

# TRA 001A Luton Local Plan: 2015 Pre-submission Transport Evidence



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# 1. Introduction

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# 1 Introduction

- 1.1 The Central Bedfordshire and Luton Transport Model (CBLTM) is a multi-modal model used in assessing the impacts of transport schemes and developments proposed for both Luton and Central Bedfordshire. The highway assignment model of the CBLTM has been enhanced in 2013 to provide improved model performance and coverage in and around Luton to enable the assessment of impacts of transport schemes and developments proposed for both Luton and Central Bedfordshire. This enhanced version of the transport model has been used for the initial assessment of the Luton Local Plan as detailed within this report.
- 1.2 Luton Borough Council (LBC) has commissioned AECOM to undertake transport modelling tests of the proposed Luton Local Plan, for a number of options and forecast years. To summarise the uses and context of the modelling:
  - These tests should only be used for the assessment of the Local Plan;
  - Results will provide an indicative, high level, strategic assessment; and
  - There has been assessment of potential further mitigations required in order to alleviate congestion and delays as a result of proposed growth.
- 1.3 The purpose of these tests is to provide evidence identifying the junctions and roads where congestion may occur in the future as a result of proposed developments.
- 1.4 This report explains the inputs into the Local Plan model runs and the out-turn results in comparison to different levels of development. The structure of this report after this introduction is as follows:
  - Section 2 - Summarises the Local Plan options considered,
  - Section 3 - Outlines the planning and infrastructure data which underpins the modelling tests,
  - Section 4 - Summarises the assignment results of the model tests,
  - Section 5 - Presents the conclusions of the testing.

## 2. Local Plan Options

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## 2 Local Plan Options

- 2.1 AECOM has undertaken a range of transport modelling tests of the proposed Luton Local Plan, for a number of options and forecast years. This section sets out the forecast years considered and the options tested.

### Forecast Years

- 2.2 Three forecast years were considered, namely 2016, 2021 and 2031. 2016 was chosen as it is 5 years into the 2011 to 2031 planning cycle and key committed infrastructure (Luton Town centre & Junction 10a) will be complete within this time horizon. Table 1 summarises the options tested by forecast year.
- 2.3 LBC required the assessment of several options across the forecast years, which included all the infrastructure and development proposed in line with the Local Plan in the corresponding years. The prioritisation of potential schemes was considered, alongside how they are linked with development proposals, to ensure adequate evidence is in place to identify appropriate funding which may be required, along with the likely timing of this.
- 2.4 The purpose of the Local Plan tests is to provide supporting transport evidence covering the provision of growth and linked infrastructure.. The tests were used to identify the junctions and roads where congestion may occur in the future as a result of proposed developments and will be used to inform the development of potential transport solutions.
- 2.5 The option tests and their respective forecast years are summarised in Table 1.

**Table 1: Summary of option tests and modelled years**

Option	2016	2021	2031
A	✓		
A (Alternative)	✓		
B		✓	✓
C		✓	✓
C (Alternative)			✓
C (with Mitigations)			✓

### Options Summary

- 2.6 An overview of the options considered is summarised below. The options outlined contain incremental growth, with Option A representing the committed baseline.

#### Option A

- 2.7 Option A (Reference Case) includes committed developments only. LBC have provided the uncertainty log which provided the location and quantum of the committed developments<sup>1</sup>. The committed growth includes 1,766 dwellings within Luton.

#### Option A (Alternative)

- 2.8 A sensitivity test of Option A for 2016 was also undertaken. This alternative option will assume an amended highway network scenario only (i.e. without the Woodside Link and A5-M1 Link). All other infrastructure and development planning data will remain consistent with Option A, as shown in Table 2, Table 3 and Table 4.

<sup>1</sup> Provided by Keith Dove, via email, on the 8 October 2015

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### **Option B**

2.9 Option B is to identify locations of congestion on the modelled network as a result of proposed developments in the Borough, with the aim of highlighting any 'show stoppers' or pinch points which are likely to require significant mitigations. Commitment to developments was provided by LBC as part of the Central Bedfordshire and Luton Development and Infrastructure Uncertainty Log and shows a total of 5,814 dwellings within Luton.

### **Option C**

2.10 Option C considers proposed developments in the Borough (i.e. as Option B) plus known proposed development sites in adjacent Local Authority areas. These planning assumptions applied to the 2021 and 2031 forecast years.

- North of Luton - although no application received, 1,067 and 3,211 dwellings are in the housing strategy for 2021 and 2031 respectively;
- North Hertfordshire - currently modelled to TEMPRO/ NTEM growth, more detail growth for Wandon End and Brick Kiln developments to the East of Luton has been specified to include 5,500 dwellings for 2031.

### **Option C (Alternative)**

2.11 A sensitivity test of Option C was also undertaken. This alternative assumed a lower level of development at the East of Luton site with 2,100 dwellings in 2031, instead of 5,500 dwellings included in Option C. All other development will remain consistent with Option C, as shown in Table 2, Table 3 and Table 4.

### **Option C (with Mitigations)**

2.12 Upon the results of the above Option C tests, a mitigation test of Option C was undertaken. The aim of the junction mitigations is to alleviate congestion issues that may result from the additional growth. The mitigations previously identified and modelled by AECOM from previous studies will be incorporated into this option.

### 3. Planning and Infrastructure Data

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### 3 Planning Data

#### Households and Employment

3.1 Forecast year planning data summarised in Table 2 for Luton is based on the 2015 Uncertainty Development Log, plus demand from past completions from 2011/12 to 2014/15 and future completions at 'small' sites between 2015/16 and 2019/20<sup>2</sup>. Outside of Luton, growth is based on the 2015 Uncertainty Log for Central Bedfordshire and other known levels of growth for adjacent authorities. The additional dwellings from 2011 to each forecast year and option are set out in Table 2 and the additional jobs from 2011 to each forecast year and option are set out in Table 3.

**Table 2: Additional Dwellings 2011-2031**

Area	Site	2016		2021		2031		
		Option A	Option A (Alternative)	Option B	Option C	Option B	Option C	Option C (Alternative)
Luton	Luton dwellings	1,766	1,766	3,099	3,099	6,905	6,905	6,905
Central Beds	Leighton Buzzard East	-	-	840	840	2,500	2,500	2,500
	North of Luton Extension	-	-	-	1,067	-	3,211	3,211
	Houghton Regis North 1	-	-	800	800	2,800	2,800	2,800
	Houghton Regis North 2	-	-	630	630	1,930	1,930	1,930
	Early release sites at Kestrel Way and East Bidwell	-	-	1,000	1,000	1,000	1,000	1,000
North Herts	East of Luton Extension	-	-	-	-	-	5,500	2,100
<b>Totals</b>		<b>1,766</b>	<b>1,766</b>	<b>6,369</b>	<b>7,436</b>	<b>15,135</b>	<b>23,846</b>	<b>20,446</b>

**Table 3: Additional Jobs 2011-2031**

Area	Site	2016		2021		2031		
		Option A	Option A (Alternative)	Option B	Option C	Option B	Option C	Option C (Alternative)
LBC	Butterfield Green	-	-	-	-	4,013	4,013	4,013
	Jct 10a	-	-	-	-	1,728	1,728	1,728
	Century Pk	-	-	-	-	2,599	2,599	2,599
	Power Ct	-	-	-	-	2,074	2,074	2,074
	Napier Pk	-	-	-	-	3,016	3,016	3,016
	Station Quarter	-	-	-	-	623	623	623
	Luton Airport	-	-	-	-	5,050	5,050	5,050
CBC	North of Luton Extension	-	-	-	2,500	-	3,250	3,250
	Houghton Regis North 1	-	-	1,628	1,628	2,961	2,961	2,961
	Houghton Regis North 2	-	-	550	550	550	550	550
	East Leighton Buzzard	-	-	800	800	2,400	2,400	2,400
<b>Totals</b>		<b>-</b>	<b>-</b>	<b>2,978</b>	<b>5,478</b>	<b>25,014</b>	<b>28,264</b>	<b>28,264</b>

<sup>2</sup> Confirmed by Jack Kelley, via email, on the 21 January 2016

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- 3.2 Planning data, in terms of housing, population and employment, is established in the existing version of CBLTM. The residential site data provided as part of the latest CBLTM development Uncertainty Log will be incorporated into the model to ensure that the quantum and spatial distribution of housing growth is representative of current plans.
- 3.3 There are 127 proposed development sites in total covering Luton. Each development site was located spatially within the model and the developments grouped together at a zonal level.
- 3.4 The level of certainty of development sites was provided by LBC during October 2015 as part of the updated Uncertainty Log and defines the difference between those options anticipated to be modelled. In addition, Option C includes developments in neighbouring authorities. The detail of this is specified above in Table 2 and Table 3.
- 3.5 Trip generation and attraction was calculated and attributed to the updated zone system, in line with the projections of growth. Since the purpose of the tests is to assess development proposals in line with the proposed Local Plan, the total growth will be retained and no overall constraint against TEMPRO/ NTEM will be undertaken.
- 3.6 The assumption for future growth outside of Luton will be in line with latest growth projections. This covers growth within the Central Bedfordshire as well as external traffic growth (i.e. growth generated externally, but passing through the modelled area).

#### **Airport Demand**

- 3.7 Existing highway demand for the airport would already be included in the model whilst future planned growth has been based on the 2028 traffic demand forecasts produced for Luton Airport<sup>3</sup>. The Airport planning application was predicted on the airport reaching 18 million passengers per annum by 2028, although based on the passenger increases in 2014 to 2015, it is anticipated this could be achieved by 2021. Based on this, LBC have advised that the 2028 airport demand is to be used for both the 2021 and 2031 forecast year options<sup>4</sup>. The data has been applied to the matrix following the furness methodology.

#### **Transport Infrastructure Schemes**

- 3.8 The modelled representation of committed and proposed infrastructure schemes has been considered in detail during the preparation and running of the Local Plan tests. The infrastructure included is shown in Table 4.
- 3.9 Some of the allocation of Central Bedfordshire schemes into the Luton Local Plan options will be dependent on the developments. For example, the North of Luton extension distributor roads are dependent to the North of Luton development; and the Houghton Regis North 2 Development distributor roads, Woodside Link and Poynters Road scheme (see Table 4 overleaf) are dependent to the Houghton Regis North Development.
- 3.10 The definition of the network schemes have been provided by LBC.
- 3.11 The Luton Airport Parkway Bus-Loop scheme, which has been included in previous Local Plan tests undertaken in 2013<sup>5</sup>, has been excluded from the scheme list for the 2031 options for this study as LBC has advised that this scheme is now unlikely to be implemented<sup>6</sup>.

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3 London Luton Airport Planning Application – Transport Assessment, URS, November 2012

4 Confirmed by Keith Dove, via email, on the 8 March 2016

5 Luton Local Plan; Initial Transport Evidence Base, 2013

6 Confirmed by Keith Dove, via email, on the 23 February 2016

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**Table 4: Transport Infrastructure Schemes**

Area		Scheme	2016	2016	2021	2021	2031	2031
			Option A	Option A (Alternative)	Option B	Option C	Option B	Option C and C (Alternative)
Networks	Bedford C+E	Bedford Western Bypass Phase 1	✓	✓	✓	✓	✓	✓
		Bedford Western Bypass Phase 2			✓	✓	✓	✓
		A421 Dualling	✓	✓	✓	✓	✓	✓
	HA C+E	M1 J10a	✓	✓	✓	✓	✓	✓
		M1 J10-13	✓	✓	✓	✓	✓	✓
	Central Beds and Luton C+E	Morrisons Houghton Regis	✓	✓	✓	✓	✓	✓
		Luton & Dunstable Guided Busway	✓	✓	✓	✓	✓	✓
		Luton Town Centre	✓	✓	✓	✓	✓	✓
		Luton Parkway Northern Access	✓	✓	✓	✓	✓	✓
		Luton 20mph			✓	✓	✓	✓
	Central Bedfordshire Proposed	A5 - M1 Link	✓	✗	✓	✓	✓	✓
		Woodside Link	✓	✗	✓	✓	✓	✓
		Poynters Road Scheme (20mph speed limit and HGV ban)	✓	✗	✓	✓	✓	✓
		Connection to WSL from Parkside Drive	✓	✗	✓	✓	✓	✓
		Access to Early Release Kestrel Way			✓	✓	✓	✓
		Access Road to Distribution Centre			✓	✓	✓	✓
		HRDC development access over CBC land					✓	✓
		Houghton Regis North Development 2 - Distributor Road			✓	✓	✓	✓
		East Leighton Distributor Road					✓	✓
		Leighton Buzzard Town Centre Schemes			✓	✓	✓	✓
		Luton North Bypass*			✗	✓	✗	✓
	North of Luton Extension Distributor Roads			✗	✓	✗	✓	
	Luton Proposed	Dunstable Road Pinch Points			✓	✓	✓	✓
		Airport Link to Century Park			✓	✓	✓	✓
		Dualling of Airport Access Road			✓	✓	✓	✓
		A505 - Airport Bypass					✓	✓
		Airport Junction Mitigation			✓	✓	✓	✓
Luton Airport Parkway Bus-Loop						✗	✗	

\* Luton North Bypass is in addition to the distributor road for the North of Luton Development

## 4. Assignment Results

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## 4 Assignment Results

4.1 This section presents the results of the model assignments, by year.

### 2016 Option A and 2016 Option A (Alternative)

4.2 The assignment results for the morning and evening peak for 2016 Option A and Option A (Alternative) are presented below.

4.3 Table 5 shows the key highway network statistics for 2016 Option A and Option A (Alternative). On average the vehicle delay time was 14% greater in Option A (Alternative) due to the absence of the A5-M1 Link.

**Table 5: Highway Network Statistics for Luton (2016)**

		Highway Network Statistics		Difference (%)
		2016 Option A	2016 Option A (Alternative)	2016 Op A (Alternative) vs 2016 Op A
<b>Morning Peak</b>	Vehicle Distance (veh-km)	192,621	188,663	-2
	Road Distance (km)	344	343	0
	Free Flow Vehicle Time (veh-hours)	3,686	3,660	-1
	Assigned Vehicle Time (veh-hours)	4,727	4,731	0
	Vehicle Delay Time (veh-hours)	1,041	1,071	+3
	Vehicle Queued End of Hour (PCUs)	760	855	+12
	Speed (kph)	41	40	-2
<b>Evening Peak</b>	Vehicle Distance (veh-km)	205,977	202,332	-2
	Road Distance (km)	344	343	0
	Free Flow Vehicle Time (veh-hours)	3,795	3,773	-1
	Assigned Vehicle Time (veh-hours)	4,946	4,965	0
	Vehicle Delay Time (veh-hours)	1,151	1,192	+4
	Vehicle Queued End of Hour (PCUs)	790	877	+11
	Speed (kph)	42	41	-2

4.4 Figure 1 to Figure 4 show the 'volume over capacity' ratio (i.e. network stress) for the morning and evening peak for both Option A and Option A (Alternative). Only the most severely congested junctions are shown to be 'stressed' on the plots and the stress on the individual links should be considered in parallel to that at individual junctions.

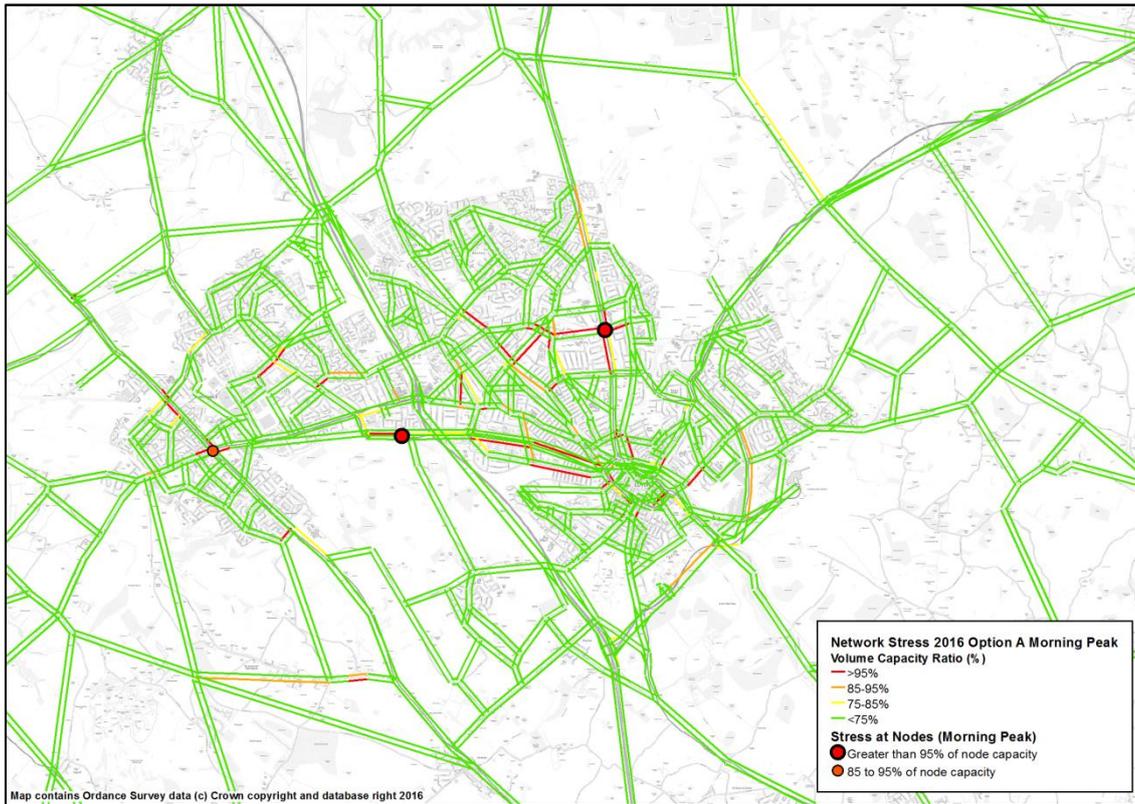
4.5 The modelling shows that 2016 options experience congestion on the main routes into Luton Town Centre in both the morning and evening peak. Typically the A6, Hatters Way and Legrave Road are the congestion hotspots. Airport Way also experiences vehicle capacity issues and this is more apparent in the evening peak period.

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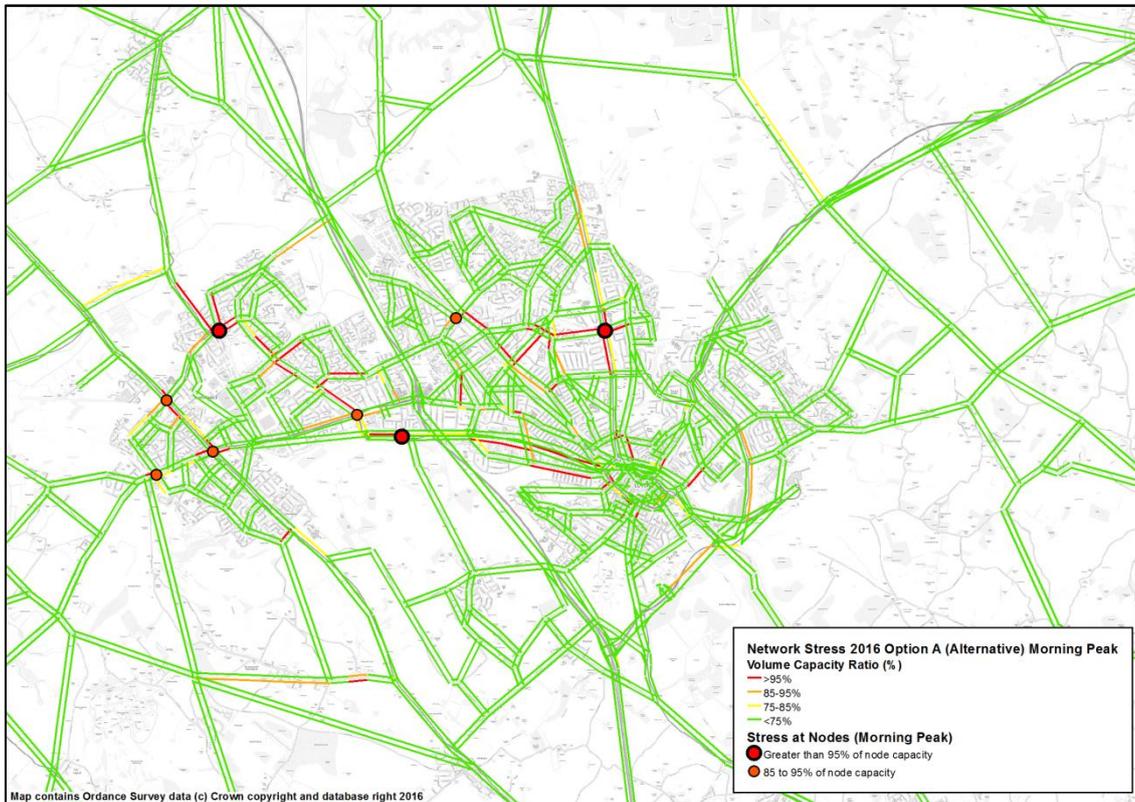
- 4.6 For Option A (Alternative), the absence of the A5-M1 Link has an impact on the link stress within Houghton Regis and Dunstable. Without the A5-M1 Link, the modelling shows that trips from the A5 to Hatters Way will have to be routed through Bedford Road, Park Road North through to Poynters Road in order to access Hatters Way. Furthermore the section of A5 in Dunstable is placed under additional pressure as trips from the A5 to Luton Town Centre route through the A5 to Church Street and Luton Road in order to access Luton Town Centre. Additionally the absence of Woodside Link means that the trips from the A5, Houghton Regis and Dunstable to the M1 would need to travel southbound along Poynters Road towards the M1 Junction 11 in order to access the M1. For Option A (i.e. with A5-M1 Link and Wookside Link), the modelling shows that these trip movements can access the M1 via the M1 Junction 11a.
- 4.7 A6/ Austin Road, Hatters Way/ Chaul End Road and Tithe Farm Road/ High Street (only affected in the Option A (Alternative)) operate at over 95% 'volume over capacity' ratio. Within the evening peak, the worse performing junctions are Leagrave Road/ Dunstable Road, Leagrave Road/ Waller Avenue and Toddington Road/ Grange Avenue junctions.
- 4.8 It should be noted that the performance of the 2016 network has been forecasted from the 2009 base year model and is a model representation of the current traffic conditions and due to the strategic nature of the model, this may lead to some variation between the modelled and the current observed traffic conditions.

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**Figure 1: Volume over capacity in Luton in 2016 Option A in the Morning Peak**

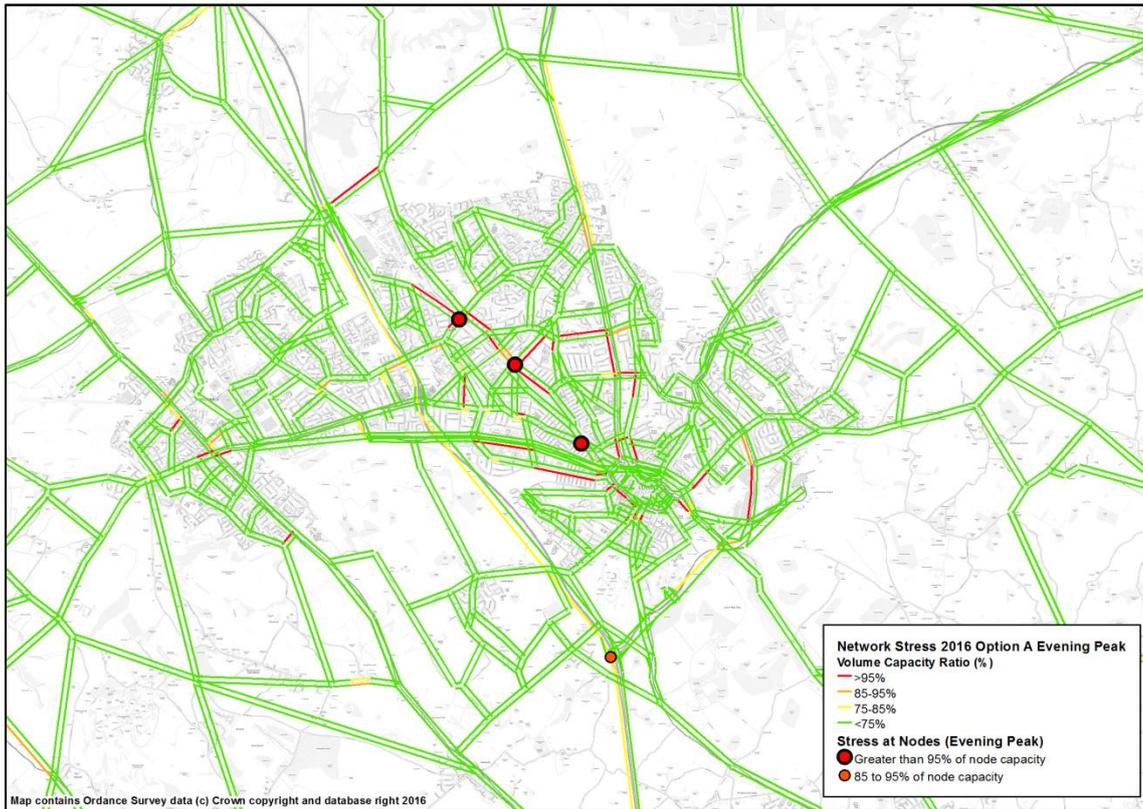


**Figure 2: Volume over capacity in Luton in 2016 Option A (Alternative) in the Morning Peak**

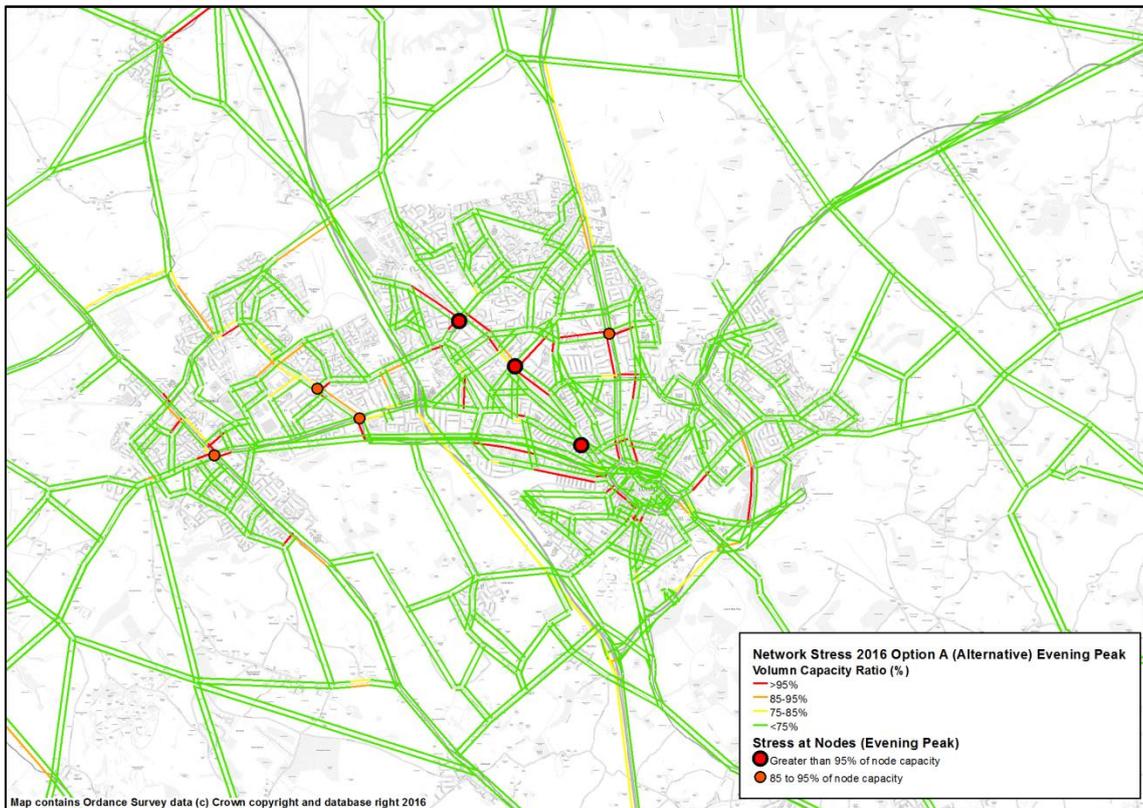


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**Figure 3: Volume over capacity in Luton in 2016 Option A in the Evening Peak**



**Figure 4: Volume over capacity in Luton in 2016 Option A (Alternative) in the Evening Peak**



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## 2021 Option B and 2021 Option C

4.9 Table 6 shows the key highway network statistics for the 2021 Option B and Option C.

4.10 The differences between the two options are quite limited despite the introduction of the M1-A6 Link and the additional demand for the North of Luton Extension. It is potential evident that the scale of the benefit of the M1-A6 Link and the impact of the additional 1,067 dwellings and 2,500 jobs for the North of Luton Extension is of similar magnitude at a high level, leading to limited differences in network statistics between the two options.

**Table 6: Highway Network Statistics for Luton (2021)**

		Highway Network Statistics		Difference (%)
		2021 Option B	2021 Option C	2021 Op C vs 2021 Op B
Morning Peak	Vehicle Distance (veh-km)	215,319	223,345	+4
	Road Distance (km)	351	368	+5
	Free Flow Vehicle Time (veh-hours)	4,093	4,168	+2
	Assigned Vehicle Time (veh-hours)	5,470	5,546	+1
	Vehicle Delay Time (veh-hours)	1,377	1,378	0
	Vehicle Queued End of Hour (PCUs)	1,033	1,062	+3
	Speed (kph)	39	40	+2
Evening Peak	Vehicle Distance (veh-km)	227,679	236,881	+4
	Road Distance (km)	351	368	+5
	Free Flow Vehicle Time (veh-hours)	4,208	4,311	+2
	Assigned Vehicle Time (veh-hours)	5,662	5,796	+2
	Vehicle Delay Time (veh-hours)	1,454	1,486	+2
	Vehicle Queued End of Hour (PCUs)	1,015	1,023	+1
	Speed (kph)	40	41	+2

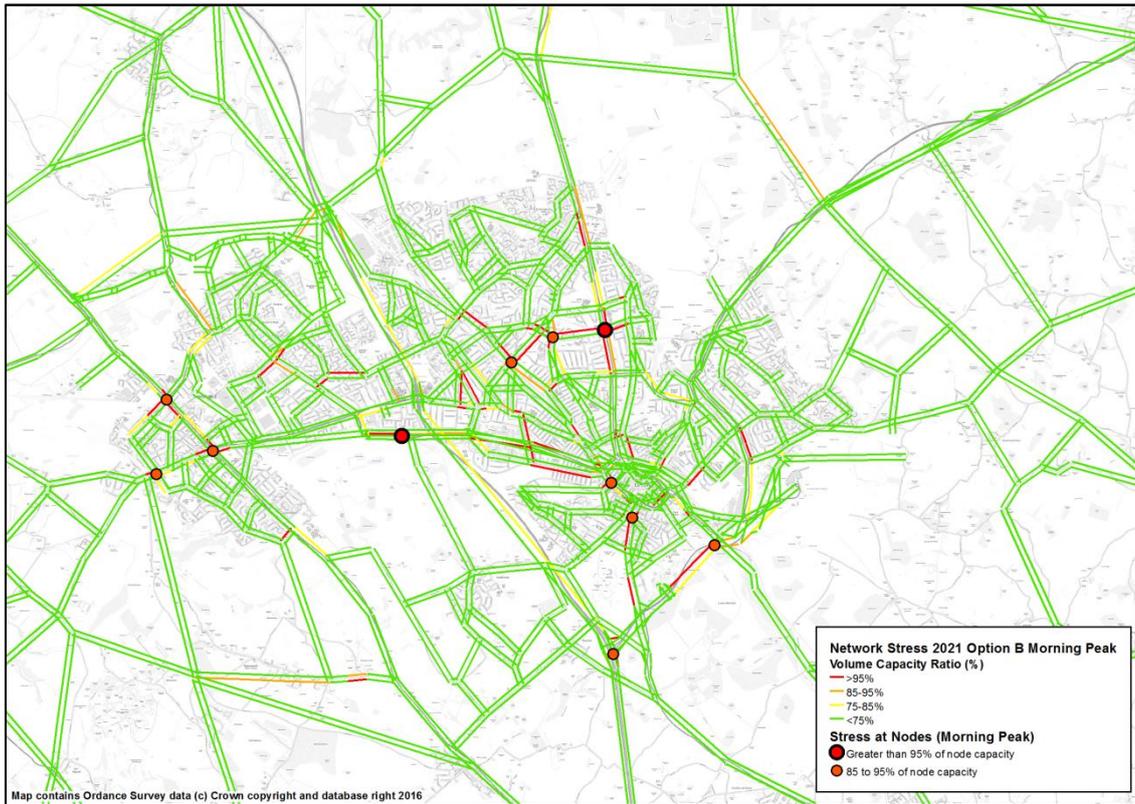
4.11 Similar to the 2016 options, both 2021 Option B and Option C experience network stress issues with routes heading towards Luton Town Centre, and the modelling shows that the A6, Hatters Way and Leagrave Road are congestion hotspots. Furthermore, there are several links with over 95% 'volume over capacity' ratio including London Road, Airport Way, Vauxhall Way, and Blundell Road.

4.12 Comparison between the Option B and Option C shows that there are limited differences between junctions that are under stress. In terms of link stress, the most notable differences between the Option B and Option C is modelled stress on the A6, which is generally greater for Option C when compared to Option B, potentially due to the additional trips from the North of Luton Extension.

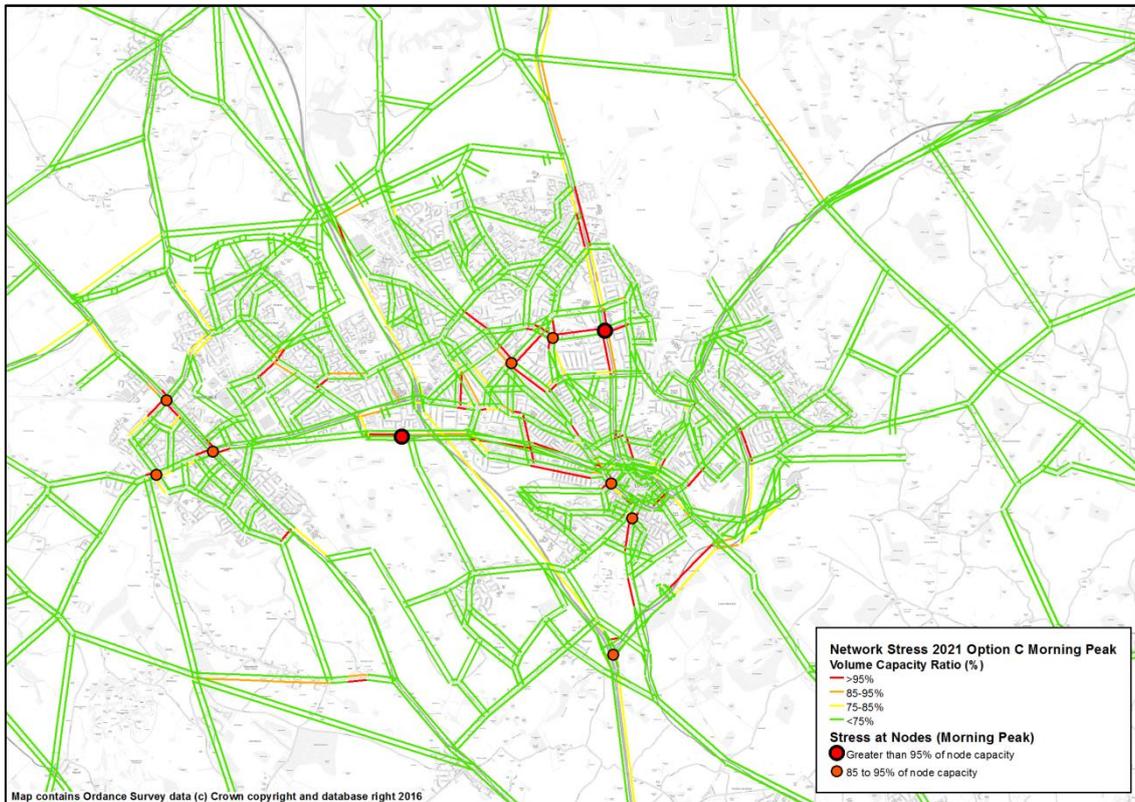
4.13 Furthermore, comparison between both 2021 options (i.e. Figure 5 to Figure 8) and 2016 Option A (i.e. Figure 1 and Figure 2) shows an overall increase in network stress. This is the result of an addition of 6,369 dwellings and 2,978 jobs for the 2021 Option B and an additional of 7,436 dwellings and 5,478 jobs for 2021 Option C. The highway links/ areas which show the most notable increase in link stress between the 2016 and 2021 options include the A5/ West Street junction in Dunstable, Airport Way, A6/ Austin Road junction, and London Road. There are no network changes between the 2016 and 2021 for these highway links/ areas, but as highway demand increases, the modelling shows that these links will experience additional stress.

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**Figure 5: Volume over capacity in Luton in 2021 Option B in the Morning Peak**

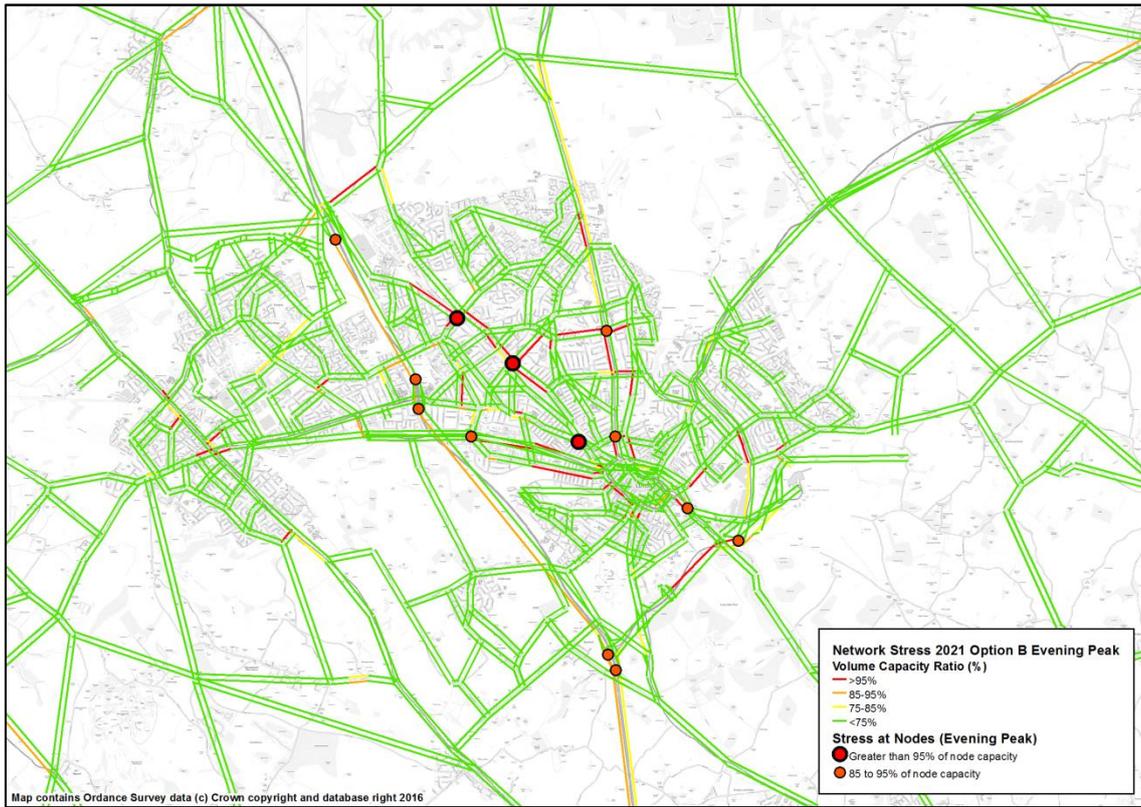


**Figure 6: Volume over capacity in Luton in 2021 Option C in the Morning Peak**

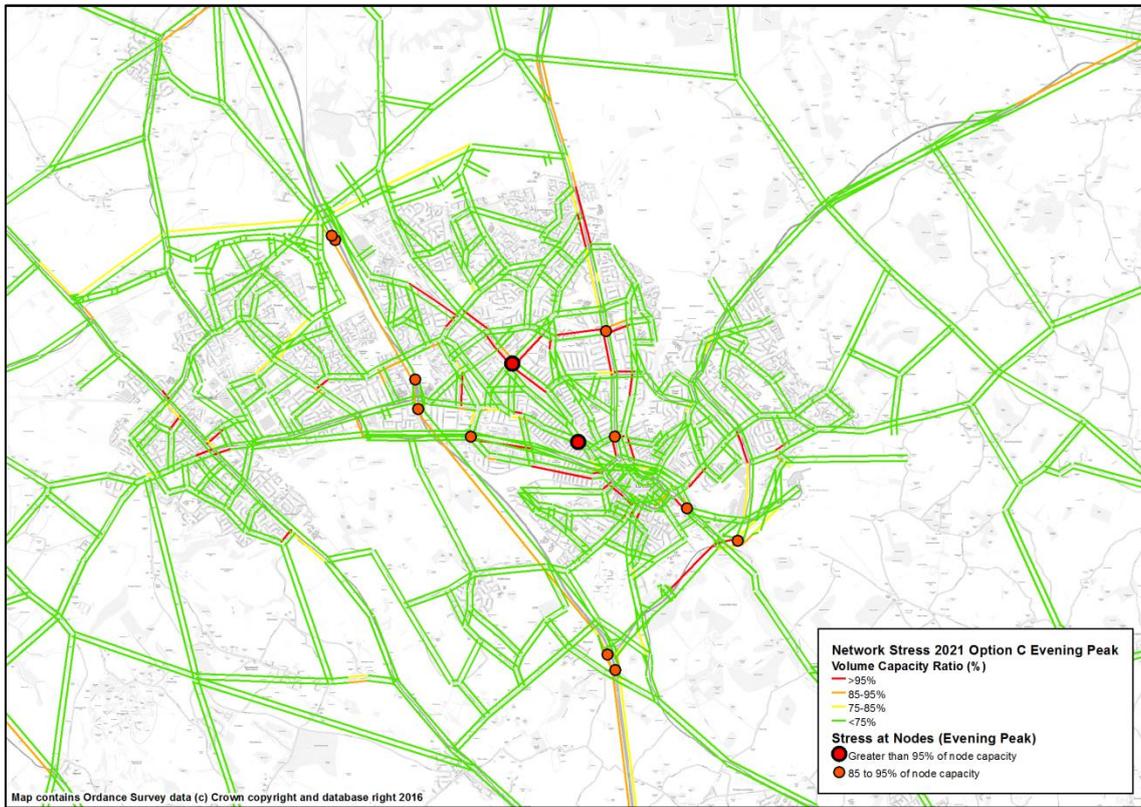


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**Figure 7: Volume over capacity in Luton in 2021 Option B in the Evening Peak**



**Figure 8: Volume over capacity in Luton in 2021 Option C in the Evening Peak**



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## 2031 Option B, 2031 Option C and 2031 Option C (Alternative)

- 4.14 Table 7 shows the key highway network statistics for 2031 Option B, Option C and Option C (Alternative). The highway network statistics show that the overall network performance for 2031 Option C is generally slightly poorer than Option B. The demand for Option C is greater therefore it might be expected that the overall delay for the network would be greater for Option C when compared to Option B.

**Table 7: Highway Network Statistics for Luton (2031)**

		Highway Network Statistics		Difference (%)	Highway Network Statistics	Difference (%)
		2031 Option B	2031 Option C	2031 Op C vs 2031 Op B	2031 Option C (Alternative)	2031 Op C (Alternative) vs 2031 Op B
Morning Peak	Vehicle Distance (veh-km)	235,539	237,621	+8	235,165	+7
	Road Distance (km)	351	346	+4	346	+4
	Free Flow Vehicle Time (veh-hours)	4,471	4,575	+7	4,514	+6
	Assigned Vehicle Time (veh-hours)	6,416	6,602	+7	6,456	+5
	Vehicle Delay Time (veh-hours)	1,945	2,028	+7	1,942	+2
	Vehicle Queued End of Hour (PCUs)	1,605	1,769	+12	1,562	-1
	Speed (kph)	37	36	+0	36	+2
Evening Peak	Vehicle Distance (veh-km)	247,753	249,784	+7	247,421	+6
	Road Distance (km)	351	346	+4	346	+4
	Free Flow Vehicle Time (veh-hours)	4,602	4,689	+7	4,636	+6
	Assigned Vehicle Time (veh-hours)	6,530	6,758	+8	6,587	+5
	Vehicle Delay Time (veh-hours)	1,928	2,069	+10	1,951	+4
	Vehicle Queued End of Hour (PCUs)	1,376	1,507	+12	1,397	+4
	Speed (kph)	38	37	+0	38	+1

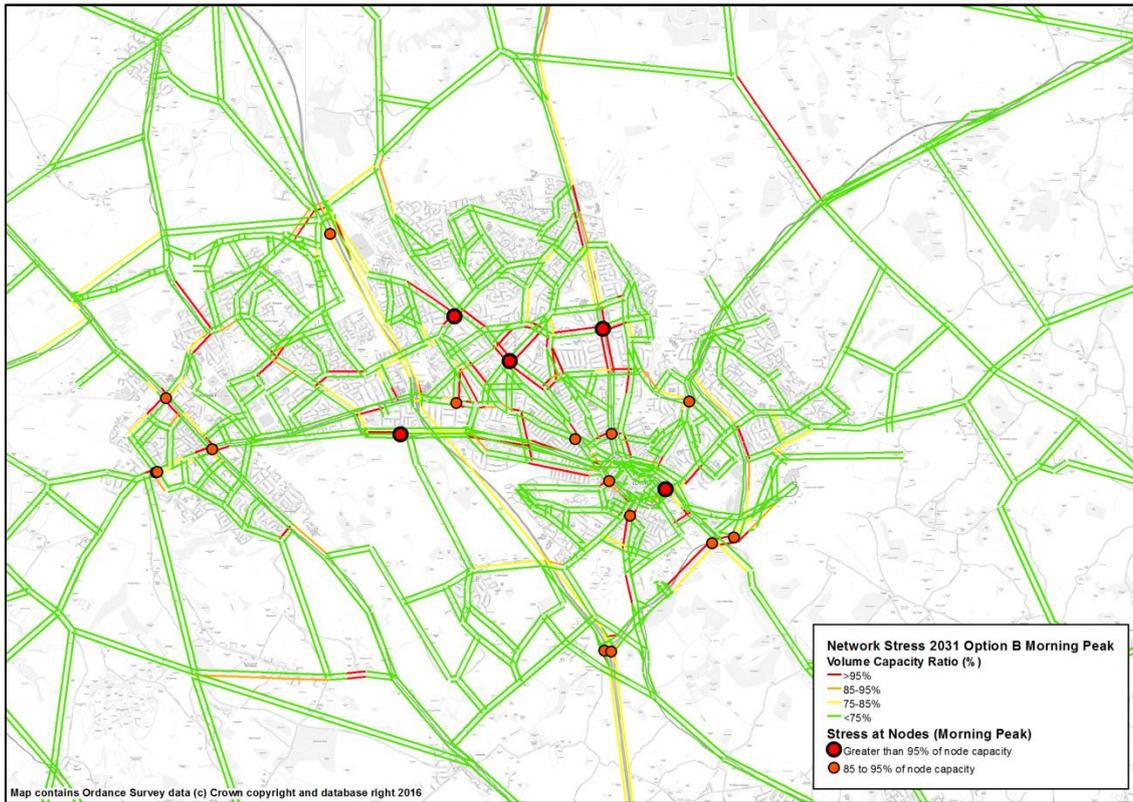
- 4.15 The modelling shows that for Option B, the main routes into Luton Town Centre are congested. These routes include the A6, Leagrave Road, Hatters Way and London Road, and are consistent between the morning and evening peak. Other congested routes include Vauxhall Way, Airport Way, Austin Road and Blundell Road, which the modelling shows that the 'volume over capacity' ratios for these links are over 95%. Furthermore node stress is identified on the slip roads surrounding the M1, specifically at Junction 10, Junction 11 and Junction 11a. The A5 in Dunstable continues to be congested during the morning peak. The A5/ Houghton Road, A5/ Church Street and Drivers Way/ West Street junctions experience congestion for 2031 Option B. Despite the rise in demand in 2031, these junctions have remained at the same level of congestion as modelled in the 2021 Option B and Option C.
- 4.16 Comparison between Option B and Option C indicate that there is an overall increase in congestion along the A6 near Austin Road as the demand for the North of Luton Extension is introduced for Option C. Additionally, the modelling shows that there is congestion at the Old Bedford Road/ Barnfield Avenue junction in Option C. On the other hand, link stress is reduced on Leagrave Road during the morning peak, potentially as vehicles re-route to the M1-A6 Link. In Option B, during the morning peak, trips coming from the A6, routing through to the M1, would route through Bramingham Road. In Option C congestion has been reduced on Bramingham Road/ B579 junction signifying trips re-routing to the M1-A6 Link. Congestion has reduced on the A6 and increased on the M1 for Option C when compared to Option B. In the evening peak there is an increase in congestion along Vauxhall Way, as a result of the growth of Luton Airport and the Century Park development for Option C. It is evident that the developments affect trip patterns throughout the network.

Capabilities on project:  
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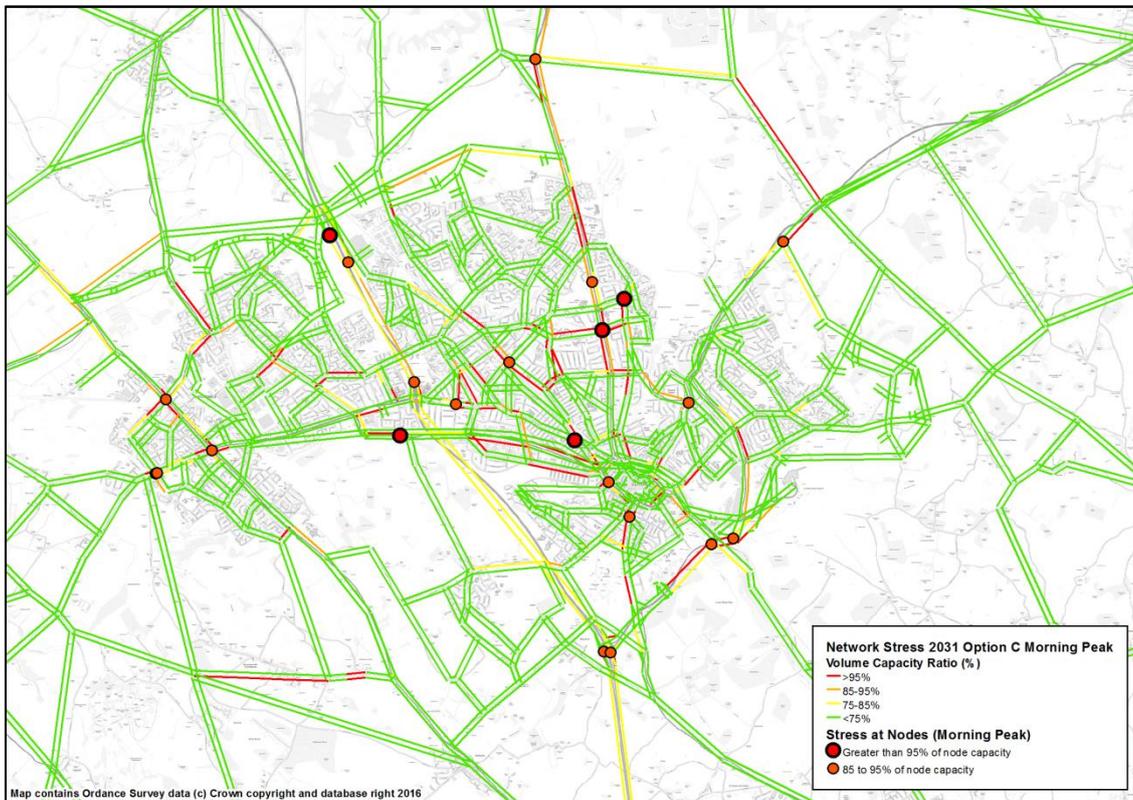
- 4.17 The performance of Option C (Alternative) is varied. Some congested areas perform well while others have performed the same as Option C or performed worse. Junctions which have improved with the reduced demand include, during the morning peak, Old Bedford Road/Barnfield Avenue, New Bedford Road/Cromwell Road, Dunstable Road/ Leagrave Road and A505/ Eastern by-pass junctions. For the evening peak, the modelling shows that Airport Way performed slightly better, however, Leagrave Road/ Blundell Road is more congestion for Option C (Alternative) when compared to Option C.
- 4.18 Overall the congestion has progressively increased across the options from 2016 to 2031 as demand increases due to the additional dwellings and jobs. From 2016 to 2031 there is a maximum increase in jobs of 28,264 and an additional 23,846 dwellings from 2016 (i.e. between 2016 Option A and 2031 Option C). The pressure on the road network to cope with this demand is high and therefore junction mitigations are needed in order to help alleviate some of these pressures.

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**Figure 9: Volume over capacity in Luton in 2031 Option B in the Morning Peak**

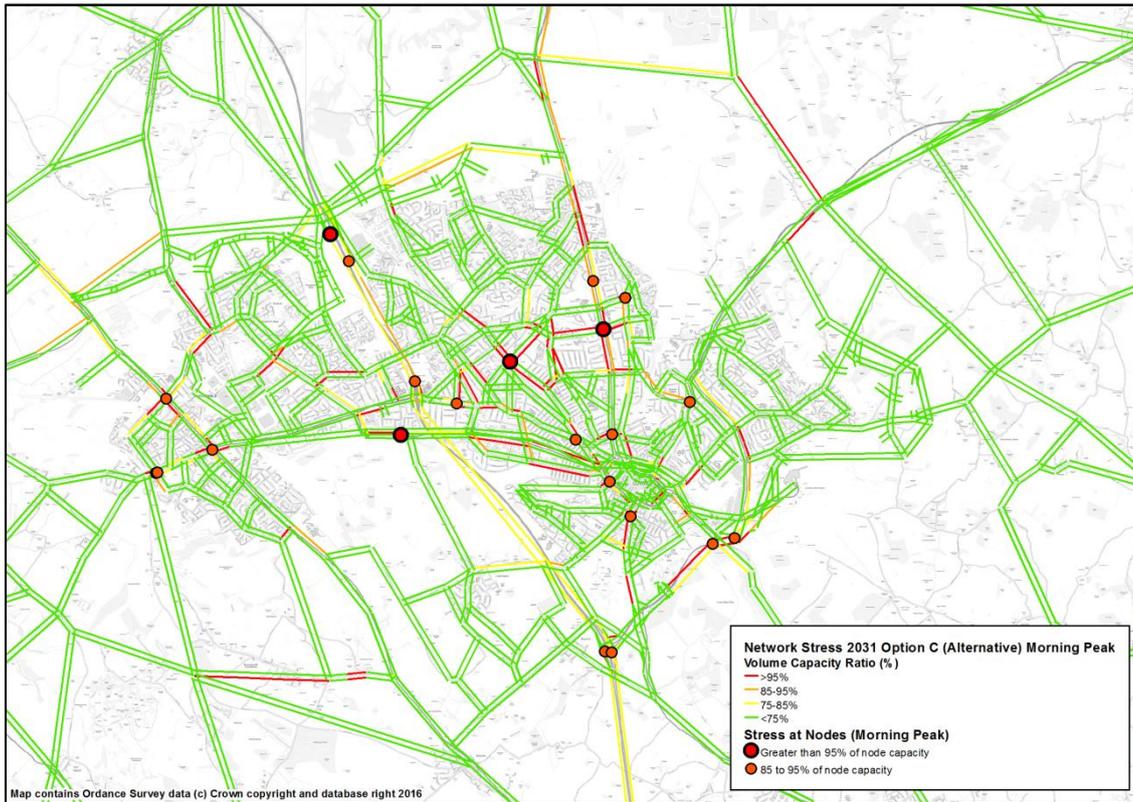


**Figure 10: Volume over capacity in Luton in 2031 Option C in the Morning Peak**

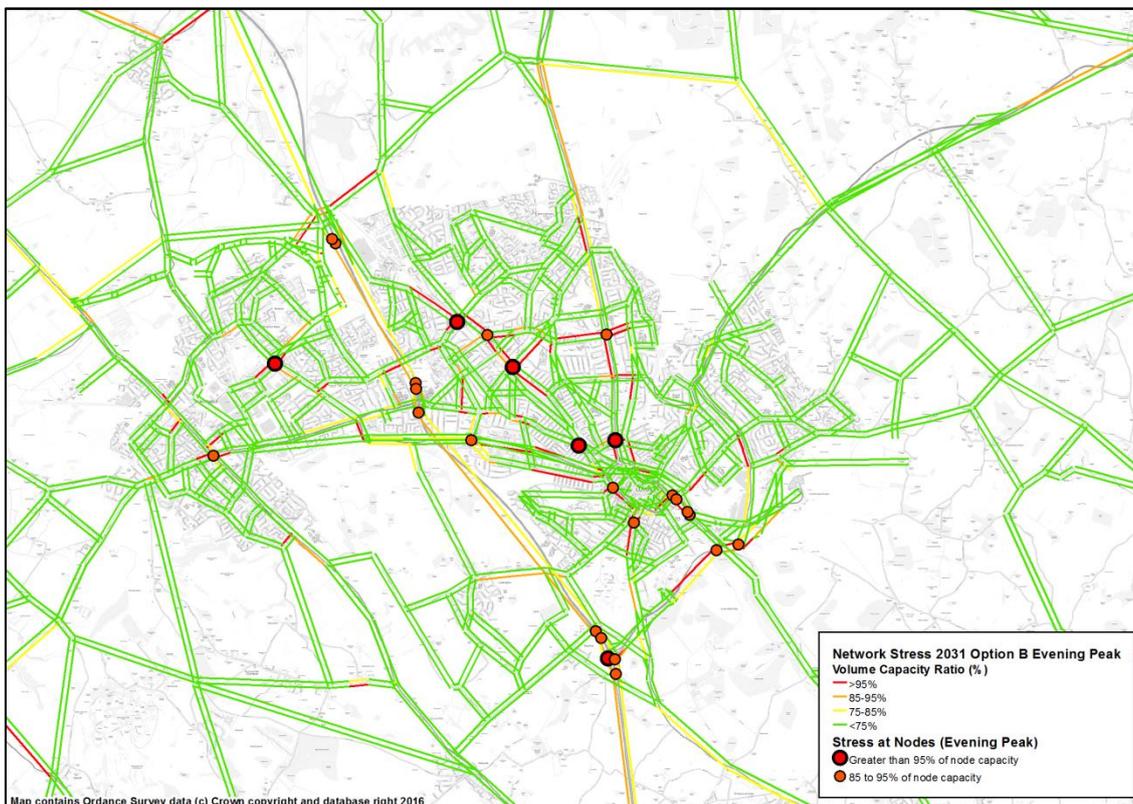


Capabilities on project:  
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**Figure 11: Volume over capacity in Luton in 2031 Option C (Alternative) in the Morning Peak**

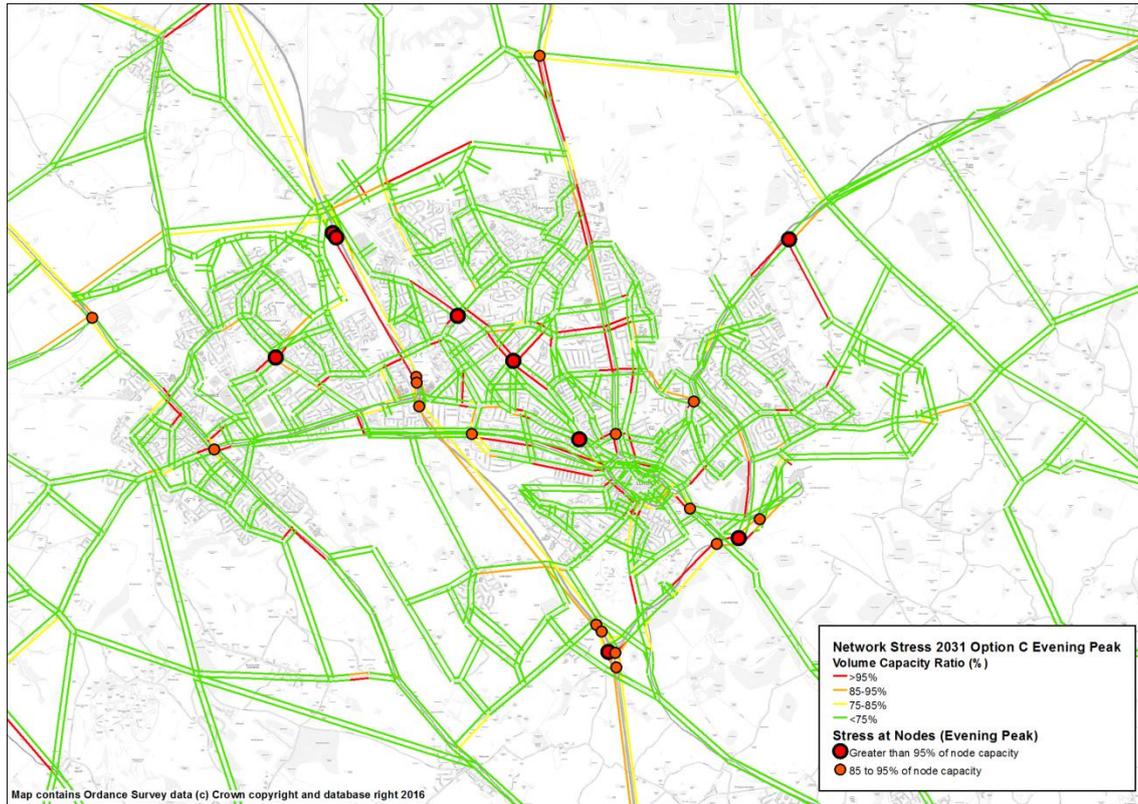


**Figure 12: Volume over capacity in Luton in 2031 Option B in the Evening Peak**

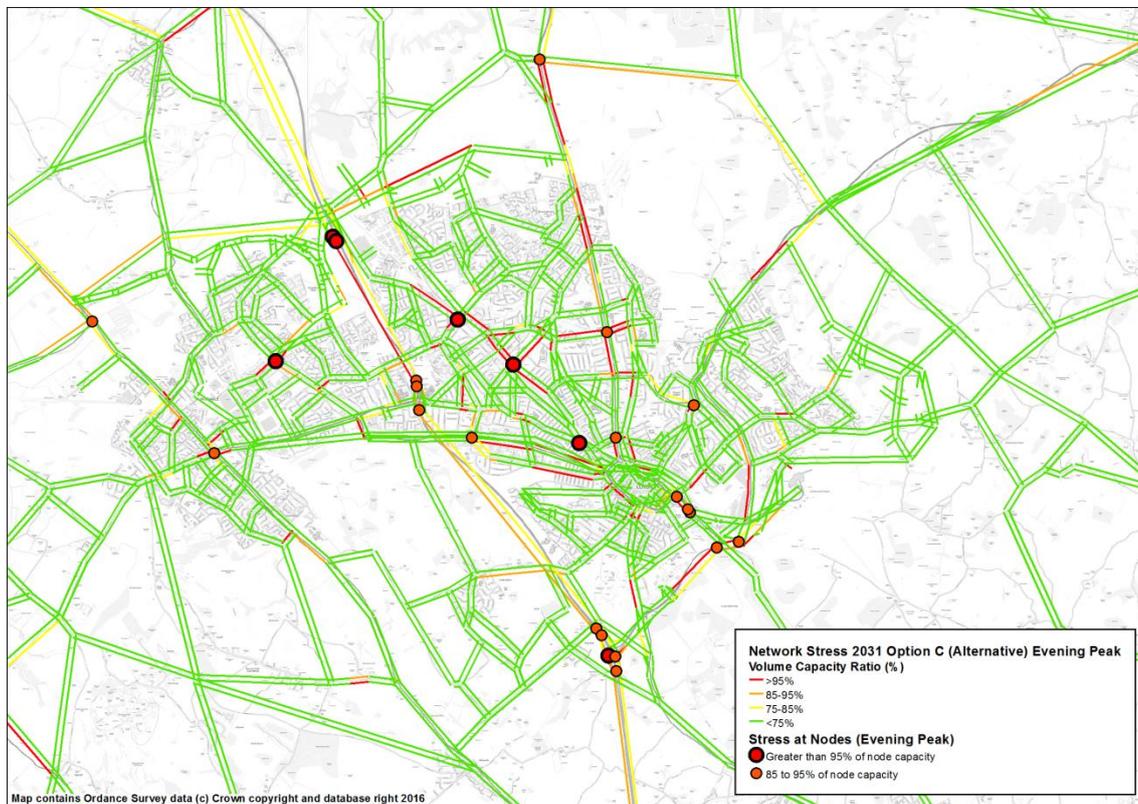


Capabilities on project:  
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**Figure 13: Volume over capacity in Luton in 2031 Option C in the Evening Peak**



**Figure 14: Volume over capacity in Luton in 2031 Option C (Alternative) in the Evening Peak**



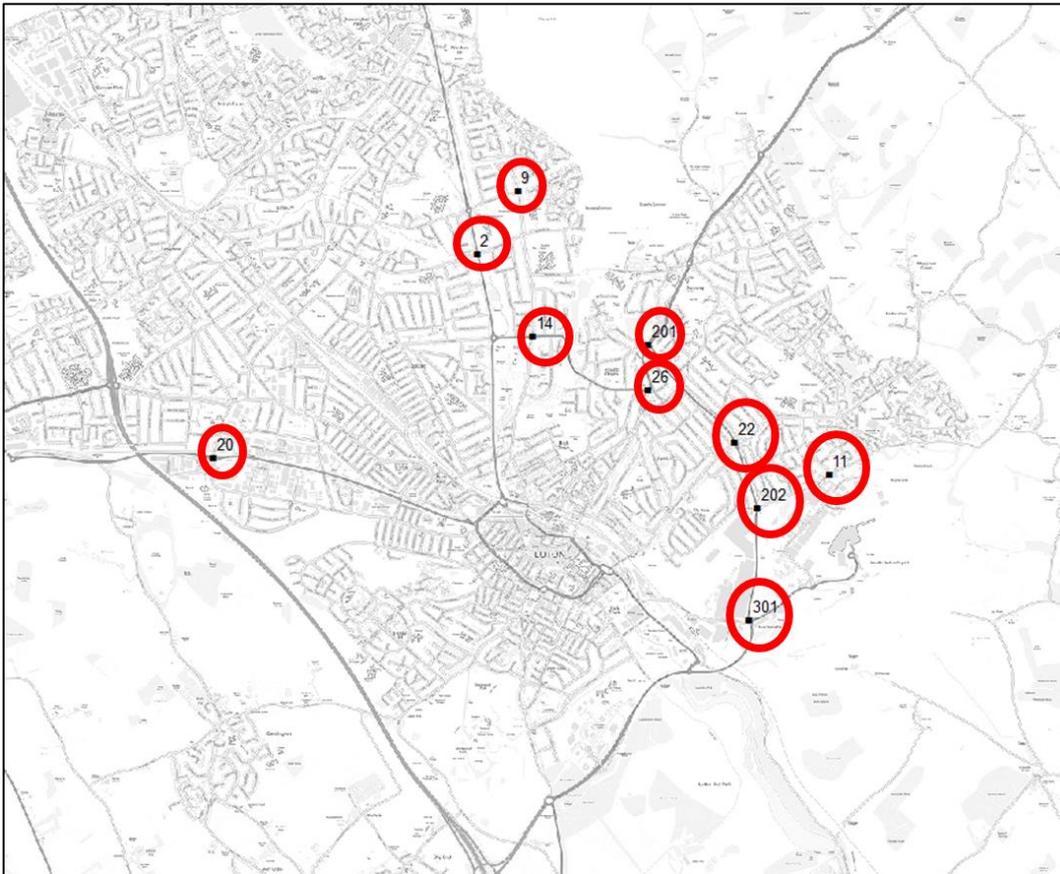
Capabilities on project:  
Transportation

**Junction Mitigations**

4.19 This section presents the junction mitigations that have been considered and the performance on the network.

4.20 LBC have stated that junction mitigation measures previously identified in Luton Local Plan<sup>7</sup> and modelled by AECOM should be included in the proposed Local Plan modelling. A single model option with junction mitigations has been considered (i.e. 2031 Option C (with Mitigations)). Figure 15 below indicates the location of the junction mitigations. Additional to the previous mitigation measures, a mitigation scheme for the Vauxhall Way/ Kimpton Road junction has also been included<sup>8</sup>. For the purpose of this report this is identified with the Site ID 301.

**Figure 15: Junction Mitigation Location**



<sup>7</sup> Luton Local Plan; Initial Transport Evidence Base, 2013

<sup>8</sup> The specification and arrangement of junction mitigation 301 was sent to us by email from Keith Dove, on the 24 March 2016

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4.21 Table 8 illustrates the proposed junction mitigations that have been modelled for this option (i.e. 2031 Option C (with Mitigations)).

**Table 8: Description of Mitigation Options**

Site ID	Proposed junction improvement	Modelling assumptions
2	Additional lanes on both approaches of A6.	New nodes added to represent flared approaches north and south of A6.
9	Additional approach lane on Barnfield Avenue.	Flare was introduced on Barnfield Avenue.
11	Additional approach lanes on Eaton Green Road approaches.	Flare was introduced to the roundabout approach.
14	Lengthening of two lane section on Old Bedford Road (S).	Additional flare introduced on Old Bedford Road. Change in signal timing to allow for increased flow to pass through the junction.
20	Removal of cycle facilities at roundabout and localised widening on roundabout approaches.	Increased roundabout capacity provided additional flares on all approaches.
22	Additional flare on Vauxhall Way.	Additional flare introduced on both approaches of Vauxhall Way.
26	Signalise Hitchin Road and Stockingstone Road junctions and convert Ramridge Road / Stockingstone Road junction to priority.	Signalised crossroad junction and priority junction coded. Signal timing based on experience introduced and Saturn signal optimisation was performed.
201	Additional flare on all approaches. Dedicated left turn lane on Stopsley Way approach.	Flare increased on all approaches.
202	Lengthen flares on Vauxhall Way and Eaton Green Road.	Flare introduced on Vauxhall Way and Eaton Green Road.
301	Conversion of the roundabout into a signalised junction	New nodes added to represent the additional lanes on the approach to the round about

4.22 Table 9 presents the key highway network statistics for the 2031 Option C (with Mitigations). Overall the mitigations have made an improvement on the network performance. It has slightly improved all network statistics parameters. Whilst the highway statistics provides an indication of the overall network performance, the stress plots (i.e. Figure 16 and Figure 17) provide more detailed information in relation to the performance of each junction mitigation measures.

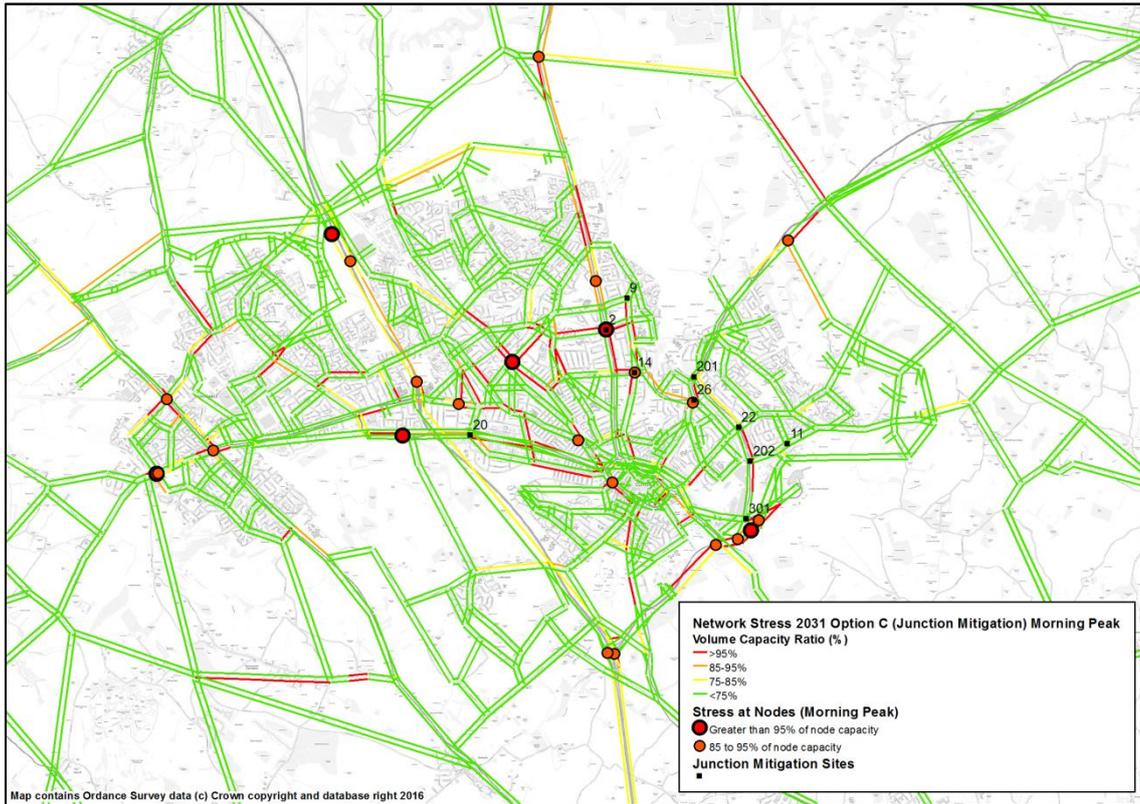
Capabilities on project:  
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**Table 9: Highway Network Statistics for Luton (2031 Option C (with Mitigations))**

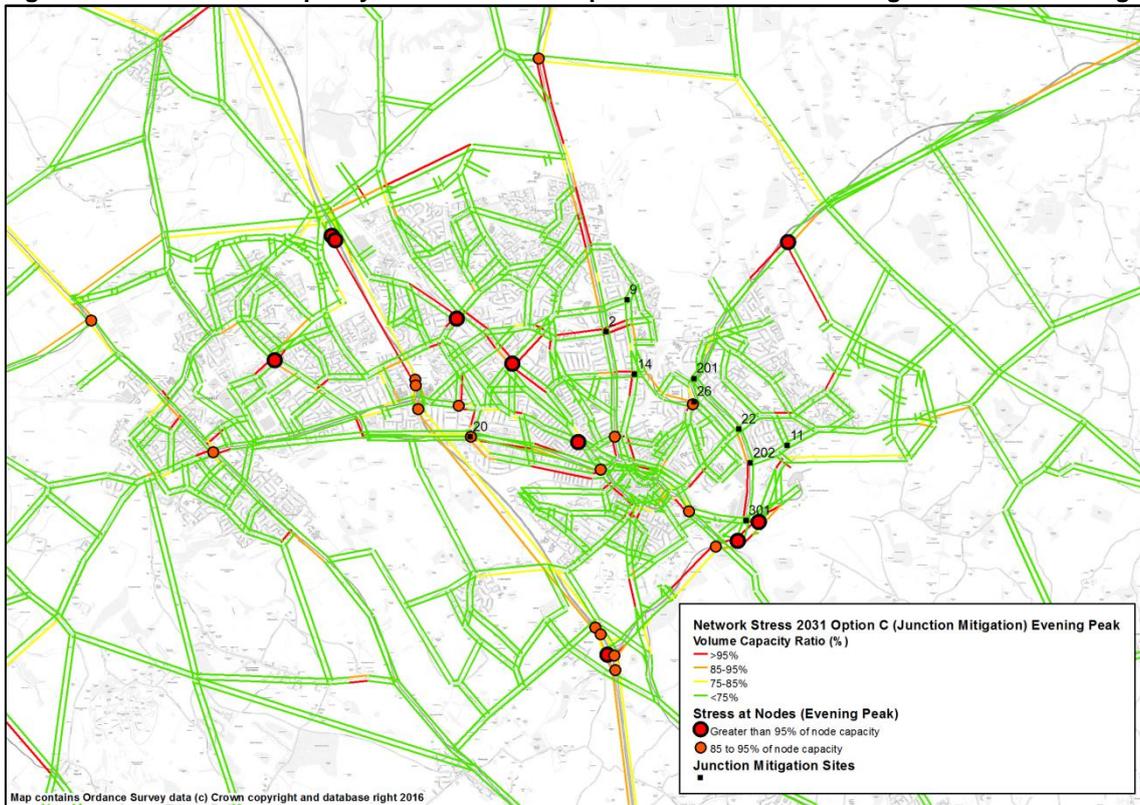
		Highway Network Statistics		Difference (%)
		2031 Option C	2031 Option C (With Mitigations)	2031 Op C vs 2031 Op C (with Mitigations)
<b>Morning Peak</b>	Vehicle Distance (veh-km)	237,621	251,088	-1
	Road Distance (km)	346	362	-1
	Free Flow Vehicle Time (veh-hours)	4,575	4,747	-1
	Assigned Vehicle Time (veh-hours)	6,602	6,792	-1
	Vehicle Delay Time (veh-hours)	2,028	2,044	-2
	Vehicle Queued End of Hour (PCUs)	1,769	1,659	-7
	Speed (kph)	36	37	0
<b>Evening Peak</b>	Vehicle Distance (veh-km)	249,784	263,308	-1
	Road Distance (km)	346	362	-1
	Free Flow Vehicle Time (veh-hours)	4,689	4,864	-1
	Assigned Vehicle Time (veh-hours)	6,758	6,920	-2
	Vehicle Delay Time (veh-hours)	2,069	2,056	-3
	Vehicle Queued End of Hour (PCUs)	1,507	1,496	-3
	Speed (kph)	37	37	1

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**Figure 16: Volume over capacity in Luton in 2031 Option C With Junction Mitigation in the Morning Peak**



**Figure 17: Volume over capacity in Luton in 2031 Option C With Junction Mitigation in the Evening Peak**



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- 4.23 The results of the modelling tests undertaken provide an indication on the performance of the junction mitigation measures considered. This is summarised in Table 10.
- 4.24 Comparisons have been made between 2031 Option C (i.e. Figure 10 and Figure 13) and the 2031 Option C (with Mitigations) (i.e. Figure 16 and Figure 17). It has identified a mixture of performances following the implementation of the junction mitigation measures. For Mitigation Site ID 9, the modelling shows that the mitigation measure considered is effectiveness and reduces the stress and therefore congestion at this junction. The modelling shows that for 2031 Option C, the 'volume over capacity ratio' for this junction is greater than 95% whilst for 2031 Option C (with Mitigations), the volume over capacity' ratio is less than 85%.
- 4.25 Conversely there are junction mitigation measures that may not be required. This is potentially due to the fact that these mitigation measures were determined from the previous Luton Local Plan and therefore may not be necessary and applicable as planning and infrastructure assumptions have now been updated. As the level and pattern of highway demand changes, some of the junctions which were identified as under stress in the previous study is no longer required. Considerations may need to be made as to whether these 'not required' mitigations are to be removed.
- 4.26 For the remaining mitigation junction measures, it has been identified that they are not performing as would be expected, despite the implementation of the mitigation measures to improve them. In some cases there are no changes in the level of performance such as Mitigation Site ID 2, 202 and 26 which still suffer from the same amount of congestion as previously seen in Option C. For Mitigation Site 14 and 301 the performance has become worse, making the junction more stressed in the 2031 Option C (with Mitigations) when compared to 2031 Option C. This is likely to be caused by the difference in demand level between the previous Luton Local Plan and this latest Local Plan, and it is possible that these mitigation measures are operating with far higher demand than they were originally designed for.

**Table 10: Existing Mitigation Performance**

Mitigation Site ID	Mitigation included Mitigation working	Mitigation included Mitigation NOT performing	Mitigation included But not required
2		✓	
20			May not be needed
22			May not be needed
201			May not be needed
202		✓	
26		✓	
9	✓		
11			May not be needed
14		✓	
301		✓	

- 4.27 Moreover, according to the modelling outputs it would suggest that further additional mitigations may be needed for other areas of with high network stress. These are listed in Table 11.

**Table 11: Additional Junction Mitigations**

<b>Additional Junction Mitigation Sites to Consider (according to the model results)</b>
New Airport Way/ A1081 Slip Roads
A1081/ B653
Chaul End/ Hatters Way
Dunstable/ Hatters Way
Leagrave Road/ Waller Avenue
Leagrave Road/ Dunstable Road
M1 Junction 10
M1 Junction 11
M1 Junction 11a

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- 4.28 The main areas of concerns within Luton are Hatters Way, Leagrave Road/ Dunstable Road, Airport Way/ New Airport Way and Beech Hill/ A505 junctions.
- 4.29 Hatters Way consistently operates over capacity and is one of the main routes into Luton Town Centre. With only one mitigation site in place (i.e. Mitigation Site ID 20) it would suggest further mitigations are required in order to alleviate the congestion along this road (e.g. Hatters Way/ Dunstable Road).
- 4.30 Additionally Airport Way, leading to Percival Way, suffers from congestion. This is less of a concern as the final design and layout of the Percival Way scheme has not been incorporated into the mitigation option (i.e. 2031 Option C (with Mitigations)). It is likely that with the final design of this scheme will reduce the congestion within this area.
- 4.31 Leagrave Road consistently operates over capacity and is of a concern due its lack of mitigations that can be put into place. The junction at Dunstable Road/ Leagrave Road and Leagrave Road/ Waller Avenue have been listed as 'too difficult' to mitigate for 'due to the constrained nature of both sites'<sup>9</sup>.
- 4.32 The junction at Dunstable Road/ Cardiff Road, which is modelled as congested, has since been updated by LBC since this study commenced. This junction now operates under a different arrangement, different from the modelled junction, of which could potentially improve the modelled congestion at this junction<sup>10</sup>.
- 4.33 The congestion at the A505/ Eastern by-pass junction may be less of a concern. Considering its design, a roundabout with two lanes in either direction on the A505 and one lane from the by-pass, this congestion is likely to have been caused from not allowing enough capacity through the junction.
- 4.34 The main areas of concern outside of Luton is Junction 10, Junction 11 and Junction 11a of the M1. The modelling shows that there is congestion on the southbound slip roads in the morning peak and on the northbound slip roads in the evening peak. While LBC cannot influence a direct mitigation for this area it is worthy of discussion with Highways England as to what mitigations can be implemented to reduce congestion.

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9 Confirmed by Keith Dove, via email, on the 20 April 2016

10 Notified by Keith Dove, in the Preliminary Results presentation, on the 19 April 2016

## 5. Summary and Conclusions

Capabilities on project:  
Transportation

## 5 Summary and Conclusions

### Overview

- 5.1 AECOM has undertaken a range of transport modelling tests of the proposed Luton Local Plan, for a number of options and forecast years. Three forecast years were considered, namely 2016, 2021 and 2031.
- 5.2 A number of options were tested throughout the forecast years and comparisons have been made between the options to identify what impact the demand has on the level of congestion on the road network.
- 5.3 The transport modelling evidence undertaken and reported within this report should only be used for the assessment of the Local Plan. The results provide an indicative, high level strategic assessment and this should be taken into consideration.
- 5.4 The model results produced seem intuitive with the increases in demand and the introduction of elements of the Luton Local Plan.

### 2016 Option A and 2016 Option A (Alternative)

- 5.5 The 2016 model runs shows the modelled traffic impact of the committed developments from LBC (Option A) and comparison between Option A and Option A (Alternative) shows the impact of with/ without the A5-M1 Link and the Woodside Link.
- 5.6 For 2016 Option A, typically the A6, Hatters Way and Leagrave Road are congestion hotspots. Additionally Airport Way experiences capacity issues and this is more apparent in the evening peak.
- 5.7 For both 2016 Option A and Option A (Alternative), there are two junctions which are operating with 'volume over capacity' ratio of over 95% for the morning peak. These are the A6/ Austin Road and Hatters Way/ Chaul End Road junctions. For Option A (Alternative), the modelling shows that the Tithe Farm Road/ High Street junction is also under stress.
- 5.8 Within the evening peak, the worse performing junctions are Leagrave Road/ Dunstable Road, Leagrave Road/ Waller Avenue and Toddington Road/ Grange Avenue for both 2016 Option A and Option A (Alternative).
- 5.9 It should be noted that the performance of the 2016 network has been forecasted from the 2009 base year model and is a model representation of the current traffic conditions and due to the strategic nature of the model, this may lead to some variation between the modelled and the current observed traffic conditions.

### 2021 Option B and 2021 Option C

- 5.10 The 2021 Option B and Option C shows the modelled traffic impact of the 2021 proposed developments from LBC (Option B) and the proposed developments of the surrounding areas (East of Luton and North Herts) (Option C).
- 5.11 Both Option B and Option C share stress in similar locations as committed housing starts to be introduced to the road network. There are limited differences between the options as the introduction of transport infrastructure schemes that allow for greater vehicle capacity is then met with an increase in demand. The A6/ Austin Road, Hatters Way/ Chaul End Road, Dunstable Road/ Cardiff Road, Dunstable Rd/ Leagrave Road and Leagrave Road/ Waller Avenue are junctions which perform with 'volume over capacity' ratio of over 95%.

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### **2031 Option B, 2031 Option C and 2031 Option C (Alternative)**

- 5.12 The modelled traffic impact of the 2031 proposed developments from LBC (Option B) versus Option B plus the proposed developments of the surrounding areas (East of Luton and North Herts) (Option C) versus the sensitivity test of Option C that assumes a lower level of development at the East of Luton site (Option C (Alternative)).
- 5.13 There is an increase in network stress from Option B to Option C as the demand increases. Again, the modelling shows that the main route that suffers from congestion is the A6. However, the results of the modelling are mixed as some areas show an increase in congestion whilst for other areas, the congestion reduce. Leagrave Road on the whole sees a reduction in congestion as the M1-A6 Link is introduced.
- 5.14 Option C (Alternative) again produces mixed results due to increasing and reducing congestion in certain areas. One notable junction with increase in the amount of congestion is the Leagrave Road/ Waller Avenue junction.

### **Junction Mitigations**

- 5.15 The junction mitigations from the previous round of testing that was completed for the Luton Local Plan were used in this study. An additional junction mitigation, Site ID 301, was added at the request of LBC.
- 5.16 The overall performance of the modelled mitigation measures was mixed. Some junction mitigations were deemed as 'not working' and 'not improving' the performance of the junction, while others were deemed as not necessary because the junction was performing as expected with the increase demand. This is potentially due to the fact these were taken from the previous Luton Local Plan and therefore may not have been optimised for the current Luton Local Plan options.
- 5.17 The main areas of concerns within the Luton are Hatters Way, Leagrave Road/ Dunstable Road, Airport Way/ New Airport Way and Beech Hill/ A505 junctions.
- 5.18 The main areas of concern outside of the Luton study area is Junction 10, Junction 11 and Junction 11a of the M1.
- 5.19 This ultimately highlights the increasing pressure that Option C is under and even though the junction mitigation measures are in place, the highway network is not performing as well as might be expected.

### **Recommendations**

- 5.20 Following our testing there is an opportunity to further enhance the model. Following our conclusions it is evident that further mitigation measures are required in order to eliminate or reduce the congestion at junctions.
- 5.21 The testing we have completed highlights that the mitigation measures have not been optimised or reviewed in order to check they are still necessary for the forecasted demand. It would be beneficial for the model if a review process was undertaken and the opportunity therefore to introduce additional junction mitigation measures. There are a number of junctions that would benefit from junction mitigation measures if they were put into place, of which Airport Way and Leagrave Road would benefit significantly with its current levels of congestion.