Spelthorne Local Plan Strategic Highway Assessment Report: Technical Annex

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CONTENTS

1 INTRODUCTION 6

1.1 REGULATION 19 APPRAISAL 6

2 BASE MODEL DEVELOPMENT 6

2.1 MODEL AND SCOPE 6
2.2 FURTHER MODEL DOCUMENTATION 7
2.3 BASE YEAR 7
2.4 MODES OF TRANSPORT 7
2.5 TIME PERIODS 8
2.6 DEMAND TYPES 9
2.7 STUDY AREA 10
2.8 ZONING 12
2.9 NETWORK REVIEW 13
2.10 JUNCTION MODELLING 13
2.11 ASSIGNMENT 15

3 MODEL VALIDATION 16

3.1 INTRODUCTION 16
3.2 ASSESSMENT OBJECTIVES 16
3.3 VALIDATION CRITERIA 17
3.4 METHODOLOGY FOR COMPARING COUNTS AND FLOW 18
3.5 MOTORWAY AND TRUNK ROAD MAINLINE COUNTS 19
3.6 COUNT SELECTION 20
3.7 DEVELOPMENT OF SINTRAM72 BASE MATRICES 21
3.8 DEVELOPMENT OF LOCAL MODEL BASE TRIP MATRICES 24
3.9 SCREENLINE AND LINK FLOW VALIDATION 32
3.10 JOURNEY TIME VALIDATION 44
3.11 NETWORK VALIDATION ADJUSTMENTS 47
3.12 VALIDATION SUMMARY 47
3.13 ASSESSMENT OF SUITABILITY 47
3.14 LIMITATIONS AND CAVEATS OF THIS STRATEGIC MODEL 48

4 MODEL FORECASTING 48

4.1 FORECAST SCENARIOS 48
4.2 FORECAST YEAR 49
4.3 DEVELOPMENT SITES AND PRO-FORMA 49

5 FORECASTING APPROACH 52

5.2 FUTURE YEAR SCENARIO A, THE DO-MINIMUM 52
5.3 FUTURE YEAR SCENARIO (B), THE DO-SOMETHING 53

6 FUTURE YEAR DO-MINIMUM 53

6.1 BACKGROUND GROWTH AND COMMITTED DEVELOPMENTS 53
6.2 VEHICLE TRIP GENERATION 54
6.3 VEHICLE TRIP DISTRIBUTION 55
6.4 GOODS VEHICLES 56
6.5 CHANGES IN FORECAST DEMAND 57
6.6 FORECAST NETWORK 57
6.7 ASSIGNMENT 58

7 FUTURE YEAR DO-SOMETHING 59

7.2 DEVELOPMENT SITES AND PRO-FORMA 59
7.3 VEHICLE TRIP GENERATION 59
7.4 TRIP RATES 60
7.5 EXTERNAL AND BACKGROUND TRAFFIC GROWTH 60
7.6 VEHICLE TRIP DISTRIBUTION 60
7.7 FORECAST NETWORK 61
7.8 ASSIGNMENT 61

8 APPENDIX 62

8.1 LINK COUNT OBSERVED VERSUS MODELLED VALUES 62
8.2 JOURNEY TIME VALIDATION ROUTE COMPARISON GRAPHS 73
8.3 SINTRAM72 LATENT DEMAND 76

TABLE OF FIGURES

FIGURE 2-1 TRAVEL MODES FOR DEMAND MODELLING 8
FIGURE 2-2 TIME PERIODS USED IN MODELLING 9
FIGURE 2-3 TRIP PURPOSES USED IN DEMAND MODELLING 10
FIGURE 2-4 SINTRAM72 INNER STUDY AREA 11
FIGURE 2-5 EXTRACTION OF SPELTHORNE NETWORK 11
FIGURE 2-6 LOCAL MODEL NETWORK SHOWING SPELTHORNE AND SURROUNDING AREAS 12
FIGURE 2-7 MODEL ZONES IN AND AROUND SPELTHORNE BOROUGH 13
FIGURE 2-8 JUNCTION CONTROLS AND LANE MARKINGS 14
FIGURE 2-9 MODELLING OF MOTORWAY MERGES 15
FIGURE 2-10 HIGHWAY ASSIGNMENT CONVERGENCE - EPSILON VALUES 16
FIGURE 3-1 MATRIX ESTIMATION COUNT SITES 21
FIGURE 3-2 STUDY AREA, HINTERLAND, AND EXTERNAL ZONE AREAS 22
FIGURE 3-3 DETAIL OF STUDY AREA ZONING 23
FIGURE 3-4 PRIOR VERSUS ME CAR TRIP ENDS FOR THE AM PEAK HOUR (0800 – 0900), LOCAL MODEL (MINIMUM LABEL VALUE = 800 CARS) 25
FIGURE 3-5 PRIOR VERSUS ME CAR TRIP ENDS FOR THE AM PEAK HOUR (0800 – 0900), SPELTHORNE BOROUGH. (MINIMUM LABEL VALUE = 250 CARS) 26
FIGURE 3-6 PRIOR VERSUS ME CAR TRIP ENDS FOR THE PM PEAK HOUR (1700 – 1800), LOCAL MODEL (MINIMUM LABEL VALUE = 800 CARS) 27
FIGURE 3-7 PRIOR VERSUS ME CAR TRIP ENDS FOR THE PM PEAK HOUR (1700 – 1800), SPELTHORNE BOROUGH (MINIMUM LABEL VALUE = 800 CARS) 28
FIGURE 3-8 CAR AM MATRIX CELL ZONAL VALUES 29
FIGURE 3-9 CAR PM MATRIX CELL ZONAL VALUES 29
FIGURE 3-10 CAR AM MATRIX ZONAL TRIP ENDS 30
FIGURE 3-11 CAR PM MATRIX ZONAL TRIP ENDS 30
FIGURE 3-12 CAR AM PRIOR VERSUS POST ME TRIP LENGTH DISTRIBUTIONS 31
FIGURE 3-13 CAR AM PRIOR VERSUS POST ME TRIP LENGTH DISTRIBUTIONS 32
FIGURE 3-14 LOCATION OF ALL VALIDATION COUNT SITES 33
FIGURE 3-15 LOCATION OF ORANGE SCREENLINE: ROADS CROSSING THE M3 NORTHBOUND AND SOUTHBOUND 34
FIGURE 3-16 LOCATION OF PURPLE SCREENLINE: ROADS CROSSING THE M25 EASTBOUND AND WESTBOUND 34
FIGURE 3-17 LOCATION OF LIGHT BLUE SCREENLINE: ROADS CROSSING THE RIVER THAMES NORTHBOUND/EASTBOUND AND SOUTHBOUND/WESTBOUND 35
FIGURE 3-18 COMPARISON PLOT OF MODELLED AGAINST OBSERVED LINK FLOWS WITH BEST-FIT REGRESSION LINE AND CORRELATION COEFFICIENT (R^2) FOR THE WEEKDAY AM PEAK HOUR (0800 – 0900) 37
FIGURE 3-19 COMPARISON PLOT OF MODELLED AGAINST OBSERVED LINK FLOWS WITH BEST-FIT REGRESSION LINE AND CORRELATION COEFFICIENT (R^2) FOR THE WEEKDAY PM PEAK HOUR (1700 – 1800) 38
FIGURE 3-20 GRAPH SHOWING THE VARIATION OF GEH FOR THE AM PEAK HOUR (0800 – 0900) 38
FIGURE 3-21 GRAPH SHOWING THE VARIATION OF GEH FOR THE PM PEAK HOUR (1700 – 1800) 39
FIGURE 3-22 LOCAL MODEL LINK FLOW VERSUS COUNT BANDWIDTH FOR THE AM PEAK HOUR (0800 – 0900) WITH ONLY LOCAL ROADS SHOWING ABOVE, AND ONLY THE M25, A30, M3 AND A316 SHOWING BELOW 40
FIGURE 3-23 LOCAL MODEL LINK FLOW VERSUS COUNT BANDWIDTH FOR THE PM PEAK HOUR (1700 – 1800) WITH ONLY LOCAL ROADS SHOWING ABOVE, AND ONLY THE M25, A30, M3 AND A316 SHOWING BELOW 41
FIGURE 3-24 SPELTHORNE VERSUS COUNT BANDWIDTH FOR THE AM PEAK HOUR (0800 – 0900) WITH ONLY LOCAL ROADS SHOWING ABOVE, AND ONLY THE M25, A30, M3 AND A316 SHOWING BELO 42
FIGURE 3-25 SPELTHORNE VERSUS COUNT BANDWIDTH FOR THE PM PEAK HOUR (1700 – 1800) WITH ONLY LOCAL ROADS SHOWING ABOVE, AND ONLY THE M25, A30, M3 AND A316 SHOWING BELOW 43
FIGURE 3-26 LOCATIONS OF JOURNEY TIME ROUTES 45
FIGURE 4-1 LOCAL PLAN COMMERCIAL DEVELOPMENT SITES IN SPELTHORNE 50
FIGURE 4-2 LOCAL PLAN RESIDENTIAL DEVELOPMENT SITES IN SPELTHORNE 51
FIGURE 5-1: OVERALL APPROACH TO FORECASTING 52
FIGURE 5-2: FORECAST MATRIX DEVELOPMENT PROCESS 53
FIGURE 6-1: EXTRACT OF SCENARIO LAND USE DATA FOR DO-MINIMUM 55
FIGURE 6-2 AM FORECAST HIGHWAY ASSIGNMENT CONVERGENCE -EPSILON VALUES FOR 2037 DO-MINIMUM 58
FIGURE 7-1 AM FORECAST HIGHWAY ASSIGNMENT CONVERGENCE - EPSILON VALUES FOR 2037 DO-SOMETHING 61

TABLE OF TABLES

TABLE 3-1 VALIDATION ACCEPTABILITY GUIDELINES 17
TABLE 3-2 SIGNIFICANCE OF MATRIX ESTIMATION CHANGES 18
TABLE 3-3 MOTORWAY AND TRUNK ROAD MAINLINE ASSESSED COUNTS 19
TABLE 3-4 PRIOR AND ME FINAL MATRIX TOTALS 28
TABLE 3-5 CAR PRIOR VERSUS POST ME TRIP LENGTH DISTRIBUTIONS 31
TABLE 3-6 SCREENLINE FLOW VALIDATION RESULTS FOR THE LOCAL MODEL 36
TABLE 3-7 LINK FLOW VALIDATION RESULTS FOR THE LOCAL MODEL 37
TABLE 3-8 JOURNEY TIME COMPARISONS FOR THE AM PEAK HOUR (0800 – 0900) 46
TABLE 3-9 JOURNEY TIME COMPARISON FOR THE PM PEAK HOUR (1700 – 1800) 46
TABLE 3-10 FLOW VALIDATION SUMMARY TABLE 47
TABLE 4-1 GROSS AND NET NON-COMMITTED HOUSEHOLDS IN SPELTHORNE BY SCENARIO 49
TABLE 6-1 LGV AND HGV GROWTH FACTORS 56
TABLE 6-2 AVERAGE GROWTH RATES 2014 TO 2037 57
TABLE 6-3: COMPLETED OR COMMITTED HIGHWAY SCHEMES INCLUDED IN THE FORECAST NETWORK 58
TABLE 7-1: RESIDENTIAL VEHICULAR TRIP RATES 60
TABLE 8-1 AM PEAK HOUR (0800 – 0900) LINK FLOW VALIDATION COUNT COMPARISON 62
TABLE 8-2 PM PEAK HOUR (1700 – 1800) LINK FLOW VALIDATION COUNT COMPARISON 67
TABLE 8-3 LATENT DEMAND BY SCENARIO - ALL TIME HOURS AND MODES FOR SINTRAM INNER STUDY AREA 76
TABLE 8-4 PERCENTAGE GROWTH BY TRIP PURPOSE RELATIVE TO 2014 BASE 77

1 INTRODUCTION

1.1 Regulation 19 Appraisal

1.1.1 Spelthorne Borough Council are preparing a new Local Plan. A Strategic Transport Assessment was completed in March 2022 for the Council's Regulation 19 publication. As part of the evidence base for this consultation, an assessment of the transport impacts of the site allocations is required. This document details the technical aspects of the modelling undertaken for this assessment and forms an annex to the main report, *Spelthorne Local Plan Strategic Highway Assessment Report,* which focuses on the outcomes of the modelling.

1.1.2 Surrey's transport model SINTRAM72 has been used for the assessment as well as a cordoned Local Model of Spelthorne and its immediate surroundings. A future year of 2037 has been assessed, to tie in with the end of the Local Plan period. Validation of the model and details of the forecasting methodology is detailed in the subsequent sections.

1.1.3 Section 2 describes the development of the Base year (2014) model from which forecasts are subsequently projected. The section introduces the two-level modelling system that is applied.

1.1.4 Section 3 sets out the model validation of both flows and journey times.

1.1.5 Sections 4 to 8 describes the forecasting process. This is based on forecasting travel demand using modelling components for trip productions and attractions (trip ends), and the patterns of travel (trip distribution). The impact of travel demand on the transport network is modelled using network assignment procedures. Section 8 also explains how the demand for travel, using the higher-level, multi-modal 'SINTRAM72' modelling, is converted to forecasts of traffic demand used to provide forecasts of peak-hour traffic conditions on the Spelthorne highway network in 2037.

1.1.6 The Appendix contains several figures and tables that are referenced in the main text.

1.1.7 The figures and tables in this report are designed for viewing in print and at standard scales, but they have a resolution that enables them to be viewed on-screen with a reasonable level of zoom to facilitate reading and discerning details.

2 BASE MODEL DEVELOPMENT

2.1 Model and Scope

2.1.1 The modelling is focused on a local highway model that covers the borough of Spelthorne and a hinterland. The hinterland incorporates areas of Elmbridge and Runnymede to the south, London Boroughs of Hillingdon, Hounslow and Richmond upon Thames to the north and east, and the Berkshire Boroughs of Windsor and Maidenhead and Slough to the west.

2.1.2 This local model is derived from Surrey County Council's (SCC) regional, multi-modal transport model, version SINTRAM72[1]. It is used in this application to provide initial ('prior') base year highway travel information for the local model in the form of origin-destination (OD) trip matrices, as well as to forecast changes. The prior OD

[1] Developed in 2017

matrices from SINTRAM72 are refined as part of the validation process reported below in Section 3.

2.1.3 The modelling system, all of which is implemented in OmniTRANS modelling software, may thus be understood as having two levels, with SINTRAM72 to forecast demand, and the local Spelthorne model to provide assessments of the highway conditions for different potential allocation sites.

2.2 Further Model Documentation

2.2.1 The validation of the SINTRAM72 model provides an important background and a further basis of assurance for the Spelthorne modelling; its validation and technical reports listed below are relevant and available from SCC on request.

2.2.2 SINTRAM72 reports include:

- The calculation of trip ends and car availability described in *Technical Note TN1 Processing Trip Ends*.
- The development of Base trip matrices described in *Technical Note TN3 Base Trip Matrix Production*.
- The validation of SINTRAM72 described in *Technical Note S72 TN4 Model Assessment and Validation Report.*
- The nature of the modelling described in *Technical Note TN5 Model Technical Report*.
- Besides this document, aspects of the model are also described in the *User Guide, Running the SINTRAM Model*.

2.2.3 In addition to the SINTRAM72 reports, *The Local Model User Guide* provides further information on the operation of the Local Model.

2.3 Base Year

2.3.1 The model base year is 2014.

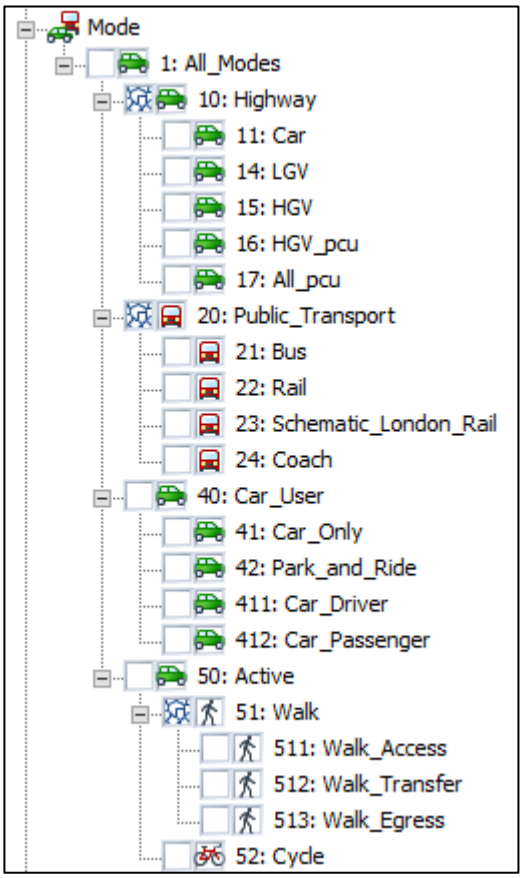
2.4 Modes of Transport

2.4.1 The modelling of demand in SINTRAM72 is multi-modal, with the main modes of:

- Highway;
- Public Transport (PT); and
- Active.

2.4.2 As shown in Figure 2-1, these categories include an extensive number of sub-modes

Figure 2-1 Travel modes for demand modelling



2.4.3 For both the SINTRAM72 and Local Model cases, primary highway vehicle types are car; light goods vehicles (LGV); and heavy goods vehicles (HGV). Additionally, bus vehicles are included in the highway traffic, as are the car components of Park & Ride trips[2].

2.4.4 For highway assignment modelling, all the vehicle types are considered in terms of passenger car units (PCUs). Most vehicles on the road have a PCU value of 1.0, i.e., 'vehicles' and 'PCUs' are the same, but HGVs have a PCU value of 2.0 and buses of 2.5, reflecting their relatively greater impact on network capacity.

2.5 Time Periods

2.5.1 The starting point for the calculation of travel demand is an average 24-hours for a working day in a 'neutral' month (avoiding significant holiday periods and more extreme winter weather). This enables total daily trip rates by trip purpose to be assumed constant over the forecasting period.

2.5.2 For most demand modelling though, trips are allocated to the four time-periods of AM (0700 – 1000), Inter-Peak (1000 – 1600), PM (1600 – 1900), and Off-Peak/night-time (1900 – 0700).

2.5.3 The demand modelling focuses on the 12 daytime hours covered by AM, Inter-peak (IP), and PM, but return-trips include consideration of Off-Peak (OP) travel.

2.5.4 The SINTRAM72 highway modelling uses 'peak hour' factors to represent heightened levels of congestion within the AM and PM peak periods, respectively

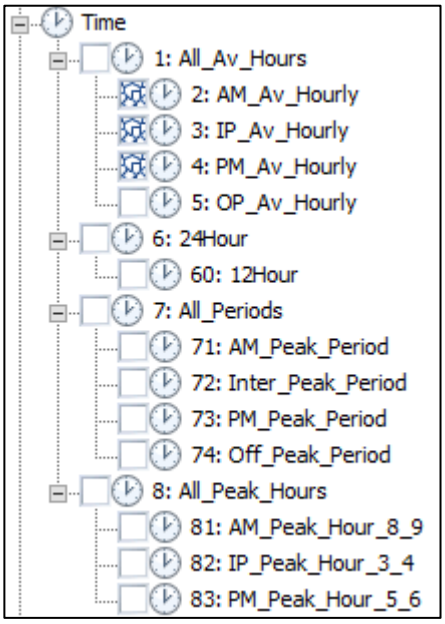
[2] Park and ride trips include connectivity between car and rail as well as traditional car and bus.

taken as occurring for the peak hours 0800 – 0900 and 1700 – 1800. For the Local Model AM and PM peak hours, trips are further adjusted with reference to values of local peak-hour traffic counts.

2.5.5 An average hourly Inter-Peak highway network assignment is generated in the Local Modelling but is not subject to specific validation or reporting.

2.5.6 The set of time periods used at various points in the modelling is shown in Figure 2-2.

Figure 2-2 Time periods used in modelling

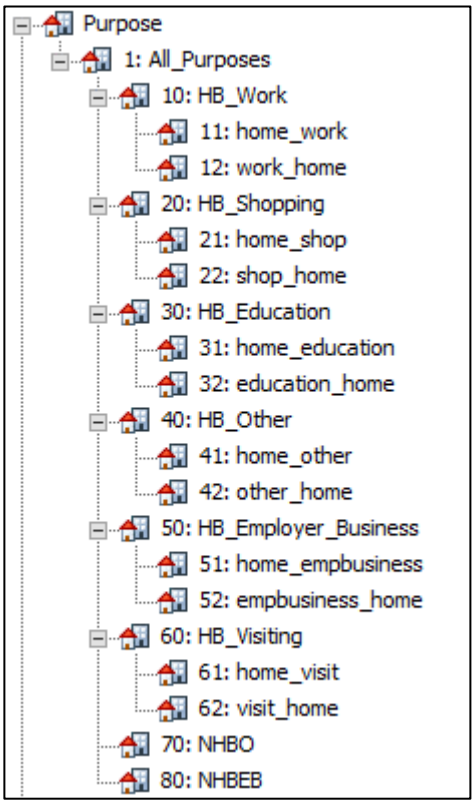


2.6 Demand Types

2.6.1 For demand modelling, trips are initially considered as ‘tours’ and identified as ‘Production-Attraction’ (‘PA’) trips. Tours apply to home-based (HB) trips, with an outbound trip from the home implying (in nearly all cases) a return trip later in the day. Non-home based (NHB) trips do not imply return trips. For network assignment modelling, and, importantly, for local modelling, trips are considered as ‘Origin-Destination’ (‘OD’) movements for a particular time period, that is, OD trip tables (matrices) include both outbound and (returning) inbound home-based trips, as well as any NHB trips arising in the particular time period.

2.6.2 The set of trip purposes used in demand modelling is shown in Figure 2-3.

Figure 2-3 Trip purposes used in demand modelling



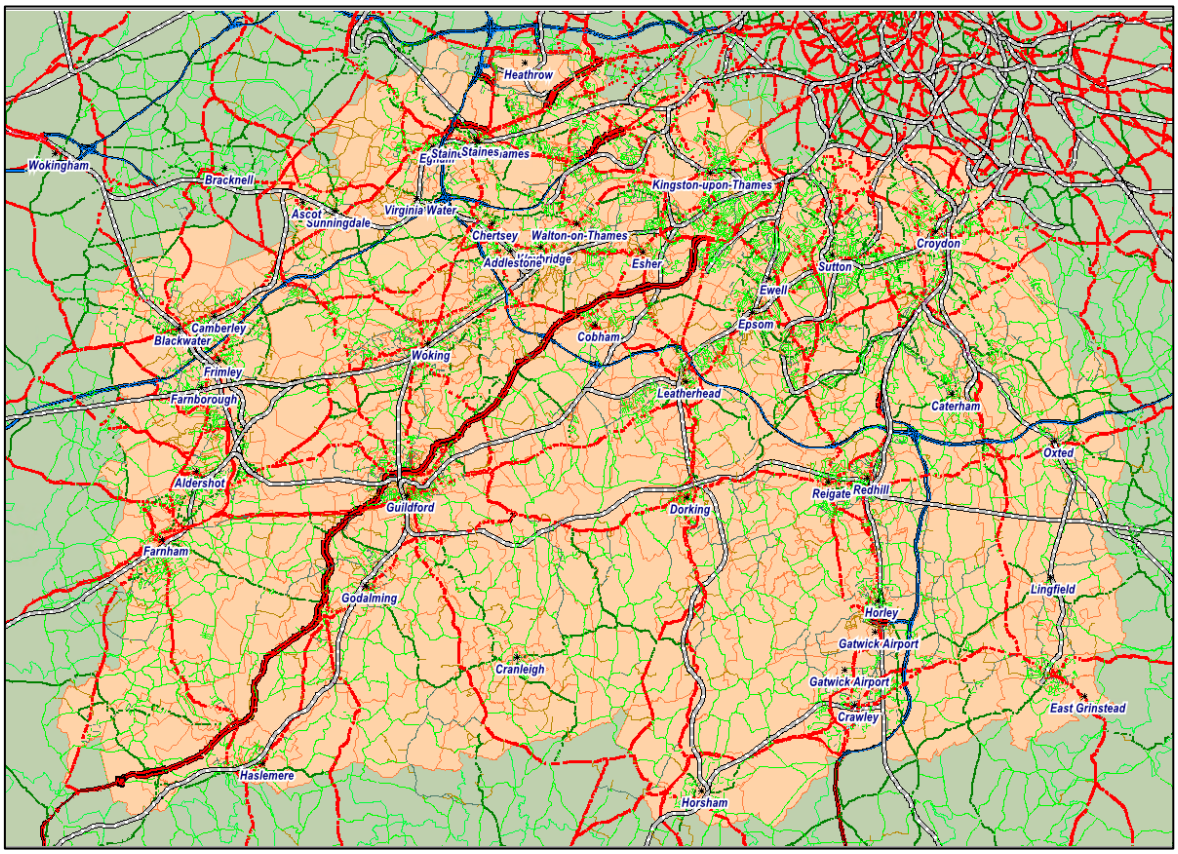
2.6.3 Travel demand is further categorised in the demand modelling according to the availability of a car for travel.

2.6.4 For the Local Model, all person car trips are considered as all purposes combined but, obviously, the pattern of trips reflects the underlying trip purposes used in the demand modelling.

2.7 Study Area

2.7.1 Figure 2-4 shows a part of the SINTRAM72 transport network. An 'Inner Study Area' (ISA), where the modelling is most detailed, is shown with a light orange background. The ISA includes Surrey and some adjacent areas.

Figure 2-4 SINTRAM72 Inner Study Area



2.7.2 The Local Model is defined by a cordon around the borough of Spelthorne and some adjacent areas in the SINTRAM72 model, as shown in Figure 2-5 below, to produce the Local Model shown in Figure 2-6 following.

Figure 2-5 Extraction of Spelthorne network

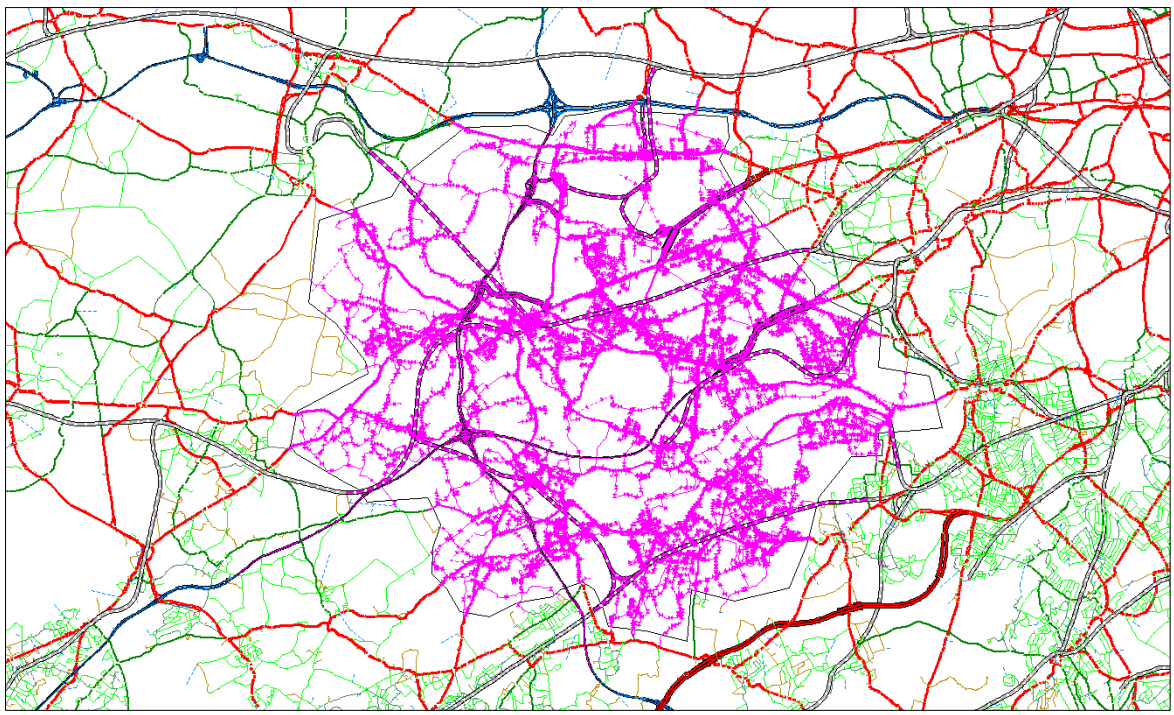
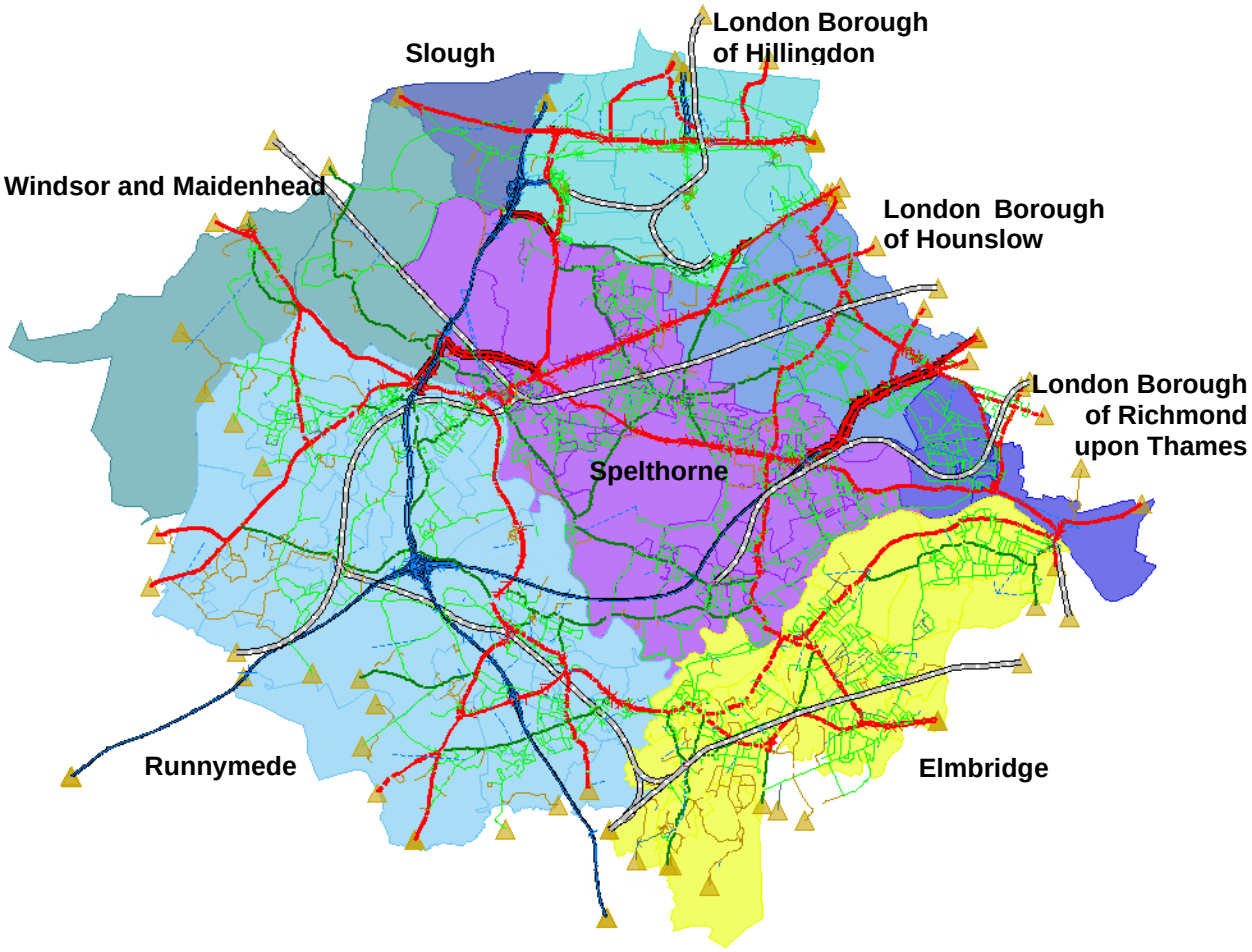


Figure 2-6 Local Model network showing Spelthorne and surrounding areas



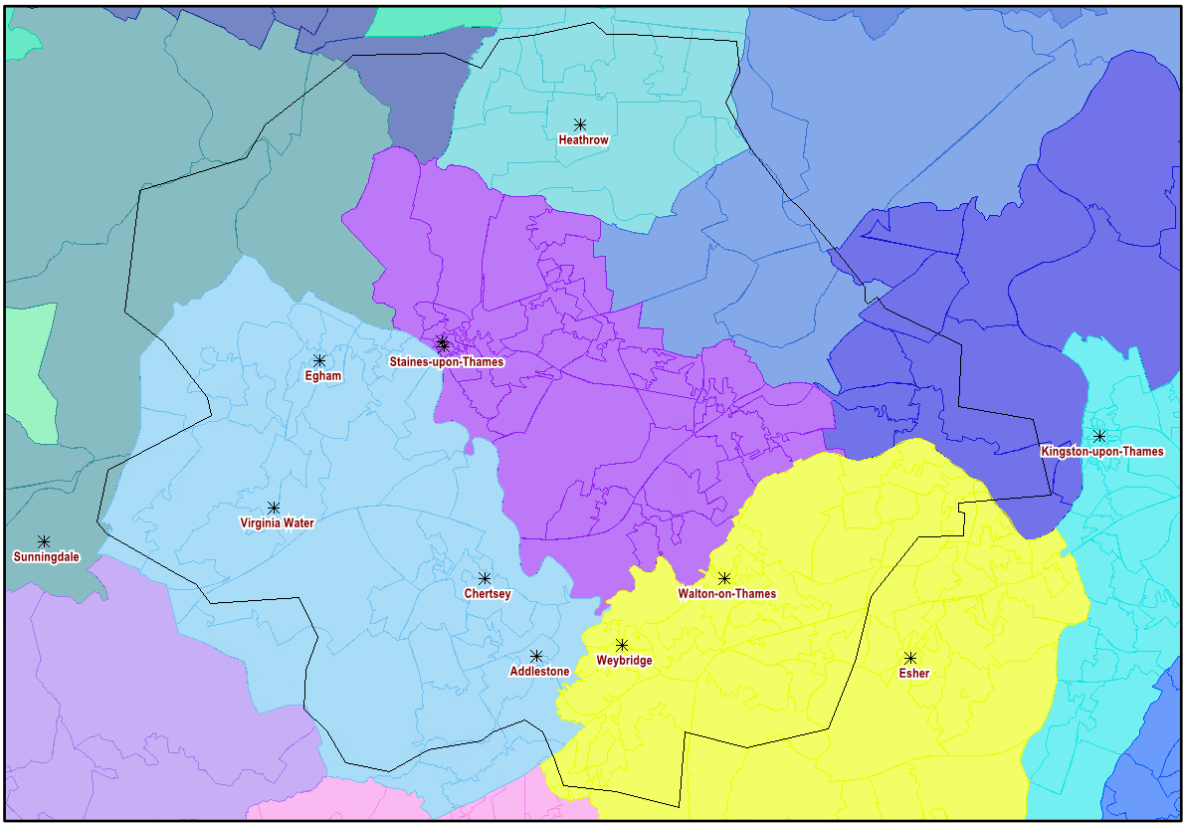
2.7.3 Spelthorne contains Junctions 1 to 2 of the M3 between Sunbury-on-Thames and Shepperton, and Junctions 13 to 14 of the M25 from Staines-upon-Thames to Stanwell Moor. The key intersection of the M3 and M25 is in Runnymede Borough but has been included in the model. These roads which are the responsibility of National Highways, have been reported separately in the analysis.

2.7.4 The primary cross-boundary impacts are addressed by inclusion of parts of Runnymede, Windsor and Maidenhead, Slough, Elmbridge and the London Boroughs of Hounslow, Hillingdon and Richmond upon Thames in the Local Model, as shown in Figure 2-6 above.

2.8 Zoning

2.8.1 The Local Model has 283 zones defined. Of these, 67 correspond to the cordon crossing points, the main ones of which are labelled as triangles in Figure 2-6 above. Figure 2-7 below shows example details of the zoning in Spelthorne and the surrounding area.

Figure 2-7 Model zones in and around Spelthorne Borough



2.9 Network Review

2.9.1 To ensure that the model network reflects layout on street, a review of the SINTRAM network in Spelthorne and its immediate surroundings was carried out. This involved checking numerous parameters including speed limits, road class, number of lanes, junction layouts and priorities, one-way streets and banned turns. Checks were made against a variety of information sources including SCC's Street Gazetteer data and aerial mapping.

2.10 Junction Modelling

2.10.1 The network modelling includes explicit modelling of junctions. This is naturally more prominent in urban areas. Figure 2-8 illustrates the example of junction modelling at junction 13 of the M25. This includes the intersection of the A30 and M25 roads, which is also shown in Figure 2-9 where the symbols indicate the location of additional attention to the modelling of delays when merging onto motorways. In this case, the delays are experienced on the link downstream of the indicated node.

2.10.2 The design of a junction determines the volume of vehicles able to pass through the junction in a defined period of time, and the maximum volume is the saturation flow (pcu/hour). OmniTRANS uses basic saturation flows for each movement per junction type, differentiated by type of movement e.g., left or right turning, straight ahead etc. The software decreases the saturation flow automatically accounting for effects like the number of lanes, shared lanes, give way, blocking probabilities, signal settings, etc.

2.10.1 Signal junctions are coded within the model as having 'automated' signal timings. This means cycle times and green times are not explicitly coded to match observed settings. The model calculates an optimal time and green times for the given junction

layout and turning flows. Using the automated signal settings ensures that when forecasting is undertaken, signal timings are appropriate as they adapt to match the future traffic flows. This reflects what would occur on street whereby signal timings would be revalidated in response to changing flow conditions.

Figure 2-8 Junction controls and lane markings

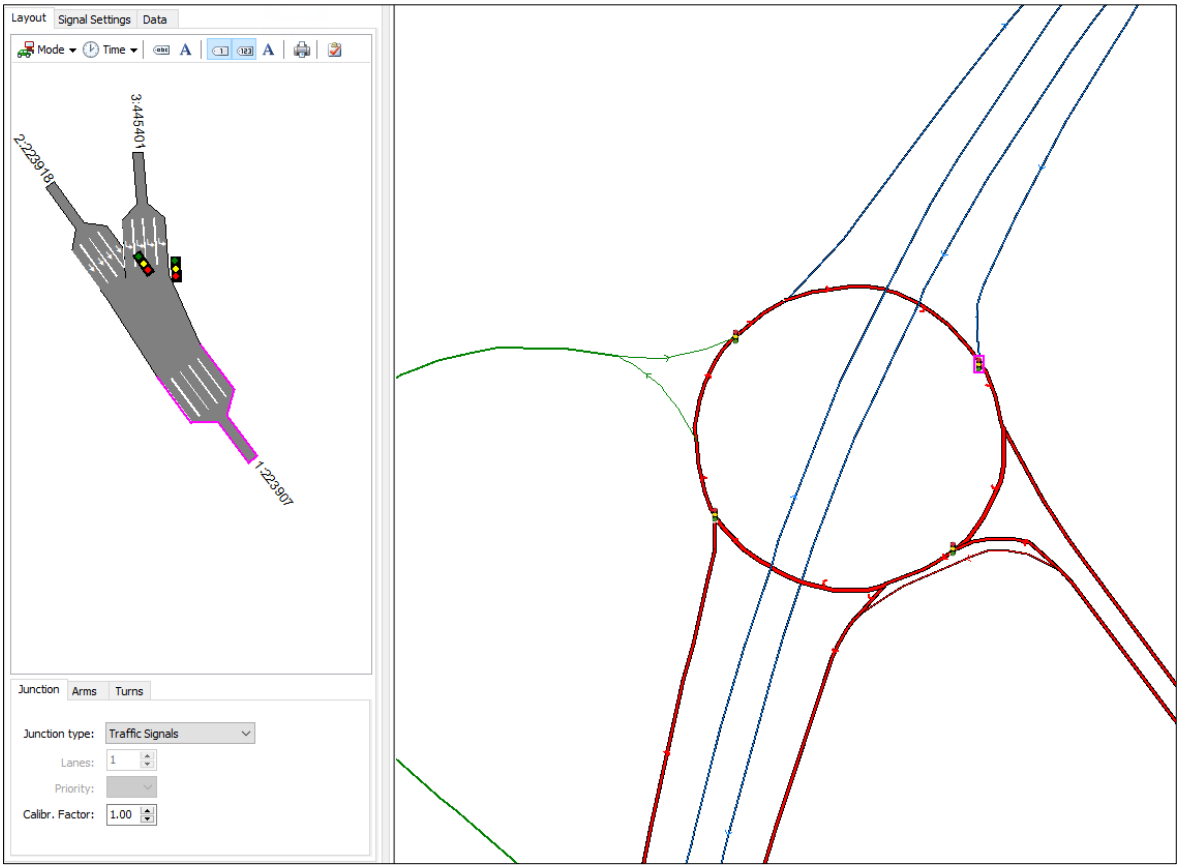
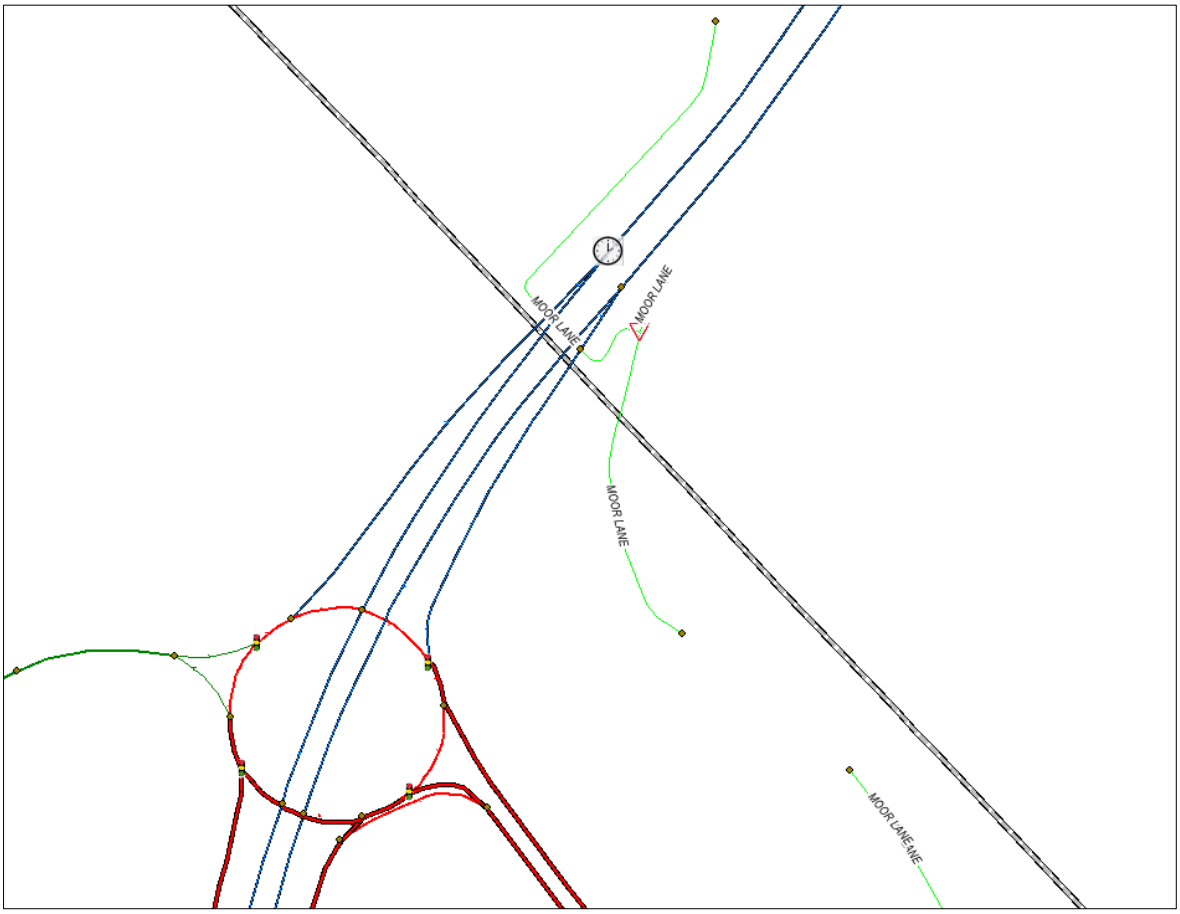


Figure 2-9 Modelling of motorway merges



2.11 Assignment

2.11.1 The local highway assignment modelling is provided by the OtTraffic component of OmniTRANS, which provides multi-user class (MUC) equilibrium assignment.

2.11.2 The MUC assignment models the combined effects of cars, LGVs, and HGVs on congestion, while supporting different routeing characteristics for each class.

2.11.3 Congestion effects on links are modelled via speed-flow curves derived from 'COBA', as specified in Appendix D of Transport Appraisal Guidance (TAG) Unit M3.1 "*Highway Assignment Modelling*", and which take account road types, widths, and localities (urban, rural, etc.).

2.11.4 Delays at junctions are modelled via relationships based on 'time-dependent queueing theory'. These are described further in the OmniTRANS support document *Junction Modelling*.

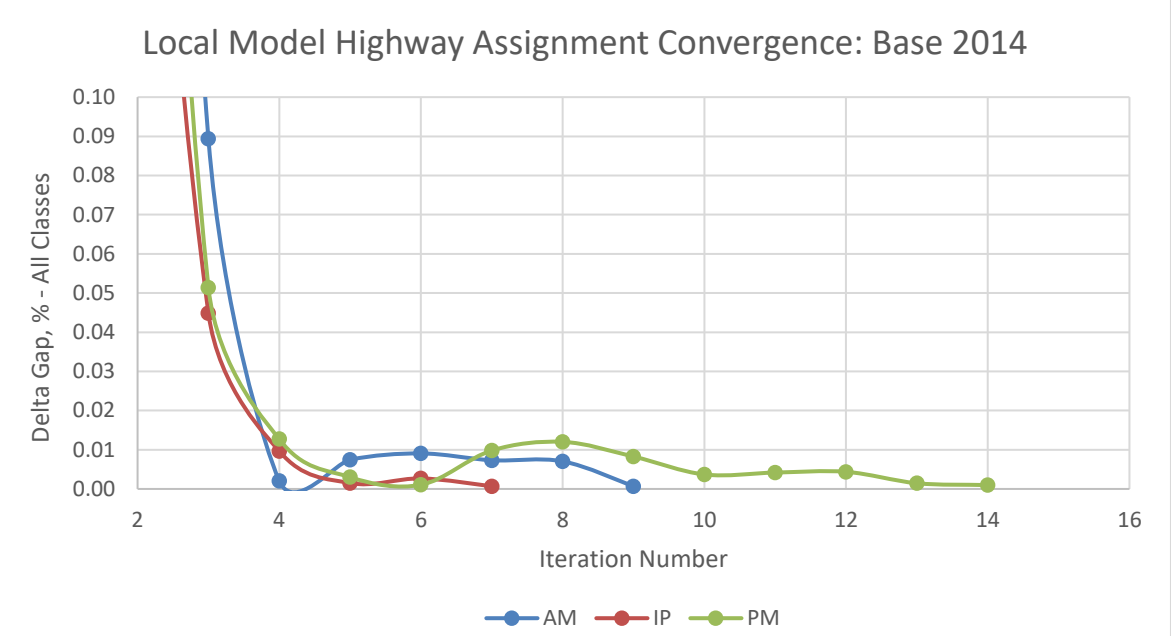
2.11.5 Additionally, SCC's consultants have implemented a custom 'cost function' for modelling merging delays at motorway junctions. This is based on TRL research evidence documented in Appendix D.9 of TAG Unit M3.1.

2.11.6 Routes through the network are calculated in terms of 'generalised time' (units of minutes). The coefficients for the expressions used to calculate generalised time are the same as reported for SINTRAM72 and are taken from the November 2016 WebTAG Databook for values of time (VoT) and vehicle operating costs (VOC) applicable to each of Cars, LGVs, and HGVs.

2.11.7 The assignments are run through an iterative process which is halted when the variation in results, as defined by the TAG (Unit M3.1, Section C.2.4) 'Delta' Gap statistic, is less than the TAG target value of 0.1%.

2.11.8 The convergences for the Spelthorne network are shown in Figure 2-10 for the AM, IP and PM base year case.

Figure 2-10 Highway assignment convergence - epsilon values



2.11.9 Initial convergence is quite fast in the base year for all time periods.

3 MODEL VALIDATION

3.1 Introduction

3.1.1 The validation reported here focuses on the local highway model that covers Spelthorne and a hinterland incorporating parts of adjacent authorities.

3.1.2 As described previously, this local model is derived from Surrey County Council's regional, multi-modal transport model, version SINTRAM72, which is used to provide initial ('prior') base year highway travel information for the local model in the form of origin-destination (OD) trip matrices, and later could be used to forecast changes in the demand for travel, in for example 2037, the Local Plan forecast year. The prior OD matrices from SINTRAM72 are refined as part of the validation process reported in this section.

3.1.3 This chapter focuses on the local model base year (2014) highway validation, considering the comparison of modelled traffic flows with observations at count and along screenlines and, similarly, comparisons of journey times along a set of ten journey time routes defined for the purpose. Changes to the matrix due to Matrix Estimation have been considered alongside this.

3.2 Assessment Objectives

3.2.1 The primary objective of the local model validation is to provide assurance that the model's replication of observed base year traffic flows and congestion levels is

sufficient, and also to give confidence in any potential forecast highway network modelling for using this model.

3.3 Validation Criteria

3.3.1 Validation simply compares modelled and observed data. The standard criteria for assessing highway network models is provided by the Department for Transport's WebTAG guidance, notably, *Unit M3 Highway Assignment Modelling*.

3.3.2 The validation of a highway assignment model includes comparisons of the following:

a) assigned flows and counts totalled for each screenline or cordon, as a check on the quality of the trip matrices;

b) assigned flows and counts on individual links as a check on the quality of the assignment; and

c) modelled and observed journey times along routes, as a check on the quality of the network and the assignment.

3.3.3 For trip matrix validation within traffic assignments, the measure which should be used is the percentage difference between modelled flows and counts. Comparisons at screenline level provide information on the quality of the trip matrices.

3.3.4 For link flow validation the measures used are the absolute and percentage differences between modelled flows and observed counts as well as the GEH statistic. The GEH statistic is a form of the chi-squared statistic that incorporates both relative and absolute errors, and is defined as follows:

$$GEH = \sqrt{\frac{(M-C)^2}{(M+C)/2}}$$

where: GEH is the GEH statistic

M is the modelled flow

C is the observed flow

3.3.5 For journey time validation the measure used is the percentage difference between modelled and observed journey times, subject to an absolute maximum difference.

3.3.6 The WebTAG acceptability guidelines for each of these measures are summarised in Table 3-1 below.

Table 3-1 Validation acceptability guidelines

Validation Criteria	Acceptability Guideline
Differences between screenline modelled flows and counts should be less than 5% of the counts	All or nearly all screenlines
Individual flows within 100 vph of counts for flows less than 700 vph	> 85% of cases
Individual flows within 15% of counts for flows from 700 to 2,700 vph	
Individual flows within 400vph of counts for flows more than 2,700 vph	
GEH < 5 for individual flows	
Modelled journey times within 15% (or 1 minute, if higher)	

3.3.7 TAG unit M3-1 states that the validation of a highway assignment model should not only be about achieving the flow validation criteria. This is so that matrix estimation is not relied upon too much and some models where flow validation is not quite met are still fit for purpose. The limits set out in relation to matrix estimation changes are listed in TAG unit M3-1 Table 5 (copied below in Table 3-3) and should be respected as a priority over validation standards in TAG unit M3-1 Tables 1, 2 and 3 (summarised in this report in Table 3-1 above). This is particularly true of models of large, congested areas such as Spelthorne.

Table 3-2 Significance of matrix estimation changes

Measure	Significance Criteria
Matrix zonal cell values	Slope within 0.98-1.02 Intercept near 0 R^2 in excess of 0.95
Matrix zonal trip ends	Slope within 0.99-1.01 Intercept near 0 R^2 in excess of 0.98
Trip length distributions	Means within 5% Standard Deviations within 5%
Sector to sector level matrices	Difference within 5%

3.4 Methodology for Comparing Counts and Flow

3.4.1 The local model observed traffic counts are derived from the set used in SINTRAM72 modelling, of which there were over 3,500 one-way counts. These counts were taken in the period 2011 to 2016. Those older than 2012 were given a lower count-weighting.

3.4.2 Flows should not change too much unless the counts are situated next to major land use change in the interim. Change in flow from year to year is also highly dependent on capacity. For example, a link at capacity is unlikely to have flow increase if demand exceeds or equals supply, but a link with spare capacity is more subject to growth. Nevertheless, if the road is a minor road, it is likely that other count data will not exist in that location.

3.4.3 Of the 3,500 counts in SINTRAM72, 580 relate to the local model highway network. As described below, flow validation is based on 385 counts from across the subarea.

3.4.4 This total large number of counts, and their distribution on the highway network, is due to the wide sources of traffic count data that have contributed to the set. These include counts produced by DfT, National Highways, Surrey CC, as well as counts commissioned for individual concerns. The count data has also been observed by different means, both instrumented and manual, and across widely varying numbers of days. These differences are encoded via 'confidence level' factors[3] that are used in matrix estimation.

3.4.5 These different forms and sources of collection also vary in how, and the extent to which, traffic is classified by the vehicle types used in the modelling of car, LGV, and HGV.

[3] Confidence levels vary between 0.0 ('no confidence') and 1.0 ('full confidence'). The range applied in practice varies from 0.6 to 0.9, largely depending on the data collection type and numbers of repeated observations.

3.4.6 Where counts have not been classified, or only in a limited way, then estimates have had to be made of the numbers of cars, light, and heavy good vehicles associated with each count site and for each time period.

3.5 Motorway and Trunk Road Mainline Counts

3.5.1 Simple inspection of the count data on the motorway and trunk road network, of the M25 and M3, reveals a number of inconsistencies that cannot be resolved by any feasible set of modelled flows. For these roads, the peak hour counts are less than the experienced levels of congestion imply. The reason for this is readily accounted by the extensive queueing present at the start of the modelled periods, where long stretches of 4 and 3-lane motorway and trunk road can store up to 2,000 vehicles in a 2km stretch. Peak hour queueing occurs, of course, elsewhere in the network, but the discrepancies between counted flows and travel demand are most significant for these roads.

3.5.2 For this reason, peak hour motorway and trunk road mainline count data has largely been discounted in the modelling and validation. Instead, reliance is placed, in the first instance, on the demand placed on the motorways by the 'prior' matrices, that is, the demand as derived by SINTRAM72. This demand is calculated from wide-ranging data sources but is partly based on average-hourly 3-hour counts for each of the AM and PM periods, and then subject to 'peak hour' adjustment factors. On this account, the prior estimates for the motorway flows (notably at the entry and exit points) may be considered to be reasonably representative.

3.5.3 Another source of assessment of appropriate motorway flow demand is provided by journey time data (as described later in Section 3.10). Through flow-delay relationships, these can provide fair indicators of travel demand.

3.5.4 A further source of the assessment of motorway demand, given that these motorways are typically highly congested in the peak hours, is provided by noting the maximum counted flows and the capacity of the motorways, as defined by consideration of COBA relationships and the number of lanes. For this, the highest observed values, for the entire morning and afternoon, were sourced from the Highway England's WebTRIS database, where the data was available. This provided 24 assessed counts to be used in the model as set out in Table 3-3.

Table 3-3 Motorway and trunk road mainline assessed counts

Count Nr	Description	Link Nr
3337	M3 EB J3 - J2	332630
3576	M3 EB Within J2	121183
3577	M3 EB J2 - J1	335380
3578	M3 WB J1 - J2	335365
3579	M3 WB Within J2	121182
480	M25 CW J10 - J11	342147
1592	M25 CW Within J11	333030
3580	M25 CW J11 - J12	72422
3581	M25 CW Within J12	90325
1695	M25 CW J12 - J13	335181
1740	M25 CW Within J13	337610
1821	M25 CW J13 - J14	70573
3583	M25 CW Within J14	338492

Count Nr	Description	Link Nr
1834	M25 CW J14 - J15	338683
1836	M25 AC J15 - J14	338677
3584	M25 AC Within J14	338495
1820	M25 AC J14 - J13	70572
1743	M25 AC Within J13	337612
1694	M25 AC J13 - J12	335270
3582	M25 AC Within J12	334327
1595	M25 AC Within J11	333033
481	M25 AC J11 - J10	342138
3585	M4 NB J4	340539
3586	M4 SB J4	340533

3.5.5 Therefore, although the motorway and trunk road counts are not used directly, it is possible to form a view of the 'assessed' demand against which the modelled flows may be considered. On this basis, and noting the largely accurate modelling of motorway travel times described in Section 3.10, it is possible to assert confidence in the motorway flows indicated by the prior trip matrices.

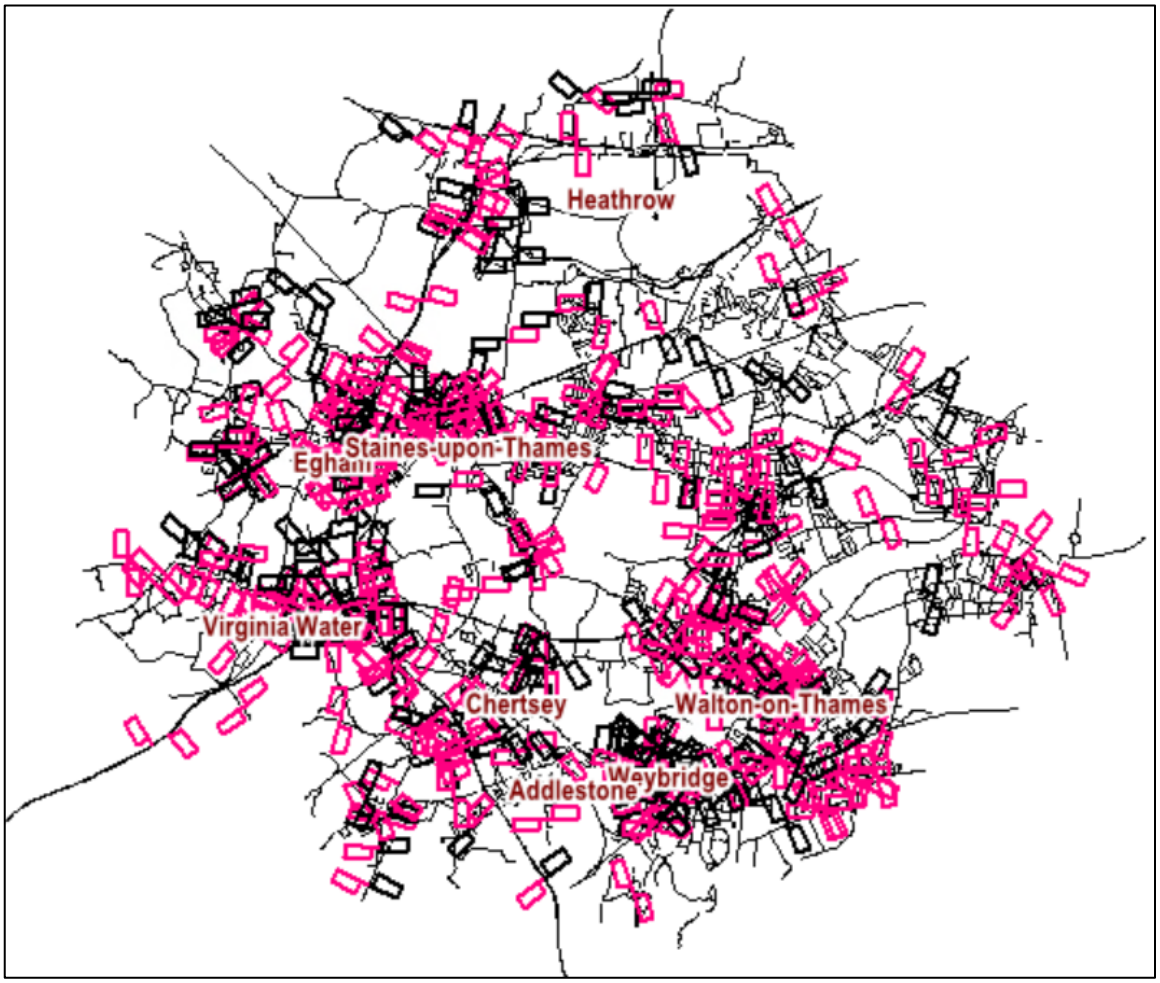
3.5.6 Modelling motorway and trunk road flow levels adequately is significant, as they carry flows that are ten times those of many roads in the rest of the local model network. Thus, errors of 10% in motorway counts and related routeings can correspond to 100% of many local counts.

3.6 Count Selection

3.6.1 Although not a concern for much of Spelthorne, there is a sufficient density of counts that inconsistencies between adjacent and nearby counts are manifest. In some cases, these discrepancies may reasonably be associated with queueing effects reducing the apparent demand (as per motorways but on a smaller scale), but in other cases the reasons are not clear.

3.6.2 Sets of counts have therefore been defined respectively for matrix estimation and for flow validation. These sets are selected in terms of 'reliable' counts for which 377 counts are used for matrix estimation. As shown in Figure 3-1, these count sites are indicated by the pink rectangles.

Figure 3-1 Matrix estimation count sites



3.6.3 TAG Unit M3 specifies the use of another set of counts for validation purposes that are not used in matrix estimation. This is problematic for several reasons: if the 'validation' counts differ from the 'estimation' counts then they should be included in the estimation set if the differences imply additional information that should not unreasonably be withheld from the estimation. If the differences arise because of observation errors, then they are not fair validation tests.

3.6.4 For these reasons, the assessment of model flows is confined to the 385 counts that have passed the quality threshold of 'reasonably self-consistent'. The full set of 580 counts is retained in the model so that variances with modelled values can be inspected.

3.6.5 The number of 385 counts is large for the size of the Spelthorne network, so any broad level of agreement, coupled with the established provenance of the prior OD matrices, provides strong assurance that the model reflects base year travel patterns.

3.7 Development of SINTRAM72 Base Matrices

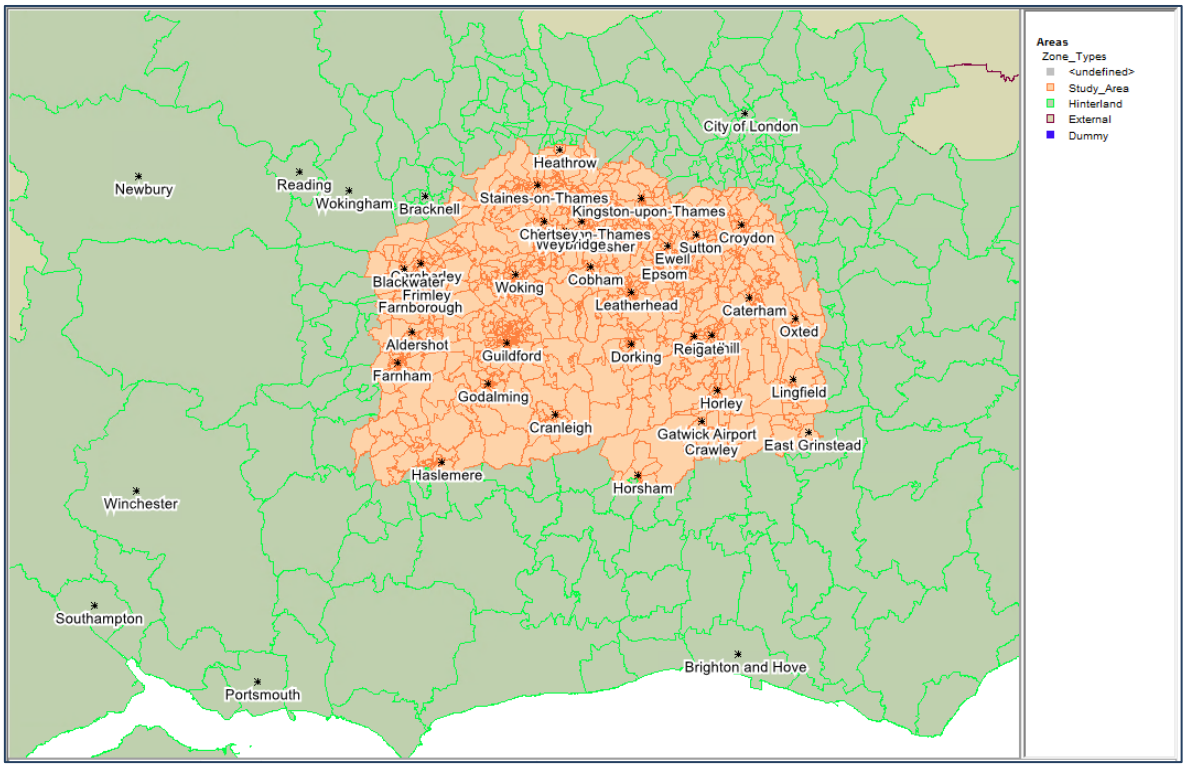
3.7.1 The starting point for the Local Model base matrices is provided by the base matrices in the SINTRAM72 model, with 2014 being the base year in both cases.

3.7.2 The zones in the SINTRAM72 model are categorised as: *(Inner) Study Area*: zones 1 – 1325; *Hinterland*: zones 1326 – 1553; and *External*: zones 1554 – 1595.

3.7.3 A set of zones are classified as 'Dummy' zones and used for representing developments on major 'greenfield' sites[4]; these bring the total number of zones in the SINTRAM72 model to 1615.

3.7.4 Figure 3-2 shows the Study Area and Hinterland zones in the context of the south-east of England. As is clearly shown, the Hinterland zones (green boundaries) are much larger than the Study Area zones.

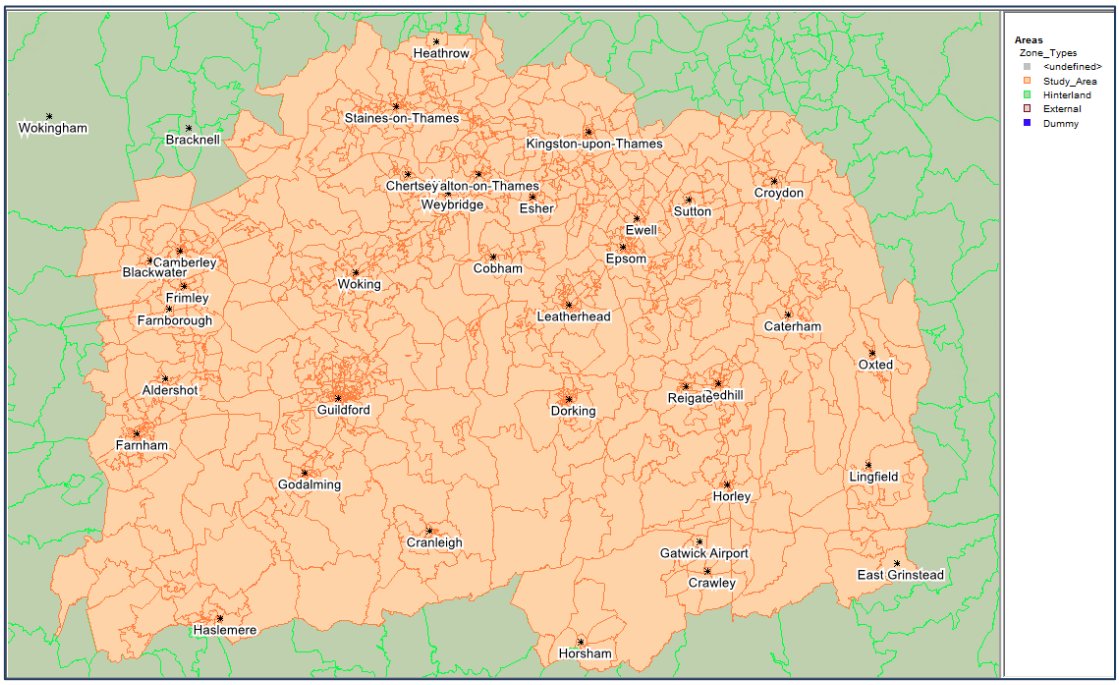
Figure 3-2 Study area, hinterland, and external zone areas



3.7.5 Figure 3-3 below shows a more detailed view of the SINTRAM72 zoning in the Study Area.

[4] 'Greenfield' should be interpreted here as (largely) vacant sites subject to significant land use change, thus including 'brownfield' sites.

Figure 3-3 Detail of study area zoning



3.7.6 The development of the SINTRAM72 base matrices involved a complex and comprehensive process, reported in *SINTRAM72 Technical Notes TN2* and *TN3*.

3.7.7 The process starting point is the set of trip ends calculated from CTripEnd v7.2, but with locally defined 2014 ONS mid-year population data, and 2014 NOMIS employment data for the study area. This data corresponds to standard update estimates of 2011 ONS Census data. Hinterland and External zones use data provided by CTripEnd. Information on this aspect is provided in *SINTRAM72 Technical Note TN1*.

3.7.8 The trip end data is used, together with National Travel Survey (NTS) information for the South East, to synthesise a full set of Production-Attraction (PA) matrices for different trip purposes and travel modes. The PA matrices reflect 'tours', rather than trips, in which trips outbound from home imply return trips to home later in the day.

3.7.9 The base matrix development process uses a broad range of observed data to enhance the initial synthesised matrices. This is done first for PA matrices (e.g. using Census Travel to Work data) from which a set of Origin-Destination (OD) trip matrices are derived. OD matrices define travel patterns for particular periods of the day and include outbound and return trips, as well as non-home based (NHB) trips. These OD matrices are revised using varied data sets but including GPS-based observations of car travel patterns.

3.7.10 Traffic count data is also used to enhance the OD matrices. This is via the same matrix estimation procedure applied to the Local Model matrices, but in the case of SINTRAM72 matrices the matrix estimation is only used to influence travel patterns, not scaling of the numbers of trips. This is because SINTRAM72 matrices are constrained to trip rates by purpose (with the trip rates originating from NTS data).

3.7.11 The comprehensive assessment of the SINTRAM72 base matrices that is reported provides evidence that the properties of the base matrices, such as trip length distributions match expectations, and that the different sources of updating

information have effects commensurate with their assessed levels of precision and accuracy.

3.7.12 The SINTRAM72 OD matrices for goods vehicles (LGV and HGV types) are much less robustly based and rely largely on matrix estimation.

3.8 Development of Local Model Base Trip Matrices

3.8.1 The Local Model base trip matrices use traffic count data and matrix estimation provided by OmniTRANS to update prior OD matrices generated from SINTRAM72.

3.8.2 The location of the 377 traffic counts used in the estimation is indicated above in Figure 3-1, which shows the sites as pink rectangular symbols.

3.8.3 The major assurance for the quality of the local matrices is provided by their provenance as extracts of SINTRAM72 matrices. In general, the Local Model matrix estimation alters the matrices, but only to a relatively limited extent, so that travel patterns are not markedly altered. This is illustrated in Figure 3-4 to Figure 3-7, which displays origin (blue) and destination (green) trip ends for the base prior (darker) and the final matrix estimation ('ME', lighter) cases[5].

3.8.4 Figure 3-4 compares the prior and matrix estimation car trip ends for the entire Local Model for the AM peak hour, and a close-up view of Spelthorne is provided in Figure 3-5. Similarly, Figure 3-6 and Figure 3-7 present comparisons for the Local Model and Spelthorne, but for the PM peak hour.

3.8.5 It can be seen that there is very little change overall, with more change occurring at the cordon edge, specifically on the external zones at either end of the M25, the western side of the M3, A30 and northern end of A408. This coincides with these corridors carrying some of the greatest volume of trips in the model. In both the AM and PM peak hours, there is a general increase in car trip ends arising from matrix estimation.

[5] Some zones are shown with no trip ends. These correspond to future 'Greenfield' sites which, correctly, do not have base year trips.

Figure 3-4 Prior versus ME car trip ends for the AM peak hour (0800 – 0900), Local Model (minimum label value = 800 Cars)

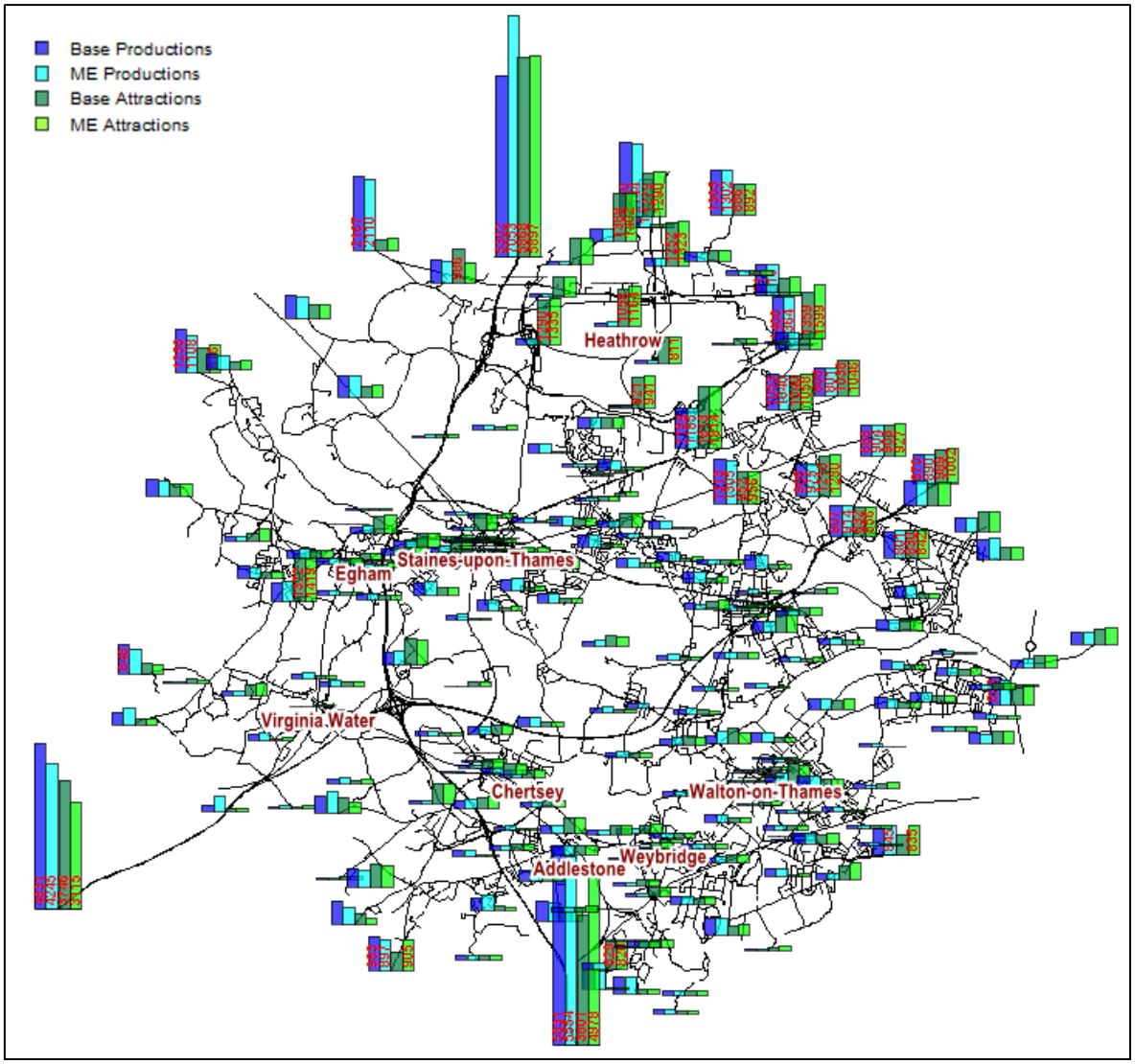


Figure 3-5 Prior versus ME car trip ends for the AM peak hour (0800 – 0900), Spelthorne Borough. (minimum label value = 250 Cars)

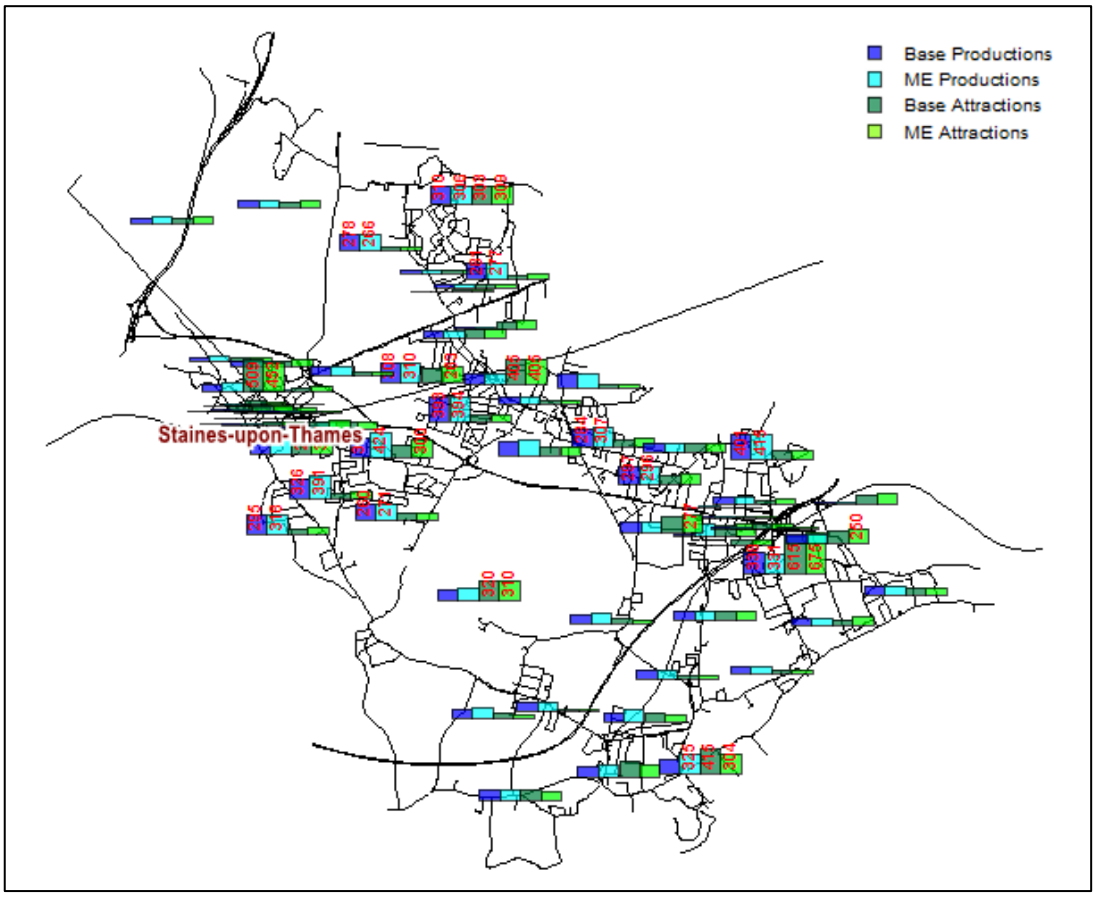


Figure 3-6 Prior versus ME car trip ends for the PM peak hour (1700 – 1800), Local Model (minimum label value = 800 Cars)

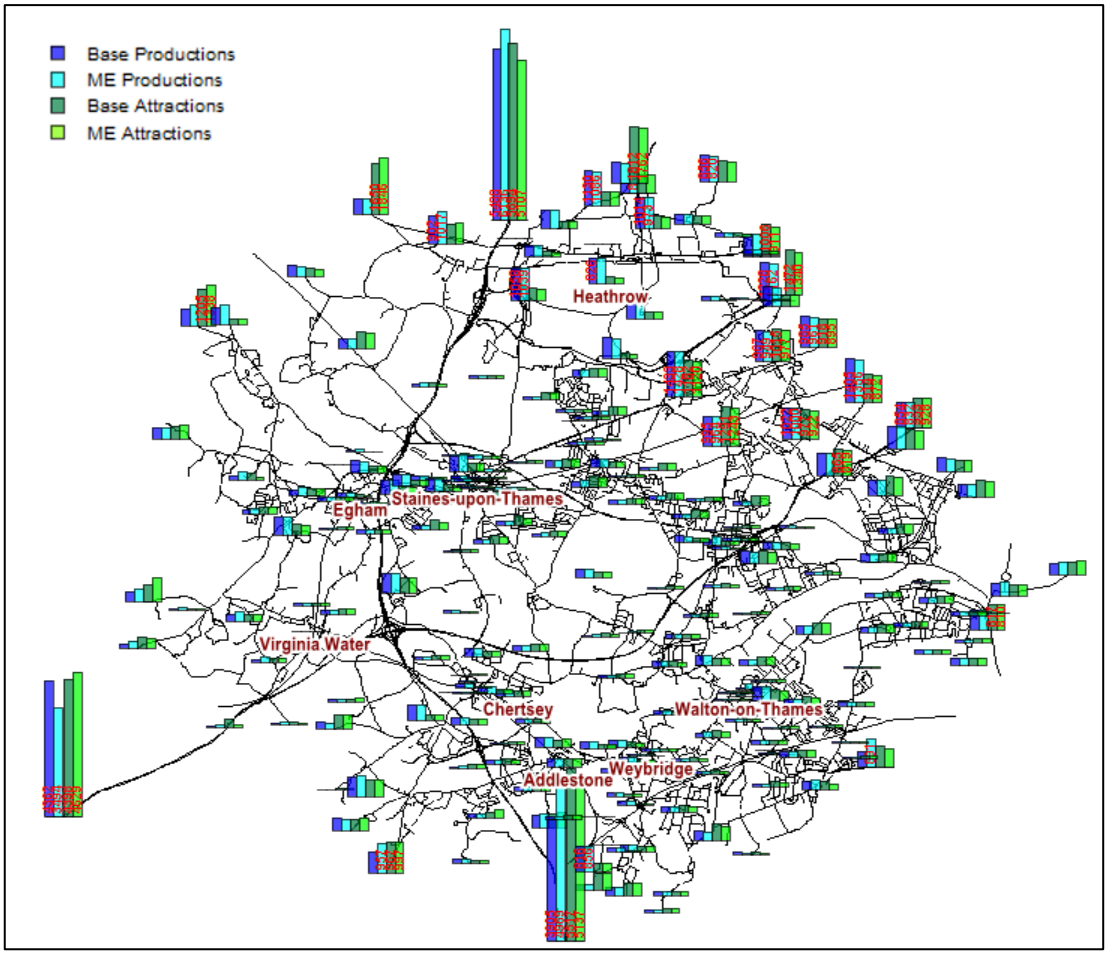
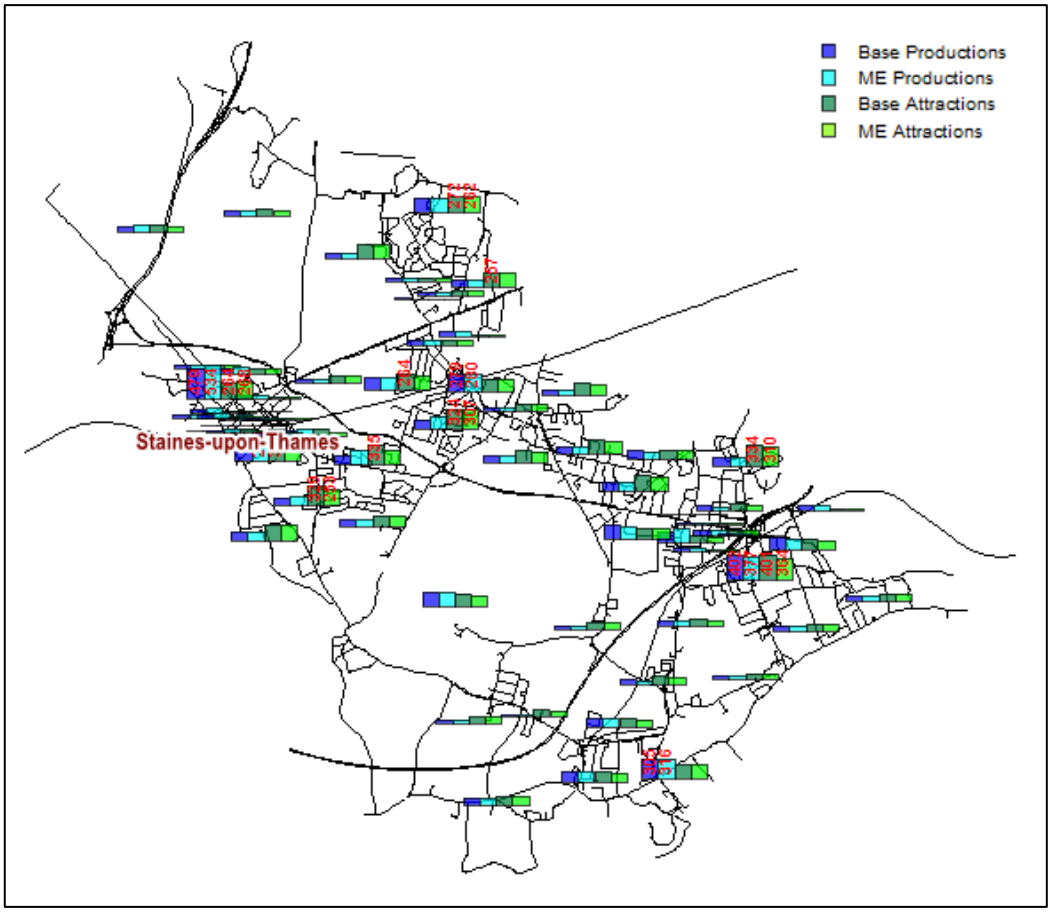


Figure 3-7 Prior versus ME Car Trip Ends for the PM Peak Hour (1700 – 1800), Spelthorne Borough (minimum label value = 800 Cars)



3.8.6 Consideration of the trip matrix totals, presented in Table 3-4 below, shows the total volume of trips changing by 0% in the AM and the nominal amount of 3% in the PM case. Table 3-4 gives values for the original prior matrices (as generated by SINTRAM72) and the final matrix estimated matrices.

Table 3-4 Prior and ME final matrix totals

Matrix Type	Cars	LGV	HGV	All Vehicles	% of Original Total
AM Peak Hour (0800 - 0900)					
Prior matrix	74716	35421	5082	115218	100%
ME Matrix	77710	32547	5206	115464	100%
PM Peak Hour (1700 - 1800)					
Prior Matrix	67929	21226	3193	92348	100%
ME Matrix	71409	19643	4020	95072	103%

3.8.7 The primary purpose of matrix estimation is to refine prior matrices, and such refinements should be sufficiently small that they are not regarded as significant. The limits set out in relation to matrix estimation changes listed in Table 3-2 (TAG unit M3-1 Table 5) and have been discussed below.

3.8.8 Matrix zonal cell values have been presented below with the prior matrix against the post ME matrix as can be seen in Figure 3-8 and Figure 3-9.

3.8.9 In the AM, the slope is almost within 0.98 to 1.02 (0.0877 away); the intercept is close to 0; but the R^2 is short of 0.95. In the PM the slope is 0.0737 from being within 0.98 and 1.02; the intercept is slightly closer to 0 than the AM; the R^2 is closer than in the AM to 0.95.

Figure 3-8 Car AM matrix cell zonal values

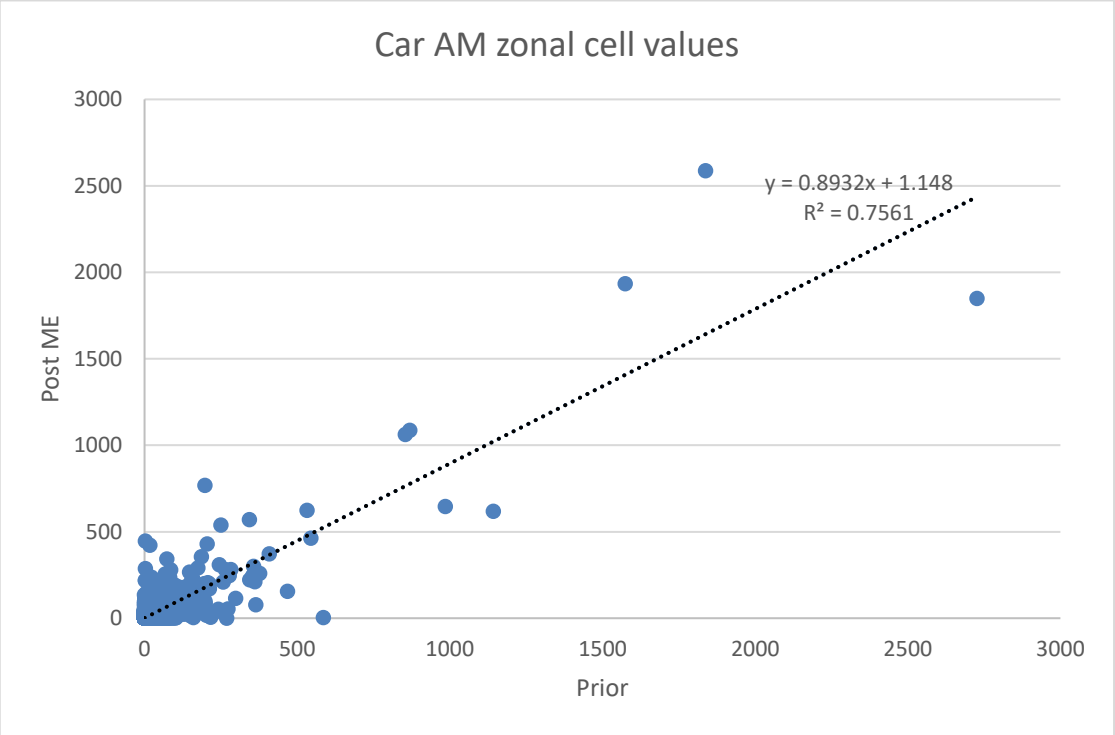
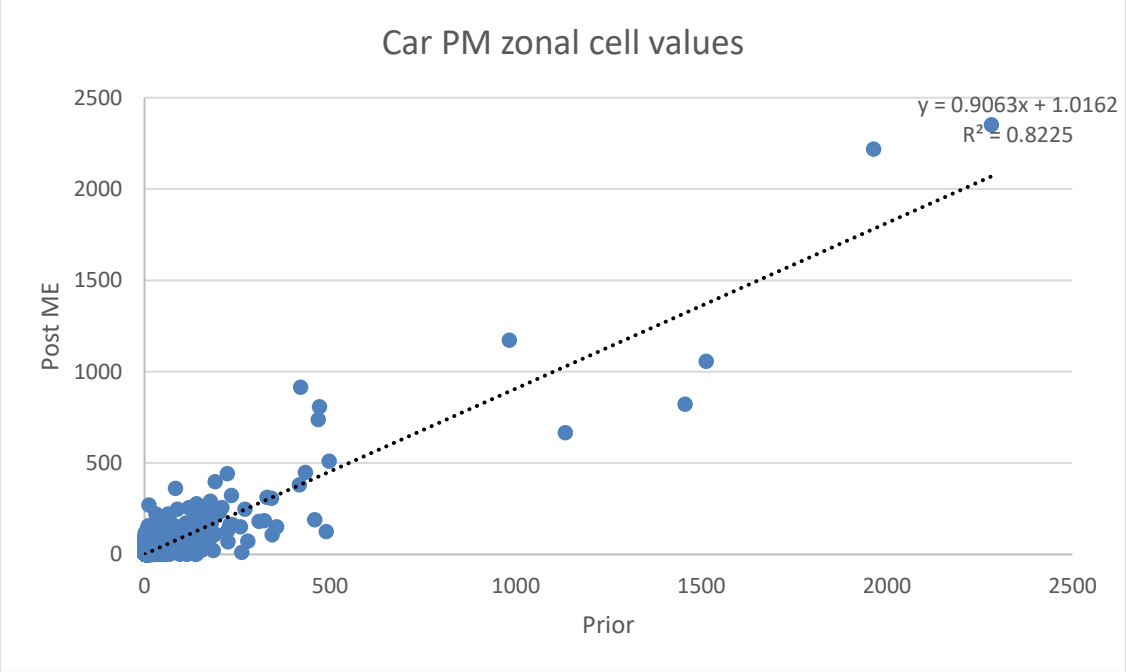


Figure 3-9 Car PM matrix cell zonal values



3.8.10 Matrix zonal trip ends have been presented below with the prior matrix against the post ME matrix as can be seen in Figure 3-10 and Figure 3-11.

3.8.11 In the AM, the slope is almost within 0.99 to 1.01 (0.0261 away); the intercept is close to 0; and the R^2 is only 0.0112 short of 0.98. In the PM the slope is 0.0329 from being within 0.99 and 1.01; the intercept is close to 0 but a little further than the AM; but the R^2 is in excess of 0.98.

Figure 3-10 Car AM matrix zonal trip ends

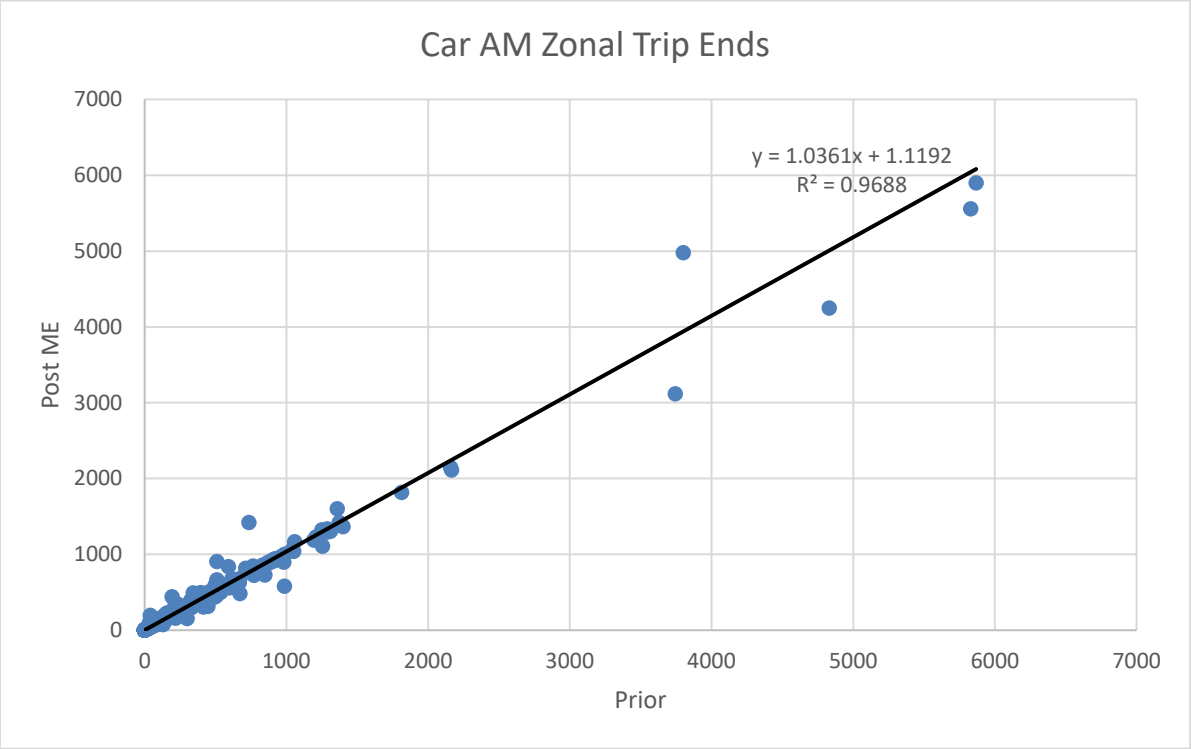
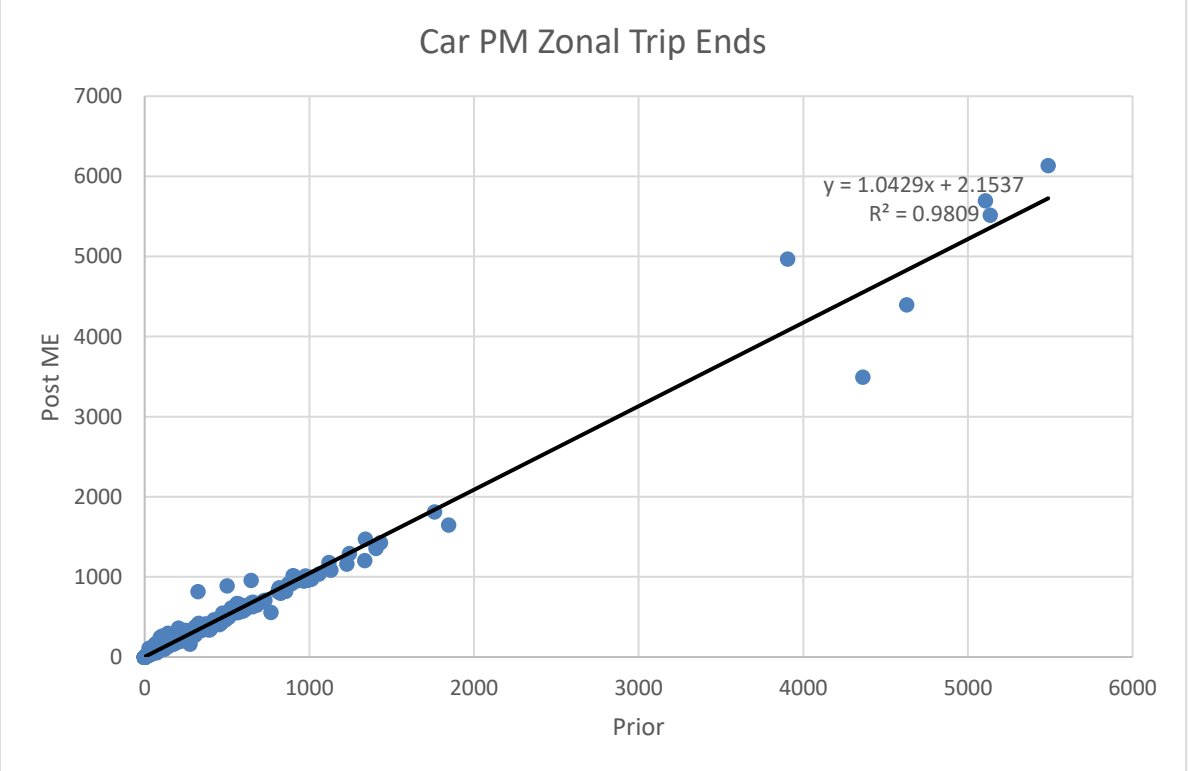


Figure 3-11 Car PM matrix zonal trip ends



3.8.1 The means and standard deviations of the Trip Length Distributions for Car are presented in Table 3-5 for the AM and PM. Note that external to external trips have been excluded since these distort the results.

Table 3-5 Car prior versus post ME trip length distributions

	AM		PM	
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**
2014 Prior	7.43	8.09	7.68	8.12
2014 Post ME	8.38	7.9	9.21	8.52
% Change	-11%	2%	-17%	-5%

3.8.1 It can be seen that both the standard deviations and the means are beyond the 5% threshold. The mean trip length distributions have a larger percentage difference, with the post matrix estimation matrix having a higher trip length in both time periods. In the Spelthorne model this may in part be due to the dominance of the high speed M25 and M3 in this model and the daily variability of these routes' congestion. On less congested days drivers often take the longer distance, higher speed routes. Nevertheless, Figure 3-12 and Figure 3-13 demonstrate how close the trip length distributions are.

Figure 3-12 Car AM prior versus post ME trip length distributions

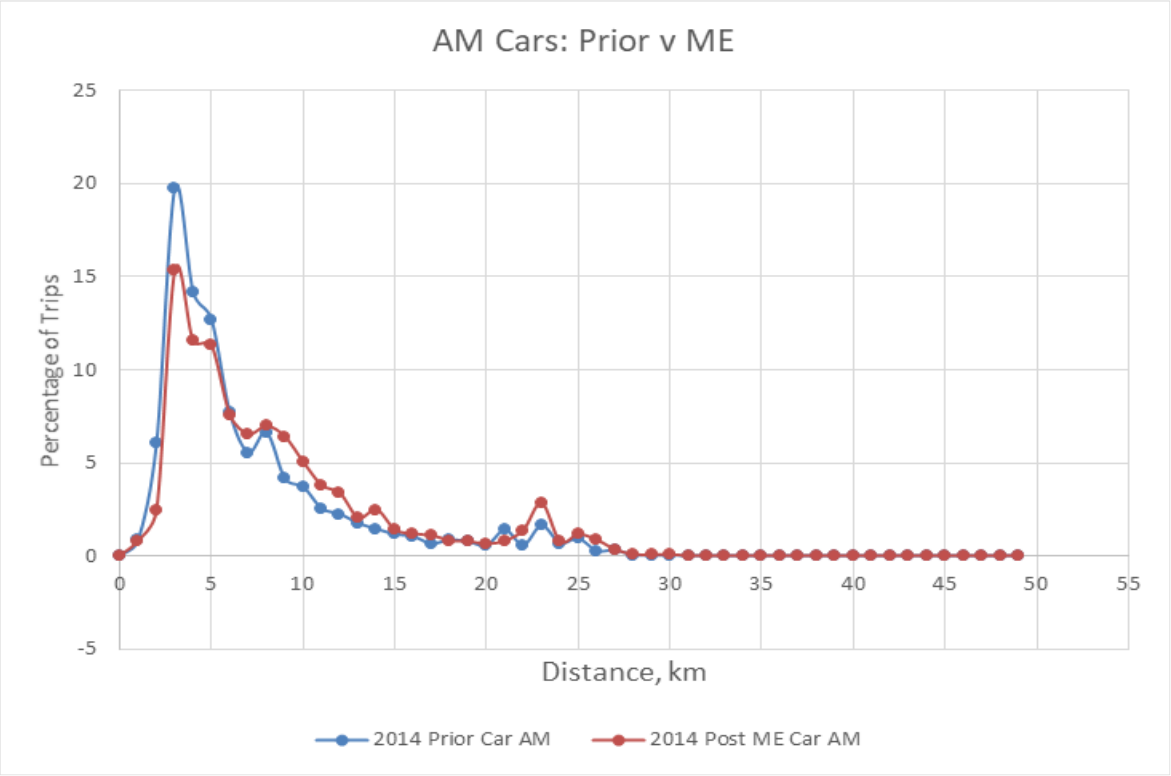
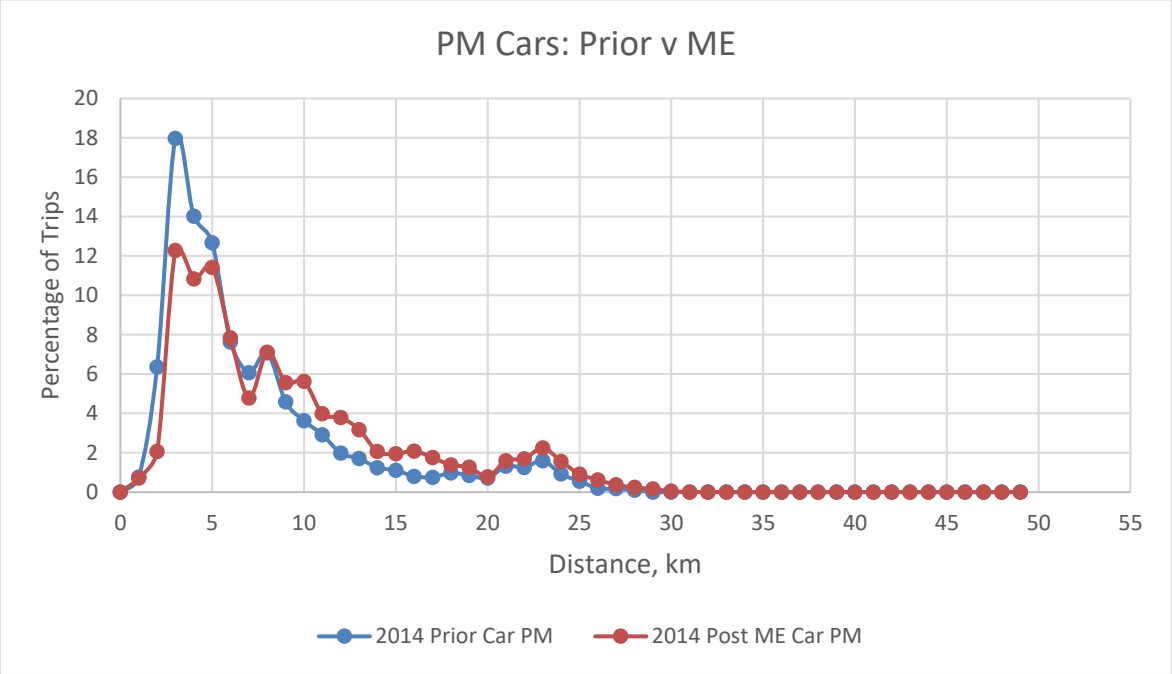


Figure 3-13 Car AM Prior versus post ME trip length distributions

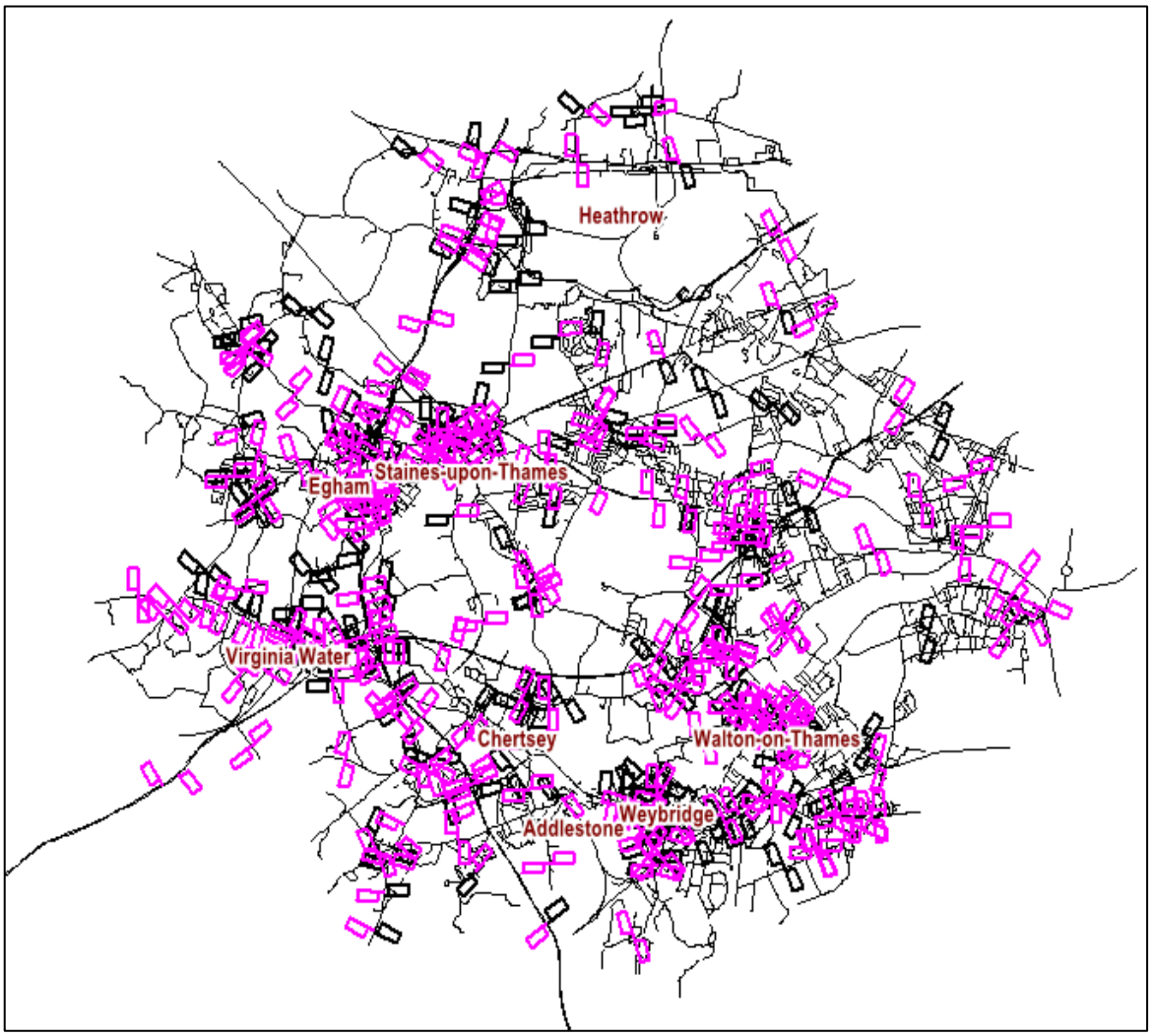


3.8.2 Sector to sector level matrices have not been examined since in effect the Local Spelthorne Model is a sector of the larger SINTRAM model.

3.9 Screenline and Link Flow Validation

3.9.1 Figure 3-14 below shows the location, in pink, of the 385 one-way count sites, which have been used for validation.

Figure 3-14 Location of all validation count sites



3.9.1 Figure 3-15, Figure 3-16 and Figure 3-17 show the 3 screenlines assessed bi-directionally in the Spelthorne Local Model for validation. The screenlines have been examined with the M3 and M25 high flow routes included/excluded where appropriate in line with TAG unit M3-1, this is highlighted in Table 3-6.

Figure 3-15 Location of orange screenline: roads crossing the M3 northbound and southbound

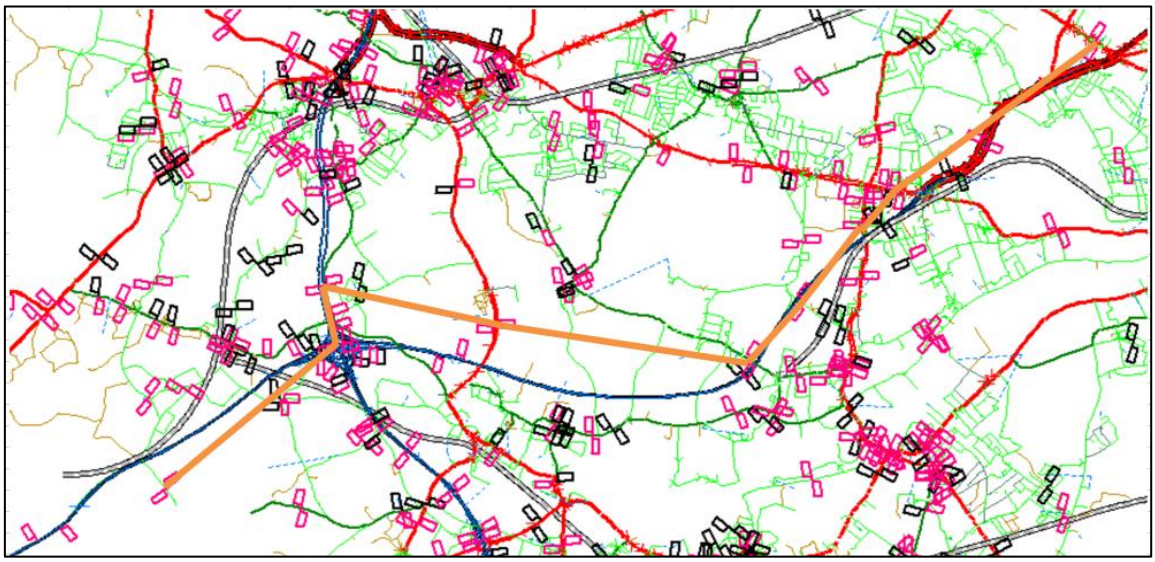


Figure 3-16 Location of purple screenline: roads crossing the M25 eastbound and westbound

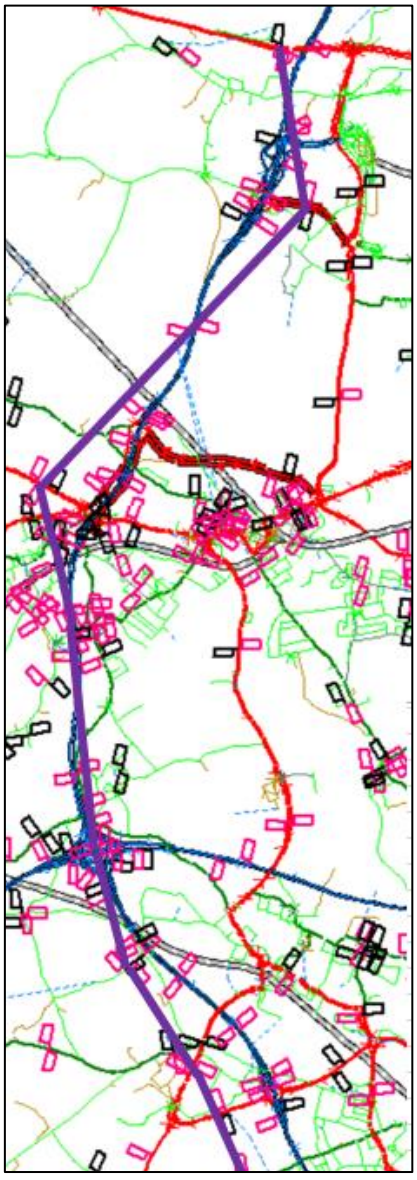


Figure 3-17 Location of light blue screenline: Roads crossing the River Thames northbound/eastbound and southbound/westbound

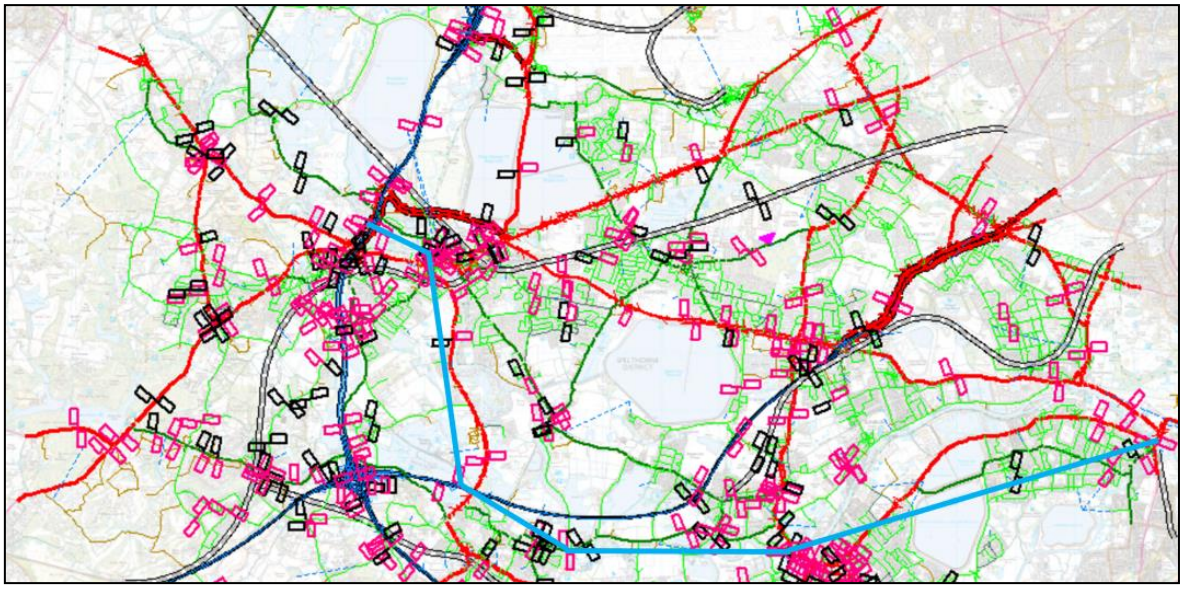


Table 3-6 Screenline flow validation results for the Local Model

Description		AM Peak % Diff Car	AM Peak % Diff LGV	AM Peak % Diff HGV	**AM Peak % Diff TOTAL**	IP Peak % Diff Car	IP Peak % Diff LGV	IP Peak % Diff HGV	**IP Peak % Diff TOTAL**	PM Peak % Diff Car	PM Peak % Diff LGV	PM Peak % Diff HGV	**PM Peak % Diff TOTAL**
Roads crossing M3 NB	inc M25	0%	7%	-5%	**0%**	0%	7%	4%	**1%**	0%	2%	1%	**0%**
Roads crossing M3 SB	inc M25	8%	-6%	-2%	**5%**	1%	5%	-3%	**2%**	4%	2%	49%	**7%**
Roads crossing M3 NB	exc M25	-7%	8%	-8%	**-6%**	0%	7%	4%	**1%**	1%	7%	1%	**2%**
Roads crossing M3 SB	exc M25	-10%	-6%	-4%	**-9%**	-9%	-2%	-1%	**-7%**	-2%	17%	-20%	**-1%**
Roads crossing M25 EB	inc M3	-2%	36%	5%	**2%**	11%	10%	7%	**10%**	1%	-4%	14%	**1%**
Roads crossing M25 WB	inc M3	0%	26%	-11%	**2%**	23%	33%	22%	**25%**	0%	-4%	-29%	**-1%**
Roads crossing M25 EB	exc M3	-4%	62%	8%	**3%**	11%	10%	7%	**10%**	2%	-11%	41%	**1%**
Roads crossing M25 WB	exc M3	1%	69%	-19%	**7%**	23%	33%	22%	**25%**	1%	-20%	40%	**-1%**
Roads crossing Thames NB/EB	inc M25/M3	4%	5%	-1%	**4%**	-5%	-7%	42%	**-2%**	2%	-2%	15%	**3%**
Roads crossing Thames SB/WB	inc M25/M3	4%	4%	-23%	**3%**	-3%	11%	46%	**2%**	6%	19%	-17%	**6%**
Roads crossing Thames NB/EB	exc M25/M3	-13%	-12%	7%	**-13%**	-5%	-5%	8%	**-5%**	-4%	-1%	10%	**-4%**
Roads crossing Thames SB/WB	exc M25/M3	-5%	-3%	1%	**-5%**	-9%	-2%	1%	**-7%**	-13%	-7%	35%	**-12%**

3.9.1 In the AM and PM, all but one screenline is within a 10% difference between counts and flows, with most meeting the 5% criteria. This is slightly worse for the IP. The car performs best in all time periods which is expected due to less data existing for LGV and HGVs not only in Surrey, but across the transport sector. Given the size of this model, but also TAG's wish to focus on ensuring Prior and Post Matrix Estimation matrices are not too different, the results are considered acceptable.

3.9.2 Table 3-7 presents the summary of the link flow validation of both the weekday AM and PM peak hours in terms of the Department for Transport's acceptability guidelines.

3.9.3 In the AM peak hour 81% of observed movements met the GEH criteria and 80% the flow criteria In the PM peak hour 84% of observed movements met the GEH criteria and 82% the flow criteria.

3.9.4 In the AM and PM peak hour, the GEH and flow statistics fall just short of the TAG desired acceptance level of 85%. As discussed above, the validation of a highway assignment model should not only be about achieving the flow validation criteria. This is so that matrix estimation is not relied upon too much and some models where flow validation is not quite met are still fit for purpose. This is particularly true of models of large, congested areas such as Spelthorne.

Table 3-7 Link flow validation results for the Local Model

	Total Counts	Met GEH		Met Flow		>10	Av. GEH
AM Peak Hour (0800-0900)	385	311	81%	307	80%	12	3.42
IP Average (1000-1600)	367	336	92%	331	90%	6	2.31
PM Peak Hour (1700-1800)	348	294	84%	285	82%	4	3.13

3.9.5 Figure 3-18 and Figure 3-19 show the modelled flows plotted against the observed with best-fit regression line and correlation coefficient (R^2), for each model time period. This aids in visualising the goodness of fit. The R^2 values presented indicate that overall the model reflects observed traffic flows well.

Figure 3-18 Comparison plot of modelled against observed link flows with best-fit regression line and correlation coefficient (R^2) for the weekday AM Peak Hour (0800 – 0900)

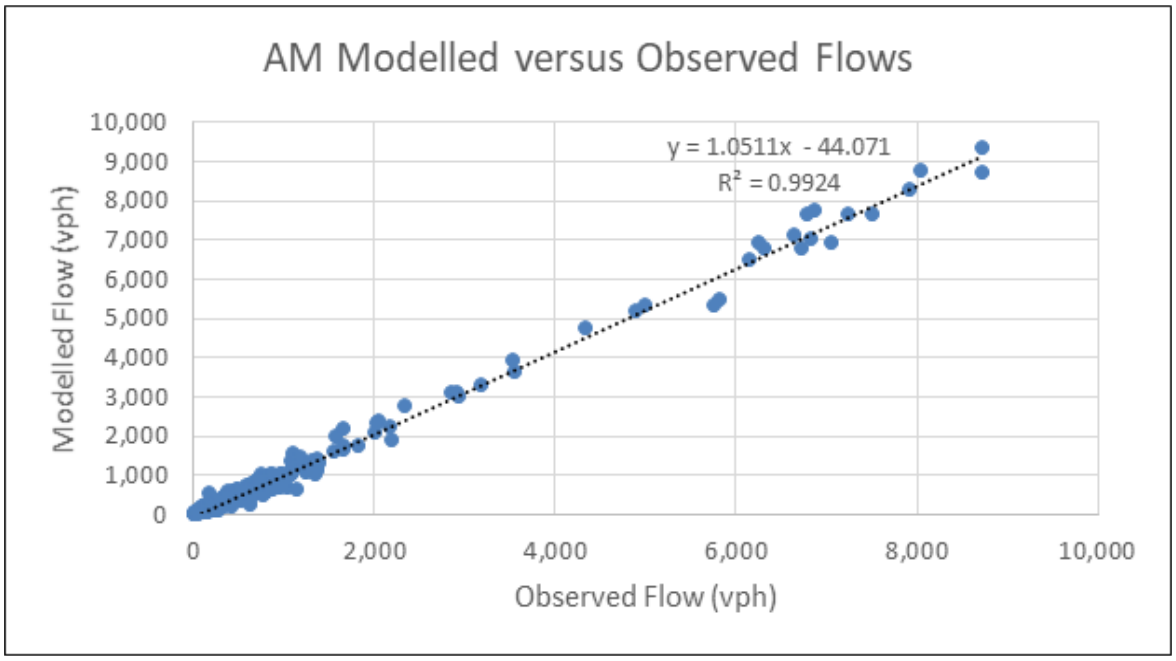
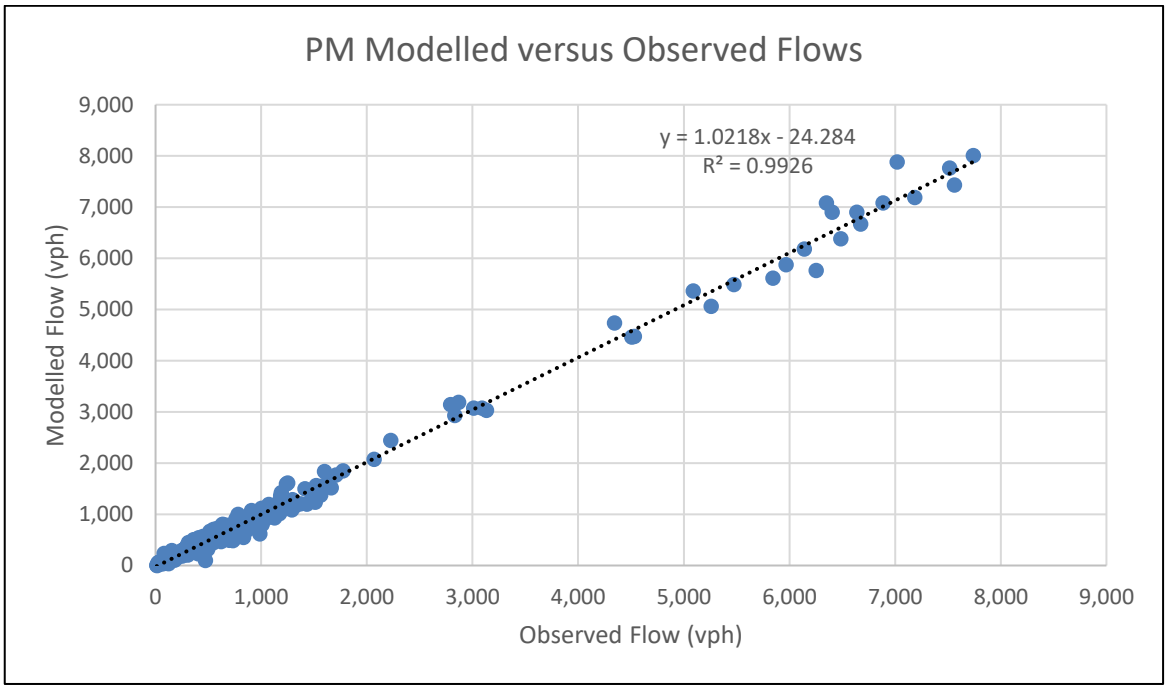


Figure 3-19 Comparison plot of modelled against observed link flows with best-fit regression line and correlation coefficient (R^2) for the weekday PM Peak Hour (1700 – 1800)



3.9.6 The cumulative frequency of GEH, for the AM and PM peak hours respectively, is presented in Figure 3-20 and Figure 3-21. In both the AM and PM peak hours, 86% of the counts have a GEH of less than 6.

Figure 3-20 Graph showing the variation of GEH for the AM peak hour (0800 – 0900)

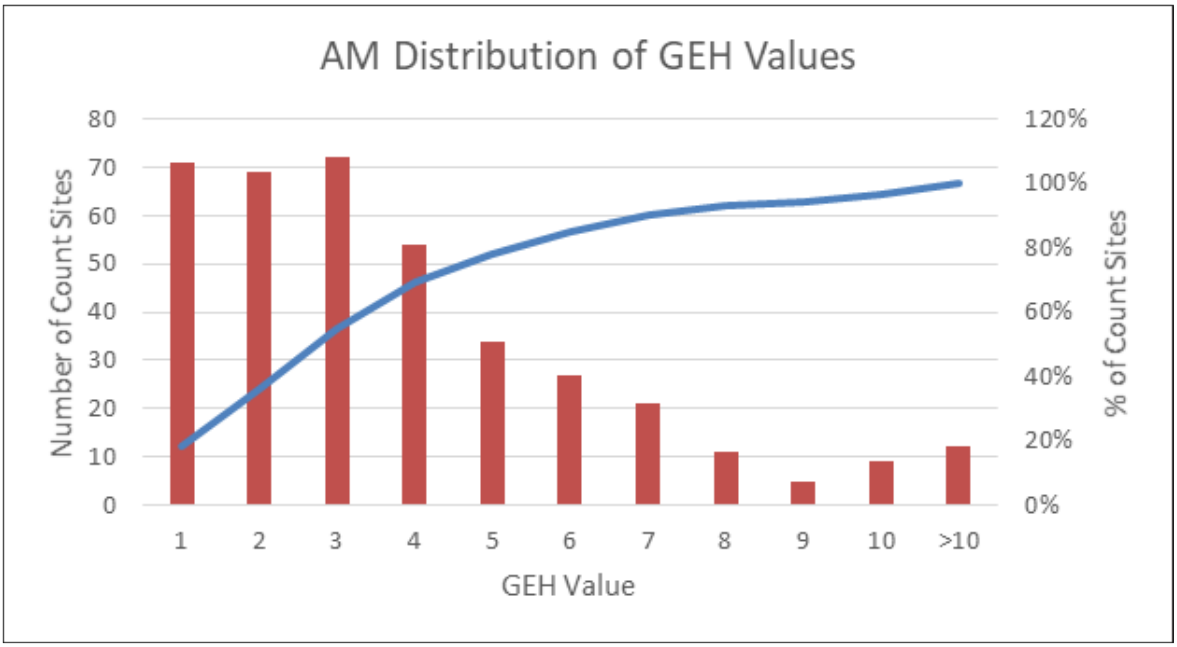
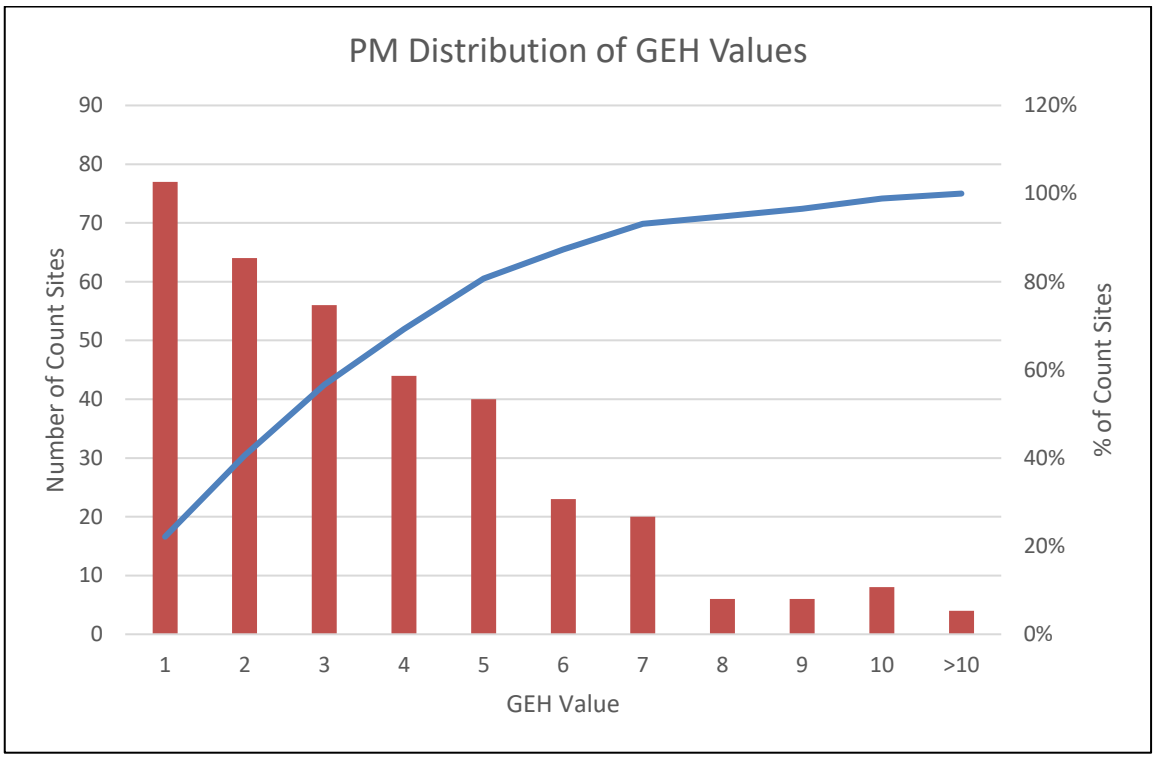


Figure 3-21 Graph showing the variation of GEH for the PM peak hour (1700 – 1800)

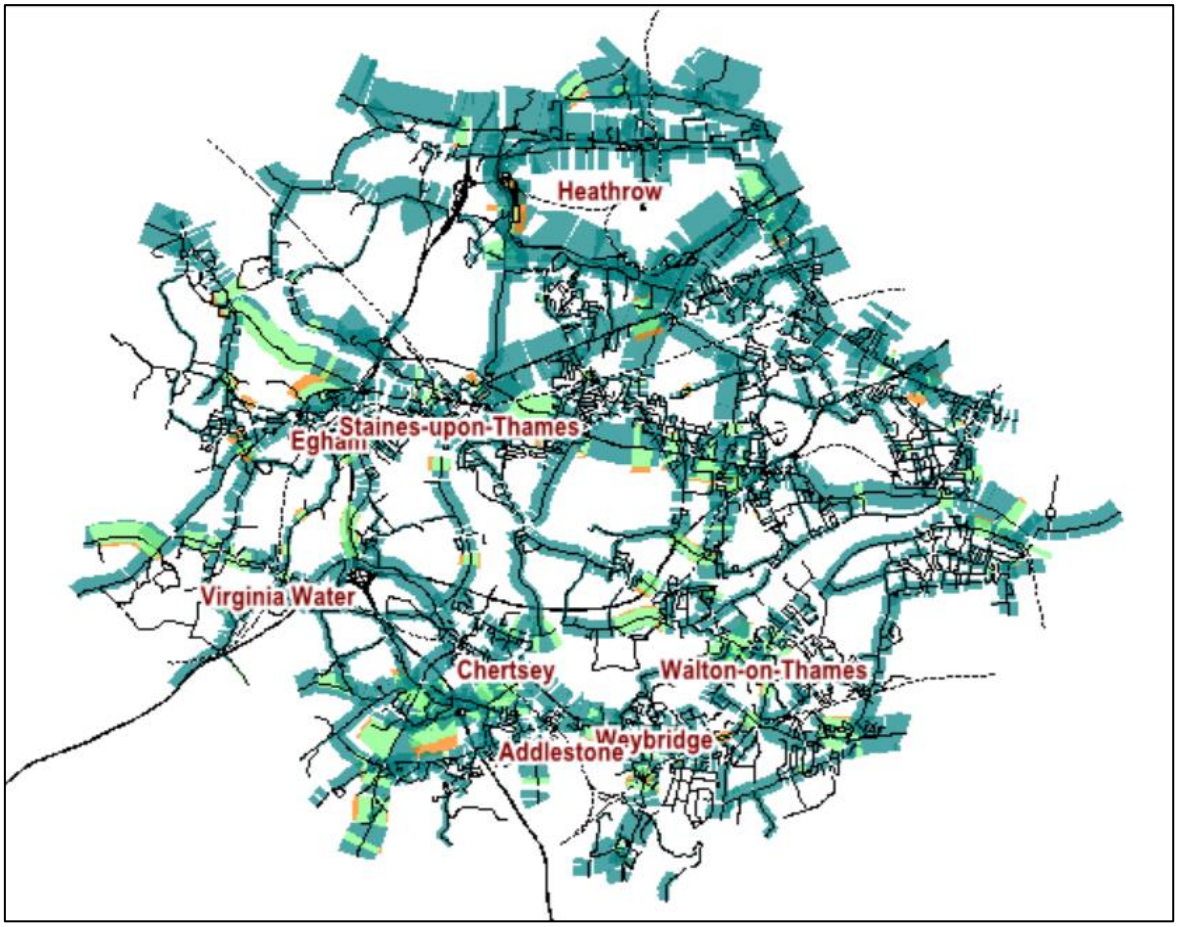


3.9.1 Figure 3-22 and Figure 3-23 display observed versus model flow bandwidths for the entire Local Model. Due to scaling and for purposes of clarity, a close up of the Borough is provided in Figure 3-24 and Figure 3-25, for the AM and PM peak hours respectively.

3.9.2 The bandwidths[6] are proportional to the level of flow. A bandwidth coloured light green indicates that an observed count is present on the link. Where the green bands have an orange edge, the model flow is less than the observed flow. Where the green bands show a dark green edge, the model flow is greater than the observed flow.

[6] The bandwidths reflect all counts in the model and exclude P&R car flows.

Figure 3-22 Local Model Link Flow versus Count Bandwidth for the AM Peak Hour (0800 – 0900) with only Local roads showing above, and only the M25, A30, M3 and A316 showing below



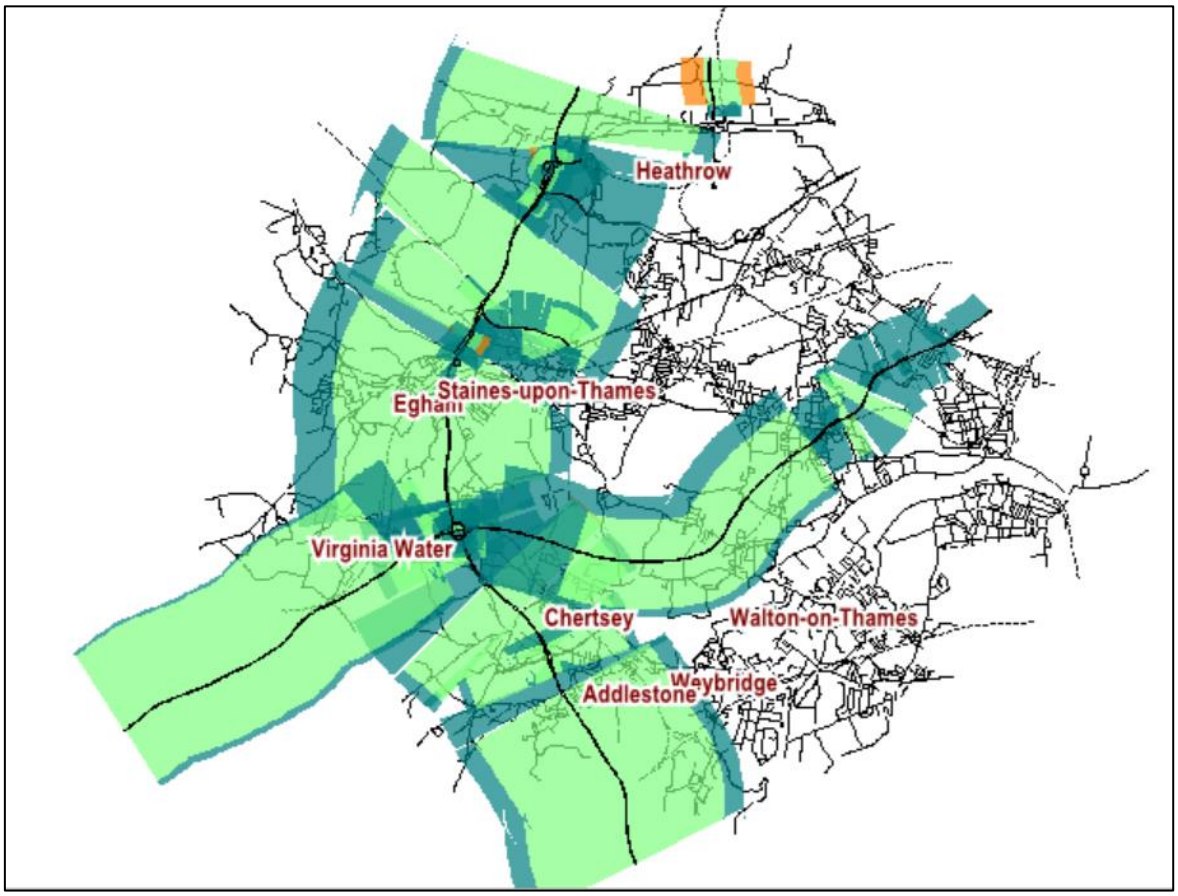


Figure 3-23 Local Model Link Flow versus Count Bandwidth for the PM Peak Hour (1700 – 1800) with only Local roads showing above, and only the M25, A30, M3 and A316 showing below

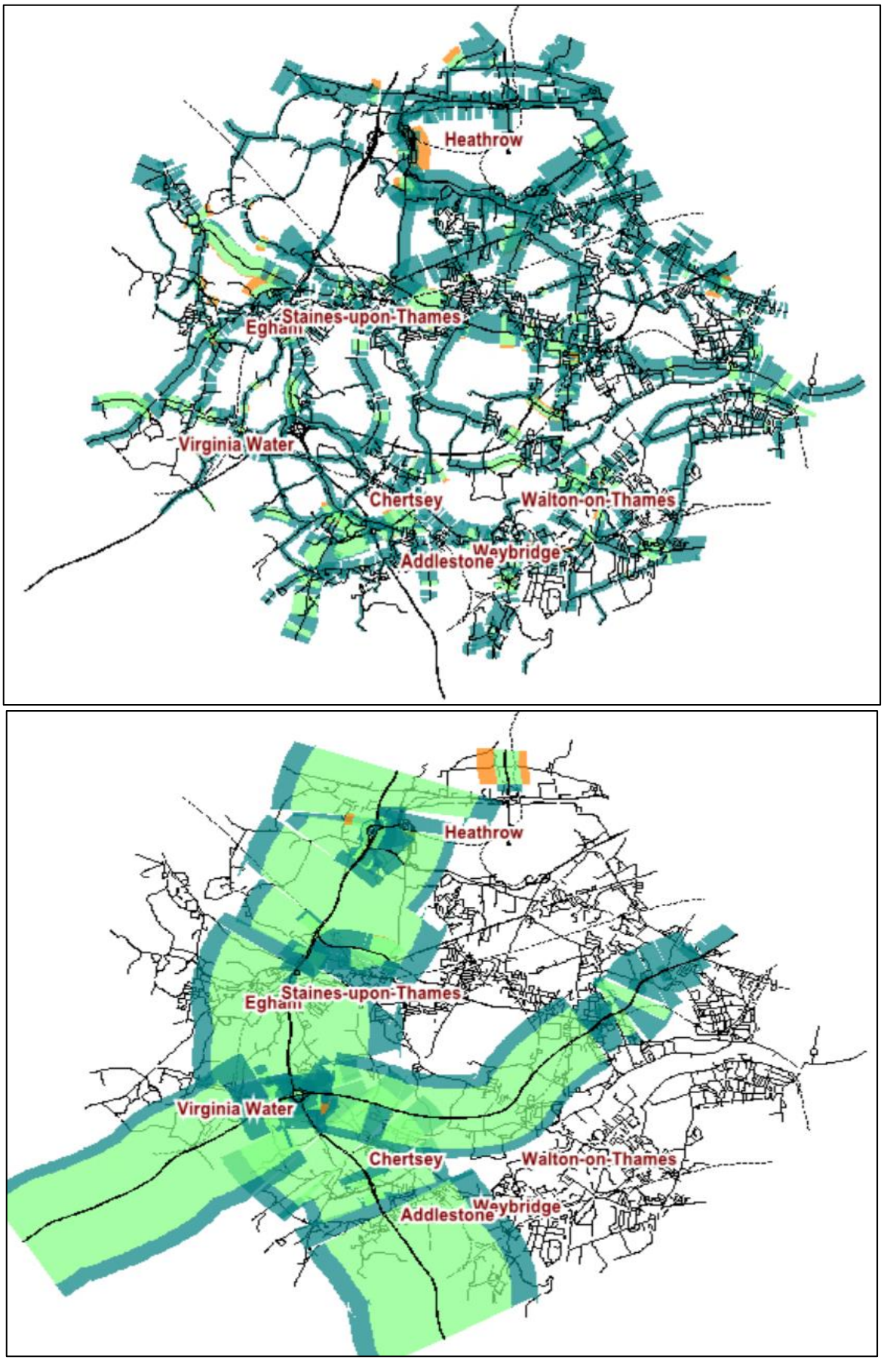


Figure 3-24 Spelthorne versus Count Bandwidth for the AM Peak Hour (0800 – 0900) with only Local roads showing above, and only the M25, A30, M3 and A316 showing below

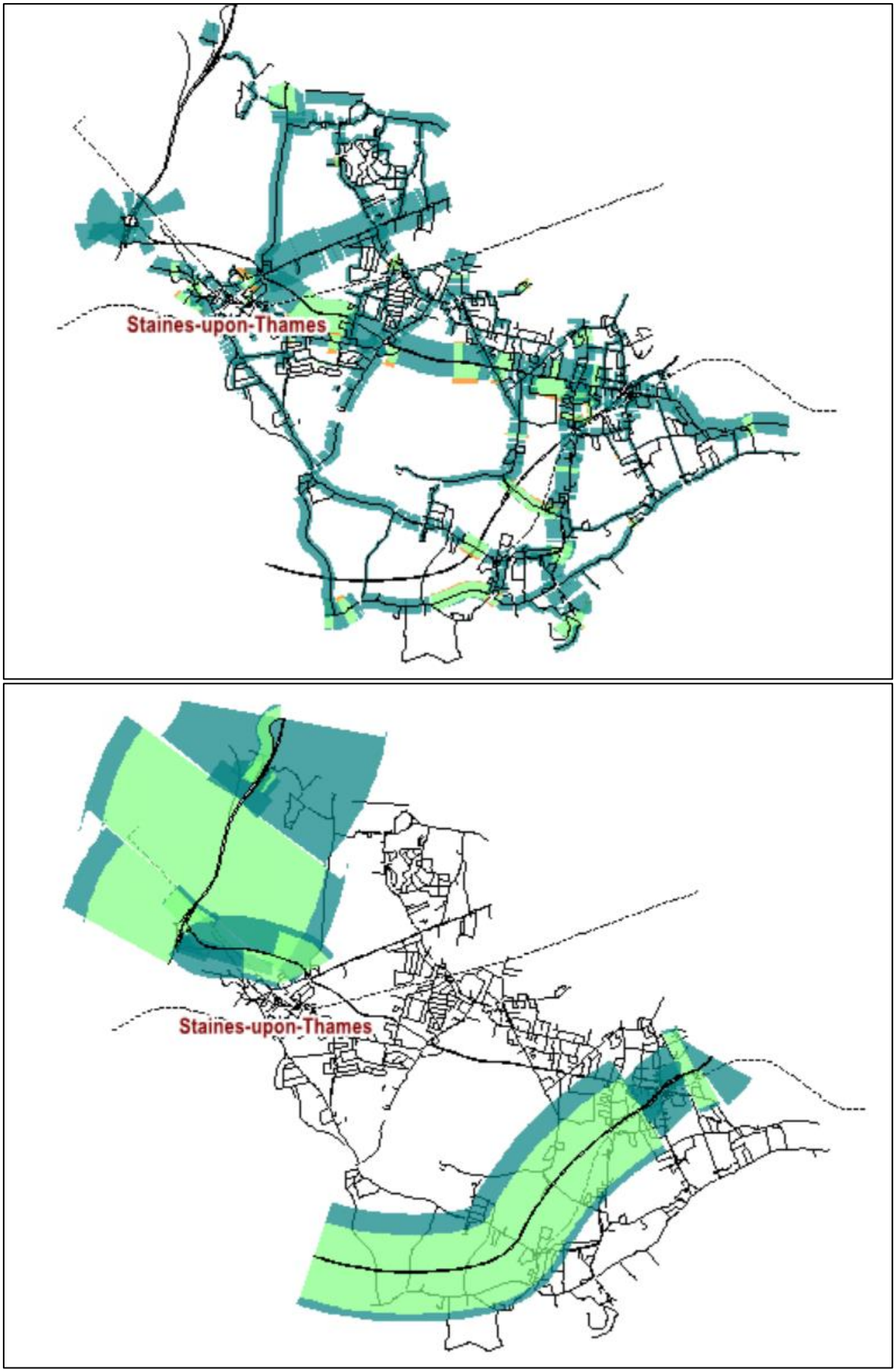
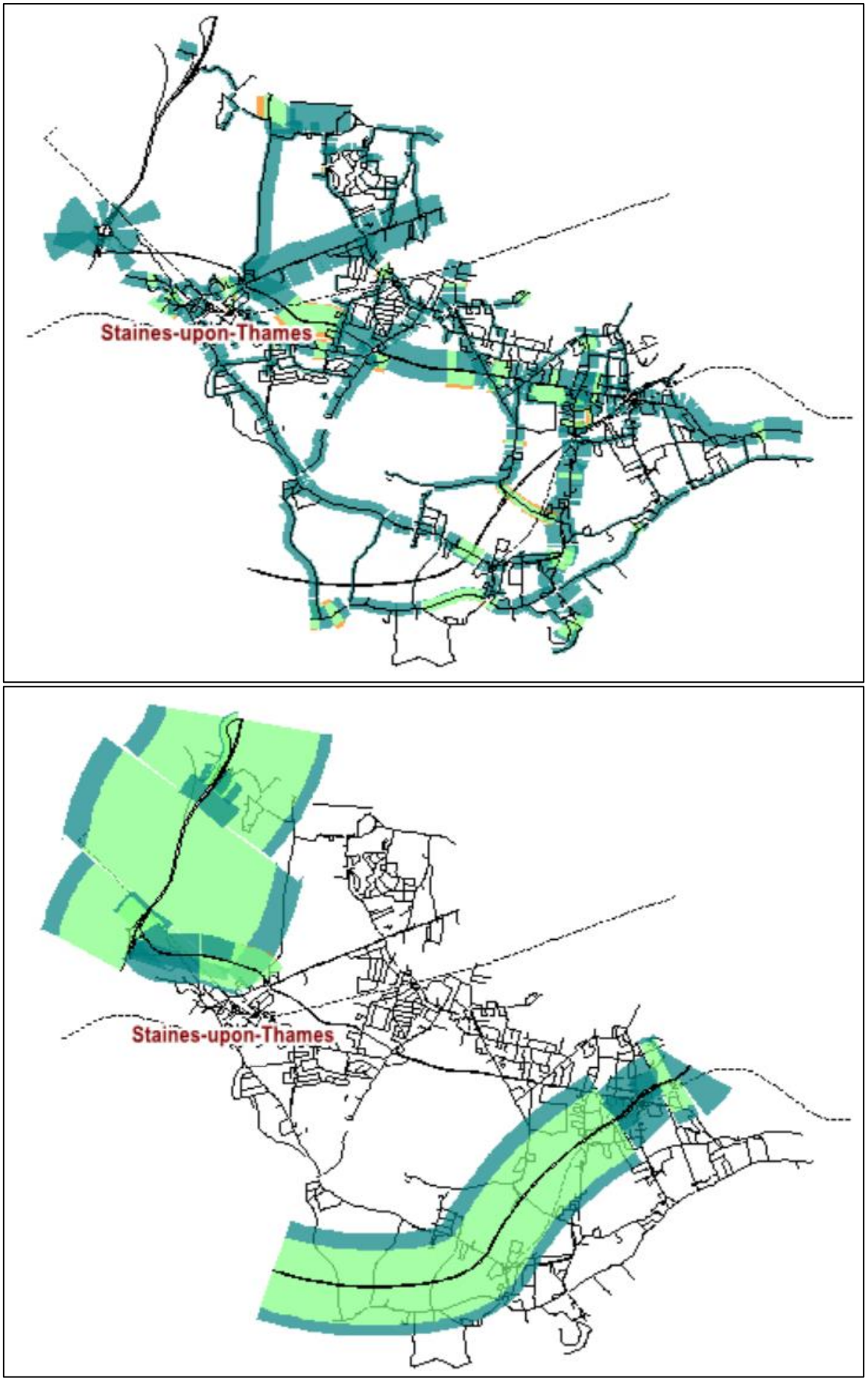


Figure 3-25 Spelthorne versus Count Bandwidth for the PM Peak Hour (1700 – 1800) with only Local roads showing above, and only the M25, A30, M3 and A316 showing below



3.9.3 A full comparison of observed and modelled flow for the selected counts is provided in Section 8.1 of the Appendix.

3.10 Journey Time Validation

3.10.1 Ten journey time routes have been defined for the purposes of assessing modelled journey times, as shown in Figure 3-26, and listed in Table 3-8 and Table 3-9**.** This implies twenty one-way journey time routes for the AM and PM time periods, which equals forty result sets.

3.10.2 The journey time data was acquired from Highways Analyst, developed by Basemap. Highways Analyst uses Teletrac-Navman data supplied the Department for Transport that is mapped to the Ordnance Survey (OS) Integrated Transport Network (ITN) to calculate journey time by ITN link. The Teletrac-Navman data is obtained from GPS-equipped vehicles traversing the highway, which provides high volume GPS-based samples. In contrast to the traffic count data, it is statistically precise at capture and does not have associated self-consistency problems.

3.10.3 Tuesday to Thursday weekday data (excluding school holidays) was extracted for the academic year. This was used to calibrate and verify model values of delay, speed and travel times.

3.10.4 The captured data is converted to the modelled road network algorithmically and involves some melding where ITN and model networks are not the same (typically because some junction geometry detail is omitted for modelling reasons). Modelled junction delays are included in the upstream link to which they apply. It can be less clear from the GPS data to which links junction delays are associated (given ambiguities in determining the extent of junctions, and their entry and exit delays). This results in a few caveats for individual link times, but overall journey times still match with Teletrac-Navman and, generally, the journey time data is regarded as precise and accurate, especially when taken over a contiguous set of links.

3.10.5 The journey time routes are between 5 and 25 km in length. The observed journey times vary between approximately 10 and 57 minutes.

Figure 3-26 Locations of journey time routes

3.10.6 Evaluation of modelled and observed journey times provides a good indication of how well the model is replicating delay, especially as the observed data is extensive both in terms of area coverage and the sample size.

3.10.7 Table 3-8 and Table 3-9 compare the observed journey time routes with those extracted from the model. Section 0, in the Appendix, presents graphs which compare observed and modelled travel times across the length of each analysed routes.

3.10.8 With reference to the criteria set out in Table 3-1, the model successfully validates in both time periods. As can be seen in both tables, modelled journey times, whilst meeting the necessary criteria, are being slightly underestimated in most cases.

3.10.9 In summary the model is successfully validating in terms of journey times but is generally underestimating these compared to observed times. This indicates that either the model is underestimating delay at junctions or modelled speeds are too high.

Table 3-8 Journey time comparisons for the AM Peak Hour (0800 – 0900)

Route	Length (km)	Observed Time (mins)	Modelled Time (mins)	Differ-ence	% Differ-ence	Met Criteria? ✓/✗
A4_EB_AM	9.02	16.6	16.2	-0.5	-3%	✓
A4_WB_AM	8.66	14.5	14.7	0.2	1%	✓
A317_A3050_EB_AM	14.43	41.0	36.8	-4.2	-10%	✓
A317_A3050_WB_AM	14.57	36.7	32.6	-4.1	-11%	✓
A244_NB_AM	13.64	45.2	43.0	-2.2	-5%	✓
A244_SB_AM	13.63	42.7	38.5	-4.2	-10%	✓
A30_EB_AM	18.40	30.2	29.1	-1.1	-4%	✓
A30_WB_AM	19.12	31.5	30.2	-1.3	-4%	✓
B378_NB_AM	5.86	17.0	16.0	-0.9	-5%	✓
B378_SB_AM	5.86	15.6	15.0	-0.6	-4%	✓
A320_NB_AM	10.81	18.1	18.6	0.5	3%	✓
A320_SB_AM	10.82	18.1	18.9	0.8	4%	✓
A308_EB_AM	22.69	56.6	54.3	-2.2	-4%	✓
A308_WB_AM	22.63	48.4	43.7	-4.7	-10%	✓
M3_A316_EB_AM	21.78	16.0	15.4	-0.6	-4%	✓
M3_A316_WB_AM	21.76	14.8	14.9	0.1	1%	✓
M25_NB_AM	19.35	16.8	17.3	0.5	3%	✓
M25_SB_AM	19.34	20.4	19.4	-1.0	-5%	✓
B376_NB_AM	14.70	28.4	25.8	-2.6	-9%	✓
B376_SB_AM	14.61	28.7	27.5	-1.2	-4%	✓
Total number of routes met criteria						20
% of routes met criteria						100%
Within DfT acceptability guidelines?						Yes

Table 3-9 Journey time comparison for the PM Peak Hour (1700 – 1800)

Route	Length (km)	Observed Time (mins)	Modelled Time (mins)	Differ-ence	% Differ-ence	Met Criteria? ✓/✗
A4_EB_PM	9.02	18.0	15.9	-2.1	-12%	✓
A4_WB_PM	8.66	19.9	19.1	-0.8	-4%	✓
A317_A3050_EB_PM	14.43	35.2	31.3	-3.9	-11%	✓
A317_A3050_WB_PM	14.57	34.1	31.4	-2.7	-8%	✓
A244_NB_PM	13.64	42.4	39.0	-3.4	-8%	✓
A244_SB_PM	13.63	42.5	39.4	-3.1	-7%	✓
A30_EB_PM	18.40	30.9	30.4	-0.6	-2%	✓
A30_WB_PM	19.12	33.8	31.5	-2.3	-7%	✓
B378_NB_PM	5.86	13.6	13.8	0.2	1%	✓
B378_SB_PM	5.86	16.3	14.9	-1.4	-9%	✓
A320_NB_PM	10.81	20.7	18.5	-2.2	-11%	✓
A320_SB_PM	10.82	19.5	18.3	-1.2	-6%	✓
A308_EB_PM	22.69	57.6	52.9	-4.7	-8%	✓
A308_WB_PM	22.63	57.4	52.3	-5.1	-9%	✓
M3_A316_EB_PM	21.78	14.1	14.3	0.2	1%	✓
M3_A316_WB_PM	21.76	21.1	19.7	-1.3	-6%	✓
M25_NB_PM	19.35	36.0	33.4	-2.6	-7%	✓
M25_SB_PM	19.34	27.0	25.0	-2.0	-7%	✓
B376_NB_PM	14.70	27.0	26.2	-0.8	-3%	✓
B376_SB_PM	14.61	28.7	27.1	-1.6	-6%	✓
Total number of routes met criteria						20
% of routes met criteria						100%
Within DfT acceptability guidelines?						Yes

3.11 Network Validation Adjustments

3.11.1 The validation of the network's flows and journey times mainly involved attention to the trip matrices, as described earlier in Section 3.8.

3.11.2 In just a few instances where specific issues arose, link times have been adjusted in light of observed data. These changes, it must be noted, are included in the results presented in Section 3.10 above.

3.11.3 The main changes related to specific parts of the network where the modelling was not reflecting all the factors. The adjustments were applied to replicate:

- Delay at pedestrian crossings, which are not explicitly modelled;
- Queue propagation at major junctions along the ten journey time routes; and
- Motorway queueing.

3.12 Validation Summary

3.12.1 The model validates well across geography, road types and time periods, without the prior matrices being too different from the post matrix estimation matrices.

3.12.2 The assessment with respect to observed flows is less assured due to the variability of the large count dataset, as well as limitations in the standard count comparison metrics. A broad view across the study area, though, does not indicate any systematic problems. For reference, the flow validation summary table is repeated below:

Table 3-10 Flow validation summary table

	Total Counts	Met GEH		Met Flow		>10	Av. GEH
AM Peak Hour (0800-0900)	385	311	81%	307	80%	12	3.42
IP Average (1000-1600)	367	336	92%	331	90%	6	2.31
PM Peak Hour (1700-1800)	348	294	84%	285	82%	4	3.13

3.12.3 The journey time comparisons provide more assurance because of the statistical strength of the observed data, and to which the model's results match well with 100% validation in both time periods.

3.12.4 Details are also open for further inspection via spreadsheets providing additional technical documentation, on request.

3.13 Assessment of Suitability

3.13.1 This sub-area model has been validated in preparation for the assessment of Spelthorne's Local Plan spatial strategy. The validation criteria set out in previous sections are a guide and the larger and more complex the model the more difficult it is to meet all the criteria. Tag Unit M3.1 states in paragraph 3.2.2 that "the achievement of the validation guidelines… does not guarantee that a model is 'fit for purpose' and likewise a failure to meet the specified validation standards does not mean that a model is not 'fit for purpose'". It is therefore up to the modeller to determine whether a model is suitable for its intended purpose. The development of this model sought to strike a balance between flow validation, journey time validation and minimising matrix changes in order to produce a suitable tool for evaluating the impact of the Spelthorne Local Plan.

3.13.2 The Local Plan Assessment will adjust the matrices to reflect the trips generated by committed and proposed development in Spelthorne. Trip distribution for new zones

will be taken from existing adjacent zones with similar land use. Outputs of the assessment will include changes in traffic volumes and speeds, journey times, junction delay, and level of service associated with the additional development related demand. The model has good flow validation and journey times rendering it suitable for assessing these changes. Taking the overall model performance into account, despite the flow validation not meeting the 85% threshold in all time periods, it is considered that the model is suitable for the purposes of the Spelthorne Local Plan assessment.

3.14 Limitations and Caveats of this strategic model

3.14.1 When choosing a model to use, it is important to recognise that all models have limitations, including strategic models such as SINTRAM and its associated Local Models. Strategic models cannot represent accurately every individual journey made by every mode and route. They are also not precise in the way they replicate specific individual behaviour and the interaction between individuals. There are many factors that impact people's travel behaviour and the day-to-day variation in congestion which are random and impossible to predict.

3.14.2 The model is strategic in nature and has good validation at this level, but local junction validation may be required if the model outputs are to be used in detailed junction assessments.

3.14.3 The strategic nature of this model and its findings do not in any way reduce the need for individual developments to have detailed, local transport assessments carried out which may identify additional specific impacts on the network (e.g., junction congestion) that require mitigation.

3.14.4 Understanding the limitations of a model is key to making the best use of it and taking advantage of its strengths. The reasonable expectation from this model is that it is able to estimate the likely route choice of transport users, and the resulting average levels of congestion.

3.14.5 Outputs are provided in good faith and the user accepts full responsibility to satisfy themselves of the accuracy, reliability, and completeness of the information.

3.14.6 The results from this model are only one element of a much wider evidence base needed to be considered in the development of further policy documents.

3.14.7 It is advised that whenever a model is used for a new project, it should be reviewed and refined to ensure that it is fit for purpose for the purposes of that project.

4 MODEL FORECASTING

4.1 Forecast Scenarios

4.1.1 For this Regulation 19 assessment, the followings scenarios have been modelled:

- Do-Minimum – this includes growth outside the borough, plus growth from planned and committed developments since 2014 within the borough.

- Do-Something – as above **plus** Local Plan Land Availability Assessment sites, Regulation 19 Site Allocations, and windfalls.

4.1.2 The Do-Something scenario has been compared against the Do-Minimum, to determine the highway impact of the Local Plan.

4.1.3 For all scenarios, natural demographic and employment changes, as determined by the Department for Transport's (DfT) National Trip End Model (NTEM) have been included for the whole of Great Britain. In line with the DfT's Transport Appraisal Guidance, adjustments have been made to the NTEM data to reflect the locality and composition of the committed development sites which comprise the scenarios.

4.2 Forecast Year

4.2.1 The model forecast year is 2037.

4.3 Development Sites and Pro-Forma

4.3.1 Information regarding the composition of both commercial and residential development sites to be considered in this appraisal was provided by Spelthorne Borough Council in the form of the County Council's pro-forma.

4.3.2 Each development site listed in the pro-forma was matched to the model zone system using provided grid references and Geographic Information System (GIS).

4.3.3 Figure 4-1 geographically presents the commercial development sites that have been set out in the pro-forma for the Do-Something scenario. Figure 4-2 shows the same but for residential sites. Note that sites which have already received planning permission are not included within these figures.

4.3.4 The gross and net total of non-committed households for each scenario is summarised in Table 4-1 for Spelthorne Borough. The net is the difference between the existing site households and the proposed.

Table 4-1 Gross and net non-committed households in Spelthorne by scenario

Non-Committed Households	2037 Do-Minimum	2037 Do-Something
Gross	4,645	13,494
Net	4,154	12,394

Figure 4-1 Local Plan commercial development sites in Spelthorne, by location and number of employees

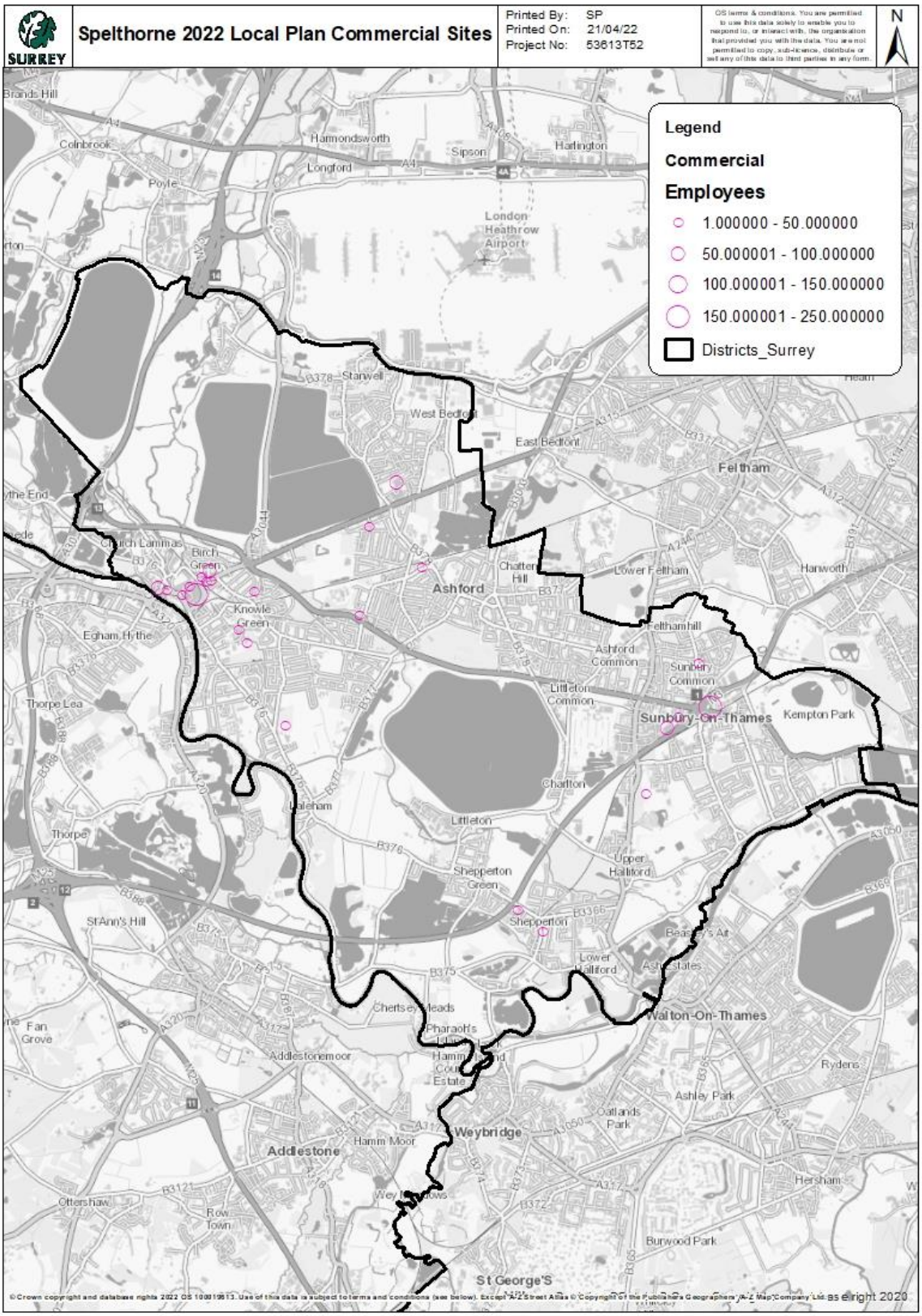
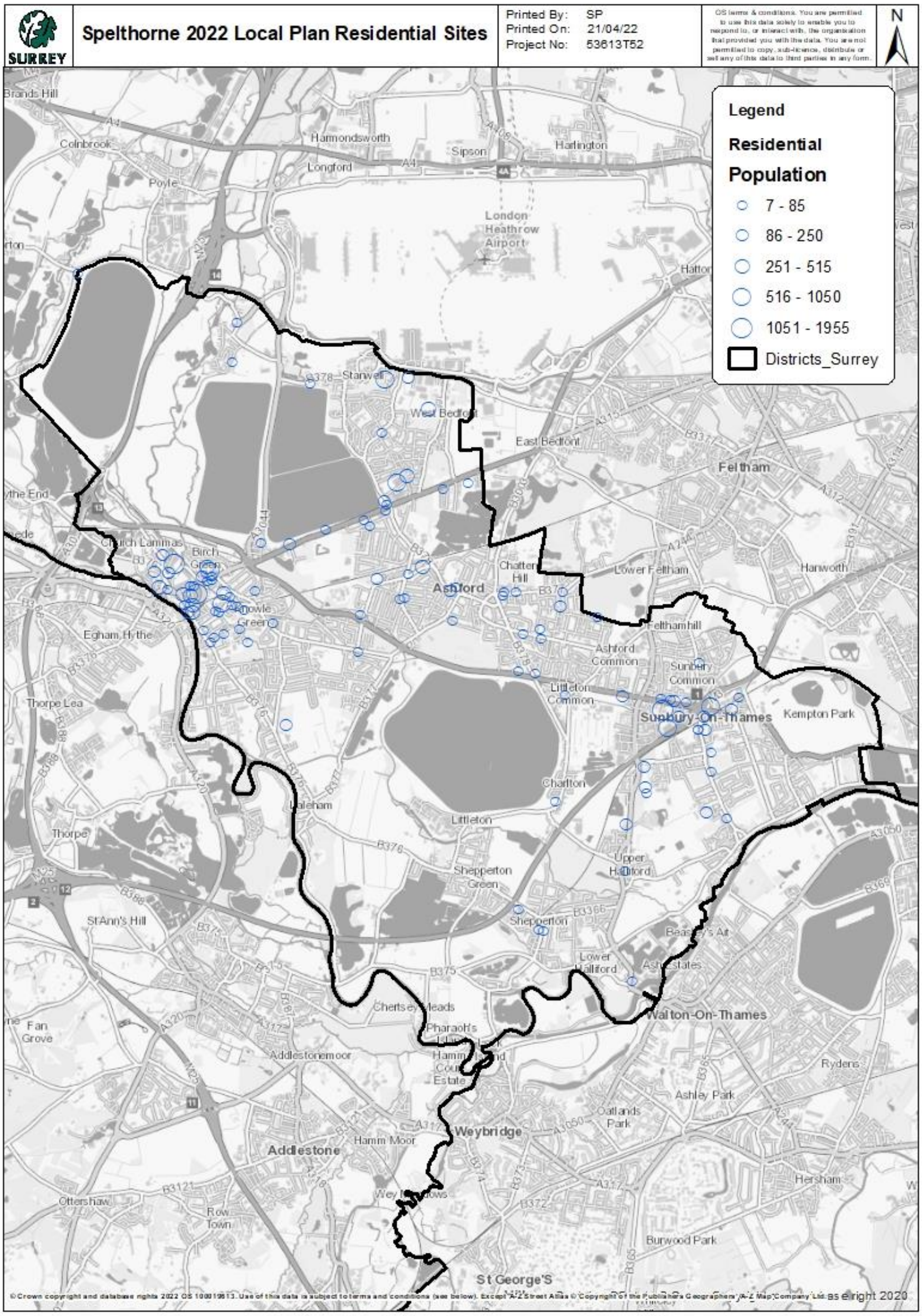


Figure 4-2 Local Plan residential development sites in Spelthorne, by location and population size



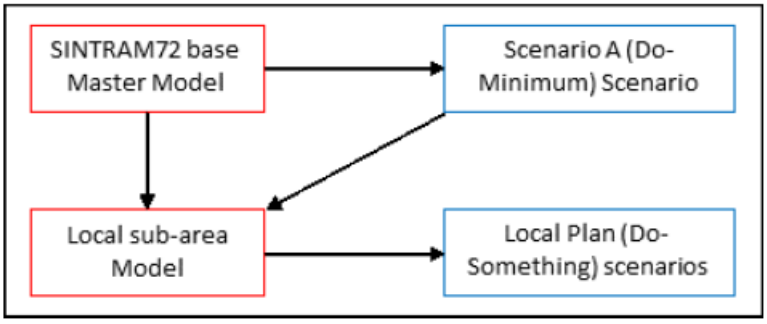
5 FORECASTING APPROACH

5.1.1 For Local Plan related assessments, the forecasting approach incorporates the following network (supply) and growth (demand) alterations:

- committed changes to the highway and public transport networks;
- background growth both outside and within the sub-area model;
- growth arising from committed developments within the local planning authority area;
- growth arising from proposed Local Plan related developments, including windfall developments; and
- mitigation to address the proposed growth, which can result in adjustments to both the demand (e.g., fewer highway and public transport trips due to more commuters working from home or travelling using active modes) and network (e.g., junction alterations).

5.1.2 The overall approach to the forecasting process is shown in Figure 5-1. This illustrates the relationship between the master model, sub-area model and the future year scenarios.

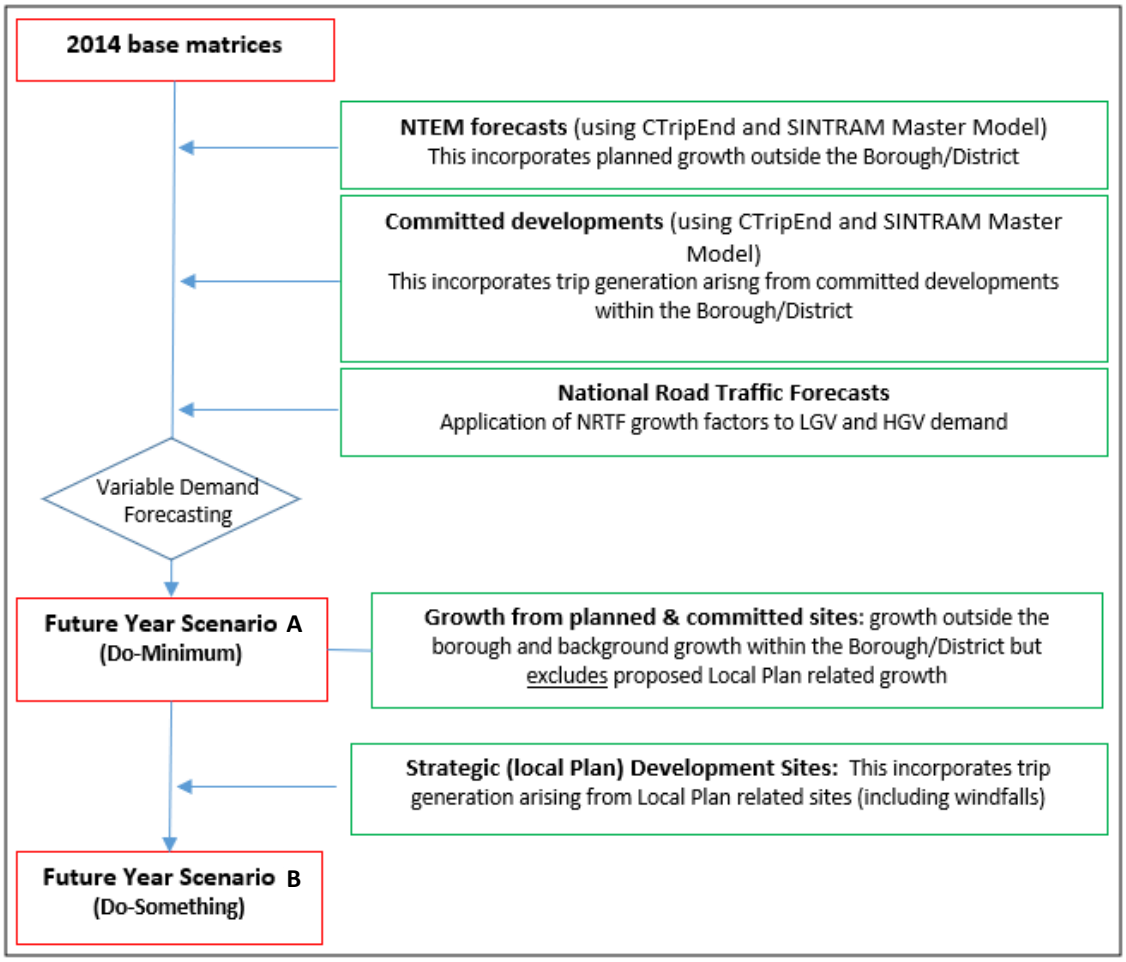
Figure 5-1: Overall approach to forecasting



5.2 Future Year Scenario A, the Do-Minimum

5.2.1 The approach to establishing the future year Do-Minimum (Scenario A) is shown in Figure 5-2.

Figure 5-2: Forecast matrix development process



5.2.2 For the Scenario A matrices, growth outside the borough and background growth within the borough was determined using the demographic and employment changes contained within the Department for Transport's (DfT) National Trip End Model (NTEM). Trips associated with built and committed developments within the borough since 2014 are calculated from planning data provided by Spelthorne Borough Council with corresponding population and employment data inserted into CTripEnd via the associated 'ixi' tables. This process is described in greater detail in the following Section 6, including how the forecast demand is applied to the Sub-Area Model.

5.3 Future Year Scenario (B), the Do-Something

5.3.1 The production of Scenario B matrices builds upon the Scenario A matrices. Unlike Scenario A, the forecasting was undertaken within the local sub-area model. This process is described in Section 7.

6 FUTURE YEAR DO-MINIMUM

6.1 Background Growth and Committed Developments

6.1.1 In order to establish the future year Do-Minimum scenario, against which the Do-Something scenarios are compared, background growth both inside and outside the study area were established.

6.1.2 There are two factors influencing the demand for car travel during the peak hours being modelled which are:

1) general demographic and economic trends, as per DfT's National Trip End Model (NTEM) forecasts; and,
2) Local Plan developments in housing and employment.

6.1.3 Growth outside the study area was forecast through the use of CTripEnd. This is part of the National Trip End Model (NTEM) and sits behind TEMPro. CTripEnd provides the same information as TEMPro, but in greater detail.

6.1.4 The following large development sites outside the borough were also explicitly included in the do-minimum scenario. These are large developments sites located close to the borough boundary, where the resulting trip generation might have a significant impact on the network within the study area.

- Longcross Garden Village (Southern Site),
- Longcross Garden Village (Northern Site),
- South Bedfont,
- Bedfont Gardens,
- Airport Business Park,
- MOD Feltham.

6.1.5 Increased trips arise from background growth (for example, increases in car ownership, etc.) and development that has either been built since the base year (2014) or is committed. The former is obtained from data contained within CTripEnd whereas the latter is informed by planning data provided by the Planning Authority and fed into CTripEnd.

6.1.6 This planning data was provided in the form of the County Council's pro-forma. Each development site listed in the pro-forma has been matched to the model zone system using provided grid references and Geographic Information System (GIS). Where the network access of large development sites does not relate well to existing centroid connectors, they have been given their own new zone.

6.2 Vehicle Trip Generation

6.2.1 As described above, Local Model trip ends (zonal trip productions and attractions) were initially derived from SINTRAM72 modelling, which uses local population and employment data at a detailed level for the Do-Minimum.

6.2.2 An extract of the Planning Spreadsheet which contains the proposed local land use data used in the Do-Minimum forecasting, and which is derived from the Pro-Forma information supplied by Spelthorne Borough Council, is shown in Figure 6-1. The differences relate to the base year (2014) values.

Figure 6-1: Extract of scenario land use data for Do-Minimum

SCC URN	Development Name	Other landuses (SPECIFY: please add a comment here or in column L)		No. of car park spaces	Access point for development (if new and/or alternative access to be used)	Date of proposed change of use	% of site built out by the interim year	% of site built out by the forecast year	Residential C3				Land Use Class & Description	Primary & Secondary Schools E03	
		No. Of Employees	Gross Floor Area (GFA m²)						Population	Dwellings: No. of Houses	Dwellings: No. of Flats	Total No. Of Dwellings		No. Of Employees	Gross Floor Area (GFA m²)
	C3 RESIDENTIAL COMPLETIONS (fully complete since														
1	194A Laleham Road	0	0	5	194A Laleham Road	2015		100	9	0	4	4	C3, housing & A	0	0
2	West Wing, Ashford Hospital London Road	0	0	178	West Wing, Ashford Hospital London Road	2015		100	350	0	152	152	C3, housing	0	0
3	Land adjoining The Grazing Stanwell New Road	0	0	1	Land adjoining The Grazing Stanwell New Road	2015		100	2	1	0	1	C3, housing	0	0
4	108 Feltham Hill Road	0	0	2	108 Feltham Hill Road	2015		100	2	1	0	1	C3, housing	0	0
5	Trident House Clare Road	0	0		Trident House Clare Road	2015		100	21	0	9	9	C3, housing	0	0
6	Kingfisher House, Clarks Wharf Thames Street	0	0	3	Kingfisher House, Clarks Wharf Thames Street	2015		100	0	0	0	0	C3, housing	0	0
7	7 Ferndale Road	0	0	3	7 Ferndale Road	2015		100	0	0	0	0	C3, housing	0	0
8	Les Spice, 2 Station Approach	0	0	0	Les Spice, 2 Station Approach	2015		100	5	0	2	2	C3, housing	0	0
9	Penton Hook Farm Penton Hook Road	0	0	7	Penton Hook Farm Penton Hook Road	2015		100	5	-1	3	2	C3, housing	0	0
10	Land R/O 70 Junction Road	0	0	4	Land R/O 70 Junction Road	2015		100	5	2	0	2	C3, housing	0	0
11	Sunbury Scouts & Guides Hall & School House Schc	0	0	2	Sunbury Scouts & Guides Hall & School House School \	2015		100	5	2	0	2	C3, housing	0	0
12	80 High Street	0	0	6	80 High Street	2015		100	9	0	4	4	C3, housing	0	0
13	The Nutshells Abbey Road	0	0	4	The Nutshells Abbey Road	2015		100	0	0	0	0	C3, housing	0	0
14	432 London Road	0	0	3	432 London Road	2015		100	2	-1	2	1	C3, housing	0	0
15	90 Petersfield Road	0	0	4	90 Petersfield Road	2015		100	2	1	0	1	C3, housing	0	0
16	Land r/o 393 Ashford Road	0	0	1	Land r/o 393 Ashford Road	2015		100	2	1	0	1	C3, housing	0	0
17	Metropolitan Police Training Centre Green Street	0	0	66	Metropolitan Police Training Centre Green Street	2015		100	64	21	7	28	C3, housing	0	0
18	Old Manor Farm Studio Church Street	0	0	9	Old Manor Farm Studio Church Street	2015		100	2	2	-1	1	C3, housing	0	0
19	245 Staines Road	0	0	4	245 Staines Road	2015		100	2	1	0	1	C3, housing	0	0
20	The George Public House, 244 Staines Road East	0	0	13	The George Public House, 244 Staines Road East	2015		100	9	0	4	4	C3, housing	0	0
21	Land between 33-37 Chertsey Road	0	0	3	Land between 33-37 Chertsey Road	2015		100	2	1	0	1	C3, housing	0	0

6.2.3 Trip productions were calculated from daily trip rates for different trip purposes from the DfT's National Trip End Model (NTEM) CTripEnd v7.2 system. Trip attractions for different purposes were allocated to zones on the basis of different types of employment levels per zone. A sample of these are shown in Figure 6-1.

6.2.4 Further details are provided in the SINTRAM72 documentation *Technical Note TN1 Processing Trip Ends*, which also describes the allocation of trips into 'car available' and 'non-car available' categories.

6.2.5 CTripEnd is based on a coarser zoning system than the 1615 zones used in SINTRAM72. However, it allows the introduction of finer zones, as is done for SINTRAM72 in general but also for local area models.

6.2.6 Because the forecasts for population and employment are provided from the two sources of the DfT's CTripEnd software, which represents general forecasts, and from data supplied by Spelthorne Borough Council on built and committed development, provision is included in the calculations to avoid issues of 'double-counting' arising from the use of the two data sources, subject to some constraints.

6.2.7 The basic notion is that committed growth implied by 'local' data is more considered than that given by the DfT estimates; that is, there is a clearer view as to its spatial distribution across the Borough in specific zones. Accordingly, the implied local growth in the modelling period is first 'scaled down' across the borough, then the local forecast growth is applied to the specific zones as provided by Spelthorne. In this way, the overall growth level for the borough respects the DfT future year forecasts.

6.3 Vehicle Trip Distribution

6.3.1 The trip ends will be used in the SINTRAM72 modelling to construct 'latent' (or 'unconstrained') demand PA trip matrices and their zonal trip ends. This corresponds to the demand for travel implied by economic and land use data applying to the forecast scenario, but not considering congestion on the transport networks, which can inhibit demand. Calculating the effects of congestion on demand relative to the latent demand represents the 'variable demand' element. This involved a number of 'demand-supply' iterations in the modelling process.

6.3.2 The PA (production-attraction) matrices in the demand modelling reflect all-day home-based (HB) 'tours', that is, implying outbound from the home and inbound returning to the home, plus non-home based (NHB) trips. These PA matrices are converted to OD (origin-destination) trip matrices for three time-periods representing the AM peak, inter-peak, and PM peak. These are used for highway assignment

(congestion) modelling in SINTRAM72, but also provide the forecast 'prior' car matrices for the Local Model.

6.3.3 Once the latent demand matrices have been established, as outlined above, SINTRAM72 takes account of congestion through 'variable demand modelling' (VDM). This follows the form of modelling recommended in WebTAG (Unit M2 Variable Demand Modelling), and details of the SINTRAM72 implementation are provided in the SINTRAM72 Technical Note *TN5 Model Technical Report*.

6.3.4 A central component of the methodology is provided by '(hierarchical incremental) choice modelling', which models traveller choices for travel.

6.3.5 The choice modelling is driven by the costs of different options. In the modelling, these are expressed as generalised time (minutes) where financial costs (e.g. fares, fuel, and parking costs) are converted to time units using values of time applicable to the relevant segments of demand, such as different trip purposes, as provided in the WebTAG Data Book.

6.3.6 The sensitivity of choices to cost differences is modelled using initial values taken from WebTAG Data Book parameters. These have been adjusted as part of the SINTRAM72 forecasting validation process, in particular, through the WebTAG 'Realism' sensitivity tests.

6.3.7 The choice modelling is confined to destination and mode choices. Mode choice includes Park & Ride as a choice for car users. Home-based work (commuting) and education trips are 'doubly-constrained' to match employment and education zonal trip attractions.

6.3.8 The sensitivity of travel choices to changes in costs is limited to trips with one or both ends in the SINTRAM72 Inner Study Area. mode, time period, and destination characteristics of other ('external-to-external') trips are based on growth factoring ('Furnessing') base year/reference trips to trip ends derived from CTripEnd.

6.3.9 Once the trip matrices have been forecast via VDM modelling, they are converted to car matrices for the Local Model. These are then subject to further processing within the Local Model to reflect the changes between the prior and estimated matrices arising in the base year validation modelling.

6.3.10 The means of achieving this is by calculating a set of production and attraction adjustment factors for each zone that reflect the changes between the base matrices and the equivalent estimated matrices. These adjustment factors are then applied to the future year matrices using a Furness factoring process.

6.4 Goods Vehicles

6.4.1 Goods vehicle trip matrices are forecast using growth factors by for LGVs and HGVs derived from DfT Road Traffic Forecasts 2018[7]. HGV and LGV growth for the South East region was extracted and interpolated to derive growth factors for the interim and horizon years. Note that growth for the period 2014 to 2015 has been assumed to be consistent with annual growth in the 2015 to 2020 period. The resulting growth factors are shown below in

6.4.2 Table 6-1.

[7] Table 1, Road Traffic Forecasts 2018 (publishing.service.gov.uk)

Table 6-1 LGV and HGV growth factors

	LGV	HGV
2014 to 2037	1.375	1.108

6.5 Changes in Forecast Demand

6.5.1 The modelling process, as described above, converts the land use forecasts into travel demand forecast. There are four main steps in this process:

1) Calculate latent demand in SINTRAM72 – just taking account of land use changes;
2) Take account of highway congestion on demand for car travel in SINTRAM72 – VDM modelling;
3) Convert forecast vehicle OD matrices to Local Sub-area Model OD vehicle matrices; and
4) Apply base-year Local Sub-area Model re-validation adjustments to Local Model OD forecasts.

6.5.2 The changes mean that there is more than one set of forecasts. Clearly, it is the results of the last step that are most pertinent, but it can be informative to understand the results of the earlier steps when seeking to interpret the results. On this account, the Appendix (see Section 8.3) includes results from SINTRAM72 modelling.

6.5.3 NOTE: Care is required with regard to the units in the tables relating to demand, especially when comparing between tables. The tables are labelled, but values can vary according to PA (outbound elements of tours) or OD trips, average hourly and peak hours, summed over 24-hours or over AM, IP, and PM average hourly flows.

6.5.4 Table 6-2 shows average growth rates by trip purpose from 2014 to 2037. It may be noted that work and education trips, which predominate in the peak hours, especially the AM peak, have lower growth rates than other purposes.

Table 6-2 Average growth rates 2014 to 2037

Trip Purposes	Mean Production Growth	Mean Attraction Growth
Home based education	1.06	1.11
Home based employers' business	1.08	1.14
Home based other	1.18	1.23
Home based shop	1.18	1.22
Home based visiting	1.11	1.10
Home based work	1.02	1.07
NHBEB	1.12	1.12
NHBO	1.16	1.16

6.5.5 Further details of Latent Demand changes are provided in Table 8-3 and Table 8-4 in the Appendix.

6.5.6 The matrix totals applying in the local sub-area model forecasts are modified from Latent Demand values on account of highway congestion and local sub-area model validation changes.

6.6 Forecast Network

6.6.1 All forecast networks are a copy of the base coupled with the changes described below.

6.6.2 In all forecast scenarios, completed or committed highway schemes of strategic importance since 2014 have been included, as listed in Table 6-3. These are

inserted into the model prior to forecasting so that demand is responsive to these changes in supply.

Table 6-3: Completed or committed highway schemes included in the forecast network

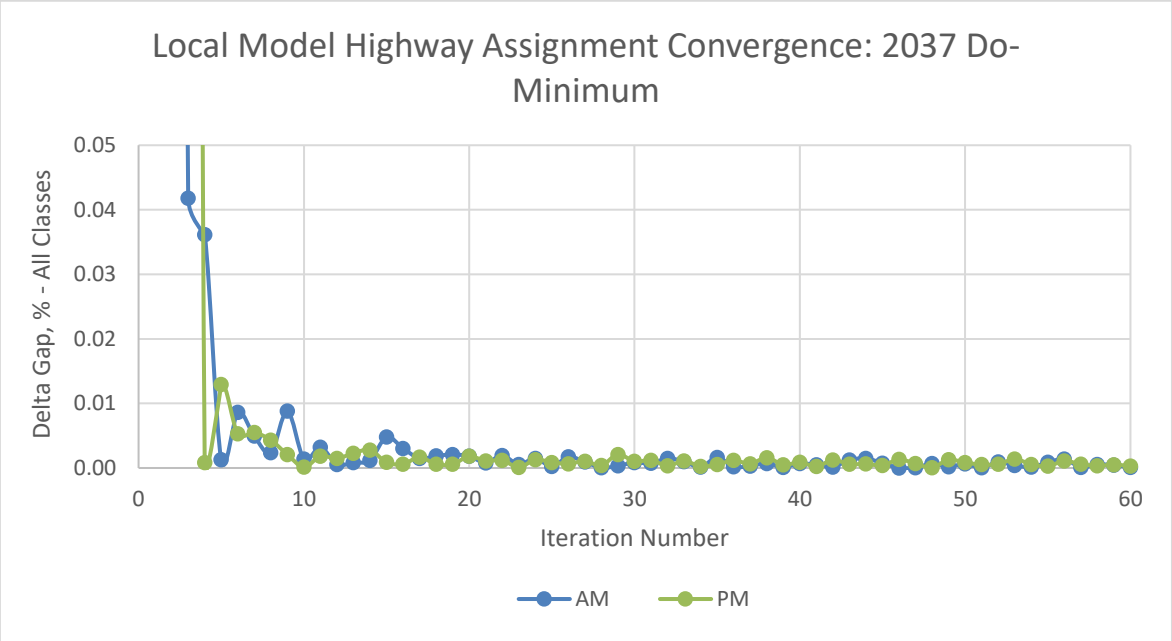
F1	Malden Rushett signal junction of A243 Leatherhead Road with B280 Fair Oak Lane
F2	M3 Hard Shoulder running J2 to 4a
F3	A325 Portsmouth Road two lanes between Toshiba and Frimley Hospital roundabouts
F4	Waitrose access to A246 York Road, Guildford
F5	East Street development, Farnham
F6	Redhill balanced network
F7	Runnymede roundabout scheme
F8	Epsom Plan E
F9	Horley Masterplan
F11	Meadows scheme, Camberley
F12	M23 J8 to 10 smart motorway
F18	Millbrook car park, Guildford
F21	Staines STP
F22	A240 Reigate Road Nescot College entrance, Epsom
F23	A327 Minley Link, Fleet
F25	M25 J8
F27	A30 Crooked Billet roundabout
F28	M25 Junction 13
F31	Longcross
F33	A320 HIF
S73.F36	A31/A331 Signals on Tongham RA
S73.F37	A30 and Camberley Town Centre Improvement Works

6.7 Assignment

6.7.1 Assignment for the forecast network is as described in Section 2.11 for the base year. For the forecast Do-Minimum scenario 60 iterations were used for both time periods, ensuring that the delta gap was less than 0.1% for at least 4 consecutive iterations.

6.7.2 Figure 6-2 shows convergence for the Do-Minimum forecast. The first few iterations are omitted to provide clarity for variations in the later iterations.

Figure 6-2 Highway assignment convergence - epsilon values for 2037 Do-Minimum



7 FUTURE YEAR DO-SOMETHING

7.1.1 The approach described below was used for the Do-Something scenario options building on the Future Year Do-Minimum, Scenario A, which was explained in Section 6 above.

7.1.2 However, for the Do-Something scenario the approach was applied to the local sub-area model rather than to the master model, as indicated in Figure 5-1.

7.2 Development Sites and Pro-Forma

7.2.1 As for the future year Do-Minimum scenario, information regarding the composition of both commercial and residential development sites to be considered in the appraisal was provided by Spelthorne Borough Council in the form of Surrey County Council's pro-forma. Each development site listed in the pro-forma was matched to the SINTRAM72 model zone system using the grid references provided and Geographic Information System (GIS).

7.2.2 Windfall sites were included within the Do-Something scenario with data supplied by Spelthorne based on historic past trends.

7.3 Vehicle Trip Generation

7.3.1 However, for the proposed (non-approved) sites, instead of using trip productions informed by the DfT's National Trip End Model, vehicle trips generated by each development site were calculated using the information contained within the pro-forma combined with survey data extracted from the Trip Rate Information Computer Database (TRICS).

7.3.2 TRICS is the national standard database system of trip generation and analysis used in the planning application process. The database holds thousands of trip rate surveys generated by different land uses and location type across the UK and Ireland.

7.3.3 For developments within Spelthorne Borough, the database has been interrogated for sites of a similar geographical location and land use in line with guidance from the 2016 Good Practice Guide. The database produces trip rates per 100m^2 gross floor area (GFA), site area (Ha), number of residents or by residential unit. The resulting trip rates will be applied to the size and composition of each development to calculate the trip generation for each site. Consideration has been made to the previous or existing land use of the development site and the trips it would have created. These trips have been deducted from those generated by the new development to prevent double counting providing that the site was active in 2014.

7.3.4 The trip generation has been calculated separately for vehicles arriving and departing each development site. This will also be split into the vehicle types: car, LGV and HGV, similarly informed by the information contained within the TRICS database. The trips rates that will be used for residential developments are shown in Table 7-1.

7.3.5 At this concept stage, all development related trips have been assumed to be new trips, and as such can be considered to represent a worst-case scenario. No allowance has been made for linked, pass-by, diverted or transferred trips. The base assumption is that people will maintain past and current travel behaviour. Demand is therefore projected into the future based on past observations. Trip rates have been applied directly and no adjustments have been made. This represents a

traditional 'predict and provide' approach rather than a vision based, supply led scenario based on the emerging 'decide and provide' principles.

7.3.6 Negative values can arise due to a greater number of vehicle trips being generated from the previous development(s) than the new site(s) being proposed. Where negative trips were present, these have been removed from the surrounding zone when applied in the model.

7.4 Trip Rates

7.4.1 Once the unallocated planning data had been provided, trip rates for each site, both residential and commercial, were identified. Surrey County Council has already extracted trip rate data from the TRICS database 7.7.4 (2021), and this dataset is available for inspection.

Table 7-1: Residential vehicular trip rates

Location	Main Land Use	Sub Land Use	Units	Number of Surveys	Arrivals		Departures	
					0800-0900	1700-1800	0800-0900	1700-1800
Town Centre	C3	Houses	No. of dwellings	-	Not used			
Town Centre	C3	Flats	No. of dwellings	3	0.031	0.063	0.080	0.049
Edge of Town Centre	C3	Houses	No. of dwellings	9	0.149	0.243	0.300	0.187
Edge of Town Centre	C3	Flats	No. of dwellings	17	0.052	0.173	0.174	0.096
Suburban Area	C3	Houses	No. of dwellings	29	0.117	0.354	0.379	0.188
Suburban Area	C3	Flats	No. of dwellings	12	0.054	0.140	0.173	0.077
Edge of Town	C3	Houses	No. of dwellings	42	0.137	0.336	0.368	0.157
Edge of Town	C3	Flats	No. of dwellings	3	0.101	0.246	0.217	0.130
Neighbourhood Centre	C3	Houses	No. of dwellings	13	0.109	0.314	0.332	0.126
Neighbourhood Centre	C3	Flats	No. of dwellings	2	0.050	0.146	0.137	0.073
Free Standing	C3	Houses	No. of dwellings	1	0.153	0.403	0.361	0.181
Free Standing	C3	Flats	No. of dwellings	-	No sites in TRICS			

7.4.2 The trips rates that were used for the potential residential developments are shown in Table 7-1 above. Trip rates for commercial land uses have not been listed given the diverse range of land uses they apply to but are available on request. Their land uses are then matched to an appropriate main and sub land use using descriptions provided by Spelthorne Borough Council in the pro-forma. Each proposed development has been assigned to one of the geographical locations shown in Table 7-1 above using the TRICS guidance on location definitions.[8]

7.5 External and Background Traffic Growth

7.5.1 External and background growth was dealt with using CTripEnd during the Do-Minimum scenario. Since the Do-Something scenarios are then built on top of this, there is no need to cater further for background growth.

7.6 Vehicle Trip Distribution

7.6.1 As the master model trip matrices were produced using data from multiple sources, including TomTom GPS data, Census data, national travel survey and gravity modelling, it is considered that the model reflects trip distribution comprehensively. Consequently, forecast trips associated with proposed developments will be derived from the distribution for that zone or, in the case of greenfield sites, appropriate adjacent zones.

7.6.2 This is considered to be a better approach compared with deriving the distribution solely from the Office of National Statistics (ONS) Census 2011 journey to work dataset.

[8] S:\Core\Transport Studies\MUG\SoftwareHelp\TRICS Locations Definitions.pdf

7.6.3 Vehicle trips for windfall sites were distributed differently. Windfall development of small sites was distributed based on population per zone, whilst windfall development identified as a change in use from office to residential was distributed based on jobs per zone.

7.7 Forecast Network

7.7.1 This is the same as the Do-Minimum forecast network, as mentioned in Section 6.6 above.

7.7.2 All forecast networks were a copy of the base coupled with the completed or committed highway schemes of strategic importance described in Section 6.6.

7.8 Assignment

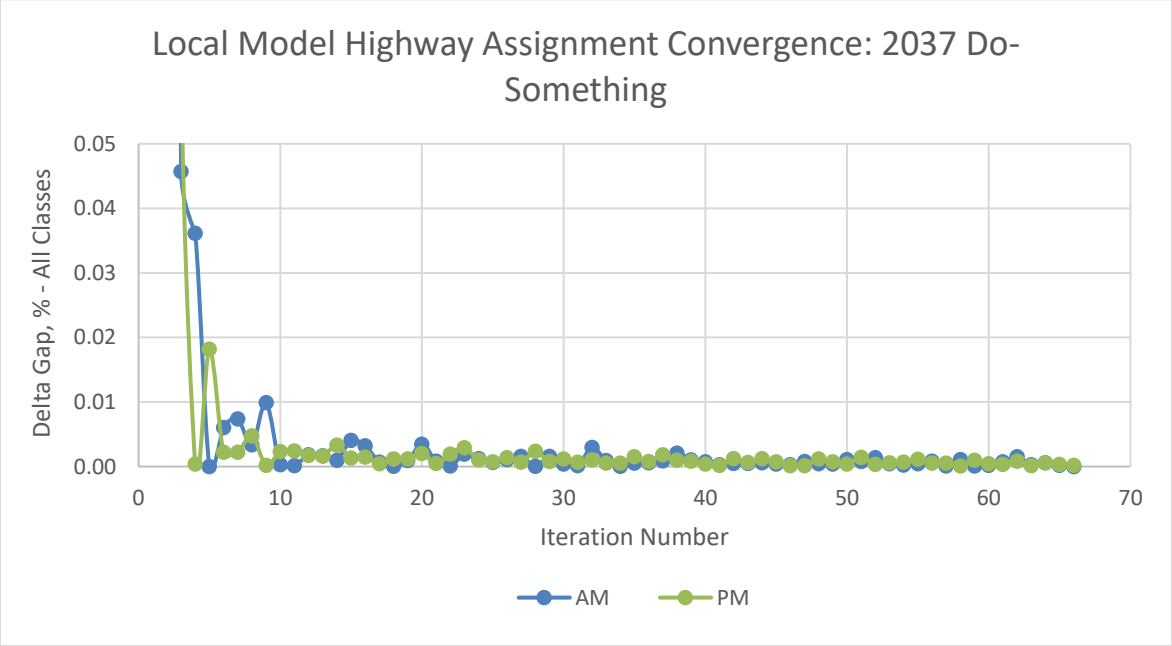
7.8.1 It is assumed that there will be no issue with access to and egress from the development sites.

7.8.2 The trips within the forecast matrices were fixed when assigned to the network. In comparison to a variable demand approach, where demand for each origin and destination pair can vary according to demand elsewhere to reflect behavioural change, this represents a worst case situation and makes the impact of the development sites more transparent to aid the decision making process.

7.8.3 The Do-Something matrices were assigned to the network using a fixed trip equilibrium assignment as detailed in paragraph 6.7.1 for the Do-Minimum.

7.8.4 Convergence is provided in Figure 7-1 for the Do-Something forecast. The first two iterations are omitted to provide clarity for variations in the later iterations. 66 iterations were required to ensure that the delta gap was less than 0.1% for at least 4 consecutive iterations. This is 6 iterations more than the Do-Minimum, due to the larger number of vehicle trips.

Figure 7-1 Highway assignment convergence - epsilon values for 2037 Do-Something



8 APPENDIX

8.1 Link Count Observed versus Modelled Values

Table 8-1 AM Peak Hour (0800 – 0900) Link Flow Validation Count Comparison

Name	Obs Total	Mod Total	Diff	% Diff	GEH
4317: ATC B389 Christchurch Road E-W	480	409	-71	-15%	3.36
4318: ATC B389 Christchurch Road W-E	535	515	-20	-4%	0.89
3346: MCC A308 Windsor Road W-E	882	963	81	9%	2.67
3347: MCC A308 Windsor Road E-W	482	481	-1	0%	0.04
4242: ATC A320 Guildford Road N-S	1090	1016	-74	-7%	2.29
4241: ATC A320 Guildford Road S-N	984	997	13	1%	0.41
9013: ASS* M25 CW J10 - J11	6837	7038	201	3%	2.41
3741: MCC D3912 Wellington Way W-E	611	544	-67	-11%	2.79
3742: MCC D3912 Wellington Way E-W	844	701	-143	-17%	5.14
4243: ATC A320 Guildford Road S-N	956	679	-277	-29%	9.69
4244: ATC A320 Guildford Road N-S	909	846	-63	-7%	2.14
1999: ATC A320 Guildford Road S-N	805	679	-126	-16%	4.63
2000: ATC A320 Guildford Road N-S	791	846	55	7%	1.91
4090: ATC A320 Guildford Road S-N	1047	679	-368	-35%	12.53
4091: ATC A320 Guildford Road N-S	920	846	-74	-8%	2.50
1996: ATC A319 Chobham Road W-E	389	570	181	47%	8.26
1995: ATC A319 Chobham Road E-W	201	176	-25	-12%	1.81
3451: MCC A320 Guildford Road N-S	1186	1474	288	24%	7.91
3450: MCC A320 Guildford Road S-N	1837	1735	-102	-6%	2.41
3513: MCC B386 Longcross Road W-E	659	756	97	15%	3.65
3514: MCC B386 Longcross Road E-W	169	511	342	202%	18.54
3983: MCTC B386 Holloway Hill E-W	661	783	122	18%	4.53
3434: MCC M25 J11 - J12 S-N	6800	7630	830	12%	9.78
3435: MCC M25 J12 - J11 N-S	7068	6939	-129	-2%	1.54
2355: TRADS M25 M25 J12 clockwise - M3 J2 S-N	2041	2304	263	13%	5.65
4450: ATC D3095 Franklands Drive N-S	56	85	29	51%	3.40
3552: MCC B3121 Spinney Hill E-W	360	475	115	32%	5.65
3438: MCC A317 St Peters Way W-E	2015	2097	82	4%	1.80
9014: ASS* M25 CW Within J11	5819	5477	-342	-6%	4.55
2362: TRADS M25 M25 J11 clockwise exit S-N	1110	1561	451	41%	12.33
9020: ASS* M25 AC Within J11	4896	5200	304	6%	4.28
3398: MCC A318 Chertsey Road S-N	756	887	131	17%	4.58
3399: MCC A318 Chertsey Road N-S	729	816	87	12%	3.14
1565: ATC A318 New Haw Road N-S	736	662	-74	-10%	2.81
1566: ATC A319 New Haw Road S-N	745	797	52	7%	1.89
1771: ATC B374 Brooklands Road S-N	933	820	-113	-12%	3.83
1772: ATC B374 Brooklands Road N-S	901	861	-40	-4%	1.35
1810: ATC B372 St Georges Avenue W-E	277	231	-46	-17%	2.88
1811: ATC B372 St Georges Avenue E-W	354	248	-106	-30%	6.08
1809: ATC B373 Hanger Hill S-N	452	526	74	16%	3.33
4833: MCC B3121 Station Road N-S	385	397	12	3%	0.62
1992: ATC A317 Weybridge Road E-W	1026	908	-118	-12%	3.81
1769: ATC B374 Heath Road N-S	502	507	5	1%	0.20
1770: ATC B374 Heath Road S-N	640	441	-199	-31%	8.55
1768: ATC B374 Heath Road S-N	620	552	-68	-11%	2.79
3682: MCC D3883 Brooklands Lane E-W	197	193	-4	-2%	0.32
3681: MCC D3883 Brooklands Lane W-E	78	113	35	45%	3.56
1774: ATC B373 Hanger Hill S-N	577	529	-48	-8%	2.05
1773: ATC B373 Hanger Hill N-S	684	769	85	12%	3.14
4774: MCTC A317 Weybridge Road E-W	775	747	-28	-4%	1.03
4771: MCTC A317 Balfour Road E-W	555	490	-65	-12%	2.86
4776: MCTC D3877 Portmore Park Road S-N	226	190	-36	-16%	2.53
4775: MCTC D3877 Portmore Park Road N-S	310	257	-53	-17%	3.16
4743: MCTC A317 Monument Hill W-E	799	780	-19	-2%	0.68
4745: MCTC A317 High Street E-W	607	595	-12	-2%	0.48
3423: MCC A317 Monument Hill W-E	741	761	20	3%	0.73
3980: MCTC A320 Guildford Road S-N	670	630	-40	-6%	1.59

Name	Obs Total	Mod Total	Diff	% Diff	GEH
3981: MCTC A320 Guildford Road N-S	975	1038	63	6%	1.99
1855: RT ATC A317 St Peters Way East E-W	717	870	153	21%	5.41
2364: TRADS M25 M25 J11 clockwise access S-N	1653	2153	500	30%	11.46
2359: TRADS M25 M25 J11 anti-clockwise exit N-S	1658	1739	81	5%	1.97
2358: TRADS M25 J12 - J11 N-S	6264	6939	675	11%	8.30
1600: ATC A317 Chertsey Road S-N	1095	1367	272	25%	7.76
3349: MCC A317 Eastworth Road E-W	779	736	-43	-6%	1.56
2705: MCTC B375 Bridge Road E-W	508	506	-2	0%	0.09
2704: MCTC B375 Bridge Road W-E	446	355	-91	-20%	4.54
4469: MCC B375 Chertsey Bridge E-W	847	958	111	13%	3.70
4470: MCC B375 Chertsey Bridge W-E	883	1002	119	14%	3.89
4767: MCTC B375 Renfree Way W-E	585	527	-58	-10%	2.45
4768: MCTC B375 Renfree Way E-W	474	546	72	15%	3.17
2627: MCTC B389 Sandhills Lane W-E	346	383	37	11%	1.94
2628: MCTC C10 Trumps Green Road S-N	361	334	-27	-7%	1.43
2629: MCTC C10 Trumps Green Road N-S	288	297	9	3%	0.55
2631: MCTC B389 Christchurch Road E-W	464	384	-80	-17%	3.89
2625: MCTC C10 Stroude Road S-N	236	268	32	14%	2.04
2624: MCTC C10 Stroude Road N-S	208	188	-20	-10%	1.43
2200: TRADS M3 M3 J2 eastbound to M25 J12 W-E	3558	3646	88	2%	1.46
2202: TRADS M3 M25 J12 clockwise to M3 J2 eastbound W-E	810	941	131	16%	4.44
2199: TRADS M3 M25 J12 clockwise to M3 J2 westbound E-W	1363	1363	0	0%	0.00
2198: TRADS M3 M3 westbound within J2 E-W	1219	1321	102	8%	2.87
2352: TRADS M25 M25 J12 anti-clockwise - M3 J2 N-S	2054	2370	316	15%	6.73
3527: MCC B388 Thorpe By-Pass S-N	505	490	-15	-3%	0.67
3528: MCC B388 Thorpe By-Pass N-S	409	346	-63	-15%	3.22
9018: ASS* M25 AC J13 - J12	6644	7121	477	7%	5.75
9017: ASS* M25 CW J12 - J13	8052	8744	692	9%	7.55
1510: ATC B388 Thorpe Lea Road S-N	634	600	-34	-5%	1.39
3114: MCTC D3187 Whitehall Lane E-W	227	167	-60	-27%	4.30
3113: MCTC D3187 Whitehall Lane W-E	167	204	37	22%	2.71
3112: MCTC C10 Stroude Road N-S	353	287	-66	-19%	3.67
3111: MCTC C10 Stroude Road S-N	514	450	-64	-12%	2.92
3110: MCTC C10 Manorcrofts Road W-E	381	342	-39	-10%	2.04
3109: MCTC C10 Manorcrofts Road E-W	280	186	-94	-34%	6.14
4425: ATC D3131 Tite Hill W-E	324	220	-104	-32%	6.29
4426: ATC D3131 Tite Hill E-W	208	127	-81	-39%	6.26
4836: MCC C10 Station Road S-N	309	310	1	0%	0.08
4837: MCC C10 Station Road N-S	267	177	-90	-34%	6.04
3689: MCC D3150 Mullens Road W-E	33	44	11	34%	1.80
3690: MCC D3150 Mullens Road E-W	45	10	-35	-78%	6.71
3584: MCC C125 Pooley Green Road W-E	155	47	-108	-70%	10.76
3585: MCC C125 Pooley Green Road E-W	95	78	-17	-18%	1.87
1982: ATC A308 Windsor Road E-W	543	481	-62	-11%	2.74
1981: ATC A308 Windsor Road W-E	964	963	-1	0%	0.03
1983: ATC A308 The Causeway W-E	829	738	-91	-11%	3.24
9022: ASS* M25 CW Within J13	6870	7749	879	13%	10.28
2346: TRADS M25 M25 J13 anti-clockwise access N-S	1155	648	-507	-44%	16.89
9029: ASS* M25 AC Within J13	6146	6473	327	5%	4.12
3503: MCC A320 Staines Road S-N	538	343	-195	-36%	9.29
3504: MCC A320 Staines Road N-S	587	460	-127	-22%	5.55
1998: ATC A320 Chertsey Lane N-S	508	504	-4	-1%	0.16
3635: MCC D3302 Riverway E-W	12	0	-12	-100%	4.90
3541: MCC B376 Laleham Road W-E	607	649	42	7%	1.66
3542: MCC B376 Laleham Road E-W	549	405	-144	-26%	6.57
2097: ATC B3376 Thorpe Road N-S	229	188	-41	-18%	2.86
2098: ATC B3376 Thorpe Road S-N	318	311	-7	-2%	0.37
1782: ATC B376 Laleham Road N-S	398	392	-6	-2%	0.31
1781: ATC B376 Laleham Road S-N	902	787	-115	-13%	3.96
4134: ATC C248 Kingston Road W-E	434	377	-57	-13%	2.86
3379: MCC A308 Staines Bridge W-E	757	629	-128	-17%	4.85
3380: MCC A308 Staines Bridge E-W	1375	1123	-252	-18%	7.14
3919: MCTC B376 Bridge Street N-S	444	486	42	9%	1.95

Name	Obs Total	Mod Total	Diff	% Diff	GEH
1780: ATC B376 Wraysbury Road E-W	326	367	41	13%	2.20
3915: MCTC B376 Wraysbury Road N-S	461	517	56	12%	2.53
3917: MCTC B376 Church Street W-E	125	113	-12	-10%	1.13
2936: MCTC B376 Wraysbury Road S-N	331	350	19	6%	1.05
2938: MCTC D3283 Hale Street W-E	419	541	122	29%	5.58
2937: MCTC D3283 Hale Street E-W	365	411	46	13%	2.36
4735: MCTC D3282 Fairfield Avenue N-S	416	180	-236	-57%	13.66
4736: MCTC D3282 Fairfield Avenue S-N	98	89	-9	-9%	0.89
1777: ATC C248 Kingston Road E-W	581	430	-151	-26%	6.72
1778: ATC C248 Kingston Road W-E	475	427	-48	-10%	2.28
2414: TRADS A30 Between A308 and M25 E-W	1578	1982	404	26%	9.58
4740: MCTC A308 London Road W-E	284	79	-205	-72%	15.26
1775: ATC A308 London Road W-E	627	222	-405	-65%	19.64
1776: ATC A308 London Road E-W	881	642	-239	-27%	8.67
4133: ATC C248 Kingston Road E-W	773	503	-270	-35%	10.70
4132: ATC C248 Kingston Road W-E	530	473	-57	-11%	2.53
1988: ATC A308 Staines Bypass E-W	1288	1169	-119	-9%	3.41
1987: ATC A308 Staines Bypass W-E	866	909	43	5%	1.45
4176: ATC A308 Staines Road West W-E	1247	1117	-130	-10%	3.79
3017: MCTC C241 Stanwell Road S-N	334	235	-99	-30%	5.86
3018: MCTC C241 Stanwell Road N-S	373	351	-22	-6%	1.15
3015: MCTC B378 Church Road E-W	251	200	-51	-20%	3.42
3016: MCTC B378 Church Road W-E	334	281	-53	-16%	2.99
3020: MCTC B378 Stanwell Road S-N	569	435	-134	-24%	5.99
3019: MCTC B378 Stanwell Road N-S	691	633	-58	-8%	2.27
3720: MCC D3252 Parkland Grove N-S	54	104	50	93%	5.67
2083: ATC B3003 Clockhouse Lane S-N	1012	916	-96	-10%	3.10
1606: ATC B3003 Clockhouse Lane S-N	912	916	4	0%	0.13
1605: ATC B3003 Clockhouse Lane N-S	484	547	63	13%	2.76
2349: TRADS M25 M25 J13 clockwise access S-N	1567	1609	42	3%	1.05
9028: ASS* M25 AC J14 - J13	7920	8250	330	4%	3.67
9023: ASS* M25 CW J13 - J14	8738	9357	619	7%	6.51
4131: ATC B378 Town Lane N-S	214	182	-32	-15%	2.25
3678: MCC D3226 Cranford Avenue E-W	46	67	21	46%	2.83
9025: ASS* M25 CW J14 - J15	7514	7645	131	2%	1.50
9026: ASS* M25 AC J15 - J14	8738	8719	-19	0%	0.20
1812: ATC B372 St Georges Avenue W-E	213	100	-113	-53%	9.02
4591: MCTC D3868 Oatlands Avenue E-W	214	82	-132	-61%	10.81
4590: MCTC D3868 Oatlands Avenue W-E	190	119	-71	-38%	5.73
4759: MCTC D3865 Oatlands Chase W-E	296	323	27	9%	1.53
4760: MCTC D3865 Oatlands Chase E-W	562	472	-90	-16%	3.95
4755: MCTC C155 Station Avenue E-W	345	283	-62	-18%	3.51
4756: MCTC C155 Station Avenue W-E	351	424	73	21%	3.73
4761: MCTC B365 Ashley Road N-S	789	628	-161	-20%	6.05
4758: MCTC B365 Ashley Road N-S	551	487	-64	-12%	2.79
4757: MCTC B365 Ashley Road S-N	660	648	-12	-2%	0.49
3131: MCTC C152 Burwood Road E-W	387	403	16	4%	0.82
3132: MCTC C152 Burwood Road W-E	308	367	59	19%	3.23
3133: MCTC C152 Burwood Road W-E	378	482	104	27%	5.01
3134: MCTC C152 Burwood Road E-W	424	476	52	12%	2.45
3129: MCTC C156 Westcar Lane N-S	129	73	-56	-44%	5.61
3130: MCTC C156 Westcar Lane S-N	162	114	-48	-29%	4.05
3088: MCTC A244 Hersham Bypass W-E	1049	984	-65	-6%	2.04
3089: MCTC A317 Hersham Bypass W-E	559	497	-62	-11%	2.70
3090: MCTC A317 Hersham Bypass E-W	609	560	-49	-8%	2.02
3086: MCTC A244 Robinsway S-N	375	376	1	0%	0.07
3085: MCTC A244 Robinsway N-S	562	558	-4	-1%	0.19
3087: MCTC A244 Hersham Bypass E-W	912	866	-46	-5%	1.55
3592: MCC C152 Burwood Road S-N	523	567	44	8%	1.90
3593: MCC C152 Burwood Road N-S	906	915	9	1%	0.30
4178: ATC A244 Esher Road E-W	974	965	-9	-1%	0.29
4179: ATC A244 Esher Road W-E	1043	1033	-10	-1%	0.32
2110: ATC D3875 Walton Lane E-W	288	191	-97	-34%	6.30

Name	Obs Total	Mod Total	Diff	% Diff	GEH
2109: ATC D3875 Walton Lane W-E	201	285	84	42%	5.41
3548: MCC B365 Ashley Road N-S	391	345	-46	-12%	2.39
4789: MCTC A3050 Oatlands Drive S-N	592	669	77	13%	3.08
4790: MCTC A3050 Oatlands Drive N-S	479	539	60	12%	2.64
3713: MCC D3860 Red House Lane W-E	15	34	19	126%	3.82
3714: MCC D3860 Red House Lane E-W	11	5	-6	-59%	2.33
4809: MCTC A244 Ashley Road S-N	812	730	-82	-10%	2.93
4807: MCTC B365 Ashley Road S-N	319	254	-65	-21%	3.87
4803: MCTC A244 Hersham Road S-N	496	469	-27	-5%	1.21
4804: MCTC A244 Hersham Road N-S	507	533	26	5%	1.15
4802: MCTC A244 High Street N-S	931	862	-69	-7%	2.32
4808: MCTC B365 Ashley Road N-S	332	321	-11	-3%	0.63
4763: MCTC B375 Russell Road E-W	512	435	-77	-15%	3.56
4764: MCTC B375 Russell Road W-E	544	440	-104	-19%	4.68
4769: MCTC B376 High Street N-S	273	353	80	29%	4.51
4770: MCTC B376 High Street S-N	356	308	-48	-13%	2.62
2095: ATC B3366 Green Lane W-E	594	720	126	21%	4.91
2096: ATC B3366 Green Lane E-W	470	501	31	7%	1.39
3626: MCC D6293 Western Drive S-N	46	41	-5	-11%	0.77
3627: MCC D6293 Western Drive N-S	67	114	47	70%	4.95
4779: MCTC A244 Gaston Bridge Road S-N	713	679	-34	-5%	1.30
4780: MCTC A244 Gaston Bridge Road N-S	534	566	32	6%	1.38
4799: MCTC A244 Walton Bridge E-W	1185	1238	53	4%	1.51
4797: MCTC D3875 Walton Lane N-S	353	279	-74	-21%	4.14
4796: MCTC D3875 Walton Lane S-N	153	192	39	25%	2.95
4801: MCTC A244 Walton Bridge W-E	1392	1291	-101	-7%	2.77
4800: MCTC A244 Walton Bridge E-W	1171	1219	48	4%	1.38
4785: MCTC A244 New Zealand Avenue E-W	407	386	-21	-5%	1.05
4786: MCTC A244 New Zealand Avenue W-E	639	630	-9	-1%	0.36
4788: MCTC A3050 Bridge Street W-E	519	556	37	7%	1.61
4787: MCTC A3050 Bridge Street E-W	603	597	-6	-1%	0.23
4792: MCTC A244 Walton Bridge Road S-N	901	901	0	0%	0.00
4791: MCTC A244 Walton Bridge Road N-S	1360	1031	-329	-24%	9.52
2030: ATC A3050 Terrace Road S-N	435	521	86	20%	3.93
2029: ATC A3050 Terrace Road N-S	526	564	38	7%	1.61
4753: MCTC A3050 Church Street W-E	506	548	42	8%	1.85
4752: MCTC A3050 Church Street E-W	498	477	-21	-4%	0.94
4749: MCTC A3050 Hepworth Way E-W	560	583	23	4%	0.97
4754: MCTC D3807 Bridge Street N-S	118	68	-50	-42%	5.13
4751: MCTC D3809 High Street N-S	180	149	-31	-17%	2.40
1954: ATC A244 Hersham Road S-N	392	415	23	6%	1.15
3685: MCC D3837 Walton Park W-E	173	178	5	3%	0.39
3686: MCC D3837 Walton Park E-W	171	180	9	5%	0.68
4782: MCTC A244 Gaston Bridge Road S-N	963	992	29	3%	0.93
4781: MCTC A244 Gaston Bridge Road N-S	748	809	61	8%	2.17
1949: ATC A244 Gaston Bridge Road S-N	851	992	141	17%	4.65
4778: MCTC B3366 Green Lane E-W	384	413	29	7%	1.43
4777: MCTC B3366 Green Lane W-E	420	484	64	15%	3.01
4390: ATC D6263 Charlton Lane W-E	427	382	-45	-11%	2.26
4389: ATC D6263 Charlton Lane E-W	356	398	42	12%	2.16
2947: MCTC D6254 Loudwater Road N-S	49	47	-2	-4%	0.27
2948: MCTC D6254 Loudwater Road S-N	35	21	-14	-41%	2.69
2950: MCTC C234 Fordbridge Road W-E	298	230	-68	-23%	4.21
2949: MCTC C234 Fordbridge Road E-W	212	188	-24	-11%	1.72
2952: MCTC C234 Fordbridge Road E-W	240	235	-5	-2%	0.34
2951: MCTC C234 Fordbridge Road W-E	312	250	-62	-20%	3.67
1957: ATC A244 Upper Halliford Road S-N	962	952	-10	-1%	0.33
1958: ATC A244 Upper Halliford Road N-S	580	634	54	9%	2.19
1597: ATC C233 Charlton Road N-S	684	576	-108	-16%	4.31
1598: ATC C233 Charlton Road S-N	822	579	-243	-30%	9.17
3662: MCC D6249 Stratton Road N-S	63	91	28	45%	3.24
3995: MCTC A244 Windmill Road N-S	732	572	-160	-22%	6.28
3994: MCTC A244 Windmill Road S-N	832	756	-76	-9%	2.71

Name	Obs Total	Mod Total	Diff	% Diff	GEH
4079: MCTC D6306 Brooklands Close N-S	163	152	-11	-7%	0.85
3991: MCTC A244 Windmill Road S-N	845	826	-19	-2%	0.65
3990: MCTC A244 Windmill Road N-S	834	766	-68	-8%	2.42
4080: MCTC D6306 Brooklands Close W-E	92	215	123	133%	9.92
4081: MCTC D6306 Brooklands Close E-W	145	91	-54	-37%	4.94
4174: ATC A308 Staines Road West W-E	1088	1033	-55	-5%	1.68
1814: ATC A308 Staines Road West E-W	1266	1121	-145	-11%	4.21
1815: ATC A308 Staines Road West W-E	1114	1237	123	11%	3.59
3378: MCC A308 Staines Road West E-W	1329	1265	-64	-5%	1.78
3377: MCC A308 Staines Road West W-E	1372	1350	-22	-2%	0.61
1817: ATC A308 Staines Road West W-E	1268	1247	-21	-2%	0.60
1816: ATC A308 Staines Road West E-W	1172	1265	93	8%	2.66
1948: ATC A244 Cadbury Road N-S	377	416	39	10%	1.98
1947: ATC A244 Cadbury Road S-N	712	856	144	20%	5.14
2048: ATC B377 Feltham Road W-E	388	282	-106	-27%	5.80
2047: ATC B377 Feltham Road E-W	203	119	-84	-41%	6.58
3405: MCC A316 Hanworth Road W-E	2855	3103	248	9%	4.55
2193: TRADS A316 Sunbury East of M3 Junction 1 W-E	2927	3103	176	6%	3.21
3554: MCC B369 Walton Road E-W	390	385	-5	-1%	0.23
3553: MCC B369 Walton Road W-E	595	586	-9	-2%	0.37
4467: MCC A309 Hampton Court Way S-N	1317	1361	44	3%	1.20
4468: MCC A309 Hampton Court Way N-S	1280	1246	-34	-3%	0.96
3540: MCC B3379 Bridge Road E-W	447	348	-99	-22%	4.99
3539: MCC B3379 Bridge Road W-E	186	232	46	25%	3.18
2031: ATC A3050 Hurst Road W-E	650	538	-112	-17%	4.61
2032: ATC A3050 Hurst Road E-W	350	378	28	8%	1.46
2415: TRADS A30 Between B378 and A315 W-E	1251	1082	-169	-14%	4.96
2194: TRADS A316 Sunbury East of M3 Junction 1 E-W	2947	3021	74	3%	1.35
2341: TRADS M25 M25 J14 clockwise - Heathrow T5 S-N	752	899	147	19%	5.10
2337: TRADS M25 Heathrow T5 - M25 J14 anti-clockwise N-S	413	454	41	10%	1.95
2336: TRADS M25 M25 J14 anti-clockwise - Heathrow T5 N-S	785	791	6	1%	0.20
2335: TRADS M25 M25 J14 anti-clockwise - A3113 N-S	1102	1151	49	4%	1.45
1986: ATC A308 Staines Road East E-W	744	743	-1	0%	0.04
1985: ATC A308 Staines Road East W-E	495	644	149	30%	6.23
9005: ASS* M3 EB J3 - J2	5757	5312	-445	-8%	5.98
3443: MCC M3 J2 - J3 E-W	3539	3939	400	11%	6.55
2019: ATC A329 Blacknest Road W-E	767	834	67	9%	2.38
2020: ATC A329 Blacknest Road E-W	509	345	-164	-32%	7.92
1910: ATC A30 London Road S-N	644	615	-29	-5%	1.16
1909: ATC A30 London Road N-S	425	282	-143	-34%	7.61
3323: MCC D3017 Kitsmead Lane S-N	118	120	2	1%	0.15
3324: MCC D3017 Kitsmead Lane N-S	92	85	-7	-7%	0.72
3327: MCC D3918 Wellington Avenue S-N	494	443	-51	-10%	2.35
3328: MCC D3918 Wellington Avenue N-S	265	215	-50	-19%	3.21
3321: MCC C10 Trumps Green Road S-N	318	403	85	27%	4.46
3322: MCC C10 Trumps Green Road N-S	147	245	98	67%	7.02
4319: ATC B389 Christchurch Road E-W	436	560	124	29%	5.57
4323: ATC B389 Christchurch Road E-W	549	576	27	5%	1.14
4325: ATC B389 Christchurch Road E-W	565	576	11	2%	0.46
2996: MCTC A328 St Judes Road S-N	577	594	17	3%	0.68
2995: MCTC A328 St Judes Road N-S	522	557	35	7%	1.50
2997: MCTC A30 Egham Hill E-W	656	614	-42	-6%	1.68
3667: MCC D3118 Larchwood Drive S-N	101	131	30	30%	2.79
3668: MCC D3118 Larchwood Drive N-S	42	62	20	48%	2.81
3401: MCC A328 St Judes Road S-N	445	433	-12	-3%	0.59
2642: MCTC B3021 Burfield Road W-E	152	66	-86	-56%	8.22
2643: MCTC B3021 Burfield Road E-W	79	73	-6	-7%	0.66
2632: MCTC A308 Windsor Road S-N	516	481	-35	-7%	1.56
2637: MCTC A308 Straight Road S-N	748	547	-201	-27%	7.89
2636: MCTC A308 Straight Road N-S	762	995	233	31%	7.86
2638: MCTC A328 Priest Hill N-S	518	490	-28	-5%	1.27
2641: MCTC A328 Priest Hill N-S	533	478	-55	-10%	2.43
2640: MCTC A328 Priest Hill S-N	446	520	74	17%	3.37

Name	Obs Total	Mod Total	Diff	% Diff	GEH
4924: Partial B3376 New Wickham Lane W - E	552	473	-79	-14%	3.50
4925: Partial B3376 New Wickham Lane E - W	486	468	-18	-4%	0.80
4930: Partial B388 Thorpe Lea Road S - N	701	647	-54	-8%	2.08
4931: Partial B388 Thorpe Lea Road N - S	648	557	-90	-14%	3.69
4926: Partial B388 Vicarage Road S - N	418	385	-33	-8%	1.63
4927: Partial B388 Vicarage Road N - S	347	319	-28	-8%	1.53
4928: Partial B3376 New Wickham Lane W - E	738	606	-133	-18%	5.12
4929: Partial B3376 New Wickham Lane E - W	743	659	-84	-11%	3.17
4932: Partial B3376 Thorpe Lea Road W - E	650	521	-128	-20%	5.31
4922: ATC D3192 Callow Hill S - N	498	622	124	25%	5.26
4923: ATC D3192 Callow Hill N - S	321	308	-13	-4%	0.72
9006: ASS* M3 EB Within J2	1661	1667	6	0%	0.15
9008: ASS* M3 WB J1 - J2	3197	3282	85	3%	1.49
9009: ASS* M3 WB Within J2	1354	1321	-33	-2%	0.90
9015: ASS* M25 CW J11 - J12	7243	7630	387	5%	4.49
9016: ASS* M25 CW Within J12	5007	5326	319	6%	4.44
9019: ASS* M25 AC Within J12	4337	4751	414	10%	6.14
9024: ASS* M25 CW Within J14	6325	6760	435	7%	5.38
9027: ASS* M25 AC Within J14	6738	6778	40	1%	0.48
5070: MCC A4 Colnbrook Bypass W - E	988	864	-124	-13%	4.06
5076: MCC A4 Bath Road W - E	755	786	31	4%	1.12
5078: MCC A311 High Street N - S	523	522	-1	0%	0.05
5079: MCC A311 High Street S - N	588	548	-40	-7%	1.69
5080: MCC A312 Harlington Road W S - N	755	595	-160	-21%	6.15
5081: MCC A312 Harlington Road W N - S	749	649	-100	-13%	3.77
5086: MCC A312 Hampton Road W W - E	851	786	-65	-8%	2.26
5087: MCC A312 Hampton Road W E - W	764	772	8	1%	0.27
5088: MCC A308 Upper Sunbury Road W - E	503	498	-5	-1%	0.21
5089: MCC A308 Upper Sunbury Road E - W	615	604	-11	-2%	0.45
5092: MCC A30 Great South West Road W - E	2170	2243	73	3%	1.55
5093: MCC A30 Great South West Road E - W	2203	1890	-313	-14%	6.92
5097: MCC A4 Bath Road W - E	1174	1372	198	17%	5.55
5098: MCC A312 Hampton Road E S - N	393	410	17	4%	0.83
5099: MCC A312 Hampton Road E N - S	664	483	-181	-27%	7.54
5101: MCC A315 Staines Road W - E	701	583	-118	-17%	4.67
5102: MCC A308 Hampton Court Road W - E	1378	1272	-106	-8%	2.92
5103: MCC A308 Hampton Court Road E - W	1079	1046	-33	-3%	1.02
5104: MCC C Broad Lane (Hampton) W - E	245	262	17	7%	1.08
5105: MCC C Broad Lane (Hampton) E - W	153	125	-28	-18%	2.33

Table 8-2 PM Peak Hour (1700 – 1800) Link Flow Validation Count Comparison

Name	Obs Total	Mod Total	Diff	% Diff	GEH
4317: ATC B389 Christchurch Road E-W	565	644	79	14%	3.20
4318: ATC B389 Christchurch Road W-E	415	405	-10	-2%	0.47
3346: MCC A308 Windsor Road W-E	884	851	-33	-4%	1.11
3347: MCC A308 Windsor Road E-W	750	635	-115	-15%	4.36
4242: ATC A320 Guildford Road N-S	1032	1063	31	3%	0.97
4241: ATC A320 Guildford Road S-N	1057	1038	-19	-2%	0.60
9013: ASS* M25 CW J10 - J11	6140	6184	44	1%	0.56
3741: MCC D3912 Wellington Way W-E	1007	801	-206	-20%	6.86
3742: MCC D3912 Wellington Way E-W	480	459	-21	-4%	0.96
4243: ATC A320 Guildford Road S-N	1007	946	-61	-6%	1.94
4244: ATC A320 Guildford Road N-S	928	896	-32	-3%	1.05
1999: ATC A320 Guildford Road S-N	931	946	15	2%	0.50
2000: ATC A320 Guildford Road N-S	852	896	44	5%	1.50
4090: ATC A320 Guildford Road S-N	1080	946	-134	-12%	4.20
4091: ATC A320 Guildford Road N-S	875	896	21	2%	0.72
1996: ATC A319 Chobham Road W-E	304	370	66	22%	3.57
1995: ATC A319 Chobham Road E-W	340	368	28	8%	1.51
3451: MCC A320 Guildford Road N-S	1183	1364	181	15%	5.06

Name	Obs Total	Mod Total	Diff	% Diff	GEH
3450: MCC A320 Guildford Road S-N	1251	1610	359	29%	9.49
3513: MCC B386 Longcross Road W-E	242	260	18	7%	1.14
3514: MCC B386 Longcross Road E-W	513	669	156	30%	6.42
3983: MCTC B386 Holloway Hill E-W	864	690	-174	-20%	6.26
3434: MCC M25 J11 - J12 S-N	6405	6902	497	8%	6.09
3435: MCC M25 J12 - J11 N-S	6887	7081	194	3%	2.32
2355: TRADS M25 M25 J12 clockwise - M3 J2 S-N	2225	2441	216	10%	4.47
4450: ATC D3095 Franklands Drive N-S	135	173	38	28%	3.03
3552: MCC B3121 Spinney Hill E-W	441	536	95	21%	4.29
3438: MCC A317 St Peters Way W-E	2069	2074	5	0%	0.11
9014: ASS* M25 CW Within J11	5259	5064	-195	-4%	2.71
2362: TRADS M25 M25 J11 clockwise exit S-N	1002	1120	118	12%	3.61
9020: ASS* M25 AC Within J11	5474	5487	13	0%	0.17
3398: MCC A318 Chertsey Road S-N	763	684	-79	-10%	2.95
3399: MCC A318 Chertsey Road N-S	991	866	-125	-13%	4.11
1565: ATC A318 New Haw Road N-S	621	641	20	3%	0.81
1566: ATC A319 New Haw Road S-N	627	637	10	2%	0.41
1771: ATC B374 Brooklands Road S-N	1052	1027	-25	-2%	0.78
1772: ATC B374 Brooklands Road N-S	747	759	12	2%	0.44
1810: ATC B372 St Georges Avenue W-E	328	427	99	30%	5.09
1811: ATC B372 St Georges Avenue E-W	288	240	-48	-17%	2.93
1809: ATC B373 Hanger Hill S-N	619	681	62	10%	2.44
4833: MCC B3121 Station Road N-S	660	547	-113	-17%	4.60
1992: ATC A317 Weybridge Road E-W	832	846	14	2%	0.47
1769: ATC B374 Heath Road N-S	451	494	43	10%	1.98
1770: ATC B374 Heath Road S-N	504	473	-31	-6%	1.39
1768: ATC B374 Heath Road S-N	609	582	-27	-4%	1.10
3682: MCC D3883 Brooklands Lane E-W	30	56	26	86%	3.93
3681: MCC D3883 Brooklands Lane W-E	52	74	22	43%	2.79
1774: ATC B373 Hanger Hill S-N	789	762	-27	-3%	0.96
1773: ATC B373 Hanger Hill N-S	459	501	42	9%	1.91
4774: MCTC A317 Weybridge Road E-W	705	708	3	0%	0.12
4771: MCTC A317 Balfour Road E-W	631	539	-92	-15%	3.82
4776: MCTC D3877 Portmore Park Road S-N	350	309	-41	-12%	2.24
4775: MCTC D3877 Portmore Park Road N-S	143	170	27	19%	2.14
4743: MCTC A317 Monument Hill W-E	637	786	149	23%	5.59
4745: MCTC A317 High Street E-W	505	569	64	13%	2.77
3423: MCC A317 Monument Hill W-E	944	856	-88	-9%	2.95
3980: MCTC A320 Guildford Road S-N	750	594	-156	-21%	6.00
3981: MCTC A320 Guildford Road N-S	960	851	-109	-11%	3.63
1855: RT ATC A317 St Peters Way East E-W	945	852	-93	-10%	3.12
2364: TRADS M25 M25 J11 clockwise access S-N	1599	1838	239	15%	5.76
2359: TRADS M25 M25 J11 anti-clockwise exit N-S	1237	1594	357	29%	9.50
2358: TRADS M25 J12 - J11 N-S	6349	7081	732	12%	8.94
1600: ATC A317 Chertsey Road S-N	1030	1077	47	5%	1.46
3349: MCC A317 Eastworth Road E-W	465	439	-26	-6%	1.22
2705: MCTC B375 Bridge Road E-W	473	98	-375	-79%	22.23
2704: MCTC B375 Bridge Road W-E	784	709	-75	-10%	2.75
4469: MCC B375 Chertsey Bridge E-W	826	675	-151	-18%	5.50
4470: MCC B375 Chertsey Bridge W-E	1173	1010	-163	-14%	4.93
4767: MCTC B375 Renfree Way W-E	513	449	-64	-12%	2.91
4768: MCTC B375 Renfree Way E-W	427	362	-65	-15%	3.30
2627: MCTC B389 Sandhills Lane W-E	259	231	-28	-11%	1.81
2628: MCTC C10 Trumps Green Road S-N	381	398	17	4%	0.84
2629: MCTC C10 Trumps Green Road N-S	361	502	141	39%	6.81
2631: MCTC B389 Christchurch Road E-W	620	504	-116	-19%	4.89
2625: MCTC C10 Stroude Road S-N	197	214	17	9%	1.19
2624: MCTC C10 Stroude Road N-S	296	258	-38	-13%	2.31
2200: TRADS M3 M3 J2 eastbound to M25 J12 W-E	2831	2933	102	4%	1.90
2202: TRADS M3 M25 J12 clockwise to M3 J2 eastbound W-E	780	1000	220	28%	7.38
2199: TRADS M3 M25 J12 clockwise to M3 J2 westbound E-W	1468	1440	-28	-2%	0.72
2198: TRADS M3 M3 westbound within J2 E-W	1520	1564	44	3%	1.13
2352: TRADS M25 M25 J12 anti-clockwise - M3 J2 N-S	2793	3145	352	13%	6.47

Name	Obs Total	Mod Total	Diff	% Diff	GEH
3527: MCC B388 Thorpe By-Pass S-N	354	450	96	27%	4.78
3528: MCC B388 Thorpe By-Pass N-S	554	610	56	10%	2.30
9018: ASS* M25 AC J13 - J12	7020	7880	860	12%	9.97
9017: ASS* M25 CW J12 - J13	6675	6670	-5	0%	0.06
1510: ATC B388 Thorpe Lea Road S-N	706	767	61	9%	2.24
3114: MCTC D3187 Whitehall Lane E-W	97	115	18	19%	1.75
3113: MCTC D3187 Whitehall Lane W-E	205	246	41	20%	2.71
3112: MCTC C10 Stroude Road N-S	368	406	38	10%	1.91
3111: MCTC C10 Stroude Road S-N	304	342	38	12%	2.10
3110: MCTC C10 Manorcrofts Road W-E	300	313	13	4%	0.73
3109: MCTC C10 Manorcrofts Road E-W	256	268	12	5%	0.72
4425: ATC D3131 Tite Hill W-E	181	103	-78	-43%	6.54
4426: ATC D3131 Tite Hill E-W	451	273	-178	-40%	9.38
4836: MCC C10 Station Road S-N	249	293	44	18%	2.69
4837: MCC C10 Station Road N-S	315	246	-69	-22%	4.11
3689: MCC D3150 Mullens Road W-E	58	52	-6	-11%	0.88
3690: MCC D3150 Mullens Road E-W	54	47	-7	-13%	1.00
3584: MCC C125 Pooley Green Road W-E	134	175	41	31%	3.29
3585: MCC C125 Pooley Green Road E-W	86	74	-12	-14%	1.35
1982: ATC A308 Windsor Road E-W	783	635	-148	-19%	5.54
1981: ATC A308 Windsor Road W-E	778	851	73	9%	2.57
1983: ATC A308 The Causeway W-E	660	538	-122	-18%	4.98
9022: ASS* M25 CW Within J13	5844	5612	-232	-4%	3.07
2346: TRADS M25 M25 J13 anti-clockwise access N-S	1415	1497	82	6%	2.15
9029: ASS* M25 AC Within J13	6485	6383	-102	-2%	1.27
3503: MCC A320 Staines Road S-N	391	461	70	18%	3.37
3504: MCC A320 Staines Road N-S	766	767	1	0%	0.05
1998: ATC A320 Chertsey Lane N-S	736	782	46	6%	1.68
3635: MCC D3302 Riverway E-W	14	0	-14	-100%	5.29
3541: MCC B376 Laleham Road W-E	708	625	-83	-12%	3.22
3542: MCC B376 Laleham Road E-W	476	584	108	23%	4.67
2097: ATC B3376 Thorpe Road N-S	340	300	-40	-12%	2.23
2098: ATC B3376 Thorpe Road S-N	264	300	36	14%	2.15
1782: ATC B376 Laleham Road N-S	741	776	35	5%	1.25
1781: ATC B376 Laleham Road S-N	539	611	72	13%	3.00
4134: ATC C248 Kingston Road W-E	742	521	-221	-30%	8.81
3379: MCC A308 Staines Bridge W-E	1067	965	-102	-10%	3.19
3380: MCC A308 Staines Bridge E-W	1028	895	-133	-13%	4.30
3919: MCTC B376 Bridge Street N-S	383	330	-53	-14%	2.80
1780: ATC B376 Wraysbury Road E-W	448	569	121	27%	5.37
3915: MCTC B376 Wraysbury Road N-S	585	661	76	13%	3.03
3917: MCTC B376 Church Street W-E	300	387	87	29%	4.71
2936: MCTC B376 Wraysbury Road S-N	409	541	132	32%	6.05
2938: MCTC D3283 Hale Street W-E	402	419	17	4%	0.86
2937: MCTC D3283 Hale Street E-W	559	637	78	14%	3.20
4735: MCTC D3282 Fairfield Avenue N-S	375	282	-93	-25%	5.15
4736: MCTC D3282 Fairfield Avenue S-N	59	35	-24	-41%	3.54
1777: ATC C248 Kingston Road E-W	373	275	-98	-26%	5.47
1778: ATC C248 Kingston Road W-E	716	510	-206	-29%	8.31
2414: TRADS A30 Between A308 and M25 E-W	1776	1848	72	4%	1.69
4740: MCTC A308 London Road W-E	476	452	-24	-5%	1.11
1775: ATC A308 London Road W-E	712	643	-69	-10%	2.65
1776: ATC A308 London Road E-W	658	594	-64	-10%	2.56
4133: ATC C248 Kingston Road E-W	731	542	-189	-26%	7.49
4132: ATC C248 Kingston Road W-E	733	489	-244	-33%	9.89
1988: ATC A308 Staines Bypass E-W	987	620	-367	-37%	12.94
1987: ATC A308 Staines Bypass W-E	1291	1089	-202	-16%	5.85
4176: ATC A308 Staines Road West W-E	1323	1170	-153	-12%	4.33
3017: MCTC C241 Stanwell Road S-N	445	300	-145	-33%	7.50
3018: MCTC C241 Stanwell Road N-S	346	332	-14	-4%	0.76
3015: MCTC B378 Church Road E-W	330	266	-64	-20%	3.73
3016: MCTC B378 Church Road W-E	305	208	-97	-32%	6.04
3020: MCTC B378 Stanwell Road S-N	742	566	-176	-24%	6.89

Name	Obs Total	Mod Total	Diff	% Diff	GEH
3019: MCTC B378 Stanwell Road N-S	618	540	-78	-13%	3.22
3720: MCC D3252 Parkland Grove N-S	43	73	30	70%	3.94
2083: ATC B3003 Clockhouse Lane S-N	649	789	140	22%	5.23
1606: ATC B3003 Clockhouse Lane S-N	673	789	116	17%	4.30
1605: ATC B3003 Clockhouse Lane N-S	838	660	-178	-21%	6.49
2349: TRADS M25 M25 J13 clockwise access S-N	1626	1575	-51	-3%	1.28
9028: ASS* M25 AC J14 - J13	7740	8005	265	3%	2.99
9023: ASS* M25 CW J13 - J14	7186	7187	1	0%	0.01
4131: ATC B378 Town Lane N-S	329	343	14	4%	0.77
3678: MCC D3226 Cranford Avenue E-W	34	63	29	85%	4.17
9025: ASS* M25 CW J14 - J15	7561	7432	-129	-2%	1.49
9026: ASS* M25 AC J15 - J14	7515	7762	247	3%	2.82
1812: ATC B372 St Georges Avenue W-E	220	227	7	3%	0.49
4591: MCTC D3868 Oatlands Avenue E-W	116	106	-10	-8%	0.93
4590: MCTC D3868 Oatlands Avenue W-E	171	165	-6	-4%	0.47
4759: MCTC D3865 Oatlands Chase W-E	392	363	-29	-7%	1.50
4760: MCTC D3865 Oatlands Chase E-W	545	441	-104	-19%	4.68
4755: MCTC C155 Station Avenue E-W	374	421	47	13%	2.36
4756: MCTC C155 Station Avenue W-E	425	514	89	21%	4.11
4761: MCTC B365 Ashley Road N-S	772	896	124	16%	4.31
4758: MCTC B365 Ashley Road N-S	527	548	21	4%	0.92
4757: MCTC B365 Ashley Road S-N	312	452	140	45%	7.15
3131: MCTC C152 Burwood Road E-W	284	311	27	10%	1.58
3132: MCTC C152 Burwood Road W-E	260	277	17	7%	1.03
3133: MCTC C152 Burwood Road W-E	280	328	48	17%	2.78
3134: MCTC C152 Burwood Road E-W	284	345	61	21%	3.44
3129: MCTC C156 Westcar Lane N-S	71	34	-37	-53%	5.16
3130: MCTC C156 Westcar Lane S-N	91	51	-40	-43%	4.68
3088: MCTC A244 Hersham Bypass W-E	774	795	21	3%	0.74
3089: MCTC A317 Hersham Bypass W-E	417	456	39	9%	1.89
3090: MCTC A317 Hersham Bypass E-W	468	454	-14	-3%	0.67
3086: MCTC A244 Robinsway S-N	430	501	71	16%	3.27
3085: MCTC A244 Robinsway N-S	405	404	-1	0%	0.06
3087: MCTC A244 Hersham Bypass E-W	850	889	39	5%	1.31
3592: MCC C152 Burwood Road S-N	644	654	10	1%	0.37
3593: MCC C152 Burwood Road N-S	604	606	2	0%	0.09
4178: ATC A244 Esher Road E-W	977	969	-8	-1%	0.27
4179: ATC A244 Esher Road W-E	830	819	-11	-1%	0.38
2110: ATC D3875 Walton Lane E-W	123	86	-37	-30%	3.60
2109: ATC D3875 Walton Lane W-E	263	282	19	7%	1.16
3548: MCC B365 Ashley Road N-S	357	456	99	28%	4.93
4789: MCTC A3050 Oatlands Drive S-N	803	728	-75	-9%	2.71
4790: MCTC A3050 Oatlands Drive N-S	538	511	-27	-5%	1.17
3713: MCC D3860 Red House Lane W-E	41	33	-8	-20%	1.37
3714: MCC D3860 Red House Lane E-W	10	3	-7	-66%	2.54
4809: MCTC A244 Ashley Road S-N	770	844	74	10%	2.61
4807: MCTC B365 Ashley Road S-N	308	340	32	10%	1.77
4803: MCTC A244 Hersham Road S-N	457	493	36	8%	1.66
4804: MCTC A244 Hersham Road N-S	657	636	-21	-3%	0.83
4802: MCTC A244 High Street N-S	1155	1137	-18	-2%	0.53
4808: MCTC B365 Ashley Road N-S	396	490	94	24%	4.46
4763: MCTC B375 Russell Road E-W	498	468	-30	-6%	1.35
4764: MCTC B375 Russell Road W-E	601	536	-65	-11%	2.73
4769: MCTC B376 High Street N-S	315	353	38	12%	2.09
4770: MCTC B376 High Street S-N	308	367	59	19%	3.19
2095: ATC B3366 Green Lane W-E	511	487	-24	-5%	1.07
2096: ATC B3366 Green Lane E-W	417	446	29	7%	1.40
3626: MCC D6293 Western Drive S-N	31	43	12	40%	2.01
3627: MCC D6293 Western Drive N-S	58	66	8	13%	0.97
4779: MCTC A244 Gaston Bridge Road S-N	906	788	-118	-13%	4.06
4780: MCTC A244 Gaston Bridge Road N-S	764	660	-104	-14%	3.90
4799: MCTC A244 Walton Bridge E-W	1175	1268	93	8%	2.67
4797: MCTC D3875 Walton Lane N-S	162	146	-16	-10%	1.28

Name	Obs Total	Mod Total	Diff	% Diff	GEH
4796: MCTC D3875 Walton Lane S-N	403	231	-172	-43%	9.65
4801: MCTC A244 Walton Bridge W-E	1510	1240	-270	-18%	7.29
4800: MCTC A244 Walton Bridge E-W	907	1073	166	18%	5.29
4785: MCTC A244 New Zealand Avenue E-W	618	619	1	0%	0.05
4786: MCTC A244 New Zealand Avenue W-E	584	703	119	20%	4.68
4788: MCTC A3050 Bridge Street W-E	654	780	126	19%	4.72
4787: MCTC A3050 Bridge Street E-W	541	481	-60	-11%	2.66
4792: MCTC A244 Walton Bridge Road S-N	952	909	-43	-4%	1.40
4791: MCTC A244 Walton Bridge Road N-S	1431	1198	-233	-16%	6.42
2030: ATC A3050 Terrace Road S-N	696	745	49	7%	1.82
2029: ATC A3050 Terrace Road N-S	576	580	4	1%	0.15
4753: MCTC A3050 Church Street W-E	607	742	135	22%	5.20
4752: MCTC A3050 Church Street E-W	559	535	-24	-4%	1.03
4749: MCTC A3050 Hepworth Way E-W	553	546	-7	-1%	0.31
4754: MCTC D3807 Bridge Street N-S	232	188	-44	-19%	3.02
4751: MCTC D3809 High Street N-S	279	257	-22	-8%	1.32
1954: ATC A244 Hersham Road S-N	416	480	64	15%	3.00
3685: MCC D3837 Walton Park W-E	74	85	11	15%	1.26
3686: MCC D3837 Walton Park E-W	193	218	25	13%	1.75
4782: MCTC A244 Gaston Bridge Road S-N	1015	903	-112	-11%	3.62
4781: MCTC A244 Gaston Bridge Road N-S	961	898	-63	-7%	2.08
1949: ATC A244 Gaston Bridge Road S-N	909	903	-6	-1%	0.20
4778: MCTC B3366 Green Lane E-W	434	414	-20	-5%	0.97
4777: MCTC B3366 Green Lane W-E	346	291	-55	-16%	3.06
4390: ATC D6263 Charlton Lane W-E	455	297	-158	-35%	8.15
4389: ATC D6263 Charlton Lane E-W	363	265	-98	-27%	5.51
2947: MCTC D6254 Loudwater Road N-S	38	42	4	11%	0.64
2948: MCTC D6254 Loudwater Road S-N	31	32	1	2%	0.12
2950: MCTC C234 Fordbridge Road W-E	338	260	-78	-23%	4.50
2949: MCTC C234 Fordbridge Road E-W	326	265	-61	-19%	3.58
2952: MCTC C234 Fordbridge Road E-W	349	307	-42	-12%	2.35
2951: MCTC C234 Fordbridge Road W-E	354	292	-62	-18%	3.46
1957: ATC A244 Upper Halliford Road S-N	805	846	41	5%	1.44
1958: ATC A244 Upper Halliford Road N-S	830	879	49	6%	1.66
1597: ATC C233 Charlton Road N-S	831	546	-285	-34%	10.85
1598: ATC C233 Charlton Road S-N	759	557	-202	-27%	7.87
3662: MCC D6249 Stratton Road N-S	23	57	34	147%	5.34
3995: MCTC A244 Windmill Road N-S	680	665	-15	-2%	0.57
3994: MCTC A244 Windmill Road S-N	816	695	-121	-15%	4.41
4079: MCTC D6306 Brooklands Close N-S	122	136	14	12%	1.25
3991: MCTC A244 Windmill Road S-N	953	824	-129	-14%	4.34
3990: MCTC A244 Windmill Road N-S	633	686	53	8%	2.07
4080: MCTC D6306 Brooklands Close W-E	123	36	-87	-70%	9.70
4081: MCTC D6306 Brooklands Close E-W	195	144	-51	-26%	3.89
4174: ATC A308 Staines Road West W-E	1127	931	-196	-17%	6.12
1814: ATC A308 Staines Road West E-W	1244	1250	6	1%	0.18
1815: ATC A308 Staines Road West W-E	1143	1082	-61	-5%	1.81
3378: MCC A308 Staines Road West E-W	1162	1195	33	3%	0.97
3377: MCC A308 Staines Road West W-E	1479	1403	-76	-5%	2.01
1817: ATC A308 Staines Road West W-E	1296	1288	-8	-1%	0.21
1816: ATC A308 Staines Road West E-W	1073	1195	122	11%	3.63
1948: ATC A244 Cadbury Road N-S	634	803	169	27%	6.30
1947: ATC A244 Cadbury Road S-N	472	490	18	4%	0.81
2048: ATC B377 Feltham Road W-E	296	249	-47	-16%	2.86
2047: ATC B377 Feltham Road E-W	407	370	-37	-9%	1.89
3405: MCC A316 Hanworth Road W-E	3090	3074	-16	-1%	0.29
2193: TRADS A316 Sunbury East of M3 Junction 1 W-E	3012	3074	62	2%	1.12
3554: MCC B369 Walton Road E-W	604	517	-87	-14%	3.69
3553: MCC B369 Walton Road W-E	484	471	-13	-3%	0.59
4467: MCC A309 Hampton Court Way S-N	1089	1095	6	1%	0.18
4468: MCC A309 Hampton Court Way N-S	1662	1516	-146	-9%	3.66
3540: MCC B3379 Bridge Road E-W	283	296	13	5%	0.76
3539: MCC B3379 Bridge Road W-E	254	190	-64	-25%	4.31

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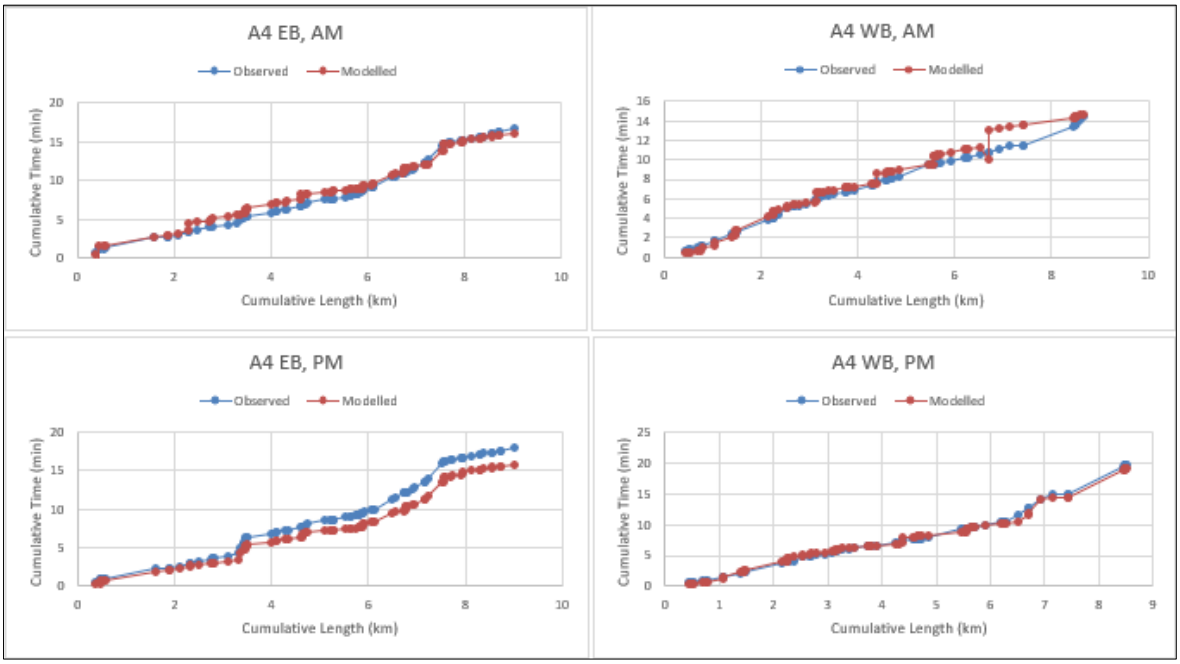
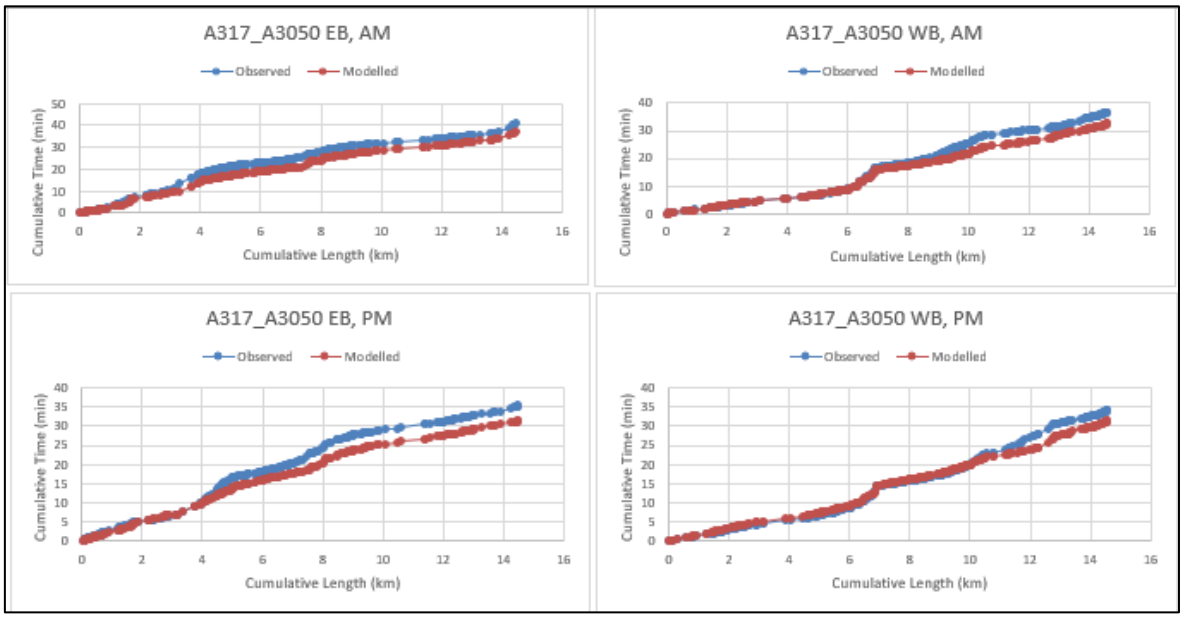
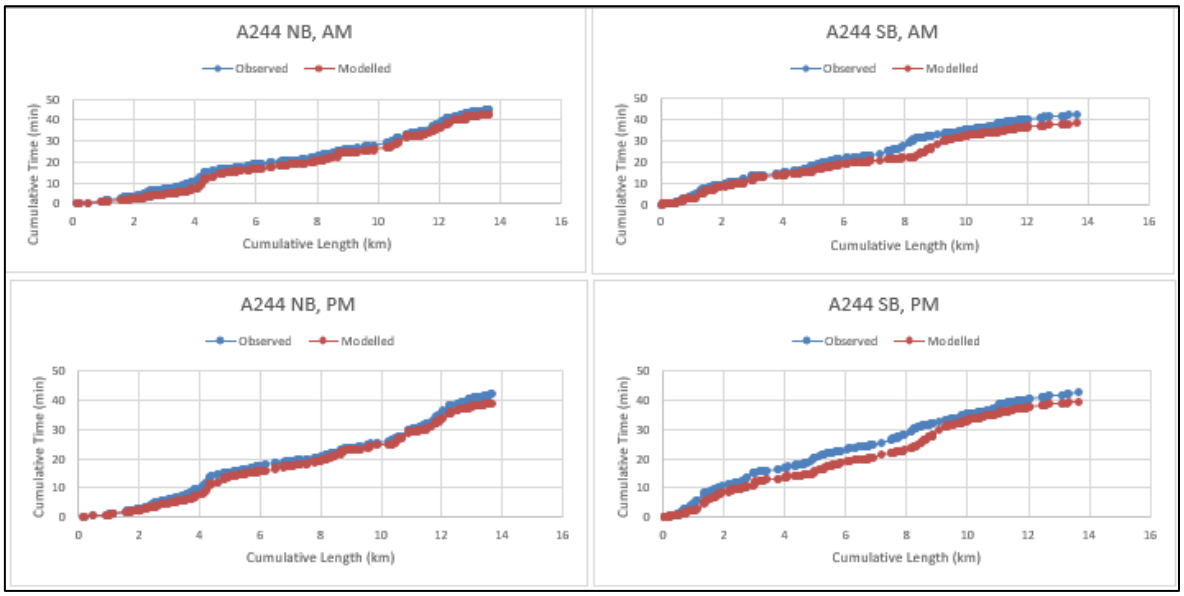
2031: ATC A3050 Hurst Road W-E	417	413	-4	-1%	0.19
2032: ATC A3050 Hurst Road E-W	674	590	-84	-12%	3.33
2415: TRADS A30 Between B378 and A315 W-E	1021	919	-102	-10%	3.27
2194: TRADS A316 Sunbury East of M3 Junction 1 E-W	3131	3031	-100	-3%	1.80
2341: TRADS M25 M25 J14 clockwise - Heathrow T5 S-N	433	479	46	11%	2.17
2337: TRADS M25 Heathrow T5 - M25 J14 anti-clockwise N-S	710	743	33	5%	1.21
2336: TRADS M25 M25 J14 anti-clockwise - Heathrow T5 N-S	572	570	-2	0%	0.10
2335: TRADS M25 M25 J14 anti-clockwise - A3113 N-S	1189	1427	238	20%	6.59
1986: ATC A308 Staines Road East E-W	744	697	-47	-6%	1.74
1985: ATC A308 Staines Road East W-E	580	721	141	24%	5.54
9005: ASS* M3 EB J3 - J2	4531	4478	-53	-1%	0.80
3443: MCC M3 J2 - J3 E-W	5088	5363	275	5%	3.80
2019: ATC A329 Blacknest Road W-E	553	490	-63	-11%	2.75
2020: ATC A329 Blacknest Road E-W	666	627	-39	-6%	1.52
1910: ATC A30 London Road S-N	378	365	-13	-3%	0.67
1909: ATC A30 London Road N-S	619	471	-148	-24%	6.34
3323: MCC D3017 Kitsmead Lane S-N	84	77	-7	-9%	0.83
3324: MCC D3017 Kitsmead Lane N-S	139	130	-9	-7%	0.80
3327: MCC D3918 Wellington Avenue S-N	177	147	-30	-17%	2.36
3328: MCC D3918 Wellington Avenue N-S	494	317	-177	-36%	8.78
3321: MCC C10 Trumps Green Road S-N	155	291	136	88%	9.11
3322: MCC C10 Trumps Green Road N-S	347	362	15	4%	0.82
4319: ATC B389 Christchurch Road E-W	547	703	156	28%	6.23
4323: ATC B389 Christchurch Road E-W	608	615	7	1%	0.29
4325: ATC B389 Christchurch Road E-W	620	615	-5	-1%	0.19
2996: MCTC A328 St Judes Road S-N	454	476	22	5%	1.04
2995: MCTC A328 St Judes Road N-S	541	569	28	5%	1.17
2997: MCTC A30 Egham Hill E-W	939	737	-202	-21%	6.97
3667: MCC D3118 Larchwood Drive S-N	54	78	24	44%	2.92
3668: MCC D3118 Larchwood Drive N-S	104	114	10	10%	1.00
3401: MCC A328 St Judes Road S-N	516	507	-9	-2%	0.41
2642: MCTC B3021 Burfield Road W-E	79	95	16	21%	1.76
2643: MCTC B3021 Burfield Road E-W	128	79	-49	-38%	4.81
2632: MCTC A308 Windsor Road S-N	751	635	-116	-15%	4.39
2637: MCTC A308 Straight Road S-N	954	854	-100	-10%	3.32
2636: MCTC A308 Straight Road N-S	724	727	3	0%	0.10
2638: MCTC A328 Priest Hill N-S	416	362	-54	-13%	2.76
2641: MCTC A328 Priest Hill N-S	397	333	-64	-16%	3.35
2640: MCTC A328 Priest Hill S-N	590	660	70	12%	2.81
4924: Partial B3376 New Wickham Lane W - E	479	543	65	13%	2.86
4925: Partial B3376 New Wickham Lane E - W	451	538	87	19%	3.90
4930: Partial B388 Thorpe Lea Road S - N	633	762	130	21%	4.91
4931: Partial B388 Thorpe Lea Road N - S	700	735	35	5%	1.31
4926: Partial B388 Vicarage Road S - N	372	420	48	13%	2.41
4927: Partial B388 Vicarage Road N - S	443	387	-56	-13%	2.76
4928: Partial B3376 New Wickham Lane W - E	765	699	-66	-9%	2.43
4929: Partial B3376 New Wickham Lane E - W	666	737	71	11%	2.67
4932: Partial B3376 Thorpe Lea Road W - E	544	486	-58	-11%	2.54
4922: ATC D3192 Callow Hill S - N	348	346	-2	-1%	0.13
4923: ATC D3192 Callow Hill N - S	631	798	167	26%	6.25
9006: ASS* M3 EB Within J2	1548	1545	-3	0%	0.08
9008: ASS* M3 WB J1 - J2	2868	3186	318	11%	5.78
9009: ASS* M3 WB Within J2	1589	1564	-25	-2%	0.62
9015: ASS* M25 CW J11 - J12	6638	6902	264	4%	3.21
9016: ASS* M25 CW Within J12	4507	4461	-46	-1%	0.68
9019: ASS* M25 AC Within J12	4343	4735	392	9%	5.82
9024: ASS* M25 CW Within J14	5969	5873	-96	-2%	1.24
9027: ASS* M25 AC Within J14	6252	5765	-487	-8%	6.29
5070: MCC A4 Colnbrook Bypass W - E	768	915	147	19%	5.08
5076: MCC A4 Bath Road W - E	927	917	-10	-1%	0.35
5078: MCC A311 High Street N - S	662	645	-17	-3%	0.68
5079: MCC A311 High Street S - N	491	395	-96	-19%	4.54
5080: MCC A312 Harlington Road W S - N	711	682	-29	-4%	1.09

Name	Obs Total	Mod Total	Diff	% Diff	GEH
5081: MCC A312 Harlington Road W N - S	951	790	-161	-17%	5.46
5086: MCC A312 Hampton Road W W - E	760	904	144	19%	4.98
5087: MCC A312 Hampton Road W E - W	792	694	-98	-12%	3.61
5088: MCC A308 Upper Sunbury Road W - E	700	491	-209	-30%	8.59
5089: MCC A308 Upper Sunbury Road E - W	825	710	-115	-14%	4.15
5092: MCC A30 Great South West Road W - E	1707	1770	63	4%	1.50
5093: MCC A30 Great South West Road E - W	1563	1376	-187	-12%	4.88
5097: MCC A4 Bath Road W - E	731	663	-68	-9%	2.59
5098: MCC A312 Hampton Road E S - N	610	503	-107	-18%	4.55
5099: MCC A312 Hampton Road E N - S	521	469	-52	-10%	2.34
5101: MCC A315 Staines Road W - E	668	671	3	0%	0.13
5102: MCC A308 Hampton Court Road W - E	1373	1203	-170	-12%	4.74
5103: MCC A308 Hampton Court Road E - W	1176	1028	-148	-13%	4.47
5104: MCC C Broad Lane (Hampton) W - E	128	140	12	9%	1.03
5105: MCC C Broad Lane (Hampton) E - W	80	239	159	199%	12.61

8.2 Journey Time Validation Route Comparison Graphs



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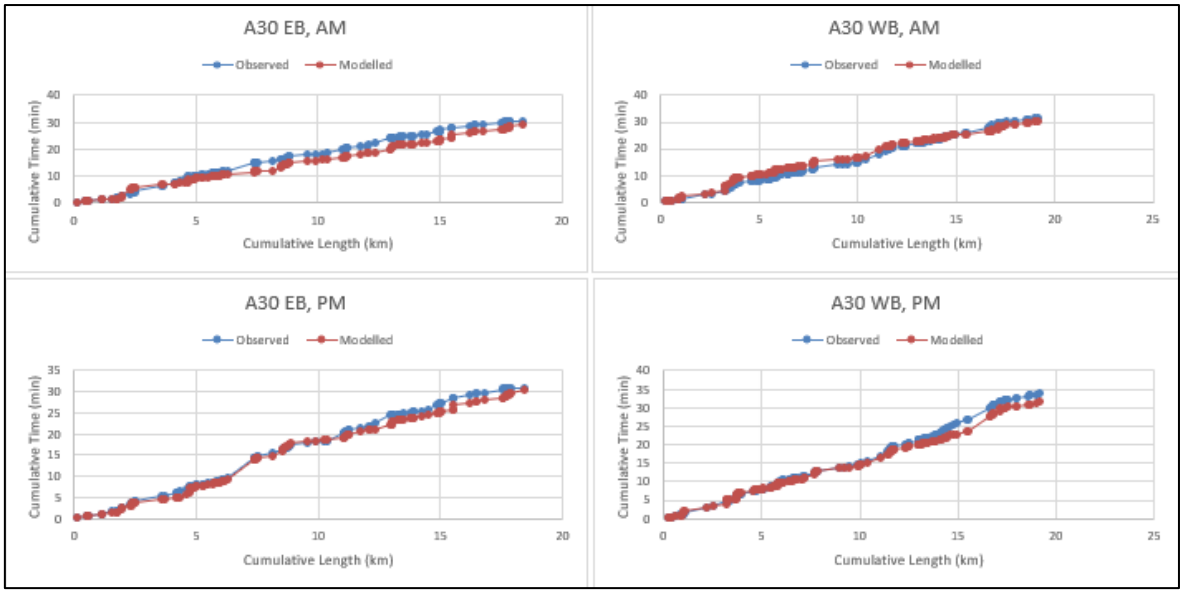
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
A244 SB, AM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
A244 NB, PM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
A244 SB, PM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)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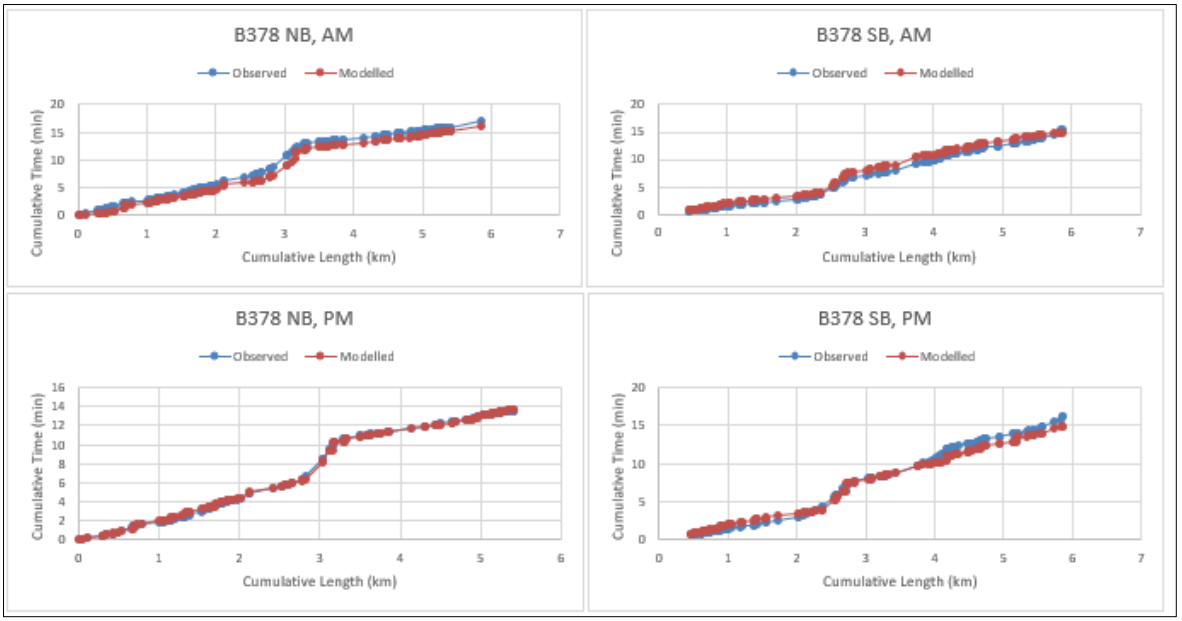
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
A30 WB, AM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
A30 EB, PM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
A30 WB, PM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)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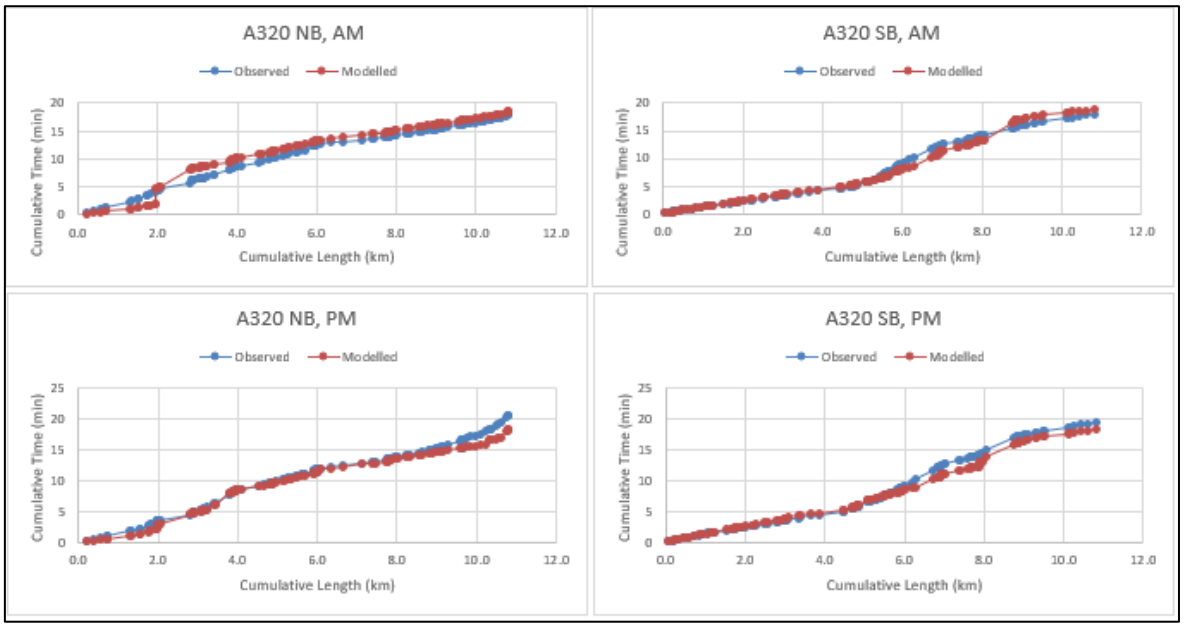
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
B378 SB, AM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
B378 NB, PM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
B378 SB, PM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)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Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
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Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
A320 NB, PM
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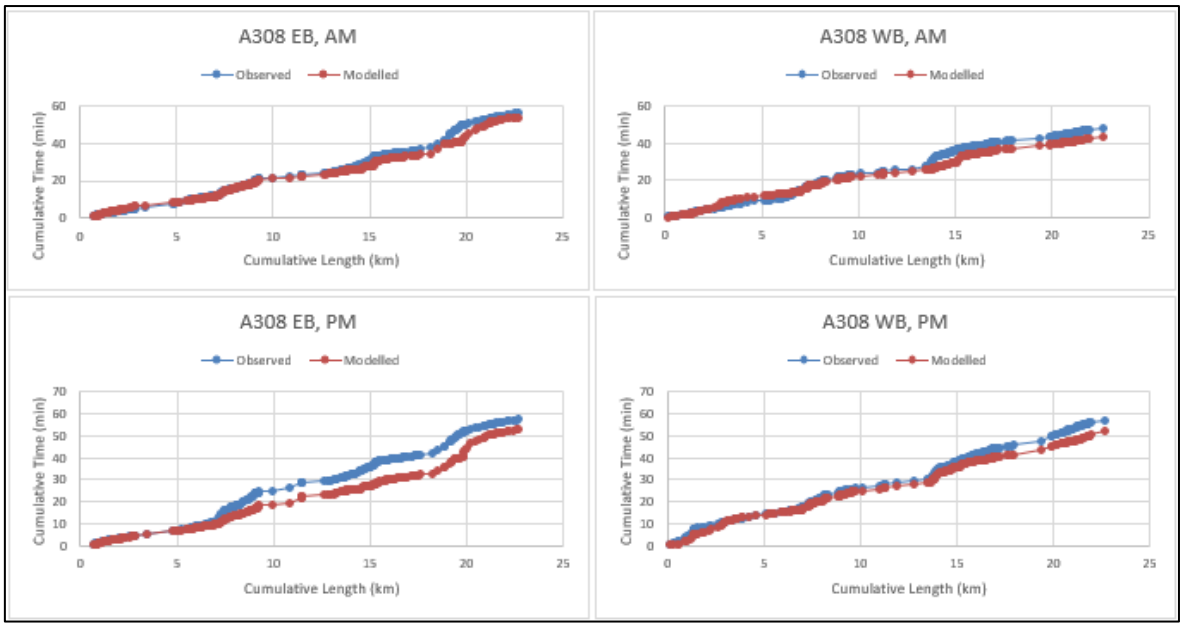
Modelled
Cumulative Time (min)
Cumulative Length (km)
A320 SB, PM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)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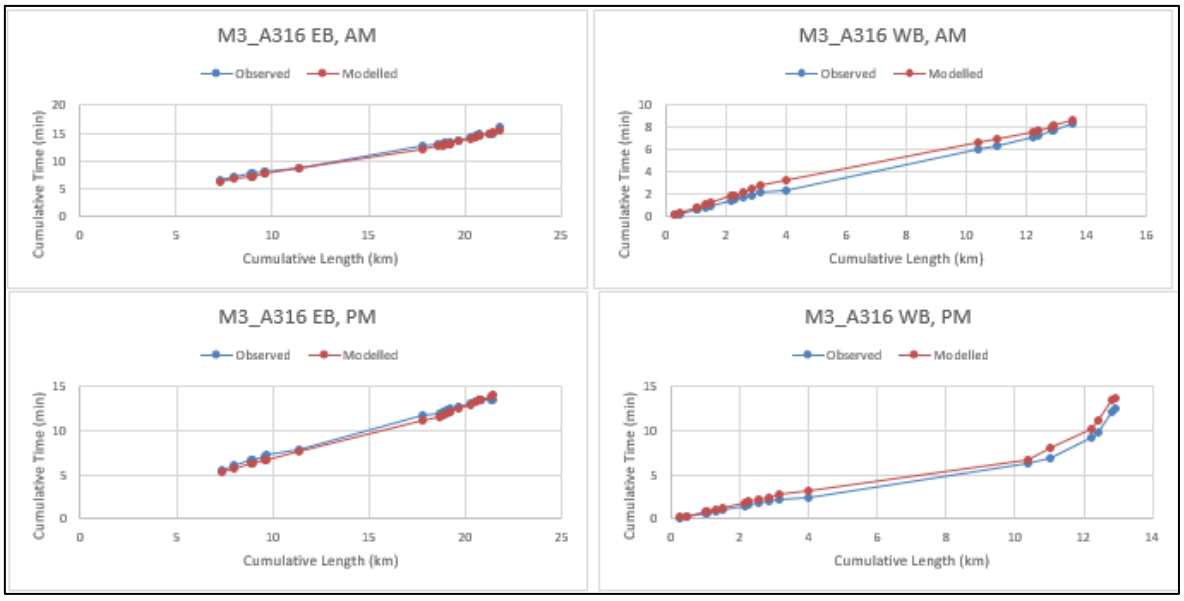
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
A308 WB, AM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
A308 EB, PM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
A308 WB, PM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)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Observed
Modelled
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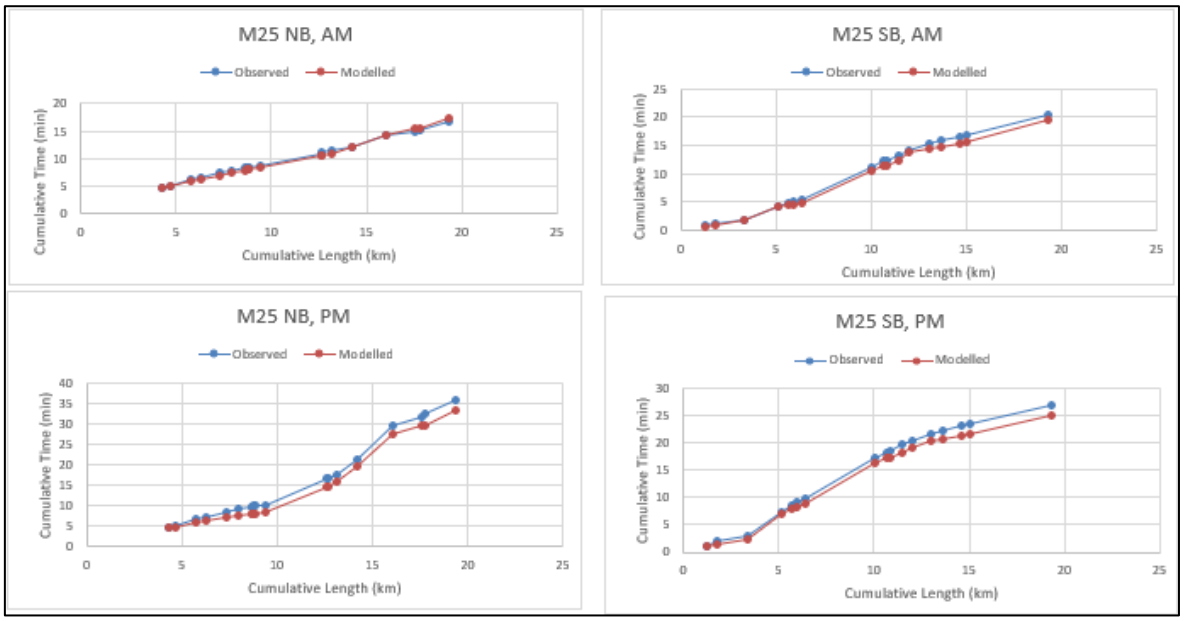
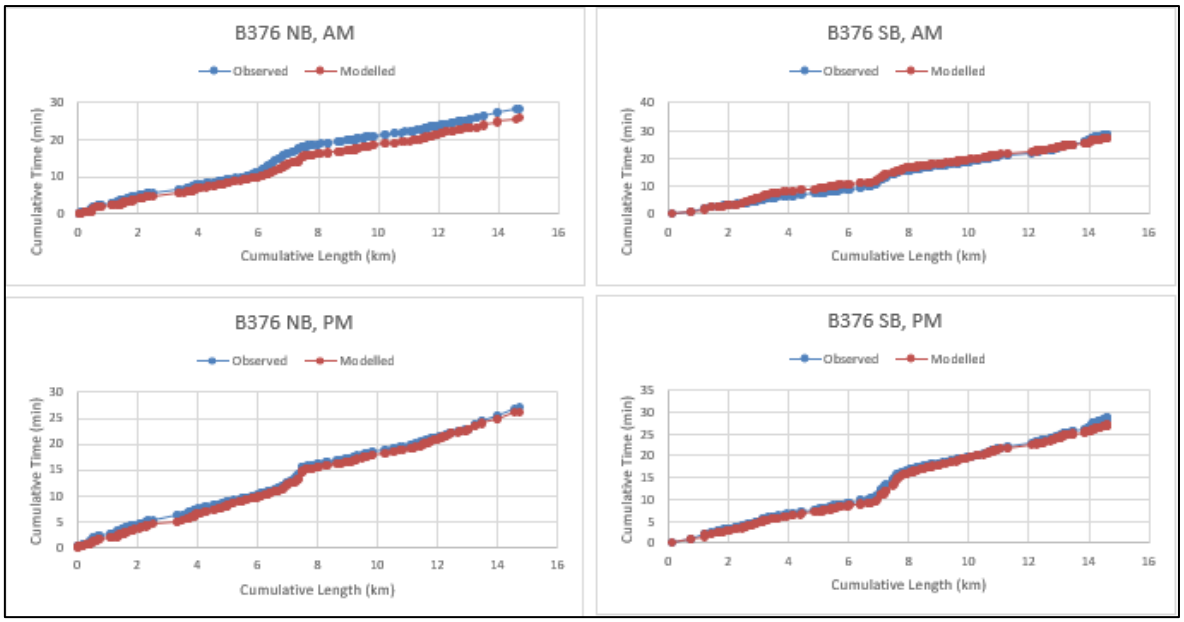
Cumulative Length (km)
M3_A316 WB, AM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
M3_A316 EB, PM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)
M3_A316 WB, PM
Observed
Modelled
Cumulative Time (min)
Cumulative Length (km)





8.3 SINTRAM72 Latent Demand

Table 8-3 Latent Demand by Scenario - All Time Hours and Modes for SINTRAM Inner Study Area

Purpose	2037 Do-Minimum
home_education	603,831
home_empbusiness	104,196
home_other	652,829
home_shop	612,285
home_visit	173,055
home_work	710,798
NHBEB	143,256
NHBO	666,720
Total	**3,666,970**

Table 8-4 Percentage Growth by Trip Purpose Relative to 2014 Base

Purpose	2014 Base	2037 Do-Minimum
home_education	100.0%	106.2%
home_empbusiness	100.0%	108.5%
home_other	100.0%	118.0%
home_shop	100.0%	117.9%
home_visit	100.0%	111.6%
home_work	100.0%	102.1%
NHBEB	100.0%	112.5%
NHBO	100.0%	116.0%
Total	**100.0%**	**111.5%**