

# Chelmsford Local Plan

Transport Impact Sensitivity Testing & Sustainability Review

March 2017









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# **Executive Summary**

#### Introduction

We have been commissioned by Essex County Council to assist Chelmsford City Council (CCC) with understanding the transport impact of their Local Plan Spatial Options (1-3) and mitigation proposals as outlined in the recent 'Issues and Options Consultation Document – November 2015'.

This technical report documents the appraisal and findings of three sensitivity tests identified by CCC, along with an outline assessment of a proposed Writtle Bypass and carriageway widening of the A12 around Chelmsford. The report also considers sustainable transport infrastructure as a mitigation measure to help address future congestion concerns.

#### **Sensitivity Testing**

The three sensitivity tests undertaken for this study have been referred to as Tests A-C in this technical report, and are as follows:

- Test A Alternative Urban Focus and Growth along Key Corridors
- Test B New Settlement and Safeguarding Green Wedges
- Test C Deliverability Focus

As with Spatial Options 1-3, it is difficult to differentiate between Tests A-C with regard to the impact of development traffic on levels of congestion across the wider Chelmsford urban area by 2036.

This is understood to be due to a number of contributory factors:

- the relatively small differences in the quanta of development proposed between the tests;
- the broad spread of development proposed across the administrative area – including Great Leighs and South Woodham Ferrers;
- the high levels of background congestion predicted in the city centre and along corridor routes by 2036; and
- the influence of wider traffic re-routing as a result of A12 congestion.

Assessing the comparative impact of each sensitivity test on traffic flows across Chelmsford helps to differentiate between the tests and highlight the local highway impact of larger developments. However, it should be caveated that the differences in traffic flow modelled between the tests have little impact on overall levels of congestion modelled across Chelmsford for each.



Across the modelled peak hours, Test C (deliverability focus) is consistent in generating the smallest overall traffic flow increases across the Chelmsford urban area, along the A12 and city centre routes. This is perhaps understandable with Test C having the lowest overall quantum and broadest dispersal of development across the administrative area.

At a more local level, Test C shows the largest increase in modelled traffic flow along Lordship Road and Ongar Road in Writtle. This can be attributed to the development at Warren Farm, which contains more dwellings in Test C compared with Tests A or B.

The larger quantity of housing at the proposed Hammonds Farm development associated with Test B, results in higher modelled traffic flows along the A12, at the A12 Junction 18, and along rural rat-run routes through Sandon, Bicknacre and East Hanningfield.

Coverage of the road network at the periphery of the VISUM model is less detailed, with network validation focussed on the urban area of Chelmsford. Consequently, the strategic highway impact of Local Plan development in South Woodham Ferrers and Great Leighs cannot be robustly quantified using the same modelling approach adopted for developments closer to Chelmsford.

This assessment does not, therefore, cover the local highway impact of development in Great Leighs and South Woodham Ferrers. A more detailed assessment of local junction impacts in the vicinity of the potential housing and employment locations has been commissioned and will form part of an updated appraisal of the Preferred Option.

#### Mitigation Testing

Modelling suggests that the network impact of the proposed Writtle Bypass (considered without a proposed Western Relief Road) will be localised to Ongar Road, Lordship Road and adjacent rural routes.

Flows along the proposed bypass are shown to not exceed 500 vehicles in either direction during peak hours. These are split between strategic movements travelling between the A414 and the A1060, and local traffic accessing development in the West of Chelmsford from the A414.

Analysis suggests that the proposed bypass could be sufficient to mitigate the impacts of a Warren Farm development of around 1000 dwellings on the road network through Writtle.



Widening the A12 to three lanes between Junctions 15 (Margaretting) and 19 (Boreham) results in a small reduction in modelled city centre traffic flow along A138 Chelmer Road, Springfield Road and routes through North Springfield. However, overall levels of congestion predicted along corridor routes into the city centre and through the city centre itself remain largely unaffected.

It is apparent from the modelling that projected 2036 traffic flows along the A12 between J17 (Sandon) and J19 (Boreham) could exceed the capacity of a threelane carriageway. As a consequence, modelled peak hour congestion is likely to remain on the A12 between these junctions.

To best tackle future congestion across the urban area of Chelmsford, a strong emphasis will need to be placed on:

- Improving sustainable travel infrastructure
- Promoting the use of non-car modes
- Effective travel planning
- Sustainable development in terms of accessibility

#### Sustainable Infrastructure Review

2011 Journey to Work census data identifies that more than 50% of Chelmsford residents working within Chelmsford administrative area drive to work. Also, 35.2% of Chelmsford residents who live within 4km of the city centre (acceptable cycling distances) and work in the city centre travel by car. There would appear to be potential for modal shift from driving, to travelling by bus or bicycle to work in the city centre.

Potential housing locations in the city centre and in North Chelmsford (Broomfield) are located within an acceptable walking distance of existing public transport services and are currently the best served in terms of existing bus provision on their closest routes. In this regard, these locations might be considered the best for encouraging bus use to/from new developments.

Potential housing locations in Great Baddow/Sandon and Writtle are located within an acceptable 4km cycling distance of the city centre. Development in North East Chelmsford will also be located within cycling distance of a proposed rail station at Beaulieu Park. Focus should therefore be spent on promoting cycling at these locations, and investing in cycling infrastructure to maximise uptake.



# **1** Introduction

### 1.1 Background

We have been commissioned by Essex County Council (ECC) to assist Chelmsford City Council (CCC) with understanding the transport impact of their Local Plan Spatial Options and mitigation proposals as outlined in the 'Issues and Options Consultation Document – November 2015'.

The current Chelmsford Local Development Framework (LDF) covers the period from 2001 to 2021. The Government requires Local Authorities to put in place Local Plans which provide certainty for the supply of housing land for a period of up to 10 years and ideally for up to 15 years. It is therefore now necessary for Chelmsford City Council to prepare the next Chelmsford Local Plan for 2021 to 2036.

The Chelmsford Strategic Model has been developed in VISUM as part of a separate commission for ECC. VISUM is 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.

On behalf of CCC, this project will focus on using the Chelmsford Strategic Model to demonstrate a sound and robust highways evidence base by testing CCC's emerging growth proposals and identifying transport mitigation measures to as far as possible accommodate planned growth to support the emerging Chelmsford Local Plan.

This document serves as a continuation of the analysis and findings contained within the earlier technical note: 'Chelmsford Local Plan: Transport Impact of Local Plan Spatial Options – November 2016'. This considered the highway impact of the three Spatial Options included in the Local Plan Issues and Options consultation (Options 1-3).

The report content covers an appraisal and findings of three Local Plan sensitivity tests identified by CCC, along with an outline assessment of a proposed Writtle Bypass and carriageway widening of the A12 around Chelmsford. The report also includes an appraisal of sustainable transport infrastructure as a mitigation measure to help address future congestion concerns.



This report serves as the second of three reports produced to provide evidence to support a Local Plan Preferred Option ahead of consultation in March 2017. The third report covers an initial appraisal of CCC's Preferred Option<sup>1</sup>. The three reports place a focus on documenting the highway impact of Local Plan development across the strategic road network.

The sensitivity testing, mitigation appraisal and sustainability review, as documented in this report, was originally carried out in Autumn 2016 and has now been finalised ahead of the consultation on CCC's Preferred Option.

## 1.2 Modelling Approach

Consistent with the appraisal of Spatial Options 1-3 and the initial appraisal of the Preferred Option, the sensitivity testing and mitigation modelling documented in this report uses a fixed demand highway assignment version of the VISUM Chelmsford Strategic Model. This means that travel behaviour responses to congestion have not been modelled, i.e. there have been no changes to the numbers of car trips people make beyond the growth in trips to the future year, no changes to the destinations of car trips, no switching to other modes such as bus or rail and no changes in time of travel. As such the results, although consistent with each other, will likely represent a slight overestimate of traffic levels.

A study commissioned in March 2017 will be undertaken to consider the local junction impact of developments associated with CCC's Preferred Option. This will use the recently developed Variable Demand VISUM model for Chelmsford and will incorporate the latest agreed development and infrastructure assumptions. Subsequent reporting will include an updated assessment of the strategic network impact and detailed assessment of the impact of development traffic on local junctions.

<sup>&</sup>lt;sup>1</sup> With development assumptions known as of November 2016.



## 1.3 Document Layout

This document consists of six chapters, as follows:

- Chapter 1: Introduction
- Chapter 2: Sensitivity Tests: Methodology and Assumptions – this details the modelling methodology and methods of analysis, the development and infrastructure assumptions used, and the trip generation and distribution built into the model;
- Chapter 3: Additional Mitigation Testing this documents the modelling of a proposed Writtle Bypass and a separate test to assess the impact of possible A12 carriageway widening;
- Chapter 4: Sensitivity Tests: Analysis this documents the modelling outputs and analysis of the three sensitivity tests;
- Chapter 5: Sustainable Infrastructure Review this section covers a review of sustainable travel behaviour in Chelmsford and considers the outline feasibility of public transport, walking and cycling measures;
- Chapter 6: **Summary & Conclusion** this draws together the conclusions from the work described in the earlier chapters.

# 1.4 Glossary of Modelling Terms

- Actual (Link) 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 MinimumReferred to in this study as a reference case against which to<br/>compare the various Local Plan scenarios. The 2036 Do-<br/>Minimum scenario does not contain housing or job growth in<br/>Chelmsford covering the Local Plan period 2021-2036.



**Fixed Demand** Demand for peak hour travel that does not change to take account of congestion on the road network.

- Matrix FurnessProcess of creating a matrix of vehicle journeys based on known<br/>trip ends for both origins and destinations.
- NTEM 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).
- **Variable Demand** Demand for peak hour travel that is adjusted to take account of congestion on the 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/CapacityThe volume of traffic calculated as a percentage of the capacityRatioof the road. 100% equates to the road being at full capacity –<br/>often characterised by large queue extents and delays.



# 2 Sensitivity Tests: Methodology & Assumptions

## 2.1 Sensitivity Tests

The three sensitivity tests that have been identified by CCC are as follows:

- **Test A** Alternative Urban Focus and Growth along Key Corridors
- Test B New Settlement and Safeguarding Green Wedges
- Test C Deliverability Focus

The following section of this report summarises these tests in terms of the assumptions used to model their wider impact on the transport network.

#### 2.1.1 Development location and access

All three sensitivity tests have been modelled using a 2036 forecast year (the end of the Local Plan period) and build on the 2036 Do-minimum scenario modelled as part of the appraisal of the three Spatial Options. Details of the Do-minimum scenario modelled can be found in the earlier Spatial Option testing report. The tests also include the same committed development proposals contained within the current plan period with construction now expected to extend beyond 2021.

Table 2-1 below summarises the additional housing development assumptions used for each option:

Development Locations	Sensitivity Test Development Allocations		
	Α	В	С
Location 1 Chelmsford Urban Area	2,500	2,500	2,500
Location 2 West Chelmsford	750	-	1,000
Location 3 North Chelmsford (Broomfield)	800	800	800
Location 4 North East Chelmsford	3,000	3,000	3,000
Location 5 East Chelmsford (East of Great Baddow)	500	-	500
Location 6 North of South Woodham Ferrers	1,500	2,250	2,000
Location 7 Great Leighs	250	1,250	300
Location 8 Howe Green	-	-	-



Development Locations	Sensitivit Allocatio	y Test Deve ns	elopment
Location 9 Rettendon Place	500	50	300
Location 10 Boreham	-	-	-
Location 11 Danbury	-	-	-
Location 12 Bicknacre	50	-	50
Location 13 Ford End	100	-	50
Location 14 Great Waltham	-	-	-
Location 15 Little Waltham	-	-	-
Location 16 East Hanningfield	50	-	50
Location 17 Woodham Ferrers	-	-	-
Location 18 East Chelmsford (North of Sandon)	100	-	100
Location 19 East Chelmsford (Hammonds Farm – New Settlement)	1,650	3,000	1,650
Location 20 Beaulieu Post 2021 Roll-Over	2,500	2,500	2,500
Location 21 Boreham Airfield	500	500	-
Location 22 Great Leighs - West	1,000	-	450

Table 2-1: Housing assumptions for Tests A-C

Table 2-2 below summarises the additional employment and retail assumptions used for each option:

Development Proposals	Description	Zone Location	Network load-on point
Greater Beaulieu Business Park	Business Park B1 40,000sqm	Zone 128	Via proposed Beaulieu Park junction north of Boreham Interchange.
Location 1 Chelmsford Urban Area	Food Retail 11,500sqm 4,000sqm office	Split across Zones 1 / 2 / 3 / 4 / 8 / 9 / 10 / 76 using existing distribution	Various
Location 4 North East Chelmsford	Office/Business Park 45,000sqm	Zone 97	Via 2x local access points to the proposed Radial Distributor Road



Development Proposals	Description	Zone Location	Network load-on point
Location 6 North of South Woodham Ferrers	Office 1,000sqm	Zone 111	50% via B1418, 50% via B1012
Location 18 East Chelmsford (North of Sandon)	5,000sqm Office/High Tech Business Park	Zone 136	Via A414 (west of A12)
Location 19 East Chelmsford (Hammonds Farm – New Settlement)	50,000sqm Office/High Tech Business Park	Zone 101	50% via A414 (east of A12), 50% via new access link connecting into Sandford Mill Lane (see Table 2-3)

Table 2-2: Employment and retail assumptions for Tests A-C

Trips starting or ending outside of the Chelmsford Administrative Area have been controlled to forecasts from the National Trip End Model (NTEM V6.2) as per the Department for Transport's guidance and in the absence of any more up-to-date information at the time of undertaking this work.

#### 2.1.2 Development trip generation and distribution

Vehicle trips to and from the developments by model zone have been calculated based on the assumptions listed above and using the same method as that employed for the Chelmsford Strategic Model initial forecasting as reported in the Traffic Forecasting Report, Version 2, August 2016. Zone connector shares have been updated to load the quantities of traffic associated with the development on the assumed connector nodes in the proportions detailed, whilst leaving the quantity of base traffic assigned as per the base model.

The total forecast year trips (base year trips and development trips for each option) have been distributed between start and end points (origins and destination zones) through a Furness process to create the demand matrices for the model. This method is also the same as that employed for the Chelmsford Strategic Model initial forecasting as reported in the Traffic Forecasting Report, Version 2, August 2016 and uses the distribution from the base model as a starting point.

Fuel and income factors as reported in the Traffic Forecasting Report, Version 2, August 2016 have been used to grow the vehicle matrices further to account for changes in those variables.



#### 2.1.3 Infrastructure

Each of the sensitivity tests has been modelled with the infrastructure outlined in Table 2-3:

Infrastructure	Description
Eastern Gateway Access Road	Road linking Navigation Road or High Bridge Road to Chelmer Viaduct via Chelmer Waterside providing an eastern gateway route into City Centre
A132 dualling	Dualling of A132 between junction with B1418 and A130
Additional Park and Ride in NE Chelmsford	Potential location to be tested at J19 A12 Boreham Interchange
Additional Park and Ride in south west/west Chelmsford	Potential location to be tested on A414 between London Road and Margaretting Road.
New junction on A130 Essex Regiment Way	New roundabout junction on the A130 Essex Regiment Way located north of the Park and Ride site off Pratt's Farm Lane. Development associated with the high-tech business park in Zone 91, has been reassigned to access via this new junction.
<b>Proposed</b> new access link to Hammonds Farm development	Proposed new access route connecting Hammonds Farm to A414 Maldon Road in vicinity of Sandon Mill Lane via new bridge over A12 (modelled using zone connectors).
<b>Proposed</b> signalisation of A12 J18 eastern roundabout	Developer proposed signalisation of the A414 approach and removal of the Hammonds Lane approach arm.

Table 2-3: Additional infrastructure modelled

Modelling also includes the proposed Chelmsford North East Bypass connecting the A130 at Great Leighs with the A12 at the Boreham Interchange<sup>2</sup>.

Thus, in effect, infrastructure considered in the Spatial Option modelling has been brought forward for inclusion in this latest assessment, but with the omission of the proposed Western Relief Road.

#### 2.1.4 Methods of analysis

In keeping with the methods of analysis undertaken for Spatial Options 1-3, modelled outputs for each time period (AM peak hour (08:00-09:00), IP hour (12:00-13:00), PM peak hour (17:00-18:00)) have been analysed and presented via the following methods:

<sup>&</sup>lt;sup>2</sup> Based on the Design Freeze A scheme design documented in 'Chelmsford North East Bypass

<sup>-</sup> Scheme Review Report: Volume 1' Jacobs, 12th November 2015



- Impact on network congestion analysis of volume over capacity ratios to provide insight into the likely future impact of each sensitivity test on levels and patterns of congestion in Chelmsford;
- Comparative impact on traffic flows analysis of likely flow differences between the sensitivity tests; and
- Impact on traffic flows analysis of likely vehicle flow differences between each sensitivity test and a Do-minimum development scenario.

Traffic flow analysis has been reported through the use of link flow diagrams illustrating modelled flows, or flow differences between scenarios, on the road network using coloured bars.

Although the comparison plots of each test against a Do-minimum development scenario are presented in the same style as those for Spatial Options 1-3 in the previous report (see Figure 4.2 & Appendix B), a direct comparison with earlier flow difference plots is not possible as these considered the impact of Local Plan development only, while the latest analysis incorporates additional infrastructure from the outset.

For the separate appraisals of the Writtle Bypass and A12 widening, volume over capacity ratio plots and flow difference plots with and without each scheme have been used to illustrate likely network impact. While modelling has considered the modelled impact of the schemes alongside each of the three sensitivity tests, the report illustrates the likely scheme impact using examples taken from one (or more) of the tests.

Analysis has been supported through the use of VISUM model screenshots. The screenshots used in the report cover the Chelmsford urban area defined as encompassing Beaulieu Park to the north, Sandon to the east, Galleywood to the south and Writtle to the west.

Coverage of the road network at the periphery of the VISUM model is less detailed, with network validation focussed on the urban area of Chelmsford. Consequently, the strategic highway impact of Local Plan development in South Woodham Ferrers and Great Leighs cannot be robustly quantified using the same modelling approach adopted for developments closer to Chelmsford.

This assessment does not, therefore, cover the local highway impact of development in Great Leighs and South Woodham Ferrers. A more detailed assessment of local junction impacts in the vicinity of the potential housing and development locations has been commissioned and will form part of the upcoming local junction appraisal of the Preferred Option.



# **3 Additional Mitigation Testing**

## 3.1 Scheme Proposals

#### 3.1.1 Writtle Bypass

Additional modelling has been undertaken to consider the impact of a Writtle Bypass connecting the A1060 to the A414 as a measure to mitigate growth in traffic flow through Writtle. The alignment of the route, signposted speeds and link capacity are indicative at this early stage, and have been set at a level to ensure a full modelled reassignment of through-traffic movements away from the existing Ongar Road / Lordship Road route. Thus, the maximum potential of the scheme has been considered in this study. Should the bypass be considered further in the future, a more detailed appraisal would be required.

To simplify the modelling, Cow Watering Lane has been used to represent the alignment of the bypass, with the capacity of the existing modelled link being enhanced and a new roundabout modelled at the junction with the A414. This can be seen in Figure 3.1 below. The area shaded in red represents the broad corridor within which it is envisaged that a Writtle Bypass would be routed.



Figure 3.1: Modelled / Possible area of alignment of a proposed Writtle Bypass



#### 3.1.2 A12 Widening Test

A further assessment has been undertaken to consider the impact of widening the A12 to three lanes around Chelmsford between Junctions 15 and 19 – the location of which is shown in Figure 3.2 below.

Highways England have recently concluded a public consultation on plans to widen the A12 between Junctions 19 (Boreham Interchange) and 25 (Marks Tey). Proposals have been shown to help address congestion along the route, provide network resilience and improve safety. While it is accepted that extension of the carriageway widening proposals to cover the A12 between Junctions 15 and 19 would likely provide benefits associated with network resilience and improved safety, this assessment appraises the extent of the congestion benefits in the local area associated with carriageway widening.



Figure 3.2: Extent of A12 widening modelled

Earlier appraisal of Spatial Options 1-3 revealed that modelled congestion along the A12 carriageway noticeably influenced patterns of traffic flow through Chelmsford city centre and along corridor routes into and out of the city. This, it was felt, had the potential to dilute the impact of Local Plan development and, in part explain the lack of difference in the impact of the various Local Plan Spatial Options on levels of congestion in and around the city centre.



Therefore, an assessment has been carried with the A12 widened to three lanes around Chelmsford to determine whether this might lead to a modelled reduction in traffic flow and congestion in the city centre and subsequently provide a better platform to evaluate the traffic impact of each sensitivity test.

### 3.2 Network Impact of a Writtle Bypass

Across Sensitivity Tests A-C, modelling suggests that the network impact of the proposed Writtle Bypass will be localised to Ongar Road, Lordship Road and adjacent rural routes.

Flows along the proposed bypass do not exceed 500 vehicles in either direction during peak hours. The majority of flows using the route in either direction are split between strategic movements travelling between the A414 and the A1060, and local traffic accessing development in the West of Chelmsford from the A414.

The largest transfer of vehicles to the proposed bypass is modelled in the PM peak – which, in turn, shows the greatest reduction in congestion along Ongar Road and Lordship Road. Figure 3.3 illustrates the impact of the bypass in the PM peak with Test C – containing the largest quantum of housing proposed on land to the west of Chelmsford.



Figure 3.3: 2036 PM Peak 'actual' link flow difference plots: Test C with / without Writtle Bypass



The following two plots illustrate the difference in congestion modelled along Ongar Road and Lordship Road with/without the bypass in place.



Figure 3.4: 2036 Test C with Writtle Bypass PM Peak 'volume / capacity ratios'



Figure 3.5: 2036 Test C without Writtle Bypass PM Peak 'volume / capacity ratios'



With reference to the keys in the congestion plots above, links modelled with a volume/capacity ratio of 85% or more 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. Those shown in the plots as having a ratio exceeding 90% have been highlighted as likely to experience moderate levels of congestion.

By comparing the modelled levels of congestion experienced in Writtle between a Test C development plus bypass, and a do-minimum scenario with neither (see Figure 3.6 below), it is apparent that the proposed bypass could be sufficient to mitigate the impacts of the Local Plan development on the road network in Writtle, but with little wider benefit.



Figure 3.6: 2036 Do-Minimum without Writtle Bypass PM Peak 'volume / capacity ratios'

Given the likely localised impact of the scheme, subsequent analysis in this report does not consider the traffic impact of Tests A-C both with and without the Writtle Bypass. Rather, focus has been placed on modelling the Tests <u>without</u> the Writtle Bypass.



## 3.3 Impact of A12 Widening

Model outputs demonstrate that widening of the A12 between Junction 15 (Margaretting) and 19 (Boreham) results in a small reduction in modelled city centre traffic flow along the A138 Chelmer Road, Springfield Road and rat-run routes through North Springfield – most notably in the AM peak with Tests A-C. In the PM peak, an increase in the capacity of the A12 carriageway is shown in the model to reduce the volume of rat-running along adjacent rural routes through Little Baddow.

This supports the assertions made in the reporting of Spatial Options 1-3 that congestion along the A12 results in a diversion of longer distance traffic flows to city centre routes.

It is, however, apparent that projected 2036 traffic flows along the A12 between J17 (Sandon) and J19 (Boreham) could exceed the capacity of a three-lane carriageway. As a consequence, modelled peak hour congestion is likely to remain on the A12 between these junctions. This limits the impact of carriageway widening in attracting longer distance traffic away from routes through the city centre. Instead, the widening facilitates better accessibility to the city centre via A1114 Essex Yeomanry Way (Baddow Bypass).



Figure 3.7: 2036 Test A without Writtle Bypass AM Peak 'volume / capacity ratios'





Figure 3.8: 2036 Test A without Writtle Bypass with A12 widened AM Peak 'volume / capacity ratios'



Figure 3.9: 2036 AM Peak 'actual' link flow difference plots: Test A with / without A12 widening





Figure 3.10: 2036 PM Peak 'actual' link flow difference plots: Test A with / without A12 widening

Overall, the assessment has shown that the widening of the A12 to three lanes has had little impact on city centre modelled traffic flow and congestion patterns. As such, it has not provided a sufficient platform to assess the comparative impact of the sensitivity tests with A12 traffic flows using the route as intended.

Subsequent comparative analysis of Tests A-C has therefore been undertaken without the widening of the A12 included.

Although modelling indicates that sections of the A12 around Chelmsford could require widening beyond three lanes in order to accommodate predicted traffic flows, we would recommend that further modelling is undertaken to confirm this and we have not undertaken any viability or feasibility work for A12 widening as part of this project.



# 4 Sensitivity Tests: Analysis

# 4.1 Summary Analysis: Congestion and traffic flow impact

#### 4.1.1 Congestion Analysis

As with Spatial Options 1-3, from the modelling it is difficult to differentiate between Sensitivity Tests A-C with regard to the impact of development traffic on levels of congestion across the wider Chelmsford urban area.

This is understood to be due to a number of contributory factors:

- the relatively small difference in the quantum of development proposed between the sensitivity tests;
- the broad spread of development proposed across the administrative area including Great Leighs and South Woodham Ferrers;
- the high levels of background congestion predicted in the city centre and along corridor routes by 2036 (as seen in Do-Minimum scenario modelling); and
- the influence of wider traffic re-routing as a result of A12 congestion.

Figure 4.1 below provides a snapshot of the similar levels of congestion modelled between the Tests in the AM peak. Areas highlighted in dark red are considered to be the most congested in the models.



Figure 4.1: 2036 AM Peak example congestion plots produced for Tests A-C in the Chelmsford urban area.

- Test A Alternative Urban Focus and Growth along Key Corridors
- Test B New Settlement and Safeguarding Green Wedges
- Test C Deliverability Focus



A full selection of congestion plots (accompanied with keys) can be found in Appendix A of this report.

#### 4.1.2 City Centre Congestion

It is apparent from the modelling that the potential housing, employment and infrastructure is likely to have little impact on the high levels of congestion modelled in the city centre and along many corridor routes into Chelmsford by 2036.

With limits on the availability of space to build sufficient physical infrastructure to address urban congestion, a strong emphasis will need to be placed on improving sustainable travel infrastructure, promoting the use of non-car modes, effective travel planning and addressing the sustainable accessibility of future development. This is considered further in Section 5 of this report.

#### 4.1.3 Link Flow Analysis

Link flow difference plots showing the impact of Local Plan development and infrastructure over a 'do-minimum' scenario are also included in the appendices of this report. These comparison plots (also 'summarised' in Figure 4.2 below) should not be compared directly with similar plots presented in the reporting of Spatial Options 1-3 as these consider the impact of Local Plan development only.

As with the congestion analysis, it is difficult to distinguish between each of the sensitivity tests with regard to their impact on modelled traffic flows across the wider Chelmsford urban area evaluated against a do-minimum scenario.

Figure 4.2 below provides a snapshot of the similar traffic flow impact modelled between the sensitivity tests in the AM peak. Areas highlighted in dark red are modelled as having the highest increases in flow over a do-minimum scenario, whilst areas highlighted in dark blue are modelled as having the highest decreases.





Figure 4.2: 2036 AM Peak example traffic flow difference plots produced for Tests A-C each against a dominimum scenario

A full selection of flow difference plots (accompanied with keys) can be found in Appendix B of this report.

When evaluated against a 'do-minimum' scenario, across a wider network the differences in traffic flow impact modelled between Tests A-C are shown to be small.

## 4.2 Comparative Analysis: Peak hour traffic flow impact

The following analysis considers the modelled traffic flow impact of one sensitivity test directly against another in the AM, Inter and PM peak hours. The modelling has assumed no A12 widening and no provision of a Writtle bypass.

Assessing the comparative impact of each sensitivity test on modelled traffic flows across Chelmsford helps to differentiate between the tests and highlight the likely local highway impact of larger developments. However, it should be caveated that the differences in modelled traffic flow between the tests has little impact on overall levels of congestion modelled across Chelmsford for each.

#### 4.2.1 AM Peak

The following figures show differences in modelled flows in the AM peak between pairs of sensitivity tests.





Figure 4.3: 2036 AM Peak 'actual' link flow difference plots: Test A vs Test B without Writtle Bypass



Figure 4.4: 2036 AM Peak 'actual' link flow difference plots: Test A vs Test C without Writtle Bypass





Figure 4.5: 2036 AM Peak 'actual' link flow difference plots: Test B vs Test A without Writtle Bypass



Figure 4.6: 2036 AM Peak 'actual' link flow difference plots: Test B vs Test C without Writtle Bypass





Figure 4.7: 2036 AM Peak 'actual' link flow difference plots: Test C vs Test A without Writtle Bypass



Figure 4.8: 2036 AM Peak 'actual' link flow difference plots: Test C vs Test B without Writtle Bypass



The modelling shows that Test C is likely to have the smallest overall comparative impact on traffic flows in the AM peak.

Test A is shown in the assessment to have the greatest overall impact on traffic flows across Chelmsford; it shows the largest increases in flow on city centre routes - notably Springfield Road, and also a larger increase in A12 traffic flows than in Test C.

Tests B and C appear to have a similar impact on modelled traffic flows across the wider network. At a more local level, the larger quantum of housing at the proposed Warren Farm development associated with Test C, results in a larger increase in modelled traffic flow along Lordship Road and Ongar Road in Writtle. Similarly, the larger quantity of housing at the proposed Hammonds Farm development associated with Test B, results in higher modelled traffic flows along the A12, at the A12 Junction 18, and along rural rat-run routes through Sandon, Bicknacre and East Hanningfield.

Test A is shown to experience higher volumes of modelled traffic along White Hart Lane in the north east of Chelmsford, leading to modelled flow increases along Springfield Road into the city centre. The modelled difference compared with Tests B and C appears predominantly as a result of congestion in the vicinity of Lawn Lane and Nabbott's Farm Roundabouts and a subsequent rerouting of local traffic (from the Beaulieu Park development) away from the Chelmer Valley Road route to the city centre.

It may not, however, be reasonable to attribute variations in the levels of congestion modelled along Chelmer Valley Road to the locations and quantum of Local Plan development proposed for each of the sensitivity tests.

With only minor differences identified between development proposals to the north of Chelmsford, the model is unlikely to be accurate enough to determine the scale of impact of each sensitivity test on traffic flows along Chelmer Valley Road, and across the city centre.<sup>3</sup>

However, the modelling does nevertheless highlight the levels of congestion possible along Chelmer Valley Road in the future and the unpredictability this could have on traffic assignment patterns into the city centre.

<sup>&</sup>lt;sup>3</sup> The accuracy of the model in this instance is determined by the how well the base model can and does replicate the observed situation in the area of interest.



#### 4.2.2 Inter Peak

The following figures show differences in modelled flows in the inter peak between pairs of sensitivity tests.



Figure 4.9: 2036 Inter Peak 'actual' link flow difference plots: Test A vs Test B without Writtle Bypass





Figure 4.10: 2036 Inter Peak 'actual' link flow difference plots: Test A vs Test C without Writtle Bypass



Figure 4.11: 2036 Inter Peak 'actual' link flow difference plots: Test B vs Test A without Writtle Bypass





Figure 4.12: 2036 Inter Peak 'actual' link flow difference plots: Test B vs Test C without Writtle Bypass



Figure 4.13: 2036 Inter Peak 'actual' link flow difference plots: Test C vs Test A without Writtle Bypass





Figure 4.14: 2036 Inter Peak 'actual' link flow difference plots: Test C vs Test B without Writtle Bypass

With lower overall levels of modelled background congestion along corridor routes into the city centre, and in the city centre itself, the modelled impact of development traffic on overall network flows is enhanced.

This, in turn, has magnified the modelled difference between Test A and Tests B & C with regard to the impact on flows in the north east of Chelmsford and along Springfield Road – as observed in the AM peak modelling. The flow difference plots shown below also suggest a switch from Chelmer Valley Road to Springfield Road in Test A, resulting in a change in the modelled pattern of traffic flow approaching the city centre – although overall volumes of traffic into the city centre remain broadly the same.

As with the AM peak analysis, the modelled shift in city centre corridor approach flows appears unlikely to be the direct result of local development proposals associated with Test A. Given there are only minor differences identified between development proposals to the north of Chelmsford, the model is unlikely to be accurate enough to determine the scale of impact on conditions along Chelmer Valley Road, and across the city.



As with the AM peak, there is little difference in traffic flow impact between Test B and Test C – except locally in the vicinity of Hammonds Farm and Warren Farm.

#### 4.2.3 PM Peak

The following figures show differences in modelled flows in the PM peak between pairs of sensitivity tests.



Figure 4.15: 2036 PM Peak 'actual' link flow difference plots: Test A vs Test B without Writtle Bypass




Figure 4.16: 2036 PM Peak 'actual' link flow difference plots: Test A vs Test C without Writtle Bypass



Figure 4.17: 2036 PM Peak 'actual' link flow difference plots: Test B vs Test A without Writtle Bypass





Figure 4.18: 2036 PM Peak 'actual' link flow difference plots: Test B vs Test C without Writtle Bypass



Figure 4.19: 2036 PM Peak 'actual' link flow difference plots: Test C vs Test A without Writtle Bypass





Figure 4.20: 2036 PM Peak 'actual' link flow difference plots: Test C vs Test B without Writtle Bypass

The PM peak is the most congested of the three peaks modelled, and highlights different variations between the sensitivity tests. However, Test C is again shown to have the smallest overall comparative impact on modelled traffic flows.

There appears to be little overall difference in modelled traffic flow impact between Test A and Test C. Test C looks likely to result in higher flows along Colchester Road and Chelmer Road, while it suggests Test A is likely to result in higher flows along White Hart Lane and Essex Yeomanry Way (Baddow Bypass).

The modelling shows variation in approach flow to the Boreham Interchange via Colchester Road and Chelmer Road. These links, along with the A12 and rural routes to the east of Chelmsford are all shown in the modelling to experience higher volumes of traffic with Test B – predominantly as a result of the larger development numbers proposed on the Hammonds Farm site. It is therefore apparent from the modelling that Test B is likely to have the largest overall impact on traffic flows in the PM peak.



## **5** Sustainable Infrastructure Review

## 5.1 Census Journey to Work Characteristics

Analysis of the 2011 Census journey to work data has been undertaken in order to establish the existing commuting travel patterns within the Chelmsford administrative area, and major origins and destinations for work. Full details can be found in Appendix C.

#### 5.1.1 Journey to Work trips within Chelmsford

Analysis of journey to work trips contained within Chelmsford administrative area found that:

• Over half of Chelmsford residents (55.5%) currently commute within the Chelmsford administrative area for work, and over half of these residents travel to work by car (53.0%).

To reduce car travel, the focus should be to target the 53% of residents who drive to work within the Chelmsford administrative area, and encourage a modal shift to more sustainable modes of travel (bus travel, cycling and walking). Which mode residents will shift to will depend on the length of journey being undertaken and proximity of their journey to the city centre.

The Department for Transport (DfT) has guidelines for acceptable cycling distances<sup>4</sup>, which state that an acceptable cycling distance to the town centre is 4km (2.4 miles). Therefore, journey to work trip census data from areas of Chelmsford within 4km from the city centre to the city centre (defined as the centre point of area bound by Victoria Road and Parkway for purpose of analysis) was analysed.

<sup>&</sup>lt;sup>4</sup> Department for Transport (DfT) LTN 1/04 3.10.13 – acceptable cycling limits





Figure 5.1: Modal split of journey to work trips from areas within 4km of the city centre to the city centre (2011 Census JTW)

Figure 5.1 shows that 35.2% of Chelmsford residents, who live within 4km from the city centre (acceptable cycling distance) and also work in the city centre, drive to work.

Similar analysis was undertaken for Colchester (designated a Cycling Town in 2008, with a Cycling Town Delivery Strategy<sup>5</sup> that sets out targets and objectives, and how they will be achieved) and Ipswich (in the neighbouring Suffolk region). Table 5-1 provides a direct comparison of modal split for Chelmsford, Colchester and Ipswich.

<sup>&</sup>lt;sup>5</sup> Colchester Borough Council (2008) Colchester Cycling Town Delivery Strategy and (2012) Colchester Cycling Delivery Strategy Supplementary Planning Document



Origin and Destination	% Modal Split					
	Drive to work	Travel on foot	Cycle	Bus		
Chelmsford	35.2	38	8.1	10.4		
Colchester	35.6	31.8	6	17.3		
Ipswich	30.7	37.2	5.9	16.8		

Table 5-1: Comparison of modal split for journey to work trips from within 4km of the city/town centre to the city/town centre

The uptake of cycling to work within a 4km radius of the centre for Chelmsford was higher in 2011 than for Colchester, which has Cycling Town status. The percentage of those travelling to work by bicycle has the potential to increase further, as there are significant planned improvements to the cycle infrastructure across Chelmsford through the Chelmsford Growth Package and Chelmsford Cycling Plan, which forms part of the Essex Cycling Strategy. These seek to improve the connectivity of outer regions of Chelmsford to the city centre.

There is however, a much lower proportion of commuters within 4km of the centre choosing to travel by bus in Chelmsford compared to Colchester and Ipswich. Based on towns of a similar size and demographic, there would appear to be the potential to encourage a greater uptake of bus travel in Chelmsford.

#### 5.1.2 Journey to Work Trips to and from Chelmsford

Analysis of journey to work trips to Chelmsford from outside and from Chelmsford to outside indicates that:

- The majority of trips from the Chelmsford administrative area to Basildon and Braintree (popular work destinations for Chelmsford residents after Chelmsford and London), are made by car (more than 80%). However, commuters from Chelmsford to London demonstrate different travel behaviour, as the majority of Chelmsford residents who work in London travel by train (70.1%). The existing rail infrastructure provides frequent and speedy train services from Chelmsford to Stratford and London Liverpool Street; and
- The majority of trips from outside of the Chelmsford administrative area to the administrative area are made by car (more than 80%, except London, where the percentage is lower (66.4%)). To reduce car travel in the city centre for work, these trips need to be in scope of one of the existing Park and Ride services (at Sandon and Chelmer Valley).



#### 5.1.3 Increasing levels of sustainable travel

- In order to sustainably tackle the growth in Chelmsford and the impact of additional traffic within the local area, there is a need to promote and encourage sustainable travelling, targeting both existing residents, as well as residents of the new developments.
- For development locations within 4km of the city centre, focus on promoting walking, cycling and bus travel for journey to work trips into the city centre is important. Section 5.2.4 in this report will provide more information on the role that cycling can play in Chelmsford.
- For development locations more than 4km from the city centre, focus should be on making bus travel more attractive for journey to work trips to the centre. As the majority of commuters travelling from Chelmsford and beyond, drive to work in Chelmsford, the use of Park and Ride facilities should be encouraged to intercept car trips on the outskirts of Chelmsford, rather than retain them travelling into the city centre.

## 5.2 Role of Public Transport and Sustainable Modes

#### 5.2.1 Public Transport – Existing Situation

Buses play an important role in Essex as a sustainable transport alternative to the car. This has been emphasised in 'Getting around Essex - A bus and passenger Transport Strategy Summary (September 2015)'. Therefore, ECC have set objectives and priorities in their long term strategy to deliver improved services.

Around 85% of bus services in Essex are commercially operated, however in Chelmsford, a number of bus routes are funded by Essex County Council at certain times of the day (mostly evening and weekend services). The existing bus services within the Chelmsford administrative area are operated predominantly by First Essex. There are also a number of independent bus operators within the area, and these include Stephensons of Essex, Regal Busways, JW Lodge & sons, Ford Coaches, NIBSbuses, as well as a number of demand response services (e.g. Chelmsford Community Transport and Arrow Taxis). Days of operation and service frequency vary greatly between the different services due to management by different parties.

Bus services are concentrated within the centre of Chelmsford, linking the city centre, railway station and the surrounding areas. The majority of services run



through the bus station, and therefore the city centre is well served by existing bus services. Further out from the centre, the number of buses serving the local area decreases. Accessible transport is also provided via a passenger transport scheme in Chelmsford, the Chelmsford Community Transport, which helps people who are rurally isolated or have restricted mobility.

#### 5.2.2 Public Transport – Development Proposals

The Spatial Options for Chelmsford were set out by CCC in their document, Chelmsford Local Plan – Issues and Options Consultation, November 2015<sup>6</sup>. These are:

- Spatial Option 1 Urban Focus;
- Spatial Option 2 Urban Focus and Growth on Key Transport Corridors; and
- Spatial Option 3 Urban Focus and Growth in Key Villages.

More information about these options can be found in the aforementioned document.

In addition, three sensitivity tests have been developed (see Section 2.1):

- Test A Alternative Urban Focus and Growth along Key Transport Corridors;
- Test B New Settlement and Safeguarding Green Wedges; and
- Test C Deliverability Focus.

Within the three Spatial Options, there are a number of large potential housing locations (more than 500 houses) for the Chelmsford administrative area. These are listed in Table 5-2 below, and are the main focus of the bus service accessibility review.

Location Number	Name/ Location	Maximum number of proposed housing units
1	Chelmsford urban area and food/retail spaces	2,500 (all options)
2	West Chelmsford	3,000 (Option 1)
3	North Chelmsford (Broomfield)	1,500 (Option 1)
4	North East Chelmsford and office/retail spaces (B1)	3,000 (Option 1)

<sup>&</sup>lt;sup>6</sup> Chelmsford City Council (2015) Chelmsford Local Plan Issues and Options Consultation Document.



Location Number	Name/ Location	Maximum number of proposed housing units
6	North of South Woodham Ferrers	2,000 (Option 1)
7	Great Leighs	2,000 (Option 1)
8	Howe Green	800 (Option 3)
9	Rettendon Place	1,250 (Option 2)
10	Boreham	800 (Option 3)

Table 5-2: Major developments within Spatial Options 1-3 of more than 500 housing units

The following listed below are large potential housing locations (more than 500 houses) within Tests A-C:

Location Number	Name/ Location	Maximum number of proposed housing units
1	Chelmsford urban area and food/retail spaces	2,500 (all tests)
2	West Chelmsford	750 (Test A); 1,000 (Test C)
3	North Chelmsford (Broomfield)	800 (all tests)
4	North East Chelmsford and office/retail spaces (B1)	3,000 (all tests)
5	East Chelmsford (East of Great Baddow)	500 (Test A and C)
6	North of South Woodham Ferrers	1,500 (Test A); 2,250 (Test B); 2,000 (Test C)
7	Great Leighs	1,250 (Test B)
9	Rettendon Place	500 (Test A)
19	Hammonds Farm	1,650 (Tests A and C); 3,000 (Test B)
20	North Chelmsford (Beaulieu Roll Over)	2,500 (all tests) existing plan commitment
21	Boreham Airfield	500 (Tests A and B)
22	Great Leighs (west)	1,000 (Test A)

Table 5-3: Major developments within Tests A-C of more than 500 housing units

At the time of writing, Location 18 North of Sandon housing has increased to up to 400 housing for Tests A-C and has been assessed in terms of sustainable infrastructure upon request by CCC.



The Highways and Transportation Development Control Policies guidance for Essex<sup>7</sup> states that all new residential and industrial estates must be accessible by public transport and all units must be within 400 metres (acceptable walking distance) of a bus stop.

In order to meet requirements for new developments in terms of bus service accessibility, actions may include extension of an existing bus route into the development to serve the full development, addition of bus stops along an existing route, or addition of a new service to connect the development to local facilities in the city centre or nearby settlements. The most feasible option for each development will be dependent on the location, and frequency of existing services, and determined by further analysis e.g. review existing bus patronage, potential demand for bus services generated by the new development, and impact of route extensions on the service frequency.

Table 5-4 below provides a summary of the number of local buses currently serving each development location in the peak hours and theoretically possible indicative ways of improving their accessibility by bus. For more detailed information including maps indicating how close those potential housing and employment locations are from existing bus routes see Appendix D.

Location	AM peak buses (8-9hr)	PM peak buses (17- 18hr)	Nearest bus stop	Location currently within 400m of bus stop? Areas not covered?	Ways of improving bus accessibility
1 Chelmsford Urban Area	>15	>15	Bus station expected to be within reasonable walking distance	Yes	
2 West Chelmsford	6	6	2 buses-Avon Road (east), 2 buses-Roxwell Road (south)	Not completely Western/ north- western area of development	Possible extension of bus route into the development
3 North Chelmsford (Broomfield)	11	13	5 buses- Broomfield hospital (south), 6 buses-Broomfield Road (east)	Not completely North western area of the development	Possible extension of bus route into the development

<sup>&</sup>lt;sup>7</sup> Essex County Council (2007) Highways and Transportation Development Control Policies



Location	AM peak buses (8-9hr)	PM peak buses (17- 18hr)	Nearest bus stop	Location currently within 400m of bus stop? Areas not covered?	Ways of improving bus accessibility
4 North East Chelmsford	5	5	>400m	No Planned development will put parts of the location within 400m	Possible extension of Channels bus service route. Analysis to ensure bus provision meets demand for office/retail development during peak hours
5 East Chelmsford (East of Great Baddow)	3	3	Manor Farm shop (south)	Potentially. Dependent on area of development.	
6 North of South Woodham Ferrers	3	3	2 buses- Burnham Road library (south west of main development)	No North and east of the development	Possible extension of bus route into the development
7/22 Great Leighs/ Great Leighs West	3	3	All buses run through the middle of the development	Not completely Outer edges of the development	Possible extension of bus route into the development location.
8 Howe Green	0	0	4 buses-East Hanningfield Road (north east)	Not completely Southern and western area of development	Possible introduction of bus (through East Hanningfield- west of development)
9 Rettendon Place	0	0	School bus stop on main road (south west)	Not completely Eastern side of the development	Possible addition of bus stop and potential increase in frequency.
10 Boreham	4	4	3 buses- Plantation Road (west) and Church (south west)	Not completely Eastern and south- eastern area of the development	Possible addition of bus stops along Plantation Road.
18 North of Sandon	3	3	Brick Kiln Road	Potentially. Dependent on area of development.	Possible extension of bus route should the location be more than 400m from north to south.
19 Hammonds Farm	3	3	Old Boarding School (south)	Potentially. Dependent on area of development.	Possible extension of bus route should the location be more than 400m from north to south.



Location	AM peak buses (8-9hr)	PM peak buses (17- 18hr)	Nearest bus stop	Location currently within 400m of bus stop? Areas not covered?	Ways of improving bus accessibility
20 North Chelmsford (Beaulieu Roll Over)	2	2	>400m	No Planned development will put parts of the location within 400m	Ensure that there is good connectivity to bus and rail services
21 Boreham Airfield	0	0	>400m	No	Possible extension of the Channels bus route north.

Table 5-4: Major development locations, existing peak bus services and potential action

This suggests that the Chelmsford Urban Area (1) and North Chelmsford Broomfield (3) developments are currently the best served in terms of provision of buses on their existing closest bus routes. It can be seen that, with the exception of the Chelmsford Urban Area (1) and East Chelmsford east of Baddow (5), none of the other development locations are likely to fall completely within 400m of an existing bus stop. However, the following development locations would appear to have most of their area located within 400m of an existing bus stop:

- West Chelmsford (2);
- North Chelmsford Broomfield (3);
- Great Leighs (7/22);
- Howe Green (8);
- Rettendon Place (9);
- Boreham (10);
- North of Sandon (18) dependent on area of development;
- Hammonds Farm (19) dependent on area of development; and
- North Chelmsford (Beaulieu Roll Over) (20).

Thus the Chelmsford Urban Area (1) and the North Chelmsford Broomfield (3) development locations are the best for encouraging bus use to/from new developments from existing infrastructure.

#### 5.2.3 Impact of improved bus services

There are a number of studies that have looked at the impact of improving bus services. In particular, the University of Leeds conducted a study in conjunction with the Institute for Transport Studies, investigating the link between buses and



economic growth<sup>8</sup>. The study estimated that approximately 360,000 people have a job that is considered better and more productive due to improved accessibility provided by adequate bus services. The study also suggested that approximately 30,000 people would not be in the UK labour market without bus services.

It identified that bus services provide access to education and training, especially for deprived areas, and supports the vitality of urban centres by providing access to retail and leisure facilities.

20% of the study interviewees stated that they had not applied for or had turned down a job due to the lack of a suitable bus service between their origin and the job. It was noted amongst the respondents that fares and journey times were key factors in the decision-making process on primary mode of transport.

Therefore, it is reasonable to suggest that improving bus services will have the potential to reduce the number of car trips, and also lead to additional economic benefits, however, this is dependent on journey times, reliability and fares of bus services available.

#### 5.2.4 Cycling – Existing Situation

Chelmsford has an existing cycle network which provides connections between different parts of Chelmsford (e.g. city centre, Chelmer Village, Moulsham, Melbourne).

The studies for the Chelmsford Growth Package, have identified potential gaps in cycling network and infrastructure in Chelmsford. This includes the general desire for more cycling and walking links, particularly in North Chelmsford, and concern surrounding the lack of safe cycle routes between Broomfield and the city centre.

There is already significant growth planned in the cycling network (subject to funding) with increasing connectivity by bicycle between different parts of the Chelmsford administrative area. A proportion of the secured £15 million Chelmsford Growth Package (CGP) is expected to fund new and improve cycle links in and around Chelmsford urban area. The Chelmsford Cycle Action Plan, which forms part of the county-wide Essex Cycling Strategy, also hopes to assist in increasing level of cycling to work for shorter journeys. It has been emphasised in responses to the Issues and Options Consultation for the Chelmsford Cycle Action Plan, that new suburbs must be well connected with cycle paths. There are

<sup>&</sup>lt;sup>8</sup> https://www.its.leeds.ac.uk/fileadmin/user\_upload/News/BusesEconomicGrowth\_FINAL-REPORT.pdf



plans for an extensive network throughout the Greater Beaulieu Park, cycle routes to north-west (Melbourne) and more towards the south of the city (Moulsham and Galleywood). These plans will benefit existing residents and employees of the City, helping to reduce the number of their existing and forecast growth in car trips, and depending on the development location, may also benefit residents and employees of future planned developments.

#### 5.2.5 Cycling – Impact of development location

Since 2007, the Cycle Monitor sites in Chelmsford have recorded a 27% increase in the number of cyclists in a period where general traffic growth remained static. This indicates that improvements in cycle facilities and the network have been successful in promoting cycling as a travel choice. To maintain growth in the cyclist numbers within the Chelmsford administrative area, new developments within acceptable cycling distances should be well connected via cycle routes to the city centre.

Department for Transport (DfT) has guidelines for acceptable cycling distances<sup>9</sup>, which state that an acceptable cycling distance is considered to be 4km (2.4 miles), which is the average length of cycling journeys. Therefore, developments within 4km of the city centre and existing and potential train stations have been considered.

The developments within approximately 4km of the city centre include:

- Location 1 (Urban Chelmsford Area);
- Location 2 (West Chelmsford);
- Location 5 (East Chelmsford east of Great Baddow);
- Location 18 (North of Sandon);
- Location 19 (Hammonds Farm); and
- Location 20 (North Chelmsford Beaulieu Roll Over).

These are shown in Figure 5.2 below.

<sup>&</sup>lt;sup>9</sup> Department for Transport (DfT) LTN 1/04 3.10.13 – acceptable cycling limits





Figure 5.2: 4km buffer around the city centre

The potential housing and employment location 1 is already well connected by existing cycle routes, and the CGP will increase connectivity to the other parts of Chelmsford administrative area. The existing cycling network radiates out from the city centre and follows green wedges (areas designed to protect river valleys) in Chelmsford e.g. River Chelmer North green wedge and River Can and River Wid West green wedge. The existing cycle routes provide good connectivity to surrounding residential areas. It has been identified by CCC in the Site Allocations document for the Local Development Framework that enhancement of existing and creation of new footpaths and cycle routes along green wedges in Chelmsford is planned and will further improve connectivity by bike and foot.

Proposals exist to extend cycle routes around Chignall Road and Broomfield Road leading into the city centre, and residents of West Chelmsford development location (2) would benefit from these routes on the cycle network. There is potential for extension of the safe cycle route to connect the development to the



proposed cycle routes within the vicinity (which includes off-road cycle links to the city centre through Admirals Park, and extends to Writtle).

The potential East Chelmsford housing location (5) is served by an existing cycle route which goes north-west from the location towards Chelmer Village and westwards from there to the city centre. The route also extends north-eastwards crossing the A12 and further eastwards from there. Hammonds Farm (19) is located within 500m of the potential East Chelmsford housing location (5) and therefore there is potential to connect Hammonds Farm to the development and the existing cycle route that goes through the potential East Chelmsford housing location location.

The potential North of Sandon housing location (18) is located within 500m of an existing cycle route that leads north west towards the city centre. There is potential for extension to provide a safe cycle route to join the development to existing routes.

Beaulieu Park cycle routes are proposed as part of the Beaulieu Park development, and therefore the North Chelmsford Beaulieu Roll Over (20) development location should be well connected to the existing cycle network and the city centre (south westward) with the existence of the Beaulieu Park cycle routes.

The feasibility of improving the cycle network at each development location is dependent on the existing infrastructure, size of the development, and the distance from the city centre and commuter towns. For more rural locations, local cycle routes to facilities such as the post office may promote cycling locally. However it will not have an impact on cycle trips into Chelmsford.

There are a few potential development locations which are within acceptable cycling distance to train stations, as shown in Figure 5.3.





Figure 5.3: 4km buffer around the South Woodham Ferrers and Battlesbridge Station

Locations 6 (North of South Woodham Ferrers), 9 (Rettendon Place), and 17 (Woodham Ferrers) are within 4km of South Woodham Ferrers Station. However, there are no existing cycle routes to connect these locations to the station. Rettendon Place (9) also lies within 4km of Battlesbridge Station, and there is an existing cycle path between them. However, it does not provide a continuous route between Rettendon Place and Battlesbridge Station. Additional and extension of cycle routes may improve the accessibility of development to the nearby stations, and encourage cycling for short trips to and from the station.





Figure 5.4: 4km buffer around the proposed Beaulieu station

The housing and employment locations in the north and north east of Chelmsford (development locations 4, 10, 20 and 21) are within 4km of the proposed Beaulieu station. Proposed Beaulieu Park cycle routes extend across the whole of the Beaulieu Park, and connect to the existing Chelmsford cycle network, and provide routes from the Beaulieu Roll Over location to the station. Extension of the cycle routes to cover North East Chelmsford (4) and Boreham Airfield (21) developments further north should increase accessibility of these locations to the new station. There is an existing cycle route from city centre, passing the new station to the western periphery of Boreham. The cycle route could potentially be



extended into Boreham, and provide a direct safe route to the new rail station or the park and ride, reducing the number of short car trips to the station. The development at Boreham is not deemed to be located within suitable cycle distances to the city centre, however with the extension of the cycle network to the development, this would also provide an option to cycle longer distances (>4km) to the city centre.

Although the other development locations are not located within 4km of the city centre or a railway station, and therefore not within acceptable cycling distances, the existing cycle infrastructure has been reviewed and potential improvements have been identified.

- Location 3 (Broomfield) has an existing cycle route to Great Waltham to the east, and a cycle route (mixed on and off-road) is under consideration along Broomfield Road going south, connecting to the existing cycle network at Springfield and Melbourne. This would significantly increase accessibility by bicycle to the city centre.
- Locations 8 (Howe Green) and 9 (Rettendon Place) have limited local services, and little or no existing cycle routes in the vicinity, and are not within acceptable cycling distances to larger settlements. Location 7/22 (Great Leighs) has an existing school, post office, restaurants and employment area, and is located approximately 2km southwest of Great Notley Garden Village, Currently there is no existing cycle route between Great Notley and Great Leighs. Improvement in bus infrastructure would potentially be more beneficial in providing direct and improved access to the city centre and other local facilities.
- Of the smaller potential housing locations (less than 500 housing units) and those not mentioned, 11 (Danbury), 12 (Bicknacre), 13 (Ford End), 15 (Little Waltham), and 16 (East Hanningfield) are currently not connected by any cycle routes. Focus at these locations should be on improving accessibility to local services.

For development locations within 4km of the city centre or railway station, improvements in cycle infrastructure such as safe cycle routes and provision of cycle parking at the station will encourage uptake of cycling for shorter trips and provide good connectivity with other modes of public transport. However, for smaller development locations, improvement should focus on improving local connectivity to enable access to local services. In more rural locations,



improvement of bus services may likely have a greater impact on travel choices than improvement in cycling provision.

#### 5.2.6 Impact of improved cycle facilities

A number of studies have been undertaken in order to assess the impact of improving cycling levels through the provision of infrastructure, promotion/ marketing of cycling and cycle training. The majority of these studies have taken place between 2004 and 2009. The most prominent studies are "The Effects of Smarter Choice Programmes in the Sustainable Travel Towns: Summary Report" (DfT)<sup>10</sup> and "Cycling Demonstration Towns Monitoring Project Report 2006 to 2009" (Cycling England)<sup>11</sup>. These studies took place in 8 different towns / cities in a variety of locations within the UK.

The studies found that cycling levels have increased by between 3% and 55%, with an average increase of around 23% in each location over a 4 - 5 year period, while the percentage decrease in vehicle trips was around -2.5% over the same period. Considering the number of existing car trips, -2.5% over the 4-5 years equates to a fairly significant number of vehicles.

Results demonstrate that a targeted and integrated approach leads to a positive result in modal shift from car use to cycling. The Essex Cycle Strategy and the subsequent District / Borough / City based Cycling Action Plans aim to provide a similar approach which will help to boost cycling levels in the City. In addition, it is anticipated that a proportion of the £15 million secured for the CGP will be used to fund new and improved cycle links in and around the Chelmsford administrative area. The CyclePoint initiative at Chelmsford station was introduced in 2013 and has been a successful scheme providing 1000 bicycle parking spaces and changing room facilities. It is regularly close to capacity and therefore demonstrates that targeted schemes will aid change travel behaviour.

#### 5.2.7 Rail

The proposed Beaulieu Rail Station will provide existing and new residents in north and north-east Chelmsford with a more convenient alternative to Chelmsford rail station. This would likely reduce the demand for Chelmsford station and ease the number of car trips into the centre, especially trips solely for the rail station. Residential areas of proposed locations 4, 5 and 10 are located

<sup>&</sup>lt;sup>10</sup> https://www.gov.uk/government/publications/the-effects-of-smarter-choice-programmes-in-the-sustainable-travel-towns-full-report

http://webarchive.nationalarchives.gov.uk/20110407094607/http://www.dft.gov.uk/cyclingenglan d/site/wp-content/uploads/2009/12/cdts-monitoring-project-report-2006-09.pdf



1.5km north, 1.8m east and 3.8km south of the proposed station respectively, and improvements to bus and cycle facilities could potentially minimise the number of short car trips from these new development locations to the rail station.

The existing rail station at South Woodham Ferrers is also located around 1km from the proposed housing location to the north of the town. Improvements made to walking and cycle facilities in the area could help to reduce the number of short car trips made to the rail station.

#### 5.2.8 Sustainable Travel Planning

Sustainable travel planning will need to play an important role in promoting sustainable travel. Implementation of a travel plans for new developments can influence travel behaviour locally. Measures may include:

- implementation of car sharing schemes;
- inclusion of public transport vouchers or discount schemes for residents of new developments (in conjunction with any new bus services/routes);
- shuttle bus services for employment travel (for example the
- implementation of the Channels bus service) ; and
- facilities for encouraging cycling e.g. secure storage lockers and changing facilities.

Personal Travel Planning (PTP) schemes involve engaging with residents through interviews and handing out PTP packs that include useful transport leaflets and incentives, to promote sustainable transport.

It has previously been implemented in Harlow with some success during 2009-2011. During the first PTP study in Harlow, there was an overall 6% reduction in car trips and 14% increase in walking observed over a 5 month period in Mark Hall, Fifth Avenue and the Katherines area. The second PTP study in the Sumners estate and the Katherines area also saw a reduction in car trips (7% and 11% reduction in the Sumners and Katherines area respectively) over a 5 month period in 2010. Finally, the third PTP study extended target area to Great Parndon, Kingsmoor, Stewards and Sumners Farm estates in 2011. Overall, walking increased by 32% and bus use by 17%, which was due to the discount 'taste' tickets provided by the bus operator.



## 6 Summary & Conclusion

As with Spatial Options 1-3, it is difficult to differentiate between Sensitivity Tests A-C with regard to the likely impact of development traffic on levels of congestion across the wider Chelmsford urban area. This is understood to be due to the small difference in the quantum of development proposed between the Tests and the broad spread of development proposed across the administrative area.

Across the modelled peak hours, Tests C would appear to be consistent in generating the smallest overall traffic flow increases across the Chelmsford urban area, along the A12 and city centre routes. This is perhaps understandable with Test C having the lowest overall quantum and broadest dispersal of development across the administrative area.

The strategic highway impact of Local Plan development in South Woodham Ferrers and Great Leighs cannot be robustly quantified using the same modelling approach adopted for developments closer to Chelmsford. A more detailed assessment of local junction impacts in the vicinity of the potential housing and employment locations has been commissioned and will form part of an upcoming local junction appraisal of the Preferred Option.

At a more local level, Test C shows the largest increase in modelled traffic flow along Lordship Road and Ongar Road in Writtle, while Test B shows the largest increase in modelled traffic flow along the A12, at the A12 Junction 18, and along rural rat-run routes through Sandon, Bicknacre and East Hanningfield. These differences can be attributed to the proposed development locations at Warren Farm (West Chelmsford Location 2) and Hammonds Farm (Location 19) respectively.

With regard to mitigation, modelling suggests that the network impact of the proposed Writtle Bypass will be confined to the local area to the west of Chelmsford. The bypass itself might be expected to carry small volumes of traffic sufficient to mitigate the impacts of a Warren Farm development (Location 2) of around 1000 dwellings on the road network through Writtle.

Similarly, A12 widening to three lanes appears to have little overall impact on levels of congestion predicted along corridor routes into the city centre and through the city centre itself. Modelling suggests that congestion will likely remain on the widened A12 carriageway between Junctions 17 and 19, limiting the transfer of longer-distance trips from city centre routes back to the A12 trunk road.



With limited opportunities to increase the capacity to address congestion across the urban area of Chelmsford, a strong emphasis will need to be placed on improving sustainable travel infrastructure, promoting the use of non-car modes, effective travel planning and addressing the sustainable accessibility of future development.

In reviewing sustainable transport, there is potential for modal shift - especially for journey to work trips from within 4km of the city centre towards the centre, switching from car to bus or bicycle. Development location-specific action will likely improve existing bus and cycle infrastructure, and encourage the uptake of more sustainable forms of travel.

From beyond 4km of the city centre, focus on improving bus provision, and encouraging use of Park and Ride facilities will minimise additional traffic in the city centre, especially during peak hours. The Chelmsford Urban Area and the North Chelmsford (Broomfield) area are the best locations of those proposed for more than 500 houses for encouraging bus use to/from new developments using existing infrastructure.

There are three potential housing locations consisting of more than 500 houses within acceptable cycling distances to the city centre within spatial options 1-3 (Chelmsford Urban area, West Chelmsford and East Chelmsford) and an additional 2 (East Chelmsford East of Baddow and some extent of Hammonds Farm) within Sensitivity Tests A-C. To maximise cycling from these developments, the accessibility to safe cycle routes should be increased through extensions to the proposed and existing cycling network, providing direct routes to the city centre. Improvements to cycle links are likely to form part of the CGP, including upgrades to signage and lighting for example, and there are opportunities to further enhance cycle routes along Chelmsford's green wedges. The successful cycle parking initiative, CyclePoint, has demonstrated that there is potential to influence travel behaviour to/from train stations and this has potential to be replicated at the proposed Beaulieu Station.

Sustainable travel planning will need to play a vital role in promoting sustainable travel, especially for new developments. Change in travel behaviour can be influenced by incentives to use bus services or implementation of car sharing schemes.



# **Appendices**



# **Appendix A: Congestion Plots**





Figure A-1: 2036 Test A with Writtle Bypass AM Peak 'volume / capacity ratios'



Figure A-2: 2036 Test A without Writtle Bypass AM Peak 'volume / capacity ratios'





Figure A-3: 2036 Test A without Writtle Bypass with A12 widened AM Peak 'volume / capacity ratios'



Figure A-4: 2036 Test B with Writtle Bypass AM Peak 'volume / capacity ratios'





Figure A-5: 2036 Test B without Writtle Bypass AM Peak 'volume / capacity ratios'



Figure A-6: 2036 Test B without Writtle Bypass with A12 widened AM Peak 'volume / capacity ratios'





Figure A-7: 2036 Test C with Writtle Bypass AM Peak 'volume / capacity ratios'



Figure A-8: 2036 Test C without Writtle Bypass AM Peak 'volume / capacity ratios'





Figure A-9: 2036 Test C without Writtle Bypass with A12 widened AM Peak 'volume / capacity ratios'



Figure A-10: 2036 Test A with Writtle Bypass Inter Peak 'volume / capacity ratios'





Figure A-11: 2036 Test A without Writtle Bypass Inter Peak 'volume / capacity ratios'



Figure A-12: 2036 Test A without Writtle Bypass with A12 widened Inter Peak 'volume / capacity ratios'





Figure A-13: 2036 Test B with Writtle Bypass Inter Peak 'volume / capacity ratios'



Figure A-14: 2036 Test B without Writtle Bypass Inter Peak 'volume / capacity ratios'





Figure A-15: 2036 Test B without Writtle Bypass with A12 widened Inter Peak 'volume / capacity ratios'



Figure A-16: 2036 Test C with Writtle Bypass Inter Peak 'volume / capacity ratios'





Figure A-17: 2036 Test C without Writtle Bypass Inter Peak 'volume / capacity ratios'



Figure A-18: 2036 Test C without Writtle Bypass with A12 widened Inter Peak 'volume / capacity ratios'





Figure A-19: 2036 Test A with Writtle Bypass PM Peak 'volume / capacity ratios'



Figure A-20: 2036 Test A without Writtle Bypass PM Peak 'volume / capacity ratios'





Figure A-21: 2036 Test A without Writtle Bypass with A12 widened PM Peak 'volume / capacity ratios'



Figure A-22: 2036 Test B with Writtle Bypass PM Peak 'volume / capacity ratios'




Figure A-23: 2036 Test B without Writtle Bypass PM Peak 'volume / capacity ratios'



Figure A-24: 2036 Test B without Writtle Bypass with A12 widened PM Peak 'volume / capacity ratios'





Figure A-25: 2036 Test C with Writtle Bypass PM Peak 'volume / capacity ratios'



Figure A-26: 2036 Test C without Writtle Bypass PM Peak 'volume / capacity ratios'





Figure A-27: 2036 Test C without Writtle Bypass with A12 widened PM Peak 'volume / capacity ratios'



# **Appendix B: Traffic Flow Difference Plots**





Figure B-1: 2036 AM Peak 'actual' link flow difference plots: Do Minimum vs Test A without Writtle Bypass



Figure B-2: 2036 AM Peak 'actual' link flow difference plots: Do Minimum vs Test B without Writtle Bypass





Figure B-3: 2036 AM Peak 'actual' link flow difference plots: Do Minimum vs Test C without Writtle Bypass



Figure B-4: 2036 Inter Peak 'actual' link flow difference plots: Do Minimum vs Test A without Writtle Bypass





Figure B-5: 2036 Inter Peak 'actual' link flow difference plots: Do Minimum vs Test B without Writtle Bypass



Figure B-6: 2036 Inter Peak 'actual' link flow difference plots: Do Minimum vs Test C without Writtle Bypass





Figure B-7: 2036 PM Peak 'actual' link flow difference plots: Do Minimum vs Test A without Writtle Bypass



Figure B-8: 2036 PM Peak 'actual' link flow difference plots: Do Minimum vs Test B without Writtle Bypass





Figure B-9: 2036 PM Peak 'actual' link flow difference plots: Do Minimum vs Test C without Writtle Bypass



# Appendix C: Census Journey to Work Analysis



Appendix C examines travel patterns using Census 2011 Journey to Work data to understand the containment and attraction, production and mode of trips for Chelmsford administrative area.

## **Trip Destinations**

Figure C-1 below shows the trip destinations and containment of Chelmsford residents for journey to work trips as recorded in the 2011 Census.



Figure C-1: Trip Destinations for Chelmsford Residents (2011 Census JTW) \*Other includes destinations representing less than 0.4% of total trips

Figure C-1 shows that more than half of residents in Chelmsford (55.5% of total respondents, representing 24,121 residents) do not travel outside of Chelmsford for work. The main destinations for work outside of Chelmsford are London (19.9%), Basildon (4.7%), Braintree (3.8%) and Brentwood (3.4%).





Figure C-2: Trip Origins for People Working in Chelmsford (2011 Census JTW) \*Other includes destinations representing less than 0.4% of total trips

2011 Census Journey to Work statistics shows that 7,204 people commute into Chelmsford for work. Figure 1.2 indicates that the more than a third of people travelling into Chelmsford (33.6%) commute from London. A further 18.8% and 8.8% of commuters to Chelmsford are residents of Southend and Thurrock respectively.

# **Mode Choice of Trips**

#### Chelmsford

The 2011 census collects data on respondent's address of workplace, and mode of transport for commuting trips, which are referred to as journey to work (JTW) trips.





Figure C-3: Modal Split for People Living in Chelmsford (2011 Census JTW)

Figure C-3 shows that more than half of residents in Chelmsford (55.2%) travel to work by car. A further 15.5% of Chelmsford residents travel to work by train and 14% by foot. A smaller proportion travel to work by bus, as passenger in a car and by bicycle (5.2%, 4.4%, and 4.2% respectively).



Figure C-4: Modal Split for People Working in Chelmsford (2011 Census JTW)



Figure C-4 shows that the majority of people who work in Chelmsford travel to work by car (75.2%), followed by 10.1% by train, 3.9% as a passenger in a car, 3.1% by bus and 2.7% by foot.



#### **Colchester and Ipswich**

Figure C-5: Modal Split trips from MSOAs within 4km of the town centre to the centre (Colchester 007) (2011 Census JTW)



Figure C-6: Modal Split trips from MSOAs within 4km of the town centre to the centre (Ipswich 007) (2011 Census JTW)



Figures 1.5 show that approximately a third of Colchester residents living within 4km of the town centre and work in the town centre, drive to work, and another third of these residents travel to work on foot. A further 17.3% use the local bus services to travel to work. A similar behaviour is shown in Figure 1.6, for Ipswich, where 30.7% of Ipswich residents living within 4km of the city centre and travel to the city centre for work drive. An additional 37.2% travel on foot and 16.8 travel by bus to work.

# Mode Choice by Origin/Destination

This section examines the mode choice for trips to work for people who live and work in Chelmsford, the top 3 work destinations of residents in Chelmsford (London, Basildon, Braintree after Chelmsford), and the top 3 origins for people who work in Chelmsford (London, Southend, Thurrock).

#### Chelmsford



Figure C-7: Modal Split trips contained within Chelmsford (2011 Census JTW)

Figure C-7 shows that more than half of people who live and work in Chelmsford travel to work by car (53.0%), followed by 23.9% on foot, 8% by bus, 7% by bicycle and 5.8% as passenger in a car.





Figure C-8: Modal Split for People Working in Chelmsford travelling from outside of Chelmsford (2011 Census JTW)

Figure C-8 shows that the majority of people who work in Chelmsford, and live outside of Chelmsford travel to work by car (86.6%), whilst 3.5% travel by rail and 3.2% travel by bus.



#### London

Figure C-9: Modal split for residents of Chelmsford working in London (2011 Census JTW)



Figure C-9 shows that the majority of residents who live in Chelmsford and commute to London for work travel by train (70.1%). This is followed by 24% who travel by car and much smaller percentages travelling via other methods.



Figure C-10: Modal split for residents of London working in Chelmsford (2011 Census JTW)

Figure C-10 shows that the majority of residents who live in London and work in Chelmsford drive to work (66.4%). The next popular mode of transport for commuting from London to Chelmsford is train (17.7%), with smaller percentages of respondents travelling by underground (5.4%) and as a passenger in a car (4.0%).



#### Basildon and Braintree (destinations)



Figure C-11: Modal split for residents of Chelmsford working in Basildon (2011 Census JTW)



Figure C-12: Modal split for residents of Chelmsford working in Braintree (2011 Census JTW)

Figure C-11 shows that the majority of residents of Chelmsford who work in Basildon drive to work (88.3%), 4.0% are passengers in a car and 3.6% take the bus. For Chelmsford residents who work in Braintree, a similarly large proportion also drive to work (83.6%), and 3.9% are passengers in a car. Figure C-12 shows that 4.7% of respondents travel by train from Chelmsford to Braintree for work,



which is a higher percentage than those travelling by train from Chelmsford to Basildon. This is likely due to direct trains operating between Chelmsford and Braintree. Driving is the first choice mode of transport for residents working outside of Chelmsford.



#### Southend and Thurrock (origins)

Figure C-13: Modal split for residents of Southend working in Chelmsford (2011 Census JTW)



Figure C-14: Modal split for residents of Thurrock working in Chelmsford (2011 Census JTW)



Figures C-13 and C-14 show that the modal split for residents of Southend and Thurrock who work in Chelmsford is similar. The majority of people who live in Southend and Thurrock drive to work in Chelmsford (82.9% and 86.8% respectively), and 3.8% of residents working in Chelmsford are passengers in a car. Car is the first choice for mode of transport to work from outside of Chelmsford.



# Appendix D: Existing Bus Services at Potential Housing Locations



Location	Description	Bus number and routes	Frequency (approximate)	Nearest bus stop to potential housing location	Location located within 400m of bus stop?	Potential action
2	West Chelmsford	<ul> <li><u>54</u> Beaulieu Park to North Melbourne (via North Springfield and Town Centre)</li> <li><u>51</u> Chignal Estate to Galleywood (via Chelmsford)</li> <li><u>59</u> Chelmsford to Harlow (via Roxwell)</li> <li><u>3</u> Writtle to Southend (via Chelmsford &amp; Great Baddow)</li> <li><u>46</u> Ongar to Chelmsford (via Writtle)</li> </ul>	Monday-Saturday: every 20 minutes peak hours, every 30 mins off-peak, hourly in evenings [05:30/07:00- 23:00] Sunday: every hour [09:00-22:00] Monday- Friday/Saturday: every 30 minutes [07:00/07:30-19:00] Sunday: every hour [09:00-23:00] Monday-Saturday: every hour [0600-20:00] Sunday: every 2 hours (4 journeys each way) Monday- Friday: every hour [09:00- 1600] Saturday: every 2 hours [07:00- 17:00] Monday-Saturday: every 2-3 hours [07:30-17:00]	<ul> <li>Services 51 and 54C stop immediately east of proposed location on Avon Road.</li> <li>Services 46 and 59 stop south of the proposed location on Roxwell Road.</li> </ul>	Not completely The western and north-western area of the proposed location may not be within acceptable walking distances of the nearest bus stop.	Possible extension of bus route to the proposed location e.g. bus <b>51</b> nearest service from city centre).
3	North Chelmsford (Broomfield)	42 Galleywood- Broomfield/ Stansted	Monday-Saturday: every 15-20 minutes pre-morning peak hours, every 10 minutes peak and off-peak hours, every 15-30 minutes evening [05:30/06:00-23:30] Sunday: every 30 minutes [07:30- 17:30]	<ul> <li>Buses 33,36,40,42,47 start and terminate at Broomfield hospital south of the proposed location.</li> </ul>	Not completely The north western part of the proposed location may not be within acceptable	Potential extension of bus route to the proposed location.



Location	Description	Bus number and routes	Frequency (approximate)	No to ho	earest bus stop potential ousing location	Location located within 400m of bus stop?	Potential action
		<b><u>70</u></b> Chelmsford- Colchester (via Broomfield, Great Leighs and Braintree)	Monday- Friday: Every 15-25 minutes peak hours, every 20 minutes off-peak hours, 30-35 minutes evenings [06:00-20:00] Saturday: every half an hour [06:30- 19:00] Sunday: every 2 hours [07:00-21:00]	•	There is a bus stop to the east of the proposed location along Broomfield Road (16, 344, 352, <b>42</b> , 52, <b>70</b> ).	walking distances of the nearest bus stop.	e.g. bus <b>47</b> Monday to Saturday.
		36 Chelmsford-South Woodham (via Great Baddow)	Monday- Friday: every 15-20 minutes peak hours, 30 minutes off- peak, every hour in the evenings, [06:00-22:30] Saturday: every 30 minutes [07:00- 22:30] Sunday: every 2 hours [08:30-20:30]				
		<b><u>40</u></b> Broomfield hospital- Great Baddow ( <i>via Chelmsford</i> )	Monday- Friday/Saturday: Every 30 minutes [06:30-20:00/19:00]				
		<b>47</b> Moulsham - Broomfield Hospital (via Chelmsford and Beaulieu Park)	Monday-Saturday: every hour [08:30-17:30]				
		<b>33</b> Southminster - Broomfield Hospital (via Maldon and Chelmsford)	Sunday: every 2 hours [09:00-21:00]				
		<u><b>16</b></u> Chelmsford- Wethersfield ( <i>via Broomfield</i> )	Monday- Saturday: 8 trips each way [10:30-18:00]				



Location	Description	Bus number and routes	Frequency (approximate)	Nearest bus stop to potential housing location	Location located within 400m of bus stop?	Potential action
		<u>52</u> Chelmsford - Pleshey (via Broomfield Hospital and Great Waltham)	Monday- Friday: Every 2 hours [10:00-17:00] 5/6 trips each way Saturday: 2-4 trips each way			
		352 Halstead – Chelmsford (via Braintree and Great Leighs)	Monday- Saturday: two trips each way Sunday: every 2 hours [0930/10:30- 19:30/20:30]			
		<u>344</u> Chelmsford- Black Notley (via Broomfield and Great Leighs)	Friday: one trip each way			
		676 Colchester- Little Waltham Via Witham and Chelmsford	Monday- Friday: School bus- 1 trip each way			
		621 Chelmsford (St John Payne School)- Braintree (via Great Notley)				
		<b>A/B</b> Broomfield - Little Leighs/Great Waltham				
4	North East Chelmsford	Proposed ChART Chelmsford Area Rapid Transport	Monday- Friday: every 20 minutes peak and off-peak hours, every 30 minutes evenings. Saturday: every 30 minutes Sunday: hourly	ChART bus route will be more than acceptable walking distance to the proposed location.	No The proposed location will not be within	Potential extension of the Channels bus service route into the development.



Location	Description	Bus number and routes	Frequency (approximate)	Nearest bus stop to potential housing location	Location located within 400m of bus stop?	Potential action
		Proposed Channels bus service Greater Beaulieu park connecting Chelmsford City centre and rail stations	Monday- Saturday: every 30 minutes	<ul> <li>Channels bus service will run into Greater Beaulieu Park.</li> </ul>	acceptable walking distances of the nearest bus stop.	
5/18	East Chelmsford (East of Great Baddow)/ North of Sandon	<u><b>36</b></u> Chelmsford- Great Baddow-Bicknacre. White Swan- South Woodham	Monday- Friday: every 15-20 minutes peak hours, every 30 minutes off-peak hours, every hour evening [06:00-22:30] Saturday: every 30 minutes [07:00- 22:30] Sunday: every 2 hours [08:30-20:30]	• South of the location, along Maldon Road. 00- 0:30]	e Yes/ Potentially- ong dependent on ad. size of the location.	h of the ion, along lon Road. Yes/ Potentially- dependent on size of the location. N/A/ Potential extension of bus route into the location.
		<u>3</u> Writtle to Southend ( <i>via Chelmsford</i> & <i>Great Baddow</i> )	Monday- Friday: every hour [09:00- 1600] Saturday: every 2 hours [07:00- 17:00]			
		<u>31 Maylandsea to</u> <u>Chelmsford (via</u> <u>Maldon)</u>	Monday-Friday: 3 services between 05:00-07:00 and 2 services between 20:00-22:00 Saturday: 23 services between 06:00-08:00 and 2 services between 20:00-22:00			
		33 Southminster - Broomfield Hospital (via Maldon and Chelmsford)	Sunday: every 2 hours [09:00-21:00]			
		Chelmsford	each way			



Location	Description	Bus number and routes	Frequency (approximate)	Nearest bus stop to potential housing location	Location located within 400m of bus stop?	Potential action
		C4 Maldon- Brentwood				
6	North of South Woodham Ferrers <b>36</b> Chelmsford- Great Baddow-Bicknacre. White Swan- South WoodhamMonday- Friday: every 15-20 minutes peak hours, every 30 minutes off-peak hours, every 30 minutes off-peak hours, every 40 evening [06:00-22:30]Saturday: every 30 minutes [07 22:30]Saturday: every 30 minutes [07 22:30]94 Basildon-Wickford- Rettendon- Woodham FerrersMonday- Friday: limited service before 09:00, every hour thereat [09:00-17:00]Saturday: every 2 hours (09:00- 	Monday- Friday: every 15-20 minutes peak hours, every 30 minutes off-peak hours, every hour evening [06:00-22:30] Saturday: every 30 minutes [07:00- 22:30] Sunday: every 2 hours [08:30-20:30] Monday- Friday: limited service before 09:00, every hour thereafter [09:00-17:00] Saturday: every 2 hours (09:00- 17:00]	There is a bus stop ( <b>36</b> , <b>94</b> ) at the south west periphery of the proposed location (Burnham Road library bus stop)	No The north and east of the proposed location may not be within acceptable walking distances of the nearest bus stop.	Potential extension of bus route into the proposed location. Only the bus <b>36</b> connects to the city centre.	
		<ul> <li>503 Southchurch-South Woodham</li> <li>Ferrers (via Rettendon)</li> <li>594 Woodham Ferrers <ul> <li>Witham (via Boreham and Hatfield Peverel)</li> </ul> </li> <li>637 Chelmsford -South Woodham Ferrers (via Great Baddow)</li> </ul>	<b>Monday- Friday:</b> School bus- 1 trip each way			



Location	Description	Bus number and routes	Frequency (approximate)	N te h	learest bus stop o potential ousing location	Location located within 400m of bus stop?	Potential action					
7/22	Great Leighs/Great Leighs West	eat ghs/Great ghs/West70 Chelmsford- Broomfield- LittleMonday- Friday: Every 15-25 minutes peak hours, 20 minutes off- peak hours, 30-35 minutes evenings [06:00-20:00]All buses (70, 352 344, 621, A/B) run through the middle of the proposed location.Saturday: every half an hour [06:30- 19:00]Sunday: every 2 hours [07:00-21:00]Image: Colore to the proposed location.	344, 621, A/B) run through the middle of the proposed location.The outer edges of the proposed location may not be within acceptable	The outer edges of the proposed location may not be within acceptable walking distances	Potential extension of bus route into the proposed location e.g. bus <b>70</b> (at certain intervals from Monday-							
		<u>352</u> Halstead – Chelmsford (via Braintree and Great Leighs)	Monday- Saturday: two trips each way Sunday: every 2 hours [0930/10:30- 19:30/20:30]			walking distances of the nearest bus stop, even if it runs through the middle of the	walking distances of the nearest bus stop, even if it runs through the middle of the	walking distances Satu of the nearest bus stop, even if it runs through the middle of the	walking distances of the nearest bus stop, even if it runs through the middle of the	walking distances of the nearest bus stop, even if it runs through the middle of the	walking distances of the nearest bus stop, even if it runs through the middle of the	Saturday).
		<b>344</b> Chelmsford- Black Notley ( <i>via Broomfield and</i> <i>Great Leighs</i> )	rd- Black <b>Friday</b> : one trip each way	proposed location.								
		621 Chelmsford (St John Payne School)- Braintree (via Great Notley)	<b>Monday- Friday:</b> School bus- 1 trip each way									
		Leighs/Great Waltham										
8	Howe Green          Howe Green       3       Writtle to S         (via Chelmsfe       Great Baddo         11A       Chelmsfe         Temple Farm         Estate         (via Southend)	<u>3</u> Writtle to Southend (via Chelmsford & Great Baddow)	Monday- Friday: every hour [09:00- 1600] Saturday: every 2 hours [07:00- 17:00]	•	<ul> <li>There is a bus stop at East Hanningfield Road (Southlands Chase bus stop for</li> </ul>	Not completely The southern and western part of proposed location	Potential introduction of a bus service along route of bus <b>3</b> , but					
		<b><u>11A</u></b> Chelmsford- Temple Farm Ind Estate (via Southend-on-sea)	Sunday: every 2 hours [09:30-19:30]	buses 1,3,11A, 513)	may not be within acceptable walking distances	travelling through East Hanningfield (Southend Road) passing the						



Location	Description	Bus number and routes	Frequency (approximate)	Nearest bus stop to potential housing location	Location located within 400m of bus stop?	Potential action	
		<u>1</u> Oxney Green - Canvey (via Chelmsford bus station)	Monday- Friday: 1 trip from Chelmsford to Canvey 15:00, 2 trips from Canvey to Chelmsford [09:35,10:35]		to the nearest bus stop.	to the nearest bus stop.	proposed location's western periphery.
		513 Southchurch- Chelmsford (via Rettendon and Great Baddow)	Monday-Friday: School bus- one trip each way				
9	Rettendon Place	3 Writtle to Southend (via Chelmsford & Great Baddow)	Monday- Friday: every hour [09:00- 1600] Saturday: every 2 hours [07:00- 17:00]	<ul> <li>The nearest bus stop is located at the south western periphery of the</li> </ul>	The nearest bus stop is located at the south western periphery of the proposed location (School bus stop on Main Road) Not completely The eastern side of the proposed location may not be within acceptable walking distances	Addition of bus stop outside the proposed location (ensure within	
		<u><b>11A</b></u> Chelmsford- Temple Farm Ind Estate (via Southend-on-sea)	Sunday: every 2 hours [09:30-19:30]	proposed location (School bus stop on Main Road)		acceptable walking distance) and increase in frequency of buses.	
	1Oxney Green - CanveyMonday- Friday: 1 trip Chelmsford to Canvey from Canvey to Chelms from Canvey to Chelms form Canvey to Chelms	<b>Monday- Friday:</b> 1 trip from Chelmsford to Canvey 15:00, 2 trips from Canvey to Chelmsford [09:35,10:35]	to the nearest bus stop.	e.g. bus <b>3</b> Monday-Saturday			
		<u><b>513</b></u> Southchurch- Chelmsford ( <i>via Rettendon and</i> <i>Great Baddow</i> )	Monday-Friday: School bus- one trip each way				
		<b><u>1B</u></b> Chelmsford - Thundersley (via Howe Green and Rettendon)	Monday- Friday: one trip 17:30 (Chelmsford-Thundersley)				



Location	Description	Bus number and routes	Frequency (approximate)	Nearest bus stop to potential housing location	Location located within 400m of bus stop?	Potential action
10	Boreham	72       Chelmsford-Witham         (via Springfield and         Boreham)         71A       - Chelmsford –         Colchester       (via Boreham and         (via Boreham and       Witham)         676       Colchester- Little         Waltham       Via Witham and         Chelmsford       48A         A       Chelmsford-         Boreham       (via Chelmer Village         and Springfield)       Chelmsford-	Monday-Saturday: every 25-40 minutes peak hours, every 30 minutes off-peak and 30-40 minutes evenings [06:30-19:30] Monday- Saturday: every 20-30 minutes peak hours, every 30 minutes off peak [6:00-19:00] Sunday: every 2hours [09:00-21:00] Monday- Friday: School bus 1 trip each way Sunday: one trip each way [21:48/22:09]	• The nearest bus stops (buses 42A, 71A, 72) are located at the western periphery of the proposed location (Plantation Road bus stop) and approximately 150m south west of the proposed location (St. Andrew Church bus stop).	Not completely The eastern and south-eastern part of the proposed location is unlikely to be within acceptable walking distances to the nearest bus stop, which is located on the western periphery of the proposed location.	Potential addition of bus stops along Plantation Road.
	<b>T3</b> - Boreham- Chelmsford ( <i>via Chelmsford</i> , Maldon and Boreham) <b>Monday- Saturday</b> : one trip (Boreham-Chelmsford) [06:21]					
19	Hammonds Farm	<u><b>36</b></u> Chelmsford- Great Baddow-Bicknacre. White Swan- South Woodham	Monday- Friday: every 15-20 minutes peak hours, every 30 minutes off-peak hours, every hour evening [06:00-22:30] Saturday: every 30 minutes [07:00- 22:30] Sunday: every 2 hours [08:30-20:30]	<ul> <li>South of location on Maldon Road (Old Boarding School).</li> </ul>	Depending on the area of the location, the northern part may not be within 400m of bus stop.	Potential addition of bus stops within the location.



Location	Description	Bus number and routes	Frequency (approximate)	Nearest bus stop to potential housing location	Location located within 400m of bus stop?	Potential action
		<u>3</u> Writtle to Southend ( <i>via Chelmsford</i> & <i>Great Baddow</i> )	Monday- Friday: every hour [09:00- 1600] Saturday: every 2 hours [07:00- 17:00]			
		<u>31 Maylandsea to</u> <u>Chelmsford (via</u> <u>Maldon)</u>	Monday-Friday: 3 services between 05:00-07:00 and 2 services between 20:00-22:00			
			Saturday: 23 services between 06:00-08:00 and 2 services between 20:00-22:00			
		<u>33</u> Southminster - Broomfield Hospital (via Maldon and Chelmsford)	Sunday: every 2 hours [09:00-21:00]			
		510 Southminster- Chelmsford	Monday-Friday: School bus- 1 trip each way			
		C4 Maldon- Brentwood	Monday-Friday: School bus- 1 trip each way			
20	Beaulieu Post 2021 Roll- Over	Proposed Channels bus service Greater Beaulieu park connecting Chelmsford City centre and rail stations	Monday- Saturday: every 30 minutes	No existing bus stop within 400m of proposed housing location.	It is a new development, and therefore bus infrastructure provided should be adequate and meet all criteria.	
21	Boreham Airfield	Currently no bus services serving proposed location	N/A	No existing bus stop within 400m of proposed housing location.	No	Potential extension of Channels bus service (further north).



# Bus Service Key:

More than once an hour	Once an hour	Once every two hours or less frequent	School bus
		looo hoquoni	



## Bus accessibility from potential housing locations

The following sketches have been provided to indicate the proximity of proposed development locations to existing bus routes to indicate theoretically possible extensions of routes. It is important to note that the potential housing location boundaries are indicative and subject to change. Also bus services are largely operated on a commercial basis and no consultation with bus operators has been undertaken.

#### Location 2 - West Chelmsford







# Location 3 - North Chelmsford (Broomfield)





#### **Location 4 - North East Chelmsford**

Locations 5,18,19 - North East Chelmsford North of Sandon, East of Baddow and Hammonds Farm







## Location 6 - North of South Woodham Ferrers



#### **Location 8 - Howe Green**




