# Basildon Local Plan

## Part 2 - Publication Local Plan Transport & Highway Impact Assessment (March 2018)

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# Document Control Sheet

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# Glossary of Terms

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| **ARCADY** | See 'Junctions 9' |
| **Assignment model** | A highway assignment model identifies the most likely route a trip will be made by trips within a highway network, allocating trips to the best route based on time and distance to make that trip. |
| **BBC** | Basildon Borough Council |
| **BCAP** | Basildon Cycling Action Plan |
| **DfT** | Department for Transport |
| **ECC** | Essex County Council |
| **HE** | Essex Highways, Essex is the Highway Authority responsible for the operation and maintenance of the roads in Basildon. Essex is supported by Ringway Jacobs who represent Essex as the Highways Authority. |
| **HE** | Highways England is responsible for the operation, management and maintenance of the UK motorway and trunk road strategic network. |
| **HELAA sites** | Sites from the *Housing and Economic Land Availability Assessment* which have been proposed for allocation within the Local Plan, or reasonable alternatives, taken forward from the Draft Local Plan and New and Alternative sites consultations. |
| **HIA** | Highways Impact Assessment, this document forms the highways impact assessment for the Basildon Local Plan and has been produced in line with the guidance set out in the National Planning Policy Framework for Transport Evidence Bases. |
| **GPS** | Global Positioning System, in the context of this report it is data acquired from vehicles using satnav systems, purchased by the DfT to form their Trafficmaster database. |
| **Junctions 9** | A computer modelling software package that models the capacity of mini and standard roundabouts, providing information on queue lengths and delays. It also includes PICADY which measures the capacity of priority junctions. |
| **LINSIG** | A modelling package used primarily for standalone junctions with traffic signal control, and models the effect on traffic capacities and queuing. LINSIG also optimises signal timings to reduce delay or increase capacity at junctions. |
| **LTC2 / LTAM** | Highways England replaced the Lower Thames Crossing (LTC) 2 Model with the Lower Thames Area Model (LTAM) to test the impact of the Lower Thames Crossing and support the Business Case. |

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| | Microprocessor Optimised Vehicle Actuation |
| **MOVA** | |
| **NTM / NTEM** | See 'Traffic Growth' |
| **OA** | Census data Output Areas, these are geographical areas created for Census data, specifically for the output of census data. The OA is the lowest geographical level at which census estimate are provided. In the context of this report Journey to Work census data from 2011 has been used. |
| **Passenger Car Units / 'PCUs'** | Unless otherwise stated, queue length outputs are expressed in terms of 'Passenger Car Units' (PCUs). This measurement accounts for all vehicle types, with a standard car measuring 1 PCU and larger Heavy Goods Vehicles modelled as 2 PCUs. Modelled queues represent the average maximum on each approach arm across the peak hour. They are therefore indicative of queuing extents at the busiest point of the peak hour and are not representative of average conditions. |
| **Publication Local Plan** | Also referred to as Publication Local Plan Growth or Final Growth, for the purposes of this report this refers to the additional traffic generated by the level of development included within the Publication Local Plan March 2018. |
| **RLA** | *Residential Land Available*, which are defined as development sites with planning permission (Committed Development sites). |
| **SATURN** | An area-wide assignment modelling package utilised for previous (2014) Basildon Highway Impact Assessment, where a model network and trip matrix covered the urban and strategic road network in and around Basildon. The software considers the wider impact of network revisions by dynamically reassigning traffic along the most efficient routes possible, based on journey time and journey length. |
| **SELEP** | *South East Local Enterprise Partnership* |
| **TEMPRO** | See 'Traffic Growth' |
| **TRADS** | 'Traffic Flow Data System' maintained by Highways England that holds traffic flow data at sites on the UK's strategic road network. |
| **Trafficmaster Data** | GPS data used to derive average vehicle journey times across the UK's strategic and urban road network from a large sample of individual journeys. The data can then be used to determine average link speeds and areas of congestion on the road network (by measuring observed speed in relation to free-flow speed). |
| **Traffic Growth (NTM / NTEM / TEMPRO)** | Observed traffic flows have been factored up to forecast year levels using the DfT's national road traffic forecasts from the NTM (National Transport Model) by road type, which have been factored further by using National Trip End Model (NTEM) forecasts using TEMPRO (Trip End Model |

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| | Presentation Programme) to determine a growth rate based on growth in local development trips in Basildon (at a Borough level), adjusted in line with current Local Plan development assumptions. TEMPRO is the name of the software that presents the NTEM data set. |
| **Transport Assessment (TA)** | A Transport Assessment sets out transport issues relating to a proposed development, identifying what measures will be taken, the anticipated impacts and safety for all modes of travel. |
| **TRICS** | The '*Trip Rate Information Computer System*' serving as a database of trip rates for developments surveyed in the UK. The database is used in transport planning to quantify the number of trips generated by new developments. |
| **V/C** | Volume/Capacity |
| **VISSIM** | A microsimulation modelling package which is typically utilised to model a series of junctions situated within close proximity, and is currently being used to assess the impacts of the Basildon Town Centre / Masterplan. |
| **VISUM** | An area-wide assignment modelling package which has been used to build a 'skeleton' model of the urban and strategic road network across the Borough. Similar to SATURN in functionality, for this study the model software has been used to assign Local Plan development traffic to the fastest route determined by applied average speed data taken from the Trafficmaster database. |
| **WebTAG** | The web-based '*Transport Analysis Guidance'* published by the DfT which consists of software tools and guidance on transport modelling and appraisal methods which are applicable for highways and public transport interventions. |

# Executive Summary

## Introduction

Basildon Borough Council (BBC) has prepared a proposed Publication Local Plan (also referred to as the 'Final Growth Scenario' within this report), which will provide the planning framework for future growth and development within the Basildon Borough area up to and beyond 2034. It will identify land and the strategy for delivering housing, businesses, retail and leisure, as well as areas for protection, such as open space and sites for specific designations.

The final Part 2 – Transport & Highway Impact Assessment (HIA) updates previous work, to test earlier versions of the Local Plan, and assesses the final level of growth associated with the Publication Local Plan 2018. The assessment includes an updated modelling methodology and tests the overarching package of highway measures required to help mitigate the traffic impact associated with the expected Local Plan growth.

## Publication Local Plan Growth

The Publication Local Plan will deliver the following development. The HIA includes a total of 18,283 residential dwellings even though approximately 3,180 dwellings are anticipated to be delivered beyond the plan period. This is in order to test the 'total projected housing supply available' as a 'worst-case':

- 18,283 residential dwellings
- 261,520 sqm floor space of employment
- 85,061 sqm floor space of commercial (retail and leisure)

The residential sites have principally been informed by existing planning permissions, the Housing and Economic Land Availability Assessment (HELAA) and Urban / Town Centre sites coming forward. A small amount (6%) of additional housing will be delivered through Windfall sites and Green Belt Infill / Plotland sites. The majority of housing (60%) will be delivered in and around the Basildon settlement area, with Billericay and Wickford accommodating approximately 20% in each settlement.

The majority of employment land is located on the fringe of existing employment sites along the northern edge of Basildon, with new expansion located to the east of the town. Employment opportunities have also been identified within the town centres of Wickford and Billericay. The majority of retail and leisure sites are proposed within town centre locations, within Basildon, Wickford, Billericay and Pitsea, with some edge of town sites proposed at retail parks towards the east of Basildon, south of Billericay and the south and west of Wickford. Laindon Town Centre will also deliver new retail development through the regeneration of the centre.

## Transport Model

The model study area includes the key road networks within BBC with a particular focus on the highway networks in and around the major settlements of Basildon, Wickford and

Billericay. A two tier modelling approach has been adopted for the study, which uses a VISUM (v14) assisted spreadsheet model to understand the impact of future development across the network. The modelling approach has been prepared in line with DfT/WebTAG modelling principles and was deemed reasonable in scale and 'fit for purpose' to assess the highway network within the Borough.

The spreadsheet element of the model generates the future traffic growth, vehicle trip generation and distribution. The VISUM model has been built covering the entire Borough and has been used specifically to assign development only traffic across the network. The assigned future development flows are then combined with background traffic growth from the spreadsheet model and assessed in individual junction models for each scenario.

The model includes the weekday AM (0800-0900) and PM (1700-1800) peak hours. These time periods have been identified as the typical network peak periods across the week and also generally represent the typical peak traffic generation periods of future development proposed in the Publication Local Plan.

The model includes the existing road network and also includes proposed new link roads for the assessment of the preferred mitigation package, principally including: a Western Link Road in Billericay; a new junction and link roads at the A127 / Pound Lane at East of Basildon; and an access road serving sites to the west of Basildon at Dunton. Network changes associated with the Basildon Town Centre Masterplan and the A127 / A130 Fairglen Interchange Scheme have also been included, along with other known local junction schemes, for forecast year assessment.

The study includes a highway assessment of forecast flows and tests 35 junctions across the network using standalone junction modelling software. It should be noted that not every junction in the Borough has been assessed to this level of detail and the study area has been informed by the previous studies leading into this final assessment.

The base year for the modelling is 2014, which has been derived from observed turning counts at the key junctions included in the model. The model forecast year is 2034 and is consistent with the Local Plan period. The forecast scenarios assume that all development proposed is fully built-out, occupied and operational by 2034. The following scenarios have been tested:

- 2014 Base representing the existing situation
- 2034 Background Growth (also referred to as the Do-Minimum or Reference Case) base scenario uplifted to 2034 using background growth factors from TEMPRO plus committed development traffic only, representing a future situation without any Local Plan growth for benchmarking against the Final Growth Scenario
- 2034 Final Growth Scenario No Mitigation – the Publication Local Plan growth with only committed network changes and no highway mitigation
- 2034 Final Growth Scenario With Mitigation – the Publication Local Plan growth including the preferred mitigation package

Forecast traffic flows have been derived from existing traffic surveys, TEMPRO growth factors and land use trip information from TRICS. The trip rates used assume that a reasonable level of sustainable transport improvements are delivered in the future and take account of some modal shift away from car use. The Publication Local Plan development growth is anticipated to generate an additional 9,950 new vehicle trips to the network in the AM peak and 10,150 in the PM peak. Approximately 60% of this traffic is related to housing delivery, 25% is associated with employment and the remaining traffic either retail, leisure or education related.

The origin and destination of trips travelling to and from the development sites, known as trip distribution, has been derived from the 2011 Census journey to work (JTW) dataset, which provides the most recent available data for modelling purposes. The VISUM model has been used to assign development only trips to both the current road layout and updated road layout to compare the 2034 Final Growth Scenarios with and without the preferred mitigation package.

It is important to acknowledge that the VISUM assignment model is limited to development only trips. Where reassignment of background traffic to new link roads is anticipated, VISUM has only been used initially to inform how much background traffic is likely to reassign to the new route, based on the patterns of development traffic. This has been sense checked against observed turning counts and the JTW census data to ensure the eventual reassignment is realistic. However, this approach does not involve dynamic assignment and therefore the 'rebalancing' of demand across available capacity on both new and existing links, which is likely to occur in reality, has not been assessed within the model. An additional sensitivity test has been undertaken, whereby only half the assumed background traffic will reassign to the new links, as an intermediary assessment for benchmarking and information purposes.

**Modelling Results**

The junctions included within the HIA study area have been assessed to ascertain the specific traffic impact of the development proposed in Basildon Borough across the network. The junction modelling software estimates the performance of a junction in terms of how close to capacity it is operating at.

This analysis illustrates the level of baseline junction performance under existing conditions, and highlights the cumulative impacts of traffic growth with and without the inclusion of the Publication Local Plan growth.

Currently the majority of junctions modelled (71%) illustrate they are operating within capacity, which reduces to approximately half of the junctions modelled (49%) in the 2034 Background (Do-Minimum) scenario. The Do-Minimum indicates that even if a Basildon Local Plan was not delivered over the assessment period organic traffic growth would have a significant impact on the Borough network.

With the addition of the Final Growth scenario, a total of 31% junctions continue to operate within capacity, while 69% of junctions exceed capacity.

These junction modelling results have identified where mitigation measures are required as a priority across the study area, in order to alleviate any adverse impacts from local traffic growth as shown within the 2034 Background and Final Growth Scenarios. An initial package of highway mitigation measures has been identified and assessed against the corresponding scenarios.

**Mitigation Assessment**

The proposed package of mitigation measures includes individual junction layout changes, traffic management solutions and the introduction of new highway infrastructure. The delivery of these schemes would be reliant on a combination of developer contributions as well as local and central funding mechanisms.

The schemes and associated junction modelling results are discussed in more detail in this section with a focus on:

- Committed schemes – including those already planned or recently delivered which come forward whether the Local Plan was delivered or not;
- Individual junction improvements – unidentified through highway assessment work to date;
- Highway infrastructure improvements – including new developer enabled link roads and associated junction improvements; and
- Wider highway schemes – high level assessment of wider schemes, proposed across the plan period, currently subject to consultation or early feasibility appraisal.

The proposed mitigation package tested with the Final Growth Scenario is considered an initial set of interventions required to ideally mitigate the network back to the current level of observed performance or, at the very least, provide betterment over the modelled level of performance under the 'Do-Minimum' situation in the 2034 Background Growth Scenario.

The assessment is generally considered a robust 'worst-case' for Local Plan testing. Additional sensitivity testing has been undertaken to address the limitations of the model and better understand the impact of key infrastructure requirements.

Overall, the results illustrate, at a strategic level, that the Publication Local Plan Growth scenario can be mitigated to a similar level of network performance as the existing situation at a number of locations across the network. Where this is not achieved, traffic growth can at least be mitigated back to a similar or improved level to the 2034 Background Growth ('Do-Minimum') Scenario, where no Local Plan growth or transport improvements are delivered.

In some instances, the mitigation package does not wholly address the anticipated traffic growth and where there are residual impacts, further consideration is needed of the potential for:

- Further more ambitious sustainable improvements and modal shift;
- Intelligent Transport Systems e.g. MOVA; and

- ‘Peak Spreading’.

All of which have not been tested but could realistically reduce the highway impact of the Local Plan. Notwithstanding this further potential, Transport Assessments will still be required for sites as they come forward in order to establish the specific impacts of the individual sites and to ensure that they are appropriately mitigated. Individual developers would be expected to consider this package as minimum and, where appropriate, identify potential for further improvements.

**Summary**

The Basildon Borough Council Publication Local Plan (2018) sets out the Council’s strategy to deliver 18,283 new homes; 261,520 sqm of employment floor space; 85,061 sqm of Retail/Leisure floor space; and 6,195 new pupil places, over the next 15 years.

This Part 2 – Transport and Highway Impact Assessment has been prepared to support the Publication Local Plan and test the likely forecast traffic impact of the development proposals against the existing transport supply and a package of sustainable and physical mitigation schemes.

The assessment methodology adopted is considered a robust basis to test the Publication Local Plan. The transport modelling has tested a total of 18,283 new homes, of which 3,180 of these dwellings are anticipated to come forward beyond the plan period. Therefore, the 2034 future scenarios are considered to be ‘worst-case’ tests of the ‘total projected housing supply available’, given they assume that all 18,283 dwellings will come forward by the end of the plan period 2014-2034.

The existing situation and a 2034 Background (‘Do-Minimum’) scenario have also been assessed to benchmark the overall traffic impact of the Publication Local Plan and help define where mitigation is needed. The ‘Do-Minimum’ considers a scenario where the Local Plan is not delivered and forecast traffic growth is limited only to known committed development and TEMPRO growth factors.

In the first instance, the Publication Local Plan has been tested with the existing transport supply. This included ‘reasonable’ assumptions for improvements to sustainable infrastructure, and modal shift away from the car, but with little or no improvements to highway infrastructure. As would be expected, given the quantum of housing, employment, retail and leisure development proposed, the results indicate that the forecast development traffic would increase traffic levels significantly across the network and that further mitigation is needed.

In advance of delivering any physical improvements, which can be costly and could encourage further unconstrained car use, more ambitious sustainable transport and travel demand management interventions should be identified and delivered by development. This would need to capitalise and expand on the walking, cycling and public transport improvements promoted in this study and demonstrate increased sustainable modal shift. Other factors, including ‘Peak Spreading’, would also need to be considered to reflect potential changes in travel behaviour and the availability of network capacity at different times of the day.

Over and above any further sustainable transport improvements, the assessment demonstrates that a package of physical mitigation schemes will be required to mitigate the impact of Publication Local Plan related traffic. The analysis demonstrates that the delivery of a combination of more ambitious sustainable transport and physical highway improvements could potentially mitigate the most significant impacts of the Local Plan. In many instances, junction approaches would deliver 'nil-detriment' over the existing situation, or at the least, improve on the 2034 Background ('Do-Minimum') Scenario, where no Local Plan growth is delivered. It is acknowledged that the analysis identifies localised residual impacts on the network, partially due to the eventual reassignment of traffic to new link roads, but also due to the challenges associated with delivering junction improvements in constrained urban areas.

The preferred mitigation package should be considered as a minimum and the scale of any required scheme will need to be monitored and refined throughout the plan period and tested within a Transport Assessment and Travel Plan as part of any development coming forward in a planning application.

A number of wider highway schemes will potentially come forward in the plan period, including the A127 / A130 Fairglen Interchange Short-Term Scheme and a new Lower Thames Crossing, as well as other local junction schemes. These schemes will also need to be considered alongside the delivery of the Publication Local Plan to maintain a consistent approach and ensure mitigation is delivered at an appropriate scale and 'fit for purpose'.

# 1 Introduction

## 1.1 Background

1.1.1 Basildon Borough Council (BBC) has prepared a proposed Publication Local Plan (also referred to as the 'Final Growth Scenario' within this report), which will provide the planning framework for future growth and development within the Basildon Borough area up to and beyond 2034. It will identify land and the strategy for delivering housing, businesses, retail and leisure, as well as areas for protection, such as open space and sites for specific designations.

1.1.2 Previous work undertaken by Essex Highways (EH) over the last few years, including an initial Highway Impact Assessment (2013/14) and Mitigation & Modelling Assessments (2014/15) of different options have been used to inform the early stages of planning, based on available development information as it was understood at the time. An outline Draft Local Plan Growth Scenario was published in January 2016, and was subject to public consultation between 28 January and 24 March 2016.

1.1.3 In response to the consultation feedback from a 'New and Alternative Sites' consultation, as well as specific development updates, further tests were undertaken of the 2016 Draft Local Plan Growth Scenario using a VISUM model for the whole Borough. The traffic impact of these development changes was assessed within a 'Part 1' Transport and Highway Impact Assessment Report (July 2017).

## 1.2 Study Overview

1.2.1 This document forms a final 'Part 2' Highway Impact Assessment (HIA) of the proposed Publication Local Plan. This latest work builds on the outcomes of the 'Part 1' report and assesses the final level of growth associated with the Publication Local Plan 2018. The assessment includes refinements to both the modelling methodology and the overarching package of highway measures required to help mitigate the traffic impact associated with the expected Local Plan growth.

1.2.2 This report provides a summary of the latest highway impact assessments of the BBC Publication Local Plan, March 2018. While reference is made to previous studies, this report effectively replaces all previous highway testing results for the former provisional Draft Local Plan scenarios.

1.2.3 As with previous studies, the 'Part 2' HIA has been produced in line with the National Planning Policy Guidance "Transport evidence bases in plan making and decision taking" – 2014.

1.2.4 The modelling undertaken within this study expands on the preceding studies and assessments, through the inclusion of additional junction assessments, and enhances elements of the mitigation modelling through the use of VISUM to

assess potential reassignment of development traffic across the network for the following scenarios:

- 2014 Base – current highway situation
- 2034 Background Growth – 'Do-Minimum' future situation with added committed development, planned highway schemes and background (TEMPRO) traffic growth only
- 2034 Publication Local Plan Growth (No Mitigation) – continuation of the previous scenario with the addition of Local Plan development traffic and no highway mitigation
- 2034 Publication Local Plan Growth (With Mitigation) – continuation of the previous scenario with the addition of junction and highway mitigation interventions

## 1.3 VISUM Model

1.3.1 This study uses a 'skeleton' VISUM model to assign development only traffic to the network. It should be noted that this is not a full assignment model and the assignment methodology used is informed by current average link speed data obtained from Trafficmaster. The development traffic assigned by this model is then added to background traffic, within a spreadsheet model, based on current assignment patterns and NTEM growth. Therefore, no capacity restrictions were applied or coded into the model, and network delays were considered separately as part of the overall junction modelling outputs and network performance.

1.3.2 The use of a VISUM model provides a more refined method of assignment of traffic than the earlier assessments, particularly when considering the potential impact of new 'link' roads on the network. The 2013/15 assessments used a combination of a SATURN model for Basildon and spreadsheet-based models for Billericay and Wickford to assign traffic. The use of the VISUM model addresses concerns that have been raised during earlier consultation related to the level of interaction between the SATURN network model and the spreadsheet based models.

1.3.3 The VISUM model allows traffic reassignment associated with the proposed large-scale 'strategic' infrastructure schemes identified to mitigate development impact, for example a new junction on the A127 at Pound Lane / Cranfield Park Road. These have now been considered in tandem with nearby proposed smaller junction or road widening mitigation measures.

## 1.4 Format of this Report

1.4.1 This document sets out the methodology and findings of the highway impact assessment for the Basildon Publication Local Plan, and is structured as follows:

**Section 1** **Introduction.**

**Section 2** **Background & Previous Work –** Provides an outline of previous transport studies undertaken, in relation to proposed local growth in the Basildon area, and any findings relevant to this 'Part 2' assessment.

**Section 3** **Publication Local Plan Growth –** Provides an overview of the Publication Local Plan Growth Scenario development.

**Section 4** **Transport Model & Study Area –** Identifies the extent of the study area and transport modelling used to assess the Publication Local Plan.

**Section 5** **Forecasting, Trip Generation, Distribution and Assignment –** Provides details of the scenarios to be modelled and the associated methodology for trip generation, distribution and assignment.

**Section 6** **Junction Modelling –** Provides a summary of the junction modelling results for different growth scenarios without mitigation measures.

**Section 7** **Mitigation Schemes –** Provides a description of the preferred mitigation package and wider highway schemes considered within the assessment.

**Section 8** **Mitigation Assessment –** Sets out the modelling assessments of the proposed highway mitigation package for the Publication Local Plan Growth Scenario.

**Section 9** **Sustainable Transport Infrastructure Appraisal –** Appraisal of the existing and proposed sustainable transport infrastructure and opportunities for improvements.

**Section 10** **Cross Boundary Impacts –** This section presents a high level appraisal of cross-boundary implications.

**Section 11** **Summary –** Summarises the study outcomes and conclusions.

# 2 Background & Previous Work

2.1.1 Throughout this report, reference is made to the "2013/15 Transport Studies" – this refers to the previous transport assessment work completed by Essex Highways between 2013 and 2017. Reference is made to specific reports where necessary and is summarised in Table 2-1.

**Table 2-1: Summary of previous Highway Impact Assessment Undertaken to Date to Inform the Local Plan**

| Date of study | Scenarios | Development assumptions | Modelling software used |
|---|---|---|---|
| 2013/14 | Low growth option | 16,000 dwellings + employment | Junction 9 and Linsig for junction capacity<br>SATURN for Basildon Assignment, Spreadsheets for Wickford and Billericay |
| | High growth option | 22,700 dwellings + employment | |
| 2014/15 | Mitigation options for above scenarios | 16,000 dwellings + employment | Junction 9 and Linsig for junction capacity<br>SATURN for Basildon Assignment, Spreadsheets for Wickford and Billericay |
| | | 22,700 + employment | |
| 2016/17 | Preferred Local Plan Option – Draft Local Plan Jan 2016 Growth (2034) | 16,060 dwellings 13.3ha B1, 22.6ha B2, 33.2ha B8, 7.8ha retail, 1.15 ha commercial | Junction 9 and Linsig for junction capacity<br>VISUM for development traffic assignment<br>2013/15 assignment for background traffic. |
| | Background Growth (2034) | 2869 dwellings and TEMPRO growth | |
| | Baseline 2014 | 2011/2012/2014/ 2016 traffic surveys with TEMPRO growth applied to 2014 | |

2.1.2 BBC produced a Highways 'Topic Paper' in 2015, the purpose of this topic paper was to provide an executive summary of all the technical documents that had been commissioned by BBC in partnership with Essex County Council to inform the Local Plan process. This section provides an overview of this and other interrelated work.

## 2.2 2013/2014 Highways Impact Assessment 'Basildon Borough Local Plan Highway Impact Assessment' (Essex Highways – January 2014)

2.2.1 This report was commissioned to provide an assessment of the highway impact of two Local Plan development options put forward by Basildon Borough Council (BBC) one for 16,000 and one for 22,700 dwellings and each with associated employment development up to the year 2031. The assessment was based around specific modelling of the Basildon, Billericay and Wickford areas with key junctions and links forming the study area.

2.2.2 The 2031 design year was modelled using a SATURN network within Basildon and bespoke spreadsheet models for Billericay and Wickford. Basildon was modelled using the SATURN area-wide modelling software as an existing model inclusive of the area that was already available. Traffic flows in Billericay and Wickford were modelled separately in MS Excel spreadsheet models, as the existing SATURN model did not cover these towns in detail and the spreadsheets would be capable of including the simpler highway networks in the town. The flows calculated within

the spreadsheet models were then used to create junction models in Junctions 8 and PICADY software.

2.2.3 The results of the assessment showed that some of the development options may cause significant localised impacts as proposed in the respective scenarios. The additional traffic from the development along with the general background growth in traffic up to 2031, would in some cases, exacerbate issues at junctions and on links already experiencing capacity constraints. Problems were most apparent in Billericay, Wickford, and East Basildon. The report highlighted the need to identify mitigation measures to be investigated and led to two further pieces of work to look at Highway Mitigation, outlined below.

## 2.3 2014/2015 Highway Mitigation Modelling:

**'Technical Note – Junction Mitigation Testing, Billericay' (Essex Highways – August 2014)**

**'Wickford & Basildon Modelling Scheme Appraisal' (Essex Highways – December 2015)**

2.3.1 A further study was undertaken to establish the mitigation that would be required to accommodate the Local Plan future development with several different mitigation measures assessed at junctions, which had been identified as a particular concern in the earlier work.

2.3.2 An initial review of the associated design and cost implications was undertaken. Two separate notes were prepared, one which addressed junction mitigation options for Billericay and a second which addressed mitigation options in Wickford and Basildon.

2.3.3 These assessments determined that highway improvements could be made throughout the network to address capacity issues at a number of junctions that would otherwise be expected to be over capacity following the realisation of the Local Plan.

## 2.4 Concurrent Transport Studies

2.4.1 There are a number of other Transport Studies, relevant to the Local Plan, that have recently been completed or are currently being undertaken. The most relevant are outlined below. The majority of these studies are ongoing and their anticipated findings are still subject to completion. Where available, data from these studies has been included or factored into the modelling methodology for this 'Part 2' study, or at the very least, consideration has been given to the likely impacts and interrelationship of the Publication Local Plan with these studies.

### Basildon Town Centre Masterplan

2.4.2 In 2012 Basildon Borough Council adopted a Masterplan to guide the future development of its town centre to 2030. The Highway proposals from the masterplan are being progressed as part of the Basildon Integrated Transport

Package - South East Local Enterprise Partnership (SELEP) Business Case. Basildon recently won £9.8m, from the Government's Housing Infrastructure Marginal Viability Fund, to boost the regeneration of Basildon town centre's East Square, and start delivering associated schemes set out in the Masterplan.

2.4.3 Ardent Consulting Engineers produced the Transport Assessment for the Masterplan for Basildon based on 2011 data, which included an assessment of the traffic impact of the regeneration of the town centre and Masterplan proposals. Trip rates within the Ardent assessment are taken from TRICS and are based on an average over a number of years from similar sites selected from the TRICS database. The trip rates adopted by Ardent to calculate these values have been reviewed and are considered reasonable and so have been used within this assessment for Basildon Town Centre developments.

2.4.4 Essex Highways has previously prepared a VISSIM model for the masterplan area, covering the main railway station and retail/commercial areas accessed via Broadmayne, Southernhay, Roundacre, Nether Mayne and Upper Mayne. The scheme is due to go to public consultation in summer 2018 with the aim of commencing works towards the end of 2018.

2.4.5 While any further detailed modelling of the Masterplan proposals has not been undertaken explicitly as part of this study, the outcomes of the latest VISSIM assessment work, undertaken in 2017, are discussed in more detail in Section 7 of this study.

**Wickford Town Centre Regeneration Phase 2: Redevelopment Options – Final Report (2017)**

2.4.6 In 2006, a Wickford Town Centre Masterplan set out a number of Phase 1 Regeneration Projects, which have now been completed. Subsequently, BDP and Urban Flow were appointed to investigate three further regeneration projects (out of 5 shortlisted by the Council as part of the Wickford Phase 2 Regeneration Programme), including:

- The High Street – public realm improvements, including proposals for decluttering and potential pedestrianisation
- Wickford main car park – redevelopment site
- Station Avenue car park – redevelopment site

2.4.7 The work has culminated in the Wickford Town Centre Regeneration Phase 2: Redevelopment Options – Final Report (2017), which identifies a number of options for further testing at each of the regeneration projects.

2.4.8 While any new development coming forward as part of the proposals has been included in the Publication Local Plan Growth, any changes to the High Street and subsequent traffic impact are yet to be defined and tested for feasibility.

2.4.9 BBC intend to commission a detailed modelling exercise later in 2018 to assess different options for the potential closure of the High Street to traffic at certain

times of day. The outcomes of this work will not be available for this 'Part 2' study and, where relevant, reference has been made to the potential impacts of any changes to the High Street.

### A127 Corridor for Growth

2.4.10 ECC is leading on various studies along the A127, which provides the key east-west route connection for the Borough between the M25 in the west and Southend in the east. It is particularly important as it presents a physical barrier between the southern settlement of Basildon and the northern settlements of Wickford and Billericay – access between each of these areas relies on a number of north/south interchanges and junctions along the A127 corridor.

2.4.11 Within the A127 Corridor for Growth Route Management Strategy (March 2014) there are individual pieces of work which are currently at various stages of planning and development, the vast majority of which are focussed on interchange capacity and/or safety improvements. Where relevant, this ongoing work is considered throughout this study.

### Lower Thames Crossing

2.4.12 The Lower Thames Crossing is a proposed new road crossing of the River Thames which will connect the counties of Essex (north) and Kent (south). The scheme is being developed by Highways England and a decision on the preferred route was made on 12 April 2017.

2.4.13 The planned route is expected to run from the M25 near North Ockendon with a new link / junction on the M25, crossing the A13 at Orsett before crossing the Thames via tunnel east of Tilbury and Gravesend. A new link road will then take traffic towards the A2 and M2 near Shorne.

### Basildon Cycling Action Plan (BCAP)

2.4.14 In line with the Essex Cycling Strategy, the Basildon Cycling Action Plan (BCAP) ultimately provides ECC / BBC with a strategy for a range of potential cycling improvements to encourage residents and workers in the Borough to travel by bike. The aims of developing the Cycling Action Plan are to:

- Identify the current level of cycle demand within the Borough and how cycling levels can be increased;
- Identify any cycle safety issues within the Borough;
- Identify gaps in existing cycle provision, particularly relating to key routes;
- Identify ways of closing the gaps in cycle provision and proposed cycle enhancements; and
- Investigate ways of marketing existing and proposed cycle routes.

2.4.15 The BCAP will ultimately form an important piece of work which will guide the provision of cycling infrastructure in support of the Publication Local Plan.

**High Level Development Frameworks – Pell Frischmann (2017)**

2.4.16 Pell Frischmann were commissioned by BBC to undertake high level development frameworks (HLDFs) for several sites being promoted for development, which would potentially need to be served by new or improved infrastructure, at south west of Billericay, Gardiners Lane South and East Basildon.

2.4.17 The south west of Billericay HLDF, identified the need for a comprehensive and coordinated approach to the phased delivery of a South Western Relief Road (referred to in this 'Part 2' study as the Western Relief Road). The route would serve the potential housing allocations and address major congestion issues caused by the new development elsewhere in central Billericay.

2.4.18 The East Basildon HLDF acknowledges the need for traffic mitigation, given the close proximity of proposed development to A13, A127 and A130 strategic highway network. A major new grade separated junction onto the A127 has been recommended, which will assist with enabling development to the south of the A127 and have wider benefits to unlocking other development opportunities to the north, with wider improvements to journey times to the local area. The overall mitigation scheme would need to include a number of complementary measures:

- New grade separated junction on the A127 to replace existing left-in left-out arrangements at Pound Lane and Cranfield Park Road with an improved link to Wickford
- New Road connecting the new A127 junction with Courtauld Road (high level analysis undertaken identifies that alternative upgrading of Burnt Mills Road requires private land and is thus more difficult/costly)
- New Road between the north part of Pound Lane and London Rd, creating alternative route to the south part of Pound Lane
- New signalised junction on London Road with the New Road
- Pound Lane to serve local traffic - measures to reduce speed and/or capacity
- Traffic calming on Burnt Mills Road
- London Road/Sadlers Farm Junction improvements – potential signal timing changes, introduction of cycleways

2.4.19 The Gardiners Lane HLDF recommended the following improvements to the transport infrastructure to accommodate proposed development:

- Capacity improvements associated with junction on the A127 / A132 Nevendon Interchange (completed in 2017 through SELEP funded A127 Resilience Package)
- Local traffic on Gardiners Lane South
- Improved junction of Gardiners Lane South with A1235
- Emergency access to A1235 from the south west corner of development

- HGV traffic confined to the north-east part of the site
- Residential and school traffic preferably uses southern site access
- Public transport improvements
- Endeavour Drive bus link

2.4.20 The outcomes of the HLDFs have been considered in this 'Part 2' study and where appropriate new network connections, junction improvements and traffic management changes have been included in the modelling assessment.

**Outline Transport Statement Land East of Frithwood Lane, Billericay – i-Transport (2017)**

2.4.21 A review has also been undertaken of a South Western Relief Road by i-Transport on behalf of Gleeson Developments Limited. The study indicated potential for around 1,000 vehicles to reassign from the town centre roads onto the South Western Relief Road each weekday peak period. Additionally, traffic that is routing between the A129 London Road / Mountnessing Road / Western Road and the A176 / Basildon via Tye Common Road / Little Burstead (i.e. currently avoiding Billericay town centre) will also be expected to transfer to the South Western Relief Road.

2.4.22 It was demonstrated during early testing of the Local Plan that any additional traffic resulting from the future year scenario testing would likely exacerbate the Billericay highways network issues and lead to other congestion 'hotspots'.

2.4.23 The highway capacity delivered by the new relief road is intended to accommodate growth in this location and improve the capacity and flow of local roads serving the rest of Billericay. New development in the area is expected to make a contribution towards such improvements to the local and strategic road network as appropriate.

2.4.24 The Highway Mitigation Modelling validated the South Western Relief Road as an essential piece of infrastructure without which the developments cannot be accommodated. It is expected to deliver two key functions, having a significant benefit for the wider local area, by serving the new developments within the growth arc and diverting transit from the town centre, thus making it more attractive for local trips, which in turn would boost local economy.

**Neighbouring Local Plans**

2.4.25 The status of the neighbouring authorities Local Plans have been reviewed to determine whether their associated transport assessment work has been sufficiently developed to inform conclusions on cross boundary impacts within this 'Part 2' study.

2.4.26 The current status of the neighbouring authorities Local Plans is summarised below:

- **Rochford District** – Completed stage 1 'issues and options' public consultation (closed 7th March 2018) and processing responses. A target date of Spring/Summer 2021 has been proposed for full adoption of the new Local Plan.
- **Brentwood Borough** - The council has just completed the stage 2 'preferred options' public consultation (closed 12th March 2018), with a proposed target date of Spring/Summer 2019 for full adoption of the new Local Plan.
- **Chelmsford City** - The council has just completed the stage 3 'pre-submission' public consultation (closed 14th March 2018), with a proposed target date of early 2019 for full adoption of the new Local Plan.
- **Thurrock Council** - The council is in the process of the initial plan preparation and evidence base development work for the new Local Plan, with the 'call for sites' public consultation open from 9th March 2018 until 23rd April 2018. A target date of October 2020 has been proposed for full adoption of the new Local Plan.
- **Southend-on-Sea Borough** - The council has just completed the initial plan preparation and evidence base development work for the new Local Plan, with the 'call for sites' public consultation closed in May 2017 and the 'Integrated Impact Assessment (including Sustainability Appraisal): Scoping Report' public consultation closed on 8th December 2017. A target date of Winter 2019 has been proposed for full adoption of the new Local Plan.
- **Castle Point Borough** - Following the Council's decision to withdraw the New Local Plan 2016 on 29th March 2017, the Council will continue to use the 1998 Adopted Local Plan as amended and saved by the Secretary of State for Communities and Local Government in 2007, together with numerous non-statutory Supplementary Planning Documents.

2.4.27 The review highlights that in most cases, with the exception of Chelmsford City, the overall evidence bases supporting these Local Plans are not sufficiently developed to inform cross boundary analysis at this stage. Where available, reference and comparison has been made to modelling outputs for Chelmsford City's Local Plan. In lieu of further up to date modelling flow values, for neighbouring Authorities, the outputs of this 'Part 2' study will be used to inform cross boundary impacts.

# 3 Publication Local Plan Growth

3.1.1 The Publication Local Plan Growth Scenario analysed within this 'Part 2' report comprises 18,283 residential dwellings, 261,520 sqm floor space of employment, 85,061 sqm floor space of commercial (retail and leisure) and 6,195 additional school places. A map of the principal development sites is shown on Figure 3-1 at the end of this chapter and a summary breakdown of proposed development sites is included at **Appendix A**.

3.1.2 In comparison to the 2016 Draft Local Plan Growth Scenario, analysed in the 'Part 1' report, this represents an additional 2,223 residential dwellings and 5,100 sqm of leisure floor space. In contrast, there is a reduction of 429,745 sqm of employment floor space and 18,299 sqm of retail floor space. The previous studies did not test the addition of new and expanded education sites, due to a lack of information at the time, but the 'Part 2' HIA now makes provision for the projected uplift in pupil numbers to account for growth at both primary and secondary school level.

## 3.2 Residential Development Sites

3.2.1 Residential development sites consist of the following:

- Housing and Economic Land Availability Assessment (HELAA) sites – sites proposed for allocation or have reasonable alternatives proposed as a result of consultation feedback;
- Urban and Town Centre sites;
- Residential Land Availability (RLA) sites – sites that have planning permission (committed development sites);
- GB Infill sites – potential sites that would be suitable for 'infill' development on land located between existing houses in areas of the Green Belt including Plotland locations (Plotland locations have been specifically mapped whereas the GB infill has been assumed as a percentage uplift for growth); and
- Windfall sites – sites that have not specifically been identified as available in the Local Plan allocation process but could potentially come forward as 'unexpected' development during the plan period.

3.2.2 HELAA, RLA and Urban / Town Centre sites are located across all three of the districts, with the Plotland sites located primarily to the east and north of Basildon, based within the Green Belt of the Basildon Borough.

## 3.3 Employment Sites

3.3.1 Employment development sites consist of the following:

- Potential employment sites in the Green Belt,
- Key employment sites,

- Existing employment sites in the urban area,
- Existing employment sites in the rural area and
- Vacant/underutilised land.

3.3.2 The majority of employment land is located on the fringe of existing employment sites along the northern edge of Basildon, with new expansion areas located to the west and east of the district. Employment opportunities have also been identified within the town centres of Wickford and Billericay.

## 3.4 Retail and Leisure Sites

3.4.1 All retail and leisure sites are proposed in and around the Wickford, Billericay, Basildon, Laindon and Pitsea areas. The majority of these sites are proposed within town centre locations, within Basildon, Wickford, Billericay and Pitsea, with some edge of town sites proposed at retail parks located in Basildon, and towards the east of Basildon, south of Billericay and the south and west of Wickford.

## 3.5 Education Sites

3.5.1 Total pupil numbers have been estimated based on information provided by the Education Authority as to the educational requirements of potential development sites in the Publication Local Plan. It is worth noting that the analysis has been produced by undertaking a desk top study to present a 'moment in time' assessment of the impact of Local Plan growth. More detailed consideration of site constraints etc. is still to be carried out and therefore all pupil numbers are considered to be initial estimates at this stage. School trips have been tested as a 'worst-case' and based on existing catchment patterns, which include a high level of travel from outside priority catchment areas, given the current availability of school places.

3.5.2 Approximately half of the proposed education uplift will be accommodated in newly built schools with the remaining half to be accommodated in extensions or available capacity at existing schools. Advice from the education authority has highlighted that proposed new & expanded school provision in the key settlement areas will change the pattern of travel and reduce the need or opportunity for pupils to travel outside of the priority catchment areas in future years, which would cause a likely reduction in journey distances and car trips from the modelled scenario. For example, once secondary school places fill up in Billericay and Wickford, this will reduce the availability of places for Basildon pupils to attend those schools, putting pressure on the need for new school places in the Basildon settlement, and once provided will reduce the number of trips from the south of the Borough to the north of the Borough. Furthermore, the majority of school sites are to be located in close proximity to the proposed residential strategic sites, serving as a local facility within the newly developed catchment areas.

## 3.6 Application of the Final Growth Scenario

3.6.1 Table 3-1 below provides an outline of the proposed Final Growth Scenario, detailing the split of each site type (as summarised above) for each of the four main land uses.

3.6.2 Trip generation for each of the sites identified within the Final Growth Scenario has been calculated and assigned to the highway network in accordance with the methodology set out in Section 4 and Section 5 below.

**Table 3-1: Proposed Final Growth Scenario**

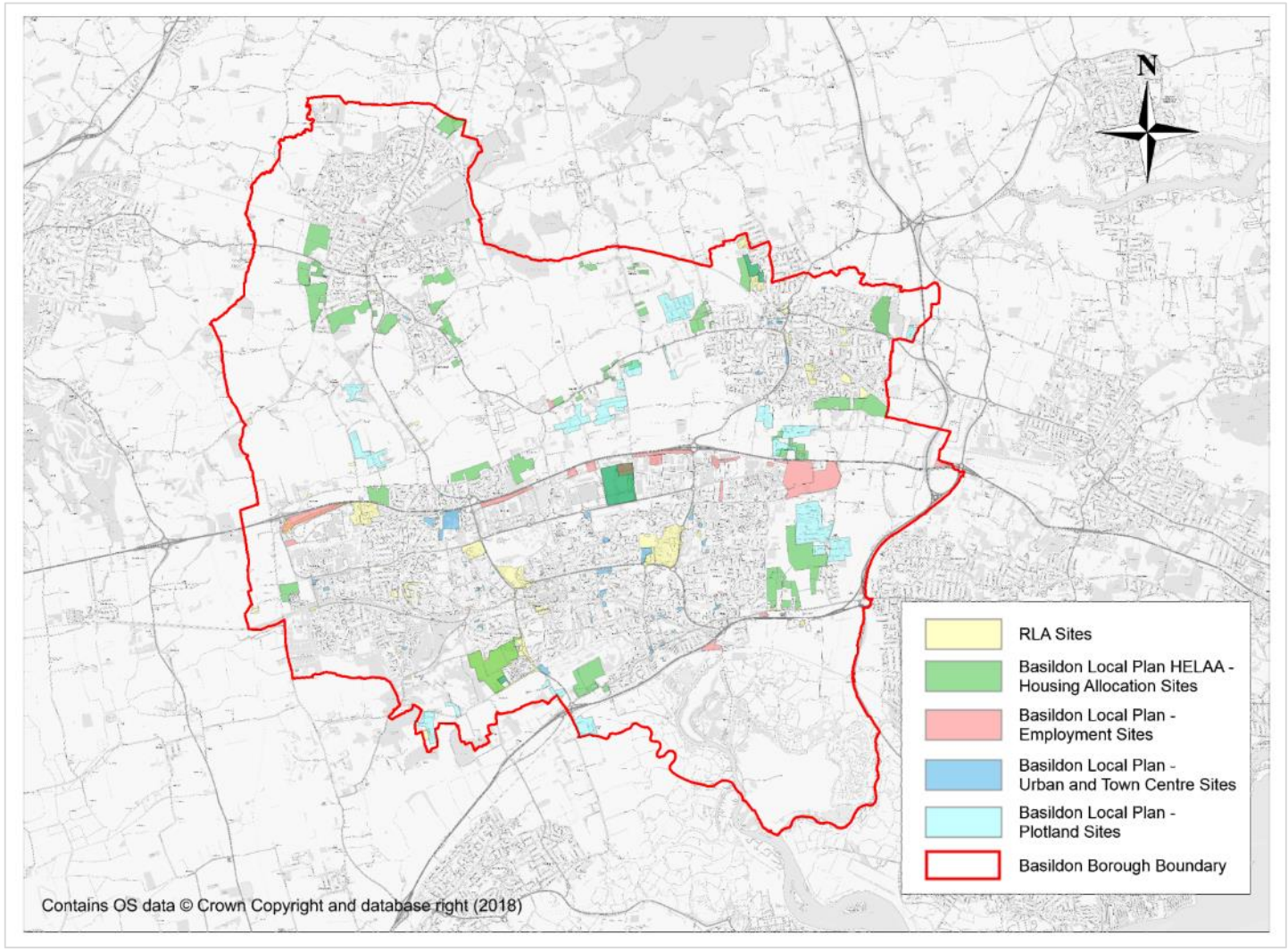
| Land Use | Proposed Development |
|---|---|
| **Residential (units)** | **18,283** |
| *HELAA* | *12,631* |
| *Town Centre* | *1,284* |
| *RLA* | *3,271* |
| *Plotland* | *122* |
| *Windfall* | *960* |
| *GB Infill* | *15* |
| **Employment (sqm)** | **261,520** |
| *B1 Office* | *130,005* |
| *B2 Industrial Unit* | *70,340* |
| *B8 Warehousing* | *61,175* |
| **Retail / Commercial (sqm)** | **85,061** |
| *Retail Comparison* | *59,761* |
| *Retail Convenience* | *8,700* |
| *Commercial* | *16,600* |
| **Education (pupils)** | **6,195** |
| *Primary School* | *4,515* |
| *Secondary School* | *1,680* |

## 3.7 Development Access

3.7.1 An initial review has been undertaken with Essex County Council to identify potential principal access points for major sites to the highway network. This was an initial desktop review and represents likely locations for safe and convenient vehicular access. It is acknowledged that a number of these sites will also require secondary or additional access points for emergency vehicles, which will need to be agreed at the detailed planning stage.

3.7.2 A location plan of the potential principal access points is included at **Appendix B**. All locations should be treated as indicative and subject to the eventual site layout and detailed design and road safety audit. Additional secondary access points will also need to be reviewed against housing numbers and eventual layout to ensure all sites make adequate provision for emergency services access.

**Figure 3-1: Proposed Final Growth Scenario - Development Sites**



# 4 Transport Model & Study Area

## 4.1 Overview

4.1.1 The model study area includes the key road networks within BBC with a particular focus on the highway networks in and around the major settlements of Basildon, Wickford and Billericay.

4.1.2 A two-tier modelling approach has been adopted for the HIA, which uses a VISUM (v14) assisted spreadsheet model to understand the impact of future development across the network.

4.1.3 The spreadsheet element of the model generates the future traffic growth, vehicle trip generation and distribution. The VISUM model has been built covering the entire Borough and has been used specifically to assign development only traffic across the network. The assigned future development flows are then combined with background traffic growth from the spreadsheet model and assessed in individual junction models for each scenario.

4.1.4 It is important to note that the model outputs do not fully account for detailed considerations including traffic interactions, dynamic reassignment and individual driver behaviour. The model can however, provide an appraisal of traffic problems across the core BBC geographical area including vehicle demand, junction performance and stretches of road likely to be operating above their theoretical capacity. These outputs will highlight areas where some form of mitigation is likely to be required to reduce the traffic impact of forecast development.

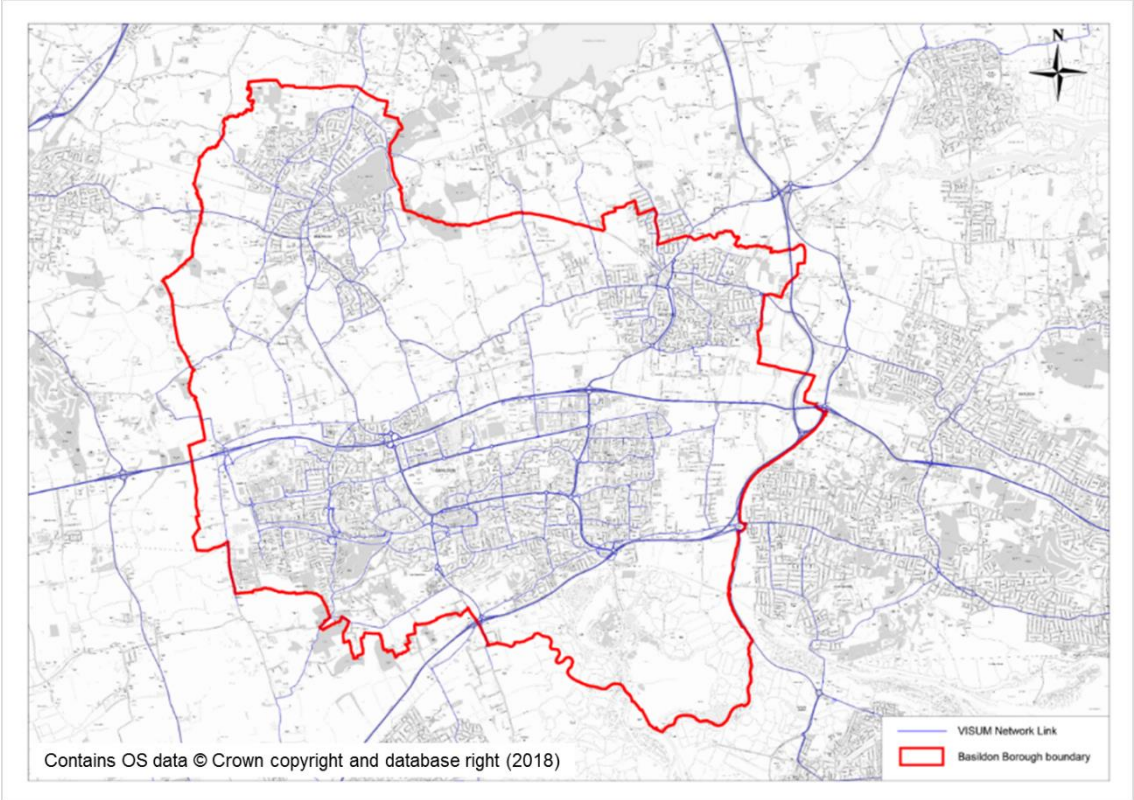
4.1.5 The modelling approach has been prepared in line with DfT/WebTAG modelling principles and was deemed reasonable in scale and 'fit for purpose', by Essex Highways in consultation with ECC and BBC, to assess the highway network within the Borough under the given scenarios. This section discusses the overall methodology in more detail.

## 4.2 VISUM Network Model

### Model Extent

4.2.1 A 'skeleton' VISUM model of the urban and strategic road network across the Borough has been built and the extent is shown in Figure 4-1. The purpose of undertaking VISUM modelling at this stage of planning is to assign future development only trips to the network as accurately as possible. The VISUM model has not been used to assign background traffic on the highway network.

**Figure 4-1: VISUM Model Extent and Study Area**




4.2.2 Average vehicle speeds from 2014/15 Trafficmaster journey time data and distance have been used to inform the links that the development trips would use within the VISUM model network. The Trafficmaster GPS data is derived from a large sample of individual journeys and the corresponding average link speeds, by time period, which have been applied to the modelled areas of the Borough road network. The VISUM model network also includes key cross boundary approaches at the A127, A130 and A13 to determine likely impacts on neighbouring authorities.

4.2.3 The VISUM model has also been used to inform the potential reassignment of development only trips resulting from the introduction of certain mitigation measures including new link roads and significant junction improvements.

4.2.4 While the VISUM model does not specifically assign background traffic, where possible, the development only reassignment outputs have been used to inform a separate 'standalone' methodology to reassign background traffic. This method is discussed later in this report.

**Model Zones**

4.2.5 The zone system used in the VISUM network is based on 2011 Census Journey-To-Work (JTW) Output Areas (OAs). This corresponds to the Basildon SATURN model zone system, used for previous work, enabling a

more direct comparison of demand between the two model approaches. The VISUM zoning system is included at **Appendix C**.

4.2.6 Initial discussions were held with the ECC Strategic Development team in August 2016 to identify where the major development sites are likely to access the road network.

4.2.7 Development sites comprising 30 units or more have been allocated to appropriate zones within the model. Specific zones have been created for some larger sites with the anticipated access arrangements to the network agreed with ECC where detailed development and masterplan information is unavailable.

4.2.8 There are 231 sites, totalling 1,319 residential units, identified within the Local Plan that are small developments of less than 30 units. In isolation, these sites are unlikely to generate a significant level of traffic. However, it is important to account for this traffic growth and trips have been distributed proportionally across the zones that they are located either within or closest to.

4.2.9 Model matrices were constructed by allocating the development trips to spatially representative model zones and then arrivals and departures were distributed based on Census JTW data. As the Census data does not include JTW by mode at Output Area level, car driver data at Middle Layer Super Output Area (MSOA) level was factored to the appropriate level.

**Model Time Periods**

4.2.10 The model includes the weekday AM and PM peak hours for the following periods:

- AM Weekday 0800-0900
- PM Weekday 1700-1800

4.2.11 These time periods have been identified as the typical network peak periods across the week and also generally represent the typical peak traffic generation periods of future development proposed in the Publication Local Plan. The model time periods are therefore considered a robust worst-case for assessment purposes.

**Network Assumptions**

4.2.12 VISUM models have been created to represent each of the following assessment scenarios:

- Background Growth (2034): NTEM/TEMPRO growth plus committed development traffic assigned using VISUM, with no alterations to the highway network.

- Publication Local Plan Growth (2034): Adjusted[1] NTEM/TEMPRO growth, committed development, plus Local Plan development, with no alterations to the highway network.
- Publication Local Plan Growth with mitigation (2034) – used to assign development traffic, with application of necessary mitigation and infrastructure being tested:[2]
  - 2016 Publication Local Plan Growth (2034) – with no alterations to the highway network, used to assign traffic to junctions where no directly related reassignment is expected.
  - Dunton Link Road VISUM model – used to assign development traffic to junctions modelled to understand the impact of Dunton Link Road on the surrounding junctions.
  - South Western Billericay sites Western Link Road VISUM model – used to assign development traffic to the junctions modelled to understand the impact of the Western Relief Road. Note that an additional version of this model was created to assess the combined impact of the Western Relief Road and the removal of one-way restrictions on Laindon Road.
  - East Basildon sites Pound Lane VISUM model – used to assign development traffic to the junctions modelled in the vicinity of the new junction with A127 and associated link roads.

4.2.13 The 2034 VISUM models also include a number of recently completed and proposed highway improvement projects that are expected to be completed by 2034. While it is realistic to assume that additional highway improvement works may be developed and/or delivered prior to the 2034 assessment year, such assumptions are limited and only the known major schemes which currently have agreement or sufficient detail have been accounted for within the VISUM model.

4.2.14 For reference, those major projects which have been included in the 2034 assessment scenarios are as follows:

- Additional northbound lane on A176 Nethermayne between Hospital roundabout and Roundacre roundabout
- Basildon Hospital access improvements

[1] In the Publication Local Plan scenarios background growth only, accounting for just economic and wider UK growth from TEMPRO, has been applied. Any other planning assumptions (additional housing or employment growth) included within TEMPRO for the Borough up to 2034 was removed to avoid double counting.

[2] Different VISUM models have been created for the different mitigation scenarios tested. The only difference between each model is that links have been added to allow the new movements created by the mitigation measures listed. Where mitigation measures include upgrades to existing junctions, the Publication Local Plan Growth VISUM model has been used (so the same assignment is used as the unmitigated model). Where the mitigation measure being tested is a new highway scheme such as a new junction or link road, the VISUM model for that scenario has been used so that the reassignment of traffic resulting from the new routing created is understood.

- Additional lane on the A127 Nevendon roundabout circulatory carriageway
- A130 northbound widening to three lanes between Rettendon and Howe Green (A12 interchange)
- Basildon Town Centre Masterplan improvements including shared space and bus / taxi only road schemes
- A127 / A130 Fairglen Interchange Short-Term Scheme (2034 with Mitigation scenario only).

4.2.15 Additional necessary highway mitigation schemes have been identified over and above these schemes, as a result of the modelling assessments, which are discussed later in this report.

## 4.3 Highway Assessment Extent

### Study Area

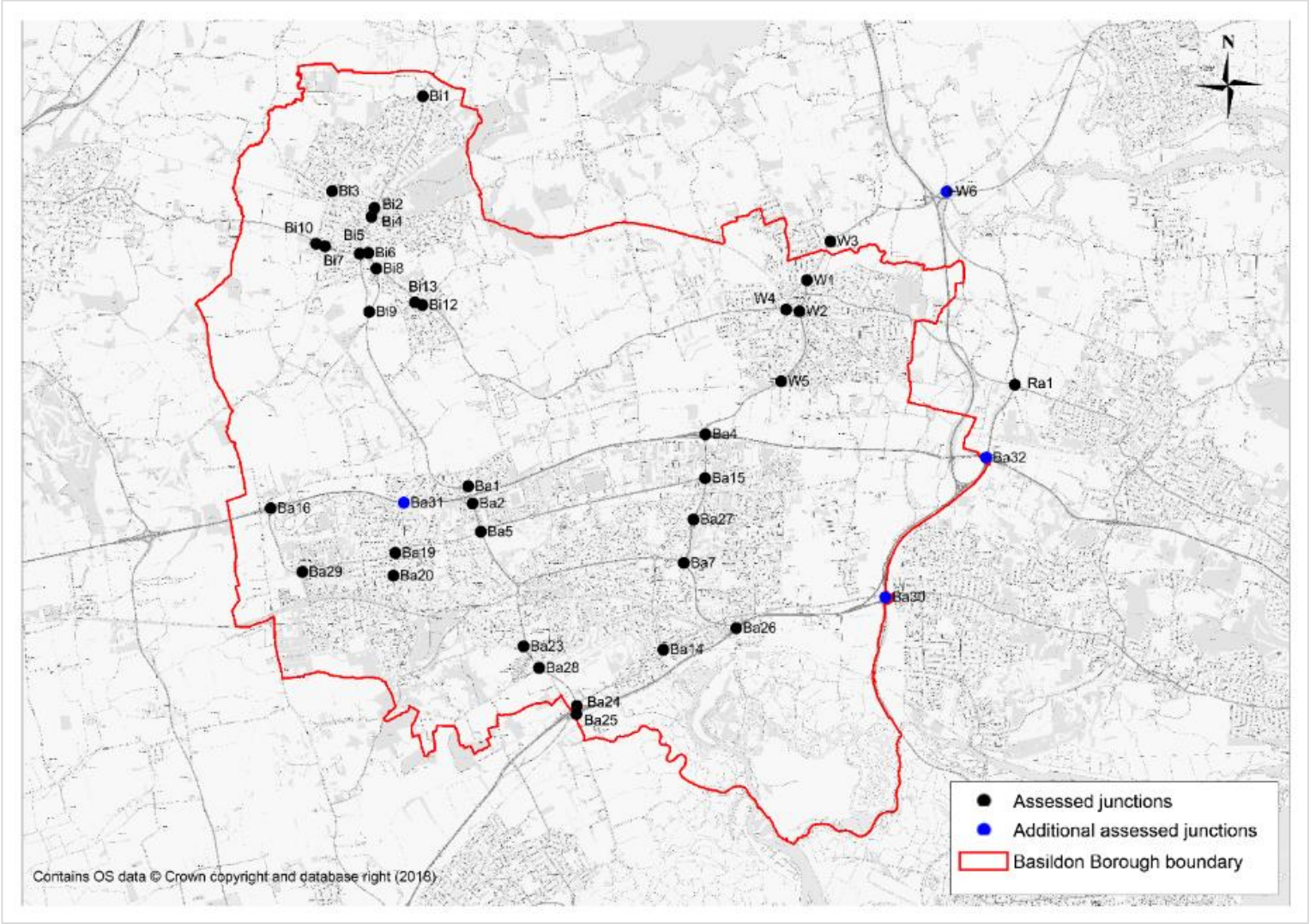
4.3.1 An initial study area was defined at the outset of developing the BBC Local Plan in 2011, which included key junctions to be assessed in and around each of the principal settlements and Borough highway network. Junctions have been included on the basis of current performance, likelihood of the junction being impacted upon by traffic growth and proximity to the core Borough and wider strategic networks. Over time, additional junctions have been added to the study area.

4.3.2 It was agreed with ECC and BBC that the subsequent 2013/15 transport studies and the 2017 Part 1 and 2018 Part 2 HIAs would also focus on this defined study area and those junctions that have been specifically modelled within this 'Part 2' study are listed in Table 4-1 and shown in Figure 4-2. Appendix D includes more detailed junction location plans at a settlement level.

**Table 4-1: Junctions Included in Study**

| ID | Junction Location | Existing Layout | Mitigation Modelled |
|---|---|---|---|
| **Basildon** | | | |
| Ba1 | A127 / A176 Noak Bridge Interchange North | Standard rbt | Yes |
| Ba2 | A127 / A176 Noak Bridge Interchange South | Standard rbt | No |
| Ba4 | A127/A132 Nevendon Interchange Junction | Signal rbt | Yes |
| Ba5 | Cranes Farm Rd / A176 Upper Mayne / St Nicholas Ln | Standard rbt | Yes |
| Ba7 | Broadmayne / South Mayne / Ashlyns | Standard rbt | No |
| Ba14 | B1464 London Road / High Road / Clay Hill Road | Mini rbt | Yes |
| Ba15 | Cranes Farm Road / A132 East Mayne | Standard rbt | No |
| Ba16 | A127 / B148 West Mayne (Dunton) Interchange | Large rbt | No |
| Ba19 | High Road / West Mayne / St. Nicholas Lane | Standard rbt | No |
| Ba20 | High Road / Somerset Road / Laindon Link | Standard rbt | No |
| Ba23 | A176 Nether Mayne / Hospital Access | Signal rbt | Yes |
| Ba24 | A13/A176 Five Bells Interchange North | Standard rbt | Yes |
| Ba25 | A13/A176 Five Bells Interchange South | Standard rbt | Yes |
| Ba26 | A13/A132 Pitsea Interchange | Standard rbt | Yes |
| Ba27 | A132 East Mayne / Whitmore Way / Felmores | Standard rbt | No |
| Ba28 | A176 Nether Mayne / Dry Street | Priority (3-arm) | Yes |
| Ba29 | B148 West Mayne / Mandeville Way | Standard rbt | No |
| Ra1 | A1245 Chelmsford Road / A129 London Road | Standard rbt | Yes |
| **Billericay** | | | |
| Bi1 | B1007 Stock Road / Queens Park Avenue / Potash Rd | Standard rbt | No |
| Bi2 | B1007 Stock Road / Radford Way | Mini rbt | No |
| Bi3 | Mountnessing Road / Perry Street / Radford Way | Standard rbt | No |
| Bi4 | B1007 High Street / Norsey Road / Western Road | Signal (4-arm) | Yes |
| Bi5 | A129 London Road / High Street / Sun Street | Standard rbt | Yes |
| Bi6 | A129 Sun Street / Chapel Street | Standard rbt | No |
| Bi7 | A129 London Road / Tye Common Road / Western Rd | Signal (4-arm) | No |
| Bi8 | A129 Southend Road / A176 | Standard rbt | No |
| Bi9 | A176 / Kennel Lane / Laindon Road | Standard rbt | No |
| Bi10 | A129 London Road / Mountnessing Road | Priority (3-arm) | No |
| Bi12 | A129 Southend Rd / Outwood Common Road | Priority (3-arm) | No |
| Bi13 | A129 Southend Rd / Hickstars Lane | Priority (3-arm) | Yes |
| **Wickford** | | | |
| W1 | A132 Runwell Road / A132 / Runwell Road | Standard rbt | No |
| W2 | A132 Golden Jubilee Way / Radwinter Ave / A129 London Rd | Standard rbt | Yes |
| W3 | A132 Runwell Road / Church End Lane | Priority (3-arm) | No |
| W4 | A129 London Road / Nevendon Road / High Street | Signal (4-arm) | Yes |
| W5 | A132 / Cranfield Park Road / Nevendon Road | Standard rbt | No |

**Figure 4-2: Junction Modelling Extent and Study Area**



**Junction Assessments**

4.3.3 This 'Part 2' study builds on the previous studies to assess the Publication Local Plan Growth Scenario. The junction assessments form the basis of the study to test future traffic impact and network performance across the Borough. Junction models have been produced for all junctions (as shown in Figure 4-2 / Table 4-1) using the following industry standard junction modelling software:

- TRL's Junctions 9 to assess network performance of priority (T-Junctions and non-signalised cross roads) and roundabout junctions; and
- JCT's LINSIG v3.0 to assess network performance of traffic signals.

4.3.4 It should be noted that not every junction in the Borough has been assessed to this level of detail. Where capacity issues are not expected, these have been excluded, and where other studies are taking place separately these will be referred to but haven't been specifically assessed as part of the HIA.

4.3.5 While the study area and junctions assessed provide a sufficient level of detail to assess the Publication Local Plan at a strategic level, there may be additional impacts from specific development sites on local junctions on the highway network, which will only become evident as development comes forward across the plan period. These impacts will need to be assessed by developers within Transport Assessments (TAs) as part of the planning process and any need for further mitigation will also need to be agreed and promoted by the respective developer.

4.3.6 The iterative nature of the studies to date, and analysis of modelling outputs, has allowed a range of mitigation and highway improvement schemes to be tested. A preferred package of highway mitigation has been put forward and tested as part of this study to demonstrate the likely level of new transport infrastructure required to accommodate the full delivery of the Publication Local Plan. The assessment of mitigation is discussed later in Section 8 of this study.

## 4.4 Further Network Considerations

4.4.1 In addition to the principal study area, it was agreed that a number of other junctions, where parallel studies and improvement schemes are currently being investigated, would be given consideration in this assessment.

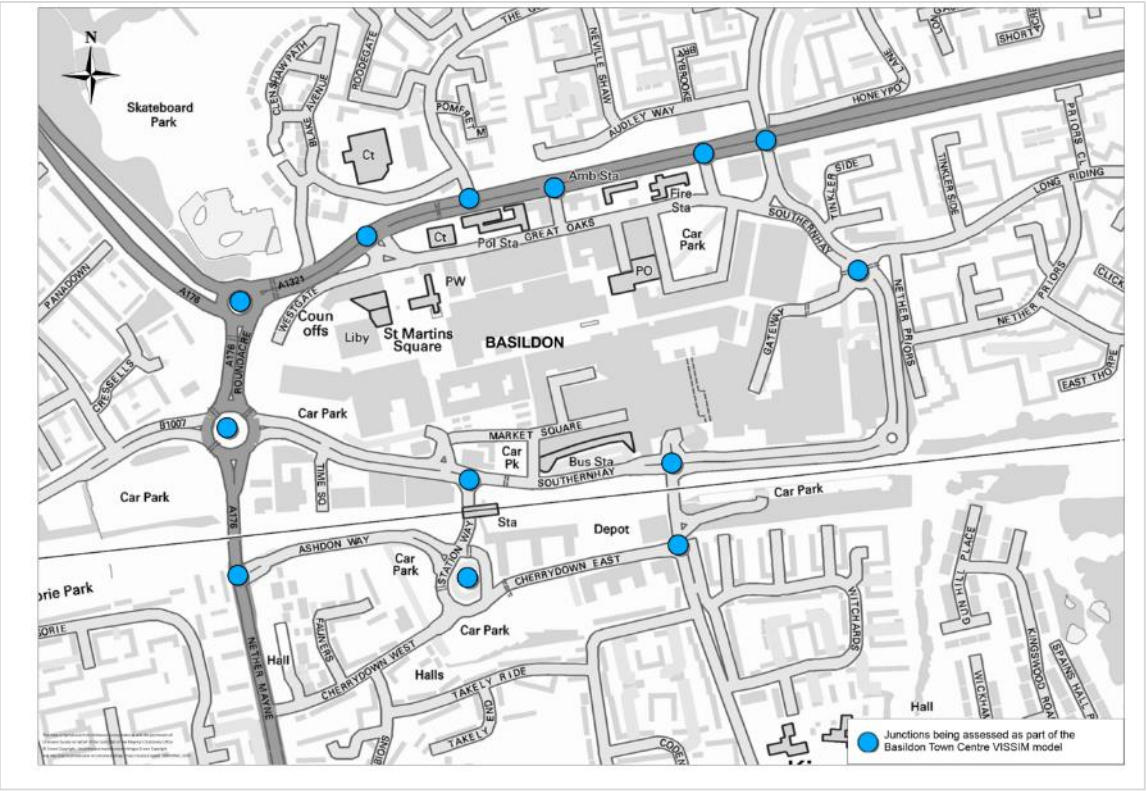
**Basildon Town Centre VISSIM model**

4.4.2 Essex Highways have developed a VISSIM Town Centre model as part of the Basildon Integrated Transport Package - South East Local Enterprise Partnership (SELEP) Business Case. This assessment includes consideration of a number of aspirations arising from the Basildon Town Centre Masterplan,

including a number of highway modifications in the immediate surrounds of the town centre. For reference, the study area for this work is shown in Figure 4-3 and includes the following junctions.

- Broadmayne / A176 Upper Mayne
- Broadmayne / Great Oaks / Westgate
- Broadmayne / Ghyllgrove
- Southernhay / Station Way / Roundacre
- Southernhaye / Clay Hill Road
- Clay Hill Road / Cherrydown East
- Station Way / Ashdon Way
- A176 Nether Mayne /Ashdon Way
- Roundacre / A176 Nether Mayne / Laindon Link
- Broadmayne / The Gore
- Broadmayne / Little Oaks
- Broadmayne / Linkway
- Southernhay / Long Riding.

**Figure 4-3: Map of Junctions Assessed in Basildon Town Centre VISSIM Model**




4.4.3 In summary, the Masterplan testing investigates modified signal control, link closures to general traffic, and two-way operation instead of existing one-way streets, specifically, two-way flow along Station Way, Cherrydown East, and Clayhill Road. The two-way flow requires extensive junction layout changes to the following junctions:

- Roundacre/Station Way/Fodderwick and Southernhay;
- Southernhay/Clayhill Road;
- Station Way/Ashdon Way; and

- Cherrydown East/Clayhill Road/Car Park 13.

4.4.4 The proposed measures are recommendations at this stage and part of a committed scheme, subject to public consultation. Where applicable, highway changes proposed as part of the latest Masterplan work have been incorporated into the VISUM model to ensure that the future highway network scenario is modelled consistently at a strategic level.

**Corridor studies - A127 / A13 Interchanges and Junctions**

4.4.5 As outlined previously, Essex Highways are progressing a number of concurrent studies for a number of junctions and interchanges along the A127 and A13 corridors. At the time of undertaking this study, these corridor schemes were all at various stages of initiation, feasibility or delivery.

4.4.6 A number of junctions, which fall outside the Borough boundary and are not within the study area, have been excluded from this assessment. The following junction schemes and their status form part of the A127 Corridor for Growth route strategy (those for which individual junction assessments have been excluded are identified in grey text):

| | |
|---|---|
| A127 / B186 Warley Interchange | - Feasibility / outline design |
| A127 / A128 (Halfway House interchange) | - Feasibility |
| A127 / West Mayne (Dunton interchange) | - Assessment not yet commenced |
| A127/High Rd 'Fortune of War' roundabout | - Feasibility / options assessment |
| A127 / A176 (Noak Bridge Interchange South) | - Works not currently planned |
| A127 / A132 Nevendon Interchange | - Construction works complete |
| A127 / Pound Lane[3] | - Proposed as part of wider mitigation |
| A127 / A130 Fairglen Interchange | - Subject to Consultation |
| A127 / A129 Rayleigh Weir | - Completed May 2017. |
| A13 / Sadlers Farm | - Feasibility / options assessment |

4.4.7 At the time of undertaking this study final schemes were not available or sufficiently progressed for the 'Fortune of War' and 'Sadlers Farm' junctions. Furthermore, schemes are not currently being assessed for the 'Dunton' and Noak Bridge South A127 interchanges. The study has therefore only assessed the current layout of these junctions with any future scheme expected to be designed to accommodate the likely future traffic growth of the Publication Local Plan.

4.4.8 The preferred short term A127 / A130 Fairglen Interchange scheme, currently subject to public consultation, has been tested with future Publication Local Plan traffic growth. While a specific scheme has not been tested at the restricted A127 / Pound Lane / Cranfield Park road junction, it is acknowledged that a 'fit for purpose' all movement arrangement would be brought forward later in the plan period by wider mitigation proposals

[3] This proposal is specifically assessed as part of wider mitigation being proposed and is discussed in greater detail in Section 7.

associated with a potential new link road. All proposed permitted movements at this location have therefore been introduced to the VISUM future network to allow vehicles to assign to the available route choices.

**Wider Schemes**

4.4.9 An assessment of some local improvements at the **A1245 / A132 Rettendon Turnpike**, in neighbouring Chelmsford City authority, has also been assessed in this 'Part 2' study for information purposes due to the proximity of Wickford and A130.

4.4.10 It is also noted that a long-term scheme considering the **widening of A127 carriageway** to three lanes is likely to be assessed in due course by ECC. The timeframe for assessment and delivery is unknown at this stage and a scheme has not been considered as part of this assessment.

4.4.11 A decision was made on the preferred route for the **Lower Thames Crossing** in 2017. The scheme is currently subject to an updated modelling exercise with the new Lower Thames Area Model (LTAM) replacing the previous Lower Thames Crossing (LTC)2 model and is expected to go to Public Consultation in the summer of 2018. It is understood that up to date modelling outputs will not be released and made available by Highways England (HE) until after this consultation event and the latest results are not currently available.

4.4.12 The HE will need to provide advice on the likely impacts of the new crossing on the highway network in Basildon as their modelling develops. Where possible, this 'Part 2' study provides a high-level commentary on the possible impacts based on previous work undertaken.

# 5 Forecasting, Trip Generation, Distribution and Assignment

5.1.1 The VISUM assisted spreadsheet model was adapted to assign future development related traffic growth across the district and forecast traffic flows at the identified key junctions.

5.1.2 This section outlines the methodologies used to derive forecast year traffic scenarios for modelling and assessment including background growth, trip generation, distribution and assignment for each of the modelled scenarios using the information provided within the Publication Local Plan Growth Scenario. This information is required for the junction modelling and forms the basis of the assessment of the proposed development on the local highway network.

5.1.3 The Publication Local Plan has been tested for the 'total projected housing supply available' up to and beyond the plan period of 2034. It should be noted that only 15,000 dwellings are expected to be delivered in the plan period, with a further 3000+ dwellings planned post 2034. As such the outputs contained in this report test the full 18,233 dwellings within the plan period and the overall highway impact presented is unlikely to occur until after 2034. This represents a 'worst-case' scenario with regard to traffic growth and therefore provides a robust assessment of the traffic related effects of the Publication Local Plan.

## 5.2 Scenario Modelling

5.2.1 The base year for the modelling is 2014, which has been derived from observed turning counts at the key junctions included in the model (see Figure 4-2). The model forecast year is 2034 and is consistent with the Local Plan period. The forecast scenarios assume that all development proposed is fully built-out, occupied and operational by 2034.

5.2.2 As previously stated, this study builds on previous assessments and option testing of development scenarios to inform the eventual Publication Local Plan. This final assessment includes the following four scenarios to demonstrate the traffic impact of future development on the Borough network:

- **2014 Base –** derived from surveyed traffic counts at junctions based on 2011-2013 flows and uplifted to 2014 values using TEMPRO growth within a spreadsheet model, with some junctions using more recent traffic data, collected between 2014 and 2016.
- **2034 Background Growth –** (also referred to as the Do-Minimum or Reference Case) based on the previous scenario junction flows uplifted to 2034 using adjusted background growth factors from TEMPRO, plus committed development traffic only, applied in a spreadsheet model. This

scenario represents the likely future situation without any Local Plan growth and is used for benchmarking against the Final Growth Scenario.

- **2034 Final Growth Scenario No Mitigation –** continuation of the previous scenario combined with the Publication Local Plan growth VISUM model junction flows. Only localised junction changes as identified to occur between 2016 and 2034 applied. Demand derived using VISUM outputs for the Final Growth traffic movements, combined with the spreadsheet based background growth and refined in the spreadsheet model.
- **2034 Final Growth Scenario With Mitigation –** continuation of the previous scenario with the addition of an identified package of mitigation measures, including junction layout changes for selected junctions and highway schemes across the network. Demand derived using VISUM outputs for Final Growth traffic movements, combined with the spreadsheet based background growth and refined in the spreadsheet model.

5.2.3 The mitigation measures that have been modelled are based on discussions with BBC and ECC, taking account of the development proposed in the Final Growth Scenario and drawing on the conclusions of the mitigation results produced in the 'Part 1' study. Where mitigation measures within this report have been previously tested as part of one of the 2013/15 assessments, this revised modelling provides a more up to date assessment with the Final Growth Scenario, and a more robust development traffic assignment methodology. Further details of the mitigation measures proposed are set out in Section 7.

5.2.4 The 'Base' and '2034 Background Growth' scenarios have been compared to the Local Plan Growth and Local Plan Growth plus mitigation scenarios to benchmark the impact of Local Plan Growth on the highway network.[4]

## 5.3 Forecast Traffic Volumes

5.3.1 A three-step process was applied to establish the post-development traffic volumes which were to be tested as part of the Highway Impact Assessment. This included:

- Gathering 'base' traffic information from junction surveys – a Base Case scenario
- Applying a background growth factor to these traffic volumes across the network to arrive at an assessment year 'base' – Background Growth (2034) scenario; and

[4] As per the requirements of the NPPF 'Transport Evidence bases in Plan Making and Decision Taking' Guidance. The Baseline and Background Growth scenarios are not development options in their own right.

- Adding the modelled development trips for the Publication Local Plan Growth (2034) scenario.

5.3.2 Each of these steps are discussed in further detail in this section.

**2014 Base Case**

5.3.3 Manual Classified Turning Counts (turning traffic movements) were undertaken across the Borough between Tuesday 24th and Thursday 26th May 2011 between the hours of 07:00 to 10:00 and 16:00 to 19:00 to determine the volume of turning traffic during peak periods. Automatic Traffic Counts (ATCs) were also undertaken for a seven-day period from May 21st 2011 to record flows on key links between junctions in order to establish the pattern of flow over a weekly period and also in some instances, provide a form of validation of the turning count data.

5.3.4 This data previously formed the basis of the 2014/2015 highway impact and mitigation assessments. Where available, more recent junction counts have been used and compared against those used in previous studies. The count comparison between the various earlier studies and the recent years, generally indicates a slight increase in traffic in line with TEMPRO growth and therefore the application of TEMPRO growth to traffic counts to bring them all to 2014 base case levels is considered appropriate.

5.3.5 Manual Classified Turning Counts and Automated Classified counts were undertaken for the Five Bells and Pitsea interchanges in October 2014 and at Cranes Farm Road / East Mayne (Manual Classified counts completed in October 2012 and Automated Classified counts in February 2016 to verify the October turning movement counts. Manual Classified counts undertaken at the Nether Mayne / Dry Street junction (in March 2012) have also been included, as this junction was not included as part of the 2011 collection.

5.3.6 Finally, new surveys were undertaken in November 2016 at Southend Road/ Outwood Common Road/ Hickstars Lane in Billericay and at West Mayne/ Mandeville Way in Basildon to ensure these junctions (newly added to the list of in-scope junctions) can be included in the highway impact assessments.

5.3.7 As per the previous 2013/15 transport studies, the use of the 2011 volumes plus the incorporation of newer survey information, where available, is considered appropriate for the purpose of forming a ‘base case’ scenario of network volumes across the Borough. For the base case, a scenario year of 2014 has been selected to match the Local Plan period. The junction survey volumes have been factored up (where necessary) to represent 2014

conditions[5], and any highway improvement works that have been completed up to the year 2014 have also been included. Further information regarding this factoring process is discussed in the following section.

**Background Growth (2034) Scenario**

5.3.8 Department for Transport (DfT) modelling guidance prescribes the use of default trip growth rates obtained from the *Trip End Model Presentation Program* (TEMPro), a program which extracts trip data for each planning area from the National Trip End Model (NTEM) forecasts. The forecasts include population, employment, dwellings by car ownership, trip ends and simple traffic growth factors based on data from the National Transport Model (NTM).

5.3.9 In order to establish a future year scenario *without* Local Plan development, the 'base case' volumes were factored based on NTM/TEMPRO to represent the future development year being assessed (2034).

5.3.10 Development assumptions were removed from TEMPRO to ensure that double-counting of new development trips would be excluded as best as possible from the assessments; as the Draft Local Plan development trips are distributed via the VISUM model. The TEMPRO / NTEM growth applied is therefore considered to be representative of the delivery of smaller development sites; and as such, any approved RLA developments less than 30 units in size are considered to be incorporated within the TEMPRO growth allowances.

5.3.11 These volumes therefore represent present-day distribution of trips across the network; that is, traffic is expected to continue to utilise the same routes through the Borough without regard to potential congestion issues that may arise as the general background traffic increases. The resulting network volumes represent network operation for a scenario where no Local Plan Growth comes forward but background growth continues. This is provided in order to provide a point for comparison, allowing conclusions to be drawn about the impact of the Local Plan Growth scenario, it is not a growth option in its own right.

**Publication Local Plan Growth (2034) Scenario**

5.3.12 Once the Background Growth (2034) flows have been established for both the AM and PM peak periods, the VISUM-modelled development flows are added. Therefore, the 2034 post-development scenario represents the base traffic flows factored up to the future assessment year, with the Publication Local

[5] With the exception of junctions which have been surveyed after 2014, where the newer (2016) counts have been conservatively adopted 'as-is' rather than being factored down.

Plan development trips overlaid. Development trip generation is discussed later in this section.

5.3.13 Individual junctions have then been assessed with the Baseline (2014), Background Growth (2034) and Draft Local Plan Growth (2034) traffic movements for comparison, to determine the resulting implications of the Publication Local Plan growth scenario.

## 5.4 Land Use Development Trip Generation

5.4.1 The *Trip Rate Information Computer System* (TRICS) database has been used to determine the total number of vehicle trips (arrivals and departures) that are expected to be generated by the proposed Local Plan development sites in each peak period.

5.4.2 The methodology makes provision for the delivery of reasonable improvements to sustainable access, e.g. public transport, cycling and walking, beyond what is currently available. TRICS sites representing the best fit location and accessibility data to reflect these improvements has been used where possible to account for reasonable level of sustainable modal shift across the Borough.

5.4.3 This follows an industry recognised best practice approach, and has been applied across all previous supporting transport studies (including the 'Part 1' study) providing updates where necessary between each stage of testing. This approach has been continued for the Final Growth Scenario, with additional refinements made to the methodology where appropriate, as outlined below.

### Housing Trip Generation

5.4.4 The residential trip rates used within the 2014 study were split by type of trip based on the type of residential development (privately owned houses, flats, rental etc.) and by 'in town' and 'edge/out of town' sites.

5.4.5 It was considered more appropriate however, to identify trip rates based on their location proximity to town centres rather than by tenure and dwelling type, in line with the guidance in the 2016 TRICS user guide, as stated: *"The most important data fields in terms of site selection compatibility are the main category and sub-category location types."* It continues, explaining that in general it is recognised that *"Sites in a town centre with good local public transport accessibility will naturally, as a rule, achieve a different type of modal split to a site in the country without any public transport."*

5.4.6 Residential trip rates were then recalculated for the 2017 'Part 1' study creating average trip rates from observed sites with varying proportions of houses, flats, rented, shared ownership and privately owned dwellings. The proportion of tenure and dwelling type has been identified in Table 5-1 and is

considered to be representative of the types of sites expected to come forward in Basildon. This follows the same methodology used for similar highway impact assessments produced for other districts in Essex and are considered to be robust.

5.4.7 Trip rates per dwelling unit have been extracted from the TRICS database for various types of housing, including flats, houses and a mixture of both. This analysis has used multi-modal surveys, and has excluded data from Ireland, Northern Ireland & Inner London Boroughs as well as weekend surveys.

5.4.8 The database includes but does not separate out privately owned and affordable housing. The data is considered to represent an appropriate cross-section of the various housing types that will be delivered.

5.4.9 Trip rates were calculated for a range of different residential development types and an average was generated by site proximity to town centres. On this basis, trip rates were extracted from TRICS based on surveys from residential development located within the following five categories:

- Town Centre;
- Edge of Town Centre;
- Suburban Area;
- Edge of Town; and
- Neighbourhood Centre.

5.4.10 The above list descends in order of proximity to the Town Centre, which are sites generally closer to major employment and retail areas, with the exception of Neighbourhood Centres. These locations are defined within the TRICS database and supporting guidance.

5.4.11 The samples used to calculate a trip rate for each spatial category includes a mixture of privately owned, rented and affordable housing and therefore accounts for the possible cross-section of housing types which are likely to comprise the future residential mix. The breakdown of the sites included within the assessment are summarised in Table 5-1:

**Table 5-1: Breakdown of TRICS sites used to calculate trip rates**

| Housing Mix | Site Location | | | | | |
|---|---|---|---|---|---|---|
| | Edge of Town | Edge of Town Centre | Neighbour-hood Centre | Suburban Area | Town Centre | Total |
| **Mixed Affordable / Private** | **12** | **1** | **2** | **14** | **2** | **31** |
| Mixed Houses / Flats | 12 | 1 | 2 | 14 | 2 | 31 |
| | | | | | | |
| **Mostly Affordable** | **11** | **4** | **3** | **11** | **3** | **32** |
| Mixed Houses / Flats | 3 | 1 | 1 | 3 | | 8 |
| Mostly Flats | 3 | 2 | 2 | 6 | 3 | 16 |
| Mostly Houses | 5 | 1 | | 2 | | 8 |
| | | | | | | |
| **Mostly Private** | **29** | **16** | | **42** | **4** | **91** |
| Mixed Houses / Flats | 5 | 4 | | 6 | 1 | 16 |
| Mostly Flats | 2 | 7 | | 14 | 3 | 26 |
| Mostly Houses | 22 | 5 | | 22 | | 49 |

5.4.12 The median trip rates from the TRICS database have been obtained as a means of excluding any significant outliers from the sample selection. Table 5-2 summarises the median peak hour housing trip rates extracted from the TRICS database for the five site location categories for the modelled peak hour assessments.

**Table 5-2: Summary of median vehicle trip rates for housing sites**

| Location of Site | Hourly Vehicle Movements Per Unit | | | |
|---|---|---|---|---|
| | AM Peak (08:00 -09:00) | | PM Peak (17:00 -18:00) | |
| | Arrivals | Departures | Arrivals | Departures |
| Town Centre | 0.042 | 0.091 | 0.091 | 0.065 |
| Edge of Town Centre | 0.096 | 0.208 | 0.196 | 0.158 |
| Suburban Area | 0.098 | 0.286 | 0.276 | 0.138 |
| Edge of Town | 0.133 | 0.333 | 0.330 | 0.158 |
| Neighbourhood Centre | 0.072 | 0.326 | 0.362 | 0.181 |

5.4.13 Using the TRICS location definitions, each proposed residential development site (including those less than 30 units in size) was allocated to one of the five categories identified in Table 5-2, and the trip rates applied to determine future traffic growth across the Borough.

5.4.14 The residential trip rate methodology is considered robust for estimating the associated likely future vehicle trip generation across the Borough.

### Employment Trip Generation

5.4.15 The allocated split in land use types and TRICS location for the proposed employment development sites has been used to determine appropriate trip rates per total gross floor area (sqm) for B1 Office, B2 Industrial Unit and B8 Warehousing. Table 5-3 summarises the assumptions used for the Final Growth Scenario.

**Table 5-3: Employment land use type split (GFA)**

| BBC Ref | Site Address | TRICS Site Location | B1 Office | B2 Industrial Unit | B8 Warehousing |
|---|---|---|---|---|---|
| E6 | East Basildon Extension | Edge of Town | 31,500 | 20,000 | 16,790 |
| H5/E5 | Gardiners Lane (protected under BAS E1) | Edge of Town | 24,750 | | |
| E3 | Ford Technical | Edge of Town | 60,300 | | |
| E3 | Ford Technical | Edge of Town | 6,165 | | |
| E3 | Ford Technical | Edge of Town | 7,290 | | |
| E2* | Cranes Industrial Estate* | Edge of Town | | 15,168 | |
| E2 | Cranes Industrial Estate (Costa) | Edge of Town | | 11,880 | |
| E2/E4 | Burnt Mills | Edge of Town | | | 2,580 |
| E2/E4 | Burnt Mills | Edge of Town | | | 2,310 |
| E2/E4 | Burnt Mills | Edge of Town | | | 750 |
| E2/E4 | Burnt Mills | Edge of Town | | | 540 |
| E2/E4 | Burnt Mills | Edge of Town | | 3,480 | |
| E2/E4 | Burnt Mills | Edge of Town | | | 11,670 |
| E2* | Noak Bridge* | Edge of Town | | 6,960 | 11,880 |
| E2/E4 | Festival Business Park | Edge of Town | | 5,976 | |
| E2/E4 | Festival Business Park | Edge of Town | | | 5,940 |
| E2 | Terminus Drive Pitsea (protected under BAS E2) | Edge of Town | | | 4,350 |
| E2 | Radford Way | Edge of Town Centre | | | 930 |
| E2 | Wickford Business Park | Suburban Area | | | 1,110 |
| E7 | Bluehouse Farm | Edge of Town | | 1,044 | 1,305 |
| E7 | White Bridge Farm | Edge of Town | | | 1,020 |
| E7 | Annwood Lodge | Edge of Town | | 4,512 | |
| E9 | Sadlers Farm | Edge of Town | | 1,320 | |
| **Total (sqm)** | | | **130,005** | **70,340** | **61,175** |

*It should be noted that, as part of minor change to the Final Growth scenario, the employment sites at Noak Bridge and Cranes Industrial Estate have been relocated to the strategic site at East of Basildon. The transport modelling does not include this change and was undertaken for the previous locations. The anticipated change affects approximately 22,128sqm of B2 Industrial and 11,880sqm of B8 floor space. While the traffic generation would not be considered negligible, the likely traffic impact changes, from the modelled scenario, would see a reduction in traffic at the A127 Noak Bridge Interchange, as well as the A176 and A1235 corridors. Traffic would be transferred to the new all movement interchange proposed at A127 / Pound Lane, as part of the East of Basildon sites. The new junction would be built 'fit for purpose', to accommodate the forecast traffic growth, and the relocation of these development sites would add to the viability case for the proposed infrastructure. Further modelling, at this stage, is not deemed necessary.

5.4.16 The trip rates applied to employment development sites are set out in Table 5-4 below.

**Table 5-4: Summary of average vehicle trip rates for employment sites**

| Land Use Type | Hourly Vehicle Movements Per 100 sqm | | | |
|---|---|---|---|---|
| | AM Peak (08:00 -09:00) | | PM Peak (17:00 -18:00) | |
| | Arrivals | Departures | Arrivals | Departures |
| Office Town Centre | 0.500 | 0.049 | 0.071 | 0.518 |
| Office Edge of Town Centre | 1.809 | 0.247 | 0.236 | 1.760 |
| Industrial Unit Edge of Town Centre | 0.375 | 0.087 | 0.150 | 0.400 |
| Warehousing Edge of Town Centre | 0.117 | 0.055 | 0.063 | 0.208 |

### Retail and Leisure Trip Generation

5.4.17 For the retail and leisure development sites proposed for the 2017 'Part 1' study, detailed assumptions were agreed for the split in land use types in respect to total gross floor area (sqm), with their respective trip rates applied for each of the different commercial sites (a variation of retail and leisure facilities), as extracted from the TRICS database.

5.4.18 Under the Final Growth Scenario, as tested within this report, the same proportional split was assumed across the leisure facilities element of the commercial development sites (including cinema, restaurants/bars and community facilities), given the limited information available at the time, with regards to these land use type splits.

5.4.19 For the retail element of the proposed commercial development sites, it was considered more appropriate to use the allocated split in land use type provided by BBC (either as a comparison or convenience retail site), in respect to total gross floor area (sqm). With a significant change proposed for the total retail floor space, the previous detailed retail proportional split assumptions were considered unsuitable for the numbers proposed in the Final Growth Scenario, and therefore the 'high level' split provided by BBC was used instead.

5.4.20 In addition, the comparison retail land use trip rates have been updated to better reflect the likely end land uses, with non-food retail park trip rates applied, replacing the local shop trip rates used previously. This was agreed on the understanding that comparison retail is more concerned with the sale of high-end goods (TVs, white goods etc.) whereby a non-food retail park trip rate would be more appropriate than a local shop/shopping centre trip rate, as outlined within the TRICS definitions guidance.

5.4.21 The allocated split in land use types and TRICS location for the proposed commercial sites has been used to determine appropriate trip rates per total gross floor area (sqm) for the respective land uses. Table 5-5 summarises the assumptions used for the Final Growth Scenario.

**Table 5-5: Retail and Leisure land use type split (GFA)**

| BBC Ref | Site Location | Retail Comparison | Retail Convenience | Leisure |
|---|---|---|---|---|
| R2 | Town Centre | 30,000 | 1,000 | 15,100 |
| R5 | Town Centre | 6,300 | 1,900 | 650 |
| R11 | Edge of Town | 1,500 | | |
| R11 | Edge of Town | 1,500 | | |
| R6 | Town Centre | 500 | 500 | 100 |
| R3 | Town Centre | | 2,480 | 100 |
| R4 | Town Centre | 5,100 | 1,000 | 650 |
| H12 | Edge of Town | 7,500 | 1,000 | |
| H13 | Edge of Town | 400 | 320 | |
| H18 | Edge of Town | 4,119 | 500 | |
| | Edge of Town | 2,842 | | |
| **Total (sqm)** | | **59,761** | **8,700** | **16,600** |

5.4.22 For both the leisure and retail elements, their respective trip rates were applied for each of the different sites, as extracted from the TRICS database. Table 5-6 summarises the commercial trip rate assumptions under the Final Growth Scenario.

**Table 5-6: Summary of average vehicle trip rates for commercial sites**

| Land Use Type | Hourly Vehicle Movements Per 100 sqm | | | |
|---|---|---|---|---|
| | AM Peak (08:00 -09:00) | | PM Peak (17:00 -18:00) | |
| | Arrivals | Departures | Arrivals | Departures |
| Cinema | 0.000 | 0.000 | 1.251 | 0.971 |
| Restaurants / Bars | 0.000 | 0.000 | 1.059 | 0.389 |
| Non-food Retail Park | 0.206 | 0.037 | 0.960 | 0.910 |
| Convenience Stores | 0.947 | 0.947 | 1.136 | 1.420 |
| Community Centre | 1.033 | 0.453 | 0.495 | 0.707 |

### Education Trip Generation

5.4.23 An initial assessment of education sites has been added as part of this study to account for anticipated growth at both primary and secondary school level.

5.4.24 Where it is assumed that a primary school site will primarily serve a corresponding new residential strategic development local adjustments have been made to reflect the internalisation of pupil traffic i.e. trip generation generally accounts for school employee trips from the wider network only. However, at secondary school sites and where it is unclear where these trips will originate or where the specific catchment area is located, trips have been calculated as a ‘‘worst-case’’, based on existing catchment patterns.

5.4.25 BBC have advised that there is currently a high level of travel from outside priority catchment areas, given the current availability of school places. Advice from the Education Authority has highlighted that proposed new school provision in the key settlement areas will likely change this pattern and reduce the need for students to travel outside of their priority catchment areas in

future years i.e. a likely reduction in journey distances and car trips from the modelled scenario.

5.4.26 For both the proposed extension and new build education development sites, the proposed pattern of school expansion, provided by EEC, was used to derive respective trip rates for education sites (primary and secondary schools) from the TRICS database.

5.4.27 Table 5-7 summarises the assumptions for Education land uses.

**Table 5-7: Educational land use type split (pupils)***

| BBC Ref | Build Type | Primary School | Secondary School |
|---|---|---|---|
| H18 | New | 630 | |
| | Extension | 210 | |
| H13 | New | 420 | |
| | Extension | 131 | |
| | Extension | 131 | |
| | Extension | 131 | |
| | Extension | 131 | |
| H5/E5 | New | 630 | |
| H6 | New | 420 | |
| H7 | Extension | 420 | |
| H10 | New | 420 | |
| H12 | New | 420 | |
| H12 | New | 420 | |
| | Extension | | 420 |
| H12 | New | | 1,260 |
| **Total (pupils)** | | **4,515** | **1,680** |

*It should be noted that, following the completion of the transport modelling, ECC provided updated education expansion forecasts to support the Publication Local Plan. While the modelling has generally made sufficient provision for school expansion in Billericay and Wickford, the modelled scenario only included 6 form entry (FE) for Basildon secondary schools, compared to the 11 FE highlighted in the updated ECC and Infrastructure Delivery Plan numbers. The modelling therefore underestimates the level of secondary school provision in Basildon by 1,050 pupils.

As stated, the modelling methodology provides only an initial assessment at this stage and assumes a 'worst-case' in terms of education trip distribution and the potential for sustainable travel. It is anticipated that an element of the traffic impact, of these additional school places, will be offset by a reduction in the need to travel outside priority catchment areas as well as the added potential for pupils within Basildon to travel more sustainably. The traffic modelling is deemed to make sufficient provision for school based traffic at this stage.

5.4.28 The trip rates applied to education sites are set out in Table 5-8.

**Table 5-8: Summary of average vehicle trip rates for educational sites**

| Land Use Type | Hourly Vehicle Movements Per Pupil | | | |
|---|---|---|---|---|
| | AM Peak (08:00 -09:00) | | PM Peak (17:00 -18:00) | |
| | Arrivals | Departures | Arrivals | Departures |
| Primary School | 0.269 | 0.181 | 0.030 | 0.044 |
| Secondary School | 0.159 | 0.104 | 0.014 | 0.027 |

## 5.5 Trip Adjustments

5.5.1 A number of adjustments have been made to refine the final trip generation methodology for the purposes of the 'Part 2' study. This is largely to account for the availability of more up to date land use data as well as analysis of the outputs of previous studies. The adjustments made to the total combined land use type trip generations calculations (prior to inputting in the VISUM model) are outlined below.

### Rail Heading

5.5.2 The overall distribution of vehicle trips is based on car based journey to work census data. It was considered that this methodology did not account for a proportion of vehicle trips that travel to nearby railway stations completing the journey to work by rail as the 'main mode' within the journey to work data. As a result, the model was perceived to be underestimating rail heading vehicle trips particularly within the main urban areas.

5.5.3 The journey to work origin-destination census data was reviewed for car and rail trips and an adjustment factor was applied to each development site dependant on their location. This allowed the network origin-destination matrix to be updated, taking into account multi-modal development trips travelling to nearby railway stations by car for the Final Growth scenario.

### Vehicle to Passenger Car Unit (PCU) Uplift

5.5.4 The TRICS database was used to obtain HGV trip rates for each of the development land uses, and in turn a HGV proportion was calculated for each development type, allowing the vehicle trips to be uplifted to PCUs. This is in line with the conversion applied to the background traffic flows and is required for the junction modelling testing. Table 5-9 summarises HGV proportions for the respective land uses.

**Table 5-9: Summary of HGV% adjustment factors for PCU uplift**

| Land Use Type | Hourly HGV% of Total Vehicle Movements | | | |
|---|---|---|---|---|
| | AM Peak (08:00 -09:00) | | PM Peak (17:00 -18:00) | |
| | Arrivals | Departures | Arrivals | Departures |
| Residential | 0.90% | 0.30% | 0.00% | 0.00% |
| B1 Office | 0.48% | 2.96% | 1.33% | 0.27% |
| B2 Industrial Unit | 3.30% | 16.95% | 2.44% | 0.26% |
| B8 Warehousing | 25.00% | 48.08% | 53.33% | 28.85% |
| Cinema | 0.00% | 0.00% | 0.00% | 0.00% |
| Restaurants / Bars | 0.00% | 0.00% | 0.00% | 0.00% |
| Non-food Retail Park | 5.83% | 51.35% | 0.63% | 0.00% |
| Convenience Stores | 0.00% | 0.00% | 0.00% | 0.00% |
| Community Centre | 1.32% | 2.94% | 0.00% | 0.00% |
| Education | 0.00% | 0.00% | 0.00% | 0.00% |

### Internal Residential / Employment Trips

5.5.5 It has been recognised that some trips generated by new housing development will have a destination within a newly created place of employment. This would equate to a single trip, rather than one 'origin' trip generated by the housing plus a second 'destination' trip generated by the employment site (e.g. the same trip essentially being counted twice).

5.5.6 The origin of employment trips has been assumed based on 2011 journey to work percentage splits. Those that are expected to be made from developments within Basildon have been removed from the overall trip generation for the site as these trips are already accounted for within the residential development trip rates.

### Retail Trips

5.5.7 The TRICS data assumes that all trips generated by a land use are considered 'new' to the network. However, particularly in the case of retail and leisure trip rates where visitors will make a number of smaller 'linked' trips on foot to different services within a town centre as part of a single overall vehicle trip to / from the town centre.

5.5.8 Given the projected levels of accessibility within the local area, it was considered reasonable to assume that a significant proportion of visitors to Basildon would take advantage of the proximity of a number of local services, and therefore undertake a series of these 'linked' trips within the town centres by foot, which potentially overstates the number of actual 'new' vehicle trips to the network.

5.5.9 Research on 'linked' trips has been subject to a number of studies over recent years. This has generally concluded that, while the linking of trips between a number of complementary land uses is likely to occur, the extent is very much subject to site specific factors e.g. access and services offered. TRICS have previously presented wider research data indicating that a range of approximately 35%-65% of trips to district centres could be making more than

one 'linked' trip to multiple services as part of the overall visit. A previous case example was applied for the Tonbridge Town Centre Masterplan (2007)[6] where the following trip generation reductions applied, to account for 'linked' trips at each land use:

- Retail – 35% reduction;
- Community – 30% reduction;
- Restaurant – 30% reduction; and
- Leisure – 30% reduction.

5.5.10 These trip rate reductions are consistent with the wider research presented by TRICS and have been assumed as a reasonable approach for assessment purposes in this 'Part 2' study. The reductions have been applied to the trip rates extracted from the TRICS database for the relevant land use to provide a 'new' trip rate. Table 5-10 summarises the revised trip rates with the reductions applied.

**Table 5-10: Summary of adjusted vehicle trip rates for Retail and Leisure sites**

| Land Use Type | Hourly Vehicle Movements Per 100 sqm | | | |
|---|---|---|---|---|
| | AM Peak (08:00 -09:00) | | PM Peak (17:00 -18:00) | |
| | Arrivals | Departures | Arrivals | Departures |
| Cinema | 0.000 | 0.000 | 1.251 | 0.971 |
| Restaurants / Bars | 0.000 | 0.000 | 0.741 | 0.272 |
| Non-food Retail Park | 0.134 | 0.024 | 0.624 | 0.592 |
| Convenience Stores | 0.616 | 0.616 | 0.738 | 0.923 |
| Community Centre | 0.723 | 0.317 | 0.347 | 0.495 |

### Sustainable Access Improvements

5.5.11 Within the housing allocation site sustainability appraisal, the 23 separate housing allocation (HA) policies, referred to in the Draft Local Plan as H7 to H29, were reviewed and scored based on their combined existing and potential levels of sustainable accessibility, at each of the HA policy locations.

5.5.12 Those identified as having a 'high' level of sustainable accessibility (with an appraisal score of 300+) were allocated the trip rates associated with the location type category one step above their location type category previously allocated, in order to assign reduced trip rates to developments showing potential for higher levels of sustainable accessibility.

5.5.13 The residential sites identified to have a 'high' level of sustainable accessibility along with their former and revised location type categories are presented below in Table 5-11. A total of seven separate HA sites were scored with a 'high' level of sustainable accessibility, resulting in edge of town locations to

[6] Kent Highway Services (2007) - Tonbridge Town Centre Masterplan Technical Note on Trip Generation, Distribution and Assignment

be assigned suburban area trip rates, and suburban area locations to be assigned edge of town centre trip rates.

**Table 5-11: HA Sites Scoring a 'High' Level of Sustainable Accessibility**

| HA | Appraisal Score | Address | Town | Former TRICS Location Category | Revised TRICS Location Category |
|---|---|---|---|---|---|
| H5/E5 | 337 | Land off Gardiners Lane South | Basildon | Suburban Area | Edge of Town Centre |
| H6 | 324 | Land at Nethermayne, Kingswood | Basildon | Suburban Area | Edge of Town Centre |
| H12 | 330 | Land east of Tyefields, south of Burnt Mills Road | Basildon | Edge of Town | Suburban Area |
| H14 | 310 | Land north of Southend Road and east of the railway | Wickford | Edge of Town | Suburban Area |
| H15 | 351 | Land south and north of Barn Hall | Wickford | Suburban Area | Edge of Town Centre |
| H18 | 326 | Land west of Mountnessing Road, north of London Road and south of the railway line | Billericay | Suburban Area | Edge of Town Centre |
| H21 | 303 | Thatched Cottage and land to the rear of Thatched Cottage, Southend Road | Billericay | Edge of Town | Suburban Area |

### Trip Rate Summary

5.5.14 In summary, the refinements applied to the overall trip generation methodologies used for previous studies and the methodology used for the Final Growth Scenario include the following:

- The addition of education sites to account for growth at both primary and secondary school level;
- Revised retail land use split assumptions;
- Revised comparison retail land use trip rates (TRICS) to reflect likely end land uses;
- Rail trip adjustments to take into account multi-modal development trips travelling to nearby railway stations;
- Uplifting development vehicle trips to PCUs in line with units applied to the background traffic flows; and
- The use of reduced vehicle trip rates to represent reasonable improvements to sustainable access across the Borough.

5.5.15 The resulting number of new vehicle trips to the network are summarised in Table 5-12. The development growth is anticipated to generate an additional 9,950 new trips to the network in the AM peak and 10,150 in the PM peak.

Approximately 60% of this traffic is related to housing delivery, 25% is associated with employment and the remaining traffic either retail, leisure or education related.

**Table 5-12: Proposed Local Plan Final Growth Scenario Land Use Trip Generation**

| Land Use | Trip Generation | | | |
|---|---|---|---|---|
| | AM Peak (08:00 -09:00) | | PM Peak (17:00 -18:00) | |
| | Arrivals | Departures | Arrivals | Departures |
| Residential | 1,695 | 4,376 | 4,237 | 2,371 |
| Employment | 2,310 | 331 | 148 | 2,166 |
| Retail & Leisure | 139 | 75 | 572 | 510 |
| Education | 610 | 406 | 62 | 101 |
| **Total** | **4,754** | **5,188** | **5,019** | **5,148** |

## 5.6 Trip Distribution

5.6.1 The origin and destinations of trips travelling to and from the development sites, known as trip distribution, were derived from the 2011 Census journey to work (JTW) dataset. As previously discussed, and in order to utilise this data, a model zone system (see **Appendix C**) was defined based on the Census JTW output areas and boundaries. It was then possible to aggregate the JTW data to fit within the zone definitions of the VISUM assisted spreadsheet model.

5.6.2 A matrix of Census JTW trips was subsequently derived and used as a basis for the creation of sectored distribution matrices for each of the four main settlements in the model, including Basildon, Billericay and Wickford as well as for the wider Borough and beyond.

5.6.3 Individual developments were assigned to a specific zone and associated distribution pattern for each scenario. The distributions applied to any further development sites included in the study area are therefore based on 2011 observed trip patterns for specific areas in the Borough. Since the majority of travel from home to work occurs in the AM peak, it was assumed that the home end of the trip is the origin, and the work place the destination. This assumption was inverted to inform the PM peak.

5.6.4 For assessment purposes any school traffic has been distributed using the overarching JTW method discussed above. Any adjustments for rail heading commuter trips have been added over and above this principal distribution methodology described.

## 5.7 Trip Assignment & Route Identification

### Base Network

5.7.1 The principal functionality of the Highway Impact Assessment model is spreadsheet based. However, the model was enhanced to improve its

efficiency while reducing bias and potential sources of errors. This included a simplified macro-strategic model application, using PTV VISUM v14, to assist new development trip only assignment calculations within the area of interest with a particular emphasis on the following detailed and strategic modelling areas (see Figure 4-1):

- Detailed Network – Basildon, Billericay and Wickford
- External Wider Strategic Network

5.7.2 The simplified route choice strategic model represents an attempt to simulate the current and potential future transport route choice for development trips to be used in the spreadsheet based forecast outputs for further testing in standalone junction assessment software. It should be noted that this stage of the modelling process is not a dynamic VISUM assignment model and route choice assumptions are fixed for all future development traffic arriving or departing from the different zones.

5.7.3 VISUM was selected for this modelling exercise due to its flexibility to assist a spreadsheet interface and ability to efficiently undertake highway route choice and assignment calculations. The model is also broadly compatible with other VISUM models developed by ECC across the county.

5.7.4 The modelled network area was created using the Integrated Transport Network (ITN). ITN segregates links into motorways, A-roads, B-roads, minor roads, local streets, private roads, and alleys, in descending order of importance. Private roads, and alleys were excluded from the calculations since only the principal road network was the subject of the study.

5.7.5 The different highways classes or types were coded into the model, using guidance from COBA Volume 13 Section 1 part 5, to classify roads based on characteristics including: road class; number of lanes; and speeds.

5.7.6 In the external model area, only major highways (selected Motorways, A-roads and B-roads) were coded in order to guarantee good levels of accessibility. Due to the simplified nature of the model for basic assignment purposes, existing congestion was only partially considered through Trafficmaster average speeds for final route choice. Therefore, no priorities on junctions or capacity restrictions were applied or coded into the model. Network delays are considered in more detail separately as part of the overall junction model outputs and network performance discussed later in this report.

5.7.7 The model uses the zonal system (see **Appendix C**) with a series of appropriate connectors to ensure that travelling times were realistic and loaded into the principal areas of interest. In addition, connector length was updated to a constant value so that route choice was chosen only based on OD characteristics and not based on travelling time.

5.7.8 The assignment methodology used within the VISUM model was 'Equilibrium' based, utilising unitary demand matrices without incremental loading. This is an 'all demand' based approach, and therefore route choice was distributed based on final flows to evaluate the use of alternative routes, with only the most likely chosen under an 'all or nothing' scenario.

5.7.9 The model has a limitation on performing micro-simulation specific tasks or taking into consideration existing or future high levels of congestion. Forecast matrices have therefore been fixed when assigned to the network. This represents a worst-case scenario and allows the impact of the potential development sites to be assessed more transparently to simplify the scenario testing and decision making processes.

5.7.10 The modelling approach follows recognised and accepted DfT / WebTAG principles and is therefore considered robust, fit for purpose and appropriate in scale for the type of highway network included in the Highway Assessment study area.

**Future Network Changes**

5.7.11 The VISUM assignment model has been adapted, where possible, to assess the future transport network. The proposed new link roads, along with any new permitted movements at specific junctions or links, were coded into the model using a similar method to the existing network.

5.7.12 Forecast development only trips were run with the same demand matrices on the updated network to identify any reassignment patterns between the existing and updated transport networks.

5.7.13 The future background traffic has not been explicitly assessed in the VISUM element of the model. However, the outputs of the development only trip assignment patterns have been considered in combination with a standalone spreadsheet based approach, taking account of observed traffic data, census JTW data and likely routing options, to inform the potential reassignment of background traffic.

5.7.14 As previously stated, this approach does not involve dynamic assignment and therefore route choice was distributed based on final flows to evaluate the use of alternative routes, with only the most likely chosen under an 'all or nothing' scenario i.e. the 'rebalancing' of demand across available capacity on both new and existing links, which is likely to occur in reality, has not been assessed within the model.

**Sensitivity Test - Background Reassignment**

5.7.15 The methodology adopted assigns the desired maximum level of traffic likely to use any new routes as a 'full' reassignment scenario. Acknowledging the

limitations of the model, a sensitivity test has been undertaken to assess a lower level of background traffic reassignment.

5.7.16 The sensitivity test assumes that all new development only trips are reassigned, as per the VISUM analysis, but with only half of the desired level of background traffic reassigning. In the absence of a dynamic assignment model, this has been considered alongside the 'full' reassignment scenario and unmitigated scenario as an intermediary assessment for benchmarking and information purposes.

# 6 Junction Modelling

## 6.1 Definition of Results

6.1.1 The junctions included within the HIA study area have been assessed in order to ascertain the specific traffic impact of the development proposed in Basildon Borough across the network.

6.1.2 The junction assessments have been undertaken using standard industry software. The junction modelling software estimates the performance of a junction in terms of how close to capacity it is operating at. Capacity is the maximum potential number of vehicles that can travel through the junction. It is usually expressed in terms of vehicles per hour or day. Junction modelling software expresses the performance of a junction in different ways, each method compares the number of vehicles (volume) using the junction in a given time period, to the total capacity of the junction during that time period.

6.1.3 Each modelling software package uses different terminology to describe how close to capacity a junction is operating as follows:

- Junctions 8 (ARCADY) – '**Ratio of Flow to Capacity**' (RFC): 0.85 = approaching capacity, 1.00 = at capacity
- LINSIG – '**Degree of Saturation**' (DoS): 85% = approaching capacity, 100% = at capacity
- VISUM – '**Volume / Capacity**' (V/C): 0.85 = approaching capacity, 1.00 = at capacity.

6.1.4 Despite values being expressed as ratios or percentages, capacity outputs from the three modelling packages are broadly equivalent to one another, and are presented in their varying forms for the purpose of comparative analysis.

6.1.5 When RFC or DoS values exceed values of either 1.00 or 100% respectively, theoretical capacity has been reached and queue lengths are subject to exponential growth. The instability of traffic flows, where approach is over-capacity, results in an inherent difficulty in accurately predicting queue lengths. For this reason, values attributed to over-capacity approach arms should be seen as indicative rather than representative, and are again more useful for comparative analysis.

6.1.6 Unless otherwise stated, queue length outputs are expressed in terms of 'Passenger Car Units' (PCUs). This measurement accounts for all vehicle types, with a standard car measuring 1 PCU and larger Heavy Goods Vehicles modelled as 2 PCUs. Modelled queues represent the average maximum on each approach arm across the peak hour. They are therefore indicative of

queuing extents at the busiest point of the peak hour and are not representative of average conditions.

6.1.7 Results are illustrated in tables presented in this section with corresponding plots in **Appendix E**. Results showing the level of operation at each junction are presented per scenario under the Red-Amber-Green (RAG) system, based on the V/C of the worst operating arm within the AM and PM peak hours modelled, as outlined below:

**Table 6-1: Junction Assessment 'RAG' System**

| Colour Code | Definition | V/C (RFC, DoS) |
|---|---|---|
| | Green denotes a junction with all approaches operating with a Volume of Traffic: Capacity (V/C) ratio of under 0.85 - which suggests that the junction has sufficient spare capacity. | <0.85 |
| | Yellow indicates a junction with one or more approaches operating with a V/C ratio of between 0.85 and 1.00 - which suggests that the junction is nearing or at capacity. | 0.85 -1.00 |
| | Amber denotes a junction where one or more approaches is operating with a V/C ratio of between 1.00 and 1.15 – junction is operating over capacity but further improvements to sustainable access could mitigate impact. | 1.00-1.15 |
| | Red indicates a junction with one or more approaches operating with a V/C ratio of 1.15 or over – junction is operating over capacity and could potentially require physical mitigation. | >1.15 |
| | Some red coded junctions are denoted by an 'X', where an approach may be significantly over capacity and potentially require physical mitigation. | X |

6.1.8 An 'Amber' category has been applied to junctions where results are marginally exceeding theoretical capacity (RFC / DoS 1.00-1.15). This identifies potential congestion points on the network, where further effective sustainable access improvements, could reasonably mitigate the impact. This approach adopts a more pragmatic approach, potentially avoiding the deployment of costly physical highway improvements, which could also encourage further unconstrained car use.

6.1.9 It should be noted that results have been rounded to the nearest two decimal places and, in some instances values at the category cut off points have been allocated either above or below the threshold value, despite showing the same number at the category cut off point.

## 6.2 Junction Model Results – No Mitigation

6.2.1 This section summarises the overall junction performance at each of the sites tested within the Basildon Borough study area for the following scenarios without the inclusion of any mitigation, other than committed schemes (including Junctions Ba4 and Ba23):

- **2014 Base**
- **2034 Background Growth –** (also referred to as the Do-Minimum)
- **2034 Final Growth Scenario No Mitigation**

6.2.2 Table 6-2 and Table 6-3 provide a summary of each junction's performance for the AM and PM peak hours respectively. Results show the highest recorded RFC/DoS on any arm as a high level indication of performance and potential need for mitigation, which is assessed separately in Section 7.

6.2.3 The results show in the 2014 Base scenario that 25 junctions operate at or within capacity (≤1.00 V/C) with 10 junctions either marginally or significantly exceeding capacity in either peak. With the addition of the 2034 Background Growth scenario, an additional 8 junctions show to operate over capacity, with 17 junctions operating at or within capacity, and up to 18 junctions exceeding capacity. With the addition of the 2034 Final Growth scenario development traffic, an additional 6 junctions show to operate over capacity when compared to the background growth, with 11 junctions operating at or within capacity, and 24 junctions exceeding capacity.

6.2.4 This analysis illustrates the level of baseline junction performance under existing conditions, and highlights the cumulative impacts of traffic growth with and without the inclusion of the Publication Local Plan growth.

6.2.5 Currently the majority of junctions modelled (71%) illustrate they are operating within capacity, which reduces to approximately half of the junctions modelled (49%) in the 2034 Background (Do-Minimum) scenario. The Do-Minimum indicates that even if a Basildon Local Plan was not delivered over the assessment period organic traffic growth would have a significant impact on the Borough network.

6.2.6 With the addition of the Final Growth scenario, a total of 31% junctions continue to operate within capacity, while 69% of junctions exceed capacity.

6.2.7 These junction modelling results have identified where mitigation measures are required as a priority across the study area, in order to alleviate any adverse impacts from local traffic growth as shown within the 2034 Background and Final Growth Scenarios. An initial package of highway mitigation measures has been identified and assessed against the corresponding scenarios in Section 7.

### Table 6-2: Junction Model Results AM

| Junction ID | Junction Location | Existing Junction Type | Performance Summary AM | | |
|---|---|---|---|---|---|
| | | | 2014 Base | 2034 Background Growth | 2034 Final Growth Scenario No Mitigation |
| **Basildon** | | | | | |
| Ba1 | A127 / A176 Noak Bridge Interchange North | Standard rbt | 0.80 | 0.95 | 1.31 |
| Ba2 | A127 / A176 Noak Bridge Interchange South | Standard rbt | 0.63 | 0.71 | 0.89 |
| Ba4 | A127/A132 Nevendon Interchange Junction | Signal rbt | 0.99 | 1.00 | 1.03 |
| Ba5 | Cranes Farm Road / A176 Upper Mayne / St. Nicholas Lane | Standard rbt | 0.99 | 1.26 | 1.52 |
| Ba7 | Broadmayne / South Mayne / Ashlyns | Standard rbt | 0.97 | 1.18 | 1.52 |
| Ba14 | B1464 London Road / High Road / Clay Hill Road | Mini rbt | 0.93 | 1.04 | 1.05 |
| Ba15 | Cranes Farm Road / A132 East Mayne | Standard rbt | 1.04 | 1.11 | 1.24 |
| Ba16 | A127 / B148 West Mayne (Dunton) Interchange | Large rbt | 0.45 | 0.52 | 0.96 |
| Ba19 | High Road / West Mayne / St. Nicholas Lane | Standard rbt | 0.71 | 0.81 | 0.91 |
| Ba20 | High Road / Somerset Road / Laindon Link | Standard rbt | 0.36 | 0.40 | 0.43 |
| Ba23 | A176 Nether Mayne / Hospital Access | Signal rbt | 0.86 | 0.81 | 0.79 |
| Ba24 | A13/A176 Five Bells Interchange North | Standard rbt | 1.37 | 1.67 | 1.93 |
| Ba25 | A13/A176 Five Bells Interchange South | Standard rbt | 0.45 | 0.50 | 0.58 |
| Ba26 | A13/A132 Pitsea Interchange | Standard rbt | 1.18 | 1.49 | 1.48 |
| Ba27 | A132 East Mayne / Whitmore Way / Felmores | Standard rbt | 0.75 | 0.84 | 0.99 |
| Ba28 | A176 Nether Mayne / Dry Street | T-junction | 0.18 | 0.30 | 0.51 |
| Ba29 | B148 West Mayne / Mandeville Way | Standard rbt | 0.88 | 1.01 | 1.11 |
| Ra1 | A1245 Chelmsford Road / A129 London Road | Standard rbt | 0.76 | 0.86 | 0.86 |
| **Billericay** | | | | | |
| Bi1 | B1007 Stock Road / Queens Park Avenue / Potash Road | Standard rbt | 0.83 | 0.97 | 1.11 |
| Bi2 | B1007 Stock Road / Radford Way | Mini rbt | 0.92 | 1.03 | 1.04 |
| Bi3 | Mountnessing Road / Perry Street / Radford Way | Standard rbt | 0.75 | 0.84 | 0.88 |
| Bi4 | B1007 High Street / Norsey Road / Western Road | Signal (4-arm) | 0.91 | 1.01 | 1.05 |
| Bi5 | A129 London Road / High Street / Sun Street | Standard rbt | 1.10 | 1.23 | 1.31 |
| Bi6 | A129 Sun Street / Chapel Street | Standard rbt | 0.78 | 0.85 | 0.90 |
| Bi7 | A129 London Road / Tye Common Road / Western Road | Signal (4-arm) | 1.22 | 1.65 | 1.41 |
| Bi8 | A129 Southend Road / A176 | Standard rbt | 0.75 | 0.84 | 0.95 |
| Bi9 | A176 / Kennel Lane / Laindon Road | Standard rbt | 0.74 | 0.84 | 1.00 |
| Bi10 | A129 London Road / Mountnessing Road | Priority (3-arm) | 0.70 | 0.89 | 1.67 |
| Bi12 | A129 Southend Rd / Outwood Common Road | Priority (3-arm) | 0.77 | 0.94 | 1.23 |
| Bi13 | A129 Southend Rd / Hickstars Lane | Priority (3-arm) | 0.57 | 0.64 | 0.69 |
| **Wickford** | | | | | |
| W1 | A132 Runwell Road / A132 / Runwell Road | Standard rbt | 1.07 | 1.19 | 1.42 |
| W2 | A132 Golden Jubilee Way / Radwinter Avenue / A129 London Road | Standard rbt | 0.81 | 0.96 | 1.02 |
| W3 | A132 Runwell Road / Church End Lane | Priority (3-arm) | 0.57 | 1.86 | X |
| W4 | A129 London Road / Nevendon Road / High Street | Signal (4-arm) | 0.88 | 1.00 | 1.15 |
| W5 | A132 / Cranfield Park Road / Nevendon Road | Standard rbt | 0.80 | 0.77 | 0.87 |

### Table 6-3: Junction Model Results PM

| Junction ID | Junction Location | Existing Junction Type | Performance Summary PM | | |
|---|---|---|---|---|---|
| | | | 2014 Base | 2034 Background Growth | 2034 Final Growth Scenario No Mitigation |
| **Basildon** | | | | | |
| Ba1 | A127 / A176 Noak Bridge Interchange North | Standard rbt | 1.06 | 1.17 | 1.38 |
| Ba2 | A127 / A176 Noak Bridge Interchange South | Standard rbt | 0.71 | 0.82 | 0.90 |
| Ba4 | A127/A132 Nevendon Interchange Junction | Signal rbt | 0.90 | 0.89 | 0.97 |
| Ba5 | Cranes Farm Road / A176 Upper Mayne / St. Nicholas Lane | Standard rbt | 0.97 | 1.11 | 1.27 |
| Ba7 | Broadmayne / South Mayne / Ashlyns | Standard rbt | 0.84 | 0.99 | 1.13 |
| Ba14 | B1464 London Road / High Road / Clay Hill Road | Mini rbt | 1.22 | 1.34 | 1.38 |
| Ba15 | Cranes Farm Road / A132 East Mayne | Standard rbt | 0.85 | 0.90 | 1.04 |
| Ba16 | A127 / B148 West Mayne (Dunton) Interchange | Large rbt | 0.49 | 0.55 | 0.80 |
| Ba19 | High Road / West Mayne / St. Nicholas Lane | Standard rbt | 0.63 | 0.72 | 0.84 |
| Ba20 | High Road / Somerset Road / Laindon Link | Standard rbt | 0.48 | 0.52 | 0.56 |
| Ba23 | A176 Nether Mayne / Hospital Access | Signal rbt | 0.91 | 0.91 | 0.90 |
| Ba24 | A13/A176 Five Bells Interchange North | Standard rbt | 1.19 | 1.36 | 1.71 |
| Ba25 | A13/A176 Five Bells Interchange South | Standard rbt | 0.60 | 0.65 | 0.65 |
| Ba26 | A13/A132 Pitsea Interchange | Standard rbt | 1.05 | 1.31 | 1.66 |
| Ba27 | A132 East Mayne / Whitmore Way / Felmores | Standard rbt | 0.71 | 0.81 | 0.94 |
| Ba28 | A176 Nether Mayne / Dry Street | T-junction | 0.42 | 0.70 | X |
| Ba29 | B148 West Mayne / Mandeville Way | Standard rbt | 0.66 | 0.71 | 0.79 |
| Ra1 | A1245 Chelmsford Road / A129 London Road | Standard rbt | 0.95 | 1.14 | 1.09 |
| **Billericay** | | | | | |
| Bi1 | B1007 Stock Road / Queens Park Avenue / Potash Road | Standard rbt | 0.87 | 0.99 | 1.14 |
| Bi2 | B1007 Stock Road / Radford Way | Mini rbt | 1.13 | 1.26 | 1.26 |
| Bi3 | Mountnessing Road / Perry Street / Radford Way | Standard rbt | 0.73 | 0.82 | 0.89 |
| Bi4 | B1007 High Street / Norsey Road / Western Road | Signal (4-arm) | 0.83 | 0.94 | 0.96 |
| Bi5 | A129 London Road / High Street / Sun Street | Standard rbt | 1.26 | 1.41 | 1.54 |
| Bi6 | A129 Sun Street / Chapel Street | Standard rbt | 0.81 | 0.89 | 0.90 |
| Bi7 | A129 London Road / Tye Common Road / Western Road | Signal (4-arm) | 0.96 | 1.58 | 1.41 |
| Bi8 | A129 Southend Road / A176 | Standard rbt | 1.00 | 1.11 | 1.13 |
| Bi9 | A176 / Kennel Lane / Laindon Road | Standard rbt | 0.48 | 0.52 | 0.53 |
| Bi10 | A129 London Road / Mountnessing Road | Priority (3-arm) | 1.00 | 1.14 | X |
| Bi12 | A129 Southend Rd / Outwood Common Road | Priority (3-arm) | 0.73 | 0.80 | 0.85 |
| Bi13 | A129 Southend Rd / Hickstars Lane | Priority (3-arm) | 0.58 | 0.63 | 0.64 |
| **Wickford** | | | | | |
| W1 | A132 Runwell Road / A132 / Runwell Road | Standard rbt | 1.07 | 1.34 | 1.48 |
| W2 | A132 Golden Jubilee Way / Radwinter Avenue / A129 London Road | Standard rbt | 0.85 | 1.00 | 1.11 |
| W3 | A132 Runwell Road / Church End Lane | Priority (3-arm) | 1.34 | X | X |
| W4 | A129 London Road / Nevendon Road / High Street | Signal (4-arm) | 0.73 | 0.90 | 0.99 |
| W5 | A132 / Cranfield Park Road / Nevendon Road | Standard rbt | 0.63 | 0.69 | 1.03 |

# 7 Mitigation Schemes

7.1.1 As detailed within the previous studies, a number of mitigation options were tested leading into the Draft Local Plan Growth scenario to identify the most suitable combination of mitigation measures across the study area. This 'Part 2' study assesses the preferred collective package of mitigation measures identified to support the delivery of the Publication Local Plan growth.

7.1.2 It is anticipated that the whole package of works is likely to be required to help mitigate the Publication Local Plan growth. However, it is important to note that the requirement for such schemes should be reviewed throughout the plan period against updated delivery rates of development, traffic data and modelling to ensure the eventual schemes are appropriate in scale and 'fit for purpose'. Any physical highway improvements need to be balanced against the potential for sustainable modal shift, changes in travel behaviour and ensure that road capacity is not over-provided, which would potentially encourage further unconstrained car use.

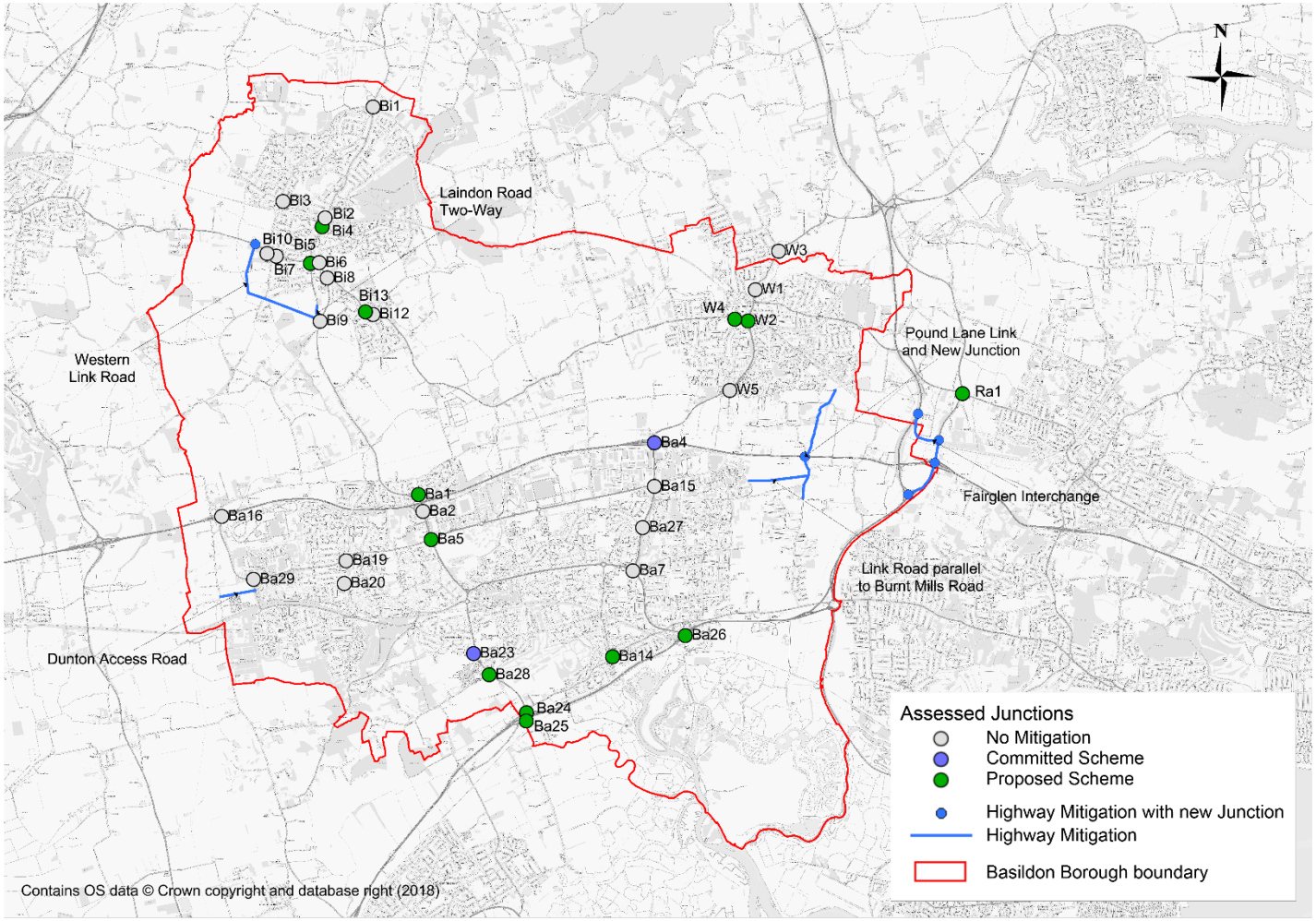
7.1.3 The package of mitigation measures includes individual junction layout changes, traffic management solutions and the introduction of new highway infrastructure. The delivery of these schemes would be reliant on a combination of developer contributions as well as local and central funding mechanisms.

7.1.4 The schemes and associated junction modelling results are discussed in more detail in this section with a focus on:

- Committed schemes – including those already planned or recently delivered which come forward whether the Local Plan was delivered or not;
- Individual junction improvements – unidentified through highway assessment work to date;
- Highway infrastructure improvements – including new developer enabled link roads and associated junction improvements; and
- Wider highway schemes – high level assessment of wider schemes, proposed across the plan period, currently subject to consultation or early feasibility appraisal.

7.1.5 Figure 7-1 shows the location of each of the schemes discussed.

**Figure 7-1: Preferred Mitigation Package and Other Highway Improvements**



## 7.2 Committed Highway Improvement Schemes

7.2.1 While a number of additional highway improvement works have been identified as part of the preferred mitigation package, the following committed schemes have been included in the VISUM model for both the 2034 Background Growth and 2034 Final Growth scenarios:

- Additional northbound lane on A176 Nethermayne between Hospital roundabout and Roundacre roundabout & Basildon Hospital access improvements (Ba23)
- Additional lane on the A127 Nevendon roundabout circulator carriageway and signals upgrade (Ba4)
- A130 northbound widening to three lanes between Rettendon and Howe Green (A12 interchange) outside of study area and included on periphery of model

7.2.2 These works are viewed as separate to any highway mitigation schemes, that have emerged out of the Local Plan assessment work, and have been included in both the 2034 Background and Final Growth scenarios.

**Ba4 A127/A132 Nevendon Interchange Junction**

7.2.3 This scheme was completed in 2017 as part of the A127 Resilience Package funded by the Government's Local Growth Fund via the South East Local Enterprise Partnership (SELEP). Improvements included alterations to the existing layout, with the introduction of an additional 3rd lane on the circulatory carriageway, additional entry lanes and the upgrading and linking of signals. The scheme completion postdates the 2014 base year but has been included in the 2034 Background and Final Growth Scenarios.

**Ba23 A176 Nether Mayne / Basildon Hospital Access**

7.2.4 The mitigation proposed at this signalised roundabout considers minor alterations to the existing layout, with the introduction of an additional northbound lane on the A176 Nether Mayne extending north to the junction with Ashdon Way. The controlled crossing located outside the school is relocated approximately 75m further south towards the Hospital junction, to provide a larger waiting area in the centre of the road for pedestrians and cyclists. Additionally, on the A176 Nether Mayne South part time signals have been installed to manage PM peak flows, excluding the hospital slip road, and at the Basildon Hospital Access the exit arm has been increased from 1 lane with a 30m flare at approach to 2 full lanes.

7.2.5 The A176 Nethermayne widening scheme was funded through the Government's Local Pinch Point Fund, allocated for highway schemes that address local traffic pinch points and assist in the release of economic and

housing growth. The widening of the hospital access with additional exit lane was funded through SELEP / LGF, Basildon Integrated Transport Package.

## 7.3 Junction Mitigation Schemes

7.3.1 The 'Part 1' Study included an assessment of an initial package of mitigation proposals. This 'Part 2' Study has developed the initial proposals to reflect the traffic impact of the Publication Local Plan. Table 7-1 summarises where a junction layout change has been tested under the 2034 Background and Final Growth scenarios as either completed, future committed or as part of the proposed mitigation package.

7.3.2 The improvements include the two committed schemes, tested as part of the 2034 Background Growth scenario, for information purposes. An additional 13 junction improvements are proposed as part of the preferred mitigation package, with 10 to be tested with a full layout conversion from either an existing priority or roundabout (mini or standard) to a proposed signalised junction. A further 3 junctions are to be tested with minor layout alterations.

7.3.3 Where available, initial concept designs for these proposed improvements are included at **Appendix F** with scheme descriptions discussed later in this section.

**Table 7-1: Junction Layout Changes**

| Junction ID | Junction Location | Existing Junction Type | 2034 Background Growth | 2034 Final Growth Scenario with Mitigation |
|---|---|---|---|---|
| **Basildon** | | | | |
| Ba1 | A127 / A176 Noak Bridge Interchange North | Standard Roundabout | | Signal Roundabout Increased circulatory carriageway widen entries |
| Ba2 | A127 / A176 Noak Bridge Interchange South | Standard Roundabout | | |
| Ba4 | A127/A132 Nevendon Interchange Junction | Signal Roundabout | Additional lane on circulatory carriageway and entry lanes | Additional lane on circulatory carriageway and entry lanes |
| Ba5 | Cranes Farm Road / A176 Upper Mayne / St. Nicholas Lane | Standard Roundabout | | Widened carriageway on St Nicholas Lane approach |
| Ba7 | Broadmayne / South Mayne / Ashlyns | Standard Roundabout | | |
| Ba14 | B1464 London Road / High Road / Clay Hill Road | Mini Roundabout | | Signal (3-arm) |
| Ba15 | Cranes Farm Road / A132 East Mayne | Standard Roundabout | | |
| Ba16 | A127 / B148 West Mayne (Dunton) Interchange | Large Roundabout | | |
| Ba19 | High Road / West Mayne / St. Nicholas Lane | Standard Roundabout | | |
| Ba20 | High Road / Somerset Road / Laindon Link | Standard Roundabout | | |
| Ba23 | A176 Nether Mayne / Hospital Access | Signal Roundabout | Widened carriageway on Basildon Hospital Access Additional lane on A176 N | Widened carriageway on Basildon Hospital Access Additional lane on A176 N |
| Ba24 | A13/A176 Five Bells Interchange North | Standard Roundabout | | Signal Roundabout |
| Ba25 | A13/A176 Five Bells Interchange South | Standard Roundabout | | Signal Roundabout |

| Junction ID | Junction Location | Existing Junction Type | 2034 Background Growth | 2034 Final Growth Scenario with Mitigation |
|---|---|---|---|---|
| Ba26 | A13/A132 Pitsea Interchange | Standard Roundabout | | Signal Roundabout |
| Ba27 | A132 East Mayne / Whitmore Way / Felmores | Standard Roundabout | | |
| Ba28 | A176 Nether Mayne / Dry Street | Priority (3-arm) | | Signal (4-arm) Linked to Ba23 |
| Ba29 | B148 West Mayne / Mandeville Way | Standard Roundabout | | |
| Ra1 | A1245 Chelmsford Road / A129 London Road | Standard Roundabout | | Signal Roundabout with dedicated A1245 N to A129 E slip & widening |
| **Billericay** | | | | |
| Bi1 | B1007 Stock Road / Queens Park Avenue / Potash Road | Standard Roundabout | | |
| Bi2 | B1007 Stock Road / Radford Way | Mini Roundabout | | |
| Bi3 | Mountnessing Road / Perry Street / Radford Way | Standard Roundabout | | |
| Bi4 | B1007 High Street / Norsey Road / Western Road | Signal (4-arm) | | Eastbound entry only on Norsey Rd Widen carriageway on Western Rd |
| Bi5 | A129 London Road / High Street / Sun Street | Standard Roundabout | | Signal (4-arm) |
| Bi6 | A129 Sun Street / Chapel Street | Standard Roundabout | | |
| Bi7 | A129 London Road / Tye Common Road / Western Road | Signal (4-arm) | | |
| Bi8 | A129 Southend Road / A176 | Standard Roundabout | | |
| Bi9 | A176 / Kennel Lane / Laindon Road | Standard Roundabout | | |
| Bi10 | A129 London Road / Mountnessing Road | Priority (3-arm) | | |
| Bi12 | A129 Southend Rd / Outwood Common Road | Priority (3-arm) | | |
| Bi13 | A129 Southend Rd / Hickstars Lane | Priority (3-arm) | | Signal (3-arm) |
| **Wickford** | | | | |
| W1 | A132 Runwell Road / A132 / Runwell Road | Standard Roundabout | | |
| W2 | A132 Golden Jubilee Way / Radwinter Avenue / A129 London Road | Standard Roundabout | | Widened approach on A132 Golden Jubilee Way North |
| W3 | A132 Runwell Road / Church End Lane | Priority (3-arm) | | |
| W4 | A129 London Road / Nevendon Road / High Street | Signal (4-arm) | | Traffic redistribution on London Road East Widened carriageway on London Road West |
| W5 | A132 / Cranfield Park Road / Nevendon Road | Standard Roundabout | | |

### Scheme Descriptions

7.3.4 The preferred mitigation measures are an initial package of improvement schemes identified throughout the various studies leading into this final 'Part 2' Study. The schemes have been designed to basic concept level and assessed in the available modelling platforms to remain consistent with the overall assessment. All schemes would be subject to further option testing and design feasibility as or when required.

7.3.5 Where available, the proposed junction mitigation layouts are either included at **Appendix F** or illustrated as concepts with the respective description below.

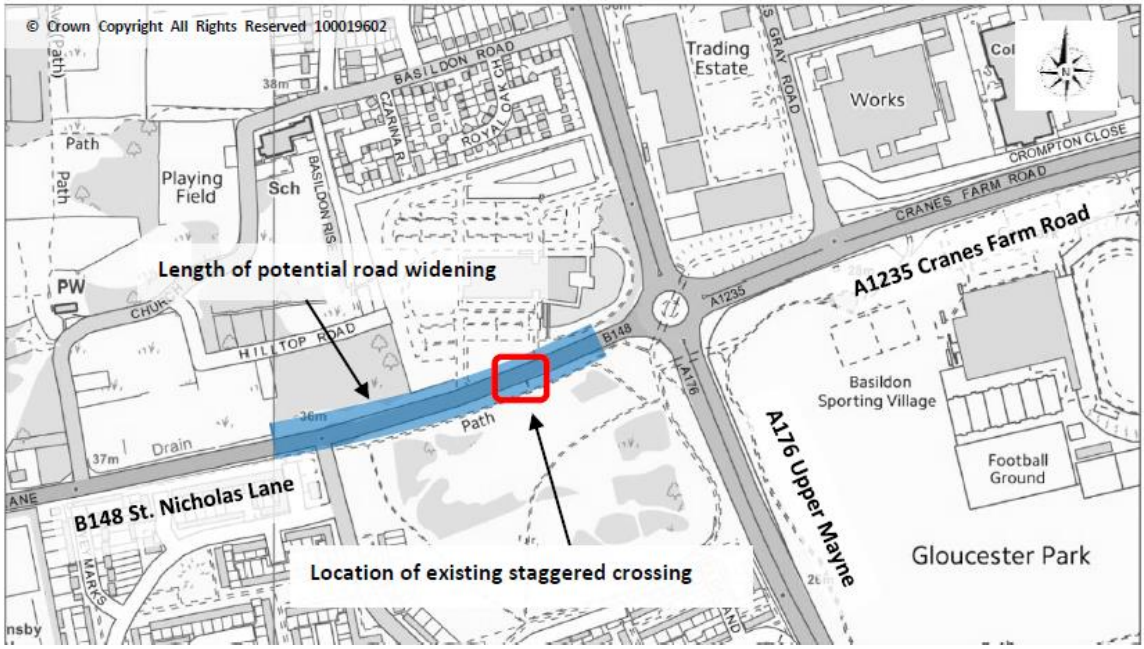
### Ba1 – A127 / A176 Noak Bridge Interchange North

7.3.6 The mitigation proposed at this junction considers a full layout conversion from a standard roundabout to a signalised roundabout, with signal controlled approaches at 3 of the 4-arms at the junction (excluding the A176 Noak Hill Road). Peak time signals could be considered to better manage traffic flow during the inter peak periods. Road widening is also proposed at the approaches on South Wash Road and A176 Upper Mayne, with the circulatory carriageway increasing from 2 lanes to 3 lanes. See drawing B3553R6A-01-00-SK01 in **Appendix F**.

### Ba5 – Cranes Farm Road / A176 Upper Mayne / St. Nicholas Lane

7.3.7 The scheme proposed at this standard roundabout considers minor alterations to the existing layout, with the introduction of road widening tested on St Nicholas Lane lengthening the existing two-lane approach, with the relocation of the staggered pedestrian crossing further back along the approach arm, and the removal of cross-hatching on the carriageway approach. See Figure 7-2 for basic scheme concept.

**Figure 7-2: A176 Upper Mayne/B148 St Nicholas Lane Roundabout and Carriageway Widening**




### Ba14 – B1464 London Road / High Road / Clay Hill Road

7.3.8 The scheme proposed at this junction considers a full layout conversion from a mini roundabout to a 3-arm signalised junction, with dual lane approaches proposed on each arm. The existing zebra crossing would be replaced by controlled pedestrian crossing on each arm as part of the signals, to be run as

an all red pedestrian stage. See drawing B3553R6A-03-00-SK01 in **Appendix F**.

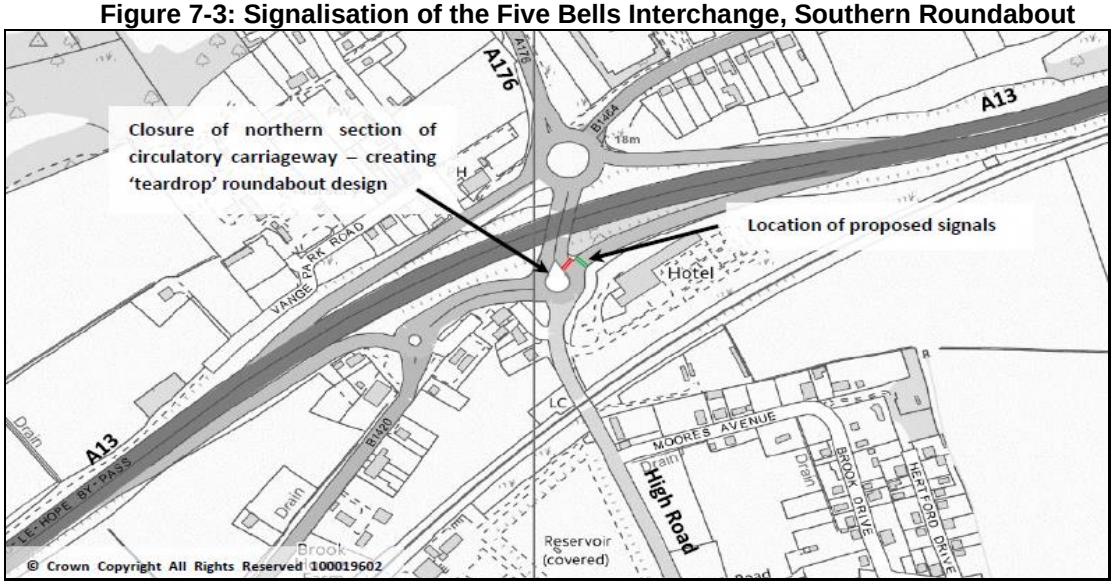
**Ba24 – A13/A176 Five Bells Interchange North**

7.3.9 The mitigation proposed at this junction considers a full layout conversion from a standard roundabout to a partial signalised roundabout on the A13 eastbound off slip and A176 Upper Mayne approaches. A dedicated uncontrolled filter lane will bypass the proposed A13 off slip signals to assist with traffic flow and peak time signals would also be considered to ease flow in inter peak periods. The existing uncontrolled pedestrian crossing and refuge island, located approximately 20m back from the junction on the A13 off slip, will be relocated to the new signal stop line as an uncontrolled crossing to accommodate the filter lane. See drawing B3553R6A-04-00-SK01 in **Appendix F**.

**Ba25 – A13/A176 Five Bells Interchange South**

7.3.10 The mitigation proposed at this junction considers a full layout conversion from a standard roundabout to a signalised roundabout, with a signal controlled approach on the A13 exit only, and the closure of the northern section of roundabout circulatory carriageway to create a 'teardrop' design. See Figure 7-3 for basic scheme concept.

**Figure 7-3: Signalisation of the Five Bells Interchange, Southern Roundabout**




**Ba26 – A13/A132 Pitsea Interchange**

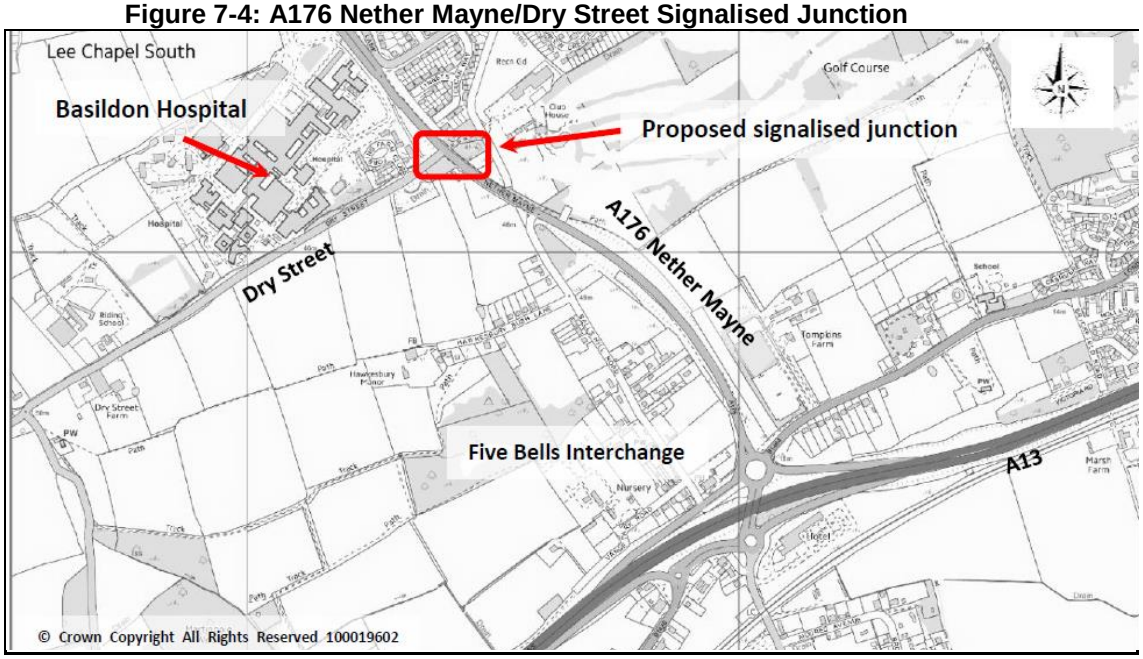
7.3.11 The mitigation proposed at this junction considers a full layout conversion from a standard roundabout to a signalised roundabout, with all arms and their respective sections of the circulatory carriageway to be signal controlled at peak times. An uncontrolled crossing point is proposed on the westbound A13 off slip and improved lane markings should be investigated on the circulatory

carriageway adjacent to A132 South Mayne. See drawing B3553R6A-05-00-SK01 in **Appendix F**.

**Ba28 – A176 Nether Mayne / Dry Street**

7.3.12 With development sites proposed on land adjacent to Basildon Hospital, the junction of Dry Street with the A176 Nether Mayne has been identified as a potential pinch-point location, with congestion expected in future years. The junction considers a full layout conversion from a 3-arm priority to a 4-arm signalised junction. This is modelled with the addition of the proposed development access road, situated to the east of the junction, and linked with Junction Ba23 - A176 Nether Mayne / Hospital Access, approximately 400m to the north. See Figure 7-4 for basic scheme concept.

**Figure 7-4: A176 Nether Mayne/Dry Street Signalised Junction**




**Bi4 – B1007 High Street / Norsey Road / Western Road**

7.3.13 The scheme proposes the implementation of an eastbound one-way restriction on Norsey Road for approximately 250m from the junction up to Highland Grove, effectively reducing the junction to three approach arms to improve capacity. Former westbound traffic on Norsey Road will be able to reroute via St Andrews Drive and Stock Road to the west. Additionally, road widening on Western Road is proposed, extending the 2 lane approach from approximately 10m to 35m in length. See drawing B3553R6A-07-00-SK01 in **Appendix F.**

**Bi5 – A129 London Road / High Street / Sun Street**

7.3.14 The mitigation proposed at this junction considers a full layout conversion from a standard roundabout to a 4-arm signalised junction, incorporating all turning movements permitted under the existing layout. Signal timings have been

optimised to minimise delay in an attempt to better accommodate future traffic demand. The A129 London Road east-west movements have been assigned two lanes, therefore necessitating a two-lane exit on the A129 London Road arm.

**Bi13 – A129 Southend Rd / Hickstars Lane**

7.3.15 The proposed scheme includes the signalisation of the 3-arm priority junction, with the addition of a controlled pedestrian crossing at each arm to be run as an all red pedestrian stage. The existing zebra crossings located on Hickstars Lane (arm B) and Southend Road west would be removed. See drawing B3553R6A-12-00-SK01 in **Appendix F.**

**W2 – A132 Golden Jubilee Way / Radwinter Avenue / A129 London Road**

7.3.16 The scheme includes minor alterations to the existing layout, which widens the existing two-lane northern approach on A132 Golden Jubilee Way to provide a third left turn only lane and reduces the central island to provide a straighter alignment across the junction and increased circulatory capacity. See drawing B3553R6A-13-00-SK01 in **Appendix F**.

**W4 – A129 London Road / Nevendon Road / High Street**

7.3.17 The scheme proposes minor alterations to include widening the eastbound A129 London road to lengthen the two-lane approach, the westbound A129 London Road approach has ahead manoeuvre moved from left lane to right lane and the pedestrian island has been reduced to improve alignment. See drawing B3553R6A-14-00-SK01 in **Appendix F.**

**Ra1 – A1245 Chelmsford Road / A129 London Road**

7.3.18 The scheme is outside the main study area in neighbouring Rochford District but has been included given the proximity to Basildon Borough. The proposals include a dedicated north to east filter lane from A1245 Chelmsford Road to A129 London Road east. Additional proposals include improved road markings with the introduction of a third lane on A1245 Chelmsford Road south and extending the two-lane approach A129 London Road west. There is also potential to provide PM peak time signals on A129 London Road east to provide additional capacity for the A1245 Chelmsford Road south approach. This junction upgrade is intended to complement the wider proposals for the nearby A127 / A130 Fairglen Interchange short-term scheme, situated approximately 1.2km to the south of the junction. See drawing B3553R6A-06-00-SK01 in **Appendix F**.

## 7.4 Highway Mitigation Schemes

7.4.1 The preferred mitigation package includes a number of highway schemes in addition to the identified junction improvements. The highway schemes are

shown previously on Figure 7-1 and range from development enabled link roads, with significant infrastructure requirements, to local traffic management solutions and include:

- Southern Laindon Road, Billericay two-way implementation;
- Billericay Western Link Road (WLR);
- New Pound Lane Phase 1, A127 Junction and Tresco Way / Cranfield Park Road Link;
- New Link road parallel to Burnt Mills Road with banned left turn for westbound traffic; and
- Dunton Link Road.

7.4.2 These highway mitigation schemes have been considered as a high-level assessment and test their impact on traffic distribution and assignment across the highway network only. No further analysis is provided on the feasibility of the proposed schemes (such as layout designs or detailed junction modelling). With the provision of new link roads and changes in permitted movements, additional road capacity and alternative routes are expected to redistribute traffic demand across the highway network to alleviate network congestion.

7.4.3 In the first instance, these highway mitigation schemes have been assessed within the VISUM model using the 2034 Final Growth development only demand matrices to reassign traffic onto the network in line with the proposed highway changes. As previously stated, the outputs of this modelling exercise were then used in combination with observed traffic data and background growth to inform a separate standalone reassignment methodology for all forecast demand.

7.4.4 **Please note** that the reassignment methodology applied to these forecast flows does not account for individual junction or link delays and assumes, as an 'all or nothing' scenario, that the maximum number of vehicles will reassign to this route regardless of available capacity. It is anticipated that this is a ''worst-case'' assessment and any eventual junction delay would lead to a lower level of reassignment with associated demand rebalancing and using any spare capacity elsewhere on the network.

7.4.5 The reassigned development flows and background traffic were converted in the spreadsheet model into turning movements for each of the individual junction models assessments.

**A176 Laindon Road Two-Way**

7.4.6 A two-way route has been proposed on Laindon Road to the south of Billericay, removing the existing southbound only one-way restrictions,

between Junction Bi5 (A129 London Road / High Street / Sun Street) to the north and Junction Bi9 (A176 / Kennel Lane / Noak Hill Road) to the south.

7.4.7 The scheme would complement the Billericay Western Link Road (WLR) and, as shown in Figure 7-5, would enable northbound traffic flows from Noak Hill Road to continue directly into Billericay via A176 Laindon Road at the roundabout, and subsequently remove the need to pass through Junction Bi8 (A176 / A129 Southend Road) and Junction Bi6 (A129 Sun Street / Chapel Street).

**Figure 7-5: A176 Laindon Road and Junctions to be Assessed**


**Billericay Western Link Road (WLR)**

7.4.8 A Western Link Road (WLR) has been proposed to the south west of Billericay, forming the new edge of the development area on the western side of the town, and will provide a south-western link between the A176 / Laindon Road / Noak Hill roundabout and the A129 London Road. Figure 7-6 illustrates the potential options (A & B) considered for the route of the WLR. The precise location of the road will be subject to detailed design and Masterplanning of the associated site allocations at H18.

**Figure 7-6: Billericay Western Link Road Options A & B**


7.4.9 Delivery of this highway mitigation scheme is required to support the strategic housing site H18 allocated to the south west of Billericay, and will provide additional highway capacity to accommodate future traffic growth and divert traffic away from the congested town centre.

7.4.10 Allowing traffic to transfer to the link road will improve the capacity and flow of local roads serving the rest of Billericay, reassigning traffic that is routing between the A129 London Road / Mountnessing Road / Western Road and the A176 / Basildon via Tye Common Road / Little Burstead (i.e. currently avoiding Billericay Town Centre) as well as reducing the need to travel through the town centre will significantly alleviate congestion at local hotspots.

7.4.11 An outline Transport Statement, prepared by i-Transport on behalf of Gleesons, indicated the link road could attract up to 1,000 two-way vehicle trips away from town centre roads during 3-hour AM / PM peak periods.

7.4.12 The modelling undertaken of the highway schemes proposed in and around the Billericay area, including the WLR and Laindon two-way schemes, indicates that a significant volume of traffic could be redistributed away from town centre routes.

7.4.13 In the first instance, when compared to the 'no' mitigation scenario, the VISUM modelling forecasts between 220 and 350 two-way development only trips would be reassigned to the WLR in either the AM or PM peak hours. When considered alongside potential background traffic reassignment, a further 500-1,000 vehicle turning movements could be reduced at key junctions in the peak hours, including the A129 London Road with Sun Street (Bi5), Tye Common Road (Bi7) and Mountnessing Road (Bi10). Smaller reductions (<500) peak hour vehicle turning movements are also forecast at a number of junctions across Billericay.

7.4.14 The reassignment of traffic to the WLR will bring about some localised increases (<250) in turning movements at junctions (Bi3) and A129 Southend Road / A176 (Bi8) in the peak hours.

**Pound Lane Link: Phase 1 (New Pound Lane Phase 1, A127 Junction and Tresco Way / Cranfield Park Road Link)**

7.4.15 A new all movement grade separated junction on the A127 between the Nevendon and Fairglen Interchanges is proposed in the vicinity of Pound Lane and Cranfield Park Road. This is expected to mitigate the impact of development traffic at the existing left-in / left-out restricted junction. Additionally, the junction would provide a new development enabled link road (Pound Lane Link: Phase 1) between Basildon and Wickford, via Pound Lane / Cranfield Park Road / Tresco Way, alleviating traffic from the Nevendon Interchange and the A132 corridor through Wickford by providing a link to new and existing housing to the east and south of the town.

7.4.16 This mitigation option was previously explored in the Part 1 report, and assessed as a 3 phase scheme initially proposed at the Pound Lane Link. Phase 1 was included as stated above, with the addition of Phases 2 and 3 which extended from the Pound Lane junction to the north east in Shotgate, connecting to the A129 and the A130 respectively. The modelling results from the Part 1 report illustrated that traffic diverted onto the new link at Pound Lane resulted in 'rat running' through the east Basildon and the town centre, causing local congestion issues, rather than using the strategic highway network via the A130 and A13, providing no benefit to the highway network and junctions located within the Basildon area. Therefore, this option has been taken forward in this Part 2 assessment with the phase 1 link only. The scheme is still subject to design, detailed junction modelling and it is assumed that any new junction would be built 'fit for purpose' to accommodate future traffic growth.

7.4.17 The complete scheme will principally affect trip assignment at the eastern end of the A127 corridor and would lead to a potential reduction in the volume of turning movements at the A127 Nevendon Interchange (Ba4). When compared to the 'no' mitigation scenario, the VISUM modelling forecasts up to

475 vehicles per hour (vph) two-way development only trips could be reassigned from A127 Nevendon Interchange (Ba4) to the new Tresco Way / Cranfield Park Road Link in either the AM or PM peak hours. When considered with the potential for background traffic reassignment, there could be a significant reduction (approximately 2000-3000 vph)[7] in vehicle turning movements at the A127 Nevendon Interchange (Ba4) during the peak hours.

7.4.18 The introduction of a new all movement interchange at A127 / Pound Lane would also encourage traffic from Basildon to reassign to the eastern end of the A127, to access the A130 northbound, via the Fairglen Interchange and A1245. This could reduce some traffic routing through Basildon, towards the A130 via the Pitsea Interchange (Ba26), but increase traffic through the A127 / A130 Fairglen Interchange and A1245 corridor. The level of reassignment realised will be subject to available capacity at the proposed new A127 / A130 Fairglen Interchange scheme and within Basildon town centre.

**New Link Road Parallel to Burnt Mills Road with Banned left turn for westbound traffic on the link road parallel to Burnt Mills Road**

7.4.19 A parallel new link road to the north of Burnt Mills Road, connecting Pound Lane with Courtauld Road has been proposed, providing an additional route into Basildon. A banned left turn would be imposed for westbound traffic, at the junction with Courtauld Road, to reduce the amount of traffic travelling towards east Basildon via the new Pound Lane Link.

7.4.20 The restrictions have been put in place, given the increase in traffic in Basildon from the introduction of the Pound Lane Link, despite a reduction in traffic flows at the main junctions in Wickford. This enforces a banned left turn for westbound traffic, at the junction with Courtauld Road. This would reduce the amount of traffic travelling towards east Basildon via the Pound Lane Link, expecting traffic to alternatively reroute via Junction Ba4 (Nevendon Interchange) travelling in to the east of Basildon from the north.

**Dunton Link Road**

7.4.21 A new Dunton Link Road is proposed to serve new development (H8) to the west of Basildon and Laindon town centre. The link road is likely to be a development enabled access road primarily to serve housing and potential relocation of playing fields and sport facilities via Mandeville Way. This will provide a more direct and viable route for development traffic travelling into Laindon, given the restricted movements at the existing Lower Dunton Road / B148 West Mayne junction to the north, avoiding unnecessary U-turn movements at the A127 Dunton Interchange.

[7] Subject to full or intermediate (Sensitivity Test) reassignment

7.4.22 The new link road would likely form a 'major access road', with a secondary access for emergency vehicles and potential for a bus route extension with pedestrian and cycle facilities.

## 7.5 Wider Highway Schemes

7.5.1 The following schemes have been considered as part of the overall package of mitigation measures given their scale and strategic significance. Each scheme is at a different stage of design feasibility and detail. Where possible, a scheme has been included with the assessment of the Final Growth Scenario as either part of the detailed modelling, e.g. the A127 / A130 Fairglen Interchange scheme, or as part of the overall narrative depending on the level of detail available.

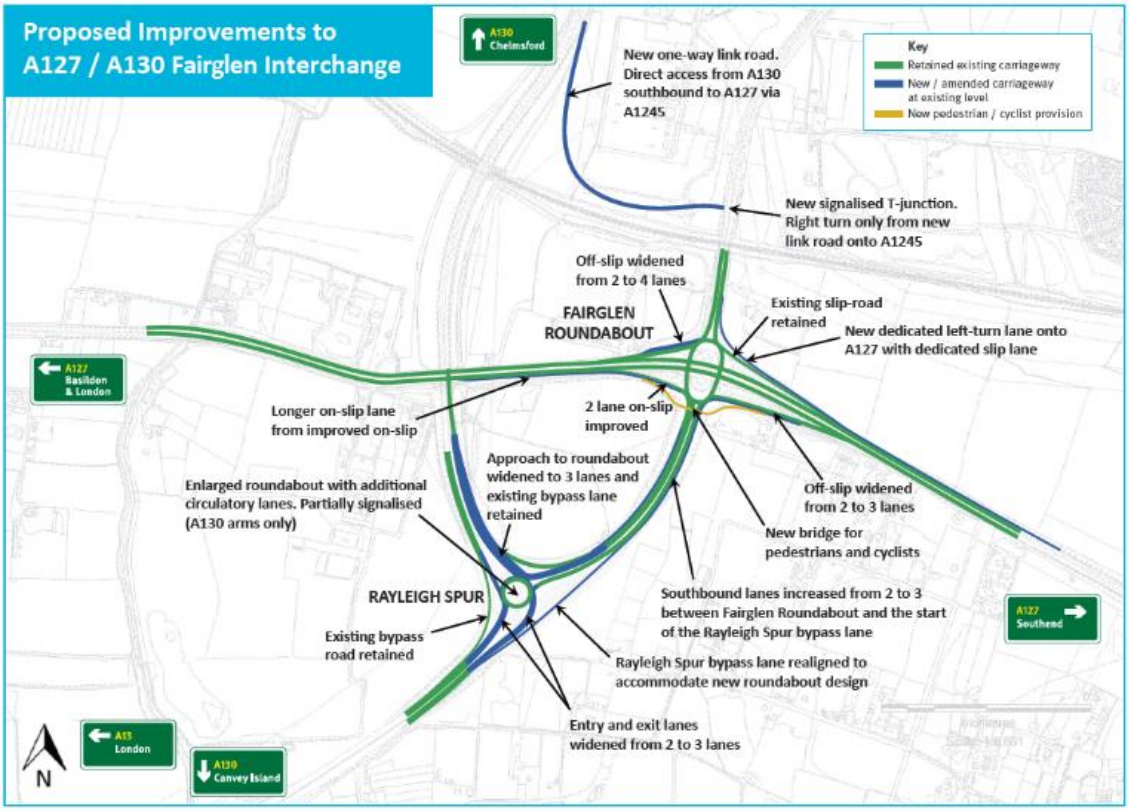
**(BA32) – A127 / A130 Fairglen Interchange Short-Term Scheme**

7.5.2 The A127 / A130 Fairglen Interchange short-term scheme is expected to address existing and anticipated capacity issues over the next 15-20 years. It is acknowledged that a longer-term scheme may be required at a later date, subject to the actual level of traffic growth.

7.5.3 The short-term scheme is currently subject to public consultation with the intention of preparing the outline business case later in 2018. The scheme concept is shown in Figure 7-7 includes three key elements including:

- A new link road from A130 to A127 via A1245 – providing a more direct route to the A127 eastbound;
- Fairglen Roundabout improvements – including signalising approaches, dedicated filter lanes, lane widening and a new pedestrian/cycle bridge; and
- Rayleigh Spur Roundabout improvements – including signalising approaches and increased lane capacity.

**Figure 7-7: A127 / A130 Fairglen Interchange Scheme**




7.5.4 Sufficient detail of the A127 / A130 Fairglen Interchange scheme design and modelling is available for assessment purposes and therefore outputs are considered in detail. **Please note** the scheme is still subject to the outcomes of the public consultation, eventual funding decisions and could potentially change at a later date.

**(W6) – A1245 / A132 Rettendon Turnpike Roundabout**

7.5.5 The scheme falls within neighbouring authority Chelmsford City Council. However, given the proximity to the A130 / A132 interchange and Borough boundary and assessment of proposed improvements has been included for information purposes.

7.5.6 The scheme proposals include minor alterations to the existing layout including road widening on the southern A1245 and northern Main Road approaches.

**(BA30) – A130 / A13 / London Road 'Sadlers Farm' Roundabout**

7.5.7 The junction is currently subject to a design study to investigate early options for improvements. A preferred scheme is therefore yet to be determined and has not been included in this assessment. However, the existing layout has been tested against each of the growth scenarios and the Final Growth

Scenario forecast traffic flows are being used to inform the design of an eventual preferred option.

**(BA31a/b) –A127 / High Road 'Fortune of War' Junction**

7.5.8 The junction is currently subject to a design study to investigate different options to replace the restricted 'left-in / left-out' arrangement with an all-movement interchange. A preferred scheme is therefore yet to be determined and has not been included in this assessment. However, the existing layout has been tested against each of the growth scenarios and the Final Growth Scenario forecast traffic flows are being used to inform the design of an eventual preferred option.

**Basildon Town Centre Masterplan Improvements**

7.5.9 In 2016/17 Essex Highways undertook a VISSIM microsimulation modelling exercise to test initial highway improvement options, proposed for the Basildon Town Centre Masterplan area. The forecast scenarios used the previous Draft Local Plan Growth scenario to test a range of options to inform the Basildon Integrated Transport Package – South East Local Enterprise Partnership (SELEP) Business Case. The outcomes of this initial work have now been passed on to a new consultancy partnership to develop and deliver a preferred package of measures for the town centre Masterplan in line with the final Publication Local Plan growth scenario.

7.5.10 While any further detailed modelling of the Masterplan proposals has not been undertaken explicitly as part of this study, a summary of the outcomes of the most recent VISSIM assessment work, undertaken by Essex Highways in 2017, is discussed below.

7.5.11 The study area is primarily made up of four key routes, A1321 Broadmayne, A176 Nethermayne, Southernhay, and Cherrydown East, assessing a total of 13 junctions (see Figure 4-3), including the following:

Broadmayne/A176 Upper Mayne

A176 Nether Mayne/Ashdon Way

Broadmayne/Great Oaks /Westgate

Roundacre/A176 Nether Mayne/Laindon Link

Broadmayne/Ghyllgrove

Broadmayne/The Gore

Southernhay/Station Way/Roundacre

Broadmayne/Little Oaks

Southernhaye/Clay Hill Road

Broadmayne/Linkway

Clay Hill Road/Cherrydown East

Southernhay/Long Riding

Station Way/Ashdon Way

7.5.12 The assessment investigated modified signal control, link closures to traffic, and two-way operation instead of existing one-way streets, specifically, two-way flow along Station Way, Cherrydown East, and Clayhill Road. The two-way flow element would require extensive junction layout changes to the following junctions:

- Roundacre/Station Way/Fodderwick and Southernhay;
- Southernhay/Clayhill Road;
- Station Way/Ashdon Way; and
- Cherrydown East/Clayhill Road/Car Park 13.

7.5.13 Junctions were modelled in LinSig, to identify the most effective signal control layout, and to determine whether the junctions could accommodate the highest possible re-routing of traffic. The revised signal layouts were then tested in the VISSIM model to understand how re-routing may alter overall journey times.

7.5.14 Modelling alterations were also incorporated into the base model, including:

- Southernhay closure between Clayhill Road and Station Way to general traffic (buses only on this section);
- Two-way traffic on Station Way, Cherrydown East, and Clayhill Road between Southernhay and Cherrydown East;
- Revision of junction layout at Roundacre/Station Way/Fodderwick and Southernhay, Southernhay/Clayhill Road, Station Way/Ashdon Way, and Cherrydown East/Clayhill Road/Car Park 13 for traffic and pedestrian movements; and
- Closure of Cherrydown East outside of Trafford House.

7.5.15 A total of three options were tested through an iterative modelling process, including the initial Masterplan proposals and two variant options:

- Option 2 provided a continuation of the initial Option 1, with the addition of a Ghyllgrove access on to Cranes Farm Road, alleviating pressure on Broadmayne and East Mayne (currently closed to general traffic, with only buses and taxis using this link).
- Option 3 provided a continuation of Option 2, adding a pedestrian facility at the junction of Roundacre/Station Way/Fodderwick, linking The Icon building with Basildon rail station.

7.5.16 The results illustrated that, in isolation, Option 1 alone would provide significant dis-benefits to the network when compared to the base model, while the additional improvements tested in Option 2 and Option 3 could

deliver improvements to the overall impact of the Masterplan proposals and future growth on the highway network.

7.5.17 The schemes were modelled with a forecast year of 2036, which incorporated the previous Draft Local Plan Growth scenario. The assessment concluded that Option 3, providing the additional benefit of improved pedestrian accessibility, was considered the most preferable option to be taken forward further testing and feasibility.

7.5.18 Furthermore, on-street observations identified other areas for improvement at the signalised junctions along Broadmayne, through the revalidation of SCOOT (Split Cycle Offset Optimisation Technique), given the timings did not appear to link well between junctions or provide early green cut-offs to allow more congested approaches to run.

7.5.19 The modelling shows that without any highway improvements in the future year, the existing layout would struggle to cope with the growth forecasted in 2036. While Option 3 does not necessarily mitigate forecast growth back to the existing situation, the proposals would provide a more resilient option, than the current layout and other options tested, as well as providing overall benefits to non-motorised users in and around the town centre. The following measures should also be included in the Option 3 proposals:

- Opening up Ghyllgrove northern approach to allow general traffic to access Cranes Farm Road; and
- Revalidate SCOOT along the Broadmayne corridor to optimise signal linking between junctions to minimise delay.

# 8 Mitigation Assessment

## 8.1 Overview

8.1.1 The junction model results tested with the preferred mitigation package are summarised for the AM peak in Table 8-1 and PM peak in Table 8-2 for the Borough network in the Basildon, Billericay and Wickford settlement areas respectively. For each area, a high-level summary (i.e. highest RFC / DoS performing arm) is provided for all modelled junctions, showing the overall junction performance in each peak period. For any junctions showing a 'red'[8] result (where the junction is operating significantly over capacity) in either peak period under the RAG system, a more detailed discussion of the modelling outputs is provided. The analysis illustrates the incremental change in results between the unmitigated growth scenarios, discussed earlier, and the latest testing of the Final Growth Scenario with the proposed mitigation measures.

8.1.2 It should be noted that, although adjustments have already been made to the Final Growth Scenario trip generation to account for 'reasonable' sustainable measures, it is anticipated that a greater level of sustainable modal shift and reductions in car travel could be achieved, avoiding the need for excessive and costly infrastructure improvements to the network. It is therefore considered suitable to provide a detailed analysis for junctions with a RFC / DoS of more than 1.15, given junctions showing an 'amber' impact (RFC / DoS 1.00-1.15) are assumed possible to mitigate through further sustainable modal shift. Results are illustrated in tables presented in this section with corresponding plots in **Appendix F**.

8.1.3 The results provide a strategic indication of the acceptability of the mitigated highway impact of the Publication Local Plan. In the first instance, results should ideally demonstrate 'nil detriment' over the existing level of service on the Borough highway network. However, mitigation needs to be considered against overall value for money; what is realistically achievable within any constraints; and also within the context of discouraging unconstrained car use. Where there are any residual significant impacts on the network, and as a minimum, these have been considered against the 2034 Background Growth results to demonstrate whether the Final Growth Scenario can at least deliver betterment over the future 'Do-Minimum' situation i.e. organic traffic growth without the delivery of a Local Plan.

[8] **Note -** Some red coded junctions are denoted by an 'X', where an approach may be significantly over capacity and the modelling output does not return a reliable result.

**Table 8-1: With Mitigation Junction Model Results – Borough Network Summary AM**

| Junction ID | Junction Location | Existing Junction Type | Performance Summary AM | | | |
|---|---|---|---|---|---|---|
| | | | 2014 Base | 2034 Background Growth | 2034 Final Growth Scenario No Mitigation | 2034 Final Growth Scenario With Mitigation |
| **Basildon** | | | | | | |
| Ba1 | A127 / A176 Noak Bridge Interchange North | Standard rbt | 0.80 | 0.95 | 1.31 | 1.06 |
| Ba2 | A127 / A176 Noak Bridge Interchange South | Standard rbt | 0.63 | 0.71 | 0.89 | 0.78 |
| Ba4 | A127/A132 Nevendon Interchange Junction | Signal rbt | 0.99 | 1.00 | 1.03 | 0.50 |
| Ba5 | Cranes Farm Road / A176 Upper Mayne / St. Nicholas Lane | Standard rbt | 0.99 | 1.26 | 1.52 | 1.27 |
| Ba7 | Broadmayne / South Mayne / Ashlyns | Standard rbt | 0.97 | 1.18 | 1.52 | 1.05 |
| Ba14 | B1464 London Road / High Road / Clay Hill Road | Mini rbt | 0.93 | 1.04 | 1.05 | 0.88 |
| Ba15 | Cranes Farm Road / A132 East Mayne | Standard rbt | 1.04 | 1.11 | 1.24 | 0.99 |
| Ba16 | A127 / B148 West Mayne (Dunton) Interchange | Large rbt | 0.45 | 0.52 | 0.96 | 0.84 |
| Ba19 | High Road / West Mayne / St. Nicholas Lane | Standard rbt | 0.71 | 0.81 | 0.91 | 1.00 |
| Ba20 | High Road / Somerset Road / Laindon Link | Standard rbt | 0.36 | 0.40 | 0.43 | 0.44 |
| Ba23 | A176 Nether Mayne / Hospital Access | Signal rbt | 0.86 | 0.81 | 0.79 | 0.83 |
| Ba24 | A13/A176 Five Bells Interchange North | Standard rbt | 1.37 | 1.67 | 1.93 | 1.16 |
| Ba25 | A13/A176 Five Bells Interchange South | Standard rbt | 0.45 | 0.50 | 0.58 | 0.56 |
| Ba26 | A13/A132 Pitsea Interchange | Standard rbt | 1.18 | 1.49 | 1.48 | 0.82 |
| Ba27 | A132 East Mayne / Whitmore Way / Felmores | Standard rbt | 0.75 | 0.84 | 0.99 | 0.90 |
| Ba28 | A176 Nether Mayne / Dry Street | T-junction | 0.18 | 0.30 | 0.51 | 0.76 |
| Ba29 | B148 West Mayne / Mandeville Way | Standard rbt | 0.88 | 1.01 | 1.11 | 1.12 |
| Ra1 | A1245 Chelmsford Road / A129 London Road | Standard rbt | 0.76 | 0.86 | 0.86 | 0.66 |
| **Billericay** | | | | | | |
| Bi1 | B1007 Stock Road / Queens Park Avenue / Potash Road | Standard rbt | 0.83 | 0.97 | 1.11 | 0.88 |
| Bi2 | B1007 Stock Road / Radford Way | Mini rbt | 0.92 | 1.03 | 1.04 | 0.69 |
| Bi3 | Mountnessing Road / Perry Street / Radford Way | Standard rbt | 0.75 | 0.84 | 0.88 | 0.92 |
| Bi4 | B1007 High Street / Norsey Road / Western Road | Signal | 0.91 | 1.01 | 1.05 | 0.60 |
| Bi5 | A129 London Road / High Street / Sun Street | Standard rbt | 1.10 | 1.23 | 1.31 | 0.81 |
| Bi6 | A129 Sun Street / Chapel Street | Standard rbt | 0.78 | 0.85 | 0.90 | 0.98 |
| Bi7 | A129 London Road / Tye Common Road / Western Road | Signal | 1.22 | 1.65 | 1.41 | 0.51 |
| Bi8 | A129 Southend Road / A176 | Standard rbt | 0.75 | 0.84 | 0.95 | 0.52 |
| Bi9 | A176 / Kennel Lane / Laindon Road | Standard rbt | 0.74 | 0.84 | 1.00 | 0.73 |
| Bi10 | A129 London Road / Mountnessing Road | Priority | 0.70 | 0.89 | 1.67 | 2.36 |
| Bi12 | A129 Southend Rd / Outwood Common Road | Priority | 0.77 | 0.94 | 1.23 | 0.82 |
| Bi13 | A129 Southend Rd / Hickstars Lane | Priority | 0.57 | 0.64 | 0.69 | 0.87 |
| **Wickford** | | | | | | |
| W1 | A132 Runwell Road / A132 / Runwell Road | Standard rbt | 1.07 | 1.19 | 1.42 | 1.12 |
| W2 | A132 Golden Jubilee Way/Radwinter Ave/ A129 London Rd | Standard rbt | 0.81 | 0.96 | 1.02 | 1.04 |
| W3 | A132 Runwell Road / Church End Lane | Priority | 0.57 | 1.86 | X | 1.06 |
| W4 | A129 London Road / Nevendon Road / High Street | Signal | 0.88 | 1.00 | 1.15 | 0.92 |
| W5 | A132 / Cranfield Park Road / Nevendon Road | Standard rbt | 0.80 | 0.77 | 0.87 | 0.41 |

**Table 8-2: With Mitigation Junction Model Results – Borough Network Summary PM**

| Junction ID | Junction Location | Existing Junction Type | Performance Summary PM | | | |
|---|---|---|---|---|---|---|
| | | | 2014 Base | 2034 Background Growth | 2034 Final Growth Scenario No Mitigation | 2034 Final Growth Scenario With Mitigation |
| **Basildon** | | | | | | |
| Ba1 | A127 / A176 Noak Bridge Interchange North | Standard rbt | 1.06 | 1.17 | 1.38 | 1.24 |
| Ba2 | A127 / A176 Noak Bridge Interchange South | Standard rbt | 0.71 | 0.82 | 0.90 | 0.79 |
| Ba4 | A127/A132 Nevendon Interchange Junction | Signal rbt | 0.90 | 0.89 | 0.97 | 0.37 |
| Ba5 | Cranes Farm Road / A176 Upper Mayne / St. Nicholas Lane | Standard rbt | 0.97 | 1.11 | 1.27 | 1.16 |
| Ba7 | Broadmayne / South Mayne / Ashlyns | Standard rbt | 0.84 | 0.99 | 1.13 | 0.81 |
| Ba14 | B1464 London Road / High Road / Clay Hill Road | Mini rbt | 1.22 | 1.34 | 1.38 | 1.07 |
| Ba15 | Cranes Farm Road / A132 East Mayne | Standard rbt | 0.85 | 0.90 | 1.04 | 0.62 |
| Ba16 | A127 / B148 West Mayne (Dunton) Interchange | Large rbt | 0.49 | 0.55 | 0.80 | 0.74 |
| Ba19 | High Road / West Mayne / St. Nicholas Lane | Standard rbt | 0.63 | 0.72 | 0.84 | 1.21 |
| Ba20 | High Road / Somerset Road / Laindon Link | Standard rbt | 0.48 | 0.52 | 0.56 | 0.56 |
| Ba23 | A176 Nether Mayne / Hospital Access | Signal rbt | 0.91 | 0.91 | 0.90 | 0.85 |
| Ba24 | A13/A176 Five Bells Interchange North | Standard rbt | 1.19 | 1.36 | 1.71 | 1.21 |
| Ba25 | A13/A176 Five Bells Interchange South | Standard rbt | 0.60 | 0.65 | 0.65 | 0.77 |
| Ba26 | A13/A132 Pitsea Interchange | Standard rbt | 1.05 | 1.31 | 1.66 | 0.89 |
| Ba27 | A132 East Mayne / Whitmore Way / Felmores | Standard rbt | 0.71 | 0.81 | 0.94 | 0.82 |
| Ba28 | A176 Nether Mayne / Dry Street | T-junction | 0.42 | 0.70 | X | 0.92 |
| Ba29 | B148 West Mayne / Mandeville Way | Standard rbt | 0.66 | 0.71 | 0.79 | 0.93 |
| Ra1 | A1245 Chelmsford Road / A129 London Road | Standard rbt | 0.95 | 1.14 | 1.09 | 0.91 |
| **Billericay** | | | | | | |
| Bi1 | B1007 Stock Road / Queens Park Avenue / Potash Road | Standard rbt | 0.87 | 0.99 | 1.14 | 1.23 |
| Bi2 | B1007 Stock Road / Radford Way | Mini rbt | 1.13 | 1.26 | 1.26 | 1.02 |
| Bi3 | Mountnessing Road / Perry Street / Radford Way | Standard rbt | 0.73 | 0.82 | 0.89 | 1.10 |
| Bi4 | B1007 High Street / Norsey Road / Western Road | Signal | 0.83 | 0.94 | 0.96 | 0.84 |
| Bi5 | A129 London Road / High Street / Sun Street | Standard rbt | 1.26 | 1.41 | 1.54 | 0.85 |
| Bi6 | A129 Sun Street / Chapel Street | Standard rbt | 0.81 | 0.89 | 0.90 | 1.13 |
| Bi7 | A129 London Road / Tye Common Road / Western Road | Signal | 0.96 | 1.58 | 1.41 | 0.54 |
| Bi8 | A129 Southend Road / A176 | Standard rbt | 1.00 | 1.11 | 1.13 | 1.17 |
| Bi9 | A176 / Kennel Lane / Laindon Road | Standard rbt | 0.48 | 0.52 | 0.53 | 0.68 |
| Bi10 | A129 London Road / Mountnessing Road | Priority | 1.00 | 1.14 | X | 0.54 |
| Bi12 | A129 Southend Rd / Outwood Common Road | Priority | 0.73 | 0.80 | 0.85 | 0.78 |
| Bi13 | A129 Southend Rd / Hickstars Lane | Priority | 0.58 | 0.63 | 0.64 | 0.62 |
| **Wickford** | | | | | | |
| W1 | A132 Runwell Road / A132 / Runwell Road | Standard rbt | 1.07 | 1.34 | 1.48 | 0.74 |
| W2 | A132 Golden Jubilee Way/Radwinter Ave/ A129 London Rd | Standard rbt | 0.85 | 1.00 | 1.11 | 1.16 |
| W3 | A132 Runwell Road / Church End Lane | Priority | 1.34 | X | X | 1.13 |
| W4 | A129 London Road / Nevendon Road / High Street | Signal | 0.73 | 0.90 | 0.99 | 0.75 |
| W5 | A132 / Cranfield Park Road / Nevendon Road | Standard rbt | 0.63 | 0.69 | 1.03 | 0.34 |

## 8.2 Network Summary

8.2.1 As previously stated, and without mitigation, the delivery of 2034 Final Growth Scenario (Publication Local Plan) would introduce a number of congestion issues across the network, with 11 junctions operating within capacity (≤1.00 RFC / DoS), 9 junctions demonstrating an 'amber' impact (1.00-1.15 RFC / DoS) and up to 15 junctions demonstrating a 'red' impact (>1.15 RFC / DoS) on at least one approach in either peak.

8.2.2 The introduction of the preferred mitigation package (summarised in Table 8-1 and Table 8-2), shows that 19 junctions would operate within capacity (≤1.00 RFC / DoS), with 8 junctions demonstrating an 'amber' impact (1.00-1.15 RFC / DoS) and a further 8 junctions demonstrating a 'red' impact (>1.15 RFC / DoS) on at least one approach in either peak. This represents a significant improvement on the 2034 Final Growth 'No Mitigation' Scenario and emphasises the need for mitigation across the network.

8.2.3 As stated previously, results exceeding 1.15 RFC / DoS have been considered as a significant impact on the network and unlikely to be mitigated by further sustainable transport improvements. When compared against the Existing and 2034 Background Growth Scenarios, the mitigated 2034 Final Growth Scenario demonstrates the following as 'worst-case' on any approach in either peak:

- 19 junctions would operate within a 1.00 RFC / DoS compared to 25 junctions in the existing situation and 17 junctions in the 2034 Background Growth Scenario;
- 27 junctions would operate within a 1.15 RFC / DoS compared to 29 junctions in the existing situation and 24 junctions in the 2034 Background Growth Scenario; and
- 8 junctions would have at least one approach in either peak operating in excess of a 1.15 RFC / DoS compared to 6 junctions in the existing situation and 11 junctions in the 2034 Background Growth Scenario.

8.2.4 The results illustrate, at a strategic level, that the Publication Local Plan Growth scenario can be mitigated to a similar level of network operation as the existing situation at a number of locations across the network. Where this is not achieved, traffic growth can at least be mitigated back to generally deliver betterment over the 2034 Background Growth ('Do-Minimum') scenario, where no Local Plan growth and only limited transport improvements are delivered.

8.2.5 Any residual impacts shown across the network and the impact of sensitivity testing, of the preferred mitigation package, are discussed in more detail in this section.

## 8.3 Sensitivity Testing

8.3.1 The results of the mitigation assessment have been based on the assumption that the 'full' potential for traffic reassignment is realised with the introduction of new links. As previously stated, due to the limitations of the reassignment model, a sensitivity test of an 'intermediate' level of background traffic reassignment has been undertaken to provide a benchmark for the potential impact of the mitigation package.

8.3.2 Table 8-3 provides a comparison performance summary of the following 2034 Final Growth scenarios:

- No Mitigation
- With Mitigation – 'Full' background reassignment
- With Mitigation – 'Intermediate' background reassignment (Sensitivity Test)

8.3.3 The results of the sensitivity testing show some minor positive and negative impacts when considered against the 'full' reassignment mitigation test, with four additional junctions operating over capacity (>1.00 RFC / DoS).

8.3.4 The results show that the introduction of new link roads in the Basildon settlement area, while having an overall benefit over the 'no mitigation' scenario, will be less sensitive to the eventual level of traffic reassignment.

8.3.5 Similarly, junctions on the A176 and A129 to the south of Billericay, will be subject to minor localised 'rebalancing' to make the most efficient use of highway capacity.

8.3.6 In Wickford, the impact of the Tresco Way / Cranfield Park Road section of A127 / Pound Lane improvements is likely to realise the 'full' level of reassignment, given the impact on junctions along the A132 corridor within the town centre.

8.3.7 Overall, the sensitivity testing shows that 'full' level of reassignment potential does not necessarily need to be realised to deliver benefits across the network. However, it is evident that an element of rebalancing would likely occur, at specific locations on the network, to achieve an equilibrium between the scenarios tested and make the most efficient use of available capacity.

8.3.8 While the optimum assignment pattern cannot be fully assessed within the model limitations, it is recommended that as specific schemes come forward, similar sensitivity testing is undertaken with the most up to date data to refine the eventual scale and layout of any required mitigation scheme.

**Table 8-3: Background Traffic Reassignment Sensitivity Testing**

| Junction ID | Junction Location | Performance Summary | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2034 Final Growth Scenario No Mitigation | | 2034 Final Growth Scenario With Mitigation | | 2034 Final Growth Scenario With Mitigation SENSITIVITY TEST | |
| | | AM | PM | AM | PM | AM | PM |
| **Basildon** | | | | | | | |
| Ba1 | A127 / A176 Noak Bridge Interchange North | 1.31 | 1.38 | 1.06 | 1.24 | 1.08 | 1.27 |
| Ba2 | A127 / A176 Noak Bridge Interchange South | 0.89 | 0.90 | 0.78 | 0.79 | 0.83 | 0.84 |
| Ba4 | A127/A132 Nevendon Interchange Junction | 1.03 | 0.97 | 0.50 | 0.37 | 0.83 | 0.65 |
| Ba5 | Cranes Farm Road / A176 Upper Mayne / St. Nicholas Lane | 1.52 | 1.27 | 1.27 | 1.16 | 1.20 | 1.21 |
| Ba7 | Broadmayne / South Mayne / Ashlyns | 1.52 | 1.13 | 1.05 | 0.81 | 1.22 | 0.90 |
| Ba14 | B1464 London Road / High Road / Clay Hill Road | 1.05 | 1.38 | 0.88 | 1.07 | 0.89 | 1.04 |
| Ba15 | Cranes Farm Road / A132 East Mayne | 1.24 | 1.04 | 0.99 | 0.62 | 1.12 | 0.86 |
| Ba16 | A127 / B148 West Mayne (Dunton) Interchange | 0.96 | 0.80 | 0.84 | 0.74 | 0.90 | 0.77 |
| Ba19 | High Road / West Mayne / St. Nicholas Lane | 0.91 | 0.84 | 1.00 | 1.21 | 0.96 | 1.04 |
| Ba20 | High Road / Somerset Road / Laindon Link | 0.43 | 0.56 | 0.44 | 0.56 | 0.44 | 0.56 |
| Ba23 | A176 Nether Mayne / Hospital Access | 0.79 | 0.90 | 0.83 | 0.85 | 0.85 | 0.91 |
| Ba24 | A13/A176 Five Bells Interchange North | 1.93 | 1.71 | 1.16 | 1.21 | 1.16 | 1.22 |
| Ba25 | A13/A176 Five Bells Interchange South | 0.58 | 0.65 | 0.56 | 0.77 | 0.56 | 0.67 |
| Ba26 | A13/A132 Pitsea Interchange | 1.48 | 1.66 | 0.82 | 0.89 | 0.89 | 0.99 |
| Ba27 | A132 East Mayne / Whitmore Way / Felmores | 0.99 | 0.94 | 0.90 | 0.82 | 0.94 | 1.09 |
| Ba28 | A176 Nether Mayne / Dry Street | 0.51 | X | 0.76 | 0.92 | 0.81 | 1.01 |
| Ba29 | B148 West Mayne / Mandeville Way | 1.11 | 0.79 | 1.12 | 0.93 | 1.12 | 0.86 |
| Ra1 | A1245 Chelmsford Road / A129 London Road | 0.86 | 1.09 | 0.66 | 0.91 | 0.85 | 1.14 |
| **Billericay** | | | | | | | |
| Bi1 | B1007 Stock Road / Queens Park Avenue / Potash Road | 1.11 | 1.14 | 0.88 | 1.23 | 1.02 | 1.18 |
| Bi2 | B1007 Stock Road / Radford Way | 1.04 | 1.26 | 0.69 | 1.02 | 0.94 | 1.23 |
| Bi3 | Mountnessing Road / Perry Street / Radford Way | 0.88 | 0.89 | 0.92 | 1.10 | 0.88 | 1.10 |
| Bi4 | B1007 High Street / Norsey Road / Western Road | 1.05 | 0.96 | 0.60 | 0.84 | 0.65 | 0.85 |
| Bi5 | A129 London Road / High Street / Sun Street | 1.31 | 1.54 | 0.81 | 0.85 | 0.95 | 0.98 |
| Bi6 | A129 Sun Street / Chapel Street | 0.90 | 0.90 | 0.98 | 1.13 | 1.15 | 1.00 |
| Bi7 | A129 London Road / Tye Common Road / Western Road | 1.41 | 1.41 | 0.51 | 0.54 | 1.50 | 0.77 |
| Bi8 | A129 Southend Road / A176 | 0.95 | 1.13 | 0.52 | 1.17 | 0.60 | 1.70 |
| Bi9 | A176 / Kennel Lane / Laindon Road | 1.00 | 0.53 | 0.73 | 0.68 | 0.67 | 0.55 |
| Bi10 | A129 London Road / Mountnessing Road | 1.67 | X | 2.36 | 0.54 | 1.02 | 0.78 |
| Bi12 | A129 Southend Rd / Outwood Common Road | 1.23 | 0.85 | 0.82 | 0.78 | 1.01 | 0.81 |
| Bi13 | A129 Southend Rd / Hickstars Lane | 0.69 | 0.64 | 0.87 | 0.62 | 0.98 | 0.79 |
| **Wickford** | | | | | | | |
| W1 | A132 Runwell Road / A132 / Runwell Road | 1.42 | 1.48 | 1.12 | 0.74 | 1.23 | 1.14 |
| W2 | A132 Golden Jubilee Way/Radwinter Ave/ A129 London Rd | 1.02 | 1.11 | 1.04 | 1.16 | 1.19 | 1.47 |
| W3 | A132 Runwell Road / Church End Lane | X | X | 1.06 | 1.13 | 1.54 | X |
| W4 | A129 London Road / Nevendon Road / High Street | 1.15 | 0.99 | 0.92 | 0.75 | 0.93 | 0.75 |
| W5 | A132 / Cranfield Park Road / Nevendon Road | 0.87 | 1.03 | 0.41 | 0.34 | 0.69 | 0.66 |

## 8.4 Residual Impacts

8.4.1 This section provides a more detailed discussion of residual impacts associated with the mitigation package at specific locations in each of the key settlement areas. Results are illustrated in corresponding plots in **Appendix G**.

8.4.2 The results presented in this section include information on queue lengths. It should be noted that generally, where the RFC / DoS exceeds 1.00 on a particular approach, the accuracy of the modelled queue analysis decreases. Queue lengths on any approach exceeding an RFC / DoS of 1.0 should therefore be treated with caution.

**Basildon Area**

8.4.3 The modelling results of the mitigation package demonstrate that a number of capacity benefits will be delivered in the Basildon area. In particular, the combination of local junction improvements and the reassignment of traffic to the Pound Lane Phase 1 schemes will have capacity benefits for the 2034 Final Growth Scenario at:

- (Ba2) A127 / A176 Noak Bridge Interchange South
- (Ba4) A127 / A132 Nevendon Interchange
- (Ba7) Broadmayne / South Mayne / Ashlyns
- (Ba15) Cranes Farm Road / A132 East Mayne
- (Ba26) A13/A132 Pitsea Interchange
- (Ba27) A132 East Mayne / Whitmore Way / Felmores

8.4.4 In addition:

- the introduction of a Dunton Access Road will reduce the impact of development traffic on the (Ba16) A127 / B148 West Mayne (Dunton) Interchange; and
- a new 4-arm signal junction at (Ba28) A176 Nether Mayne / Dry Street will also deliver significant improvements in the PM peak period.

8.4.5 The residual impacts identified at specific locations on the network are discussed below. Table 8-4 summarises the overall 2034 Final Growth Scenario ‘with mitigation’ junction modelling results for the Basildon area.

**Table 8-4: Junction Model Results – Basildon**

| Junction ID | Junction Location | Modelled Junction Type | AM | PM |
|---|---|---|---|---|
| **Basildon** | | | | |
| Ba1 | A127 / A176 Noak Bridge Interchange North | Signal rbt | 1.06 | 1.24 |
| Ba2 | A127 / A176 Noak Bridge Interchange South | Standard rbt | 0.78 | 0.79 |
| Ba4 | A127/A132 Nevendon Interchange Junction | Signal rbt | 0.50 | 0.37 |
| Ba5 | Cranes Farm Road / A176 Upper Mayne / St. Nicholas Lane | Standard rbt | 1.27 | 1.16 |
| Ba7 | Broadmayne / South Mayne / Ashlyns | Standard rbt | 1.05 | 0.81 |
| Ba14 | B1464 London Road / High Road / Clay Hill Road | Signal (3 arm) | 0.88 | 1.07 |
| Ba15 | Cranes Farm Road / A132 East Mayne | Standard rbt | 0.99 | 0.62 |
| Ba16 | A127 / B148 West Mayne (Dunton) Interchange | Large rbt | 0.84 | 0.74 |
| Ba19 | High Road / West Mayne / St. Nicholas Lane | Standard rbt | 1.00 | 1.21 |
| Ba20 | High Road / Somerset Road / Laindon Link | Standard rbt | 0.44 | 0.56 |
| Ba23 | A176 Nether Mayne / Hospital Access | Signal rbt | 0.83 | 0.85 |
| Ba24 | A13/A176 Five Bells Interchange North | Signal rbt | 1.16 | 1.21 |
| Ba25 | A13/A176 Five Bells Interchange South | Signal rbt | 0.56 | 0.77 |
| Ba26 | A13/A132 Pitsea Interchange | Signal rbt | 0.82 | 0.89 |
| Ba27 | A132 East Mayne / Whitmore Way / Felmores | Standard rbt | 0.90 | 0.82 |
| Ba28 | A176 Nether Mayne / Dry Street | Signal (4 arm) | 0.76 | 0.92 |
| Ba29 | B148 West Mayne / Mandeville Way | Standard rbt | 1.12 | 0.93 |
| Ra1 | A1245 Chelmsford Road / A129 London Road | Standard rbt | 0.66 | 0.91 |

8.4.6 Table 8-4 shows that within Basildon: at least one arm at 4 of the junctions tested are operating significantly over capacity (‘red’ result) and 3 are operating marginally over capacity (‘amber’ result) as a ‘worst-case’ in either peak period with mitigation.

8.4.7 The 4 junctions operating significantly over capacity, even with the introduction of mitigation, are Ba1, Ba5, Ba19 and Ba24. These are discussed in more detail below with reference to the junction modelling results for all scenarios tested:

- 2014 Existing
- 2034 Background Growth Scenario
- 2034 Final Growth Scenario ‘no mitigation’
- 2034 Final Growth Scenario ‘with mitigation’

8.4.8 Results are provided by arm for RFCs / DoS and queue lengths measured in PCUs.

### (Ba1) – A127 / A176 Noak Bridge Interchange North

- Arm A - South Wash Road
- Arm B - A127 Southend Arterial Road
- Arm C - A176 Upper Mayne
- Arm D - A176 West

**Table 8-5: Ba1 Detailed Junction Results**

| Scenario | Results | A | B | C | D |
|---|---|---|---|---|---|
| **AM** | | | | | |
| 2014 Base | Queue | 4 | 0 | 2 | 1 |
| | RFC | 0.80 | 0.03 | 0.62 | 0.55 |
| 2034 Background Growth | Queue | 12 | 0 | 2 | 2 |
| | RFC | 0.95 | 0.03 | 0.68 | 0.62 |
| 2034 Final Growth Scenario No Mitigation | Queue | 136 | 0 | 3 | 3 |
| | RFC | 1.31 | 0.04 | 0.72 | 0.70 |
| 2034 Final Growth Scenario With Mitigation | Queue | 38 | 0 | 14 | 33 |
| | DoS | 1.06 | 0.93 | 0.78 | 1.02 |
| **PM** | | | | | |
| 2014 Base | Queue | 1 | 0 | 87 | 1 |
| | RFC | 0.46 | 0.06 | 1.06 | 0.46 |
| 2034 Background Growth | Queue | 1 | 0 | 204 | 1 |
| | RFC | 0.52 | 0.06 | 1.17 | 0.51 |
| 2034 Final Growth Scenario No Mitigation | Queue | 1 | 0 | 553 | 2 |
| | RFC | 0.54 | 0.15 | 1.38 | 0.61 |
| 2034 Final Growth Scenario With Mitigation | Queue | 7 | 4 | 388 | 8 |
| | DoS | 0.65 | 0.45 | 1.24 | 0.67 |

8.4.9 The current junction layout (standard roundabout) operates within capacity in the AM peak, with only South Wash Road (arm A) significantly exceeding capacity with the addition of 2034 development traffic. In the PM peak, the junction already exceeds capacity on the A176 Upper Mayne (arm C) in the existing situation, operating significantly over capacity with the addition of the background growth in 2034, and further deteriorating with the addition of the development traffic (while all other arms continue to operate within capacity).

8.4.10 The mitigated junction would operate only marginally over capacity in the AM peak, significantly improving on the unmitigated 2034 Final Growth Scenario. In the PM peak, the southern A176 approach would continue to operate significantly over capacity, with mitigation. However, the mitigated layout improves on the current layout, and it should be noted that signalising the junction would provide an improved traffic management option particularly at congested peak times. Furthermore, the modelling does not take account of the potential added journey time benefits of installing MOVA (Microprocessor Optimised Vehicle Actuation) at signal junctions. Research has shown that MOVA is effective at reducing journey time delays and can improve junction efficiency by up to 13% and further reduce the impact at this junction.

8.4.11 While not achieving nil-detriment over the existing situation, the mitigated layout is anticipated to improve on the 2034 Background Growth scenario AM and at a similar level to the respective PM peak. Further benefits would be expected with the installation of MOVA.

### (Ba5) - Cranes Farm Road / A176 Upper Mayne / St. Nicholas Lane

- Arm A - Upper Mayne North
- Arm B - Cranes Farm Road
- Arm C - Upper Mayne South
- Arm D - St Nicholas Lane

**Table 8-6: Ba5 Detailed Junction Results**

| Scenario | Results | A | B | C | D |
|---|---|---|---|---|---|
| **AM** | | | | | |
| 2014 Base | Queue | 3 | 2 | 4 | 18 |
| | RFC | 0.76 | 0.63 | 0.81 | 0.99 |
| 2034 Background Growth | Queue | 5 | 3 | 10 | 106 |
| | RFC | 0.84 | 0.74 | 0.92 | 1.26 |
| 2034 Final Growth Scenario No Mitigation | Queue | 26 | 4 | 28 | 195 |
| | RFC | 0.99 | 0.81 | 0.99 | 1.52 |
| 2034 Final Growth Scenario With Mitigation | Queue | 20 | 5 | 36 | 132 |
| | RFC | 0.97 | 0.82 | 1.01 | 1.27 |
| **PM** | | | | | |
| 2014 Base | Queue | 3 | 17 | 1 | 3 |
| | RFC | 0.74 | 0.97 | 0.40 | 0.74 |
| 2034 Background Growth | Queue | 1 | 88 | 5 | 7 |
| | RFC | 0.46 | 1.11 | 0.83 | 0.89 |
| 2034 Final Growth Scenario No Mitigation | Queue | 2 | 187 | 12 | 29 |
| | RFC | 0.59 | 1.27 | 0.93 | 1.03 |
| 2034 Final Growth Scenario With Mitigation | Queue | 1 | 124 | 5 | 3 |
| | RFC | 0.38 | 1.16 | 0.83 | 0.76 |

8.4.12 This junction is modelled as a standard roundabout for all scenarios, with arm widening tested on St Nicholas Lane (arm D) as part of the mitigation. This comprises lengthening the existing two-lane approach, with the relocation of the staggered pedestrian crossing further back along the approach arm, and the removal of cross-hatching on the carriageway approach.

8.4.13 For both peak periods, the current junction layout is already operating near capacity, falling significantly over capacity on St Nicholas Lane (arm D) in the AM peak and over capacity on Cranes Farm Road (arm B) in the PM peak with the addition of the background growth in 2034, and further deteriorating with the addition of the final growth traffic.

8.4.14 The junction continues to operate significantly over capacity at the respective arms in each peak even with the proposed mitigation. However, the scheme does improve on the existing layout and brings the level of performance to a more comparative level to that shown in 2034 Background Growth scenario.

8.4.15 It should be noted that any mitigation scheme at the BA31a/b – Fortune of War junction, implementing an all movement interchange, could reduce demand at this junction. A further review of any mitigation will therefore be required once a scheme for Fortune of War has been finalised.

**(BA19) - Ba19 High Road / West Mayne / St. Nicholas Lane:**

- Arm A - High Road North
- Arm B - St Nicholas Lane
- Arm C - High Road South
- Arm D - West Mayne

**Table 8-7: Ba19 Detailed Junction Results**

| Scenario | Results | A | B | C | D |
|---|---|---|---|---|---|
| **AM** | | | | | |
| 2014 Base | Queue | 2 | 1 | 1 | 1 |
| | RFC | 0.71 | 0.37 | 0.35 | 0.31 |
| 2034 Background Growth | Queue | 4 | 1 | 1 | 1 |
| | RFC | 0.81 | 0.41 | 0.39 | 0.35 |
| 2034 Final Growth Scenario No Mitigation | Queue | 9 | 1 | 1 | 1 |
| | RFC | 0.91 | 0.46 | 0.43 | 0.41 |
| 2034 Final Growth Scenario With Mitigation | Queue | 23 | 1 | 1 | 1 |
| | RFC | 1.00 | 0.46 | 0.44 | 0.54 |
| **PM** | | | | | |
| 2014 Base | Queue | 2 | 1 | 0 | 1 |
| | RFC | 0.63 | 0.34 | 0.31 | 0.49 |
| 2034 Background Growth | Queue | 3 | 1 | 1 | 1 |
| | RFC | 0.72 | 0.38 | 0.34 | 0.54 |
| 2034 Final Growth Scenario No Mitigation | Queue | 5 | 1 | 1 | 2 |
| | RFC | 0.84 | 0.39 | 0.36 | 0.60 |
| 2034 Final Growth Scenario With Mitigation | Queue | 112 | 1 | 1 | 2 |
| | RFC | 1.21 | 0.44 | 0.40 | 0.61 |

8.4.16 This junction is modelled as a standard roundabout for all scenarios, with no junction layout changes proposed. The junction is showing to operate within capacity across all scenarios, with only High Road (arm A) exceeding capacity in the PM peak with the introduction of the wider highway mitigation package.

8.4.17 The impact of the wider highway mitigation package has reassigned 300 additional vehicles to High Road (arm A) as part of the reassignment methodology. It should also be noted that any eventual mitigation scheme at the BA31a/b – Fortune of War junction, implementing an all movement interchange, could further change demand patterns at this junction. A further review of whether mitigation is need will therefore be required once a scheme for Fortune of War has been finalised.

**(Ba24) - A13/A176 Five Bells Interchange North**

- Arm A - A176 Nether Mayne
- Arm B - B1464 London Road
- Arm C - A13 Eastbound On-Slip (exit only)
- Arm D - A176 Upper Mayne
- Arm E - Bells Hill Road/ A13 West

**Table 8-8: Ba24 Detailed Junction Results**

| Scenario | Results | A | B | C | D | E |
|---|---|---|---|---|---|---|
| **AM** | | | | | | |
| 2014 Base | Queue | 1 | 1 | Exit only | 2 | 124 |
| | RFC | 0.54 | 0.34 | Exit only | 0.67 | 1.37 |
| 2034 Background Growth | Queue | 2 | 1 | Exit only | 3 | 224 |
| | RFC | 0.62 | 0.39 | Exit only | 0.74 | 1.67 |
| 2034 Final Growth Scenario No Mitigation | Queue | 2 | 1 | Exit only | 4 | 320 |
| | RFC | 0.60 | 0.39 | Exit only | 0.78 | 1.93 |
| 2034 Final Growth Scenario With Mitigation | Queue | 5 | 44 | Exit only | 11 | 3 |
| | DoS | 0.72 | 1.16 | Exit only | 0.73 | 0.53 |
| **PM** | | | | | | |
| 2014 Base | Queue | 91 | 1 | Exit only | 1 | 93 |
| | RFC | 1.11 | 0.38 | Exit only | 0.45 | 1.19 |
| 2034 Background Growth | Queue | 168 | 1 | Exit only | 1 | 166 |
| | RFC | 1.22 | 0.42 | Exit only | 0.49 | 1.36 |
| 2034 Final Growth Scenario No Mitigation | Queue | 159 | 1 | Exit only | 1 | 392 |
| | RFC | 1.20 | 0.42 | Exit only | 0.53 | 1.71 |
| 2034 Final Growth Scenario With Mitigation | Queue | 170 | 39 | Exit only | 7 | 27 |
| | DoS | 1.21 | 1.17 | Exit only | 0.61 | 1.03 |

8.4.18 The current junction layout (standard roundabout) already significantly exceeds capacity on the A13 off-slip (Arm E) in both peak periods, and exceeds capacity on the A176 Nether Mayne (arm A) in the existing PM peak. These arms further deteriorate with the addition of the background and development traffic (while all other arms continue to operate within capacity).

8.4.19 The proposed mitigation layout models the junction as a signalised roundabout, testing peak signal timings on the A176 Upper Mayne (arm D) and the A13 exit (Arm E), both linked to the southern roundabout.

8.4.20 While the mitigation scheme does not necessarily remove all the capacity issues, it is expected to at least return the junction to a similar level of performance as the existing situation, while delivering significant betterment over the existing layout in both the 2034 Background and unmitigated Final Growth Scenarios.

### Billericay Area

8.4.21 The modelling results of the mitigation package demonstrate that a number of capacity benefits will be delivered in the Billericay area. In particular, the combination of the Laindon Road two-way scheme, local junction improvements and the reassignment of traffic to the Western Link Road (WLR) will have capacity benefits for the 2034 Final Growth Scenario at:

- (Bi2) B1007 Stock Road / Radford Way
- (Bi4) B1007 Stock Road / Norsey Road / High Street / Western Road
- (Bi5) A129 London Road / High Street / Sun Street
- (Bi7) A129 London Road / Tye Common Road / Western Road
- (Bi9) A176 / Kennel Lane / Laindon Road
- (Bi13) A129 Southend Rd / Hickstars Lane

8.4.22 The residual impacts identified at specific locations on the network are discussed below. Table 8-9 summarises the overall junction modelling results for the Billericay area with mitigation.

**Table 8-9: Junction Model Results – Billericay**

| Junction ID | Junction Location | Modelled Junction Type | AM | PM |
|---|---|---|---|---|
| **Billericay** | | | | |
| Bi1 | B1007 Stock Road / Queens Park Avenue / Potash Road | Standard rbt | 0.88 | 1.23 |
| Bi2 | B1007 Stock Road / Radford Way | Mini rbt | 0.69 | 1.02 |
| Bi3 | Mountnessing Road / Perry Street / Radford Way | Standard rbt | 0.92 | 1.10 |
| Bi4 | B1007 High Street / Norsey Road / Western Road | Signal (4 arm) | 0.60 | 0.84 |
| Bi5 | A129 London Road / High Street / Sun Street | Signal (4 arm) | 0.81 | 0.85 |
| Bi6 | A129 Sun Street / Chapel Street | Standard rbt | 0.98 | 1.13 |
| Bi7 | A129 London Road / Tye Common Road / Western Road | Signal (4 arm) | 0.51 | 0.54 |
| Bi8 | A129 Southend Road / A176 | Standard rbt | 0.52 | 1.17 |
| Bi9 | A176 / Kennel Lane / Laindon Road | Standard rbt | 0.73 | 0.68 |
| Bi10 | A129 London Road / Mountnessing Road | Priority (3 arm) | 2.36 | 0.54 |
| Bi12 | A129 Southend Rd / Outwood Common Road | Signal (4 arm) | 0.82 | 0.78 |
| Bi13 | A129 Southend Rd / Hickstars Lane | Signal (3 arm) | 0.87 | 0.62 |

8.4.23 Table 8-9 shows that within Billericay: 3 junctions are operating significantly over capacity (showing a 'red' result) and 3 are operating marginally over capacity (showing an 'amber' result) as a 'worst-case' in either peak period with mitigation.

8.4.24 It should be noted that the majority of impacts in Billericay, both positive and negative, are due to the reassignment of WLR traffic. As previously stated, the full reassignment modelled may not be fully realised with some trips continuing to use existing route options subject to available capacity. Notwithstanding this, the 4 junctions shown to be operating significantly over capacity, even with the introduction of mitigation, are Bi1, Bi8 and Bi10. These are discussed in more detail below with reference to the junction modelling results for all scenarios tested:

- 2014 Existing
- 2034 Background Growth scenario
- 2034 Final Growth scenario 'no mitigation'
- 2034 Final Growth scenario 'with mitigation'

8.4.25 Results are provided by arm for RFCs / DoS and queue lengths measured in PCUs.

**(Bi1) – B1007 Stock Road / Queens Park Avenue / Potash Road**

- Arm A - B1007 Stock Road North
- Arm B - Potash Road
- Arm C - B1007 Stock Road South

- Arm D - Queens Park Avenue

**Table 8-10: Bi1 Detailed Junction Results**

| Scenario | Results | A | B | C | D |
|---|---|---|---|---|---|
| **AM** | | | | | |
| 2014 Base | Queue | 2 | 5 | 1 | 1 |
| | RFC | 0.71 | 0.83 | 0.43 | 0.44 |
| 2034 Background Growth | Queue | 4 | 13 | 1 | 1 |
| | RFC | 0.78 | 0.97 | 0.49 | 0.5 |
| 2034 Final Growth Scenario No Mitigation | Queue | 4 | 47 | 1 | 1 |
| | RFC | 0.81 | 1.11 | 0.51 | 0.52 |
| 2034 Final Growth Scenario With Mitigation | Queue | 3 | 7 | 1 | 1 |
| | RFC | 0.70 | 0.88 | 0.47 | 0.46 |
| **PM** | | | | | |
| 2014 Base | Queue | 6 | 5 | 1 | 1 |
| | RFC | 0.87 | 0.84 | 0.52 | 0.37 |
| 2034 Background Growth | Queue | 17 | 11 | 1 | 1 |
| | RFC | 0.99 | 0.95 | 0.58 | 0.42 |
| 2034 Final Growth Scenario No Mitigation | Queue | 61 | 10 | 2 | 1 |
| | RFC | 1.14 | 0.92 | 0.58 | 0.47 |
| 2034 Final Growth Scenario With Mitigation | Queue | 80 | 5 | 1 | 3 |
| | RFC | 1.23 | 0.82 | 0.56 | 0.70 |

8.4.26 The preferred highway mitigation package does not include any specific changes at this site. The junction is located on the periphery of the model study area and the changes between the 'with' and 'no' mitigation scenarios are the result of minor changes in traffic flows brought about by the overall reassignment of traffic in Billericay due to new infrastructure including the WLR.

8.4.27 The results show that 'with' mitigation the AM peak is likely to improve performance on all approaches, achieving nil-detriment over the existing situation. In the PM arms B-D are also shown to improve with Arm A increasing from 'over capacity' to 'significantly over capacity'. As previously stated, the reassignment methodology assumes a maximum number of vehicle trips will reassign to new routes and it does not fully account for overall network capacity. The changes identified at this junction are deemed marginal and would not necessarily occur if the full level of traffic reassignment was not realised. However, it is recommended that junction performance is reviewed throughout the plan period and improvement options explored where necessary.

**(Bi8) – A129 Southend Road / A176**

- Arm A - A129 Southend Road North
- Arm B - A129 Southend Road East
- Arm C - A176 (south)

**Table 8-11: Bi8 Detailed Junction Results**

| Scenario | Results | A | B | C |
|---|---|---|---|---|
| **AM** | | | | |
| 2014 Base | Queue | 1 | 1 | 3 |
| | RFC | 0.41 | 0.53 | 0.75 |
| 2034 Background Growth | Queue | 1 | 2 | 5 |
| | RFC | 0.44 | 0.60 | 0.84 |
| 2034 Final Growth Scenario No Mitigation | Queue | 1 | 2 | 13 |
| | RFC | 0.45 | 0.69 | 0.95 |
| 2034 Final Growth Scenario With Mitigation | Queue | 1 | 1 | 1 |
| | RFC | 0.52 | 0.50 | 0.37 |
| **PM** | | | | |
| 2014 Base | Queue | 3 | 2 | 21 |
| | RFC | 0.74 | 0.65 | 1.00 |
| 2034 Background Growth | Queue | 4 | 4 | 58 |
| | RFC | 0.80 | 0.80 | 1.11 |
| 2034 Final Growth Scenario No Mitigation | Queue | 5 | 5 | 67 |
| | RFC | 0.82 | 0.85 | 1.13 |
| 2034 Final Growth Scenario With Mitigation | Queue | 124 | 26 | 6 |
| | RFC | 1.17 | 1.12 | 0.85 |

8.4.28 As with junction Bi1, the preferred highway mitigation package does not include any specific changes at this site. The changes between the 'with' and 'no' mitigation scenarios are largely the result of changes in traffic flows brought about by the overall reassignment of traffic in Billericay due to the WLR.

8.4.29 The results show that 'with' mitigation, the AM peak is likely to improve performance on all approaches, achieving nil-detriment over the existing situation. In the PM, the southern A176 approach on Arm C is shown to improve, with the A129 arms (A and B) shown to increase to 'significantly over capacity' and 'over capacity' respectively. The reassignment of flows has therefore resulted in minor changes to the distribution of delay at the junction.

8.4.30 The full reassignment of the WLR could potentially attract an additional 300 vehicles to the junction in the PM. While the methodology shows some beneficial, as well as negative, impacts the eventual reassignment of traffic is expected to balance out using available capacity on both existing and new routes through the town. However, it is recommended that junction performance is reviewed throughout the plan period and further improvement options explored where necessary.

**(Bi10) – A129 London Road / Mountnessing Road**

- Arm A - A129 London Road West
- Arm B - Mountnessing Road
- Arm C - A129 London Road East

**Table 8-12: Bi10 Detailed Junction Results**

| Scenario | Results | B-C | B-A | C-B |
|---|---|---|---|---|
| **AM** | | | | |
| 2014 Base | Queue | 2 | 2 | 2 |
| | RFC | 0.70 | 0.67 | 0.70 |
| 2034 Background Growth | Queue | 5 | 5 | 3 |
| | RFC | 0.86 | 0.89 | 0.79 |
| 2034 Final Growth Scenario No Mitigation | Queue | 20 | 56 | 6 |
| | RFC | 1.03 | 1.67 | 0.89 |
| 2034 Final Growth Scenario With Mitigation | Queue | 0 | 494 | 1 |
| | RFC | 0.03 | 2.36 | 0.48 |
| **PM** | | | | |
| 2014 Base | Queue | 1 | 1 | 15 |
| | RFC | 0.47 | 0.46 | 1.00 |
| 2034 Background Growth | Queue | 1 | 3 | 39 |
| | RFC | 0.59 | 0.77 | 1.14 |
| 2034 Final Growth Scenario No Mitigation | Queue | 4 | 64 | 109 |
| | RFC | 0.82 | X | 1.47 |
| 2034 Final Growth Scenario With Mitigation | Queue | 0 | 1 | 1 |
| | RFC | 0.16 | 0.54 | 0.40 |

8.4.31 The mitigation package does not include a specific change to this junction and any changes of impact in the 'with' mitigation scenario are due to the introduction of the WLR. The results show that the reassignment of traffic will generally bring about significant improvements at this junction with an overall reduction of traffic.

8.4.32 The PM peak 'with' mitigation test shows an improved level of performance over the existing situation. However, in the AM, an increase of approximately 200 right turners, reassigning from Mountnessing Road towards the WLR, would impact on the minor arm performance.

8.4.33 As stated previously, the eventual reassignment of traffic is expected to balance out using available capacity on both existing and new routes through the town. However, it is recommended that junction performance is reviewed throughout the plan period and further improvement options explored where necessary.

### Wickford Area

8.4.34 The modelling results of the mitigation package demonstrate that a number of capacity benefits will be delivered in the Wickford area. In particular, the combination of local junction improvements and the reassignment of traffic to the Pound Lane Phase 1 Tresco Way / Cranfield Park Road Link will have capacity benefits for the 2034 Final Growth Scenario at:

- (W1) A132 Runwell Road / A132 / Runwell Road
- (W3) A132 Runwell Road / Church End Lane
- (W4) A129 London Road / Nevendon Road / High Street
- (W5) A132 / Cranfield Park Road / Nevendon Road

8.4.35 The residual impacts identified at specific locations on the network are discussed below. Table 8-13 summarises the overall junction modelling results

for the Wickford area with mitigation. The results show that within Wickford, 1 junction is operating significantly over capacity (showing a 'red' result), 2 are operating marginally over capacity (showing an 'amber' result), 1 junction is operating at or nearing over capacity (showing a 'yellow' result), and 1 is operating under capacity (showing a 'green' result), as a 'worst-case' in either peak period with mitigation. Junction W2 continuing to operate significantly over capacity with mitigation is discussed in further detail below.

**Table 8-13: Junction Model Results – Wickford**

| Junction ID | Junction Location | Modelled Junction Type | AM | PM |
|---|---|---|---|---|
| **Wickford** | | | | |
| W1 | A132 Runwell Road / A132 / Runwell Road | Standard rbt | 1.12 | 0.74 |
| W2 | A132 Golden Jubilee Way / Radwinter Avenue / A129 London Road | Standard rbt | 1.04 | 1.16 |
| W3 | A132 Runwell Road / Church End Lane | Priority (3-arm) | 1.06 | 1.13 |
| W4 | A129 London Road / Nevendon Road / High Street | Signal (4-arm) | 0.92 | 0.75 |
| W5 | A132 / Cranfield Park Road / Nevendon Road | Standard rbt | 0.41 | 0.34 |

**W2 A132 Golden Jubilee Way / Radwinter Avenue / A129 London Road:**

- Arm A - A132 Golden Jubilee Way North
- Arm B - Radwinter Avenue
- Arm C - A132 Golden Jubilee Way South
- Arm D - A129 London Rd
- Arm E - The Co-operative Food Access Road

**Table 8-14: W2 Detailed Junction Results**

| Scenario | Results | A | B | C | D | E |
|---|---|---|---|---|---|---|
| **AM** | | | | | | |
| 2014 Base | Queue | 4 | 2 | 3 | 1 | 0 |
| | RFC | 0.81 | 0.64 | 0.75 | 0.45 | 0.09 |
| 2034 Background Growth | Queue | 9 | 3 | 13 | 2 | 0 |
| | RFC | 0.91 | 0.75 | 0.96 | 0.61 | 0.11 |
| 2034 Final Growth Scenario No Mitigation | Queue | 50 | 15 | 11 | 2 | 0 |
| | RFC | 1.02 | 0.98 | 0.94 | 0.65 | 0.12 |
| 2034 Final Growth Scenario With Mitigation | Queue | 2 | 2 | 30 | 3 | 0 |
| | RFC | 0.62 | 0.68 | 1.04 | 0.70 | 0.11 |
| **PM** | | | | | | |
| 2014 Base | Queue | 4 | 1 | 5 | 2 | 1 |
| | RFC | 0.82 | 0.42 | 0.85 | 0.61 | 0.5 |
| 2034 Background Growth | Queue | 10 | 1 | 23 | 3 | 2 |
| | RFC | 0.92 | 0.54 | 1.00 | 0.72 | 0.62 |
| 2034 Final Growth Scenario No Mitigation | Queue | 120 | 2 | 28 | 13 | 4 |
| | RFC | 1.11 | 0.60 | 1.01 | 0.95 | 0.79 |
| 2034 Final Growth Scenario With Mitigation | Queue | 2.3 | 4.0 | 83.2 | 6.1 | 1.8 |
| | RFC | 0.68 | 0.79 | 1.16 | 0.86 | 0.63 |

8.4.36 This junction is modelled as a standard roundabout for all scenarios, with the approach widened on the A132 Golden Jubilee Way North (arm A) as part of the mitigation. This comprises widening the existing two-lane approach, to provide a third left turn only lane, with the central island area reduced to provide straighter alignment across the junction from this arm.

8.4.37 Overall, with the exception of Arm C, the proposed scheme would improve on the junction performance recorded in the 2034 Background and Final Growth Scenarios and generally shows nil-detriment over the existing situation.

8.4.38 Only the PM peak is operating significantly over capacity with mitigation, on the A132 Golden Jubilee Way South (arm C). This increase illustrates no significant concerns however, showing a similar level of performance in previous scenarios, with arm C already operating at theoretical capacity in the 2034 Background Growth Scenario. In addition, all other arms show an increase in capacity with mitigation, with a noticeable improvement on Arm A as a result of the third left turn only lane from the proposed widening on approach.

8.4.39 It should be noted that a separate Wickford Town Centre Masterplan study is to be commissioned, which will explore potential options for restricting vehicle access to the adjacent High Street. This study will include further modelling to assess the localised and wider impacts of traffic reassignment. It is anticipated that current mitigation proposed at Junction W4 will be superseded and enhanced by the outcomes of this Masterplan study.

## 8.5 Assessment of Wider Highway Schemes

8.5.1 As agreed with ECC and BBC, further analysis was also undertaken for junctions located on the wider strategic network for information purposes and to consider potential upgrades in and around the Borough and study area.

The following junctions (see Figure 4-2 and Figure 7-1) are included:

- A127 Fortune of War roundabout (existing layout only)
- A13 Sadlers Farm roundabout (existing layout only)
- Rettendon Turnpike roundabout (existing layout and proposed scheme)
- A127 / A130 Fairglen Interchange Short-Term Scheme (existing layout and proposed short-term scheme) *

*It should be noted that the A127 / A130 Fairglen Interchange Scheme is currently subject to a much wider modelling exercise to support the consultation and a business case. This separate assessment will use the updated Lower Thames Area Model (LTAM) model, when available in late 2018, to test the Lower Thames Crossing impacts as well as localised impacts from BBC development growth. The LTAM model uses a more detailed dynamic assignment model, which accounts for the reassignment of traffic to available capacity both on the network as well as to the adjoining peak 'shoulder periods' i.e. peak spreading.

This separate modelling adds additional layers of assessment, over and above the outputs of the modelling used to assess the Publication Local Plan, and will potentially arrive at different results, resulting in potential further changes to the scheme. Any

results provided in this 'Part 2' study are for information purposes **only** and are subject to further testing in the LTAM model by ECC and Highways England.

### Existing Layouts

8.5.2 The existing junction layouts have been tested with the current and forecast 2034 Background Growth and Final Growth scenarios. The results are shown in Table 8-15 and Table 8-16.

**Table 8-15: Wider Schemes Modelling Results AM**

| Junction ID | Junction Location | Existing Junction Type | Performance Summary AM | | |
|---|---|---|---|---|---|
| | | | 2014 Base | 2034 Background Growth | 2034 Final Growth Scenario No Mitigation |
| **Basildon** | | | | | |
| Ba30 | Sadlers Farm A130 / A13 / London Road | Signal rbt | 0.91 | 1.00 | 1.11 |
| Ba31 (a) | Fortune of War (North) A127 / High Road North | Standard rbt | 0.18 | 0.20 | 0.22 |
| Ba31 (b) | Fortune of War (South) A127 / High Road | Standard rbt | 0.54 | 0.61 | 1.16 |
| Ba32 | Fairglen Interchange A127 / A1245 | Signal rbt | 0.91 | 1.02 | 1.13 |
| **Wickford** | | | | | |
| W6 | Rettendon Turnpike A1245 / A132 | Standard rbt | 0.75 | 0.82 | 0.86 |

**Table 8-16: Wider Schemes Modelling Results PM**

| Junction ID | Junction Location | Existing Junction Type | Performance Summary PM | | |
|---|---|---|---|---|---|
| | | | 2014 Base | 2034 Background Growth | 2034 Final Growth Scenario No Mitigation |
| **Basildon** | | | | | |
| Ba30 | Sadlers Farm A130 / A13 / London Road | Signal rbt | 1.12 | 1.09 | 1.17 |
| Ba31 (a) | Fortune of War (North) A127 / High Road North | Standard rbt | 0.24 | 0.29 | 0.40 |
| Ba31 (b) | Fortune of War (South) A127 / High Road | Standard rbt | 0.47 | 0.52 | 0.71 |
| Ba32 | Fairglen Interchange A127 / A1245 | Signal rbt | 0.92 | 1.01 | 1.24 |
| **Wickford** | | | | | |
| W6 | Rettendon Turnpike A1245 / A132 | Standard rbt | 1.12 | 1.79 | 2.29 |

8.5.3 The results show that, within the 2014 base scenario, Fortune of War and Fairglen operate at or within capacity (≤1.00 V/C). However, Rettendon Turnpike and Sadlers Farm both exceed capacity in the PM peak. In the forecast Background and Final Growth Scenarios, Fairglen will also exceed capacity in both the AM and PM periods and Fortune of War (south) will exceed capacity in the AM.

### Proposed Layouts

8.5.4 Sadlers Farm and Fortune of War are currently subject to separate ongoing wider studies to identify potential solutions at these locations. While an improvement scheme has yet to be finalised, any new layout will be tested and designed, where possible, to accommodate the Publication Local Plan growth.

8.5.5 The A127 / A130 Fairglen Interchange Short-Term Scheme is located on the district and borough boundaries of Basildon, Rochford and Castle Point and is subject to DfT approval of a Full Business Case proposed in 2020. The

Rettendon Turnpike scheme is located within neighbouring Chelmsford City Council and is not currently committed. The proposed layouts have been tested with 2034 Final Growth scenario 'with mitigation' flows i.e. including the impact of new link roads and junction improvements on traffic reassignment. Table 8-17 provides a summary of the 'worst-case' impacts recorded at the junctions in the peak hours.

**Table 8-17: Junction Model Results – Wider Schemes**

| Junction ID | Junction Location | Modelled Junction Type | AM | PM |
|---|---|---|---|---|
| **Additional Junction Models** | | | | |
| Ba32 | Fairglen Interchange A127 / A1245 | Signal rbt | 1.85 | 1.57 |
| W6 | Rettendon Turnpike A1245 / A132 | Standard rbt | 0.73 | 0.76 |

8.5.6 The Rettendon Turnpike scheme is expected to accommodate 2034 Final Growth scenario traffic. However, the A127 / A130 Fairglen Interchange Short-Term Scheme is expected to exceed capacity with the full forecast traffic growth and a more detailed review has been provided below to explore the potential impacts. It should be noted, that the short-term scheme is only expected to address capacity issues over the next 15-20 years and that an eventual long-term scheme would be required thereafter, subject to the actual level of traffic growth realised.

**(Ba32) – Fairglen Interchange 'with' and 'without' proposed scheme**

- **Existing Layout:**
  - Arm A - A1245 North
  - Arm B - A127 East
  - Arm C - A1245 South
  - Arm D - A127 West
- **Proposed A127 / A130 Fairglen Interchange Scheme Layout**
  - Arm A - A1245 North
  - Arm B - A127 East
  - Arm C - A130 South
  - Arm D - A130 West
  - Arm E - A127 West
  - Arm F - A130 Slip Road

**Table 8-18: Ba32 Detailed Junction Results**

| Scenario | Results | A1245 N | A127 E | A1245 S | A127 W | A130 S | A130 W | A130 Slip |
|---|---|---|---|---|---|---|---|---|
| **AM** | | | | | | | | |
| 2014 Base Existing Layout | Queue | 12 | 16 | 13 | 4 | | | |
| | Dos | 0.91 | 0.85 | 0.91 | 0.35 | | | |
| 2034 Background Growth Existing Layout | Queue | 44 | 26 | 66 | 5 | | | |
| | Dos | 1.02 | 0.90 | 1.02 | 0.35 | | | |
| 2034 Final Growth Scenario Existing Layout | Queue | 62 | 28 | 101 | 6 | | | |
| | Dos | 1.13 | 0.91 | 1.13 | 0.39 | | | |
| 2034 Final Growth Scenario With Scheme | Queue | 130 | 15 | | 18 | 14 | 8 | 276 |
| | Dos | 1.26 | 0.96 | | 0.94 | 0.95 | 0.72 | 1.80 |
| **PM** | | | | | | | | |
| 2014 Base Existing Layout | Queue | 5 | 17 | 15 | 15 | | | |
| | Dos | 0.74 | 0.84 | 0.92 | 0.89 | | | |
| 2034 Background Growth Existing Layout | Queue | 8 | 21 | 61 | 24 | | | |
| | Dos | 0.88 | 0.81 | 1.01 | 0.95 | | | |
| 2034 Final Growth Scenario Existing Layout | Queue | 0 | 128 | 153 | 31 | | | |
| | Dos | 0.43 | 1.24 | 1.24 | 0.98 | | | |
| 2034 Final Growth Scenario With Scheme | Queue | 97 | 57 | | 480 | 505 | 19 | 21 |
| | Dos | 1.24 | 1.19 | | 1.53 | 1.57 | 0.99 | 0.99 |

8.5.7 The current junction layout (signalised roundabout), operates within capacity in the 2014 Base Scenario, exceeding capacity with the addition of the background growth traffic on the A1245 in both the AM and PM peak. The junction performance continues to worsen with the addition of the final growth traffic, falling significantly over capacity on the A1245 South in the PM peak.

8.5.8 The proposed short-term scheme layout models the junction as a signalised roundabout, linked with the Rayleigh Spur to the south, accommodating substantial improvements across the two junctions, with a number of additional lanes and approaches, as well as the inclusion of the new A130 link road.

8.5.9 Wider consideration of the reassignment of traffic, resulting from the A127 / A130 Fairglen Interchange Short-Term Scheme as well as other schemes, including the Pound Lane Phase 1 improvements, could attract an additional 3,200 vehicle movements and the PM will attract an additional 2,850 additional movements at the junctions included in the scheme. This initial assessment of the short-term scheme shows that delay in the AM is redistributed to the A1245 north and A130 Slip approaches. In the PM, the junction is shown to continue operating over capacity on a number of approaches.

8.5.10 The reassignment of traffic tested relies on the maximum volume of traffic that could be attracted to a particular route given the overall package of interventions on the network. It is realistic to assume that a proportion of this traffic would continue to use existing route options and not reassign to the extent shown in this assessment.

8.5.11 Furthermore, and as previously stated, the short-term scheme is still subject to more detailed modelling once the Highways England Lower Thames Area Model (LTAM) is available for use later in 2018 and the results presented are for information purposes only. This process, as well as ongoing monitoring,

will determine the potential need for any long-term scheme, subject to eventual development delivery and associated traffic growth.

## 8.6 Mitigation Phasing

8.6.1 The Planning Practice Guidance in relation to transport evidence bases in plan making, recognises the need to address the transport impact of land allocations and the phasing of mitigation needed to address these impacts.

8.6.2 The Infrastructure Delivery Plan (IDP) forms a vital component of the Local Plan and includes the package of schemes, set out in this 'Part 2' study, to mitigate the transport impact. However, the IDP is recognised as a 'living document' and would evolve as new or updated evidence is made available. As such, the modelling of interim assessment years is not considered appropriate on this basis, with the level of assessment expected to be proportional to the strategic nature of the Local Plan document.

8.6.3 The phasing of mitigation will ultimately be dependent on the eventual detail, scale and delivery rates of development across the plan period and the availability of funding through developer contributions, as well as central and local government funding opportunities.

8.6.4 At this stage, only a high-level phasing plan for the various schemes in this report can be presented. In the first instance this has been guided by the most recent anticipated Final Growth Scenario housing trajectory provided by BBC. Table 8-19 provides a summary, excluding Windfall and Green Belt Infill[9], of the projected housing trajectory for each of the principal settlements up to and beyond the plan period using the following horizon periods:

- Short term – up to 2022
- Medium term – 2022-2027
- Long term - 2027-2034
- Beyond Plan Period – >2034

**Table 8-19: Final Growth Scenario Housing Units Trajectory (Excl. Windfall/GB Infill)**

| Settlement | Expected Yield | Short | Medium | Long | Beyond Plan Period |
|---|---|---|---|---|---|
| Basildon | 10,048 | 3553 | 1731 | 3,350 | 1,414 |
| Billericay | 3,260 | 194 | 546 | 1,256 | 1,264 |
| Wickford | 3,728 | 1024 | 619 | 1,582 | 503 |
| **Total** | **17,036** | **4,771** | **2,896** | **6,188** | **3,181** |
| | **Delivery Rate** | **28%** | **17%** | **36%** | **19%** |

[9] Excludes Windfall and Green Belt Infill where locations are unknown at this stage

8.6.5 The latest trajectory anticipates that approximately 28% of housing will be delivered in the shorter term over the next 5 years. However, it should be noted that 3,600 of these units are either completions, between 2014-17, or sites with extant permission at multiple locations in each settlement. Only 1,171 new units will therefore be delivered in the next 5 years. A further 2,896 units are forecasted for delivery by 2027.

8.6.6 The majority (69%) of completions and new housing delivery in the next 10 years is proposed in the Basildon urban area, including 485 units associated with Basildon town centre regeneration. Up to 1,650 units are also expected to come forward in and around Wickford. In the short-medium term, the phasing of mitigation will need to address local congestion pinch-points, including those identified in this 'Part 2' study, in and around the Basildon and Wickford urban areas. This would include the eventual Masterplan schemes for Basildon and Wickford as part of the respective town centre regeneration proposals.

8.6.7 The trajectory forecasts that the majority of housing (55%) will be delivered either in the latter stages or beyond the end of the plan period. This will include the larger strategic sites and associated infrastructure at H18-South West Billericay, H12-East of Basildon and H14-Land South of Wickford. It is recommended in the medium-long term that local congestion pinch-points, within Billericay, are addressed as well as any residual impacts in the Basildon and Wickford urban areas. Any development coming forward at West Basildon Urban extension would also need to provide a new access road.

8.6.8 In the longer term, the major enabling infrastructure proposals associated with H18-South West Billericay, H12-East of Basildon and H14-Land South of Wickford will also need to come forward. Table 8-20 provides a high level indication of the likely phasing of mitigation over the plan period and beyond.

**Table 8-20: High Level Mitigation Phasing Plan**

| Mitigation Schemes | Short | Medium | Long | Beyond Plan Period |
|---|---|---|---|---|
| **Local Schemes** | | | | |
| Basildon Junctions | | | | |
| Wickford Junctions | | | | |
| Billericay Junctions | | | | |
| West Basildon Access | | | | |
| **Major Infrastructure** | | | | |
| Basildon/Wickford TC Masterplans | | | | |
| South of Wickford / East of Basildon | | | | |
| SW Billericay WLR | | | | |

8.6.9 It is acknowledged that the housing trajectory is only a guide and could realistically change over the Plan period. There could be scope for some

development to come forward earlier in different parts of the Borough either in advance of, or with limited need for, substantial mitigation.

8.6.10 The outcomes of this assessment do show that some areas of the highway network to the west of Basildon town centre, and across the towns of Wickford and Billericay, may have some spare capacity. Junction modelling results show that there are a number of junctions still operating within capacity (≤1.00 RFC / DoS) or marginally exceeding theoretical capacity, yet assumed possible to mitigate through further sustainable modal shift (1.00-1.15 RFC / DoS), within the '2034 Final Growth Scenario No Mitigation' scenario.

8.6.11 Modelling results for both peak periods illustrate junctions to be operating within capacity across the centre of Billericay (situated along the A129 to the south east and Mountnessing Road to the north west) and to the west of Basildon town centre (situated along the A176 and the B148 towards the north to the A127). Additionally, alternative junctions located across the centre of Billericay (situated along the B1007 to the north and south, and the A176 and Laindon Road to the south) and across the south of Wickford (situated along the A129 to the west and A132 to the south) are shown to be operating marginally over capacity, but with the potential to be mitigated through limited or sustainable transport mitigation options.

8.6.12 These pockets of available highway capacity do present opportunities to explore the delivery of some smaller developments, or early phases of larger developments, in advance of significant mitigation coming forward. However, given the proposed mitigation is considered as an overarching package and that a number of local junction improvements will likely be required in the short term, any development coming forward would need to present a robust case through the planning process where little or no mitigation is proposed.

8.6.13 It should be reiterated that, and in the first instance, mitigation should be maximised through sustainable modal shift and changes in travel behaviour prior to the delivery of physical infrastructure. Where new infrastructure is required, the improvements set out in this 'Part 2' study provide a starting point, and any development coming forward would need to provide a strategy that was appropriate in scale to deliver improvements across the network, which may include additional schemes over and above those set out in this study.

## 8.7 Peak Spreading

8.7.1 Modelling for this study has focussed on the peak hours when, by definition, the junctions are likely to be the most congested. Increasing congestion in the peak hour is likely to result in a number of different responses in travel behaviour from the people making those trips. Taking an alternative route is considered the first response and, where possible, this has been considered

as part of the reassignment modelling and sensitivity testing. The next most likely response is to change the time of travel by a small amount, also known as peak hour spreading. The extent to which this is likely to take place is difficult to quantify, however, the fact that it will take place is important as this is likely to reduce the impact of the traffic growth in the future from the modelling results reported.

8.7.2 The Design Manual for Roads and Bridges (DMRB) outlines that 'peak spreading' refers to 'a reduction in the proportion of traffic in the most congested part of the peak period, with corresponding increases immediately before and after the height of the peak'[10] across the preceding and / or subsequent hour i.e. demand would redistribute to available capacity across the weekday 0700-1000 and 1600-1900 3-hour periods rather than continuing during the traditional peak hour.

8.7.3 There are two categories of peak spreading, which are not always distinguishable:

- 'Passive' peak spreading - is when a vehicle journey extends beyond the peak due to increased delays; and
- 'Active' peak spreading is when people start their journeys earlier or later to avoid the worst traffic conditions.

8.7.4 In both instances, the potential for passive or active 'peak spreading' has not been captured within the modelling methodology, which reiterates that a robust 'worst-case' has been tested.

8.7.5 Furthermore, it is understood that Highways England are assessing the potential for 'peak spreading' in their latest modelling for the Lower Thames Crossing in their LTAM model.

8.7.6 The results demonstrate that there will be residual impacts across the Borough network even with the introduction of the preferred mitigation package. While 'peak spreading' should not be considered as a mitigation measure, it is reasonable to assume that an element of 'peak spreading' will occur and network capacity will be utilised more efficiently across the 3-hour peak period than shown in the modelling results.

## 8.8 Summary

8.8.1 The proposed mitigation package tested with the Final Growth Scenario is considered an initial set of interventions required to ideally mitigate the network back to the current level of observed performance or, at the very

[10] DMRB Volume 12, Section 2 Appendix F – The Application of Peak Spreading, http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol12/section2/12s2p1.pdf

least, provide betterment over the modelled level of performance under the 'Do-Minimum' situation in the 2034 Background Growth scenario.

8.8.2 The assessment is generally considered a robust 'worst-case' for Local Plan testing. Additional sensitivity testing has been undertaken to address the limitations of the model and better understand the impact of key infrastructure requirements.

8.8.3 Overall, the results illustrate, at a strategic level, that the Publication Local Plan Growth scenario can be mitigated to a similar level of network performance as the existing situation at a number of locations across the network. Where this is not achieved, traffic growth can at least be mitigated back to a similar level to the 2034 Background Growth ('Do-Minimum') Scenario, where no Local Plan growth or transport improvements are delivered.

8.8.4 In some instances, the mitigation package does not wholly address the anticipated traffic growth and where there are residual impacts, further consideration is needed of the potential for:

- Further more ambitious sustainable improvements and modal shift;
- Intelligent Transport Systems e.g. MOVA; and
- 'Peak Spreading'.

8.8.5 All of which have not been tested but could realistically reduce the highway impact of the Local Plan. Notwithstanding this further potential, Transport Assessments will still be required for sites as they come forward in order to establish the specific impacts of the individual sites and to ensure that they are appropriately mitigated. Individual developers would be expected to consider this package as minimum and, where appropriate, identify potential for further improvements.

# 9 Sustainable Transport Infrastructure Appraisal

## 9.1 Introduction

9.1.1 The Basildon Draft Local Plan (January 2016) identifies a number of strategic polices which, amongst other things, seek out to ensure the delivery of an enhanced and integrated transport network, facilitating improvements to footpaths, footways and cycling infrastructure, as well as public transport infrastructure and services.

9.1.2 The guidance note titled '*Transport evidence bases in plan making and decision making – October 2014*', published under the Department for Communities and Local Government's National Planning Policy Framework (NPPF), outlines the sustainable approach recommended to inform a transport assessment of a Local Plan. This includes consideration of "*The locations of proposed land allocations and areas/corridors of development and potential options for the provision of sustainable transport and transport networks to serve them".*

9.1.3 On this basis and in addition to the potential highway mitigation schemes / interventions detailed in the previous section, a desktop qualitative appraisal review of sustainable transport infrastructure has also been undertaken to help accommodate the growth in person trips projected in the Borough by 2034. This qualitative assessment focused on the consideration of sustainable infrastructure targeted at particular areas of the Borough based on the location and relative size of Local Plan development sites. It has also involved co-ordination with work currently being undertaken to develop the Basildon Cycling Action Plan in order to identify possible cycle infrastructure improvements as part of the Essex County Cycling Strategy.

9.1.4 The objective of this appraisal is to highlight key corridors where future demand for sustainable transport is likely to exist, and therefore where measures may be required to facilitate a mode shift away from private motor vehicles, in order to help focus the efforts of the strategic policies relating to sustainable transport provision set out in the Publication Local Plan.

## 9.2 Bus Network

### Identification of existing infrastructure

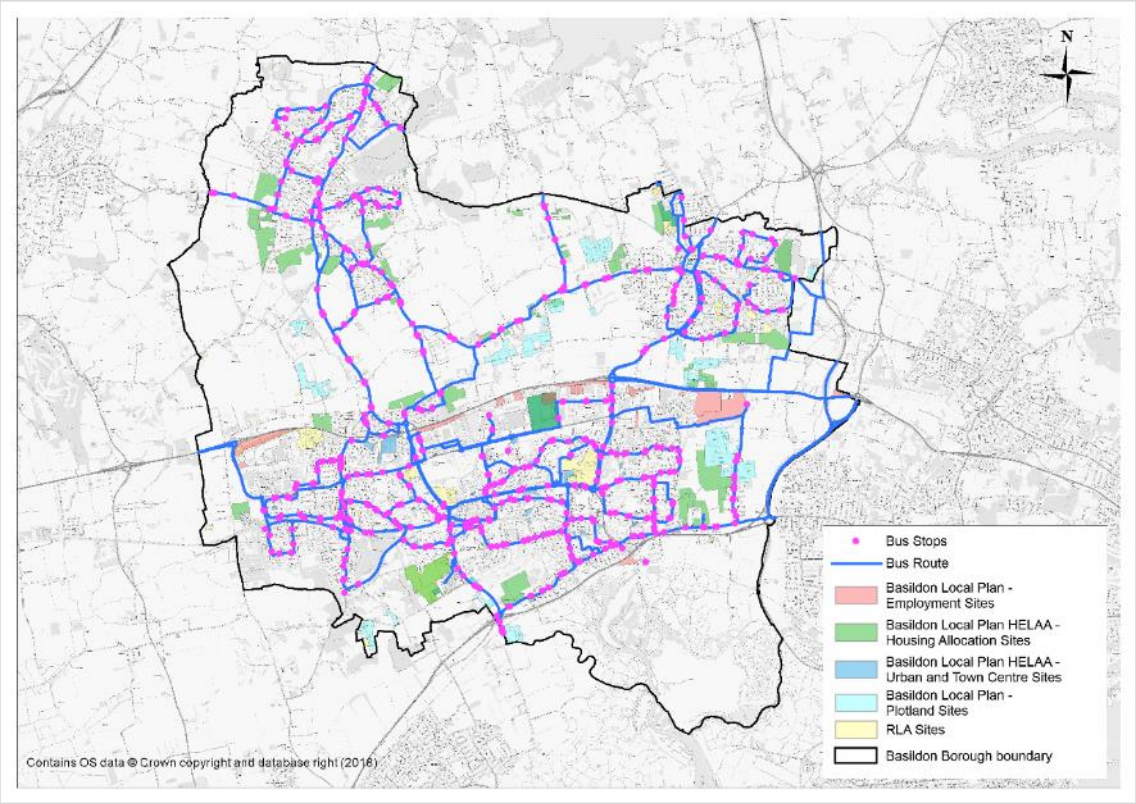
9.2.1 An overview of the existing bus provision in the Borough, including bus routes, stops and frequencies, has been undertaken in order to identify possible gaps in future service provision. The consideration of 'gaps' may range between areas that have no bus services at all, infrequent bus services, or bus services with insufficient or inadequately located bus stops. In order to set the context,

Figure 9-1 has been prepared to show the provision of existing bus infrastructure and services in the context of the Publication Local Plan growth scenario.

9.2.2 The mapping of existing bus routes against the location of planned future growth as shown in Figure 9-1 allows for an appraisal of locations where extending or diverting bus routes, increasing the capacity of existing bus services and/or the provision of new bus services to developments (specifically those that are large enough for a new service to be economically viable) and the promotion of existing bus services might be necessary.

9.2.3 In addition to this, census Journey to Work (JTW) patterns across Basildon have also been analysed to determine areas of scope for encouraging uplift in bus modes based on the volumes of short distance commuter trips to key locations in the Borough. From this information, it is evident that a high level of demand exists for bus connections to rail services, as well as connections to and from Basildon itself from other parts of the Borough, particularly from Wickford and Billericay.

**Figure 9-1: Existing Bus Route Network in Basildon Borough**



**Potential improvement options – bus routes**

9.2.4 Provision of new bus services or alterations to existing services would be dependent on site location both in regard to general services and the rest of the bus network, social mix, design of the development etc. Isolated developments in rural areas would be less likely to sustain a service than those on the edge of town.

9.2.5 Discussions with Essex County Council's Passenger Transport team determined levels of development estimated in the region of 400-600 dwellings as appropriate for provision of a new bus service. On this basis, there are a number of sites which form part of the Publication Local Plan growth scenario which may be of sufficient size to attract a new bus service. There are also a number of closely situated sites which, when combined, could be of sufficient size also to attract a new bus route.

9.2.6 Based on this list of 'major' sites, reference has been made to the journey to work census data (JTW) and specifically the car trips made to and from each approximate area. The car driver trips have been considered because it more clearly identifies the 'desire lines' for those travelling to and from work and shows those trips that have the highest potential to be completed instead via a bus service.

9.2.7 An appraisal of the larger development sites which do not currently have immediate access to a bus service is presented below, along with recommendations to resolve these shortfalls.

**Southwest of Billericay – Housing Allocations H18a-d**

9.2.8 Located to the southwest of Billericay, Housing Allocation sites H18a-d are anticipated to comprise of some 2014 residential units, with access anticipated via Tye Common Road which currently is not served by a bus route, as shown in Figure 9-2. Bus route no. 9 (Basildon – Brentwood) and no. 256 (Basildon – Billericay) both currently operate within the vicinity of Tye Common Road.

9.2.9 Based on 2011 JTW data, a high proportion of car driver trips to and from south Billericay have a destination within Brentwood, Laindon or Basildon. Existing bus trips to/from work are minimal, but either occur to Basildon or to Chelmsford. See Figure 9-3.

9.2.10 The level of residential development forecast suggests that a new or diverted bus route via Tye Common Road / Frithwood Lane and/or along the new link road should be provided to ensure that new residents can access Billericay town centre and rail station, as well as Basildon and Brentwood via public transport. The service could either be a new route or a diversion or connection into existing inter-town services.

**Figure 9-2: Potential bus service provision southwest of Billericay**

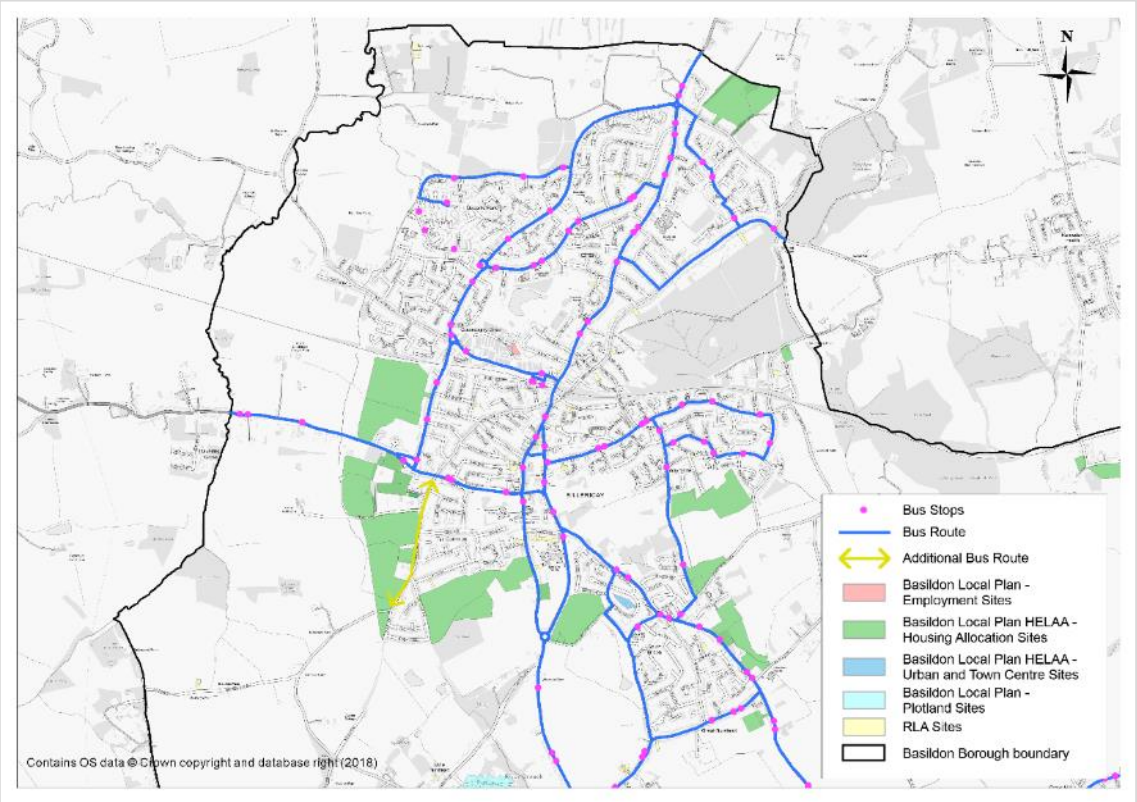
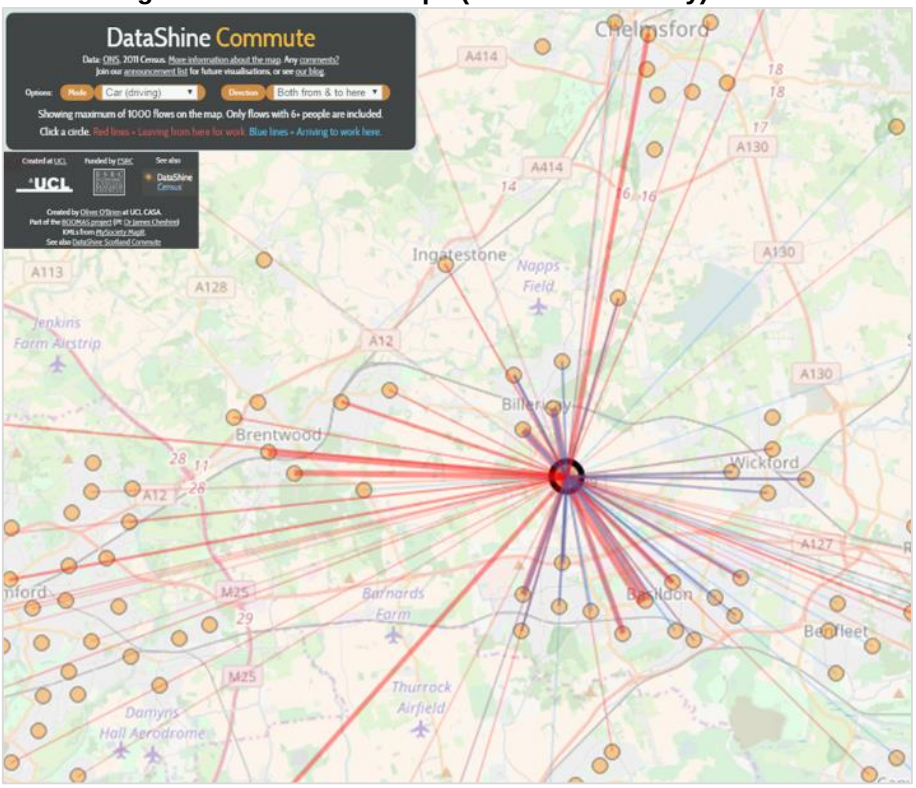



**Figure 9-3: 2011 JTW Trips (south of Billericay) – Car Driver**




*Source: http://commute.datashine.org.uk/(2017)*

### Southeast of Wickford – Housing Allocations H13 & Burnt Mills

9.2.11 Housing Allocation H13, located to the southeast of Wickford on Cranfield Park Road, is anticipated to accommodate some 1,107 residential units. Although fairly frequent bus services currently operate along Cranfield Park Road / Salcott Crescent to the northeast of the Housing Allocation, the shape of the site(s) means that these services will not be located within a convenient walking distance to the majority of new residents.

9.2.12 Based on 2011 JTW data, see Figure 9-5, a high proportion of car driver trips to and from south Wickford have a destination predominantly within Basildon or Laindon, as well as Wickford and Shotgate. Existing bus trips to/from work are minimal, but all occur in the direction of Basildon.

9.2.13 These movement patterns along with the anticipated size of Housing Allocation H13 suggest that it could be supported by a new bus route or a diversion of an existing service which currently operate to the northwest of the site. Either way, a service or services should provide a public transport connection into Wickford and to Basildon / Laindon to facilitate these trips which are currently popular by private car.

9.2.14 The potential new A127 interchange presents an opportunity for a new north-south bus route connecting Cranfield Park Road and Pound Lane to also serve the proposed employment areas along Burnt Mills Road, as shown in Figure 9-4.

**Figure 9-4: Potential bus service provision south of Wickford**

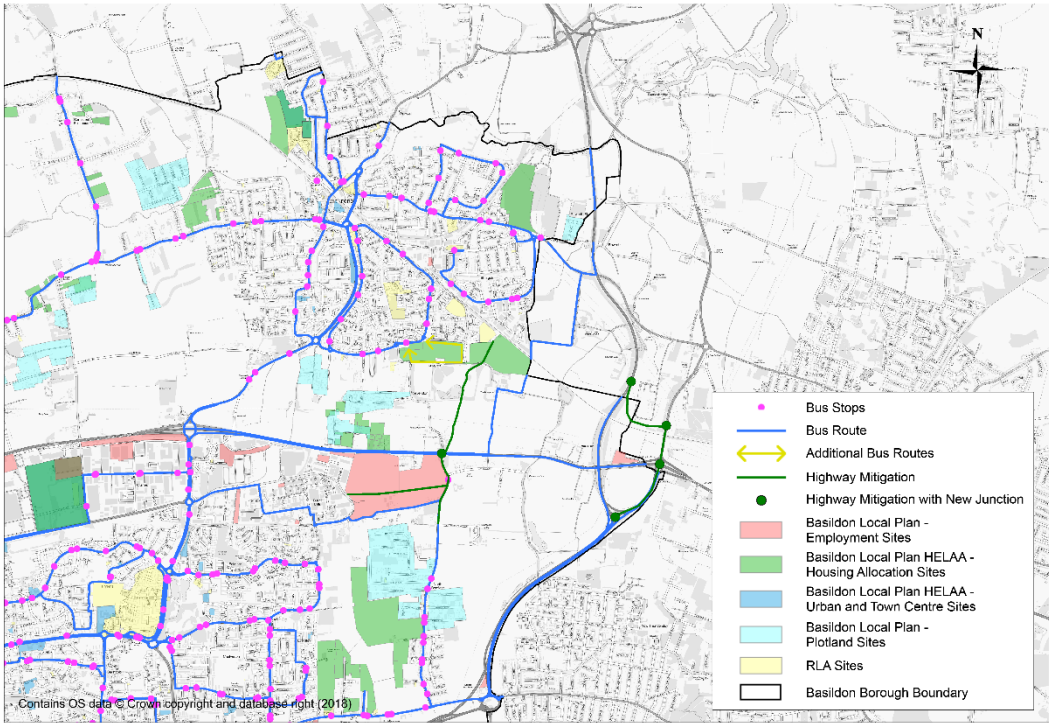
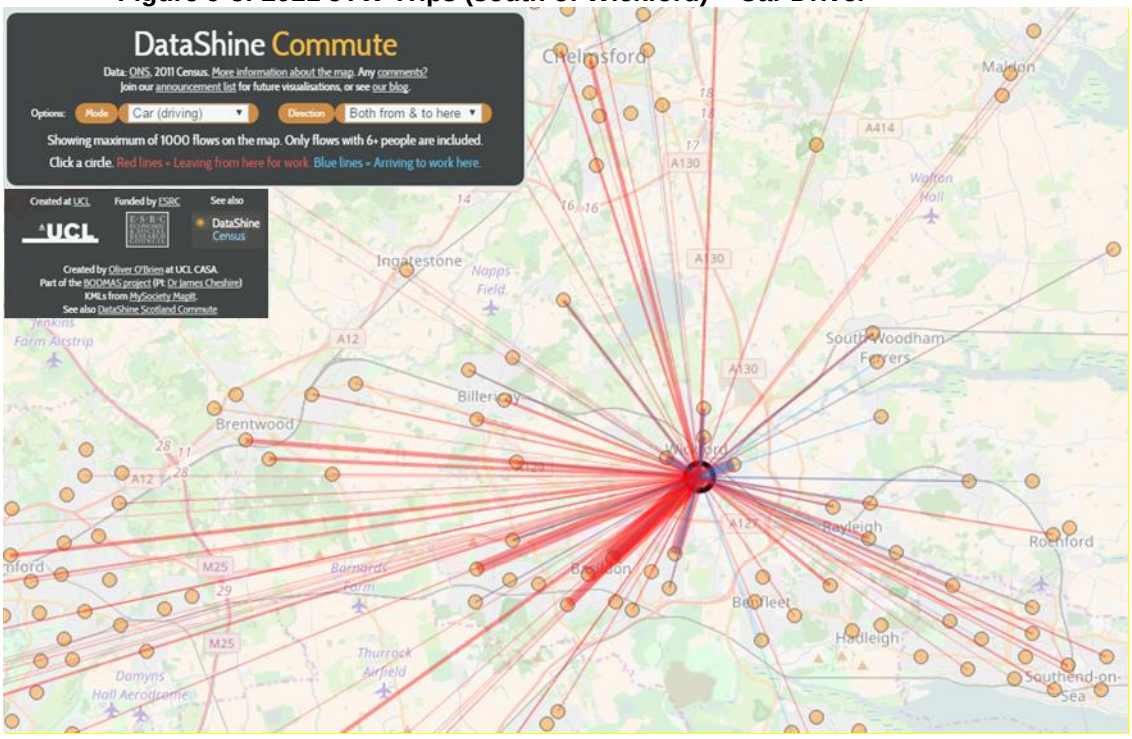


**Figure 9-5: 2011 JTW Trips (south of Wickford) – Car Driver**




*Source: http://commute.datashine.org.uk/(2017)*

### West of Basildon – Housing Allocation H8

9.2.15 Housing Allocation H8, located to the west of Basildon and Laindon and on the western side of West Mayne is anticipated to accommodate just over 300 new residential units. Currently bus services run along the main routes surrounding this land. There is an opportunity to reroute one of these services to connect future residents with Laindon, Basildon and other key employment areas within the Borough.

9.2.16 Based on 2011 JTW data, a high proportion of car driver trips to and from west Basildon have a destination predominately within various parts of Basildon – most predominately the employment land in Laindon and Basildon Town Centre - as well as Brentwood. Existing bus trips to/from work are minimal, but generally occur towards Basildon.

**Figure 9-6: Potential bus service provision west of Basildon**

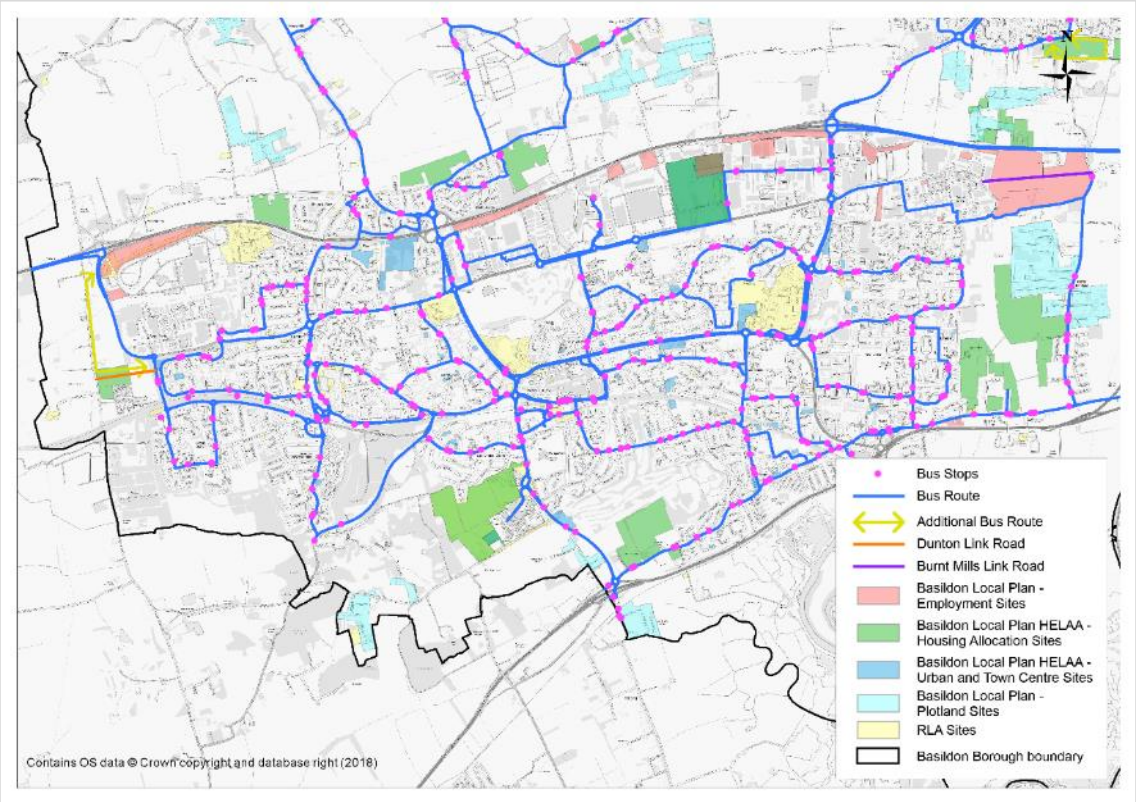
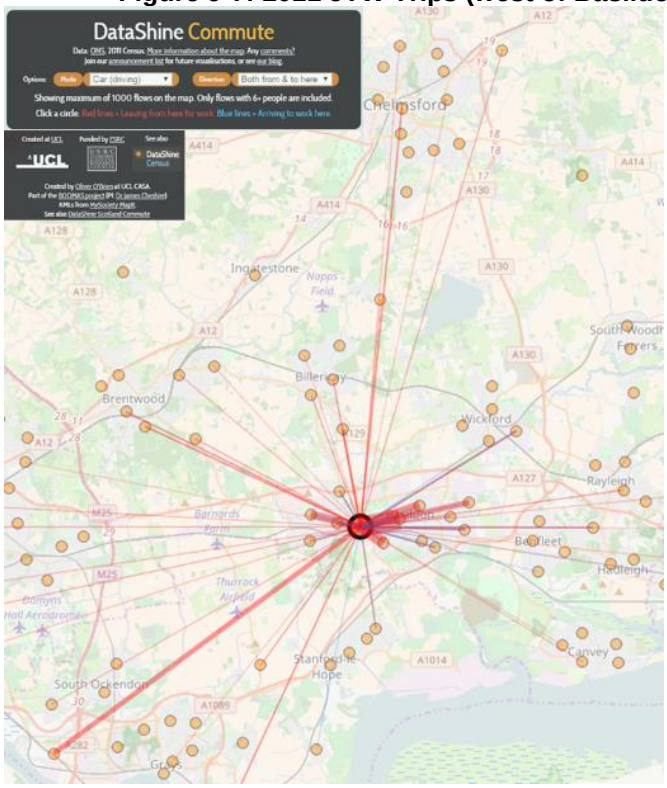



**Figure 9-7: 2011 JTW Trips (west of Basildon) – Car Driver**




*Source: http://commute.datashine.org.uk/(2017)*

### Housing Allocations H6 and H12

9.2.17 Located at the southern and eastern fringes of Basildon respectively, Housing Allocations H6 (725 residential units) and H12 (1,988 residential units) are of a size likely to be solely capable of supporting a bus service or multiple services.

9.2.18 Housing Allocation H12 is bisected by open space and as such would need to be adequately serviced by bus along both its eastern and western 'halves'.

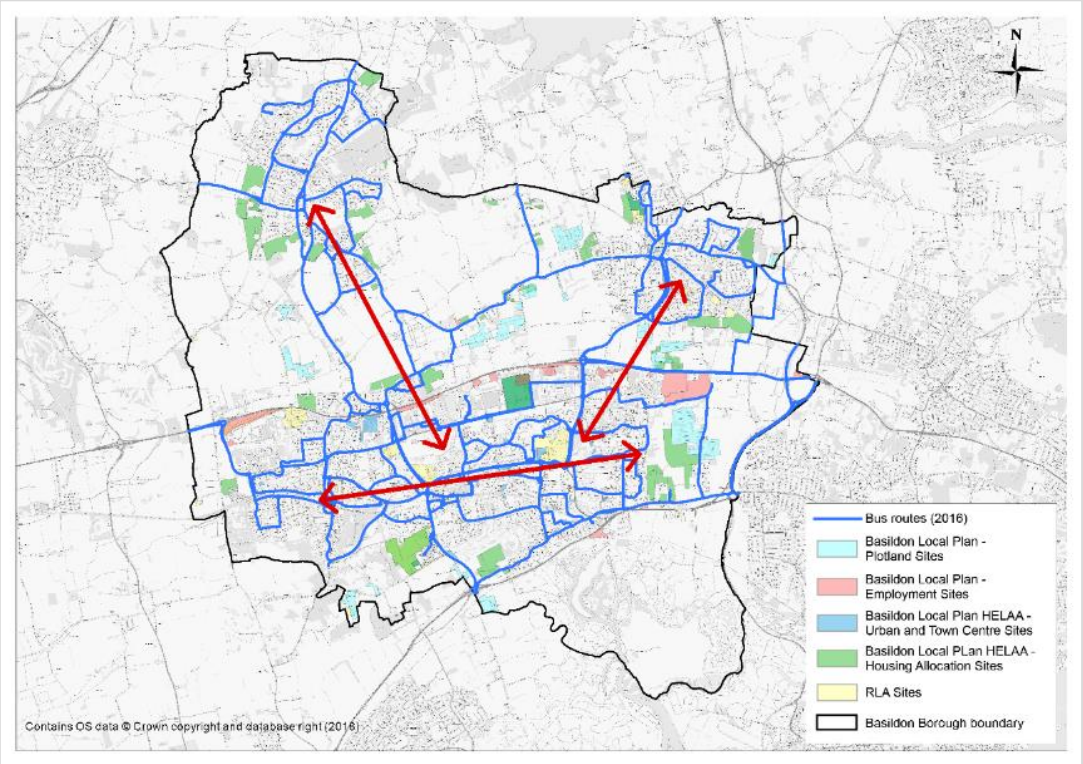
9.2.19 It should also be noted that a small development (20 to 30 dwellings) could support a change to an existing bus service (i.e. looping through the estate and re-joining the existing route) if required resources were limited to kick-starting and marketing/publicity for example.

### Potential improvement options – junction priority

9.2.20 Based on existing journey to work patterns, see Figure 9-7, and the distribution and quantum of anticipated residential and employment-based development which forms the Publication Local Plan, there are considered to be three main public transport 'corridors' where demand is likely to grow significantly see Figure 9-8.

9.2.21 Any bus infrastructure proposals will be subject to agreement on their viability with bus companies. This, it is envisaged, should be undertaken as part of development Transport Assessments in the future.

**Figure 9-8: Indicative Demand Corridors**



## 9.3 Cycling Network

### Identification of existing cycling infrastructure

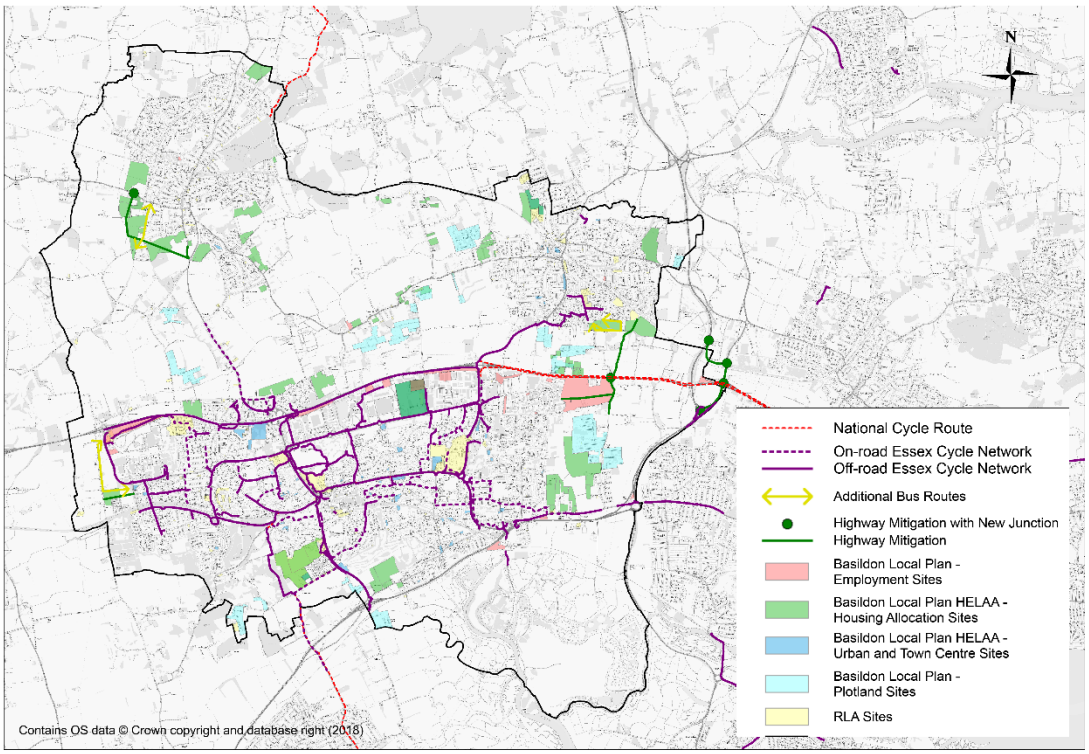
9.3.1 Figure 9-9 has been prepared to show the existing cycling network in Basildon, which comprises of a mixture of on and off-road facilities, part of which is on the National Cycle Route. For context, the sites which form the Publication Local Plan growth scenario have been overlaid onto this figure to show how the existing infrastructure relates to the likely future development.

9.3.2 As can be seen, there is a good provision of facilities through Basildon town centre (particularly east-west), but limited connectivity within Wickford and Billericay. Apart from the connection between Basildon and Wickford, there is no cycle connection between any other major conurbations within the Borough.

9.3.3 The National Cycle Route passes through the heart of Basildon to/from Southend in the east and Thurrock in the south, and also extends south from Chelmsford but terminates at Heath Road, at the northern side of Billericay.

9.3.4 Figure 9-9 also demonstrates that there are a number of sites within the Publication Local plan growth scenario which are not (currently) linked into town centre locations with cycling infrastructure, particularly in Billericay and Wickford.

**Figure 9-9: Existing Cycling Network in Basildon (with Draft Local Plan development sites)**




### Potential improvement opportunities

9.3.5 A Cycle Action Plan for Basildon has been produced and this identifies opportunities to provide additional cycle routes and facilities, increasing the proportion of trips made by bike.

9.3.6 Through the delivery of the BCAP, it is hoped that the provision of complete cycle routes or even a coherent cycle network will encourage people to make short trips by bicycle rather than by car. Future development can then add to the cycle network, thus providing an even wider cycle network, encouraging both existing and future short trips to be made by bicycle. The delivery of such cycling schemes and recommendations identified as part of the BCAP are to be supported through policy within the Basildon Local Plan.

## 9.4 Sustainable Transport Measures

9.4.1 For the larger sites, both residential and employment, it will be important to include a requirement through the planning process for sustainable modes of travel to be considered and thoroughly planned for in both ‘hard’ measures (e.g. such as cycle paths, bus routes, pedestrian connections, etc.) as well as ‘soft’ measures (e.g. travel plans, incentives such as subsidised costs, etc.). It will be important for large sites to plan for all modes of travel not just the private motor car.

9.4.2 Personal Travel Planning (PTP) schemes could also be considered, involving engaging with residents through interviews and handing out PTP packs that include useful transport leaflets and incentives, to promote sustainable transport.

## 9.5 Trip Rate Variation

9.5.1 A separate study was undertaken to inform other Local Plan assessments, within Essex (Essex Highways, May 2016), which looked at the propensity to use public transport. This study reviewed the potential for morning peak hour journeys to switch to public transport modes by reviewing multi-modal surveys in the TRICS database[11], and then calculating and analysing typical bus trip rates per dwelling based on location and varying levels of public transport provision.

9.5.2 The TRICS database, which contains survey data on the number of trips that enter and leave developments, has been explored to see which conditions result in higher or lower vehicle trip generation and public transport use characteristics.

9.5.3 Through the analysis of the trip rates, it was demonstrated that where there are good levels of public transport provision, then car trip generation is likely to be less than where there is poor public transport provision. Correlation between the public transport provision for the sites used from the TRICS database and 2011 Census journey to work data was investigated and it was found that there is a positive correlation between trips to work by public transport and public transport provision, although not necessarily strong.

9.5.4 Correlation coefficients were calculated, where +1 is a perfect positive correlation and -1 is a perfect negative correlation and 0 is no correlation. Houses scored 0.81 (strong) and flats scored 0.59 (modest). There is negative correlation between car use and public transport provision, particularly for flats, so where there is poor public transport provision there will be high use of cars; the scores were 0.39 (weak / no correlation) for houses and -0.52 (modest) for flats.

9.5.5 The study undertaken indicates that it is reasonable to assume that a higher proportion of trips will be made by sustainable modes where good sustainable transport is provided. A reduction in trip rates has not been applied within this assessment. However, where a site is located on the edge of town but not on the outer fringe of a town and is accessible by public transport or based on the recommendations below is likely to have public transport access in the future, the ‘suburban’ trip rate has been adopted. This is considered to be more

[11] Note that sites within TRICS are from throughout England and are not specific to Essex. The sites used in the study had varying availability of public transport.

representative of residential development which has access to local services including public transport connections; rather than development that sits at the outer fringes of urban areas where private car use may be more probable.

9.5.6 As previously stated, in considering the trip generation methodology for the Final Growth Scenario, a reduction in trip rates that can be justified in combination with the sustainable transport mitigations proposed, has been included within the assessment of the mitigation measures.

## 9.6 Summary

9.6.1 Although not exhaustive, the above review identifies a number of initial opportunities where provision for sustainable modes of transport are likely to be required in the future, to support development, and are likely to encourage more sustainable modes of travel from the outset.

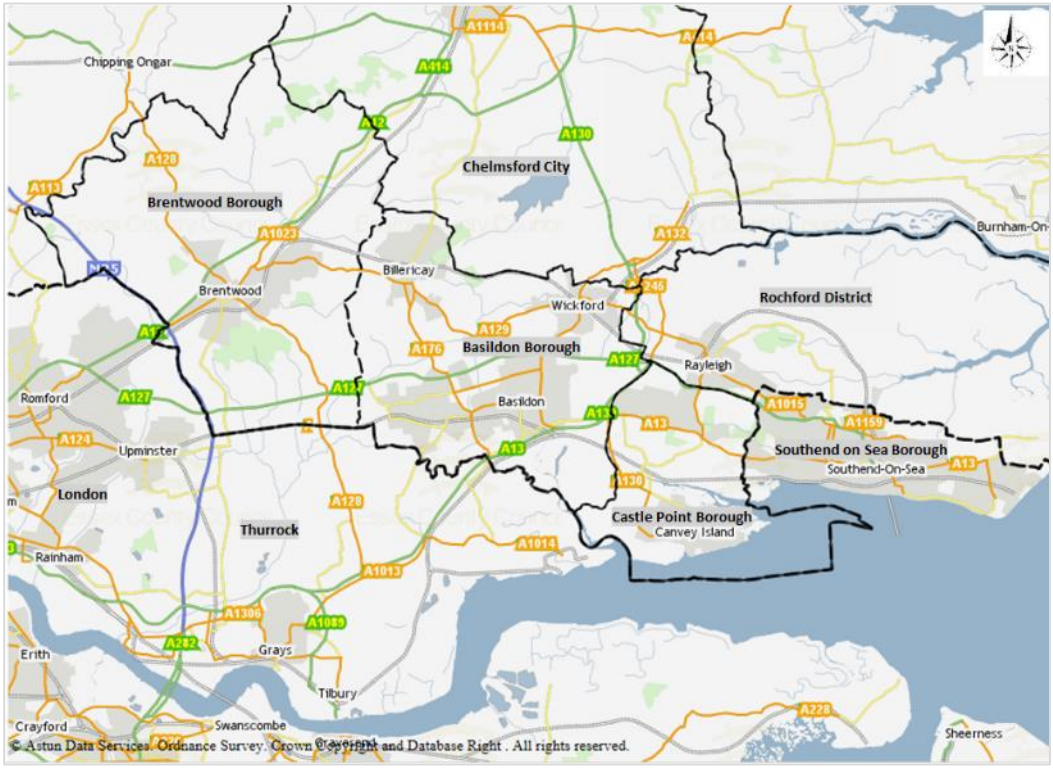
9.6.2 At this stage, it is not proposed to undertake any design work on walking/cycling proposals. However, the development of the Basildon Cycling Action Plan will continue to develop options and proposals. In addition, a Sustainable Transport Strategy will be developed for Basildon and this will feed into a wider South Essex Sustainable Transport Strategy should one be developed.

# 10 Cross Boundary Impacts

## 10.1 Introduction

10.1.1 The previous sections have generally focussed on the internal impacts within the Borough. This section provides a high level review of the forecast cross-boundary trips generated by the Publication Local Plan with the surrounding Local Authorities, which are also in various stages of developing their own Local Plans. For reference, the neighbouring Local Authorities are shown in Figure 10-1.

**Figure 10-1: Basildon's Neighbouring Boroughs & Districts**




10.1.2 The purpose of this appraisal is to quantify the likely impact of the Publication Local Plan development traffic on the road network, at the Borough boundary with neighbouring authorities, and provide consideration of the cross boundary transport effects between the various Boroughs, districts and unitary authorities.

## 10.2 Methodology

10.2.1 The key highway links which have formed the focus of this appraisal include:

- B1007 in Stock (Chelmsford CC)
- A130 (Chelmsford CC)
- A127 (Brentwood BC) (Southend UA) (Rochford DC)

- A13 (Thurrock UA) (Southend UA) (Castle Point DC)

10.2.2 Cross-boundary development flows on the strategic road network have been identified using the VISUM network model for the 2034 Publication Local Plan growth scenario combined with DfT traffic counts. The trip generation methodology and application of TEMPRO background growth rates account for an element of trip generation/attraction to and from areas outside of the Borough and therefore to some extent external impacts are partially accounted for.

10.2.3 Further work with neighbouring Boroughs will be undertaken to understand the impact of development in those neighbouring Authorities on the road network in Basildon as and when their respective Local Plans are finalised.

10.2.4 The potential cross-boundary impacts of the Publication Local Plan growth have been derived by calculating the percentage change in flows, between the 2034 Background Growth and Final Growth scenarios at each network location assessed.

## 10.3 Cross-Boundary Impact Appraisal

10.3.1 The flows and percentage increases on the key strategic cross boundary routes are outlined in Table 10-1.

**Table 10-1: Cross Boundary Traffic Flows and Percentage Increases**

| Location | 2034 Background Growth Two Way Flows | | 2034 Final Growth Two Way Flows | | Flow Increase (%) | |
|---|---|---|---|---|---|---|
| | AM | PM | AM | PM | AM | PM |
| **B1007 Chelmsford** | 1684 | 1722 | 1784 | 1817 | 6% | 6% |
| ***Chelmsford CC Local Plan*** | | | *1488* | *1653* | | |
| **A130 Chelmsford** | 3609 | 3604 | 4131 | 4050 | 14% | 12% |
| ***Chelmsford CC Local Plan*** | | | *5190* | *4937* | | |
| **A127 Brentwood** | 5726 | 5698 | 7098 | 7120 | 24% | 25% |
| **A13 Thurrock** | 5381 | 5401 | 6068 | 6052 | 13% | 12% |

10.3.2 In particular, the results show some significant increases in traffic along the A127 corridor towards Brentwood in both percentage increase and absolute flows. The A130 to/from Chelmsford and A13 to/from Thurrock are likely to experience traffic increases of 10-15%.

10.3.3 Table 10-1 summarises the outcomes of the modelling work developed to support the Basildon Publication Local Plan. As previously stated, with the exception of Chelmsford City Council, the modelling work to support the Local Plans of neighbouring authorities was not sufficiently developed to inform this

'Part 2' study and the data therefore relies on the outcomes of the Basildon Local Plan modelling.

10.3.4 Where data is available from the Chelmsford City Council modelling on the A130 and B1007, Table 10-1 highlights the respective forecast flows in *red*. It is noted that the A130 two-way flows are 25% higher in the AM peak and 21% higher in the PM peak in the Chelmsford City Council modelling. However, the corresponding B1007 flows are 16% lower in the AM peak and 10% lower in the PM peak in the Chelmsford City Council modelling.

10.3.5 The potential disparity in modelled flows can be a result of a range of factors. In the first instance, daily fluctuations in traffic flows across the network can result in differences of approximately 10% depending on when data was collected and local traffic conditions. It should also be emphasised that the comparison of outputs from different models can present a number of key challenges, including:

- Data sources to inform the analysis have been collected from a range of sources and therefore provide an inconsistent base for comparison purposes;
- The modelling software/approach used to support the Basildon Local Plan was not consistent with the VISUM variable demand approach used to assess the Chelmsford Local Plan;
- The Local Plan periods for the neighbouring Local Plans are not consistent with the Basildon Local Plan and do not use the 2034 forecast year; and
- Traffic flows on the periphery of the Local Plan models are unlikely to be as robust as flows from more central detailed areas of the model networks.

10.3.6 As a consequence of these limitations, it is recognised that any flow comparisons should be treated as indicative and for information purposes only.

# 11 Summary

## 11.1 Overview

11.1.1 This 'Part 2' Transport and Highway Impact Assessment has considered the overall impact for all development included in the Publication Local Plan up to and beyond the plan period of 2034. It should be noted that the assessment tests the 'total projected housing supply available', which includes the delivery of more than 3180 additional dwellings post 2034. As such the outputs contained in this report represent a 'worst-case' with regard to traffic growth and provide a robust assessment of the traffic related effects of the Publication Local Plan.

11.1.2 The analysis builds on previous studies leading into the development of the earlier Draft Local Plan and then Publication Local Plan Growth scenarios to test the acceptability of the likely transport impacts on the Borough network. While this study can be read as a standalone assessment of the Publication Local Plan, reference should be made to the preceding 'Part 1' study to understand the progression of the Local Plan from draft status to publication.

11.1.3 The assessment has been undertaken at a strategic level, using a VISUM assisted spreadsheet model, and represents a forecast 'point in time' to be able to identify the likely highway impacts and a high level strategy to mitigate these impacts. It is recognised that, while the study outputs are considered robust, a range of external factors, including economic and travel behaviour, will dictate the level of growth across the Borough over the next 15 years. As such, parts of the network are subject to separate ongoing studies and potential further improvement, which have not been fully explored in this study.

11.1.4 It is important to continually monitor the delivery of development and infrastructure across the plan period to reflect actual build rates and updated traffic conditions. Developers will be expected to submit Transport Assessments and Travel Plans to establish the specific impacts of individual sites and to ensure that they are appropriately mitigated.

11.1.5 The Publication Local Plan will aim to deliver 18,283 residential units; 261,520 sqm of employment floor space; 85,061 sqm of Retail/Leisure floor space; and 6,195 new pupil places. The plan will be supported by a package of sustainable transport mitigation improvements, to encourage modal shift, as well as a range of highway and local junction improvement schemes, to mitigate residual traffic impact.

11.1.6 The development growth is anticipated to generate an additional 9,950 new trips to the network in the AM peak and 10,150 in the PM peak. Approximately 60% of this traffic is related to housing delivery, 25% is associated with employment and the remaining traffic either retail, leisure or education related.

When combined with background traffic growth over the plan period, the Publication Local Plan growth equates to an approximate increase in traffic of 22% in Basildon, 20% in Billericay and 23% in Wickford settlement areas.

11.1.7 The assessment uses the following scenarios to assess the cumulative and resulting traffic impacts of development growth and infrastructure delivery over the next 15+years:

- **2014 Base** – representation of the base or current highway network.
- **2034 Background Growth** – (also referred to as the Do-Minimum or Reference Case) based on the previous scenario uplifted to 2034 using background growth factors from TEMPRO, plus committed development traffic and schemes. This scenario represents the likely future situation without any Local Plan growth and is used for benchmarking against the Final Growth Scenario.
- **2034 Final Growth Scenario 'No Mitigation'** – continuation of the previous scenario combined with adjusted TEMPRO background traffic and the Publication Local Plan growth.
- **2034 Final Growth Scenario 'With Mitigation'** – continuation of the previous scenario with the addition of an identified package of mitigation measures and associated traffic reassignment.

11.1.8 A Sustainable Accessibility Appraisal has been undertaken to support this Highway Impact Assessment, and there have been several areas where the potential to improve sustainable access have been identified. Access to sustainable modes will be an extremely important measure to mitigate the impact of local development traffic. A Sustainable Transport Strategy will be produced for the Basildon area which will feed into the wider South Essex area strategy if developed.

11.1.9 The Final Growth scenarios have been tested with an assumed reasonable level of improvement to sustainable access e.g. public transport, walking and cycling. While, it is anticipated that further gains in sustainable modal shift to non-car modes could be achieved, over and above the levels tested, the analysis highlights a number of residual impacts on key junctions and corridors, with the need for more substantial physical highway interventions.

11.1.10 A preferred package of highway improvements has been developed as part of previous studies leading into this 'Part 2' study, which has been tested in the 2034 Final Growth Scenario 'with Mitigation'. In the first instance, results should ideally demonstrate 'nil detriment' over the existing level of service on the Borough network, or at the very least, improve on the forecast Background (Do-Minimum) scenario. While this package is considered a minimum requirement, mitigation also needs to be considered against overall value for

money; what is realistically achievable within any constraints; and also within the context of discouraging unconstrained car use. New developments will be expected to explore strategies to deliver these objectives as part their overall mitigation contribution.

11.1.11 The analysis provides a strategic indication of the acceptability of the mitigated highway impact of the Publication Local Plan. Generally, the results show that the majority of the network can either be mitigated to a similar level of service as the existing situation or, at least, improve on the Background (Do-Minimum) scenario. A small number of residual impacts have been identified, which can either be attributed to the impact of traffic reassignment, to the new link roads, or would need further consideration with the eventual scheme design and feasibility.

11.1.12 A summary of the study outcomes for the principal settlement areas is discussed below.

## 11.2 Billericay

11.2.1 The Sustainable Accessibility Appraisal demonstrated most sites identified for residential development in Billericay have good or high levels of sustainable accessibility. The majority of sites in Billericay also have potential for encouraging cycle use, based on their proximity to local services, and some sites could warrant either a new or redirected bus service to the site.

11.2.2 A number of highway mitigation schemes have been identified for Billericay, ranging from local junction improvements to a more substantial Western Link Road to the south west of the town.

11.2.3 The need for a Western Link Road has been demonstrated within this study and is also supported by previous work, undertaken by Pell Frischmann on behalf of BBC, and also i-Transport, on behalf of developer Gleessons. When considered alongside the removal of the one-way restriction on the southern end of A176 Laindon Road, the Western Link Road could attract a significant level of traffic (>1000 vehicle movements) away from Billericay town centre junctions during the AM and PM peaks.

11.2.4 The eventual assignment of traffic across the network would be subject to available capacity but it is evident that the Western Link Road would form a key part of the mitigation strategy for Billericay and would be complemented by other local junction improvements.

## 11.3 Wickford

11.3.1 The Sustainable Accessibility Appraisal demonstrated that the sites identified for residential development in Wickford have good or high levels of sustainable accessibility. The majority of sites in Wickford have potential for

encouraging cycle use, based on their proximity to local services. In general, sites in Wickford are not large enough to provide potential to support additional public transport services. Only site H13, Land south of Cranfield Park Road, has potential to change existing bus services to serve the development site.

11.3.2 The proposed Pound Lane Phase 1 scheme, with new A127 Junction and Tresco Way / Cranfield Park Road link road, will provide a significant level of mitigation, relieving traffic on the A132 corridor and junction with A127.

11.3.3 There are some localised impacts in and around Wickford town centre, in particular on Golden Jubilee Way and the High Street area. While some localised junction improvements can address some of these impacts, it is acknowledged that a Masterplan exercise is underway to look at different options for improving the High Street environment for all road users. Option testing and feasibility assessments are due to be undertaken later in 2018, which will take account of the Publication Local Plan Growth as part of any solution.

## 11.4 Basildon

11.4.1 The Sustainable Accessibility Appraisal demonstrated that some sites in Basildon have limited levels of sustainable access. The large sites within Basildon do have potential for better public transport services to be provided and the majority of sites have potential for encouraging cycle use based on their proximity to local services. If this potential is realised it could be expected to reduce reliance on cars, reducing vehicle trips.

11.4.2 The proposed Pound Lane Phase 1 scheme, with new A127 Junction and Tresco Way / Cranfield Park Road link road, will provide improvements for the development to the East of Basildon. The scheme will need to be delivered in combination with a new link road parallel to Burnt Mills Road with a restricted left turn junction with Courtauld Road to avoid additional traffic routing through the eastern end of Basildon town centre. It should be noted that an improved all movement A127 junction with Pound Lane will attract additional traffic to the A127 corridor towards the A127 / A130 Fairglen Interchange on the boundary with Rochford District. The A127 / A130 Fairglen Interchange short-term scheme is currently subject to consultation and could also introduce additional traffic movements at the junction. The scheme will be fully assessed as part of the Lower Thames Crossing modelling in LTAM, later this year. The modelling indicates that, if the full reassignment of traffic is realised, there will be potential impacts on this area of the network, including the A129 London Road / A1245 Chelmsford Road junction immediately to the north by 2034. This will trigger the need for the long term A127/A130 Fairglen scheme to be implemented in the latter part of the Local Plan period.

11.4.3 A package of junction improvements will be needed in and around the Basildon settlement area to address local impacts and complement the Basildon Town Centre Masterplan proposals.

## 11.5 Conclusions

11.5.1 The Basildon Borough Council Publication Local Plan 2018 (also referred to as the 'Final Growth Scenario' within this report), sets out the Council's strategy to deliver 18,283 new homes; 261,520 sqm of employment floor space; 85,061 sqm of Retail/Leisure floor space; and 6,195 new pupil places, over the next 15 years.

11.5.2 This Part 2 – Transport and Highway Impact Assessment has been prepared to support the Publication Local Plan and test the likely forecast traffic impact of the development proposals against the existing transport supply and a package of sustainable and physical mitigation schemes.

11.5.3 The transport modelling has tested a total of 18,283 new homes, of which 3,180 of these dwellings are anticipated to come forward beyond the plan period. Therefore, the 2034 future scenarios are considered to be 'worst-case' tests of the 'total projected housing supply available', given they assume that all 18,283 dwellings will come forward by the end of the plan period 2014-2034.

11.5.4 The existing situation and a 2034 Background ('Do-Minimum') scenario have also been assessed to benchmark the overall traffic impact of the Publication Local Plan and help define where mitigation is needed. The 'Do-Minimum' considers a scenario where the Local Plan is not delivered and forecast traffic growth is limited only to known committed development and TEMPRO growth factors.

11.5.5 In the first instance, the Publication Local Plan has been tested with the existing transport supply. This included 'reasonable' assumptions for improvements to sustainable infrastructure, and modal shift away from the car, but with little or no improvements to highway infrastructure. As would be expected, given the quantum of housing, employment, retail and leisure development proposed, the results indicate that the forecast development traffic would increase traffic levels significantly across the network and that further mitigation is needed.

11.5.6 In advance of delivering any physical improvements, which can be costly and could encourage further unconstrained car use, more ambitious sustainable transport and travel demand management interventions should be identified by development. This would need to capitalise and expand on the walking, cycling and bus improvements promoted in this study and demonstrate increased sustainable modal shift. Other factors, including 'Peak Spreading',

would also need to be considered to reflect potential changes in travel behaviour and the availability of network capacity at different times of the day.

11.5.7 Over and above any further sustainable transport improvements, the assessment demonstrates that a package of physical mitigation schemes will be required to mitigate the impact of Publication Local Plan related traffic. The analysis demonstrates that the delivery of a combination of more ambitious sustainable transport and physical highway improvements could potentially mitigate the most significant impacts of the Local Plan. In many instances, junction approaches would deliver 'nil-detriment' over the existing situation, or at the least, improve on the 2034 Background ('Do-Minimum') Scenario, where no Local Plan growth is delivered. It is acknowledged that the analysis identifies localised residual impacts on the network, partially due to the eventual reassignment of traffic to new link roads, but also due to the challenges associated with delivering junction improvements in constrained urban areas.

11.5.8 The preferred mitigation package should be considered as a minimum and the scale of any required scheme will need to be monitored and refined throughout the plan period and tested within a Transport Assessment and Travel Plan as part of any development coming forward in a planning application.

11.5.9 A number of wider highway schemes will potentially come forward in the plan period, including the A127 / A130 Fairglen Interchange Short-Term Scheme and a new Lower Thames Crossing, as well as other local junction schemes. These schemes will also need to be considered alongside the delivery of the Publication Local Plan to maintain a consistent approach and ensure mitigation is delivered at an appropriate scale and 'fit for purpose'.