) to assess and compare the 'Do Nothing', 'Do Optimum' and 'Final Concept' options in terms of all vehicle journey times, bus journey times and reliability and peak hour queue lengths at key junctions along the length of the proposed scheme, based on 2016 and 2031 flows. The model has been run multiple times and an average of results has been taken. The results focus on the AM peak (8am-9am) and PM peak (5pm-6pm). The variations in bus journey times within these runs have been assessed to provide an indication of how bus journey reliability would be affected within each scenario.

Whilst individual cyclists are not included as a vehicle type explicitly in the Paramics model, provision for cycle movements is implicitly taken into account in the modelling where appropriate to reflect interactions with other vehicular traffic. The proposals provide for segregated provision for cyclists along the corridor and at locations where specific provision to assist cyclists is provided then this is explicitly included within the Paramics model. For example:

- Advanced stop-lines and/or advance green times for cyclists at signalised junctions,

- Toucan crossing provision,
- Crossings for cyclists/pedestrians on 'Dutch' roundabout entry and exit.

Traffic flows for 2031 have been provided by the Cambridge Sub-Region Model (CSRM) which has recently been updated to reflect more accurately the capacity of the road network, to take into account the emerging Local Plan developments and to reflect the anticipated influence on traffic levels of Greater Cambridge Partnership measures and other transport infrastructure improvements that are expected to be delivered over the coming years. This modelling scenario, known as the Foundation Year base, is also being used to assess other GCP schemes. The traffic modelling is based on current best practice advice for both strategic and local modelling techniques. All models have been developed using WebTAG Department for Transport guidance in terms of model development and validation. Industry standard modelling and forecasting techniques have been used.

Modelling Results and Conclusions

Journey Times (All Vehicles)

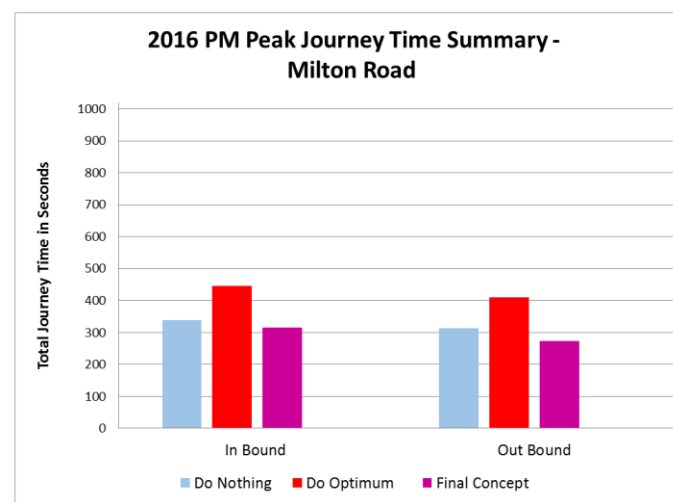
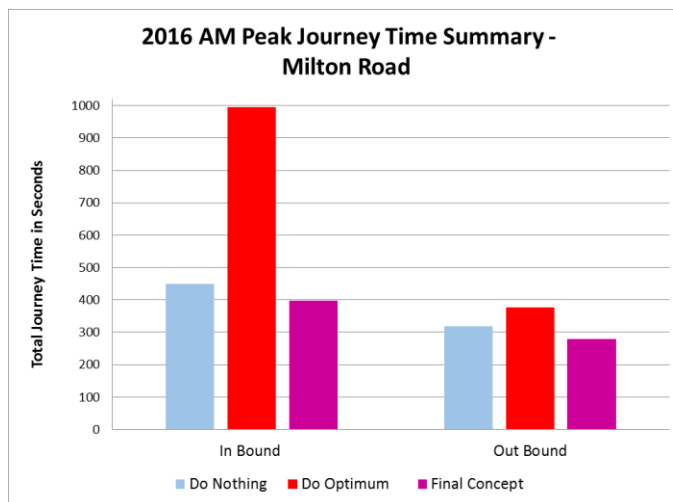
The graphs below provide a summary of 2016 & 2031 peak period journey times in minutes (combined bus and non-bus) within the AM and PM peak periods along the length of Milton Road, for each of the three scenarios tested.

Compared with 'Do Nothing', in the 2016 AM peak the 'Do Optimum' proposal shows a more than doubling of the current journey times inbound into Cambridge from 7.5 mins to 16.6 mins. Outbound journeys are estimated to increase by 1 minute from 5.3 mins to 6.3 mins. In the 2016 PM peak inbound journey times increase by 1.8 minutes from 5.6 to 7.4 mins. Outbound trips increase by 1.6 minute from 5.2 mins to 6.8 mins.

The 'Final Concept' scenario in comparison to 'Do Nothing' shows a slight decreasing of the journey time, in both directions, in the AM and PM peak. In the 2016 AM Peak this results in around a 1 minute saving for inbound journeys and 0.6 minute saving for outbound. In the PM peak a journey time saving of 0.4 minutes is estimated for inbound journeys and 0.6 for outbound.

Overall the 2016 journey time comparison demonstrates that the 'Final Concept' essentially maintains current levels of total vehicle journey times along Milton Road in the AM and PM peaks while still delivering many of the elements of pedestrian & cycle provision identified in the 'Do Optimum' Scheme. The 'Do Optimum' scheme if delivered in its entirety is estimated to significantly increase the delays in the network compared to 'Do Nothing'.

2016 DO NOTHING' V 'DO OPTIMUM' v 'FINAL CONCEPT JOURNEY TIME COMPARISON



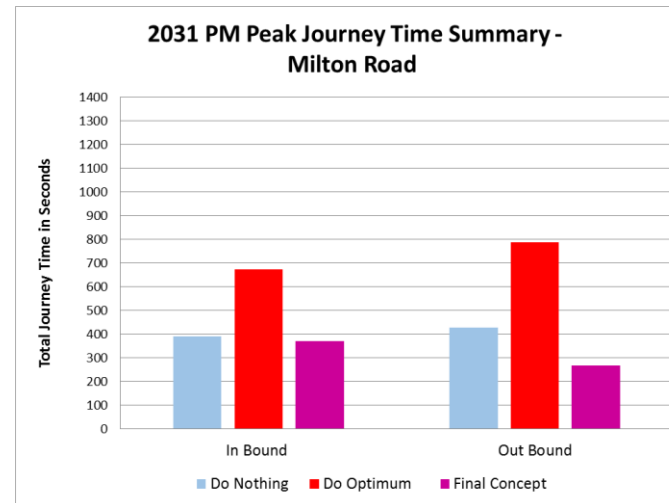
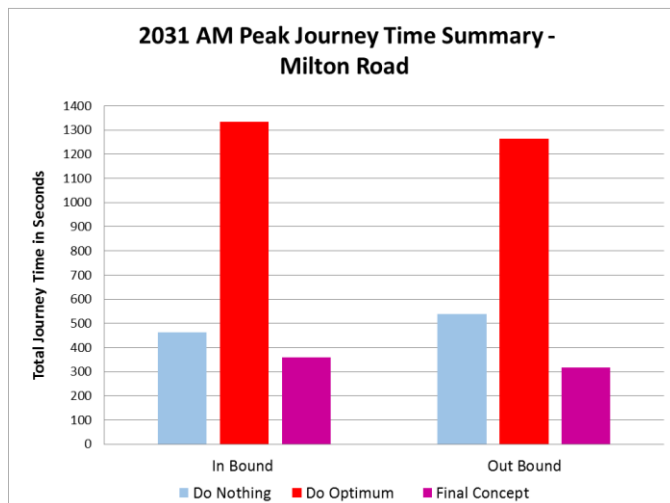
The graphs below provide a summary of estimated 2031 peak period journey times (combined bus and non-bus). In general the results indicate that extra traffic flow expected along Milton Road in 2031 will increase the delays in the network within all scenarios.

Compared with 'Do Nothing', in the 2031 AM peak the 'Do Optimum' proposal shows an estimated tripling of the current journey times into Cambridge from 7.7 mins to 22.2 mins. Outbound journey times are estimated to more than double from 9.0 mins to 21.1 mins. In the PM peak inbound journey times are predicted to increase by 4.7 minutes from 6.5 to 11.2 mins. Outbound trips increase by 6.0 minutes from 7.1 mins to 13.1 mins.

The 'Final Concept' scenario in comparison to 'Do Nothing' shows a slight 2031 AM peak decrease in the inbound journey time, of 1.7 minutes, and the outbound journey time is estimated to decrease by 3.3 minutes. In the 2031 PM peak, the inbound journey time is similar to the 'Do Nothing' scenario (saving 0.3 minutes) and the outbound journey time shows a saving of around 2.6 minutes.

The 2031 journey time comparison shows the 'Do Optimum' proposal does not cope well with expected 2031 traffic flows and the delay is significantly increased compared to 2016. 'Final Concept' provides a scenario which achieves the shortest journey time in both directions in 2031, within the AM & PM Peak.

2031 DO NOTHING' v 'DO OPTIMUM' v 'FINAL CONCEPT' JOURNEY TIME COMPARISON



Bus Journey Time and Bus Reliability

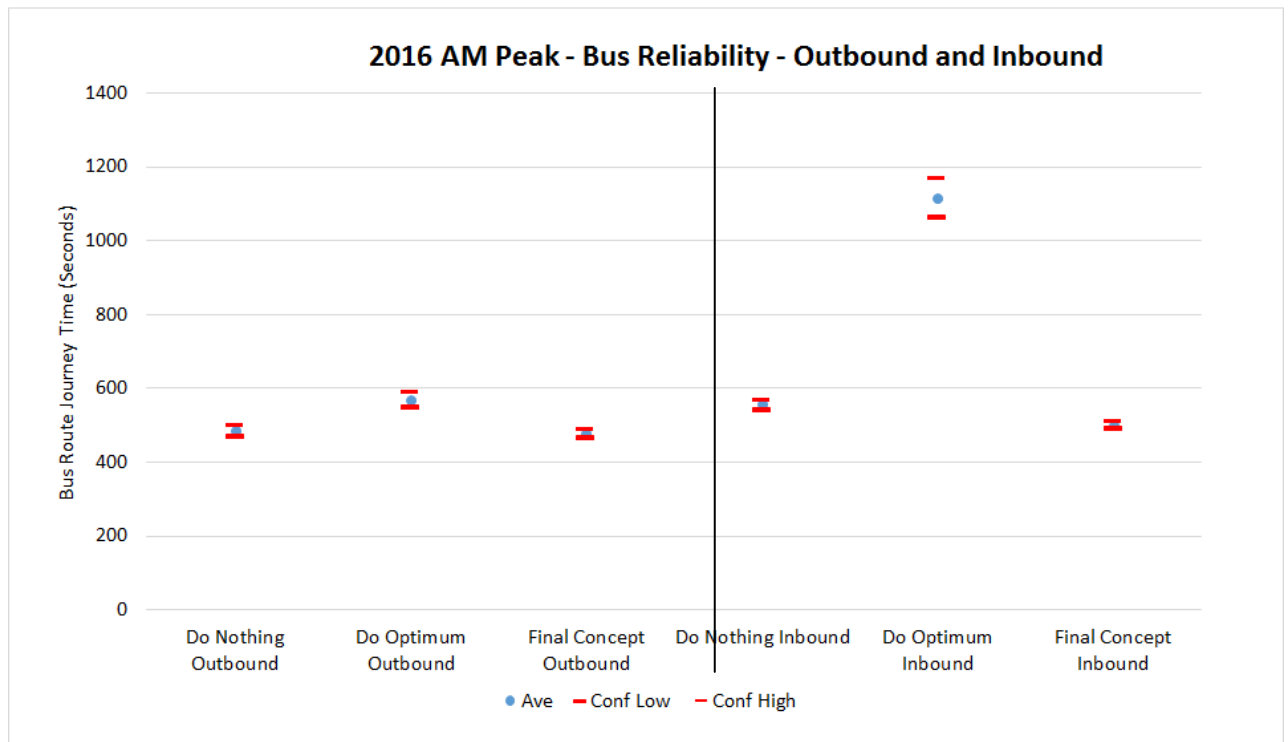
The impact on bus reliability within each of the three scenarios is shown below. The bus journeys are based on those services that travel the entire length of the scheme and do not make any allowance for dwell times at stops. The bus journey time also includes the journey along Mitcham's Corner and Victoria Ave (due to the way the bus routes are coded into the model), therefore the bus journey times shown in the graphs can be longer than the general traffic, which does not include the journey time along Mitcham's corner and Victoria Ave, however it still enables a direct comparison between scenarios.

It should be noted that within the 'Final Concept' scenario the modelling work does not currently take account of measures within traffic signal sequences to prioritise bus movements which could further reduce bus journey times but may lengthen non-bus times. However, within the 'Do Optimum' scheme, all bus priority detailed within the proposal has been included in order to fully represent the 'Do Optimum' scheme put forward in its entirety.

The bus reliability indicators are provided relative to the current 2016 situation and the estimated future 2031 situation. Within both these time periods figures presented are the average journey times for the services over 10 model runs and seek to compare the range of journey times recorded over each peak hour to give a standard deviation and confidence interval which indicates journey time variability during the hour.

The graphs below show bus service average journey times and reliability in 2016 and 2031 for each scenario in the AM and PM peak. The closer the low/high confidence interval is to the average the less variability in the bus journey times recorded in the model and the more reliable the bus service. The journey time is indicated on the y axis.

2016 AM 'DO NOTHING' v 'DO OPTIMUM' v 'FINAL CONCEPT' BUS JOURNEY TIME AND RELIABILITY



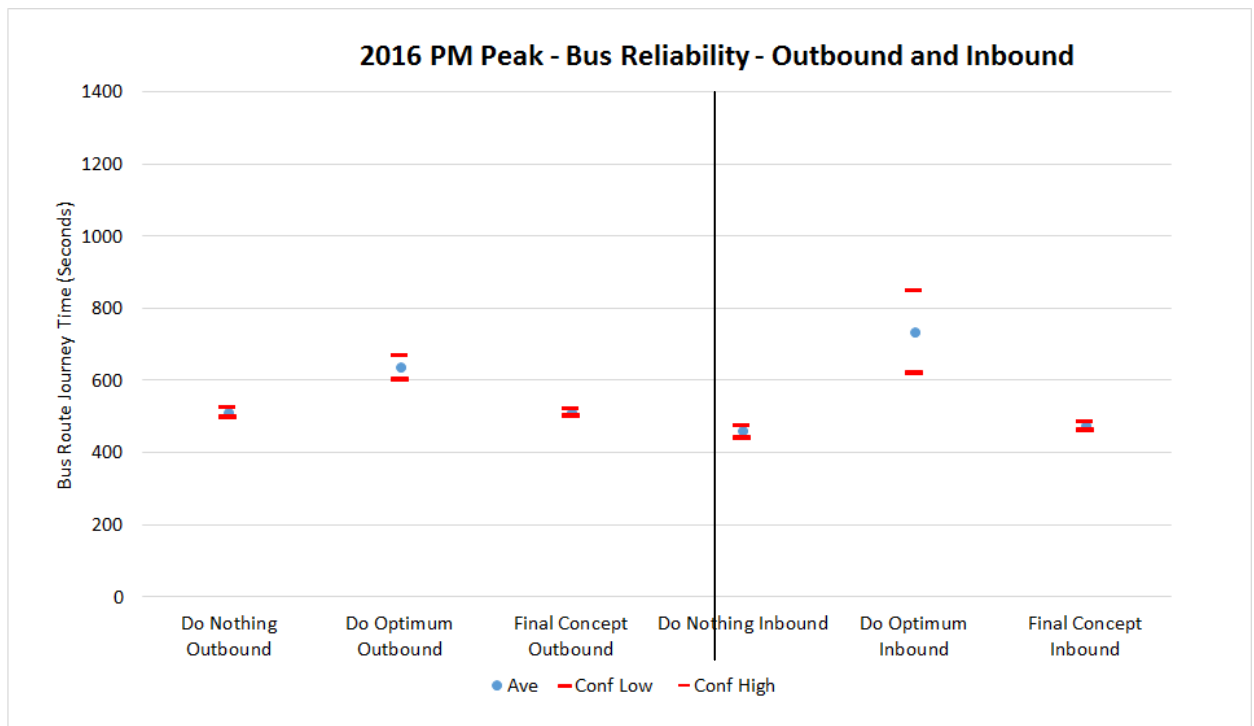
In the 2016 AM peak outbound bus reliability in 'Do Optimum' is slightly worse than the 'Do Nothing' with average journey times being 1.4 minutes longer. For inbound bus travel, reliability is much worse, with average journey times being 9.3 minutes longer and more variable in the 'Do Optimum' proposal compared to the 'Do Nothing' scenario, this is despite 'Do Optimum' including for bus priority within the signalisation of certain junctions. A significant contributor to the increase in inbound bus journey times is the large reduction in bus lane provision within the 'Do Optimum' proposal, compared to the 'Do Nothing'.

The 'Final Concept' provides a similar total length of bus lanes to the 'Do Nothing' scenario but allocates these sections of bus lane more evenly between inbound and outbound bus travel, in comparison to the 'Do Nothing' scenario which focuses bus lanes on inbound bus travel. The 2016 AM 'Final Concept' bus reliability results shows improved bus reliability for both directions of travel, maintaining average bus journey times inbound (even with a reduction of bus lanes on this side of the road in comparison to 'Do Nothing') and improving outbound average bus journey times in comparison to 'Do Nothing' (through increasing bus lanes on this side of the road). As previously stated bus priority measures at traffic signals have not yet been applied in the 'Final Concept' scenario which has the ability to further reduce bus journey times but may lengthen non-bus times.

Note: Bus priority measures at traffic signals can be counter-productive unless applied in a balanced way avoiding undue delay for other traffic which can, in itself, lead to delays to buses upstream of key junctions. Further detailed work on this will be

undertaken as part of the detailed design work once key junction layouts have been determined and remodelled for the purposes of a business case.

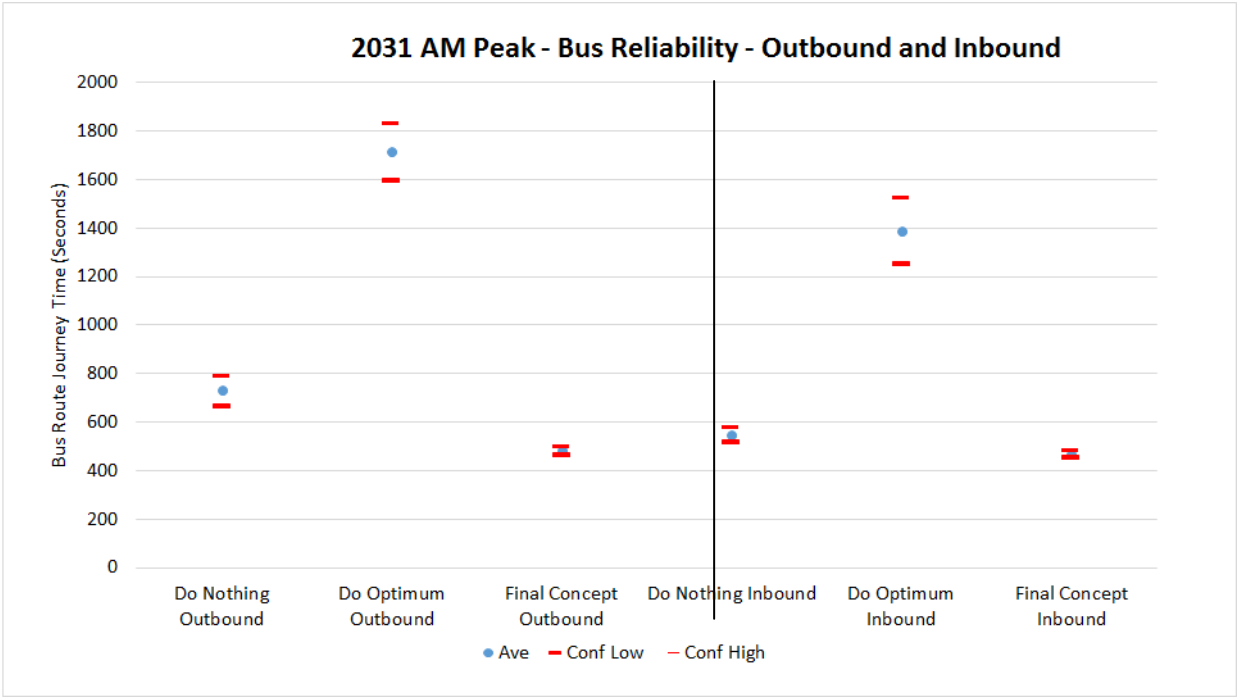
2016 PM 'DO NOTHING' v 'DO OPTIMUM' v 'FINAL CONCEPT' BUS JOURNEY TIME AND RELIABILITY



In the 2016 PM peak, outbound bus reliability in 'Do Optimum' is worse than the 'Do Nothing' and average journey times are 2.1 minutes longer. For inbound travel, bus reliability is much worse and average journey times extent to 4.6 minutes longer.

The 'Final Concept' again seeks to strike a balance across all modes and shows improved bus reliability for both directions of travel while maintaining average journey times to the 'Do Nothing'. This will be improved further in detailed design through the consideration of priority measures at traffic signals not yet been applied in the 'Final Concept' Scenario.

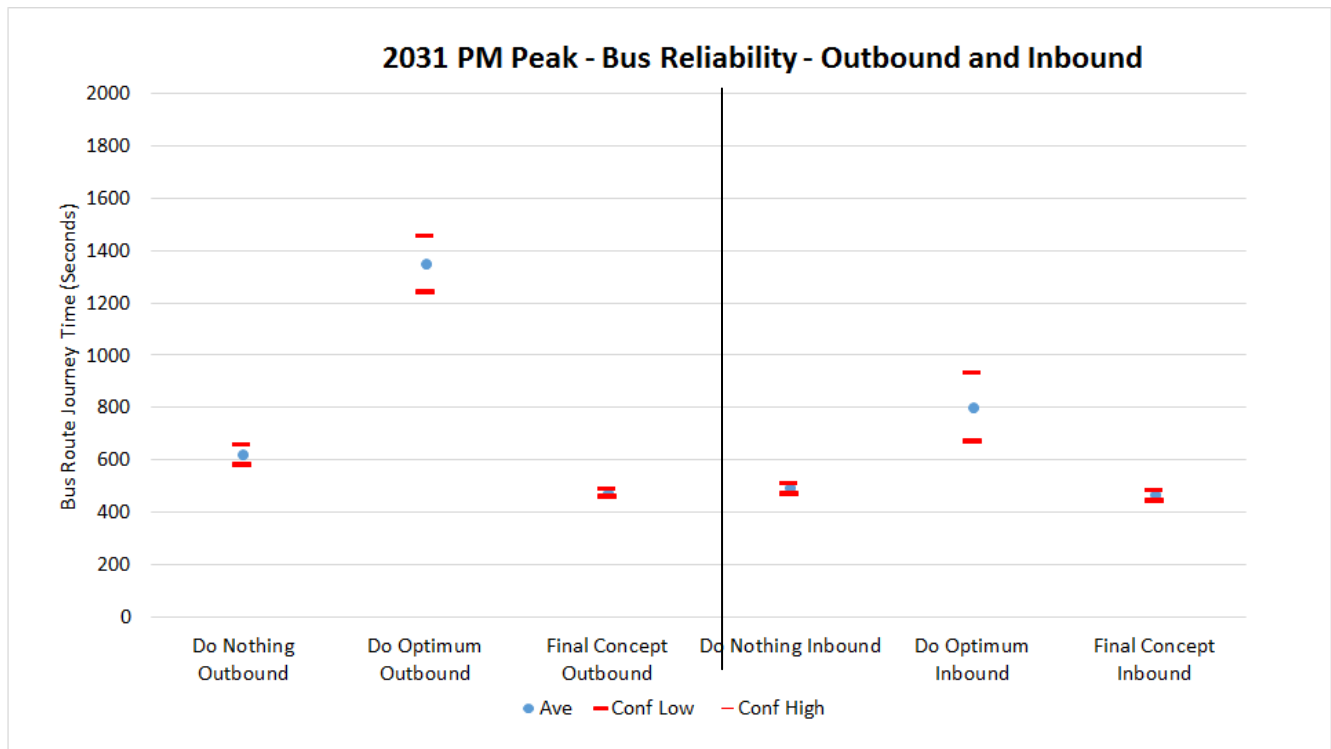
2031 AM ‘DO NOTHING’ v ‘DO OPTIMUM’ v ‘FINAL CONCEPT’ BUS JOURNEY TIME AND RELIABILITY



In the 2031 AM peak, outbound bus reliability in ‘Do Optimum’ is worse than the ‘Do Nothing’ and average journey times are 16.4 minutes longer. Inbound bus reliability is also worsened in combination with average journey times increasing by 14.0 minutes.

The ‘Final Concept’ in the 2031 AM Peak shows improved bus reliability in both directions of travel and improved average journey times over the ‘Do Nothing’ scenario, saving 4.1 minutes in average journey time for outbound bus travel and 1.3 minutes for inbound bus travel.

2031 PM 'DO NOTHING' v 'DO OPTIMUM' v 'FINAL CONCEPT' BUS JOURNEY TIME AND RELIABILITY



In the 2031 PM peak, outbound bus reliability in 'Do Optimum' is worse than the 'Do Nothing' and average journey times are 12.2 minutes longer. Inbound bus reliability is also more variable in combination with average journey times increasing by 5.2 minutes.

The 'Final Concept' in the 2031 PM Peak shows improved bus reliability in both directions of travel and improved average journey times over the 'Do Nothing' scenario, saving 2.5 minutes in average journey time for outbound bus travel and 0.6 minutes for inbound bus travel.

The modelling results demonstrate that the proposed 'Final Concept' can reduce the bus journey time and improve bus reliability in 2031. The 'Do Optimum' proposal significantly increases bus journey time and bus journey time variability is much increased, showing the scheme is unable to provide bus priority over general road traffic in 2031, within the context of increasing congestion on the network.

Whilst the 'Do Optimum' solution developed through the LLF contains many useful proposals, the modelling assessment undertaken demonstrates that this design concept would significantly disadvantage bus vehicle movements in no small part due to a significant reduction of bus lanes over the current 'Do Nothing' scenario. This therefore indicates a further deterioration in bus journey times and reliability in 2031 under this scenario.

Improved bus travel in 2031 is required, to be able to adequately cater for longer distance movements into Cambridge from, for example, the new towns of Northstowe, Waterbeach and Camborne where cycling and walking are not reasonable options. Improving access to Cambridge from these areas is essential for increased economic growth which is the main driver for the Greater Cambridge Partnership. As the 'Do Optimum' scheme does not adequately address the scheme objectives relating to buses, modifications are required to achieve a better overall balance, as suggested within the 'Final Concept' scheme.

Consideration of 'Do Optimum' design modifications to develop a 'Final Concept'

As part of the process to identify modifications to the 'Do Optimum' design, in order to develop the 'Final concept' design, further LLF meetings were held in May and June to seek feedback on the emerging modelling results and to test initial ideas for modifying the design to better response to all the scheme objectives.

Individual Junction Modelling

To consider how best to modify the 'Do Optimum' design, into a 'Final Concept' design, alternative junction designs have been assessed with a view to balancing vehicle journey times along Milton Road (whilst maintaining as much as possible the 'Do Optimum' ideas for pedestrians and cycling), to optimise the length of bus lanes and to maximise the opportunities for landscaping and tree planting.

The modelling undertaken is based on conceptual designs rather than fully engineered detailed designs, however, the results provide a broad comparison on a similar basis of the impacts of the different design options at these key junctions and is considered appropriate for comparison purposes and to guide and inform decision making.

Within the Paramics modelling, four key junctions, during the peak periods, have been reviewed in detail to understand the issues of why the 'Do Optimum' design results in significant increases in vehicle journey times along Milton Road. The aim of this analysis has been to consider various design modifications aimed at achieving a better response to all project objectives, and hence inform the 'Final Concept' design proposal. The key junctions considered along Milton Road and which most significantly affect the overall journey times of vehicle traffic are:

- Gilbert Road,
- Elizabeth Way,
- Arbury Road, and

- King's Hedges Road

Officers have reflected on the individual junction modelling results and have reviewed other design issues that arise from the 'Do Optimum' design to consider what junction design changes would be appropriate for inclusion in the 'Final Concept'.

The results presented below look at each junction in turn and show the differences in maximum vehicle queuing at each arm of the junction, as well as overall total vehicle queuing, relative to the three scenarios of 'Do Nothing', 'Do Optimum' and the final junction designs included within the 'Final Concept' scheme. These results are shown relative to the peak periods of 2016 and 2031 and measured in terms of number of vehicles.

It should be noted that although each junction is looked at separately in the analysis below, each scheme must be ultimately looked as a whole and hence the total journey time and bus reliability has been presented first in this Appendix. Impacts at one junction can be due to the cumulative impact of all changes at junctions along the road. So for example if more traffic is able to pass through Elizabeth Way this can impact downstream on Gilbert Road and so on. Therefore, although there may, in some cases, look like small differences between some of the junctions considered, when assessed as a whole these can culminate in bigger difference across the whole scheme.

Gilbert Road Junction

Do Nothing



Do Optimum



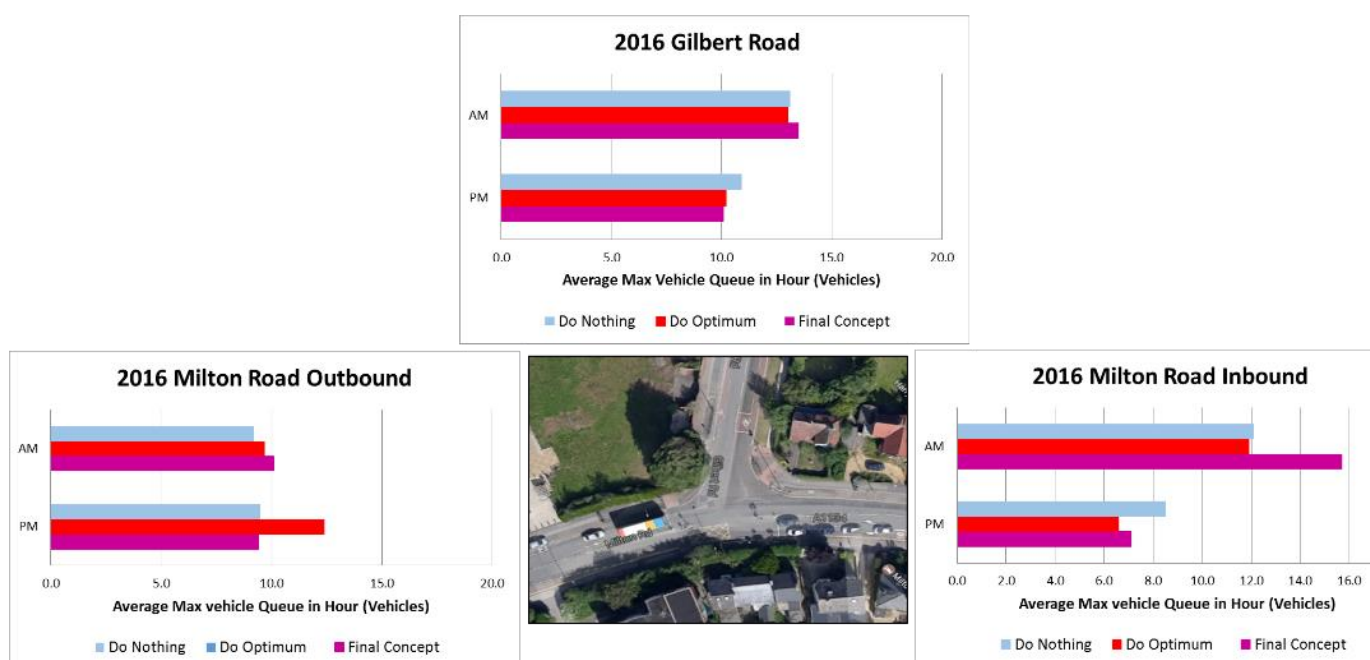
Final Concept

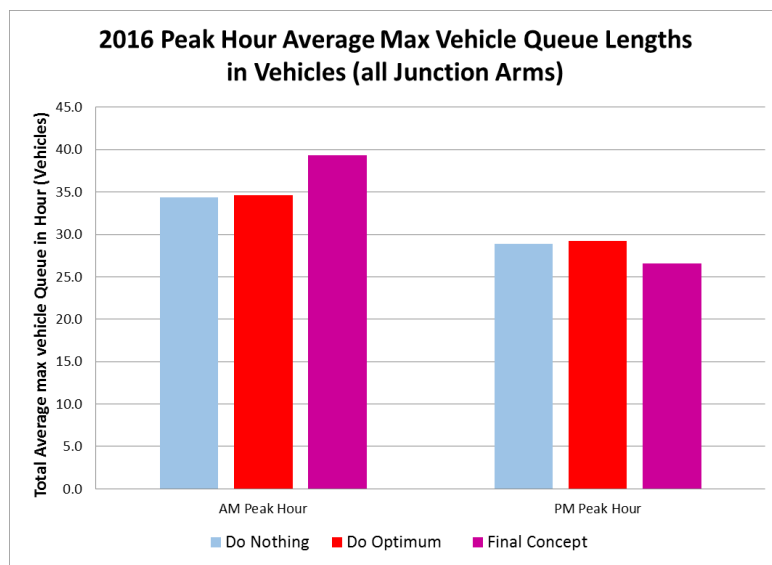


In reviewing the 'Do Optimum' junction layout, it was identified that the suggested radiuses of the junction were too tight to allow for all vehicle turning movements and hence the corner radii need to be relaxed. As a result this would impact on the space available for cycle and pedestrian movements.

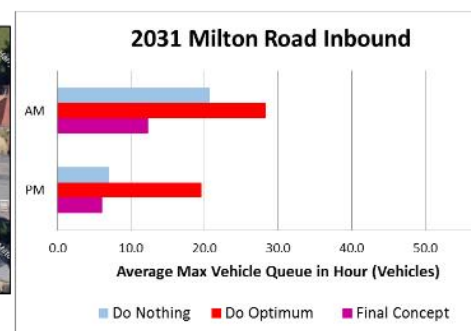
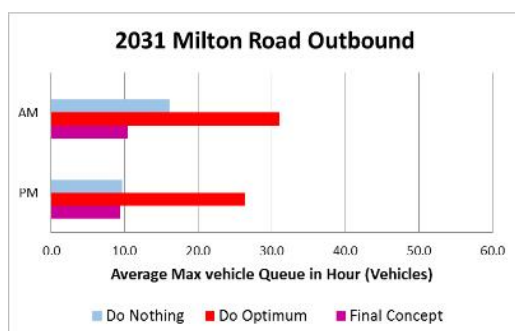
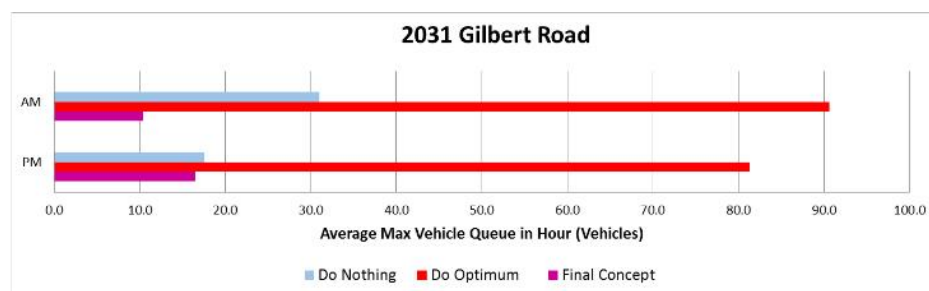
Whilst the proposed Final Concept design achieves a high degree of segregation for cyclists leading to and from the junction, there is insufficient space available for fully segregated cycle movements across the junction. It is suggested that the current signal staging should be trained with a main road and side road stage along with a full green pedestrian stage. In considering layout changes the need to avoid delays arising from motor vehicles turning right into the side road without compromising inbound cycle movements on the main road has been taken in to account.

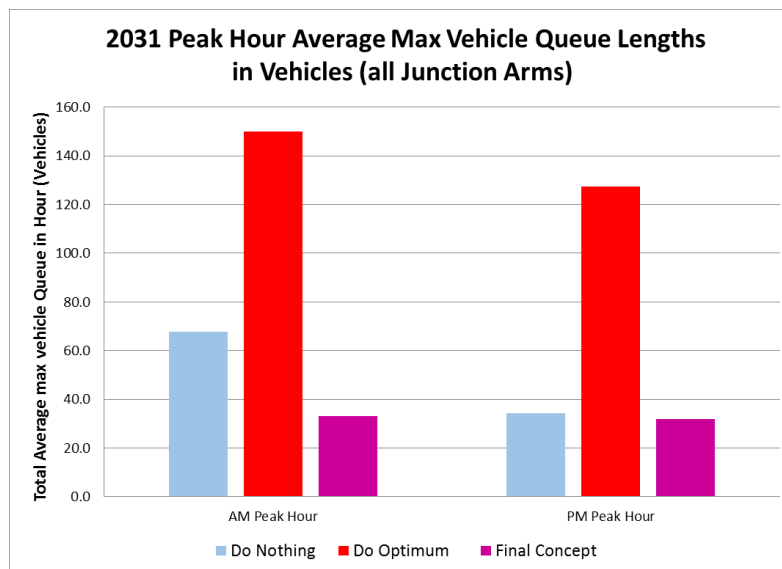
2016 'DO NOTHING', 'DO OPTIMUM AND 'FINAL CONCEPT' QUEUE LENGTH SUMMARY RESULTS





2031 'DO NOTHING', 'DO OPTIMUM AND 'FINAL CONCEPT' QUEUE LENGTH SUMMARY RESULTS





Graphs above compare the queue length on each arm and the total queue length at Gilbert Road junction in 'Do Nothing', 'Do Optimum' and 'Final Concept' scenarios in 2016 and 2031. In 2016, the total queue length is quite similar in all of the scenarios. The comparison demonstrates that neither the 'Do Optimum' nor the 'Final Concept' schemes have significant impact on this junction in 2016 in comparison to the 'Do Nothing' scenario. The 'Final Concepts' slight total queue increase (4.9 vehicles) is due to the improvements at Elizabeth Way roundabout, within this scenario, which allows more traffic from Elizabeth way to reach the inbound arm of Milton Road at the Gilbert Road junction.

In terms of cumulative impacts of additional delay on all approaches to the junctions at Gilbert Road in 2031, in both the AM and PM peak hour there is significant additional delay associated with 'Do Optimum' and this is as a result of increases in queueing on all approaches but most notably on Gilbert Road.

This occurs because of the additional delay and queuing that is experienced at Elizabeth Way and its interaction with the signals at Arbury Road which causes blocking back to Mitcham's Corner and impacts on the ability of traffic to exit from Gilbert Road. The link queue length result indicates the queue at the Milton Road outbound link north of Gilbert Road blocks back to Gilbert Road and Milton Road.

The 2031 flow has less impact on the 'Final Concept' with the improved Elizabeth Way signalised roundabout and optimised Arbury Road junction. In the AM peak, the queue length on Gilbert Road is slightly less than 2016 as the flow on Gilbert Road is indicated to decrease in 2031 following incorporation of the CSRM projected reallocation of flows on the network in 2031.

Elizabeth Way Junction

Ring priority ("grünlicht crossing")
 Roundabouts, as commonly found in
 and Northern Europe. See also
www.knowltonethers.com

Two cycle lane whenever
 need to access crossings etc.

central cycle lane
 for large vehicles
 positioned when waiting.

priority crossings must be
 1 car length from the
 roundabout.

Presence of bus in bus lane at roundabout entry
 automatically gives precedence to bus since
 1 car length right of way of any car waiting to
 enter the roundabout.

Two-way cycle lane
 as that riders can
 choose either side, whichever they
 the two-way cycle lane.

Two-way cycle crossing as that riders can
 choose either side, whichever they
 the two-way cycle lane.

Driver-priority crossing must be set back
 roundabout at least 1 car length to give
 waiting and cycling a chance to read in
 of motor vehicles. Exits from roundabouts
 driver-priority crossings must be single lane.

An aerial photograph of a roundabout. The central island is a large, circular green area. The approach lanes are paved with red material, creating a distinct border around the central island. The surrounding area includes grey buildings and green spaces. The roundabout has four entry and exit points, with dashed white lines indicating the flow of traffic.

As the 'Dutch' style roundabouts are a key aspect of the 'Do Optimum' design and given the challenges in modelling this design concept, the Paramics modelling process has been peer reviewed by consultants, Royal Haskoning DHV, who have experience this is field of modelling. Royal Haskoning DHV has confirmed that the results from the Paramics process are broadly as expected.

A 'T' junction signalised design would:

- A signalised roundabout would:

- reduce traffic delays compared with a 'Do Nothing' scenario
- reduce the high level of injury accidents at the junction involving cyclists

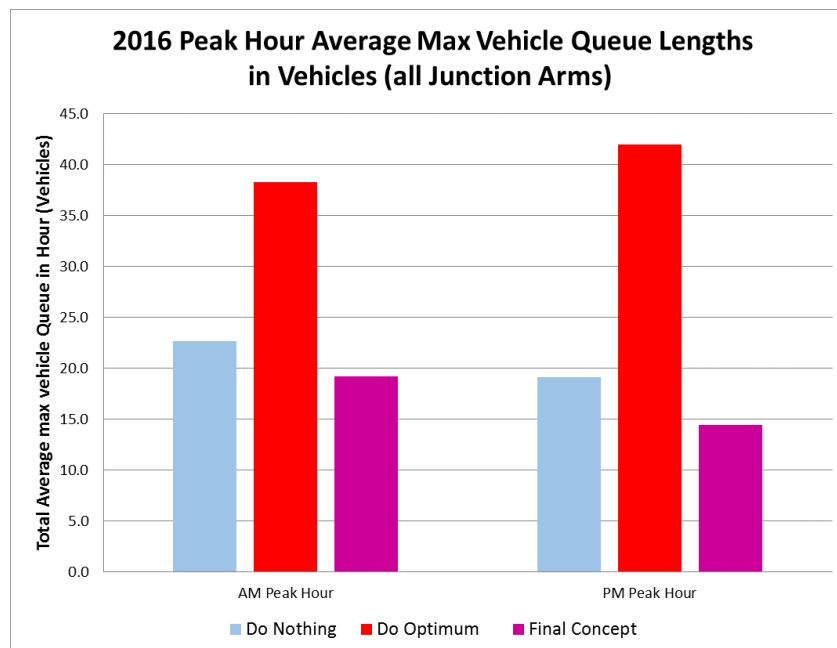
- Require more traffic signal street clutter
- achieve less segregation of cycling movements
- retain access/egress for Highworth Avenue

Whilst the number of daily trips affected by closing off the Highworth Avenue arm is small, local concerns have been raised over the impact on motorised access/egress for Highworth Avenue residents and the 'Do Optimum' design addresses these concerns by retaining access/egress directly to/from Milton Road, albeit at a cost to main road movements. Against a backdrop of concern over the accessibility of Highworth Avenue, a signalised roundabout options is suggested within the 'Final Concept'.

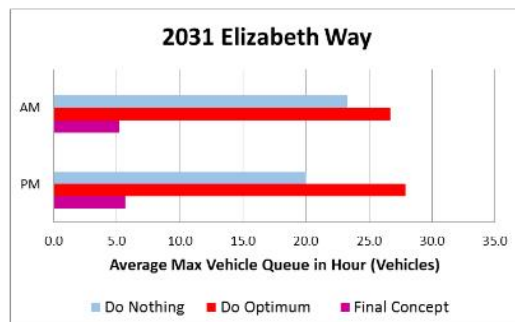
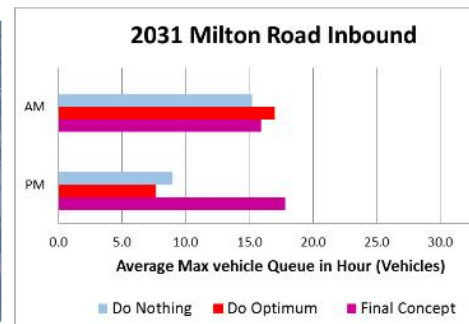
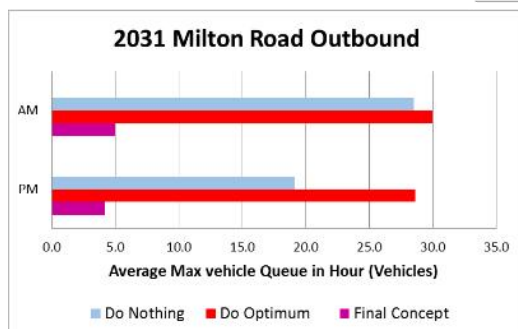
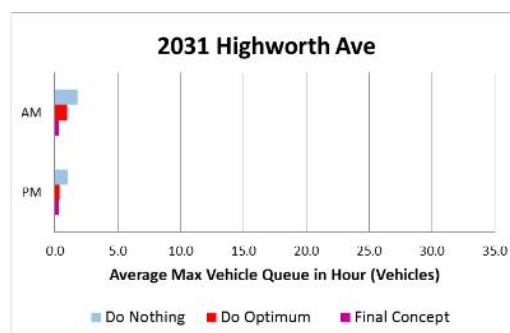
It is recognised that further work on how to manage cycling movements, and provide as much segregation as possible, as part of a signalised roundabout design, needs to be further strengthen and this will be considered at the detailed design stage.

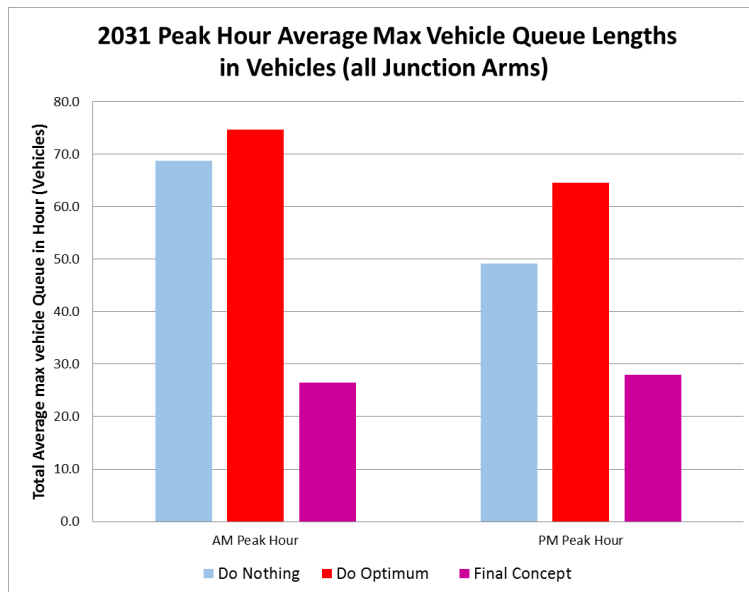
2016 'DO NOTHING', 'DO OPTIMUM AND 'FINAL CONCEPT' QUEUE LENGTH SUMMARY RESULTS





2031 'DO NOTHING', 'DO OPTIMUM AND 'FINAL CONCEPT' QUEUE LENGTH SUMMARY RESULTS





The graphs above compare the total queue length and the queue length on each arm at Elizabeth Way junction.

In 2016, the 'Do Optimum' scenario has longer queues on Elizabeth Way and Milton Road than 'Do Nothing'. The significant queue length increase on Elizabeth Way indicates the junction is over capacity in the 'Do Optimum' scheme. The 'Final Concept' scenario shows much improved total queue lengths in comparison with the 'Do Nothing' scenario, in large part due the signalisation reducing driver hesitation and delay, increasing capacity, and through better signal optimisation with the Arbury Road junction.

In 2031 the level of queueing increases across all scenarios and on all approaches, particularly in the AM peak where total queue delay almost doubles in 'Do Optimum' from 38 vehicles in 2016 up to 78 vehicles in 2031. In the PM peak the increase in queueing is less pronounced.

In both the AM and PM peaks the 2031 flow significantly increases the queue length on Elizabeth way in the 'Do Nothing' scenario, close to the levels indicated in the 'Do Optimum' scenario, which could block back to the Chesterton Road roundabout.

The overcapacity of the junction on Elizabeth Way in the 'Do Optimum' scenario causes rerouting on Milton Road and has a resultant effect on the performance of Gilbert Road in 2031. The 'Do Optimum' Scenario shows slightly shorter queue lengths on the Milton Road inbound arm in the PM peak, but this is due to excessive congestion at the Arbury Road junction and Kings Hedges junction blocking the traffic from arriving at his arm.

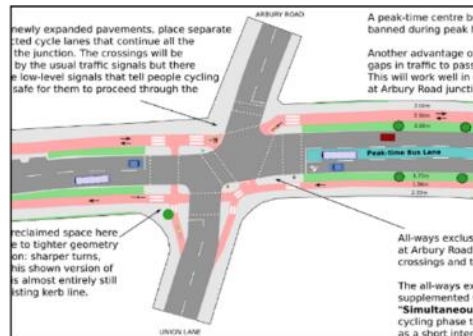
It is notable that the 2031 'Final Concept' provides an improvement in overall queuing compared with the 'Do Nothing' scenario in 2031 as the signalised roundabout improves the capacity at the junction.

Arbury Road Junction

Do Nothing



Do Optimum



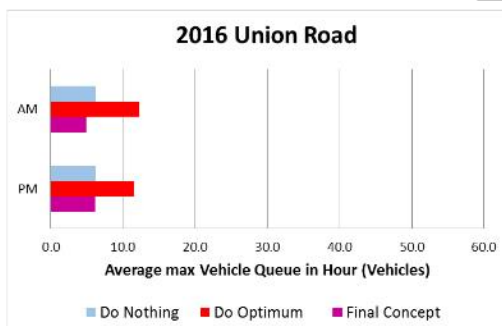
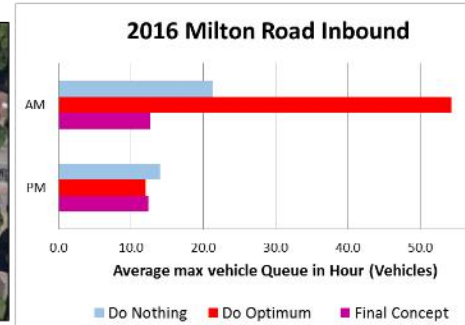
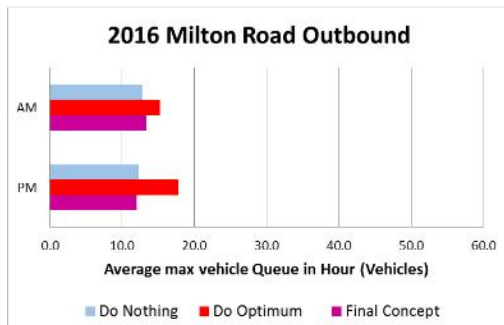
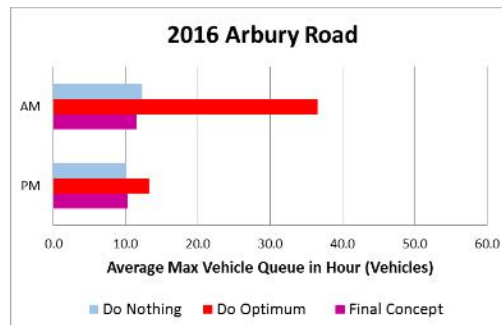
Final Concept

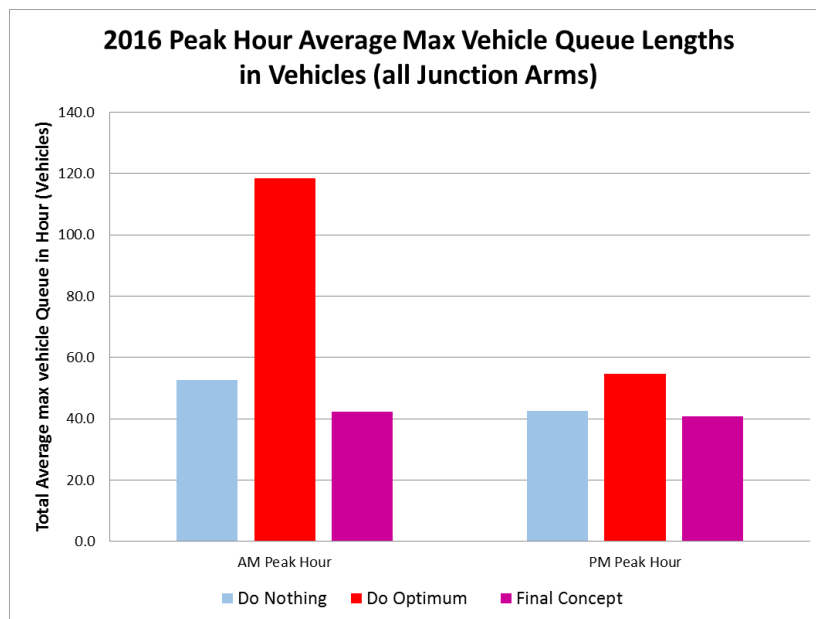


At the Arbury Road / Union Lane junction the 'Do Optimum' design advocates a slight staggering of the layout and a multiple signal stage sequence which would result in much longer delays and queuing. It would also be very difficult to fit this design within the existing highway boundaries whilst maintaining road space for larger vehicles to manoeuvre. The 'Do Something' design proposed closing off the Union Lane arm of the junction to motor vehicle movements. Whilst this approach would be more effective in managing queuing and delays, the concerns over traffic being displaced to other routes within East Chesterton and the impact on local accessibility as a result of closing off Union Lane are recognised and officers have considered alternative design options.

Compromise designs to keep open the Union Lane arm have been explored including the left turn from Union Lane being prohibited. Such an option was shown to reduce queuing on Union Lane itself whilst allowing the Union Lane signal stage to run at the same time as the main road crossing stage thereby optimising the signal sequence to allow a greater proportion of 'green time' to be given to the main road. However, feedback from the LLF suggests any restriction on traffic movements at the junction would be unacceptable to the local community despite the benefits that could accrue in terms of managing overall traffic delays. Therefore, within the 'Final Concept' the existing junction signal operation has been retained with further consideration to be given to the segregation of cycling movements as part of detailed design work.

2016 'DO NOTHING', 'DO OPTIMUM' AND 'FINAL CONCEPT' QUEUE LENGTH SUMMARY RESULTS





2031 'DO NOTHING', 'DO OPTIMUM AND 'FINAL CONCEPT' QUEUE LENGTH SUMMARY RESULTS

The graphs above compare the total queue length and the queue length on each arm at Arbury Junction. In both years 2016 and 2031, the 'Do Optimum' scenario generates longer queues than the 'Do Nothing' and 'Final Concept', on Arbury Road and Milton Road inbound, due to the over capacity of Elizabeth Way junction and the queues blocking back to Arbury Road junction. The 'Final Concept' slightly reduces queue length on Milton Road compared with 'Do Nothing' due to an extra flare provided on Milton Road inbound, which increases the capacity of the junction, as well as better optimisation with a signalised roundabout at Elizabeth Way.

In total, the 2031 results do not show significant queue length increases across the scenarios as the CSRM modelling indicates minimal flow increase on Arbury Road and Union Lane in 2031.

King's Hedges Road Junction

Do Nothing



Do Optimum



Final Concept

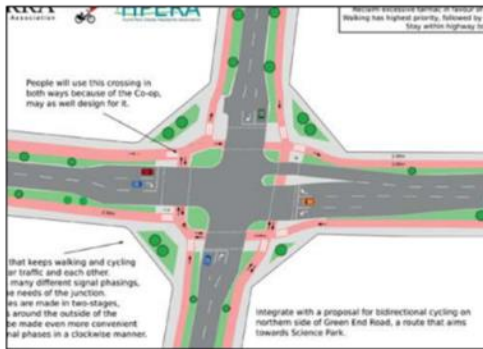


At the King's Hedges Road junction the 'Do Optimum' scheme identifies a preference for a 'Dutch' style roundabout scheme which is what has been modelled within the 'Do Optimum' scenario, within the results show below. However, within the 'Do Optimum' proposals a signalised junction option, with single stage pedestrian and cycling crossing points across each arm has also been identified as acceptable by the LLF.

It is considered that a signalised junction at this location is considered to be more viable than a 'Dutch' style roundabout in terms of balancing the flows at the junction and also balancing the benefits for sustainable transport modes and the impact on car based travel, subject to further detailed design work.

In developing the 'Final Concept' junction design at Kings Hedges Road, the key ideas for cycle and pedestrian segregation and single point crossings, as shown in the 'Do Optimum' signalised junction design, have been accommodated.

Do Optimum



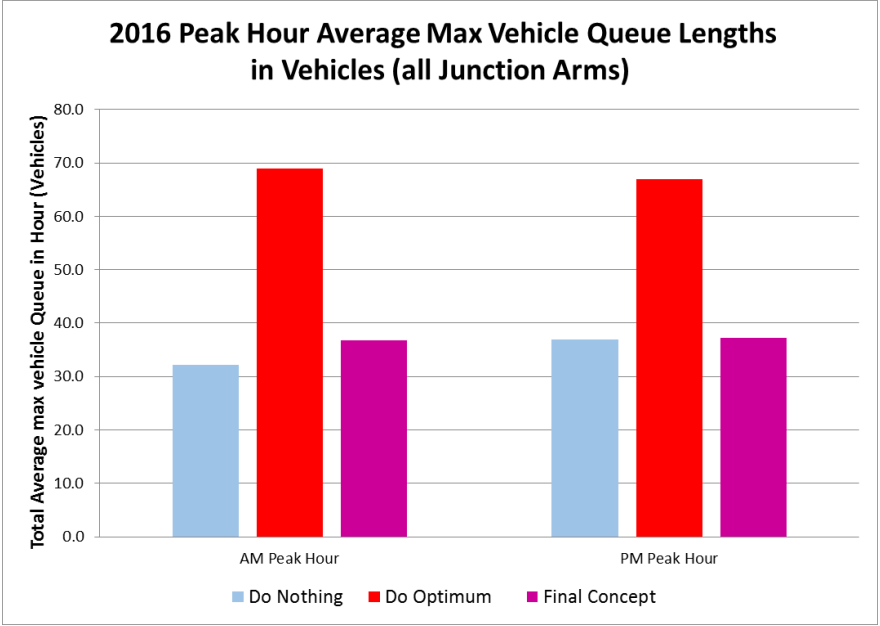
Final Concept



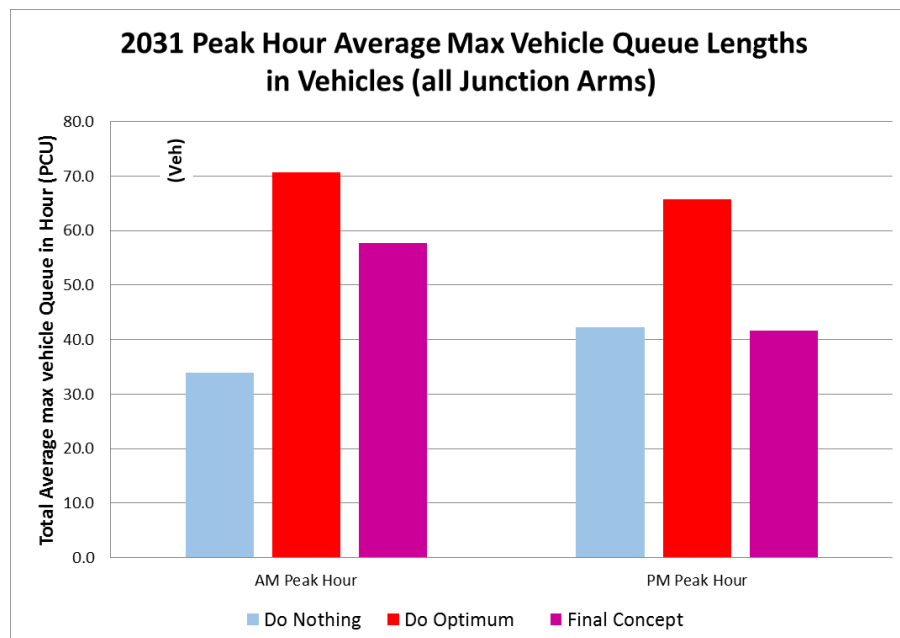
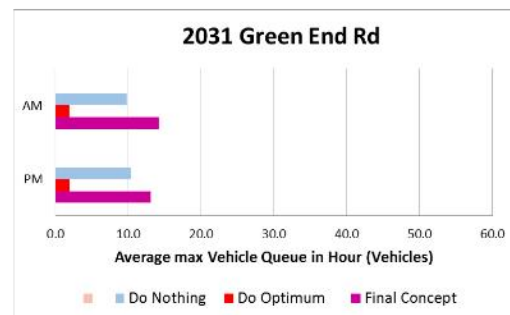
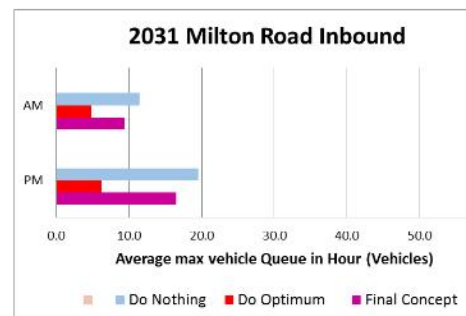
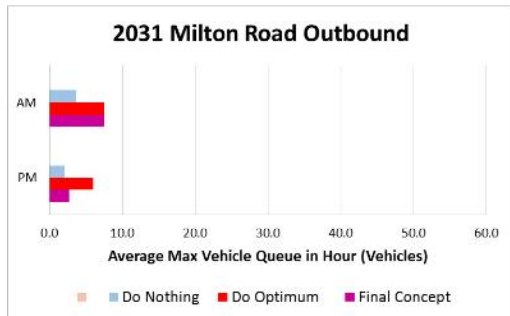
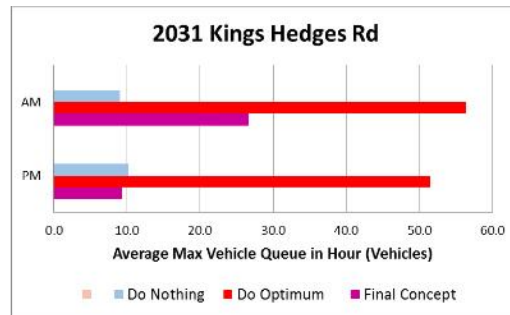
The layout of the 'Do Optimum' signalisation design fails to adequately accommodate all turning movements and needs a larger carriageway area which, in turn, reduces the space available for cycling and pedestrian movements, as indicated within the proposed 'Final Concept' junction design. However, officers believe that many of the ideas for segregating cycle movements from motorised traffic are worth further consideration as the detailed design is developed.

2016 'DO NOTHING', 'DO OPTIMUM' AND 'FINAL CONCEPT' QUEUE LENGTH SUMMARY RESULTS





**2031 'DO NOTHING', 'DO OPTIMUM AND 'FINAL CONCEPT' QUEUE LENGTH
SUMMARY RESULTS**



The graphs above compare the total queue length and the queue length on each arm at the King's Hedges Road Junction.

In year 2016 and year 2031, both the 'Do Optimum' (Dutch Style Roundabout) and 'Final Concept' experience an increase in overall queuing delay in the AM peak compared with the current layout, with 'Do Optimum' having the greatest impact which is mainly attributable to the additional queue length on King's Hedges Road.

The additional all green pedestrian/cyclist stage in the 'Final Concept' scenario significantly increases the queue delays in AM peak. The queue length on King's Hedges Road is significantly increased in the 'Do Optimum' scenario as the roundabout prioritises the flow on Milton Road outbound, which stops vehicles gaining priority onto the roundabout from King's Hedges Road.

The 2031 flows increase the total queue length in the 'Do Nothing' scenario and the 'Final Concept' scenario but does not indicate a significant additional impact on the 'Do Optimum' scenario as the junction is already over capacity in 2016 and the extra 2031 flow cannot be released into the junction.

