Cycle Enfield - A1010 South

LB Enfield

A1010 South Preliminary Modelling Assessment

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1. Introduction

1.1 Purpose of report

1.1.1 This preliminary technical note describes some of the background to the Cycle Enfield proposals, analyses existing data on traffic on the A1010 South and reports on preliminary modelling of the changes proposed by the Cycle Enfield project at the junctions along the corridor.

1.1.2 The scheme is currently subject to a road safety audit and further modelling may be required, depending on the results of the audit. The base traffic models used have been audited and approved by TfL. Once the proposed scheme is finalised, the proposed scheme models will then be formally audited by TfL.

1.1.3 An increase in cycling is expected to support delivering the following benefits, as specified in TfL's summary report on 'Delivery of the benefits of cycling in outer London'[1]:

- Improved air quality;
- Reduced childhood obesity;
- Improved quality of life;
- Tackling health inequalities;
- Strengthened local economies by boosting local journeys;
- Address the climate change agenda;
- Create liveable streets;
- Reduced requirement for car parking spaces, freeing up valuable land.

1.1.4 The Cycle Enfield project aims to:

- Make places cycle-friendly and provide better streets and places for everyone;
- Make cycling a safe & enjoyable choice for local travel;
- Create better, healthier communities;
- Provide better travel choices for the 34% of Enfield households who have no access to a car and an alternative travel choice for the 66% that do;
- Transform cycling in Enfield;
- Encourage more people to cycle;
- Enable people to make short journeys by bike instead of by car.

1.2 Background to the Cycle Enfield proposals

1.2.1 Cycling is a core part of the Mayor of London's proposals for transport and is one of the measures aimed at dealing with the huge growth in population and employment expected in London. There has been a growth of some 5m daily trips on London's transport networks since 1993. There is a recognition that the solution to this expected growth in travel and congestion is to offer better and more sustainable transport choices – cycling is a key element in this.

[1] http://content.tfl.gov.uk/benefits-of-cycling-summary.pdf

1.2.2 The investment in London over the last decade into better public transport, walking and cycling is changing travel behaviour - car travel is down 1m trips per day in a decade, even with a 20% population growth - people are shifting to public transport, walking and cycling. Last year was the first year when use of public transport, walking and cycling exceeded car use.

1.2.3 TfL's research into the potential for cycling estimated that a total of 4.3 million additional trips each day are potentially cycleable, with nearly two thirds of these currently made by car, with the remainder largely made by bus. Four in ten of these trips are made for shopping and leisure purposes and just under a quarter for work purposes -the greatest unmet potential for growth is within outer London, which has an estimated 54 per cent of these potentially cycleable trips.

1.2.4 Consequently the Mayor's Cycling Vision was developed, and various measures were proposed, with the aim of reaching a target of 5% of London journeys by bike by 2026. There is strong evidence that this level of investment leads to changes in travel behaviour:

- Cycle hire – now has some 10m trips a year;
- Cycling to work in London has doubled in the last 10 years;
- Cycle Superhighways had a 47-83% increase in cycle use;
- The number of cyclists entering central London in the morning peak has increased by 177 per cent since 2001 on TLRN roads.
- In Central London, traffic has been dropping while cycling has been increasing, for example on the Embankment traffic is down 24%, on Farringdon Street it is down 44%.
- In the morning peak (2012) cycles accounted for 26 per cent of all vehicular traffic crossing the central London cordon inbound to central London and for 22 per cent of vehicular traffic heading out of central London in the evening peak – some roads had an even higher proportion of cyclists. While these increases are in central London, and lower changes are expected in outer London, they show the huge attraction of and potential for cycling in London.

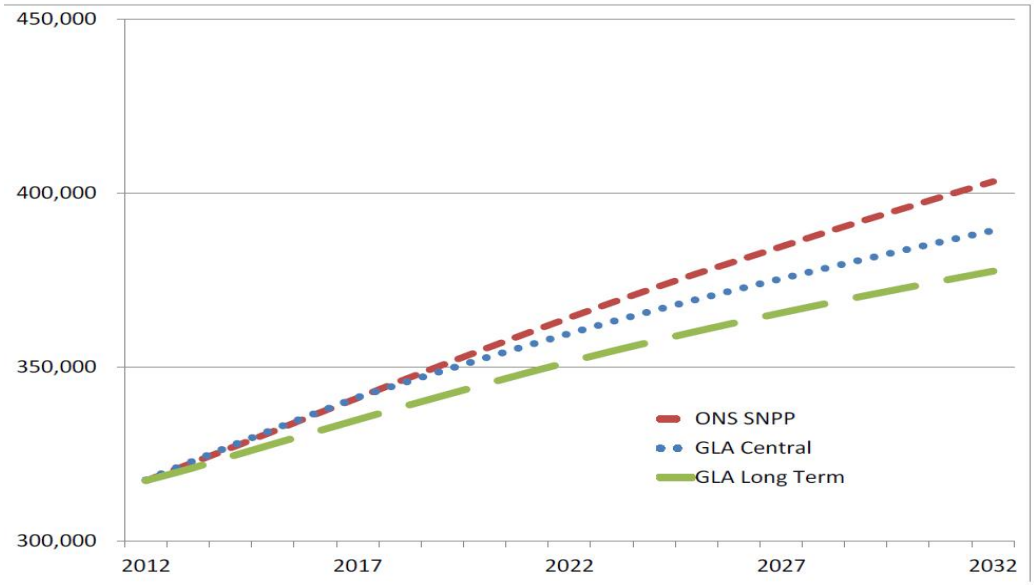
1.3 Travel demand in Enfield and on the A1010 South

1.3.1 The Consultation on a New Plan for Enfield 2017-2032[2] report refers to growth figures developed by the Greater London Authority (GLA) and Office for National Statistics (ONS), these projections *"indicate that population growth in Enfield over the next 15 years could exceed 400,000, an increase of 29% from 2011".*

1.3.2 Figure 1 taken from the Consultation Report shows the GLA and ONS Population Projections 2012 - 2032.

[2] https://new.enfield.gov.uk/services/planning/planning-policy/local-plan/#1

Figure 1:GLA and ONS Population Projections 2012 -2032



1.3.3 The consultation report also states that *"A corresponding growth in households means there would be an additional 25,000 to 35,000 households during the plan period (which would equate to up to 1,700 extra homes per ward)".*

1.3.4 It is important to note in the context of this growth that the whole of Enfield is an Air Quality Management Area. In 2011 the Greater London Authority (GLA) identified ten Air Quality Focus Areas within LB Enfield, including Green Lanes at Palmers Green and Enfield Town. These were selected by the GLA as areas where there is the most potential for improvements in air quality within the Capital.

1.3.5 Despite recent increases in population and employment in the borough, daily traffic volumes along the A1010 have fallen over the past 15 years. This trend is broadly in line with traffic volume trends evident across London as summarised in TfL's latest annual Travel in London report, published in 2014[3]. However, the report indicates that there are "*signs that traffic in London is growing again after a decade of falls, this being reflected in indicators of road network performance (delay and journey time reliability)*". The report goes on to state that "*both 2012 and 2013 saw growth in [traffic in] outer London*" and that "*indications for 2014 are that traffic volumes have grown across London as a whole, as the economy recovers from recession and population continues to grow rapidly. It is possible that London is now seeing a movement away from a long period of stability on the road network in terms of performance indicators such as delay and journey time reliability – this will become clearer over the coming year*".

1.3.6 The recent Roads Task Force estimated that delay per kilometre would increase Outer London congestion by 15% by 2031, and in the Enfield area by 10%.

1.3.7 Despite the reduction in daily traffic volumes since 2000 described above, the A1010 South corridor currently operates close to capacity during peak times. This is potentially due to a lower level of reduction in peak hour traffic when compared to daily trends, suggesting that the daily traffic profile along the corridor has become more peaked in recent years. Local junction modelling using current traffic flow data indicates that the A1010 South junctions with Croyland Road/Bounces Road, Galliard Road/Nightingale Road and Bury Street/Rosemary Avenue all operate in excess of 95% of available capacity during peak times.

[3] http://content.tfl.gov.uk/travel-in-london-report-7.pdf

1.3.8 Any forecast growth in traffic volumes would therefore result in a significant increase in congestion and delays and a corresponding reduction in air quality along the A1010 South corridor, accompanied by a likely increase in rat-running along neighbourhood roads in the vicinity in the do-nothing scenario. In the context of the potential increases in traffic in outer London summarised above, it is therefore important that measures are implemented to reduce dependency on the car for people making journeys along this corridor.

1.3.9 The north London Sub-Regional Transport Plan (SRTP) summarises the public transport enhancements that will support a shift away from car use to some degree across the four boroughs in the sub-region (for example, London Overground capacity increases, rail enhancements in the Upper Lea Valley and the completion of the Thameslink Programme). However, these programmes are strategic in nature and are not focussed on the area around the A1010 South corridor, as illustrated in the 2014 SRTP update summary of proposals[4].

1.3.10 In addition, the DfT traffic count data suggests that goods vehicle traffic constitutes a relatively low level of overall volumes along the corridor. The latest data from 2014 indicates that goods vehicles made up 16% of all motorised vehicular traffic south of the A406 on the A1010 reducing to 12% south of Nightingale Road. The proportion of goods vehicles is important since these vehicles are typically making delivery or servicing trips and are therefore much more difficult to transfer to other modes than car or motorcycle trips.

1.3.11 The data described above suggests that cycling has significant potential to help address the issue of traffic congestion and delays on the A1010 South. TfL's Analysis of Cycling Potential report, published in December 2010, indicated that 94% of cycling trips are less than 8km in length[5]. The report also identified that "*the greatest unmet potential for growth can be found within outer London – 54% of potentially cycleable trips – and only 5% of the 'total potential' in outer London is actually cycled*". Within the outer London North sub-region, only 4% of all identified potential cycle trips were actually being cycled.

[4] http://content.tfl.gov.uk/north-srtp-poster-2014-update.pdf

2. Preliminary Junction Modelling Results

2.1 Methodology

2.1.1 This report summarises the results of the preliminary traffic modelling on the A1010 South. It is based on junction traffic models (ARCADY, PICADY and LINSIG) for each of the junctions where major changes are proposed as a result of the Cycle Enfield proposals.

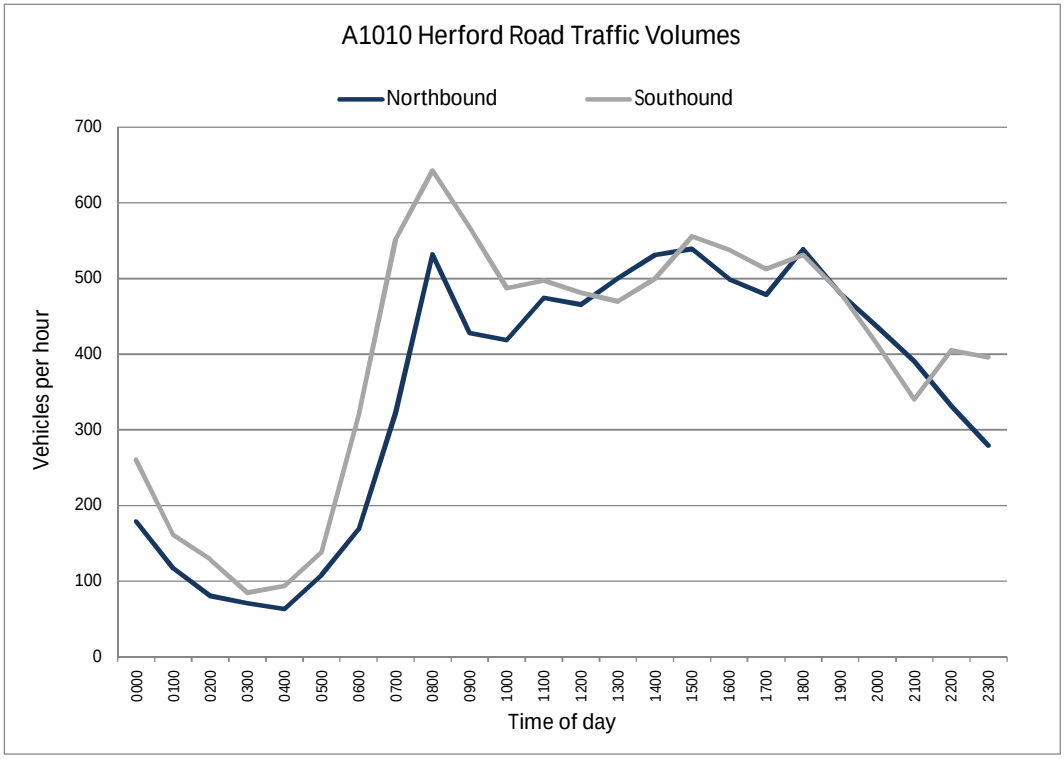
2.1.2 The results are preliminary as the design is subject to a road safety audit and will also be audited by TfL, before the design and modelling results are finalised.

2.1.3 The tests are shown with a number of scenarios, based on potential reduction in vehicle flows along the corridor. The 'core scenario' assumes a reduction of 5% of motor traffic on the corridor – The Cycle Enfield target is 5% of trips by cycle and it is anticipated that this mode shift will be concentrated on the routes with the highest level of facility, such as A1010 Hertford Road. This is still considered to be conservative for the peak hours, based on experience elsewhere in London. This indicates that the effect may be even higher; particularly given there is an opportunity for some traffic to re-assign to other alternate routes e.g. the A10. It also recognises that some of these trips may come from bus or walk, as well as car. Two sensitivity tests have also been undertaken, one with a reduction of 2.5% of motor traffic and one with a 10% reduction.

2.2 Daily Variation in Traffic Flow

2.2.1 Investigations have been undertaken for the morning and evening peak hours, which as shown in Figure 2, are the busiest periods of the day. Outside of these periods traffic volumes decrease, therefore the modelling is regarded as a conservative estimate and delays should be lower at most other times of the day.

Figure 2: A1010 Herford Road Daily Traffic Volumes (opposite to the Tramway Avenue Junction)



Note: Surveys undertaken at Tramway Avenue/Hertford Road junction in February 2015.

2.3 Junction Arrangements at the Proposed Signalised Junctions

2.3.1 There are five junctions where significant changes are proposed, which will be signal-controlled with provision for cyclists to safely progress through the junction and pedestrians wherever practical.

- Junction of The Broadway with Smythe Close
- Junction of Church Street with The Green/The Broadway/Balham Road/Bus Station Exit
- Junction of Hertford Road with Bounces Road and Croyland Road
- Junction of Hertford Road with Bury Street and Rosemary Avenue
- Junction of Hertford Road with Galliard Road with Nightingale Road

2.3.2 The development of a proposed layout for the junction of A406-North Circular Road with Fore Street, as part of the Cycle Enfield scheme, is being undertaken by TfL and will form part of a separate consultation along with the junction of Fore Street with Leeds Street and College Gardens.

2.3.3 The Junction of The Green/Hertford Road with the northern Bus Station Access is within the extent of the corridor but the layout is unaffected by the proposed scheme. However, the signal timings at the junction have been reviewed to reduce delay.

2.3.4 Two options are being considered at the junction of Church Street with The Green/The Broadway/Balham Road/Bus Station Exit; Option 1 converts the junction to a 4-arm signalised junction and Option 2 to be converts it to a signalised roundabout, with separate signals for cyclists. The junction of Hertford Road with Bury Street and Rosemary Avenue is to be converted to a signalised junction.

2.3.5 These junctions have been modelled using standard traffic engineering software packages, in accordance with TfL procedures, with base models approved by TfL. The final proposed modelling will also be audited by TfL.

2.3.6 The preliminary modelling results indicate that the changes to journey times at junctions for vehicular traffic are not expected to be significant in the peak hours in the core scenario.

2.3.7 Some junctions are envisaged to be improved with the proposals (for example the junction of Hertford Road with Bounces Road and Croyland Road and Hertford Road/The Green/Bus Station Access, where timings have been improved), while others show small additional delays. The results are different by direction and by peak; in some cases a junction has additional small delays in one direction, in one peak, and some time savings in another.

2.3.8 It should be noted that at junctions where priority control, or a roundabout, is being replaced by signals (Church Street/The Green/The Broadway roundabout, Hertford Road/Bury Street roundabout) delays do increase (see section 2.5 for more details). These junctions have been signalised to provide safe passage for cyclists through the junction.

2.3.9 A more detailed summary of the junction modelling results can be found at Appendix A.

2.4 Degree of Junction Saturation

2.4.1 Table 1 on the following page shows the estimated degree of saturation (DoS) at the junctions – a DoS of over 100% indicates that a junction is overcapacity; a DoS of 90% is regarded as acceptable in congested urban locations.

2.4.2 The table shows that all junctions operate below 100% DoS in all scenarios tested, except for Hertford Road/Bury Street/Rosemary Avenue, where in AM peak, the '2.5% flow reduction scenario' shows DoS of 100.5% which is considered to be at the capacity level and acceptable under the adopted worst case modelling methodology for this study.

2.4.3 Therefore, it can be concluded that under the core scenario, the capacity of the junctions within the scheme are not significantly affected. Notable improvements in capacity are expected during the AM and PM peaks at the junctions of Croyland Road/Bounces Road, Hertford Road/The Green/Bus Station (in both Options 1 and 2) and Church Street/The Green/The Broadway (in Option 2).

Table 1: Preliminary Estimates of Degree of Saturation at Signalised Junctions

Junction	Base		Core Scenario (5% reduction)		Sensitivity 1 (2.5% reduction)		Sensitivity 2 (10% reduction)	
	AM	PM	AM	PM	AM	PM	AM	PM
The Broadway - Smythe Close (Opt1)	59.6%	76.8%	74.7%	78.0%	76.8%	80.0%	70.8%	74.2%
Church St - The Green - The Broadway (Opt1)	78.1%	81.6%	88.3%	83.0%	90.8%	85.4%	83.5%	78.7%
Hertford Road - The Green - Bus Station (Opt1)	82.6%	86.8%	69.5%	67.0%	71.5%	68.8%	66.0%	63.5%
The Broadway - Smythe Close (Opt2)	59.6%	76.8%	74.9%	76.6%	76.7%	78.5%	71.0%	72.3%
Church St - The Green - The Broadway (Opt2)	78.1%	81.6%	66.2%	74.1%	68.3%	56.6%	62.9%	70.4%
Hertford Road - The Green - Bus Station (Opt2)	82.6%	86.8%	67.4%	66.6%	69.1%	68.4%	63.9%	63.1%
Hertford Road - Bounces Road - Croyland Rd	94.0%	100.5%	86.5%	87.0%	88.9%	89.3%	82.3%	82.5%
Hertford Road - Bury St - Rosemary Avenue	97.0%	86.0%	97.9%	91.6%	100.5%	93.9%	92.6%	86.6%
Hertford Road - Galliard Road - Nightingale Rd	96.4%	95.2%	97.3%	96.6%	99.9%	99.3%	92.3%	91.4%

2.5 Journey Time Changes at Junctions

2.5.1 Table 2 on the following page, shows the estimated changes in journey time at the junctions in seconds per Passenger Car Unit (PCU), during the peak periods for the northbound and southbound movements on the A1010 South. A (PCU) is a method used in transport modelling to allow for the different vehicle types within a traffic flow group to be assessed in a consistent manner. The factors are 1 for a car or light goods vehicle, 1.5 for a medium goods vehicle, 2 for a bus, and 2.3 for a heavy goods vehicle, 0.4 for a motorcycle and 0.2 for a pedal cycle.

2.5.2 As with the degree of saturation table (Table 1) some junctions experience reductions in journey times for one or both movements, and others experience increases in journey times, in the core scenario. The Edmonton Green Network (which includes The Broadway/Smythe Close, Church St/The Green/The Broadway and Hertford Road/The Green/Bus Station junctions) will experience an increase in journey times on the southbound approach by 30 seconds in Option 2, as well as the highest increase on the northbound approach of 46.5 seconds, also in the AM Peak, in Option 2. Bury Street/Rosemary Avenue junction increases by 51 seconds in the AM peak on the northbound approach, and by 24.1 seconds in the PM peak but there is an improvement on the southbound approach in the AM Peak of 27 seconds. Galliard Road/Nightingale Road junction increases by 12.6 seconds in the AM peak on the northbound approach and by 3 seconds in the PM peak on the southbound approach but there are also savings of over 30 seconds on the southbound approach in the AM Peak and the northbound approach in the PM Peak. The junction of Croyland Road/Bounces Road also shows an overall reduction in journey times (up to 1 minute) on the northbound approach with a marginal increase of journey time in southbound direction by 9 seconds in the PM peak hour.

2.5.3 The total delay in the core scenario, for all junctions along the corridor, when Option 1 is introduced at Edmonton Green shows a range from an increase of 55 seconds, which occurs in the northbound AM Peak, to a decrease in journey time of 68 seconds in the PM Peak in the same direction. For Option 2 the journey time along the length of the corridor ranges from an increase of 71 seconds in the northbound AM peak, to a decrease of 44 seconds in the northbound PM Peak, based on the modelling.

2.5.4 These changes are not regarded as significant given the conditions on the corridor and the significant improvements in cycling, with some pedestrian improvements also integrated. The proposed A1010 south scheme includes three junctions which have been converted to signalised junctions from their existing priority control or roundabout layout and whilst the existing delays at those junctions are not significant the layouts are not considered to be safe for the cyclists.

2.5.5 We note that it is also proposed to link the junctions controls using SCOOT (Split Cycle Offset Optimisation Technique), which can detect daily fluctuations in flows and manage the junction timings accordingly to optimise the network, and this is likely to improve the resilience of the network.

Table 2: Preliminary Estimates of Change in Journey time at Signalised Junctions (seconds)

Junction	Movement	Core Scenario (5% reduction)		Sensitivity 1 (2.5% reduction)		Sensitivity 2 (10% reduction)	
		AM	PM	AM	PM	AM	PM
The Edmonton Green Network-Option 1 *(Includes the junctions of The Broadway - Smythe Close, Church St - The Green – The Broadway, and Hertford Road - The Green – Bus Station)*	Northbound	29.9	-3.4	37.1	1.2	19.7	-11.4
	Southbound	21.2	-8.7	25	-6.3	15.8	-12.7
The Edmonton Green Network-Option 2 *(Includes the junctions of The Broadway - Smythe Close, Church St - The Green – The Broadway, and Hertford Road - The Green – Bus Station)*	Northbound	46.5	20.5	49.6	24.9	41.2	14.4
	Southbound	29.8	5.6	33	7.8	24.5	1.7
Hertford Road - Bounces Road - Croyland Rd	Northbound	-38.8	-58.1	-38.4	-55.1	-39.6	-62.5
	Southbound	-1.6	8.6	1.6	11.9	-5.8	3.8
Hertford Road - Bury St - Rosemary Avenue	Northbound	50.9	24.1	60.3	30.4	39.5	17
	Southbound	-27.2	4.4	-22	6	-32.6	2.5
Hertford Road - Galliard Road - Nightingale Rd	Northbound	12.6	-30.3	27.3	-26.2	2.5	-35
	Southbound	-34.8	3.1	-34.2	3.7	-36	1.7
Total (for Option 1 Edmonton Green Network)	Northbound	54.6	-67.7	86.3	-49.7	22.1	-91.9
	Southbound	-42.4	7.4	-29.6	15.3	-58.6	-4.7
Total (considering Opt 2 for Edmonton Green Network)	Northbound	71.2	-43.8	98.8	-26	43.6	-66.1
	Southbound	-33.8	21.7	-21.6	29.4	-49.9	9.7

2.6 Changes in Queue Lengths at Junctions

2.6.1 The modelling results for queues at each of the key junctions can be found in the junction results summary tables shown in Appendix A. Where junctions have been converted from priority control, or a roundabout, to a signalised junction it can be seen that queues do increase. The modelling for signalised junctions produce results for the Mean Maximum Queue (MMQ) which is the estimated mean number of PCUs which have added onto the back of the queue up to the time when the queue finally clears.

2.6.2 Notable increases in queues occur at the Hertford Street/Bury Street junction where an increase in queues on all approaches occurs, with a maximum increase of 21 PCUs, during AM peak in the core scenario.

2.7 Further work

2.7.1 Prior to the commissioning of the detailed design element of the scheme the designs will be subject to a Road Safety Audit and the comments received as a result of this will be incorporated into the designs. Once the designs and modelling have been finalised they will be subject to a formal audit by TfL to verify the results. The base modelling has already been through this process and has been used to develop the proposed models to date. In addition, work is ongoing on other areas of the scheme, based on consultation feedback.

3. Corridor Assessment

3.1 Overview

3.1.1 There are a number of interventions introduced as part of the scheme that may have a potential impact on vehicles journey times, as follows:

- Major changes to junction arrangements, as described above;
- Delay to traffic behind stopping/stationary buses;
- Removal of right turn 'pockets (at priority junctions);
- Reduced carriageway widths;
- Changes to pedestrian crossings.

3.1.2 An assessment has therefore been carried out on the cumulative effect of the interventions.

3.2 Methodology

3.2.1 A spreadsheet was developed to estimate journey times impacts along the A1010, including the effect of 'delay' locations (in this case junctions and bus stops). The model covered the full length of the corridor from the College Gardens to Lincoln Road junction and both directions of traffic were assessed in two time periods (weekday AM peak hour and PM peak hour).

3.2.2 The A1010 scheme covers approximately 2.1miles. The existing average total journey time (including delay impacts) as recorded during the traffic surveys is in the range of 10-13 minutes along the full length of the corridor during AM peak period, with a similar journey time recorded in the southbound direction in the PM Peak. However, based on the surveys, the northbound journey time is on average approximately 20 minutes.

3.2.3 The potential impact of each of intervention type is described in the following sections.

3.3 Junction arrangements at the proposed signalised junctions

3.3.1 There are seven junctions where changes are proposed, with the results described in earlier chapters of this report.

3.4 Buses stopping in carriageway at bus stops

3.4.1 The proposed design has six bus stops where buses will need to stop in the carriageway, and traffic will need to stop behind them. This is likely to have the following impacts:

- Bus journey times should decrease – at most bus stops, buses currently need to merge with traffic, causing delays;
- Delay traffic behind stopping buses.

3.4.2 The proposed journey times are considered conservative for two key reasons as follows:

- No over-taking of buses at stops is assumed to occur on the corridor, where there is no overtaking lane – in reality, some drivers will over-take buses, reducing delay impacts associated with buses stopping at in-line stops;
- No time savings for bus passengers are assumed as a result of buses no longer being delayed merging into traffic at stops that are effectively converted to in-line facilities – typical practice at TfL currently is to provide in-line bus stops with kerb build-outs on most bus corridors to prevent delays of this nature to services.

3.5 Removal of right turn pockets at priority junctions

The scheme includes the removal of eight right-turn 'pockets' on the A1010, four in the northbound direction and four in the southbound direction. The average increase in delay at these junctions is approximately 6-8 seconds for vehicles held behind the right turning traffic. However, it is expected that this will result in a negligible increase in the overall journey time because traffic will have a clear corridor after the vehicles have turned and also will proceed to the subsequent signalised junction, where it will join the back of the queue. This negates the earlier delay experienced on the corridor. However, a delay associated with the removal of the right turn pockets has been included in the corridor journey time.

3.6 Reduced carriageway widths

While the carriageway narrows with the introduction of the scheme, it will remain wide enough for two vehicles to pass and it is not felt that the average speed on the links will reduce significantly below the existing average speed of approximately 22 to 27mph under free flow conditions.

3.7 Pedestrians crossings

At two locations staggered signalised crossings are proposed to be improved to straight crossings.

Where east/west Greenways intersect with the A1010 South, it is proposed to introduce parallel zebra and cycle priority crossings, replacing an existing zebra crossing and a staggered signalised crossing.

It is not expected that these changes to the crossings would have an impact on the average journey time of the traffic on the corridor, but it is accepted that there would be delays occasionally when a pedestrian and/or cyclists is crossing. It should however be noted that the new crossings would have significant advantages for pedestrians and disabled people in particular and the existing wide central islands at the signalised crossings have also been observed to slow traffic during free flow conditions.

3.8 Proposed impact

Based on the modelling assessment described above, for the core scenario, the estimated increases in average journey time (per mile) along the corridor are as shown in Table 3. These journey times are based on the proposed junctions and bus stops, with the option with the higher delay values used for the Edmonton Green network, to reflect a worst case scenario.

Table 3: Additional vehicle delay (per mile)

Additional average delay (seconds per mile)	Northbound	Southbound
AM peak	56s	12s
PM peak	6s	32s

Appendix A. : Junction Results Summary

New-Edmonton Green Network - Option 1 (New Four Arm Signalised Junction)

Approach	Existing AM DoS (%)	Existing AM Delay (Sec/PCU)	Existing AM MMQ (PCU)	Existing PM DoS (%)	Existing PM Delay (Sec/PCU)	Existing PM MMQ (PCU)	Core Scenario - Proposed @5% Reduction AM DoS (%)	Core Scenario AM Delay (Sec/PCU)	Core Scenario AM MMQ (PCU)	Core Scenario PM DoS (%)	Core Scenario PM Delay (Sec/PCU)	Core Scenario PM MMQ (PCU)	Sensitivity 1 - Proposed @2.5% Reduction AM DoS (%)	Sensitivity 1 AM Delay (Sec/PCU)	Sensitivity 1 AM MMQ (PCU)	Sensitivity 1 PM DoS (%)	Sensitivity 1 PM Delay (Sec/PCU)	Sensitivity 1 PM MMQ (PCU)	Sensitivity 2 - Proposed @10% Reduction AM DoS (%)	Sensitivity 2 AM Delay (Sec/PCU)	Sensitivity 2 AM MMQ (PCU)	Sensitivity 2 PM DoS (%)	Sensitivity 2 PM Delay (Sec/PCU)	Sensitivity 2 PM MMQ (PCU)
The Broadway - Smythe Close																								
The Broadway - Ahead and Right - Nbound	Refer to table below - Edmonton Green Network - Option 2 (Signalised Roundabout)						74.7%	28.1	15	75.7%	30.9	14.7	76.8%	29.2	15.8	77.7%	32.1	15.4	70.8%	26.3	13.5	71.7%	29.1	13.2
Smythe Close Left							27.9%	61.2	1.1	60.7%	63.6	3.6	28.7%	61.4	1.1	62.3%	64.7	3.8	26.3%	60.7	1	57.5%	61.8	3.4
Smythe Close- Right							17.5%	57.5	0.7	72.9%	72.5	5	17.5%	57.5	0.7	75.4%	75.5	5.3	15.9%	57.2	0.6	69.8%	69.4	4.6
The Broadway Left - Sbound							73.5%	78.8	4	78.0%	65.3	6	75.7%	81.9	4.3	80.0%	68.2	6.3	70.0%	74.1	3.7	74.2%	60.7	5.5
The Broadway Ahead - Sbound							71.3%	9.7	9.5	63.2%	9.6	6.1	73.2%	10.8	10	64.9%	10.8	6.5	67.4%	8.7	8.6	59.8%	9	5.3
Church Street - The Green -The Broadway -Balham Road																								
The Green - Ahead - Nearside	Refer to table below - Edmonton Green Network - Option 2 (Signalised Roundabout)						60.6%	39.7	6.6	50.1%	46	5.9	61.3%	39.8	6.7	51.0%	45.8	6.1	59.1%	39.7	6.4	47.9%	46	5.6
The Green - Ahead - Middle							58.0%	48.2	6.3	45.9%	32.7	5.5	60.6%	48.2	6.7	47.7%	32.8	5.7	53.5%	48	5.7	43.1%	32.8	5.1
The Green - Right							86.1%	54.2	13.6	80.6%	52.1	10.7	88.9%	59.5	14.6	83.0%	55.2	11.3	81.6%	48.3	12.3	76.4%	48	9.9
Church Street - Ahead, Right and Left							88.3%	39.6	17.5	83.0%	32.8	15.7	90.8%	44.1	19.1	85.4%	35.1	16.8	83.5%	33.7	15	78.7%	29.6	13.8
The Broadway - Ahead Left							84.3%	69.4	8.9	79.1%	44.1	8.4	85.3%	72.3	9.2	82.5%	49	9.4	80.6%	61.9	7.9	74.9%	38.4	7.5
The Broadway - Right							14.5%	23.4	1.7	16.6%	29.9	1.9	14.7%	23.1	1.7	16.9%	29.6	1.9	13.6%	23.9	1.6	15.6%	30.3	1.8
The Broadway - Ahead							81.7%	65	8.2	77.7%	42	8.2	85.3%	72.3	9.2	79.0%	44.3	8.5	76.5%	56.9	7.1	74.3%	37.2	7.4
The Green - Ahead and Left - NB							36.9%	11.9	4.9	43.1%	11.9	7.1	38.0%	11.7	4.9	44.8%	11.6	7.2	34.6%	12.3	4.8	40.8%	12.2	7.1
The Green @ Balham Rd- Ahead - Nbound							29.3%	3.8	4.3	28.2%	3.1	3.3	29.9%	3.8	3.8	28.9%	3.1	3.8	27.9%	3.9	3.3	27.0%	3	3.3
Balham Road - Left							22.3%	53	1.1	23.5%	53.3	1.1	22.3%	53	1.1	24.0%	53.4	1.2	20.5%	52.6	1	22.3%	53	1.1
The Green @ Balham Rd - Ahead - Sbound							76.7%	11.3	16.7	65.7%	7.4	3.9	78.9%	12.1	18.3	67.5%	7.6	4	72.7%	10.2	7.1	62.2%	7	3.5
Bus Station Exit							10.1%	54.3	0.4	7.4%	53.9	0.3	10.8%	54.4	0.5	8.1%	54	0.3	9.5%	54.2	0.4	7.4%	53.9	0.3
Hertford Road - The Green - Bus Station																								
The Green - Ahead - Nbound	Refer to table below - Edmonton Green Network - Option 2 (Signalised Roundabout)						56.4%	7	11.5	59.5%	7.8	12.8	57.9%	7.2	12.1	61.4%	8.2	13.6	53.4%	6.4	10.3	56.5%	7.3	11.7
The Green - Right - Nbound							33.4%	74.6	0.9	23.4%	51.8	1	34.7%	75.3	0.9	24.7%	52	1.1	32.1%	74.6	0.9	22.7%	51.6	1
Bus Station Exit							47.8%	50	3.5	53.9%	52.1	4	49.3%	50.5	3.6	55.4%	52.7	4.2	44.7%	49.1	3.2	50.8%	51	3.7
The Green - Ahead and Left - Sbound							69.5%	16.5	14.9	67.0%	19.4	13.8	71.5%	17.1	15.9	68.8%	20	14.4	66.0%	15.6	13.7	63.5%	18.5	12.6

New-Edmonton Green Network - Option 2 (Signalised Roundabout)

Approach	Existing AM DoS (%)	Existing AM Delay (Sec/PCU)	Existing AM MMQ (PCU)	Existing PM DoS (%)	Existing PM Delay (Sec/PCU)	Existing PM MMQ (PCU)	Core Scenario - Proposed @5% Reduction AM DoS (%)	Core Scenario AM Delay (Sec/PCU)	Core Scenario AM MMQ (PCU)	Core Scenario PM DoS (%)	Core Scenario PM Delay (Sec/PCU)	Core Scenario PM MMQ (PCU)	Sensitivity 1 - Proposed @2.5% Reduction AM DoS (%)	Sensitivity 1 AM Delay (Sec/PCU)	Sensitivity 1 AM MMQ (PCU)	Sensitivity 1 PM DoS (%)	Sensitivity 1 PM Delay (Sec/PCU)	Sensitivity 1 PM MMQ (PCU)	Sensitivity 2 - Proposed @10% Reduction AM DoS (%)	Sensitivity 2 AM Delay (Sec/PCU)	Sensitivity 2 AM MMQ (PCU)	Sensitivity 2 PM DoS (%)	Sensitivity 2 PM Delay (Sec/PCU)	Sensitivity 2 PM MMQ (PCU)
The Broadway - Smythe Close																								
The Broadway - Ahead and Right - Nbound	59.6%	12.5	9.2	76.8%	27.7	13	74.9%	29	15	75.5%	31.6	14.6	76.7%	29.9	15.6	77.5%	32.7	15.3	71.0%	27.1	13.7	71.5%	29.6	13.1
Smythe Close Left	18.4%	41.2	0.9	48.3%	42.9	3	28.7%	61.4	1.1	62.8%	65.1	3.8	29.5%	61.7	1.1	64.4%	66.2	3.9	27.1%	60.9	1	59.6%	63	3.5
Smythe Close- Right	10.1%	39.4	0.5	52.4%	43.5	3.4	16.7%	57.3	0.6	70.8%	70.3	4.7	16.7%	57.3	0.6	72.9%	72.5	5	15.2%	57	0.6	67.3%	67.2	4.4
The Broadway Left - Sbound	42.0%	11.4	5.6	55.4%	23.8	7.7	72.1%	86.3	3.8	76.6%	75.1	5.7	74.2%	89.4	4	78.5%	77.9	6	68.5%	81.8	3.5	72.3%	70.1	5.1
The Broadway Ahead - Sbound	28.5%	13.9	5.5	38.5%	20.9	4.5	71.3%	25.6	14.3	62.8%	25.7	11.3	73.0%	26.3	14.9	64.6%	26.2	11.6	67.4%	24.3	13.1	59.5%	24.8	10.4
Church Street - The Green - The Broadway																								
The Broadway - Nbound	44.2%	2.3	0.4	45.7%	2.4	3.8	65.4%	22.5	6.4	74.1%	25.1	7.9	67.1%	22.9	6.6	76.4%	25.9	8.3	61.9%	21.8	5.9	70.4%	23.9	7.2
Church Street	78.1%	8.6	1.8	81.6%	10.8	5.2	66.2%	16.3	5.8	68.0%	17.5	6.4	68.3%	16.8	6.3	70.1%	18.1	6.9	62.9%	15.8	5.4	64.5%	16.9	5.7
The Green - Sbound Nearside	57.9%	5.2	6.2	51.7%	5.4	4.7	51.7%	16.7	6.3	47.2%	16	5.6	53.0%	16.9	6.6	48.4%	16.2	5.7	49.1%	16.3	5.9	44.6%	15.6	5.1
The Green - Sbound Offside	46.6%	3.9	1.8	39.4%	4.4	4.3	48.6%	16.6	5.3	42.1%	15.7	4.4	50.0%	16.8	5.6	43.5%	15.9	4.6	46.1%	16.2	5	40.0%	15.4	4.1
The Green - Balham Rd																								
The Green - Ahead and Left - Nbound	39.1%	3.5	3.4	52.5%	5.4	5.3	35.4%	2.8	2.6	44.0%	4	2.9	36.7%	2.8	2.7	45.4%	4.1	3	33.4%	2.7	2.3	41.7%	3.9	2.5
The Green - Ahead - Nbound	11.8%	2.8	1	10.7%	2.4	0.6	10.9%	2	0.6	12.1%	2.3	0.5	11.1%	2	0.6	12.5%	2.3	0.5	10.6%	2	0.6	11.6%	2.3	0.5
The Green - Ahead - Sbound	63.0%	3.9	2.5	61.7%	9.6	7.2	56.7%	4.8	5.5	55.1%	5.4	10.8	58.2%	5	6	56.6%	5.6	11.7	53.8%	4.5	4.9	52.2%	5.2	9.8
Bus Station Exit	7.2%	39.8	0.3	3.0%	17	0.1	8.1%	49.6	0.4	3.3%	21.8	0.1	8.6%	49.6	0.4	3.6%	21.9	0.1	7.6%	49.5	0.4	3.3%	21.8	0.1
Balham Road - Left	6.7%	3.4	0.1	7.6%	3.5	0	5.5%	2.8	0	5.9%	2.8	0	5.5%	2.8	0	6.1%	2.8	0	5.0%	2.8	0	5.6%	2.8	0
The Green - Bus Station																								
The Green - Ahead - Nbound	62.3%	14.2	8.9	70.1%	18.4	15.4	54.8%	9.6	8.7	58.8%	10.9	9.9	56.4%	9.9	9.2	60.6%	11.2	10.4	51.9%	9.2	8	55.8%	10.4	9.1
The Green - Right - Nbound	19.9%	53.5	0.6	17.6%	44.3	0.9	26.7%	75.7	0.7	22.7%	54.1	1	28.1%	76.3	0.7	24.1%	54.4	1	25.4%	75.1	0.7	22.0%	53.9	0.9
Bus Station Exit	48.1%	43.1	3.1	46.8%	39.7	3.3	50.4%	52.5	3.5	53.9%	52.1	4	52.4%	53.3	3.7	55.4%	52.7	4.2	48.3%	51.8	3.3	50.8%	51	3.7
The Green - Ahead and Left - Sbound	82.6%	24.2	17.6	86.8%	34.7	17.5	67.4%	15.3	14.2	66.6%	19.3	13.7	69.1%	15.8	14.9	68.4%	19.8	14.3	63.9%	14.5	12.8	63.1%	18.4	12.5

Hertford Road with Bounces Road and Croyland Road

	Existing						Core Scenario - Proposed @5% Reduction						Sensitivity 1 - Proposed @2.5% Reduction						Sensitivity 2 - Proposed @10% Reduction					
	AM			PM			AM			PM			AM			PM			AM			PM		
Approach	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)
Croyland Rd - All Movements	81.1%	88.7	4.7	35.1%	50.6	2.1	Exit Only						Exit Only						Exit Only					
Hertford Rd - Ahead and Left - SB	85.3%	44.1	12.8	73.1%	38.4	11.1	86.5%	35.1	20.7	86.3%	42.9	17.8	88.9%	38.3	22.3	88.6%	46.2	19	82.0%	31	18.1	81.7%	38.1	15.7
Hertford Rd - Ahead and Right - SB	55.7%	29.9	6.3	38.5%	29.8	4.9	Lane removed						Lane removed						Lane removed					
Bounces Rd - All Movements	83.2%	56.5	6	100.5%	132.6	19.2	86.5%	72.8	7.2	87.0%	62.3	10.4	88.1%	75.9	7.6	89.3%	67.1	11.2	82.3%	66.1	6.2	82.5%	55.6	8.9
Hertford Rd - All Movements - NB	94.0%	62.2	18.2	100.1%	100	31.9	62.7%	25.8	10.7	86.2%	43.5	18.2	64.3%	26.5	11.2	88.4%	46.6	19.4	59.4%	24.4	9.7	81.6%	38.7	16

Hertford Road with Bury Street

	Existing- (Mini- Roundabout)						Core Scenario - Proposed @5% Reduction						Sensitivity 1 - Proposed @2.5% Reduction						Sensitivity 2 - Proposed @10% Reduction					
	AM			PM			AM			PM			AM			PM			AM			PM		
Approach	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)
A1010 Hertford Road - All Movements - SB	97.0%	69.51	15.3	78.0%	18.57	3.5	88.2%	41.6	20.3	69.4%	24.6	10.6	91.2%	47	22.4	74.1%	26.4	11.3	83.1%	35.9	17.5	62.2%	22.1	9.4
A1010 Hertford Road - All Movements -NB	71.0%	12.42	2.4	86.0%	23.95	5.5	93.2%	58.4	22.2	91.0%	43.1	23.9	95.7%	67.9	24.8	93.5%	49.4	26.3	88.3%	47.1	18.9	86.3%	36	20.5
Bury Street - All Movements	65.0%	17.41	1.8	49.0%	12.41	1	97.9%	93.3	22.6	91.6%	79.6	13.4	100.5%	115.4	26.6	93.9%	88.9	14.7	92.6%	67.3	17.6	86.6%	66.5	11.4

Hertford Road with Galliard Road with Nightingale Road

	Existing						Core Scenario - Proposed @5% Reduction						Sensitivity 1 - Proposed @2.5% Reduction						Sensitivity 2 - Proposed @10% Reduction					
	AM			PM			AM			PM			AM			PM			AM			PM		
Approach	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)	DoS (%)	Delay (Sec/PCU)	MMQ (PCU)
Hertford Rd - Ahead and Left- SB	96.2%	60.5	23.6	75.5%	25.5	7.2	72.0%	24.5	13.6	64.6%	23.2	6.9	73.8%	25.1	14.2	66.3%	23.7	7.2	68.2%	23.2	11.5	61.2%	22.4	6
Hertford Rd - Ahead and Right - SB	88.8%	69.3	11.2	51.3%	32.3	4.2	65.1%	37.7	8.6	59.6%	40.1	6.1	66.8%	38.1	9	61.9%	40.9	6.3	61.5%	36.4	8	53.4%	37.5	5.6
Nightindale Rd - All Movements	96.4%	84.9	16.9	94.2%	71.4	14.4	97.3%	96.8	18.2	96.6%	94.9	18.1	99.9%	117.4	21.6	99.3%	113.5	21	92.3%	73.2	14.1	91.4%	72	14.3
Hertford Rd - All Movements - NB	80.5%	42.7	9.3	95.2%	78.5	13.2	88.1%	57.7	15.1	82.6%	49.7	13	93.3%	72.5	17.6	85.7%	54	14	81.0%	47.4	12.7	77.4%	44.8	11.6
Galliard Rd - Ahead and Right	80.3%	67.8	6.9	79.2%	74.6	4.8	90.1%	121.3	7.2	64.9%	76.1	3.4	92.5%	132.5	7.9	66.2%	77.4	3.5	85.9%	106	6.2	61.5%	73.3	3.1