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Essex Highways

Chelmsford Local Plan

Pre-Submission Strategic & Local Junction Modelling

January 2018

RINGWAY JACOBS integrated expertise

Essex County Council

Document Control Sheet

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Executive Summary

Background

1.1.1 This Executive Summary presents the key outputs and analysis of strategic and local highway impact modelling undertaken for the assessment of Chelmsford City Council's (CCC) Pre-Submission Local Plan Spatial Option. It is intended for this study to be incorporated into the transport evidence base in support of the Local Plan when taken forward to Examination in Public in 2018.

1.1.2 The study has been commissioned by Chelmsford City Council (CCC) to update the latest Preferred Option Local Plan assessment (December 2017) using development and infrastructure assumptions agreed in October 2017 specifically for the Pre-Submission Spatial Option. This includes revisions to housing and employment numbers, and transport infrastructure schemes.

1.1.3 This Executive Summary highlights the changes in modelling assumptions and outputs produced over those reported in the Preferred Option Local Plan modelling. It is therefore recommended that the 'Local Plan Preferred Option Strategic & Local Junction Modelling report' (Essex Highways, December 2017) is used for reference when considering the findings of this update study.

1.1.4 This summary also includes up-to-date traffic model plots illustrating the modelled strategic highway impact of the Pre-Submission option, and documents the results of a study into the likely impact of traffic growth on journey times in Chelmsford's city centre. It also provides a comparison of cross boundary traffic flows from the Chelmsford Pre-Submission Local Plan assessment and in Local Plan assessments undertaken by neighbouring authorities.

1.1.5 As before, the Chelmsford Strategic Model (VISUM) has been used to carry out the assessment of Local Plan impact on the local and strategic road network by the end of the upcoming Local Plan period in 2036.

Changes to Development & Infrastructure Assumptions

1.1.6 This section summarises the changes to development and infrastructure assumptions since the modelling of the 2036 Preferred Spatial Option of the Local Plan. These latest assumptions have been incorporated into an appraisal of the likely impact of the Pre-Submission Local Plan on the highway network.

1.1.7 The 2036 'Do Minimum' and 'Local Plan' modelled scenarios have no longer been defined by development planned either side of the start of the Plan period (2021). This is because the latest housing trajectory of committed developments in Chelmsford extends beyond 2021, whilst Local Plan development including Chelmer Waterside, has been brought forward for phased development prior to the start of the 2021-2036 Local Plan period.

1.1.8 Instead, the latest Do Minimum scenario contains all committed development with planning consent in Chelmsford (irrespective of planned construction date), whilst the Local Plan scenario contains development without planning permission.

1.1.9 Changes made to the 2036 Do Minimum and Preferred Spatial Option Local Plan development allocations are summarised in Tables S1-S3.

Table S1: Change in residential assumptions in 2036 Do Minimum scenario

2036 Do Minimum (Preferred Option Modelling) Correct as of April 2017	
Planned Residential Development 2015-2021	
Town Centre Area Action Plan	1,939
North Chelmsford Area Action Plan	2,677
Site Allocations Development Plan	870
Unallocated Large Sites	786
Unallocated Small Sites	517

2036 Do-Minimum (Pre-Submission Modelling) *Updated November 2017*	
Planned Residential Development 2015-2023	
Town Centre Area Action Plan	2,120
North Chelmsford Area Action Plan	4,889*
Site Allocations Development Plan	899
Unallocated Large Sites	1,319
Unallocated Small Sites	766
Total Difference	**+3,204**
Total Difference (not including Beaulieu Post 2021 Rollover)	**+624**

* Includes Beaulieu Post-2021 Roll-Over previously modelled only in Local Plan scenario

Table S2: Change in residential, employment & retail assumptions in 2036 Local Plan scenario

Preferred Option			
Development Location	**Housing (dwellings)**	**Employment (Business Park) sqm**	**Commercial (Retail) sqm**
Location 1: Chelmsford Urban Area	2,957	17,000	5,000
Location 2: West Chelmsford	800		
Location 3: East Chelmsford (East of Great Baddow)	400	5,000	
Location 4: North East Chelmsford	3,000	45,000	
Location 5: Moulsham Hall and North Great Leighs	1,100		
Location 6: North Chelmsford (Broomfield)	800		
Location 7: Boreham	145		
Location 8: North of South Woodham Ferrers	1,000	1,000	
Location 9: Bicknacre	30		
Location 10: Danbury	100		
Beaulieu Post 2021 Roll-Over	2,580		
Windfall Sites	1,500		

Pre-Submission Option			
Development Location	**Housing (dwellings)**	**Employment (Business Park) sqm**	**Commercial (Retail) sqm**
Location 1: Chelmsford Urban Area	2,317	14,000	5,000
Location 2: West Chelmsford	800		
Location 3: East Chelmsford (East of Great Baddow)	400	5,000	
Location 4: North East Chelmsford	3,000	45,000	
Location 5: Moulsham Hall and North Great Leighs	1,100		
Location 6: North Chelmsford (Broomfield)	450		
Location 7: North of South Woodham Ferrers	1,000	1,000	
Location 8: Bicknacre	30		
Location 9: Danbury	100		
Beaulieu Post 2021 Roll-Over	0		
Windfall Sites	1,400		
Existing Commitments 1-5	100*		
Total Difference	**-3,715**	**-3,000**	**0**
Total Difference (not including Beaulieu Post 2021 Roll-Over)	**-511**	**-3,000**	**0**

* A further 245 dwellings with planning permission have been modelled in the Do Minimum scenario (and are included in the totals shown in Table S1).

1.1.10 As with earlier modelling studies, committed developments comprising less than 30 dwellings were distributed evenly across Chelmsford administrative area development zones. These smaller sites accounted for 13% of the total developments modelled in the latest Do Minimum modelling.

1.1.11 In addition, the windfall housing has decreased by 100 dwellings from 1,500 to 1,400 as result of the changes in development assumptions.

1.1.12 Changes made to the 2015-2036 non-residential assumptions in the Pre-Submission Local Plan are shown in Table S3.

Table S3: Change in employment assumptions in Do Minimum and Local Plan scenarios

Development	Change to non-residential assumptions
Former Royal Mail Premises, Victoria Road	-3,000m^2 employment (business park)
City Park West (Former ARU Central)	-7,635m^2 employment (business park) +350m^2 supporting retail
Marconi Evolution (Former Marconi Works)	-4,616m^2 employment (business park) -3,639m^2 supporting retail +367m^2 leisure
The Exchange and CM2 – Anderson Site	-56m^2 employment (business park)
Channels Business Park	+2,342.5m^2 general industrial
Medical School + ARU Development	+3,954m^2 education nursery

1.1.13 In addition, the Pre-Submission scenario removes a further 7,514m^2 of employment (office) space from brownfield sites in the city centre.

1.1.14 The following revisions have been made to infrastructure assumptions for the Pre-Submission modelling:

- The previously modelled two-way flyover at the Army & Navy Roundabout has been reverted back to its existing single lane layout; and
- Left turn filter lanes have been added to Sheepcotes Roundabout (Braintree Road to Essex Regiment Way) and to Nabbotts Roundabout (Essex Regiment Way to White Hart Lane) - see Figures S1 & S2.

1.1.15 Essex Highways are currently undertaking an appraisal of various improvement options and a buildability/feasibility study of a two-way flyover at the Army and Navy Roundabout. There are no firm timescales set for delivery of the schemes being considered. As such, proposed infrastructure upgrades have not been included in this latest modelling study.

1.1.16 The proposed roundabout filter lanes are illustrated in Figures S1 & S2 below.

Figure S1: Sheepcotes Roundabout – location of proposed left turn filter lane

Figure S2: Nabbotts Farm Roundabout – location of proposed left turn filter lane

1.1.17 The latest development and infrastructure assumptions were incorporated into the Chelmsford Strategic Model (VISUM) model in order to undertake an updated appraisal of the likely impact of these assumptions on the transport network.

Wider Impact on Strategic Road Network

1.1.18 This section summarises the differences in modelled traffic flow on the Chelmsford strategic network resulting from the changes in the development and infrastructure assumptions associated with the Pre-Submission Spatial Option. Up-to-date traffic flow and congestion plots illustrating the overall highway impact of the Pre-Submission Option are also presented.

Differences in Traffic Flow over the 2036 Preferred Option Local Plan

1.1.19 Figures S3 and S4 in this section illustrate the differences in traffic flow modelled between the Pre-Submission Local Plan and the Preferred Option Local Plan scenarios in the AM and PM peak hours respectively.

Figure S3: AM Peak Hour 2036 difference in traffic flow between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford

1.1.20 The focus of higher levels of modelled traffic flow on the Chelmsford strategic road network is on the A12 and corridor routes into Chelmsford such as the A414 Three Mile Hill London Road, A114 Essex Yeomanry Way (Baddow Bypass), A1060 Roxwell Road, and Essex Regiment Way. Other higher levels of traffic flow includes the eastbound circulatory of the Army and Navy roundabout. There are also lower levels of traffic flows in the city centre, and along the B1008 Broomfield Road.

1.1.21 Higher levels of modelled flow on the A12 and corridor routes into the city centre can be explained largely though the impact of variable demand modelling. The overall smaller number of vehicle trips modelled in the AM peak hour has led to fewer trips being extracted from the model by the variable demand process. This has had the effect of removing fewer trips from trunk roads and strategic corridor routes.

1.1.22 A reduction in the number of proposed dwellings in Broomfield as part of Local Plan development proposals has resulted in lower levels of forecast modelled traffic flows along Main Road, Broomfield.

1.1.23 In the AM peak hour, due to maintaining a single lane flyover at the Army and Navy Roundabout, eastbound traffic flows in the Pre-Submission modelling to route around the circulatory carriageway. However, this has led to modelled traffic flows slightly reducing along Parkway in the city centre.

1.1.24 There have also been changes to the assignment of local traffic flows in the vicinity of the proposed Broomfield Hospital northern access link road. This is understood to be the result of minor amendments made to the allocation of Pre-Submission development flows in Broomfield to zone connectors (network load-on points) in the model.

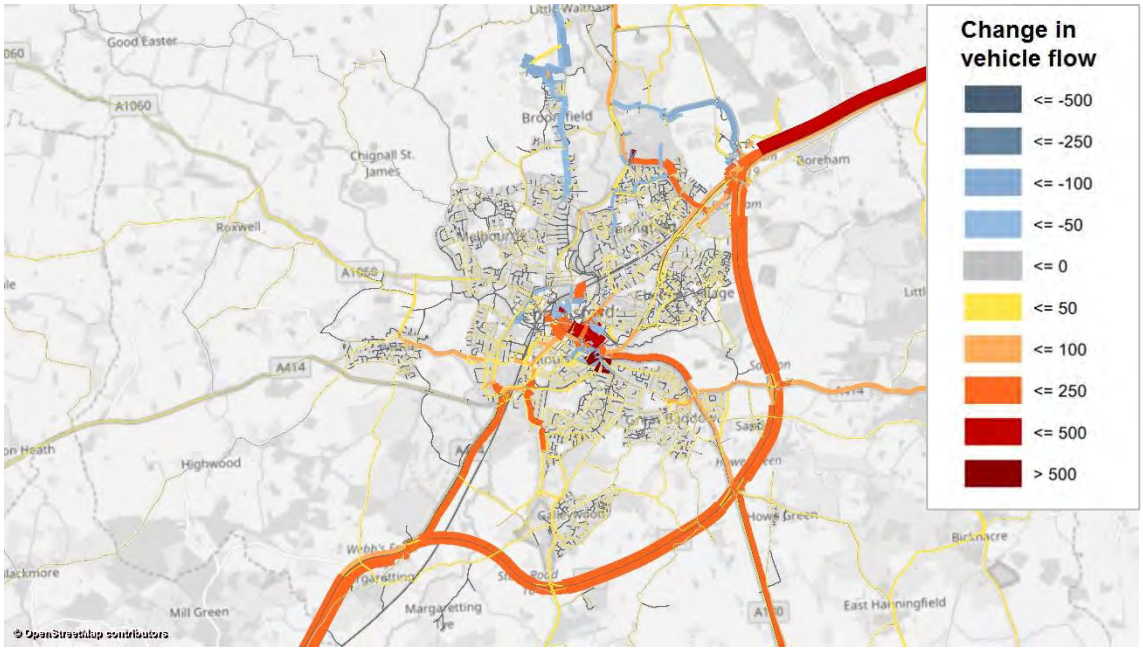

Figure S4: PM Peak Hour 2036 differences in traffic flow between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford

1.1.25 The focus of higher levels of modelled traffic flow on the Chelmsford strategic road network in the PM peak hour is similar to patterns shown in the AM peak hour. There are large volumes of additional traffic on the A12 and corridor routes out of Chelmsford such as the A414 Three Mile Hill London Road, A114 Essex Yeomanry Way (Baddow Bypass) and Essex Regiment Way. As modelled in the AM peak hour, lower levels are also modelled along Broomfield Road in the PM peak hour. Elsewhere, there are notable higher levels of modelled traffic flow heading out of the city centre through the Army and Navy roundabout, and along the A1060 Parkway and A1099 High Bridge Road.

1.1.26 As with the AM peak hour, larger volumes of flow on the A12 and corridor routes into/out of the city centre can be explained largely though the impact of variable demand modelling. The moderately lower vehicle flows modelled along the Broomfield Road Corridor and on strategic routes in North East Chelmsford can again be partly attributed to the reduction in the number of proposed dwellings in these areas.

1.1.27 In the PM peak hour, due to maintaining a single lane flyover at the Army and Navy Roundabout, westbound traffic flows in the Pre-Submission modelling route around the circulatory carriageway. This results in longer modelled delays on the Van Diemans Road approach to the junction, and a subsequent assignment of traffic flow via alternative city centre corridor routes including New London Road. This change in assignment has led to a higher modelled traffic flow on Parkway, and noticeably in circulatory movements at the Market Roundabout.

1.1.28 Elsewhere, the introduction of a left-turn slip lane at Nabbotts Roundabout is likely to have contributed to higher volumes of traffic flow modelled in the PM peak hour along the A130 White Hart Lane.

Change in Traffic Flow over the 2036 Do Minimum Scenario – Impact of the Pre-Submission Local Plan scenario

1.1.29 Figures S5 and S6 in this section illustrate the change in traffic flow modelled between the latest 2036 Pre-Submission Local Plan and Do Minimum scenarios in the AM and PM peaks respectively. The changes in modelled traffic flow therefore illustrate the likely impact of the Pre-Submission proposals, and can be directly compared with similar outputs presented in the reporting of the Local Plan Preferred Option[1].

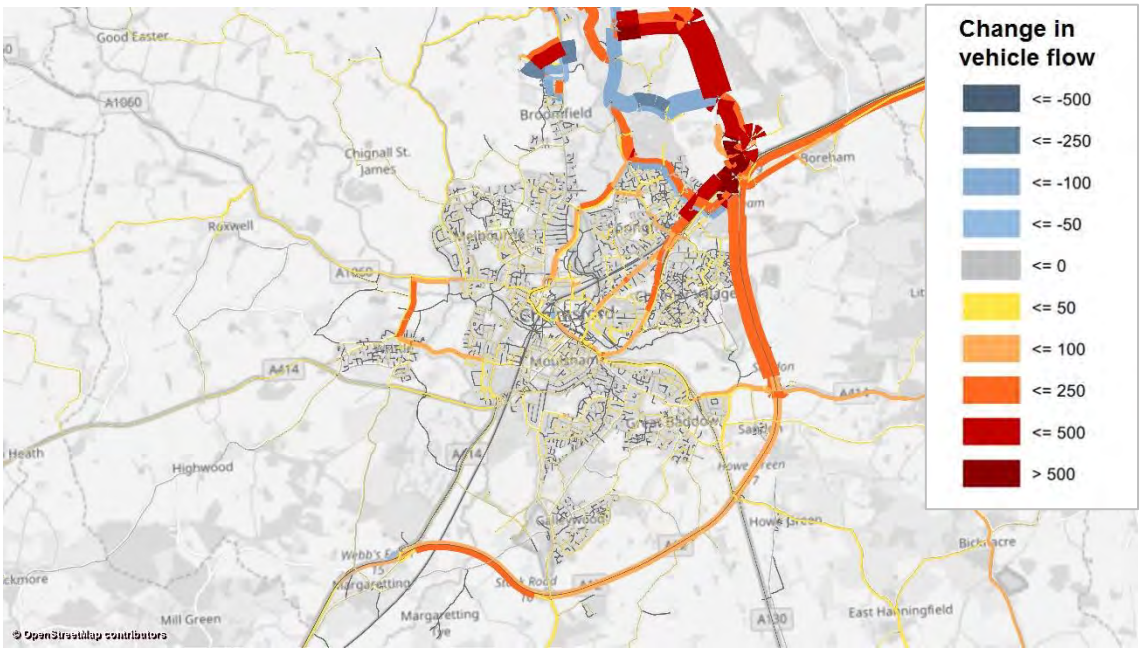

Figure S5: AM Peak Hour 2036 change in traffic flow over the Do Minimum with Pre-Submission Local Plan in Chelmsford

[1] Chelmsford Local Plan Preferred Option Strategic & Local Junction Modelling – Essex Highways – December 2017 : Figures 3.11 and 3.13

1.1.30 The focus of modelled traffic flow increase on the Chelmsford road network in the AM peak hour is in North East Chelmsford. The proposed Beaulieu Rail Station and Park and Ride site are shown to attract additional flows through the Boreham Interchange, whilst the Chelmsford North East Bypass (CNEB) is modelled to accommodate strategic flows that have transferred from the A130 Essex Regiment Way. The current A130 route - including the southern section of Essex Regiment Way and White Hart Lane, are accordingly modelled accommodating greater volumes of local development traffic. The addition of the Nabbotts Roundabout left turn filter lane is expected to help accommodate a greater volume of traffic through the junction.

1.1.31 The impact of the Local Plan is also likely to be felt along the A12 corridor, with increases in traffic modelled between J19 (Boreham Interchange) and J18 (Sandon).

1.1.32 Elsewhere, traffic flow increases are modelled in the vicinity of development sites to the East of Chelmsford on the A414 in Sandon, and to the West of Chelmsford on the A1060 Roxwell Road and Lordship Road. Traffic is also modelled to transfer to the proposed new link in the vicinity of Broomfield Hospital. Moderate traffic flow increases are shown in the city centre along Parkway and corridor routes to/from the north – specifically, A1016 Chelmer Valley Road, Springfield Road and A138 Chelmer Road.

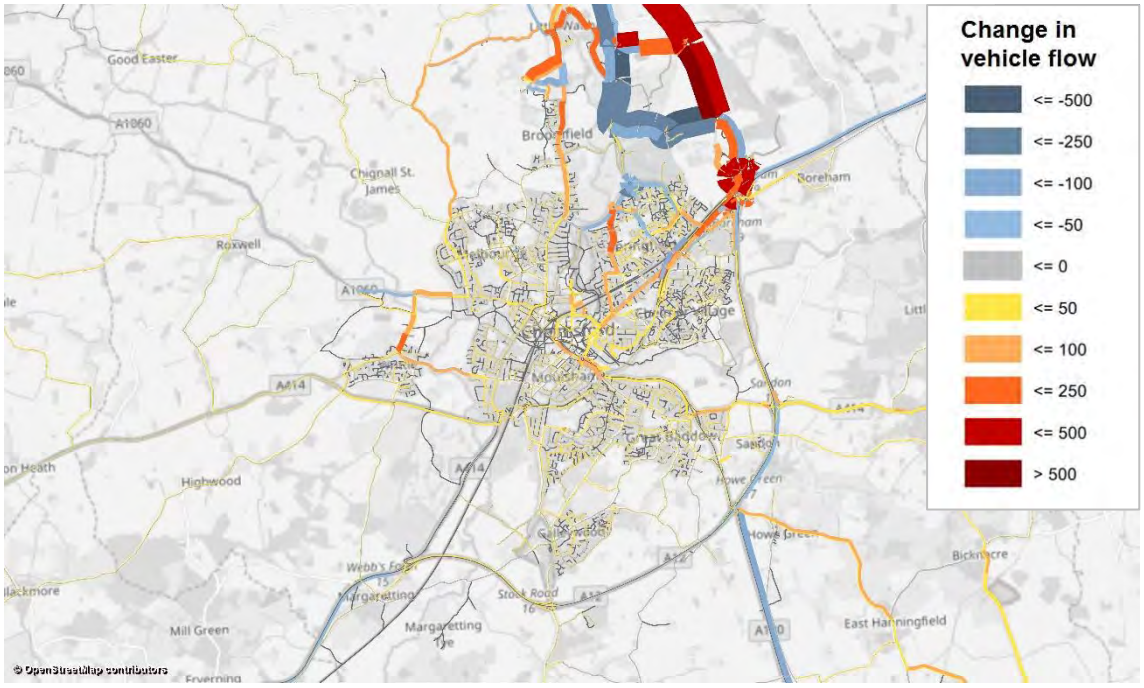

Figure S6: PM Peak Hour 2036 change in traffic flow over the Do Minimum with Pre-Submission Local Plan in Chelmsford

1.1.33 The focus of traffic flow increase on the Chelmsford road network in the PM peak hour is again modelled in North East Chelmsford with the pattern of flow change similar to that shown in the AM peak hour – although the CNEB is modelled to accommodate a greater increase in vehicles transferring from the A130 Essex Regiment Way.

1.1.34 Moderate traffic flow increases are shown in the city centre along Parkway and corridor routes to/from the north – specifically the B1008 Main Road, Lawn Lane and Springfield Road. Overall, patterns of modelled flow change are similar to those modelled in the AM peak hour, albeit to a lesser extent along the A12 corridor and on most routes into and out of Chelmsford (with the exception of the B1008 Main Road).

Change in link Volume-to-Capacity percentage over the 2036 Do Minimum Scenario – Impact of the Pre-Submission Local Plan

1.1.35 Figures S7 and S8 below illustrate the change in the modelled volume-to-capacity percentage (V/C%) on modelled links between the Pre-Submission Local Plan scenario and the Do Minimum scenario in the AM and PM peak hours respectively. The changes in modelled V/C% are therefore a result of Local Plan Pre-Submission proposals. Links highlighted as dark red are modelled as having at least a 20% increase in V/C.

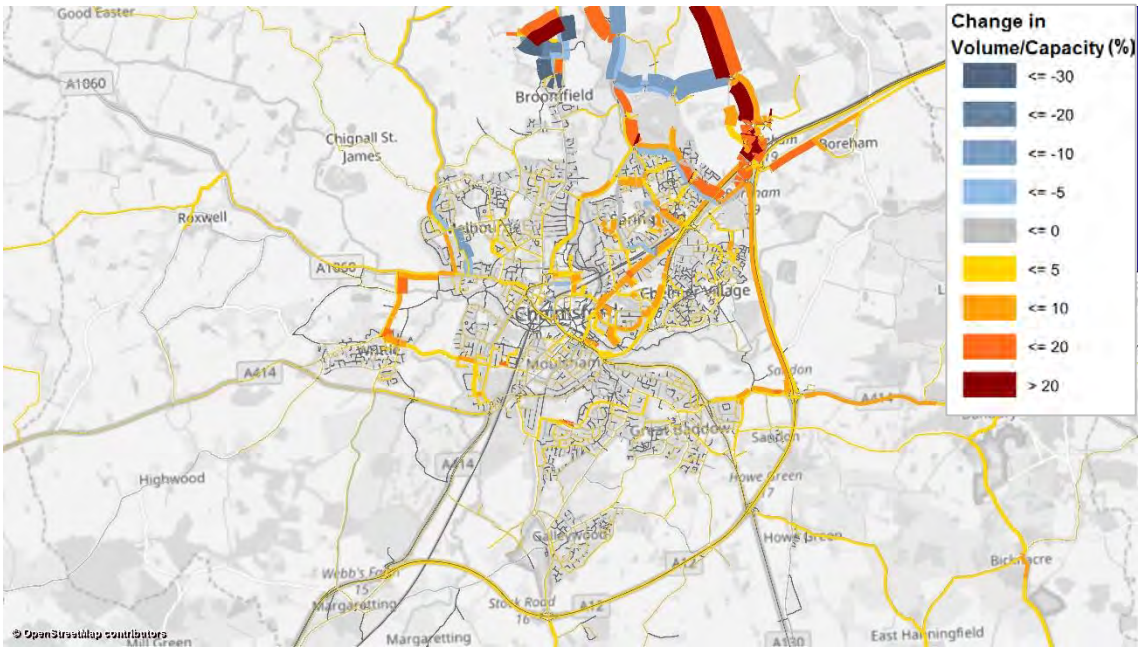

Figure S7: AM Peak Hour 2036 change in V/C% over the Do Minimum with Pre-Submission Local Plan in Chelmsford

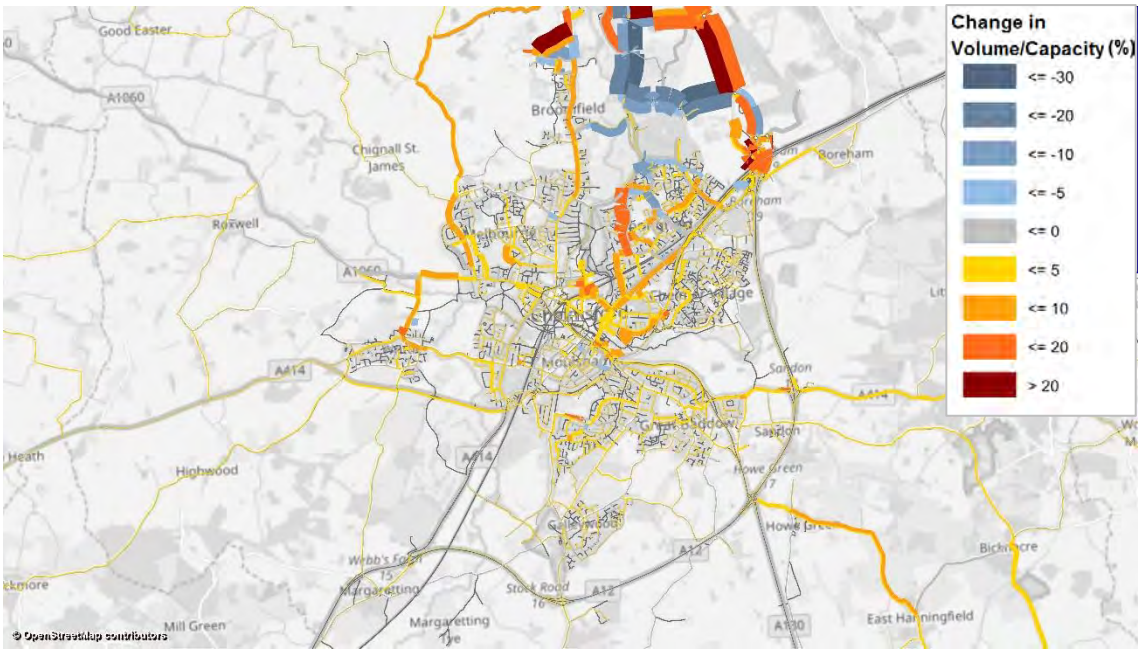

Figure S8: PM Peak Hour 2036 change V/C% over the Do Minimum with Pre-Submission Local Plan in Chelmsford

1.1.36 The scale of increase in the modelled V/C% along routes in and around Chelmsford reflects the increase in traffic flow and the capacity of the network. New routes such as the CNEB and Broomfield Hospital new northern link road have a large increase in V/C% as traffic flows are newly introduced to the route.

1.1.37 When viewed alongside comparable V/C% plots presented in the Preferred Option Strategic & Local Junction Modelling report[2], the latest outputs suggest that earlier observations and conclusions made around the likely future network capacity of the wider strategic road network remain largely unaffected by the changes made to the assumptions for the Pre-Submission modelling.

[2] Chelmsford Local Plan Preferred Option Strategic & Local Junction Modelling – Essex Highways – December 2017 : Figures 3.15 and 3.17

Impact on Great Leighs and South Woodham Ferrers

1.1.38 Revisions made to development and infrastructure assumptions in the Pre-Submission modelling are not expected to impact heavily on forecast traffic flows in Great Leighs and South Woodham Ferrers. Allocations in these areas remain the same as those in the Preferred Option, and both settlements are located a distance away from areas where development and infrastructure changes have been made.

1.1.39 Whilst it is recognised that forecast flows along the A131 and A130 (north and south of Chelmsford) may change to a small degree from those modelled in the Preferred Option, such changes are sufficiently small to fall within the accepted margin of error, due to the 'strategic' nature, of modelled assignment in VISUM – particularly in outlying areas of the model.

Local Junction Modelling

1.1.40 This section summarises the likely impact on local junctions of the changes to development and infrastructure assumptions associated with the latest Pre-Submission modelling.

1.1.41 The assessment was undertaken by comparing modelled turning movements at junctions on the Chelmsford strategic road network in the AM and PM peak hours between the latest Pre-Submission modelling and the previous Preferred Option modelling.

1.1.42 Analysis of the change in vehicle flows on the strategic road network, suggests that the following development and model assignment changes will have the greatest impact on flows through local junctions:

- Moving of the Beaulieu Post 2021 roll-over development into the Do-Minimum scenario,
- The reduction in housing proposed in Broomfield; and
- The increase in traffic flow on corridor routes as a result of changes in variable demand.

1.1.43 Turning flow differences greater than +/- 100 were recorded and are presented in Table S4 below. Differences of less than +/- 100 fall within the margins of error of the model due to the 'strategic' nature of modelled assignment in VISUM.

1.1.44 With the exception of the Boreham Interchange, flow differences modelled at local junctions are shown to be small and/or are unlikely to adversely impact overall performance. Prior analysis and recommendations for mitigation made in the Preferred Option Strategic & Local Junction Modelling report therefore remain relevant. Whilst the latest modelling suggests additional traffic will route through the Boreham Interchange, overall conclusions on junction performance remain consistent, with the latest findings strengthening the case for further capacity enhancements to accommodate flows in a Do-Minimum scenario.

Table S4: Difference in approach arm vehicle flows at key junctions in Chelmsford between Preferred Option and Pre-Submission modelling[3]

Junction No.	Junction / Turning Movement	AM 2036 Difference in Actual Flow		PM 2036 Difference in Actual Flow		Previous Preferred Option Junction Modelling
		DM	LP	DM	LP	
23	A12 J19 Boreham Interchange (Generals Lane/RDR 1 to A12 South)	240	34	145	108	At/Over Capacity
	A12 J19 Boreham Interchange (Boreham Main Road to Generals Lane/RDR 1)	28	-127	12	0	At/Over Capacity
	A12 J19 Boreham Interchange (A12 South to Generals Lane/RDR 1)	35	4	188	18	At/Over Capacity
	A12 J19 Boreham Interchange (A130 Colchester Rd to Generals Lane/RDR 1)	1	307	25	-12	At/Over Capacity
	A12 J19 Boreham Interchange (A130 Colchester Rd to A12 South)	124	-104	71	24	At/Over Capacity
	A12 J19 Boreham Interchange (A138 Chelmer Rd to Generals Lane/RDR 1)	45	-122	170	2	At/Over Capacity
10	Main Road - Hospital Approach Roundabout (B1008 Main Rd South to North)	56	100	37	41	Under Capacity
6	Channels Drive Roundabout (A130 Essex Regiment Way South to North)	69	18	-104	71	Under Capacity
1	Moulsham Hall Lane Roundabout (Main Road to A131 South)	17	113	14	60	Under Capacity
7	Nabbotts Roundabout (A130 Essex Regiment Way to White Hart Lane)	117	-47	111	85	At/Over Capacity
11	Main Rd – School Lane, Broomfield Junction (School Lane to B1008 Main Rd North)	26	-89	117	-65	Approaching Capacity
	Main Rd – School Lane, Broomfield Junction (B1008 Main Rd North to School Lane)	-108	-197	-105	-56	At/Over Capacity
	Main Rd – School Lane, Broomfield Junction (B1008 Main Rd South to North)	14	17	139	32	Under Capacity

[3] Flows less than 100 fall within an acceptable margin of error associated with the strategic model assignment, and should not be considered significant.

Impact on City Centre

1.1.45 For this latest assessment of the Local Plan Pre-Submission Option, the localised impact of proposed development and infrastructure has been modelled in the city centre using the Chelmsford VISSIM micro-simulation model. Focus has been placed on analysing changes in vehicle journey times along Springfield Road and the Parkway corridor between the Army and Navy Roundabout and the gyratory at the junction with Broomfield Road, through a comparison of outputs from the 2036 Do Minimum and Pre-Submission Local Plan scenarios.

1.1.46 Figure S9 highlights different coloured sections of Springfield Road and Parkway where journey times have been segmented[4]. Segmentation of journey time analysis along the two routes has helped to provide a clearer understanding of the impact of Local Plan proposals at various junctions along the corridor through the city centre.

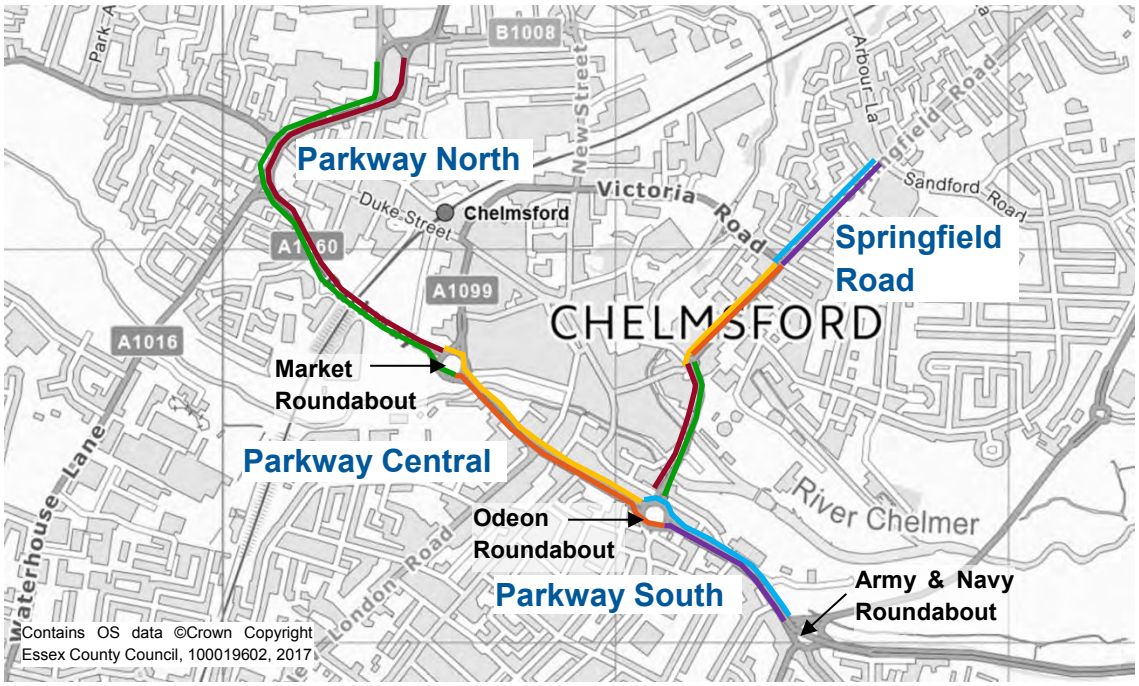

Figure S9: Extent of Springfield Road and Parkway journey time route analysis

[4] Coloured sections of each route can be cross-referenced with the segmented journey times shown in Tables 4-1 & 4-2 with corresponding colours.

1.1.47 Tables S5 and S6 below show average peak hour journey times along the Springfield Road and Parkway corridors in 2014/15, and those modelled in a 2036 forecast year with and without Pre-submission Local Plan development and infrastructure. The colour scheme used to highlight each section of the corridor routes can be cross-referenced with the colours used in Figure S9.

Table S5: Observed and modelled forecast journey times along Parkway

	Average travel time per vehicle (hrs:mins:secs)	AM 2014/15	AM Do Min 2036	AM Local Plan 2036
	Westbound			
	Army & Navy to Odeon Roundabout	00:01:26	00:01:22	00:01:41
	Odeon to Market Roundabout	00:01:44	00:01:37	00:01:40
	Market Roundabout to Parkway Gyratory j/w Broomfield Rd	00:02:55	00:03:35	00:03:31
	Total	**00:06:06**	**00:06:33**	**00:06:52**
	Eastbound			
	B1008 j/w Parkway Gyratory to Market Roundabout	00:03:47	00:05:41	00:05:05
	Market Roundabout to Odeon Roundabout	00:01:30	00:01:56	00:02:08
	Odeon to Army & Navy Roundabout	00:02:42	00:00:56	00:00:56
	Total	**00:07:58**	**00:08:33**	**00:08:09**
	Average travel time per vehicle (hrs:mins:secs)	**PM 2014/15**	**PM Do Min 2036**	**PM Local Plan 2036**
	Westbound			
	Army & Navy to Odeon Roundabout	00:00:43	00:01:25	00:01:28
	Odeon to Market Roundabout	00:01:44	00:01:47	00:02:01
	Market Roundabout to Parkway Gyratory j/w Broomfield Rd	00:02:55	00:05:27	00:05:25
	Total	**00:05:22**	**00:08:39**	**00:08:54**
	Eastbound			
	B1008 j/w Parkway Gyratory to Market Roundabout	00:04:19	00:07:45	00:07:58
	Market Roundabout to Odeon Roundabout	00:01:44	00:02:19	00:02:32
	Odeon to Army & Navy Roundabout	00:01:48	00:01:44	00:01:49
	Total	**00:07:51**	**00:11:48**	**00:12:19**

Table S6: Observed and modelled forecast journey times along Springfield Road

	Average travel time per vehicle (hrs:mins:secs)	AM 2014/15	AM Do Min 2036	AM Local Plan 2036
	Southbound			
	Sandford Road to Victoria Road	00:01:19	00:01:04	00:01:06
	Victoria Road to Bond street	00:00:39	00:00:50	00:00:52
	Bond Street to Odeon	00:00:53	00:01:01	00:01:03
	Total	**00:02:51**	**00:02:55**	**00:03:00**
	Northbound			
	Odeon to Bond Street	00:00:43	00:01:25	00:01:44
	Bond Street to Victoria Road	00:02:24	00:02:46	00:02:54
	Victoria Road to Sandford Road	00:00:58	00:00:58	00:00:59
	Total	**00:04:05**	**00:05:10**	**00:05:37**
	Average travel time per vehicle (hrs:mins:secs)	**PM 2014/15**	**PM Do Min 2036**	**PM Local Plan 2036**
	Southbound			
	Sandford Road to Victoria Road	00:02:22	00:01:48	00:02:50
	Victoria Road to Bond street	00:01:38	00:01:42	00:01:56
	Bond Street to Odeon	00:02:29	00:01:59	00:01:57
	Total	**00:06:29**	**00:05:30**	**00:06:42**
	Northbound			
	Odeon to Bond Street	00:00:32	00:01:32	00:02:08
	Bond Street to Victoria Road	00:01:27	00:03:05	00:03:32
	Victoria Road to Sandford Road	00:01:20	00:00:57	00:00:58
	Total	**00:03:19**	**00:05:33**	**00:06:39**

1.1.48 Recent published studies for the Chelmsford City Centre Growth Package suggest that in the peak hour there is around 4% reserve network capacity in Chelmsford city centre[5]. Forecast modelling for the Pre-Submission Local Plan has shown that peak hour background traffic flows in the Do Minimum scenario will increase by an average of 4% in the city centre up to 2036, with a further increase (over the Do Minimum) of 2% resulting from Local Plan development and infrastructure.

1.1.49 Observations from the VISSIM model runs demonstrate that the city centre network subsequently becomes over-saturated with vehicles during the course of the AM and PM peak hours in a 2036 forecast year. This results in significant congestion across areas of the modelled city centre network, and this is shown to impact journey times along Parkway and Springfield Road.

1.1.50 Modelling demonstrates that congestion along sections of Parkway and Springfield Road creates pinch-points that, on occasion, result in improved journey times along other stretches of each route. This helps to explain why modelled journey times along certain sections were seen to be lower than observed 2014 values, whilst overall modelled journey times in each direction were higher in most instances.

1.1.51 Key findings taken from the city centre journey time analysis, are as follows:

- Background growth between 2014 and 2036 resulted in an increase in modelled journey times along Parkway of 7% (around 1 min) in the AM peak. In the PM peak, journey times increased by 56% (around 7 mins).
- Modelled journey time increases were also recorded along Springfield Road, with significantly higher increases northbound – 26% in the AM peak (around 1 min) and 67% in the PM peak (over 2 mins).
- Southbound journey times along Springfield Road were shown to increase marginally by 2% (a few secs) in the modelled AM peak and reduce by 15% (around 1 min) in the PM peak. This was shown in the model to be a result of congestion along the Parkway corridor creating an upstream pinch-point.

[5] http://www.essexhighways.org/highway-schemes-and-developments/major-schemes/chelmsford-future-transport-network.aspx

- The addition of Local Plan development and infrastructure resulted in no overall change in modelled journey times along Parkway in the AM peak. In the PM peak, journey times increased by a further 4% (45 secs).
- Along Springfield Road, the addition of Local Plan development and infrastructure resulted in a further increase in journey times of 6% (30 secs) in the AM peak and 21% (over 2 mins) in the PM peak – with little directional variation.

1.1.52 These outputs are in line with overall findings from the Chelmsford City Centre Growth Package studies[6], and further support the case for a need to encourage a greater shift towards public transport, cycling and walking modes.

Cross Boundary Impact

1.1.53 This section considers a review of the cross boundary impact of Local Plan proposals on the road network in neighbouring Districts and Boroughs. The review consists of two parts:

- A comparison of forecast-year modelled traffic flows on main routes crossing the administrative boundary with flows modelled by neighbouring authorities;
- A review of the modelled assignment of cross-boundary trips to/from larger proposed Local Plan developments located outside of Chelmsford city centre.

1.1.54 Table S7 below, details the directional vehicle flows on the key corridor routes crossing the Chelmsford administrative boundary modelled for the Chelmsford Local Plan in 2036, and those modelled for neighbouring authorities' Local Plans. It should be noted that due to the early-stage of the Local Plan modelling for Brentwood and Uttlesford, forecast traffic data was not available for comparison as part of this study.

[6] http://www.essexhighways.org/highway-schemes-and-developments/major-schemes/chelmsford-city-growth-package.aspx

Table S7: Modelled vehicle flow comparisons on key roads crossing the Chelmsford administrative boundary

	Neighbour Authority			AM Directional Flow				PM Directional Flow			
Road	**Authority**	**LP Year**	**Model Type**	**Chelmsford LP (2036)**		**Neighbour Authority LP**		**Chelmsford LP (2036)**		**Neighbour Authority LP**	
				IB	**OB**	**IB**	**OB**	**IB**	**OB**	**IB**	**OB**
A131	Braintree	2033	VISUM (fixed demand)	1292	1126	2101	1913	1179	1951	1842	2239
A12 (north)	Braintree	2033	VISUM (fixed demand)	4870	3863	4576	3672	3950	4743	3829	4710
A414 (east)	Maldon	2026	Spreadsheet	1037	678	1596	861	763	1146	928	1439
A130 (south)	Basildon	2034	SATURN/Spreadsheet	2377	2813	4061*		2654	2283	3948*	
B1007	Basildon	2034	SATURN/Spreadsheet	606	882	1684*		878	775	1820*	
A12 (south)	Brentwood	-	-	3128	3316	N/A	N/A	3847	3219	N/A	N/A
A414 (west)	Epping Forest	2033	Spreadsheet	606	876	720	1270	915	592	975	818
A1060	Uttlesford	-	-	224	266	N/A	N/A	356	251	N/A	N/A
B1008	Uttlesford	-	-	693	611	N/A	N/A	783	484	N/A	N/A

*Modelled two-way flow only available at time of reporting

1.1.55 Differences in directional flows at the Chelmsford administrative boundary shown in Table S7 are understood to occur as a result of variations in modelling approaches between Local Plan studies, as well as differences in development assumptions and their application in the modelling.

1.1.56 For example, directional flows modelled along the A131 for the Chelmsford Local Plan are notably lower than those modelled for the Local Plan studies in Braintree. This is understood to be, in part, due to a higher estimate of development proposed at Great Leighs for the Braintree modelling (based on information available at the time). The Braintree Local Plan modelling also accounted for a specific concentration of development around Braintree town centre and at Great Notley, with larger volumes of traffic subsequently assigned to the A131. For the Chelmsford Local Plan, development growth in Braintree district was calculated from TEMPro, which resulted in a more even distribution of development and a wider assignment of development traffic modelled across the road network.

1.1.57 The modelled assignment of cross-boundary development trips was determined using 'flow bundle analysis' in the Chelmsford forecast VISUM model. This analysis highlighted the assigned routes of trips arriving to or departing from model zones containing Local Plan development in areas outside of the city centre. This analysis was carried out with the AM, IP and PM peak hour models.

1.1.58 For the purpose of this study, focus has been placed on determining the impact of Local Plan developments in the following locations:

- North East Chelmsford (Greater Beaulieu Park)
- Great Leighs
- South Woodham Ferrers

1.1.59 Table S8 below summarises the modelled traffic flows, generated by the three largest Local Plan developments, crossing the administrative boundary to/from neighbouring districts and boroughs along key strategic corridors in the VISUM model. The impact of smaller developments would be expected to have a relatively small impact limited to the nearest corridor route(s).

Table S8: Peak hour development traffic flows on key routes crossing the Chelmsford Local Authority Area boundary

AM Peak (08:00-09:00)

VISUM Zone	Local Plan Location Ref	Site Description	O/D	Braintree (via A131)	Braintree (via A12 N)	Maldon (via A414 E)	Basildon (via A130)	Brentwood (via A12 S)	Epping (via A414 W)	Uttlesford (via A1060)	Uttlesford (via B1008)
89/91/97	4	North East Chelmsford	Origin	40	15	5	30	48	2	3	108
95/96	5	Great Leighs	Origin	72	0	1	7	8	0	1	8
111	7	North of South Woodham Ferrers	Origin	0	9	10	38	1	1	0	0
89/91/97	4	North East Chelmsford	Destination	108	51	13	4	61	17	7	44
95/96	5	Great Leighs	Destination	11	0	1	1	1	0	0	6
111	7	North of South Woodham Ferrers	Destination	0	1	0	13	1	0	0	0

PM Peak (17:00-18:00)

VISUM Zone	Local Plan Location Ref	Site Description	O/D	Braintree (via A131)	Braintree (via A12 N)	Maldon (via A414 E)	Basildon (via A130)	Brentwood (via A12 S)	Epping (via A414 W)	Uttlesford (via A1060)	Uttlesford (via B1008)
89/91/97	4	North East Chelmsford	Origin	123	12	28	73	45	2	0	154
95/96	5	Great Leighs	Origin	23	1	3	4	4	0	0	20
111	7	North of South Woodham Ferrers	Origin	0	9	10	94	1	0	0	0
89/91/97	4	North East Chelmsford	Destination	137	28	25	14	95	13	5	157
95/96	5	Great Leighs	Destination	39	3	2	5	12	0	0	51
111	7	North of South Woodham Ferrers	Destination	0	0	17	74	6	0	0	0

Refer to Appendix F for a VISUM model zone plan of Chelmsford (as referenced in the first column)

1.1.60 As shown in Table S8, development in both North East Chelmsford and Great Leighs would be expected to add to background traffic flows heading north to/from Braintree District via the A131 and Uttlesford District via the B1008. However, flows from these developments represent a small proportion of overall development trip totals, with the bulk of journeys heading to/from the south via Chelmsford.

1.1.61 Based on trip generation calculations and VISUM modelled distributions, the larger Local Plan development sites might be expected to contribute around two or three additional trips a minute in either direction along the A131 and B1008 in a typical peak hour. The volume of development trips crossing to/from Uttlesford and Braintree districts is modelled to be slightly higher in the PM peak hour.

1.1.62 Development in South Woodham Ferrers, and also in North East Chelmsford, might be expected to add to background traffic flows heading south to/from Basildon Borough via the A130. The volumes of traffic modelled crossing the administrative boundary might be expected to contribute up to three additional trips a minute in either direction along the A130, with higher volumes modelled in the PM peak hour.

1.1.63 Elsewhere, traffic volumes travelling on main routes between Chelmsford and neighbouring authorities are modelled to be small in both peak hours. Development traffic routing via the A12, for example, is likely to be restricted in number given the lack of forecast available capacity along the route.

Summary & Conclusions

1.1.64 At a strategic network level, the latest model outputs illustrating the impact of 2036 Pre-Submission Local Plan development and infrastructure are broadly comparable to those presented in the Preferred Option Strategic & Local Junction Modelling report. This suggests that earlier observations and conclusions made around the future network capacity of the wider road network remain largely unaffected by the changes made to the 2036 development assumptions for the Pre-Submission.

1.1.65 However, with an overall reduction in Local Plan development modelled for the Pre-Submission, the subsequent weakened impact of variable demand modelling is shown to result in higher levels of modelled traffic flows along trunk roads and corridor routes into and out of Chelmsford city centre. This, along with local changes made to development allocations to the north of Chelmsford, is modelled to result in different traffic flows through a number of assessed junctions.

1.1.66 Published studies[7] have revealed that in the peak hour there is around 4% reserve network capacity in Chelmsford city centre. Forecast modelling for the Pre-Submission Local Plan has shown that peak hour background traffic flows will increase by an average of 4% in the city centre up to 2036, with a further increase (on top of the background growth) of 2% resulting from Local Plan development and infrastructure. This is therefore forecast to cause the city centre network to become over-saturated with vehicles during the course of the AM and PM peak hours in a 2036 forecast year, leading to forecast increases in vehicle journey time along routes including Parkway and Springfield Road.

1.1.67 Whilst a focused review of the impact on the city centre road network was not included in the Preferred Option assessment, it is recognised that the impact of maintaining the single lane flyover at the Army and Navy Roundabout has had an impact on flows along Parkway, with noticeable changes likely over the strategic model outputs presented for the city centre in the Preferred Option modelling report.

[7] http://www.essexhighways.org/highway-schemes-and-developments/major-schemes/chelmsford-city-growth-package.aspx

1.1.68 With the exception of the Boreham Interchange, flow differences modelled at local junctions are shown to be small and/or are unlikely to adversely impact overall performance. Prior analysis and recommendations for mitigation made in the Preferred Option Strategic & Local Junction Modelling report therefore remain relevant. Whilst the latest modelling suggests additional traffic will route through the Boreham Interchange, overall conclusions on junction performance remain consistent, with the latest findings strengthening the case for further capacity enhancements to accommodate flows in a Do-Minimum scenario.

1 Introduction

1.1 Background

This report presents the outputs and analysis of strategic and local highway impact modelling undertaken for the assessment of Chelmsford City Council's (CCC) Local Plan Pre-Submission Spatial Option. Findings from this study will contribute towards the transport evidence base to support the Pre-Submission Spatial Option and package of mitigation measures when taken forward to Examination in Public in 2018.

The study has been commissioned by Chelmsford City Council to update the latest Local Plan Preferred Option assessment[8] using development and infrastructure assumptions agreed in October 2017 specifically for the Pre-Submission Spatial Option. This includes revisions to housing and employment numbers, and transport infrastructure schemes.

This report details the changes in modelling assumptions used and outputs produced from those reported in the more detailed Local Plan Preferred Option modelling. It is therefore recommended that the Preferred Option Strategic & Local Junction Modelling report is used as a reference when considering the findings of this update study.

The report includes up-to-date forecast traffic flow and volume-to-capacity plots from the modelling illustrating the likely strategic highway impact of the Pre-Submission option. In addition, the report documents the results of a study into the likely impact of traffic growth on journey times in Chelmsford's city centre. It also provides a comparison of cross-boundary traffic flows suggested by the CCC Pre-Submission assessment and in Local Plan assessments undertaken by neighbouring authorities.

As before, the Chelmsford Strategic Model (in VISUM) has been used to carry out the assessment of Local Plan impact on the strategic road network by the end of the upcoming Local Plan period in 2036.

Details on the VISUM model build, and modelling methodology can be found in the Preferred Option Strategic & Local Junction Modelling report.

[8] Chelmsford Local Plan – Preferred Option Strategic & Local Junction Modelling (Essex Highways - December 2017)

1.2 Document Layout

This document consists of seven chapters, as follows:

Chapter 1 - **Introduction**

Chapter 2 – **Pre-Submission Assumptions** – This details the latest development and infrastructure assumptions modelled for the Pre-Submission Plan and focuses on differences from those modelled previously for the Preferred Option Plan.

Chapter 3 – **Wider Impact on Strategic Road Network** – This considers both the likely change in impact between the earlier Preferred Option modelling and the latest Pre-Submission modelling, and also presents the likely impact of the Pre-Submission plan in its own right.

Chapter 4 - **Impact on City Centre** – This provides detail on the city centre modelling of the Pre-Submission Plan using VISSIM micro-simulation software.

Chapter 5 - **Impact on Local Junctions** – This revisits the local junction assessments undertaken for the Preferred Option Plan, identifies changes in approach flows associated with the Pre-Submission Plan and considers any likely subsequent impact on junction performance.

Chapter 6 – **Cross Boundary Impact** – This looks at the likely impact of Chelmsford's Local Plan development on key routes passing into neighbouring authorities.

Chapter 7 - **Conclusions**

1.3 Glossary of Modelling Terms

Actual Flow The modelled vehicle flow on a road accounting for both the reassignment of traffic as a result of network capacity constraint and through congestion caused by the presence of conflicting vehicle movements on the road network.

Do Minimum / Do Min Referred to in this study as a reference case against which to compare the various Local Plan Spatial Option scenarios. The 2036 Do Minimum scenario does not contain housing or job growth in Chelmsford covering the Local Plan period 2021-2036.

Fixed Demand Demand for peak hour travel that does not change to take account of changes in travel behaviour such as changing frequency of trip, changing mode of travel or changing destination in response to levels of congestion on the road network.

Matrix Furness Process of creating a matrix of vehicle trips based on known trip ends for both origins and destinations.

NTEM / TEMPro National Trip End Model – produced by the Department for Transport, it uses a number of forecasts for population, employment and households by car ownership to forecast changes in trip ends (trips by origin and by destination). The results are viewed in software called TEMPro (Trip End Model Presentation Program).

Trafficmaster A database provided by the Department for Transport containing Global Positioning System derived journey times of vehicles.

Trip Ends Referred to in this study as the origin or destination trip totals to/from for a particular development or model zone.

Variable Demand Demand for peak hour travel that does take account of changes in travel behaviour such as changing frequency of trip, changing mode of travel or changing destination in response to levels of congestion on the road network.

VISSIM	A micro-simulation modelling package used in this study to assess the impact of development traffic on the city centre road network.
VISUM	An area-wide assignment modelling package used in this study to assess the impact of development traffic on the wider 'strategic' road network in and around Chelmsford.
Volume-to-Capacity Percentage (V/C%)	The volume of traffic flow calculated as a percentage of the capacity of the road. 1 equates to the road being at full capacity – often characterised by large queue extents and delays.

2 Pre-Submission Assumptions

2.1 Changes to development and infrastructure assumptions

This section reports on the changes to development and infrastructure assumptions since the modelling of the Local Plan Preferred Option. These latest assumptions have been used to model the likely impact of the Pre-Submission option on the transport network.

The earlier Preferred Option modelling considered a Do Minimum scenario that included committed development and infrastructure in the current plan period between 2014 and 2021. The Local Plan scenario then modelled the development allocations and proposed infrastructure to be included in the next plan period 2021-2036.

For the Pre-Submission modelling, the latest housing trajectory of committed developments in Chelmsford extends beyond 2021, whilst Local Plan development including Chelmer Waterside, has been brought forward for phased development prior to the start of the 2021-2036 Plan period.

Subsequently, the latest Do Minimum scenario contains all committed development with planning permission in Chelmsford from 2015 onwards – including the committed proportion of the Chelmer Waterside Local Plan allocation, whilst the latest Local Plan scenario contains all proposed development without planning permission.

2.2 The Do Minimum Scenario

A summary of the changes to the residential development in the latest Do Minimum Pre-Submission modelled scenario from the previous Do Minimum (Preferred Option) modelled scenario can be found in Table 2-1 below. A more detailed list of the Do Minimum Pre-Submission residential developments is included in Appendix A of this report.

Table 2-1: Change in residential development in the Do Minimum scenario

2036 Do Minimum (Preferred Option Modelling) *Correct as of April 2017*	
Planned Housing Development 2015-2021	
Town Centre Area Action Plan	1,939
North Chelmsford Area Action Plan	2,677
Site Allocations Development Plan	870
Unallocated Large Sites	786
Unallocated Small Sites	517

2036 Do Minimum (Pre-Submission Modelling) *Updated November 2017*	
Planned Housing Development 2015-2023	
Town Centre Area Action Plan	2,120
North Chelmsford Area Action Plan	4,889*
Site Allocations Development Plan	899
Unallocated Large Sites	1,319
Unallocated Small Sites	766
Total Difference	**+3,204**
Total Difference (not including Beaulieu Post 2021 Rollover)	**+624**

* Includes Beaulieu Post-2021 Roll-Over previously modelled only in Local Plan scenario

The committed housing development modelled for the Pre-Submission Do Minimum scenario is reflective of CCC's latest Housing Site Schedule, and is correct as of November 2017.

In total, an additional 624 dwellings have been modelled, whilst the Beaulieu roll-over development comprising 2,325 dwellings has been moved into the Do Minimum scenario – having previously only been included in the Local Plan scenario modelling. This change is in keeping with the revised assumption established for modelling committed development irrespective of the planned construction date, as outlined in Section 2.1 of this report.

As with earlier modelling studies, committed developments comprising less than 30 dwellings were distributed evenly across Chelmsford administrative area development zones. These smaller sites accounted for 13% of the total developments modelled in the latest Do Minimum modelling[9].

[9] For the Preferred Option modelling, smaller sites accounted for approximately 17% of total developments modelled.

A revised allocation of non-residential developments planned between 2015 and 2021 to be included in the latest Pre-Submission modelling was also confirmed with CCC in October 2017. Revisions since the Preferred Option modelling are show in Table 2-2 below, with a full up-to-date list of non-residential development included in the Pre-Submission modelling in Appendix A.

Table 2-2: Change in non-residential development in the Do Minimum scenario

Development	Change to non-residential assumptions
Former Royal Mail Premises, Victoria Road	-3,000 m^2 employment (business park)
City Park West (Former ARU Central)	-7,635 m^2 employment (business park) +350 m^2 supporting retail
Marconi Evolution (Former Marconi Works)	-4,616 m^2 employment (business park) -3,639 m^2 supporting retail +367 m^2 leisure
The Exchange and CM2 – Anderson Site	-56 m^2 employment (business park)
Channels Business Park	+2,343 m^2 general industrial
Medical School + ARU Development	+3,954 m^2 education nursery

The Pre-Submission scenario also removes a further 7,514 m^2 of employment (office) space from brownfield sites in the city centre. The revised brownfield site allocations can be found in Appendix A of this report, whilst the changes are summarised in Table 2-3 below:

Table 2-3: Change in non-residential brownfield development in the Do Minimum scenario

Development	Change to non-residential assumptions
Parkway House, 49 Baddow Road	-2,010 m^2 employment (office)
Rosebury House, 41 Springfield Road	-1,764 m^2 employment (office)
Threadneedle House, Market Road	-3,740 m^2 employment (office)

2.2.1 Do Minimum Infrastructure Changes

The following revisions have been made to infrastructure assumptions for the Do Minimum scenarios in the Pre-Submission modelling:

- The previously modelled two-way flyover at the Army & Navy Roundabout has been reverted back to its existing single lane layout; and
- Left turn filter lanes have been added to Sheepcotes Roundabout (Braintree Road to Essex Regiment Way) and to Nabbotts Farm Roundabout (Essex Regiment Way to White Hart Lane).

Essex Highways are currently undertaking an appraisal of various improvement options and a buildability/feasibility study of a two-way flyover at the Army and Navy Roundabout. There are no firm timescales set for delivery of the schemes being considered. As such, proposed infrastructure upgrades have not been included in this latest modelling study.

The proposed roundabout filter lanes are illustrated in Figure 2.1 and Figure 2.2.

Figure 2.1: Sheepcotes Roundabout – location of proposed left turn filter lane

Figure 2.2: Nabbotts Farm Roundabout – location of proposed left turn filter lane

There has been no change in traffic growth assumptions for this latest modelling. Development trips and distributions have been updated following the changes made to development assumptions. More information on the modelling methodology can be found in the Preferred Option Strategic & Local Junction Modelling report.

2.3 The Local Plan Scenario

Table 2-4 below shows the changes to development assumptions in the 2036 Local Plan scenario as of October 2017 for the Pre-Submission.

Table 2-4: Change in residential, employment & retail development in the Local Plan scenario

Preferred Option			
Development Location	**Housing (dwellings)**	**Employment (Business Park) sqm**	**Commercial (Retail) sqm**
Location 1: Chelmsford Urban Area	2,957	17,000	5,000
Location 2: West Chelmsford	800		
Location 3: East Chelmsford (East of Great Baddow)	400	5,000	
Location 4: North East Chelmsford	3,000	45,000	
Location 5: Moulsham Hall and North Great Leighs	1,100		
Location 6: North Chelmsford (Broomfield)	800		
Location 7: Boreham	145		
Location 8: North of South Woodham Ferrers	1,000	1,000	
Location 9: Bicknacre	30		
Location 10: Danbury	100		
Beaulieu Post 2021 Roll-Over	2,580		
Windfall Sites	1,500		

Pre-Submission Option			
Development Location	**Housing (dwellings)**	**Employment (Business Park) sqm**	**Commercial (Retail) sqm**
Location 1: Chelmsford Urban Area	2,317	14,000	5,000
Location 2: West Chelmsford	800		
Location 3: East Chelmsford (East of Great Baddow)	400	5,000	
Location 4: North East Chelmsford	3,000	45,000	
Location 5: Moulsham Hall and North Great Leighs	1,100		
Location 6: North Chelmsford (Broomfield)	450		
Location 7: North of South Woodham Ferrers	1,000	1,000	
Location 8: Bicknacre	30		
Location 9: Danbury	100		
Beaulieu Post 2021 Roll-Over	0		
Windfall Sites	1,400		
Existing Commitments 1-5*	100		
Total Difference	**-3,715**	**-3,000**	**0**
Total Difference (not including Beaulieu Post 2021 Roll-Over)	**-511**	**-3,000**	**0**

* A further 245 dwellings with planning permission have been modelled in the Do Minimum scenario (and are included in the totals shown in Table 2-1).

Windfall housing numbers included in the Local Plan scenario modelling, are understood to have decreased by 100 dwellings from 1500 to 1400 as result of the changes made to the Local Plan development assumptions for the Pre-Submission. Existing commitments without planning permission have now been included in the latest Local Plan modelled scenario.

No changes were made to the 2021-2036 non-residential development and brownfield assumptions included in the Local Plan scenario for the Pre-Submission.

Infrastructure revisions made for the Pre-Submission Do-Minimum scenario were carried over into the latest Local Plan scenario. No additional infrastructure changes associated with the Pre-Submission Local Plan were proposed or modelled.

3 Wider Impact on Strategic Road Network

3.1 Introduction

The assessment of the wider impact of the Pre-Submission Local Plan is covered across two chapters of this report.

This first section looks at changes in the impact of the Local Plan on Chelmsford's strategic road network relative to the findings reported for the Preferred Option modelling.

The second section re-evaluates the Local Plan impact on the Chelmsford strategic road network compared with a Do Minimum scenario based on the latest Pre-Submission assumptions.

3.2 Impact of changes to Local Plan development and infrastructure assumptions

This section of the report reviews the differences in modelled traffic flow and volume-to-capacity percentage (V/C%) on the Chelmsford strategic road network in the AM and PM peak hours following changes made to the development and infrastructure assumptions associated with the Local Plan scenario for the Pre-Submission. Analysis is presented in the form of figures illustrating differences in model output between comparable Preferred Option and Pre-Submission Local Plan models.

Figures illustrating differences in the inter peak period to the Pre-Submission Local Plan from the Preferred Option Local Plan can be found in Appendix B.

3.2.1 Differences in traffic flow from the Local Plan Preferred Option

Figure 3.1 and Figure 3.2 illustrate the changes in traffic flow modelled between the Pre-Submission Local Plan and the Preferred Option Local Plan scenarios in the AM peak hour.

Figure 3.1: AM Peak 2036 change in traffic flow between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford

The focus of higher levels of modelled traffic flow on the Chelmsford strategic network is on the A12 and corridor routes into Chelmsford such as the A414 Three Mile Hill London Road, A114 Essex Yeomanry Way (Baddow Bypass), A1060 Roxwell Road, and Essex Regiment Way. Other notable higher levels of traffic flow include the eastbound circulatory of the Army and Navy roundabout. There are also lower levels of traffic flow in the city centre, and along the B1008 Broomfield Road.

Higher levels of modelled flow on the A12 and corridor routes into the city centre can be explained largely through the impact of variable demand modelling. The overall smaller number of vehicle trips modelled in the AM peak hour has led to fewer trips being extracted from the model by the variable demand process. This has had the effect of removing fewer trips from trunk roads and strategic corridor routes.

Figures illustrating the change in traffic flow and V/C% between the fixed demand Pre-Submission Local Plan and Preferred Option Local Plan can be found in Appendix C. These figures help to further illustrate the scale of the impact of variable demand changes to the modelled flows compared with the impact of the changes in development and infrastructure assumptions.

A reduction in the number of proposed dwellings in Broomfield has resulted in lower levels of forecast modelled traffic flows along Main Road, Broomfield.

There have also been changes to the assignment of local traffic flows in the vicinity of the proposed Broomfield Hospital northern access link road. This is due to small amendments made to the allocation of Pre-Submission development flows in Broomfield to zone connectors (network load-on points) in the model.

It should be noted that vehicle route choice in the vicinity of Broomfield Hospital via the proposed developer link road, Court Road, and Hospital Approach will be heavily dependent on specific development access arrangements in the area. The VISUM model is not a suitable tool for modelling such accesses in detail, and as such, it is recommended that more detailed modelling using micro-simulation, for example, is undertaken by developers to determine the likely impact of proposed development and infrastructure in the immediate local area.

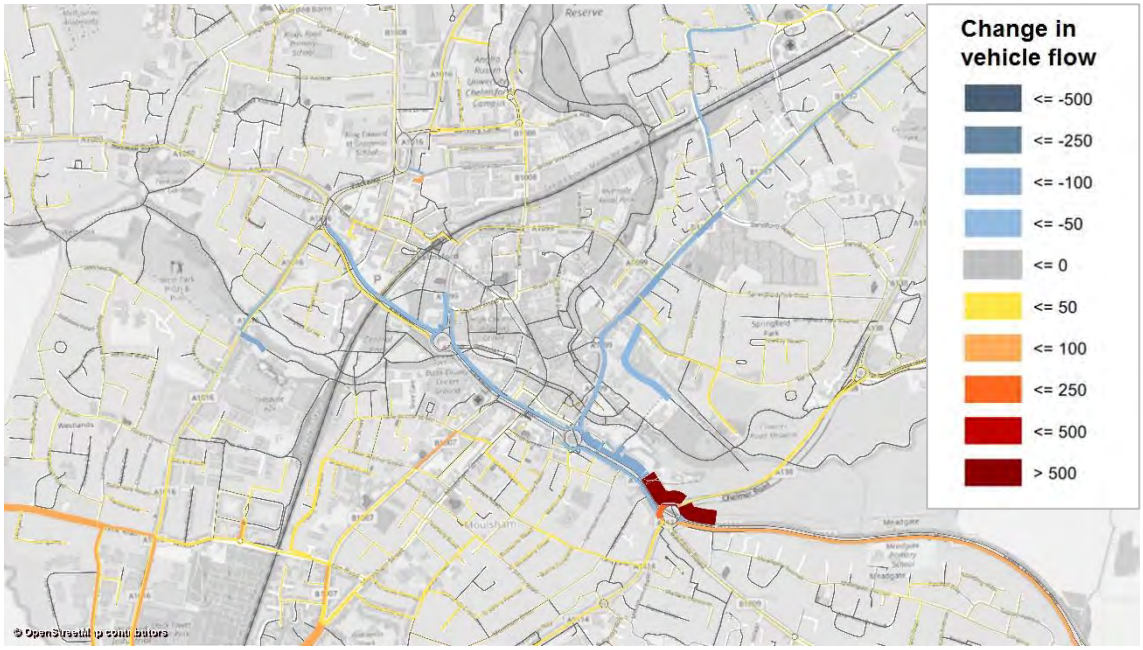

Figure 3.2: AM Peak 2036 change in traffic flow between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford city centre

In the AM peak hour, due to maintaining a single lane flyover at the Army and Navy Roundabout, eastbound traffic flows in the Pre-Submission modelling route around the circulatory carriageway, as shown in Figure 3.2. This has led to modelled traffic flows slightly reducing along Parkway in the city centre.

Figure 3.3 and Figure 3.4 illustrate the changes in traffic flow modelled between the Pre-Submission Local Plan and the Preferred Option Local Plan scenarios in the PM peak hour.

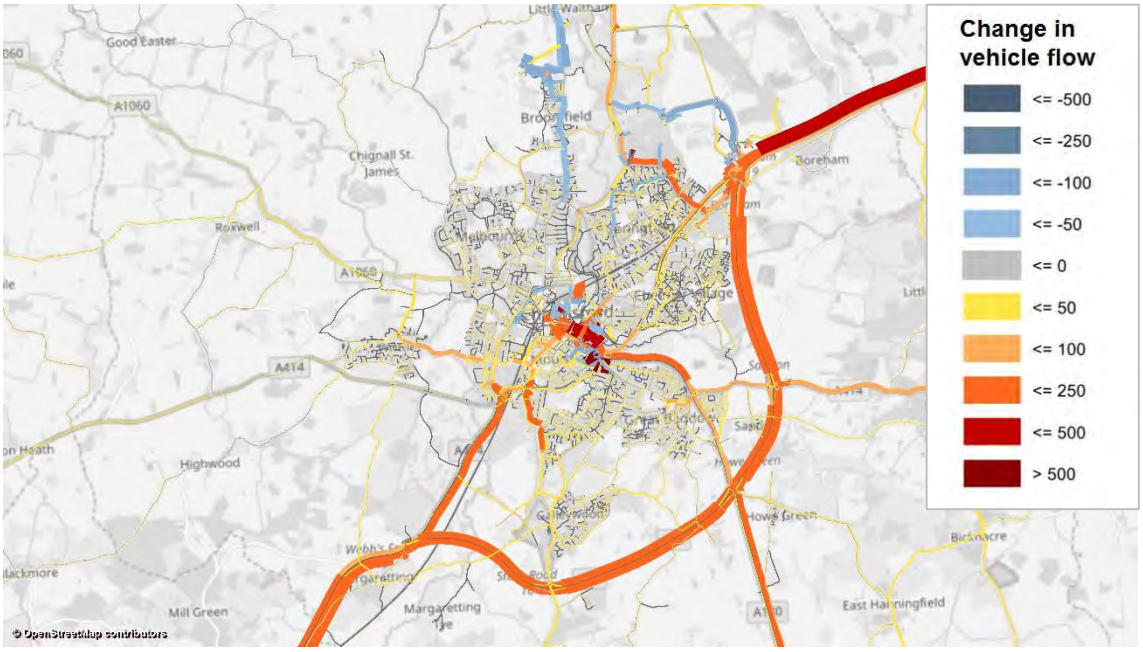

Figure 3.3: PM Peak 2036 change in traffic flow between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford

The focus of higher levels of modelled traffic flow on the Chelmsford strategic road network in the PM peak hour is similar to patterns shown in the AM peak hour. There are large volumes of additional traffic on the A12 and corridor routes out of Chelmsford such as the A414 Three Mile Hill London Road, A114 Essex Yeomanry Way (Baddow Bypass) and Essex Regiment Way. As modelled in the AM peak hour, similar lower levels are also modelled along Broomfield Road in the PM peak hour. Elsewhere, there are notable higher levels of modelled traffic flow heading out of the city centre through the Army and Navy roundabout, and along the A1060 Parkway and A1099 High Bridge Road.

As with the AM peak hour, larger volumes of flow on the A12 and corridor routes into/out of the city centre can be explained, in part, through the impact of variable demand modelling. The moderately lower vehicle flows modelled along the Broomfield Road corridor can again be partly attributed to the reduction in the number of proposed dwellings in these areas.

Elsewhere, the introduction of a left turn slip lane at Nabbotts Roundabout is likely to have contributed to higher volumes of traffic modelled in the PM peak hour along the A130 White Hart Lane.

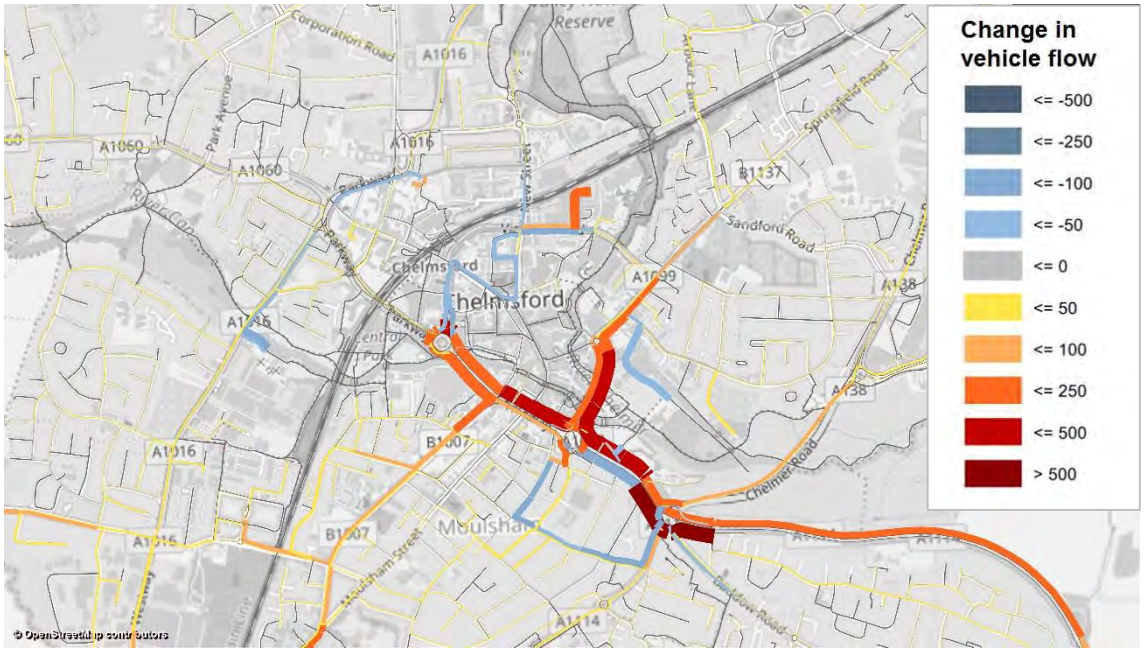

Figure 3.4: PM Peak 2036 change in traffic flow between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford city centre

In the PM peak hour, due to maintaining a single lane flyover at the Army and Navy Roundabout, westbound traffic flows in the Pre-Submission modelling route around the circulatory carriageway, as shown in Figure 3.4. This has resulted in longer modelled delays on the Van Diemans Road approach to the junction and a subsequent assignment of traffic flow via alternative city centre corridor routes including New London Road. This change in assignment has led to a higher modelled traffic flow on Parkway, and noticeably on circulatory movements at the Market Roundabout.

3.2.2 Differences in Volume-to-Capacity Percentage from the Local Plan Preferred Option

Figure 3.5 and Figure 3.6 illustrate the differences in the V/C% on modelled links between the Pre-Submission Local Plan and the Preferred Option Local Plan scenarios in the AM peak hour.

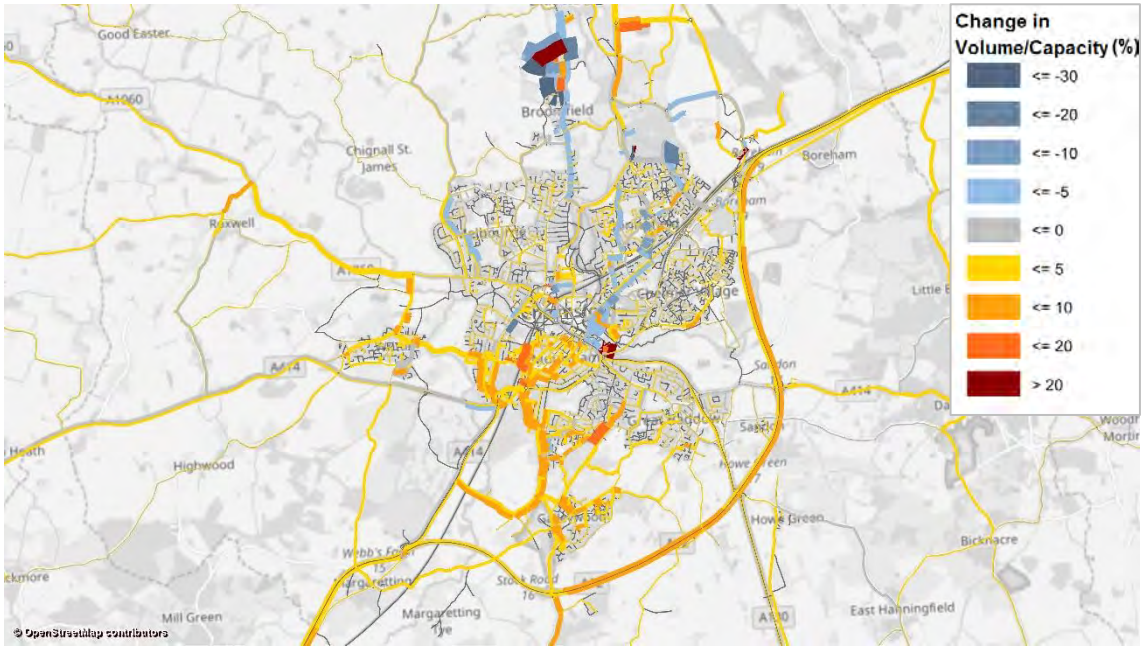

Figure 3.5: AM Peak 2036 change in network V/C% between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford

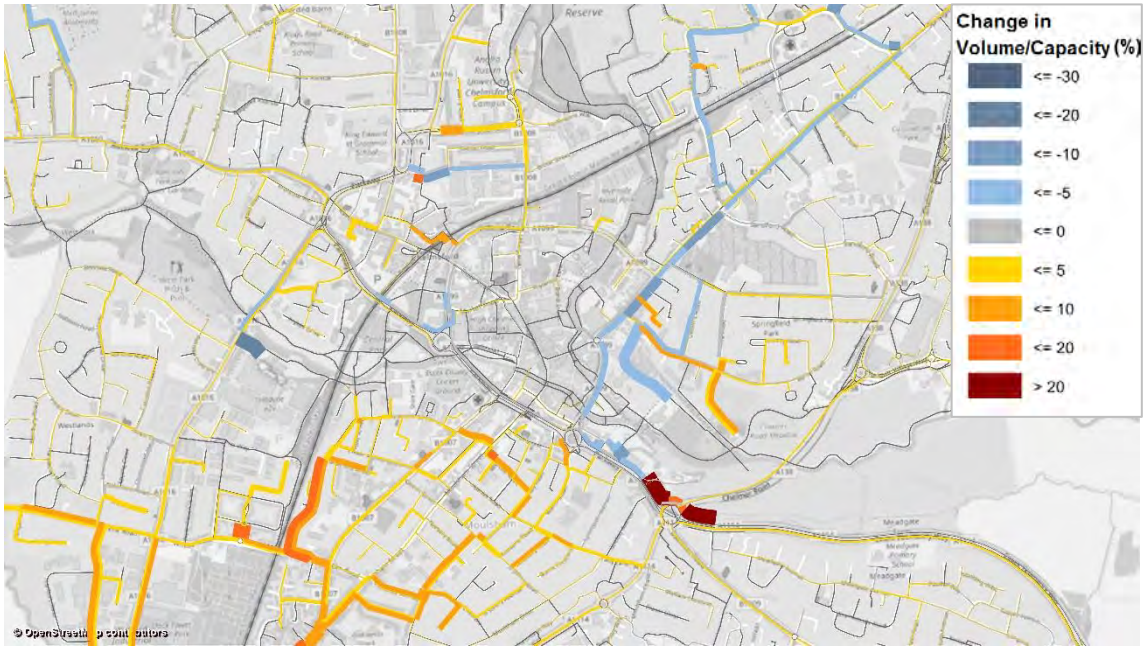

Figure 3.6: AM Peak 2036 change in network V/C% between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford city centre

Figure 3.7 and Figure 3.8 illustrate the changes in the V/C% on modelled links between the Pre-Submission Local Plan and the Preferred Option Local Plan scenarios in the PM peak hour.

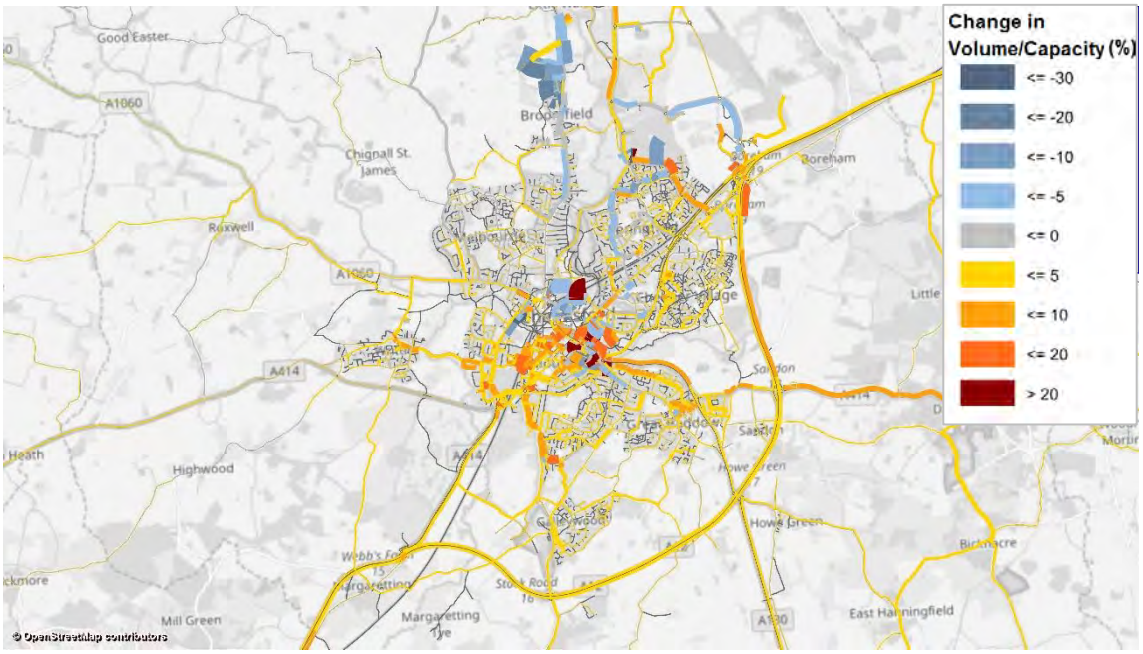

Figure 3.7: PM Peak 2036 change in network V/C% between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford

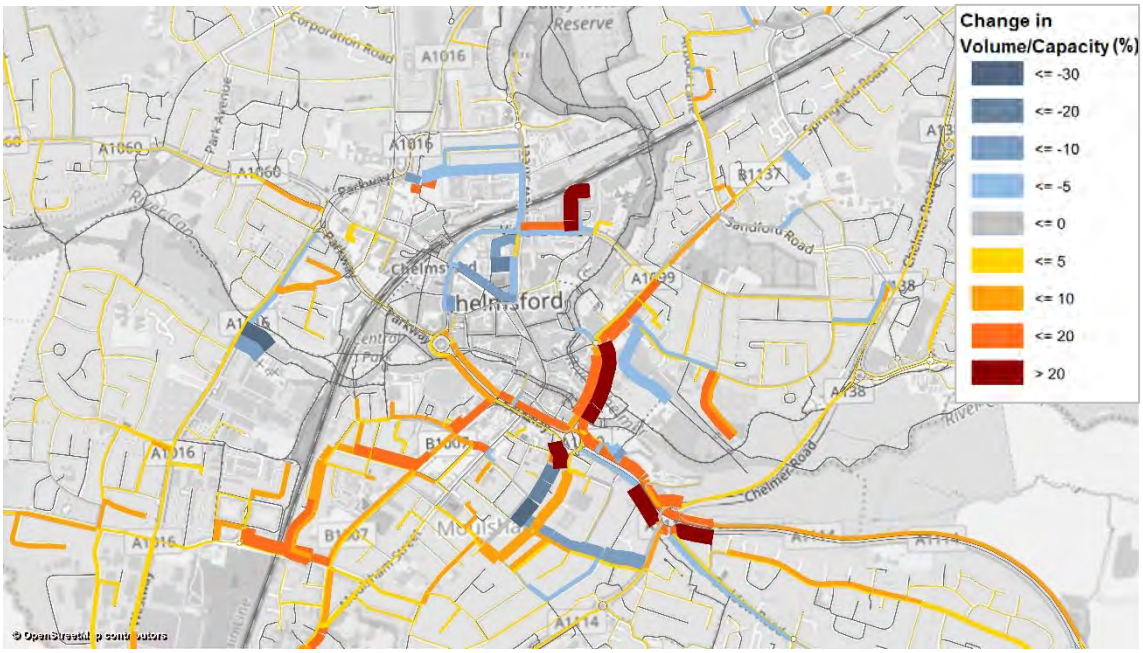

Figure 3.8: PM Peak 2036 change in network V/C% between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford city centre

The scale of the change in the V/C% along routes in and around Chelmsford reflects changes shown in traffic flow when considered alongside the capacity of the urban and strategic road network.

When viewed alongside comparable V/C% plots presented in the Preferred Option Strategic & Local Junction Modelling report, the latest outputs suggest that earlier observations and conclusions made around the future network capacity of the wider strategic road network remain largely unaffected by the changes made to the assumptions for the Pre-Submission modelling.

Whilst a focused review of the impact on the city centre was not included in the Preferred Option assessment, it is recognised that modelling the single lane flyover at the Army and Navy Roundabout has resulted in different flows along Parkway, which can be seen by comparison with the strategic model outputs presented for the city centre in the Preferred Option Strategic & Local Junction Modelling report. The findings from this latest modelling provide insight into the likely highway impact of a change to the layout of the flyover over the Army and Navy Roundabout. It is anticipated that further analysis of this will be undertaken as part of a separate commission focusing on capacity improvements at the junction.

3.3 Re-evaluation of Local Plan Strategic Network Impact

This section of the report presents findings and analysis associated with the modelling of the latest Pre-Submission Local Plan.

Model outputs illustrating the forecast year flows and the V/C% on the strategic road network for the Do Minimum Pre-Submission scenario can be found in Appendix D of this report. These can be compared with similar outputs presented in the Preferred Option Strategic & Local Junction Modelling report.

With the exception of the Army and Navy Roundabout, development and infrastructure changes associated with the Pre-Submission modelling are shown to have a minor impact on the overall patterns of routing traffic and congestion modelled in Chelmsford.

Subsequent VISUM model outputs, illustrated in Figure 3.9 to Figure 3.24, present similar vehicle flow and congestion patterns to those shown in Section 3.3 of the Preferred Option Strategic & Local Junction Modelling report. Where appropriate, commentary and analysis from the earlier report has therefore been repeated below with supplementary content included where strategic differences have been identified.

3.3.1 2036 Forecast Traffic Flows

Figure 3.9 and Figure 3.10 below illustrate the modelled traffic flows across the Chelmsford road network in a 2036 AM peak hour scenario with Pre-Submission

Local Plan development and infrastructure present. Vehicle flow plots for an inter-peak hour can be found in Appendix E of this report.

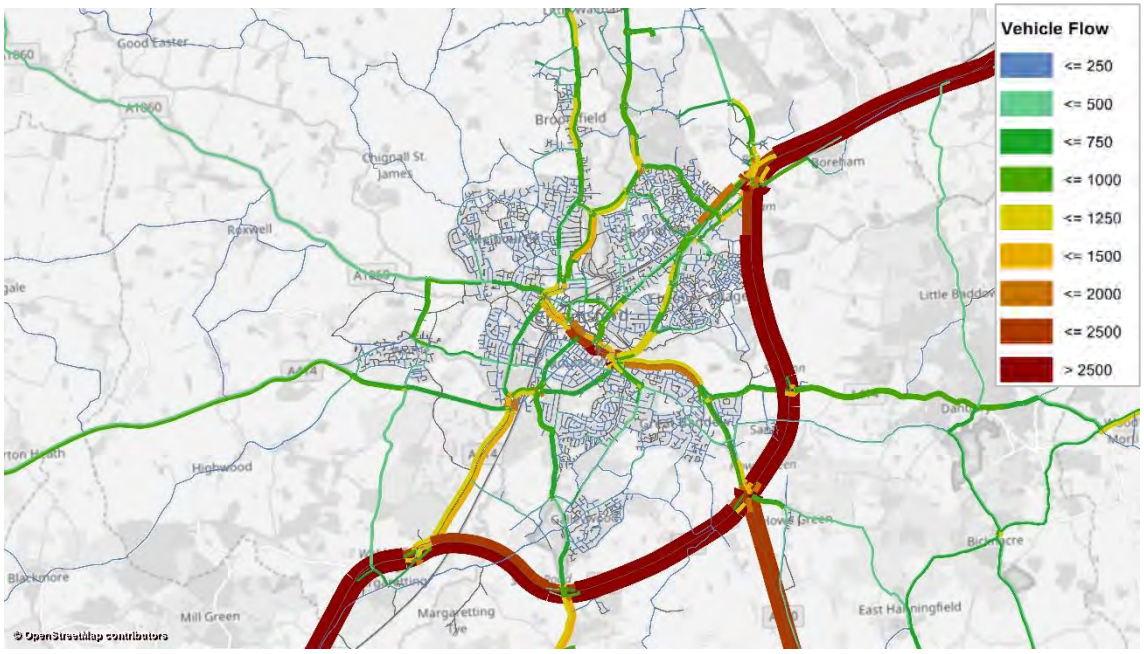

Figure 3.9: AM Peak Hour 2036 forecast traffic flows in Chelmsford (with Pre-Submission Local Plan)

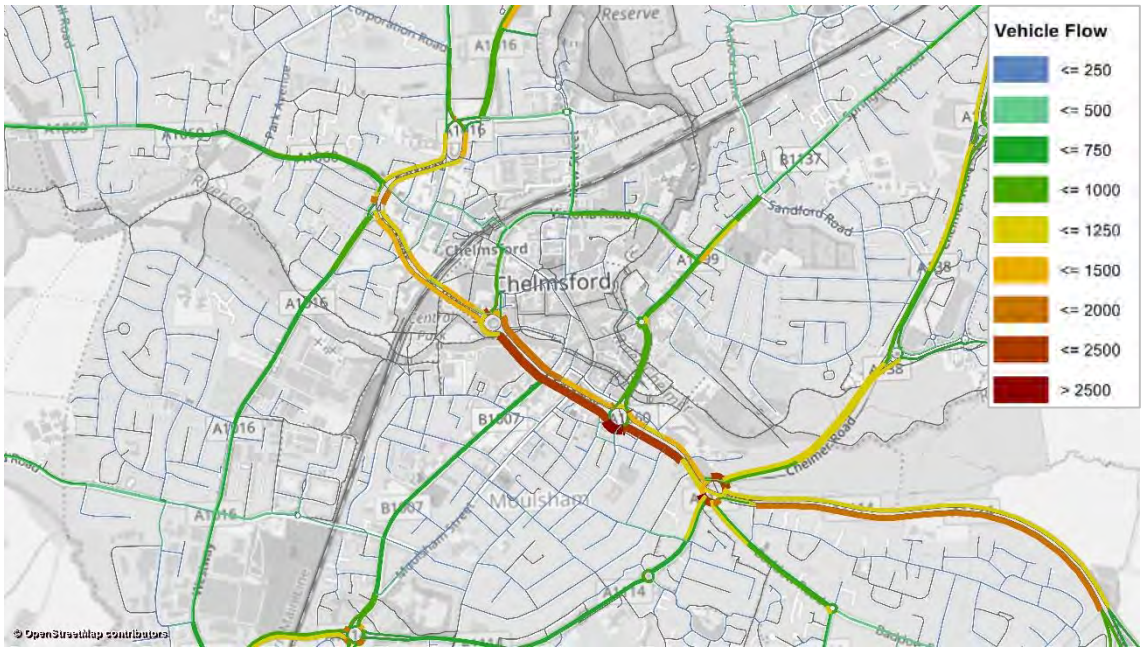

Figure 3.10: AM Peak Hour 2036 forecast traffic flows in Chelmsford city centre (with Pre-Submission Local Plan)

Flow outputs from the modelled Local Plan scenario help provide context for understanding the scale of network flow change associated with Local Plan development and infrastructure provision (See Section 3.3.2).

Patterns of modelled traffic flow reflect the road hierarchy in Chelmsford, with higher flows shown on trunk roads (A12 and A130 south) and corridor routes into Chelmsford such as the A414 Three Mile Hill London Road, A1114 Essex Yeomanry Way (Baddow Bypass) and B1008 Main Road, Broomfield.

Some of the key routes demonstrate flow 'tidality', with greater volumes of traffic modelled heading into the city centre in the AM peak hour and larger volumes heading away from the city centre in the PM peak hour – see Figure 3.11 and Figure 3.12 below. Modelled flows along Parkway also demonstrate tidality, with westbound flows higher in the AM peak hour and eastbound flows higher in the PM peak hour.

Across the modelled network and in the city centre in particular, traffic flows are shown to be higher in the PM peak hour.

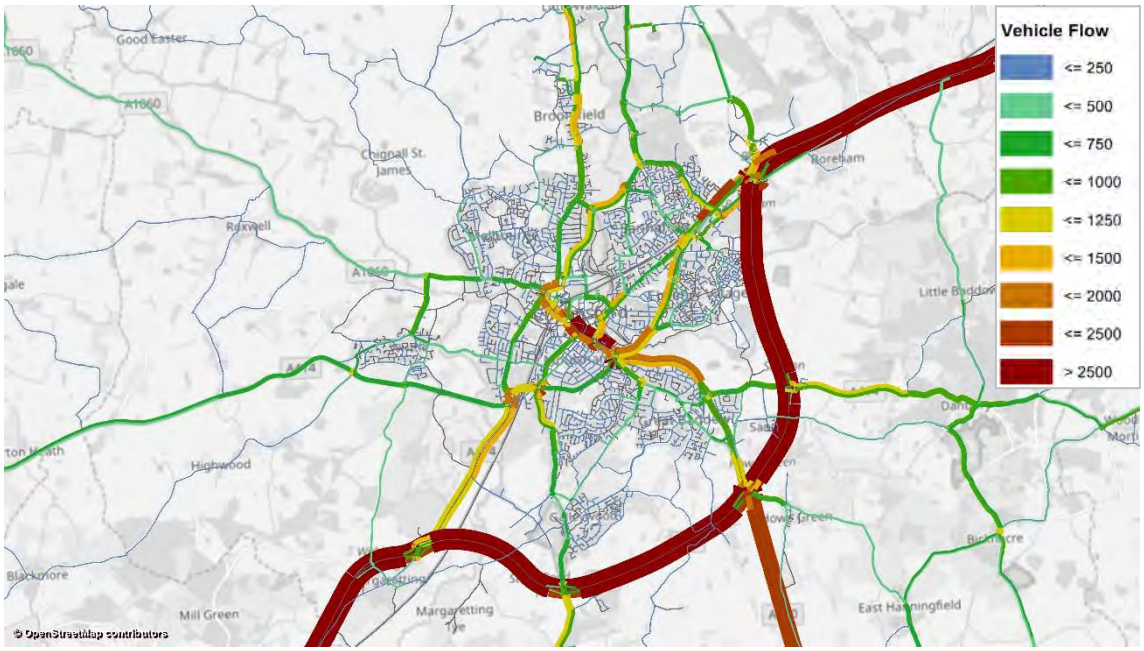

Figure 3.11: PM Peak Hour 2036 forecast traffic flows in Chelmsford (with Pre-Submission Local Plan)

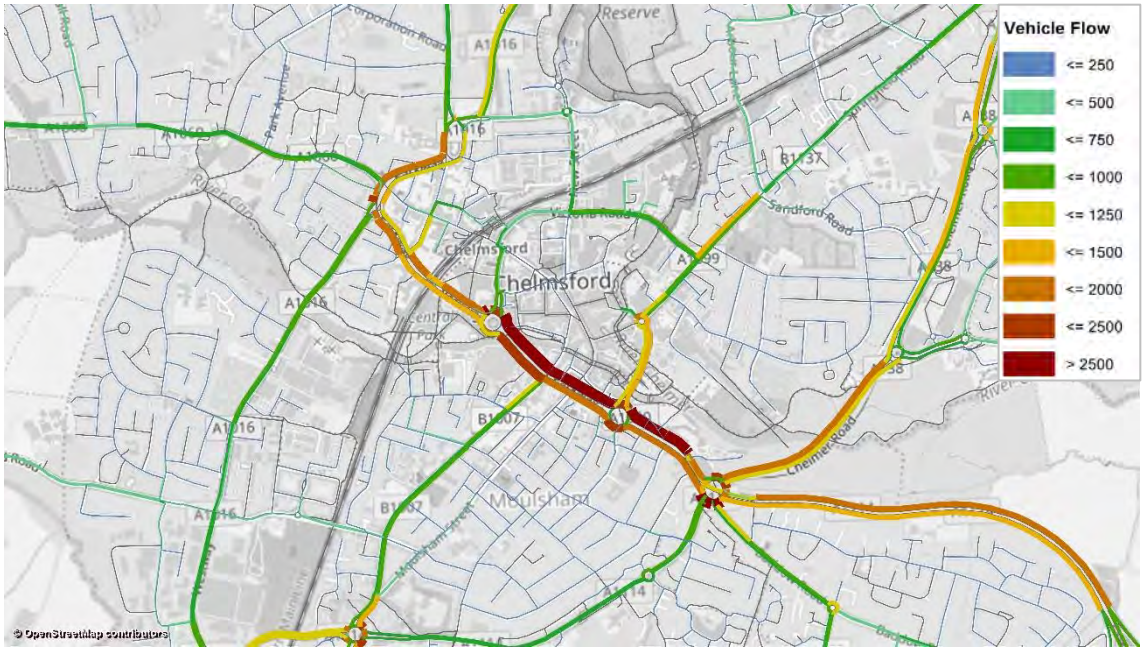

Figure 3.12: PM Peak Hour 2036 forecast traffic flows in Chelmsford city centre (with Pre-Submission Local Plan)

3.3.2 Change in Traffic Flow over the Do Minimum Scenario – Impact of the Pre-Submission Local Plan

Figure 3.13 and Figure 3.14 below illustrate the change in traffic flow modelled between the latest Pre-Submission Local Plan and Do Minimum scenarios in the AM and PM peaks respectively. The changes in modelled traffic flow therefore illustrate the likely impact of the Pre-Submission proposals, and can be directly compared with similar outputs presented in the reporting of the Local Plan Preferred Option[10].

[10] Chelmsford Local Plan Preferred Option Strategic & Local Impact Modelling – Essex Highways – November 2017 : Figures 3.11 and 3.13

Figure 3.13: AM Peak Hour 2036 change in traffic flow over the Do Minimum with Pre-Submission Local Plan in Chelmsford

The focus of modelled traffic flow changes on the Chelmsford road network in the AM peak hour is in North East Chelmsford. Through-traffic flows are modelled to be removed from the Radial Distributor Road (RDR1) and are routed via the proposed 'Outer' Radial Distributor Road (RDR2). These flows combine with local development traffic from the Greater Beaulieu development, resulting in significant flow increases from the Do Minimum scenario.

The proposed Beaulieu Rail Station and Park and Ride site are shown to attract additional flows through the Boreham Interchange, whilst the Chelmsford North East Bypass (CNEB) is modelled to accommodate strategic flows that have transferred from the A130 Essex Regiment Way. The current A130 route - including the southern section of Essex Regiment Way and White Hart Lane, are accordingly modelled accommodating greater volumes of local development traffic. The addition of the Nabbotts Roundabout left turn filter lane is also expected to help accommodate a greater volume of traffic through the junction.

The impact of the Local Plan is also likely to be felt along the A12 corridor, with increases in traffic modelled between J19 (Boreham Interchange) and J18 (Sandon).

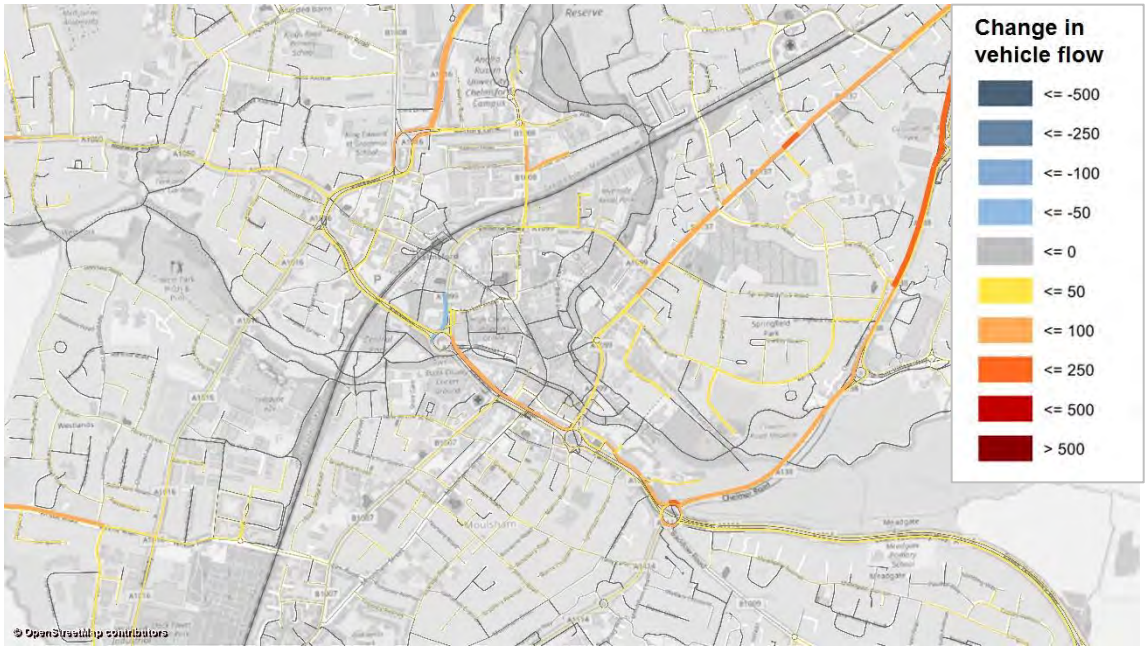

Figure 3.14: AM Peak Hour 2036 change in traffic flow over the Do Minimum with Pre-Submission Local Plan in Chelmsford city centre

Away from North East Chelmsford, traffic flow increases are modelled in the vicinity of development sites to the East of Chelmsford on the A414 in Sandon, and to the West of Chelmsford on the A1060 Roxwell Road and Lordship Road. Traffic is also modelled to transfer to the proposed new link in the vicinity of Broomfield Hospital. Moderate traffic flow increases are shown in the city centre along Parkway and corridor routes to/from the north – specifically, A1016 Chelmer Valley Road, Springfield Road and A138 Chelmer Road, as shown in Figure 3.13.

Modelled flow increases in the AM peak hour are shown to occur along a number of routes identified in the Do Minimum scenario modelling where congestion is expected to be more prevalent (see Appendix D). Notable examples include Springfield Road and High Bridge Road in the city centre, Lordship Road in Writtle, White Hart Lane, and the A12 between J19 and J17.

Figure 3.15 and Figure 3.16 illustrate the change in traffic flow modelled between the 2036 Do Minimum scenario and 2036 Local Plan Pre-Submission scenario in the PM peak.

Figure 3.15: PM Peak Hour 2036 change in traffic flow over the Do Minimum with Pre-Submission Local Plan in Chelmsford

Figure 3.16: PM Peak Hour 2036 change in traffic flow over the Do Minimum with Pre-Submission Local Plan in Chelmsford city centre

The focus of modelled traffic flow change on the Chelmsford road network in the PM peak hour is again in North East Chelmsford. Here, the patterns are similar to those modelled in the AM peak hour – although the CNEB is modelled to

accommodate a greater increase in vehicles transferring from the A130 Essex Regiment Way.

Elsewhere, moderate traffic flow increases are shown in the city centre along Parkway and corridor routes to/from the north – specifically the B1008 Main Road, Lawn Lane and Springfield Road.

Overall, patterns of modelled flow change are similar to those modelled in the AM peak hour, albeit to a lesser extent along the A12 corridor and on most routes into and out of Chelmsford (with the exception of the B1008 Main Road).

Modelled flow increases in the PM peak hour are shown to occur along a small number of routes identified in the Do Minimum scenario modelling where congestion is expected to be more prevalent (see Appendix D). These include Springfield Road (south-westbound) and Parkway (north-eastbound on the approach to Market Roundabout).

3.3.3 Change in Volume-to-Capacity Percentage over the Do Minimum Scenario – Impact of the Local Plan Pre-Submission

Figure 3.17 and Figure 3.18 below illustrate the change in the modelled V/C% between the Do Minimum scenario and Pre-Submission Local Plan scenario in the AM peak hour. The changes in modelled V/C% are therefore a result of Local Plan Pre-Submission development and infrastructure changes. Links highlighted as dark red are modelled as having at least a 20% increase in V/C.

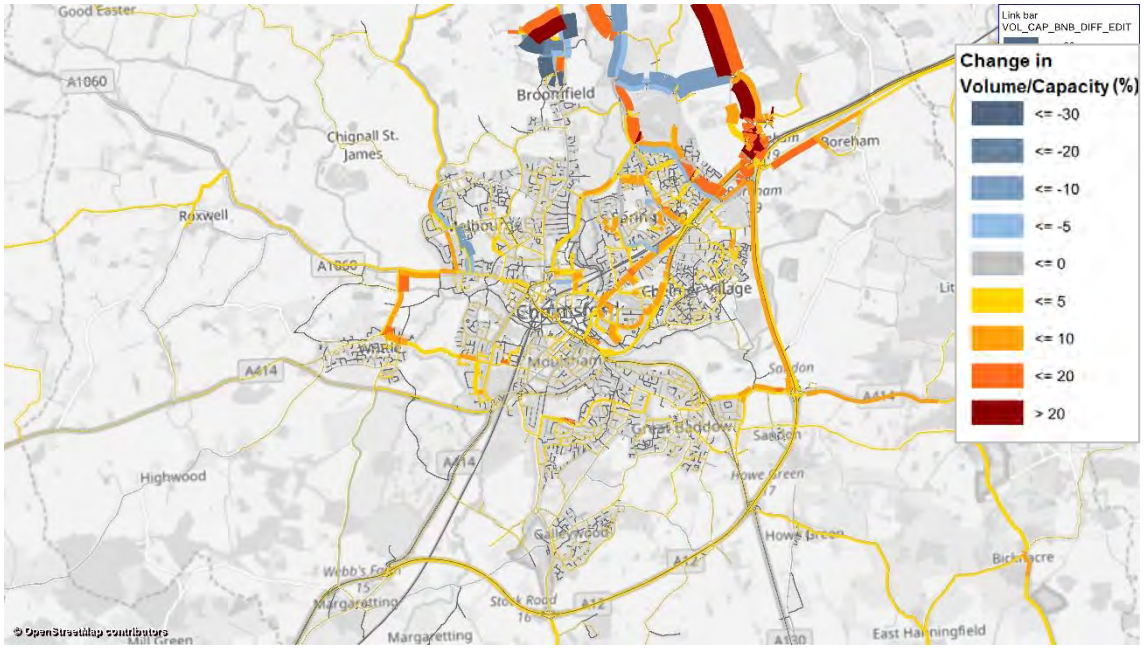

Figure 3.17: AM Peak Hour 2036 change in V/C% over the Do Minimum with Pre-Submission Local Plan in Chelmsford

Figure 3.18: AM Peak Hour 2036 change in V/C% over the Do Minimum with Pre-Submission Local Plan in Chelmsford city centre

Figure 3.19 and Figure 3.20 below illustrate the change in the modelled V/C% between the Do Minimum scenario and Pre-Submission Local Plan scenario in the PM peak hour.

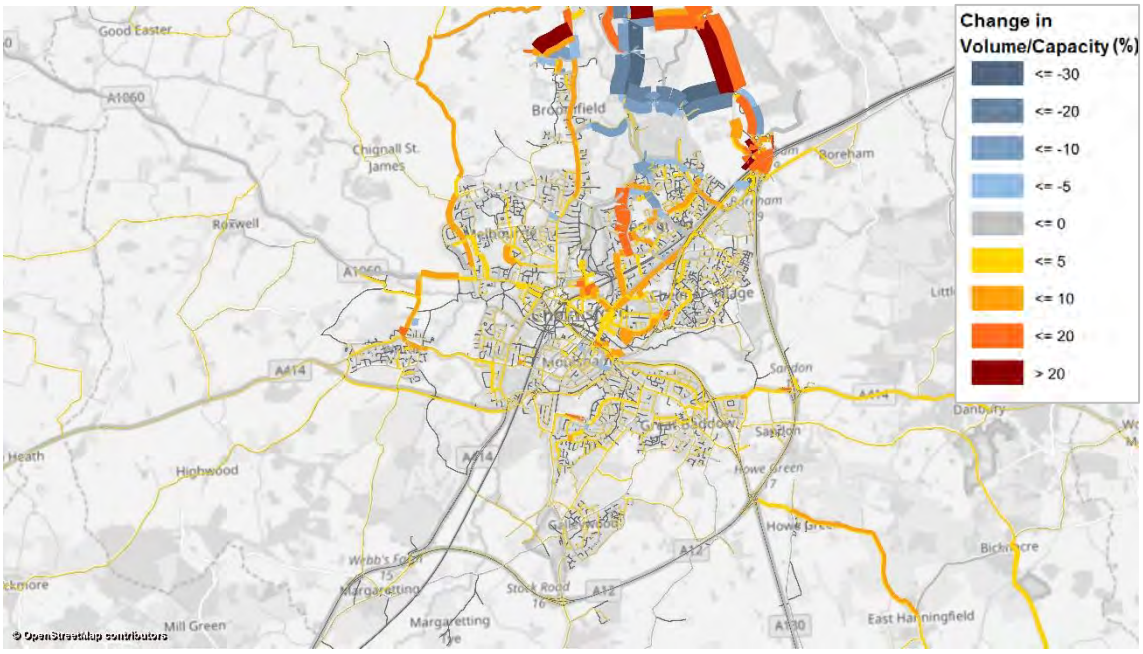

Figure 3.19: PM Peak Hour 2036 change in V/C% over the Do Minimum with Pre-Submission Local Plan in Chelmsford

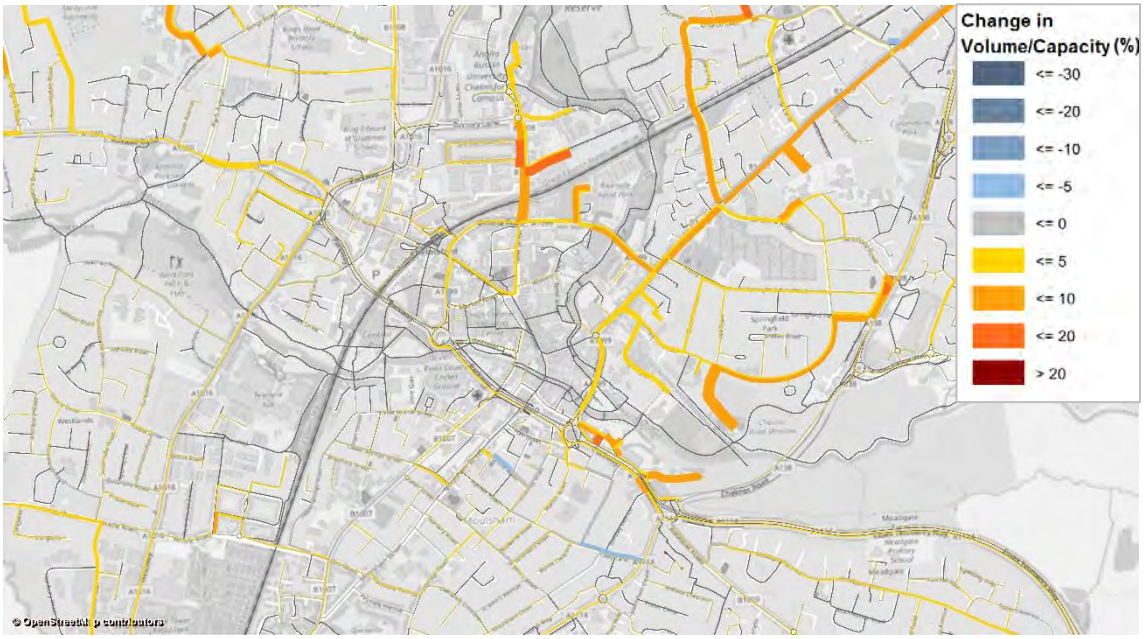

Figure 3.20: PM Peak Hour 2036 change in V/C% over the Do Minimum with Pre-Submission Local Plan in Chelmsford city centre

The scale of increase in the modelled V/C% along routes in and around Chelmsford in both peak hours reflects the increase in traffic flow and the capacity of the network. New routes such as the CNEB have a large increase in V/C% as traffic flows are introduced to the route. Springfield Road and Parkway in the city centre experience similar increases in modelled traffic flow to each other in the AM and PM peak hours. However, as Springfield Road has a comparatively lower capacity, the increase in modelled V/C% along the route is proportionally higher.

The scale of change in V/C% modelled on routes is placed in greater context when considering the overall modelled level of congestion on the road network in 2036 with the Pre-Submission Local Plan development in place. This is discussed in the following section of this report.

When viewed alongside comparable V/C% plots presented in the Preferred Option Strategic & Local Junction Modelling report[11], the latest outputs suggest that earlier observations and conclusions made around the likely future network capacity of the wider strategic road network remain largely unaffected by the changes made to the assumptions for the Pre-Submission modelling.

[11] Chelmsford Local Plan Preferred Option Strategic & Local Junction Modelling – Essex Highways – November 2017 : Figures 3.15 and 3.17

3.3.4 2036 Forecast Congestion

Modelled V/C% plots for the 2036 Local Plan scenario are provided below for the AM and PM peak hours to illustrate the main areas of network constraint forecast across Chelmsford with the addition of Pre-Submission Local Plan development and infrastructure. Plots for the inter peak can be found in Appendix E.

Routes with a V/C% of 80 (operating at 80% of capacity) can be considered to be approaching capacity. It is likely that these links will be affected by rising levels of congestion as the ratio increases. Routes shown in the congestion plots as operating at 90% capacity have been highlighted as likely to experience moderate levels of congestion. Modelled levels of congestion increase exponentially once the V/C% exceeds 100 and the flow of traffic along the route exceeds the capacity of the link.

Figure 3.21 and Figure 3.22 below illustrate the main areas of congestion in Chelmsford in the AM peak hour Local Plan scenario. Patterns of congestion in the city centre and across the wider road network are broadly similar to those modelled in the Do Minimum scenario (see Appendix D), with small increases in the modelled V/C% along key routes in and around Chelmsford.

Figure 3.21: AM Peak Hour 2036 forecast V/C% in Chelmsford (Pre-Submission Local Plan)

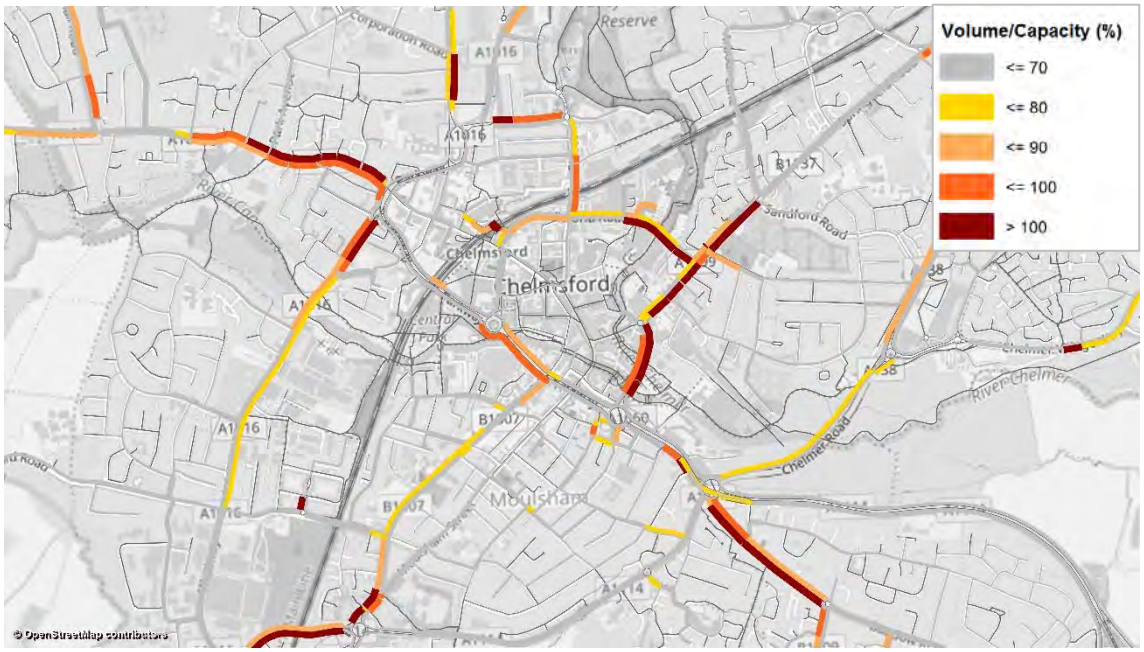

Figure 3.22: AM Peak Hour 2036 forecast V/C% in Chelmsford city centre (Pre-Submission Local Plan)

Figure 3.23 and Figure 3.24 illustrate the main areas of congestion in Chelmsford in the PM peak hour Local Plan scenario. Again, patterns of congestion in the city centre and across the wider strategic road network are similar to those shown in the Do Minimum scenario (see Appendix D), with small increases in the modelled V/C percentage along key routes in and around Chelmsford.

Observations from the forecast model suggests that overall levels of congestion on the A12 and main routes in and around the urban area of Chelmsford are likely to be higher in the PM peak hour.

Figure 3.23: PM Peak Hour 2036 forecast V/C% in Chelmsford (Pre-Submission Local Plan)

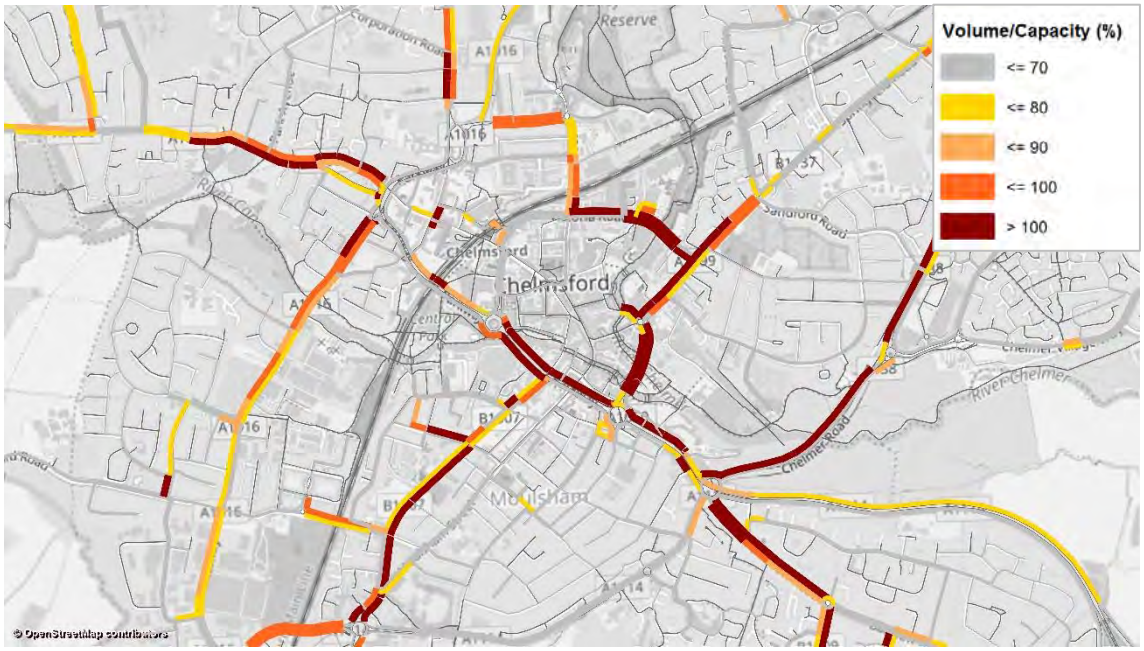

Figure 3.24: PM Peak Hour 2036 forecast V/C% in Chelmsford city centre (Pre-Submission Local Plan)

3.4 Impact on Great Leighs and South Woodham Ferrers

Revisions made to development and infrastructure assumptions in the Pre-Submission modelling are not expected to impact heavily on forecast traffic flows in Great Leighs and South Woodham Ferrers. Allocations in these areas remain the same as those in the Preferred Option, and both settlements are located a distance away from areas where development and infrastructure changes have been made. Whilst it is recognised that forecast flows along the A131 and A130 (north and south of Chelmsford) may change to a small degree from those modelled in the Preferred Option, such changes are sufficiently small to fall within the accepted margin of error, due to the 'strategic' nature, of modelled assignment in VISUM – particularly in outlying areas of the model.

4 Impact on the City Centre

4.1 Introduction

Published studies[12] have revealed that in the peak hour there is around 4% spare network capacity in Chelmsford city centre.

Therefore, for this latest assessment of the Local Plan Pre-Submission option, the localised impact of proposed development and infrastructure has been modelled in the city centre using the Chelmsford VISSIM micro-simulation model. This analysis was not carried out for the earlier Preferred Option work. Focus has been placed on analysing changes in vehicle journey times along Springfield Road and the Parkway corridor between the Army and Navy Roundabout and the gyratory at the junction with Broomfield Road, through a comparison of outputs from the 2036 Do Minimum and Pre-Submission Local Plan scenarios.

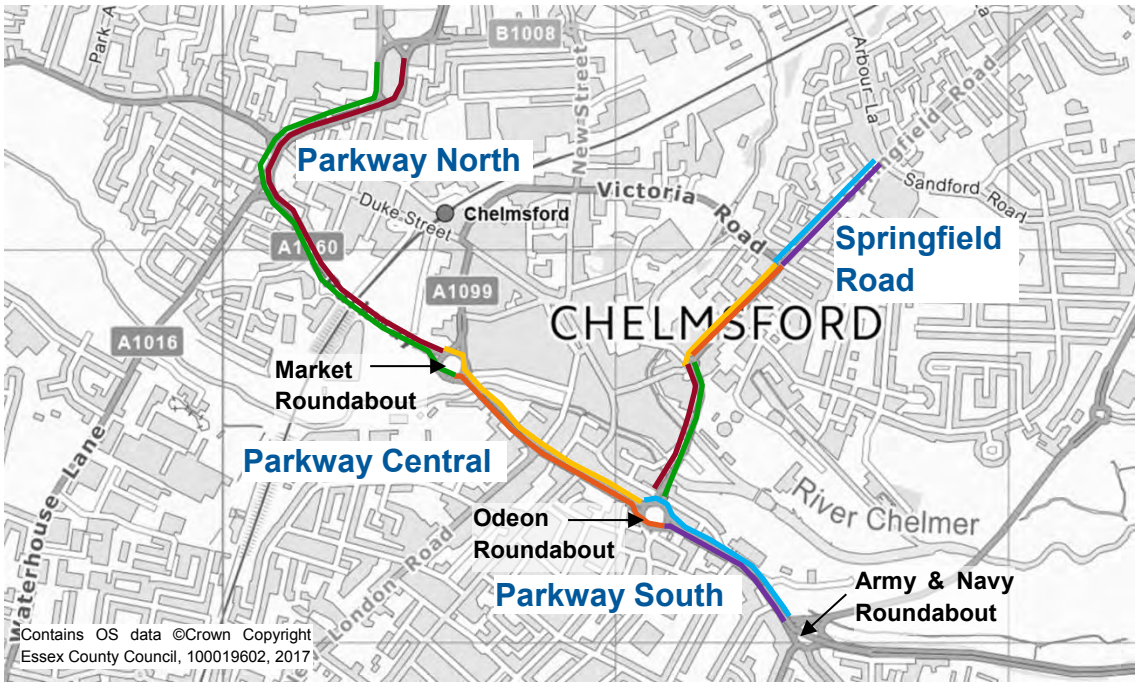

Figure 4.1: Extent of Springfield Road and Parkway journey time route analysis

Figure 4.1 highlights different coloured sections of Springfield Road and Parkway where journey times have been segmented[13]. Segmentation of journey time

[12] http://www.essexhighways.org/highway-schemes-and-developments/major-schemes/chelmsford-city-growth-package.aspx

[13] Coloured sections of each route can be cross-referenced with the segmented journey times shown in Tables 4-1 & 4-2 with corresponding colours.

analysis along the two routes has helped to provide a clearer understanding of the impact of Local Plan proposals at various junctions along the corridor through the city centre.

4.2 Updating the VISSIM Model

4.2.1 VISSIM Matrix Development

To test the impact of Local Plan development and infrastructure on the city centre, vehicle demand matrices were built for the 2036 assessment year using flows taken from the VISUM model.

To do this, the location of the external and internal zones in the VISSIM model was first identified using Figure 4.2 below. A cordon was established in the VISUM model to represent the extremity of the VISSIM model network which governs the location of the external zones on the edge of the zone plan shown below (for example zones 1 & 2).

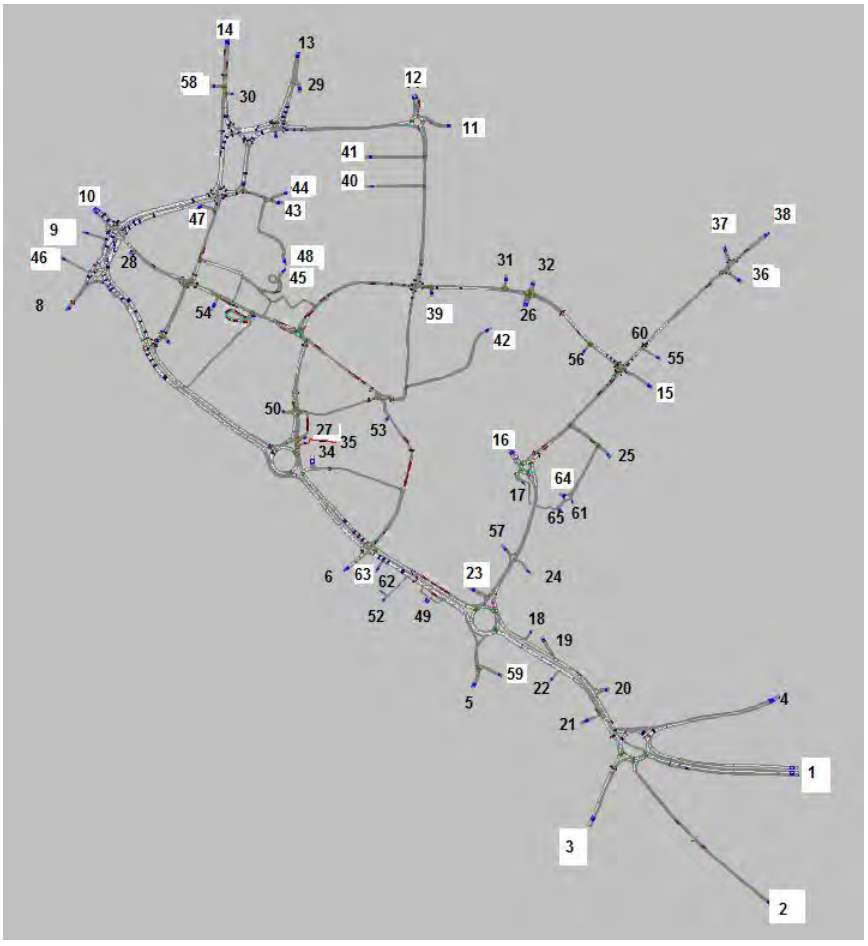

Figure 4.2: Chelmsford city centre VISSIM model zone plan

Two way actual flows were then extracted from the VISUM model on links crossing the external cordon and on links matching the location of the internal VISSIM model zones. Care was taken to ensure that all trips within origins or destinations within the cordon in the VISUM model were assigned to zones within the VISSIM model.

These flows were subsequently used to create new trip end origin/destination totals for the VISSIM model matrices representing a 2036 assessment year. The VISSIM base year matrices were then furnessed to the new 2036 trip end totals in order to create 2036 matrices.

VISSIM matrices were developed for the AM and PM peak hours for the Do Minimum and Local Plan scenarios.

4.2.2 Journey Time Data Extraction

VISSIM model assignments were then run for each peak hour scenario using the newly created 2036 matrices and the base model network. Average peak hour vehicle journey times along the Springfield Road and Parkway corridor were then extracted from the model for the various segmented sections of the route as shown in Figure 4.1.

DfT Trafficmaster journey time data was also obtained along the same segmented sections of the Springfield Road and Parkway corridors, to represent an observed base year for comparison with the model outputs. Average recorded peak hour vehicle journey times were taken from the 2014/15 published dataset to maintain consistency with the base year of the Chelmsford Strategic Model.

Analysis of results for the base and future year scenarios is presented in the following section of this report.

4.3 VISSIM Journey Time Analysis

Table 4-1 and Table 4-2 below show average peak hour journey times along the Parkway and Springfield Road corridors in 2014/15, and those modelled in a 2036 forecast year with and without Pre-submission Local Plan development and infrastructure. The colour scheme used to highlight each section of the corridor routes can be cross-referenced with the colours used in Figure 4.1.

Table 4-1: Observed and modelled forecast journey times along Parkway

	Average travel time per vehicle (hrs:mins:secs)	AM 2014/15	AM Do Min 2036	AM Local Plan 2036
	Westbound			
	Army & Navy to Odeon Roundabout	00:01:26	00:01:22	00:01:41
	Odeon to Market Roundabout	00:01:44	00:01:37	00:01:40
	Market Roundabout to Parkway Gyratory j/w Broomfield Rd	00:02:55	00:03:35	00:03:31
	Total	**00:06:06**	**00:06:33**	**00:06:52**
	Eastbound			
	B1008 j/w Parkway Gyratory to Market Roundabout	00:03:47	00:05:41	00:05:05
	Market Roundabout to Odeon Roundabout	00:01:30	00:01:56	00:02:08
	Odeon to Army & Navy Roundabout	00:02:42	00:00:56	00:00:56
	Total	**00:07:58**	**00:08:33**	**00:08:09**
	Average travel time per vehicle (hrs:mins:secs)	**PM 2014/15**	**PM Do Min 2036**	**PM Local Plan 2036**
	Westbound			
	Army & Navy to Odeon Roundabout	00:00:43	00:01:25	00:01:28
	Odeon to Market Roundabout	00:01:44	00:01:47	00:02:01
	Market Roundabout to Parkway Gyratory j/w Broomfield Rd	00:02:55	00:05:27	00:05:25
	Total	**00:05:22**	**00:08:39**	**00:08:54**
	Eastbound			
	B1008 j/w Parkway Gyratory to Market Roundabout	00:04:19	00:07:45	00:07:58
	Market Roundabout to Odeon Roundabout	00:01:44	00:02:19	00:02:32
	Odeon to Army & Navy Roundabout	00:01:48	00:01:44	00:01:49
	Total	**00:07:51**	**00:11:48**	**00:12:19**

Table 4-2: Observed and modelled forecast journey times along Springfield Road

	Average travel time per vehicle (hrs:mins:secs)	AM 2014/15	AM Do Min 2036	AM Local Plan 2036
	Southbound			
	Sandford Road to Victoria Road	00:01:19	00:01:04	00:01:06
	Victoria Road to Bond street	00:00:39	00:00:50	00:00:52
	Bond Street to Odeon	00:00:53	00:01:01	00:01:03
	Total	**00:02:51**	**00:02:55**	**00:03:00**
	Northbound			
	Odeon to Bond Street	00:00:43	00:01:25	00:01:44
	Bond Street to Victoria Road	00:02:24	00:02:46	00:02:54
	Victoria Road to Sandford Road	00:00:58	00:00:58	00:00:59
	Total	**00:04:05**	**00:05:10**	**00:05:37**
	Average travel time per vehicle (hrs:mins:secs)	**PM 2014/15**	**PM Do Min 2036**	**PM Local Plan 2036**
	Southbound			
	Sandford Road to Victoria Road	00:02:22	00:01:48	00:02:50
	Victoria Road to Bond street	00:01:38	00:01:42	00:01:56
	Bond Street to Odeon	00:02:29	00:01:59	00:01:57
	Total	**00:06:29**	**00:05:30**	**00:06:42**
	Northbound			
	Odeon to Bond Street	00:00:32	00:01:32	00:02:08
	Bond Street to Victoria Road	00:01:27	00:03:05	00:03:32
	Victoria Road to Sandford Road	00:01:20	00:00:57	00:00:58
	Total	**00:03:19**	**00:05:33**	**00:06:39**

Published studies have revealed that in the peak hour there is around 4% spare network capacity in Chelmsford city centre[14]. Forecast modelling for the Pre-Submission Local Plan has shown that peak hour background traffic flows in the Do Minimum scenario will increase by an average of 4% in the city centre up to 2036, with a further increase (over the Do Minimum) of 2% resulting from Local Plan development and infrastructure.

Observations from the VISSIM model runs demonstrate that the city centre network subsequently becomes over-saturated with vehicles during the course of the AM and PM peak hours in a 2036 forecast year. This results in significant

[14] http://www.essexhighways.org/highway-schemes-and-developments/major-schemes/chelmsford-future-transport-network.aspx

congestion across areas of the modelled city centre network, and this is shown to impact journey times along Parkway and Springfield Road.

Modelling demonstrates that congestion along sections of Parkway and Springfield Road creates pinch-points that, on occasion, result in improved journey times along other stretches of each route. This helps to explain why modelled journey times along certain sections were seen to be lower than observed 2014 values, whilst overall modelled journey times in each direction were higher in most instances.

Key findings taken from the city centre journey time analysis, is as follows:

Do Minimum Scenario

- Background growth between 2014 and 2036 resulted in an increase in modelled journey times along Parkway of 7% (around 1 min) in the AM peak. In the PM peak, journey times increased by 56% (around 7 mins).
- Modelled journey time increases were also recorded along Springfield Road, with significantly higher increases northbound – 26% in the AM peak (around 1 min) and 67% in the PM peak (over 2 mins).
- Southbound journey times along Springfield Road were shown to increase marginally by 2% (a few seconds) in the modelled AM peak and reduce by 15% (around 1 min) in the PM peak. This was shown in the model to be a result of congestion along the Parkway corridor creating an upstream pinch-point.

Local Plan Scenario

- The addition of Local Plan development and infrastructure resulted in no overall change in modelled journey times along Parkway in the AM peak. In the PM peak, journey times increased by a further 4% (45 secs).
- Along Springfield Road, the addition of Local Plan development and infrastructure resulted in a further increase in journey times of 6% (30 secs) in the AM peak and 21% (over 2 mins) in the PM peak – with little directional variation.

The above points are illustrated in Figure 4.3 and Figure 4.4 which show the extent of forecast congestion in the Chelmsford VISSIM model along Parkway in the vicinity of the Parkway/New London Road junction and the Odeon Roundabout at a single moment/snapshot during the busiest part of the AM peak hour. Small black rectangles represent cars and larger and/or coloured rectangles represent other vehicles (vans, HGVs, buses etc.).

Figure 4.3: AM Peak Pre-Submission Do Minimum scenario – Chelmsford VISSIM Model screen-shot

Figure 4.4: AM Peak Pre-Submission Local Plan scenario – Chelmsford VISSIM Model screen-shot

The above two figures indicate that congestion along Parkway – west of Odeon Roundabout, could increase as a result of Local Plan Pre-Submission development allocations and infrastructure proposals. This is in line with overall

findings from the Chelmsford City Centre Growth Package studies[15], and supports the case for the need to encourage a greater shift towards public transport, cycling and walking modes.

Figure 4.5 and Figure 4.6 illustrate the same area of the Chelmsford VISSIM model at a moment during the busiest part of the PM peak hour. The micro-simulation of future traffic flows on the city centre road network indicates that congestion could be just as apparent without additional Local Plan development and infrastructure, and that in the PM peak hour the congestion and queuing are forecast to be more extensive than in the AM peak hour.

Figure 4.5: PM Peak Pre-Submission Do Minimum scenario – Chelmsford VISSIM Model screen-shot

[15] http://www.essexhighways.org/highway-schemes-and-developments/major-schemes/chelmsford-city-growth-package.aspx

Figure 4.6 PM Peak Pre-Submission Local Plan scenario – Chelmsford VISSIM Model screen-shot

5 Impact on Local Junctions

5.1 Introduction

This chapter of the report considers the impact of the Local Plan Pre-Submission on local junctions in the vicinity of proposed development sites. The assessment uses the findings from the latest strategic impact assessment of the Pre-Submission option to determine the change in vehicle flows through key junctions compared with those modelled as part of the Preferred Option appraisal.

The Preferred Option Strategic & Local Junction Modelling report presents capacity analysis of junctions based on the previous development and infrastructure assumptions for the Do Minimum and Local Plan Preferred Option scenarios. Mitigation proposals were subsequently developed and assessed for some of the junctions where forecast flows were shown to exceed current available capacity.

By identifying the change in forecast vehicle flows through local junctions between versions of the model based on the Pre-Submission and Preferred Option Local Plans, this section of the report will assess whether the findings and mitigation proposals stated in the Preferred Option report should change in light of the latest revisions to development and infrastructure proposed.

5.1.1 Key Influences on Local Junction Flows

Analysis of the change in vehicle flows on the strategic road network presented in the earlier chapters, suggests that the following development and model assignment changes will have the greatest impact on flows through local junctions:

- Moving of the Beaulieu Post 2021 roll-over development into the Do Minimum scenario;
- The reduction in housing proposed in Broomfield; and
- The increase in traffic flow on corridor routes as a result of changes in variable demand.

5.2 Local Junction Flow Comparison

For this assessment, VISUM turning movement flows used in the development of matrices for the Preferred Option junction capacity assessments were compared with updated flows taken from the VISUM modelling of the Pre-Submission option. Turning flow differences greater than +/- 100 were recorded and are

presented in Table 5-1 below. Differences of less than +/- 100 fall within the margins of error of the model due to the 'strategic' nature of modelled assignment in VISUM.

5.2.1 Analysis of Outputs

The following junctions, as illustrated in Table 5-1 on the following page, are shown to experience a change in modelled flow greater than +/-100 vehicles.

Boreham Interchange

Impacted predominantly by the movement of the Beaulieu Post 2021 roll-over development, the AM and PM Do-Minimum modelled scenarios are modelled to have a greater volume of vehicles heading to/from the RDR 1 and 2. Changes in the pattern of modelled flows approaching the interchange are also observed in the AM Local Plan scenario, but with little overall change in vehicle numbers. In the PM Local Plan scenario there is a proportionately small modelled increase in movements between the RDR 1/Generals Lane and the A12 south.

Earlier reporting of the capacity benefits of the proposed developer infrastructure concludes that further improvements would be required to address congestion at all three of the linked junctions. Findings from the impact assessment of the Pre-Submission option do not affect these overall conclusions, but strengthen the case for further capacity enhancements to accommodate flows in a Do Minimum scenario.

Broomfield Road Hospital Approach Roundabout

Changes in modelled traffic flow at the Hospital Approach Roundabout are shown to be caused by a localised reassignment of vehicles between the proposed developer link road to the north, Court Road to the south, and Hospital Approach itself. As mentioned earlier, routing in this area of the VISUM model is likely to be heavily dependent on specific development access arrangements, and the VISUM model is not best placed to model this accurately.

Regardless, for the Pre-Submission scenario, any such modelled increase in flow heading south to north through the junction in the AM peak hour would not be expected to adversely impact the performance of the B1008 south approach or Hospital Approach arms. These arms were both shown to operate under capacity in the Preferred Option junction modelling.

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Table 5-1: Difference in approach arm vehicle flows at key junctions in Chelmsford between Preferred Option and Pre-Submission modelling[16]

Junction No.	Junction / Turning Movement	AM 2036 Difference in Actual Flow		PM 2036 Difference in Actual Flow		Previous Preferred Option Junction Modelling
		DM	LP	DM	LP	
23	A12 J19 Boreham Interchange (Generals Lane/RDR 1 to A12 South)	240	34	145	108	At/Over Capacity
	A12 J19 Boreham Interchange (Boreham Main Road to Generals Lane/RDR 1)	28	-127	12	0	At/Over Capacity
	A12 J19 Boreham Interchange (A12 South to Generals Lane/RDR 1)	35	4	188	18	At/Over Capacity
	A12 J19 Boreham Interchange (A130 Colchester Rd to Generals Lane/RDR 1)	1	307	25	-12	At/Over Capacity
	A12 J19 Boreham Interchange (A130 Colchester Rd to A12 South)	124	-104	71	24	At/Over Capacity
	A12 J19 Boreham Interchange (A138 Chelmer Rd to Generals Lane/RDR 1)	45	-122	170	2	At/Over Capacity
10	Main Road - Hospital Approach Roundabout (B1008 Main Rd South to North)	56	100	37	41	Under Capacity
6	Channels Drive Roundabout (A130 Essex Regiment Way South to North)	69	18	-104	71	Under Capacity
1	Moulsham Hall Lane Roundabout (Main Road to A131 South)	17	113	14	60	Under Capacity
7	Nabbotts Roundabout (A130 Essex Regiment Way to White Hart Lane)	117	-47	111	85	At/Over Capacity
11	Main Rd – School Lane, Broomfield Junction (School Lane to B1008 Main Rd North)	26	-89	117	-65	Approaching Capacity
	Main Rd – School Lane, Broomfield Junction (B1008 Main Rd North to School Lane)	-108	-197	-105	-56	At/Over Capacity
	Main Rd – School Lane, Broomfield Junction (B1008 Main Rd South to North)	14	17	139	32	Under Capacity

[16] Flows less than 100 fall within an acceptable margin of error associated with the strategic model assignment, and should not be considered significant.

Channels Roundabout

Channels Roundabout on the A130 was previously modelled as operating under capacity - except for the A130 Essex Regiment Way approach from the north in the AM peak hour. Flow reductions subsequently modelled for the Pre-Submission on the southern approach to the junction in the PM peak hour Do Minimum scenario, therefore have little impact on the conclusions made in the earlier Preferred Option report.

Moulsham Hall Lane Roundabout

An increase in AM peak hour flow modelled from Main Road to the A131 South at Moulsham Hall Lane Roundabout has been caused by a small revision made to the allocation of Pre-Submission development flows in Great Leighs to zone connectors (network load-on points) in the model. The change to the model network and subsequently to vehicle flows is not expected to impact the performance of the roundabout which was shown to operate under capacity in the Preferred Option junction modelling.

Nabbotts Roundabout

Nabbotts Roundabout is the only junction referred to in Table 5-1 as having capacity improvements modelled in VISUM for the Pre-Submission option in both the Do Minimum and Local Plan scenarios. It is therefore possible that the increase in vehicles modelled heading from the A130 Essex Regiment Way to the A130 White Hart Lane has been caused by the inclusion of a proposed left turn filter lane at the roundabout which helps to facilitate this movement.

Earlier capacity modelling of Nabbotts Roundabout for the Preferred Option included the proposed left turn filter lane, but would not have included the additional traffic flows identified at the junction in the latest Pre-Submission modelling. However, as these flows would be expected to use the filter lane and not pass through the junction, the earlier capacity modelling of Nabbotts Roundabout should remain unaffected.

School Lane, Main Road Broomfield Junction

The reduction in the number of houses proposed in Broomfield as part of the latest Pre-Submission Local Plan, has resulted in a reduction in vehicle movements turning into and out of School Lane in the Local Plan scenario – notably in the AM peak hour. Moderate changes in traffic flow are also modelled at the junction in the Do Minimum scenario and which results from the movement of the Beaulieu Post 2021 roll-over development into the Do Minimum scenario.

In the model, this changes the pattern of vehicle routing between the B1008 Main Road, Broomfield and the A130 Essex Regiment Way.

The overall changes modelled in the Pre-Submission at this junction are unlikely to change the conclusions made in the Preferred Option junction modelling. Flow increases are modelled along approaches that were previously identified as operating under or (just) approaching capacity, whilst the flow reductions are unlikely to bring the Main Road North approach within capacity.

6 Cross Boundary Impact

6.1 Introduction

This chapter of the report reviews the likely cross boundary impact of Local Plan proposals on the road network in neighbouring Districts and Boroughs. The review consists of two parts:

1) A comparison of forecast year modelled traffic flows on main routes crossing the administrative boundary with flows modelled by neighbouring authorities;
2) A review of the modelled assignment of cross-boundary trips to/from larger proposed Local Plan developments located outside of Chelmsford city centre.

A comparison of traffic flows modelled for neighbouring Local Plans provides an indication as to whether or not cross boundary flows have been largely accounted for in the respective Local Plan highway impact appraisals.

The review of the modelled assignment of cross boundary development trips provides a more direct insight as to the scale of vehicle numbers modelled to be routing to/from the Chelmsford Administrative Area via the road network of neighbouring authorities.

6.2 Cross Boundary Flow Comparison

2036 forecast traffic flows from the latest Pre-Submission modelling were recorded on the following routes at the border with surrounding local authorities:

Clockwise from the north:

- A131 (to/from Braintree DC)
- A12 N (to/from Braintree DC)
- A414 E (to/from Maldon DC)
- A130 (to/from Basildon BC)
- A12 S (to/from Brentwood BC)
- A414 W (to/from Epping Forest DC)
- A1060 (to/from Uttlesford DC)
- B1008 (to/from Uttlesford DC)

This is illustrated in Figure 6.1 on the following page.

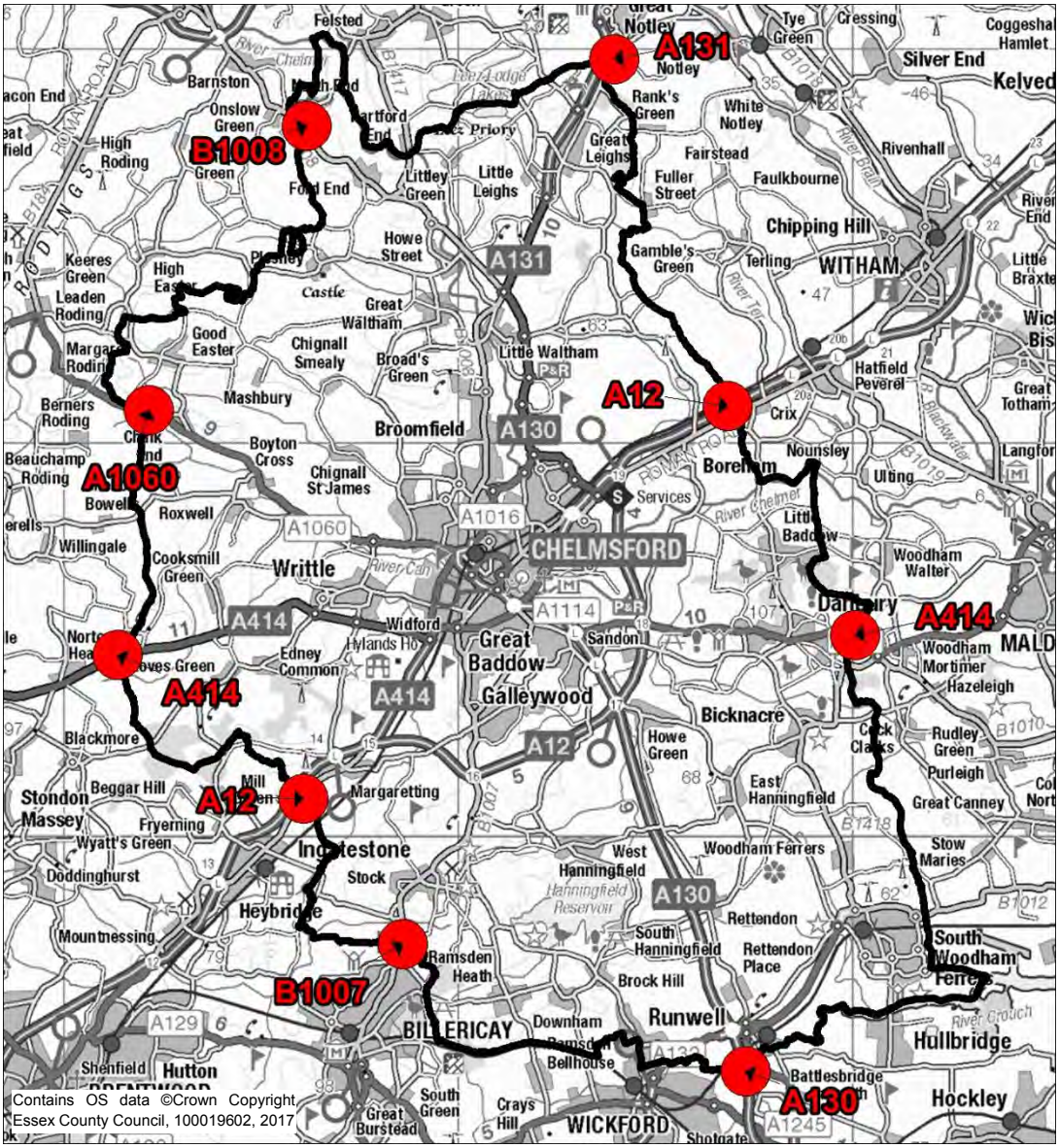

Figure 6.1: Location of cross boundary flow comparisons on key routes between Chelmsford and neighbouring authorities

Chelmsford's administrative boundary is located a distance away from the main validation cordon in the Chelmsford VISUM Model. Consequently, it was felt that the model outputs taken directly from the forecast modelling would not be sufficiently robust for comparison purposes.

Therefore, forecast traffic flows were calculated using adjusted TEMPro/NTM growth rates[17] to factor observed flows to 2036 levels, with Chelmsford Local Plan development trips subsequently added from the VISUM model[18].

Modelled flows from the Chelmsford Local Plan were then compared, where possible, against flows taken from models developed for neighbouring authorities to assess their own Local Plans. This approach presented a few key challenges, namely:

1) The modelling software/approach used by neighbouring authorities was not consistent with the VISUM variable demand modelling used to assess the Chelmsford Local Plan;
2) The Local Plan periods for the neighbouring Local Plans are not consistent with the Chelmsford Local Plan and thus do not use the 2036 forecast year modelled for the Chelmsford Local Plan,
3) Traffic flows on the periphery of the Local Plan models – including the Chelmsford Strategic Model (VISUM), are unlikely to be as robust as flows from more central areas of the model networks, which would likely be subject to more extensive base year validation, and;
4) Neighbouring authorities are at different stages of their Local Plan assessments and not all transport appraisals have been undertaken. Modelling data was therefore not available from Brentwood Borough Council or Uttlesford District Council.

As a consequence of these limitations, it was recognised from the outset that flow comparisons could only be treated as indicative. Furthermore, as not all neighbouring authorities modelled an inter peak hour as part of their Local Plan assessment, flow comparisons were carried out for the AM and PM peak hours only.

6.2.1 Flow outputs

Table 6-1 details the directional vehicle flows on the key corridor routes crossing the Chelmsford administrative boundary modelled for the Chelmsford Local Plan in 2036, and those modelled for neighbouring authorities' Local Plans.

[17] Using alternative growth assumptions to remove housing and job growth in Chelmsford
[18] Calculated from the difference between the Do-Minimum and Local Plan scenario traffic flows on the particular route.

Table 6-1: Modelled vehicle flow comparisons on key roads crossing the Chelmsford administrative boundary

Road	Neighbour Authority			AM Directional Flow				PM Directional Flow			
	Authority	LP Year	Model Type	Chelmsford LP (2036)		Neighbour Authority LP		Chelmsford LP (2036)		Neighbour Authority LP	
				IB	OB	IB	OB	IB	OB	IB	OB
A131	Braintree	2033	VISUM (fixed demand)	1292	1126	2101	1913	1179	1951	1842	2239
A12 (north)	Braintree	2033	VISUM (fixed demand)	4870	3863	4576	3672	3950	4743	3829	4710
A414 (east)	Maldon	2026	Spreadsheet	1037	678	1596	861	763	1146	928	1439
A130 (south)	Basildon	2034	SATURN/Spreadsheet	2377	2813	4061*		2654	2283	3948*	
B1007	Basildon	2034	SATURN/Spreadsheet	606	882	1684*		878	775	1820*	
A12 (south)	Brentwood	-	-	3128	3316	N/A	N/A	3847	3219	N/A	N/A
A414 (west)	Epping Forest	2033	Spreadsheet	606	876	720	1270	915	592	975	818
A1060	Uttlesford	-	-	224	266	N/A	N/A	356	251	N/A	N/A
B1008	Uttlesford	-	-	693	611	N/A	N/A	783	484	N/A	N/A

*Modelled two-way flow only available at time of reporting

Differences in directional flows at the Chelmsford administrative boundary shown in Table 6-1 are understood to be a result of variations in modelling approaches between Local Plan studies, as well as differences in development assumptions and their application in the modelling.

For example, directional flows modelled along the A131 for the Chelmsford Local Plan are notably lower than those modelled for the Local Plan studies in Braintree. This is understood to be, in part, due to a higher estimate of development proposed at Great Leighs for the Braintree modelling (based on information available at the time). The Braintree Local Plan modelling also accounted for a specific concentration of development around Braintree town centre and at Great Notley, with larger volumes of traffic subsequently assigned to the A131. For the Chelmsford Local Plan, development growth in Braintree district was calculated from TEMPro, which resulted in a more even distribution of development and a wider assignment of development traffic modelled across the road network.

6.3 Assignment of Cross Boundary Development Trips

6.3.1 Methodology

The modelled assignment of cross-boundary development trips was determined using 'flow bundle analysis' in the Chelmsford forecast VISUM model. This analysis highlighted the assigned routes of trips arriving at or departing from model zones containing Local Plan development in areas outside of the city centre. This analysis was carried out with the AM, IP and PM peak hour models.

As the model zones contained a mixture of existing and Local Plan development, trip end calculations used in the building of the VISUM model matrices were interrogated to determine numbers of development trips as a proportion of all trips arriving at and departing from model zones. Factors were then derived from these calculations to apply to the link flows generated by the flow bundle analysis.

From this, it was then possible to estimate flows from specific developments on main routes/model links crossing the administrative boundary to/from neighbouring districts and boroughs.

For the purpose of this study, focus has been placed on determining the impact of Local Plan developments in the following locations:

- North East Chelmsford (Greater Beaulieu Park)

- Great Leighs
- South Woodham Ferrers

Development flows were then recorded crossing the administrative boundary on the following corridor routes as previously illustrated in Figure 6.1 (clockwise from north):

- A131 (to/from Braintree DC)
- A12 N (to/from Braintree DC)
- A414 E (to/from Maldon DC)
- A130 (to/from Basildon BC)
- A12 S (to/from Brentwood BC)
- A414 W (to/from Epping Forest DC)
- A1060 (to/from Uttlesford DC)
- B1008 (to/from Uttlesford DC)

Not all development flows will cross the administrative boundary in the VISUM model via the main strategic corridor routes. Therefore, this assessment does not capture all development trips heading to/from neighbouring authorities. It does, however, provide some insight into the likely impact of the larger Local Plan developments on the main roads in Essex.

6.3.2 Model Outputs & Analysis

Table 6-2 on the following page summarises the modelled traffic flows, generated by the three largest Local Plan developments, crossing the administrative boundary to/from neighbouring districts and boroughs along key strategic corridors in the VISUM model. The impact of smaller developments would be expected to have a relatively small impact limited to the nearest corridor route(s).

Table 6-2: Modelled peak hour development traffic flows on key routes crossing the Chelmsford Local Authority Area boundary

AM Peak (08:00-09:00)

VISUM Zone	Local Plan Location Ref	Site Description	O/D	Braintree (via A131)	Braintree (via A12 N)	Maldon (via A414 E)	Basildon (via A130)	Brentwood (via A12 S)	Epping (via A414 W)	Uttlesford (via A1060)	Uttlesford (via B1008)
89/91/97	4	North East Chelmsford	Origin	40	15	5	30	48	2	3	108
95/96	5	Great Leighs	Origin	72	0	1	7	8	0	1	8
111	7	North of South Woodham Ferrers	Origin	0	9	10	38	1	1	0	0
89/91/97	4	North East Chelmsford	Destination	108	51	13	4	61	17	7	44
95/96	5	Great Leighs	Destination	11	0	1	1	1	0	0	6
111	7	North of South Woodham Ferrers	Destination	0	1	0	13	1	0	0	0

PM Peak (17:00-18:00)

VISUM Zone	Local Plan Location Ref	Site Description	O/D	Braintree (via A131)	Braintree (via A12 N)	Maldon (via A414 E)	Basildon (via A130)	Brentwood (via A12 S)	Epping (via A414 W)	Uttlesford (via A1060)	Uttlesford (via B1008)
89/91/97	4	North East Chelmsford	Origin	123	12	28	73	45	2	0	154
95/96	5	Great Leighs	Origin	23	1	3	4	4	0	0	20
111	7	North of South Woodham Ferrers	Origin	0	9	10	94	1	0	0	0
89/91/97	4	North East Chelmsford	Destination	137	28	25	14	95	13	5	157
95/96	5	Great Leighs	Destination	39	3	2	5	12	0	0	51
111	7	North of South Woodham Ferrers	Destination	0	0	17	74	6	0	0	0

Refer to Appendix F for a VISUM model zone plan of Chelmsford (as referenced in the first column)

Development in both North East Chelmsford and Great Leighs would be expected to add to background traffic flows heading north to/from Braintree District via the A131 and Uttlesford District via the B1008. However, flows from these developments represent a small proportion of overall development trip totals, with the bulk of journeys heading to/from the south via Chelmsford. Based on trip generation calculations and VISUM modelled distributions, the larger Local Plan development sites might be expected to contribute around two or three additional trips a minute in either direction along the A131 and B1008 in a typical peak hour. The volume of development trips crossing to/from Uttlesford and Braintree districts is modelled to be slightly higher in the PM peak hour.

To limit the scope of the analysis, focus was placed on assessing the volume of development flows on key corridor routes. It should, however, be noted that in the case of the Great Leighs development, similar volumes were also shown utilising London Road which runs parallel to the A131.

Development in South Woodham Ferrers, and also in North East Chelmsford, might be expected to add to background traffic flows heading south to/from Basildon Borough via the A130. The volumes of traffic modelled crossing the administrative boundary might be expected to contribute up to three additional trips a minute in either direction along the A130, with higher volumes modelled in the PM peak hour.

Elsewhere, traffic volumes travelling on main routes between Chelmsford and neighbouring authorities are modelled to be small in both peak hours. Development traffic routing via the A12, for example, is likely to be restricted in number given the lack of forecast available capacity along the route.

7 Conclusions

At a strategic network level, the latest model outputs, illustrating the impact of 2036 Pre-Submission Local Plan development and infrastructure, are broadly comparable to those presented in the Preferred Option Strategic & Local Junction Modelling report. This suggests that earlier observations and conclusions made around the future network capacity of the wider road network remain largely unaffected by the changes made to the 2036 development assumptions for the Pre-Submission.

However, with an overall reduction in Local Plan development modelled for the Pre-Submission, the subsequent weakened impact of variable demand modelling is shown result in higher levels of modelled traffic flows along trunk roads and corridor routes into and out of Chelmsford city centre. This, along with local changes made to development allocations to the north of Chelmsford, is modelled to result in different traffic flows through a number of assessed junctions.

Published studies have revealed that in the peak hour there is around 4% spare network capacity in Chelmsford city centre. Forecast modelling for the Pre-Submission Local Plan has shown that peak hour background traffic flows will increase by an average of 4% in the city centre up to 2036, with a further increase (on top of the background growth) of 2% resulting from Local Plan development and infrastructure. This is therefore forecast to cause the city centre network to become over-saturated with vehicles during the course of the AM and PM peak hours in a 2036 forecast year, leading to forecast increases in vehicle journey time along routes including Parkway and Springfield Road.

Whilst a focused review of the impact on the city centre road network was not included in the Preferred Option assessment, it is recognised that the impact of maintaining the single lane flyover at the Army and Navy Roundabout has had an impact on flows along Parkway, with noticeable changes likely over the strategic model outputs presented for the city centre in the Preferred Option modelling report.

With the exception of the Boreham Interchange, flow differences modelled at local junctions are shown to be small and/or are unlikely to adversely impact overall performance. Prior analysis and recommendations for mitigation made in the Preferred Option Strategic & Local Junction Modelling report therefore remain relevant. Whilst the latest modelling suggests additional traffic will route through the Boreham Interchange, overall conclusions on junction performance remain

consistent, with the latest findings strengthening the case for further capacity enhancements to accommodate flows in a Do Minimum scenario.

Appendices

Appendix A: Pre-Submission Modelling Full Development Assumptions

Table A1: Do-Minimum Pre-Submission residential assumptions – summary table

	Year 1 15/16		Year 2 16/17		Year 3 17/18		Year 4 18/19		Year 5 19/20		Year 6 20/21		Year 7 21/22		Year 8	
Housing allocations included in Do-Minimum scenario modelling	**Market**	**Affordable**	**Market**	**Affordable**	**Market**	**Affordable**	**Market**	**Affordable**	**Market**	**Affordable**	**Market**	**Affordable**	**Market**	**Affordable**	**2022/23**	**Post 2023**
Town Centre Area Action Plan Allocations	337	10	39	70	40	28	531	158	122	80	253	46	174	0	232	0
North Chelmsford Area Action Plan	76	18	205	103	287	107	313	148	396	130	273	149	199	61	314	2110
Site Allocations Development Plan Document Allocations	88	9	134	43	82	33	116	47	63	40	81	50	59	30	24	0
Large Sites (Unallocated)	113	0	221	0	206	0	179	23	199	0	60	0	224	94	0	0
Small Sites (Unallocated)	111	16	173	10	292	19	40	0	98	0	6	0	0	1	0	0

Table A2: Local Plan Pre-Submission development assumptions

Development Locations	Site Description	No. of Dwellings	Employment (Business Park) sqm	Supporting Commercial (Retail) sqm
Location 1 Chelmsford Urban Area	Former Royal Mail Premises, Victoria Road	113		
	Rivermead, Chelmsford	80	7000	
	Railway Sidings, New Street		7000	
	Navigation Road sites, Chelmsford	35		
	Travis Perkins, Navigation Road, Chelmsford	75		
	Baddow Road Car Park and Lane to the East, Chelmsford	190		1000
	Lockside, Navigation Road, Chelmsford	130		
	Former Gas Works and Peninsula, Wharf Road, Chelmsford	249		
	Essex Police HQ and Sports Ground, New Court Road, Chelmsford	250		
	Car Park W of County Hotel	45		
	Former St Peter's College, Fox Crescent, Chelmsford	185		
	North of Gloucester Avenue (John Shennan), Chelmsford	200		
	Civic Centre Land, Fairfield Road, Chelmsford	100		1000
	Riverside Ice & Leisure Land, Victoria Road, Chelmsford	125		
	Chelmsford Social Club and private car park, 55 Springfield Road, Chelmsford	90		
	Garage site and land, Medway Close, Chelmsford	10		
	Former Chelmsford Electrical and Car Wash, New Street, Chelmsford	40		1000
	Waterhouse Lane Depot and Nursery, Chelmsford	20		1000
	Eastwood House Car Park, Glebe Road, Chelmsford	100		
	Church Hall Site, Woodhall Road, Chelmsford	19		
	British Legion, New London Road, Chelmsford	15		
	Garage Site, St Nazaire Road, Chelmsford	12		
	Car Park r/o Bellamy Court, Broomfield Road, Chelmsford	10		
	Ashby House Car Parks, New Street, Chelmsford	80		
	BT Telephone Exchange, Cottage Place, Chelmsford	30		1000
	Rectory Lane West	75		
	Rectory Lane East	25		
	Land rear of 17-37 Beach's Drive	14		
Location 1 Subtotal		**2317**	**14000**	**5000**
Location 2 West Chelmsford	WARREN FARM	800		
Location 3 East Chelmsford (East of Great Baddow)	East Chelmsford - East of Chelmsford/North of Great Baddow (3a) - Manor Farm	250		
	East Chelmsford - East of Chelmsford/North of Great Baddow (3b) - Land North of Maldon Road	50	5000	
	East Chelmsford - East of Chelmsford/North of Great Baddow (3c) - Land South of Maldon Road	100		
Location 4 North East Chelmsford	NORTH EAST CHELMSFORD	3000	45000	
Location 5 Moulsham Hall and North Great Leighs	Great Leighs - Land at Moulsham Hall	750		
	Great Leighs – Land East of London Road	250		
	Great Leighs – Land North and South of Banters Lane	100		
Location 6 North Chelmsford (Broomfield)	NORTH OF BROOMFIELD	450		
Location 7 Boreham	BOREHAM	0		
Location 8 North of South Woodham Ferrers	NORTH OF SOUTH WOODHAM FERRERS	1000	1000	
Location 9 Bicknacre	BICKNACRE	30		
Location 10 Danbury	DANBURY	100		

Table A3: Pre-Submission non-housing assumptions

Development Locations	Employment (Business Park) sqm	Supporting Commercial (Retail) sqm	Food Retail sqm	Leisure sqm	General Industrial sqm	Storage & Distribution sqm	GP Surgery sqm	Education Nursery sqm	Community Centre sqm	Hotel sqm	TOTAL
2015-2021											
Springfield Business Park	8535					8535					17070
City Park West (Former ARU Central)	2185	350									2535
Marconi Evolution (Former Marconi Works)	294	1271		367							1932
The Exchange (CM2) – Anderson Site	1424										1424
Beaulieu Square		910	432				450	225	270		2287
Temple Farm (IBSA Village)	62500				50000						112500
Channels Business Park					18342						18342
Aquila, Bond Street Development		26644									26644
Aldi			1492								1492
Essex County Cricket Club,				1754							1754
Clocktower Industrial and Retail Park	2600	8222			2600	2600					16022
Crouch Vale Nurseries & Plantworld			6899	1435							8334
Medical School + ARU Development								3954			3954
Chelmsford Trade Park - Westway	3464				3464	3464					10393
2021-2036											
NE Chelmsford Employment and Non-Residential Uses – permitted as part of Beaulieu scheme with Rail Station provided	9000			2000				3000		3700	17700
Greater Beaulieu Business Park	40000										40000

Table A4: Pre-Submission brownfield development assumptions

2015-2021 sites have not been included if they are considered to generate low levels of car traffic – either due to site size (<1000sqm), land use type or lack of available parking.
- Office sites <1000sqm are calculated to generate/attract fewer than 10 trips in the peak hour. Business park and industrial land uses generate fewer trips.

Development Locations	Employment (Office) sqm	Supporting Commercial (Retail) sqm	Leisure sqm	General Industrial sqm	Storage & Distribution sqm	Community Centre sqm	Hotel sqm	TOTAL
2015-2021								
Royal Mail Sorting Office, 30 Victoria Road, Chelmsford				-3000				-3000
64-66 Broomfield Road	-2536							-2536
South Lodge Hotel, 196 New London Road, Chelmsford							-1463	-1463
London House, 111 New London Road, Chelmsford	-2562							-2562
PARKWAY HOUSE, 49 BADDOW ROAD	-2010							-2010
ROSEBURY HOUSE, 41 SPRINGFIELD ROAD	-1764							-1764
THREADNEEDLE HOUSE, MARKET ROAD	-3740							-3740
Gemini House, 88-90 New London Road, Chelmsford	-1968							-1968
2021-2036								
BT TELEPHONE EXCHANGE COTTAGE PLACE				-11000				-11000
EASTWOOD HOUSE (CAR PARK) GLEBE ROAD	-3750							-3750
CAR PARK R/O BELLAMY COURT BROOMFIELD ROAD		-100						-100
NAVIGATION ROAD SITES		-1250						-1250
TRAVIS PERKINS NAVIGATION ROAD				-7500				-7500
LAND NORTH WEST OF LOCKSIDE MARINA HILL ROAD SOUTH				-5000				-5000
CHELMSFORD SOCIAL CLUB AND PRIVATE CAR PARK 55 SPRINGFIELD ROAD						-2500		-2500
RIVERSIDE ICE AND LEISURE, Victoria road			-3750					-3750
ASHBY HOUSE CAR PARKS NEW STREET	-2364							-2364
FORMER CHELMSFORD ELECTRICAL AND CAR WASH NEW STREET				-3750				-3750
RIVERMEAD INDUSTRIAL ESTATE BISHOP'S HALL LANE CHELMSFORD				-18750				-18750
WATERHOUSE LANE DEPOT AND NURSERY					-8750			-8750
BRITISH LEGION NEW LONDON ROAD						-1250		-1250

Public Car Park Closures 2021-2036:
Wharf Road Long Stay
Rectory Road East

Appendix B: Pre-Submission – Preferred Option Inter Peak Model Difference Plots

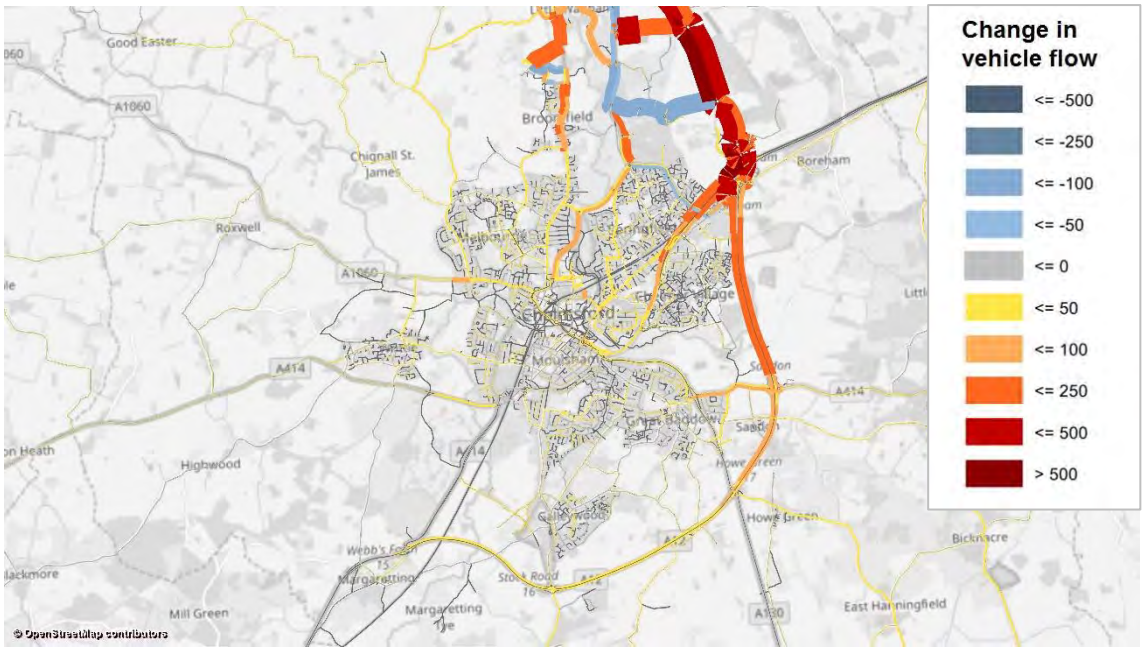

Figure B1: Inter Peak Hour 2036 change in traffic flow between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford

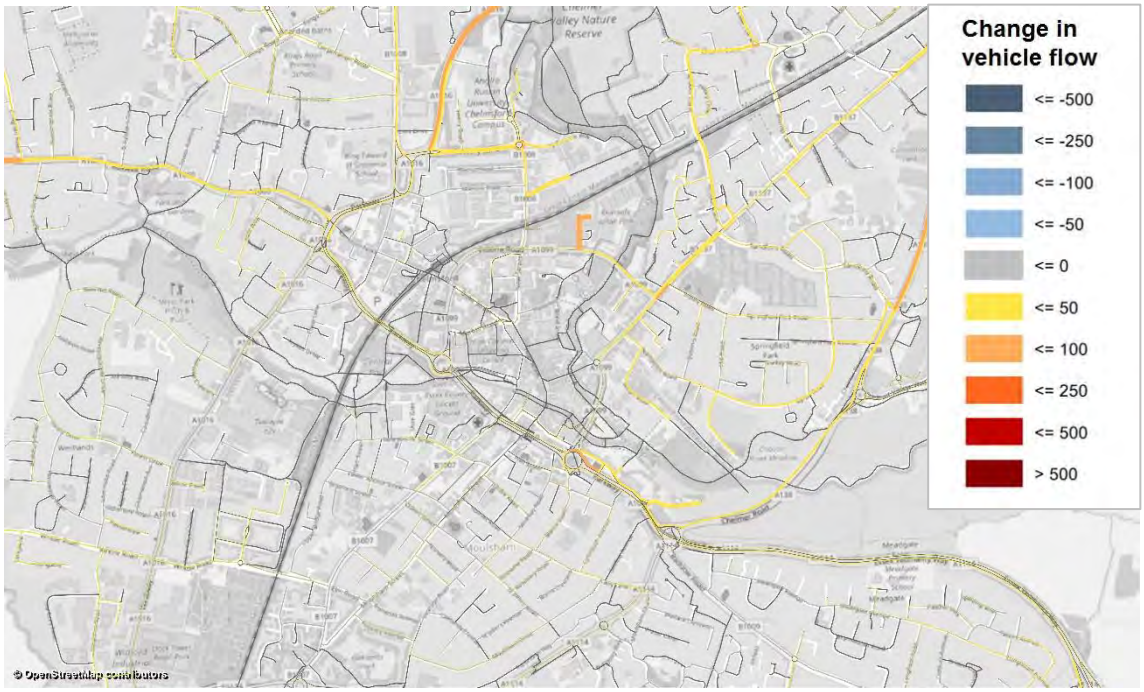

Figure B2: Inter Peak Hour 2036 change in traffic flow between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford city centre

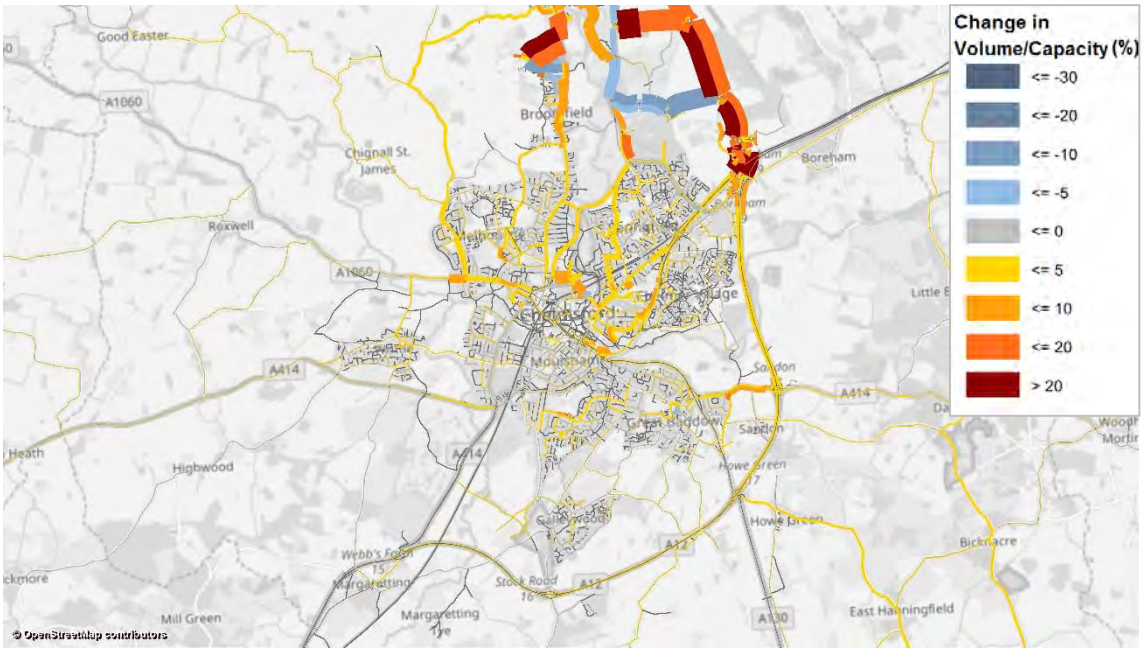

Figure B3: Inter Peak Hour 2036 change in network V/C% between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford

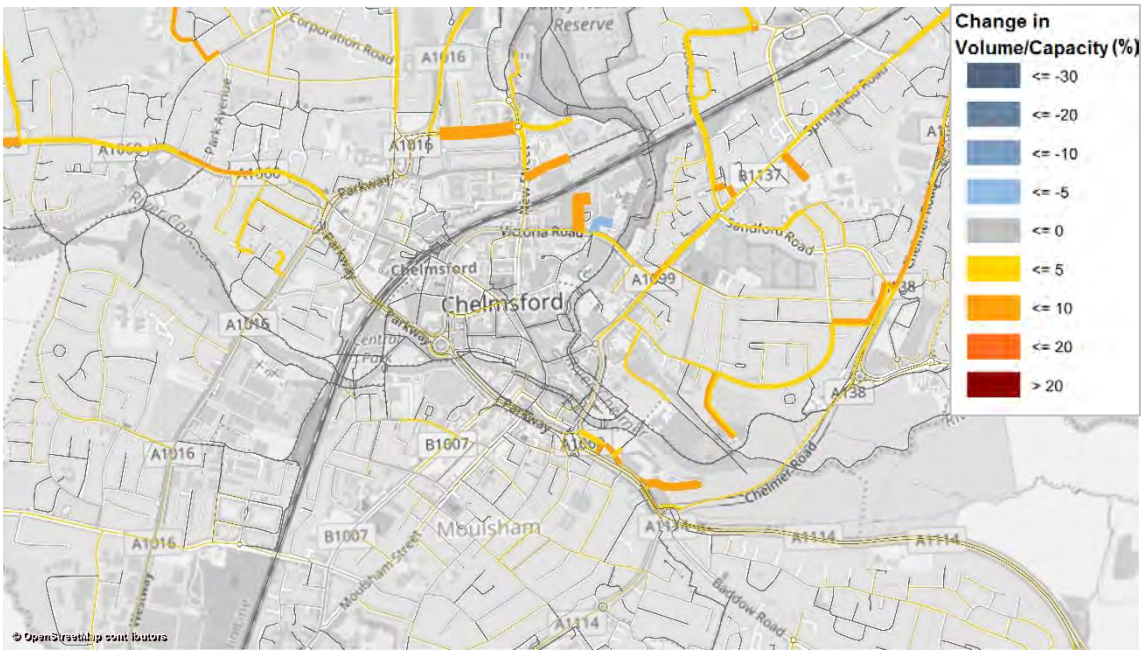

Figure B4: Inter Peak Hour 2036 change in network V/C% between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford city centre

Appendix C: Pre-Submission – Preferred Option Fixed Demand Model Difference Plots

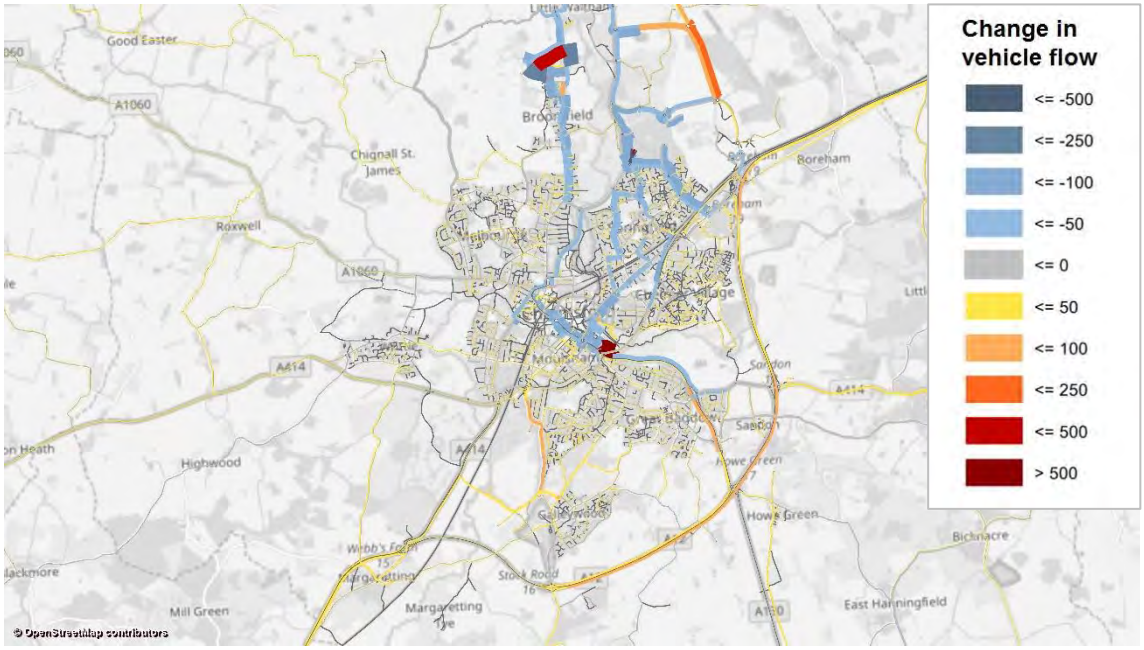

Figure C1: AM Peak Hour 2036 change in traffic flow between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford – Fixed Demand

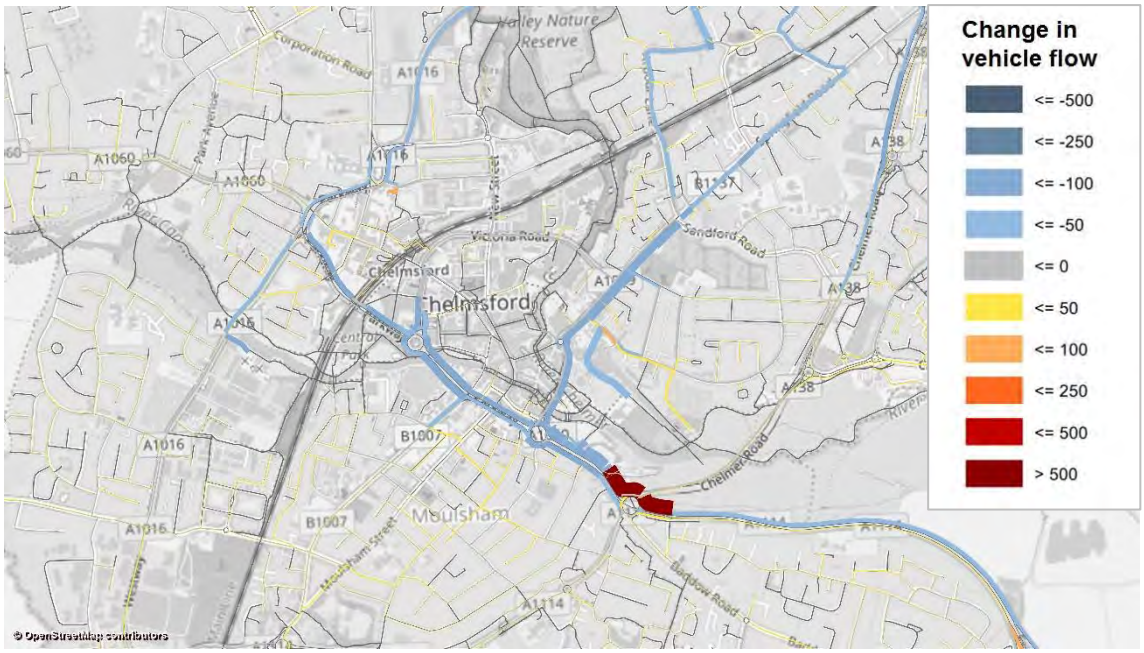

Figure C2: AM Peak Hour 2036 change in traffic flow between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford city centre – Fixed Demand

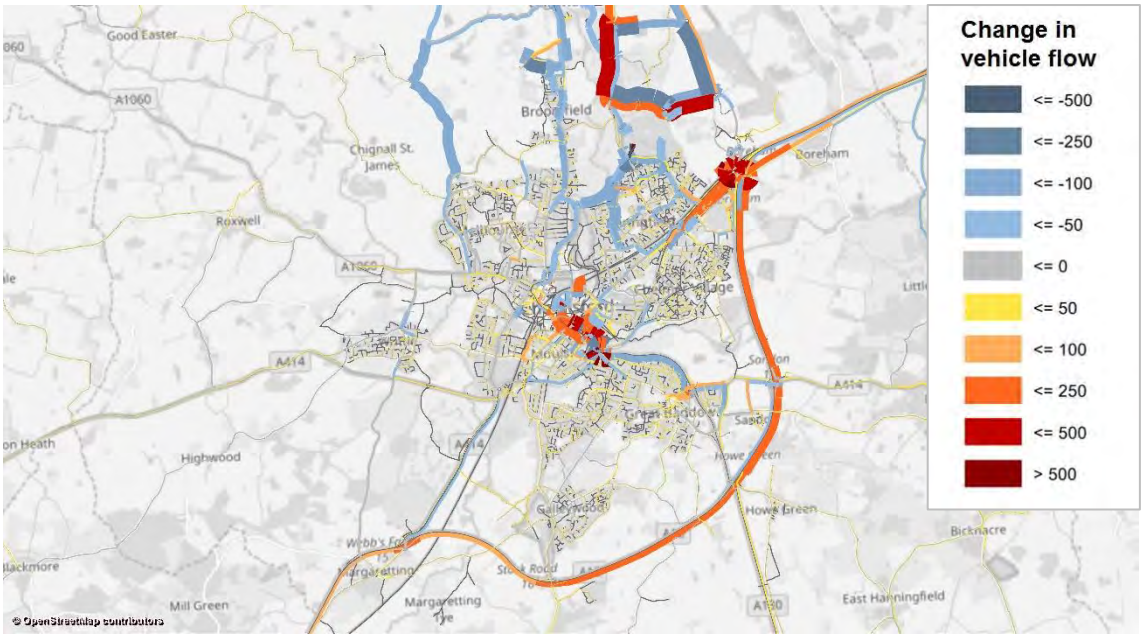

Figure C3: PM Peak Hour 2036 change in traffic flow between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford – Fixed Demand

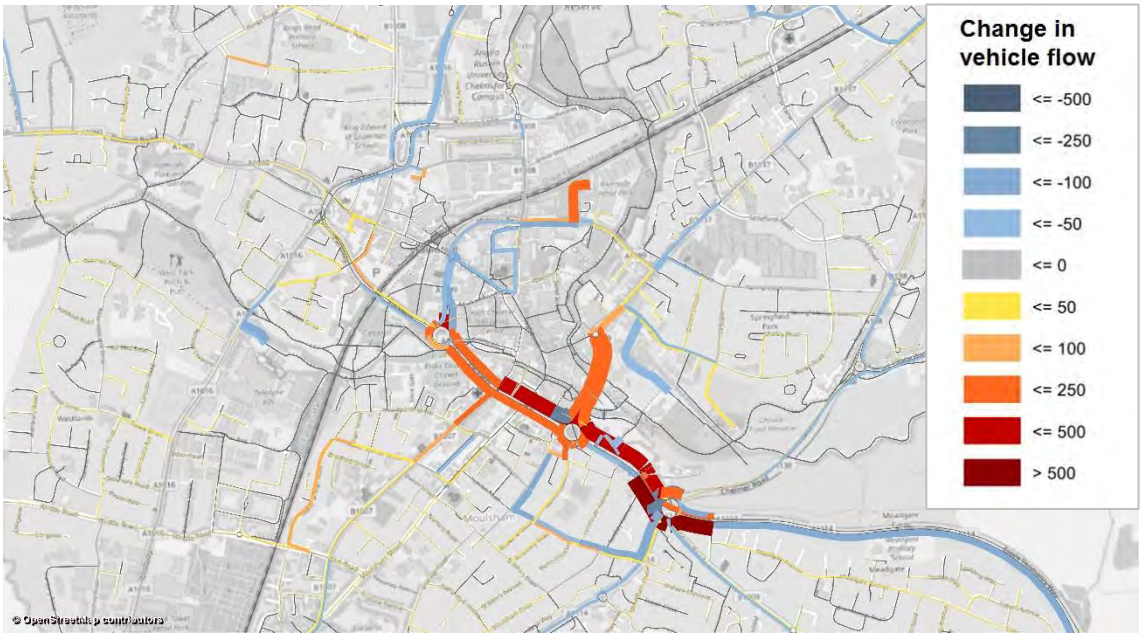

Figure C4: PM Peak Hour 2036 change in traffic flow between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford city centre – Fixed Demand

Figure C5: AM Peak Hour 2036 change in network V/C% between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford – Fixed Demand

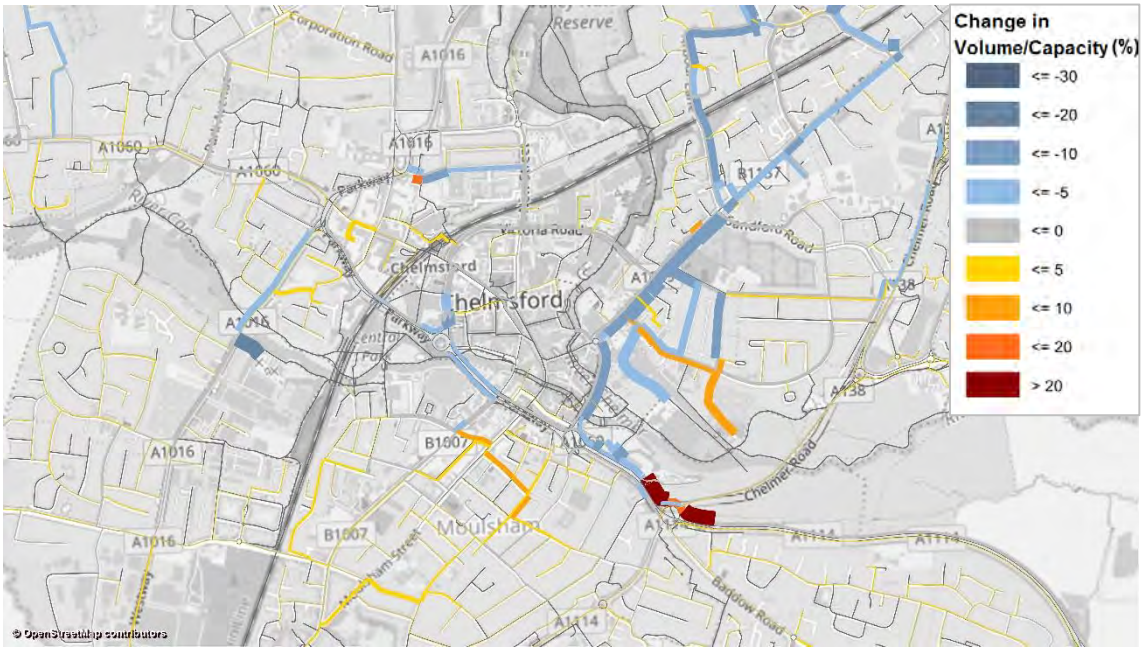

Figure C6: AM Peak Hour 2036 change in network V/C% between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford city centre – Fixed Demand

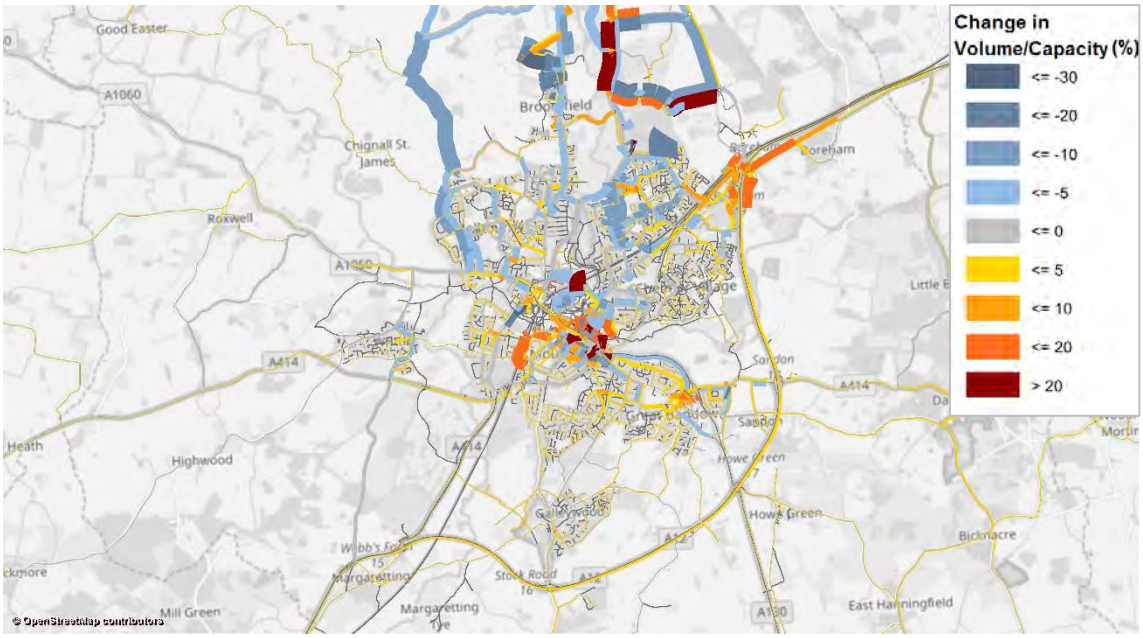

Figure C7: PM Peak Hour 2036 change in network V/C% between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford – Fixed Demand

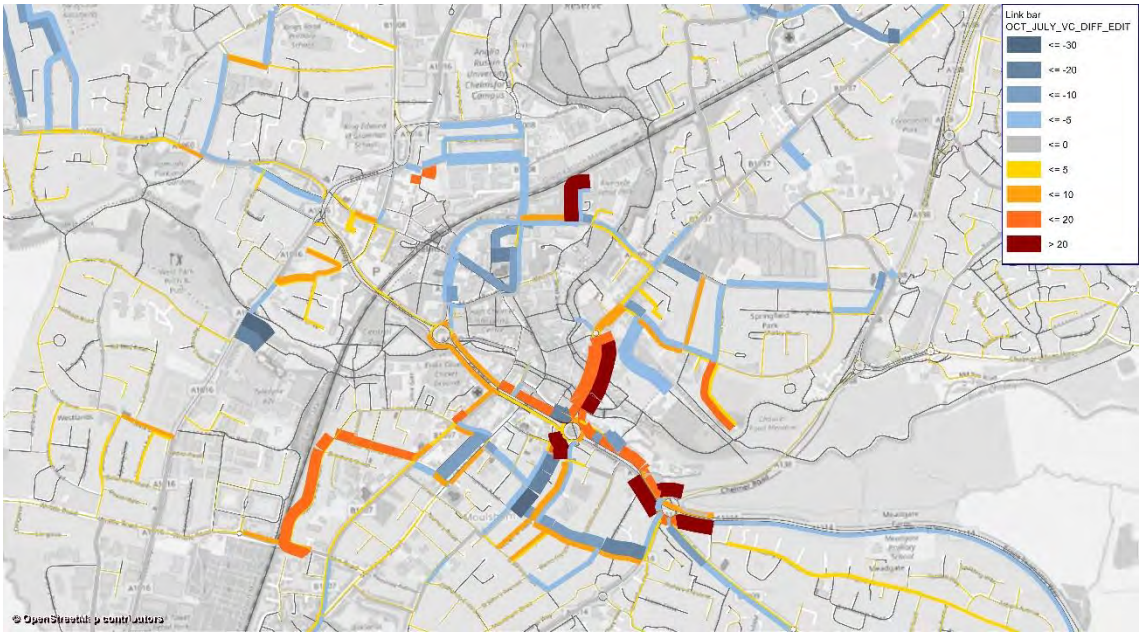

Figure C8: PM Peak Hour 2036 change in network V/C% between the Pre-Submission Local Plan and the Preferred Option Local Plan modelling in Chelmsford city centre – Fixed Demand

Appendix D: Pre-Submission Do Minimum Model Flow & V/C Plots

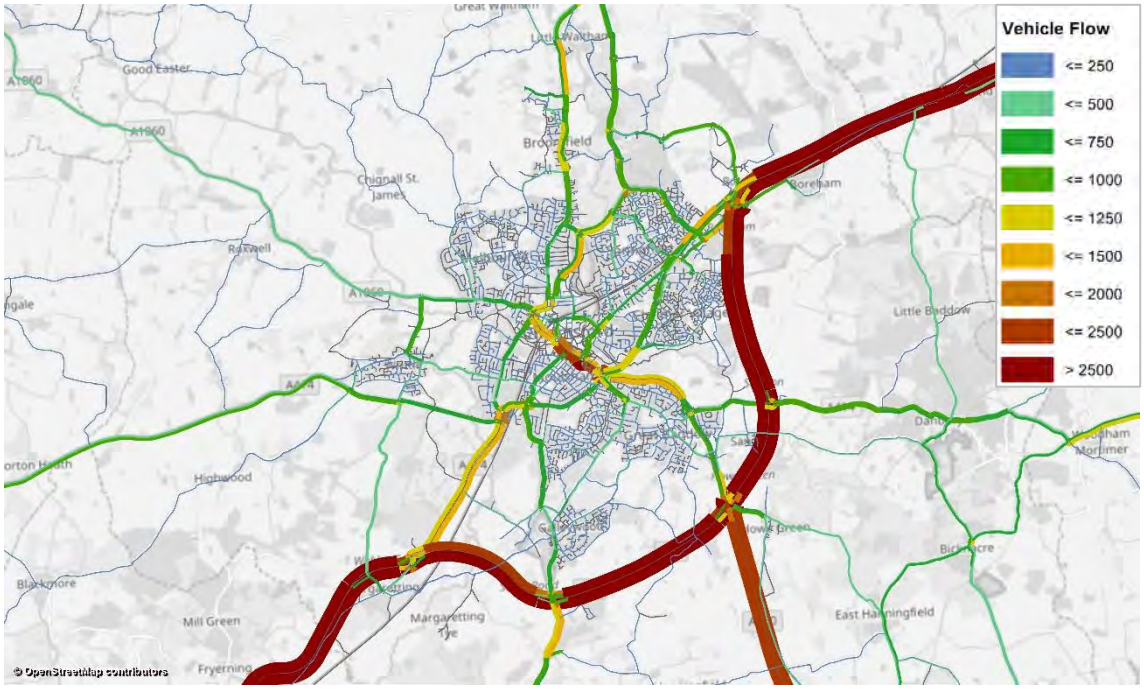

Figure D1: AM Peak Hour 2036 forecast traffic flows in Chelmsford (with Pre-Submission Do Minimum assumptions)

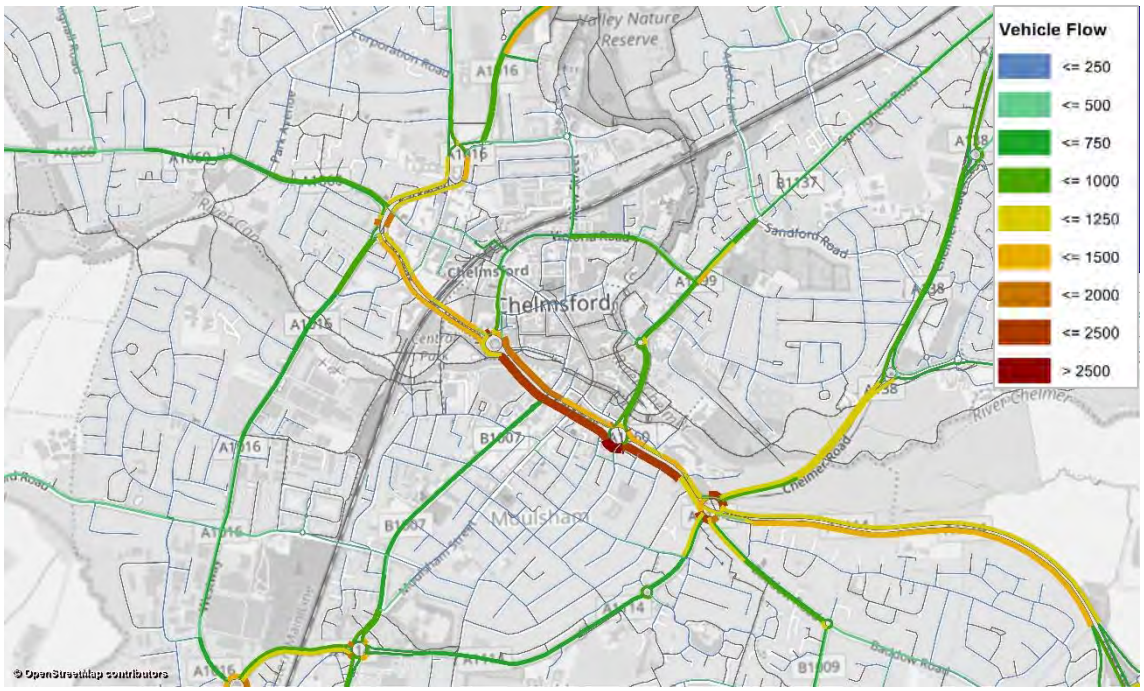

Figure D2: AM Peak Hour 2036 forecast traffic flows in Chelmsford city centre (with Pre-Submission Do Minimum assumptions)

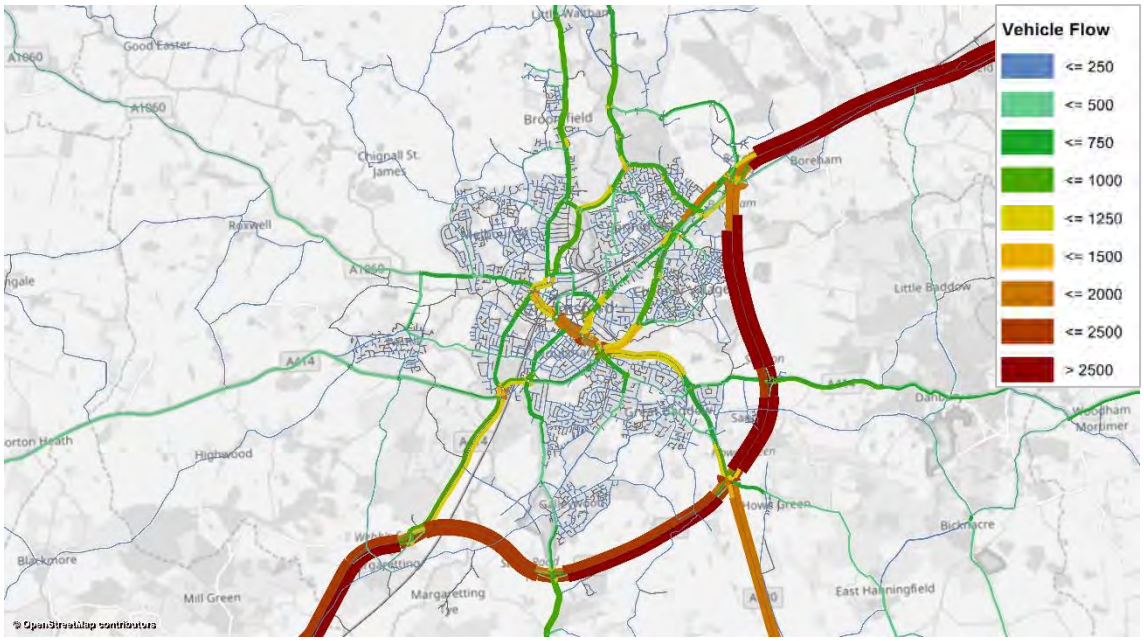

Figure D3: Inter Peak Hour 2036 forecast traffic flows in Chelmsford (with Pre-Submission Do Minimum assumptions)

Figure D4: Inter Peak Hour 2036 forecast traffic flows in Chelmsford city centre (with Pre Submission Do-Minimum assumptions)

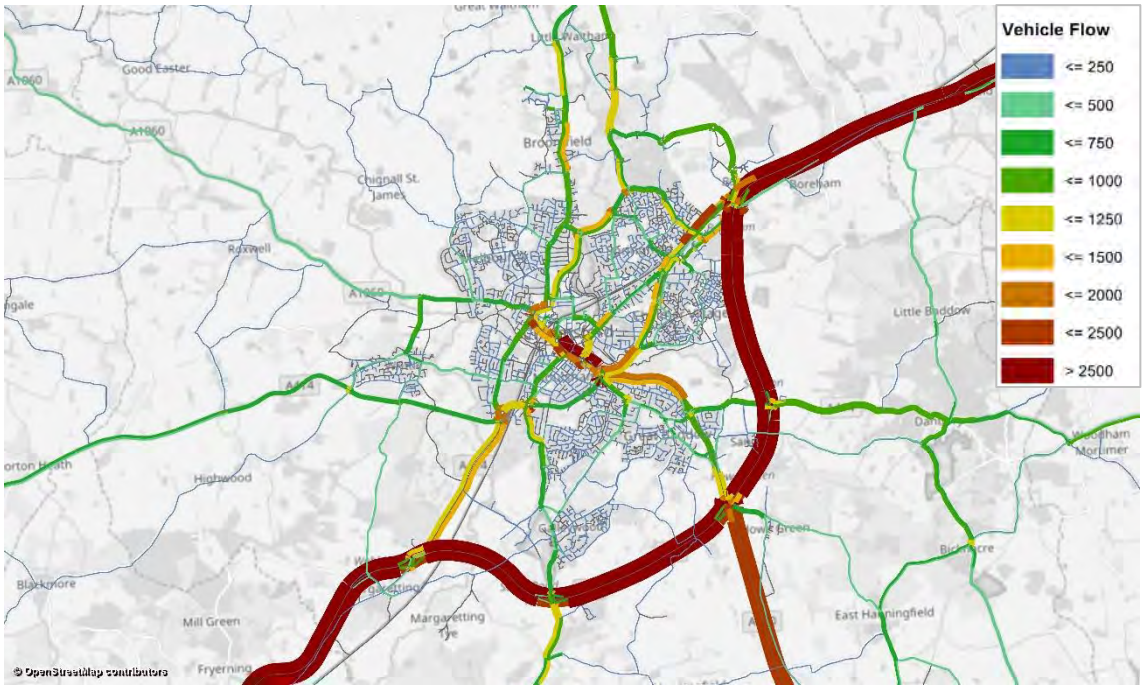

Figure D5: PM Peak Hour 2036 forecast traffic flows in Chelmsford (with Pre-Submission Do Minimum assumptions)

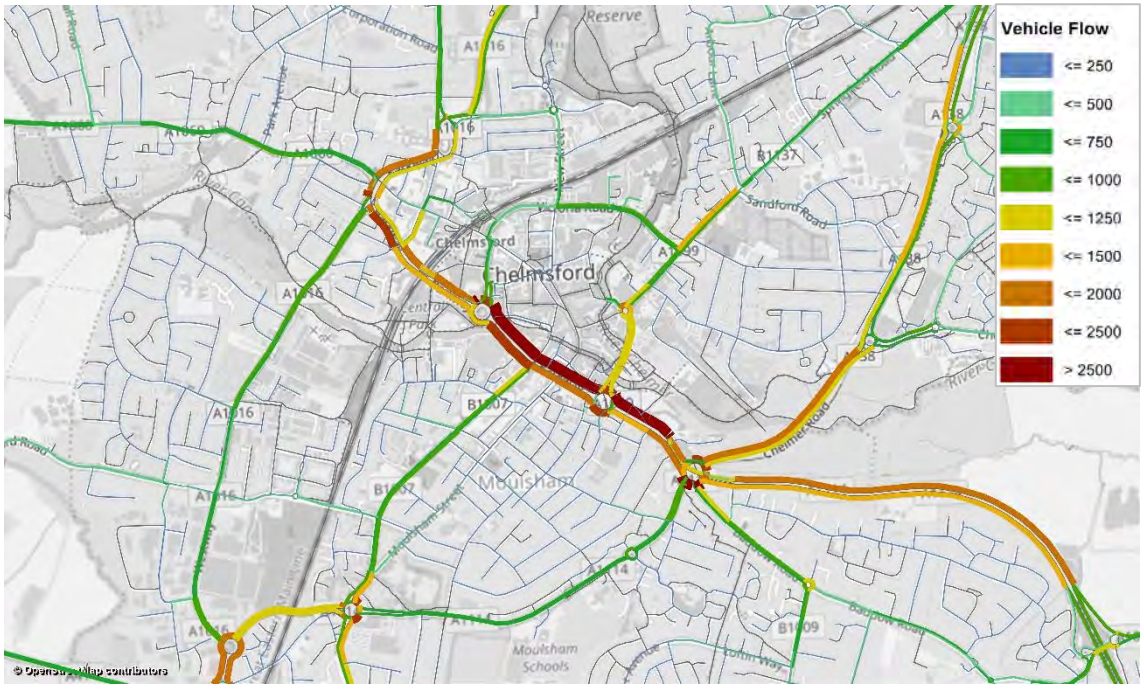

Figure D6: PM Peak Hour 2036 forecast traffic flows in Chelmsford city centre (with Pre-Submission Do Minimum assumptions)

Figure D7: AM Peak Hour 2036 forecast V/C% in Chelmsford (with Pre-Submission Do Minimum assumptions)

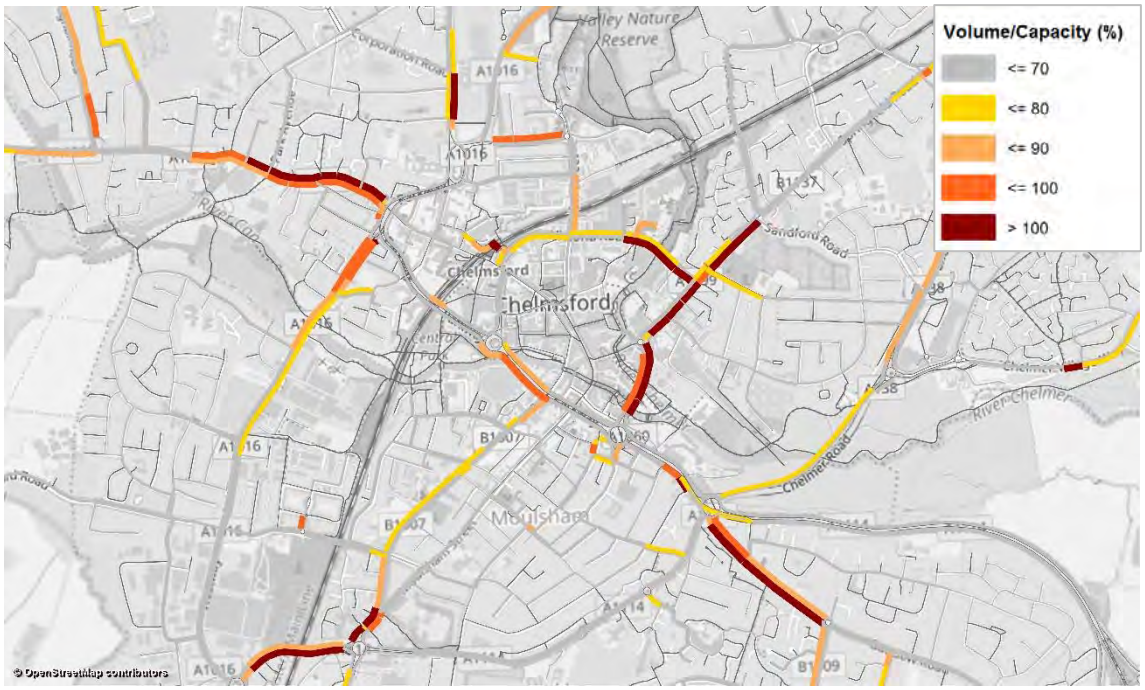

Figure D8: AM Peak Hour 2036 forecast V/C% in Chelmsford city centre (with Pre-Submission Do Minimum assumptions)

Figure D8: Inter Peak Hour 2036 forecast V/C% in Chelmsford (with Pre-Submission Do Minimum assumptions)

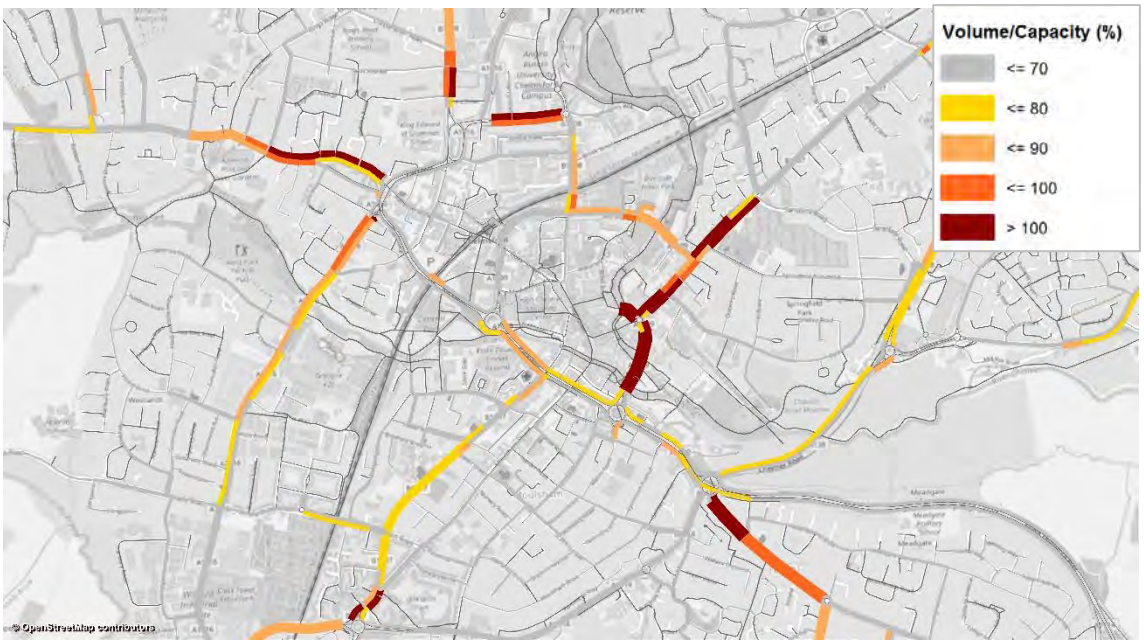

Figure D9: Inter Peak Hour 2036 forecast V/C% in Chelmsford city centre (with Pre-Submission Do Minimum assumptions)

Figure D10: PM Peak Hour 2036 forecast V/C% in Chelmsford (with Pre-Submission Do Minimum assumptions)

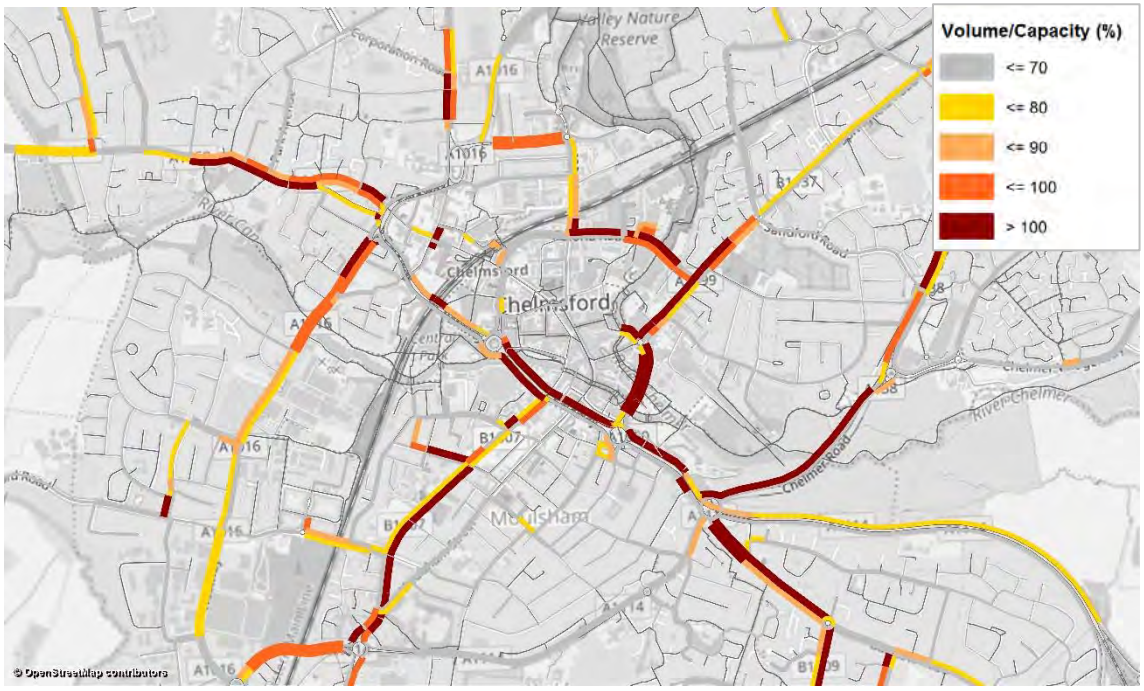

Figure D11: PM Peak Hour 2036 forecast V/C% in Chelmsford city centre (with Pre-Submission Do Minimum assumptions)

Appendix E: Pre-Submission Inter Peak Model Flow & V/C Plots

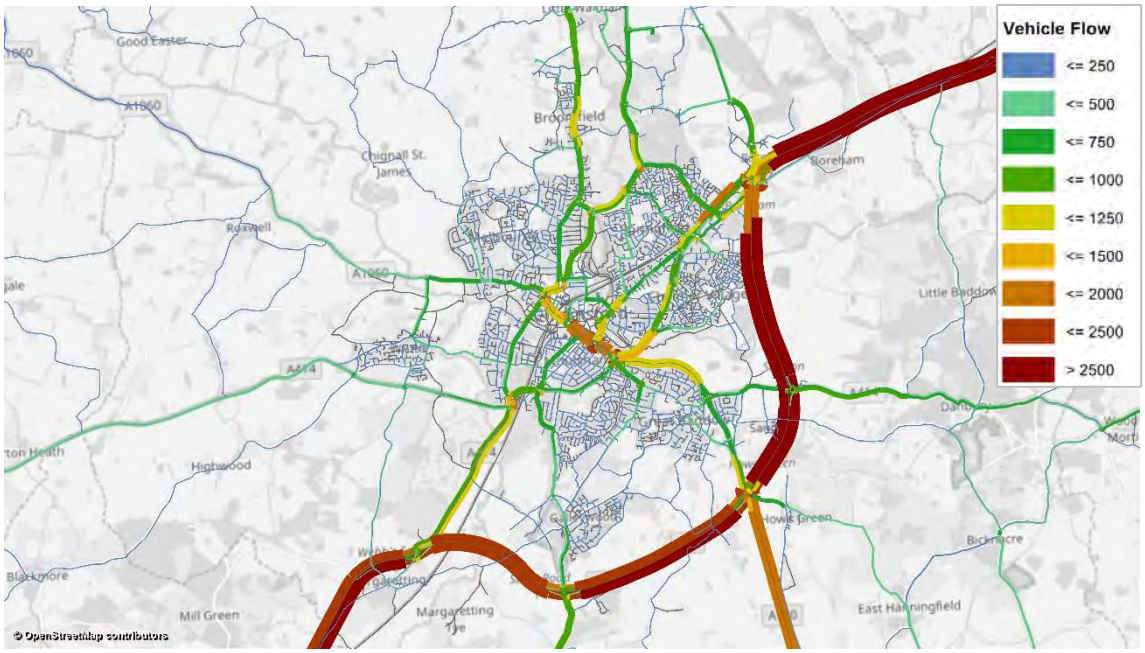

Figure E1: Inter Peak 2036 forecast traffic flows in Chelmsford (with Pre-Submission Local Plan)

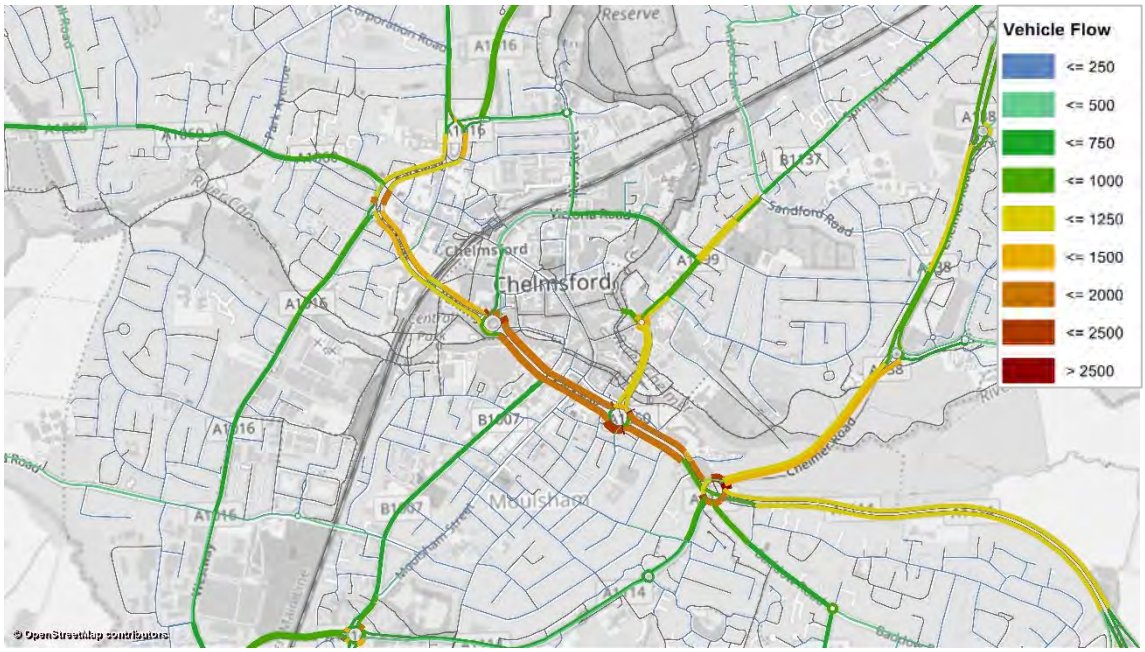

Figure E2: Inter Peak 2036 forecast traffic flows in Chelmsford city centre (with Pre-Submission Local Plan)

Figure E3: Inter Peak 2036 forecast V/C% in Chelmsford (with Pre-Submission Local Plan)

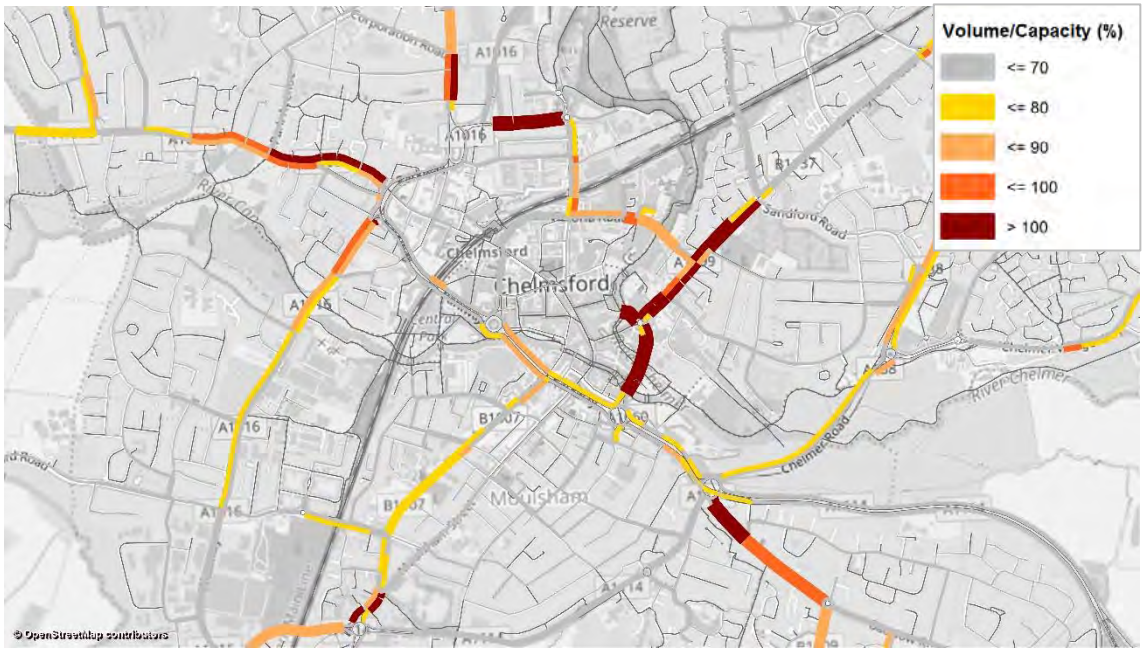

Figure E4: Inter Peak 2036 forecast V/C% in Chelmsford city centre (with Pre-Submission Local Plan)

Appendix F: Chelmsford Strategic Model (VISUM) Zone Plan

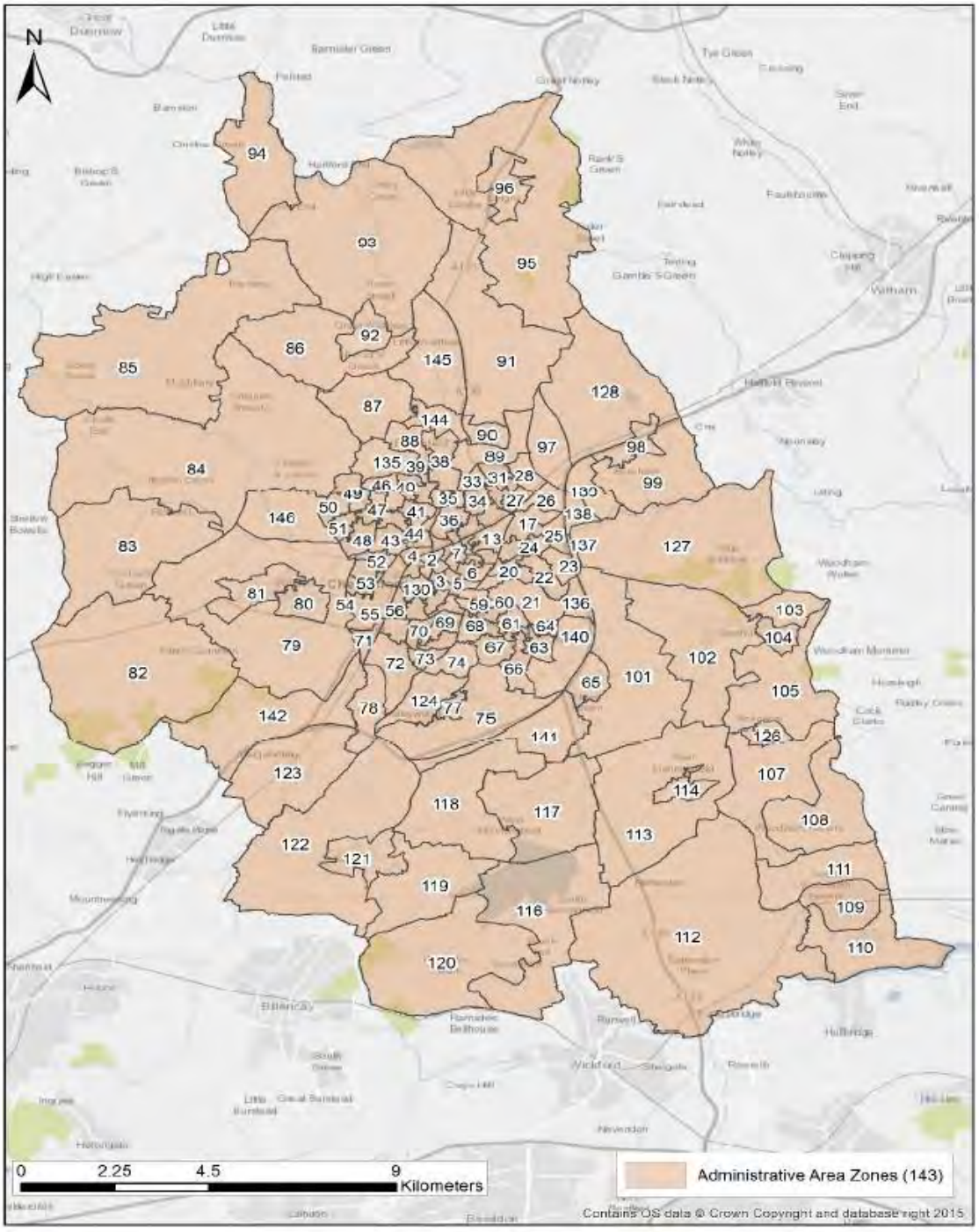

Figure F1: Chelmsford Strategic Model (VISUM) zone system for Chelmsford Administrative Area

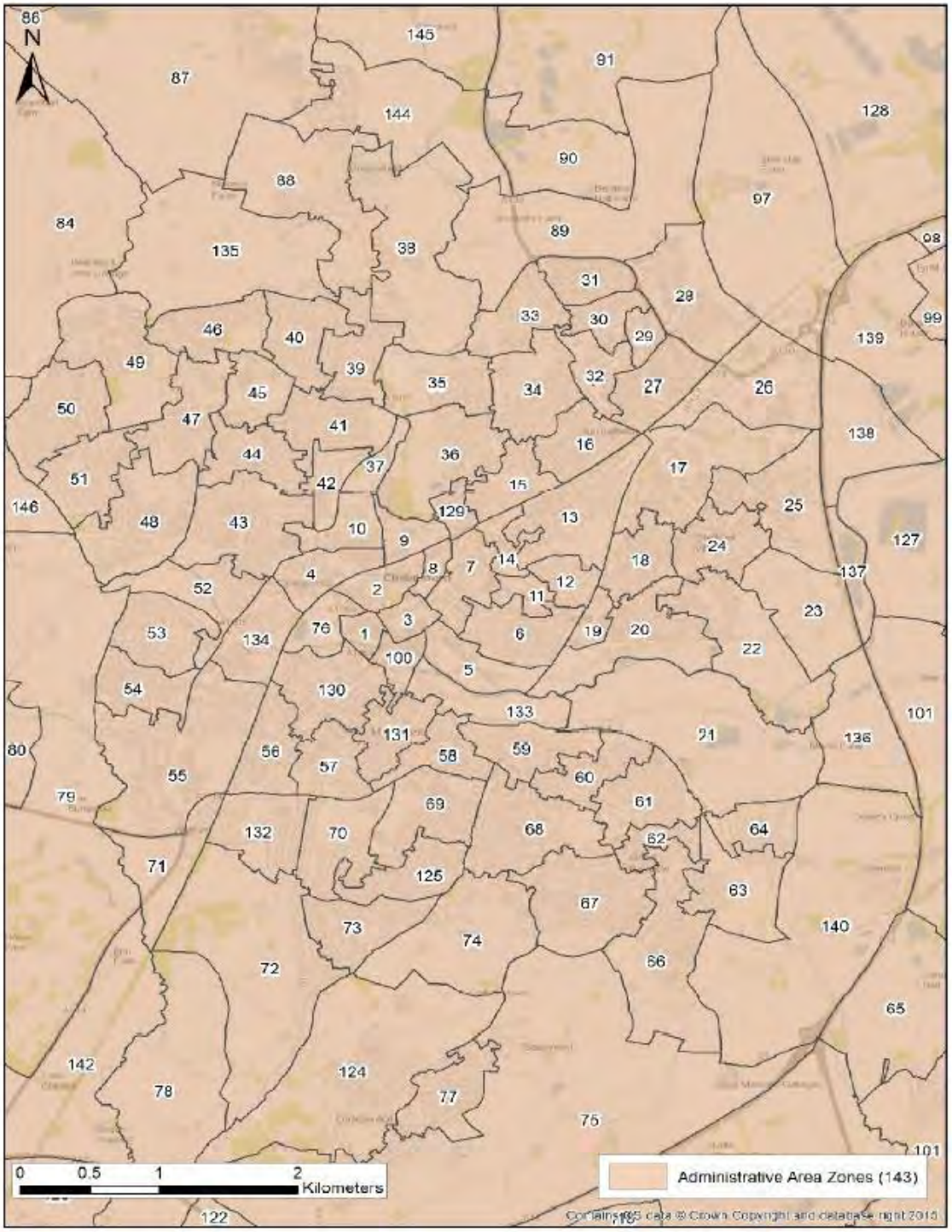

Figure F2: Chelmsford Strategic Model (VISUM) zone system for Chelmsford City Centre