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Cycle Enfield - A105

LB Enfield

A105 Preliminary Traffic Modelling Assessment

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25 January 2016

Preliminary Modelling Assessment
LB Enfield

Document history and status

Revision	Date	Description	By	Review	Approved
0	13/10/15	Draft for client review	AS	JH	AN
A	15/10/15	Draft for client review	AS	AN	AN
B	05/11/2015	Final for Review	AS	AN	AN
C	18/11/2015	Final for Review	AS	AN	AN
C	25/01/2016	Final	AS	AN	AN

Distribution of copies

Revision	Issue approved	Date issued	Issued to	Comments
B	AS	06/11//2015	LB Enfield	
C	AS	18/11//2015	LB Enfield	
D	AS	25/01//2016	LB Enfield	

Cycle Enfield - A105

Project no:	B240G001
Document title:	A105 Preliminary Traffic Modelling Assessment
Document No.:	1
Revision:	D
Date:	25 January 2016
Client name:	LB Enfield
Client no:	
Project manager:	Alex Stebbings
Author:	Alex Stebbings
File name:	I:\UNIF\Projects\NCC Traffic Team Project Library\Enfield Mini Holland\Route A105\Deliverables\Reports\Modelling Summary Report\A105 Preliminary Traffic Modelling Report RevD.docx

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Contents

1. Introduction ... 3
1.1 Purpose of report ... 3
1.2 Background to the Cycle Enfield proposals ... 3
1.3 Travel demand in Enfield and on the A105 ... 4
2. Preliminary junction modelling results ... 6
2.1 Methodology ... 6
2.2 Daily variation in traffic flow ... 6
2.3 Junction arrangements at the proposed signalised junctions ... 7
2.4 Degree of junction saturation ... 7
2.5 Journey time changes at junctions ... 8
2.6 Changes in Queue Lengths at Junctions ... 9
2.7 Further work ... 9
3. Corridor Assessment ... 10
3.1 Overview ... 10
3.2 Methodology ... 10
3.3 Junction arrangements at the proposed signalised junctions ... 10
3.4 Buses stopping in carriageway at bus stops ... 10
3.5 Removal of right turn pockets at priority junctions ... 11
3.6 Reduced carriageway widths ... 11
3.7 Locations where zebra crossings have replaced advisory crossings ... 11
3.8 Proposed Impact ... 11

Appendix A. : Junction Results Summary

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 A105 and reports on preliminary modelling of the changes proposed by the Cycle Enfield project at junctions on Green Lanes in Enfield.

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 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 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 A105

1.3.1 The London Plan indicates that the 2011 population in the four north London boroughs of Enfield, Barnet, Haringey and Waltham Forest combined was 1.2m, and is projected to grow to 1.4m by 2031[2], an increase of 17%. Jobs in the four boroughs are forecast to rise from 390,000 to 430,000 over the same period, an increase of 10%.

1.3.2 Enfield Council's Core Strategy document, published in 2010, refers to 2008 GLA growth projections, which predicted an increase in resident population in the borough from 285,100 in mid-2007 to between 293,500 and 303,800 by 2026 (growth of between 3% and 6.6%). Updated figures from the GLA released in 2014 now suggest that the population of the borough is already close to 325,000, and trend-based forecasts suggest it could rise as high as 360,000 over the next ten years (although forecasts linked to future development and land availability suggest more modest growth to over 330,000 during the same period)[3]. GLA employment projections released this year also indicate that total jobs in the borough are forecast to increase from 108,000 in 2011 to 115,000 by 2026[4].

1.3.3 The Enfield Core Strategy (2010) has a core objective to '*enhance traffic flow by the provision of appropriate infrastructure as well as the promotion of sustainable methods of transport and a pattern of development that reduces the need to travel*'.

1.3.4 It is also 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.

[2] http://content.tfl.gov.uk/north-srtp-plan-update-2014.pdf - page 4
[3] http://data.london.gov.uk/dataset/2014-round-population-projections
[4] http://data.london.gov.uk/dataset/gla-employment-projections

1.3.5 Despite recent increases in population and employment in the borough, daily traffic volumes along the A105 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[5]. 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 A105 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 A105 junctions with Village Road, Bush Hill Road/Church Street, Bourne Hill/Hedge Lane, Fox Lane, Alderman's Hill and Broomfield Lane/Oakthorpe Road all operate in excess of 95% of available capacity during peak times.

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 A105 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 A105 corridor, as illustrated in the 2014 SRTP update summary of proposals[6].

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 along the southern section just to the north of the North Circular junction, reducing to 10-12% along sections further to the north. 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 A105. TfL's Analysis of Cycling Potential report, published in December 2010, indicated that 94% of cycling trips are under 8km in length[7]. 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.

[5] http://content.tfl.gov.uk/travel-in-london-report-7.pdf
[6] 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 A105. It is based on individual 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.

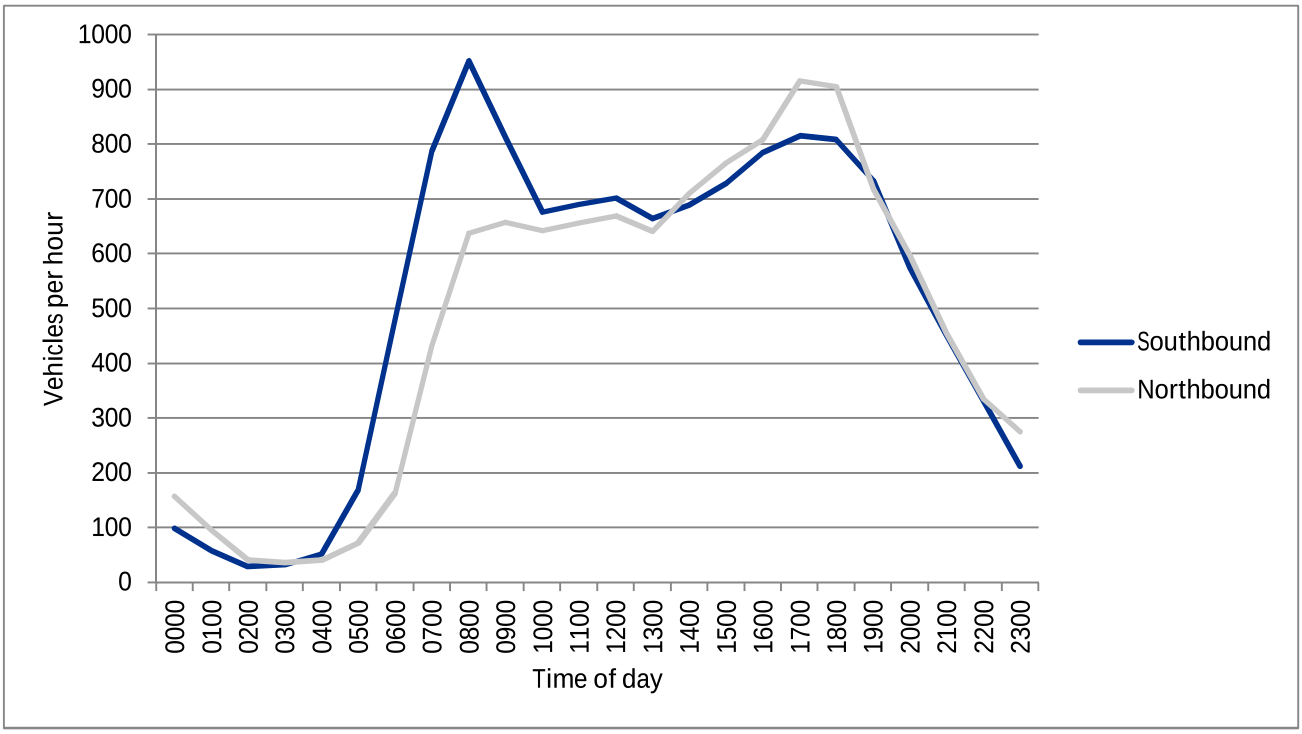
2.1.2 The results are preliminary as the design is subject to a road safety audit and will also be audited by TfL, before the design and modelling results are finalised.

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 Green Lanes. This is considered conservative for the peak hours, based on experience elsewhere in London which indicates that the effect may be higher, particularly given the opportunity for some traffic to re-assign to e.g. the A10 but 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 The tests have been undertaken for the morning and evening peak hours, which as shown in Figure 1, are the busiest periods of the day. Outside of these periods traffic volumes decrease, with flows dropping by up to 25% in the periods between these peak periods - the modelling is therefore regarded as a conservative estimate and delays should be lower at most other times of the day.

Figure 1: Greens Lanes Traffic Volumes.



Surveys undertaken at a location south of Highfield Road in July 2014.

2.3 Junction arrangements at the proposed signalised junctions

2.3.1 There are seven junctions where significant changes are proposed, which will be signal-controlled with provision for pedestrians and cyclists to safely progress through the junction, with Fox Lane converted from a roundabout to a priority controlled T-junction. These junctions have been modelled using standard traffic engineering software packages and TfL procedures, with base models approved by TfL. Final modelling will also be audited by TfL.

2.3.2 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.

2.3.3 Some junctions can be improved with the proposals (for example Green Lanes/Broomfield Lane/Oakthorpe Road and Church Street/Bush Hill Road), 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.

2.3.4 It should be noted that at junctions where priority control, or a roundabout, is being replaced by signals (Sainsbury's Access and Ford's Grove) delays do increase (see section 2.5 for more details). These junctions have been signalised to provide a safe progression through the junction for people cycling, whilst also providing signalised crossings at Ford's Grove.

2.3.5 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, through all scenarios tested. The overall assessment is that capacity is not significantly affected – under the core scenario, only the Sainsbury's junction shows a significant change in capacity but still operates with a reasonable level of spare capacity. Notable improvements in capacity are expected in the am peak at the junctions of Alderman's Hill, Broomfield Lane/Oakthorpe Road and Church Street/Bush Hill Road, with improvements to the latter in the pm peak as well.

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
Ridge Avenue/Village Road/Bush Hill Road/Church Street	95.6	96.3	83.2	80.5	92.4	84.3	77.8	78
A105/Fords Grove/Station Road	85.0	87.0	88.5	80.3	91.7	82.4	83.6	76.2
Green Lanes/Sainsbury's	37.1	82.0	72.8	90.4	74.7	92.7	69	85.6
A105/Bourne Hill/Hedge Lane	96.7	97.2	93.6	92.5	96.6	93.8	88.6	90.8
Green Lanes/Fox Lane	77.9	87.6	74.0	83.0	78.0	87.0	67.0	76.0
Green Lanes/Alderman's Hill (Signalised)	95.3	93.2	72.2	86.9	74.1	89.1	68.3	82.1
Green Lanes/Broomfield Lane/Oakthorpe Road	99.2	99.4	88.2	93.5	90	95.8	92.4	87.8

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 minutes per Passenger Car Unit (PCU), during the peak periods for the northbound and southbound movements on the A105. 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, 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, when considering the core scenario. The junction with Sainsbury's experiences the highest increase in journey times in the northbound direction (between 20 and 35 seconds), with the southbound approach increased by approximately 5 seconds. The A105 southbound approach to Ford's Grove increases by between 8 and 14 seconds, with the northbound approach increasing by between 4 and 5 seconds. In the AM Peak the northbound and southbound approach at Bourne Hill/Hedge Lane increase by between 15 and 24 seconds, with the southbound approach increasing by 7 seconds in the PM Peak. At the Fox Lane junction the conversion to a priority controlled junction increase the southbound delay by between 5 and 7 seconds, but reduces the northbound delay by between 8 and 28 seconds. However, Bush Hill Road/Church Street, Alderman's Hill and Bush Hill Road/Oakthorpe Road junctions show an overall reduction in journey times (up to 1 minute 6 seconds) on the Green Lane approaches.

2.5.3 When the overall delay based on the junction modelling is considered, most changes are small, with no change (plus or minus) more than 40 seconds at any location, apart from the Green Lanes/Broomfield Lane/Oakthorpe Road (where there is an improvement in journey time of 1 minute 6 secs on the southbound approach). Total changes for the core scenario summed across all the junctions show a range between a decrease in journey time of 1m 18 seconds seconds and an increase of 15 seconds. 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.

2.5.4 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
Ridge Avenue/Village Road/Bush Hill Road/Church Street	Northbound	-16.4	-7.1	-11.3	-4.5	-20.0	-8.3
	Southbound	-12.4	-35.7	-9.5	-33.5	-15.4	-35.8
A105/Fords Grove/Station Road	Northbound	5.3	3.5	4.3	4.6	4.7	1.7
	Southbound	13.5	7.9	9.6	9.5	8.9	5.4
Green Lanes/Sainsbury's	Northbound	20.2	34.8	20.9	39.6	19.1	29.1
	Southbound	5.2	5.0	5.9	5.7	4.0	3.8
A105/Bourne Hill/Hedge Lane	Northbound	23.5	-1.8	27.1	4.8	17.8	-16.0
	Southbound	14.6	7.0	21.5	8.9	4.9	0.7
Green Lanes/Fox Lane	Northbound	-8.2	-28.1	-8.2	-28.1	-8.2	-28.1
	Southbound	5.0	7.4	5.6	8.6	3.8	5.6
Green Lanes/Alderman's Hill Signalised	Northbound	-2.4	-4.8	-2.0	-2.4	-3.0	-8.4
	Southbound	-38.2	-2.9	-37.4	-1.8	-39.5	-5.1
Green Lanes/Broomfield Lane/Oakthorpe Road	Northbound	-7.5	-36.5	-7.0	-31.9	-8.5	-41.8
	Southbound	-1m6s	-26.1	-1m4s	-27.0	-1m9s	-33.6
Total	Northbound	14.5	-40.0	23.8	-17.9	1.9	-1m18s
	Southbound	-1m18s	-37.4	-1m9s	-29.6	-1m42s	-59.0

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 junction 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 The notable increases in queues are on the approaches to the junction with Sainsbury's, where the northbound movement is currently free flow and the proposed queue for the core scenario is between 13 and 27 and the increase on the southbound approach between 10 and 13. Ford's Grove also experiences an increase in queues on the all approaches with a maximum increase of 15 PCUs, although it should be noted that this total is over both lanes on the southbound approach in the AM Peak. The northbound approach to the Bourne Hill/Hedge Lane junction also experiences and increase in queue of 9 PCUs in the AM Peak.

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

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;
- Buses stopping in-carriageway (in-line) at bus stops;
- Removal of right turn ‘pockets (at priority junctions);
- Reduced carriageway widths;
- Changes to pedestrian crossings.

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

3.2 Methodology

The A105 scheme covers approximately 3.2 miles. Journey times along the full length of the corridor affected by the scheme vary during different periods of the day and direction but are approximately 10-15mins in each direction. Average speeds along the full length of the corridor therefore range between about 13mph and 19mph.

A spreadsheet model was developed to simulate traffic flow along the A105, including the effect of ‘delay’ locations (in this case junctions and bus stops). The model covered the full length of the corridor from the North Circular to Enfield Town and both directions of traffic were modelled in two time periods (weekday AM peak hour and PM peak hour).

The model was based on 5 second time increments. A 5 minute lead-in period and a 15 minute lead-out period were incorporated around the modelled hour. During the modelled hour traffic enters at a rate based on observed data, and in the lead-out period no further traffic was assumed to enter, allowing residual delay to be calculated.

A ‘base’ situation was modelled and this was then compared to a ‘do-something’ situation with the relevant scheme in place. The base model predicted a total journey time (including delay impacts) of 13 minutes along the full length of the corridor during peak times (in both directions) and slightly less in the off peak direction, which is within the range from observed data.

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

3.3 Junction arrangements at the proposed signalised junctions

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

The proposed design has a number of 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.

The modelling forecasts described above are conservative for two key reasons as follows:

- No over-taking of buses at stops is assumed to occur on the corridor during the modelled time periods, 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 some 19 right-turn 'pockets' on the A105, 10 in the northbound direction and 9 in the southbound direction. The average increase in delay at these junctions is approximately 2-4 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 below the existing average speed of approximately 22 to 27mph under free flow conditions.

3.7 Locations where zebra crossings have replaced advisory crossings

Some pedestrian advisory crossings would be replaced with zebra crossings as part of the scheme. The new zebra crossings would predominantly be located in residential areas, and while they serve key desire lines the pedestrian footfall is relatively light when compared to town centre locations.

It is therefore not expected that this 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.

3.8 Proposed Impact

Based on the modelling assessment described above, the estimated increase in journey time (in seconds per mile) based on the proposed junctions and bus stops are as shown in Table 3.

Table 3: Additional vehicle delay (second per km)

Additional delay (seconds per mile)	Northbound	Southbound
AM peak	33	24
PM peak	25	47

Appendix A. : Junction Results Summary

Ridge Avenue/Village Road/Bush Hill Road/Church Street																								
	Base						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)
Ridge Avenue Ah & Lt	92	60.5	19	89.2	46.4	15.1	81.3	44.1	15.2	80.5	39.3	14	84.3	49.2	17.0	83.4	41.9	15.4	77	40.5	13.5	78	38.1	12.8
Ridge Avenue Rt	95.6			91.1			83.2			80.5			92.4			83.6			77			78		
Village Road Ah & Lt	89.6	50.7	15.7	96.3	69	19	82.1	38.3	15.7	79.6	33.3	13.7	85.2	41.2	17.2	82.6	35.5	15	77.8	35.3	13.9	77.3	33.2	12.4
Church Street	80	41.7	11	72.8	33.6	8.8	83.2	48.7	12.1	80	47.6	11	88.7	52.0	13.0	82.9	49.8	11.8	77.4	45.8	10.8	76.8	45.3	10.1
Bush Hill Road	50.7	37.5	6.1	47.1	33.8	4.5	77.2	66.9	8.2	77.2	66.9	8.2	80.2	70.3	8.8	84.3	81.9	7.8	73.3	63.3	7.5	57.8	49.6	5.4

A105/Fords Grove/Station Road																								
	Base						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)
Green Lanes N/bound Ah & Rt	56	7.6	1.3	81	16.3	5.5	44.7	12.9	5.9	78.3	19.8	15.3	44.4	11.9	5.8	80.3	20.9	16.1	42.3	12.3	5.4	74.1	18	13.4
Green Lanes S/bound	85	23.7	4.9	87	25.3	0.7	87.6	37.2	20	80.3	33.2	13.9	85.7	33.3	19.5	82.4	34.8	14.8	83	32.6	17.5	76.2	30.7	12.5
Fords Grove	55	9.1	1.2	40	6.8	4	82.6	50.9	9.3	70.7	39.6	5.3	91.7	70.3	12.2	72.7	40.5	5.6	78.1	47.1	8	67	38.2	4.9
Station Road	47	10.6	0.9	58	16.2	1.3	88.5	72	10.7	78.8	49.5	8.6	91.4	82.7	12.1	80.9	51.5	9	83.6	62	9.3	74.8	46.1	7.9

Green Lanes/Sainsbury's Access																								
	Base						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)	Average Queue	DoS (%)	Delay (Sec/PCU)	Average Queue	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)
Green Lanes N/bound	Free Flow			Free Flow			71.4	20.2	13.3	90.3	34.8	27	73.4	20.9	14	92.7	39.6	29.5	67.7	19.1	12.1	85.6	29.1	23.4
Green Lanes S/bound	30.2	10.2	0.4	41.7	13.2	0.7	72.8	15.4	13.3	61.5	18.2	10.3	74.7	16.1	14.1	69.6	18.9	10.9	69	14.2	11.7	57.4	17	9.4
Sainsbury's Exit	37.1	24.0	0.6	82	67.2	3.1	49.6	39	2.9	90.4	76.2	11.2	51	39.3	3	92.4	82.6	12.1	47.4	38.6	2.7	85.3	64.6	9.3

A105/Bourne Hill/Hedge Lane																								
	Base						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)
Green Lanes N/bound	70.3	29	7.6	94.5	54.4	22.8	91.5	52.5	16.8	91.5	52.6	23.4	94.4	56.1	17.9	93.78	59.2	25.7	82.4	46.8	14.1	85.2	38.4	18
Green Lanes S/bound Ah & Rt	56.6	31.7	6.3	71.6	45.5	5.3	91.5	51.2	23.5	81.2	39.6	17.1	93.9	58.1	25.9	83.2	41.5	18.2	87	41.5	18.9	75.8	33.3	14.1
Green Lanes S/bound Ah & Lt	82.5	41.6	11.5	53.3	19.7	6.4																		
Bourne Hill	88.9	44.9	13.5	88.8	46.8	13.5	93.6	64.8	18.9	86.5	48.4	14.7	96.6	78.6	22.4	89.1	52.5	16.2	88.6	51	13.5	84	44.9	11.9
Hedge Lane	96.7	72.8	18.6	97.2	76.1	23.2	83.7	45.1	13.1	92.5	60.8	20.9	86.8	48.5	15	85.2	70.4	23.7	78.4	40	9.4	90.8	56	17.4

Green Lanes/Fox Lane																								
	Base						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)	Average Queue	DoS (%)	Delay (Sec/PCU)	Average Queue	RFC	Delay (Sec/VEH)	Average Queue	RFC	Delay (Sec/VEH)	Average Queue	RFC	Delay (Sec/VEH)	Average Queue	RFC	Delay (Sec/VEH)	Average Queue	RFC	Delay (Sec/VEH)	Average Queue	RFC	Delay (Sec/VEH)	Average Queue
Green Lanes N/bound	77.9	8.2	3.3	87.6	28.1	6	Free Flow			Free Flow			Free Flow			Free Flow			Free Flow			Free Flow		
Green Lanes S/bound	57.9	8.8	1.4	64.0	8.8	1.7	51.0	13.8	1	55.0	16.2	1.2	53.0	14.4	1.1	57.0	17.4	1.3	47.0	12.6	0.9	51.0	14.4	1.0
Fox Lane	56.5	16.2	1.3	50.0	16.2	1	74.0	34.2	2.6	83.0	40.8	3.80	78.0	39.6	3.10	87.0	47.4	4.70	67.0	27.0	2.0	76.0	30.6	2.7

Green Lanes/Alderman's Hill																								
	Base						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)
Green Lanes N/bound Ah& Lt	71.1	22.9	4.9	88	35.1	10.5	62.8	20.5	6.7	85.4	30.3	17.0	64.5	20.9	7.2	87.6	32.7	18.4	59.5	19.9	6	80.8	26.7	14.6
Green Lanes S/bound Ahead	95.3	60.4	11.7	69.2	23.7	6.9	71.4	29.0	8.5	69.8	32.0	9.1	73.3	29.8	8.9	71.7	33.1	9.7	67.7	27.7	7.5	66.2	29.8	8.3
Green Lane S/bound Right		74			46																			
Alderman's Hill	94.1	71.4	8.9	93.2	71	10	72.2	41.8	5.9	86.9	58.2	8.1	74.1	42.8	6.1	89.1	62.3	8.8	68.3	40.2	5.4	82.1	51.9	6.9

Green Lanes/Broomfield Lane/Oakthorpe Road																								
	Base						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)
Green Lanes N/bound	81.1	30.6	11	99.1	76.8	26.1	66.1	23.1	13.3	88.6	40.3	22.6	67.7	23.6	13.9	91.3	44.9	24.6	62.6	22.1	12.4	84	35	19.8
Green Lanes S/bound	99.2	109	16.8	95.3	83.5	13.3	80.8	42.8	12.5	88.7	57.4	14.9	83	44.8	13.2	88.3	56.5	15.3	76.7	39.7	11.3	83.9	49.9	12.8
Broomfield Lane	69.3	45.9	4.4	99.4	137.6	12.5	88.2	89	6.6	93.5	108.2	9.1	90	94.3	7.1	95.8	120.3	10.2	82.4	76	5.4	87.8	87.4	7.1
Oakthorpe Road	18.9	38.5	1.1	54.2	52	2.9	33.6	61.4	1.5	80	101.8	4.5	34.2	61.7	1.5	81.3	104.5	4.7	30.9	60.5	1.4	76	93.2	4