A12 Chelmsford to A120 widening

Traffic Data Collection Report

November 2016

Contents

1. Introduction

1.1 Purpose of report

Highways England is developing the proposals announced in the Autumn Statement 2014 (AS14) Roads Investment Strategy[1] (RIS) through the Project Control Framework (PCF) process. This report relates to proposals in the East of England Area 6 (south) for the A12 Chelmsford to A120 (Junction 19 – 25).

The purpose of the Traffic Data Collection Report (TDCR, formerly Traffic Survey Report (TSR)) is to set out the collection and initial analysis of data upon which the transport model is to be built. The TDCR undertakes to:

- set out the need for traffic data taking into consideration the current PCF Stage and data required for subsequent Stages, following the data requirements set out in the Appraisal Specification Report (ASR).
- collate, summarise and review available existing traffic data
- identify the need for additional survey data and its contribution to the traffic forecasts
- describe the surveys and data cleaning, expansion and checking up to the point in which it transfers to the model building process (and is then addressed in the LMVR)
- summarise and discuss the outputs from the data collection and traffic surveys

The TDCR is one of a number of reports produced at PCF Stage 1 (option identification) related to the ongoing development and appraisal of the transport scheme. The data collection specification described in this report is consistent with the requirements of the ASR which sets out how the transport model for the scheme will be developed.

This data gathering and collection exercise for the purposes of transport model development and scheme appraisal has included the collation of traffic data from a range of sources including our Traffic Flow Data System (HATRIS, now known as WebTRIS), Essex County Council, the Department for Transport (DfT), and data available from other scheme development processes including the A120 Braintree to A12 project. A number of different types of data have been collected including volumetric, vehicle classification (including heavy goods vehicles (HGV) percentages), queue length data, automatic number plate recognition (ANPR) data, Trafficmaster journey time data and collision data.

Road-side Interview (RSI) data has not been collected as part of this project. RSI data is traditionally obtained in order to provide information about the origins, destinations, timings and purpose of individual journeys. We have made use of a source of mobile phone data provided by Telefonica. A further description of this and other data sources is provided in the remainder of this report.

1.2 Scheme background

Following the 2013 spending review, the Government announced its plans for the biggest ever upgrade of the strategic road network (SRN). The HM Treasury document, Investing in Britain's Future[2] set out details of the programmes of infrastructure investment, which included the tripling of investment on major road enhancements from today's levels to over £3bn annually by 2020/21.

[1] DfT, 2015. *Road Investment Strategy*: *for the 2015/16-2019/20 Road Period*.
https://www.gov.uk/government/publications/road-investment-strategy-for-the-2015-to-2020-road-period
[2] HM Treasury, 2013. Investing in Britain's Future.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209279/PU1524_IUK_new_template.pdf

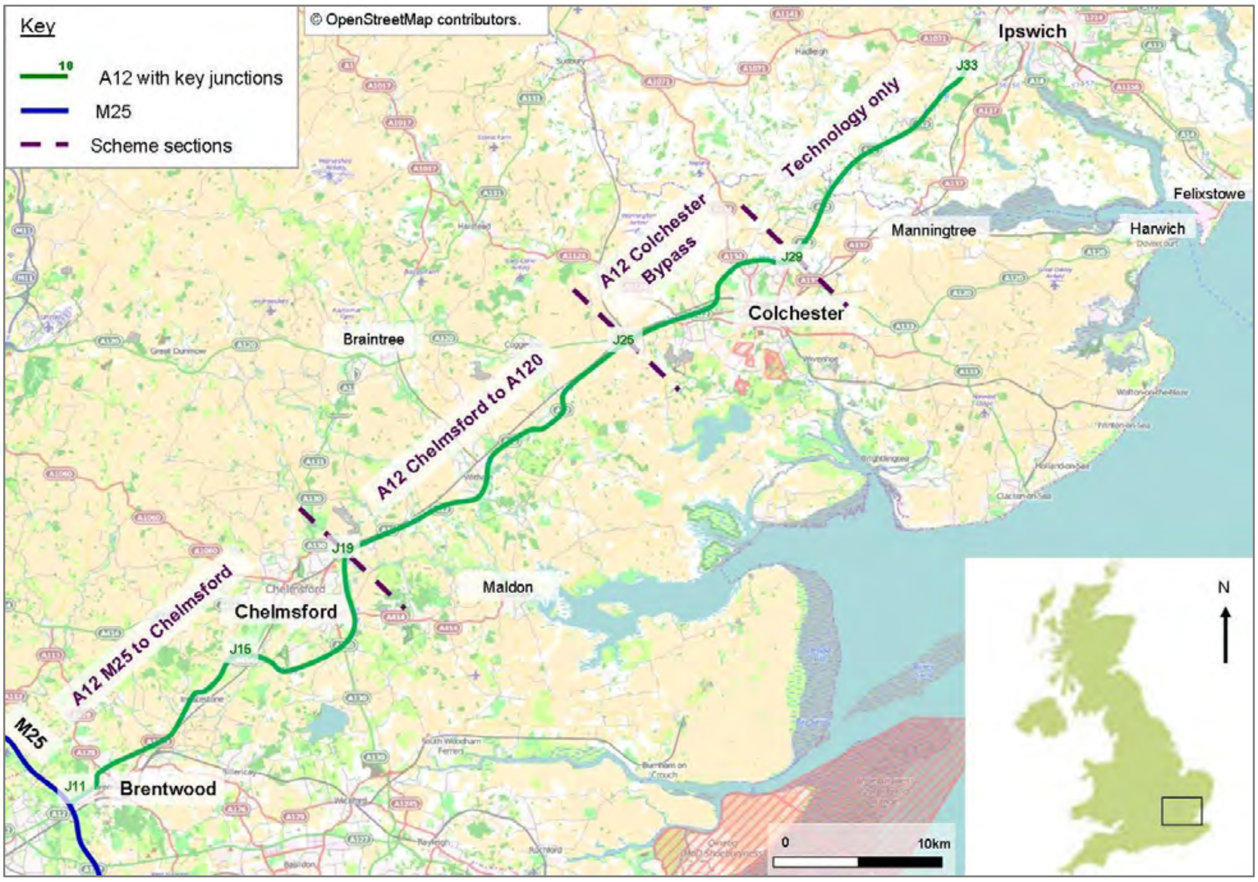

Figure 1-1: Road Investment Strategy Schemes - A12

In April 2014 we published our evidence reports for the 18 Route Based Strategies (RBS), which collectively cover the SRN. The full RBSs were published in March 2015. The East of England Route Strategy[3] is pertinent to this study as it covers the A12. The purpose of the strategy is to:

- be clear about what we intend to do where, why and when within a five year spending control period
- outline our priorities for the five year period and beyond
- provide details about the proposed investment to improve asset condition and vision for customer operations service
- inform the RIS investment plan for the current five year period.

The RBSs are being used to assist in generating efficiencies for our future investment plans and performance improvements, providing improvements in customer experience, and better informing the public. Our intent is that the RBSs will also act as a catalyst for the further development and delivery of scheme priorities which tackle the most important challenges and opportunities for customers. Possible solutions for priority sections of the 18 routes were identified through this process .We then produced initial SOBCs and OARs for potential schemes, including those located within the A12 corridor.

The Department for Transport (DfT) report Action for Roads[4] outlines the role that major A roads, including the A12, play in the economy. These roads are particularly important to freight and make up a majority of the non-motorway SRN. Action for Roads identified the need to transform key A roads into 'expressways' in order to meet a minimum standard of build, safety and resilience. In terms of the A12 this is a longer term aspiration and the expressway standards have yet to emerge.

[3] Highways England, 2015. East of England Route Strategy. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/416730/East_of_England.pdf
[4] DfT, 2013, Action for Roads. A Network for the 21st Century. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/212590/action-for-roads.pdf

The A12 is known to experience capacity, resilience and other operational issues. The A12/A120 Route Strategy[5] published in March 2013 notes that the route will be functioning above capacity by 2021 and will struggle to keep up with the growth in demand if the large amount of growth proposed in the local area eventuates. The operations at the seaports of Harwich and Felixstowe are also likely to increase, which would add further freight traffic demand to this corridor.

The A12 has previously been improved in stages and is now a dual carriageway for its entire length between the M25 and A14. The road is constructed to inconsistent standards including sections that are dual 2 and dual 3 lane, and locations where at-grade accesses to residential, commercial and agricultural properties have been retained.

In March 2015, the DfT announced major new investment for the A12 as part of the RIS including widening, traffic technology improvements and a package of associated mitigation schemes.

1.3 Current stage of project

The project is progressing through our PCF process, and the scheme is presently at PCF Stage 1 – Option Identification. The products that are produced at this stage of the process relating to business case and funding are:

- Appraisal Specification Report (ASR, refined)
- Traffic Data Collection Report (TDCR, this report)
- Local Model Validation Report (LMVR)
- Traffic Forecasting Report (TFR)
- Appraisal Summary Table (AST, refined)
- Economic Assessment Report (EAR)
- Business Case (reviewed)

1.4 Structure of report

Following the introduction, the structure of the TDCR includes:

- **Section 2** – Need for traffic data
- **Section 3** – Summary and review of existing data
- **Section 4** – Use of available traffic models
- **Section 5** – Specification and execution of surveys
- **Section 6** – Final volumetric and trip dataset
- **Section 7** – Journey time data
- **Section 8** – Operational data
- **Section 9** – Suitability of accumulated database

[5] Highways Agency, 2013, A12/A120 Route Based Strategy. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/364194/FINAL_A12_RBS__with_figures_.pdf

2. Need for traffic data

2.1 Scheme objectives

The RIS outlines our long term ambition to revolutionise and modernise the SRN and sets out the performance requirements for how we aim to achieve this. The performance will be assessed in eight key areas;

- Making the network safer.
- Improving user satisfaction.
- Supporting the smooth flow of traffic.
- Encouraging economic growth.
- Delivering better environmental outcomes.
- Helping cyclists, walkers and other vulnerable users of the network.
- Achieving real efficiency.
- Keeping the network in good condition.

A set of study objectives have informed the options sifting process in order to identify the most suitable package of improvements for the A12. The RIS objectives are consistent with our Business Plan and considered to be complementary to the associated policy objectives of Essex County Council.

In line with policy based objectives which align with local and regional transport and land use objectives, a set of intervention specific objectives has been established and are used to target the key issues for improvement on a more localised level. Combining these specific objectives with the RIS objectives will help ensure that the chosen solutions resolve key local and strategic issues.

The key problems and issues are summarised as follows:

- Link capacity issues exacerbated by continued growth in traffic.
- Resilience and reliability issues in particular associated with incidents.
- Junction performance issues affecting A12 mainline and access to urban centres.
- Constrained local and regional economic growth potential.
- Limited non-motorised users (NMU) provision along and across the route.

2.2 Overview of data requirements

For the purposes of this project and the progression of the scheme through the PCF process, traffic data is required primarily to refine and improve the understanding of existing transport conditions as relevant to the scheme, and to inform transport model development.

Traffic data is a key input to the PCF products listed in section 1.3. It is a direct input to the analysis undertaken in the ASR and within this report. The scheme transport model is developed using the traffic data as input, and the model is an output during PCF Stage 1, the details of which are recorded within the LMVR. An appropriate level of traffic data is required to ensure that current and subsequent stages of the scheme development process are based on sufficient data.

All subsequent products use the data either directly or indirectly, through its application within the transport model suite for the development and appraisal of the scheme. Outputs from the transport model and the forecasting process inform the economic assessment, the AST, and related environmental studies, in particular associated with air quality and noise scoping and assessment. A more detailed description of the scope of the appraisal activities in PCF Stage 1 is recorded within the ASR.

2.3 Use of survey data

A number of different types of data are to be collected as part of the scheme development process, as summarised in section 1.1. The key uses of the different types of survey data are set out below in Table 2-1.

Type of Data	Overview of Key Uses
Volumetric data (link)	- Establish baseline link volume conditions including identification of peak hours - Independent set of volumetric data for model validation
Volumetric data (junction turning)	- To review the performance of the transport model at a turns level at the A12 junctions - An input to the development of operational models to assess the performance of the A12 junctions
Vehicle classification data	- To provide data that is compatible with the vehicle types represented in the traffic model - Independent set of volume data for model calibration and/or validation by vehicle type
Automatic number plate recognition	- To establish an understanding of movement patterns within particular areas including major towns and along the A12 - To provide additional comparison data for checking the assigned trip matrices - To calculate A12 journey times as an independent check against Trafficmaster journey time data
Telefonica data	- To develop observed Origin-Destination trip matrices representing highway demand in the transport model - Trip purposes information to be used in the highway model demand development
Journey time data	- Trafficmaster data for model validation of journey times along selected routes - HATRIS Journey Time Data Base (JTDB) journey time data to use as further check of Trafficmaster data
Origin – destination data (Trafficmaster)	- As input to the development of LGV matrices for the transport model
DfT base year freight matrices	- As input to the development of HGV matrices for the transport model
Stats19 collision data	- To guide the scheme development process with regard to locations of collision clusters - To be used in conjunction with the DfT software COBALT to derive the accident benefits of the scheme

Table 2-1: Outline use of survey data

The combined set of existing traffic data that has been collated from different sources and new survey data will be used to construct, calibrate and validate the 2016 base year model for the A12 improvement scheme. Using this model as a base, future traffic growth forecasts and housing and employment development information will be collated to develop a future scenario of the proposed opening year of the scheme and a projection 15 years hence.

2.3.1 Further model development

The ASR for the scheme sets out the scope of model to be developed. We envisaged that the data obtained and collected for the purposes of the transport model development will be sufficient for this and later PCF stages. However, this is subject to the outcomes of the transport model development at PCF Stage 1 which will be reported in the LMVR. Any need to further refine the model including the collection of additional data to inform these refinements, will be reviewed and progressed at the next stage of scheme development.

3. Summary and review of existing data

3.1 Existing data review

Before undertaking the initial assessment of the data requirements for the A12 model, existing traffic data were identified from various sources including previous and ongoing modelling work. The use of any data needs to be within the standards outlined our Traffic Appraisal Modelling and Economics (TAME) division advice note '*Roads Investment Strategy 1 – PCF Stage 1 Modelling Requirements'* (June 2015). The guidance states that in relation to data quality factors the following should be considered:

- **Age of data**: Whilst WebTAG indicates that matrices with supporting survey data greater than six years should be the subject of extensive redevelopment work; this will be relaxed to 10 years.
- **Journey purposes**: Where data has been sourced without detail of journey purposes, a variety of methodologies are possible, proportionate to the time restrictions being faced. Under severe restrictions, the application of national average splits at a matrix level appropriate to the time of day (sourced from the WebTAG data book) can be considered. If time constraints are less severe, application of splits derived from extant models on an individual zonal (or collection of zone) basis would be preferable. Additional methodologies may be agreed with the relevant ACO.
- **'Big data'**: Although the final outputs from the national matrix project are unlikely to be available in the timescales required by schemes within PCF Stage 1 at the beginning of RIS1, early person-trip matrices sourced from the national matrix project may be available for schemes of particular importance. Otherwise, other available extant matrices based on big data, developed for other historic or current schemes may be of use to individual schemes.

The potential useful data sources identified as part of the review process are discussed in detail in the following sections. Existing traffic count data is described, followed by a brief description of other data sources including trip data, journey time data and geometric and operational data.

3.2 Existing traffic data

The locations of existing traffic count data were established and reviewed as part of the process of developing the specification for the transport model, as reported in the ASR. A significant amount of volumetric traffic data covering the study area is available sourced from automatic traffic counts (ATC) and manual classified traffic counts (MCC).This information was obtained from different sources, which are as follows:

- HATRIS ATC data set.
- Permanent or temporary ATC and MCC sites supplied by Essex County Council, (ECC).
- Data from the ongoing A120 Braintree to A12 study.

The location of the existing available count data is shown in Figure 3-1. A summary of the existing traffic data including type, collection date range and OS Grid Reference is presented in Appendices B to D.

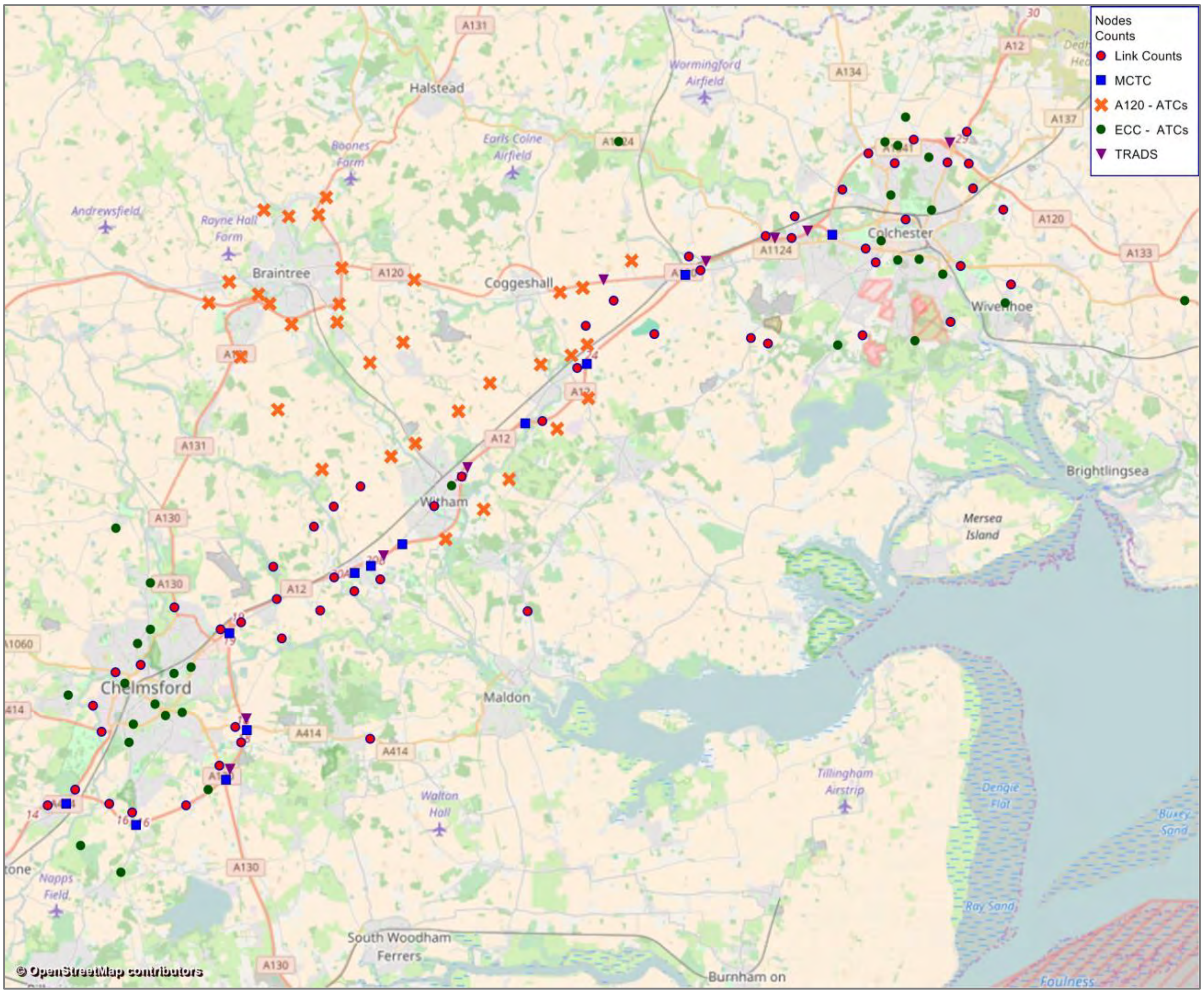

Figure 3-1: Locations of existing volumetric traffic data

Traffic count data from the volumetric count sites range from a collection period between 2014 and 2016, for all time periods of the day, for both weekdays and weekends and are considered to provide a useful recent dataset for a number of key corridors within the study area. Any counts identified from the year 2013 or before were not taken forward for consideration as part of the data review exercise and only ATC data was used from the A120 and ECC data sources.

3.2.1 Volumetric data

The three sources of existing volumetric data are described below, in further detail. Appendices B to D sets out the locations where data has been obtained and provides a key summary of the traffic information including AM, inter-peak (IP) and PM peak hour flows, average daily traffic flow, and % of heavy / long vehicles, where available. The volumetric data is intended for use in establishing baseline traffic conditions and in transport model calibration or validation.

3.2.1.1 HATRIS (37 sites)

The HATRIS database was examined to establish data availability for the purposes of this study. Continuously recorded traffic data was extracted for the neutral month of May 2016, consistent with the month during which the main additional survey programme was planned for completion.

The HATRIS count data is broken down into three vehicle length classes, <5.2m, 5.2 – 6.6m and >6.6m. Any estimate of vehicle classification will be obtained from fully vehicle-classified counts rather than from HATRIS sites as the length divisions don't necessarily represent the actual vehicle classification.

3.2.1.2 Local Authority (ECC) (40 sites)

A database of traffic count information has been made available by ECC. The data generally comprises ATCs and classified turning counts (CTCs) collected by/on behalf of the Council. ATC counts are available at a number of locations throughout Essex, with data recorded at both permanent inductive loop sites as well as temporary sites recorded on an ad-hoc basis. Temporary counts have typically been carried out for a 7 or 14 day period.

CTCs have been undertaken at key junctions, generally on an annual basis. The CTCs are typically undertaken for the 12-hour period between 07:00 and 19:00 hours, or in some instances the counts are limited to peak periods. The data is recorded in 15-minute intervals, typically using a standard 10 category vehicle classification.

3.2.1.3 A12 Braintree to A12 study (38 sites)

The A120 study undertook data collection for the purposes of informing transport model development for that particular scheme. The data collected as part of the study is broken down into the same length divisions as for the HATRIS data. The data obtained for the purposes of this study is limited to counts undertaken in April 2016 only.

3.3 Other existing data

3.3.1 Trip data

For the purposes of this project, mobile phone origin-destination data has been made available from Telefonica. The same data is being used in the development of our Regional Transport Models. The data provides[6] fully observed movements at a Census Middle Super Output Area disaggregation. The processes applied to the mobile phone data to enable assignment within the A12 model are detailed further in the ASR. Section 6.3.1 provides more detail regarding the dataset.

This dataset is provided as a complete alternative to RSI information. No recent RSI data was identified within the study area as part of an initial review of information.

3.3.2 Journey time data

A number of existing sources of journey time data are available. Journey time data is traditionally used for the purposes of understanding baseline transport conditions and for validating transport models.

The DfT provide data purchased from Trafficmaster containing global positioning system (GPS) derived journey times of vehicles. This dataset is made available to various parties including local authorities. Travel times for particular routes can be derived from this data based on a specification of links in the Integrated Transport Network (ITN). Journey times along a defined route are produced based on a collation and aggregation of data for individual ITN links along the route. This data set is recorded continuously, and is available for all primary and secondary road links across the UK. This data provides a large vehicle sample which can help to provide a statistically accurate representation of existing journey time conditions. The data available for the purposes of this study covers the average weekday in the neutral months of September – October 2014 and April – June 2015.

In addition to the DfT Trafficmaster data, journey time data was also taken from our Journey Time Database (JTDB) which provides information for different sections of the motorway. This data will be further used to compare with the journey time data obtained from Trafficmaster

[6] Highway England, 2015. *Regional Model Matrix Development: Consistent Approach Towards using Provisional Data.*

3.3.3 Geometric and operational data

A variety of standard mapping sources are available for use under the appropriate license arrangements for the purposes of scheme development and transport modelling. These include:

- Ordnance Survey (OS) Mastermap tiles.
- Freely available OS mapping products.
- Google Earth / Maps and Streetview.
- AA route planning software.

Site observations supplement and confirm the accuracy of the mapping sources used. The mapping information will be used for a number of purposes including network model building, operational assessment of junctions and reviewing the plausibility of journey routing.

3.4 Source quality and model risk

Once potentially useful data sources were identified they were reviewed to identify which existing data was suitable for use for the purposes of this project. An initial set of criteria to identify potentially suitable data sources is outlined below.

- Data should be from a neutral month in 2016, 2015 or 2014 to align with data required for model development as outlined in the ASR.
- There should be at least one week's worth of continuous data.
- The location of the counts should be relevant to towns, villages or key routes that would be suitable for use as screenlines / cordons or as separate model validation sites.

Based on the criteria listed above, those counts which match the criteria were selected and processed to be used prior to the data quality checks described later in this report.

Some of the Local Authority (ECC) link count sites were collected and processed in hourly intervals only and therefore incompatible with the peak hour selected for the purposes of the transport model (see 6.3.1). For these sites, the AM peak hour traffic volume was estimated by modifying the 07:00 – 08:00 data by an adjustment factor determined by comparison of the AM peak and 07:00 – 08:00 data from nearby link count sites with 15 minute data and similar traffic profiles.

The traffic data that was collected in 2015 and 2014 was converted to 2016 values by applying a factor calculated from comparisons of nearby historic count data with data from the same location for May 2016. Separate factors were calculated for AM and PM peaks and Inter-peak periods. Where factors were found to be outside of a specified range, the 2015 or 2014 data was then discarded on the basis that it was considered unrepresentative of 2016 traffic conditions.

The trip and journey time data sources are provided as generally accepted forms of data for the purposes of model development. The checking process for the journey time data is described later in this document.

Based on the review of existing data and consideration of potential use of existing model data, the suitability of the coverage of the data was reviewed against the data requirements including the proposed screenlines and cordons presented in the ASR. It was decided to collect additional data to address gaps identified in the data coverage. The new data collected as part of this study is discussed further in section 5.

4. Use of available traffic models

4.1 Existing traffic models

The development of the modelling strategy described in the ASR began with a review of existing modelling tools. There are known to be a number of existing and emerging models which include the A12 within their modelled network; our new South East Regional Transport Model (SERTM), our East of England Regional Model (EERM), and the ECC Chelmsford and Colchester models.

SERTM is being built for the specific purpose of informing the development of RIS schemes, however the base and forecast models are not yet available and only limited interim information is presently available from these models. EERM has been updated and is available via a 'Tier 1' release. Once SERTM is in place this model will supersede EERM as the primary regional modelling tool. The Chelmsford and Colchester town-wide models are owned by Essex County Council (ECC) and include particular sections of the A12 within the model networks. These ECC models have been shared with us for the purposes of the RIS study process.

The updates to EERM, a regional model which includes the full extent of the A12, have been undertaken for the specific purposes of the RIS programme. As part of this commission, all RIS schemes are being coded into the model to assess cumulative impact.

Whilst the EERM and SERTM model are being developed / updated for the purposes of RIS scheme modelling, the models are regional and therefore have been built with a relative lack of detail in specific local areas. Zoning systems are broad; and model calibration and validation processes have sought to ensure a good overall fit with observed data across the region, at a strategic level only.

A review of the existing EERM, Chelmsford and Colchester models that are within the proximity of the study area has been carried out with a view to analysing their potential use within the current study. The three models were reviewed in terms of their age, geographic coverage and forecast years. In addition, the calibration/validation results of each model were reviewed for links on the A12. The purpose of this model review was to inform decisions about the most appropriate methodology for PCF Stage 1 scheme assessment.

4.2 Use of existing model information

In consideration of the review of existing models and the specification and scope of work required for PCF Stage 1, the following conclusions are drawn.

- The models described above are either broad regional models or urban-focused models and none of these models are designed to be suitably scheme specific. It is therefore considered unlikely that any one such model could be directly used as the sole tool for the modelling and appraisal of the A12 scheme.
- The SERTM model is not yet available for use within the timescales for the development and appraisal of the A12 scheme. However, certain elements of the input data to SERTM are available (trip data, model zoning systems and networks), and these have been taken forward into the methodology for the development of the transport model.
- The current update to EERM (Tier 1) was intended to provide a model which better meets some of the specification but we have concluded this model is not suitable for the purposes of the A12 scheme.
- The existing Chelmsford and Colchester models have significant limitations, in particular the age of data and the extent of the model networks. However, the model networks have been considered useful and taken forward as inputs into the network building for the A12 model.

5. Traffic surveys

5.1 Survey specification

A traffic survey specification was developed following the collation and review of existing data sources, and alongside the production of a methodology for transport model development. The survey specification required for production of the transport model has been agreed in the ASR, and is reflected in this report. The general purpose of the surveys is summarised in Table 2.1.

The traffic survey programme comprises of link counts, CTCs, journey time surveys, ANPRs and queue surveys. The full list of surveys is presented in the appendices to this report.

5.1.1 Link counts

The collection methodology for the link counts is to use inductive-loop based automatic traffic count technology or high-mast video technology (in particular for sites on the mainline A12). Each site monitors traffic volumes in both directions and categorises by vehicle type and vehicle speed.

Figure 5-1 illustrates the locations of the link count surveys.

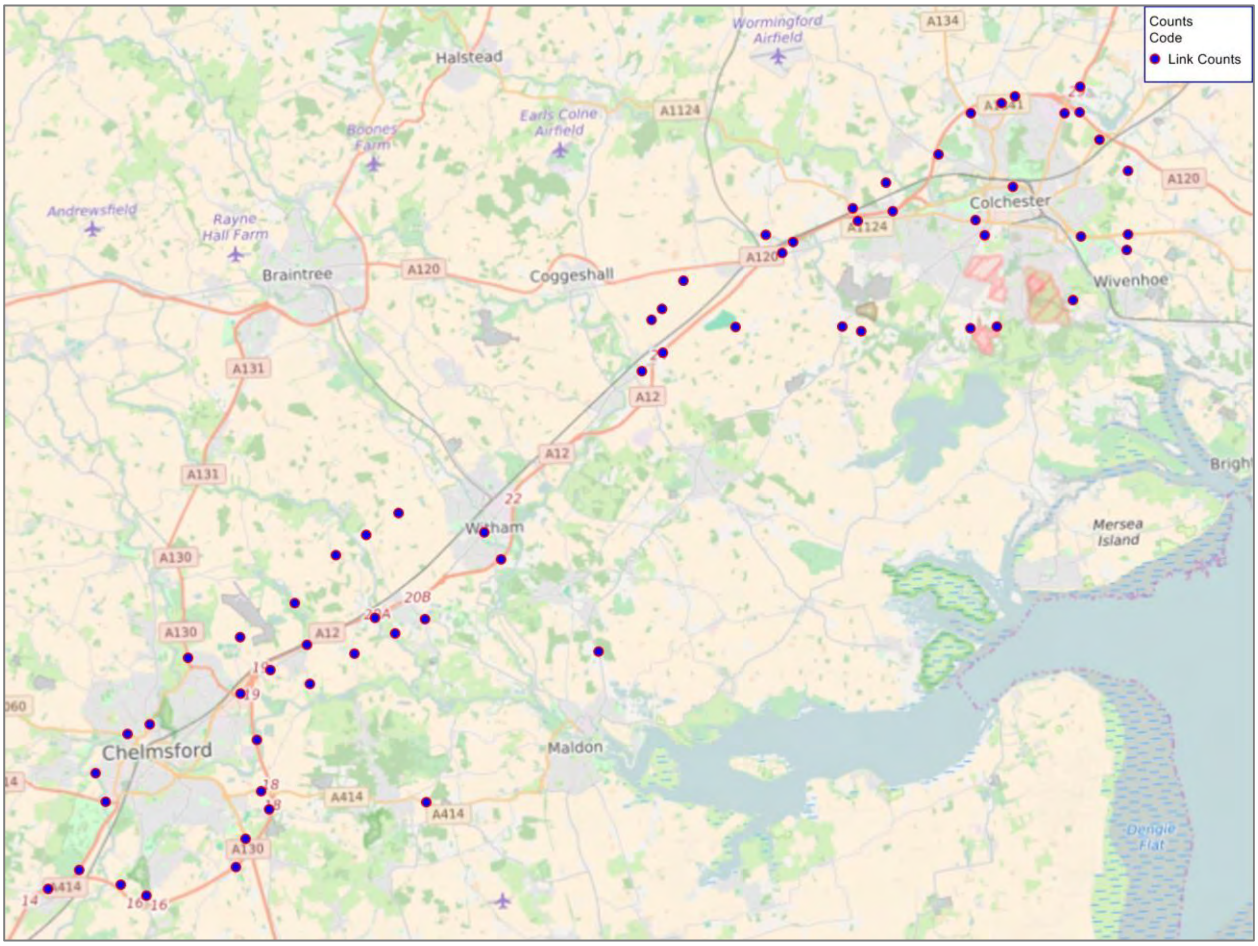

Figure 5-1 : Link count surveys

5.1.2 Classified turning counts

The turning counts are captured using high-mast video technology. The turning count surveys have been undertaken on a single day for 12 consecutive hours (07:00 – 19:00) during a typical neutral week during May, undertaken during the same time as the programme of link counts. The turning counts include all major junctions of the A12 inclusive of and between junctions 19 and 25 and extend further beyond the immediate area of the scheme to junction 15 towards London.

Expansion factors calculated from the ATCs will be used to convert the manual count 12 hour totals into flow figures that represent traffic in an average 24 hour period, or annual average daily flow (AADF).The turning count survey locations are presented in Figure 5-2.

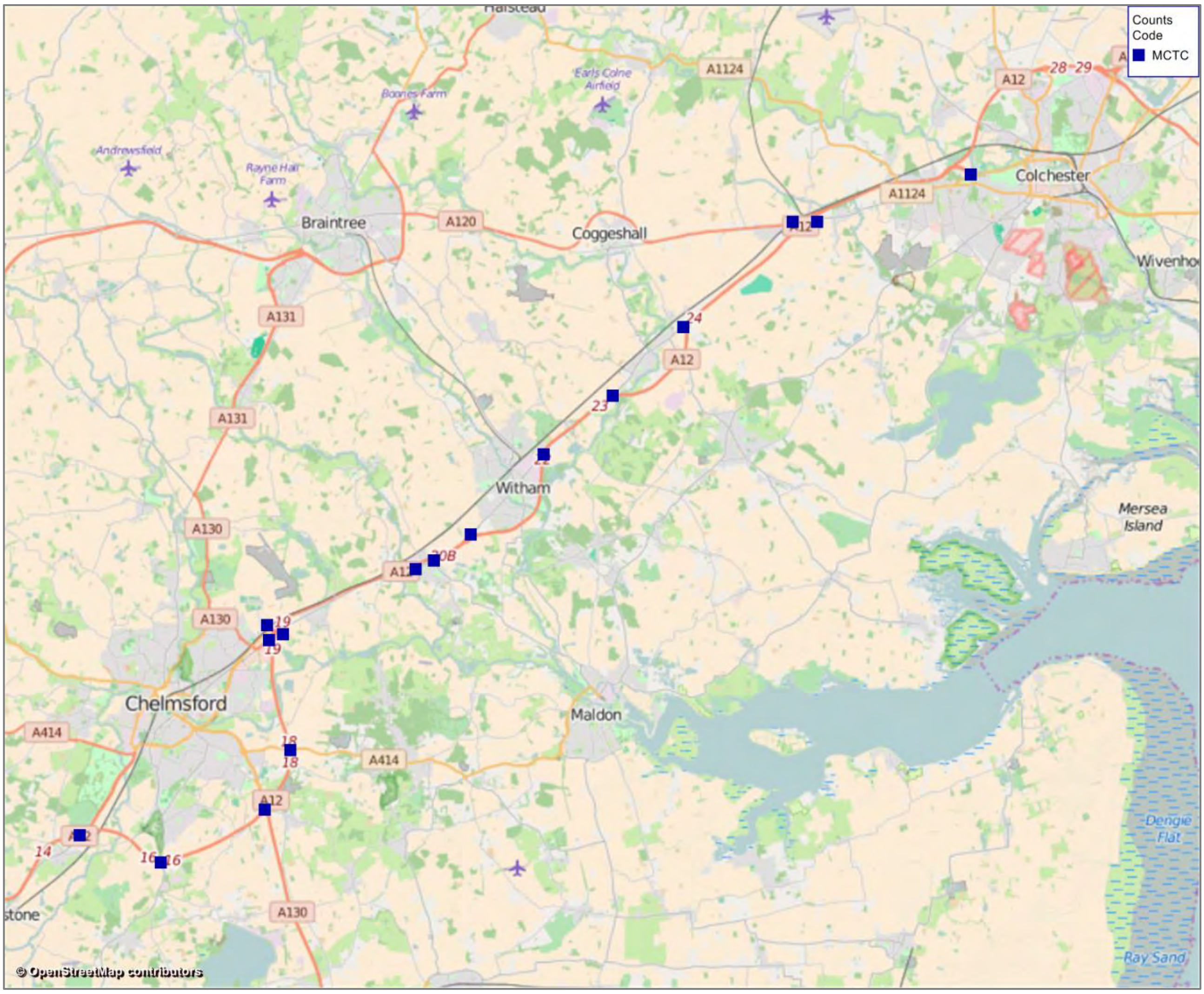

Figure 5-2 : Classified turning count surveys

5.1.3 ANPR surveys

A programme of ANPR surveys was undertaken to capture data at a series of locations along the A12 mainline, and around a cordon reflecting the urban area of Chelmsford. The ANPR survey locations are presented in Figure 5-3. The survey output provides journey time and journey pattern information. This survey was carried out on a weekday during a neutral month, on the 24th May. The ANPR surveys were accompanied by a 12-hour volumetric traffic count which was undertaken for the purposes of establishing ANPR sample rates only. Further details of the data set are presented in section 6 of this report.

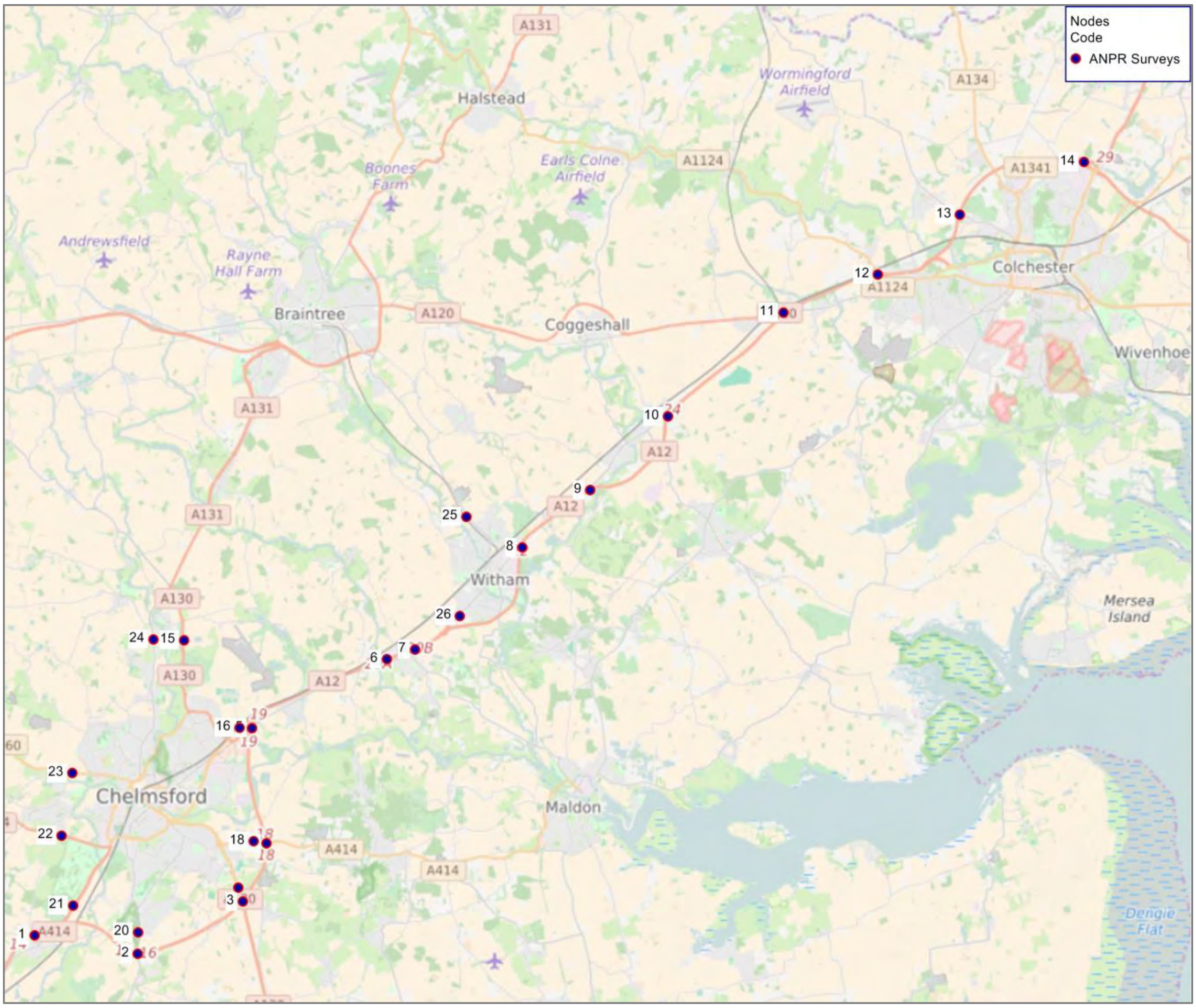

Figure 5-3: ANPR surveys

5.1.4 Queue length surveys

Queue length surveys were carried out to assess the operational performance of the junctions on the A12, from junctions 19 to junction 25, and to calibrate the junction performance within the A12 strategic model. The locations that were surveyed include all numbered mainline junctions from 19 to 25. The surveys were conducted on 10th May between 07:00 – 19:00 covering morning, inter-peak and evening peak periods. Further details of the queue length surveys can be found in section 8.2.1.

5.1.5 Survey programme

Table 5-1 presents an overview of the survey programme. The survey data is captured over a two week period largely during May 2016, reflecting a neutral period. A number of further link count surveys were specified after the initial survey period based on further knowledge gained during the scheme development process. These additional surveys were collected over a two week period in June / early July 2016.

Data type	Survey Method	Survey Dates
Link Counts	ATC (pneumatic tube)	03/05/2016 – 25/05/2016
	ATC (pneumatic tube)	20/06/2016 – 10/07/2016
	High-mast video	03/05/2016 – 31/05/2016
Classified Turning Counts	High-mast video	10/05/2016
Queue Length Surveys	High-mast video	10/05/2016
ANPR	Video	24/05/2016

Table 5-1 : Survey programme

A number of issues were reported during the collection of link count data at sites 6, 7, 18, 19 and 25 (see appendices) including damage to traffic counting equipment. In response, the survey dates were extended at these locations in order to capture a suitable duration of data.

5.1.6 Vehicle classification

As part of the specification for the survey programme, vehicles were categorised into the following classifications depending on the data type and survey method which are shown in Table 5-2:

Vehicle Classification		
ATC (pneumatic tube)	High Mast Video	Video (ANPR)
Pedal Cycle	Pedal Cycle	n/a
Motor Cycle	Motor Cycle	Other
Car	Car	Car
LGV	LGV	LGV
Buses	Buses	Buses
Rigid 2 Axle	OGV1	OGV1
Rigid 3 Axle		
Rigid 4 Axle	OGV2	OGV2
Artic 3 Axle		
Artic 4 Axle		
Artic 5+ Axle		

Table 5-2 : Vehicle classifications

** Note 1: Local Authority (ECC) data provided with 10 vehicle classifications (as ATC (pneumatic tube) but excluding pedal cycles)*

5.2 Representative bias of surveys

WebTAG Unit M1.2 specifies that traffic surveys should be carried out during neutral or representative months of the year, avoiding main and local holiday periods, local school holidays and other abnormal traffic periods. WebTAG describes April, May, June, September, October and November as neutral months excluding:

- the weeks before and after Easter if it falls in April
- May - excluding the Thursday before and all of the week of each bank holiday
- September – excluding school holidays or return to school weeks

As such the surveys carried out above have been undertaken in the periods that WebTAG defines as neutral.

5.3 Survey results

The full list of site locations and a checked and reviewed summary of the data is presented in the appendices to this report, as set out below:

- Appendix B (data from HATRIS)
- Appendix C (data from ECC)
- Appendix D (data from the A120 study)
- Appendix E (surveyed link count data)
- Appendix F (queue length results)

The results in the appendices show the summary of counts, both from the existing data sources and the newly collected traffic data. The summary tables include the location, direction, grid reference, survey month, peak hour flows and the percentage of heavy vehicles at each count location. The data filtering, checking and review process is described in section 3.4 and in the remainder of this report.

6. Final volumetric and trip dataset

This section presents information relating to the link counts, CTCs, and ANPR data collected as part of the specification for the A12 transport model. In addition the mobile phone trip data is also described. This section includes detail related to the data quality and checking process and results. A summary of the existing traffic volume conditions within the study area based on the dataset is provided.

6.1 Summary of volumetric dataset

A summary of the total number of counts, taken forward for use in the further development of the scheme, is presented in Table 6-1. The full list of count locations and summaries of key traffic information is presented in the appendices to this report. Figure 6-1 presents the locations of the complete data set, including existing and surveyed data.

Count Source	No. of surveys by collection year				Total no. of counts
	2016 (May)	2016 (Other)	2015	2014	
Survey - Link Counts	39	26	-	-	**65**
Survey - CTCs	16	-	-	-	**16**
A120 study counts	-	38	-	-	**38**
ECC counts	-	23	15	2	**40**
HATRIS counts	37	-	-	-	**37**
Total no. of counts	**92**	**87**	**15**	**2**	**196**

Table 6-1 : Summary of volumetric dataset

6.2 Data quality and checking

Data obtained from the surveys was subject to a number of initial quality checks before the data was issued. A series of further checks were then undertaken on the data set provided by the survey company, Any data anomalies identified by the survey company, for example as a result of faulty equipment, resulted in the exclusion of that data from the dataset and the extension of the survey programme. The additional data collected by extending the survey dates was taken forward for checking and supply. It was reported that weather conditions were generally fine during the survey periods and no weather related issues were reported that may have resulted in a significant issue for the validity of any particular count data.

Inter- junction checks were carried out between any nearby sites of either the same type or different survey type (CTCs, ATCs, ANPR). The inter-junction check files highlight any large differences between sites, and where differences are found, files are annotated with comments showing reasons for differences, e.g. an accident, so that the user of the count data has full knowledge of noted data issues and the reason for those issues. The traffic flows were then manually checked by a data analyst using a graphical representation of the flows for each separate day which shows any unusual peaks or troughs, and a comment in explanation of any unusual flow is added. All data was then rechecked by the quality checking department, including the inter-junction check files, prior to release.

In addition to the checks that were carried out by the survey company, further or repeat checks were carried out by reviewing profiles to check inconsistencies in flow patterns, for instance to identify if an inter-peak count is greater than the count for the AM and PM peak hours, and to review the tidality of the data in order to establish if any of the data is incorrectly labelled.

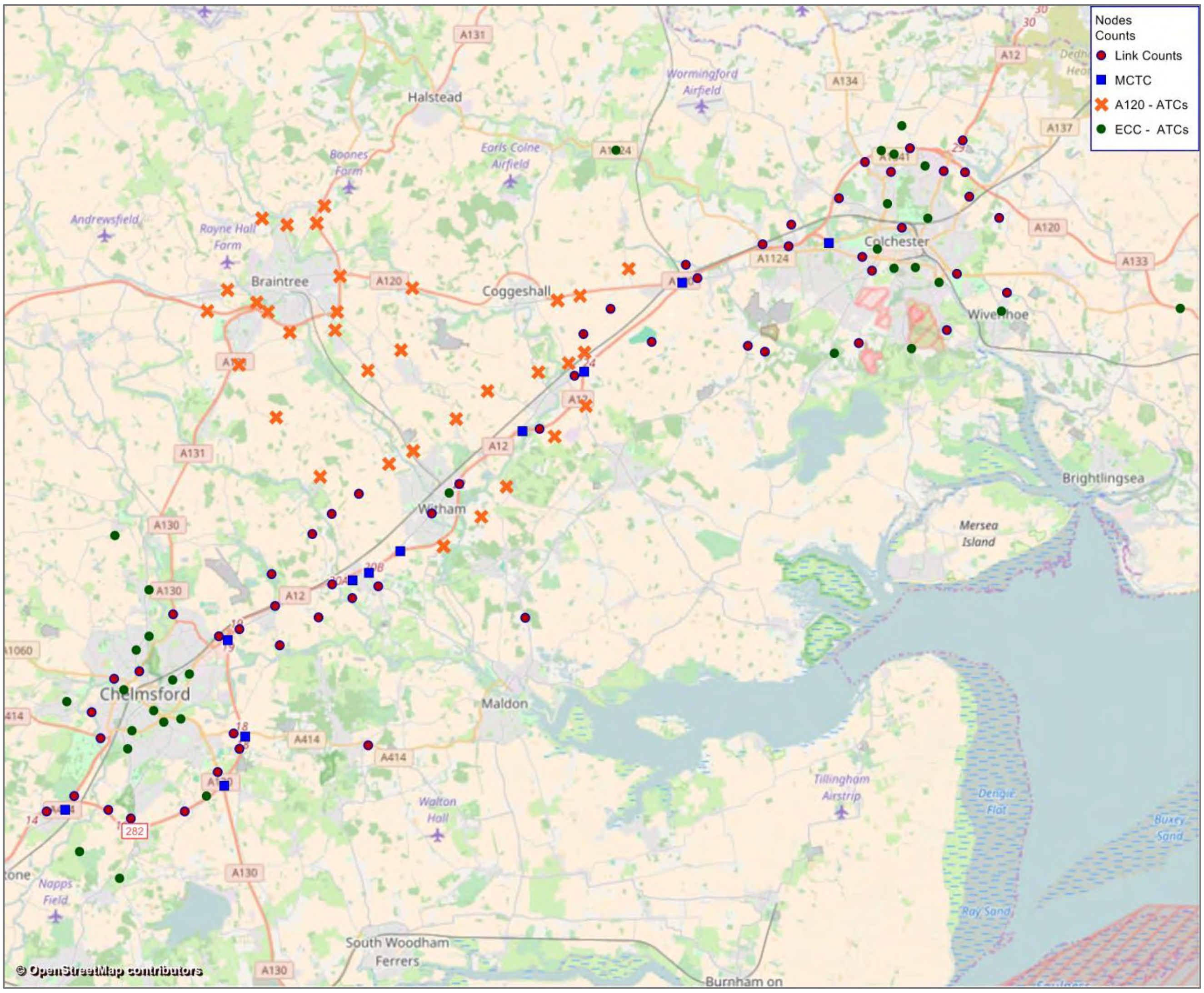

Figure 6-1 : Location plan of final volumetric dataset

6.2.1 Consistency checks

Two sets of consistency checks were undertaken on the dataset. First, the data for key local authority roads adjacent to junctions on the A12 were reviewed. These are locations where a CTC and a corresponding link count were available. The purpose of the check was to confirm that the traffic volumes recorded by the CTC were representative of the average two-week link volumes recorded by the corresponding link count for the comparable location. The results of this check are presented in Table 6-2.

The comparison for the tests covered the AM, and PM peak hours and the IP period. For the large majority of all count comparisons the difference between the CTCs and ATCs is less than 10% or within a level of difference which can be considered related to count accuracy and/or daily variation. Where counts are identified to compare outside of a 10% tolerance level, these counts have been investigated further.

Link location	Direction	ATC count			Turning count			Difference %		
		AM	IP	PM	AM	IP	PM	AM	IP	PM
A414 Three Mile Hill	NEB	1516	785	1068	1539	758	988	2%	4%	8%
A414 Three Mile Hill	SWB	1118	779	1356	1126	777	1325	1%	<1%	2%
B1007 Stock Rd	NB	486	367	841	491	362	792	1%	1%	6%
B1007 Stock Rd	SB	769	383	512	780	386	509	1%	1%	1%
A114 Southend Rd	NB	1739	732	983	1571	734	1098	11%	0%	12%
A114 Southend Rd	SB	1113	763	1443	1131	778	1498	2%	2%	4%
A138 Chelmer Rd	SB	1646	709	1035	1544	705	1039	7%	1%	<1%
B1137 Main Rd	EB	229	373	621	239	376	702	4%	1%	11%
B1137 Main Rd	WB	678	418	473	707	438	491	4%	5%	4%
B1024 London Rd	NEB	412	250	392	384	238	377	7%	5%	4%
B1024 London Rd	SWB	378	256	456	344	259	418	9%	1%	9%
B1408 London Rd	EB	365	376	609	390	350	600	7%	7%	1%
B1408 London Rd	WB	511	311	396	618	300	428	21%	3%	8%
A120 Coggeshall Rd	EB	989	915	1046	1103	905	1127	12%	1%	8%
A120 Coggeshall Rd	WB	1207	931	1158	1179	946	1210	2%	2%	4%

Table 6-2 : Local authority road data consistency checks

Where count comparisons reveal differences between the link and CTC count of greater than 10%, an adjustment will be made to the turning count when used in strategic or operational modelling. For example, the data comparison for the B1408 London Road showed a larger discrepancy in a WB direction during the AM peak. The turning count, which was performed on a single day, showed 100 additional vehicles entering the roundabout than the 14-day average ATC would suggest, which may be due to a traffic incident or other anomaly on the day the turning count was carried out.

A second consistency check was undertaken to assess the consistency of traffic volume data collected for the A12 mainline using the link count data and HATRIS data. The purpose of the check was to confirm the traffic volumes recorded by link counts (pneumatic tubes and high-mast videos) were consistent with the two-week link volumes recorded by the corresponding HATRIS link counts for the comparable location. The results of this check are presented in Table 6-3.

Link location	Direction	HATRIS count			Survey link count			% Difference		
		AM	IP	PM	AM	IP	PM	AM	IP	PM
A12 J14 - 15	NB	2663	2142	3187	2747	2160	3203	3.2%	0.8%	0.5%
A12 J17 - 16	SB	2952	1838	2388	2930	1811	2407	0.7%	1.5%	0.8%
A12 J19 - 18	SB	3494	2444	3389	3372	2445	3340	3.5%	0.1%	1.5%
A12 J20a - 19	SB	4133	2286	3143	4130	2311	3088	0.1%	1.1%	1.7%
A12 J23 - 24	NB	2400	1926	2906	2434	1945	2942	1.4%	0.9%	1.3%
A12 at J25	SB	3621	2582	3417	3564	2580	3445	1.6%	0.1%	0.8%
A12 J30 - 29	SB	2891	1620	2420	2788	1642	2449	3.6%	1.4%	1.2%

Table 6-3: A12 traffic data consistency checks

The results from the consistency check showed minimal difference in the range of 0.1% to 3.6% or within a level of difference which can be considered related to count accuracy and/or daily variation at different sections along the A12 mainline.

6.3 Existing traffic conditions

This section sets out a review of initial traffic conditions on the A12, consistent with the data analysis undertaken as part of the OAR and SOBC produced at PCF Stage 0. In addition, a more detailed review of the peak profile has been undertaken in order to establish the peak hour that the transport model will reflect.

6.3.1 Traffic profile and peak hour

A total of 34 Automatic Traffic Counts (ATC) and 30 video-based Manual Classified (MCC) link counts have been used to establish the peak hour and their locations are presented in Appendix E.

Counts on Tuesdays, Wednesday and Thursdays were averaged to calculate an average traffic count for that particular time period. Monday and Friday were excluded from the analysis as traffic flows on those two days can deviate from a typical weekday average. Counts on Saturdays and Sundays were also excluded as the model will represent the average weekday. Tables presenting the two week, two-way average traffic flow for all the link counts in the study area during the AM and PM peak periods are included in Appendix E. The two week average traffic flow for the link counts on the A12 during the AM and PM peak periods is presented in Tables 6-4 and 6-5.

The tabular data is also presented as figures illustrating the traffic volume profile across peak periods. The information shows the fifteen minute two way traffic flow as a percentage of the total flow over the whole three hour peak period. Figures 6-3 and 6-4 represent all the link counts in the study area and Figures 6-5 and 6-6 represent the counts on the A12 only. The time period shown on the x-axis is the ‘quarter hour beginning’, i.e. 07:00 represents the period 07:00 – 07:15.

Time	Site								
	MCC_5	MCC_7	MCC_10	MCC_14	MCC_15	MCC_18	MCC_20	MCC_23	MCC_27
07:00-07:15	1199	1097	1679	1691	1393	1345	1790	1864	1355
07:15-07:30	1232	1111	1716	1773	1406	1296	1828	2017	1443
07:30-07:45	1244	1175	1741	1903	1412	1280	1777	2177	1582
07:45-08:00	1165	1126	1630	1800	1485	1257	1914	2199	1489
08:00-08:15	1161	1099	1592	1813	1436	1313	1713	1990	1364
08:15-08:30	1116	1114	1651	1803	1435	1201	1725	2113	1464
08:30-08:45	1044	1056	1596	1651	1338	1182	1663	2118	1448
08:45-09:00	958	988	1517	1543	1294	1022	1472	1863	1231
09:00-09:15	991	975	1424	1421	1118	1024	1378	1629	1139
09:15-09:30	894	851	1309	1365	1129	993	1409	1575	1138
09:30-09:45	896	839	1319	1305	1050	1012	1445	1604	1059
09:45-10:00	817	776	1241	1296	1123	1043	1450	1588	1066

Table 6-4: 2 weeks average traffic volume, 07:00-10:00 (A12 counts)

Time	Site								
	MCC_5	MCC_7	MCC_10	MCC_14	MCC_15	MCC_18	MCC_20	MCC_23	MCC_27
16:00-16:15	1126	1081	1639	1671	1327	1236	1700	1930	1373
16:15-16:30	1208	1136	1726	1743	1393	1265	1798	2073	1396
16:30-16:45	1149	1107	1682	1742	1428	1340	1765	2053	1504
16:45-17:00	1200	1128	1731	1745	1263	1311	1776	2160	1523
17:00-17:15	1157	1114	1678	1810	1267	1263	1782	2154	1566
17:15-17:30	1217	1097	1564	1724	1375	1307	1872	2293	1612
17:30-17:45	1214	1104	1553	1715	1385	1295	1835	2222	1554
17:45-18:00	1170	1081	1507	1566	1276	1230	1826	2160	1496
18:00-18:15	1081	975	1422	1370	1226	1160	1644	1853	1304
18:15-18:30	985	856	1340	1275	1120	1042	1530	1747	1223
18:30-18:45	942	834	1281	1191	969	945	1392	1525	1046
18:45-19:00	873	800	1150	1101	848	765	1209	1318	873

Table 6-5: 2 weeks average traffic volume, 16:00-19:00 (A12 counts)

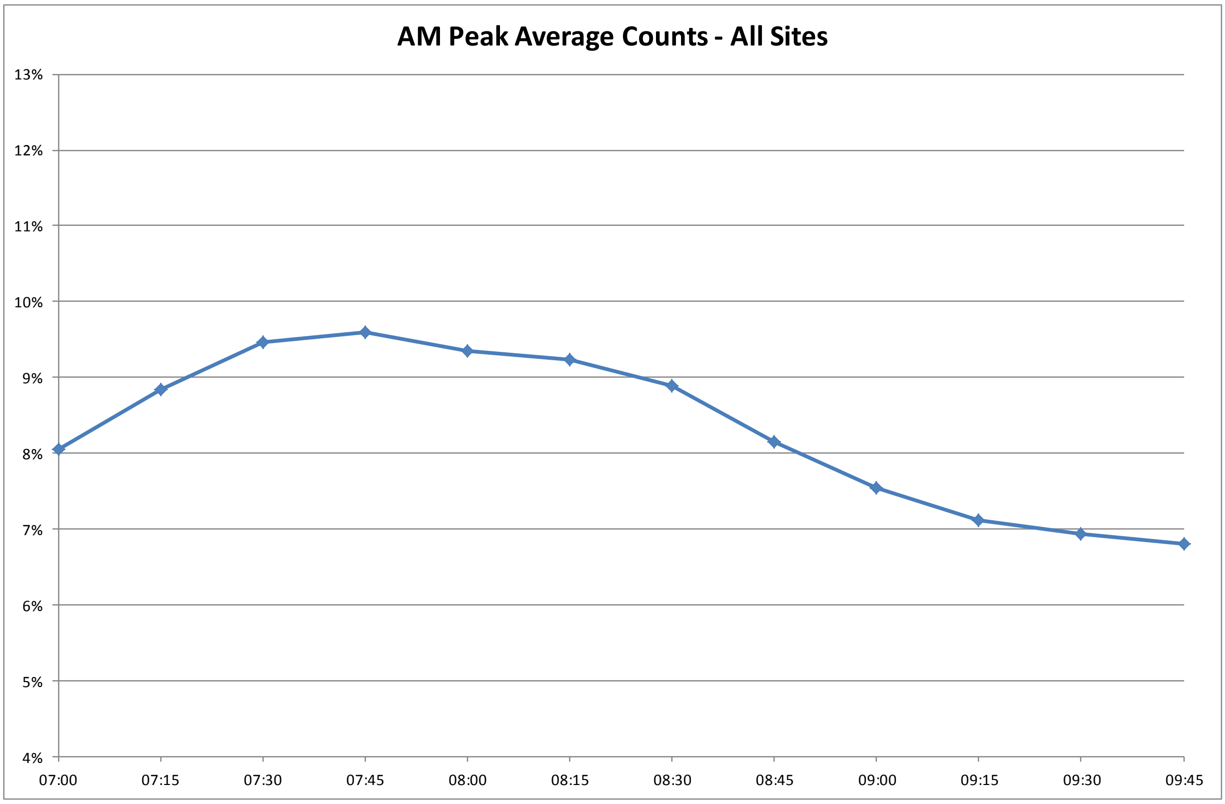

Figure 6-2: Average flow against time, 07:00-10:00 (all sites)

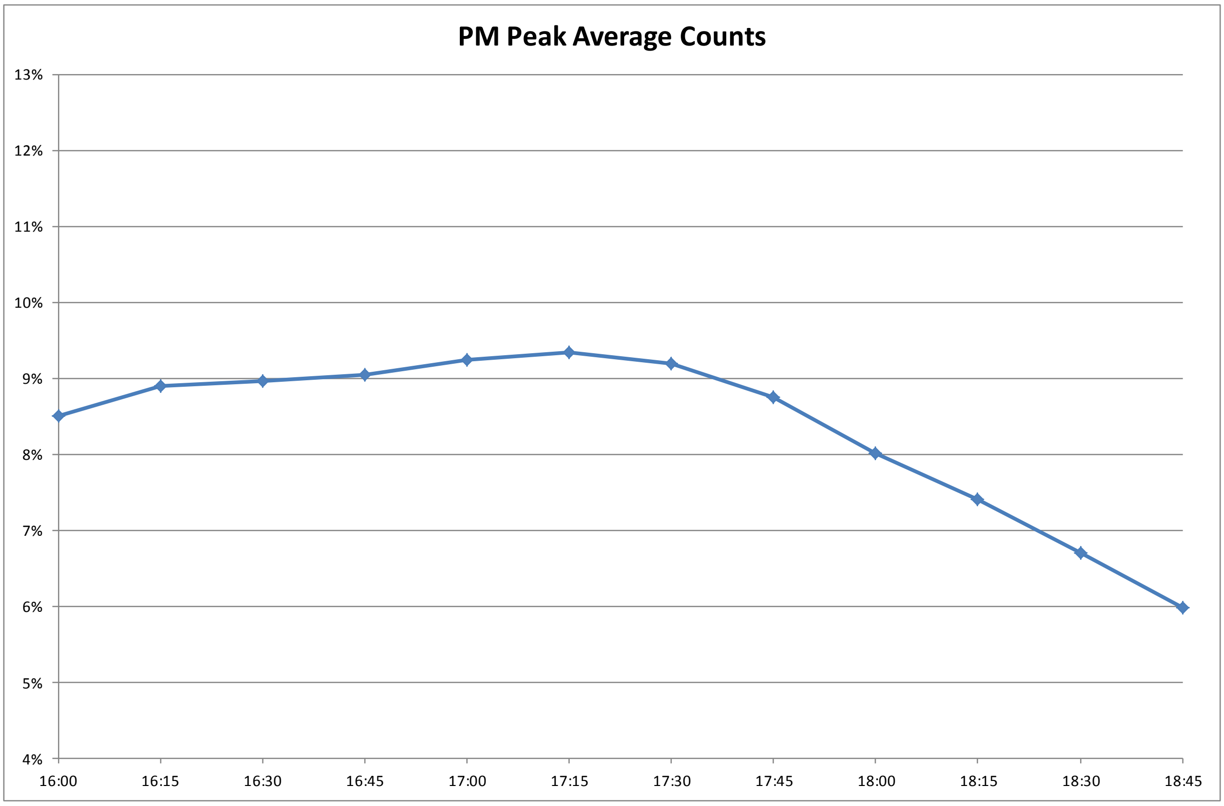

Figure 6-3: Average flow against time, 16:00-19:00 (all sites)

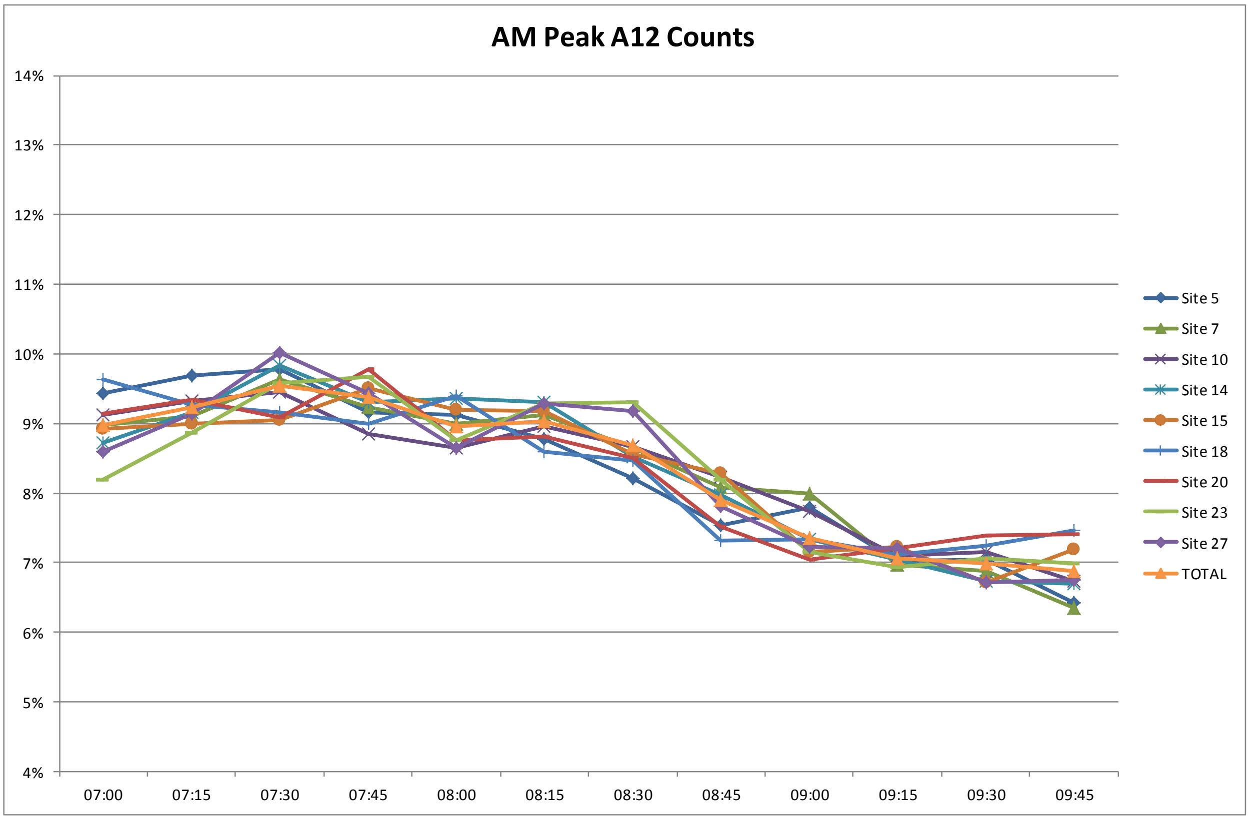

Figure 6-4: Average flow for each site against time, 07:00-10:00 (A12 sites)

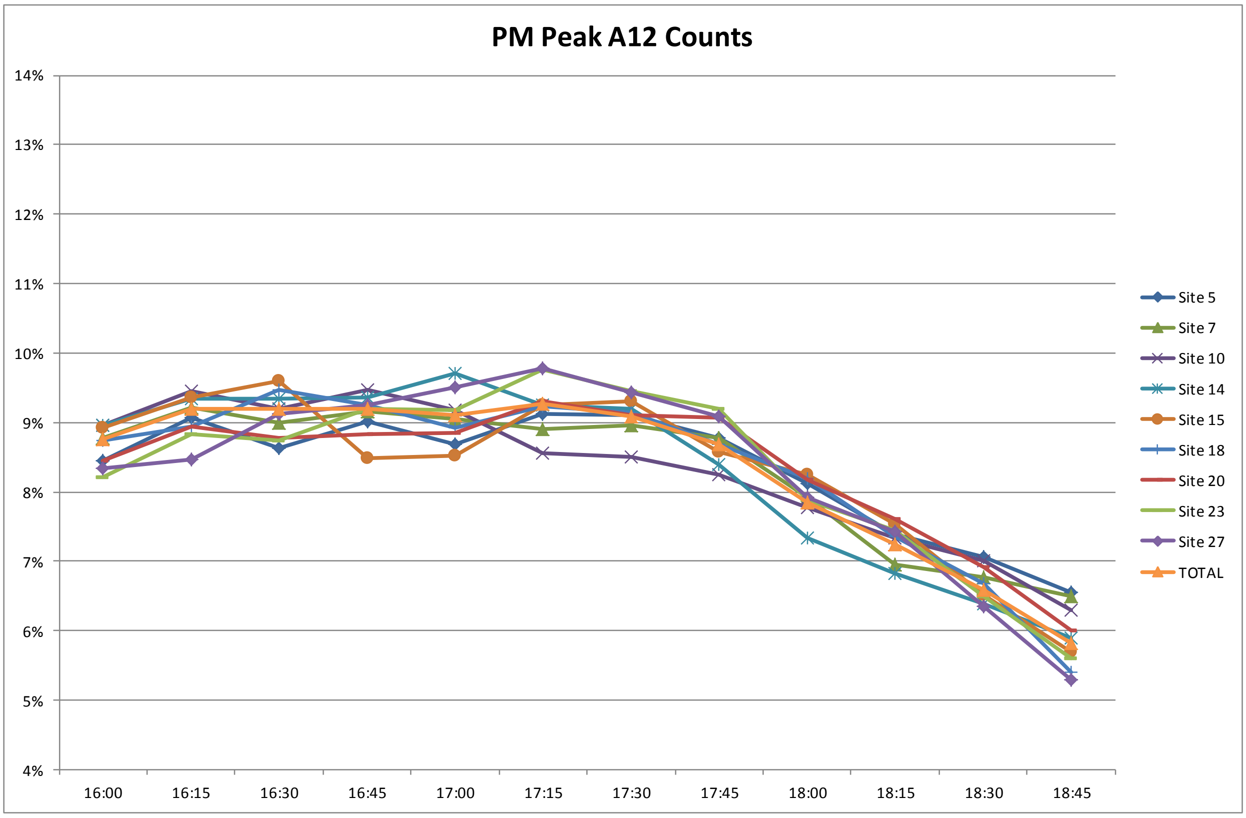

Figure 6-5: Average flow for each site against time, 16:00-19:00 (A12 sites)

In addition, the rolling hourly flow was calculated where four successive 15 minute periods are added to make an hour. For example the rolling hourly traffic flow for the time period 07:00-08:00 is the sum of counts for the periods 07:00-07:15, 07:15-07:30, 07:30-07:45 and 07:45-08:00. Tables 6-6 and 6-7 below show the rolling hourly traffic flow for all the count locations for both AM and PM periods and Table 6-8 and Table 6-9 show the data for the A12 sites.

Time	Total Two-way Counts	% Difference from Maximum
07:00-08:00	108924	4.49%
07:15-08:15	112839	1.06%
07:30-08:30	114049	-
07:45-08:45	112301	1.53%
08:00-09:00	107923	5.37%
08:15-09:15	102482	10.14%
08:30-09:30	96070	15.76%
08:45-09:45	90144	20.96%
09:00-10:00	86058	24.54%

Table 6-6: Rolling hourly traffic volume, 07:00-10:00 (All Sites)

Time	Total Two-way Counts	% Difference from Maximum
16:00-17:00	109609	3.78%
16:15-17:15	111862	1.80%
16:30-17:30	113229	0.60%
16:45-17:45	113914	-
17:00-18:00	113027	0.78%
17:15-18:15	109244	4.10%
17:30-18:30	103248	9.36%
17:45-18:45	95573	16.10%
18:00-19:00	86997	23.63%

Table 6-7: Rolling hourly traffic volume, 16:00-19:00 (All Sites)

Time	Total Two-way Counts	% Difference from Maximum
07:00-08:00	55590	0.12%
07:15-08:15	55657	-
07:30-08:30	55456	0.36%
07:45-08:45	54258	2.51%
08:00-09:00	52081	6.42%
08:15-09:15	49702	10.70%
08:30-09:30	46744	16.01%
08:45-09:45	44180	20.62%
09:00-10:00	42691	23.30%

Table 6-8: Rolling hourly traffic volume, 07:00-10:00 (A12 Sites)

Time	Total Two-way Counts	% Difference from Maximum
16:00-17:00	54430	2.05%
16:15-17:15	55137	0.77%
16:30-17:30	55461	0.19%
16:45-17:45	55567	-
17:00-18:00	55041	0.95%
17:15-18:15	53285	4.11%
17:30-18:30	50342	9.40%
17:45-18:45	46592	16.15%
18:00-19:00	42216	24.03%

Table 6-9: Rolling hourly traffic volume, 16:00-19:00 (A12 Sites)

Examination of the results from the traffic count data analysed above for the AM peak period shows a similar pattern in both charts. The percentage rises from 07:00 to a peak at 07:30 and then declines steadily. In the PM peak there is a similar pattern, the percentage rises from 16:15 to a peak at 16:45 and then declines steadily.

When considered alongside rolling hour data, the information shows that there is only a small difference (<5% difference from the maximum) between the traffic proportions and totals for all sites and for the A12 sites for the periods commencing between 07:00 to 07:45 and 16:00 to 17:15. On this basis it has been specified that the AM peak hour for the model be considered as 07:30 - 08:30 and for the PM peak the traditional peak hour of 17:00 – 18:00.

6.3.2 Traffic volumes – A12

The traffic volume analysis on the route is based on a combination of the available data sources and the main source is the link count data collected specifically for the purpose of this study. The analysis has focused on:

- average daily flow (ADT)
- percentage of heavy goods vehicles (%HGV)
- occurrence of AM and PM peak hours
- AM and PM peak hour traffic flows

It should be noted that the count points do not cover all sections of the A12 route. For sections without link counts, virtual counts were calculated by combining the link counts and turning counts at junctions. Volumes were calculated working both forwards from the previous link count and backwards from the next link count in the same direction, and the average of the two virtual counts used where there was only a small difference (<5%).

As the CTCs only recorded data from 07:00 to 19:00, to calculate an ADT a scaling factor was applied to the total volumes recorded at each turning count from 07:00 to 19:00. These scaling factors were calculated for each turning count as a weighted average of the equivalent factors from representative nearby link counts with 24 hour data available.

The analysis of the traffic data presented below is consistent the earlier data analysis presented in the PCF Stage 0 OAR and SOBC. The southbound direction is busier during the AM peak and the northbound busier during the PM peak. This aligns with journey to work analysis that has revealed commuting desire lines between Colchester and Chelmsford. The busiest link on this section of the A12 is between junctions 20b and 21, with ADT flows of approximately 45,000 in each direction. This may indicate that this particular section is used by traffic “crossing” the A12 and it is linked with the commuting desire line between Braintree and Maldon and between Braintree and Chelmsford.

The percentage of heavy vehicles is greater than 9% throughout the route, indicating that it is used by significant volumes of freight traffic. Table 6-10 below shows the traffic volumes on each section of the A12.

Link	ADT (2016)	HGV% (ADT)	AM peak hour flow	PM peak hour flow	AM peak hour	PM peak hour
Northbound						
Junction 19 to 20a	44171	10%	3210	3769	07:30 - 08:30	17:00 - 18:00
Junction 20a to 20b	40619	10%	2928	3434	07:30 - 08:30	17:00 - 18:00
Junction 20b to 21	45300	10%	3351	3874	07:30 - 08:30	17:00 - 18:00
Junction 21 to 22	35862	12%	2773	2817	07:30 - 08:30	17:00 - 18:00
Junction 22 to 23	39799	10%	2773	3644	07:30 - 08:30	17:00 - 18:00
Junction 23 to 24	33294	12%	2434	2942	07:30 - 08:30	17:00 - 18:00
Junction 24 to 25	37115	11%	2820	3302	07:30 - 08:30	17:00 - 18:00
Southbound						
Junction 25 to 24	37964	10%	3034	2729	07:30 - 08:30	17:00 - 18:00
Junction 24 to 23	32640	11%	2687	2219	07:30 - 08:30	17:00 - 18:00
Junction 23 to 22	39348	10%	3752	2624	07:30 - 08:30	17:00 - 18:00
Junction 22 to 21	35548	12%	3036	2597	07:30 - 08:30	17:00 - 18:00

Link	ADT (2016)	HGV% (ADT)	AM peak hour flow	PM peak hour flow	AM peak hour	PM peak hour
Northbound						
Junction 21 to 20b	45155	9%	4153	3343	07:30 - 08:30	17:00 - 18:00
Junction 20b to 20a	39912	10%	3613	2911	07:30 - 08:30	17:00 - 18:00
Junction 20a to 19	43569	9%	4130	3088	07:30 - 08:30	17:00 - 18:00

Table 6-10: Traffic volumes along the A12 (2016)

6.3.3 Volume over capacity – A12

A summary of the existing traffic volumes and estimated capacities on the A12 between junctions 19 and 25 are shown in Table 6-10, and a ratio of traffic volume to road link capacity (V/C), or 'stress' factor, for the AM and PM peaks presented. Existing A12 mainline carriageway capacity and volume to capacity ratios have been estimated using traffic data from different data sources collected as part of this study. The process for estimating the lane capacities is documented in the Stage 0 OAR report.

A V/C ratio of 1.00 represents the theoretical capacity limit of a link. Links approaching 1.00 are also likely to experience an increased prevalence of queuing and congestion, and an increased sensitivity to incidents. The information presented in Table 6-11 shows the following sections between junctions 19 and 25 to be approaching capacity, with the V/C ratio exceeding 0.9:

- Junctions 23 to 22 (southbound) during the AM peak hour .
- Junctions 21 to 20b (southbound) during the AM peak hour.
- Junctions 20b to 20a (southbound) during the AM peak hour.
- Junctions 22 to 23 (northbound) during the PM peak hour.
- Junctions 20b to 21 (northbound) during the PM peak hour.

Link	Peak hour volume		Estimated capacity (veh/hr)	V/C ratio		DMRB reference capacity
	AM	PM		AM	PM	
Northbound						
Junction 19 to 20a	3210	3769	6600	0.49	0.57	6,891
Junction 20a to 20b	2928	3434	3900 - 4200	0.70 - 0.75	0.82 - 0.88	4,196
Junction 20b to 21	3351	3874	3900 - 4200	0.80 - 0.86	0.92 - 0.99	4,196
Junction 21 to 22	2773	2817	3900 - 4200	0.66 - 0.71	0.67 - 0.72	4,196
Junction 22 to 23	2773	3644	3900 - 4200	0.66 - 0.71	0.87 - 0.93	4,196
Junction 23 to 24	2434	2942	3900 - 4200	0.58 - 0.62	0.70 - 0.75	4,196
Junction 24 to 25	2820	3302	3900 - 4200	0.67 - 0.72	0.79 - 0.85	4,196
Southbound						
Junction 25 to 24	3034	2729	3900 - 4200	0.72 - 0.78	0.65 - 0.70	4,196

Link	Peak hour volume		Estimated capacity (veh/hr)	V/C ratio		DMRB reference capacity
	AM	PM		AM	PM	
Junction 24 to 23	2687	2219	3900 - 4200	0.64 - 0.69	0.53 - 0.57	4,196
Junction 23 to 22	3752	2624	3900 - 4200	0.89 - 0.96	0.62 - 0.67	4,196
Junction 22 to 21	3036	2597	3900 - 4200	0.72 - 0.78	0.62 - 0.67	4,196
Junction 21 to 20b	4153	3343	3900 - 4200	0.99 - 1.06	0.80 - 0.86	4,196
Junction 20b to 20a	3613	2911	3900 - 4200	0.86 - 0.93	0.69 - 0.75	4,196
Junction 20a to 19	4130	3088	6600	0.63	0.47	6,891

Table 6-11: Link volume over capacity along the A12 (2016)

6.4 Trip dataset

6.4.1 Telefonica data

Mobile phone data has been obtained for the purposes of this project. The data is consistent with that being used as part of the development of our Regional Models including the South East Regional Transport Model (SERTM). The information has been provided as anonymised data which has been collected between 2nd March and 27th March 2015 as Monday to Friday averages. Data for each hour between 05:00 and 19:59 was segmented into hourly matrices, while data for the remaining hours of 0:00 to 04:59 and 20:00 to 23:59 was aggregated into two separate matrices.

The data in the Trip Information System includes only motorised journeys aggregating rail, bus, goods vehicles and cars. Journeys are represented in the database as person trips, not vehicle trips.

The origin – destination (OD) matrices provided as part of the interim Trip Information System are based on a national trip database in which the start and end point of every journey in mainland UK is assigned to an MSOA (England and Wales) or intermediate zone (Scotland). The strength of the data is in the ability to accurately detect longer trips. One of the limitations of mobile phone event data is that it will not always capture very short trips. Therefore, the highest accuracy of the data supplied is for trips between different MSOAs, whereas the ability to detect trips within each MSOA is relatively lower. A more detailed description of the mobile data analysis and verification process is explained in section 5.3.1 of the ASR.

The trip data was provided in spreadsheet or database compatible files for each hour between 05:00 and 19:59, while data for the remaining hours of 0:00 to 04:59 and 20:00 to 23:59 was aggregated. Each file includes a number at the end that indicates which trip start hour (or aggregated interval) it corresponds to. For each hourly matrix, each cell represents hourly weekday average trips in our sample.

For each interval matrix, each cell represents the sum of hourly weekday average trips across the interval in our sample.

The five trip purposes provided in the separate columns of the OD matrix CSV files are:

- 'hbw_outbound' (home-based work outbound): work related trips starting from home
- 'hbw_inbound' (home-based work inbound): work related trips ending at home

- ‘hbo_outbound’ (home-based other outbound): non-work related trips starting from home
- ‘hbo_inbound’ (home-based other inbound): non-work related trips ending at home
- ‘nhb’ (not home based): trips that do not start nor end at home

6.4.2 Origin – destination data from Trafficmaster

OD data was obtained from the DfT Trafficmaster database which provides the origin and destination of trips. These records provide a vehicle class for each trip as well as a starting LSOA, finishing LSOA and duration of trip.

Origin-Destination data has been received from the DfT for the area as outlined in Figure 6-6 below:

Figure 6-6 : Trafficmaster OD data area

This origin-destination data has been used to help inform the development of the LGV trip matrices within the model.

6.4.3 Automatic Number Plate Recognition

In total, 26 ANPR surveys were conducted along the A12 corridor and Chelmsford, for 12 hour periods between 07:00 – 19:00 during a weekday of a neutral month (May). By matching up number plates collected across the 26 sites, localised origin destination data can be calculated. This data will be used to inform the trip matrix creation, by using the surveys to provide additional comparison data for checking the assigned trip matrices.

The data will also be used as an additional source of journey time information for the purposes of comparison with the Trafficmaster data. The locations of the ANPR survey camera are detailed in the section 5.1.3.

ANPR can miss number plates if these are obscured or unreadable and as such the capture rate falls below 100%. The ANPR survey was supported by link count surveys at each entry / exit point, allowing the estimation of the capture rate for inbound and outbound vehicles. Overall capture rates of 88.9% and 73.1% for inbound and outbound traffic were achieved for this survey. Since this survey is largely being used to compare proportions rather than provide absolute figures, the capture rates are considered sufficient to support model development for the stated purposes. The number of records used to calculate the AM, PM hour and IP period data are shown together with the number of records rejected from the calculations in Appendix G.

7. Journey time data

This section describes the locations and journey time routes that have been analysed for the purposes of establishing baseline conditions to inform transport model development. The journey time data is used to check and compare the delays and travel times calculated by the model with observed data as part of a model validation process.

In line with WebTAG Unit M3.1 section 4.4.2, journey time data along selected routes were obtained from Trafficmaster. Trafficmaster is a dataset made available to local authorities and is based on data gathered using Satellite navigation devices installed in cars and other vehicles. Travel times are specified for links in the Integrated Transport Network (ITN). Times along a set of routes are collated by aggregating the set of ITN links along the route.

The ANPR sites provide the means to replicate the journey time along the A12 between Junctions 15 and 29.

7.1 Journey time routes

The routes along which journey time data has been extracted for the purposes of model validation are illustrated in Figure 7-1 below.

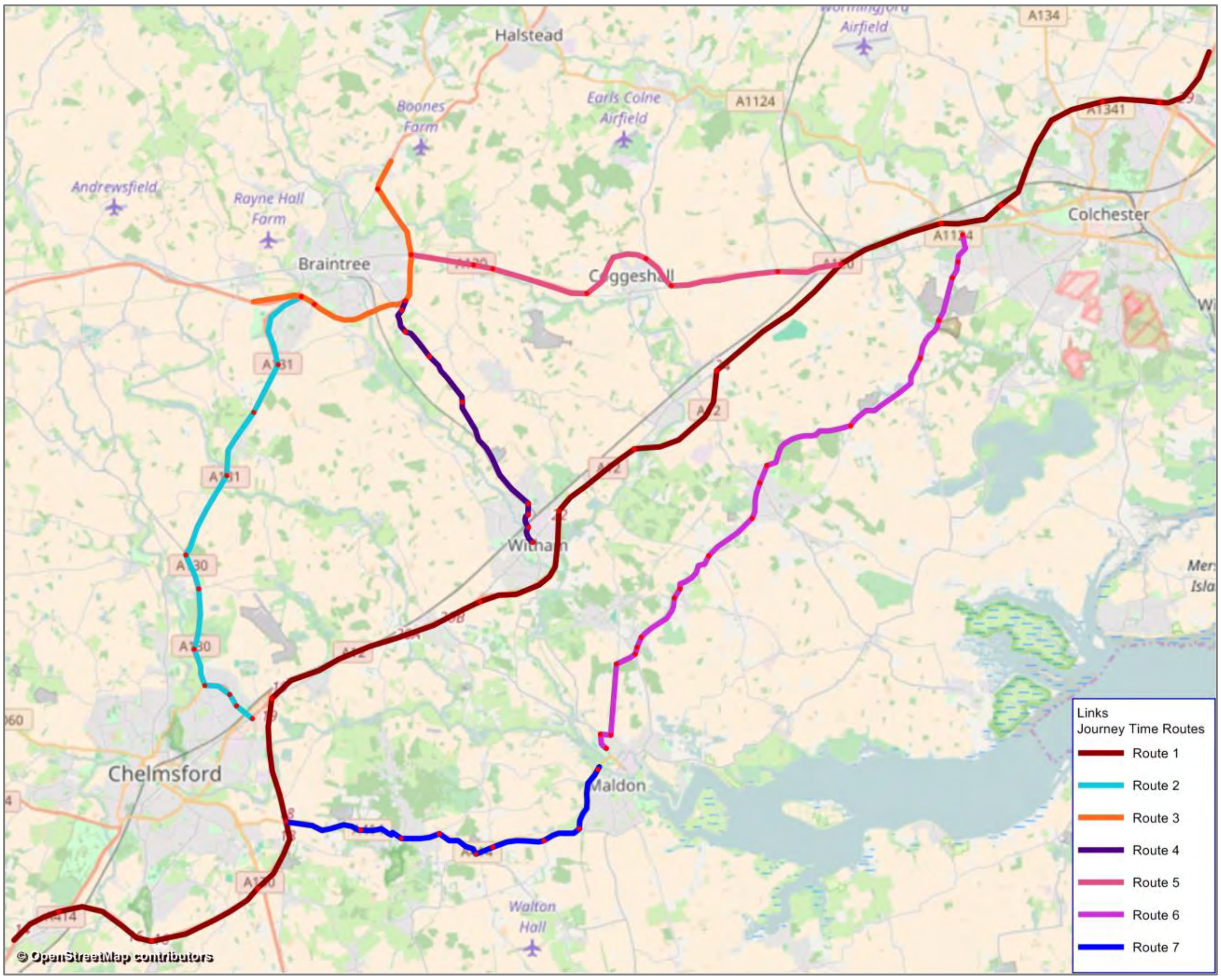

Figure 7-1 : Journey time routes for model validation

7.2 Existing journey time conditions

For this study, the journey time data for the neutral months of April to June 2015 was extracted from the Trafficmaster data and the average weekday travel times were used. Periods affected by Easter, school half terms and bank holidays were excluded from the dataset. The observed time for all journey time routes for all peak periods are presented in Table 7-1 below.

ID.	Route	Route Description	Average observed time (mm:ss) by time period		
			AM	IP	PM
1	101	A12 junction 15 to 29	32:10	30:57	42:42
	102	A12 junction 29 to 15	39:48	29:58	31:35
2	201	A130/A131 Chelmsford to Braintree	17:19	14:49	16:09
	202	A130/A131 Braintree to Chelmsford	23:07	15:11	16:07
3	301	A120 to A131 Braintree	07:01	07:33	14:06
	302	A131 to A120 Braintree	13:19	07:48	09:08
4	401	B1018 Witham to Braintree	10:37	10:41	13:02
	402	B1018 Braintree to Witham	13:11	11:34	11:45
5	501	A120 Braintree to Marks Tey	17:19	14:27	20:30
	502	A120 Marks Tey to Braintree	17:00	13:53	14:12
6	601	B1022 Heybridge to Colchester	23:44	23:38	23:34
	602	B1022 Colchester to Heybridge	25:42	24:21	26:37
7	701	A414 Chelmsford to Maldon	14:01	14:07	17:11
	702	A414 Maldon to Chelmsford	16:23	14:01	13:53

Table 7-1: Trafficmaster average observed journey times

The journey times along the A12 corridor between junction 15 and 29, and between junction 19 and 25 are shown graphically in Figures 7-2 and 7-3 below:

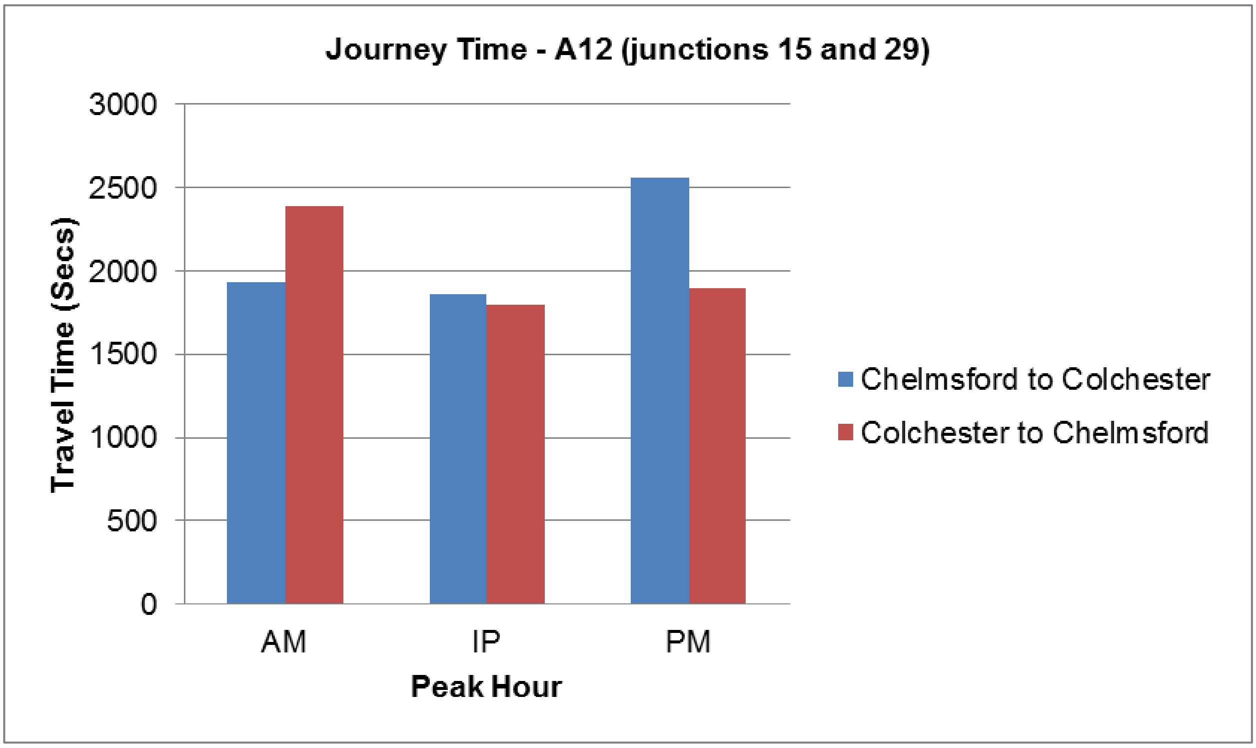

Figure 7-2 : Journey Times on the A12 between junction 15 and 29

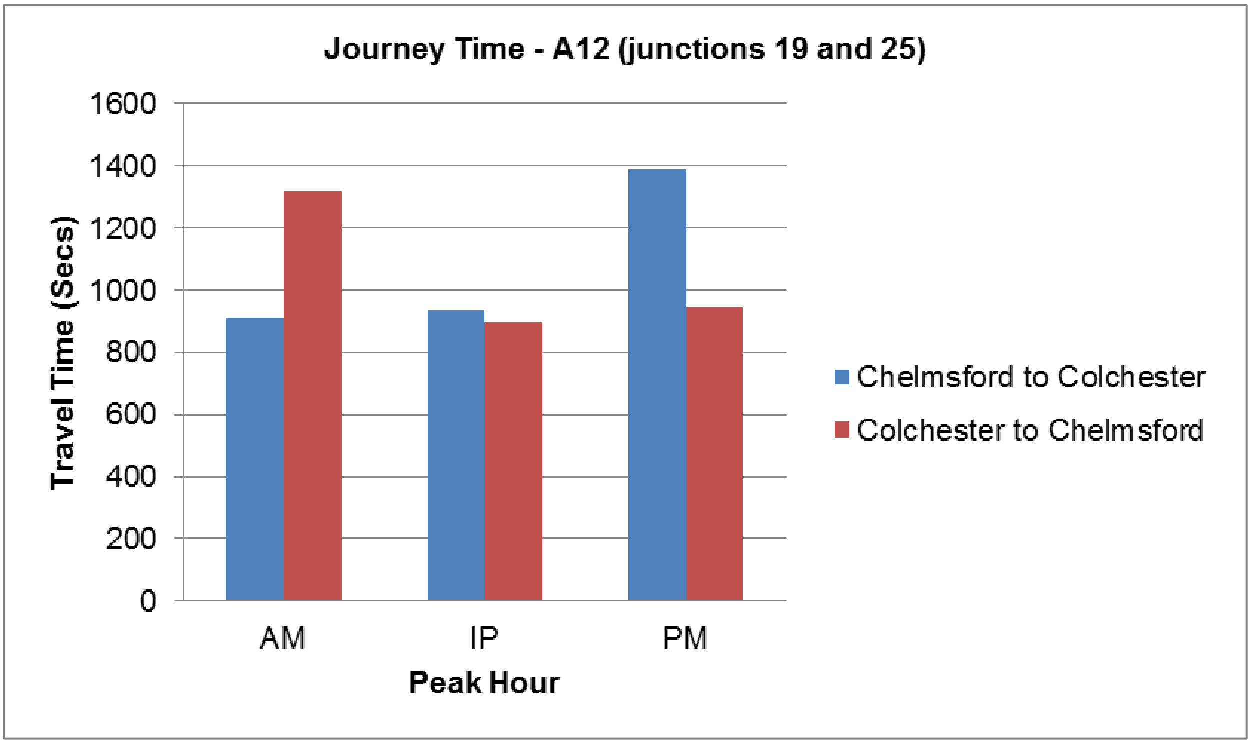

Figure 7-3 : Journey Times on the A12 between junction 19 and 25

7.3 Summary of journey time data

The journey time data illustrates the additional journey time during peak periods relative to the average inter-peak period, as a measure of delay experienced during the AM and PM peak hours. The data is consistent with the description of baseline conditions presented in the Stage 0 OAR and SOBC and wider local knowledge.

Journey times are shown to increase markedly during the AM peak in a southbound direction and during the PM peak in a northbound direction, consistent with the tidal pattern of traffic volume along the route. On Local Authority routes, the journey times fit with the known pattern of commuting within the area, including travel into Chelmsford from the Braintree area in the morning peak and generally prevalent congestion on the A120 during peak periods.

The Trafficmaster journey times are based on continuously available data for a 5 month period, whereas the ANPR surveys were undertaken on a single day only. In terms of the sample rate of the data available, around 1% of the total daily traffic volume was captured in the Trafficmaster data source, and 20 - 40% traffic was captured from the ANPR data. Table 7-2 presents the sample sizes of the Trafficmaster and ANPR data.

Data Source	Direction	AM Peak	Inter-Peak	PM Peak
Trafficmaster	SB	1.3%	0.7%	0.6%
	NB	0.7%	1.3%	1.3%
ANPR	SB	23.1%	27.3%	19.6%
	NB	26.8%	43.0%	42.0%

Table 7-2: Trafficmaster and ANPR data sample sizes

7.4 Data quality and checking

The journey time data obtained from the ANPR and JTDB analysis were used for comparing the data obtained from Trafficmaster along the A12. Tables 7-3 and 7-4 present a comparison of the data obtained from the two data sets.

Route	AM			IP			PM		
	TrMa	ANPR	% diff	TrMa	ANPR	% diff	TrMa	ANPR	% diff
Northbound									
Junction 15 – 29	32:10	30:14	6.0%	30:57	31:27	-1.6%	42:42	43:13	-1.2%
Junction 19 – 25	15:10	14:59	1.2%	15:33	14:59	3.7%	23:07	23:34	-1.9%
Southbound									
Junction 29 – 15	39:48	n/a	n/a	29:58	29:32	1.4%	31:35	29:41	6.0%
Junction 25 – 19	21:55	n/a	n/a	14:58	14:54	0.4%	15:44	14:27	8.2%

Table 7-3: Journey time comparison – Trafficmaster and ANPR data

Note 1: Southbound AM peak ANPR data excluded from the comparison due to the occurrence of an incident on the particular survey day which resulted in non-typical journey time conditions.

Route	AM			IP			PM		
	TrMa	JTDB	% diff	TrMa	JTDB	% diff	TrMa	JTDB	% diff
Northbound									
Junction 15 – 29	32:10	32:16	-0.3%	30:57	32:55	-6.3%	42:42	46:05	-7.9%
Junction 19 – 25	15:10	14:13	6.3%	15:33	14:16	8.3%	23:07	23:11	-0.3%
Southbound									
Junction 29 – 15	39:48	42:17	-6.2%	29:58	31:42	-5.8%	31:35	32:26	-2.7%
Junction 25 – 19	21:55	19:14	12.2%	14:58	16:18	-8.9%	15:44	16:58	-7.8%

Table 7.4: Journey time comparison – Trafficmaster and JTDB data

The purpose of the ANPR and JTDB data is to provide a check of the journey times presented in the Trafficmaster data set across each period hour and period. The journey time data comparison shows that the difference in travel times along the various lengths and directions of the A12 aligns well across different datasets. The results indicated a maximum difference of 8.3% and a maximum absolute difference of less than 2 minutes when compared against ANPR data, and a maximum difference of 12.2% and a maximum absolute difference of less than 3 minutes when compared against JTDB data.

The small differences between the datasets can be explained by the different collection method and survey period. On the basis of this comparison, we can conclude that the Trafficmaster data is a good representation of existing journey time conditions and suitable for the purpose of model validation.

8. Operational data

This section describes the mapping, signal, queue length, and accident data collected as part of the A12 model development.

8.1 Mapping and geometrical data

The model development methodology incorporates the use of the existing Chelmsford and Colchester models for the model simulation network. Therefore, additional data in the form of ITN was not deemed necessary for the model network development and the buffer network was coded using Google Maps. Figure 8-1 shows the road network for the model build.

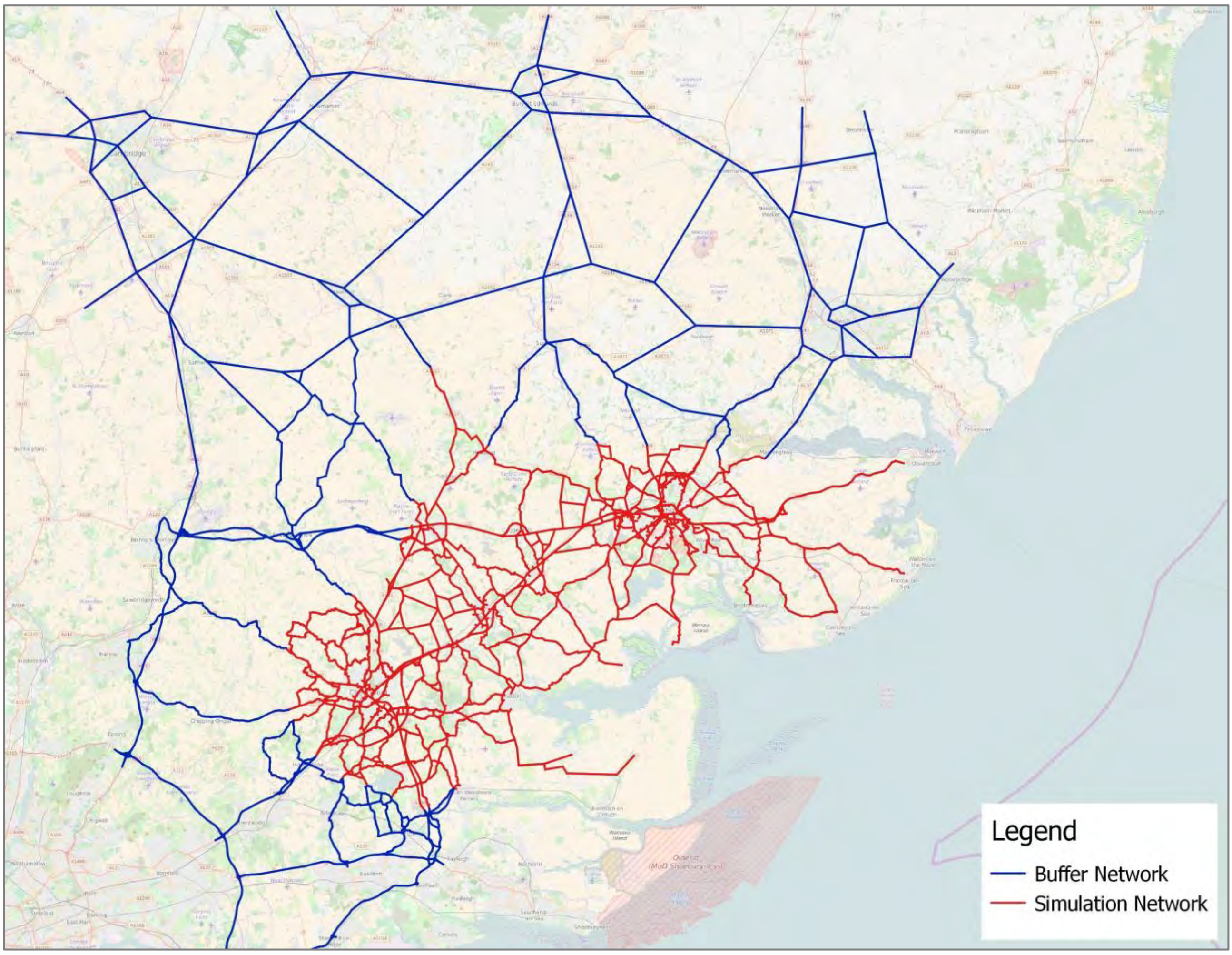

Figure 8-1: A12 Model Network

8.2 Signalised junctions

A number of signalised junctions have been identified in the Area of Detailed Modelling (AoDM); however, many of these signals have already been coded in emerging SATURN models such as SERTM. Rather than coding these junctions as part of the A12 model, the existing signal times have been taken from the SERTM coding and transferred into the A12 model. For signalised junctions that aren't coded in SERTM, signal time information was obtained from ECC. Figure 8-2 below shows the signalised junctions in the AoDM.

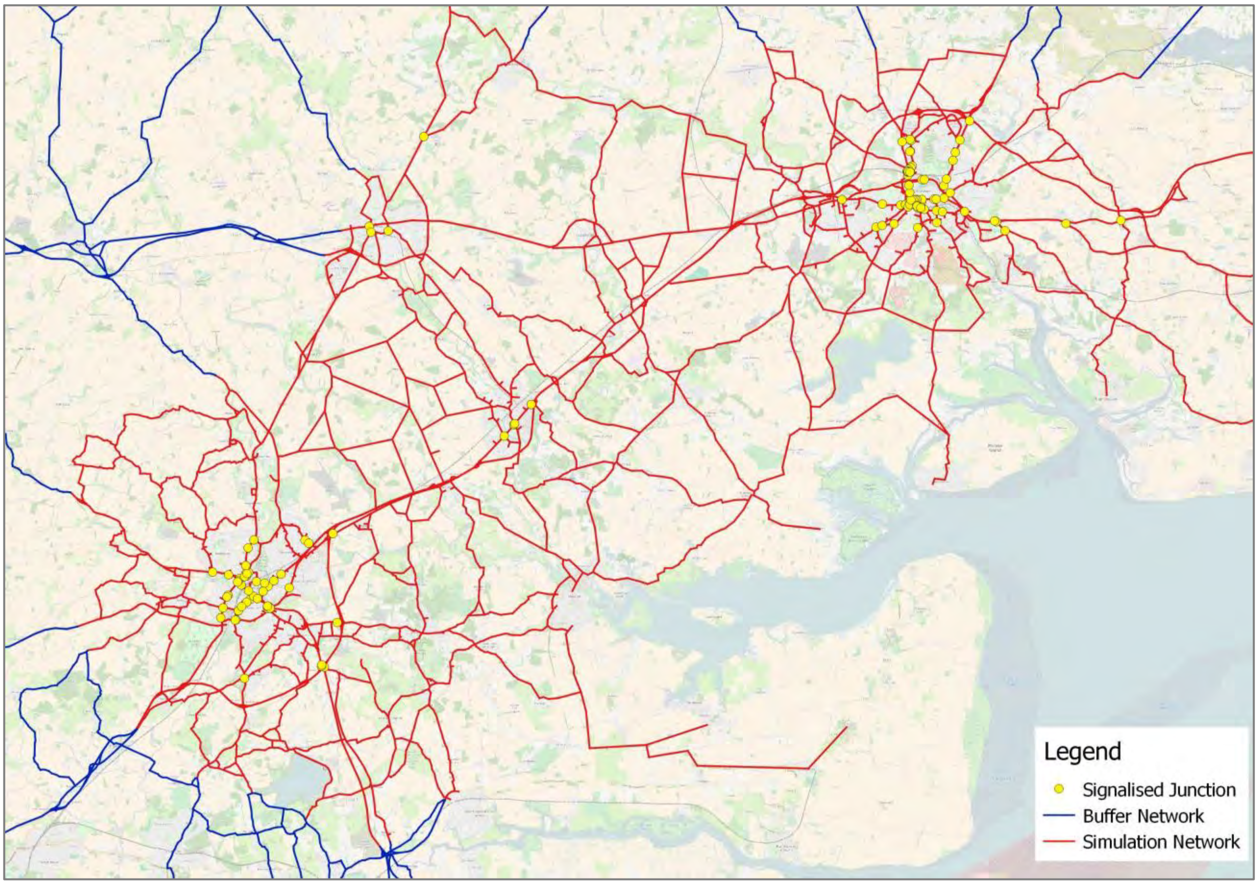

Figure 8-2: Signalised junctions in AoDM

8.3 Operational data (queue length)

Manual queue surveys were undertaken at eight key locations across the scheme area in the vicinity of the A12**.** To supplement SATURN's modelling of operational performance, a further more detailed assessment will be undertaken of key junctions through the development of operational models. Junctions 9 and Linsig software suites will be used to inform the operational assessment of the strategic junctions on the A12, from junction 19 to junction 25, and to inform the calibration of junction performance within the SATURN model.

The junctions that have been identified for operational assessment are:

- A12 Junction 19
- A12 Junction 20a
- A12 Junction 20b
- A12 Junction 21
- A12 Junction 22
- A12 Junction 23
- A12 Junction 24
- A12 Junction 25

Manual queue surveys were conducted at 8 sites on 10th May and were conducted between 07:00-19:00 covering morning, inter-peak and evening periods. These surveys were carried out on the same day as CTC surveys.

The following queue count data was collected for each lane at the following sites:

- Queue counts by lane recorded in intervals of 5 minutes.
- Maximum queue observed by lane recorded in intervals of 5 minutes.
- Hourly maximum and average queue lengths in metres.
- Full survey period, maximum and average queue lengths in metres.

The following Table 8-1 shows details of the queue length survey locations.

Site ID	Location	Conditions	X Coordinate	Y Coordinate	Approach	MCC site Number
S1	A12/A130/A138 (junction 19)	Dry	51.753955	0.518657	All	MCC 5/6/7
S2	Bury Lane/B1137 (near junction 20A)	Dry	51.77492	0.590386	All	MCC8
S3	B1137/The St (near junction 20B)	Dry	51.77507	0.599697	All	MCC9
S4	B1389/Gershwin Blvd (near junction 21)	Dry	51.78551	0.618308	All	MCC10
S5	Colemans Bridge/Colchester Rd (near junction 22)	Dry	51.807974	0.651434	All	MCC11
S6	Cranes Ln/B1024 (near junction 23)	Dry	51.82715	0.688008	All	MCC12
S7	B1024/London Rd (near junction 24)	Dry	51.847359	0.722138	All	MCC13
S8	A12/A120/B1408/London Rd (junction 25)	Dry	51.880264	0.786479	All	MCC14/15

Table 8-1: Queue length survey locations

8.3.1 Queue length survey results

Appendix F shows observed maximum queue length by approach arm (all lanes combined) and time period. The queue lengths are presented in metres and in PCUs.

8.4 Collision and incident data

At PCF Stage 0, STATS 19 Collision data for the route was collected from the six year period 1st January 2010 to 31st December 2015. The extent of the data collected and the severity of the accidents over the six years is presented in Figure 8-3 below.

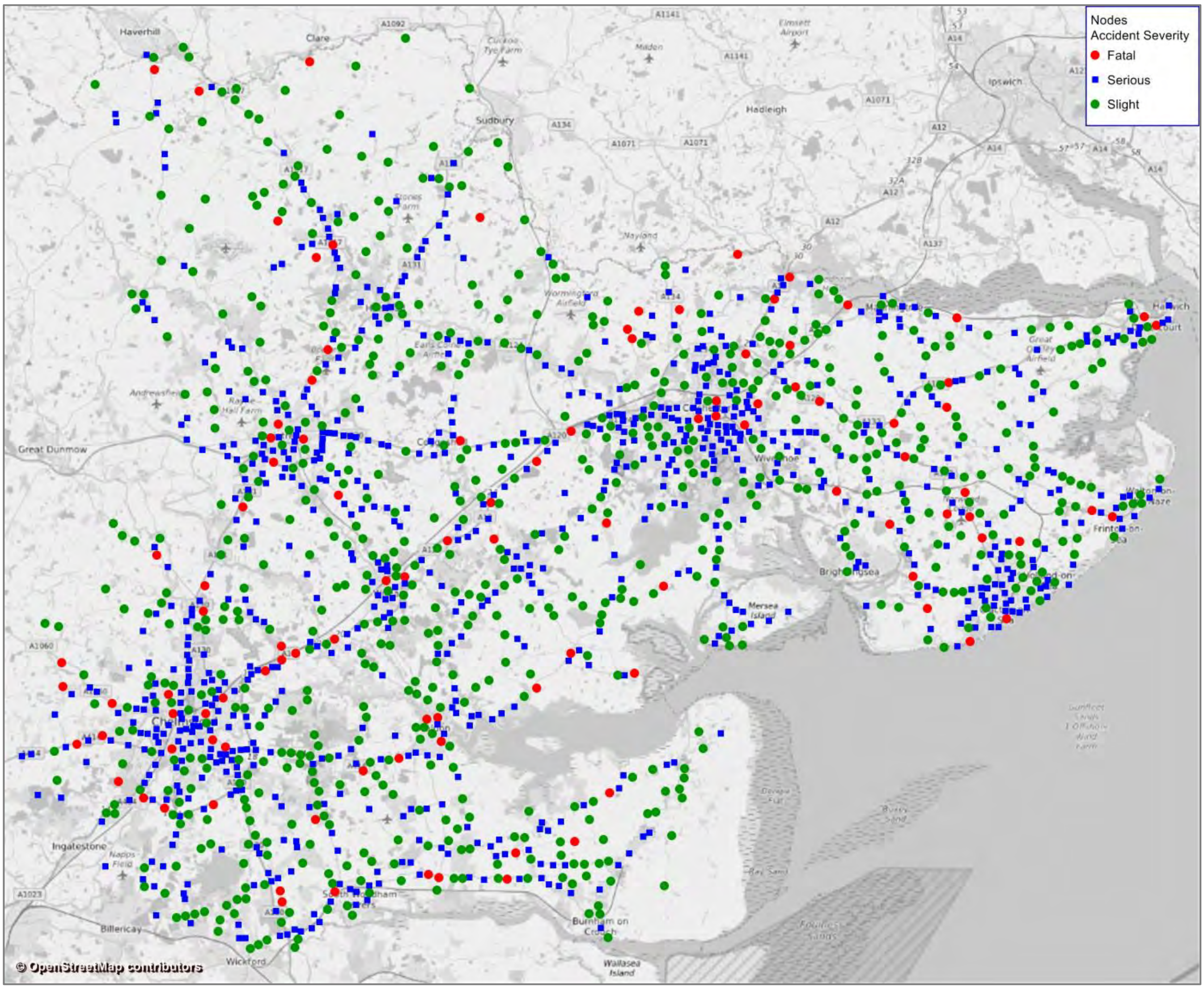

Figure 8-3: Collisions between 2010 and 2015 in the study area

9. Suitability of accumulated database

9.1 Data management

A substantial volume of traffic data from various sources has been collated for the purposes of informing scheme development including the development of a transport model.

The integrity of the raw data is protected by storing the files within a computer folder structure. Electronic files of differing format and for multiple time periods are stored separately on secure servers and working copies made prior to processing thus preserving the data in its original state and format.

Where possible all data collection sites are referenced by the originators assigned name, for instance all Local Authority and the A120 count data retain the same site numbers for ease of comparison. However, newly collected data and HATRIS data has new site numbers and file identifiers assigned.

Quality checks are applied to the data during the processing stage prior to export to the model building process, ensuring consistency and accuracy throughout the model building process, and for subsequent use in the processing of model outputs.

9.2 Summary of adequacy of data

This report has identified and described the traffic survey data collected and collated to assess and quantify baseline conditions and to develop a traffic model for the A12. The survey provides the necessary information for the model building process such as building trip matrices and for the calibration and validation of the model.

Each of the surveys undertaken has been described explaining its purpose, as well as showing the locations and individual survey dates. Analysis has then been carried out for each of the survey types and the results presented.

The traffic data collated for this study has been obtained from credible sources. A process of data filtering and checking has been implemented to confirm the suitability of traffic data provided for the study purposes. Additional traffic survey data has been collected using a specialist survey sub-contractor. A process of checking has limited the potential for erroneous data to be taken forward into the final dataset.

The Trafficmaster data is commonly used for transport model development purposes across the UK and is considered the most appropriate source of journey time data. However, additional data collection has been specified in order to provide a check of the journey time data from Trafficmaster.

Further operational data has been collected in order to provide more detailed modelling to support and inform the strategic transport model development.

As outlined in this report, a number of data issues were found with the newly captured link count data due to technical problems and the survey dates were extended at these locations to capture suitable replacement data for the calibration and validation of the transport model.

No significant issues have been identified linked for the newly captured CTC and ANPR data, and a process of comparison with link count volumes has enabled any appropriate adjustments to be made to these datasets.

Overall it is considered that the new and existing data collected as part of the A12 model development, forms a suitable and comprehensive database, sufficiently detailed to establish principal traffic movements and characteristics within the area of the A12 Chelmsford to A120, (J19-25) scheme

Appendix A. Glossary of terms

Term	Description
AADF	Average Annual Daily Traffic
AoDM	Area of Detailed Modelling
ACO	Appraisal Certifying Officer
AM	AM peak hour
ANPR	Automatic Number Plate Recognition
ASR	Appraisal Specification Report
AST	Appraisal Summary Table
ATC	Automatic Traffic Count
Capacity	The ability of a highway link or junction to carry or accommodate traffic flow
CSV	Comma separated value file
CTC	Classified Turning Count
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
ECC	Essex County Council
EAR	Economic Assessment Report
EERM	East of England Regional Model
GPS	Global Positioning System
HATRIS	Highways Agency Traffic Information System
HGV	Heavy Goods Vehicle
IP	Inter peak hour
ITN	Integrated Transport Network
JTDB	Journey Time Database
KSI	Killed/Seriously Injured
Linsig	Software for the assessment and design of traffic signal junctions
LMVR	Local Model Validation Report
MCC	Manual Classified Count
MSOA	Middle Layer Super Output Areas
NDD	Network Delivery and Development directorate
NMU	Non-Motorised Users
OAR	Option Assessment Report
OD	Origin Destination
OS	Ordinance Survey
PCF	Project Control Framework
PCU	Passenger Car Unit
PM	PM peak hour

Term	Description
RBS	Route Based Strategies
RIS	Roads Investment Strategy
RSI	Road-side Interview
SATURN	Transport modelling software
SERTM	South East Regional Transport Model
SOBC	Strategic Outline Business Case
SRN	Strategic Road Network
STATS 19	Road accident statistics as reported to the police using STATS19 accident reporting form, published by DfT
TAG	Transport Analysis Guidance, published by the Department for Transport (see also WebTAG)
TFR	Traffic Forecasting Report
TDCR	Traffic Data Collection Report
TSR	Traffic Survey Report
V/C	Volume/Capacity ratio
WebTAG	The Department for Transport guidance document on the conduct of transport studies (see also TAG)

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The Technical Assessment Report details the assessment of options leading up to consultation.