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Mersey Gateway Highway Model

Local Model Validation Report : Volume 1

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Contents

1. Introduction

BACKGROUND

1.1 Mott MacDonald has been commissioned by Halton Borough Council (HBC) to build highway traffic and public transport models to assist in the development of a demand forecast model as part of the business case for the Mersey Gateway.

1.2 This report describes the development and validation of the highway model that has been used in the appraisal of the proposed Mersey Gateway development. The model has been developed to be consistent with the guidance set out in WebTAG and in the Design Manual for Roads and Bridges Volume 12, Section 2 "Appendix B – Local Model Validation Report".

1.4 The highway network and traffic zone system were developed from scratch to cover the full area to be modelled, which stretches from the Mersey Tunnels, between Liverpool and Birkenhead, through Halton to Warrington and the M6 Thelwall viaduct. A number of Roadside Interview (RSI) surveys were made available from recent studies in the area and these were supplemented by 19 additional RSIs carried out specifically for this study in June 2006. To supplement those trips observed at the RSI sites, synthetic trip matrices were developed based on information from the Merseyside Household Travel Interview Survey and equivalent data from the National Travel Survey, planning data and inter-zonal costs from the modelled network.

1.5 This report describes development of the network and zone system, development and merging of the vehicle trip matrices, collection and analysis of traffic count data by time period and vehicle type, assignment parameters and the calibration and validation for morning peak, average interpeak, evening peak and average overnight hours.

SCHEME OBJECTIVES

1.6 The Silver Jubilee Bridge (SJB) linking Runcorn and Widnes is one of the main routes for trips across the River Mersey in the North West region, with the Mersey Tunnels (Queensway and Kingsway) and the Thelwall Viaduct on the M6 to the east of Warrington being the other alternative crossing options. As such, the SJB has both local and regional significance.

1.7 The approaches to the SJB are currently congested during peak periods, and this congestion is further increased when incidents on other crossings result in diversion of traffic onto the Silver Jubilee Bridge that would normally use one of the alternative crossing points.

1.8 A second crossing of the River Mersey in the Halton area has been proposed to try and relieve this congestion and improve the links between Halton and the wider North West area, as well as to promote economic and social regeneration. This second crossing, known as the Mersey Gateway, will aim to fulfil the following objectives:

O1. To relieve the congested SJB, thereby removing the constraint on local and regional development and better provide for local transport needs;
O2. To apply minimum toll charges to both Mersey Gateway and SJB consistent with the amount required to satisfy affordability constraints;
O3. To improve accessibility in order to maximise local development and regional economic growth opportunities;
O4. To improve local air quality and enhance the general urban environment;
O5. To improve public transport links across the river; and

O6. To encourage the increased use of cycling and walking.
O7. To restore network resilience for road transport across the River Mersey

DESCRIPTION OF MERSEY GATEWAY

1.9 The Mersey Gateway comprises 4.2 km of new dual 3-lane highway, a major river estuary crossing and numerous crossings of other obstacles (i.e. road, canals and a railway). The scheme and its context are illustrated in Figure 1.1. The most striking feature of the scheme is the River Crossing Bridge which has a total length of 2.4km. The bridge crossing will consist of approximately 600m of approach spans to the north of the Mersey Tidal Estuary and 800m to the south. The tidal estuary crossing itself will consist of 1000m of cable-stayed bridge consisting of 4 spans supported by 3 towers. Typical lengths of the approach spans are 70-100m. The overall height of the towers would be around 120-140m above the river level.

1.10 The route starts on the north side of the River Mersey to the north west of the existing Ditton Roundabout. Initially the route passes along existing highway that will be widened to the south to create a toll plaza into an area of previous public recreation (i.e. a disused golf course). The route then passes through an area of light industry on either side of a railway crossing. Next the route crosses a modern light industrial estate (the Catalyst Trading Estate) and a chemical works before crossing the St Helens canal and out over the Upper Mersey Estuary. Both banks of the river are fringed with extensive widths of salt marsh and have a wide shallow river channel with extensive areas of sand banks at most states of the tidal range.

1.11 On the south bank of the river, the route passes over Wigg Island (a nature reserve created on the site of former chemical works) and over the Manchester Ship Canal. The crossing's landfall is in the Astmoor Industrial Estate, comprising modern industrial units. The route ties into the existing expressway system of Runcorn at the junction between the Central and Daresbury Expressways. The route then uses the Central Expressway to pass through the residential and retail areas of the new town before eventually linking to the motorway system at Junction 12 of the M56.

1.12 Improving accessibility locally within Halton and also within the region is one of the prime objectives of the scheme. The improvement of access will be achieved at all levels such as private vehicle transport, public transport and walking and cycling. Reduced traffic on the Silver Jubilee Bridge will enable improved public transport and pedestrian provision to be delivered.

1.13 The proposals for the main route through Widnes include provision of large open structures and landscaped urban areas to encourage the linking of the communities to the north and south of the Mersey Gateway. It is hoped that this will help establish improved links between the currently disaggregated communities within this area of Widnes.

1.14 Future access arrangements to the Silver Jubilee Bridge will provide opportunities for landscaping and public realm improvements to the north and south of the river. The form of any changes to access arrangements is currently being explored through the public consultation exercise.

1.15 Sustainability is key to the delivery of the Mersey Gateway and is set out within the objectives for the scheme by requiring the Mersey Gateway to improve accessibility and public transport links across the river and encourage the increased use of cycling and walking. The key to delivering these local improvements is reducing traffic on the Silver Jubilee Bridge as a result of providing a new river crossing.

1.16 Community enhancement is a key sustainability deliverable of the Mersey Gateway and this will be delivered through improved links between Runcorn and Widnes and as a result of the regeneration opportunities offered by the scheme.

MODELLING BACKGROUND

1.17 The Programme Entry approval stipulated a number of conditions that are required to be satisfied for Department for Transport (DfT) support for the project to be maintained. These funding conditions define the parameters for project delivery. The imposed condition relevant to this LMVR was a requirement for a new traffic model that complied with DfT guidance, particularly in respect of the application of variable demand modelling.

1.18 The Mersey Gateway traffic model has been developed with the aim of withstanding the extensive scrutiny anticipated during the planning and procurement process. The key change in the modelling approach from the programme entry stage relates to the appraisal of variable demand in the context of congested networks where travel behaviour is also influenced by road user charging. The model complies with policy guidance in what is a relatively new area of DfT appraisal.

1.19 The Mersey Gateway traffic model has been developed with the aim of withstanding the extensive scrutiny anticipated during the planning and procurement process. The key change in the modelling approach from the programme entry stage relates to the appraisal of variable demand in the context of congested networks where travel behaviour is also influenced by road user charging. The model complies with policy guidance in what is a relatively new area of DfT appraisal.

1.20 This Highway Model Local Model Validation Report (LMVR) describes the procedure followed for the development of the Mersey Gateway highway model, and the subsequent model calibration and validation. This is based upon making best use of the various sources of data made available for the study, supplemented by selected data collected specifically for the purpose.

FORMAT OF REPORT

1.21 Following this introductory Chapter this LMVR is structured as follows.

2 The Mersey Gateway Transport Model
3 Traffic Data
4 Demand Matrices
5 Networks
6 Model Validation and Acceptability Criteria
7 Model Convergence
8 Model Calibration
9 Model Validation – Halton
10 Model Validation – Full Model Area
11 Summary and Conclusions.

1.22 **Tables and Figures for this report are to be found in Volume 2.**

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2. The Mersey Gateway Transport Model

REQUIREMENTS FOR THE MODEL

2.1 To deliver the required support for the Mersey Gateway Project the new traffic model needed to achieve the following:

- Produce Base Year model results that generally meet DfT model validation criteria.
- Provide the basis for evaluating the impact of the proposed Mersey Gateway on existing travel behaviour taking into account strategic and local reassignment, changes in trip distribution and induced traffic effects.
- Provide the basis for investigating the influence of toll charging options for the Silver Jubilee Bridge (SJB) and Mersey Gateway (MG).
- Provide the output required for economic evaluation, including the wider economic effects, and environmental appraisal, thus accommodating the full scope of investigation required to complete the outline business case and to produce the evidence required to support the planning application and public inquiry process.
- Enable operational assessments to be undertaken in selected future years to inform the final scheme reference design and level of service specifications to be used to support the planning process and procurement.
- Provide the basis for appraising options for re-balancing the local transport infrastructure based on the adjusted role of SJB in providing a local river crossing, to support the Halton Council's future Local Transport Policy, including options to improve public transport.

2.2 The main focus of the model's development and validation has been the area close to the Mersey Gateway scheme, which has been taken generally to cover the whole of Halton Borough, i.e. Runcorn and Widnes. However, it was recognised that there was a need to compare modelled and observed traffic volumes elsewhere. The expectation was that the modelled traffic volumes and speeds on roads within a wider simulation area needed to be realistic in order to reliably reflect route choice in respect of crossings of the River Mersey between Liverpool and Birkenhead, and in both Halton Borough and Warrington. Traffic volumes within the area bounded by the M62, M6, M56 and M53, defined as the simulation area and shown in Figure 2.1, were considered in-scope in terms of achieving realistic route choice for traffic crossing the River Mersey at any of these locations.

MODEL STUDY AREA

2.3 The geographical scope of the model is illustrated in Figure 2.2. The primary validation area is the area close to the scheme and covers Runcorn and Widnes. The area bounded by the M62, M6, M56 and M53, was considered in-scope in terms of achieving realistic route choice for traffic crossing the River Mersey and has been defined as simulation (area where detailed junction modelling is included).. Figure 2.3 shows the main traffic routes in the model area.

2.4 External zones have been defined to reflect the catchments of the major routes to/from the model area; these comprise the following routes:

- M6 South
- M56 East
- M62 East
- M6 North
- A570 (north of M58 J3)
- M53 South
- A550 (North Wales).

2.5 Each of these external zones represents a series of Districts, Counties and Regions, as appropriate for the matrix building and forecasting.

2.6 The base year for the model is 2006.

PRIMARY VALIDATION AREA

2.7 A focus of the model's development and validation has been the area close to the Mersey Gateway, which has been taken generally to cover the whole of Halton Borough, i.e. Runcorn and Widnes. In order to assess the local effects within Runcorn and Widnes, there is a more detailed network within Halton, as shown in Figure 2.4.

MODELLING APPROACH

2.8 The overall approach to the development and validation of the Mersey Gateway can be summarised as follows:

- collation and assessment of existing data that could be made available for the current study;
- collection of supplementary RSI data;
- collection of extensive traffic count data by time period and vehicle type for model calibration and validation;
- development of a traffic zone system;
- coding of highway network in SATURN;
- gathering real-time traffic signal timings for network simulation coding;
- derivation of observed journey time data;
- analysis of RSI survey data to develop matrices of fully observed trips;
- development of synthetic trip matrices;
- matrix merging to combine fully observed RSI and synthetic matrices;
- matrix and network calibration;
- model calibration;
- model validation; and
- forecasting.

2.9 A brief overview of each of these tasks is presented in the following paragraphs; further detail is provided as appropriate in subsequent Chapters.

Collation and Assessment of Existing Data

2.10 Following investigation, it was determined that RSI data could be made available from the following previous studies:

- 2003 Liverpool Queensway tunnel RSI;
- 2003 Birkenhead RSIs;
- 2005 Warrington RSIs;
- 2003 Chester RSIs; and
- 2003 South Liverpool RSIs (only half day).

The location of these sites is indicated in Figure 2.5.

Collection of Supplementary RSI Data

2.11 In order to complement the available RSI data obtained from previous studies, 19 supplementary RSIs were carried out; these are also illustrated in Figure 2.5. Full details of the RSI surveys are presented in the Traffic Survey Report.

Collection of Traffic Count Data

2.12 A substantial quantity of traffic count data has been assembled from surveys undertaken by Mott MacDonald (MIS) for the DfT, from the Highways Agency and from the various local authorities. Where necessary, the available data was supplemented by new data collected to fill identified gaps in cordons and screenlines. Independent traffic counts were also carried out for additional validation screenlines within Runcorn and Widnes.

2.13 For each RSI site, corresponding ATC data was collected for a 2-week period for each direction of travel. This has been used to determine whether the day of the RSI represented typical traffic conditions and if not to develop adjustment factors.

Development of Traffic Zone System

2.14 All the historic RSI data obtained had postcodes allocated for trip origins and destinations. It was therefore possible to develop the traffic zone system from scratch, to meet the specific needs of the Mersey Gateway project. The approach adopted is described in Chapter 4. Once the traffic zones had been defined, all RSI postcode data was converted to traffic zones for subsequent analyses. A similar conversion was applied to the Merseyside Household Travel Interview Survey.

Coding of Highway Network in SATURN

2.15 In order to meet the requirements of the traffic model, it was decided that use of SATURN highway modelling software was the most appropriate approach. SATURN is the only widely used highway assignment software that deals adequately with the flow metering effects of junction capacity constraints. Detailed representation of traffic signal junctions was required in the simulation area (the area bounded by the M62, M6, M56 and M53). This coding was a substantial task and it was necessary to set up a structured approach to coding for consistency throughout the model area. It was also necessary to carry out comprehensive checks to confirm that the network assignments reflected observed traffic patterns and travel behaviour. This task included calibration of values of time for traffic assignment (and ultimately demand modelling) based on the results obtained from a Stated Preference survey.

Gathering Real-Time Traffic Signal Timings

2.16 An important component of the simulation network coding was to gather observed traffic signal timings for each time period. This information was obtained from the SCOOT systems for Liverpool, Birkenhead and Warrington from the relevant local authorities. In each case, full details of all signal timings throughout a 24-hour period were obtained and then summaries prepared for coding into the simulation network. Similar data was obtained from Halton and other authorities where SCOOT is not implemented. Some difficulties were experienced in obtaining current data for signalised junctions shared between the HA and a local authority; where necessary these were obtained in the course of site visits.

Derivation of Observed Journey Time Data

2.17 Journey time validation is a key element of model development, especially in the situation of the Mersey Gateway where the assignment of trips between alternative routes across the River Mersey is an important issue.

2.18 For this reason, this study has made extensive use of the DfT-supplied vehicle tracking based journey time gathered by ITIS (Integrated Transport Information Services) for the period September 2005 to August 2006. This data has been used to develop a complete network with observed journey times for each model time period. Since the analysis uses 12-months' worth of data, there are generally significant numbers of observations within each period to provide reliable average journey times.

Analysis of RSI Survey Data

2.19 The RSI survey data has been analysed and used to develop trip matrices of fully observed movements, as described in Chapter 4. This process has used the DfT approved software package ERICA which takes account of the level of certainty associated with each data item.

Development of Synthetic Trip Matrices

2.20 The development of synthetic car trip matrices has been based on trip rates and trip length distributions developed from the Merseyside Household Travel Interview Survey (HTS) and the National Travel Survey, along with planning data and travel costs developed from a highway network representation. This process is also fully described in Chapter 4.

2.21 Goods vehicle matrices, for LGVs and OGVs separately, have been developed from the ITIS vehicle tracking Origin-Destination data, set as described in Chapter 4.

Matrix Merging

2.22 The process used to combine, or merge, the fully observed RSI and synthetic matrices is described in Chapter 4. A number of alternative approaches were tested. The method adopted was that set out in WebTAG 3.10.3, giving a 90% weighting to the observed data.

Matrix and Network Calibration

2.23 An automated procedure was set up for the matrix calibration and validation procedure, with a series of linked spreadsheets to analyse the results. At each step, comparisons were produced of 'prior' and 'outturn' matrices, concentrating on OD patterns, trip lengths and trip length distributions. Comparisons were made of assigned and observed flows by vehicle type by cordon/screenline and individual count locations together with journey time comparisons on selected routes and at an overall network and link level. The matrix estimation procedure is set out at the end of Chapter 4.

2.24 In parallel with the matrix estimation, adjustments were carried out on an iterative basis to improve the operation of the highway network, especially at simulated junctions, with the aim of achieving a satisfactory comparison with observed journey times.

Model Calibration and Validation Process

2.25 The model calibration and validation process is described in Chapter 6. The criteria adopted for model convergence are then described in Chapter 7, which also provides evidence that the model achieves the specified criteria.

2.26 The results of the model calibration are then presented in Chapter 8.

Model Validation

2.27 The overall results of the model validation process are presented in Chapters 9 and 10. Chapter 9 presents the validation for Halton and for route choice across the River Mersey. Chapter 10 then presents the validation for the full model area.

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3. Traffic Data

INTRODUCTION

3.1 This chapter is concerned with the data sets used for the creation of the Mersey Gateway transport model. The structure of the chapter is as follows:

- Silver Jubilee Bridge (SJB) traffic flows: scale relative to other Mersey Crossings and temporal characteristics;
- roadside interview surveys (RSIs) from existing sources and newly collected;
- estimation of passenger car unit factors;
- traffic counts (other than those at RSIs);
- journey time data; and
- Stated Preference Surveys.

SILVER JUBILEE BRIDGE TRAFFIC FLOWS

3.2 Table 3.1 presents a comparison of average daily traffic across the River Mersey from the most recent available traffic counts at the time of model building. This shows the relative importance of the SJB and demonstrates that only the M6 Thelwall Viaduct carries more traffic than the SJB.

3.3 Based on observed hourly traffic volumes using the SJB on weekdays during three recent typical months (i.e. October 2005 and March and May 2006), as illustrated in Figure 3.1 the following modelled hours were chosen:

- Morning Peak Hour - 08:00 to 09:00 hours;
- Inter Peak Hour - average 10:00 to 16:00 hours;
- Evening Peak Hour - 16:00 to 17:00 hours;
- Overnight Hour - average 19:00 to 07:00 hours.

ROADSIDE INTERVIEW SURVEYS

3.4 Following investigation, it was determined that RSI data could be made available from the following previous studies:

- 2003 Liverpool Queensway tunnel RSI, towards Birkenhead;
- 2003 Birkenhead RSIs, all sites inbound;
- 2005 Warrington RSIs, all sites inbound;
- 2003 Omega RSIs, all sites both directions but peak periods only;
- 2003 Chester RSIs, all sites outbound; and
- 2003 South Liverpool RSIs, all sites inbound but only half day.

3.5 The location of each of these RSI sites is presented in Figure 3.2. A summary of the interview sample sizes and observed traffic flows at each site, by time period, is presented in Table 3.2. Note that the for the morning and evening peaks interviews are for the periods (0700-1000 and 1600-1900) whereas the counts are for the modelled hour. This use of interview data from the peak shoulders in the hour models was in order to ensure that acceptable interview sample sizes were used in the matrix building. Acceptable in these terms relates to the need to avoid a combination of high numbers of vehicles counted and low interview numbers. A threshold of more than 60 vehicles counted and less than 20 interviews obtained has been used in this case, with cells failing this test highlighted in Table 3.2. It can be seen that the number of instances where this test is failed is very modest. Where there are instances of completely missing data within a time period, this was dealt with as part of a more general process for dealing with unobserved roads within the RSI cordons as described in Chapter 4.

3.6 The available RSI data obtained from previous studies provided a substantial amount of origin/destination information for the model as a whole. However, it was considered essential that an RSI data set targeted specifically at the requirements of appraising the Mersey Gateway scheme was obtained. Therefore, a total of 19 further roadside interview surveys were carried out in June 2006. The locations of these are also shown in Figure 3.2. A summary of the interview sample sizes and observed traffic flows at each site, by time period, is presented in Table 3.3. Again it can be seen that instances of high flows and low sample sizes are not particularly common, and in no cases are they very severe. In general the sample size for OGVs, the hardest vehicle type for which to obtain interviews, are quite good.

3.7 Other Origin-Destination data has been obtained from the following sources:

- 2001 Census Journey to Work (J2W) data;
- Education Data:
  - 2005 Pupil Level Annual School Census (PLASC) pupil home postcode and school postcode;
  - 2005 primary and secondary school ‘hands-up’ surveys; and
  - 2006 Riverside College learners and staff home postcode by site attended.

3.8 A variety of data sources has been used to update this trip data to the model base year of 2006.

3.9 A substantial quantity of traffic count data has been assembled from surveys undertaken by Mott MacDonald (MIS) for the DfT, from the Highways Agency and from the various local authorities. Figure 3.3 illustrates the locations of all traffic counts used throughout the model area. In most cases traffic count data is available by time period and vehicle type as required for model calibration and validation; however at some minor sites the split by vehicle type has had to be estimated from adjacent and/or similar sites. Many traffic counts provide data for 2005 or 2006 but some data is from earlier years.

3.10 Based on the extensive DfT collected datasets for Merseyside, it has been identified that there has been virtually no traffic growth on non-motorway roads (where RSIs were undertaken) between 2002 and 2006 and hence no annual adjustment factors have been applied. On the basis of a detailed analysis of all automatic traffic count information available throughout Merseyside, the following indices were derived:

- 2002 106.99
- 2003 108.07
- 2004 109.17
- 2005 108.65
- 2006 108.05.

3.11 On the basis that 2006 and 2003 have almost identical indices, and that 2004 and 2005 are slightly higher, it was concluded that no adjustments were appropriate to RSI counts or to non-motorway counts generally. In fact most data used was from 2003 or 2006, strengthening the case for having no adjustment.

3.12 For each RSI site, corresponding ATC data was collected for a 2-week period for each direction of travel. This has been used to adjust the manual counts associated with the RSIs (which were also carried out for both directions). The overall factors applied to each RSI site, for both the 'forward' and transposed direction, are presented in Table 3.4. In general the extent to which the values in the table differ from unity is a measure of how atypical flows were on the survey day against the two week average.

3.13 It will be observed that the adjustment factors at certain sites are significantly different from 1.0. This appears to indicate that the traffic volumes on the survey day were substantially different from normal. In no cases however were there any known specific causes for these discrepancies, e.g. road traffic accidents on nearby roads.

TRAFFIC COUNTS (AT NON RSI SITES)

3.14 On motorways within the study area significant traffic growth has been observed. Comprehensive hourly traffic count data for May in each of 2004, 2005 and 2006 has been obtained for the following motorway links:

- M6, Junc 21a-22 Southbound
- M6, Junc 23-24 Northbound
- M62, Junc 7-8 Westbound
- M62, Junc 7-8 Eastbound
- M56, Junc 8-9 Eastbound
- M56, Junc 8-9 Westbound
- M57, Junc 4-5 Southbound
- M57, Junc 4-5 Northbound
- M58, Junc 4-5 Eastbound
- M58, Junc 4-5 Westbound
- M53, Junc 3-4 Southbound
- M53, Junc 3-4 Northbound

3.15 Based on comparisons of these counts, the adjustment factors set out in Table 3.5 have been applied, as required, to traffic counts on motorways. A comparison is also given with corresponding data from the DfT publication "Road Statistics 2006: Traffic, Speeds and Congestion", published in July 2007.

3.16 In order to carry out the validation of the model within Halton, two screenlines have been defined within each of Runcorn and Widnes, one in the north-south direction and another from west to east. These validation screenlines are shown in Figure 3.4.

3.17 Since there was only very limited traffic count data available from Halton, separate 12-hour traffic counts have been carried out to complete each of these screenlines. The observed traffic counts, illustrated in Figure 3.4, are summarised in Table 3.6.

JOURNEY TIME DATA

3.18 ITIS Holdings PLC in co-operation with the Department for Transport, have supplied journey time data from the NavTrak System and the associated Floating Vehicle Detection System (FVD) to local authorities. This data has been extracted using the Congestion and Journey Time Acquisition and Monitoring System (CJAMS), as developed by Mott MacDonald.

3.19 NavTrak is a GPS-based system initially set up to permit the tracking of stolen vehicles. However, it was recognized that through its ability to track individual vehicles it could also deliver benefits to users on a day-to-day basis such as congestion avoidance, and emergency and breakdown assistance.

3.20 The Floating Vehicle Detection System is a process and technology for the collection, analysis and forecasting of journey times using speed and location data directly from vehicles fitted with NavTrak. It therefore provides an alternative to fixed roadside sensors such as number plate readers. The NavTrak system is fitted to many models of car produced by manufacturers such as Ford, Vauxhall, Renault, Volvo and BMW. It is also installed in the coach and goods vehicle fleets operated by National Coaches and Eddie Stobart respectively, and in the AA's fleet of roadside recovery/breakdown assistance vehicles.

3.21 A full set of CJAMS data for the year September 2005 to August 2006, as provided by the DfT, is available for roads in the Merseyside area, including Halton, and has also been obtained for the remainder of the model area, including Warrington. The data has been checked as far as is possible. Data for bank holidays and weekends has been excluded. In addition, 'outlier' observations at the upper end of the speed range have also been excluded (e.g. any observation significantly in excess of the speed limit for a particular road).

3.22 Unfortunately, the CJAMS data cannot provide journey times through the Mersey Tunnels, or indeed tunnels anywhere as the GPS signals cannot be received underground. Journey times through the Mersey Tunnels were therefore obtained by means of a small-scale moving observer journey time survey carried out in November 2006 with some 50 runs completed over all three model time periods through both tunnels in each direction. The average observed times have then been inserted into the CJAMS observed journey times for completeness.

3.23 In 2005, consultants Gifford arranged to carry out moving observer journey time surveys on a series of routes within the model area; these are labelled as Routes 1 to 7 inclusive. Furthermore, Warrington MBC carried out journey time surveys on a series of routes within Warrington during 2005; these are labelled as Routes 14 to 17 inclusive. A number of additional routes have been included, as considered necessary to demonstrate validation throughout the model area, as illustrated in Figure 3.5. Tables 3.7 to 3.9 inclusive then present comparisons with the corresponding CJAMS journey times for the AM peak, Inter peak and PM peak model time periods. Information for the Overnight period is only available from CJAMS, and is presented in Table 3.10. These tables also present the CJAMS 95% confidence limits and the average number of CJAMS records for each route. The 95% confidence interval is based on the full range of values observed on the route. The values presented are indicative of the day-to-day variability in times experienced on a busy urban road network and demonstrate a substantial day-to-day variation on all routes.

3.24 It is useful to compare the moving observer journey times against the results derived from CJAMS. In the AM peak hour the CJAMS observed journey times are 1.4% faster overall than the moving observer journey times, while in the Inter peak the CJAMS observed journey times are 2.9% faster overall and in the PM peak hour the CJAMS observed journey times are significantly faster (13.7%) overall. The results also demonstrate that travel conditions in the Inter peak are generally quicker, as might be anticipated, than in either the AM peak or PM peak hours. For each time period, a proportion (5% for the AM peak, 18% for the Inter peak and 23% for the PM peak) of the moving observer average journey times fall outside the 95% confidence limits calculated from the CJAMS data.

3.25 For the AM peak and Inter peak the differences are balanced between routes that are slower and faster, but for the PM peak most CJAMS speeds are significantly faster. This could be because the moving observer journey time surveys were carried out in 2005 and the evidence from CJAMS suggests that local speeds have generally increased between 2005 and 2006, possibly due to completion of widening of the M6 Thelwall viaduct in February 2005**.** Bearing in mind that the CJAMS data represents observed average journey times for the relevant time period over a 12-month period and generally comprises hundreds or even thousands of individual observations, it is considered that CJAMS will be a more reliable basis for model validation. Therefore, only CJAMS comparisons are provided for comparison purposes as part of the model validation presented in Chapters 9 and 10.

3.26 From the 95% confidence limits it can be seen that there is a wide day-to-day variation in actual journey times as might be expected within a largely urban area. This reflects not only the random variation of individual trips but also the impact of incidents occurring on a purely random basis; these could include minor traffic incidents, short-term roadworks, traffic signal faults or other events that disrupt the typical normal situation that the model represents.

3.27 The model area consists generally of a dense urban and suburban road network. With the exception of the surrounding motorways and one or two key routes, such as the A562 Speke Road, much of the network, except within Runcorn, is at-grade with frequent junctions, extensive frontage development and a mix of on and off-carriageway bus stops. Inevitably, this means that traffic flows and journey times on the network are subject to considerable variation due to incidents that might range on any given day; from vehicles unloading and buses stopping, to breakdowns and accidents. Within Runcorn however, which was largely designed in the 1960's as a new town, there is a comprehensive network of grade-separated distributor routes and hence very few traffic signal-controlled junctions.

3.28 The nature of the network and the impact of issues such as those referred to above are reflected in the journey time and traffic flow observations. The CJAMS journey time data shows considerable variability on those routes selected for analysis. On almost all routes, the variability is greatest in the peak hours, when traffic flow and congestion is at its highest and the impact of incidents on the network is greatest.

3.29 In contrast, because there are a substantial number of individual journey time observations from the CJAMS data, there is a high confidence in the mean travel time. In all cases the 95% confidence limits of the mean are within 1 minute. Hence we are confident that the mean journey times quoted are reliable. The confidence limits for the mean represent the range we can expect for the mean observed journey time. However, the confidence limits for the CJAMS journey time show the range in which we have 95% confidence that the journey time will lie on any given day.

STATED PREFERENCE SURVEYS

3.30 A Stated Preference (SP) survey was undertaken in 2006 in order to derive local values of time, with particular reference to trips crossing the Mersey. Movements selected as being 'in-scope' for the SP surveys involved car based travel using:

- M6 Thelwall;
- Warrington Bridge Foot;
- Silver Jubilee Bridge;
- Queensway Tunnel; and
- Kingsway Tunnel.

3.31 The core results from the SP exercise are presented in Table 3.11, along with the equivalent values from WebTAG (which are not segmented by income band). The income bands (the same as that selected for income segmentation within the transport model) are:

- Low Household Income: <£15,000 pa
- Medium Household Income: between £15,000 and £30,000 pa
- High Household Income >£30,000 pa.

3.32 For the Commuting and Other purposes the SP derived values have been used in the assignment models (and also within the subsequent demand modelling based upon the assignments). It can be seen that whilst the WebTAG value for Commute falls just below the high income end of the range, that for Other is higher than the high income value. It should however be noted that the SP process simultaneously accounted for the relationship between income and value of time, and the fact that local incomes are below the national average. In respect of the latter the distribution within the high and low income bands for an area which is characterised by low wage rates and above average levels of unemployment, can be expected to be skewed towards the lower end of these ranges by comparison with the national position.

3.33 The value of time for employers business derived from the SP work is very low. This is because the survey procedure elicited responses of employees (on the basis that they could be paying any money costs themselves) rather than decisions that would ultimately be made by employers. It is considered that many participants in the SP exercise responded as if they would themselves incur any cost changes. A decision was therefore taken to base employer's business values of time on those from WebTAG.

3.34 The SP Survey investigated issues relating to the valuation of journey time reliability. However, there is no mechanism available by which such issues can be represented within road traffic assignment models.

4. Demand Matrices

4.1 This chapter describes the processes followed in developing the demand matrices for the Mersey Gateway model. The chapter is divided into the following sections:

- the zone system
- matrix segmentation
- data and survey analysis
- matrix building from RSI data
- estimation of synthetic matrices
- matrix merging
- derivation of goods vehicle matrices
- analysis of the 'prior' matrices
- approach to matrix estimation.

THE ZONE SYSTEM

4.2 The traffic zone system has been developed from scratch based on Census Output Areas (COAs). Bearing in mind the need to limit the number of traffic zones so that computer run times for the forecasting can be kept within manageable limits, the following approach was adopted for defining zones:

- generally COAs would form the building blocks for zones. Occasionally COAs had to be split where they crossed main traffic routes or comprised substantially different land use types;
- National Trip End Model (NTEM) boundaries should not be straddled;
- different land uses, e.g. industrial and residential areas should generally be in separate zones;
- RSIs should be located on zone boundaries;
- geographical barriers to movement, such as rivers, railway lines and motorways should be used to define zone boundaries where appropriate;
- within the simulation area all schools and colleges with over 1000 pupils have been allocated to a separate zone;
- consideration should be given to where the zone will be connected to the highway network; and
- each zone should have only one centroid connector.

4.3 The above rules applied rigidly only to the simulation area. Zones increase in size further from the proposed Mersey Gateway and in this case these definitions were less strictly applied.

Zone Centroids

4.4 There are 501 traffic zones within the model area with 28 external zones covering the remainder of the UK, i.e. 529 zones in total. The traffic zones for the model area are shown in Figure 4.1 and an enlarged plot for Halton is presented in Figure 4.2.

4.5 Zone centroids were located manually within a zone, depending on the distribution of houses/schools/ commercial premises (i.e. the origins and destinations of trips). The distance from the 'feeder' network node to the centroid represents the average distance travelled from

any development within the zone to the feeder node. Loading points on the highway network generally reflect actual junctions, school entrances, car parks etc. Loading points from zones are not directly connected to the main junctions coded within the simulation network.

The 28 external zones represent districts, counties and regions, depending upon their distance from the model area, and are listed in Table 4.1. These are connected to the model area network by long zone connectors. It can be seen that a maximum connector length of 50km has been applied. The purpose of this is to damp the responsiveness of long distance trips to fuel price changes during the calibration of the DIADEM demand model, a process that is described in the Forecasting Report.

MATRIX SEGMENTATION

4.6 Guided by a review of the latest DfT requirements, set out primarily in WebTAG, the overall modelling approach has been defined to meet the project objectives. A key requirement is the need to be able to model the impact of tolls on both the existing SJB (currently free) and the planned Mersey Gateway. The overall approach adopted therefore recognises the requirements set out in the recent draft guidance (WebTAG 3.12) on the appraisal of road pricing schemes.

4.7 For the SATURN assignment, and in the DIADEM process used subsequently for demand modelling, the following matrix segmentation was deemed optimal in order to reflect the impact of the introduction of tolls on the SJB and the new Mersey Gateway:

1. Car Commute High Income
2. Car Commute Medium Income
3. Car Commute Low Income
4. Car Employer's Business
5. Car Other High Income
6. Car Other Medium Income
7. Car Other Low Income
8. LGV
9. OGV.

4.8 In the above education trip making is included within the Commute purpose. In the demand modelling (as set out in the Forecasting Report) combining these purposes is considered appropriate because both are doubly constrained (i.e. trip end totals are not affected by journey costs). For appraisal of a toll bridge scheme, a clear income segmentation was regarded as more important than other potential matrix segmentations such as a more disaggregate trip purpose classification.

4.9 Appropriate income groups have been defined based on local data from the Merseyside Household Travel Interview Survey (HTS), as follows:

- Low Household Income: <£15,000 pa
- Medium Household Income: between £15,000 and £30,000 pa
- High Household Income >£30,000 pa.

4.10 Table 4.2 presents the observed distribution of households by income group. This shows that just over half of all households occur in the low income group. In terms of car owning households the split is however more equally spread. Furthermore, in terms of the number of car trips made, the distribution is clearly skewed towards the higher income end of the range, as shown in Table 4.3. The trends from the above are supported by Table 4.4, which presents the corresponding distribution of households by car ownership.

4.11 For the demand matrix synthesis process, it was considered appropriate to adopt a more refined segmentation than that ultimately to be adopted for the assignment modelling. This segmentation is as follows:

- Home based commute (HBW)
- Home based education (HBEd)
- Home based shopping (HBS)
- Home based other (HBO)
- Home based employer's business (HBEB)
- Non home based employer's business (NHBEB)
- Non home based other (NHBO).

4.12 The necessary split by income group for the consumer purposes is derived from the Merseyside HTS according to the person type and car availability cross-tabulations.

4.13 For the matrix synthesis, the typical weekday has been subdivided into the following periods; (which are then further split into the model hours for assignment purposes):

- Morning Peak – 07:00 to 10:00 hours;
- Inter Peak – 10:00 to 16:00 hours;
- Evening Peak – 16:00 to 19:00 hours;
- Overnight – 19:00 to 07:00 hours.

4.14 The factors to convert from 24-hour Production and Attraction (PA) trips to Origin – Destination (OD) trips by time period vary by purpose and direction of travel, i.e. to or from home, and are derived from the Merseyside HTS. These are presented in Table 4.5. Each row of this table sums to 1.0 and each figure gives the proportion of the total 24-hour PA trips that are included within the period OD matrices, either in the From Home or the To Home direction. The To Home trips are derived from the 24-hour PA trips by transposing the origin and destination.

MATRIX BUILDING FROM ROADSIDE INTERVIEW SURVEY DATA

Sectors

4.15 For the matrix building process, a system of 25 sectors has been developed, as illustrated in Figure 4.5 and described in Table 4.6. However there is a restriction in SATURN that limits the number of sectors for display purposes to no more than 20. An 18-sector system for display purposes has therefore also been defined, comprising a combination of the sectors used for the matrix building. This 18-sector display sector system is illustrated in Figure 4.6, and in Table 4.6.

RSI Cordons

4.16 A series of RSI cordons has been defined, as illustrated in Figure 4.3. For each of these RSI cordons, it is possible to build fully observed matrices for trips into and out of the cordon. The following cordons provide fully observed movements:

1 Runcorn
2 Widnes
3 West Warrington
4 Warrington
7 South Liverpool
8 Birkenhead
10 South Widnes
25 Chester.

4.17 ERICA software has been used for the RSI matrix building. A standard procedure has been followed to derive matrices for fully observed trips. Since RSIs are available for all crossings of the River Mersey, other than the M6 Thelwall, ERICA has also been used to build observed matrices for a high proportion of cross-river movements (all those taking place between Liverpool and Warrington). Figure 4.4 illustrates the sector to sector movements built in this manner. Shaded cells were built from the observed RSIs with non shaded cells derived from the synthetic matrix process.

4.18 Since existing RSI data around Liverpool city centre has not been made available for use on this study, there are inevitably substantial trip movements that are not fully observed. This is a gap in the trip data which has been addressed by making more use of the matrix synthesis process than was originally envisaged.

ERICA Inputs and Parameters

4.19 The observed matrices constructed from the RSI data set made use of the following inputs:

- Observed RSI data;
- Transposed RSI data; and
- Synthetic RSI data.

4.20 In total, 134 RSI sites were used to build the RSI matrices, including transposed sites and synthesised sites, as listed in Table 4.7. Of these, 63 are actually observed; this comprises 19 RSIs carried out specifically for the purpose of Mersey Gateway modelling plus 44 available RSIs from adjacent authorities. Of these sites, 43 have been transposed to represent travel in the opposite direction to that interviewed. The remaining 32 sites have had to be synthesised for a variety of reasons; including:

- South Liverpool RSI sites were only observed for the AM peak and Inter peak periods;
- Omega RSI sites were not observed during the Inter peak period; and
- some minor roads were counted but RSIs were not conducted.

4.21 These RSIs have been combined into 8 RSI cordons for the matrix building, as illustrated in Figure 4.3. In addition to these cordons, observed RSIs are available for each crossing of the River Mersey between Liverpool and Warrington, i.e. up to but excluding the M6 at Thelwall. The River Mersey has therefore also been defined as a screenline and all trips across this screenline have also been built from observed trip data.

4.22 Each RSI, except for the Omega sites, was carried out in respect of the interviews for traffic in one direction only, although in every case traffic counts were carried out for both directions. A transposing of RSI sites has been carried out using the 'forward' RSI interview data reversed to form the non-interview direction. For this process trip factors derived from travel diaries from the Merseyside Household Travel Survey were employed. These factors relate the time of return trips to the corresponding outbound trip; a simplified example is provided in Table 4.8 for Home based commute From Home trips for the hours from 07:00 - 08:00 and 08:00 – 09:00 showing the proportion of return trips for other time periods. The table provides the proportion of Home base commute trips from home that are followed by a corresponding home based commute trip to home and the time the return journey takes place. The proportions for each return hour vary according to the outbound journey time, as might be expected. The first row indicates that for commute trips from home in the hour beginning 08:00, 0.3% return in the hour beginning 00:00, whereas 43.3% return in the hour beginning 17:00, which logically represents a typical working day. It may be noted that the peak return time for trips starting within the hour from 07:00 is from 16:00 when 36.1% of trips return whereas for trips starting within the hour from 08:00 the peak return time is from 17:00 when 43.3% of trips return.

4.23 Equivalent tabulations have been prepared for each travel purpose and time period to generate transpose trips for each observed trip record. In a large majority of cases the trip purpose for the return journey is the same as for the outbound journey. In a small proportion of cases however, e.g. when there is a non-home based (NHB) trip intervening, the return trip purpose is different. Since the destination zone of the NHB trip is not in general known, the origin zone for the non-commute trip to home is also therefore unknown; in these circumstances it is not possible to generate a transposed trip for this proportion of the return trips. Overall, the proportion of transposed trips that could not be allocated was less than 10% and this was compensated for by the overall expansion factors to convert the transposed observed trip records to the reverse direction count.

4.24 Gaps in cordons were filled in by creating synthetic RSI sites by either duplicating a data set from an adjacent road and expanding to the count on the particular road, or where this was not considered reasonable, carrying out a select link analysis to generate a wholly synthetic RSI matrix. The select link analysis was derived from an assignment of the synthetic trip matrices (see next section) to the observed fixed speed network derived from CJAMS data.

Observed Matrices

4.25 Observed matrices were assembled using the ERICA software. ERICA parameter files are set up to define sector to sector movements where RSI data is available and where a reasonable screenline is present. That is, ERICA only deals with sector to sector movements that are 'fully observed'. An observed RSI matrix is built using only the sector to sector movements across the screenlines defined by the ERICA parameter files. Where trips may be observed at two locations, i.e. those from within one RSI cordon to within another RSI cordon, then two ERICA matrices are produced, labelled as matrix A and matrix B.

4.26 In order to combine these matrices, and to merge the RSI matrices with the synthetic matrices for non-observed trips, the approach set out in DMRB using variances has been adopted. Variances are generated by ERICA for each trip record in the RSI files. However for the transposed and synthetic RSI sites as produced for this project, the automatic calculation within ERICA is not appropriate.

Transposed ERICA matrices

4.27 As described above, the process for transposing RSI sites uses a more sophisticated approach than simply assuming that all trips in specific half-hour time periods may be reversed for different specific half-hour periods. The approach adopted is based on local data from trip diaries which provides the proportions of reverse trips by time period as a proportion of observed trips. In ERICA this has been implemented by duplicating the observed direction trips and applying appropriate 'use record' values to reflect the calculated proportions; these are then adjusted by expanding the transposed records to the observed count for the reverse direction. The expansion factors derived from the observed direction are retained.

4.28 However, if matrices are built using either the interviewed or reverse direction expansion factors, the reverse direction variance would be too high because of the substantial duplication of records.

4.29 If uncorrected this would lead to much lower variances than would be appropriate. In addition each RSI record includes a transpose of the original RSI ERICA variance and as each RSI record is transposed into many RSI trip records (with a trip value that does not equal 1), the variances are not applicable to the new expanded trip value as they are generated from the original interview direction RSI data. As the transposed variances do not apply to the respective transposed trip record, this will distort the matrix merging process. The transposed RSI variances are constrained to the interviewed direction variance using the following formula:

$$P = \sqrt{\frac{\sum v_I}{\sum v_T}} \text{ such that } P \times v_T = v_T'$$

This process is repeated until $\left|\sum v_I - \sum v_T'\right| < T$ for some tolerance T.

(We have used $T = 0.1$).

However, this can result in variance factors that are less than 1. This occurs as the variance V is calculated by ERICA from the variance factor e as follows:

$$V = e\,(e-1)$$

Hence if the variance factor is less than 1, the variance would become negative, which is illogical. The solution to this problem was to set variance factors that are less than 2 to a minimum value of 2 (and thus to avoid the possibility of negatives).

4.30 Finally, the DfT-approved site specific variance adjustment for transposed sites was then applied. Site specific variance factors are derived based on criteria set out in the ERICA manual (see Table 4.9). ERICA multiplies the trip record variances for each site by that factor. This ensures the most reliable source of trip data is given the most weighting when the RSI matrices are merged.

Synthetic ERICA Matrices

4.31 Synthetic RSI sites have had to be created from selected link analyses carried out using the fully synthetic matrices (see next section), assigned to the observed fixed speed network. This results in large numbers of synthetic observations. Expansion factors are derived to match the observed traffic counts but these factors are generally rather small because of the large number of synthetic observations. Hence the corresponding variances as calculated by ERICA can turn out to be negative; which is clearly logically incorrect although mathematically correct. The variance factors used to calculate variances have therefore been constrained to be at least 2.0 so that the variances produced are logical.

4.32 For the synthetic RSI sites, site specific variance factors have also been adopted from Table 4.9; for all synthetic sites a factor of 10 has been included in the site specific variance factors to reflect the fact that they are synthetic.

ERICA Merged RSI Matrices

4.33 The next step is to merge matrices A and B together to produce a complete RSI observed matrix. This merge uses the appropriate calculated variances, and site specific variance factors. The individual and merged matrices have been checked to confirm that the merged matrix provides reasonable in-between values for inter-sector movements and that no unexpected issues arise because of potentially illogical calculated variances. The ERICA variance weighted merge process is expressed as:

$$f_m = \frac{f_1 I_2 + f_2 I_1}{I_1 + I_2}$$

where:

fm = merged flow estimate

fi = flow estimate from source i

Ii = index of dispersion for source i trip estimate; defined as variance divided by trip estimate

4.34 The end results of this process are matrices of fully observed trips by vehicle type and purpose and time period. However these only include fully observed trip movements. For non-observed movements it was necessary to produce wholly synthetic matrices.

ESTIMATION OF SYNTHETIC MATRICES

4.35 The matrix synthesis procedure is required in order to estimate trips that were not fully observed by the RSIs. In practice however, the synthetic matrices include all trips within the model area. These synthetic matrices were produced by a multi-stage procedure from various data sources. At each stage of this process, checks were carried out to ensure that the results were reasonable and consistent between datasets. The final stage of the matrix building process is then to combine the fully observed RSI matrices with the corresponding synthetic matrices.

4.36 Detailed information on households has been obtained from the 2001 Census Area Statistics, which provides segmentation by household composition and car ownership. This data has been updated to 2006 by reference to the Local Land and Property Gazetteer for new builds and demolitions. Trip generation rates have been derived from the Merseyside HTS.

Overview

4.37 The Merseyside Household Travel Interview Survey (HTS) was the main source of general trip data. The latest HTS was completed in spring 2006 and is therefore appropriate for the construction of 2006 trip matrices. The HTS included a total of 2,106 households and 13,577 individual travel diary trips. This information includes all household travellers aged 5 and over who were travelling on the day previous to the first interview contact.

4.38 The derivation of synthetic matrices and demand segmentation is closely linked to the accuracy of the HTS data. Checks have therefore been carried out to provide confidence that the results are generally consistent with the National Travel Survey (NTS) to ensure that the HTS compared well to national data.

4.39 The HTS data, along with network derived inter-zonal costs, has been used to develop the trip distribution functions within the overall matrix synthesis process, except for non home-based employers business. For this latter trip purpose RSI data has been used as there is insufficient observed data in the HTS. For LGVs and OGVs, the trip distribution pattern is derived from the CJAMS O-D data (see later section 4 in this chapter).

4.40 Figure 4.7 presents the matrix synthesis procedure in the form of a flow chart. The process follows a modified 'four stage model' process with the bulk of the analysis focused on trip production / attraction and then trip distribution. It should be noted that, as specified in WebTAG 3.10.2, intrazonal trips are included within the matrix synthesis process.

4.41 The derivation of Home Based trip productions and attractions is shown in more detail in Figure 4.8. This shows that trip productions are based on the product of household numbers and trip rates. The total trip attractions are controlled to the totals implied by the trip productions and use a variety of data sources to indicate the attraction of zones for different journey purposes. The figure highlights that Census Journey to Work (J2W) data is used for Commute and Employer's Business, and performance tables and university places are used for education. Shopping and Home Based Other is mostly based on total population but adjustments are applied to better reflect shopping trips to key land use attractors within Halton, i.e. Widnes Town Centre, Halton Lea Shopping Centre and Halton General Hospital, together with the important regional trip generators of Liverpool John Lennon Airport and the Port of Liverpool.

4.42 Figure 4.7 then shows the process following on from the calculation of trip productions and attractions, which consists of the derivation of inter-zonal and intra-zonal travel costs for input to the trip distribution process.

Home Based Trip Productions

4.43 The 2001 Census Area Statistics (CAS), Table CAS61 Tenure and Car or Van Availability by Economic Activity, provides information on households for the following household composition segmentation:

1 - One Person - Pensioner

2 - One Person - Other

3 - One Family - All Pensioners

4 - One Family - Couple Family Household - no children

5 - One Family - Couple Family Household - with dependent child(ren)

6 - One Family - Couple Family Household - all children non-dependent

7 - One Family - Lone Parent Family Households - with dependent child(ren)

8 - One Family - Lone Parent Family Households - all children non-dependent

9 - Other households - with dependent child(ren)

10 - Other households - all students

11 - Other households - all pensioners

12 - Other households – other.

4.44 The CAS data is also segmented by household car ownership.

4.45 This data is available geographically by Census Output Area (COA) and hence can be translated to the model zoning system using an output area to zone correspondence. Where applicable this correspondence list includes the splitting of output areas.

4.46 For use in the matrix build, the above CAS household composition segmentation needed to be combined into the following segmentation to match that used in the Merseyside HTS:

1 - One adult only, retired

2 - One adult only, aged 16+, not retired

3 - One adult only, aged 16+, one or more children aged 0-15

4 - Two or more adults, all retired

5 - Two or more adults, aged 16+, not all retired

6 - Two or more adults, aged 16+, one or more children aged 0-15.

4.47 Table 4.10 presents the number of households in each of these categories for the whole study area. The CAS data was combined into the above household composition using the relationship shown in Table 4.11.

4.48 The HTS was used to derive trip rates by car ownership and household composition, and trip purpose. These trip rates were applied to the household data to provide an estimate of trip productions by zone, main mode of Car, PT, Walk and Cycle, and the following trip purposes:

1 - Home Based Commute

2 - Home Based Education

3 - Home Based Shopping

4 - Home Based Other

5 - Home Based Employer's Business.

4.49 Household composition and car ownership were required to provide an appropriate segmentation for the estimation of household trip making. However after the derivation of trip productions, the only segmentation absolutely necessary is by household income group, for use in DIADEM. Factors derived from the HTS were applied on a zonal production basis to convert from household composition and car ownership to household income group and trip direction.

Home Based Trip Attractions

4.50 Corresponding information on trip attractions has been obtained from the following sources.

- For Commute and Employer's Business – from Census J2W destinations, as updated to 2006.
- For Education:
  - 2005 Department for Education and Skills (DfES) School and College Achievement and Attainment Tables (formerly performance tables);
  - 2006 PLASC absenteeism;
  - 2006 Riverside College learners attendance by site and arrival / departure patterns; and
  - 2004 Higher Education Statistics Agency (HESA) (Table 0a - All students by institution).
- For Shopping and Other there was no readily available data source for trip attractions so an approach based on a combination of population and employment attractions at key retail zones has been developed.

4.51 It should be borne in mind that, whilst Education trips have been synthesised for the entire study area, within Halton, specific O-D data from the PLASC and Riverside College datasets has been used to replace the synthetic data later in the matrix building.

Non Home Based Trip Generations

4.52 Trip rates for non home based trips are generally related to the preceding home based trip attractions. 'Trip chaining' within the synthetic matrices was confined to three simplified trip chains shown in Figure 4.9. These include three trip chains referred to as:

A – Simple Trip Chain;

B – Return Home, Non Home Based Trip Chain; and

C – Full Trip, Non Home Based Trip Chain.

4.53 Trip chains B and C both include non home based (NHB) trips. The total number of trips available to make a NHB trip varies throughout the day as people arrive from home and leave to home at different times. The Merseyside HTS travel diary trip chains were interrogated to derive the propensity of From Home trips, split by purpose, to make a Non Home Based trip in later time periods. This propensity was applied to the From Home trips and the production of Non Home Based trips calculated.

4.54 The probability of returning having made a Non Home Based trip was derived from the Merseyside HTS trip chains by checking the proceeding trip purpose following a Non Home Base trip. If the preceding trip purpose was the same as the outbound Non Home Based purpose then this was assumed to represent the return to the original Non Home Based trip origin, assumed to occur in the same time period. This was used to add the additional trip chain represented in the Full Trip Non Home Based Trip Chain.

4.55 Whilst other more complex trip chains will exist it is not possible to determine the origins, destinations and time periods of the individual trips. Therefore, only the three trip chains discussed above have been included and are assumed on the basis of evidence from HTS to represent the majority of trip chains.

4.56 The NHB trip generation factors derived from the Merseyside HTS are shown in Table 4.12. By applying the appropriate trip rates to the zonal attractions for each home based trip purpose, the number of NHBEB and NHBO trips from each zone may be calculated. However this approach provides no information on the destination for these trips. Since there is no particular justification for identifying one end of any non home based trip as more significant than the other, the conventional approach has been adopted whereby the zonal attractions are assumed equal to the zonal productions for both NHBO and NHBEB

Trip Distribution

4.57 The trip distribution was applied at the 24 hour PA level within the TRIPS MVGraM program.

4.58 Separate doubly-constrained distribution functions have been calibrated for the following Home Based purposes:

- Education
- Shopping and
- Other

4.59 Home Based Commute and Home Based Employer's Business are not required as the distribution pattern for these purposes was obtained directly from the journey to work matrix data set.

4.60 Doubly-constrained distribution functions have also been calibrated for the following Non Home Based purposes:

- Employer's Business and
- Other

4.61 The initial distribution model calibration process used distributions from trips in the Merseyside HTS by origin, destination and purpose for Home Based Education, Shopping, Other, and Non Home Based Other. However, the complete RSI data set was used for Non Home Based Employer's Business as there were insufficient records in the HTS. This was assumed acceptable as this purpose has generally longer trips which are more likely to cross RSI cordons. However, this initial calibration failed to produce sensible average trip lengths. Therefore the trip distributions were adjusted to achieve observed average trip lengths, consistent with those from the National Travel Survey.

4.62 The separation, or cost, skim matrix for each origin to destination movement was defined from the generalised cost skim from the CJAMS-based fixed speed version of the SATURN model measured in minutes (see subsequent section in this Chapter). These skims reflect observed travel times for the appropriate time period and were thus more reliable, at this stage, than could be generated from the simulation network model. Intrazonal distances and times were derived from analysis of zone area and the level of development homogeneity. These were then converted to generalised costs using the appropriate Pence Per Minute (PPM) and Pence Per Kilometre (PPK) values calculated from the parameters in the then current version of WebTAG 3.5.6 (13 October 2006) using local data wherever possible. The resulting values, in 2006 prices, are presented in Table 4.13. It should be noted that these are different from the values derived from the Stated Preference surveys as discussed in Chapters 3and 5.

4.63 For Education, the generalised costs were derived from the AM peak network speeds. For all other purposes (both home-based and non-home based) the Inter peak network speeds were used.

4.64 Once the models had been calibrated, MVGraM was run in forecast mode with the estimated production and attractions for each home based purpose and the separation matrices. The output from this process was the complete 24 hour home based purpose travel matrices.

Conversion from 24 Hour PA to Model Hour OD

4.65 The outputs from the distribution process are 24 hour PA matrices. These are then converted to an O-D format by time period. Estimates of Non Home Based movements, derived by trip rate and Home Based destination totals, are then made.

4.66 This is achieved in two steps. Firstly by using trip rates derived from the HTS, using trip mid-time, for From Home and To Home directions for the following time periods:

- morning peak period 07:00 - 09:59;
- inter-peak 10:00 - 15:59;
- evening peak period 16:00 - 18:59; and
- off-peak 19:00 - 23:59 and 00:00 - 06:59 hours.

4.67 The second step is to convert from these periods to the model hours, as follows:

- Morning Peak Hour - 08:00 to 09:00 hours as proportion of AM peak period;
- Inter Peak Hour - average of 10:00 to 16:00 hours;
- Evening Peak Hour - 16:00 to 17:00 hours as proportion of PM peak period;
- Overnight Hour - average of 19:00 to 07:00 hours.

4.68 The period to hour factors were also derived from SJB data since this is the most critical part of the network for the purposes of the Mersey Gateway project. The factors adopted are presented in Table 4.14.

Matrix Constraints

4.69 As it was unlikely that the synthetic matrices produced would match observed counts across the pre-defined cordons and screenlines, a process was therefore developed to constrain the synthetic matrices for key movements.

4.70 The first stage was to replace synthetic education trips within Halton from all Local Education Authority (LEA) establishments and Halton College. Actual car origin and destination movements were derived directly from available data plus assumptions on vehicle arrivals and departures, and mode split at the college. Particular attention was paid to allocation of the observed trips to the specific modelled hours.

4.71 The second stage was to adjust the trip attractions for major attractors. For the matrix synthesis, population was used as a proxy attractor for the HB shopping, HB other and NHB Other trip purposes because of a lack of alternative land-use data. For this reason, trips to/from the main district shopping centres and Halton General Hospital were expected to be under-represented. Therefore, the population based attraction data for the main district shopping centres within Merseyside, Warrington town centre, Halton Lea and within Widnes town centre, and at Halton General Hospital, were iteratively adjusted until a reasonable representation of trips arriving and leaving these areas was modelled.

4.72 To allow the level of traffic to these major attractors to be checked, traffic counts were carried out at Halton Lea, around Widnes town centre and at Halton General Hospital and were used to indicate the number of arriving or departing trips. These counts were located with the aim of identifying terminating traffic and avoiding counting through traffic as far as possible. For the two shopping areas, it was therefore considered reasonable to assume that all trips counted were terminating in these centres. Trips to/from Halton General Hospital should be reliable as there is no opportunity for through traffic.

4.73 No count data was available for the main district shopping centres in Merseyside and Warrington town centre. Therefore, the Gross Floor Area (GFA) of each shopping area was used as a proxy to factor the Halton Lea in and out traffic counts.

4.74 No adjustments have been made for Liverpool John Lennon Airport or the Port of Liverpool. Trips to/from these locations are expected to be adequately observed in the RSI programme, as trip lengths tend to be quite long.

4.75 Finally, the synthetic matrices for each time period were assigned to the corresponding network to check the overall pattern and number of trips assigned. This procedure was repeated at stages through the network development and validation process. Initially it identified that the overall synthetic trip matrices were generally of the expected magnitude, however following further network development and changes to the behavioural routing parameters, it was found that the synthetic matrices, as a whole, tended to produce slightly low assigned traffic volumes. To overcome this overall shortfall, a global factor that varies by time period, was applied to each synthetic car trip matrix during the matrix merging process as set out below.

MATRIX MERGING

4.76 The combined trip matrices are produced by merging the observed RSI trips and the corresponding fully synthesised matrices, using ERICA. Since the RSI matrices are not segmented by income, they were first split by income according to the same zonal production factors derived from the Merseyside HTS. At this stage, the RSI observed movements and corresponding synthesised movements were compared to provide assurance that substantial differences did not exist which could introduce distortions to the overall traffic patterns as a result of the merging process.

4.77 For the merging of the RSI and wholly synthetic matrices a number of alternatives were considered. The approach ultimately adopted was to use a simple weighted averaging. WebTAG 3.10.3 para 1.5.21 suggests a 90:10 could appropriately be applied for observed:synthesised. Following discussion with the DfT it was decided to adopt this latter approach for simplicity. Note however that for the unobserved movements, the merged matrix comprises 100% of the synthetic matrix.

4.78 Tables 4.15 to 4.17 show the sector to sector trip matrices by time period for the three main model time periods. These are aggregated across trip purpose. Movements in the trip matrices that were derived from the observed and from the synthetic matrices are separately identified. It can be seen that in terms of movements relevant to river crossings generally and to Halton river crossings in particular, the observed moments predominate.

4.79 The combined matrices were then further compressed to represent the user class purposes required for the highway assignment process. Finally the person trip matrices were converted to car trips by means of vehicle occupancy rates by purpose and time period, derived from the combined RSIs, as presented in Table 4.18 for the model time periods. Note that these are unexpanded trip records and reflect the fact that some sites operated only during the morning (hence lower absolute numbers for PM as compared with AM). Since RSIs were not carried out for the overnight period, it has been assumed that the inter peak vehicle occupancy rates would also be appropriate for the overnight period.

4.80 The final step of the matrix merging process was an adjustment to compensate for the shortage of observed trip data for travellers using the M6 Thelwall viaduct. Despite extensive investigations, including analysis of RSI data obtained from the MIDMAN study, it was confirmed that O-D data for the majority of trips across the M6 Thelwall is not available. There are however sufficient traffic counts available from the HA, as well as traffic counts on most of the turning movements at the M6/M62 and M6/M56 interchanges. A process was therefore developed to synthesise the 'missing' O-D movements. Note that this issue and the subsequent corrective process only applied to trips in the 'Car Other' trip purpose category. For Commute and Employers Business the synthetic matrix process had estimated these movements based on information from the 2001 Census journey to work data.

4.81 The adjustment process for M6 Thelwall trips was based on assignments of the synthetic matrices. The first step was to produce a series of selected link analyses by vehicle type, for the key through movements. These movements were M6 on Thelwall Viaduct, M62 Junction 10 and M56 Junction 9 (all two-way). The select-link matrices were then factored so that each of the key movements achieved the required assigned traffic volume. These factored matrices were then combined with the synthetic and observed matrices during the matrix merging process. Inevitably some iterative adjustments were then required to obtain a satisfactory match for each key movement, and especially for total traffic flows, by vehicle type, across the M6 Thelwall.

DERIVATION OF GOODS VEHICLE MATRICES

4.82 Estimates of some goods vehicle movements were available from the RSIs. However there is a gap in the goods vehicle dataset because of the non-availability of RSIs for Liverpool. This may be significant as OGV traffic (which contains many long distance trips) to/from Liverpool could use either the SJB or the M6 to travel south and this choice may change when the Mersey Gateway scheme is opened. It is also the case that, as with car travel, RSIs do not observe all trips made within a given area. It was therefore considered important to synthesise goods vehicle traffic to/from Liverpool in particular. This could not be done using the Merseyside HTS as a starting point as this data source is concerned only with person trips, and so an alterative approach had to be devised.

4.83 It was ultimately decided to derive goods vehicle trip patterns from the ITIS vehicle tracking database the largest available 'observed' dataset. This was processed to extract O-D matrices based on the most recent 12-months' of data. Separate matrices were created from this source for Light Goods Vehicles (LGVs - up to 3.5 tonnes Gross Vehicle Weight (GVW)) and Heavy Goods Vehicles (OGVs - in excess of 3.5 tonnes GVW).

4.84 The remainder of this section outlines the process for building the synthetic goods vehicle matrices for the Mersey Gateway project. The synthetic goods vehicle matrices were subsequently merged with the fully observed RSI matrices, as per the process followed for the car matrices.

The following data have been used in the goods vehicle matrix synthesis process:

- ITIS Data;
- 2001 Census Journey to Work trip ends and matrices; and
- Continuing survey of Road Goods Transport - NUTS4 (Nomenclature of Units for Territorial Statistics).

Sources of Data

4.85 As described above, RSI data has been used to build observed trip matrices by vehicle type throughout the model area. In particular, all crossings of the River Mersey between (and including) the Mersey Tunnels and Warrington were surveyed.

4.86 Nevertheless, a number of sector-to-sector movements were not intercepted by RSIs, and so a technique was required to provide estimates of those unobserved movements for inclusion within the prior matrices. This section describes the synthesis of this data to derive Origin-Destination Matrices for both OGVs and LGVs, based on CJAMS data.

4.87 Information was obtained from the DfT from the "Continuing Survey of Road Goods Transport" which provides District level data and acts as a useful check on the relative magnitudes of inter-District movements obtained from the ITIS dataset. Nevertheless this data relates to annual freight tonnages rather than goods vehicle trips and needs to be factored to equivalent daily vehicle trips. Furthermore this data is only available according to NUTS zones. NUTS was created by the European Office for Statistics (Eurostat) as a single hierarchical classification of spatial units used for statistical production across the European Union. Only NUTS4 level data is available for annual freight origin/destination tonnages.

Process to identify Goods Vehicle O-D Trip Patterns

4.88 The OGV Origin-Destination (O-D) information is based upon ITIS-supplied floating vehicle data (FVD) which is derived from around 55,000 vehicles of differing types (OGV, LGV, Car, Bus, and Other) which carry a GPS device. Of these vehicles, 64% are OGVs and LGVs. This data source identifies the vehicle type and contains the geographic location of the vehicle at regular intervals whenever the vehicle's engine is switched on. This categorisation was particularly useful for partitioning the data into subsets, i.e. by vehicle type and time period.

The analysis covered all weekday trips, excluding public holidays, from August 2004 to August 2005.

To derive O-D data three main processes were performed:

- identification of each vehicle's journey (i.e. processing location data so as to estimate what constituted the 'real' start and end points);
- identification an origin and a destination location for each journey (i.e. the first and last point within the journey); and
- derivation of the trip matrices.

The methodologies employed are as described below:

Identification of a Vehicle Journey

4.89 The Congestion and Journey Time Acquisition and Monitoring System (CJAMS), developed in the Mott MacDonald Birmingham office, generally uses a 200 second time interval to separate data into separate journeys. However, for this O-D analysis, a ten minute time period was used to determine a break in a journey or the end of a journey; i.e. a stop of less than 10 minutes was assumed to be included within a journey, whereas a stop of more than 10 minutes was taken to represent a journey ending – a destination point.

4.90 This had the result that service areas, particularly Burtonwood on the M62, apparently generated a substantial number of trips. This was just one of the checks/adjustments that had to be made locally, as described below.

Identification of an Origin and Destination for each Journey

4.91 The second stage was to identify a start and an end zone for each journey. This was achieved by taking the first and last GPS point on each journey and using a GIS point-in-polygon routine to determine which zones the origin and destination points fell within. The Mersey Gateway model zone system was digitised using MapInfo for this analysis.

4.92 Goods vehicle data from ITIS is collected nationwide, and indeed extends into Europe when registered vehicles travel out of the UK. It would be very time-consuming to analyse the full dataset and many points will be quite irrelevant for the Mersey Gateway project. For this purpose therefore, GPS point data was only analysed for a journey that either started on ended within a pre-defined area. This rectangular area was defined by specified OS grid coordinates and covered a larger area than required by the traffic zones so as to allow for data entering and exiting the area of interest from adjacent districts. This approach did however mean that 'through' trips were omitted from the O-D information initially extracted and thus needed to be estimated separately.

Derivation of Total Trip Matrices

4.93 For each journey, origin and a destination zones were inferred. Reading through the database, to which this information had been appended, allowed a matrix of O-D movements to be produced. The initial total represents all O-D movements undertaken by the available sample of vehicles within the specified 12 month period. A separate matrix was produced for each user class, with the following matrix totals:

- Car 886,372

(in this project no further use has been made of the car data as it represents only a tiny sample of cars)

- LGV 2,293,941
- OGV 4,326,793.

4.94 On inspection of these matrices it was identified that there were very large numbers of intrazonal trips. Many of these occur when a goods vehicle is loading/unloading and the driver leaves the engine running. Furthermore there may be short trips, e.g. between loading and unloading points. These were not considered to be true trips for the purposes of the Mersey Gateway model and would not in any case be assigned to the modelled highway network. All intrazonal trips have been removed from the initial matrices. This reduced the overall number of trips in each matrix substantially, as indicated by the following revised matrix totals:

- LGV 1,112,282
- OGV 917,599.

4.95 Some fairly local, but nevertheless external-external, trips were also removed from the matrices because they would be unlikely to travel through the model area. Examples are movements from Lancashire to North Manchester. By doing this, the matrix totals have been reduced to:

- LGV 771,725
- OGV 660,454.

4.96 At the same time, the large number of trips terminating at Burtonwood Services on the M62 was removed as this is not a true trip origin/destination. It was not possible to re-link the appropriate trips to/from this location and hence these trips are effectively lost, however this is accounted for during the subsequent steps as described below.

4.97 The Mersey Gateway model area consists of 529 zones; however, not all of these generate goods vehicle trips according to the CJAMS based trip matrices. It is considered unlikely that any model zone will generate no goods vehicles trips at all, and indeed it was found that such zones were generally external zones for which appropriate O-D data had not been extracted rather than zones for which zero trips would be expected. It was therefore necessary to 'patch' data over these apparent holes. NUTS4 annual freight tonnage data was used for this patching, although it is based on a coarser zone system than the Mersey Gateway model. However, as the NUTS4 data relates to annual freight tonnages this also had to be factored to convert it to equivalent goods vehicle trips.

4.98 In order to derive suitable factors to convert annual freight tonnages to goods vehicle trips, a comparison was made for those zones within the model area where a good sample of goods vehicle trips was available from the RSIs. There is significant variability between individual zones, which may be expected since there is a large range of goods vehicle sizes and many empty or partially loaded trips. Nevertheless an average conversion factor of 0.0031 (i.e. goods vehicles trips per freight tonne moved) was derived and applied to those O-D movements where it was necessary to patch in additional trip data.

4.99 Despite these adjustments, there were also some zones identified where the number of goods vehicle trips appeared to be out of proportion, either high or low. In order to get a better match with observed traffic flows a number of further adjustments were made, as summarised in Table 4.19; which also provides a brief comment on the justification for the adjustment.

4.100 The total trips that remained after this stage was as follows:

- LGV 585,115
- OGV 477,570

Initial Assignment and Matrix Factoring

4.101 These adjusted LGV and OGV matrices were assigned to fixed speed networks for the AM Peak, Inter Peak and PM Peak to obtain corresponding demand flows for each time period. The fixed speed networks were themselves derived from CJAMS data, which provided journey times as well as records of vehicle movements.

4.102 Since the goods vehicle trips matrices relate to a sample of annual vehicle trips, it was then necessary to derive a set of factors to convert these matrices into hourly trips for each modelled hour. These factors are a composite of the sample rate and the conversion from total annual traffic to the required model hours, which reflect typical average weekday traffic. For this purpose, the traffic count dataset obtained for this project has been used. Over 400 classified traffic counts are available for each time period within the model area. The overall factors derived are based on the ratio of the total traffic counts to the total modelled flows on the corresponding links. The matrices were then factored accordingly and re-assigned to the fixed speed networks.

4.103 The composite factors used to convert the LGV and OGV matrices, comprising a sample of annual trips, to equivalent average weekday matrices for the model hours are as follows:

- AM peak hour: LGV - 0.068 OGV - 0.028
- Inter peak hour: LGV - 0.054 OGV - 0.028
- PM peak hour: LGV - 0.071 OGV - 0.027.

Matrix Adjustments

4.104 In order to compare the difference between observed traffic counts and model demand flows, the GEH Statistic was calculated for each link. For those links with large GEH values (>10), further analysis was carried out to investigate the reasons for these significant differences. The 2001 Census journey to work trip data was used for this purpose as this provides the best available estimate of trip attractions to workplace zones. For instance, a zone with a number of warehouses would normally generate a lot more goods vehicle trips than a residential area. If such a zone generates significant numbers of work trip attractions it may be expected that it should also generate significant flows of goods vehicles. In contrast, a predominantly residential area would not be expected to generate significant flows of goods vehicles.

4.105 In addition, select link analyses were carried out on the links with assigned flows substantially different from observed traffic counts or from expected volumes. As a result a number of adjustments were applied to specific zones.

Initial Matrix Estimation for Goods Vehicles

4.106 Using these factored matrices, new assignments were then carried out to produce updated assigned model flows. These flows were then compared with the observed traffic counts and the GEH statistic calculated. The results are presented in the first two data columns in Table 4.20. These indicate that the DMRB criteria, that 85% of the traffic volumes should have a GEH less than 5.0 as compared to the traffic counts, was not achieved, though the results for a matrix at this stage of development were considered to be quite good. The overall comparison is quite reasonable, with the proportion of sites achieving the GEH<5 criteria ranging between 49.8% and 69.3% across vehicle type and time period combinations.

4.107 In order to better meet the DMRB requirement, the SATURN matrix estimation procedure was adopted to produce the estimated trip matrices which were subsequently assigned to the fixed speed network. After one loop of matrix estimation, the resulting matrices provide a good match against traffic counts, as shown in the third and fourth data columns of Table 4.20. For each time period, for both LGVs and OGVs, the proportion of sites with GEH<5 exceeds the 85% criteria. This result was therefore considered to be acceptable.

4.108 In order to investigate the extent to which estimated matrices differ from the prior matrices, further comparisons were carried out at a sector level. Table 4.21 to 4.23 summarise these comparisons. It can be seen that some very significant trip end changes have been made. Even though the performance of the prior matrix against the DMRB link flow criteria was reasonable, it proved necessary to make a large number of detailed changes in order to exceed the defined threshold. Given the processes required to engineer the CJAMS data into a trip matrix, as described above, the need for such adjustment is unsurprising. It should also be remembered that these matrices are analogous to the synthetic matrices in the person trip matrix building process, i.e. they are expected to be approximate and are largely over written by observed data from RSIs where this available.

Flow Comparisons

4.109 Another check has also been carried out to confirm that the goods vehicle flows post the initial matrix estimation across the River Mersey are reliable. Tables 4.24 to 4.26 present comparisons of observed traffic counts and assigned model flows (in vehicles) by direction for each time period respectively. The results demonstrate a very satisfactory match for all individual links. The only link that generally does not meet the GEH<5 criteria is the A5061 Knutsford Road, but this is likely to be a minor assignment issue between this route and the adjacent routes.

Conclusion

4.110 The LGV and OGV synthetic matrices by model time period derived from the CJAMS O-D data form a reasonable basis for input into the Mersey Gateway modelling. These matrices were subsequently merged with the fully observed RSI matrices, as for the corresponding synthetic car matrices. The matrix merging process followed similar principles to that employed for person trips.

4.111 Sector matrices (post merging) identifying the contribution of the observed (RSI) and synthetic (CJAMS) data to the final matrices are given in Tables 4.27 to 4.29 (for LGVs) and 4.30 to 4.32 (for OGVs). As with person travel it can be seen that the majority of movements likely to be influential in respect of changes to river crossing opportunities are derived from the observed data. The large number of intra sector trips in the matrices reflect the way in which the CJAMS data source picks up relatively short distance trips made by vehicle making multiple deliveries.

ANALYSIS OF THE INITIAL MERSEY GATEWAY MODEL MATRICES

4.112 Following the matrix merging process for person trips and the merging and preliminary matrix estimation for goods vehicles, a series of checks has been carried out on the resulting 'prior matrices'. A summary of the key results is presented in a series of tables for each model time period. For the AM peak hour, Table 4.33 presents a comparison of model traffic flows by vehicle type across each RSI cordon while Table 4.34 presents a similar comparison for the River Mersey screenline showing each crossing separately. Table 4.35 then presents a comparison of observed traffic counts and model flows for all traffic counts presented by the sector within which the traffic count is located. Finally Table 4.36 presents a summary comparison between the observed traffic counts and the assigned model flows by trip purpose and vehicle type, showing how the model flows meet the DMRB calibration criteria, set out in Section 6. Tables 4.37 – 4.40 present corresponding results for the Inter peak hour and Tables 4.41 – 4.44 present the PM peak hour results.

4.113 It should be noted that all model flows in these tables, and subsequently in this report, refer to 'actual' flows, as defined by SATURN rather than 'demand' flows. This means that these are traffic flows that can actually be accommodated through the network and especially through the simulation junctions. Where there are delays, then this is possibly due to 'demand' flows exceeding the available capacity and hence the 'actual' flows will be lower. Since the RSIs and traffic counts collect data on observed traffic conditions, these are effectively equivalent

to 'actual' flows, and hence this is a fair and reasonable basis for comparison. It is only at locations at or downstream from where traffic queues arise that there is a difference between the 'demand' and 'actual' flows and the location and extent of traffic queues has been checked through comparisons of observed and modelled journey times.

4.114 The key conclusion from these results is that, as anticipated, the prior matrices when assigned did not result in a model that met the DMRB validation criteria, with only around 50% of model flows matching traffic counts with a GEH<5. Nevertheless there is generally a good match at a cordon/screenline level and for individual links across the River Mersey. The largest differences are by individual sector, which was anticipated as these comparisons reflect a larger contribution from the synthetic matrices than from the fully observed RSIs. It was clear from these results that further effort would be required to enhance the model validation. This would include both network refinement (to ensure appropriate routeing) and the application of matrix estimation.

APPROACH TO MATRIX ESTIMATION

4.115 Matrix estimation is a mathematical technique to iteratively adjust a trip matrix to produce a better match against observed traffic counts. It is a well known technique and can be readily implemented within SATURN. However there are a number of complications in the current situation. The base year car matrices are segmented by income group and trip purpose. Thus there are 7 car matrices; but the traffic counts cannot distinguish trips by these categories. Mott MacDonald has therefore employed a procedure under which car traffic counts have been segmented by income/purpose according to the link flow proportions produced by assigning the segmented prior matrices. Matrix estimation for cars can then be carried out on a multiple-user class basis. These link flow proportions are updated with each successive run of the matrix estimation process, where generally of the order of 7 iterations were required.

Figure 4.10 is a flow chart that describes the matrix estimation process.

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5. Networks

HIGHWAY NETWORK CODING

5.1 The highway network has been developed from scratch, initially using MapInfo and the Ordnance Survey (OS) Integrated Transport Network (ITN) street map data. The validation area as initially adopted is basically Halton district, which covers the immediate area around the proposed Mersey Gateway on both sides of the River Mersey. However the model needed be able to reliably represent route choice for cross-river trips that may use either the Mersey Tunnels to the west, pass through Warrington or over Thelwall Viaduct to the east. Hence the model simulation area needs to encompass these alternatives; and has therefore been defined by the M62 to the north, the M6 to the east, the M56 to the south and the M53 to the west, as shown in Figure 5.1. There is little development in north Cheshire of concern for cross-river travel but St Helens to the north is directly connected to the existing SJB. Hence the buffer network has been defined with additional zones to the north of the M62 but relatively little to the south of the M56, other than a zone to cover Chester

5.2 The network within Halton is shown to a larger scale in Figure 5.2.

Link Types

5.3 Link types have been defined based on COBA link classifications and the requirements of SATURN, as presented in Table 5.1. Flow/delay curves have been defined accordingly, and are based on COBA 11 speed/flow curves.

Simulation Network Link Speeds

5.4 For most links within the simulation area a fixed speed between junctions has been defined. Within urban areas it is generally the case that variations in journey times with level of flow are a function of junction rather than link delay. The research evidence of which we are aware[1] found no discernable relationship between speed and flow for most urban link types. Land-use related factors such as parked vehicles, pedestrian presence, bus stops etc were much more influential. The fixed speeds for the Mersey Gateway model have been defined on the basis of the speed limits for the relevant road class, but in some cases these were adjusted to reflect observed local conditions, mainly a slowing of speeds in urban central areas.

5.5 In a limited number of cases the COBA 11-based speed-flow curves have been attributed to links in the simulation network. This is appropriate in cases where links do not have downstream capacity restraint, therefore some measure is necessary to simulate the actual speed on the link (as determined by the volume of traffic) rather than allow vehicles to travel at a fixed speed. In the Mersey Gateway network speed-flow curves have been attributed to the entire motorway network, the Mersey tunnels, the Knowsley expressway and all grade-separated expressways in Halton, including the Silver Jubilee Bridge. The validation of resultant speeds on these links comes from the comparisons with observed journey times.

Centroid Connectors

5.6 Traffic zones are connected to the network using single centroid connectors and single stub links. The centroid connectors in the MG network each have a distance of 1metre, while a cost calculated to represent the average distance travelled from locations within the zone is attached to each stub link. This allows the model to more accurately represent the cost of travel between centroids and the network. It also prevents traffic switching loading points between model iterations, thus improving convergence. In certain cases, as described below, more than one connector has had to be added in order to represent multiple network access points. The speeds on the stub links are 20 km/hr in the simulation area and 30 km/hr in the buffer area, where zones are generally much larger and less densely developed. Where stub

[1] A Note on Traffic Speeds in London. Coombe RD, Buchanan M, TEC June 1976.

links join the network in the simulation area, nodes have been coded to offer suitable capacity for traffic to arrive and depart from zones.

5.7 As part of the network calibration, it was necessary to investigate a couple of zone connectors where substantial delays were found during the assignment. One instance was in Birkenhead town centre where substantial traffic flows were all allocated to a single centroid connector. In reality there are several access links into the town centre, and the relevant car parks, and it is therefore more reasonable to distribute the traffic between several centroid connectors; and this has been done. For Liverpool city centre multiple connectors were employed but in addition a large number of trips to/from the city centre zone have been re-distributed, in part, between adjacent zones according to the availability of parking. In total only eight zones have been provided with multiple zone connectors.

JUNCTION SIMULATION CODING

5.8 Within the validation area, all significant traffic routes have been included and all junctions between these have been simulated. All traffic signal controlled junctions have been coded; these operate on fixed time plans and the signal timings have been provided by Halton BC.

5.9 Within the remainder of the simulation area, the network coding has been defined to

- cover all routes likely to be used by traffic to or from the validation area; and
- provide a clear representation of the alternative routes across the Mersey (i.e. the tunnels, crossings in Warrington and Thelwall Viaduct).

5.10 In the outer area less significant traffic routes have been omitted as far as reasonable while ensuring that all traffic between zones has at least one logical and direct route. All junctions have been coded in detail, but with simplification where they involve roads not included within the network definition. Traffic signals in Liverpool, Wirral and Warrington are operated under SCOOT control or using MOVA. For these junctions, actual signal timings have been obtained for a 24 hour period during September/October and the appropriate average timings, and offsets, coded into the network for each modelled hour.

5.11 For consistency, a note was prepared to set out a standard method for coding each junction. This formed the basis for network coding and covers:

- saturation flows
- priority junctions
- stacking capacity
- signal stages and timing
- signalised roundabouts
- roundabouts
- banned turns
- level crossings
- pedestrian crossings
- do-minimum and Do-something network nodes
- SATURN parameters.

Network Checking

5.12 Throughout the network building process, careful checks have been carried out at each stage. Initially the MapInfo network has been reviewed to confirm the overall coverage within each area. Then, once the network had been converted into SATURN, this was checked within SATURN and checks of routing and assignment with a unit matrix were undertaken to identify and fix the more obvious problems. At this stage, link types were defined for every link and observed travel speeds obtained from the CJAMS database. These observed speeds reflect actual observations between September 2004 and August 2005 and observed speeds were extracted for each model time period. This provided the basis for further checking of the network and routing. Only once this had been done was the simulation coding added into the network.

Toll Plazas

5.13 The Mersey Tunnels toll plazas have been coded as signal junctions in the network simulation coding. The restraint on capacity imposed by queues for payment at toll booths is simulated by limiting the amount of green time at these nodes, thereby reducing capacity and creating the queuing and delay that exist in reality. The capacities of toll booths are derived from a series of 3-minute observations made during site visits to the Kingsway toll plaza on 1 May and 2 May 2007, as presented in Table 5.2. There are effectively three types of toll booths:

- automatic, which are un-manned and may be used by drivers to pay cash, with no change given, or drivers that have an electronic tag;
- staffed toll booths, where the operator will give change to the driver;
- staffed toll booths for OGVs/buses, which is the nearside lane for use by all OGVs and buses, some of which will have tags.

5.14 These toll booth capacities, together with the number of toll booths available, demonstrate that the toll plaza capacity is sufficient to permit traffic flows through the tunnels at their maximum physical capacity. Hence toll booth capacity is apparently not a constraint on traffic through the Mersey Tunnels, assuming all toll booths are in operation at peak periods. There is anecdotal evidence that at peak times, traffic is sometimes stopped at the Birkenhead portals due to traffic exiting the tunnels into Liverpool resulting in queues developing at nearby junctions (queuing within the tunnels is not allowed for safety reasons). The available evidence therefore suggests that the Mersey Tunnels' capacity is not simply defined by the link capacity and is more influenced by the capacity of the signal-controlled junctions in Liverpool city centre, particularly at the exit to the Birkenhead tunnel (Queensway), the Wallasey Tunnel (Kingsway) having much greater stacking capacity.

NETWORK ASSIGNMENT PROCESS

5.15 The assignment process adopts a conventional approach with the SATURN parameters set to achieve a high level of convergence to at least meet the DMRB convergence criteria, as set out in Chapter 7. This requires a substantial number of assignment iterations.

5.16 Initial assignments were undertaken using assignment parameters adopted from previous models and based on experience. These were then adjusted in order to give better convergence and greater cost stability for the demand modelling stage. For the network parameters, a change made was that to the "GAPM" parameter which governs gap acceptance for merges. This was lowered from 2.0 to 1.5 seconds in order to better reflect general merging behaviour within the study area. For the Silver Jubilee Bridge, where merging behaviour is such that almost equal priority is given to merging traffic the parameter APRESV was introduced and set to 1.0, in order to give equal weight to merging vehicles, which is consistent with peak period behaviour observed during site visits.

5.17 The nine separate trip matrices are assigned onto the network. In addition a pre-load has been defined for each model time period to reflect significant bus flows. In total 42 bus services are represented on the network, which includes various bus-only links and turns. These bus routes reflect actual bus routes crossing the SJB and typical bus routes throughout the simulation area wherever bus flows exceed 10 buses per hour in either direction. This means that significant bus movements are taken into account in the junction modelling. Bus frequencies are varied by time period as appropriate, based on 2006 bus timetable information obtained from Halton BC, Warrington MBC and MerseyTravel.

INTRAZONAL TIMES AND DISTANCES

5.18 Intrazonal times and distances have been developed based on consideration of the developed area of a zone and, where necessary, any additional distance between the zone and a suitable link in the highway network. These values have been used in the matrix synthesis and will also be required in the variable demand forecasting. Intrazonal travel speeds in the simulation area have been taken as 20 km/hr for urban zones and 30 km/hr for rural zones. Within the buffer area and for external zones, corresponding intrazonal travel speeds have been taken as 48 km/hr.

BEHAVIOURAL ROUTING PARAMETERS

5.19 The Values of Time (VoT) adopted for the car–commuting and car–other purposes were based on those derived from the Stated Preference Surveys discussed in Chapter 3. For employers business WebTAG values have been employed. In both cases these have been adjusted to values of time per vehicle using the observed average vehicle occupancy by purpose assuming that driver/passenger values of time are in the same proportion as given in WebTAG 3.5.6. The vehicle operating costs (VoCs) were based upon WebTAG parameters and an estimated average network speed.

5.20 For goods vehicles, the values of time and vehicle operating costs were based on WebTAG parameters (as in 3.5.6 section 1.2) as national values should be more appropriate for these vehicle types, and since reliable local data is not available. For LGVs and OGVs, these values were then converted to the model base year of 2006. Similarly the VoCs initially adopted were derived from WebTAG parameters for all vehicle types.

5.21 The initial values of time for OGVs which were based on WebTAG values only take account of the driver's wage rate. Research by the University of Leeds (Value of Time for Road Commercial Vehicles, working Paper 563, Fowkes 2001) has shown that goods vehicle operators place a much higher value of time than this for goods vehicle journeys, because of issues such as vehicle utilisation and time sensitive deliveries. On this basis, OGV values of time have been increased by 60% to take account of these issues of just-in-time operations.

5.22 This decision to increase the OGV value of time is supported by the following statement in TAG 3.12.2 (paragraph 11.5.3):

"Currently the Department has a single value of time of £10.18 (2002 market prices and values) for freight business time savings for use in appraisal. This value applies to all vehicle classes and drivers as well as passengers. The values only represent the value of driver's time and it is considered that this might be overlooking other important aspects of freight time savings benefits. For instance there could be a value applicable to the load being carried, no adjustment is currently made for unloaded vehicles compared with loaded, and some consider there to be a value for the just in time delivery. All of these aspects are to be examined in the research to be commissioned in the summer."

5.23 This adjustment applied in Mersey Gateway is considered to fall well within the accepted range. A factor as high as 2.303 could be proposed on the basis of 'Advice on Modelling of Congestion Charging or Tolling Options for Multi Modal Studies' dated 24th January 2002 issued by DfT to Multi Modal Study Teams.

5.24 All VoT and VoCs have been converted to the Pence Per Minute (PPM) and Pence Per Kilometre (PPK) parameters required by SATURN. The behavioural routing parameters adopted for the 2006 base year are as presented in Table 5.3.

REPRESENTATION OF TOLLS

5.25 The only locations within the modelled area where tolls are currently applied are the Mersey Tunnels. Table 5.4 presents the base year tolls. Note that OGVs are banned from the Queensway Tunnel.

5.26 Data on the proportion of traffic using electronic tags to pay the tolls through the Mersey Tunnels is not available. There is an 11.5% discount applicable (from £1.30 to £1.15) for these. In the absence of data we have assumed the following average toll paid by purpose for the Mersey Tunnels in the 2006 base year validation:

- Car Commute High Income £1.20
- Car Commute Medium Income £1.20
- Car Commute Low Income £1.20
- Car Employer's Business £1.30 i.e. no discount
- Car Other High Income £1.25
- Car Other Medium Income £1.25
- Car Other Low Income £1.25
- LGV £1.30 i.e. no discount
- OGV £4.65 weighted average, i.e. no discount

5.27 Since OGVs are modelled as a single category, it was necessary to derive an average toll to use in the model. There is only limited data available on the mix of different types of OGVs within the model area and the COBA manual suggests a significant different mix of OGV1 and OGV2 on different categories of road, with higher proportions of OGV2 (articulated vehicles) on motorways and non built-up trunk roads. In contrast, OGVs are banned from the Queensway Tunnels and there are apparently relatively low numbers using the Kingsway Tunnels. Suitable data is not available within Warrington but limited data is available from automatic classified counts on the motorway network, but these differ significantly from the data currently being gathered for the SJB. The latest SJB data has therefore been selected to provide this split, as summarised in Table 5.5.

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6. Model Validation and Acceptability Criteria

INTRODUCTION

6.1 This chapter provides a description of the criteria used to validate the model and determine its acceptability for use in the appraisal of the Mersey Gateway scheme. The chapter is divided into the following sections:

- definitions for calibration, validation and model acceptability;
- validation criteria;
- independence of validation data; and
- acceptability criteria for the Mersey Gateway model.

CALIBRATION, VALIDATION AND MODEL ACCEPTABILITY

6.2 Calibration is the adjustment of the inputs to the model (both supply and demand components) in order to improve its capability to represent the characteristics of travel in the modelled area. Whilst calibration can and should be targeted at producing a good match between modelled and observed journey times and counts, adjustments should only be made where they demonstrably improve the realism of the model. As an example, adjustments of the trip matrices to achieve a match to observed flows should not result in a pattern of demand that is contrary to that which has been observed in surveys.

6.3 Validation involves comparing traffic flow and journey time outputs from the model with observed data, using a specific set of performance criteria. These criteria are defined in the Design Manual for Roads and Bridges (DMRB).

6.4 In practice calibration and validation are an iterative process. As each change is made to the model its outputs are tested against the validation criteria.

6.5 Model acceptability is not the same as performance against the validation criteria. It is defined by whether or not the model's outputs will enable conclusions to be drawn with sufficient confidence for the required decisions to be made. This judgement is made in part upon performance against the validation criteria, but equally important are the features of the model that are specifically relevant to the scheme under consideration.

VALIDATION CRITERIA

Traffic Flow

6.6 For traffic flow validation comparisons are made of modelled values against observations. Three methods for the comparison set out in DMRB have been made use of within this report. These are:

- GEH;
- variable by scale of flow; and
- regression.

6.7 Paragraph 4.4.42 of DMRB Volume 12.2.1 defines the GEH indicator as:

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

where: M is the modelled flow

C is the observed flow (i.e. the traffic count).

GEH scores are always positive and range upwards from 0, which represents a perfect match. Scores in the range 0 - 5 are considered to be good. For example, with an observed flow of 1000vph:

- modelled flows +/- 10% (i.e. 900vph or 1100vph) would have GEH scores of 3.24, which is below 5.0 and considered a good fit;
- modelled flows +/- 20% (i.e. 800vph or 1200vph) would have GEH scores of 6.67, which is above 5.0 and considered less satisfactory.

6.8 The GEH statistic is more demanding for larger flows than smaller flows. For example, an observed motorway flow of 4000vph with a modelled flow +/-10% would have a GEH score of 6.17. This is a worse fit than the case of the observed flow of 1000vpd represented by a modelled flow +/-10% mentioned above.

6.9 The effects of relatively small day-to-day variations in counts can have a significant effect on the level of GEH statistic achieved. For example, on a link where the observed flow is 900 on a particular day, a modelled flow of 1150 will give a GEH of 7.8. However, if the count were to be 1000, the GEH would be 4.6.

6.10 The DfT's criteria set out in DMRB (12.2.1 Table 4.2) is that, for individual flows, the GEH should be less than 5 in greater than 85% of cases. In addition, for screenline totals, the GEH should be less than 4 in all (or nearly all) screenlines.

6.11 The DfT's criteria set out in DMRB for assignment validation also include differences and percentage differences between observed and modelled flows, which vary by scale of flow (12.2.1 Table 4.2). Specifically:

- for individual flows below 700vph, the modelled flow should be within 100vph of the observed flow;
- for flows between 700vph and 2700 vph, the modelled flow should be within 15% of the observed flow;
- for flows above 2700vph, the modelled flow should be within 400vph of the observed flow;

in at least 85% of cases.

Journey Times

6.12 The same table in DMRB also specifies validation acceptability guidelines for the comparison of modelled journey times with observed times. Modelled times should be within 15% (or 1 minute, if higher) of the observed for greater than 85% of routes.

6.13 DMRB also requires that the 95% confidence intervals for observed values should also be presented.

INDEPENDENCE OF VALIDATION DATA

6.14 Comparisons between modelled and observed data can be carried out at two levels:

- a comparison of the modelled outputs against the observed data that have been used in model building, but for which the complexity of model building, model responses and other constraints mean that an exact or even a close match is not guaranteed; and
- a comparison of modelled outputs against observed data that has not been used in the model building process – known as independent validation.

6.15 Journey time validation is almost always independent, as the journey times produced by the model are based in large measure upon calibrated flow/delay relationships and not upon direct time inputs from observed sources. The issue of the appropriateness of use of data that is not independent arises in respect of flow validation.

6.16 Observed flow data is used in both the creation of trip matrices from sources of data such as roadside interviews, and in the calibration of trip matrices through the matrix estimation process. However, use of this data in model building does not in any way guarantee a match between observed and modelled flows. For this to be achieved a multitude of factors relating to the zone definition, the matrix building process, estimation of unobserved trips, the network definition and coding, the estimation of assignment parameters and the application of matrix estimation need to be correctly implemented. Therefore, the achievement of a good validation using observed data on which the model building has been to a degree dependent is a good indicator of the models acceptability.

6.17 Use of independent data for validation is preferable when practicable. However, it is often the case that due to the requirement to synthesise elements of the trip matrices, flows along significant sections of road (away from the RSI cordons) need to be adjusted by the matrix estimation process. A common practice has therefore become to include all counts in the matrix estimation process, as any uncounted significant roads will otherwise have a poor validation. For Mersey Gateway independent screenlines were originally proposed in Halton, but it proved necessary to eventually include this data in the matrix estimation in order to achieve a satisfactory overall traffic flow validation. Model runs with the use of these screenlines as an independent validation source are described in Chapter 9.

ACCEPTABILITY CRITERIA FOR THE MERSEY GATEWAY MODEL

6.18 The primary objective of the model is to provide a good representation of the flows and journey times associated with crossings of the Mersey, particularly in the Halton area but importantly at crossings to the West and East of Halton, whilst performing satisfactorily in terms of the flows and journey times across the model as a whole. Ability to do this for the base year provides evidence of applicability of the model in forecasting. Acceptability criteria for the model can therefore be defined in terms of its performance in respect of:

- the DMRB link flow validation criteria as described above;
- DMRB journey time validation
- flows across the Mersey;
- route choice across the Mersey; and
- flows local to Mersey Crossing at Halton

6.19 All of the above are addressed within the detailed chapters that follow. These are:

- Chapter 8 Model Calibration – concerned with the process of ensuring a good correspondence between modelled and observed traffic flows
- Chapter 9 Model Validation Halton – concerned with journey time validation within Halton
- Chapter 10 Model Validation for the Full Model Area – concerned with journey time validation across the wider model area and with replication of observed route choice across the river Mersey

6.20 Chapter 11, Summary and Conclusion, provides an overall assessment of the performance of the model against the acceptability criteria.

7. Model Convergence

INTRODUCTION

7.1 In general iterative methods for reaching equilibrium (between the loading of traffic, the re-calculation of link and turn costs and the re-building of OD paths) will not converge absolutely. Rather, it is necessary to demonstrate that the model has achieved convergence to an acceptable level to be able to produce stable, consistent and robust model results.

7.2 Convergence of congested assignment models, such as the Mersey Gateway, can be monitored using a variety of indicators. The Design Manual for Roads and Bridges (DMRB), Volume 12a (Appendix H para 2.1), Traffic Appraisal in Urban Areas, defines three types of indicator for assessing the degree to which the assignment process has converged.

- Global stability indicators, based on comparison between successive iterations of network-wide values of total journey time, total journey distance, total or average travel costs or average speeds.
- Disaggregate stability indicators, based on absolute changes in values of individual link flows, costs or times and origin-destination costs or a combination of these.
- Proximity indicators, reflecting how close the current flow and cost pattern is to the assignment objective.

7.3 The three types of indicator are described below followed by model convergence statistics from the Mersey Gateway Highway Model.

GLOBAL STABILITY

7.4 It is important to achieve stability in network costs between assignment iterations in order to have confidence in the use of the model. However, stability at a global level, such as change in total travel cost reported in this study, is not sufficient for ensuring model convergence. Such measures may hide substantial uncertainty at a lower level, such as an individual link flows or O-D costs. Even though global stability may provide useful information during the iterative process, it should always be accompanied by disaggregate analysis at link or O-D level.

DISAGGREGATE STABILITY

7.5 The DMRB identifies three disaggregate stability indicators as being straightforward to compute, easy to interpret and explain, and robust in their explanation of assignment stability:

- Average absolute difference (AAD) in link flows between successive iterations, given by:

$$AAD = 1/N \sum \left| V_a^n - V_a^{n-1} \right| \text{ for a=1 to N}$$

Where: N = number of links

V_a^n = flow on link a iteration n

- Relative average absolute difference (RAAD) in link flows between successive iterations, given by:

$$RAAD = 1/N \sum \left| V_a^n - V_a^{n-1} \right| / V_a^{n-1} \text{ for a=1 to N}$$

7.6 Appendix H of Volume 12a, Part 1 of the DMRB states that a model should achieve at least one of the following criteria to demonstrate a stable and robust assignment:

- Percentage flow (changing less than 5%) for more than 95% of links.

- RAAD in flows less than 1%
- AAD in flows less than 1 vehicle per hour

7.7 These criteria should be satisfied for two consecutive iterations and that at least one of these criteria should be satisfied and the values of the other two measures should also be reported. It should be noted that there is an apparent inconsistency in DMRB between the definition of the criterion, since Chapter 4 (Table 4.1) suggests:

- Percentage flow (changing less than 5%) for more than 90% of links for four consecutive iterations.

7.8 It was decided that the criterion from Appendix H of DMRB Volume 12a should be used for this study. Note that in use of the Mersey Gateway assignment models in forecasting the threshold was increased to 99%.

PROXIMITY

7.9 Proximity measures can only be calculated when an assignment objective has been formulated, which is the case with equilibrium assignment. The most appropriate proximity indicator is the duality gap, more commonly known as the delta, δ, statistic.

7.10 Delta represents the difference between all trips using the minimum cost route and the routing and loading obtained in the iterative process across the whole network. This difference is expressed in pcu hours as a percentage of the minimum costs and diminishes as the number of iterations increase. Delta is a natural convergence indicator for the equilibrium process, measuring how far the current flow pattern is removed from the desired equilibrium, and should approach zero at that equilibrium. Its link based form is given by:

$$\delta = \frac{\Sigma\, C_a(V_a^n)(V_a^n - F_a^{n+1})}{\Sigma\, F_a^{n+1}\, C_a(V_a^n)}$$

where $C_a(V_a^n)$ = cost of link a based on current flow estimate V_a^n

F_a^{n+1} = all or nothing flow based on $C_a(V_a^n)$

7.11 The DMRB recommends that iterations should continue until the value of delta is less than 1% or has at least stabilised.

MODEL CONVERGENCE STATISTICS

7.12 SATURN carries out the necessary tests for the above DMRB convergence criteria before terminating the iterative assignment. Tables 7.1 to 7.4 present the model statistics for each time period over the last 4 iterations of the model. The stopping criteria for the model is 95% of flows changing by less than 1%, but it can be seen that all criteria are achieved. Iteration number relates to the assignment/simulation loop.

7.13 DMRB specifies that only one of the stability measures needs to be met. It was decided to run the Mersey Gateway Highway Model until all three stability measures were met; otherwise it might imply that there may be remaining instabilities somewhere in the model. The SATURN model always completes the maximum number of iterations specified, i.e. 150. Inspection of the results shows that it is the criteria for the average absolute difference (AAD) in flows between successive iterations that is by far the hardest to achieve.

7.14 These results indicate that the base year Mersey Gateway Highway Model is well converged in all modelled time periods and has more than achieved the DMRB convergence criteria.

8. Model Calibration

OVERVIEW

8.1 The assignment calibration process involves, for each modelled time period, assigning the trip matrix to the network, and then assessing the 'goodness of fit' between modelled and observed traffic volumes and journey times. Elements of the model (e.g. the matrix or the details of the networks) can then be adjusted or corrected until the fit is judged to be satisfactory. During each step in this process, the assignment has to be stable, i.e. converged.

8.2 The calibration of the assignment interacts with the process of establishing the model, as interim calibrations can be used to detect incorrect network and matrix data. For example, the assignment may show that insufficient traffic is assigned to a particular link as compared with the count; in this case, the capacity of the link and/or junction could be too low in the model, perhaps because the approach to the junction has been coded incorrectly. Interim validations therefore provide the opportunity to review and, where necessary correct, the network coding to reflect the actual conditions. In addition, after the initial trip matrices were assigned to the initial network and the assignment/simulation process was run to convergence, the matrix estimation procedure could then be used to improve the initial matrix, as outlined in Chapter 4 of this report.

8.3 The prime criteria used to assess the assignment calibration are the correlation between observed and modelled flows and journey times as per the Department for Transport's (DfT) criteria set out in Volume 12A of the Design Manual for Roads and Bridges. These are summarised in Chapter 6. Note that although the Mersey Gateway model represents a wide area from the Irish Sea to the M6, the assignment calibration concentrated on the main area of interest for the study, i.e. the Halton area and the crossings of the Mersey between Liverpool and the M6 Motorway.

FLOW CALIBRATION

8.4 As described in Chapter 4, it has been necessary to adopt matrix estimation to improve the match between the assigned traffic flows derived from the model and the observed traffic counts. A number of iterations was required to obtain the most satisfactory match and a balance between assigned flows and observed traffic counts. The flow comparisons were carried out at a link level and summaries prepared for ease of assimilation and presentation. Inevitably, as a result of the careful checking required, a series of adjustments was identified as necessary to the simulation network coding and these were incorporated into the networks as the process proceeded. However these analyses also identified that some of the traffic counts gathered could not be matched, either with the assigned flows or more significantly with well-founded counts of flows on nearby links. As a result, inconsistent counts were removed from the traffic count dataset used for matrix estimation and model validation.

8.5 There are many options available for the matrix estimation process. The simplest, and most powerful, approach is to allow matrix estimation to change any cells in the matrix to any amount necessary. However this has the result that significant changes can be made to the matrix which may introduce unacceptable distortion. It is normal practice to restrict the extent to which matrix estimation is allowed to change the prior matrix; one method available within SATURN to do this is to use the 'Frodo' option. With this option, a matrix of zeros and ones is input to the process and then only the trips in cells where the Frodo matrix has a value of one may be changed; cells where the Frodo matrix have a value of zero will remain unchanged.

8.6 Since all trips across the River Mersey have been observed at Liverpool, Halton and Warrington, the approach adopted for the matrix estimation process has been to freeze all fully observed movements that cross the river. Matrix estimation has been allowed to change all other movements.

AM Peak Hour Calibration

8.7 The results obtained for the final calibrated matrices are presented in Tables 8.1 to 8.4 for the AM peak hour. Table 8.1 presents a comparison of traffic flows across each RSI cordon while Table 8.2 presents a more detailed comparison for all road links across the River Mersey. Table 8.3 then presents a comparison for all road links within each of the sectors defined for matrix building. Finally Table 8.4 presents a summary comparison between all of the observed and the assigned flows by vehicle type, showing how the model performs in relation to the DMRB validation criteria.

8.8 In general, the comparison for the RSI cordons (Table 8.1) is quite good, as would be expected, with all but one differences less than 10% and a majority of cordons by direction (17 out of 24) exhibiting a GEH<4 (20 <GEH5). A substantial majority (72%) of all individual links also show a GEH<5. Furthermore the comparison by link across the River Mersey (Table 8.2) is very good with overall volumes crossing the Mersey exhibiting a GEH of <4 in both directions and most links with a GEH<5. Flows crossing the river at Warrington, where the model is showing a shortfall, are the only significant issue, but even here the overall impact is not large.

8.9 Looking at the comparisons by sector (Table 8.3) covering all available traffic counts for each area, the overall pattern is equally satisfactory. In all except two areas, the difference between modelled and observed flows is within 10% and in a majority of cases the GEH is less than 4. A substantial majority (72%) of all individual links also show a GEH<5, which also applies generally across each area individually (see figure 4.5 for sector definition).

8.10 Comparisons for all available counts (Table 8.4) show a broadly satisfactory match, though not quite meeting the DMRB criteria. For both categories of goods vehicles the threshold of 85% is met for both the GEH and the flow graduated DMRB measure. For cars the measures are in the mid to high seventies, with the results for all vehicles being slightly less good.

Interpeak Hour Calibration

8.11 The results obtained for the final calibrated matrices are presented in Tables 8.5 to 8.8 for the Inter-peak peak hour.

8.12 The comparison for the RSI cordons (Table 8.5) is quite good, as would be expected, with all but one differences less than 10% and a majority of cordons by direction (19 out of 24) exhibiting a GEH<4 (22 <GEH5). A substantial majority (82%) of all individual links also show a GEH<5. The comparison by link across the River Mersey (Table 8.6) is very good for the SJB and Thelwall viaduct, but exhibits some problems again for Warrington and this time for the Mersey Tunnels in a southbound direction. Overall the modelled southbound flows across the Mersey are in line with observed, but low in the northbound direction, with a GEH of 6.

8.13 Looking at the comparisons by sector (Table 8.7) covering all available traffic counts, the overall pattern is generally satisfactory. In all except two areas the difference between modelled and observed flows is within 10% (with the problem areas having quite low flows) and in a majority of cases the GEH is less than 4. A substantial majority (80%) of all individual links also show a GEH<5, which also applies generally across each area individually.

8.14 Comparisons for all available counts (Table 8.8) show a satisfactory match, though again not fully meeting the DMRB criteria. For both categories of goods vehicles the threshold of 85% is greatly exceeded for both the GEH and the flow graduated DMRB measure. For cars the measures are at or above 80%, with the results for all vehicles being very similar.

PM Peak Hour Calibration

8.15 The results obtained for the final calibrated matrices are presented in Tables 8.9 to 8.12 for the PM peak hour.

8.16 The comparison for the RSI cordons (Table 8.9) is similar to the other two time periods, with all differences less than 10%. However only 9 out of 24 cordons exhibit a GEH of less than 4 (15 <GEH5), but a substantial majority (72%) of all individual links show a GEH<5. The comparison by link across the River Mersey (Table 8.10) is very good with only Warrington exhibiting any significant discrepancy (again a shortfall). Total modelled traffic flows across the River Mersey screenline are in line with the observed.

8.17 Looking at the comparisons by sector (Table 8.11) covering all available traffic counts, the overall pattern is again similar to that for the other time periods. In all except two areas, the difference between modelled and observed flows is within 10%. In 50% of cases the GEH is less than 4. A substantial majority (76%) of all individual links also show a GEH<5, which also applies generally across each area individually.

8.18 Comparisons for all available counts are given in Table 8.12. For both categories of goods vehicles the threshold of 85% is met for both the GEH and the 'DMRB proximity' measure. For cars the measures are in the mid to high seventies, with the results for all vehicles being very similar.

Flow Calibration Summary

8.19 Table 8.13 presents a summary of the modelled/count comparison of the assignments of the prior matrices and the calibrated matrices for all available traffic counts. The proportion of individual count sites where the modelled flows meet the various criteria is in the 40-50% range for the prior matrices, rising to between 73% and 80% for the matrices after matrix estimation has been applied. The proportion of counts within the DMRB flow criteria is slightly higher than this in each case.

8.20 The scale of improvement between the prior and calibrated matrices resulting from application of matrix estimation exhibits a fairly common pattern. A well constructed observed matrix, combined with the inherently approximate synthetic data, generally results in an improvement in performance of around 35-50% against the two types of validation criteria. The matrix estimation effects are concentrated on the synthetic trips, either because flows across RSI screenlines are already reasonable or, as is the case with the Mersey RSI screenline, are held as fixed within the matrix estimation process.

8.21 A comparison between traffic counts and assigned validated traffic flows for each traffic count site has also been prepared and the results are presented graphically in Figures 8.1 to 8.3 for the three modelled time periods. These plots also present the correlation coefficient obtained. These exceed 0.97 for each time period, which is in excess of the criterion of 0.95 specified in DMRB. Similarly the slope of the corresponding regression line lies well within the specified range of 0.90 to 1.10 for each time period, as summarised in Table 8.14. Overall these results are considered entirely satisfactory.

8.22 Tables 8.15 to 8.17 present summaries of the traffic flow calibration by RSI cordon for each time period separately. For the AM peak hour, 61% of cordons achieve GEH<4. The equivalent figures for the inter-peak and PM peak are 83% and 56% respectively. If the slightly less demanding GEH<5 measure is used then the percentages rise to around 80%.

MATRIX CALIBRATION

8.23 In addition to checking that the validated trip matrices produce a good match when assigned to the base year networks, it is also necessary to check the extent to which matrix estimation changes the size and patterns of trips within each trip matrix.

8.24 Table 8.18 presents a comparison of the main trip movements for the AM peak hour while Tables 8.19 and 8.20 present corresponding comparisons for the average inter peak and PM peak hours. The results indicate that the largest changes made, for each time period, apply to trips within Halton, which were all produced from the wholly synthetic matrices.

8.25 A comparison of the prior and calibrated matrices by trip purpose and user class is provided in tables 8.21 to 8.23. It can be seen that at a model wide level the impact of matrix estimation is very small, particularly for the peak periods where overall change is only just above 2%. For the inter-peak there is an overall growth of 4.4%. In all cases the changes are concentrated in the car mode, the goods vehicle matrices having already been subject to a previous matrix estimation as described in Chapter 4.

8.26 Comparisons have also been carried out at a trip end level for the total vehicle matrices by time period to confirm that the overall pattern of change is within acceptable limits. Table 8.24 presents a comparison of trip end changes by zone for the AM peak hour while Tables 8.25 and 8.26 present corresponding comparisons for the average inter peak average hour and the PM peak hour. The results indicate that in all cases of the order of 80% of zones are experiencing trip end changes (origin or destination) of less than 20%. These results are also presented graphically in Figure 8.4 for trip origins and Figure 8.5 for trip destinations, both for the AM peak hour, while Figures 8.6 to 8.9 present corresponding plots for the Inter peak and PM peak periods.

8.27 The impact of matrix estimation on link traffic flows is demonstrated in Figures 8.10 to 8.15, using the GEH measure. In these diagrams a blue line shows that the difference between the pre and post matrix estimation flows produces a GEH value between 5 and 8, and a green line shows values above 8. The figures cover all three time periods and show results for the network as a whole and for the Halton area. It can be seen that most links have a GEH below 5, which can be taken to indicate no significant change in flow. A blue line is indicative of the matrix estimation process adjusting a flow that was reasonable at the prior matrix stage but not close enough to the count. The green lines denote quite significant flow changes between prior and estimated matrices. These are quite concentrated on the periphery of the network and the strategic roads such as motorways. They are indicative of some major adjustments to synthetic parts of the trip matrix and to issues related to the representation of traffic where zones are quite large.

8.28 Matrix changes at sector level brought about by the matrix estimation process are summarised in Tables 8.27 to 8.32. These are for absolute change and percentage change for the three main model time periods. The tables highlight movements where absolute difference is greater than 100 and the proportionate difference is greater than 10%. Although there are significant numbers of cells highlighted it should be noted that the criteria used is demanding and that the changes tend to occur mainly in sections of the trip matrices derived from the synthesis process rather than the observed data (see Table 4.15 for the split between observed and synthesised cells). Overall there is no evidence of matrix estimation having fundamentally changed the OD pattern in the prior matrices.

ROUTE CHOICE ACROSS RIVER MERSEY

8.29 A key criteria for the assessment of the Mersey Gateway model is that the choice of route for drivers crossing the River Mersey should be accurately represented. The modelling process needs to take account of the tolls applied at the Mersey Tunnels.

8.30 A comparison of AM peak hour flows at each crossing point is presented in Table 8.33, while Tables 8.34 and 8.35 present corresponding comparisons for the Inter peak and PM peak hours. On the basis that the cross river matrices are reliable because they are based on observed data that has not been amended by matrix estimation,, these tables demonstrate that the 2006 base year route choice reliably reflects the observed route choices across the River Mersey, with only routes through Warrington showing slightly lower model flows than observed traffic counts. The issue of cross river route choice validation is returned to in Chapter 9.

OVERNIGHT HOUR CALIBRATION

8.31 It is necessary for the calculation of total revenue from tolls that the Mersey Gateway model covers a complete 24-hour period. However the RSIs only cover the period from 07:00 until 19:00 and most traffic counts cover the same period. However there are a small number of 24-hour counts, including at the SJB and the Mersey Tunnels. These have been used to derive factors, by vehicle type and purpose, to convert from the average inter-peak hour matrices to average overnight hour matrices.

8.32 There are insufficient 24-hour traffic counts to apply matrix estimation for the average overnight hour. Table 8.36 presents a comparison of the assigned flows against the available traffic counts. The results show that, as might be expected, traffic flows across the SJB provide an excellent match as the matrix factoring process was based on counts at this location. However modelled traffic flows through the Mersey Tunnels and on the M6 Thelwall Viaduct are lower than the observed traffic counts. Unfortunately overnight traffic counts are not available for routes through Warrington.

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9. Model Validation – Halton

OVERVIEW

9.1 A key focus of the model's development and validation has been the area close to the Mersey Gateway, which has been taken to cover the whole of Halton Borough, i.e. Runcorn and Widnes. The results of the model validation within this area are presented in this Chapter. It was also considered important to reliably model traffic crossing the River Mersey between Liverpool and Birkenhead, and in both Halton Borough and Warrington. The results of the validation of route choice across the River Mersey are also presented in this Chapter.

9.2 Traffic volumes within the area bounded by the M62, M6, M56 and M53, defined as the simulation area, and the somewhat wider buffer area are also considered in-scope in terms of achieving realistic route choice for traffic crossing the River Mersey at either of these locations. The results of model validation throughout this wider area are presented in Chapter 10.

JOURNEY TIME VALIDATION

9.3 A key validation criterion is for the model to accurately reproduce observed travel times throughout the highway network. As described in Chapter 3, a series of journey time routes has been defined throughout the model area, and observed travel times for these were obtained from ITIS data for an average weekday. Tables 9.1 to 9.4 present a comparison of observed and modelled journey times for routes across the SJB, for each time period, following assignment of the post matrix estimation demand. Comparisons are also presented graphically in Figures 9.1 to 9.4 for each of the individual journey time routes crossing the SJB, for each time period. Corresponding results for journey time routes using the Mersey Tunnels or passing through Warrington are presented in Chapter 10.

9.4 These results demonstrate an excellent match between the model and expected journey times. It will be noted that a substantial majority (100%, 80%, 90% and 50% respectively by time period) of model journey times periods lie within the 95% confidence limits of the observed journey times. Furthermore, the match against DMRB criteria, within +/- 15% of mean observed travel times, is also achieved in a significant majority of cases (100%, 100%, 70% and 100% respectively by time period).

9.5 Furthermore, it may be observed that for the AM peak hour, all model journey times lie within +/- 12% of the mean observed. For the Inter peak hour all model journey times lie within +/- 13% and for the Overnight within +/- 13%. The pattern for the PM peak is less good; with all model journey times lying between -2% and +39%. In all time periods there is a balance between model times being faster or slower than the mean observed times, although the PM peak is 12% slower overall. There is no evidence of any systematic over- or under-estimation of journey times other than the PM peak being about 12% slow overall.

9.6 From Figures 9.1 to 9.4, it can be seen that in general the model journey times lie between the +/-15% lines for the CJAMS observed journey times. In most cases the modelled journey times reflect well the observed journey times throughout the route, which provides further evidence that the model reliably reflects existing travel conditions. (In tables could we provide a summary of number/percentage of counts achieving DMRB, could we put confidence limits on graphs?)

FLOW VALIDATION

9.7 As well as the journey time validation, it is also important to compare the model flows against observed traffic counts. Tables 9.5 to 9.7 present comparisons for the Mersey screenline and two screenlines within each of Runcorn and Widnes, for each time period separately. The screenlines judged against the flow graduated DMRB criteria reveal pass rates of 60% for the

AM and 70% and 80% for the IP and PM periods respectively. The overall comparisons indicate that between 76% and 81% of individual links are within GEH<5 across the time periods. For each screenline individually, and combined, the overall GEH is generally acceptable although the Widnes North-South screenline is least good in each time period.

Trip Length Distributions

9.8 Trip length distributions before and after matrix estimation are shown in Figures 9.5 to 9.7 for each time period separately. Each figure presents plots for each of the three car trip purposes and the two goods vehicle classes. Tables 9.8 to 9.10 inclusive present corresponding comparisons of the mean trip lengths. Together these demonstrate a very close match between the prior and validated matrices, demonstrating that no significant distortion has been introduced to either average trip lengths or trip length distributions by the matrix estimation process. LGVs have experienced the largest change, but even here the change in average trip length is less than 10%. In Figures 9.5 to 9.7 the high occurrence of trips in the 45-50 km band is as a result of the 50km cut off for zone connector lengths applied for external zones as explained in Chapter 5. The relatively high number of short goods vehicle trips is a result of the use of ITIS (CJAMS) data. Short distance movements for pickup/set-down or vehicle 'positioning' will still be included where they cross zone boundaries, intra-zonal trips of this type were deleted.

ROUTE CHOICE ACROSS RIVER MERSEY

9.9 Not only is it important for the model to match observed traffic flows and journey times, it is also particularly important for the purposes of this study that the model route choices reflect those choices actually observed. This can be ascertained for trips across the River Mersey by comparing the observed trip patterns from the RSIs carried out on each river crossing with corresponding selected link analyses from the model. Given that trips across the Mersey were frozen in the matrix estimation, this is substantially a test of the models capability in respect of Mersey Crossing routeings.

9.10 Tables 9.11 to 9.19 compare sector matrices from the RSI process leading to the observed matrices with those from select links carried out on the calibrated model for the following river crossings

- Mersey Tunnels
- SJB
- Warrington.

9.11 Part (a) of the tables shows the RSI matrix and part (b) the select link matrix. The tables include information for all three main time periods. The shaded cells in the tables identify movements where the RSI demand was in excess of 50 and the difference when considering the select link matrices is greater than 10%, i.e. a quite demanding threshold. It can be seen that whilst there are a significant number of cells exceeding this threshold, they are not of a level of difference that alters the overall strong pattern of similarity between the two matrices. The Warrington analysis for the inter-peak and the PM peak demonstrates some issues, particularly for movements between Warrington sectors. However, here it should be noted that the RSIs covered more than just the river crossing movements, and so local traffic routeing and matrix estimation impacts will have come into play. Overall it is considered that this analysis supports the view that the model performs well in respect of replication of choice of crossing point for the river Mersey.

For tables 9.11 to 9.19 the arrangement should allow the document to be opened to see the a and b versions together,

FLOW VALIDATION WITH PARTIALLY ESTIMATED MATRICES

9.12 It was initially intended that the set of traffic counts defining the validation screenlines within Halton would be excluded from the matrix estimation process and retained for an independent flow validation. Results for the model assignments for the matrices excluding these screenlines from the estimation are presented in Tables 9.20 to 9.22 for each time period. These can be compared with the equivalent Tables 9.5 to 9.7 for the validated model using all traffic counts for the matrix estimation. Taking the all vehicle flow graduated DMRB validation criteria as an example, a comparison of the tables reveals a significant deterioration for exclusion of these counts from matrix estimation.

9.13 The key conclusion reached from the above is that the model provides a significantly improved observed/modelled flow match with the full traffic count dataset used in matrix estimation as compared to the runs with certain counts excluded from this process. For the River Mersey screenline there is little or no difference as these movements are largely based on fully observed trips which are frozen during the matrix estimation process.

9.14 As a result of the above considerations, As a result of the above considerations, all available count data sets have been used to achieve a closer match between the observed and modelled links counts.

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10. Model Validation – Full Model Area

OVERVIEW

10.1 A focus of the model's development and validation has been the area close to the Mersey Gateway, which has been taken to cover Halton Borough. The results of the journey time validation within this area were presented in Chapter 9. The results of the validation of route choice across the River Mersey were also presented in Chapter 9.

10.2 The results of the journey time validation throughout the wider model area are presented in this Chapter.

JOURNEY TIME VALIDATION

10.3 Tables 10.1 to 10.4 present the results obtained from the comparison of observed and modelled journey times. Comparisons are also presented graphically in Figures 10.1 to 10.4 for each of the individual journey time routes, for each time period.

10.4 These tables and figures demonstrate an excellent match between the model and expected journey times, except for the Overnight hour, with significant observed junction delays accurately replicated. It will be noted that a substantial majority (89%, 82%, 68% and 50% respectively by time period) of model journey times periods lie within the 95% confidence limits of the observed journey times. Furthermore, the match against DMRB criteria, within +/- 15% of mean observed travel times is achieved in a significant majority of cases (75%, 93%, 82% and 61% respectively by time period).

10.5 Overall it may be observed that for the AM peak hour, the model journey times are slightly (6.4%) faster than the mean observed. For the Inter peak hour the model journey times are 5.5% faster while for the PM peak hour the model journey times are almost exactly as the observed. For the Overnight hour the model is 4.7% slower. There is generally a balance between model times being faster or slower than the mean observed times.

10.6 From Figures 10.1 to 10.4, it can be seen that in general the model journey times lie between the +/-15% lines for the CJAMS observed journey times. In most cases the modelled journey times reflect well the observed journey times throughout the route, which provides further evidence that the model reliably reflects existing travel conditions.

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11. Summary and Conclusions

11.1 This Local Model Validation Report (LMVR) describes the procedure followed for the development of the Mersey Gateway highway model, and the subsequent model calibration and validation. The approach taken was to make best use of the various sources of data available from previous studies, supplemented by a limited quantity of data collected specifically for the purpose of the Mersey Gateway project.

11.2 The Mersey Gateway highway model has been developed with the aim of withstanding the extensive scrutiny anticipated during the planning and procurement process. The model construction has followed the available technical guidance in what is a complex and relatively new area of scheme appraisal.

11.3 A focus of the model's development and validation has been the area close to the Mersey Gateway scheme, which has been taken generally to cover the whole of Halton Borough, i.e. Runcorn and Widnes. However, given that the scheme will form a strategic crossing of the river Mersey, there is a need a good representation of traffic volumes and journey times for a wider area, stretching from the Wirral to the M6 motorway. The expectation is that the modelled traffic volumes on roads within this area need to be realistic in order to reliably reflect route choice within the model for the critical river crossings. In particular it is considered important to reliably model traffic crossing the River Mersey between Liverpool and Birkenhead, and in both Halton Borough and Warrington. Traffic volumes within the area bounded by the M62, M6, M56 and M53, defined as the model simulation area, are considered in-scope in terms of achieving realistic route choice for traffic crossing the River Mersey at any of these locations.

11.4 This LMVR describes the complete highway model development, calibration and validation process. This can be summarised as follows:

- Zone System: A total of 529 zones representing in detail the Mersey Basin between the Wirral and the M6 motorway (see Figure 4.1), with larger external zones representing travel origins and destinations for long distance trips.
- Modelled Network: An area of detailed junction simulation encompassing all major settlement and roads of significance immediately to the north and the south of the River Mersey, again between the Wirral and the M6 Motorway, with less detailed link based modelling to represent route choice for longer distance trips. The SATURN software used for this project represents the details of junction operation (lane configurations, saturation flows and signal timings etc) and junction interactions (flow metering and blocking back).
- Demand Data Collation and Collection: Existing roadside interview survey data across the model area has been collated and re-based to 2006, and new data has been collected targeted specifically at the requirements for representing the Mersey Gateway scheme.
- Observed Partial Matrices: Observed matrices have been built from the RSI data for three model time periods (0800-0900, 1000-1600 average hour and 1600-1700) for person and goods vehicle (LGV and OGV) demands. These matrices are partial in nature because only a proportion of total trips pass through a roadside interview survey site.
- Synthetic Person Matrices: Person matrices have been synthesised for each model time periods, based upon planning data, trips rates and trip length distributions from the Merseyside household survey, Census journey to work data and schools/homes location data.
- Area Wide Goods Vehicle Matrices: An estimate of goods vehicle travel across the model area has been made using observed movements from the ITIS vehicle tracking data set scaled to represent movement within the modelled time periods.

- Matrix Merging: Observed and synthetic matrix estimates have been merged, giving precedence to the observed data.
- Model Calibration: The calibration of the model has involved an iterative process of checking and refinement of the network representation with application of matrix estimation techniques to adjust the trip matrices to better replicate observed traffic counts. In this process care has been taken to avoid excessive change to the initial matrices.
- Model Validation: Origin to destination journey times estimated by the model have been validated against observed journey times derived from the ITIS data set. All available traffic counts were used in the matrix estimation process, and so the validation in this respect is not fully independent, but nevertheless the results are satisfactory.

11.5 Chapter 6 sets out criteria against which the acceptability of the model for the appraisal of the Mersey Gateway scheme can be judged. These relate to:

- the DMRB link flow validation criteria
- the DMRB journey time criteria
- flows across the Mersey
- route choice across the Mersey
- flows local to Mersey Crossing at Halton.

11.6 Performance against each of the above is now considered in turn.

- In respect of the link flow criteria the requirements of DMRB are approached but not fully met. Nonetheless it is apparent that the model provides a generally strong correlation between observed and model flows.
- The journey times within the model validate well, both local to the scheme and across the modelled area as a whole.
- Traffic flows across the river Mersey also validate well, particularly in respect of the existing Silver Jubilee Bridge.
- In respect of route choice across the river Mersey there is a good correspondence between origins and destinations observed using the Liverpool, SJB and Warrington crossings in the travel surveys and those output from the model.
- For flows local to the Mersey Crossings at Halton there is again a strong correlation between observed flows and those outputs from the model.

11.7 From the above it can be clearly seen that the model provides a good representation of highway travel demands and travel conditions in the model base year of 2006. On this basis it is clearly acceptable as the starting point for the forecasting the impacts of a new river crossing at Halton.

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Mersey Gateway Highway Model

Local Model Validation Report

Volume 2: Tables and Figures

January 2009

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Explanatory notes on the contents of the report

1. This volume of the Local Model Validation Report (LMVR) contains the tables and figures that are referred to in the LMVR Volume 1 dated January 2009.

2. The chapters which include tables and figures have been clearly marked with a dividing sheet for ease of reference.

3. The Table below shows the illustrations (tables and figures) which are expected to be found for each chapter followed by listing of individual tables and figures.

Table and Figure Numbers for Each Chapter

Chapter	Tables and Figures
1 - Introduction	• Tables: None • Figures: 1.1
2 - The Mersey Gateway Transport Model	• Tables: None • Figures: 2.1 to 2.5
3 – Traffic Data	• Tables: 3.1 to 3.11 • Figures: 3.1 to 3.5
4 – Demand Matrices	• Tables: 4.1 to 4.44 • Figures: 4.1 to 4.10
5 - Networks	• Tables: 5.1 to 5.5 • Figures: 5.1 to 5.2
6 - Model Validation and Acceptability Criteria	• Tables: None • Figures: None
7 – Model Convergence	• Tables: 7.1 to 7.4 • Figures: None
8 – Model Calibration	• Tables: 8.1 to 8.36 • Figures: 8.1 to 8.15
9 – Model validation – Halton	• Tables: 9.1 to 9.22 • Figures: 9.1 to 9.7
10 – Model Validation – Full Model Area	• Tables: 10.1 to 10.4 • Figures: 10.1 to 10.4
11 – Summary and Conclusions	• Tables: None • Figures: None

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List of Tables and Figures

List of Tables

List of Figures

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Chapter 1 Figures

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Wigan
Sefton
St. Helens
Knowsley
Manchester
Trafford
Liverpool
Warrington
Wirral
Halton
Ellesmere Port and Neston
Macclesfield
Vale Royal
Chester
Congleton
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Notes

Key

- Simulation Area
- Model Area
- Mersey Gateway
- Silver Jubilee Bridge
- Local Authority Boundary

Rev	Date	Drawn	Description	Ch'ked	App'd
P1	22/01/2009	TA	For Issue	JH	HF

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Mersey Gateway Study

Figure 1.1 - Mersey Gateway Scheme

Drawn	TA			
Dwg. Chk.	JH	Approved	HF	
Scale at A3 NTS	Project Mersey Gateway			Status PRE
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Drawing No. 231775/TP/				Rev P1

Chapter 2 Figures

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N

Blackburn with Darwen
Rossendale District
Chorley District
Rochdale District
Bury District
Wigan
Sefton
St. Helens
Manchester District
Knowsley
Trafford District
Warrington
Liverpool
Stockport District
Wirral
Halton
Ellesmere Port and Neston
Macclesfield District
Vale Royal
Chester
Congleton District

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Notes

Key

Simulation Area

Model Area

Local Authority Boundary

Rev	Date	Drawn	Description	Chk'ed	App'd
P1	26/01/09	TA	For issue	JH	HF

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Mersey Gateway Study

Figure 2.1 - Area covered by Mersey Gateway Model

Drawn	TA			
Dwg. Chk.	JH	Approved	HF	
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	File			
Drawing No.	231775/TP/			Rev P1

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Notes

Key

Local Authority Boundary

Validation Area

Model Area

Simulation Area

Rev	Date	Drawn	Description	Chkd	Appd
P1	26/01/09	TA	For Issue	JH	HF

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Mersey Gateway Study

Figure 2.2 - Geographical Scope of Model

Drawn	TA			
Dwg. Chk.	JH	Approved	HF	
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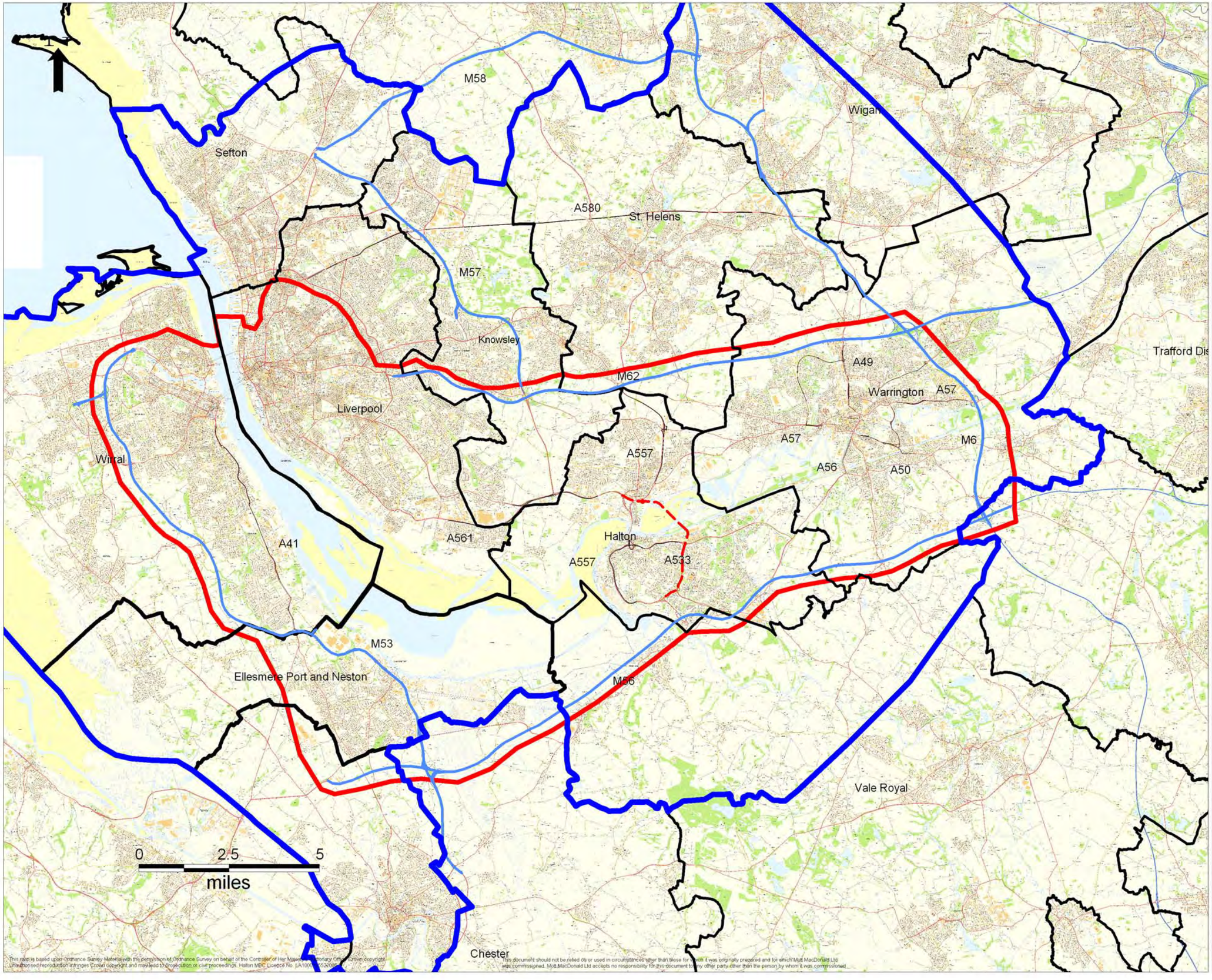

Notes

Key

Simulation Area

Model Area

Local Authority Boundary

Rev	Date	Drawn	Description	Ch'ked	App'd
P1	26/01/09	TA	For Issue	JH	HF

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Mersey Gateway Study

Figure 2.3 - Major Traffic Routes

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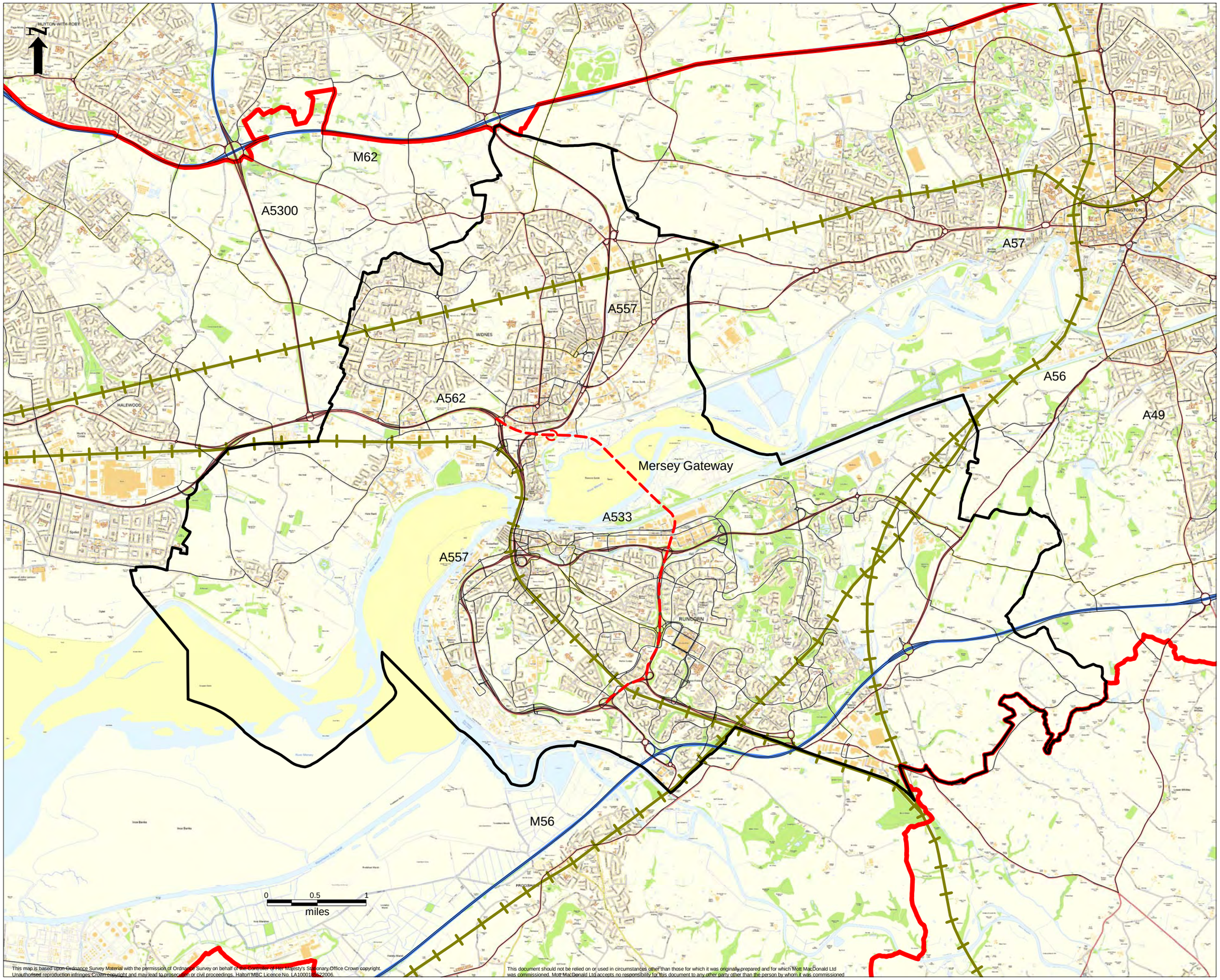

Notes

Key

Simulation Area

Network Links

Halton Boundary

Rev	Date	Drawn	Description	Ch'ked	App'd
P1	25/06/07	GD	For Issue	DOB	CS

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Mersey Gateway Study

Figure 2.4 - Modelling Validation Area

Drawn	GD			
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Notes

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RSI Cordon

Historic RSI site

New RSI site

Simulation Area

Model Area

Rev	Date	Drawn	Description	Chk'ed	App'd
P1	26/01/2009	TA	For Issue	JH	HF

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Mersey Gateway Study

Fig 2.5 - RSI Locations

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Chapter 3 Tables and Figures

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Table 3.1 Comparison of trips across the River Mersey

Crossing	2006 Base Year Traffic Counts (AADT)*		
	Southbound	Northbound	2-way
Mersey Tunnels	39,891	39,724	79,615
Silver Jubilee Bridge	42,316	42,033	84,349
Warrington Bridge	28,676	28,189	56,865
Warrington Kingsway Bridge	10,985	10,479	21,464
M6 Thelwall Viaduct	84,955	88,241	173,196
Total River Mersey Crossings	**206,823**	**208,666**	**415,489**

Table 3.2 – Comparison of Roadside Interviews and Counts for Existing Surveys

ID	RSI Location and direction	AM Peak Hour Count (vehicles)			AM Peak Period Interviews			Inter Peak Hour Count (vehicles)			Inter Peak Period Interviews			PM Peak Hour Count (vehicles)			PM Peak Period Interviews		
		Car	LGV	OGV	Car	LGV	OGV	Car	LGV	OGV	Car	LGV	OGV	Car	LGV	OGV	Car	LGV	OGV
War1	A50 Kingsway North NB	1,015	64	27	310	39	14	682	68	25	341	108	26	946	69	16	163	42	22
War2	A57 Manchester Road WB	430	66	44	273	36	16	502	92	53	514	49	33	671	84	45	271	12	16
War3	A574 Birchwood Way WB	763	42	9	341	56	16	424	34	17	401	113	35	616	26	13	263	39	24
War4	A5060 Chester Road NB	592	46	30	313	42	13	432	56	41	320	103	37	514	79	22	146	50	17
War5	A49 Wilderspool Cway NB	979	32	23	324	13	16	474	34	32	521	35	31	485	24	18	301	12	8
War6	A574 Cromwell Avenue SB	917	62	19	227	61	10	555	53	23	360	149	51	608	58	16	157	63	37
War7	A57 Sankey Way EB	1,338	133	50	410	81	13	740	100	57	498	236	59	865	88	35	354	113	60
War8	A49 Newton Road SB	1,659	232	102	274	52	17	1,025	161	140	488	192	46	1,100	147	90	276	103	21
War9	A5061 Knutsford Road WB	836	46	32	287	22	8	495	49	35	471	53	21	601	35	24	220	12	6
Bir1	New Chester Road NB	1,429	94	36	692	25	12	820	146	64	858	59	38	1,085	174	37	293	14	6
Bir2	Old Chester Road NB	622	39	17	214	14	0	235	29	8	540	105	0	230	37	13	328	33	0
Bir3	Church Road NB	410	29	11	345	18	0	149	19	7	527	82	1	184	10	4	233	20	0
Bir4	A552 Borough Road EB	372	35	10	264	18	0	528	60	15	623	112	12	558	71	12	339	27	0
Bir5	Oxton Road EB	509	41	9	303	33	3	263	24	8	546	94	0	219	26	7	293	28	0
Bir6	Park Road South EB	508	27	9	290	30	1	250	18	6	613	70	0	235	25	4	272	15	0
Bir7	Park Road North EB	371	30	5	280	24	0	191	21	9	515	99	2	164	17	9	253	27	0
Bir8	Laird Street EB	446	58	16	301	53	1	375	47	15	639	98	0	312	35	14	283	33	0
Bir9	Corporation Road EB	626	73	15	246	33	12	177	39	25	439	156	20	202	42	27	187	62	11
Bir10	Duke Street SB	411	70	29	230	93	12	291	73	46	471	244	55	334	79	37	274	65	5
Bir11	Tower Road SB	930	117	50	277	50	15	438	89	46	574	166	21	529	67	43	275	35	14
Bir12	Queensway Tunnel EB	1,000	6	179	1,009	19	18	632	9	130	1,581	22	9	1,406	13	185	941	14	13
Omg13	Gemini Link Road WB	146	52	18	147	24	16							427	154	7	307	16	6
Omg14	Gemini Link Road EB	485	174	22	473	27	11							333	120	5	517	20	6
Omg15	Burtonwood Road Sth NB	596	214	30	323	27	14							602	216	14	322	29	6
Omg16	Burtonwood Road Sth SB	653	235	29	344	28	9							597	215	13	390	19	6
Liv101	Garston Way EB	1025	96	49	188	24	10	687	94	67	169	30	15						
Liv103	Long Lane SB	307	35	6	204	11	5	182	22	5	191	22	5						
Liv104	Mather Avenue SB	516	45	11	259	16	8	334	31	10	219	11	6						
Liv105	Allerton Road SB	201	14	3	137	8	5	92	15	0	93	11	1						
Liv201	Menlove Avenue SB	866	58	23	233	22	13	487	60	19	203	23	18						
Liv202	Allerton High Street WB	765	20	1	210	14	5	482	7	3	157	18	5						
Liv203	Speke Road SB	350	30	15	179	10	7	188	29	7	164	19	7						
Liv301	Hollies Road SB	215	15	5	181	8	3	107	10	2	133	8	5						
Liv302	Baileys Lane SB	492	59	8	187	12	5	177	27	9	164	20	7						
Liv303	Lower Road EB	137	4	1	132	5	5	65	4	3	118	11	8						
Liv404	Hale Road SB	404	55	54	179	27	28	490	48	44	260	19	31						
Ches1	A41 Liverpool Road SB	1,029	50	20	312	23	4	432	30	17	389	31	13	467	42	11	218	10	3
Ches2	A5032 Whitby Lane SB	496	13	24	263	13	4	311	11	17	358	29	8	315	14	3	218	9	3
Ches3	A56 Warrington Road WB	1,018	111	34	238	34	5	677	88	34	378	46	10	1,098	104	22	220	8	6
Ches10	A548 Sealand Road EB	787	60	22	188	22	5	380	67	33	253	24	9	347	60	20	146	9	6
Ches11	A540 Parkgate Road SB	577	15	32	194	11	3	173	34	18	198	25	17	187	19	5	86	9	6
	Total	**27,228**	**2,697**	**1,129**	**11,781**	**1,178**	**362**	**14,938**	**1,797**	**1,090**	**15,287**	**2,692**	**662**	**16,237**	**2,150**	**771**	**8,546**	**948**	**308**

Note: (shaded cells show instances of count being greater than 60 and number of interviews being fewer than 20)

Table 3.3 – Comparison of Roadside Interviews and Counts for Mott MacDonald Surveys

ID	RSI Location and direction	AM Peak Hour Count (vehicles)			AM Peak Period Interviews			Inter Peak Hour Count (vehicles)			Inter Peak Period Interviews			PM Peak Hour Count (vehicles)			PM Peak Period Interviews		
		Car	LGV	OGV	Car	LGV	OGV	Car	LGV	OGV	Car	LGV	OGV	Car	LGV	OGV	Car	LGV	OGV
1	Kingsway Tunnel EB	2723	169	119	986	29	15	819	148	128	323	38	32	1,244	175	90	209	11	14
2	SJB Approach (A557) EB	985	144	115	264	34	42	716	144	194	438	80	121	1036	176	91	278	42	24
3	SJB Approach (A533)NB	1271	136	58	291	30	31	977	144	100	553	85	89	1295	182	68	321	29	23
4	Rocksavage Expressway SB	1077	220	190	1,430	82	69	879	153	202	709	19	20	1225	185	124	392	27	24
5	Whitehouse Expressway EB	1027	76	44	293	31	25	645	66	50	495	51	44	960	95	38	254	13	9
5a	Wood Lane SB	363	38	1	324	26	4	185	15	4	589	42	10	330	21	7	357	16	3
6	Chester Road Daresbury NB	1104	80	84	248	27	39	406	79	81	365	72	89	619	121	49	239	20	36
8	Chester Road A56 SB	947	101	53	223	33	32	425	67	45	353	56	53	772	95	31	239	18	13
9	Gemini Retail Park EB	632	50	22	216	7	9	440	40	15	314	16	20	426	40	9	157	10	2
10	Widnes Rd/Warrington Rd WB	532	56	17	302	37	25	378	70	26	537	89	48	557	69	17	318	31	11
11	Clock Face A569 SB	464	57	18	208	44	16	160	31	10	322	46	36	267	40	3	197	14	6
12	Jubits Lane B5419 SB	327	46	35	315	38	27	177	25	22	371	45	37	323	35	30	222	8	7
13	Warrington Road A57 EB	407	75	25	206	22	24	263	58	33	309	55	43	384	66	6	186	11	9
14	Watkinson Way A557 EB	588	112	83	187	39	53	366	74	111	333	75	120	561	112	88	226	18	31
15	Cronton Crossroads A5080 EB	270	36	12	228	43	10	150	24	7	387	49	17	270	39	6	202	11	6
16	Liverpool Road B5178 EB	132	17	3	143	18	7	78	9	3	270	33	12	108	23	4	165	21	5
17	Moor Lane South EB	489	47	13	259	44	15	374	45	13	518	58	18	420	49	9	258	16	7
18	Ashley Way West A562 EB	303	73	87	154	35	36	323	80	75	287	90	87	480	97	54	229	38	21
	Total	**13,641**	**1,533**	**979**	**6,277**	**619**	**479**	**7,761**	**1,271**	**1,118**	**7,473**	**999**	**896**	**11,277**	**1,620**	**724**	**4,449**	**354**	**251**

Note: (shaded cells show instances of count being greater than 60 and number of interviews being fewer than 20)

Table 3.4 Adjustment Factors applied to RSI Observed Trips

RSI Site	RSI Location	Dir	Adjustment Factor applied		
			AM peak hour	Interpeak hour	PM peak hour
1	Kingsway Tunnel	EB	0.980	0.974	0.996
1	Kingsway Tunnel	WB	0.971	1.010	0.984
2	SJB Approach A557	NB	0.952	1.014	1.058
2	SJB Approach A557	SB	1.045	0.996	0.967
3	SJB Approach A533	NB	1.012	0.989	1.003
3	SJB Approach A533	SB	0.914	0.975	0.942
4	Rocksavage Expressway	SB	1.027	0.949	0.962
4	Rocksavage Expressway	NB	0.946	1.016	0.962
5	Whitehouse Expressway	EB	0.976	0.986	1.089
5	Whitehouse Expressway	WB	1.028	1.001	1.283
5A	Wood Lane	SB	0.670	0.923	0.585
5A	Wood Lane	NB	0.728	1.008	0.829
6	A56 Chester Road (Daresbury)	NB	0.974	1.010	1.030
6	A56 Chester Road (Daresbury)	SB	0.998	0.974	0.979
7	A49 London Road	SB	0.979	1.114	1.175
7	A49 London Road	NB	0.876	1.157	1.194
8	A56 Chester Road	SB	0.976	1.106	1.051
8	A56 Chester Road	NB	1.164	1.098	0.948
9	Gemini Retail Park	SB	1.024	0.992	1.049
9	Gemini Retail Park	NB	1.064	1.184	1.135
10	Widnes Road (Warrington)	WB	1.045	1.138	1.148
10	Widnes Road (Warrington)	EB	0.959	1.011	1.124
11	A569 Clock Face Road	SB	1.078	1.023	0.902
11	A569 Clock Face Road	NB	1.078	0.998	0.880
12	B5429 Jubits Lane	SB	1.165	1.198	0.959
12	B5429 Jubits Lane	NB	1.070	1.079	0.862
13	A57 Warrington Road	EB	0.903	1.047	1.125
13	A57 Warrington Road	WB	0.903	1.047	1.125
14	A557 Watkinson Way	EB	0.925	0.977	1.113
14	A557 Watkinson Way	WB	1.027	1.020	1.048
15	A5080 Cronton Road (Crossroads)	EB	0.855	1.126	1.096
15	A5080 Cronton Road (Crossroads)	WB	1.110	1.008	0.977
16	B5178 Liverpool Road	EB	0.950	1.042	1.127
16	B5178 Liverpool Road	WB	0.957	1.234	1.145
17	Moor Lane South	EB	0.962	1.136	1.156
17	Moor Lane South	WB	1.291	0.981	1.001
18	A562 Ashley Way West	EB	1.033	1.073	1.133
18	A562 Ashley Way West	WB	1.026	1.136	1.149
War1	A50 Kingsway	NB	1.000	1.000	1.000
War1	A50 Kingsway	SB	1.000	1.000	1.000
War2	A57 Manchester Road	WB	1.000	1.000	1.000
War2	A57 Manchester Road	EB	1.000	1.000	1.000

RSI Site	RSI Location	Dir	Adjustment Factor applied		
			AM peak hour	Interpeak hour	PM peak hour
War3	A574 Birchwood Way	WB	1.000	1.000	1.000
War3	A574 Birchwood Way	EB	1.000	1.000	1.000
War4	A5060 Chester Road	NB	1.179	1.031	0.997
War4	A5060 Chester Road	SB	0.880	1.069	0.913
War5	A49 Wilderspool Causeway	NB	0.824	1.146	1.018
War5	A49 Wilderspool Causeway	SB	0.703	0.935	1.102
War6	A574 Cromwell Avenue	SB	1.000	1.000	1.000
War6	A574 Cromwell Avenue	NB	1.000	1.000	1.000
War7	A57 Sankey Way	EB	1.000	1.000	1.000
War7	A57 Sankey Way	WB	1.000	1.000	1.000
War8	A49 Newton Road	SB	1.000	1.000	1.000
War8	A49 Newton Road	NB	1.000	1.000	1.000
War9	A50 Knutsford Road	WB	1.034	1.128	1.189
War9	A50 Knutsford Road	EB	1.244	1.075	1.072
Omega13	Gemini Link Road	WB	1.000	1.000	1.000
Omega14	Gemini Link Road	EB	1.000	1.000	1.000
Omega15	Burtonwood Road	NB	1.000	1.000	1.000
Omega16	Burtonwood Road	SB	1.000	1.000	1.000
Bir1	New Chester Road	NB	1.347	1.068	1.029
Bir1	New Chester Road	SB	0.961	1.113	0.959
Bir2	Old Chester Road	NB	1.211	1.592	1.824
Bir2	Old Chester Road	SB	1.347	1.293	1.177
Bir3	Church Road	NB	1.411	1.763	1.685
Bir3	Church Road	SB	1.055	1.206	1.156
Bir4	A552 Borough Road	NB	1.289	1.139	1.058
Bir4	A552 Borough Road	SB	1.143	1.132	1.078
Bir5	Oxton Road	NB	1.094	1.255	1.314
Bir5	Oxton Road	SB	1.426	1.287	1.278
Bir6	Park Road South	EB	1.534	1.759	1.703
Bir6	Park Road South	WB	2.032	1.481	1.478
Bir7	Park Road North	EB	1.356	1.539	1.797
Bir7	Park Road North	WB	1.570	1.377	1.273
Bir8	Laird Street	EB	0.963	1.170	1.243
Bir8	Laird Street	WB	1.377	1.297	1.283
Bir9	Corporation Road	EB	1.133	1.325	1.264
Bir9	Corporation Road	WB	1.355	1.534	1.378
Bir10	Duke Street	SB	1.246	1.290	1.645
Bir10	Duke Street	NB	1.148	1.544	1.237
Bir11	Tower Road	SB	1.030	1.115	1.113
Bir11	Tower Road	NB	1.060	1.196	1.153
Bir12	Queensway Tunnel	SB	1.000	1.000	1.000
Bir12	Queensway Tunnel	NB	1.000	1.000	1.000
SLiv101	A561 Garston Way	EB	1.039	1.086	1.074
SLiv101	A561 Garston Way	WB	0.961	1.059	0.933
SLiv102	Garston Old Road	EB	1.029	1.064	0.909
SLiv102	Garston Old Road	NB	2.067	1.205	1.070
SLiv103	Long Lane	EB	1.071	1.240	1.345

RSI Site	RSI Location	Dir	Adjustment Factor applied		
			AM peak hour	Interpeak hour	PM peak hour
SLiv103	Long Lane	NB	1.086	1.114	1.343
SLiv104	B5180 Mather Avenue	EB	1.076	1.149	1.253
SLiv104	B5180 Mather Avenue	NB	1.259	1.072	1.145
SLiv105	Allerton Road	EB	0.820	0.842	1.043
SLiv105	Allerton Road	NB	1.287	1.270	1.010
SLiv201	A562 Menlove Avenue	EB	0.904	0.950	0.986
SLiv201	A562 Menlove Avenue	NB	0.977	0.998	0.955
SLiv202	B5171 Allerton High Street	WB	0.871	1.043	1.151
SLiv202	B5171 Allerton High Street	EB	0.767	1.038	0.915
SLiv203	Speke Road	SB	1.136	1.142	1.105
SLiv203	Speke Road	NB	1.170	1.076	0.957
SLiv204	Macket's Lane	SB	0.947	1.094	1.021
SLiv204	Macket's Lane	NB	1.081	1.071	1.090
SLiv301	Hollies Road	SB	1.388	1.055	1.166
SLiv301	Hollies Road	NB	1.255	1.011	1.149
SLiv302	Baileys Lane	SB	0.706	0.880	0.841
SLiv302	Baileys Lane	NB	0.959	1.121	1.096
SLiv303	Lower Road	SB	0.965	0.900	0.915
SLiv303	Lower Road	WB	0.841	0.845	1.039
SLiv401	Speke Boulevard	WB	1.143	1.125	1.052
SLiv401	Speke Boulevard	EB	1.014	1.041	1.131
SLiv402	Jaguar Factory	In	0.909	0.991	1.008
SLiv402	Jaguar Factory	Out	1.100	0.969	1.133
SLiv403	A562 Higher Road	WB	0.620	1.040	1.041
SLiv403	A562 Higher Road	EB	0.977	0.993	0.980
SLiv404	Hale Road	SB	1.051	0.964	0.951
SLiv404	Hale Road	NB	0.972	1.076	1.008
SLiv1035	Speke Road (derived)	WB	0.732	1.052	1.047
SLiv1035	Speke Road (derived)	EB	0.980	0.974	0.996
Chester1	A41 Liverpool Road	SB	0.936	0.969	1.047
Chester1	A41 Liverpool Road	NB	1.136	1.172	1.310
Chester2	A5032 Whitby Lane	SB	1.017	1.042	1.072
Chester2	A5032 Whitby Lane	NB	0.928	1.138	1.054
Chester3	A56 Warrington Road	WB	0.849	0.875	0.624
Chester3	A56 Warrington Road	EB	0.549	0.829	0.669
Chester10	A548 Sealand Road	EB	1.246	1.311	1.379
Chester10	A548 Sealand Road	WB	1.082	1.266	1.221
Chester11	A540 Parkgate Road	SB	1.226	1.353	1.437
Chester11	A540 Parkgate Road	NB	1.032	1.225	1.392

Table 3.5 - Annual adjustment factors for Traffic Counts on Motorways

	AWT	ADT	AM peak hour	Interpeak	PM peak hour	National motor vehicle flow – Motorways (vehicles per day) *
2004	444,386	401,482	37,161	24,923	35,792	74,900
2005	469,381	421,994	39,773	26,435	37,474	75,500
2006	469,379	420,692	38,810	26,642	37,648	77,000
growth 2004 - 2006	1.0562	1.0478	1.0444	1.0690	1.0519	1.0280
growth 2005 - 2006	1.0000	0.9969	0.9758	1.0078	1.0046	1.0199

Table 3.6 - Observed traffic counts on Halton Validation Screenlines (vehicles)

Location	Dir	AM Peak			Inter Peak			PM Peak		
		Car	LGV	OGV	Car	LGV	OGV	Car	LGV	OGV
A533 Central Expressway	sb	1,446	102	41	984	95	50	1,326	123	37
A533 Central Expressway	nb	943	58	76	763	44	45	1,143	48	37
A533 Daresbury Expressway	eb	1,419	196	101	936	153	110	1,370	161	95
A533 Daresbury Expressway	wb	1,082	133	66	678	129	102	1,182	192	77
A557 Central Expressway	eb	635	46	28	237	35	35	353	61	22
A557 Central Expressway	wb	1,106	226	195	891	150	174	1,179	178	119
A558 Daresbury Expressway	nb	814	115	87	452	79	86	842	118	62
A558 Daresbury Expressway	sb	1,049	94	67	411	93	78	745	128	45
B5155 Spur Rd	nb	593	45	5	581	34	9	844	61	3
B5155 Spur Rd	sb	606	30	2	358	21	5	462	43	2
Beechwood Av Runcorn	eb	201	8	4	108	12	1	223	9	1
Beechwood Av Runcorn	wb	329	19	5	92	11	2	181	8	1
Boston Avenue	eb	288	20	4	209	20	4	279	29	1
Boston Avenue	wb	307	18	4	196	21	4	282	31	1
Cheshyre's Lane	nb	83	4	4	39	5	4	53	10	2
Cheshyre's Lane	sb	47	4	1	39	6	3	51	4	1
Chester Road, Warrington	nb	739	79	34	482	76	35	713	88	29
Chester Road, Warrington	sb	943	102	70	476	82	31	780	61	33
Halton Road Runcorn	eb	135	32	9	192	32	9	219	32	4
Halton Road Runcorn	wb	235	36	7	155	28	8	178	35	4
Heath Road	nb	367	39	5	249	31	3	272	31	0
Heath Road	sb	396	37	4	249	29	4	293	36	1
Holt Lane (to East Lane)	sb	201	15	2	138	10	3	139	14	1
Holt Lane (to Main Street)	nb	127	11	4	131	7	1	212	15	1
Keckwick Lane	nb	23	3	0	17	4	0	31	6	0
Keckwick Lane	sb	111	6	0	26	3	0	44	8	2
Moughland Lane	nb	230	15	3	152	17	5	215	22	3
Moughland Lane	sb	199	18	9	158	18	4	183	9	2
Old Quay Street Runcorn	eb	1	0	0	3	0	0	4	0	0
Old Quay Street Runcorn	wb	14	0	0	4	0	0	5	0	0
Oxford Road, Runcorn	nb	30	4	1	29	4	0	33	2	0
Oxford Road, Runcorn	sb	24	5	3	28	4	0	38	2	0
Rocksavage Expressway	eb	1,106	226	195	891	150	174	1,179	178	119
Rocksavage Expressway	wb	1,660	163	161	765	162	206	1,268	244	115
Warrington Road	nb	43	4	1	25	3	0	24	4	0
Warrington Road	sb	36	3	0	26	4	0	49	4	0
Weston Point Expressway	nb	1,619	217	186	772	203	219	1,239	262	127
Weston Point Expressway	sb	938	230	204	737	181	224	1,294	223	130
Windmill Hill Avenue	nb	671	40	6	462	27	4	526	31	4
Windmill Hill Avenue	sb	421	25	4	550	32	5	614	36	5

Table 3.7 - Observed Journey Time Comparisons – AM Peak Hour

Description of Route	CJAMS mean journey time (A)	CJAMS confidence limits (B)	Number of CJAMS records (C)	Obs mean journey time (D)	% diff (D vs. A)	within confidence limits? (D vs.B)
Route 1 EB - M53 J1 to M62 J5	27.93	22.77 to 36.50	165	25.74	-7.8%	Y
Route 1 WB - M62 J5 to M53 J1	34.20	27.72 to 43.42	262	29.72	-13.1%	Y
Route 2 NB - M56/M53 Chester to Garston	50.12	45.44 to 55.98	330	47.49	-5.3%	Y
Route 2 SB – Garston to M56/M53 Chester	50.20	44.98 to 56.97	351	47.33	-5.7%	Y
Route 3 NB - M56 J14 to M62 J6 via SJB	23.61	19.43 to 32.71	476	27.33	15.8%	Y
Route 3 SB - M62 J6 to M56 J14 via SJB	27.13	21.56 to 37.42	1,016	31.86	17.4%	Y
Route 4 NB - Preston Brook to M62 J7 via SJB	17.65	15.02 to 22.49	266	18.66	5.7%	Y
Route 4 SB - M62 J7 to Preston Brook via SJB	19.08	14.89 to 27.14	510	14.53	-23.9%	N
Route 5 NB – M56 J11 to A574 Birchwood	24.75	19.17 to 34.24	183	19.91	-19.6%	Y
Route 5 SB – A574 Birchwood to M56 J11	22.26	19.06 to 26.81	153	21.62	-2.9%	Y
Route 6 EB – M62 J7 to M6 J20	31.76	27.07 to 38.51	81	31.38	-1.2%	Y
Route 6 WB – M6 J20 to M62 J7	29.81	25.32 to 36.25	96	32.96	10.6%	Y
Route 7 NB – M56 J10 to M62 J9	24.77	20.12 to 31.89	159	26.35	6.4%	Y
Route 7 SB – M62 J9 to M56 J10	22.07	18.48 to 27.42	149	20.44	-7.4%	Y
Route 8 NB – Frodsham to Widnes Rugby Ground	23.04	18.49 to 30.93	237			
Route 8 SB – Widnes Rugby Ground to Frodsham	25.75	20.76 to 33.60	580			
Route 9 NB – Preston Brook to Green Oaks Centre	13.83	11.92 to 17.29	247			
Route 9 SB – Green Oaks Centre to Preston Brook	15.29	11.93 to 22.16	430			
Route 10 NB – Daresbury Park to Garston	24.64	21.34 to 29.61	315			
Route 10 SB – Garston to Daresbury Park	25.21	20.81 to 32.63	489			
Route 11 EB – M53 J3 to Wavertree Business Park (via Queensway)	25.60	20.66 to 32.81	39			
Route 11 WB – Wavertree Business Park to M53 J3 (via Queensway)	20.59	17.45 to 25.41	65			
Route 12 EB – M53 J3 to Wavertree Business Park (via Kingsway)	22.04	17.86 to 31.34	261			
Route 12 WB – Wavertree Business Park to M53 J3 (via Kingsway)	25.25	20.98 to 31.58	260			
Route 13 NB – M56 J10 to M62 J9 (via M6)	12.57	10.95 to 17.61	2,009			
Route 13 SB – M62 J9 to M56 J10 (via M6)	13.82	12.05 to 19.78	2,968			
Route 14 NB - M56 J10 to Smith Street (Warrington)	15.51	11.98 to 21.62	161	13.72	-11.5%	Y
Route 14 SB - Smith Street (Warrington) to M56 J10	13.88	11.33 to 18.03	151	13.43	-3.3%	Y
Route 15 NB – M6 J20 to A49 Winwick Road	18.86	15.01 to 25.26	97	20.53	8.9%	Y
Route 15 SB – A49 Winwick Road to M6 J20	17.34	14.59 to 21.52	110	17.34	0.0%	Y
Route 16 NB – A56 Chester Road to A49 Mersey Street	8.03	6.15 to 11.95	318	7.45	-7.3%	Y
Route 16 SB – A49 Mersey Street to A56 Chester Road	7.49	5.94 to 10.29	284	8.97	19.8%	Y
Route 17 – A57 Sankey Way to A5060 Chester Road	9.39	7.42 to 12.83	188	12.19	29.8%	Y
Route 18 – A5060 Chester Road to A57 Sankey Way	8.31	6.63 to 11.19	193	7.73	-7.0%	Y
Route 19 NB - Chester to Knowsley Industrial Park (via Kingsway)	50.08	44.72 to 58.60	375			
Route 19 SB - Knowsley Industrial Park to Chester (via Kingsway)	51.41	45.54 to 60.27	973			
Route 20 NB - Chester to Knowsley Industrial Park (via SJB)	39.77	34.65 to 49.84	690			
Route 20 SB - Knowsley Industrial Park to Chester (via SJB)	42.82	36.77 to 53.70	1,436			
Total	**504.15**			**496.68**	**-1.5%**	**95%**

Table 3.8 - Observed Journey Time Comparisons – Inter Peak Hour

Description of Route	CJAMS mean journey time (A)	CJAMS confidence limits (B)	Number of CJAMS records (C)	Obs mean journey time (D)	% diff (D vs. A)	within confidence limits? (D vs.B)
Route 1 EB - M53 J1 to M62 J5	23.54	20.74 to 28.17	1,755	19.52	-17.1%	N
Route 1 WB - M62 J5 to M53 J1	23.87	20.87 to 28.71	1,520	24.96	4.6%	Y
Route 2 NB - M56/M53 Chester to Garston	43.45	40.07 to 47.85	2,422	39.81	-8.4%	N
Route 2 SB – Garston to M56/M53 Chester	43.61	39.97 to 48.53	2,669	47.03	7.8%	Y
Route 3 NB - M56 J14 to M62 J6 via SJB	19.00	17.88 to 22.70	4,789	19.06	0.3%	Y
Route 3 SB - M62 J6 to M56 J14 via SJB	19.79	18.34 to 23.66	4,361	18.61	-6.0%	Y
Route 4 NB - Preston Brook to M62 J7 via SJB	14.93	14.14 to 17.92	1,999	12.95	-13.3%	N
Route 4 SB - M62 J7 to Preston Brook via SJB	14.45	13.50 to 17.78	1,958	12.36	-14.5%	N
Route 5 NB – M56 J11 to A574 Birchwood	19.30	17.19 to 22.48	1,184	18.15	-6.0%	Y
Route 5 SB – A574 Birchwood to M56 J11	19.86	17.32 to 23.71	1,072	18.03	-9.2%	Y
Route 6 EB – M62 J7 to M6 J20	26.52	24.03 to 30.09	808	27.76	4.7%	Y
Route 6 WB – M6 J20 to M62 J7	25.12	22.76 to 28.38	894	25.62	2.0%	Y
Route 7 NB – M56 J10 to M62 J9	21.77	18.53 to 26.69	1,291	20.88	-4.1%	Y
Route 7 SB – M62 J9 to M56 J10	21.48	18.04 to 26.67	1,184	24.43	13.7%	Y
Route 8 NB – Frodsham to Widnes Rugby Ground	18.40	16.38 to 22.03	2,461			
Route 8 SB – Widnes Rugby Ground to Frodsham	19.43	17.22 to 23.26	2,358			
Route 9 NB – Preston Brook to Green Oaks Centre	11.89	11.02 to 13.72	1,739			
Route 9 SB – Green Oaks Centre to Preston Brook	11.86	10.79 to 14.14	1,783			
Route 10 NB – Daresbury Park to Garston	21.72	18.98 to 26.82	2,344			
Route 10 SB – Garston to Daresbury Park	21.55	19.13 to 25.61	2,614			
Route 11 EB – M53 J3 to Wavertree Business Park (via Queensway)	18.59	16.27 to 22.27	413			
Route 11 WB – Wavertree Business Park to M53 J3 (via Queensway)	18.68	16.32 to 22.42	560			
Route 12 EB – M53 J3 to Wavertree Business Park (via Kingsway)	17.42	15.33 to 21.26	1,878			
Route 12 WB – Wavertree Business Park to M53 J3 (via Kingsway)	18.59	15.79 to 21.85	1,984			
Route 13 NB – M56 J10 to M62 J9 (via M6)	11.09	10.72 to 12.91	19,275			
Route 13 SB – M62 J9 to M56 J10 (via M6)	12.46	11.86 to 15.24	15,952			
Route 14 NB - M56 J10 to Smith Street (Warrington)	14.21	11.77 to 18.06	1,578	12.72	-10.5%	Y
Route 14 SB - Smith Street (Warrington) to M56 J10	14.44	11.52 to 19.26	1,308	13.64	-5.5%	Y
Route 15 NB – M6 J20 to A49 Winwick Road	16.05	13.61 to 20.19	721	16.26	1.3%	Y
Route 15 SB – A49 Winwick Road to M6 J20	15.30	13.30 to 18.52	895	15.52	1.4%	Y
Route 16 NB – A56 Chester Road to A49 Mersey Street	7.20	5.82 to 10.22	2,281	6.17	-14.3%	Y
Route 16 SB – A49 Mersey Street to A56 Chester Road	7.40	5.81 to 10.47	1,898	7.23	-2.4%	Y
Route 17 – A57 Sankey Way to A5060 Chester Road	8.65	6.89 to 12.06	1,752	7.50	-13.3%	Y
Route 18 – A5060 Chester Road to A57 Sankey Way	7.76	6.21 to 10.69	2,009	7.04	-9.2%	Y
Route 19 NB - Chester to Knowsley Industrial Park (via Kingsway)	46.06	42.79 to 51.19	2,483			
Route 19 SB - Knowsley Industrial Park to Chester (via Kingsway)	45.98	42.75 to 50.71	5,469			
Route 20 NB - Chester to Knowsley Industrial Park (via SJB)	34.43	32.46 to 39.31	4,390			
Route 20 SB - Knowsley Industrial Park to Chester (via SJB)	35.27	33.21 to 40.32	4,875			
Total	**427.70**			**415.24**	**-2.9%**	**82%**

Table 3.9 - Observed Journey Time Comparisons – PM Peak Hour

Description of Route	CJAMS mean journey time (A)	CJAMS confidence limits (B)	Number of CJAMS records (C)	Obs mean journey time (D)	% diff (D vs. A)	within confidence limits? (D vs.B)
Route 1 EB - M53 J1 to M62 J5	27.15	22.95 to 33.64	311	33.98	25.1%	N
Route 1 WB - M62 J5 to M53 J1	25.84	22.48 to 30.78	171	30.57	18.3%	Y
Route 2 NB - M56/M53 Chester to Garston	45.57	41.56 to 50.77	322	42.47	-6.8%	Y
Route 2 SB – Garston to M56/M53 Chester	48.76	43.13 to 56.47	285	52.49	7.6%	Y
Route 3 NB - M56 J14 to M62 J6 via SJB	21.66	18.52 to 29.87	661	27.04	24.8%	Y
Route 3 SB - M62 J6 to M56 J14 via SJB	24.40	20.50 to 31.60	516	31.30	28.3%	Y
Route 4 NB - Preston Brook to M62 J7 via SJB	16.13	14.30 to 19.70	290	20.83	29.1%	N
Route 4 SB - M62 J7 to Preston Brook via SJB	16.43	13.65 to 22.45	266	19.49	18.6%	Y
Route 5 NB – M56 J11 to A574 Birchwood	20.90	17.97 to 25.38	145	22.80	9.1%	Y
Route 5 SB – A574 Birchwood to M56 J11	20.83	18.31 to 24.38	142	25.03	20.2%	N
Route 6 EB – M62 J7 to M6 J20	29.57	26.19 to 34.21	61	35.90	21.4%	N
Route 6 WB – M6 J20 to M62 J7	27.74	24.45 to 32.26	104	31.99	15.3%	Y
Route 7 NB – M56 J10 to M62 J9	25.23	20.38 to 32.66	138	33.55	33.0%	N
Route 7 SB – M62 J9 to M56 J10	23.94	19.39 to 30.79	116	29.37	22.7%	Y
Route 8 NB – Frodsham to Widnes Rugby Ground	21.36	17.46 to 28.54	339			
Route 8 SB – Widnes Rugby Ground to Frodsham	24.08	19.87 to 30.75	254			
Route 9 NB – Preston Brook to Green Oaks Shopping Centre	12.83	11.46 to 15.43	256			
Route 9 SB – Green Oaks Shopping Centre to Preston Brook	13.07	10.94 to 18.34	253			
Route 10 NB – Daresbury Park to Garston	22.27	19.89 to 25.96	291			
Route 10 SB – Garston to Daresbury Park	23.87	20.10 to 30.35	326			
Route 11 EB – M53 J3 to Wavertree Business Park (via Queensway)	19.54	16.86 to 23.69	49			
Route 11 WB – Wavertree Business Park to M53 J3 (via Queensway)	19.79	17.08 to 23.90	56			
Route 12 EB – M53 J3 to Wavertree Business Park (via Kingsway)	18.26	16.54 to 23.52	312			
Route 12 WB – Wavertree Business Park to M53 J3 (via Kingsway)	19.87	17.40 to 24.16	243			
Route 13 NB – M56 J10 to M62 J9 (via M6)	11.60	10.78 to 14.66	2,777			
Route 13 SB – M62 J9 to M56 J10 (via M6)	12.88	11.90 to 16.70	1,954			
Route 14 NB - M56 J10 to Smith Street (Warrington)	15.19	11.88 to 20.89	162	13.88	-8.6%	Y
Route 14 SB - Smith Street (Warrington) to M56 J10	16.68	12.81 to 22.87	110	14.11	-15.4%	Y
Route 15 NB – M6 J20 to A49 Winwick Road	16.83	14.31 to 20.77	89	19.28	14.5%	Y
Route 15 SB – A49 Winwick Road to M6 J20	17.03	14.43 to 20.96	84	17.32	1.7%	Y
Route 16 NB – A56 Chester Road to A49 Mersey Street	7.96	6.02 to 12.31	288	8.21	3.1%	Y
Route 16 SB – A49 Mersey Street to A56 Chester Road	7.52	6.13 to 9.82	233	8.85	17.7%	Y
Route 17 – A57 Sankey Way to A5060 Chester Road	10.55	8.21 to 14.29	128	12.18	15.5%	Y
Route 18 – A5060 Chester Road to A57 Sankey Way	10.27	7.27 to 15.77	239	10.66	3.8%	Y
Route 19 NB - Chester to Knowsley Industrial Park (via Kingsway)	48.04	43.50 to 55.49	410			
Route 19 SB - Knowsley Industrial Park to Chester (via Kingsway)	48.23	44.40 to 53.62	737			
Route 20 NB - Chester to Knowsley Industrial Park (via SJB)	37.09	33.55 to 45.86	696			
Route 20 SB - Knowsley Industrial Park to Chester (via SJB)	41.67	36.65 to 50.26	729			
Total	**476.18**			**541.30**	**13.7%**	**77%**

Table 3.10 - Observed Journey Time Comparisons – Overnight Hour

Description of Route	CJAMS mean journey time (minutes)	CJAMS 95% confidence limits	Number of CJAMS records
Route 1 EB - M53 J1 to M62 J5	18.15	17.30 to 21.39	291
Route 1 WB - M62 J5 to M53 J1	17.90	17.07 to 20.97	396
Route 2 NB - M56/M53 Chester to Garston	34.40	32.86 to 39.65	338
Route 2 SB – Garston to M56/M53 Chester	34.98	33.49 to 39.37	368
Route 3 NB - M56 J14 to M62 J6 via SJB	18.68	17.86 to 21.30	797
Route 3 SB - M62 J6 to M56 J14 via SJB	18.94	18.10 to 21.77	634
Route 4 NB - Preston Brook to M62 J7 via SJB	14.00	13.40 to 15.81	289
Route 4 SB - M62 J7 to Preston Brook via SJB	13.16	12.55 to 15.48	171
Route 5 NB – M56 J11 to A574 Birchwood	15.37	14.71 to 17.42	227
Route 5 SB – A574 Birchwood to M56 J11	15.05	14.40 to 16.98	143
Route 6 EB – M62 J7 to M6 J20	21.42	20.49 to 24.31	84
Route 6 WB – M6 J20 to M62 J7	19.77	18.93 to 22.25	76
Route 7 NB – M56 J10 to M62 J9	15.54	14.80 to 18.69	187
Route 7 SB – M62 J9 to M56 J10	14.60	13.92 to 17.28	154
Route 8 NB – Frodsham to Widnes Rugby Ground	15.76	15.05 to 18.21	345
Route 8 SB – Widnes Rugby Ground to Frodsham	16.34	15.58 to 19.40	239
Route 9 NB – Preston Brook to Green Oaks Shopping Centre	11.20	10.70 to 12.84	217
Route 9 SB – Green Oaks Shopping Centre to Preston Brook	10.87	10.35 to 13.00	152
Route 10 NB – Daresbury Park to Garston	18.19	17.42 to 20.46	250
Route 10 SB – Garston to Daresbury Park	18.00	17.22 to 20.36	259
Route 11 EB – M53 J3 to Wavertree Business Park (via Queensway)	14.64	13.92 to 18.63	73
Route 11 WB – Wavertree Business Park to M53 J3 (via Queensway)	14.64	13.94 to 17.80	78
Route 12 EB – M53 J3 to Wavertree Business Park (via Kingsway)	16.08	15.29 to 19.89	227
Route 12 WB – Wavertree Business Park to M53 J3 (via Kingsway)	15.28	14.57 to 18.12	520
Route 13 NB – M56 J10 to M62 J9 (via M6)	11.28	10.78 to 12.89	4,636
Route 13 SB – M62 J9 to M56 J10 (via M6)	12.46	11.91 to 14.24	4,747
Route 14 NB - M56 J10 to Smith Street (Warrington)	9.77	9.29 to 12.09	138
Route 14 SB - Smith Street (Warrington) to M56 J10	9.39	8.94 to 11.46	102
Route 15 NB – M6 J20 to A49 Winwick Road	12.25	11.69 to 14.27	54
Route 15 SB – A49 Winwick Road to M6 J20	11.96	11.41 to 14.02	65
Route 16 NB – A56 Chester Road to A49 Mersey Street	5.57	5.30 to 6.71	279
Route 16 SB – A49 Mersey Street to A56 Chester Road	5.17	4.92 to 6.19	160
Route 17 – A57 Sankey Way to A5060 Chester Road	6.21	5.91 to 7.57	131
Route 18 – A5060 Chester Road to A57 Sankey Way	5.56	5.29 to 6.98	187
Total *	**337.84**		

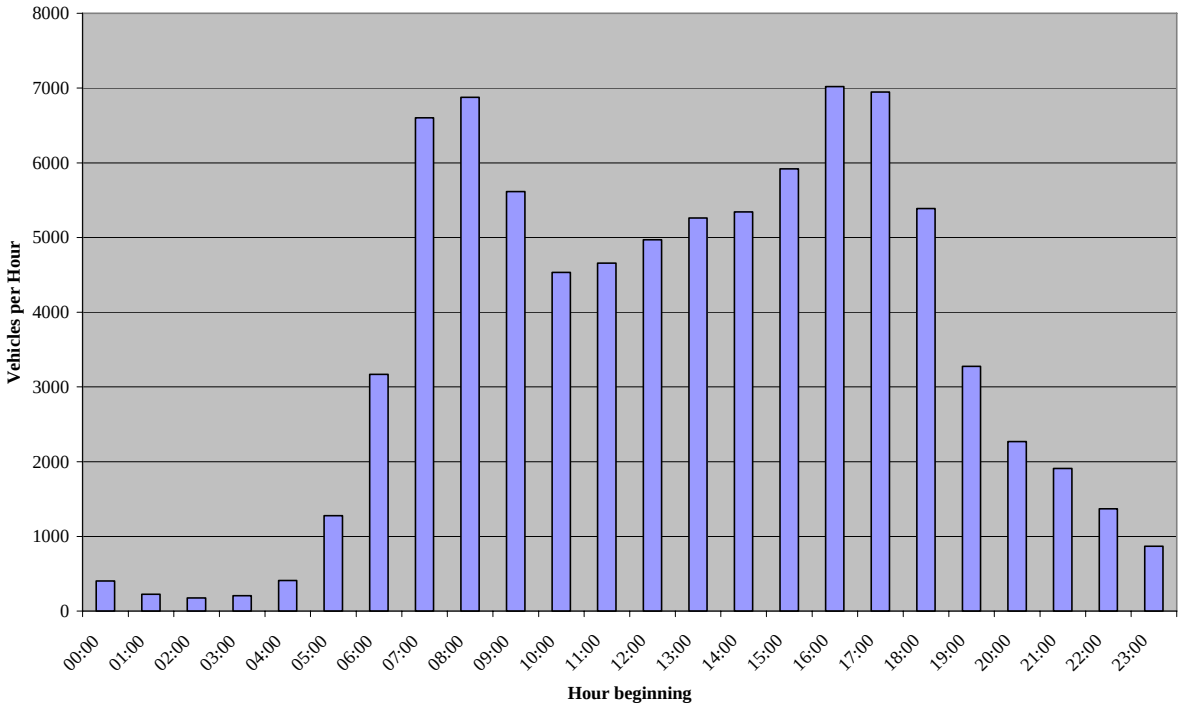
Notes: Refer to Figure 3.5 for illustration of available journey time routes
* Total excludes routes with only CJAMS journey time information

Table 3.11 - Observed Values of Time from SP Survey (pence per minute per person)

Market segment	Value of driver's time (VoT) (p/min)	Webtag (VoT) (p/min – Market Price))
Car - Commuting		9.1
Low income	4.9	
Medium income	8.1	
High income	9.3	
Car - Employer Business		
All	10.9	46.09
Car - Other		8.1
Low income	4.5	
Medium income	5.7	
High income	6.9	

Note: All values are for 2006 Base Year in 2006 prices

Figure 3.1 - Observed Temporal Distribution of Average Weekday 2-way Traffic Volumes across SJB



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0 2.5 5
miles

Notes

Key

RSI Cordon

Historic RSI site

New RSI site

Simulation Area

Model Area

Rev	Date	Drawn	Description	Chkd	App'd
P1	26/01/09	TA	For Issue	JH	HF

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Figure 3.2 - Location of RSIs and Cordons

Drawn	TA			
Dwg. Chk.	JH	Approved	HF	
Scale at A3 NTS	Project Mersey Gateway			Status PRE
	File			
Drawing No.	231775/TP/			Rev P1

N

0 2.5 5
miles

Notes

Key

Local Authority Boundary

Traffic Count

Rev	Date	Drawn	Description	Ch'ked	App'd
P1	25/06/2007	GD	For Issue	DOB	CS

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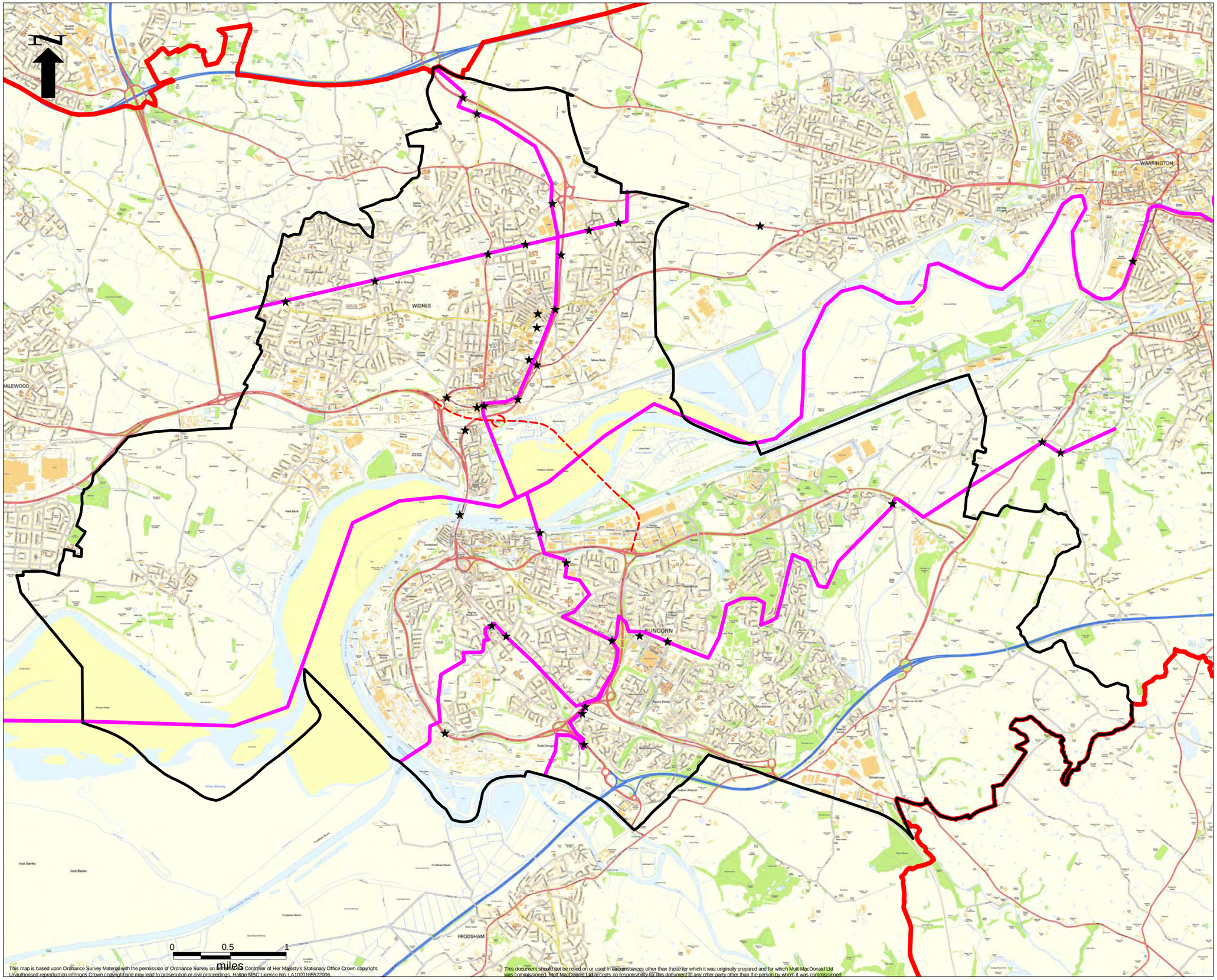
Mersey Gateway Study

Figure 3.3 - Location of Traffic Counts

Drawn	GD			
Dwg. Chk.	DOB	Approved	CS	
Scale at A3 NTS	Project Mersey Gateway			Status PRE
	File P:\Manchester\Northwest\Projects\ (Odd)\227709 Mersey Gateway\TP\5.0 Technical\5.4 Technical Notes\Maps\fig plans for report			
Drawing No. 231775/TP/				Rev P1



Notes

Key

Halton Boundary

Screenline

Screenline Counts

Simulation Area

Rev	Date	Drawn	Description	Ch'ked	App'd
P1	25/06/07	GD	For Issue	DOB	CS

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Mersey Gateway Study

Figure 3.4 - Location of Traffic Counts on Halton Validation Screenlines

Drawn	GD			
Dwg. Chk.	DOB	Approved	CS	
Scale at A3 NTS	Project Mersey Gateway			Status PRE
	File P:\Manchester\Northwest\Projects\Gtd\237709 Mersey Gateway\TP\5.0 Technical\5.4 Technical Notes\Maps\fig plans for report			
Drawing No. 231775/TP/				Rev P1

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miles

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Notes

Key

- Route 17
- Route 5
- Route 16
- Route 8
- Route 15
- Route 9
- Route 4
- Route 10
- Route 3
- Route 11
- Route 1
- Route 12
- Route 2
- Route 13
- Route 6
- Route 18
- Route 7
- Route19
- Route 14
- Route20

Rev	Date	Drawn	Description	Ch'ked	App'd
P1	09/12/08	TA	For Issue	DOB	CS

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Mersey Gateway Study

Figure 3.5 - Journey time routes adopted for validation

Drawn	TA			
Dwg. Chk.	DOB	Approved	CS	
Scale at A3 NTS	Project Mersey Gateway			Status PRE
	File			
Drawing No. 231775/TP/				Rev P1

Chapter 4 Tables and Figures

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Table 4.1 - Definition of External Zones

External Zone	Area, District, County or Region	Centroid Connector Distance (km)	Centroid Connector Speed (kph)
801	Bolton	16.8	48.0
802	Bury	20.8	48.0
803	Rochdale	29.2	48.0
804	Oldham	27.2	48.0
805	Tameside	30.0	48.0
806	Stockport	24.3	48.0
807	Manchester	17.6	48.0
808	Trafford	10.4	48.0
809	Salford	9.4	48.0
810	Ormskirk, Burscough	9.0	48.0
811	Lancashire	42.1	48.0
812	Yorkshire	50.0	48.0
813	Humberside	50.0	48.0
814	East Midlands	50.0	48.0
815	Macclesfield	17.7	48.0
816	Cumbria	50.0	67.0
817	North East	50.0	67.0
818	West Midlands	50.0	72.0
819	Congleton	23.4	48.0
820	Nantwich, Crewe	32.0	48.0
821	North Wales	36.2	48.0
822	Scotland	50.0	79.0
823	South East	50.0	71.0
824	London	50.0	61.0
825	South West	50.0	74.0
826	South Wales	50.0	59.0
827	Mid Wales	50.0	48.0
828	West Cheshire	7.4	48.0

Table 4.2– Distribution of Households by Income Group

Income group	Total Number of Households	Percentage of Total Households	Car owning Households	Percentage of Car owning Households
Low Household Income <£15,000 pa	197,939	52.5%	86,629	35.2%
Medium Household Income >= £15,000 pa and < £30,000 pa	90,567	24.0%	74,740	30.4%
High Household Income >= £30,000 pa	88,649	23.5%	84,544	34.4%
Total	**377,155**	**100.0%**	**245,913**	**100.0%**

Source: Merseyside Household Travel Interview Survey (2006)

Table 4.3 - Distribution of Car Trips by Income Group

Household Income Group (£ pa)	Home based commute	Home based education	Home based shopping	Home based other	NHB employers business	NHB other	Total Car Trips	%age
Low <£15,000	64,013	55,173	115,333	235,538	2,750	93,367	566,174	28.4%
Medium >= £15,000 and < £30,000	141,546	70,661	106,321	224,552	5,851	78,398	627,329	31.4%
High >= £30,000	236,537	76,854	92,705	276,671	14,100	106,058	802,925	40.2%
Total	**442,096**	**202,688**	**314,359**	**736,761**	**22,701**	**277,823**	**1,996,428**	**100%**
Percentage	**22.1%**	**10.2%**	**15.7%**	**36.9%**	**1.1%**	**13.9%**	**100%**	

Source: Merseyside Household Travel Interview Survey (2006)

Table 4.4 – Distribution of Households by Car Ownership

Car Ownership	Number of Households	Percentage
No car	136,776	36.3%
1 car	145,338	38.5%
2+ cars	95,040	25.2%
Total	**377,154**	**100.0%**

Table 4.5 – Factors to Convert from 24 hour to Period Matrices

Purpose	Morning Peak (07:00 - 10:00)		Inter Peak (10:00 - 16:00)		Evening Peak (16:00 – 19:00)		Overnight (19:00 – 07:00)	
	From Home	To Home	From Home	To Home	From Home	To Home	From Home	To Home
HB Commute	0.363	0.012	0.052	0.089	0.019	0.313	0.081	0.071
HB Education	0.425	0.070	0.122	0.252	0.024	0.085	0.007	0.014
HB Shopping	0.068	0.016	0.303	0.316	0.058	0.143	0.038	0.058
HB Other	0.090	0.029	0.166	0.153	0.124	0.125	0.108	0.205
HB Employer's Business	0.258	0.020	0.128	0.191	0.041	0.313	0.048	0.000
NHB Employer's Business	0.140		0.600		0.197		0.062	
NHB Other	0.243		0.490		0.191		0.076	

Table 4.6 - Sector Definitions

25 series Sector	Description	18 series Sector	Description	Includes 25 series Sectors
1	Widnes	1	Widnes	1
2	Runcorn	2	Runcorn	2
3	West Warrington	3	West Warrington	3
4	Warrington	4	Warrington	4
5	South Warrington	5	South Warrington	5
6	East Warrington	6	East Warrington	6
7	South Liverpool	7	South Liverpool	7
8	Birkenhead Town Centre	8	Birkenhead Town Centre	8
9	East Wirral	9	East Wirral	9
10	South Widnes	10	South Widnes	10
11	Liverpool	11	Liverpool	11
12	West Wirral	12	South Knowsley	14
13	Ellesmere Port	13	Ellesmere Port	13
14	South Knowsley	14	West Wirral & Wales	12, 21, 22, 23, 25
15	North Liverpool, Sefton	15	St Helens & South Lancashire	15, 16, 17
16	St Helens	16	North	18
17	South Lancashire	17	East	19, 24
18	Cumbria & Scotland	18	The South	20
19	Yorkshire & The Humber			
20	England South			
21	Wales			
22	Vale Royal			
23	Northwich			
24	Greater Manchester			
25	Chester			

Table 4.7 - Schedule of RSI Sites used in Matrix Building

ID	Description	Location
1	Warrington Site 1	A50 Kingsway North northbound
2	Warrington Site 2	A57 Manchester Road westbound
3	Warrington Site 3	A574 Birchwood Way westbound
4	Warrington Site 4	A5060 Chester Road northbound
5	Warrington Site 5	A49 Wilderspool Causeway northbound
6	Warrington Site 6	A574 Cromwell Avenue southbound
7	Warrington Site 7	A57 Sankey Way eastbound
8	Warrington Site 8	A49 Newton Road southbound
9	Warrington Site 9	A5061 Knutsford Road westbound
10	Birkenhead Site1	New Chester Road
11	Birkenhead Site2	Old Chester Road
12	Birkenhead Site3	Church Road
13	Birkenhead Site4	A552 Borough Road

ID	Description	Location
14	Birkenhead Site5	Oxton Road
15	Birkenhead Site6	Park Road South
16	Birkenhead Site7	Park Road North
17	Birkenhead Site8	Laird Street
18	Birkenhead Site9	Corporation Road
19	Birkenhead Site10	Duke Street
20	Birkenhead Site11	Tower Road
21	Birkenhead Site12	Queensway Tunnel
22	South Liverpool Site101	A561 Garston Way eastbound
24	South Liverpool Site103	Long Lane
25	South Liverpool Site104	B5180 Mather Avenue
26	South Liverpool Site105	Allerton Road
27	South Liverpool Site201	Menlove Avenue
28	South Liverpool Site202	B5171 Allerton High Street westbound
29	South Liverpool Site203	Speke Road southbound
31	South Liverpool Site301	Hollies Road southbound
32	South Liverpool Site302	Baileys Lane southbound
33	South Liverpool Site303	Lower Road
37	South Liverpool Site404	Hale Road southbound
40	Omega Site13	Gemini Link Road westbound
41	Omega Site14	Gemini Link Road eastbound
42	Omega Site15	Burtonwood Road (south) northbound
43	Omega Site16	Burtonwood Road (south) southbound
65	MottMac Site1	Kingsway Tunnel eastbound
66	MottMac Site2	SJB approach (A577)
67	MottMac Site3	SJB approach (A573) northbound
68	MottMac Site4	Rocksavage Expressway southbound
69	MottMac Site5	Whitehouse Expressway
70	MottMac Site5a	Wood Lane southbound
71	MottMac Site6	A56 Chester Road (Daresbury) northbound
73	MottMac Site8	A56 Chester Road southbound
74	MottMac Site9	Gemini Retail Park
75	MottMac Site10	Widnes Road (Warrington) westbound
76	MottMac Site11	A569 Clock Face Road southbound
77	MottMac Site12	B5429 Jubits Lane southbound
78	MottMac Site13	A57 Warrington Road eastbound
79	MottMac Site14	A557 Watkinson Road eastbound
80	MottMac Site15	A5080 Cronton Road (crossroads) eastbound
81	MottMac Site16	B5178 Liverpool Road eastbound
82	MottMac Site17	Moor Lane South eastbound
83	MottMac Site18	A562 Ashley Way West eastbound
84	Chester Site 1	A41 Liverpool Road southbound

ID	Description	Location
85	Chester Site 2	A5032 Whitby Lane southbound
86	Chester Site 3	A56 Warrington Road westbound
93	Chester Site 10	A548 Sealand Road eastbound
94	Chester Site 11	A540 Parkgate Road southbound
501	Warrington Site 1T	Warrington site 1 transposed
502	Warrington Site 2T	Warrington site 2 transposed
503	Warrington Site 3T	Warrington site 3 transposed
504	Warrington Site 4T	Warrington site 4 transposed
505	Warrington Site 5T	Warrington site 5 transposed
506	Warrington Site 6T	Warrington site 6 transposed
507	Warrington Site 7T	Warrington site 7 transposed
508	Warrington Site 8T	Warrington site 8 transposed
509	Warrington Site 9T	Warrington site 9 transposed
510	Birkenhead Site1T	Birkenhead site 1 transposed
511	Birkenhead Site2T	Birkenhead site 2 transposed
512	Birkenhead Site3T	Birkenhead site 3 transposed
513	Birkenhead Site4T	Birkenhead site 4 transposed
514	Birkenhead Site5T	Birkenhead site 5 transposed
515	Birkenhead Site6T	Birkenhead site 6 transposed
516	Birkenhead Site7T	Birkenhead site 7 transposed
517	Birkenhead Site8T	Birkenhead site 8 transposed
518	Birkenhead Site9T	Birkenhead site 9 transposed
519	Birkenhead Site10T	Birkenhead site 10 transposed
520	Birkenhead Site11T	Birkenhead site 11 transposed
565	MottMac Site1T	MottMac site 1 transposed
566	MottMac Site2T	MottMac site 2 transposed
567	MottMac Site3T	MottMac site 3 transposed
568	MottMac Site4T	MottMac site 4 transposed
569	MottMac Site5T	MottMac site 5 transposed
570	MottMac Site5aT	MottMac site 5a transposed
571	MottMac Site6T	MottMac site 6 transposed
573	MottMac Site8T	MottMac site 8 transposed
574	MottMac Site9T	MottMac site 9 transposed
575	MottMac Site10T	MottMac site 10 transposed
576	MottMac Site11T	MottMac site 11 transposed
577	MottMac Site12T	MottMac site 12 transposed
578	MottMac Site13T	MottMac site 13 transposed
579	MottMac Site14T	MottMac site 14 transposed
580	MottMac Site15T	MottMac site 15 transposed
581	MottMac Site16T	MottMac site 16 transposed
582	MottMac Site17T	MottMac site 17 transposed
583	MottMac Site18T	MottMac site 18 transposed

ID	Description	Location
584	Chester Site 1T	Chester Site 1 transposed
585	Chester Site 2T	Chester Site 2 transposed
586	Chester Site 3T	Chester Site 3 transposed
593	Chester Site 10T	Chester Site 10 transposed
594	Chester Site 11T	Chester Site 11 transposed
1021	Birkenhead Site1021	Queensway tunnel eastbound (synthesised)
1035	South Liverpool Site1035	Speke Road westbound (synthesised)
1101	Chester Rake Lane	Rake Lane southbound (synthesised)
1102	Chester Rake Lane Transpose	Rake Lane (synthesised) transposed
12031	Synth Site3a	B5356 Daresbury Lane eastbound (synthesised)
12041	Synth Site4a	B5356 Daresbury Lane westbound (synthesised)
12051	Synth Site5a	Warrington Road southbound (synthesised)
12061	Synth Site6a	Warrington Road northbound (synthesised)
12091	Synth Site9a	Hale Road northbound (synthesised)
12101	Synth Site10a	Hale Road southbound (synthesised)
12131	Synth Site13a	Penny Lane southbound (synthesised)
12141	Synth Site14a	Penny Lane northbound (synthesised)
12171	Synth Site17a	A557 Widnes Eastern Bypass northbound (synthesised)
12191	Synth Site19a	Victoria Road northbound (synthesised)
12201	Synth Site20a	Victoria Road southbound (synthesised)
12211	Synth Site21a	House Lane northbound (synthesised)
12221	Synth Site22a	House Lane southbound (synthesised)
12231	Synth Site23a	A574 Cromwell Avenue westbound (synthesised)
12241	Synth Site24a	A574 Cromwell Avenue eastbound (synthesised)
12421	Synth Site42a	Garston Way (synthesised)
12461	Synth Site46a	Long Lane (synthesised)
12481	Synth Site48a	B5180 Mather Avenue northbound (synthesised)
12521	Synth Site52a	Menlove Avenue northbound (synthesised)
12541	Synth Site54a	B5171 Allerton High Street eastbound (synthesised)
12561	Synth Site56a	Speke Road northbound (synthesised)
12601	Synth Site60a	Hollies Road northbound (synthesised)
12621	Synth Site62a	Baileys Lane southbound (synthesised)
12641	Synth Site64a	Lower Road westbound (synthesised)
12661	Synth Site66a	Speke Road eastbound (synthesised)
12681	Synth Site68a	Hale Road northbound (synthesised)
1269	Synth Site69	Hilden Road westbound (synthesised)
1270	Synth Site70	Hilden Road eastbound (synthesised)

Table 4.8 - Example of Trip Factors used to Transpose Observed RSI trips

For Home based commute From Home		Return Hour	Proportion of trips Start Hour	
			07:00	08:00
Home based commute	To home	0:00	0	0.003
Home based commute	To home	4:00	0.004	0
Home based commute	To home	6:00	0.004	0
Home based commute	To home	8:00	0.004	0
Home based commute	To home	9:00	0.009	0.003
Home based commute	To home	10:00	0	0.009
Home based commute	To home	11:00	0.009	0.006
Home based commute	To home	12:00	0.017	0.022
Home based commute	To home	13:00	0.013	0.025
Home based commute	To home	14:00	0.017	0.015
Home based commute	To home	15:00	0.065	0.034
Home based commute	To home	16:00	0.361	0.183
Home based commute	To home	17:00	0.283	0.433
Home based commute	To home	18:00	0.109	0.121
Home based commute	To home	19:00	0.017	0.025
Home based commute	To home	20:00	0.022	0.003
Home based commute	To home	22:00	0.004	0

Table 4.9 - Site Specific Variance Factors

Factor	Description
2.5	if interviews have been factored to a MCC
0.5	if factored to an ATC
1	if total site flow is based on a 1-day count
0.5	if based on a 1-week count
0	if based on 2 weeks or more of data
1.5	if the survey day-of-week to average weekday factor (which may be equal to 1.0) is based on national or regional data
0	if based on local data
2.5	if a regional or national factor (which may be 1.0) has been applied to convert to a different month
0	if the data was collected in the correct month or a local conversion factor is available
6	for every year between data collection and model base, if regional or national growth factor (which may be 1.0) is applied
0	if a local growth factor is available
10	if reverse-direction flow has been assumed to be the same as measured flow
5	for interviews factored to a reverse-direction count
0	for the interviewed direction

Source: ERICA manual page 247.

Table 4.10 - Distribution of Households by Person Type – Study Area

Person type	Study Area *		England and Wales	
	Number of Households	Percentage	Number of Households	Percentage
One adult only, retired	107,993	15.2%	3,126,938	14.4%
One adult only, aged 16+, not retired	115,777	16.3%	3,377,573	15.6%
One adult only, aged 16+, one or more children aged 0-15	65,956	9.3%	1,401,081	6.5%
Two or more adults, all retired	59,001	8.3%	2,031,472	9.4%
Two or more adults, aged 16+, not all retired	204,932	28.9%	6,737,647	31.1%
Two or more adults, aged 16+, one or more children aged 0-15	154,862	21.9%	4,986,747	23.0%
Total	**708,521**	**100.0%**	**21,661,458**	**100.0%**

Table 4.11- CAS Household Composition to Mersey Gateway Household Composition

CAS Index	CAS Household	MG Index	Mersey Gateway Household
1	One Person - Pensioner	1	One adult only, retired
2	One Person - Other	2	One adult only, aged 16+, not retired
3	One Family - All Pensioners	4	Two or more adults, all retired
4	One Family - Couple Family Household - no children	5	Two or more adults, aged 16+, not all retired
5	One Family - Couple Family Household - with dependent child(ren)	6	Two or more adults, aged 16+, one or more children aged 0-15
6	One Family - Couple Family Household - all children non-dependent	5	Two or more adults, aged 16+, not all retired
7	One Family - Lone Parent Family Households - with dependent child(ren)	3	One adult only, aged 16+, one or more children aged 0-15
8	One Family - Lone Parent Family Households - all children non-dependent	5	Two or more adults, aged 16+, not all retired
9	Other households - with dependent child(ren)	6	Two or more adults, aged 16+, one or more children aged 0-15
10	Other households - all student	5	Two or more adults, aged 16+, not all retired
11	Other households - all pensioners	4	Two or more adults, all retired
12	Other households - other	5	Two or more adults, aged 16+, not all retired

Table 4.12 - Non home based trip rates relative to preceding home based trips

Trip Purpose From Home	Time Period	NHBEB Trip Rate *	NHBO Trip Rate *
Home based commute	AM Peak Period	0.08	0.13
Home based commute	Inter peak period	0.09	0.14
Home based commute	PM Peak Period	0.03	0.08
Home based commute	Overnight period	0.01	0.11
Home based education	AM Peak Period	0.0	0.44
Home based education	Inter peak period	0.0	0.36
Home based education	PM Peak Period	0.0	0.12
Home based education	Overnight period	0.0	0.86
Home based shopping	AM Peak Period	0.0	0.22
Home based shopping	Inter peak period	0.0	0.24
Home based shopping	PM Peak Period	0.0	0.16
Home based shopping	Overnight period	0.0	0.23
Home based other	AM Peak Period	0.01	0.66
Home based other	Inter peak period	0.0	0.46
Home based other	PM Peak Period	0.0	0.18
Home based other	Overnight period	0.02	0.10

Note: * trip rate is given as the number of person trips generated per person trip attraction for the preceding trip purpose from home.

Table 4.13 - Routing Parameters for SATURN as used in Matrix Synthesis

Vehicle type/Trip purpose	PPM	PPK
Car Commute	11.68	10.59
Car Other	15.16	10.59
Car Employer's Business	62.74	13.34
LGV	23.57	15.86
OGV	20.78	43.22

Table 4.14 - Model Period to Model Hour Factors

Model Period to Hour Factors	Factor
AM Peak Period to AM Peak Hour	0.360
Inter Peak Period to Inter Peak Hour	0.167
PM Peak Period to PM Peak Hour	0.353
Overnight Period to Overnight Hour	0.083

Table 4.15 - Number of Fully Observed Sector to Sector Trips – AM peak hour prior matrix - Car

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	Widnes	5709	607	184	267	65	104	304	6	23	156	162	14	19	125	222	320	67	10	18	72	43	13	40	209	5709
2	Runcorn	524	3338	78	450	425	111	177	6	38	71	115	34	54	24	106	132	48	27	34	196	64	26	241	420	524
3	West Warrington	153	126	1232	1157	34	270	59	5	7	7	119	11	5	33	121	399	110	33	36	55	3	3	14	356	153
4	Warrington	153	122	616	2481	425	756	21	2	5	9	47	6	18	16	45	207	232	27	35	126	20	5	10	208	153
5	South Warrington	73	311	47	756	3197	475	31	5	35	3	59	25	41	15	39	161	73	51	52	303	23	12	43	930	73
6	East Warrington	54	17	197	678	273	1576	21	2	20	3	95	3	3	35	126	262	128	31	23	132	14	4	13	369	54
7	South Liverpool	247	110	15	25	18	10	1039	8	36	26	936	34	17	574	362	83	29	6	17	30	27	3	5	83	247
8	Birkenhead	2	8	1	0	4	1	5	509	787	0	10	273	39	2	8	9	1	3	7	9	21	2	1	11	2
9	East Wirral	29	55	33	28	36	20	96	2412	9740	1	875	2378	825	66	477	90	41	32	70	150	344	86	20	343	29
10	South Widnes	64	30	5	5	5	5	10	0	2	12	6	0	3	3	8	15	4	3	0	3	0	0	0	8	64
11	Liverpool	70	92	39	41	25	74	834	58	393	3	8711	295	44	1106	3431	669	202	47	111	175	82	10	13	269	70
12	West Wirral	29	73	18	27	35	53	76	1400	3105	2	1154	7042	564	104	384	143	80	61	67	176	336	86	22	357	29
13	Ellesmere Port	26	73	20	35	29	29	16	89	618	0	185	365	1857	20	84	53	13	16	25	113	382	144	33	193	26
14	Knowsley	152	97	21	92	24	64	1203	19	88	10	3074	55	32	2980	2426	532	95	33	40	95	44	11	14	298	152
15	Sefton	167	154	112	78	92	125	549	29	184	9	6881	121	65	1234	20354	2563	958	113	121	207	53	14	21	380	167
16	St Helens	261	229	435	534	254	440	233	18	2	29	1307	38	35	408	3108	17358	1239	158	105	91	49	10	15	739	261
17	Lancashire	81	132	230	594	133	561	178	22	80	14	1211	41	23	93	2071	1891	0	0	0	665	32	16	8	0	81
18	The North	27	35	64	20	51	155	11	11	20	4	134	11	14	9	102	175	0	0	0	1215	43	15	1	0	27
19	The East	31	32	50	77	31	110	36	10	39	4	227	25	22	34	149	123	0	0	0	0	184	28	6	0	31
20	The South	109	398	92	266	275	414	156	33	87	17	245	63	138	29	156	206	342	730	0	0	0	0	91	0	109
21	Wales	23	100	29	36	36	70	59	58	196	7	159	205	472	18	109	36	66	103	402	0	0	0	23	783	23
22	West Cheshire	21	119	1	24	15	21	26	12	55	3	48	46	202	6	38	25	12	17	34	0	0	0	56	227	21
23	Vale Royal	97	327	5	44	64	35	28	6	35	8	70	22	70	22	57	67	13	10	16	190	45	53	744	204	97
24	Greater Manchester	192	530	377	523	397	661	195	83	181	19	367	69	235	50	203	430	0	0	0	0	409	156	50	0	192
25	Chester	57	96	9	47	41	14	34	18	51	4	70	270	512	8	41	16	5	5	6	20	390	122	41	106	57

Notes: -Cells shaded within the table are built from RSI cordons;
-Other cells are synthesised.

Table 4.16 - Number of Fully Observed Sector to Sector Trips – Interpeak hour prior matrix - Car

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	Widnes	2001	259	73	75	19	28	248	2	7	34	46	14	11	54	61	108	18	6	15	34	12	6	33	119	36
2	Runcorn	314	1003	36	95	126	40	66	2	4	28	27	8	41	22	39	58	21	13	50	95	18	13	134	287	32
3	West Warrington	68	33	355	500	74	230	18	1	6	4	21	6	4	15	58	228	58	23	41	73	5	2	5	318	4
4	Warrington	105	93	570	713	275	284	12	1	14	5	33	8	16	21	24	171	191	29	72	115	15	4	9	226	5
5	South Warrington	29	109	22	388	981	128	7	1	13	1	19	10	12	8	18	81	82	13	18	47	6	2	18	280	12
6	East Warrington	53	34	174	288	154	473	2	1	9	5	73	8	25	36	99	187	104	18	30	168	25	7	21	227	53
7	South Liverpool	128	51	9	11	5	14	279	3	13	4	270	17	10	297	166	54	28	3	15	41	21	3	8	67	9
8	Birkenhead	3	2	1	1	2	0	3	179	754	0	3	271	20	2	10	2	4	2	9	36	17	2	0	68	5
9	East Wirral	9	10	3	9	12	2	23	839	2696	0	214	780	187	25	100	27	42	4	20	29	40	11	8	107	44
10	South Widnes	71	24	8	9	1	9	12	1	1	3	3	1	0	5	7	20	8	1	7	2	5	0	0	52	0
11	Liverpool	46	31	5	30	18	56	332	35	223	1	2570	212	23	617	1447	290	139	17	89	50	46	5	10	148	12
12	West Wirral	9	15	2	4	9	8	10	305	693	2	164	2013	109	20	61	27	34	6	20	17	41	10	6	78	139
13	Ellesmere Port	12	23	2	5	13	23	13	24	190	0	51	122	424	8	32	20	6	3	15	21	71	29	13	118	320
14	Knowsley	55	17	5	9	7	25	356	5	29	2	537	19	7	870	446	138	16	3	16	12	4	1	6	62	3
15	Sefton	71	42	20	14	38	73	145	11	95	2	1385	75	25	584	5801	860	275	17	67	39	40	6	8	129	5
16	St Helens	119	69	86	146	108	131	63	3	0	5	286	25	12	145	792	4996	274	27	51	68	23	15	9	215	13
17	Lancashire	16	28	32	187	89	68	29	3	26	2	99	34	6	17	236	261	0	0	0	259	27	4	4	0	32
18	The North	6	20	10	32	15	12	18	4	9	1	13	8	4	4	18	27	0	0	0	603	49	11	4	0	38
19	The East	23	24	26	55	13	18	24	12	21	1	78	15	8	18	73	48	0	0	0	0	116	10	6	0	49
20	The South	42	79	34	63	49	95	37	25	33	1	41	22	20	18	48	63	272	609	0	0	0	0	25	0	24
21	Wales	11	24	1	5	5	18	18	20	47	5	29	47	67	9	28	20	11	11	179	0	0	0	6	338	238
22	West Cheshire	4	8	3	4	2	3	4	2	12	0	6	12	27	1	4	15	2	3	18	0	0	0	9	105	59
23	Vale Royal	26	121	5	6	16	18	11	0	8	0	3	6	12	6	14	16	2	1	4	20	5	9	213	43	42
24	Greater Manchester	157	323	248	203	237	165	203	103	121	47	136	67	85	96	180	264	0	0	0	0	282	86	67	0	154
25	Chester	32	32	5	12	16	34	6	10	41	0	15	146	311	1	11	12	11	3	53	25	256	74	35	195	0

Notes: -Cells shaded within the table are built from RSI cordons;
-Other cells are synthesised

Table 4.17 - Number of Fully Observed Sector to Sector Trips – PM Peak hour prior matrix – Car

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	Widnes	4532	524	154	162	65	69	370	2	23	53	102	34	25	160	169	310	85	15	24	83	30	21	84	119	64
2	Runcorn	653	2493	114	191	351	87	103	8	53	22	83	80	69	89	125	181	130	35	47	331	118	99	274	615	79
3	West Warrington	130	76	634	625	88	185	20	2	31	2	46	7	19	42	115	525	302	91	58	93	28	5	4	415	11
4	Warrington	349	215	1223	1451	613	621	33	4	24	9	51	31	33	65	59	382	619	40	76	271	33	18	36	572	35
5	South Warrington	66	296	60	472	1583	304	12	6	48	4	27	41	41	41	63	190	149	38	46	210	30	12	72	485	44
6	East Warrington	109	73	251	566	423	978	23	2	13	4	106	21	3	72	164	503	472	126	108	293	47	15	30	677	15
7	South Liverpool	340	125	68	15	16	21	633	8	69	6	697	81	24	880	747	257	132	14	37	192	116	23	28	121	28
8	Birkenhead	10	12	4	2	6	1	14	468	2082	0	7	1007	69	11	9	12	41	1	13	36	47	8	3	81	7
9	East Wirral	32	37	9	7	42	12	32	1413	5949	0	409	2420	554	134	292	67	107	20	45	77	164	45	38	155	52
10	South Widnes	214	52	21	13	3	8	32	0	3	6	7	4	0	12	14	55	23	8	7	13	7	3	8	40	3
11	Liverpool	155	128	119	43	48	110	672	115	881	2	6647	853	79	2376	5591	1310	966	107	223	174	195	26	57	346	55
12	West Wirral	14	31	6	4	33	13	26	519	2276	3	431	4625	401	68	178	33	115	17	40	51	170	38	27	71	248
13	Ellesmere Port	24	67	7	9	50	19	23	61	797	3	173	569	1652	38	141	77	28	10	34	108	383	163	68	229	580
14	Knowsley	144	46	21	14	21	47	552	14	96	2	1210	72	26	1590	1093	481	76	8	33	28	24	5	26	54	2
15	Sefton	178	108	135	52	127	139	480	45	383	3	3641	320	61	1596	12674	2615	1672	84	147	122	117	25	40	207	31
16	St Helens	320	157	476	232	304	291	126	7	0	6	995	107	19	602	2706	11249	1540	143	118	70	46	22	29	414	9
17	Lancashire	86	64	134	343	72	111	35	27	64	4	195	107	12	79	841	1077	0	0	0	246	54	12	10	0	6
18	The North	14	24	32	57	41	29	7	9	50	3	41	37	11	27	92	130	0	0	0	516	75	11	6	0	4
19	The East	13	40	33	110	44	26	18	3	60	0	120	53	22	38	136	118	0	0	0	0	348	29	15	0	12
20	The South	88	169	55	168	250	127	121	35	144	4	166	141	93	88	170	200	488	872	0	0	0	0	154	0	35
21	Wales	63	71	5	28	19	14	112	18	278	0	71	271	314	52	57	77	49	32	308	0	0	0	36	456	1099
22	West Cheshire	20	62	2	17	10	3	30	1	70	0	12	70	119	9	22	10	12	11	42	0	0	0	43	153	262
23	Vale Royal	35	226	13	9	49	15	16	2	29	4	26	27	41	23	49	57	6	1	12	75	19	45	428	61	47
24	Greater Manchester	201	362	417	670	770	395	78	47	253	5	249	244	145	227	388	751	0	0	0	0	591	174	160	0	138
25	Chester	37	64	15	13	25	13	19	17	155	0	45	444	853	15	38	21	32	13	58	53	1512	252	84	280	0

Notes: -Cells shaded within the table are built from RSI cordons;
-Other cells are synthesised

Table 4.18 - Derived 2006 vehicle occupancies by Time Period and Purpose

AM peak	Car trips	Person trips	Occupancy
HB Commute	28,920	36,534	1.26
HB Education	5,445	6,871	1.26
HB Shopping	2,631	3,689	1.40
HB Other	5,911	9,259	1.57
HB Employer's Business	1,360	1,634	1.20
NHB Employer's Business	3,705	4,817	1.30
NHB Other	4,635	6,483	1.40
Average	**52,607**	**69,287**	**1.32**
Inter peak	Car trips	Person trips	Occupancy
HB Commute	7,314	10,081	1.38
HB Education	1,396	1,801	1.29
HB Shopping	3,733	5,826	1.56
HB Other	6,510	11,262	1.73
HB Employer's Business	1,520	2,195	1.44
NHB Employer's Business	4,223	5,488	1.30
NHB Other	5,721	8,210	1.44
Average	**30,417**	**44,862**	**1.47**
PM peak	Car trips	Person trips	Occupancy
HB Commute	13,842	17,395	1.26
HB Education	700	908	1.30
HB Shopping	1,498	2,457	1.64
HB Other	6,521	10,715	1.64
HB Employer's Business	557	647	1.16
NHB Employer's Business	2,033	2,658	1.31
NHB Other	3,823	5,810	1.52
Average	**28,974**	**40,590**	**1.40**

Table 4.19 - Adjustment Factors applied to Specific Zones

Zone	Location	LGV	HGV	Comment
1	Runcorn	0.5	0.5	Cemetery
3	Runcorn	5	5	Market place
12	Runcorn	0.5	0.5	Canal
54	Runcorn	0.01	0.01	Service area
73	Runcorn	1	0.1	Farms
74	Runcorn	1	0.1	Farms
144	Halton	10	10	Shopping centre
189	St. Helens	0.15	0.15	Farms
193	St. Helens	0.02	0.02	Farms
212	Warrington	2	2	Warehouse & depot
213	Warrington	2	2	Warehouse & depot
250	Warrington	0.1	0.1	Farms
251	Warrington	0.1	0.1	Farms
259	Warrington	0.01	0.01	Service area
273	Warrington	0.01	0.01	Farms
294	Wirral	2	2	Dock side
437	Vale Royal	0.5	0.5	Schools
480	Wigan	0.2	0.2	Farms
484	Vale Royal	0.1	0.1	Farms
490	Warrington	0.5	0.5	Residential area

Table 4.20 - Effect of Goods Vehicle Initial Matrix Estimation

	Prior Matrix		Estimated Matrix	
AM Peak	**LGV**	**HGV**	**LGV**	**HGV**
GEH<5	237	328	410	419
GEH<8	354	392	442	458
GEH<10	399	415	450	465
Total Number of Counts	476	476	476	476
% sites with GEH<5	49.8%	68.9%	86.1%	88.0%
% sites with GEH<8	74.4%	82.4%	92.9%	96.2%
% sites with GEH<10	83.8%	87.2%	94.5%	97.7%
Inter Peak	**LGV**	**HGV**	**LGV**	**HGV**
GEH<5	249	298	389	390
GEH<8	363	348	424	421
GEH<10	393	376	432	434
Total Number of Counts	444	444	444	444
% sites with GEH<5	56.1%	67.1%	87.6%	87.8%
% sites with GEH<8	81.8%	78.4%	95.5%	94.8%
% sites with GEH<10	88.5%	84.7%	97.3%	97.7%
PM Peak	**LGV**	**HGV**	**LGV**	**HGV**
GEH<5	255	330	413	423
GEH<8	374	409	455	464
GEH<10	413	429	467	469
Total Number of Counts	476	476	476	476
% sites with GEH<5	53.6%	69.3%	86.8%	88.9%
% sites with GEH<8	78.6%	85.9%	95.6%	97.5%
% sites with GEH<10	86.8%	90.1%	98.1%	98.5%

Table 4.21 Comparison of Goods Vehicle Matrices before and after initial Matrix Estimation – AM peak hour

Sector	LGV Trip Origins prior to ME (veh)	LGV Trip Origins post ME (veh)	LGV Absolute Difference	LGV Percentage Difference	HGV Trip Origins prior to ME (veh)	HGV Trip Origins post ME (veh)	HGV Absolute Difference	HGV Percentage Difference
1 Widnes	865	1,036	171	19.8%	381	370	-11	-2.9%
2 Runcorn	1,453	1,543	90	6.2%	528	616	88	16.7%
3 West Warrington	420	611	191	45.5%	149	184	35	23.5%
4 Warrington	1,486	1,347	-139	-9.4%	687	640	-47	-6.8%
5 South Warrington	798	654	-144	-18.0%	358	454	96	26.8%
6 East Warrington	446	214	-232	-52.0%	272	243	-29	-10.7%
7 South Liverpool	1,084	1,075	-9	-0.8%	373	436	63	16.9%
8 Birkenhead	278	488	210	75.5%	137	209	72	52.6%
9 East Wirral	1,251	2,339	1,088	87.0%	559	822	263	47.0%
10 South Widnes	146	173	27	18.5%	48	57	9	18.8%
11 Liverpool	3,085	3,308	223	7.2%	891	1,006	115	12.9%
12 South Knowsley	869	904	35	4.0%	196	198	2	1.0%
13 Ellesmere Port	440	632	192	43.6%	193	275	82	42.5%
14 W Wirral & Wales	5,242	3,663	-1,579	-30.1%	846	927	81	9.6%
15 St Helens & Sth Lancs	10,620	10,222	-398	-3.7%	3,384	4,213	829	24.5%
16 North	523	427	-96	-18.4%	145	192	47	32.4%
17 East	6,716	5,374	-1,342	-20.0%	2,514	2,584	70	2.8%
18 The South	4,065	3,865	-200	-4.9%	643	1,105	462	71.9%
Total	**39,788**	**37,874**	**-1,914**	**-4.8%**	**12,304**	**14,530**	**2,226**	**18.1%**

Table 4.22 Comparison of Goods Vehicle Matrices before and after initial Matrix Estimation – Inter peak hour

Sector	LGV Trip Origins prior to ME (veh)	LGV Trip Origins post ME (veh)	LGV Absolute Difference	LGV Percentage Difference	HGV Trip Origins prior to ME (veh)	HGV Trip Origins post ME (veh)	HGV Absolute Difference	HGV Percentage Difference
1 Widnes	687	827	140	20.4%	377	554	177	46.9%
2 Runcorn	1,154	1,203	49	4.2%	524	815	291	55.5%
3 West Warrington	334	365	31	9.3%	148	194	46	31.1%
4 Warrington	1,180	1,099	-81	-6.9%	685	813	128	18.7%
5 South Warrington	634	518	-116	-18.3%	356	417	61	17.1%
6 East Warrington	354	294	-60	-16.9%	271	282	11	4.1%
7 South Liverpool	861	1,017	156	18.1%	371	541	170	45.8%
8 Birkenhead	221	310	89	40.3%	136	217	81	59.6%
9 East Wirral	994	1,711	717	72.1%	499	884	385	77.2%
10 South Widnes	116	156	40	34.5%	48	97	49	102.1%
11 Liverpool	2,450	3,107	657	26.8%	888	1,414	526	59.2%
12 South Knowsley	690	839	149	21.6%	195	301	106	54.4%
13 Ellesmere Port	349	520	171	49.0%	181	286	105	58.0%
14 W Wirral & Wales	4,163	4,266	103	2.5%	880	1,335	455	51.7%
15 St Helens & Sth Lancs	8,434	8,534	100	1.2%	3,445	4,984	1,539	44.7%
16 North	415	457	42	10.1%	185	325	140	75.7%
17 East	5,334	5,789	455	8.5%	2,513	3,164	651	25.9%
18 The South	3,228	3,614	386	12.0%	1,669	2,177	508	30.4%
Total	**31,596**	**34,625**	**3,029**	**9.6%**	**13,372**	**18,800**	**5,428**	**40.6%**

Table 4.23 Comparison of Goods Vehicle Matrices before and after initial Matrix Estimation – PM peak hour

Sector	LGV Trip Origins prior to ME (veh)	LGV Trip Origins post ME (veh)	LGV Absolute Difference	LGV Percentage Difference	HGV Trip Origins prior to ME (veh)	HGV Trip Origins post ME (veh)	HGV Absolute Difference	HGV Percentage Difference
1 Widnes	903	881	-22	-2.4%	364	382	18	4.9%
2 Runcorn	1,517	1,365	-152	-10.0%	506	557	51	10.1%
3 West Warrington	439	412	-27	-6.2%	143	131	-12	-8.4%
4 Warrington	1,552	1,159	-393	-25.3%	661	584	-77	-11.6%
5 South Warrington	833	536	-297	-35.7%	343	292	-51	-14.9%
6 East Warrington	466	318	-148	-31.8%	262	197	-65	-24.8%
7 South Liverpool	1,131	1,059	-72	-6.4%	358	407	49	13.7%
8 Birkenhead	290	367	77	26.6%	131	155	24	18.3%
9 East Wirral	1,307	1,851	544	41.6%	481	592	111	23.1%
10 South Widnes	152	205	53	34.9%	46	68	22	47.8%
11 Liverpool	3,221	3,429	208	6.5%	856	1,030	174	20.3%
12 South Knowsley	908	858	-50	-5.5%	188	231	43	22.9%
13 Ellesmere Port	459	583	124	27.0%	174	194	20	11.5%
14 W Wirral & Wales	5,473	4,772	-701	-12.8%	849	907	58	6.8%
15 St Helens & Sth Lancs	11,089	9,673	-1,416	-12.8%	3,321	3,379	58	1.7%
16 North	546	517	-29	-5.3%	178	215	37	20.8%
17 East	7,013	6,162	-851	-12.1%	2,424	2,199	-225	-9.3%
18 The South	4,244	3,863	-381	-9.0%	1,609	1,518	-91	-5.7%
Total	**41,543**	**38,009**	**-3,534**	**-8.5%**	**12,894**	**13,039**	**145**	**1.1%**

Table 4.24 - Comparison of Goods Vehicle Flows across the River Mersey – AM Peak Hour

Link Description	Dir	Observed Traffic Count (vehicles)		Model Traffic Flow (vehicles)		% Diff		GEH	
		LGV	HGV	LGV	HGV	LGV	HGV	LGV	HGV
Kingsway Tunnel	nb	166	117	164	129	-1.0%	10.7%	0.13	1.12
Queensway Tunnel *	nb	171	0	113	0	-33.9%	0.0%	4.87	0.00
Silver Jubilee Bridge	nb	366	193	295	136	-19.3%	-29.7%	3.89	4.47
A5060 Chester Road	nb	54	35	53	35	-2.9%	-0.9%	0.21	0.06
A49 Wilderspool Causeway	nb	26	33	26	34	0.3%	3.0%	0.01	0.17
A5061 Knutsford Road	nb	48	33	41	129	-14.2%	288.3%	1.01	10.62
A50 Kingsway Bridge	nb	64	27	36	19	-44.0%	-28.8%	3.99	1.62
M6 Thelwall Viaduct	nb	570	905	583	875	2.2%	-3.3%	0.53	0.99
Sub-Total	**nb**	**1,464**	**1343**	**1,310**	**1357**	**-10.5%**	**1.0%**	**4.14**	**0.38**
Kingsway Tunnel	sb	185	144	214	173	16.2%	20.4%	2.12	2.33
Queensway Tunnel *	sb	185	0	190	0	2.6%	0.0%	0.35	0.00
Silver Jubilee Bridge	sb	346	182	330	159	-4.5%	-12.8%	0.84	1.78
A5060 Chester Road	sb	75	31	62	57	-17.1%	86.6%	1.55	4.02
A49 Wilderspool Causeway	sb	35	14	18	10	-47.4%	-29.8%	3.20	1.21
A5061 Knutsford Road	sb	45	21	35	20	-21.6%	-4.2%	1.53	0.19
A50 Kingsway Bridge	sb	90	46	93	34	3.2%	-25.1%	0.30	1.82
M6 Thelwall Viaduct	sb	560	940	553	923	-1.2%	-1.9%	0.28	0.57
Sub-Total	**sb**	**1,520**	**1378**	**1,496**	**1376**	**-1.5%**	**-0.1%**	**0.60**	**0.03**
Total	**2-way**	**2,984**	**2721**	**2,807**	**2733**	**-6.0%**	**0.5%**	**3.30**	**0.24**

Note: * HGVs are banned from the Queensway Tunnel

Table 4.25 - Comparison of Goods Vehicle Flows across the River Mersey – Inter Peak Hour

Link Description	Dir	Observed Traffic Count (vehicles)		Model Traffic Flow (vehicles)		% Diff		GEH	
		LGV	HGV	LGV	HGV	LGV	HGV	LGV	HGV
Kingsway Tunnel	nb	144	126	134	184	-7.4%	46.2%	0.90	4.67
Queensway Tunnel *	nb	112	0	136	0	21.5%	0.0%	2.16	0.00
Silver Jubilee Bridge	nb	352	319	324	207	-7.8%	-35.0%	1.50	6.88
A5060 Chester Road	nb	58	42	73	55	26.4%	29.1%	1.88	1.77
A49 Wilderspool Causeway	nb	39	22	34	22	-11.5%	2.1%	0.74	0.10
A5061 Knutsford Road	nb	55	39	56	217	2.2%	448.7%	0.16	15.65
A50 Kingsway Bridge	nb	68	26	35	17	-48.6%	-34.3%	4.60	1.92
M6 Thelwall Viaduct	nb	682	1161	706	1091	3.6%	-6.0%	0.92	2.09
Sub-Total	**nb**	**1,509**	**1735**	**1,498**	**1793**	**-0.7%**	**3.3%**	**0.28**	**1.36**
Kingsway Tunnel	sb	166	126	145	177	-12.8%	40.2%	1.71	4.12
Queensway Tunnel *	sb	94	0	177	0	88.6%	0.0%	7.15	0.00
Silver Jubilee Bridge	sb	355	322	350	306	-1.4%	-4.9%	0.26	0.89
A5060 Chester Road	sb	69	42	63	73	-8.7%	75.6%	0.74	4.16
A49 Wilderspool Causeway	sb	45	24	43	20	-4.5%	-18.6%	0.31	0.96
A5061 Knutsford Road	sb	37	31	31	43	-15.3%	38.1%	0.97	1.95
A50 Kingsway Bridge	sb	53	35	39	34	-26.8%	-3.8%	2.10	0.23
M6 Thelwall Viaduct	sb	643	1009	627	967	-2.5%	-4.2%	0.64	1.35
Sub-Total	**sb**	**1,463**	**1589**	**1,476**	**1619**	**0.9%**	**1.9%**	**0.34**	**0.75**
Total	**2-way**	**2,972**	**3324**	**2,974**	**3412**	**0.1%**	**2.6%**	**0.04**	**1.51**

Note: * HGVs are banned from the Queensway Tunnel

Table 4.26 - Comparison of Goods Vehicle Flows across the River Mersey – PM Peak Hour

Link Description	Dir	Observed Traffic Count (vehicles)		Model Traffic Flow (vehicles)		% Diff		GEH	
		LGV	HGV	LGV	HGV	LGV	HGV	LGV	HGV
Kingsway Tunnel	nb	174	90	114	137	-34.5%	52.6%	5.00	4.43
Queensway Tunnel *	nb	220	0	168	0	-23.7%	0.0%	3.74	0.00
Silver Jubilee Bridge	nb	435	231	350	158	-19.6%	-31.6%	4.30	5.24
A5060 Chester Road	nb	79	22	65	27	-17.7%	24.4%	1.65	1.08
A49 Wilderspool Causeway	nb	24	18	23	18	-4.4%	-0.4%	0.22	0.02
A5061 Knutsford Road	nb	42	29	59	83	42.7%	191.0%	2.50	7.30
A50 Kingsway Bridge	nb	69	16	47	14	-32.1%	-13.8%	2.91	0.57
M6 Thelwall Viaduct	nb	820	970	824	934	0.6%	-3.8%	0.16	1.18
Sub-Total	**nb**	**1,862**	**1375**	**1,650**	**1370**	**-11.4%**	**-0.3%**	**5.06**	**0.13**
Kingsway Tunnel	sb	349	81	302	90	-13.5%	11.6%	2.61	1.01
Queensway Tunnel *	sb	198	0	117	0	-41.1%	0.0%	6.49	0.00
Silver Jubilee Bridge	sb	419	222	372	164	-11.3%	-26.3%	2.37	4.20
A5060 Chester Road	sb	94	17	91	27	-3.1%	58.3%	0.30	2.14
A49 Wilderspool Causeway	sb	23	19	12	11	-46.5%	-42.6%	2.52	2.09
A5061 Knutsford Road	sb	53	32	46	30	-12.9%	-7.0%	0.97	0.40
A50 Kingsway Bridge	sb	45	18	28	22	-38.3%	21.9%	2.86	0.88
M6 Thelwall Viaduct	sb	788	796	778	773	-1.3%	-2.9%	0.36	0.83
Sub-Total	**sb**	**1,969**	**1185**	**1,745**	**1117**	**-11.3%**	**-5.8%**	**5.18**	**2.02**
Total	**2-way**	**3,831**	**2560**	**3,395**	**2487**	**-11.4%**	**-2.9%**	**7.24**	**1.46**

Note: * HGVs are banned from the Queensway Tunnel

Table 4.27 - Number of Fully Observed Sector to Sector Trips – AM peak hour prior matrix - LGV

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	Widnes	662	65	10	45	4	4	30	0	0	35	25	2	7	13	21	27	11	7	11	12	4	0	3	18	0
2	Runcorn	81	727	12	21	37	3	27	3	12	12	9	26	2	1	14	10	7	7	8	28	7	8	19	56	8
3	West Warrington	8	6	112	157	3	16	2	0	2	2	6	0	0	3	4	80	9	26	13	8	1	0	0	63	1
4	Warrington	19	19	86	832	38	61	2	2	0	4	4	0	2	2	1	39	24	4	6	7	1	1	2	9	3
5	South Warrington	3	13	2	38	202	26	0	0	0	4	1	91	0	0	0	12	13	3	7	87	0	0	16	21	6
6	East Warrington	9	2	20	48	27	25	6	0	1	1	1	0	0	0	1	15	8	0	17	24	0	0	0	60	3
7	South Liverpool	31	28	7	1	0	2	552	2	0	11	173	3	4	106	43	33	2	1	6	13	7	2	0	14	0
8	Birkenhead	1	1	0	0	0	0	0	57	203	0	1	53	6	1	1	1	0	0	1	1	3	0	0	8	4
9	East Wirral	1	1	0	0	0	2	7	217	1123	0	92	573	218	0	21	11	14	0	8	0	0	2	0	0	11
10	South Widnes	47	8	1	3	5	2	9	0	0	23	0	0	4	4	1	10	0	0	5	0	0	0	2	5	0
11	Liverpool	15	13	1	4	0	0	106	46	58	1	2059	13	0	152	670	81	7	11	12	8	5	1	3	0	5
12	West Wirral	0	16	4	0	51	0	8	62	457	0	30	484	27	0	53	2	3	9	3	1	211	199	15	0	17
13	Ellesmere Port	5	2	0	0	0	0	1	1	218	5	1	35	144	3	0	0	0	1	8	4	23	119	0	0	34
14	Knowsley	10	2	4	3	1	0	56	2	1	2	189	0	4	183	219	153	3	3	4	3	1	0	0	3	2
15	Sefton	12	12	7	11	2	1	73	6	73	5	750	77	7	215	3110	484	257	24	19	25	28	0	5	6	10
16	St Helens	32	24	78	85	41	22	26	2	0	10	89	0	10	112	482	1586	352	21	33	52	5	1	5	8	3
17	Lancashire	13	7	35	12	20	11	10	0	5	2	13	0	6	3	347	387	181	105	14	59	1	6	0	134	7
18	The North	16	10	17	1	6	1	12	42	1	0	20	3	10	2	25	21	104	0	20	60	3	0	1	4	0
19	The East	14	8	2	3	8	27	5	0	13	3	22	8	12	7	29	30	19	8	0	59	0	0	1	1527	2
20	The South	11	19	7	10	111	42	35	1	0	0	9	2	6	3	19	147	53	47	57	2	135	94	2	53	4
21	Wales	4	0	0	1	0	0	10	5	0	0	0	211	22	0	7	10	1	0	0	90	0	49	3	2	61
22	West Cheshire	0	7	0	0	0	0	6	1	1	0	7	199	113	0	0	1	1	0	0	79	49	0	20	10	8
23	Vale Royal	2	10	5	2	14	0	0	0	0	0	7	24	0	0	0	0	0	0	1	2	3	20	12	3	4
24	Greater Manchester	18	44	73	73	27	82	22	17	1	11	1	0	0	11	13	8	81	2	1535	73	5	19	4	1694	25
25	Chester	0	8	0	2	3	1	2	2	6	0	11	37	22	0	1	4	2	1	1	2	55	12	7	3	0

Notes: -Cells shaded within the table are built from RSI cordons;
-Other cells are synthesised

Table 4.28 - Number of Fully Observed Sector to Sector Trips – Interpeak hour prior matrix – LGV

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	Widnes	487	94	10	20	2	5	17	4	0	43	10	0	6	7	15	21	8	4	22	21	2	1	4	24	0
2	Runcorn	91	604	2	35	20	7	22	2	12	12	20	15	0	2	12	26	8	2	3	15	1	1	12	72	9
3	West Warrington	12	6	86	101	4	3	6	0	0	0	1	0	0	4	5	53	27	23	12	4	0	0	0	125	0
4	Warrington	22	15	96	663	24	51	15	0	0	5	2	0	1	2	3	53	22	2	4	7	0	0	1	29	2
5	South Warrington	6	17	0	70	158	20	0	0	0	2	1	28	0	0	2	18	10	6	7	67	0	0	8	28	1
6	East Warrington	4	1	2	56	22	22	0	0	2	4	0	0	0	0	0	7	21	0	11	16	0	0	0	16	0
7	South Liverpool	31	48	2	2	0	1	455	3	7	14	110	4	3	102	41	45	5	3	8	10	6	1	1	16	2
8	Birkenhead	1	6	0	0	1	0	0	46	190	0	1	47	8	0	4	7	0	0	2	0	1	0	0	54	1
9	East Wirral	3	3	0	0	0	0	5	180	881	0	79	442	213	5	38	11	1	3	12	0	0	1	0	1	2
10	South Widnes	62	14	1	1	6	3	3	0	0	25	0	0	7	1	0	10	1	1	2	0	0	0	0	30	0
11	Liverpool	3	16	0	2	0	0	83	38	58	1	1740	33	0	155	702	76	10	38	30	7	6	2	5	1	5
12	West Wirral	0	17	1	1	53	0	3	55	437	0	32	382	18	1	28	1	2	6	6	1	167	158	15	0	37
13	Ellesmere Port	1	0	0	1	0	0	4	12	189	0	0	25	113	2	0	1	0	1	9	5	20	104	0	0	25
14	Knowsley	8	1	1	3	0	0	71	1	1	1	146	0	3	163	222	112	2	3	6	2	1	0	0	8	0
15	Sefton	13	15	4	4	1	1	29	17	32	2	622	37	10	208	2582	361	216	21	21	9	6	1	1	16	4
16	St Helens	21	22	11	39	53	30	17	8	0	9	78	0	2	97	358	1265	318	17	41	58	9	2	2	13	2
17	Lancashire	5	11	6	29	25	11	6	5	8	1	14	0	2	2	253	316	150	84	28	74	2	4	0	99	2
18	The North	3	6	6	3	4	1	11	2	0	0	20	5	6	2	20	18	83	0	27	62	2	0	1	5	3
19	The East	10	8	7	7	6	5	10	2	8	2	30	5	8	7	25	41	6	5	0	50	0	0	1	1216	1
20	The South	11	30	2	8	61	7	9	1	0	0	15	1	4	3	20	279	31	95	46	0	70	63	2	53	5
21	Wales	2	3	0	1	0	0	5	4	0	0	11	167	18	2	2	13	1	0	0	88	0	39	3	3	64
22	West Cheshire	2	12	0	1	0	0	0	0	1	0	1	158	96	0	0	1	2	0	0	69	39	0	16	12	22
23	Vale Royal	1	13	0	1	12	0	2	0	0	0	0	12	0	0	0	0	0	0	1	2	3	16	9	3	8
24	Greater Manchester	20	58	74	13	38	50	63	40	0	9	1	0	0	7	13	4	104	1	1240	110	5	19	6	1351	2
25	Chester	2	8	2	5	2	3	4	3	12	0	6	36	30	0	4	3	4	1	1	2	65	16	7	34	0

Notes: -Cells shaded within the table are built from RSI cordons;
-Other cells are synthesised

Table 4.29 - Number of Fully Observed Sector to Sector Trips – PM Peak hour prior matrix – LGV

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	Widnes	202	11	2	13	1	0	14	0	2	12	4	0	4	2	7	12	5	1	9	3	7	1	2	13	8
2	Runcorn	13	269	2	18	7	2	12	0	3	5	3	11	20	0	4	7	5	2	15	20	1	0	2	87	6
3	West Warrington	2	2	28	47	0	0	7	0	0	0	1	0	1	0	2	21	4	3	2	0	0	0	0	15	0
4	Warrington	4	7	38	357	18	32	6	0	0	1	0	0	0	0	0	17	15	19	5	6	2	0	1	12	0
5	South Warrington	1	13	1	23	142	14	1	0	4	0	2	24	1	0	0	13	13	12	5	24	2	1	4	16	30
6	East Warrington	0	1	1	19	26	50	2	0	0	0	2	1	0	2	7	45	31	4	15	24	0	0	0	34	0
7	South Liverpool	22	27	0	0	1	1	198	0	5	8	46	3	1	23	16	13	2	1	13	8	5	0	1	7	0
8	Birkenhead	0	0	0	0	0	0	0	44	38	0	0	32	14	0	2	0	14	0	17	7	24	0	0	90	0
9	East Wirral	1	1	0	0	2	0	0	14	314	0	0	146	175	0	19	0	7	1	15	1	3	3	0	6	10
10	South Widnes	15	6	0	2	0	0	7	0	0	5	0	0	1	0	1	7	3	7	9	1	1	0	0	10	0
11	Liverpool	3	3	0	0	2	1	41	0	16	0	581	15	4	25	209	18	3	6	32	8	12	0	0	5	0
12	West Wirral	0	17	0	0	15	0	3	8	125	0	0	104	16	0	8	0	8	0	7	3	94	24	6	0	0
13	Ellesmere Port	6	5	0	0	1	0	0	2	148	0	0	16	75	0	0	1	0	3	5	3	3	15	1	0	16
14	Knowsley	5	2	0	0	0	0	9	0	0	0	24	0	0	44	45	14	1	1	7	2	0	1	0	33	0
15	Sefton	3	6	2	0	2	2	54	6	32	1	174	5	3	56	983	85	56	7	61	26	27	1	3	42	0
16	St Helens	20	9	8	3	48	50	23	0	0	5	11	4	5	15	70	870	179	16	108	81	8	1	0	13	0
17	Lancashire	3	5	1	14	20	44	10	5	3	4	6	2	1	2	83	187	127	43	17	173	2	2	0	111	0
18	The North	5	2	4	40	10	6	0	0	0	3	3	0	4	1	8	15	43	0	18	65	0	0	0	6	0
19	The East	22	12	20	14	7	6	19	10	20	9	43	14	15	8	58	99	11	4	0	28	0	0	1	601	8
20	The South	8	19	1	6	22	10	15	10	2	4	19	4	4	4	50	412	184	51	21	0	301	8	1	88	18
21	Wales	4	3	0	0	1	0	8	0	4	2	38	94	3	0	16	12	1	0	0	181	0	1	1	1	13
22	West Cheshire	3	0	0	0	1	0	0	0	3	0	0	25	13	1	1	0	1	0	0	6	1	0	2	1	0
23	Vale Royal	0	4	0	4	4	0	0	0	1	0	0	10	1	0	1	2	0	0	0	1	1	2	4	1	10
24	Greater Manchester	12	190	12	18	42	27	10	0	6	31	5	0	0	22	19	4	157	1	637	287	7	12	7	547	0
25	Chester	0	3	0	1	3	0	0	0	2	0	2	2	18	0	0	5	0	0	2	2	32	2	11	0	0

Notes: -Cells shaded within the table are built from RSI cordons;
-Other cells are synthesised

Table 4.30 - Number of Fully Observed Sector to Sector Trips – AM peak hour prior matrix – OGV (vehicles)

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	Widnes	202	11	2	13	1	0	14	0	2	12	4	0	4	2	7	12	5	1	9	3	7	1	2	13	8
2	Runcorn	13	269	2	18	7	2	12	0	3	5	3	11	20	0	4	7	5	2	15	20	1	0	2	87	6
3	West Warrington	2	2	28	47	0	0	7	0	0	0	1	0	1	0	2	21	4	3	2	0	0	0	0	15	0
4	Warrington	4	7	38	357	18	32	6	0	0	1	0	0	0	0	0	17	15	19	5	6	2	0	1	12	0
5	South Warrington	1	13	1	23	142	14	1	0	4	0	2	24	1	0	0	13	13	12	5	24	2	1	4	16	30
6	East Warrington	0	1	1	19	26	50	2	0	0	0	2	1	0	2	7	45	31	4	15	24	0	0	0	34	0
7	South Liverpool	22	27	0	0	1	1	198	0	5	8	46	3	1	23	16	13	2	1	13	8	5	0	1	7	0
8	Birkenhead	0	0	0	0	0	0	0	44	38	0	0	32	14	0	2	0	14	0	17	7	24	0	0	90	0
9	East Wirral	1	1	0	0	2	0	0	14	314	0	0	146	175	0	19	0	7	1	15	1	3	3	0	6	10
10	South Widnes	15	6	0	2	0	0	7	0	0	5	0	0	1	0	1	7	3	7	9	1	1	0	0	10	0
11	Liverpool	3	3	0	0	2	1	41	0	16	0	581	15	4	25	209	18	3	6	32	8	12	0	0	5	0
12	West Wirral	0	17	0	0	15	0	3	8	125	0	0	104	16	0	8	0	8	0	7	3	94	24	6	0	0
13	Ellesmere Port	6	5	0	0	1	0	0	2	148	0	0	16	75	0	0	1	0	3	5	3	3	15	1	0	16
14	Knowsley	5	2	0	0	0	0	9	0	0	0	24	0	0	44	45	14	1	1	7	2	0	1	0	33	0
15	Sefton	3	6	2	0	2	2	54	6	32	1	174	5	3	56	983	85	56	7	61	26	27	1	3	42	0
16	St Helens	20	9	8	3	48	50	23	0	0	5	11	4	5	15	70	870	179	16	108	81	8	1	0	13	0
17	Lancashire	3	5	1	14	20	44	10	5	3	4	6	2	1	2	83	187	127	43	17	173	2	2	0	111	0
18	The North	5	2	4	40	10	6	0	0	0	3	3	0	4	1	8	15	43	0	18	65	0	0	0	6	0
19	The East	22	12	20	14	7	6	19	10	20	9	43	14	15	8	58	99	11	4	0	28	0	0	1	601	8
20	The South	8	19	1	6	22	10	15	10	2	4	19	4	4	4	50	412	184	51	21	0	301	8	1	88	18
21	Wales	4	3	0	0	1	0	8	0	4	2	38	94	3	0	16	12	1	0	0	181	0	1	1	1	13
22	West Cheshire	3	0	0	0	1	0	0	0	3	0	0	25	13	1	1	0	1	0	0	6	1	0	2	1	0
23	Vale Royal	0	4	0	4	4	0	0	0	1	0	0	10	1	0	1	2	0	0	0	1	1	2	4	1	10
24	Greater Manchester	12	190	12	18	42	27	10	0	6	31	5	0	0	22	19	4	157	1	637	287	7	12	7	547	0
25	Chester	0	3	0	1	3	0	0	0	2	0	2	2	18	0	0	5	0	0	2	2	32	2	11	0	0

Notes: -Cells shaded within the table are built from RSI cordons;
-Other cells are synthesised

Table 4.31 - Number of Fully Observed Sector to Sector Trips – Interpeak hour prior matrix – OGV (vehicles)

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	Widnes	185	41	6	17	1	0	16	0	1	36	5	2	7	4	13	20	3	6	38	14	6	5	2	21	4
2	Runcorn	26	273	2	20	13	0	9	0	3	13	6	14	2	3	14	12	5	2	13	16	2	1	5	32	3
3	West Warrington	2	2	28	45	5	1	2	0	0	1	0	0	0	0	1	4	5	9	5	1	0	0	0	23	2
4	Warrington	8	11	37	358	25	31	2	0	0	3	0	0	0	1	1	14	14	19	5	6	2	0	1	14	2
5	South Warrington	0	11	1	40	141	13	3	0	2	4	2	23	1	4	1	48	26	24	5	21	1	1	3	12	0
6	East Warrington	0	1	1	31	30	49	2	1	0	0	1	0	0	3	4	47	18	4	12	21	0	0	0	14	0
7	South Liverpool	34	55	0	1	4	1	169	0	8	10	40	2	0	28	27	26	5	5	16	11	9	0	1	19	0
8	Birkenhead	0	0	0	0	0	1	0	44	35	0	1	21	12	0	4	0	4	0	32	14	15	0	0	76	0
9	East Wirral	2	3	0	0	2	0	3	25	273	0	5	137	179	0	18	4	0	3	31	1	5	3	0	11	20
10	South Widnes	28	11	1	2	2	0	30	0	0	7	0	0	0	0	0	8	5	6	6	4	3	1	0	29	0
11	Liverpool	4	7	0	0	3	1	64	2	3	0	566	5	3	26	226	17	5	11	48	6	25	0	0	7	1
12	West Wirral	1	8	0	0	24	0	0	9	160	0	3	113	13	3	10	11	6	0	14	4	94	25	10	0	6
13	Ellesmere Port	8	13	0	1	1	0	0	10	166	2	1	15	73	0	1	1	0	3	9	4	4	18	1	0	13
14	Knowsley	2	3	0	0	3	1	14	0	0	1	24	2	0	43	59	18	2	1	19	2	0	0	0	59	0
15	Sefton	15	17	0	1	1	4	42	10	22	2	200	10	4	52	1000	106	68	8	90	16	26	0	5	74	1
16	St Helens	18	23	4	18	63	46	27	0	0	25	17	5	5	14	67	848	178	16	129	80	18	0	1	20	3
17	Lancashire	3	7	1	23	23	45	11	10	2	6	4	9	2	2	75	215	136	48	23	143	2	1	0	209	0
18	The North	7	3	3	7	13	6	2	0	0	9	6	0	7	0	8	16	49	0	27	67	1	0	0	9	0
19	The East	10	10	2	2	7	4	10	2	24	7	42	9	6	11	75	145	15	7	0	32	0	0	0	595	0
20	The South	6	12	0	6	31	6	6	4	2	6	20	4	4	6	65	657	98	142	20	0	298	8	1	51	0
21	Wales	7	5	0	2	1	0	13	22	4	6	11	94	3	0	34	13	3	0	0	288	0	1	1	2	19
22	West Cheshire	4	0	0	0	1	0	1	0	3	1	1	24	13	2	1	2	2	0	0	8	1	0	2	4	20
23	Vale Royal	5	3	0	1	4	0	1	0	1	0	0	10	1	0	0	3	0	0	0	1	1	2	4	2	8
24	Greater Manchester	10	18	9	20	69	17	10	76	4	19	6	0	0	23	37	5	210	2	648	350	1	1	1	549	0
25	Chester	1	4	1	1	3	0	0	0	17	0	0	4	21	0	6	2	1	0	3	2	22	9	9	0	0

Notes: -Cells shaded within the table are built from RSI cordons;
-Other cells are synthesised

Table 4.32 - Number of Fully Observed Sector to Sector Trips – PM peak hour prior matrix – OGV (vehicles)

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	Widnes	169	25	2	3	0	0	23	0	1	11	3	0	4	2	10	11	2	3	15	6	6	2	3	9	0
2	Runcorn	26	238	0	12	8	1	27	0	1	5	4	23	1	3	4	6	5	0	4	15	1	0	2	7	0
3	West Warrington	1	0	28	40	2	3	0	0	0	0	0	0	0	0	1	7	1	8	0	1	0	0	0	10	0
4	Warrington	6	6	37	345	13	19	0	0	0	2	0	0	0	0	0	14	15	12	3	3	1	0	1	10	4
5	South Warrington	0	7	6	25	136	11	4	0	1	0	2	10	0	0	0	8	7	10	6	21	1	1	4	35	0
6	East Warrington	0	0	2	21	24	46	0	0	0	0	1	0	0	3	3	38	32	4	19	23	0	0	0	9	0
7	South Liverpool	20	30	0	1	1	0	174	0	4	10	30	1	0	17	19	19	3	5	10	6	8	0	1	16	0
8	Birkenhead	0	0	0	0	0	0	0	43	22	0	0	11	10	0	11	0	0	0	52	38	13	0	0	105	0
9	East Wirral	3	2	0	0	1	0	3	75	239	3	14	118	127	0	23	0	0	2	20	1	3	2	0	5	0
10	South Widnes	22	9	1	0	1	0	10	0	0	7	0	0	1	0	0	7	3	1	18	2	2	0	0	3	0
11	Liverpool	6	4	0	0	1	2	52	0	6	0	474	5	4	14	235	18	5	10	24	9	9	0	0	4	0
12	West Wirral	3	7	0	0	15	0	0	4	131	0	13	87	10	0	0	0	0	0	6	3	89	13	9	0	0
13	Ellesmere Port	9	4	0	0	1	0	4	0	122	3	1	12	66	0	0	0	0	1	6	4	3	12	1	0	10
14	Knowsley	0	2	0	1	1	6	49	0	0	0	19	0	0	38	50	55	2	1	24	10	0	1	0	66	0
15	Sefton	10	8	0	0	2	17	28	2	14	1	163	4	4	22	951	92	57	6	46	47	20	0	4	11	1
16	St Helens	19	10	1	16	35	58	19	0	0	8	8	5	5	22	55	823	192	15	83	24	7	1	1	8	0
17	Lancashire	5	5	3	5	6	61	2	0	1	6	4	3	3	2	56	150	120	37	17	88	3	1	0	167	0
18	The North	1	3	0	1	9	4	3	0	0	4	4	0	3	0	6	17	43	0	10	40	0	0	1	3	0
19	The East	15	6	1	6	6	7	5	0	6	7	22	2	2	7	45	101	12	15	0	26	0	0	0	598	0
20	The South	1	10	2	8	20	7	14	2	0	0	15	2	1	7	55	306	153	62	24	0	121	5	1	185	0
21	Wales	30	4	0	3	1	0	5	21	3	0	5	89	3	0	24	6	1	0	0	271	0	1	1	1	14
22	West Cheshire	0	0	0	0	1	0	0	0	2	0	1	22	11	1	1	0	1	0	0	7	1	0	2	1	0
23	Vale Royal	4	2	0	0	3	0	0	0	0	0	0	4	0	0	0	1	0	0	0	1	1	2	4	1	10
24	Greater Manchester	14	2	3	1	43	26	8	0	2	6	2	0	0	20	13	11	158	5	612	263	0	1	1	530	0
25	Chester	0	2	0	2	0	0	0	0	3	0	0	6	16	0	0	0	3	0	1	2	7	4	6	0	0

Notes: -Cells shaded within the table are built from RSI cordons;
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Table 4.33 - Comparison of Traffic Counts and Prior Matrix Assignment Flows by RSI Cordon (vehicles) – AM Peak Hour

RSI Cordon	Direction	Observed Traffic Count				Model Traffic Flow				GEH	% Diff	Individual Links <5
		Car	LGV	OGV	Total	Car	LGV	OGV	Total			
1	Inbound	4,201	635	327	5,162	4,542	675	360	5,577	5.7	8%	38%
Widnes	Outbound	5,331	764	323	6,419	4,950	653	322	5,925	6.3	-8%	38%
	2-way Total	9,532	1,399	650	11,581	9,492	1,328	682	11,502	0.7	-1%	38%
2	Inbound	8,024	816	539	9,378	8,596	822	670	10,087	7.2	8%	67%
Runcorn	Outbound	7,717	964	595	9,276	8,148	941	568	9,657	3.9	4%	56%
	2-way Total	15,741	1,779	1,134	18,655	16,744	1,763	1,238	19,744	7.9	6%	61%
3	Inbound	6,186	862	339	7,388	5,417	781	438	6,636	9.0	-10%	36%
West Warrington	Outbound	6,396	906	322	7,624	5,882	824	446	7,152	5.5	-6%	64%
	2-way Total	12,582	1,769	661	15,012	11,298	1,605	884	13,787	10.2	-8%	50%
4	Inbound	8,818	872	360	10,050	8,644	836	510	9,989	0.6	-1%	50%
North Warrington	Outbound	6,688	717	407	7,812	6,441	666	479	7,586	2.6	-3%	30%
	2-way Total	15,506	1,588	767	17,862	15,084	1,503	989	17,576	2.2	-2%	40%
7	Inbound	6,338	623	315	7,276	5,897	542	265	6,703	6.8	-8%	73%
South Liverpool	Outbound	5,785	637	278	6,700	4,739	599	249	5,588	14.2	-17%	55%
	2-way Total	12,123	1,260	593	13,976	10,636	1,141	514	12,291	14.7	-12%	64%
8	Inbound	9,648	918	248	10,814	8,703	943	306	9,951	8.5	-8%	58%
Birkenhead	Outbound	5,702	938	364	7,004	5,530	786	488	6,804	2.4	-3%	50%
	2-way Total	15,350	1,856	612	17,818	14,233	1,729	793	16,756	8.1	-6%	54%
10	Inbound	6,590	1,022	474	8,087	5,799	696	375	6,870	14.1	-15%	56%
South Widnes	Outbound	5,469	793	436	6,698	5,926	738	381	7,045	4.2	5%	44%
	2-way Total	12,059	1,815	910	14,785	11,725	1,434	757	13,915	7.3	-6%	50%
25	Inbound	4,227	257	140	4,624	3,641	435	167	4,244	5.7	-8%	50%
Chester	Outbound	2,218	233	105	2,555	2,020	402	131	2,554	0.0	0%	33%
	2-way Total	6,445	490	245	7,179	5,662	837	298	6,797	4.6	-5%	42%
Total	**Inbound**	**54,032**	**6,005**	**2,742**	**62,779**	**51,238**	**5,729**	**3,091**	**60,058**	**11.0**	**-4%**	**53%**
	Outbound	**45,307**	**5,952**	**2,830**	**54,089**	**43,637**	**5,610**	**3,064**	**52,311**	**7.7**	**-3%**	**47%**
	2-way Total	**99,339**	**11,957**	**5,573**	**116,868**	**94,874**	**11,339**	**6,155**	**112,369**	**13.3**	**-4%**	**50%**

Table 4.34 - Comparison of Traffic Counts and Prior Matrix Assignment Flows across the River Mersey (vehicles) – AM Peak Hour

		Car Flow						LGV						OGV (vehicles)						Total (vehicles)					
Link Description	**DIR**	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB
Kingsway Tunnel	nb	2668	2,620	-48	-2	0.9	✓	166	159	-7	-4	0.5	✓	117	138	22	19	1.9	✓	2950	2917	-34	-1	0.6	✓
Queensway Tunnel	nb	1786	1,709	-77	-4	1.8	✓	171	111	-60	-35	5.1	✓	0	0	0	0	0.0	✓	1957	1820	-137	-7	3.2	✓
Silver Jubilee Bridge	nb	2925	3,076	151	5	2.8	✓	366	296	-70	-19	3.9	✓	193	154	-39	-20	3.0	✓	3484	3526	42	1	0.7	✓
A5060 Chester Road	nb	698	719	21	3	0.8	✓	54	51	-4	-7	0.5	✓	35	38	3	8	0.5	✓	788	808	20	3	0.7	✓
Wilderspool Causeway	nb	790	746	-44	-6	1.6	✓	26	27	2	6	0.3	✓	33	26	-7	-21	1.3	✓	849	799	-50	-6	1.7	✓
A5061 Knutsford Road	nb	865	643	-222	26	8.1	×	48	48	1	1	0.1	✓	33	106	73	221	8.8	✓	945	797	-148	-16	5.0	×
A50 Kingsway North	nb	1015	798	-217	-21	7.2	×	64	34	-30	-47	4.3	✓	27	17	-10	-38	2.2	✓	1106	848	-258	-23	8.2	×
Thelwall Viaduct	nb	4977	5,136	159	3	2.2	✓	570	597	27	5	1.1	✓	905	953	48	5	1.6	✓	6452	6686	234	4	2.9	✓
TOTAL		**15724**	**15447**	**-278**	**-2**	**2.2**	✓	**1464**	**1322**	**-143**	**-10**	**3.8**	✓	**1343**	**1433**	**90**	**7**	**2.4**	✓	**18532**	**18201**	**-331**	**-2**	**2.4**	✓
Kingsway Tunnel	sb	907	793	-114	-13	3.9	✓	185	218	34	18	2.4	✓	144	164	20	14	1.6	✓	1235	1175	-60	-5	1.7	✓
Queensway Tunnel	sb	1000	1,052	52	5	1.6	✓	185	172	-14	-7	1.0	✓	0	0	0	0	0.0	✓	1185	1223	38	3	1.1	✓
Silver Jubilee Bridge	sb	2768	2,895	127	5	2.4	✓	346	307	-39	-11	2.1	✓	182	146	-36	-20	2.8	✓	3296	3348	52	2	0.9	✓
A5060 Chester Road	sb	480	415	-65	-14	3.1	✓	75	57	-17	-23	2.1	✓	31	93	62	201	7.9	✓	585	565	-20	-3	0.9	✓
Wilderspool Causeway	sb	367	394	27	7	1.4	✓	35	15	-19	-56	3.9	✓	14	8	-6	-45	1.9	✓	416	417	1	0	0.0	✓
A5061 Knutsford Road	sb	483	231	-252	-52	13.3	×	45	44	-1	-2	0.1	✓	21	22	1	3	0.2	✓	549	297	-252	-46	12.3	×
A50 Kingsway North	sb	954	909	-45	-5	1.5	✓	90	75	-15	-17	1.6	✓	46	31	-15	-33	2.4	✓	1090	1015	-75	-7	2.3	✓
Thelwall Viaduct	sb	4580	4,212	-368	-8	5.6	✓	560	561	1	0	0.0	✓	940	930	-10	-1	0.3	✓	6080	5703	-377	-6	4.9	✓
TOTAL		**11539**	**10900**	**-639**	**-6**	**6.0**	×	**1520**	**1450**	**-70**	**-5**	**1.8**	✓	**1378**	**1394**	**16**	**1**	**0.4**	✓	**14436**	**13743**	**-693**	**-5**	**5.8**	×
2-WAY TOTAL		**27263**	**26346**	**-916**	**-3**	**5.6**	×	**2984**	**2771**	**-213**	**-7**	**4.0**	✓	**2721**	**2827**	**106**	**4**	**2.0**	✓	**32968**	**31944**	**-1023**	**-3**	**5.7**	×

Note: - Shaded cells within the table denoted by a cross sign refer to values which are outside the range specified by DMRB criteria.

Table 4.35 - Comparison of Traffic Counts and Prior Matrix Assignment Flows by Sector (vehicles) – AM Peak Hour

Sector	Observed Traffic Count				Model Traffic Flow				GEH	% Diff	Individual Links <5
	Car	LGV	OGV	Total	Car	LGV	OGV	Total			
1i - Widnes	31,055	4,092	1,704	36,851	29,518	3,757	1,800	35,075	9.4	-5%	40%
2i - Runcorn	42,140	4,604	2,942	49,686	40,343	4,408	2,874	47,625	9.3	-4%	52%
3i - West Warrington	15,879	2,018	762	18,659	13,732	1,902	1,230	16,865	13.5	-10%	52%
4i - Warrington	16,347	1,669	801	18,818	15,910	1,629	1,026	18,565	1.9	-1%	39%
5i - South Warrington	1,230	137	39	1,407	495	85	211	792	18.5	-44%	0%
6i - East Warrington	14,600	1,589	2,117	18,306	14,646	1,694	2,328	18,668	2.7	2%	38%
7i - South Liverpool	10,225	1,417	892	12,534	9,650	1,211	569	11,430	10.1	-9%	33%
8i - Birkenhead Town Centre	12,809	1,557	513	14,879	11,754	1,402	711	13,867	8.4	-7%	41%
9i - East Wirral	20,243	2,211	658	23,113	17,805	2,343	1,493	21,641	9.8	-6%	37%
10i - South Widnes	12,059	1,815	910	14,785	11,725	1,434	757	13,915	7.3	-6%	50%
11i - Liverpool	38,965	4,675	1,493	45,133	38,265	4,131	1,484	43,881	5.9	-3%	48%
12i - South Knowsley	12,395	1,395	592	14,382	14,638	1,260	390	16,288	15.4	13%	56%
13i - Ellesmere Port	2,365	179	76	2,620	1,785	187	103	2,075	11.3	-21%	50%
14i – West Wirral & Wales	14,202	1,388	418	16,008	13,178	1,806	572	15,556	3.6	-3%	30%
15i - St Helens & S Lancs	49,986	7,078	2,884	59,948	54,749	7,336	2,713	64,798	19.4	8%	42%
Motorways	76,205	8,901	12,816	97,922	71,021	8,324	11,204	90,548	24.0	-8%	31%
Total	**370,707**	**44,726**	**29,618**	**445,051**	**359,214**	**42,908**	**29,466**	**431,588**	**20.3**	**-3%**	**43%**

Table 4.36 - Flow Calibration by Vehicle Type (Prior Matrix) – AM Peak Hour

Vehicle Type	Number of Counts	GEH < 5		Within DMRB	
		Number	Percentage	Number	Percentage
Car	456	194	42.5%	218	47.8%
LGV	456	388	85.1%	444	97.4%
OGV (vehicles)	456	376	82.5%	430	94.3%
Total (vehicles)	**456**	**196**	**43.0%**	**219**	**48.0%**

Table 4.37 - Comparison of Traffic Counts and Prior Matrix Assignment Flows by RSI Cordon (vehicles) – Inter Peak Hour

RSI Cordon	Direction	Observed Traffic Count				Model Traffic Flow				GEH	% Diff	Individual Links <5
		Car	LGV	OGV	Total	Car	LGV	OGV	Total			
1	Inbound	3,409	613	427	4,448	3,432	654	474	4,560	1.7	2%	46%
Widnes	Outbound	3,378	616	529	4,523	3,363	624	530	4,517	0.1	0%	46%
	2-way Total	6,787	1,229	956	8,972	6,795	1,277	1,004	9,077	1.1	1%	46%
2	Inbound	4,679	798	718	6,194	5,294	945	657	6,896	8.7	11%	56%
Runcorn	Outbound	4,860	791	678	6,329	5,312	904	596	6,812	6.0	8%	44%
	2-way Total	9,538	1,589	1,396	12,523	10,606	1,849	1,253	13,708	10.3	9%	50%
3	Inbound	4,664	729	360	5,752	4,030	598	541	5,169	7.9	-10%	27%
West Warrington	Outbound	4,917	871	396	6,184	4,612	763	567	5,942	3.1	-4%	36%
	2-way Total	9,581	1,599	756	11,937	8,642	1,360	1,109	11,111	7.7	-7%	32%
4	Inbound	5,788	700	430	6,918	5,745	703	568	7,015	1.2	1%	30%
North Warrington	Outbound	5,960	699	409	7,068	5,913	661	535	7,109	0.5	1%	40%
	2-way Total	11,748	1,399	839	13,986	11,658	1,364	1,102	14,124	1.2	1%	35%
7	Inbound	4,189	523	372	5,084	3,592	494	330	4,416	9.7	-13%	55%
South Liverpool	Outbound	4,622	615	335	5,572	2,795	525	336	3,656	28.2	-34%	27%
	2-way Total	8,811	1,138	707	10,656	6,386	1,019	666	8,072	26.7	-24%	41%
8	Inbound	5,414	791	306	6,511	4,909	872	486	6,267	3.1	-4%	42%
Birkenhead	Outbound	5,774	853	345	6,972	4,649	797	528	5,974	12.4	-14%	50%
	2-way Total	11,188	1,644	651	13,483	9,558	1,669	1,014	12,241	11.0	-9%	46%
10	Inbound	4,517	856	722	6,095	4,405	799	580	5,784	4.0	-5%	44%
South Widnes	Outbound	4,527	803	610	5,940	4,531	851	630	6,011	0.9	1%	67%
	2-way Total	9,044	1,659	1,332	12,035	8,935	1,649	1,210	11,795	2.2	-2%	56%
25	Inbound	2,126	258	134	2,518	2,176	197	156	2,529	0.2	0%	50%
Chester	Outbound	2,188	283	144	2,615	2,213	247	161	2,622	0.1	0%	50%
	2-way Total	4,314	542	277	5,133	4,389	444	317	5,150	0.2	0%	50%
Total	**Inbound**	**34,786**	**5,267**	**3,469**	**43,522**	**33,582**	**5,261**	**3,792**	**42,635**	**4.3**	**-2%**	**43%**
	Outbound	**36,226**	**5,532**	**3,445**	**45,204**	**33,387**	**5,371**	**3,884**	**42,642**	**12.2**	**-6%**	**44%**
	2-way Total	**71,012**	**10,799**	**6,914**	**88,725**	**66,970**	**10,632**	**7,676**	**85,277**	**11.7**	**-4%**	**44%**

Table 4.38 - Comparison of Traffic Counts and Prior Matrix Assignment Flows across the River Mersey (vehicles) – Inter Peak Hour

		Car Flow						LGV						OGV (vehicles)						Total (vehicles)					
Link Description	**DIR**	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB
Kingsway Tunnel	nb	798	769	-29	-4	1.0	✓	144	123	-22	-15	1.9	✓	126	188	63	50	5.0	✓	1068	1081	12	1	0.4	✓
Queensway Tunnel	nb	873	791	-82	-9	2.9	✓	112	141	29	26	2.6	✓	0	0	0	0	0.0	✓	985	932	-53	-5	1.7	✓
Silver Jubilee Bridge	nb	1859	2074	215	12	4.9	✓	352	360	8	2	0.4	✓	319	221	-98	-31	6.0	✓	2530	2655	125	5	2.5	✓
A5060 Chester Road	nb	446	411	-35	-8	1.7	✓	58	78	20	35	2.5	✓	42	67	25	58	3.3	✓	546	556	10	2	0.4	✓
Wilderspool Causeway	nb	536	193	-343	-64	18.0	×	39	26	-13	-33	2.2	✓	22	26	4	20	0.9	✓	597	246	-351	-59	17.1	×
A5061 Knutsford Road	nb	558	553	-5	-1	0.2	✓	55	92	37	68	4.4	✓	39	153	114	288	11.6	×	652	799	146	22	5.4	×
A50 Kingsway North	nb	682	314	-368	-54	16.5	×	68	37	-31	-45	4.3	✓	26	16	-10	-40	2.3	✓	776	367	-409	-53	17.1	×
Thelwall Viaduct	nb	3408	3454	46	1	0.8	✓	682	653	-29	-4	1.1	✓	1161	1269	108	9	3.1	✓	5251	5376	125	2	1.7	✓
TOTAL		9160	8560	-600	-7	6.4	×	1509	1511	1	0	0.0	✓	1735	1940	205	12	4.8	×	12405	12011	-394	-3	3.6	✓
Kingsway Tunnel	sb	940	709	-231	-25	8.0	×	166	126	-41	-24	3.4	✓	126	178	52	41	4.2	✓	1233	1013	-220	-18	6.6	×
Queensway Tunnel	sb	701	870	169	24	6.0	×	94	182	88	93	7.5	✓	0	0	0	0	0.0	✓	795	1052	257	32	8.4	×
Silver Jubilee Bridge	sb	1877	2020	143	8	3.2	✓	355	379	24	7	1.3	✓	322	314	-8	-2	0.4	✓	2554	2714	160	6	3.1	✓
A5060 Chester Road	sb	507	520	13	2	0.6	✓	69	72	2	3	0.3	✓	42	49	8	19	1.2	✓	618	641	23	4	0.9	✓
Wilderspool Causeway	sb	517	280	-237	-46	11.9	×	45	27	-18	-41	3.0	✓	24	16	-8	-35	1.9	✓	586	322	-264	-45	12.4	×
A5061 Knutsford Road	sb	509	356	-154	-30	7.4	×	37	39	2	6	0.4	✓	31	53	22	69	3.3	✓	578	448	-130	-22	5.7	×
A50 Kingsway North	sb	729	702	-27	-4	1.0	✓	53	32	-21	-40	3.3	✓	35	30	-5	-15	1.0	✓	817	763	-53	-7	1.9	✓
Thelwall Viaduct	sb	3272	3463	191	6	3.3	✓	643	643	0	0	0.0	✓	1009	1032	23	2	0.7	✓	4924	5137	213	4	3.0	✓
TOTAL		**9053**	**8921**	**-132**	**-1**	**1.4**	✓	**1463**	**1499**	**36**	**2**	**0.9**	✓	**1589**	**1671**	**82**	**5**	**2.0**	✓	**12104**	**12091**	**-14**	**0**	**0.1**	✓
2-WAY TOTAL		**18213**	**17480**	**-732**	**-4**	**5.5**	×	**2972**	**3010**	**38**	**1**	**0.7**	✓	**3324**	**3611**	**287**	**9**	**4.9**	×	**24509**	**24101**	**-408**	**-2**	**2.6**	✓

Note: - Shaded cells within the table denoted by a cross sign refer to values which are outside the range specified by DMRB criteria.

Table 4.39 - Comparison of Traffic Counts and Prior Matrix Assignment Flows by Sector (vehicles) – Inter Peak Hour

Sector	Observed Traffic Count				Model Traffic Flow				GEH	% Diff	Individual Links <5
	Car	LGV	OGV	Total	Car	LGV	OGV	Total			
1i - Widnes	17,081	2,751	1,837	21,669	16,841	2,676	1,979	21,497	1.2	-1%	51%
2i - Runcorn	24,932	3,963	3,284	32,178	24,619	4,618	2,935	32,172	0.0	0%	51%
3i - West Warrington	12,114	1,824	840	14,778	10,809	1,740	1,500	14,049	6.1	-5%	37%
4i - Warrington	12,508	1,462	869	14,839	12,367	1,478	1,151	14,996	1.3	1%	43%
5i - South Warrington	699	104	53	857	183	57	100	340	21.1	-60%	0%
6i - East Warrington	9,320	1,705	2,401	13,425	10,817	1,701	2,597	15,115	14.1	13%	50%
7i - South Liverpool	6,774	1,230	1,029	9,034	5,743	1,109	781	7,633	15.3	-16%	58%
8i - Birkenhead Town Centre	9,177	1,410	560	11,147	7,804	1,475	950	10,229	8.9	-8%	40%
9i - East Wirral	13,103	1,840	651	15,595	10,252	2,210	1,926	14,388	9.9	-8%	44%
10i - South Widnes	9,044	1,659	1,332	12,035	8,935	1,649	1,210	11,795	2.2	-2%	56%
11i - Liverpool	28,016	4,214	1,590	33,820	23,069	3,875	1,763	28,707	28.9	-15%	39%
12i - South Knowsley	8,532	1,412	676	10,620	8,665	1,355	554	10,574	0.4	0%	44%
13i - Ellesmere Port	2,503	186	61	2,750	1,092	168	104	1,364	30.6	-50%	0%
14i – West Wirral & Wales	10,453	1,223	432	12,108	8,441	1,217	579	10,238	17.7	-15%	33%
15i - St Helens & S Lancs	32,380	5,985	3,197	41,562	28,240	6,174	3,291	37,705	19.4	-9%	54%
Motorways	48,758	9,488	14,538	72,784	41,712	8,933	14,301	64,946	29.9	-11%	27%
Total	**245,393**	**40,456**	**33,350**	**319,199**	**219,591**	**40,434**	**35,720**	**295,745**	**42.3**	**-7%**	**45%**

Table 4.40 - Flow Calibration by Vehicle Type (Prior Matrix) – Inter Peak Hour

Vehicle Type	Number of Counts	GEH < 5		Within DMRB	
		Number	Percentage	Number	Percentage
Car	426	188	44.1%	220	51.6%
LGV	426	362	85.0%	414	97.2%
OGV (vehicles)	426	345	81.0%	395	92.7%
Total (vehicles)	**426**	**190**	**44.6%**	**211**	**49.5%**

Table 4.41 - Comparison of Traffic Counts and Prior Matrix Assignment Flows by RSI Cordon (vehicles) – PM Peak Hour

RSI Cordon	Direction	Observed Traffic Count				Model Traffic Flow				GEH	% Diff	Individual Links <5
		Car	LGV	OGV	Total	Car	LGV	OGV	Total			
1	Inbound	5,009	791	324	6,123	5,051	926	403	6,380	3.2	4%	69%
Widnes	Outbound	4,410	706	275	5,390	4,462	787	357	5,607	2.9	4%	31%
	2-way Total	9,418	1,496	599	11,513	9,514	1,713	760	11,987	4.4	4%	50%
2	Inbound	7,489	1,090	473	9,052	7,684	1,208	371	9,262	2.2	2%	44%
Runcorn	Outbound	7,502	954	486	8,942	8,299	1,020	363	9,683	7.7	8%	44%
	2-way Total	14,991	2,044	959	17,994	15,983	2,228	735	18,945	7.0	5%	44%
3	Inbound	6,555	882	278	7,715	6,090	899	323	7,312	4.7	-5%	45%
West Warrington	Outbound	6,370	889	266	7,526	5,719	920	333	6,971	6.5	-7%	18%
	2-way Total	12,926	1,771	544	15,241	11,809	1,818	656	14,283	7.9	-6%	32%
4	Inbound	7,075	663	293	8,032	7,924	748	318	8,990	10.4	12%	30%
North Warrington	Outbound	8,405	778	304	9,487	9,093	747	317	10,156	6.8	7%	30%
	2-way Total	15,481	1,441	597	17,518	17,017	1,495	635	19,147	12.0	9%	30%
7	Inbound	6,060	692	312	7,063	4,682	673	278	5,634	17.9	-20%	36%
South Liverpool	Outbound	6,814	602	241	7,657	5,362	596	224	6,183	17.7	-19%	36%
	2-way Total	12,874	1,294	553	14,721	10,044	1,270	502	11,816	25.2	-20%	36%
8	Inbound	6,606	945	274	7,825	6,539	877	343	7,759	0.7	-1%	50%
Birkenhead	Outbound	8,337	1,013	226	9,576	7,511	992	495	8,999	6.0	-6%	83%
	2-way Total	14,943	1,958	500	17,400	14,050	1,870	838	16,758	4.9	-4%	67%
10	Inbound	6,033	936	483	7,452	5,695	880	373	6,948	5.9	-7%	67%
South Widnes	Outbound	6,066	944	436	7,446	6,296	1,031	404	7,730	3.3	4%	56%
	2-way Total	12,099	1,881	919	14,898	11,991	1,911	776	14,678	1.8	-1%	61%
25	Inbound	2,341	237	64	2,642	2,876	167	74	3,117	8.9	18%	17%
Chester	Outbound	3,523	375	102	4,000	4,068	278	86	4,432	6.7	11%	17%
	2-way Total	5,864	612	166	6,642	6,944	445	161	7,549	10.8	14%	17%
Total	**Inbound**	**47,168**	**6,236**	**2,501**	**55,905**	**46,541**	**6,377**	**2,485**	**55,403**	**2.1**	**-1%**	**47%**
	Outbound	**51,427**	**6,260**	**2,336**	**60,023**	**50,810**	**6,373**	**2,579**	**59,762**	**1.1**	**0%**	**41%**
	2-way Total	**98,595**	**12,496**	**4,837**	**115,928**	**97,351**	**12,750**	**5,064**	**115,165**	**2.2**	**-1%**	**44%**

Table 4.42 - Comparison of Traffic Counts and Prior Matrix Assignment Flows across the River Mersey (vehicles) – PM Peak Hour

		Car Flow						LGV						OGV (vehicles)						Total (vehicles)					
Link Description	**DIR**	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB
Kingsway Tunnel	nb	1239	1377	138	11	3.8	✓	174	106	-68	-39	5.8	✓	90	147	58	64	5.3	✓	1503	1630	127	8	3.2	✓
Queensway Tunnel	nb	1023	1208	185	18	5.5	×	220	170	-50	-23	3.6	✓	0	0	0	0	0.0	✓	1243	1378	135	11	3.7	✓
Silver Jubilee Bridge	nb	2793	2933	140	5	2.6	✓	435	424	-11	-2	0.5	✓	231	160	-71	-31	5.0	✓	3459	3518	59	2	1.0	✓
A5060 Chester Road	nb	512	555	43	8	1.9	✓	79	67	-11	-14	1.3	✓	22	28	6	29	1.3	✓	613	651	38	6	1.5	✓
Wilderspool Causeway	nb	479	333	-146	-30	7.2	×	24	24	0	2	0.1	✓	18	18	0	-1	0.0	✓	521	375	-146	-28	6.9	×
A5061 Knutsford Road	nb	715	606	-108	-15	4.2	×	42	75	33	80	4.4	✓	29	70	42	146	5.9	✓	785	752	-33	-4	1.2	✓
A50 Kingsway North	nb	946	688	-258	-27	9.0	×	69	47	-22	-32	2.9	✓	16	14	-2	-14	0.6	✓	1031	748	-283	-27	9.5	×
Thelwall Viaduct	nb	5043	5247	203	4	2.8	✓	820	831	11	1	0.4	✓	970	997	27	3	0.8	✓	6833	7074	241	4	2.9	✓
TOTAL		**12751**	**12947**	**196**	**2**	**1.7**	✓	**1862**	**1745**	**-117**	**-6**	**2.8**	✓	**1375**	**1434**	**59**	**4**	**1.6**	✓	**15988**	**16126**	**138**	**1**	**1.1**	✓
Kingsway Tunnel	sb	2235	2157	-78	-4	1.7	✓	349	299	-50	-14	2.8	✓	81	90	9	11	1.0	✓	2665	2545	-120	-5	2.4	✓
Queensway Tunnel	sb	1406	1718	312	22	7.9	×	198	119	-79	-40	6.3	✓	0	0	0	0	0.0	✓	1604	1837	233	15	5.6	✓
Silver Jubilee Bridge	sb	2685	2789	104	4	2.0	✓	419	375	-44	-11	2.2	✓	222	162	-60	-27	4.4	✓	3326	3326	0	0	0.0	✓
A5060 Chester Road	sb	773	786	13	2	0.5	✓	94	113	19	20	1.8	✓	17	29	12	68	2.5	✓	885	928	43	5	1.4	✓
Wilderspool Causeway	sb	623	362	-261	-42	11.8	×	23	12	-11	-46	2.5	✓	19	9	-10	-55	2.8	✓	665	383	-282	-42	12.3	×
A5061 Knutsford Road	sb	715	473	-242	-34	9.9	×	53	53	0	1	0.1	✓	32	31	-2	-5	0.3	✓	800	556	-244	-30	9.4	×
A50 Kingsway North	sb	964	1027	63	7	2.0	✓	45	34	-11	-25	1.8	✓	18	16	-2	-11	0.5	✓	1027	1077	50	5	1.5	✓
Thelwall Viaduct	sb	4532	4446	-86	-2	1.3	✓	788	768	-20	-3	0.7	✓	796	779	-17	-2	0.6	✓	6116	5993	-123	-2	1.6	✓
TOTAL		**13934**	**13757**	**-177**	**-1**	**1.5**	✓	**1969**	**1773**	**-196**	**-10**	**4.5**	×	**1185**	**1115**	**-71**	**-6**	**2.1**	✓	**17087**	**16644**	**-443**	**-3**	**3.4**	✓
2-WAY TOTAL		**26685**	**26704**	**19**	**0**	**0.1**	✓	**3831**	**3517**	**-313**	**-8**	**5.2**	×	**2560**	**2549**	**-11**	**0**	**0.2**	✓	**33076**	**32770**	**-306**	**-1**	**1.7**	✓

Note: - Shaded cells within the table denoted by a cross sign refer to values which are outside the range specified by DMRB criteria.

Table 4.43 - Comparison of Traffic Counts and Prior Matrix Assignment Flows by Sector (vehicles) – PM Peak Hour

Sector	Observed Traffic Count				Model Traffic Flow				GEH	% Diff	Individual Links <5
	Car	LGV	OGV	Total	Car	LGV	OGV	Total			
1i - Widnes	32,529	4,336	1,549	38,413	29,845	4,578	1,765	36,189	11.5	-6%	49%
2i - Runcorn	42,521	5,181	2,253	49,955	38,980	5,941	1,786	46,707	14.8	-7%	44%
3i - West Warrington	16,321	2,012	598	18,931	14,860	2,237	843	17,940	7.3	-5%	41%
4i - Warrington	16,602	1,521	624	18,747	18,021	1,668	670	20,360	11.5	9%	30%
5i - South Warrington	1,087	101	21	1,209	407	77	29	513	23.7	-58%	0%
6i - East Warrington	13,917	2,045	1,928	17,890	15,013	2,164	2,252	19,430	11.3	9%	50%
7i - South Liverpool	10,886	1,552	695	13,133	9,196	1,492	588	11,275	16.8	-14%	58%
8i - Birkenhead Town Centre	17,429	2,389	651	20,469	16,734	2,179	1,060	19,973	3.5	-2%	71%
9i - East Wirral	17,984	2,132	402	20,519	15,853	2,536	1,551	19,940	4.1	-3%	52%
10i - South Widnes	12,099	1,881	919	14,898	11,991	1,911	776	14,678	1.8	-1%	61%
11i - Liverpool	40,666	4,574	1,154	46,394	36,906	4,469	1,252	42,627	17.9	-8%	41%
12i - South Knowsley	12,217	1,581	426	14,224	13,062	1,430	339	14,831	5.0	4%	61%
13i - Ellesmere Port	3,412	230	40	3,682	1,814	215	73	2,102	29.4	-43%	0%
14i – West Wirral & Wales	14,570	1,483	275	16,327	14,051	1,374	324	15,749	4.6	-4%	33%
15i - St Helens & S Lancs	46,977	6,998	2,271	56,246	52,995	7,187	2,204	62,386	25.2	11%	45%
Motorways	75,425	12,295	11,557	99,277	70,308	10,897	9,299	90,505	28.5	-9%	42%
Total	**374,641**	**50,310**	**25,363**	**450,314**	**360,037**	**50,355**	**24,813**	**435,205**	**22.7**	**-3%**	**46%**

Table 4.44 - Flow Calibration by Vehicle Type (Prior Matrix) – PM Peak Hour

Vehicle Type	Number of Counts	GEH < 5		Within DMRB	
		Number	Percentage	Number	Percentage
Car	456	205	45.0%	215	47.1%
LGV	456	382	83.8%	431	94.5%
OGV (vehicles)	456	386	84.6%	432	94.7%
Total (vehicles)	**456**	**205**	**45.0%**	**214**	**46.9%**

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Notes

Key

Traffic Zones

Simulation Area

Model Area

Rev	Date	Drawn	Description	Chked	App'd
P1	26/01/09	TA	For Issue	JH	HF

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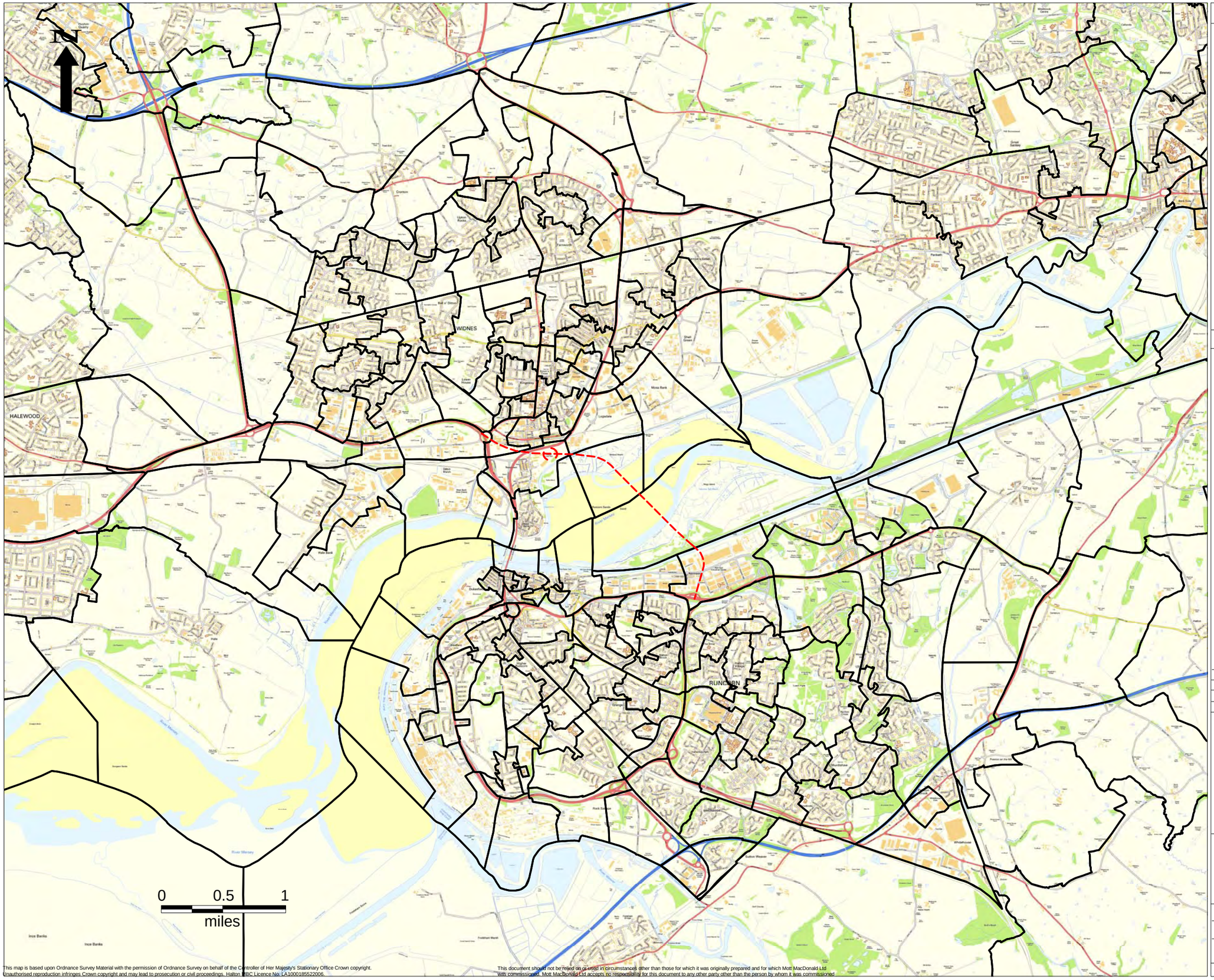
Figure 4.1 - Traffic Zones

Drawn	TA			
Dwg. Chk.	JH	Approved	HF	
Scale at A3 NTS	Project Mersey Gateway			Status PRE
	File			
Drawing No. 231775/TP/				Rev P1



Notes

Key

Traffic Zones

Rev	Date	Drawn	Description	Ch'ked	Ap'd
P1	25/06/07	GD	For Issue	DOB	CS

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Figure 4.2 - Traffic Zones within Halton

Drawn	GD			
Dwg. Chk.	DOB	Approved	CS	
Scale at A3 NTS	Project Mersey Gateway			Status PRE
	File P:\Manchester\Northwest\Projects\ (0483)\227709 Mersey Gateway\TP\5.0 Technical\5.4 Technical Notes\Maps\fig plans for report			
Drawing No. 231775/TP/				Rev P1

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Notes

Key

RSI SIte ★

RSI Cordon and Screenline

Simulation Area

Model Area

Rev	Date	Drawn	Description	Chk'ed	App'd
P1	26/01/09	GD	For Issue	JH	HF

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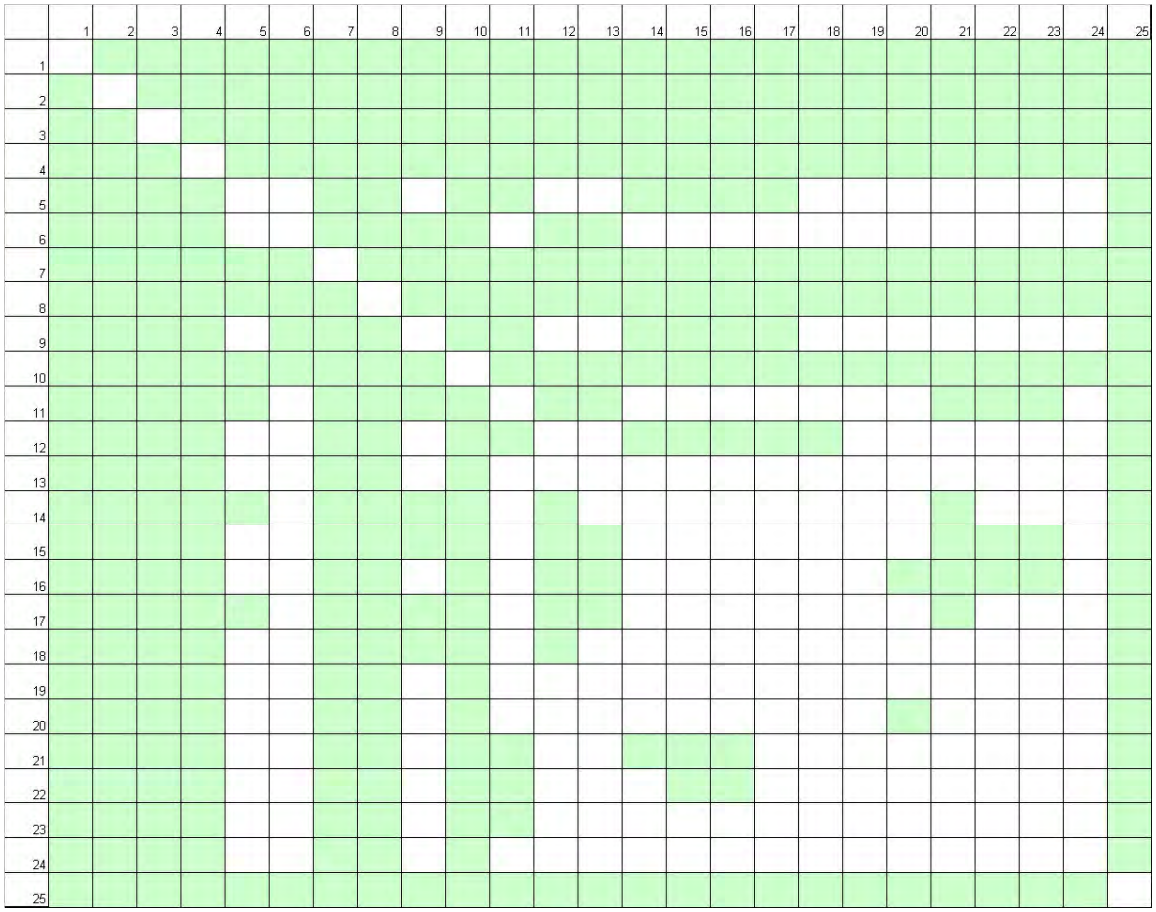
Figure 4.3 - RSI Cordons

Drawn	TA			
Dwg. Chk.	JH	Approved	HF	
Scale at A3 NTS	Project	Mersey Gateway		Status PRE
	File			
Drawing No.	231775/TP/			Rev P1

Sector

To

From



Key

Fully Observed Sector to Sector Movements

Movements from Synthetic Matrices

Design	CAD GD	Checked DOB	Approved CS
Drawing Number 231775/TP/		Date 25/06/07	
Project Mersey Gateway	File P:\Manchester\Northwest\Projects (Odd)\227709 Mersey Gateway\TP\9.0 Technical\9.4 Technical Notes\MapInfo plans for report		
Job Title Mersey Gateway Study	Drawing Title Figure 4.4 - Fully Observed Sector to Sector Movements		

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miles

Notes

Sector 19 = Yorkshire + the Humber

Key

Sector

Simulation Area

Model Area

Rev	Date	Drawn	Description	Chkd	App'd
P1	26/01/09	TA	For Issue	JH	HF

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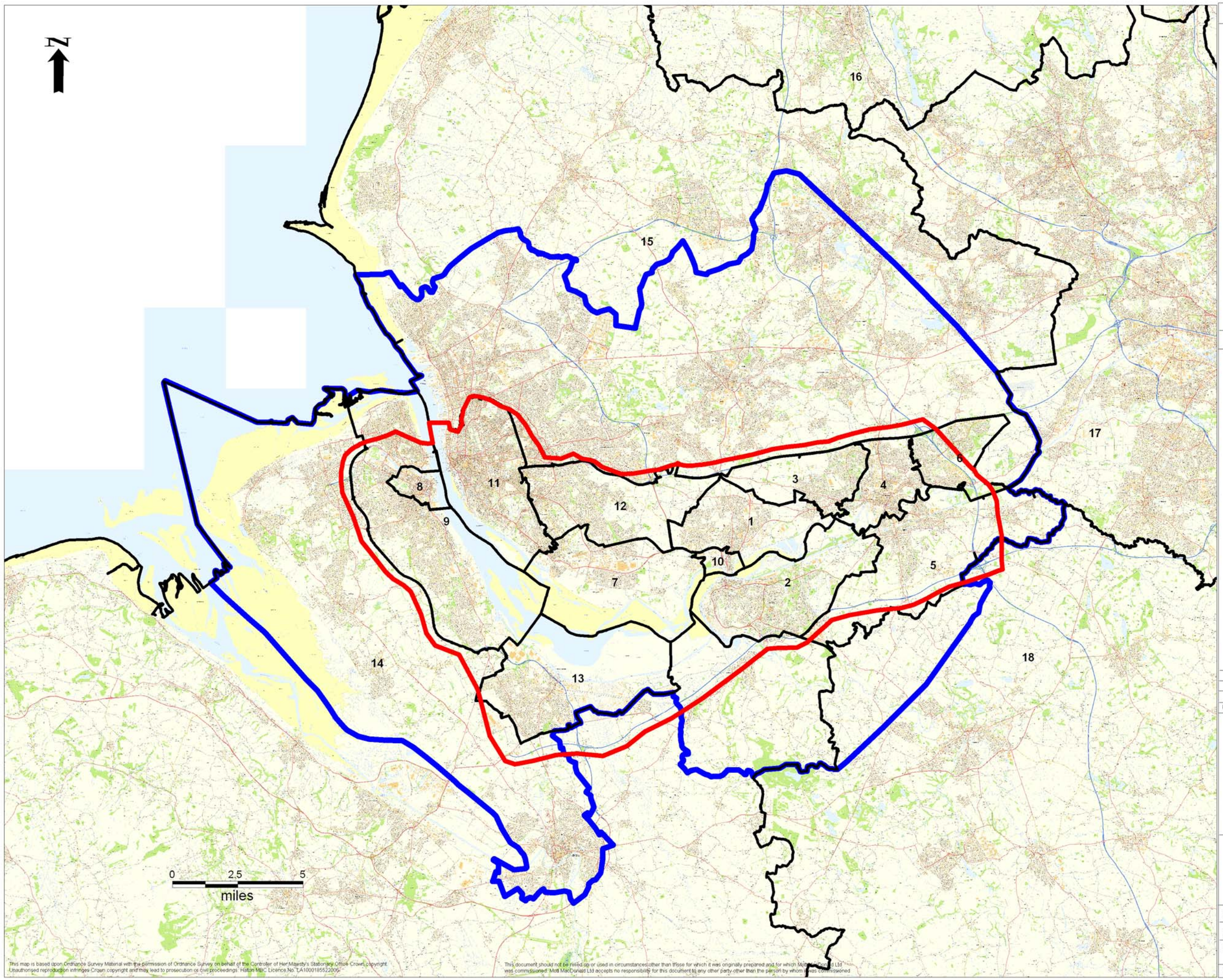
Figure 4.5 - Sectors Defined for Matrix Building

Drawn	TA			
Dwg. Chk.	JH	Approved	HF	
Scale at A3 NTS	Project	Mersey Gateway		Status PRE
	File			
Drawing No.	231775/TP/			Rev P1



Notes

Key

Sector

Simulation Area

Model Area

Rev	Date	Drawn	Description	Chkd	Appd
P1	26/01/09	TA	For Issue	JH	HF

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Figure 4.6 - Definition of Display Sectors

Drawn	TA			
Dwg. Chk.	JH	Approved	HF	
Scale at A3 NTS	Project	Mersey Gateway		Status PRE
	File			
Drawing No.	231775/TP/			Rev P1

Figure 4.7 - Matrix Synthesis Procedure

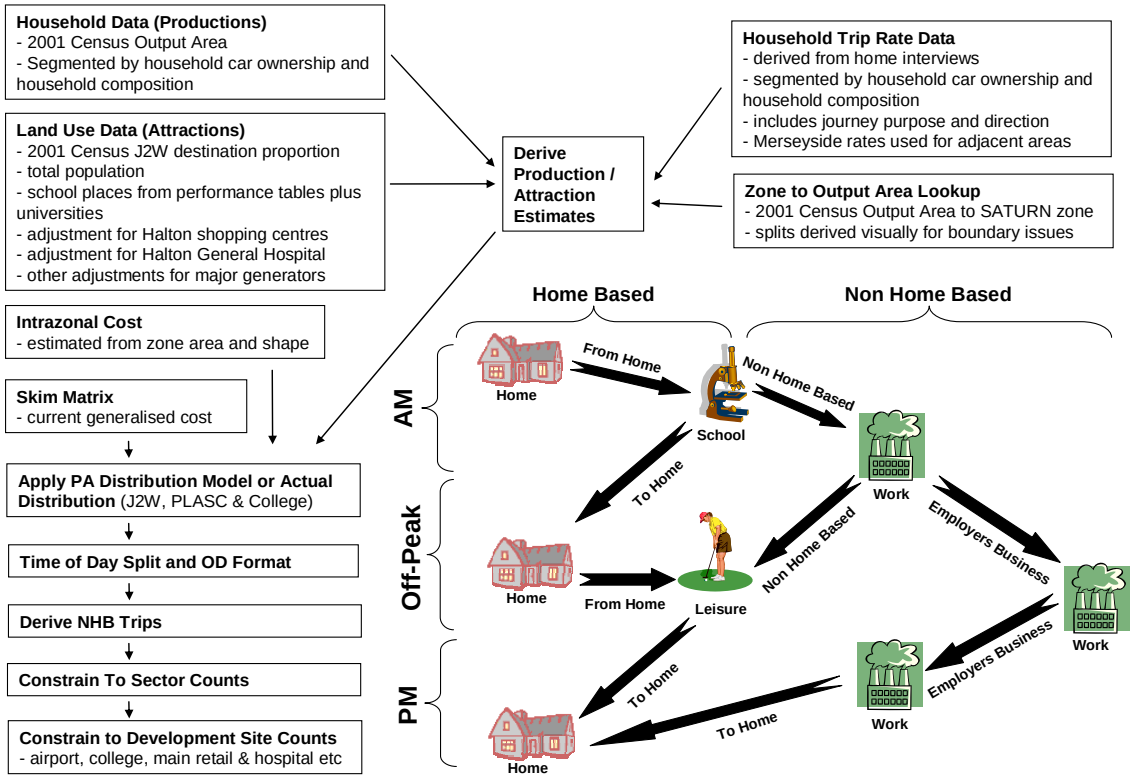


Figure 4.8 - Home Based Trip Production and Attraction Estimates

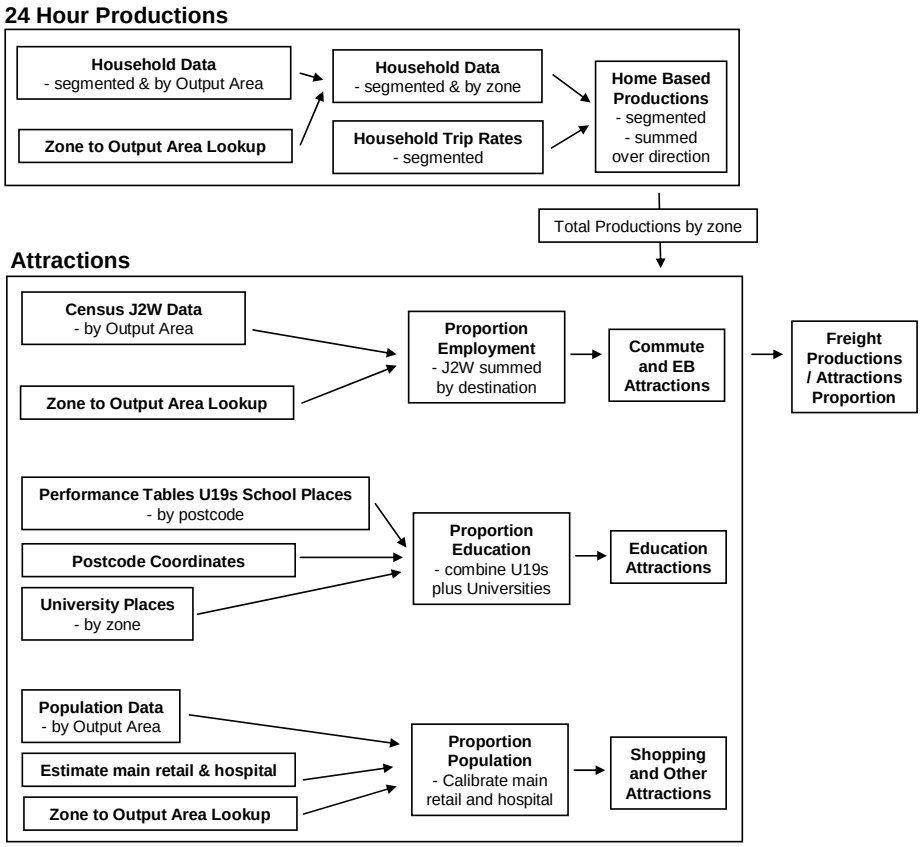
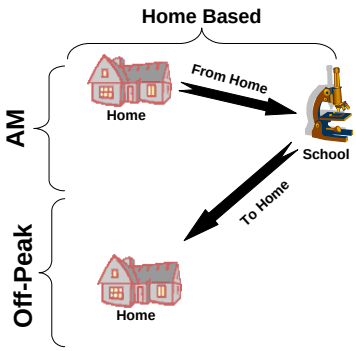
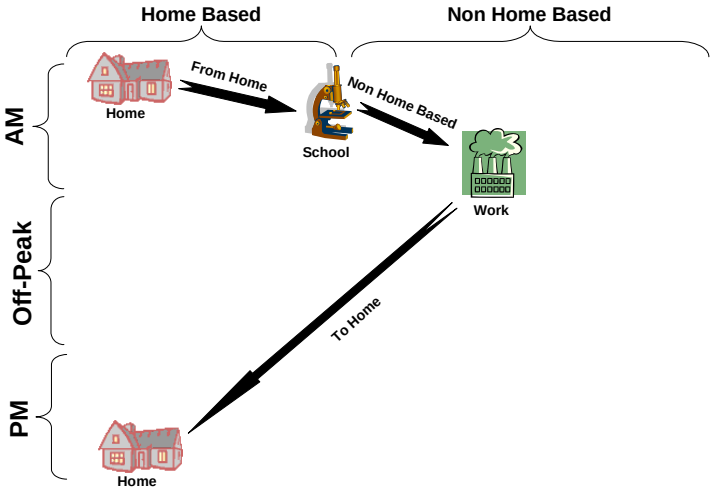


Figure 4.9 - Synthetic Trip Chains

A - Simple Trip Chain



B - Return Home Non Home Based Trip Chain



C – Full Trip Non Home Based Trip Chain

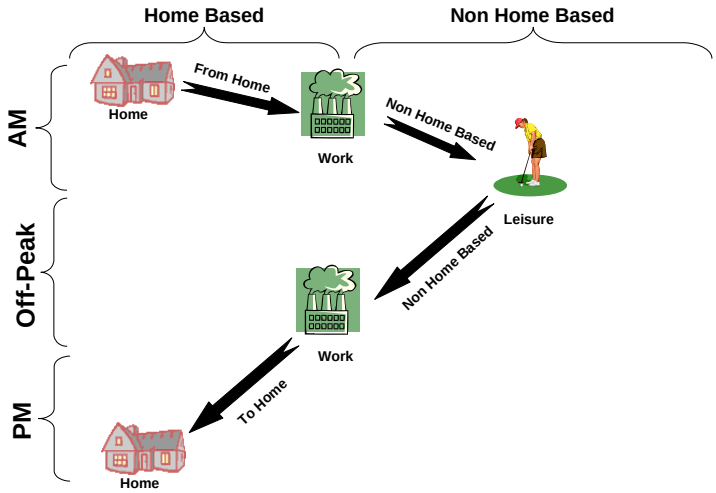
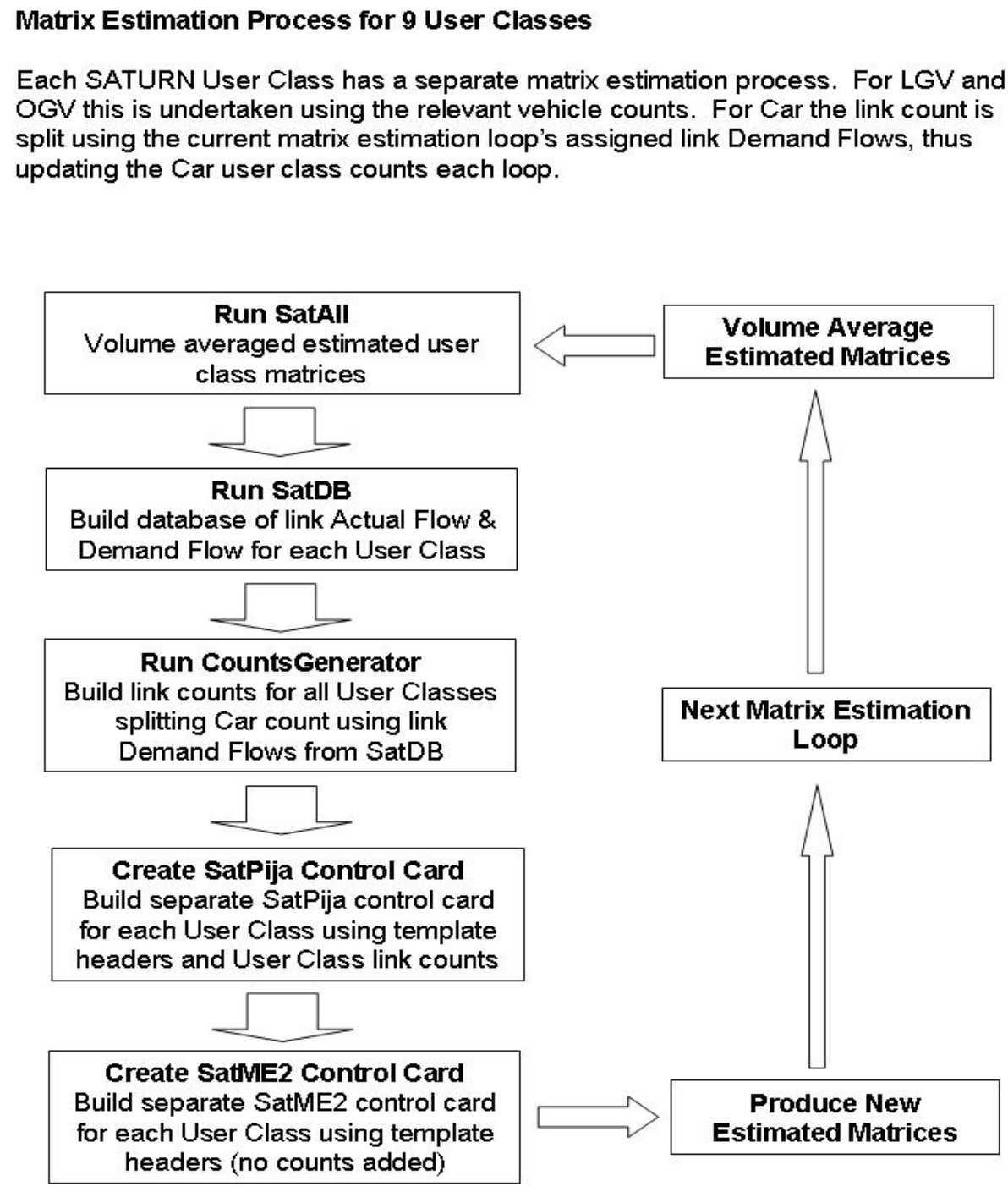


Figure 4.10 – Matrix Estimation Process for Mersey Gateway Model



Chapter 5 Tables and Figures

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Table.5.1 - SATURN network link types

Link Type	Description
	Rural
1	Motorway – D4M (70 mph)
2	Motorway – D3M (70 mph)
3	Motorway – D2M (70 mph)
4	Slip roads (long free flow 70mph)
5	Slip roads (2-lane Short links to AP network)
6	Slip roads (2-lane Short links from AP network)
7	Slip roads (1-lane Short links to AP network)
8	Slip roads (1-lane Short links from AP network)
9	D3AP (70 mph)
10	D3AP (60 mph)
11	D3AP (50 mph)
12	D3AP (40 mph)
13	D2AP (70 mph)
14	D2AP (60 mph)
15	D2AP (50 mph)
16	D2AP (40 mph)
17	S10 - Single 2 lane (10m) (60 mph)
18	S10 - Single 2 lane (10m) (50 mph)
	Suburban
19	Motorway standard - D2AP (60 mph)
20	Motorway standard - D2AP (50 mph)
45	D4AP (40 mph)
21	D3AP (60 mph)
22	D3AP (40 mph)
41	D2AP (60 mph)
23	D2AP (50 mph)
24	D2AP (40 mph)
25	S10 - Single 2 lane (10m) (60 mph)
26	S10 - Single 2 lane (10m) (50 mph)
27	S7.3 - Single 2 lane (7.3m) (60 mph)
28	S7.3 - Single 2 lane (7.3m) (50 mph)
29	S7.0 - Single 2 lane (7.0m) (60 mph)
30	S7.0 - Single 2 lane (7.0m) (50 mph)
31	S6.5 - Single 2 lane (6.5m) (40 mph)
43	S7.3 - Single 2 lane (7.3m) (30 mph)
42	S7.3 Single 2 lane (7.3m) (20mph)
	Urban
44	D4AP (30 mph)
32	D3AP (30 mph)
33	D2AP (30 mph)
34	S10 - Single 2 lane (10m) (40 mph)
35	S10 - Single 2 lane (10m) (30 mph)
36	S7.3 - Single 2 lane (7.3m) (40 mph)
37	S7.3 - Single 2 lane (7.3m) (30 mph)
38	S7.0 - Single 2 lane (7.0m) (40 mph)
39	S7.0 - Single 2 lane (7.0m) (30 mph)
40	S6.5 - Single 2 lane (6.5m) (30 mph)

Note: speeds in brackets are speed limits

Table.5.2 - Observed Capacity of Kingsway Tunnel Toll Booths

	Automatic toll booth	Staffed toll booth	Staffed toll booth for HGVs/buses
Number of Observations	9	5	3
Mean (vehicles per 3 minute period)	26.8	12.8	16.7
Standard Deviation	2.2	2.4	2.9
Capacity (vehicles per hour)	536	256	333

Table 5.3 - Behavioural Routing Parameters for SATURN

Vehicle type/Trip purpose	Mersey Gateway	
	PPM	PPK
Car Commute High Income	11.88	5.92
Car Commute Medium Income	10.35	5.92
Car Commute Low Income	6.26	5.92
Car Employer's Business	46.09	12.83
Car Other High Income	11.12	5.92
Car Other Medium Income	9.19	5.92
Car Other Low Income	7.25	5.92
LGV	17.88	14.59
OGV *	24.87	44.24

Note: Parameters are for 2006 Base Year in 2006 prices and per pcu (post occupancy)

Table 5.4 - Base Year Tolls at the Mersey Tunnels

Mersey Tunnel Tolls as from 2 April 2006		Toll Per Vehicle	
Toll Class		Cash Payments £	Fast Tag £
1	Motorcycle with sidecar and 3-wheeled vehicle Private/light goods vehicle up to 3.5 tonnes gross vehicle weight Passenger carrying vehicle with seating capacity for under 9 persons	1.30	1.15
2	Private/light goods vehicle up to 3.5 tonnes gross vehicle weight with trailer Heavy goods vehicle over 3.5 tonnes gross vehicle weight, with two axles Passenger carrying vehicle with seating capacity for 9 or more persons with two axles	1.30	1.15
3	Heavy goods vehicle over 3.5 tonnes gross vehicle weight with three axles Passenger carrying vehicle with seating capacity for 9 or more persons with three axles	3.90	3.45
4	Heavy goods vehicle over 3.5 tonnes gross vehicle weight, with four or more axles	5.20	4.60

Table 5.5 - Vehicle Mix at SJB and Weighted Average OGV Toll

Bin	Vehicle type	Observed proportion*	Assumed Toll (£)
1	Motorcycles, mopeds and scooters (including motorcycle with sidecar)	0.7%	0
2	Car or Light Van	83.3%	1.30
3	Car or Light Van + Trailer	0.2%	1.30
4	Heavy Van	6.5%	1.30
5	Light Goods	0.6%	1.30
6	Rigid	3.5%	3.90
7	Rigid + Trailer	0.6%	5.20
8	Articulated HGV	4.1%	5.20
9	Minibus	0.1%	1.30
10	Coaches	0.3%	3.90
	Average Toll for OGVs (Bins 6,7 & 8)		**4.65**

Note: * based on detailed classified counts carried out from March 2007 on SJB

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Notes

Key

Network Links

Simulation Area

Model Area

Rev	Date	Drawn	Description	Ch'ked	App'd
P1	25/06/07	GD	For Issue	DOB	CS

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Mersey Gateway Study

Figure 5.1 - Highway Network

Drawn	GD			
Dwg. Chk.	DOB	Approved	CS	
Scale at A3 NTS	Project Mersey Gateway			Status PRE
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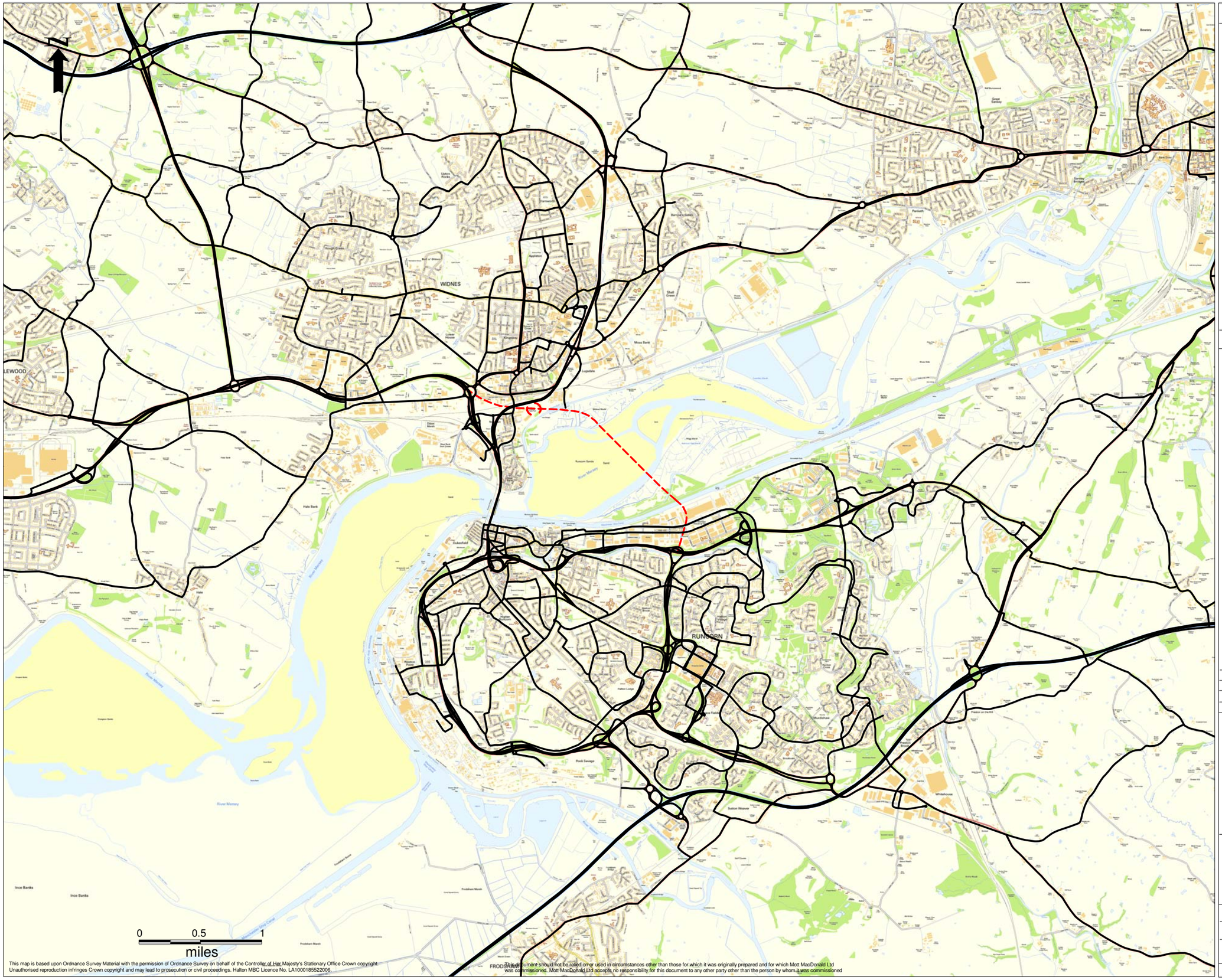
Drawing No. 231775/TP/				Rev P1



Notes

Key

Network Links

Rev	Date	Drawn	Description	Ch'ked	App'd
P1	25/06/07	GD	For Issue	DOB	CS

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Figure 5.2 - Highway Network within Halton

Drawn	GD			
Dwg. Chk.	DOB	Approved	CS	
Scale at A3 NTS	Project Mersey Gateway			Status PRE
	File P:\Manchester\Borchwood\Projects\404012\27709 Mersey Gateway\TP\5.0 Technical\5.4 Technical Notes\Maps\fm plans for report			
Drawing No. 231775/TP/				Rev P1

Chapter 7 Tables

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Table 7.1 - Convergence Statistics for the Base Year AM Peak Hour

Iteration Number	Global Stability		Disaggregate Stability			Proximity
	Assigned pcu-hours		% Flow (changing less than 1%) >95%	AAD in Flows < 1 veh/hr	RAAD in Flows < 1%	Duality gap delta δ < 1%
	Total	% change				
15	111265.5	-0.022	94.6	0.95	0.16	0.066
16	111242.2	-0.021	95.7	0.80	0.13	0.066
17	111246.4	0.004	96.5	0.65	0.11	0.050
18	111244.1	-0.002	97.2	0.61	0.10	0.052

Table 7.2 - Convergence Statistics for the Base Year Inter Peak Hour

Iteration Number	Global Stability		Disaggregate Stability			Proximity
	Assigned pcu-hours		% Flow (changing less than 1%) >95%	AAD in Flows < 1 veh/hr	RAAD in Flows < 1%	Duality gap delta δ < 1%
	Total	% change				
9	73640.1	-0.013	96.1	0.59	0.14	0.033
10	73641.1	0.001	97.3	0.42	0.10	0.025
11	73635.0	-0.008	97.8	0.36	0.09	0.021
12	73633.2	-0.002	98.4	0.27	0.07	0.018

Table 7.3 - Convergence Statistics for the Base Year PM Peak Hour

Iteration Number	Global Stability		Disaggregate Stability			Proximity
	Assigned pcu-hours		% Flow (changing less than 1%) >95%	AAD in Flows < 1 veh/hr	RAAD in Flows < 1%	Duality gap delta δ < 1%
	Total	% change				
20	103900.3	0.010	95.5	0.81	0.14	0.080
21	103886.2	-0.014	96.3	0.64	0.11	0.080
22	103884.3	-0.002	96.9	0.57	0.10	0.071
23	103855.0	-0.028	97.4	0.54	0.10	0.057

Table 7.4 - Convergence Statistics for the Base Year Overnight Hour

Iteration Number	Global Stability		Disaggregate Stability			Proximity
	Assigned pcu-hours		% Flow (changing less than 1%) >95%	AAD in Flows < 1 veh/hr	RAAD in Flows < 1%	Duality gap delta δ < 1%
	Total	% change				
4	15381.0	-0.026	95.4	0.29	0.28	0.0021
5	15380.1	-0.006	97.2	0.12	0.12	0.0012
6	15381.6	0.010	97.1	0.13	0.13	0.0019
7	15380.6	-0.007	99.5	0.02	0.02	0.00058

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Chapter 8 Tables and Figures

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Table 8.1 - Comparison of Traffic Counts and Model Flows by RSI Cordon (vehicles) – AM Peak Hour

RSI Cordon	Direction	Observed Traffic Count				Model Traffic Flow				GEH	% Diff	Individual Links <5
		Car	LGV	OGV	Total	Car	LGV	OGV	Total			
1	Inbound	4,201	635	327	5,162	4,591	672	366	5,628	6.3	9%	69%
Widnes	Outbound	5,331	764	323	6,419	5,200	695	360	6,255	2.1	-3%	54%
	2-way Total	9,532	1,399	650	11,581	9,791	1,367	725	11,883	2.8	3%	62%
2	Inbound	8,024	816	539	9,378	8,427	842	546	9,815	4.5	5%	78%
Runcorn	Outbound	7,717	964	595	9,276	8,196	953	588	9,737	4.7	5%	89%
	2-way Total	15,741	1,779	1,134	18,655	16,623	1,794	1,134	19,552	6.5	5%	83%
3	Inbound	6,186	862	339	7,388	5,677	804	432	6,913	5.6	-6%	55%
West Warrington	Outbound	6,396	906	322	7,624	6,287	889	434	7,611	0.2	0%	82%
	2-way Total	12,582	1,769	661	15,012	11,965	1,693	866	14,524	4.0	-3%	68%
4	Inbound	8,818	872	360	10,050	8,542	828	500	9,871	1.8	-2%	80%
North Warrington	Outbound	6,688	717	407	7,812	6,558	668	529	7,756	0.6	-1%	60%
	2-way Total	15,506	1,588	767	17,862	15,101	1,497	1,030	17,627	1.8	-1%	70%
7	Inbound	6,338	623	315	7,276	6,555	595	301	7,451	2.0	2%	73%
South Liverpool	Outbound	5,785	637	278	6,700	5,408	635	286	6,329	4.6	-6%	82%
	2-way Total	12,123	1,260	593	13,976	11,963	1,230	587	13,780	1.7	-1%	77%
8	Inbound	9,648	918	248	10,814	9,655	960	300	10,914	1.0	1%	75%
Birkenhead	Outbound	5,702	938	364	7,004	5,848	852	434	7,134	1.5	2%	92%
	2-way Total	15,350	1,856	612	17,818	15,503	1,812	733	18,048	1.7	1%	83%
10	Inbound	6,590	1,022	474	8,087	6,383	787	372	7,541	6.2	-7%	67%
South Widnes	Outbound	5,469	793	436	6,698	5,856	779	386	7,021	3.9	5%	78%
	2-way Total	12,059	1,815	910	14,785	12,239	1,566	758	14,562	1.8	-2%	72%
25	Inbound	4,227	257	140	4,624	4,124	274	130	4,529	1.4	-2%	67%
Chester	Outbound	2,218	233	105	2,555	1,920	257	115	2,292	5.4	-10%	50%
	2-way Total	6,445	490	245	7,179	6,045	531	245	6,821	4.3	-5%	58%
Total	**Inbound**	**54,032**	**6,005**	**2,742**	**62,779**	**53,955**	**5,760**	**2,947**	**62,662**	**0.5**	**0%**	**70%**
	Outbound	**45,307**	**5,952**	**2,830**	**54,089**	**45,275**	**5,729**	**3,132**	**54,135**	**0.2**	**0%**	**74%**
	2-way Total	**99,339**	**11,957**	**5,573**	**116,868**	**99,229**	**11,489**	**6,078**	**116,797**	**0.2**	**0%**	**72%**

Table 8.2 - Comparison of Traffic Counts and Model Flows by Link across the River Mersey (vehicles) – AM Peak Hour

		Car Flow						LGV						OGV (vehicles)						Total (vehicles)					
Link Description	**DIR**	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB
Kingsway Tunnel	nb	2668	2637	-31	-1	0.6	✓	166	164	-2	-1	0.1	✓	117	129	12	11	1.1	✓	2950	2930	-20	-1	0.4	✓
Queensway Tunnel	nb	1786	1695	-91	-5	2.2	✓	171	113	-58	-34	4.9	✓	0	0	0	0	0.0	✓	1957	1808	-149	-8	3.4	✓
Silver Jubilee Bridge	nb	2925	3123	198	7	3.6	✓	366	295	-71	-19	3.9	✓	193	136	-57	-30	4.5	✓	3484	3554	70	2	1.2	✓
A5060 Chester Road	nb	698	723	25	4	0.9	✓	54	53	-2	-3	0.2	✓	35	35	0	-1	0.1	✓	788	811	23	3	0.8	✓
Wilderspool Causeway	nb	790	762	-28	-4	1.0	✓	26	26	0	0	0.0	✓	33	34	1	3	0.2	✓	849	822	-27	-3	0.9	✓
A5061 Knutsford Road	nb	865	547	-318	-37	12.0	×	48	41	-7	-14	1.0	✓	33	129	95	288	10.6	✓	945	717	-229	-24	7.9	×
A50 Kingsway North	nb	1015	891	-124	-12	4.0	✓	64	36	-28	-44	4.0	✓	27	19	-8	-29	1.6	✓	1106	946	-160	-14	5.0	✓
Thelwall Viaduct	nb	4977	5163	186	4	2.6	✓	570	583	13	2	0.5	✓	905	875	-30	-3	1.0	✓	6452	6621	169	3	2.1	✓
TOTAL		**15724**	**15541**	**-183**	**-1**	**1.5**	✓	**1464**	**1310**	**-154**	**-11**	**4.1**	×	**1343**	**1357**	**14**	**1**	**0.4**	✓	**18532**	**18208**	**-323**	**-2**	**2.4**	✓
Kingsway Tunnel	sb	907	751	-156	-17	5.4	×	185	214	30	16	2.1	✓	144	173	29	20	2.3	✓	1235	1139	-96	-8	2.8	✓
Queensway Tunnel	sb	1000	1199	199	20	6.0	×	185	190	5	3	0.3	✓	0	0	0	0	0.0	✓	1185	1389	204	17	5.7	×
Silver Jubilee Bridge	sb	2768	2770	2	0	0.0	✓	346	330	-16	-4	0.8	✓	182	159	-23	-13	1.8	✓	3296	3259	-37	-1	0.7	✓
A5060 Chester Road	sb	480	497	18	4	0.8	✓	75	62	-13	-17	1.5	✓	31	57	27	87	4.0	✓	585	617	32	5	1.3	✓
Wilderspool Causeway	sb	367	355	-12	-3	0.6	✓	35	18	-16	-47	3.2	✓	14	10	-4	-30	1.2	✓	416	384	-32	-8	1.6	✓
A5061 Knutsford Road	sb	483	288	-195	-40	9.9	×	45	35	-10	-22	1.5	✓	21	20	-1	-4	0.2	✓	549	343	-205	-37	9.7	×
A50 Kingsway North	sb	954	934	-20	-2	0.6	✓	90	93	3	3	0.3	✓	46	34	-12	-25	1.8	✓	1090	1061	-29	-3	0.9	✓
Thelwall Viaduct	sb	4580	4529	-51	-1	0.8	✓	560	553	-7	-1	0.3	✓	940	923	-17	-2	0.6	✓	6080	6005	-75	-1	1.0	✓
TOTAL		**11539**	**11324**	**-215**	**-2**	**2.0**	✓	**1520**	**1496**	**-23**	**-2**	**0.6**	✓	**1378**	**1376**	**-1**	**0**	**0.0**	✓	**14436**	**14197**	**-239**	**-2**	**2.0**	✓
2-WAY TOTAL		**27263**	**26865**	**-398**	**-1**	**2.4**	✓	**2984**	**2807**	**-178**	**-6**	**3.3**	✓	**2721**	**2733**	**13**	**0**	**0.2**	✓	**32968**	**32405**	**-563**	**-2**	**3.1**	✓

Note: - Shaded cells within the table denoted by a cross sign refer to values which are outside the range specified by DMRB criteria.

Table 8.3 - Comparison of Traffic Counts and Model Flows by Sector (vehicles) – AM Peak Hour

Sector	Observed Traffic Count				Model Traffic Flow				GEH	% Diff	Individual Links <5
	Car	LGV	OGV	Total	Car	LGV	OGV	Total			
1i - Widnes	31,055	4,092	1,704	36,851	31,233	3,971	1,792	36,997	0.8	0%	71%
2i - Runcorn	42,140	4,604	2,942	49,686	42,494	4,620	2,828	49,942	1.1	1%	75%
3i - West Warrington	15,879	2,018	762	18,659	14,630	1,916	1,212	17,758	6.7	-5%	67%
4i - Warrington	16,347	1,669	801	18,818	15,872	1,586	1,057	18,515	2.2	-2%	74%
5i - South Warrington	1,230	137	39	1,407	782	131	148	1,061	9.8	-25%	0%
6i - East Warrington	14,600	1,589	2,117	18,306	15,117	1,594	2,164	18,875	4.2	3%	88%
7i - South Liverpool	10,225	1,417	892	12,534	10,457	1,346	729	12,532	0.0	0%	100%
8i - Birkenhead Town Centre	12,809	1,557	513	14,879	12,921	1,516	652	15,089	1.7	1%	73%
9i - East Wirral	20,243	2,211	658	23,113	20,144	2,204	1,278	23,626	3.4	2%	70%
10i - South Widnes	12,059	1,815	910	14,785	12,239	1,566	758	14,562	1.8	-2%	72%
11i - Liverpool	38,965	4,675	1,493	45,133	39,945	4,477	1,510	45,932	3.7	2%	64%
12i - South Knowsley	12,395	1,395	592	14,382	14,237	1,351	481	16,069	13.7	12%	67%
13i - Ellesmere Port	2,365	179	76	2,620	2,175	179	84	2,438	3.6	-7%	75%
14i – West Wirral & Wales	14,202	1,388	418	16,008	13,926	1,377	475	15,777	1.8	-1%	74%
15i - St Helens & S Lancs	49,986	7,078	2,884	59,948	52,660	6,992	2,858	62,509	10.4	4%	76%
Motorways	76,205	8,901	12,816	97,922	76,597	8,770	11,607	96,974	3.0	-1%	73%
Total	**370,707**	**44,726**	**29,618**	**445,051**	**375,428**	**43,594**	**29,634**	**448,656**	**5.4**	**1%**	**72%**

Table 8.4 - Flow Calibration by Vehicle Type (Validated Matrix) – AM Peak Hour

Vehicle Type	Number of Counts	GEH < 5		Within DMRB	
		Number	Percentage	Number	Percentage
Car	456	340	74.6%	352	77.2%
LGV	456	445	97.6%	456	100.0%
OGV (vehicles)	456	404	88.6%	442	96.9%
Total (vehicles)	**456**	**331**	**72.6%**	**344**	**75.4%**

Table 8.5 - Comparison of Traffic Counts and Model Flows by RSI Cordon (vehicles) – Inter Peak Hour

RSI Cordon	Direction	Observed Traffic Count				Model Traffic Flow				GEH	% Diff	Individual Links <5
		Car	LGV	OGV	Total	Car	LGV	OGV	Total			
1	Inbound	3,409	613	427	4,448	3,743	632	453	4,828	5.6	9%	85%
Widnes	Outbound	3,378	616	529	4,523	3,538	615	525	4,677	2.3	3%	77%
	2-way Total	6,787	1,229	956	8,972	7,281	1,247	977	9,505	5.5	6%	81%
2	Inbound	4,679	798	718	6,194	4,960	822	723	6,504	3.9	5%	89%
Runcorn	Outbound	4,860	791	678	6,329	5,069	806	660	6,534	2.6	3%	78%
	2-way Total	9,538	1,589	1,396	12,523	10,029	1,628	1,382	13,039	4.6	4%	83%
3	Inbound	4,664	729	360	5,752	4,373	648	565	5,585	2.2	-3%	73%
West Warrington	Outbound	4,917	871	396	6,184	4,646	746	583	5,974	2.7	-3%	64%
	2-way Total	9,581	1,599	756	11,937	9,018	1,393	1,148	11,560	3.5	-3%	68%
4	Inbound	5,788	700	430	6,918	5,412	696	692	6,800	1.4	-2%	60%
North Warrington	Outbound	5,960	699	409	7,068	5,809	666	657	7,132	0.8	1%	70%
	2-way Total	11,748	1,399	839	13,986	11,221	1,362	1,350	13,932	0.5	0%	65%
7	Inbound	4,189	523	372	5,084	4,066	519	362	4,947	1.9	-3%	91%
South Liverpool	Outbound	4,622	615	335	5,572	3,967	574	363	4,904	9.2	-12%	91%
	2-way Total	8,811	1,138	707	10,656	8,034	1,092	725	9,851	8.0	-8%	91%
8	Inbound	5,414	791	306	6,511	5,453	872	429	6,755	3.0	4%	83%
Birkenhead	Outbound	5,774	853	345	6,972	5,416	844	460	6,720	3.0	-4%	92%
	2-way Total	11,188	1,644	651	13,483	10,869	1,716	889	13,475	0.1	0%	88%
10	Inbound	4,517	856	722	6,095	4,545	802	564	5,912	2.4	-3%	89%
South Widnes	Outbound	4,527	803	610	5,940	4,659	800	602	6,060	1.6	2%	89%
	2-way Total	9,044	1,659	1,332	12,035	9,204	1,602	1,166	11,972	0.6	-1%	89%
25	Inbound	2,126	258	134	2,518	2,167	250	135	2,551	0.7	1%	100%
Chester	Outbound	2,188	283	144	2,615	2,210	276	152	2,638	0.4	1%	100%
	2-way Total	4,314	542	277	5,133	4,377	525	287	5,189	0.8	1%	100%
Total	**Inbound**	**34,786**	**5,267**	**3,469**	**43,522**	**34,719**	**5,240**	**3,923**	**43,882**	**1.7**	**1%**	**83%**
	Outbound	**36,226**	**5,532**	**3,445**	**45,204**	**35,313**	**5,326**	**4,001**	**44,640**	**2.7**	**-1%**	**81%**
	2-way Total	**71,012**	**10,799**	**6,914**	**88,725**	**70,032**	**10,566**	**7,924**	**88,522**	**0.7**	**0%**	**82%**

Table 8.6 - Comparison of Traffic Counts and Model Flows by Link across the River Mersey (vehicles) – Inter Peak Hour

		Car Flow						LGV						OGV (vehicles)						Total (vehicles)					
Link Description	**DIR**	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB
Kingsway Tunnel	nb	798	775	-23	-3	0.8	✓	144	134	-11	-7	0.9	✓	126	184	58	46	4.7	✓	1068	1093	24	2	0.7	✓
Queensway Tunnel	nb	873	771	-102	-12	3.5	✓	112	136	24	21	2.2	✓	0	0	0	0	0.0	✓	985	908	-78	-8	2.5	✓
Silver Jubilee Bridge	nb	1859	1964	105	6	2.4	✓	352	324	-28	-8	1.5	✓	319	207	-112	-35	6.9	×	2530	2496	-34	-1	0.7	✓
A5060 Chester Road	nb	446	426	-19	-4	0.9	✓	58	73	15	26	1.9	✓	42	55	12	29	1.8	✓	546	554	8	1	0.3	✓
Wilderspool Causeway	nb	536	245	-291	-54	14.7	×	39	34	-4	-11	0.7	✓	22	22	0	2	0.1	✓	597	302	-295	-49	13.9	×
A5061 Knutsford Road	nb	558	538	-20	-4	0.9	✓	55	56	1	2	0.2	✓	39	217	177	449	15.7	×	652	811	158	24	5.8	×
A50 Kingsway North	nb	682	292	-389	-57	17.6	×	68	35	-33	-49	4.6	✓	26	17	-9	-34	1.9	✓	776	344	-431	-56	18.2	×
Thelwall Viaduct	nb	3408	3446	37	1	0.6	✓	682	706	24	4	0.9	✓	1161	1091	-70	-6	2.1	✓	5251	5243	-8	0	0.1	✓
TOTAL		**9160**	**8458**	**-703**	**-8**	**7.5**	**×**	**1509**	**1498**	**-11**	**-1**	**0.3**	**✓**	**1735**	**1793**	**57**	**3**	**1.4**	**✓**	**12405**	**11749**	**-656**	**-5**	**6.0**	**×**
Kingsway Tunnel	sb	940	716	-225	-24	7.8	×	166	145	-21	-13	1.7	✓	126	177	51	40	4.1	✓	1233	1037	-196	-16	5.8	×
Queensway Tunnel	sb	701	862	161	23	5.8	×	94	177	83	89	7.2	✓	0	0	0	0	0.0	✓	795	1039	244	31	8.1	×
Silver Jubilee Bridge	sb	1877	1906	29	2	0.7	✓	355	350	-5	-1	0.3	✓	322	306	-16	-5	0.9	✓	2554	2562	8	0	0.2	✓
A5060 Chester Road	sb	507	430	-77	-15	3.6	✓	69	63	-6	-9	0.7	✓	42	73	32	76	4.2	✓	618	567	-52	-8	2.1	✓
Wilderspool Causeway	sb	517	349	-168	-33	8.1	×	45	43	-2	-5	0.3	✓	24	20	-4	-19	1.0	✓	586	411	-175	-30	7.8	×
A5061 Knutsford Road	sb	509	400	-110	-22	5.2	×	37	31	-6	-15	1.0	✓	31	43	12	38	1.9	✓	578	474	-104	-18	4.5	×
A50 Kingsway North	sb	729	689	-39	-5	1.5	✓	53	39	-14	-27	2.1	✓	35	34	-1	-4	0.2	✓	817	762	-55	-7	2.0	✓
Thelwall Viaduct	sb	3272	3366	94	3	1.6	✓	643	627	-16	-2	0.6	✓	1009	967	-42	-4	1.3	✓	4924	4960	36	1	0.5	✓
TOTAL		**9053**	**8718**	**-335**	**-4**	**3.6**	**✓**	**1463**	**1476**	**13**	**1**	**0.3**	**✓**	**1589**	**1619**	**30**	**2**	**0.8**	**✓**	**12104**	**11812**	**-292**	**-2**	**2.7**	**✓**
2-WAY TOTAL		**18213**	**17175**	**-1038**	**-6**	**7.8**	**×**	**2972**	**2974**	**2**	**0**	**0.0**	**✓**	**3324**	**3412**	**87**	**3**	**1.5**	**✓**	**24509**	**23561**	**-948**	**-4**	**6.1**	**×**

Note: - Shaded cells within the table denoted by a cross sign refer to values which are outside the range specified by DMRB criteria.

Table 8.7 - Comparison of Traffic Counts and Model Flows by Sector (vehicles) – Inter Peak Hour

Sector	Observed Traffic Count				Model Traffic Flow				GEH	% Diff	Individual Links <5
	Car	LGV	OGV	Total	Car	LGV	OGV	Total			
1i - Widnes	17,081	2,751	1,837	21,669	17,414	2,706	1,875	21,996	2.2	2%	85%
2i - Runcorn	24,932	3,963	3,284	32,178	24,602	4,098	3,175	31,875	1.7	-1%	86%
3i - West Warrington	12,114	1,824	840	14,778	11,152	1,631	1,686	14,470	2.5	-2%	70%
4i - Warrington	12,508	1,462	869	14,839	11,907	1,440	1,392	14,739	0.8	-1%	70%
5i - South Warrington	699	104	53	857	308	99	79	486	14.3	-43%	0%
6i - East Warrington	9,320	1,705	2,401	13,425	9,993	1,677	2,483	14,153	6.2	5%	63%
7i - South Liverpool	6,774	1,230	1,029	9,034	6,669	1,212	890	8,772	2.8	-3%	100%
8i - Birkenhead Town Centre	9,177	1,410	560	11,147	8,957	1,496	824	11,276	1.2	1%	85%
9i - East Wirral	13,103	1,840	651	15,595	12,577	1,867	1,584	16,028	3.4	3%	70%
10i - South Widnes	9,044	1,659	1,332	12,035	9,204	1,602	1,166	11,972	0.6	-1%	89%
11i - Liverpool	28,016	4,214	1,590	33,820	26,499	4,086	1,681	32,266	8.5	-5%	79%
12i - South Knowsley	8,532	1,412	676	10,620	8,776	1,371	592	10,739	1.2	1%	83%
13i - Ellesmere Port	2,503	186	61	2,750	1,647	175	76	1,898	17.7	-31%	50%
14i – West Wirral & Wales	10,453	1,223	432	12,108	10,077	1,208	458	11,742	3.3	-3%	93%
15i - St Helens & S Lancs	32,380	5,985	3,197	41,562	29,151	6,027	3,205	38,382	15.9	-8%	75%
Motorways	48,758	9,488	14,538	72,784	45,646	9,500	13,236	68,381	16.6	-6%	73%
Total	**245,393**	**40,456**	**33,350**	**319,199**	**234,578**	**40,195**	**34,402**	**309,174**	**17.9**	**-3%**	**80%**

Table 8.8 - Flow Calibration by Vehicle Type (Validated Matrix) – Inter Peak Hour

Vehicle Type	Number of Counts	GEH < 5		Within DMRB	
		Number	Percentage	Number	Percentage
Car	426	340	79.8%	351	82.4%
LGV	426	420	98.6%	425	99.8%
OGV (vehicles)	426	374	87.8%	402	94.4%
Total (vehicles)	**426**	**336**	**78.9%**	**344**	**80.8%**

Table 8.9 - Comparison of Traffic Counts and Model Flows by RSI Cordon (vehicles) – PM Peak Hour

RSI Cordon	Direction	Observed Traffic Count				Model Traffic Flow				GEH	% Diff	Individual Links <5
		Car	LGV	OGV	Total	Car	LGV	OGV	Total			
1	Inbound	5,009	791	324	6,123	5,284	793	406	6,482	4.5	6%	62%
Widnes	Outbound	4,410	706	275	5,390	4,778	746	372	5,896	6.7	9%	69%
	2-way Total	9,418	1,496	599	11,513	10,061	1,539	778	12,378	7.9	8%	65%
2	Inbound	7,489	1,090	473	9,052	8,169	1,034	401	9,604	5.7	6%	78%
Runcorn	Outbound	7,502	954	486	8,942	8,304	971	415	9,690	7.8	8%	78%
	2-way Total	14,991	2,044	959	17,994	16,472	2,005	816	19,294	9.5	7%	78%
3	Inbound	6,555	882	278	7,715	6,819	858	347	8,024	3.5	4%	91%
West Warrington	Outbound	6,370	889	266	7,526	5,873	884	350	7,108	4.9	-6%	45%
	2-way Total	12,926	1,771	544	15,241	12,692	1,742	698	15,132	0.9	-1%	68%
4	Inbound	7,075	663	293	8,032	7,066	666	393	8,125	1.0	1%	40%
North Warrington	Outbound	8,405	778	304	9,487	8,953	732	397	10,082	6.0	6%	80%
	2-way Total	15,481	1,441	597	17,518	16,019	1,398	790	18,207	5.2	4%	60%
7	Inbound	6,060	692	312	7,063	5,713	668	315	6,696	4.4	-5%	82%
South Liverpool	Outbound	6,814	602	241	7,657	6,403	653	258	7,314	4.0	-4%	82%
	2-way Total	12,874	1,294	553	14,721	12,116	1,320	573	14,010	5.9	-5%	82%
8	Inbound	6,606	945	274	7,825	6,769	876	243	7,888	0.7	1%	75%
Birkenhead	Outbound	8,337	1,013	226	9,576	7,909	1,010	402	9,320	2.6	-3%	75%
	2-way Total	14,943	1,958	500	17,400	14,678	1,886	645	17,208	1.5	-1%	75%
10	Inbound	6,033	936	483	7,452	6,123	847	382	7,353	1.2	-1%	89%
South Widnes	Outbound	6,066	944	436	7,446	6,487	925	382	7,794	4.0	5%	78%
	2-way Total	12,099	1,881	919	14,898	12,610	1,772	765	15,146	2.0	2%	83%
25	Inbound	2,341	237	64	2,642	2,383	199	72	2,654	0.2	0%	67%
Chester	Outbound	3,523	375	102	4,000	3,477	312	80	3,868	2.1	-3%	50%
	2-way Total	5,864	612	166	6,642	5,860	511	152	6,523	1.5	-2%	58%
Total	**Inbound**	**47,168**	**6,236**	**2,501**	**55,905**	**48,327**	**5,940**	**2,560**	**56,826**	**3.9**	**2%**	**73%**
	Outbound	**51,427**	**6,260**	**2,336**	**60,023**	**52,182**	**6,233**	**2,656**	**61,072**	**4.3**	**2%**	**70%**
	2-way Total	**98,595**	**12,496**	**4,837**	**115,928**	**100,509**	**12,173**	**5,216**	**117,898**	**5.8**	**2%**	**72%**

Table 8.10 - Comparison of Traffic Counts and Model Flows by Link across the River Mersey (vehicles) – PM Peak Hour

		Car Flow						LGV						OGV (vehicles)						Total (vehicles)					
Link Description	**DIR**	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB
Kingsway Tunnel	nb	1239	1369	129	10	3.6	✓	174	114	-60	-34	5.0	✓	90	137	47	53	4.4	✓	1503	1620	116	8	2.9	✓
Queensway Tunnel	nb	1023	1179	156	15	4.7	×	220	168	-52	-24	3.7	✓	0	0	0	0	0.0	✓	1243	1346	103	8	2.9	✓
Silver Jubilee Bridge	nb	2793	3015	222	8	4.1	✓	435	350	-85	-20	4.3	✓	231	158	-73	-32	5.2	✓	3459	3523	64	2	1.1	✓
A5060 Chester Road	nb	512	499	-13	-3	0.6	✓	79	65	-14	-18	1.6	✓	22	27	5	24	1.1	✓	613	591	-22	-4	0.9	✓
Wilderspool Causeway	nb	479	473	-6	-1	0.3	✓	24	23	-1	-4	0.2	✓	18	18	0	0	0.0	✓	521	514	-7	-1	0.3	✓
A5061 Knutsford Road	nb	715	656	-59	-8	2.2	✓	42	59	18	43	2.5	✓	29	83	55	191	7.3	✓	785	799	14	2	0.5	✓
A50 Kingsway North	nb	946	659	-287	-30	10.1	×	69	47	-22	-32	2.9	✓	16	14	-2	-14	0.6	✓	1031	720	-311	-30	10.5	×
Thelwall Viaduct	nb	5043	5287	244	5	3.4	✓	820	824	5	1	0.2	✓	970	934	-37	-4	1.2	✓	6833	7045	212	3	2.5	✓
TOTAL		**12751**	**13137**	**386**	**3**	**3.4**	✓	**1862**	**1650**	**-212**	**-11**	**5.1**	×	**1375**	**1370**	**-5**	**0**	**0.1**	✓	**15988**	**16157**	**169**	**1**	**1.3**	✓
Kingsway Tunnel	sb	2235	2162	-73	-3	1.5	✓	349	302	-47	-13	2.6	✓	81	90	9	12	1.0	✓	2665	2554	-110	-4	2.2	✓
Queensway Tunnel	sb	1406	1727	321	23	8.1	×	198	117	-81	-41	6.5	✓	0	0	0	0	0.0	✓	1604	1844	240	15	5.8	✓
Silver Jubilee Bridge	sb	2685	2786	101	4	1.9	✓	419	372	-47	-11	2.4	✓	222	164	-58	-26	4.2	✓	3326	3321	-5	0	0.1	✓
A5060 Chester Road	sb	773	810	37	5	1.3	✓	94	91	-3	-3	0.3	✓	17	27	10	58	2.1	✓	885	928	44	5	1.5	✓
Wilderspool Causeway	sb	623	409	-215	-34	9.4	×	23	12	-11	-46	2.5	✓	19	11	-8	-43	2.1	✓	665	432	-233	-35	10.0	×
A5061 Knutsford Road	sb	715	510	-205	-29	8.3	×	53	46	-7	-13	1.0	✓	32	30	-2	-7	0.4	✓	800	586	-214	-27	8.1	×
A50 Kingsway North	sb	964	1013	49	5	1.6	✓	45	28	-17	-38	2.9	✓	18	22	4	22	0.9	✓	1027	1063	36	3	1.1	✓
Thelwall Viaduct	sb	4532	4666	134	3	2.0	✓	788	778	-10	-1	0.4	✓	796	773	-23	-3	0.8	✓	6116	6216	100	2	1.3	✓
TOTAL		**13934**	**14083**	**149**	**1**	**1.3**	✓	**1969**	**1745**	**-223**	**-11**	**5.2**	×	**1185**	**1117**	**-69**	**-6**	**2.0**	✓	**17087**	**16945**	**-143**	**-1**	**1.1**	✓
2-WAY TOTAL		**26685**	**27220**	**535**	**2**	**3.3**	✓	**3831**	**3395**	**-435**	**-11**	**7.2**	×	**2560**	**2487**	**-73**	**-3**	**1.5**	✓	**33076**	**33102**	**26**	**0**	**0.1**	✓

Note: - Shaded cells within the table denoted by a cross sign refer to values which are outside the range specified by DMRB criteria

Table 8.11 - Comparison of Traffic Counts and Model Flows by Sector (vehicles) – PM Peak Hour

Sector	Observed Traffic Count				Model Traffic Flow				GEH	% Diff	Individual Links <5
	Car	LGV	OGV	Total	Car	LGV	OGV	Total			
1i - Widnes	32,529	4,336	1,549	38,413	32,572	4,359	1,682	38,613	1.0	1%	75%
2i - Runcorn	42,521	5,181	2,253	49,955	43,281	5,263	2,034	50,579	2.8	1%	81%
3i - West Warrington	16,321	2,012	598	18,931	15,867	2,055	908	18,831	0.7	-1%	70%
4i - Warrington	16,602	1,521	624	18,747	17,055	1,517	816	19,388	4.6	3%	65%
5i - South Warrington	1,087	101	21	1,209	699	94	33	825	12.0	-32%	50%
6i - East Warrington	13,917	2,045	1,928	17,890	14,949	2,109	1,999	19,056	8.6	7%	63%
7i - South Liverpool	10,886	1,552	695	13,133	11,060	1,538	633	13,231	0.9	1%	92%
8i - Birkenhead Town Centre	17,429	2,389	651	20,469	17,264	2,209	854	20,327	1.0	-1%	79%
9i - East Wirral	17,984	2,132	402	20,519	17,643	2,151	1,172	20,965	3.1	2%	70%
10i - South Widnes	12,099	1,881	919	14,898	12,610	1,772	765	15,146	2.0	2%	83%
11i - Liverpool	40,666	4,574	1,154	46,394	39,951	4,542	1,210	45,704	3.2	-1%	71%
12i - South Knowsley	12,217	1,581	426	14,224	13,186	1,558	414	15,158	7.7	7%	72%
13i - Ellesmere Port	3,412	230	40	3,682	2,905	209	50	3,164	8.9	-14%	75%
14i – West Wirral & Wales	14,570	1,483	275	16,327	14,563	1,377	287	16,227	0.8	-1%	70%
15i - St Helens & S Lancs	46,977	6,998	2,271	56,246	48,664	6,937	2,406	58,008	7.4	3%	78%
Motorways	75,425	12,295	11,557	99,277	74,090	11,805	10,268	96,162	10.0	-3%	88%
Total	**374,641**	**50,310**	**25,363**	**450,314**	**376,359**	**49,494**	**25,532**	**451,385**	**1.6**	**0%**	**76%**

Table 8.12 - Flow Calibration by Vehicle Type – PM Peak Hour

Vehicle Type	Number of Counts	GEH < 5		Within DMRB	
		Number	Percentage	Number	Percentage
Car	456	349	76.5%	357	78.3%
LGV	456	440	96.5%	453	99.3%
OGV (vehicles)	456	410	89.9%	442	96.9%
Total (vehicles)	**456**	**345**	**75.7%**	**351**	**77.0%**

Table 8.13 - Traffic Flow Calibration Summary

Model Time Period	Traffic Count sites	Prior Matrices		Calibrated Matrices	
		% with GEH<5	% within DMRB flow criteria	% with GEH<5	% within DMRB flow criteria
AM peak hour	456	43.0%	48.0%	72.6%	75.4%
Inter peak hour	426	44.6%	49.5%	78.9%	80.8%
PM peak hour	456	45.0%	46.9%	75.7%	77.0%

Table 8.14 - Summary of Traffic Count Calibration Results

	AM PEAK HOUR	INTERPEAK HOUR	PM PEAK HOUR
Correlation coefficient R^2	0.9723	0.9675	0.9762
Slope of Regression line f where Y = f.X	0.9987	0.9617	0.9924

Table 8.15 - Traffic Flow Calibration Summary by RSI Cordon – AM Peak Hour

GEH Range	Number of RSI Cordons/ Screenlines by Direction	Percentage
GEH < 4	11	61%
4 < GEH < 5	4	17%
5 < GEH < 8	3	22%
8 < GEH < 10	0	0%
GEH > 10	0	0%
Total	18	100%

Table 8.16 - Traffic Flow Calibration Summary by RSI Cordon – Inter Peak Hour

GEH Range	Number of RSI Cordons/ Screenlines by Direction	Percentage
GEH < 4	15	83%
4 < GEH < 5	0	0%
5 < GEH < 8	2	12%
8 < GEH < 10	1	6%
GEH > 10	0	0%
Total	18	100%

Table 8.17 - Traffic Flow Calibration Summary by RSI Cordon – PM Peak Hour

GEH Range	Number of RSI Cordons/ Screenlines by Direction	Percentage
GEH < 4	11	61%
4 < GEH < 5	3	17%
5 < GEH < 8	4	22%
8 < GEH < 10	0	0%
GEH > 10	0	0%
Total	18	100%

Table 8.18 - Matrix Before and After Matrix Estimation – AM Peak Hour Total vehicles

Movements	Prior Matrix – Before Matrix Estimation	Validated Matrix – After Matrix Estimation	Percentage Difference
Wholly within Halton	12711	14183	11.6%
Between Halton and other sectors	12826	13027	1.6%
All other movements	224025	227974	1.8%
Matrix Total	249562	255184	2.3%

Note: Movements based on Sectors as illustrated in Figure 4.6.

Table 8.19 - Matrix Before and After Matrix Estimation – Inter Peak Hour Total vehicles

Movements	Prior Matrix – Before Matrix Estimation	Validated Matrix – After Matrix Estimation	Percentage Difference
Wholly within Halton	8803	9763	10.9%
Between Halton and other sectors	9441	9313	-1.4%
All other movements	136610	142516	4.3%
Matrix Total	**154855**	**161592**	**4.4%**

Note: Movements based on Sectors as illustrated in Figure 4.6.

Table 8.20 - Matrix Before and After Matrix Estimation – PM Peak Hour Total vehicles

Movements	Prior Matrix – Before Matrix Estimation	Validated Matrix – After Matrix Estimation	Percentage Difference
Wholly within Halton	10780	12480	15.8%
Between Halton and other sectors	12816	13439	4.9%
All other movements	191488	193685	1.1%
Matrix Total	**215084**	**219604**	**2.1%**

Note: Movements based on Sectors as illustrated in Figure 4.6.

Table 8.21 - Comparison of Matrices before and after Matrix Estimation – AM Peak Hour (vehicles)

Vehicle Type and purpose	Total Trips in Prior Matrix	Total Trips in Validated Matrix	Percentage Difference
Car Commuting High Income	68,553	70,119	2.3%
Car Commuting Medium Income	47,790	48,928	2.4%
Car Commuting Low Income	29,961	30,901	3.1%
Total Car Commuting	146,304	149,948	2.5%
Car Employers' Business	9,487	9,849	3.8%
Car Other High Income	16,775	17,266	2.9%
Car Other Medium Income	15,119	15,576	3.0%
Car Other Low Income	14,457	14,967	3.5%
Total Car Other	46,351	47,809	3.1%
Total Car	202,142	207,606	2.7%
LGV	32,699	32,648	-0.2%
OGV	14,722	14,929	1.4%
Total	**249.563**	**255,183**	**2.3%**

Table 8.22 - Comparison of Matrices before and after Matrix Estimation – Inter Peak Hour (vehicles)

Vehicle Type and purpose	Total Trips in Prior Matrix	Total Trips in Validated Matrix	Percentage Difference
Car Commuting High Income	16,874	17,808	5.5%
Car Commuting Medium Income	11,971	12,628	5.5%
Car Commuting Low Income	7,971	8,408	5.5%
Total Car Commuting	36,816	38,844	5.5%
Car Employers' Business	9,444	9,994	5.8%
Car Other High Income	20,956	22,294	6.4%
Car Other Medium Income	18,555	19,761	6.5%
Car Other Low Income	25,302	27,071	7.0%
Total Car Other	64,813	69,126	6.7%
Total Car	111,073	117,964	6.2%
LGV	27,817	27,780	-0.1%
OGV	15,967	15,849	-0.7%
Total	**154,857**	**161,593**	**4.4%**

Table 8.23 - Comparison of Matrices before and after Matrix Estimation – PM Peak Hour (vehicles)

Vehicle Type and purpose	Total Trips in Prior Matrix	Total Trips in Validated Matrix	Percentage Difference
Car Commuting High Income	43,082	44,676	3.7%
Car Commuting Medium Income	28,606	29,620	3.5%
Car Commuting Low Income	18,601	19,319	3.9%
Total Car Commuting	90,289	93,615	3.7%
Car Employers' Business	10,129	10,456	3.2%
Car Other High Income	26,341	26,838	1.9%
Car Other Medium Income	20,874	21,253	1.8%
Car Other Low Income	19,574	19,941	1.9%
Total Car Other	66,789	68,032	1.9%
Total Car	167,207	172,103	2.9%
LGV	34,735	34,290	-1.3%
OGV	13,141	13,211	0.5%
Total	**215,083**	**219,604**	**2.1%**

Table 8.24 - Count of Tripend Changes by Zone - AM Peak Hour (total vehicles)

	Origins		Destinations	
Difference Range	Number of zones	%	Number of zones	%
-20% or less	11	2.1%	9	1.7%
-20% to 0%	153	28.9%	202	38.2%
0% to 20%	281	53.1%	238	45.0%
20% to 50%	66	12.5%	70	13.2%
50% or more	18	3.4%	10	1.9%
Total	**529**		**529**	

Table 8.25 - Count of Tripend Changes by Zone - Inter Peak Hour (total vehicles)

	Origins		Destinations	
Difference Range	Number of zones	%	Number of zones	%
-20% or less	11	2.1%	9	1.7%
-20% to 0%	165	31.2%	174	32.9%
0% to 20%	266	50.3%	249	47.1%
20% to 50%	67	12.7%	84	15.9%
50% or more	20	3.8%	13	2.5%
Total	**529**		**529**	

Table 8.26 - Count of Tripend Changes by Zone - PM Peak Hour (total vehicles)

	Origins		Destinations	
Difference Range	Number of zones	%	Number of zones	%
-20% or less	16	3.0%	12	2.3%
-20% to 0%	180	34.0%	208	39.3%
0% to 20%	229	43.3%	201	38.0%
20% to 50%	88	16.6%	90	17.0%
50% or more	16	3.0%	18	3.4%
Total	**529**		**529**	

Table 8.27 - Comparison of Prior and Validated Matrix (Validated minus Prior) – AM peak hour

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	**Total**
1 Widnes	281	0	81	24	0	-19	151	0	0	148	0	41	0	0	137	0	-25	0	**818**
2 Runcorn	0	1091	0	0	-26	0	0	12	34	0	0	0	47	226	0	0	-156	40	**1268**
3 West Warrington	41	0	6	68	0	-22	17	0	0	8	33	13	0	0	212	-11	52	0	**416**
4 Warrington	-81	0	69	31	0	308	-3	0	0	-4	26	-3	0	0	-86	28	91	0	**377**
5 South Warrington	0	9	0	0	17	0	0	15	43	0	0	0	25	40	0	0	69	72	**288**
6 East Warrington	-27	0	-39	-2	0	37	6	0	0	0	15	19	0	0	198	14	295	0	**516**
7 South Liverpool	11	0	16	-2	0	0	79	0	0	7	48	313	0	0	257	5	113	0	**846**
8 Birkenhead	0	-2	0	0	-2	0	0	0	98	0	0	0	-44	30	0	0	0	-20	**60**
9 East Wirral	0	16	0	0	6	0	0	573	366	0	0	0	192	841	0	0	0	40	**2033**
10 South Widnes	-7	0	2	-3	0	-1	20	0	0	6	5	3	0	0	1	-14	7	0	**19**
11 Liverpool	-8	0	14	7	0	-4	207	0	0	3	175	16	0	0	462	12	117	0	**1002**
12 South Knowsley	-36	0	4	-17	0	-20	127	0	0	-1	-718	-175	0	0	-162	-11	57	0	**-953**
13 Ellesmere Port	0	-3	0	0	-6	0	0	45	16	0	0	0	29	528	0	0	-41	-14	**553**
14 West Wirral & Wales	0	33	0	0	-32	0	0	-88	-445	0	0	0	46	-217	0	0	-231	-43	**-977**
15 St Helens & Sth Lancs	64	0	189	-143	0	-249	-72	0	0	122	225	21	0	0	-928	-18	259	0	**-528**
16 North	16	0	-9	4	0	-24	-11	0	0	22	12	-1	0	0	-18	0	-7	0	**-16**
17 East	-91	-406	-43	-7	-52	-371	141	0	0	-75	226	99	103	343	209	-11	-62	-133	**-130**
18 The South	0	-76	0	0	70	0	0	65	85	0	0	0	54	258	0	0	-123	0	**336**
Total	**163**	**662**	**290**	**-40**	**-26**	**-365**	**661**	**622**	**196**	**236**	**46**	**346**	**453**	**2049**	**283**	**-6**	**415**	**-58**	**5927**

Note: - Cells shown in grey are movements that have changed by more than 10% and more than 100 vehicles.

Table 8.28 Comparison of Prior and Validated Matrix (Validated minus Prior) – Inter Peak hour

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	**Total**
1 Widnes	-68	0	84	-40	0	-5	31	0	0	48	0	-9	0	0	2	-2	-11	0	**31**
2 Runcorn	0	970	0	0	16	0	0	3	8	0	0	0	20	149	0	0	-261	38	**943**
3 West Warrington	62	0	6	-106	0	-142	32	0	0	8	1	5	0	0	171	-8	35	0	**64**
4 Warrington	-9	0	112	28	0	133	4	0	0	-4	-11	-6	0	0	-67	26	34	0	**240**
5 South Warrington	0	-32	0	0	1	0	0	-1	5	0	0	0	3	2	0	0	-111	28	**-107**
6 East Warrington	-25	0	-18	80	0	9	-4	0	0	1	-56	-23	0	0	49	5	-119	0	**-102**
7 South Liverpool	93	0	50	19	0	16	2	0	0	10	330	207	0	0	197	4	141	0	**1070**
8 Birkenhead	0	-1	0	0	-1	0	0	0	362	0	0	0	-18	305	0	0	0	-18	**629**
9 East Wirral	0	0	0	0	13	0	0	147	495	0	0	0	74	355	0	0	0	35	**1119**
10 South Widnes	33	0	4	-1	0	-1	19	0	0	4	0	-3	0	0	-24	5	-78	0	**-43**
11 Liverpool	9	0	6	-6	0	18	151	0	0	3	423	54	0	0	321	9	51	0	**1039**
12 South Knowsley	9	0	8	-1	0	6	63	0	0	3	12	-66	0	0	-181	-2	162	0	**13**
13 Ellesmere Port	0	-16	0	0	0	0	0	-34	-8	0	0	0	10	377	0	0	-28	5	**308**
14 West Wirral & Wales	0	104	0	0	-2	0	0	191	407	0	0	0	395	161	0	0	-405	-55	**796**
15 St Helens & Sth Lancs	-28	0	120	28	0	101	60	0	0	68	318	-208	0	0	504	-26	172	0	**1110**
16 North	1	0	5	29	0	5	1	0	0	11	1	-2	0	0	4	0	-22	0	**33**
17 East	-34	-187	105	-43	0	-44	23	0	0	-45	-16	40	7	-130	71	-20	-54	-169	**-498**
18 The South	0	17	0	0	49	0	0	-11	9	0	0	0	1	-106	0	0	-40	0	**-82**
Total	**44**	**855**	**480**	**-13**	**76**	**95**	**382**	**295**	**1277**	**108**	**1002**	**-10**	**491**	**1112**	**1048**	**-8**	**-534**	**-136**	**6564**

Note: - Cells shown in grey are movements that have changed by more than 10% and more than 100 vehicles.

Table 8.29 - Comparison of Prior and Validated Matrix (Validated minus Prior) – PM Peak hour

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	**Total**
1 Widnes	190	0	108	50	0	2	154	0	0	48	24	-9	0	0	-92	-7	58	0	**527**
2 Runcorn	0	1469	0	0	-39	0	0	-2	5	0	0	0	24	124	0	0	-120	-12	**1450**
3 West Warrington	36	0	6	-97	0	-91	34	0	0	1	51	27	0	0	91	-35	72	0	**95**
4 Warrington	-68	0	347	102	0	41	19	0	0	-8	4	-22	0	0	-98	7	65	0	**389**
5 South Warrington	0	173	0	0	16	1	0	-2	15	0	0	0	16	-17	0	0	-87	71	**186**
6 East Warrington	-17	0	-41	3	0	-54	1	0	0	1	-24	-11	0	0	-17	12	38	0	**-109**
7 South Liverpool	73	0	56	4	0	4	-80	0	0	9	199	38	0	0	150	9	162	0	**624**
8 Birkenhead	0	4	0	0	1	0	0	0	213	0	0	0	8	135	0	0	0	-82	**278**
9 East Wirral	0	-7	0	0	19	0	0	-8	431	0	0	0	-27	-61	0	0	0	35	**382**
10 South Widnes	-21	0	-2	-4	0	-3	26	0	0	5	6	3	0	0	-64	-7	-50	0	**-113**
11 Liverpool	22	0	57	-9	0	92	185	0	0	4	469	-389	0	0	119	17	445	0	**1013**
12 South Knowsley	4	0	-1	-5	0	28	226	0	0	4	-1	-44	0	0	-178	-3	74	0	**102**
13 Ellesmere Port	0	-1	0	0	20	0	0	-6	137	0	0	0	117	486	0	0	18	32	**803**
14 West Wirral & Wales	0	24	0	0	-36	0	0	-11	420	0	0	0	586	-1300	0	0	-236	-235	**-788**
15 St Helens & Sth Lancs	105	0	61	-167	0	189	209	0	0	38	-134	-205	0	0	-925	24	746	0	**-59**
16 North	12	0	-7	-10	0	3	4	0	0	2	-3	-6	0	0	5	0	6	0	**6**
17 East	-77	47	22	-97	-178	-196	164	0	0	-20	87	66	28	-135	385	-22	-125	-191	**-241**
18 The South	0	148	0	0	62	0	0	1	54	0	0	0	36	69	3	0	-298	0	**76**
Total	**258**	**1857**	**604**	**-229**	**-135**	**15**	**942**	**-27**	**1275**	**83**	**679**	**-551**	**787**	**-697**	**-621**	**-5**	**769**	**-382**	**4622**

Note: - Cells shown in grey are movements that have changed by more than 10% and more than 100 vehicles.

Table 8.30 - Comparison of Prior and Validated Matrix (Percentage Difference) – AM peak hour

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	**Total**
1 Widnes	4.1	0	40.6	6.9	0	-18	40.9	0	0	66.8	-0.2	28.9	0	0	18.9	-1.5	-8.2	0	**7.7**
2 Runcorn	0	23.1	0	0	-5.4	0	0	123.4	59.2	0	0	0	44.3	41.5	0	0	-20.2	14.5	**13.8**
3 West Warrington	24.7	0	0.4	4.8	0	-7.8	22.3	0	0	90.4	25.7	36	0	0	26.8	-16.9	10.1	0	**8**
4 Warrington	-44.2	0	8.7	0.7	0	34.4	-9.1	0	0	-25.4	51.7	-18.6	0	0	-13.7	36	30.4	0	**4.6**
5 South Warrington	0	2.4	0	0	0.4	0	0	266.6	96.4	0	0	0	55.7	10.1	0	0	6.5	16	**3.5**
6 East Warrington	-42.1	0	-17.8	-0.3	0	2.1	18.6	0	0	-9.3	15.1	48.3	0	0	26.6	33.6	50.1	0	**10.3**
7 South Liverpool	3.2	0	71	-8.4	0	-3.4	3.8	0	0	12.3	3.9	42.4	0	0	40.9	48.7	66.2	0	**14.6**
8 Birkenhead	0	-25.3	0	0	-55.7	0	0	0	9.1	0	0	0	-55.3	5.9	0	0	0	-69	**2.2**
9 East Wirral	0	27.6	0	0	14	0	0	21.5	3.1	0	0	0	13	21	0	0	0	26.4	**9**
10 South Widnes	-4.6	0	34.6	-25.8	0	-12.4	55.2	0	0	12.3	67.7	36.8	0	0	0.8	-65.7	10.6	0	**3.6**
11 Liverpool	-8.8	0	35	16.4	0	-4.7	19.9	0	0	64.2	1.4	1.2	0	0	8.2	16.9	24.2	0	**4.4**
12 South Knowsley	-20.9	0	17.1	-18.1	0	-31.2	9.9	0	0	-12	-21.6	-5.3	0	0	-4.5	-29.3	12.9	0	**-7.4**
13 Ellesmere Port	0	-3.5	0	0	-20.2	0	0	47.5	1.3	0	0	0	1.3	24.4	0	0	-17.3	-11.1	**8.3**
14 West Wirral & Wales	0	4.1	0	0	-10.1	0	0	-5.6	-10.5	0	0	0	2.2	-1.5	0	0	-10.3	-4.1	**-3.2**
15 St Helens & Sth Lancs	10.2	0	20.6	-10.5	0	-17.8	-5.6	0	0	130.2	2.1	0.9	0	0	-1.5	-3	10.7	0	**-0.6**
16 North	29.1	0	-10.3	3.3	0	-13.8	-49.1	0	0	181.4	7.6	-6.5	0	0	-3	0	-9	0	**-0.5**
17 East	-26.8	-36.5	-7.5	-1	-8.9	-38.5	42.7	0	0	-55.1	30.9	55.7	33.7	24	10.8	-46	-0.7	-14.6	**-0.7**
18 The South	0	-16.3	0	0	16	0	0	112	93.4	0	0	0	35	20.1	0	0	-32.3	0	**4.2**
Total	**1.6**	**6.8**	**6.2**	**-0.4**	**-0.4**	**-5.1**	**8.8**	**11.2**	**1**	**30.3**	**0.1**	**4.1**	**6.6**	**7.8**	**0.3**	**-0.3**	**2.1**	**-0.8**	**2.2**

Note: - Cells shown in grey are movements that have changed by more than 10% and more than 100 vehicles.

Table 8.31 - Comparison of Prior and Validated Matrix (Percentage Difference) – Inter Peak hour

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	**Total**
1 Widnes	-1.5	0	52.7	-19.4	0	-9.7	8.1	0	0	25.1	0.1	-7.3	0	0	0.4	-6.5	-2.9	0	**0.4**
2 Runcorn	0	30.8	0	0	6.3	0	0	50.2	28.5	0	0	0	35.9	33.9	0	0	-43	20	**14.6**
3 West Warrington	45.4	0	0.9	-10.3	0	-39	88.4	0	0	86.7	2.1	13.4	0	0	23.5	-11.4	6.1	0	**1.6**
4 Warrington	-3.9	0	10.5	1.1	0	20.9	11.2	0	0	-20.7	-23.8	-22.4	0	0	-9.3	28.9	7.4	0	**3.4**
5 South Warrington	0	-14.2	0	0	0.1	0	0	-45	16.1	0	0	0	9.2	0.9	0	0	-29.6	16.5	**-2.2**
6 East Warrington	-31.9	0	-6.9	13	0	1.1	-52.2	0	0	8.1	-43.8	-31.2	0	0	5.9	17.5	-34.2	0	**-2.5**
7 South Liverpool	29.1	0	315.7	108.2	0	70.4	0.2	0	0	22.6	43.8	31.6	0	0	32.7	24.2	72.6	0	**23.7**
8 Birkenhead	0	-5.3	0	0	-16.5	0	0	0	19.1	0	0	0	-23.6	41.3	0	0	0	-21.7	**15.8**
9 East Wirral	0	-1.2	0	0	45.8	0	0	7.4	8.4	0	0	0	7.3	14.5	0	0	0	109	**8.9**
10 South Widnes	13.6	0	28	-8.9	0	-7.2	20.4	0	0	8.3	-6.1	-24.1	0	0	-22.7	31.9	-44.1	0	**-4.9**
11 Liverpool	10	0	59.7	-12.4	0	17.5	16.7	0	0	93.7	4.8	3.8	0	0	6	11	12.5	0	**5.6**
12 South Knowsley	7.3	0	64.8	-7.6	0	10.8	7.3	0	0	46.5	0.9	-4.1	0	0	-10.1	-33.5	57.3	0	**0.2**
13 Ellesmere Port	0	-21.3	0	0	0.7	0	0	-41.8	-0.9	0	0	0	1	31.7	0	0	-16.9	15.3	**7.8**
14 West Wirral & Wales	0	23.4	0	0	-1	0	0	23	16.9	0	0	0	33.7	2	0	0	-33.7	-5.6	**4.6**
15 St Helens & Sth Lancs	-5.5	0	43	4.3	0	13.8	9.4	0	0	62.3	6.1	-11	0	0	1.4	-7.5	8.5	0	**2.2**
16 North	3.1	0	21.2	50.1	0	19.6	1.1	0	0	46.2	1.3	-22	0	0	1	0	-18	0	**1.8**
17 East	-12	-31.7	27.1	-10.8	-0.1	-15.3	5.4	0	0	-35.5	-4.3	19	5.7	-13.5	3.6	-71.6	-0.7	-15.4	**-3**
18 The South	0	9.8	0	0	25.8	0	0	-22.3	24.4	0	0	0	2.6	-10.8	0	0	-14.6	0	**-1.3**
Total	**0.6**	**13**	**15.8**	**-0.2**	**1.5**	**2.5**	**7.4**	**6.9**	**10.4**	**14.7**	**5.5**	**-0.2**	**12.7**	**6.4**	**2**	**-0.4**	**-3.2**	**-2.6**	**3.7**

Note: - Cells shown in grey are movements that have changed by more than 10% and more than 100 vehicles.

Table 8.32 - Comparison of Prior and Validated Matrix (Percentage Difference) – PM Peak hour

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	**Total**
1 Widnes	3.4	0.0	63.6	25.7	0.0	2.2	33.3	0.0	0.0	42.8	19.5	-4.9	0.0	0.0	-13.6	-20.6	21.0	0.0	**5.8**
2 Runcorn	0.0	38.2	0.0	0.0	-10.0	0.0	0.0	-19.3	8.6	0.0	0.0	0.0	31.1	16.5	0.0	0.2	-16.1	-3.1	**17.0**
3 West Warrington	24.8	0.0	0.8	-11.9	0.0	-46.1	118.9	0.0	0.0	22.0	107.1	48.9	0.0	0.0	7.8	-28.8	13.2	0.0	**2.2**
4 Warrington	-17.0	0.0	24.3	3.2	0.0	5.6	45.2	0.0	0.0	-41.7	7.8	-31.9	0.0	0.0	-8.0	9.5	8.9	0.0	**4.2**
5 South Warrington	0.0	51.2	0.1	0.0	0.7	0.3	0.0	-39.3	30.5	0.0	0.0	0.0	37.5	-5.1	0.0	0.0	-12.8	20.6	**3.3**
6 East Warrington	-15.5	0.0	-15.9	0.5	0.0	-4.9	3.9	0.0	0.0	26.1	-21.3	-13.3	0.0	0.0	-1.2	8.6	4.3	0.0	**-1.8**
7 South Liverpool	17.3	0.0	56.6	17.8	0.0	15.9	-4.9	0.0	0.0	19.9	23.0	3.6	0.0	0.0	11.1	30.6	63.7	0.0	**9.3**
8 Birkenhead	0.0	27.6	0.0	0.0	10.0	0.0	0.0	0.0	9.1	0.0	0.0	0.0	7.8	11.3	0.0	0.0	0.0	-61.5	**5.4**
9 East Wirral	0.0	-15.5	0.0	0.0	42.1	0.0	0.0	-0.4	5.8	0.0	0.0	0.0	-2.3	-1.7	0.0	0.0	0.0	43.3	**2.4**
10 South Widnes	-6.1	0.0	-8.3	-25.5	0.0	-29.0	29.1	0.0	0.0	10.9	87.1	17.6	0.0	0.0	-47.4	-62.1	-44.0	0.0	**-11.4**
11 Liverpool	11.6	0.0	32.3	-18.5	0.0	80.0	19.7	0.0	0.0	120.9	4.8	-15.2	0.0	0.0	1.3	11.5	66.3	0.0	**3.7**
12 South Knowsley	2.5	0.0	-5.2	-33.2	0.0	44.7	29.3	0.0	0.0	116.6	-0.1	-2.3	0.0	0.0	-7.8	-23.9	22.1	0.0	**1.4**
13 Ellesmere Port	0.0	-1.7	0.0	0.0	39.2	0.0	0.0	-8.5	10.1	0.0	0.0	0.0	6.0	23.6	0.0	0.0	6.0	25.8	**12.1**
14 West Wirral & Wales	0.0	4.2	0.0	0.0	-13.3	0.0	0.0	-1.6	11.2	0.0	0.0	0.0	28.7	-10.5	0.0	0.2	-14.5	-20.9	**-3.1**
15 St Helens & Sth Lancs	14.4	0.0	7.0	-22.3	0.0	20.7	23.8	0.0	0.0	59.1	-2.2	-7.5	0.0	0.0	-1.9	4.5	38.4	0.0	**-0.1**
16 North	40.9	0.0	-20.8	-14.6	0.0	7.5	23.7	0.0	0.0	14.2	-4.5	-20.4	0.0	0.0	1.0	0.0	10.5	0.0	**0.3**
17 East	-17.8	8.9	4.0	-12.0	-18.0	-32.3	101.7	0.0	0.0	-33.4	18.0	18.8	15.4	-7.4	15.5	-31.2	-1.3	-20.2	**-1.2**
18 The South	0.0	63.6	0.2	0.1	15.5	0.0	0.0	2.0	37.4	0.0	0.0	0.0	35.2	8.5	0.1	0.0	-41.7	0.0	**1.1**
Total	**2.6**	**23.9**	**12.7**	**-3.0**	**-2.1**	**0.3**	**16.3**	**-0.8**	**7.3**	**17.9**	**3.3**	**-5.7**	**12.9**	**-2.6**	**-0.8**	**-0.2**	**3.8**	**-6.2**	**2.0**

Note: - Cells shown in grey are movements that have changed by more than 10% and more than 100 vehicles.

Table 8.33 - Comparison of Traffic Counts and Assigned Flows across the River Mersey – AM Peak Hour

Link Description	DIR	Car Flow						LGV						OGV (vehicles)						Total (vehicles)					
		Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB
Mersey Tunnels	nb	4,454	4,332	-122	-3	1.8	✓	337	277	-60	-18	3.4	✓	117	129	12	11	1.1	✓	4,907	4,738	-170	-3	2.4	✓
Silver Jubilee Bridge	nb	2,925	3,123	198	7	3.6	✓	366	295	-71	-19	3.9	✓	193	136	-57	-30	4.5	×	3,484	3,554	70	2	1.2	✓
Through Warrington	nb	3,368	2,924	-444	-13	7.9	×	192	155	-36	-19	2.8	✓	128	217	88	69	6.7	×	3,688	3,296	-392	-11	6.6	×
Thelwall Viaduct	nb	4,977	5,163	186	4	2.6	✓	570	583	13	2	0.5	✓	905	875	-30	-3	1.0	✓	6,452	6,621	169	3	2.1	✓
TOTAL		**15,724**	**15,541**	**-183**	**-1**	**1.5**	✓	**1,464**	**1,310**	**-154**	**-11**	**4.1**	×	**1,343**	**1,357**	**14**	**1**	**0.4**	✓	**18,532**	**18,208**	**-323**	**-2**	**2.4**	✓
Mersey Tunnels	sb	1,907	1,950	43	2	1.0	✓	370	404	35	9	1.8	✓	144	173	29	20	2.3	✓	2,420	2,528	107	4	2.2	✓
Silver Jubilee Bridge	sb	2,768	2,770	2	0	0.0	✓	346	330	-16	-4	0.8	✓	182	159	-23	-13	1.8	✓	3,296	3,259	-37	-1	0.7	✓
Through Warrington	sb	2,284	2,075	-209	-9	4.5	×	244	208	-36	-15	2.4	✓	112	122	10	9	0.9	✓	2,640	2,405	-235	-9	4.7	×
Thelwall Viaduct	sb	4,580	4,529	-51	-1	0.8	✓	560	553	-7	-1	0.3	✓	940	923	-17	-2	0.6	✓	6,080	6,005	-75	-1	1.0	✓
TOTAL		**11,539**	**11,324**	**-215**	**-2**	**2.0**	✓	**1,520**	**1,496**	**-23**	**-2**	**0.6**	✓	**1,378**	**1,376**	**-1**	**0**	**0.0**	✓	**14,436**	**14,197**	**-239**	**-2**	**2.0**	✓
2-WAY TOTAL		**27,263**	**26,865**	**-398**	**-1**	**2.4**	✓	**2,984**	**2,807**	**-178**	**-6**	**3.3**	✓	**2,721**	**2,733**	**13**	**0**	**0.2**	✓	**32,968**	**32,405**	**-563**	**-2**	**3.1**	✓

Note: - Cells shown in grey within the table have a GEH value of greater than 4.0.

Table 8.34 - Comparison of Traffic Counts and Assigned Flows across the River Mersey – Inter Peak Hour

		Car Flow						LGV						OGV (vehicles)						Total (vehicles)					
Link Description	**DIR**	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB
Mersey Tunnels	nb	1,671	1,547	-124	-7	3.1	✓	256	270	13	5	0.8	✓	126	184	58	46	4.7	×	2,053	2,000	-53	-3	1.2	✓
Silver Jubilee Bridge	nb	1,859	1,964	105	6	2.4	✓	352	324	-28	-8	1.5	✓	319	207	-112	-35	6.9	×	2,530	2,496	-34	-1	0.7	✓
Through Warrington	nb	2,222	1,501	-720	-32	16.7	×	219	198	-21	-10	1.5	✓	130	311	181	139	12.2	×	2,571	2,010	-561	-22	11.7	×
Thelwall Viaduct	nb	3,408	3,446	37	1	0.6	✓	682	706	24	4	0.9	✓	1,161	1,091	-70	-6	2.1	✓	5,251	5,243	-8	0	0.1	✓
TOTAL		**9,160**	**8,458**	**-703**	**-8**	**7.5**	×	**1,509**	**1,498**	**-11**	**-1**	**0.3**	✓	**1,735**	**1,793**	**57**	**3**	**1.4**	✓	**12,405**	**11,749**	**-656**	**-5**	**6.0**	×
Mersey Tunnels	sb	1,641	1,578	-64	-4	1.6	✓	260	322	62	24	3.6	✓	126	177	51	40	4.1	×	2,028	2,077	49	2	1.1	✓
Silver Jubilee Bridge	sb	1,877	1,906	29	2	0.7	✓	355	350	-5	-1	0.3	✓	322	306	-16	-5	0.9	✓	2,554	2,562	8	0	0.2	✓
Through Warrington	sb	2,262	1,868	-395	-17	8.7	×	204	176	-28	-14	2.0	✓	132	169	38	28	3.1	✓	2,598	2,213	-385	-15	7.8	×
Thelwall Viaduct	sb	3,272	3,366	94	3	1.6	✓	643	627	-16	-2	0.6	✓	1,009	967	-42	-4	1.3	✓	4,924	4,960	36	1	0.5	✓
TOTAL		**9,053**	**8,718**	**-335**	**-4**	**3.6**	✓	**1,463**	**1,476**	**13**	**1**	**0.3**	✓	**1,589**	**1,619**	**30**	**2**	**0.8**	✓	**12,104**	**11,812**	**-292**	**-2**	**2.7**	✓
2-WAY TOTAL		**18,213**	**17,175**	**-1,038**	**-6**	**7.8**	×	**2,972**	**2,974**	**2**	**0**	**0.0**	✓	**3,324**	**3,412**	**87**	**3**	**1.5**	✓	**24,509**	**23,561**	**-948**	**-4**	**6.1**	×

Note: - Cells shown in grey within the table have a GEH value of greater than 4.0 for total vehicles which are used for comparison against DMRB criteria.

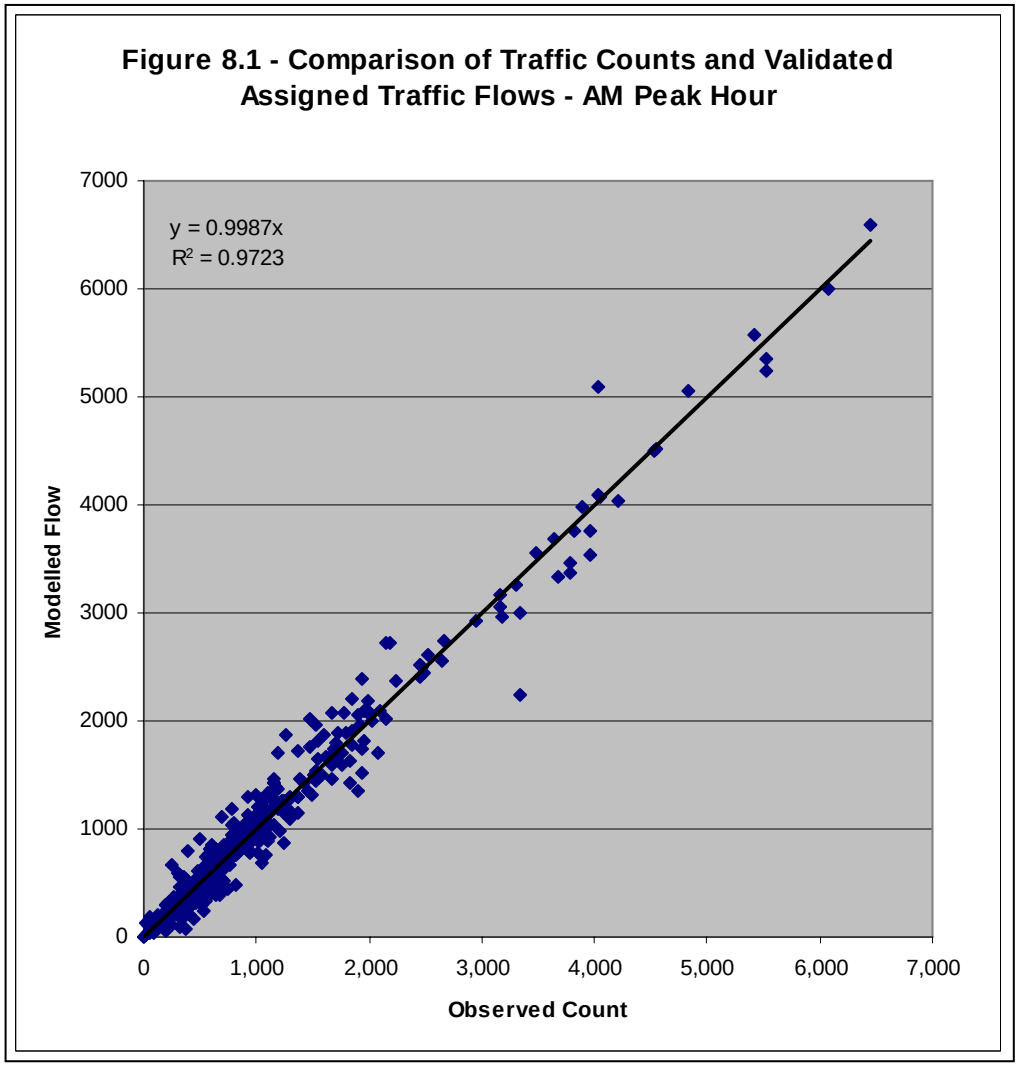
Table 8.35 - Comparison of Traffic Counts and Assigned Flows across the River Mersey – PM Peak Hour

		Car Flow						LGV						OGV (vehicles)						Total (vehicles)					
Link Description	**DIR**	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB
Mersey Tunnels	nb	2,262	2,547	285	13	5.8	×	394	282	-112	-28	6.1	×	90	137	47	53	4.4	×	2,746	2,966	220	8	4.1	×
Silver Jubilee Bridge	nb	2,793	3,015	222	8	4.1	×	435	350	-85	-20	4.3	×	231	158	-73	-32	5.2	×	3,459	3,523	64	2	1.1	✓
Through Warrington	nb	2,652	2,288	-365	-14	7.3	×	213	194	-19	-9	1.4	✓	84	142	58	68	5.4	×	2,950	2,624	-326	-11	6.2	×
Thelwall Viaduct	nb	5,043	5,287	244	5	3.4	✓	820	824	5	1	0.2	✓	970	934	-37	-4	1.2	✓	6,833	7,045	212	3	2.5	✓
TOTAL		**12,751**	**13,137**	**386**	**3**	**3.4**	✓	**1,862**	**1,650**	**-212**	**-11**	**5.1**	×	**1,375**	**1,370**	**-5**	**0**	**0.1**	✓	**15,988**	**16,157**	**169**	**1**	**1.3**	✓
Mersey Tunnels	sb	3,641	3,890	249	7	4.1	×	547	419	-129	-23	5.8	×	81	90	9	12	1.0	✓	4,269	4,398	129	3	2.0	✓
Silver Jubilee Bridge	sb	2,685	2,786	101	4	1.9	✓	419	372	-47	-11	2.4	✓	222	164	-58	-26	4.2	×	3,326	3,321	-5	0	0.1	✓
Through Warrington	sb	3,076	2,742	-334	-11	6.2	×	214	177	-37	-17	2.7	✓	87	90	4	4	0.4	✓	3,377	3,009	-368	-11	6.5	×
Thelwall Viaduct	sb	4,532	4,666	134	3	2.0	✓	788	778	-10	-1	0.4	✓	796	773	-23	-3	0.8	✓	6,116	6,216	100	2	1.3	✓
TOTAL		**13,934**	**14,083**	**149**	**1**	**1.3**	✓	**1,969**	**1,745**	**-223**	**-11**	**5.2**	×	**1,185**	**1,117**	**-69**	**-6**	**2.0**	✓	**17,087**	**16,945**	**-143**	**-1**	**1.1**	✓
2-WAY TOTAL		**26,685**	**27,220**	**535**	**2**	**3.3**	✓	**3,831**	**3,395**	**-435**	**-11**	**7.2**	×	**2,560**	**2,487**	**-73**	**-3**	**1.5**	✓	**33,076**	**33,102**	**26**	**0**	**0.1**	✓

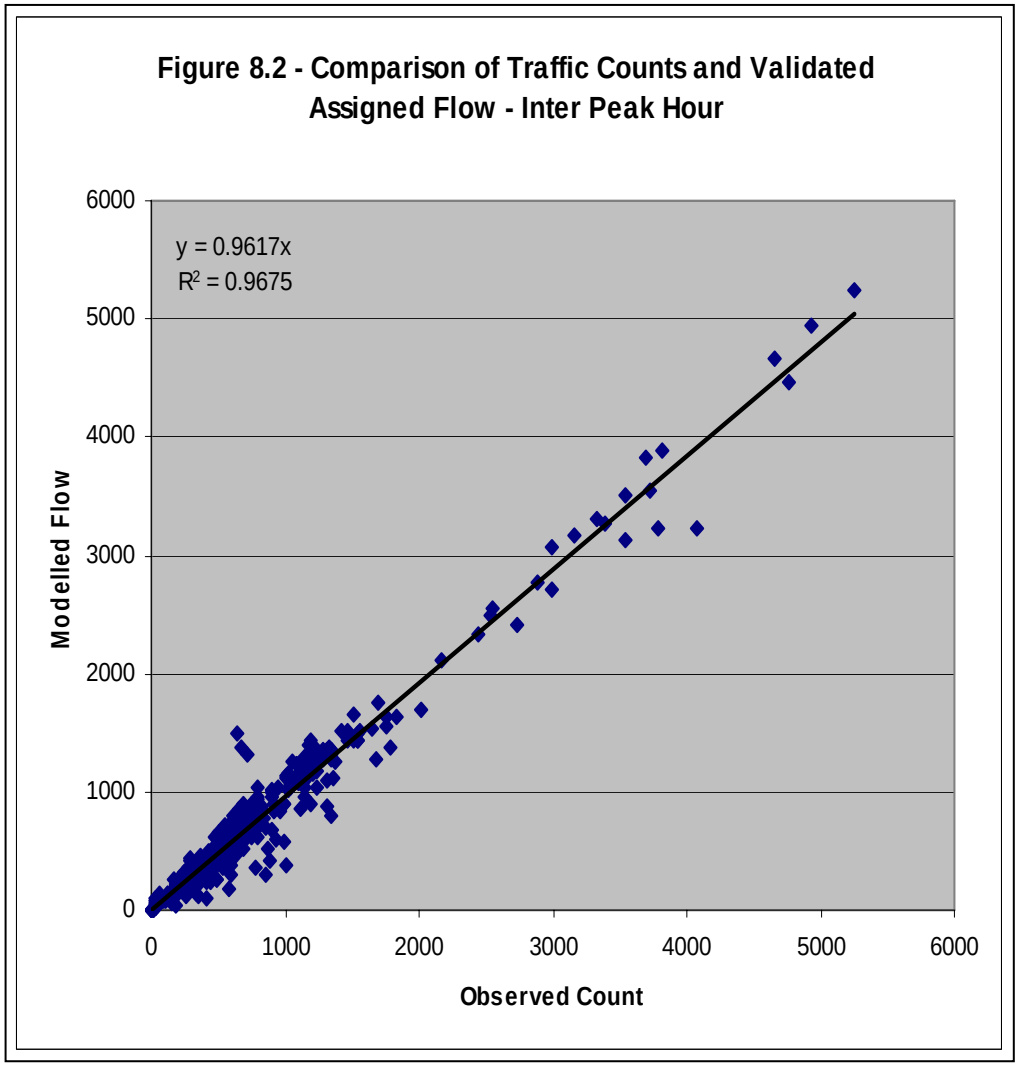
Note: - Cells shown in grey within the table have a GEH value of greater than 4.0 for total vehicles which are used for comparison against DMRB criteria.

Table 8.36 - Comparison of Traffic Counts and Assigned Flows – Overnight Hour

Link Description	Direction	Observed Traffic Count (pcus)				Model Traffic Flow (pcus)				% Diff	GEH
		Car	LGV	OGV	Total	Car	LGV	OGV	Total		
Kingsway Tunnel	nb	499	16	35	550	170	16	83	269	-51.0%	13.86
Queensway Tunnel	nb	195	24	0	219	265	22	0	286	30.7%	4.23
Silver Jubilee Bridge	nb	528	30	117	676	521	45	92	657	-2.6%	0.68
A5060 Chester Road	nb	NA	NA	NA	NA	127	10	26	163		
A49 Wilderspool Causeway	nb	NA	NA	NA	NA	91	5	10	106		
A5061 Knutsford Road	nb	NA	NA	NA	NA	146	7	27	181		
A50 Kingsway Bridge	nb	NA	NA	NA	NA	65	3	7	76		
M6 Thelwall Viaduct	nb	1,078	216	908	2,202	962	98	560	1,620	-26.4%	13.31
Sub-Total *	**nb**	**2,300**	**286**	**1,060**	**3,646**	**1,917**	**180**	**735**	**2,833**	**-22.3%**	**14.28**
Kingsway Tunnel	sb	382	12	30	424	183	16	81	280	-34.0%	7.68
Queensway Tunnel	sb	204	25	0	229	259	29	0	288	25.9%	3.68
Silver Jubilee Bridge	sb	593	34	132	758	544	48	137	729	-3.9%	1.09
A5060 Chester Road	sb	NA	NA	NA	NA	125	9	20	154		
A49 Wilderspool Causeway	sb	NA	NA	NA	NA	110	6	9	125		
A5061 Knutsford Road	sb	NA	NA	NA	NA	86	1	16	103		
A50 Kingsway Bridge	sb	NA	NA	NA	NA	164	7	13	184		
M6 Thelwall Viaduct	sb	1,106	217	843	2,166	991	88	454	1,533	-29.2%	14.73
Sub-Total *	**sb**	**2,285**	**288**	**1,004**	**3,577**	**1,978**	**181**	**672**	**2,830**	**-20.9%**	**13.20**
Total *	**2-way**	**4,585**	**574**	**2,064**	**7,223**	**3,895**	**361**	**1,407**	**5,663**	**-21.6%**	**19.43**
Total for all links	**2-way**					**4,809**	**410**	**1,535**	**6,755**		

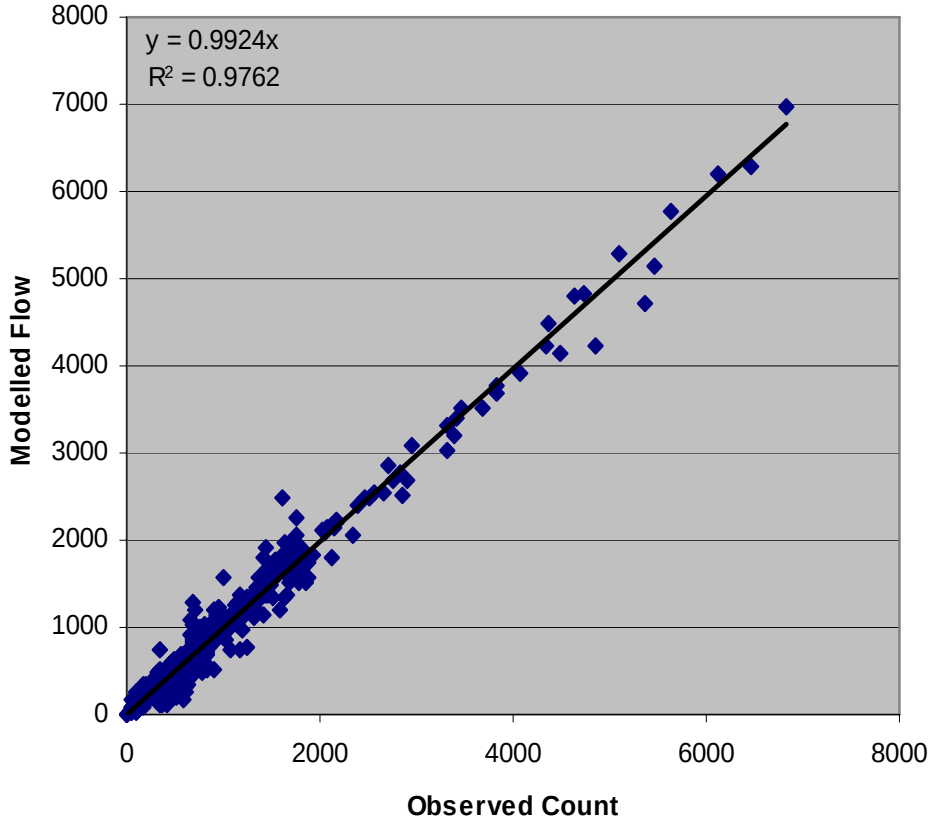


HALTON BOROUGH COUNCIL Mott MacDonald		Drawn ZC	CAD Checked	JEH	Approved CS
		Drawing Number		Date 23/08/2007	
		Project Mersey Gateway		File	
Mersey Gateway Study		Figure 8.1 Comparison of Traffic Counts and Validated Assigned Traffic Flows – AM Peak Hour			



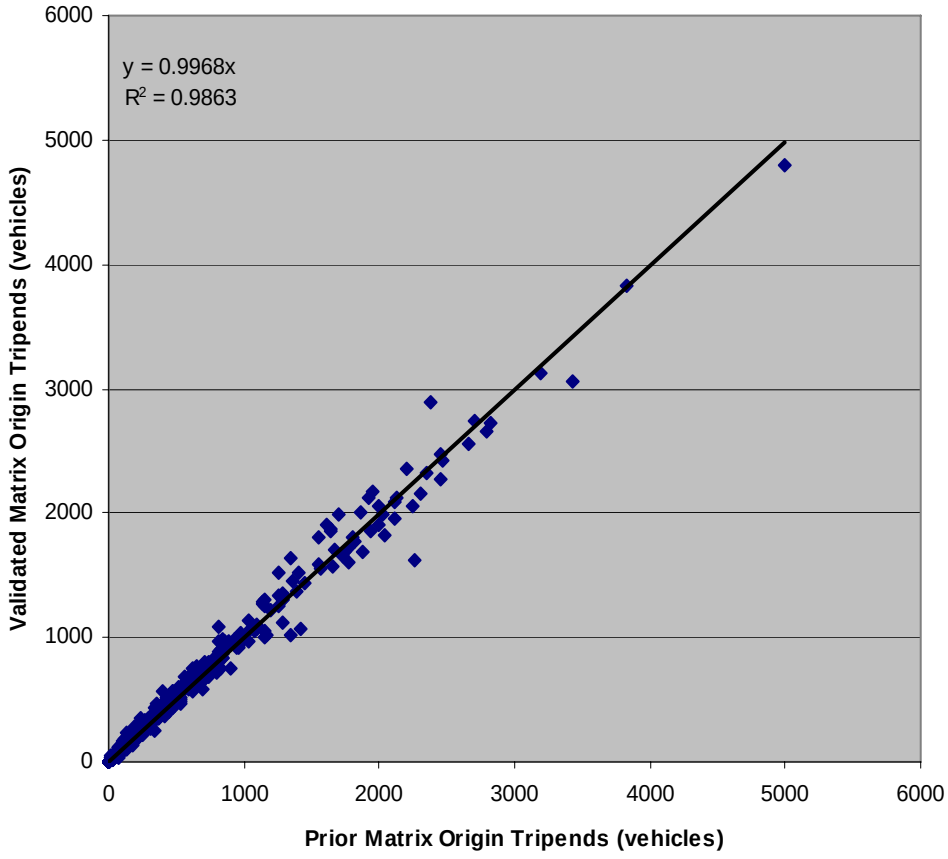
HALTON BOROUGH COUNCIL Mott MacDonald		Drawn ZC	CAD Checked	JEH	Approved ZC
		Drawing Number		Date 23/08/2007	
		Project Mersey Gateway		File	
Mersey Gateway Study		Figure 8.2 Comparison of Traffic Counts and Validated Assigned Traffic Flows – Inter Peak Hour			

Figure 8.3 - Comparison of Traffic Counts and Validated Assigned Flow - PM Peak Hour

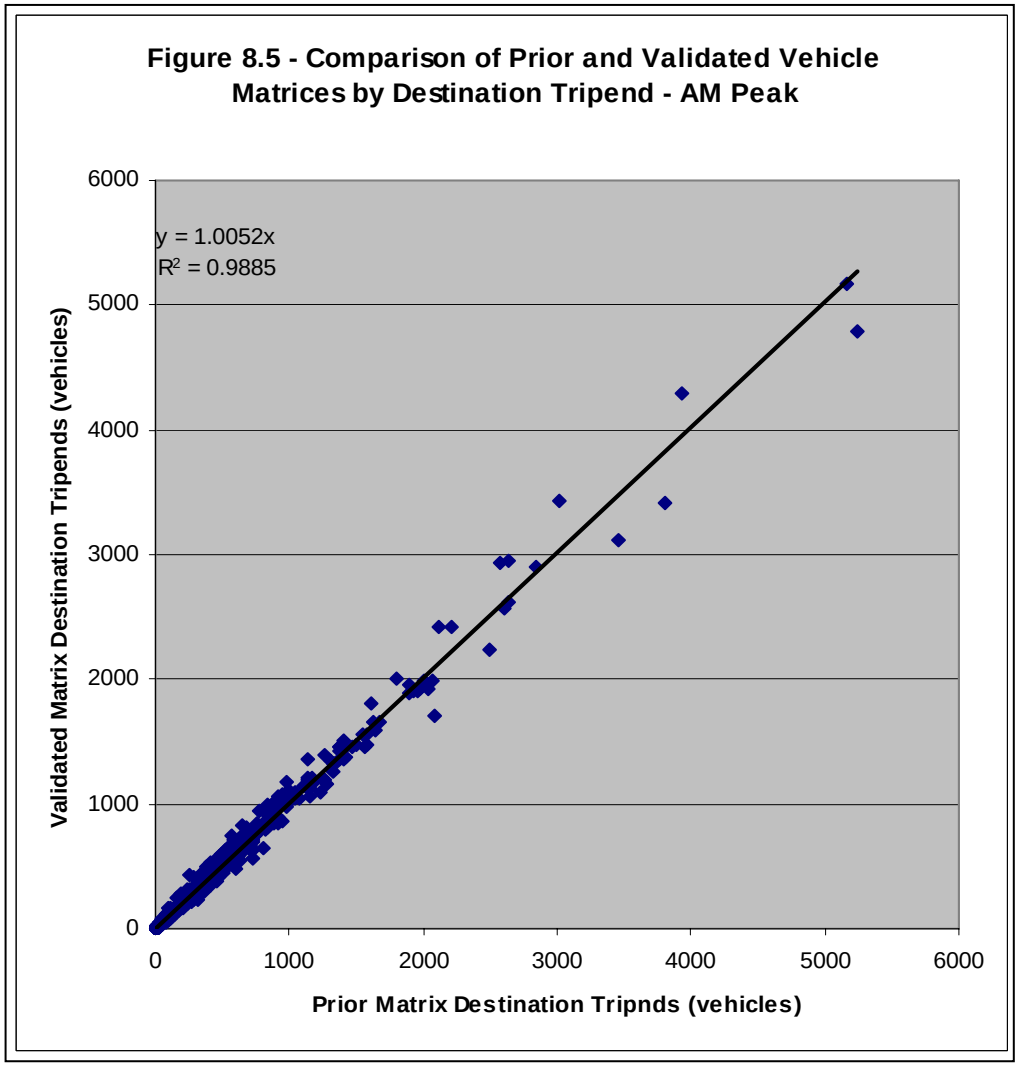


HALTON BOROUGH COUNCIL Mott MacDonald		Drawn ZC	CAD Checked	JEH	Approved CS
		Drawing Number		Date 23/08/2007	
		Project Mersey Gateway		File	
Mersey Gateway Study		Figure 8.3 Comparison of Traffic Counts and Validated Assigned Traffic Flows – PM Peak Hour			

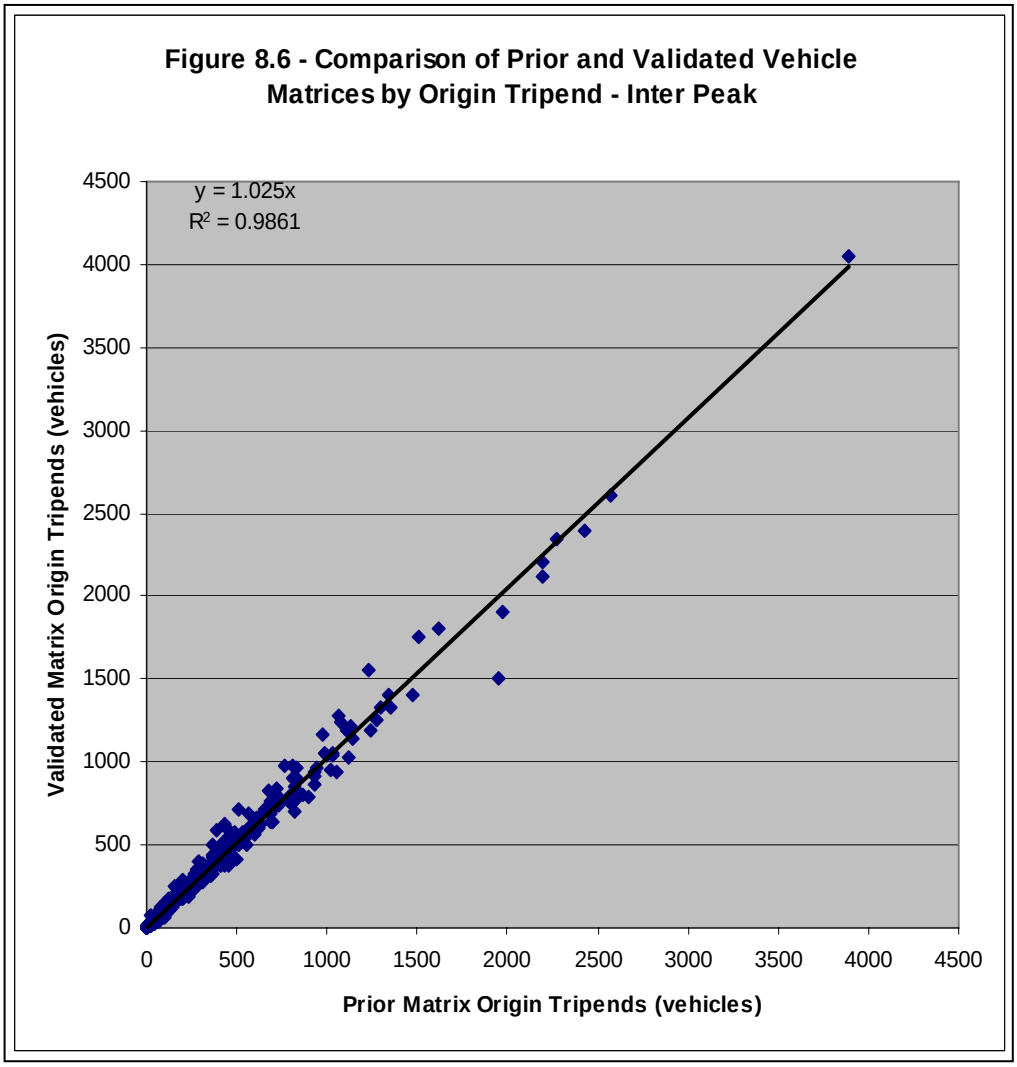
Figure 8.4 - Comparison of Prior and Validated Vehicle Matrices by Origin Tripend - AM Peak



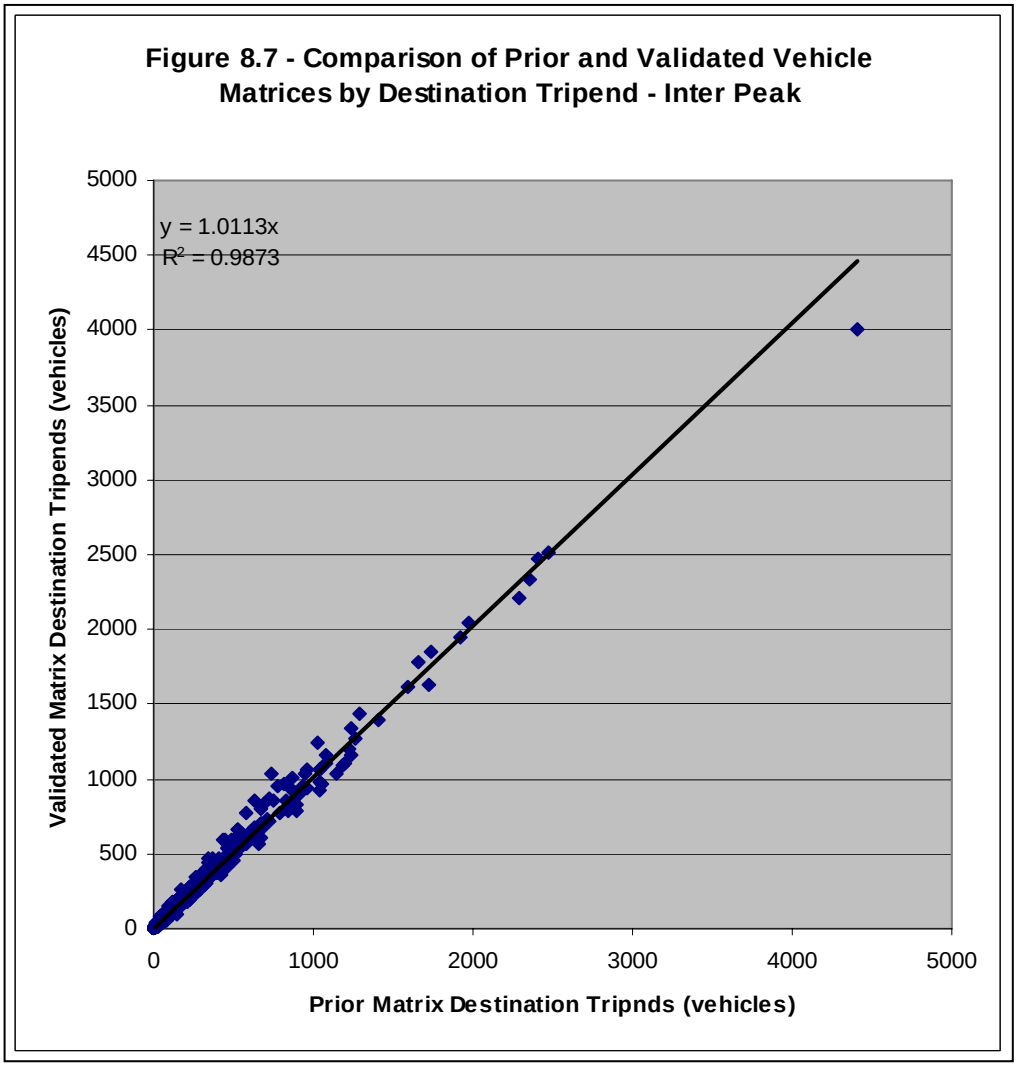
HALTON BOROUGH COUNCIL Mott MacDonald		Drawn ZC	CAD Checked	Approved JEH / CS
		Drawing Number		Date 23/08/2007
		Project Mersey Gateway	File	
Mersey Gateway Study		Figure 8.4 Comparison of Prior and Validated Vehicle Matrices by Origin Tripend – AM Peak Hour		



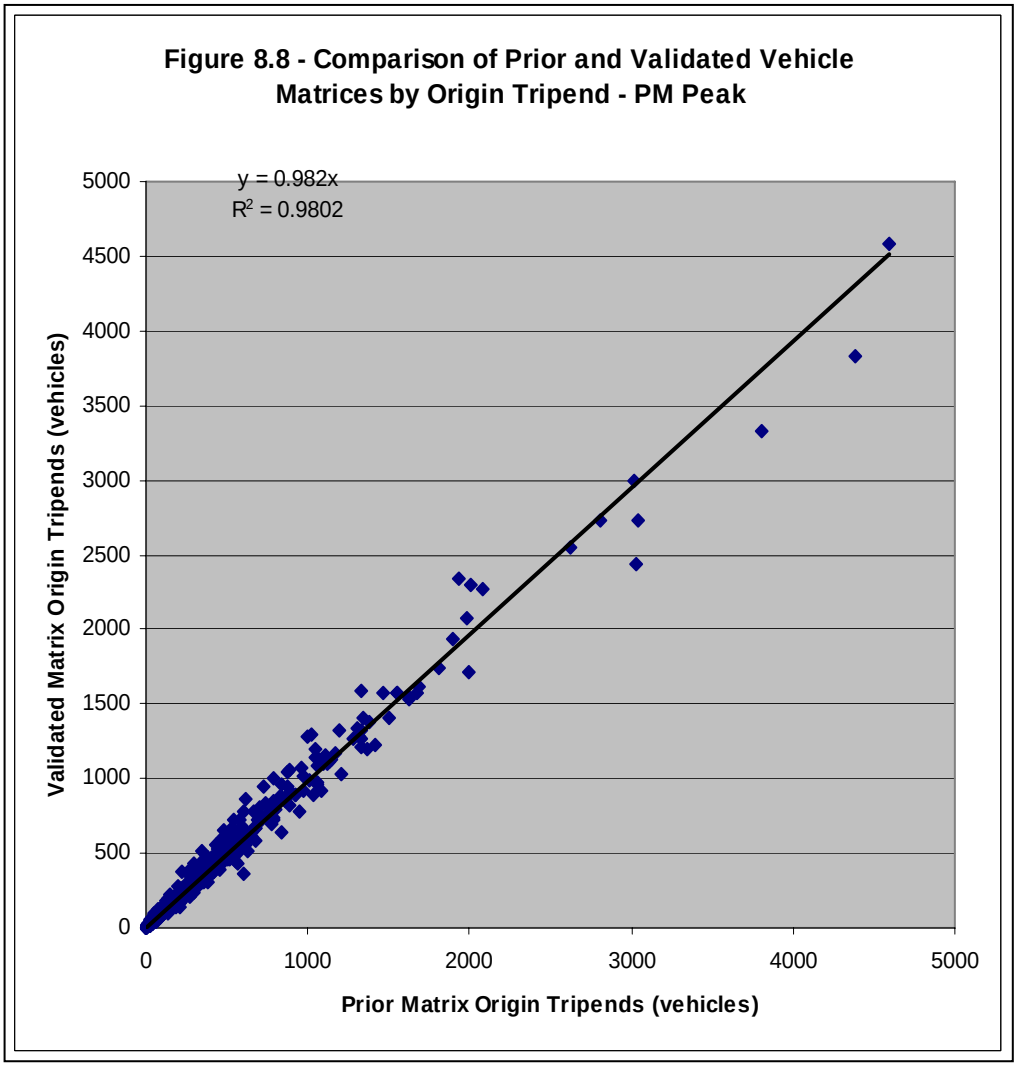
HALTON BOROUGH COUNCIL Mott MacDonald		Drawn ZC	CAD Checked	JEH	Approved CS
		Drawing Number		Date 23/08/2007	
		Project Mersey Gateway		File	
Mersey Gateway Study		Figure 8.5 Comparison of Prior and Validated Vehicle Matrices by Destination Tripend – AM Peak Hour			



HALTON BOROUGH COUNCIL Mott MacDonald		Drawn ZC	CAD Checked	JEH	Approved CS
		Drawing Number		Date 23/08/2007	
		Project Mersey Gateway		File	
Mersey Gateway Study		Figure 8.6 Comparison of Prior and Validated Vehicle Matrices by Origin Tripend – Inter Peak Hour			



HALTON BOROUGH COUNCIL Mott MacDonald		Drawn ZC	CAD Checked	JEH	Approved CS
		Drawing Number		Date 23/08/2007	
		Project Mersey Gateway	File		
Mersey Gateway Study		Figure 8.7 Comparison of Prior and Validated Vehicle Matrices by Destination Tripend – Inter Peak Hour			



HALTON BOROUGH COUNCIL Mott MacDonald		Drawn ZC	CAD Checked	JEH	Approved CS
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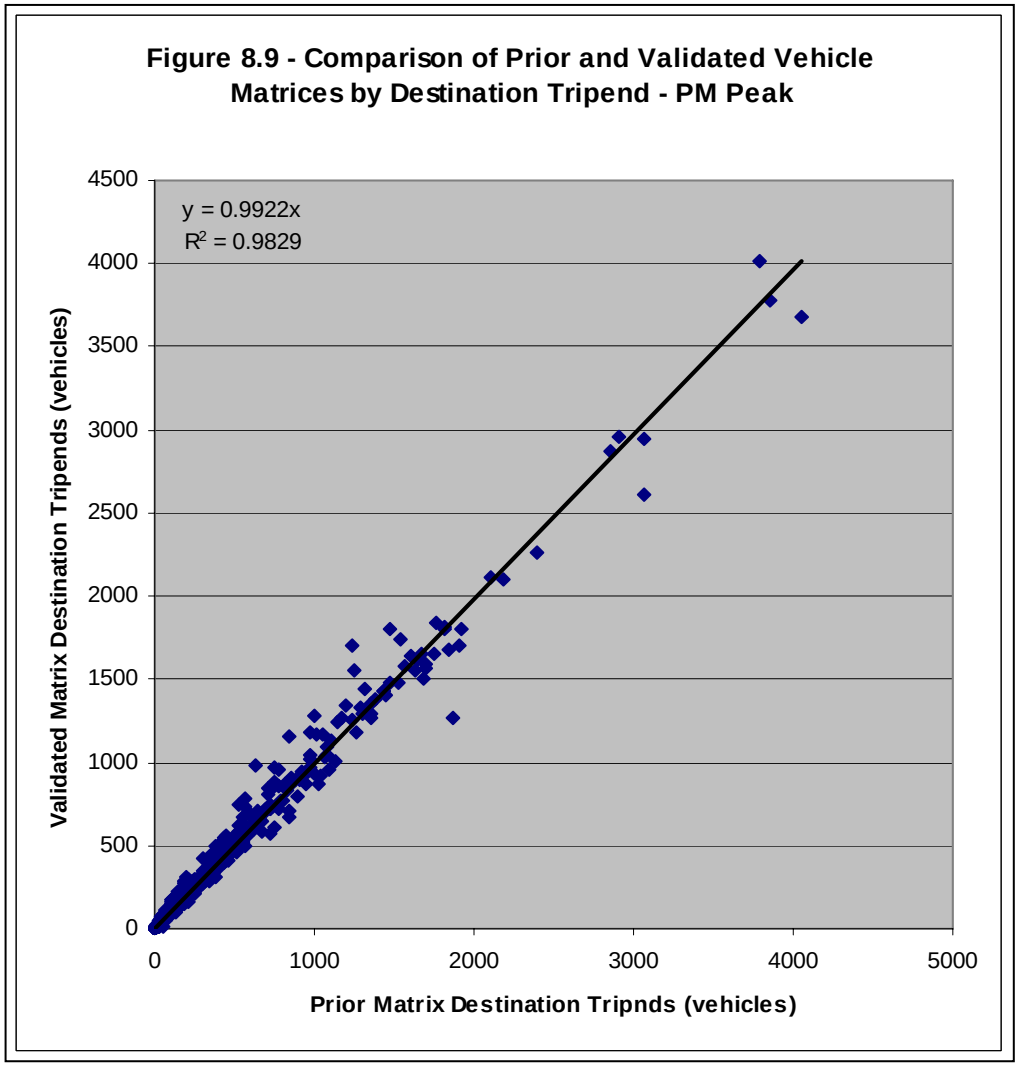
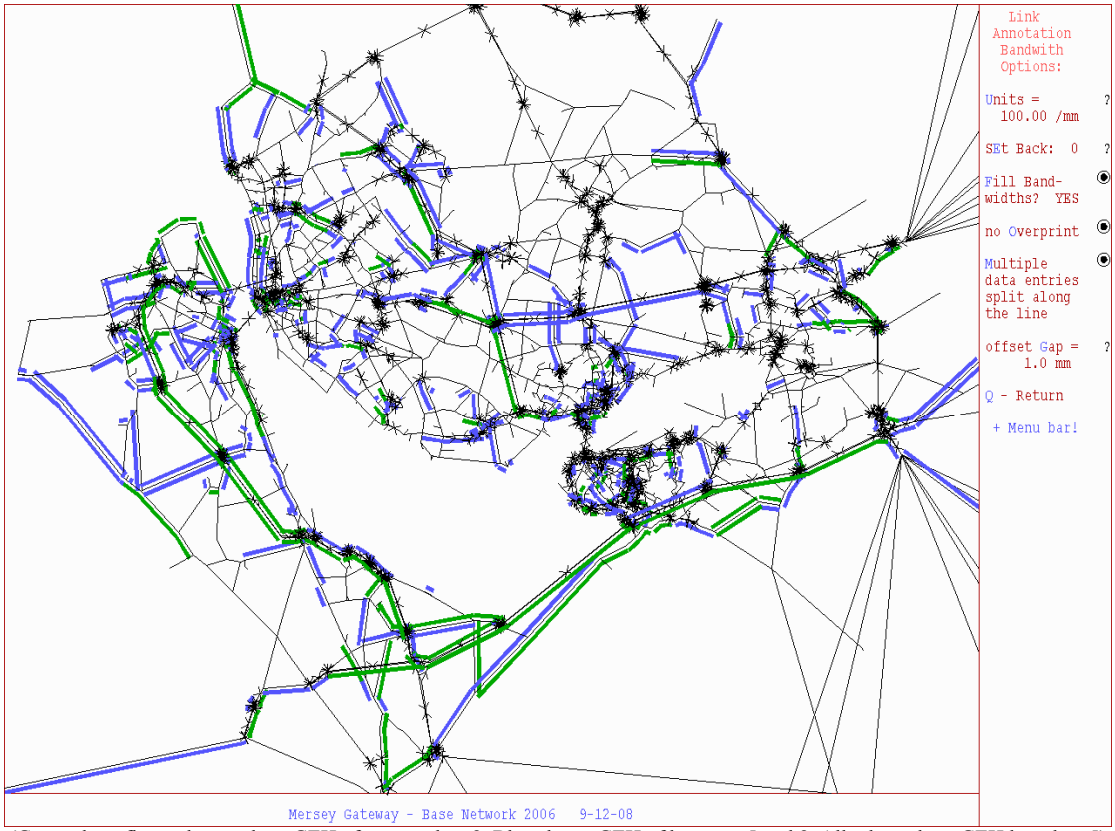
		Project Mersey Gateway	File		
Mersey Gateway Study		Figure 8.8 Comparison of Prior and Validated Vehicle Matrices by Origin Tripend – PM Peak Hour			



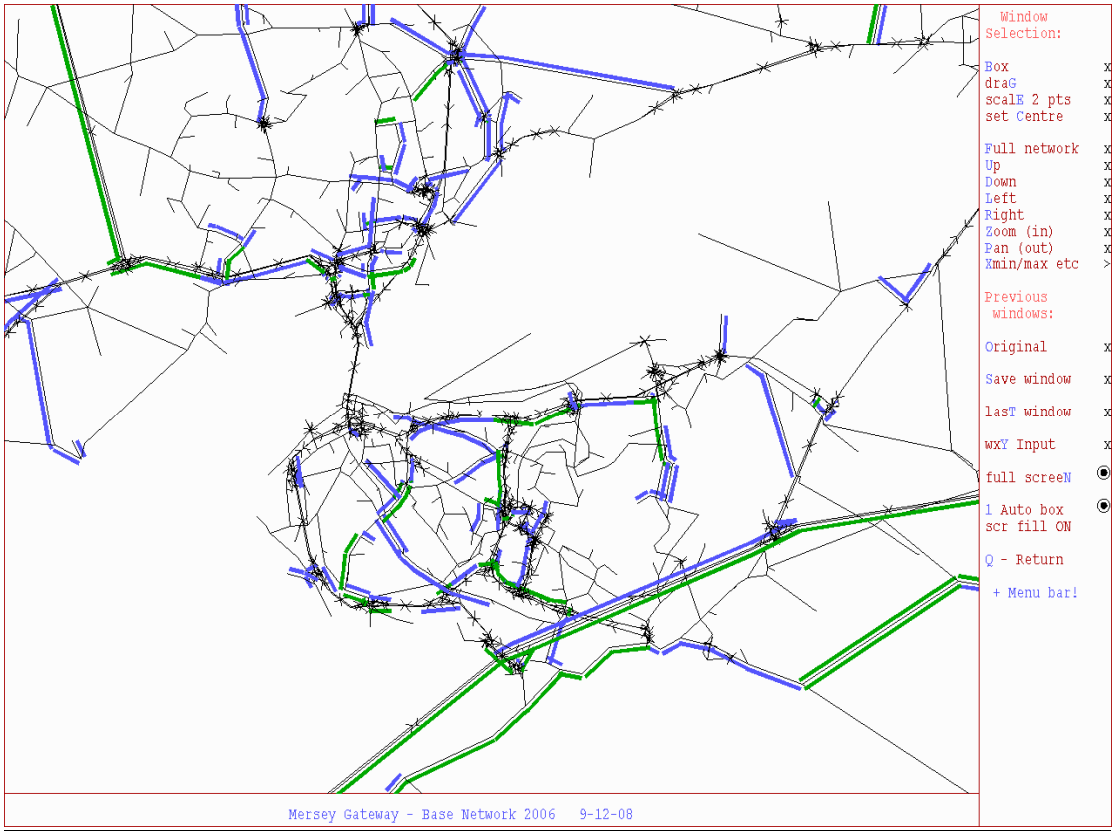
HALTON BOROUGH COUNCIL Mott MacDonald		Drawn ZC	CAD Checked	JEH	Approved CS
		Drawing Number		Date 23/08/2007	
		Project Mersey Gateway		File	
Mersey Gateway Study		Figure 8.9 Comparison of Prior and Validated Vehicle Matrices by Destination Tripend – PM Peak Hour			

Figure 8.10 - Effects of Matrix Estimation on Actual Flow – AM Full Network



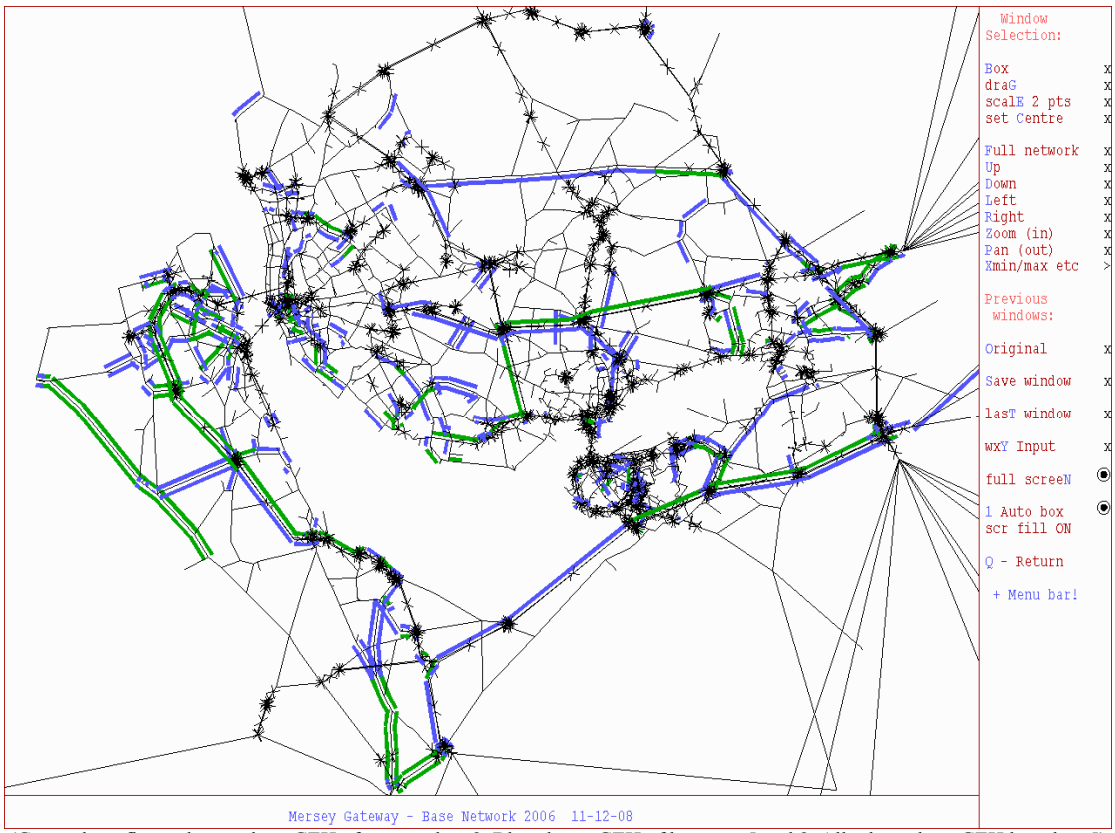
(Green show flows changes by a GEH of greater than 8. Blue shows GEH of between 5 and 8. All others show GEH less than 5)

Figure 8.11 - Effects of Matrix Estimation on Actual Flow – AM Halton



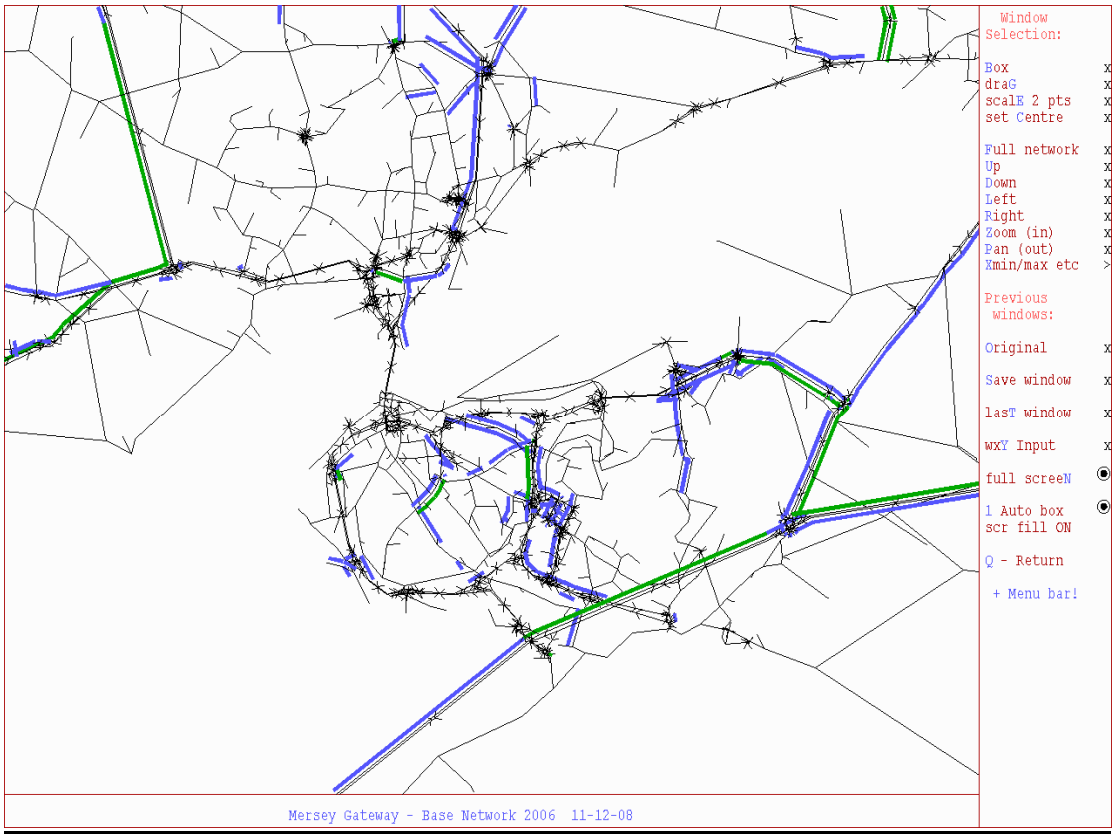
(Green show flows changes by a GEH of greater than 8. Blue shows GEH of between 5 and 8. All others show GEH less than 5)

Figure 8.12 - Effects of Matrix Estimation on Actual Flow – IP Full Network



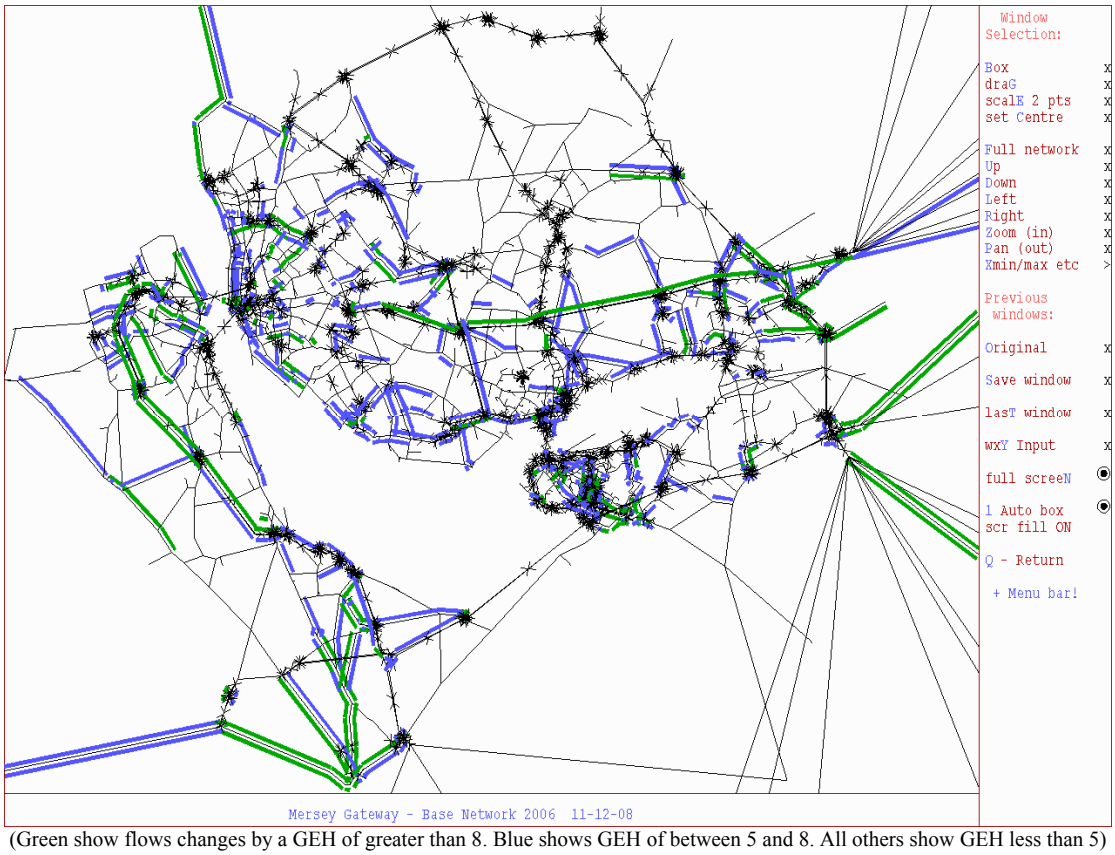
(Green show flows changes by a GEH of greater than 8. Blue shows GEH of between 5 and 8. All others show GEH less than 5)

Figure 8.13 - Effects of Matrix Estimation on Actual Flow – IP Halton



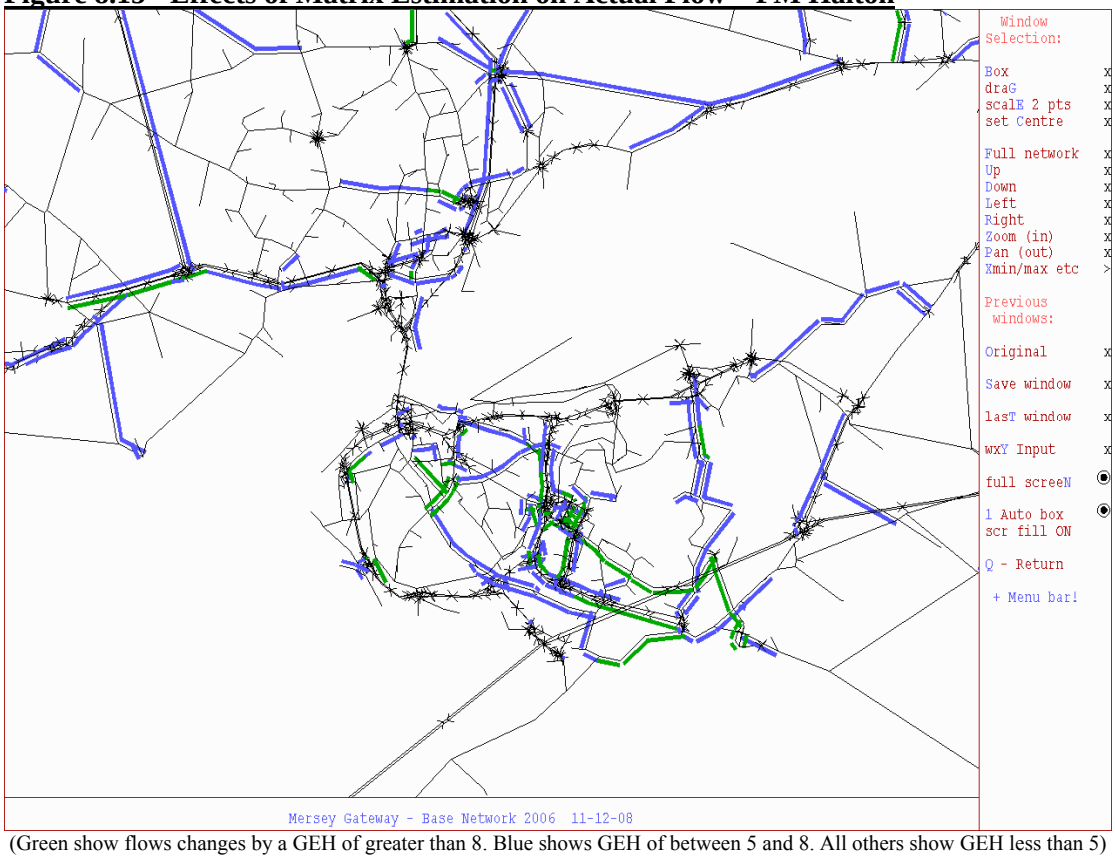
(Green show flows changes by a GEH of greater than 8. Blue shows GEH of between 5 and 8. All others show GEH less than 5)

Figure 8.14 - Effects of Matrix Estimation on Actual Flow – PM Full Network



(Green show flows changes by a GEH of greater than 8. Blue shows GEH of between 5 and 8. All others show GEH less than 5)

Figure 8.15 - Effects of Matrix Estimation on Actual Flow – PM Halton



(Green show flows changes by a GEH of greater than 8. Blue shows GEH of between 5 and 8. All others show GEH less than 5)

Chapter 9 Tables and Figures

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Table 9.1 - Observed Journey Time Comparisons – AM Peak Hour (minutes)

Description of Route	CJAMS Mean Journey Time A	Modelled Journey Time B	Percentage Difference A v B	Within 15% of CJAMS?	Within 95% Confidence Limits?
Route 3 NB - M56 J14 to M62 J6 via SJB	23.6	25.5	8.1%	Y	Y
Route 3 SB - M62 J6 to M56 J14 via SJB	27.1	28.5	5.2%	Y	Y
Route 4 NB - Preston Brook to M62 J7 via SJB	17.7	16.7	-5.6%	Y	Y
Route 4 SB - M62 J7 to Preston Brook via SJB	19.1	17.5	-8.4%	Y	Y
Route 8 NB – Frodsham to Widnes Rugby Ground	23.0	20.3	-11.7%	Y	Y
Route 8 SB – Widnes Rugby Ground to Frodsham	25.8	25.2	-2.3%	Y	Y
Route 9 NB – Preston Brook to Green Oaks Centre	13.8	15.5	12.3%	Y	Y
Route 9 SB – Green Oaks Centre to Preston Brook	15.3	14.7	-3.9%	Y	Y
Route 10 NB – Daresbury Park to Garston	24.6	23.8	-3.3%	Y	Y
Route 10 SB – Garston to Daresbury Park	25.2	23.4	-7.1%	Y	Y
Total	**215.2**	**211.1**	**-1.9%**		

Table 9.2 - Observed Journey Time Comparisons – Inter Peak Hour (minutes)

Description of Route	CJAMS Mean Journey Time A	Modelled Journey Time B	Percentage Difference A v B	Within 15% of CJAMS?	Within 95% Confidence Limits?
Route 3 NB - M56 J14 to M62 J6 via SJB	19.0	19.0	-0.1%	Y	Y
Route 3 SB - M62 J6 to M56 J14 via SJB	19.8	20.3	2.7%	Y	Y
Route 4 NB - Preston Brook to M62 J7 via SJB	14.9	13.4	-10.2%	Y	N
Route 4 SB - M62 J7 to Preston Brook via SJB	14.5	14.4	-0.2%	Y	Y
Route 8 NB – Frodsham to Widnes Rugby Ground	18.4	17.8	-3.4%	Y	Y
Route 8 SB – Widnes Rugby Ground to Frodsham	19.4	20.8	7.2%	Y	Y
Route 9 NB – Preston Brook to Green Oaks Centre	11.9	12.1	1.5%	Y	Y
Route 9 SB – Green Oaks Centre to Preston Brook	11.9	11.6	-1.9%	Y	Y
Route 10 NB – Daresbury Park to Garston	21.7	19.5	-10.3%	Y	Y
Route 10 SB – Garston to Daresbury Park	21.6	18.8	-12.9%	Y	N
Total	**173.1**	**167.7**	**-3.1%**		

Table 9.3 - Observed Journey Time Comparisons – PM Peak Hour (minutes)

Description of Route	CJAMS Mean Journey Time A	Modelled Journey Time B	Percentage Difference A v B	Within 15% of CJAMS?	Within 95% Confidence Limits?
Route 3 NB - M56 J14 to M62 J6 via SJB	21.7	26.2	20.7%	N	Y
Route 3 SB - M62 J6 to M56 J14 via SJB	24.4	27.9	14.3%	Y	Y
Route 4 NB - Preston Brook to M62 J7 via SJB	16.1	19.5	21.1%	N	Y
Route 4 SB - M62 J7 to Preston Brook via SJB	16.4	16.7	1.8%	Y	Y
Route 8 NB – Frodsham to Widnes Rugby Ground	21.4	22.5	5.1%	Y	Y
Route 8 SB – Widnes Rugby Ground to Frodsham	24.1	26.6	10.4%	Y	Y
Route 9 NB – Preston Brook to Green Oaks Centre	12.8	18.1	41.4%	N	N
Route 9 SB – Green Oaks Centre to Preston Brook	13.1	14.6	11.5%	Y	Y
Route 10 NB – Daresbury Park to Garston	22.3	25.0	12.1%	Y	Y
Route 10 SB – Garston to Daresbury Park	23.9	23.5	-1.7%	Y	Y
Total	**196.2**	**220.6**	**12.4%**		

Table 9.4 - Observed Journey Time Comparisons – Overnight Hour (minutes)

Description of Route	CJAMS Mean Journey Time A	Modelled Journey Time B	Percentage Difference A v B	Within 15% of CJAMS?	Within 95% Confidence Limits?
Route 3 NB - M56 J14 to M62 J6 via SJB	18.7	16.3	-12.5%	Y	N
Route 3 SB - M62 J6 to M56 J14 via SJB	18.9	17.6	-7.1%	Y	N
Route 4 NB - Preston Brook to M62 J7 via SJB	14.0	12.3	-11.9%	Y	N
Route 4 SB - M62 J7 to Preston Brook via SJB	13.2	12.8	-3.0%	Y	Y
Route 8 NB – Frodsham to Widnes Rugby Ground	15.8	16.3	3.3%	Y	Y
Route 8 SB – Widnes Rugby Ground to Frodsham	16.3	17.2	5.5%	Y	Y
Route 9 NB – Preston Brook to Green Oaks Centre	11.2	11.0	-1.9%	Y	Y
Route 9 SB – Green Oaks Centre to Preston Brook	10.9	10.7	-1.9%	Y	Y
Route 10 NB – Daresbury Park to Garston	18.2	17.0	-6.7%	Y	N
Route 10 SB – Garston to Daresbury Park	18.0	16.7	-7.2%	Y	N
Total	**155.2**	**147.9**	**-4.7%**		

Table 9.5 - Comparison of Traffic Counts and Assigned Flows by Validation Screenline – AM Peak Hour

Description	DIR	Car Flow						LGV						OGV (vehicles)						Total (vehicles)					
		Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB
40 River Mersey	nb	15,724	15,557	-167	-1	1.3	✓	1,464	1,311	-153	-10	4.1	×	1,343	1,358	15	1	0.4	✓	18,532	18,226	-305	-2	2.3	✓
40 River Mersey	sb	11,539	11,328	-211	-2	2.0	✓	1,520	1,496	-24	-2	0.6	✓	1,378	1,376	-2	0	0.0	✓	14,436	14,199	-237	-2	2.0	✓
Two-Way		**27,263**	**26,885**	**-378**	**-1**	**2.3**	✓	**2,984**	**2,807**	**-177**	**-6**	**3.3**	✓	**2,721**	**2,734**	**13**	**0**	**0.2**	✓	**32,968**	**32,426**	**-542**	**-2**	**3.0**	✓
41 Widnes N-S	eb	3,286	3,687	401	12	6.8	×	465	443	-21	-5	1.0	✓	238	251	13	6	0.9	✓	3,988	4,382	394	10	6.1	×
41 Widnes N-S	wb	3,554	4,134	581	16	9.4	×	436	423	-13	-3	0.6	✓	268	250	-18	-7	1.1	✓	4,257	4,807	550	13	8.2	×
Two-Way		**6,840**	**7,822**	**982**	**14**	**11.5**	×	**900**	**866**	**-34**	**-4**	**1.1**	✓	**506**	**501**	**-5**	**-1**	**0.2**	✓	**8,245**	**9,189**	**944**	**11**	**10.1**	×
42 Widnes E-W	nb	2,392	2,514	122	5	2.5	✓	361	356	-5	-1	0.2	✓	131	124	-7	-5	0.6	✓	2,884	2,994	110	4	2.0	✓
42 Widnes E-W	sb	4,067	3,757	-310	-8	5.0	×	493	417	-76	-16	3.6	✓	167	137	-30	-18	2.4	✓	4,727	4,311	-416	-9	6.2	×
Two-Way		**6,459**	**6,271**	**-188**	**-3**	**2.4**	✓	**854**	**773**	**-81**	**-10**	**2.8**	✓	**298**	**261**	**-37**	**-12**	**2.2**	✓	**7,611**	**7,305**	**-306**	**-4**	**3.5**	✓
43 Runcorn N-S	eb	4,391	4,398	6	0	0.1	✓	558	537	-21	-4	0.9	✓	343	328	-15	-4	0.8	✓	5,293	5,263	-30	-1	0.4	✓
43 Runcorn N-S	wb	4,766	4,765	-1	0	0.0	✓	485	494	10	2	0.4	✓	284	259	-25	-9	1.5	✓	5,535	5,519	-16	0	0.2	✓
Two-Way		**9,158**	**9,163**	**5**	**0**	**0.1**	✓	**1,043**	**1,031**	**-11**	**-1**	**0.4**	✓	**627**	**587**	**-40**	**-6**	**1.6**	✓	**10,827**	**10,781**	**-46**	**0**	**0.4**	✓
44 Runcorn E-W	nb	6,282	6,184	-99	-2	1.2	✓	634	616	-18	-3	0.7	✓	412	385	-27	-6	1.3	✓	7,328	7,185	-143	-2	1.7	✓
44 Runcorn E-W	sb	6,417	5,680	-737	-11	9.5	×	671	680	10	1	0.4	✓	407	400	-7	-2	0.4	✓	7,495	6,760	-735	-10	8.7	×
Two-Way		**12,700**	**11,864**	**-836**	**-7**	**7.5**	×	**1,304**	**1,296**	**-8**	**-1**	**0.2**	✓	**819**	**785**	**-34**	**-4**	**1.2**	✓	**14,823**	**13,945**	**-878**	**-6**	**7.3**	×
TWO-WAY TOTAL		**62,419**	**62,005**	**-414**	**-1%**	**1.7**	✓	**7,086**	**6,774**	**-312**	**-4%**	**3.7**	✓	**4,970**	**4,867**	**-103**	**-2**	**1.5**	✓	**74,474**	**73,646**	**-829**	**-1%**	**3.0**	✓

Note: - Cells shown in grey within the table have a GEH value of greater than 5.0 for total vehicles which are used for comparison against DMRB criteria.

Table 9.6 - Comparison of Traffic Counts and Assigned Flows by Validation Screenline – Inter Peak Hour

Description	DIR	Car Flow						LGV						OGV (vehicles)						Total (vehicles)					
		Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB
40 River Mersey	nb	9,160	8,457	-703	-8	7.5	×	1,509	1,498	-11	-1	0.3	✓	1,735	1,789	54	3	1.3	✓	12,405	11,745	-660	-5	6.0	×
40 River Mersey	sb	9,053	8,705	-348	-4	3.7	✓	1,463	1,475	12	1	0.3	✓	1,589	1,615	26	2	0.6	✓	12,104	11,794	-310	-3	2.8	✓
Two-Way		**18,213**	**17,162**	**-1,051**	**-6**	**7.9**	**×**	**2,972**	**2,973**	**1**	**0**	**0.0**	**✓**	**3,324**	**3,404**	**80**	**2**	**1.4**	**✓**	**24,509**	**23,539**	**-970**	**-4**	**6.3**	**×**
41 Widnes N-S	eb	2,540	2,586	46	2	0.9	✓	357	340	-17	-5	0.9	✓	241	270	28	12	1.8	✓	3,139	3,196	58	2	1.0	✓
41 Widnes N-S	wb	2,532	2,679	147	6	2.9	✓	372	371	-1	0	0.1	✓	298	290	-7	-2	0.4	✓	3,201	3,340	138	4	2.4	✓
Two-Way		**5,072**	**5,265**	**193**	**4**	**2.7**	**✓**	**729**	**711**	**-18**	**-2**	**0.7**	**✓**	**539**	**560**	**21**	**4**	**0.9**	**✓**	**6,340**	**6,536**	**196**	**3**	**2.4**	**✓**
42 Widnes E-W	nb	2,179	2,157	-21	-1	0.5	✓	335	328	-8	-2	0.4	✓	188	185	-3	-2	0.3	✓	2,702	2,670	-32	-1	0.6	✓
42 Widnes E-W	sb	2,172	2,166	-6	0	0.1	✓	320	288	-31	-10	1.8	✓	202	182	-20	-10	1.5	✓	2,694	2,636	-58	-2	1.1	✓
Two-Way		**4,351**	**4,324**	**-27**	**-1**	**0.4**	**✓**	**655**	**616**	**-39**	**-6**	**1.5**	**✓**	**390**	**366**	**-24**	**-6**	**1.2**	**✓**	**5,396**	**5,306**	**-90**	**-2**	**1.2**	**✓**
43 Runcorn N-S	eb	2,934	2,748	-186	-6	3.5	✓	423	454	31	7	1.5	✓	338	359	21	6	1.1	✓	3,694	3,561	-133	-4	2.2	✓
43 Runcorn N-S	wb	2,789	2,744	-45	-2	0.8	✓	438	440	2	1	0.1	✓	370	336	-35	-9	1.8	✓	3,597	3,520	-77	-2	1.3	✓
Two-Way		**5,723**	**5,492**	**-230**	**-4**	**3.1**	**✓**	**861**	**894**	**33**	**4**	**1.1**	**✓**	**708**	**695**	**-13**	**-2**	**0.5**	**✓**	**7,291**	**7,081**	**-210**	**-3**	**2.5**	**✓**
44 Runcorn E-W	nb	4,154	3,628	-526	-13	8.4	×	534	514	-20	-4	0.9	✓	411	376	-35	-9	1.8	✓	5,099	4,518	-581	-11	8.4	×
44 Runcorn E-W	sb	4,180	3,725	-455	-11	7.2	×	578	584	6	1	0.3	✓	407	397	-10	-2	0.5	✓	5,165	4,707	-458	-9	6.5	×
Two-Way		**8,334**	**7,354**	**-980**	**-12**	**11.1**	**×**	**1,112**	**1,098**	**-14**	**-1**	**0.4**	**✓**	**818**	**773**	**-45**	**-6**	**1.6**	**✓**	**10,264**	**9,225**	**-1,039**	**-10**	**10.5**	**×**
TWO-WAY TOTAL		**41,693**	**39,596**	**-2,096**	**-5**	**10.4**	**×**	**6,328**	**6,292**	**-36**	**-1**	**0.5**	**✓**	**5,779**	**5,798**	**18**	**0**	**0.2**	**✓**	**53,800**	**51,687**	**-2,114**	**-4**	**9.2**	**×**

Note: - Cells shown in grey within the table have a GEH value of greater than 5.0 for total vehicles which are used for comparison against DMRB criteria.

Table 9.7 - Comparison of Traffic Counts and Assigned Flows by Validation Screenline – PM Peak Hour

Description	DIR	Car Flow						LGV						OGV (vehicles)						Total (vehicles)					
		Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB
40 River Mersey	nb	12,751	13,119	368	3	3.2	✓	1,862	1,651	-211	-11	5.0	×	1,375	1,368	-7	-1	0.2	✓	15,988	16,138	150	1	1.2	✓
40 River Mersey	sb	13,934	14,073	140	1	1.2	✓	1,969	1,750	-219	-11	5.1	×	1,185	1,120	-66	-6	1.9	✓	17,087	16,943	-144	-1	1.1	✓
Two-Way		**26,685**	**27,192**	**508**	**2**	**3.1**	✓	**3,831**	**3,401**	**-429**	**-11**	**7.1**	×	**2,560**	**2,487**	**-73**	**-3**	**1.4**	✓	**33,076**	**33,081**	**5**	**0**	**0.0**	✓
41 Widnes N-S	eb	3,886	4,107	221	6	3.5	✓	586	591	5	1	0.2	✓	273	260	-13	-5	0.8	✓	4,745	4,957	212	4	3.1	✓
41 Widnes N-S	wb	3,687	3,939	253	7	4.1	×	558	566	8	1	0.3	✓	211	235	24	11	1.6	✓	4,456	4,740	284	6	4.2	×
Two-Way		**7,573**	**8,046**	**473**	**6**	**5.4**	×	**1,144**	**1,156**	**13**	**1**	**0.4**	✓	**484**	**495**	**11**	**2**	**0.5**	✓	**9,201**	**9,697**	**497**	**5**	**5.1**	×
42 Widnes E-W	nb	3,380	3,580	200	6	3.4	✓	390	378	-13	-3	0.6	✓	127	98	-29	-22	2.7	✓	3,897	4,056	159	4	2.5	✓
42 Widnes E-W	sb	2,727	2,641	-87	-3	1.7	✓	366	343	-23	-6	1.2	✓	120	111	-9	-7	0.8	✓	3,213	3,095	-118	-4	2.1	✓
Two-Way		**6,107**	**6,221**	**114**	**2**	**1.4**	✓	**756**	**721**	**-35**	**-5**	**1.3**	✓	**247**	**210**	**-37**	**-15**	**2.5**	✓	**7,110**	**7,151**	**41**	**1**	**0.5**	✓
43 Runcorn N-S	eb	4,089	4,003	-86	-2	1.3	✓	513	538	25	5	1.1	✓	244	223	-21	-9	1.4	✓	4,846	4,765	-81	-2	1.2	✓
43 Runcorn N-S	wb	4,420	4,368	-52	-1	0.8	✓	633	552	-82	-13	3.4	✓	229	223	-6	-3	0.4	✓	5,283	5,143	-140	-3	1.9	✓
Two-Way		**8,509**	**8,371**	**-138**	**-2**	**1.5**	✓	**1,146**	**1,090**	**-56**	**-5**	**1.7**	✓	**474**	**447**	**-27**	**-6**	**1.3**	✓	**10,129**	**9,908**	**-222**	**-2**	**2.2**	✓
44 Runcorn E-W	nb	6,147	5,827	-320	-5	4.1	×	698	639	-59	-8	2.3	✓	268	263	-5	-2	0.3	✓	7,113	6,729	-384	-5	4.6	×
44 Runcorn E-W	sb	6,018	5,849	-169	-3	2.2	✓	691	749	58	8	2.2	✓	259	258	-1	0	0.1	✓	6,968	6,856	-112	-2	1.3	✓
Two-Way		**12,165**	**11,676**	**-489**	**-4**	**4.5**	×	**1,389**	**1,388**	**-1**	**0**	**0.0**	✓	**527**	**521**	**-6**	**-1**	**0.3**	✓	**14,081**	**13,585**	**-496**	**-4**	**4.2**	×
TWO-WAY TOTAL		**61,039**	**61,507**	**468**	**1**	**1.9**	✓	**8,266**	**7,757**	**-509**	**-6**	**5.7**	×	**4,292**	**4,159**	**-133**	**-3**	**2.0**	✓	**73,597**	**73,422**	**-174**	**0**	**0.6**	✓

Note: - Cells shown in grey within the table have a GEH value of greater than 5.0 for total vehicles which are used for comparison against DMRB criteria.

Table 9.8 - Comparison of Mean Trip Lengths before and after Matrix Estimation – AM Peak Hour

Vehicle Type and purpose	Mean Trip Length in Prior Matrix (km)	Mean Trip Length in Validated Matrix (km)	Percentage Difference
Car Commuting	20.4	21.0	3.2%
Car Employers' Business	25.1	25.6	1.9%
Car Other	10.3	10.2	-0.3%
LGV	26.9	24.4	-9.2%
OGV	36.9	36.9	0.0%
Total Vehicles	20.9	20.6	-1.4%

Table 9.9 - Comparison of Mean Trip Lengths before and after Matrix Estimation – Inter Peak Hour

Vehicle Type and purpose	Mean Trip Length in Prior Matrix (km)	Mean Trip Length in Validated Matrix (km)	Percentage Difference
Car Commuting	25.8	25.4	-1.7%
Car Employers' Business	29.4	27.6	-6.0%
Car Other	11.4	11.2	-2.4%
LGV	27.2	25.0	-8.3%
OGV	38.1	38.1	0.1%
Total Vehicles	21.3	20.3	-4.9%

Table 9.10 - Comparison of Mean Trip Lengths before and after Matrix Estimation – PM Peak Hour

Vehicle Type and purpose	Mean Trip Length in Prior Matrix (km)	Mean Trip Length in Validated Matrix (km)	Percentage Difference
Car Commuting	24.1	24.4	1.0%
Car Employers' Business	25.8	25.7	-0.6%
Car Other	13.3	12.8	-3.9%
LGV	27.9	25.8	-7.4%
OGV	36.3	35.9	-1.1%
Total Vehicles	21.8	21.2	-3.0%

Table 9.11 - Comparison of Observed and Modelled Trips using the Mersey Tunnels (total vehicles) – AM Peak Hour

Table 9.11a Vehicles using Mersey Tunnels as built from RSI Data – AM Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	0	0	0	0	0	0	6	6	0	0	0	0	1	0	0	0	0	**13**
2	Runcorn	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
3	West Warrington	0	0	0	0	0	0	0	5	5	0	0	0	0	2	0	0	0	0	**13**
4	Warrington	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	**3**
5	South Warrington	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
6	East Warrington	0	0	0	0	0	0	0	2	5	0	0	0	0	0	0	0	0	0	**8**
7	South Liverpool	0	0	0	0	0	0	0	10	35	0	0	0	0	27	0	0	0	0	**71**
8	Birkenhead	2	0	0	0	0	1	5	0	0	0	44	3	0	0	48	3	14	0	**121**
9	East Wirral	12	0	29	5	0	14	90	0	0	0	1113	63	0	0	692	30	108	0	**2157**
10	South Widnes	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	**2**
11	Liverpool	0	0	0	0	0	0	0	116	466	0	0	0	33	408	0	0	0	0	**1023**
12	South Knowsley	0	0	0	0	0	0	0	18	82	0	0	0	2	44	0	0	0	0	**146**
13	Ellesmere Port	0	0	0	0	0	0	0	0	0	0	163	3	0	0	61	1	0	0	**228**
14	West Wirral & Wales	7	0	18	0	0	5	73	0	0	0	1439	97	0	0	762	68	56	0	**2526**
15	St Helens & Sth Lancs	0	0	0	0	0	0	0	115	530	0	0	0	44	360	0	0	0	0	**1049**
16	North	0	0	0	0	0	0	0	51	23	0	0	0	5	15	0	0	0	0	**94**
17	East	0	0	0	0	0	0	0	38	76	0	0	0	0	12	0	0	0	0	**126**
18	The South	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	Total	**22**	**0**	**48**	**6**	**0**	**19**	**168**	**362**	**1233**	**0**	**2758**	**166**	**84**	**871**	**1563**	**103**	**179**	**0**	**7581**

Note : - Cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.11b Vehicles using Mersey Tunnels from a Select Link Analysis of the Assignment – AM Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	0	0	0	0	0	0	6	13	0	0	0	0	4	0	0	0	0	**23**
2	Runcorn	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	**4**
3	West Warrington	0	0	0	0	0	0	0	4	6	0	0	0	0	4	0	0	0	0	**15**
4	Warrington	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	**4**
5	South Warrington	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
6	East Warrington	0	0	0	0	0	0	0	1	17	0	0	0	0	1	0	0	0	0	**19**
7	South Liverpool	0	0	0	0	0	0	0	10	39	0	0	0	0	38	0	0	0	0	**88**
8	Birkenhead	2	0	1	0	0	1	5	0	0	0	10	3	0	0	33	2	17	0	**75**
9	East Wirral	12	11	29	5	0	14	90	0	0	0	913	61	0	0	633	30	130	0	**1928**
10	South Widnes	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	**3**
11	Liverpool	0	0	0	0	0	0	0	101	452	0	0	0	42	445	0	0	0	0	**1041**
12	South Knowsley	0	0	0	0	0	0	0	18	81	0	0	0	10	59	0	0	0	0	**168**
13	Ellesmere Port	0	0	0	0	0	0	0	0	0	0	158	3	0	0	60	0	0	0	**222**
14	West Wirral & Wales	11	0	16	0	0	3	72	0	0	0	1367	92	0	0	721	63	167	0	**2513**
15	St Helens & Sth Lancs	0	0	0	0	0	0	0	85	366	0	0	0	67	417	0	0	0	0	**934**
16	North	0	0	0	0	0	0	0	52	21	0	0	0	13	17	0	0	0	0	**102**
17	East	0	0	0	0	0	0	0	28	66	0	0	0	0	25	0	0	0	0	**119**
18	The South	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	**7**
	Total	**25**	**11**	**45**	**6**	**0**	**17**	**167**	**317**	**1067**	**0**	**2448**	**159**	**132**	**1011**	**1448**	**96**	**313**	**0**	**7266**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.12 - Comparison of Observed and Modelled Trips using the Silver Jubilee Bridge (total vehicles) – AM Peak Hour

Table 9.12a Vehicles using Silver Jubilee Bridge as built from RSI Data – AM Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	723	0	5	70	0	0	0	13	1	0	0	30	140	3	0	32	68	**1084**
2	Runcorn	594	0	42	29	6	5	176	0	0	90	171	22	0	0	378	22	14	0	**1548**
3	West Warrington	0	87	0	4	4	0	0	0	0	0	0	0	4	16	0	0	1	2	**117**
4	Warrington	0	25	0	0	0	0	6	0	0	0	0	0	2	3	0	0	0	2	**38**
5	South Warrington	61	2	0	0	0	0	29	0	0	15	37	6	0	0	37	0	4	0	**191**
6	East Warrington	0	4	0	0	0	0	4	0	0	0	5	0	0	0	3	0	0	0	**15**
7	South Liverpool	0	143	0	5	18	1	0	0	4	2	0	0	15	59	2	0	30	45	**324**
8	Birkenhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
9	East Wirral	11	0	0	0	0	0	9	0	0	0	0	0	0	0	8	0	0	0	**29**
10	South Widnes	3	45	0	0	18	0	4	0	2	0	0	0	14	4	0	0	5	7	**101**
11	Liverpool	0	104	0	3	16	0	0	0	0	0	0	0	13	55	0	0	19	37	**246**
12	South Knowsley	0	93	0	3	20	0	0	0	0	0	0	0	28	81	0	0	25	33	**283**
13	Ellesmere Port	26	0	23	0	0	0	15	0	0	7	0	6	0	0	36	0	0	0	**114**
14	West Wirral & Wales	180	5	33	9	0	5	175	0	0	34	94	34	0	5	281	0	0	0	**854**
15	St Helens & Sth Lancs	0	511	0	8	77	2	0	2	16	4	0	0	98	246	0	0	33	105	**1100**
16	North	0	11	0	0	0	0	6	0	0	0	0	0	0	4	0	0	0	0	**22**
17	East	37	27	0	0	0	0	68	0	0	4	29	6	0	0	0	0	0	0	**170**
18	The South	111	0	0	0	0	0	197	0	0	27	62	20	0	0	162	0	0	0	**579**
	Total	**1023**	**1778**	**99**	**67**	**228**	**12**	**688**	**2**	**35**	**183**	**397**	**93**	**205**	**614**	**908**	**22**	**163**	**299**	**6815**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.12b Vehicles using Silver Jubilee Bridge from a Select Link Analysis of the Assignment – AM Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	655	0	0	48	0	0	0	9	0	0	0	28	167	0	0	72	46	**1026**
2	Runcorn	577	0	39	43	0	0	201	4	0	83	119	23	0	0	281	21	21	0	**1412**
3	West Warrington	0	103	0	0	3	0	0	0	0	0	0	0	3	34	0	0	0	1	**145**
4	Warrington	0	25	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**27**
5	South Warrington	24	0	0	0	0	0	28	0	1	6	25	3	0	0	22	0	0	0	**108**
6	East Warrington	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
7	South Liverpool	0	155	0	1	17	0	0	0	0	0	0	0	21	60	0	0	79	48	**381**
8	Birkenhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
9	East Wirral	16	10	1	0	0	0	8	0	0	1	0	1	0	0	1	0	0	0	**38**
10	South Widnes	0	43	0	0	10	0	0	0	0	0	0	0	8	3	0	0	4	4	**71**
11	Liverpool	0	101	0	3	16	0	0	0	0	0	0	0	4	27	0	0	44	44	**239**
12	South Knowsley	0	97	0	0	17	0	0	0	0	0	0	0	24	75	0	0	55	33	**301**
13	Ellesmere Port	33	0	8	1	0	0	15	0	0	5	6	18	0	0	75	16	0	0	**178**
14	West Wirral & Wales	212	0	32	2	0	0	170	0	0	24	99	53	0	0	380	113	0	0	**1085**
15	St Helens & Sth Lancs	0	510	0	0	76	0	0	0	0	0	0	0	75	248	0	0	0	75	**983**
16	North	0	25	0	0	0	0	0	0	0	0	0	0	2	12	0	0	0	0	**39**
17	East	81	36	0	0	0	0	223	0	0	20	22	4	0	0	0	0	0	0	**385**
18	The South	78	0	0	0	0	0	184	0	0	19	52	4	0	0	57	0	0	0	**394**
	Total	**1021**	**1760**	**80**	**50**	**187**	**0**	**829**	**4**	**12**	**156**	**322**	**107**	**166**	**626**	**816**	**151**	**275**	**251**	**6813**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.13 - Comparison of Observed and Modelled Trips travelling through Warrington (total vehicles) – AM Peak Hour

Table 9.13a Vehicles travelling through Warrington as built from RSI Data – AM Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	2	0	1	20	0	0	0	0	0	0	0	0	0	0	0	39	31	**94**
2	Runcorn	0	0	33	415	0	60	0	0	0	0	0	0	0	0	16	7	38	0	**569**
3	West Warrington	0	27	0	0	29	0	0	0	2	0	0	0	3	23	0	0	121	53	**258**
4	Warrington	0	117	0	2	435	0	0	2	3	0	0	0	18	60	0	0	93	124	**853**
5	South Warrington	48	1	43	774	5	285	6	0	0	0	25	6	0	0	188	20	175	0	**1575**
6	East Warrington	0	23	0	1	204	0	0	1	5	0	0	0	13	36	0	0	11	20	**314**
7	South Liverpool	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
8	Birkenhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
9	East Wirral	0	0	2	22	0	2	0	0	0	0	0	0	0	0	0	0	0	0	**25**
10	South Widnes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
11	Liverpool	0	0	0	1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	**11**
12	South Knowsley	0	0	0	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	**7**
13	Ellesmere Port	0	0	1	32	0	7	0	0	0	0	0	0	0	0	0	4	1	0	**44**
14	West Wirral & Wales	0	0	7	176	0	47	0	0	0	0	0	0	0	0	14	1	5	0	**249**
15	St Helens & Sth Lancs	0	29	0	1	283	0	0	0	2	0	0	0	8	61	0	0	9	17	**410**
16	North	0	17	0	0	25	0	0	0	0	0	0	0	17	48	0	0	0	26	**133**
17	East	53	147	32	184	93	1	0	0	2	0	0	2	3	30	20	0	0	6	**571**
18	The South	37	0	42	232	0	3	0	0	0	0	0	1	0	0	54	2	0	0	**372**
	Total	**138**	**363**	**159**	**1843**	**1112**	**404**	**6**	**3**	**15**	**1**	**26**	**9**	**62**	**258**	**292**	**33**	**493**	**277**	**5493**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.13b Vehicles travelling through Warrington from a Select Link Analysis of the Assignment – AM Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	0	0	7	16	0	0	0	0	0	0	0	0	0	0	0	24	12	**60**
2	Runcorn	0	0	48	395	0	44	0	0	0	0	0	0	0	0	21	9	54	0	**572**
3	West Warrington	0	21	0	32	29	0	0	0	0	0	0	0	2	10	0	0	133	38	**267**
4	Warrington	2	105	34	188	436	49	1	0	2	0	1	0	18	59	31	1	163	110	**1202**
5	South Warrington	48	1	38	743	12	268	0	0	0	0	22	10	0	0	190	20	234	0	**1588**
6	East Warrington	0	20	0	12	191	0	0	0	2	0	0	0	3	37	0	0	0	2	**268**
7	South Liverpool	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
8	Birkenhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
9	East Wirral	0	0	2	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**19**
10	South Widnes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
11	Liverpool	0	0	0	10	7	0	0	0	0	0	0	0	0	0	0	0	0	0	**17**
12	South Knowsley	0	0	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	**8**
13	Ellesmere Port	0	0	10	30	0	2	0	0	0	0	0	0	0	0	1	0	0	0	**43**
14	West Wirral & Wales	0	0	20	165	0	10	0	0	0	0	0	0	0	0	19	0	4	0	**218**
15	St Helens & Sth Lancs	0	33	0	42	279	0	0	0	0	0	0	0	6	56	0	0	3	8	**426**
16	North	0	18	0	0	25	0	0	0	0	0	0	0	13	52	0	0	0	18	**126**
17	East	37	80	25	199	65	0	0	0	7	0	0	1	13	79	16	0	0	0	**521**
18	The South	38	0	39	194	0	0	0	0	0	0	0	1	0	0	91	2	0	0	**366**
	Total	**125**	**278**	**217**	**2040**	**1063**	**374**	**2**	**0**	**12**	**0**	**23**	**12**	**54**	**293**	**370**	**33**	**617**	**188**	**5701**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.14 - Comparison of Observed and Modelled Trips using the Mersey Tunnels (total vehicles) – Inter Peak Hour

Table 9.14a Vehicles using Mersey Tunnels as built from RSI Data – Inter Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	0	0	0	0	0	0	0	4	0	0	0	0	3	0	0	0	0	**7**
2	Runcorn	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	**2**
3	West Warrington	0	0	0	0	0	0	0	0	15	0	0	0	0	18	0	0	0	0	**33**
4	Warrington	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
5	South Warrington	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
6	East Warrington	0	0	0	0	0	0	0	0	4	0	0	0	0	1	0	0	0	0	**5**
7	South Liverpool	0	0	0	0	0	0	0	0	26	0	0	0	3	32	0	0	0	2	**63**
8	Birkenhead	0	0	0	0	0	0	0	5	0	0	2	0	0	0	28	3	0	0	**38**
9	East Wirral	6	1	7	7	1	3	26	0	1	1	411	48	0	0	315	26	31	4	**889**
10	South Widnes	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
11	Liverpool	0	0	0	0	0	0	0	69	364	0	0	0	27	446	0	0	2	19	**927**
12	South Knowsley	0	0	0	0	0	0	0	5	47	0	0	0	0	30	0	0	0	0	**83**
13	Ellesmere Port	0	0	0	0	0	0	0	0	0	0	41	0	0	0	38	0	0	0	**79**
14	West Wirral & Wales	2	0	7	0	0	0	34	0	5	0	367	34	0	0	331	18	20	2	**820**
15	St Helens & Sth Lancs	0	0	0	0	0	0	0	81	264	0	0	0	34	342	0	0	0	7	**729**
16	North	0	0	0	0	0	0	0	2	16	0	0	0	0	17	0	0	0	0	**34**
17	East	0	0	0	0	0	0	0	4	27	0	3	0	0	20	0	0	0	0	**53**
18	The South	0	0	0	0	0	0	0	0	0	0	13	1	0	0	11	0	0	0	**25**
	Total	**9**	**1**	**14**	**7**	**1**	**3**	**60**	**165**	**775**	**1**	**837**	**83**	**65**	**911**	**723**	**47**	**53**	**35**	**3789**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.14b Vehicles using Mersey Tunnels from a Select Link Analysis of the Assignment – Inter Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	0	0	0	0	0	0	7	6	0	0	0	0	6	0	0	0	0	**20**
2	Runcorn	0	0	0	0	0	0	0	6	19	0	0	0	0	0	0	0	0	0	**25**
3	West Warrington	0	0	0	0	0	0	0	3	14	0	0	0	0	8	0	0	0	0	**25**
4	Warrington	0	0	0	0	0	0	0	1	2	0	0	0	0	1	0	0	0	0	**4**
5	South Warrington	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
6	East Warrington	0	0	0	0	0	0	0	2	14	0	0	0	0	0	0	0	0	0	**17**
7	South Liverpool	0	0	0	0	0	0	0	9	32	0	0	0	0	29	0	0	0	0	**69**
8	Birkenhead	8	0	2	2	0	2	6	0	0	0	6	5	0	0	40	3	57	0	**130**
9	East Wirral	7	0	7	1	1	2	43	0	0	0	406	51	0	0	315	10	60	1	**904**
10	South Widnes	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	**2**
11	Liverpool	0	0	0	0	0	0	0	88	365	0	0	0	34	471	0	0	0	0	**958**
12	South Knowsley	0	0	0	0	0	0	0	10	51	0	0	0	3	31	0	0	0	0	**94**
13	Ellesmere Port	0	0	0	0	0	0	0	0	0	0	112	1	0	0	41	0	0	0	**155**
14	West Wirral & Wales	4	0	3	0	0	0	21	0	0	0	389	34	0	0	311	15	34	0	**812**
15	St Helens & Sth Lancs	0	0	0	0	0	0	0	77	227	0	0	0	45	343	0	0	0	0	**692**
16	North	0	0	0	0	0	0	0	7	15	0	0	0	1	14	0	0	0	0	**38**
17	East	0	0	0	0	0	0	0	69	53	0	0	0	0	10	0	0	0	0	**133**
18	The South	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	Total	**18**	**0**	**12**	**3**	**1**	**4**	**70**	**282**	**799**	**0**	**913**	**92**	**83**	**913**	**708**	**28**	**150**	**1**	**4077**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.15 - Comparison of Observed and Modelled Trips using the Silver Jubilee Bridge (total vehicles) – Inter Peak Hour

Table 9.15a Vehicles using Silver Jubilee Bridge as built from RSI Data – Inter Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	653	0	2	28	1	0	2	8	6	0	0	35	129	1	1	24	62	**950**
2	Runcorn	633	0	32	34	2	0	123	2	1	60	91	48	0	4	265	5	25	0	**1325**
3	West Warrington	0	38	0	0	0	0	0	0	0	1	0	0	5	11	0	0	0	7	**61**
4	Warrington	4	24	0	0	0	0	3	3	0	0	2	2	1	5	0	0	0	1	**44**
5	South Warrington	31	5	0	0	0	0	10	0	0	9	4	8	0	1	26	0	0	0	**94**
6	East Warrington	1	1	0	0	0	0	8	0	0	3	0	0	0	0	2	0	0	0	**15**
7	South Liverpool	0	147	0	2	10	4	0	0	9	3	2	0	21	99	0	0	31	88	**416**
8	Birkenhead	2	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**6**
9	East Wirral	8	1	0	0	0	0	17	0	0	0	2	2	0	0	6	0	0	0	**35**
10	South Widnes	6	61	1	0	16	2	1	0	0	0	0	0	11	20	0	3	11	12	**144**
11	Liverpool	0	78	0	2	4	0	1	0	1	0	0	0	4	53	0	0	11	42	**197**
12	South Knowsley	0	34	0	0	7	0	0	0	2	0	0	0	10	30	0	0	8	17	**108**
13	Ellesmere Port	29	0	1	3	0	0	25	0	0	3	9	14	0	0	60	2	2	0	**151**
14	West Wirral & Wales	108	4	10	6	2	0	90	0	0	21	27	34	0	0	204	7	4	3	**520**
15	St Helens & Sth Lancs	0	248	0	0	16	2	2	0	6	0	0	0	62	208	0	0	11	58	**613**
16	North	2	3	0	0	0	0	0	0	0	3	0	0	1	3	0	0	0	0	**12**
17	East	23	36	1	0	1	0	30	0	0	12	9	14	1	4	12	0	0	0	**144**
18	The South	58	0	9	1	0	0	79	0	0	10	36	24	0	4	48	0	0	0	**270**
	Total	**905**	**1336**	**56**	**54**	**85**	**9**	**388**	**7**	**28**	**129**	**184**	**146**	**150**	**571**	**624**	**18**	**127**	**290**	**5107**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.15b Vehicles using Silver Jubilee Bridge from a Select Link Analysis of the Assignment – Inter Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	618	0	0	15	0	0	0	6	0	0	0	37	250	0	0	33	48	**1008**
2	Runcorn	617	0	30	31	0	0	131	6	19	60	75	45	0	0	234	14	12	0	**1274**
3	West Warrington	0	42	0	0	0	0	0	0	0	0	0	0	4	7	0	0	0	0	**53**
4	Warrington	1	26	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	**28**
5	South Warrington	23	0	0	0	0	0	12	0	0	6	6	9	0	0	30	0	0	0	**86**
6	East Warrington	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
7	South Liverpool	0	189	0	5	10	0	0	0	0	0	0	0	19	92	0	0	23	77	**416**
8	Birkenhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
9	East Wirral	12	0	0	0	1	0	3	0	0	1	0	0	0	0	4	0	0	0	**22**
10	South Widnes	0	60	0	0	12	0	0	0	0	0	0	0	7	11	0	0	27	6	**123**
11	Liverpool	0	80	0	0	5	0	0	0	0	0	0	0	6	32	0	0	11	12	**146**
12	South Knowsley	0	42	0	0	7	0	0	0	0	0	0	0	15	34	0	0	9	5	**112**
13	Ellesmere Port	30	0	2	0	0	0	21	0	0	3	6	17	0	0	65	7	0	0	**151**
14	West Wirral & Wales	195	0	9	0	0	0	92	0	0	15	19	41	0	0	257	23	0	0	**651**
15	St Helens & Sth Lancs	0	292	0	0	33	0	0	0	0	0	0	0	49	188	0	0	0	29	**591**
16	North	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**
17	East	52	75	0	0	0	0	65	0	0	40	8	14	0	0	0	0	0	0	**253**
18	The South	31	0	0	0	0	0	70	0	0	7	7	4	0	0	12	0	0	0	**131**
	Total	**961**	**1436**	**42**	**37**	**83**	**0**	**395**	**6**	**27**	**131**	**121**	**129**	**137**	**613**	**602**	**44**	**115**	**176**	**5055**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.16 - Comparison of Observed and Modelled Trips travelling through Warrington (total vehicles) – Inter Peak Hour

Table 9.16a Vehicles travelling through Warrington as built from RSI Data – Inter Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	2	0	2	28	4	0	0	0	0	0	0	0	0	0	0	3	3	**42**
2	Runcorn	5	0	23	173	20	33	0	0	0	0	3	0	0	0	27	0	9	1	**295**
3	West Warrington	0	18	0	5	122	4	0	0	1	0	0	0	3	20	0	0	8	21	**201**
4	Warrington	3	163	4	0	1025	11	2	2	12	2	1	1	14	93	3	3	79	129	**1546**
5	South Warrington	16	9	138	1069	0	186	1	0	0	0	9	4	0	1	136	13	26	7	**1615**
6	East Warrington	3	31	2	12	222	0	0	0	2	0	0	0	0	6	0	0	5	9	**292**
7	South Liverpool	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	**8**
8	Birkenhead	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**4**
9	East Wirral	0	0	1	10	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**12**
10	South Widnes	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	2	1	**6**
11	Liverpool	0	2	0	1	9	0	0	0	0	0	0	0	0	1	0	0	0	1	**15**
12	South Knowsley	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**
13	Ellesmere Port	0	0	2	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**18**
14	West Wirral & Wales	0	0	30	88	3	14	0	0	0	0	2	0	0	0	7	0	6	0	**149**
15	St Helens & Sth Lancs	0	19	0	6	142	0	0	0	0	0	0	0	0	6	0	0	4	5	**183**
16	North	0	1	0	4	10	0	0	0	0	0	0	0	0	0	0	0	0	2	**17**
17	East	2	5	17	67	49	8	0	0	0	1	0	0	0	4	8	0	0	1	**161**
18	The South	5	1	21	127	12	16	0	0	0	1	2	0	0	0	8	4	2	0	**199**
	Total	**34**	**251**	**238**	**1593**	**1648**	**275**	**3**	**2**	**14**	**5**	**16**	**5**	**17**	**131**	**189**	**20**	**146**	**181**	**4767**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.16b Vehicles travelling through Warrington from a Select Link Analysis of the Assignment – Inter Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	0	0	10	25	0	0	0	0	0	0	0	0	0	0	0	55	21	**111**
2	Runcorn	0	0	27	178	0	16	0	0	0	0	0	0	0	0	16	4	26	0	**267**
3	West Warrington	0	18	0	15	84	0	0	0	0	0	0	0	1	25	0	0	30	31	**204**
4	Warrington	11	133	32	142	542	33	1	0	11	0	2	1	19	60	28	1	187	122	**1326**
5	South Warrington	25	0	27	688	7	116	0	0	0	1	10	3	0	0	143	9	21	0	**1051**
6	East Warrington	0	31	0	53	142	0	0	0	2	0	0	0	3	17	0	0	0	0	**248**
7	South Liverpool	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
8	Birkenhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
9	East Wirral	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**12**
10	South Widnes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
11	Liverpool	0	0	0	1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	**11**
12	South Knowsley	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**
13	Ellesmere Port	0	0	0	8	0	1	0	0	0	0	0	0	0	0	2	0	1	0	**12**
14	West Wirral & Wales	0	0	15	51	0	6	0	0	0	0	0	0	0	0	9	0	3	0	**84**
15	St Helens & Sth Lancs	0	15	0	31	211	0	0	0	0	0	0	0	1	26	0	0	7	6	**299**
16	North	0	20	0	4	8	0	0	0	0	0	0	0	12	35	0	0	0	30	**108**
17	East	22	45	13	99	29	0	0	0	2	0	15	5	0	1	24	0	0	0	**256**
18	The South	18	0	7	64	0	0	0	0	0	0	10	4	0	0	116	0	0	0	**219**
	Total	**76**	**263**	**123**	**1358**	**1060**	**173**	**1**	**0**	**15**	**1**	**38**	**13**	**37**	**165**	**338**	**15**	**330**	**210**	**4217**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.17 - Comparison of Observed and Modelled Trips using the Mersey Tunnels (total vehicles) – PM Peak Hour

Table 9.17a Vehicles using Mersey Tunnels as built from RSI Data – PM Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	0	0	0	0	0	0	0	9	0	0	0	0	7	0	0	0	0	**15**
2	Runcorn	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	**2**
3	West Warrington	0	0	0	0	0	0	0	0	22	0	0	0	0	13	0	0	0	0	**35**
4	Warrington	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	**6**
5	South Warrington	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
6	East Warrington	0	0	0	0	0	0	0	0	8	0	0	0	0	9	0	0	0	0	**17**
7	South Liverpool	0	0	0	0	0	0	0	2	64	0	0	0	9	75	0	0	0	6	**155**
8	Birkenhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52	0	0	0	**52**
9	East Wirral	17	5	11	6	0	4	40	0	3	0	517	143	0	0	500	53	56	3	**1357**
10	South Widnes	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	**3**
11	Liverpool	0	0	0	0	0	0	0	95	973	0	0	0	58	1182	0	0	8	46	**2362**
12	South Knowsley	0	0	0	0	0	0	0	9	94	0	0	0	0	74	0	0	0	0	**177**
13	Ellesmere Port	0	0	0	0	0	0	0	0	0	0	17	0	0	0	66	0	2	0	**85**
14	West Wirral & Wales	3	0	0	0	0	0	38	1	0	0	503	72	0	23	435	18	8	0	**1100**
15	St Helens & Sth Lancs	0	0	0	0	0	0	0	75	613	0	0	0	59	757	0	0	0	5	**1509**
16	North	0	0	0	0	0	0	0	16	36	0	0	0	0	51	0	0	0	0	**102**
17	East	0	0	0	0	0	0	0	14	89	0	0	0	0	56	0	0	0	0	**160**
18	The South	0	0	0	0	0	0	0	0	0	0	8	0	0	2	10	0	0	0	**20**
	Total	**20**	**5**	**11**	**6**	**0**	**4**	**78**	**212**	**1922**	**0**	**1044**	**216**	**126**	**2249**	**1062**	**71**	**74**	**61**	**7159**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.17b Vehicles using Mersey Tunnels from a Select Link Analysis of the Assignment – PM Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	0	0	0	0	0	0	2	12	0	0	0	0	11	0	0	0	0	**25**
2	Runcorn	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**1**
3	West Warrington	0	0	0	0	0	0	0	2	25	0	0	0	0	4	0	0	0	0	**31**
4	Warrington	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	**5**
5	South Warrington	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
6	East Warrington	0	0	0	0	0	0	0	2	9	0	0	0	0	0	0	0	0	0	**11**
7	South Liverpool	0	0	0	0	0	0	0	7	69	0	0	0	0	74	0	0	0	0	**150**
8	Birkenhead	11	0	4	1	0	1	15	0	0	0	10	11	0	0	75	2	37	0	**165**
9	East Wirral	19	0	8	4	0	15	40	0	0	3	512	142	0	0	511	24	60	0	**1339**
10	South Widnes	0	0	0	0	0	0	0	0	3	0	0	0	0	2	0	0	0	0	**5**
11	Liverpool	0	0	0	0	0	0	0	120	913	0	0	0	69	1144	0	0	0	0	**2247**
12	South Knowsley	0	0	0	0	0	0	0	15	88	0	0	0	6	65	0	0	0	0	**175**
13	Ellesmere Port	0	0	0	0	0	0	0	0	0	0	160	5	0	0	110	5	0	0	**280**
14	West Wirral & Wales	6	0	2	0	0	1	29	0	0	0	550	74	0	0	480	20	25	0	**1187**
15	St Helens & Sth Lancs	0	0	0	0	0	0	0	109	511	0	0	0	69	773	0	0	0	0	**1462**
16	North	0	0	0	0	0	0	0	15	50	0	0	0	1	42	0	0	0	0	**108**
17	East	0	0	0	0	0	0	0	48	77	0	0	0	0	48	0	0	0	0	**173**
18	The South	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	Total	**36**	**0**	**14**	**5**	**0**	**17**	**84**	**322**	**1762**	**3**	**1232**	**233**	**146**	**2163**	**1175**	**51**	**122**	**0**	**7365**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.18 - Comparison of Observed and Modelled Trips using the Silver Jubilee Bridge (total vehicles) – PM Peak Hour

Table 9.18a Vehicles using Silver Jubilee Bridge as built from RSI Data – PM Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	665	0	1	37	1	0	1	9	1	0	0	30	157	1	1	32	94	**1030**
2	Runcorn	709	0	88	35	0	5	122	0	0	27	108	113	0	0	500	0	4	0	**1710**
3	West Warrington	0	41	0	0	0	0	0	0	0	0	0	0	20	26	0	0	1	3	**91**
4	Warrington	5	51	5	0	0	0	5	0	0	0	6	0	3	15	8	0	0	2	**99**
5	South Warrington	55	2	4	0	0	0	8	0	0	23	14	23	0	2	83	0	0	0	**215**
6	East Warrington	0	3	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	**7**
7	South Liverpool	0	173	0	5	18	3	0	0	11	2	0	0	20	185	2	4	56	160	**639**
8	Birkenhead	0	0	0	1	0	0	0	0	0	0	0	0	0	0	3	0	0	0	**4**
9	East Wirral	5	1	0	0	0	0	5	0	0	4	0	0	0	0	10	0	0	0	**25**
10	South Widnes	0	79	0	0	20	1	4	0	1	0	0	0	17	38	4	0	11	21	**196**
11	Liverpool	0	150	0	2	23	4	1	0	1	0	0	0	12	87	0	0	15	64	**357**
12	South Knowsley	0	42	0	0	10	0	0	0	0	0	0	0	7	22	0	0	8	23	**112**
13	Ellesmere Port	31	0	8	0	0	0	36	0	0	9	11	28	0	0	164	0	0	0	**286**
14	West Wirral & Wales	153	0	15	9	0	0	92	0	0	9	80	69	0	1	259	0	0	2	**690**
15	St Helens & Sth Lancs	6	340	0	0	35	1	0	0	5	0	0	0	55	249	0	0	11	103	**805**
16	North	0	12	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	**17**
17	East	33	21	0	0	2	0	39	0	0	0	16	19	1	1	58	0	0	0	**188**
18	The South	62	0	4	4	0	0	98	0	0	5	25	28	0	0	98	0	0	0	**324**
	Total	**1058**	**1579**	**125**	**58**	**146**	**15**	**410**	**1**	**26**	**79**	**260**	**279**	**166**	**790**	**1190**	**5**	**139**	**471**	**6796**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.18b Vehicles using Silver Jubilee Bridge from a Select Link Analysis of the Assignment – PM Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	608	0	2	28	0	0	0	10	0	0	0	36	230	0	0	51	73	**1040**
2	Runcorn	647	0	63	20	0	0	148	1	0	27	80	82	0	0	404	27	79	0	**1578**
3	West Warrington	0	50	0	0	0	0	0	0	0	0	0	0	6	10	0	0	0	0	**67**
4	Warrington	0	19	0	0	0	0	9	0	0	0	1	1	0	0	0	0	0	0	**29**
5	South Warrington	39	0	0	0	0	0	8	0	0	13	14	19	0	0	55	0	0	0	**149**
6	East Warrington	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
7	South Liverpool	0	196	0	2	16	0	0	0	1	0	0	0	24	212	0	0	77	197	**724**
8	Birkenhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
9	East Wirral	13	0	1	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	**18**
10	South Widnes	0	74	0	0	11	0	0	0	0	0	0	0	12	23	0	0	5	14	**140**
11	Liverpool	0	133	0	0	17	0	0	0	0	0	0	0	9	74	0	0	13	43	**289**
12	South Knowsley	0	47	0	0	9	0	0	0	0	0	0	0	22	57	0	0	10	7	**152**
13	Ellesmere Port	39	0	5	0	0	0	33	0	0	6	8	30	0	0	114	13	0	0	**248**
14	West Wirral & Wales	190	0	21	0	0	0	171	0	0	7	52	87	0	0	356	49	0	0	**932**
15	St Helens & Sth Lancs	0	361	0	0	48	0	0	0	0	0	0	0	44	243	0	0	0	56	**752**
16	North	0	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**27**
17	East	72	113	0	0	0	0	142	0	0	14	50	55	0	0	0	0	0	0	**446**
18	The South	42	0	0	0	0	0	138	0	0	3	21	17	0	0	33	0	0	0	**254**
	Total	**1043**	**1629**	**89**	**24**	**128**	**0**	**649**	**1**	**13**	**71**	**225**	**293**	**152**	**849**	**964**	**89**	**234**	**392**	**6844**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.19 - Comparison of Observed and Modelled Trips travelling through Warrington (total vehicles) – PM Peak Hour

Table 9.19a Vehicles travelling through Warrington as built from RSI Data – PM Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	2	0	8	34	3	0	0	0	0	0	0	0	0	2	0	3	8	**59**
2	Runcorn	0	0	88	186	10	60	0	0	0	0	2	0	0	0	34	0	5	0	**384**
3	West Warrington	0	34	0	7	155	6	0	0	2	0	0	0	1	25	0	0	13	25	**269**
4	Warrington	4	239	2	0	1066	14	0	0	28	1	3	2	31	233	4	1	127	201	**1957**
5	South Warrington	48	25	230	774	0	351	5	0	0	0	7	14	1	2	270	14	49	4	**1794**
6	East Warrington	9	36	11	17	390	0	0	0	3	0	0	0	0	11	0	0	4	16	**497**
7	South Liverpool	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**
8	Birkenhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
9	East Wirral	0	0	7	8	3	11	0	0	0	0	0	0	0	0	0	0	0	0	**30**
10	South Widnes	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	**2**
11	Liverpool	0	1	0	1	18	0	0	0	0	0	0	0	0	0	0	0	0	1	**22**
12	South Knowsley	0	0	0	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	**16**
13	Ellesmere Port	0	0	8	12	8	0	0	0	0	0	0	0	0	0	0	0	0	0	**28**
14	West Wirral & Wales	0	0	44	108	5	22	0	0	0	0	0	0	0	0	26	0	13	0	**219**
15	St Helens & Sth Lancs	6	19	0	0	137	0	0	0	2	0	0	0	0	15	0	0	2	3	**184**
16	North	0	5	0	0	21	0	0	0	0	0	0	0	0	0	0	0	4	3	**33**
17	East	0	26	9	93	123	13	0	0	0	0	0	0	0	1	12	0	0	1	**279**
18	The South	3	0	35	170	17	12	0	0	0	0	0	0	0	0	14	0	0	0	**250**
	Total	**69**	**388**	**433**	**1393**	**2006**	**493**	**5**	**0**	**36**	**1**	**12**	**16**	**33**	**288**	**362**	**16**	**220**	**264**	**6033**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.19b Vehicles travelling through Warrington from a Select Link Analysis of the Assignment – PM Peak

Sector	Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	Widnes	0	0	0	4	34	0	0	0	0	0	0	0	0	0	0	0	30	18	**86**
2	Runcorn	3	0	57	181	0	59	0	0	0	0	0	0	0	0	28	10	76	0	**414**
3	West Warrington	0	32	0	16	67	0	0	0	0	0	0	0	11	37	0	0	55	72	**291**
4	Warrington	17	191	80	238	589	32	3	4	16	0	5	2	31	143	49	2	230	169	**1799**
5	South Warrington	30	1	44	494	11	165	6	0	0	0	10	11	0	0	298	16	66	0	**1151**
6	East Warrington	0	49	0	17	266	0	0	0	6	0	0	0	2	91	0	0	0	1	**432**
7	South Liverpool	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
8	Birkenhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
9	East Wirral	0	0	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**7**
10	South Widnes	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
11	Liverpool	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	**17**
12	South Knowsley	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	**9**
13	Ellesmere Port	0	0	2	12	0	7	0	0	0	0	0	0	0	0	5	0	0	0	**25**
14	West Wirral & Wales	0	0	21	84	0	14	0	0	0	0	0	0	0	0	11	0	2	0	**133**
15	St Helens & Sth Lancs	0	18	0	47	299	0	0	0	0	0	0	0	4	28	0	0	3	5	**403**
16	North	0	9	0	0	20	0	0	0	0	0	0	0	8	27	0	0	0	1	**65**
17	East	44	68	54	283	103	0	0	0	3	0	0	5	4	35	18	0	0	0	**617**
18	The South	32	0	10	105	0	0	0	0	0	0	0	1	0	0	32	0	0	0	**180**
	Total	**126**	**367**	**268**	**1488**	**1417**	**276**	**9**	**4**	**26**	**0**	**14**	**19**	**59**	**361**	**440**	**28**	**464**	**266**	**5632**

Note : - cells shaded in grey show movements whose value in the RSI build is greater than 50 and whose value in the select link analysis is not within 10% of its RSI value

Table 9.20 - Comparison of Traffic Counts and Assigned Flows by Validation Screenline (partially validated matrix) – AM Peak Hour

		Car Flow						LGV						OGV (vehicles)						Total (vehicles)						
Description	DIR	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	% flows within 5 GEH
40 River Mersey	nb	15724	15568	-156	-1	1.2	✓	1464	1312	-153	-10	4.1	×	1343	1361	18	1	0.5	✓	18532	18240	-291	-2	2.1	✓	75%
40 River Mersey	sb	11539	11329	-210	-2	2.0	✓	1520	1503	-17	-1	0.4	✓	1378	1377	-1	0	0.0	✓	14436	14208	-229	-2	1.9	✓	75%
Two-Way		**27263**	**26896**	**-367**	**-1**	**2.2**	✓	**2984**	**2814**	**-170**	**-6**	**3.2**	✓	**2721**	**2737**	**17**	**1**	**0.3**	✓	**32968**	**32448**	**-520**	**-2**	**2.9**	✓	**75%**
41 Widnes N-S	eb	3286	3599	313	10	5.3	×	465	388	-77	-17	3.7	✓	238	241	3	1	0.2	✓	3988	4227	239	6	3.7	✓	38%
41 Widnes N-S	wb	3554	4081	527	15	8.5	×	436	410	-25	-6	1.2	✓	268	259	-9	-3	0.5	✓	4257	4750	493	12	7.3	×	63%
Two-Way		**6840**	**7680**	**840**	**12**	**9.9**	**×**	**900**	**798**	**-102**	**-11**	**3.5**	✓	**506**	**500**	**-6**	**-1**	**0.3**	✓	**8245**	**8978**	**732**	**9**	**7.9**	**×**	**50%**
42 Widnes E-W	nb	2392	2609	216	9	4.3	×	361	310	-51	-14	2.8	✓	131	127	-4	-3	0.3	✓	2884	3046	162	6	3.0	✓	75%
42 Widnes E-W	sb	4067	3991	-75	-2	1.2	✓	493	360	-133	-27	6.4	×	167	91	-76	-45	6.6	×	4727	4443	-284	-6	4.2	×	50%
Two-Way		**6459**	**6600**	**141**	**2**	**1.7**	✓	**854**	**670**	**-184**	**-22**	**6.7**	**×**	**298**	**219**	**-79**	**-27**	**4.9**	**×**	**7611**	**7489**	**-122**	**-2**	**1.4**	✓	**63%**
43 Runcorn N-S	eb	4391	4203	-189	-4	2.9	✓	558	535	-23	-4	1.0	✓	343	290	-53	-15	3.0	✓	5293	5028	-264	-5	3.7	✓	50%
43 Runcorn N-S	wb	4766	4259	-507	-11	7.5	×	485	515	31	6	1.4	✓	284	232	-51	-18	3.2	✓	5535	5007	-528	-10	7.3	×	50%
Two-Way		**9158**	**8462**	**-696**	**-8**	**7.4**	**×**	**1043**	**1051**	**8**	**1**	**0.2**	✓	**627**	**523**	**-104**	**-17**	**4.4**	**×**	**10827**	**10035**	**-792**	**-7**	**7.8**	**×**	**50%**
44 Runcorn E-W	sb	6282	5329	-953	-15	12.5	×	634	597	-37	-6	1.5	✓	412	351	-61	-15	3.1	✓	7328	6278	-1050	-14	12.7	×	54%
44 Runcorn E-W	sb	6417	5224	-1193	-19	15.6	×	671	699	28	4	1.1	✓	407	372	-35	-9	1.8	✓	7495	6295	-1200	-16	14.4	×	46%
Two-Way		**12700**	**10554**	**-2146**	**-17**	**19.9**	**×**	**1304**	**1296**	**-8**	**-1**	**0.2**	✓	**819**	**723**	**-96**	**-12**	**3.4**	✓	**14823**	**12573**	**-2250**	**-15**	**19.2**	**×**	**50%**
TWO-WAY TOTAL		**62419**	**60192**	**-2227**	**-4**	**9.0**	**×**	**7086**	**6629**	**-457**	**-6**	**5.5**	**×**	**4970**	**4702**	**-268**	**-5**	**3.9**	✓	**74474**	**71523**	**-2952**	**-4**	**10.9**	**×**	**57%**

Note: - Cells shown in grey within the table have a GEH value of greater than 5.0 for total vehicles which are used for comparison against DMRB criteria.

Table 9.21 - Comparison of Traffic Counts and Assigned Flows by Validation Screenline (partially validated matrix) – Inter Peak Hour

		Car Flow						LGV						OGV (vehicles)						Total (vehicles)						
Description	DIR	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	% flows within 5 GEH
40 River Mersey	nb	9160	8473	-687	-8	7.3	×	1509	1501	-9	-1	0.2	✓	1735	1786	51	3	1.2	✓	12405	11760	-645	-5	5.9	×	63%
40 River Mersey	sb	9053	8736	-317	-3	3.4	✓	1463	1478	15	1	0.4	✓	1589	1608	19	1	0.5	✓	12104	11822	-282	-2	2.6	✓	63%
Two-Way		**18213**	**17209**	**-1004**	**-6**	**7.5**	**×**	**2972**	**2979**	**7**	**0**	**0.1**	**✓**	**3324**	**3394**	**70**	**2**	**1.2**	**✓**	**24509**	**23582**	**-927**	**-4**	**6.0**	**×**	**63%**
41 Widnes N-S	eb	2540	2579	39	2	0.8	✓	357	318	-39	-11	2.1	✓	241	282	41	17	2.5	✓	3139	3179	41	1	0.7	✓	14%
41 Widnes N-S	wb	2532	2752	220	9	4.3	×	372	350	-22	-6	1.2	✓	298	284	-14	-5	0.8	✓	3201	3386	184	6	3.2	✓	57%
Two-Way		**5072**	**5331**	**259**	**5**	**3.6**	**✓**	**729**	**668**	**-61**	**-8**	**2.3**	**✓**	**539**	**566**	**27**	**5**	**1.2**	**✓**	**6340**	**6565**	**225**	**4**	**2.8**	**✓**	**36%**
42 Widnes E-W	nb	2179	2439	260	12	5.4	×	335	285	-50	-15	2.8	✓	188	160	-28	-15	2.1	✓	2702	2884	182	7	3.4	✓	38%
42 Widnes E-W	sb	2172	2248	75	3	1.6	✓	320	261	-59	-18	3.4	✓	202	164	-38	-19	2.8	✓	2694	2672	-22	-1	0.4	✓	63%
Two-Way		**4351**	**4686**	**335**	**8**	**5.0**	**×**	**655**	**546**	**-109**	**-17**	**4.4**	**×**	**390**	**324**	**-66**	**-17**	**3.5**	**✓**	**5396**	**5557**	**161**	**3**	**2.2**	**✓**	**50%**
43 Runcorn N-S	eb	2934	2499	-435	-15	8.3	×	423	444	21	5	1.0	✓	338	307	-30	-9	1.7	✓	3694	3250	-444	-12	7.5	×	63%
43 Runcorn N-S	wb	2789	2489	-300	-11	5.8	×	438	450	12	3	0.6	✓	370	299	-72	-19	3.9	✓	3597	3237	-360	-10	6.2	×	75%
Two-Way		**5723**	**4987**	**-735**	**-13**	**10.0**	**×**	**861**	**893**	**33**	**4**	**1.1**	**✓**	**708**	**606**	**-102**	**-14**	**4.0**	**✓**	**7291**	**6487**	**-805**	**-11**	**9.7**	**×**	**69%**
44 Runcorn E-W	sb	4154	3039	-1115	-27	18.6	×	534	499	-35	-7	1.5	✓	411	347	-64	-16	3.3	✓	5099	3885	-1214	-24	18.1	×	62%
44 Runcorn E-W	sb	4180	3206	-974	-23	16.0	×	578	572	-6	-1	0.3	✓	407	350	-57	-14	2.9	✓	5165	4128	-1038	-20	15.2	×	46%
Two-Way		**8334**	**6245**	**-2089**	**-25**	**24.5**	**×**	**1112**	**1071**	**-41**	**-4**	**1.2**	**✓**	**818**	**697**	**-121**	**-15**	**4.4**	**×**	**10264**	**8013**	**-2251**	**-22**	**23.5**	**×**	**54%**
TWO-WAY TOTAL		**41693**	**38459**	**-3234**	**-8**	**16.2**	**×**	**6328**	**6157**	**-171**	**-3**	**2.2**	**✓**	**5779**	**5587**	**-192**	**-3**	**2.5**	**✓**	**53800**	**50203**	**-3597**	**-7**	**15.8**	**×**	**55%**

Note: - Cells shown in grey within the table have a GEH value of greater than 5.0 for total vehicles which are used for comparison against DMRB criteria.

Table 9.22 - Comparison of Traffic Counts and Assigned Flows by Validation Screenline (partially validated matrix) – PM Peak Hour

		Car Flow						LGV						OGV (vehicles)						Total (vehicles)						
Description	DIR	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	Count	Model	Abs Diff	% Diff	GEH	DMRB	% flows within 5 GEH
40 River Mersey	nb	12751	13127	376	3	3.3	✓	1862	1653	-209	-11	5.0	×	1375	1364	-11	-1	0.3	✓	15988	16144	156	1	1.2	✓	88%
40 River Mersey	sb	13934	14089	156	1	1.3	✓	1969	1759	-209	-11	4.9	×	1185	1121	-64	-5	1.9	✓	17087	16970	-118	-1	0.9	✓	63%
Two-Way		**26685**	**27216**	**532**	**2**	**3.2**	✓	**3831**	**3412**	**-419**	**-11**	**7.0**	×	**2560**	**2485**	**-75**	**-3**	**1.5**	✓	**33076**	**33113**	**38**	**0**	**0.2**	✓	**75%**
41 Widnes N-S	eb	3886	3926	40	1	0.6	✓	586	558	-28	-5	1.2	✓	273	242	-31	-11	1.9	✓	4745	4726	-19	0	0.3	✓	50%
41 Widnes N-S	wb	3687	3809	122	3	2.0	✓	558	570	12	2	0.5	✓	211	233	22	10	1.5	✓	4456	4612	156	4	2.3	✓	63%
Two-Way		**7573**	**7735**	**162**	**2**	**1.8**	✓	**1144**	**1128**	**-16**	**-1**	**0.5**	✓	**484**	**475**	**-9**	**-2**	**0.4**	✓	**9201**	**9338**	**137**	**1**	**1.4**	✓	**56%**
42 Widnes E-W	nb	3380	4014	634	19	10.4	×	390	398	7	2	0.4	✓	127	95	-32	-25	3.0	✓	3897	4506	609	16	9.4	×	63%
42 Widnes E-W	sb	2727	2651	-77	-3	1.5	✓	366	320	-46	-13	2.5	✓	120	94	-26	-21	2.5	✓	3213	3065	-148	-5	2.6	✓	75%
Two-Way		**6107**	**6664**	**557**	**9**	**7.0**	×	**756**	**717**	**-39**	**-5**	**1.4**	✓	**247**	**189**	**-58**	**-23**	**3.9**	✓	**7110**	**7571**	**461**	**6**	**5.4**	×	**69%**
43 Runcorn N-S	eb	4089	3856	-233	-6	3.7	✓	513	513	0	0	0.0	✓	244	199	-45	-19	3.1	✓	4846	4567	-279	-6	4.1	×	38%
43 Runcorn N-S	wb	4420	4344	-76	-2	1.2	✓	633	570	-64	-10	2.6	✓	229	214	-15	-7	1.0	✓	5283	5127	-156	-3	2.2	✓	25%
Two-Way		**8509**	**8199**	**-310**	**-4**	**3.4**	✓	**1146**	**1083**	**-64**	**-6**	**1.9**	✓	**474**	**413**	**-61**	**-13**	**2.9**	✓	**10129**	**9695**	**-434**	**-4**	**4.4**	×	**31%**
44 Runcorn E-W	sb	6147	5388	-759	-12	10.0	×	698	619	-79	-11	3.1	✓	268	244	-24	-9	1.5	✓	7113	6252	-862	-12	10.5	×	69%
44 Runcorn E-W	sb	6018	5254	-764	-13	10.2	×	691	722	31	4	1.2	✓	259	245	-14	-5	0.9	✓	6968	6221	-747	-11	9.2	×	46%
Two-Way		**12165**	**10642**	**-1523**	**-13**	**14.3**	×	**1389**	**1341**	**-48**	**-3**	**1.3**	✓	**527**	**489**	**-38**	**-7**	**1.7**	✓	**14081**	**12472**	**-1609**	**-11**	**14.0**	×	**58%**
TWO-WAY TOTAL		**61039**	**60457**	**-582**	**-1**	**2.4**	✓	**8266**	**7681**	**-585**	**-7**	**6.6**	×	**4292**	**4052**	**-240**	**-6**	**3.7**	✓	**73597**	**72190**	**-1407**	**-2**	**5.2**	×	**58%**

Note: - Cells shown in grey within the table have a GEH value of greater than 5.0 for total vehicles which are used for comparison against DMRB criteria.

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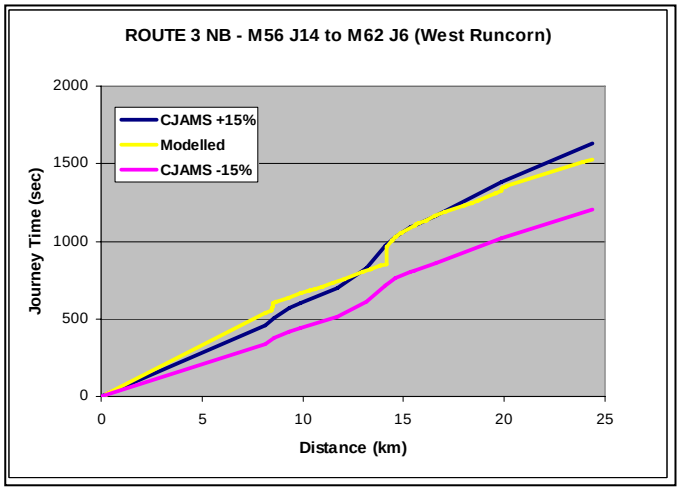
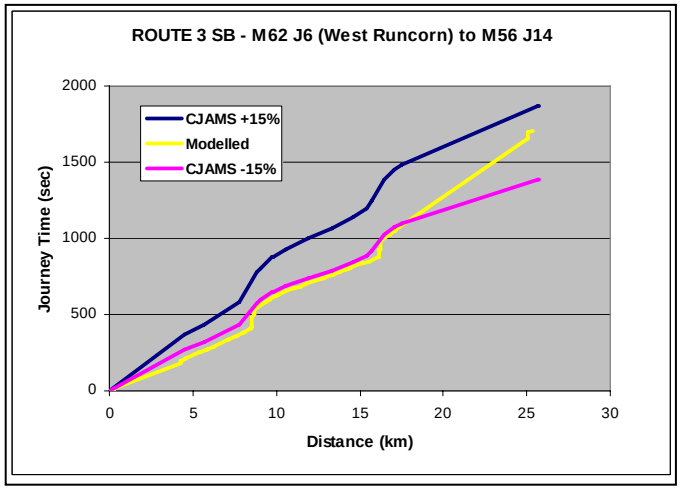
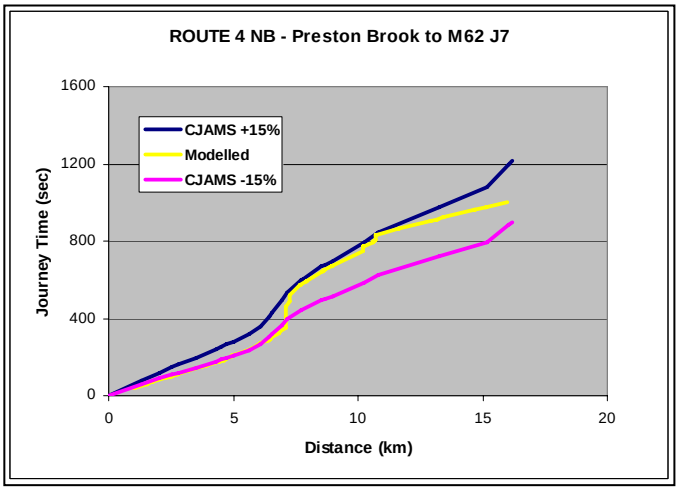
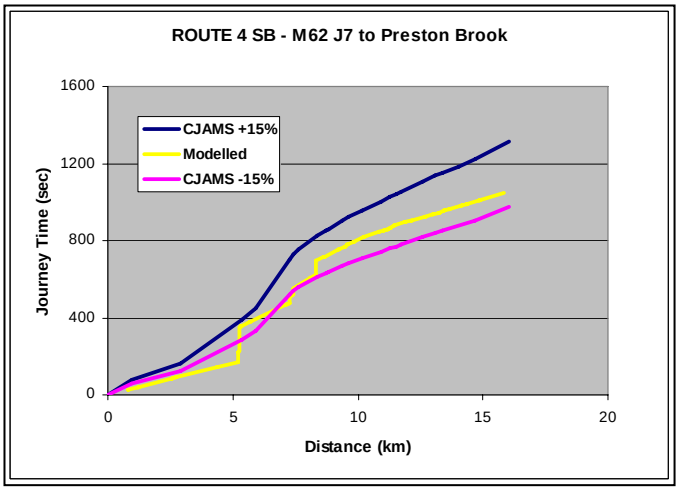
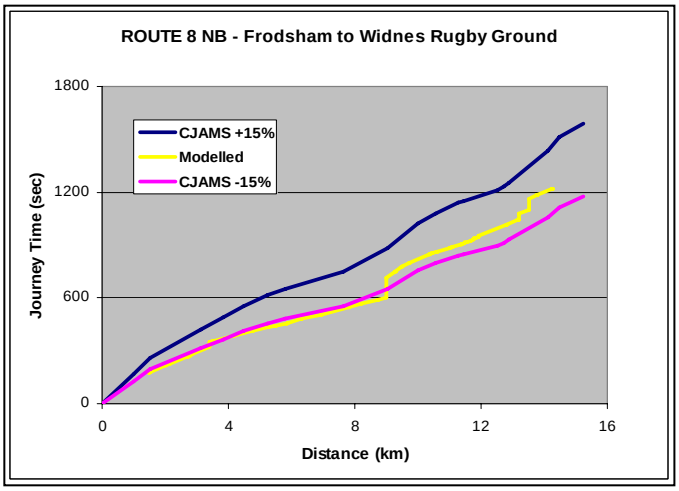
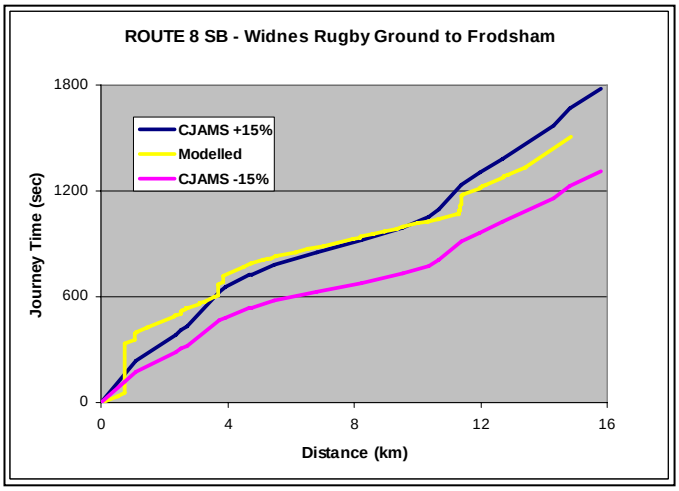




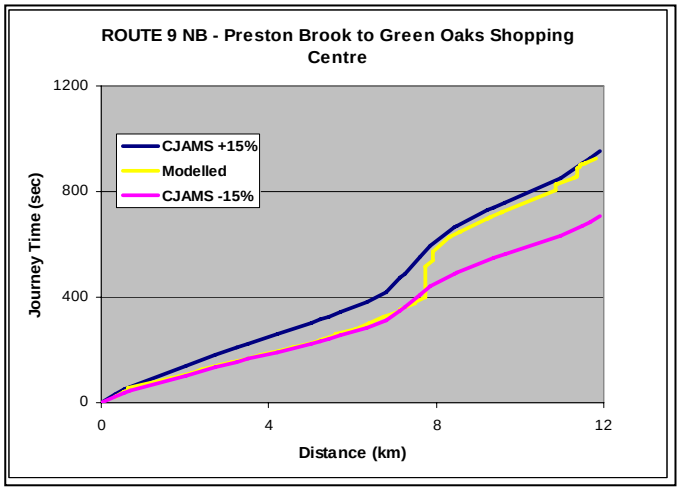


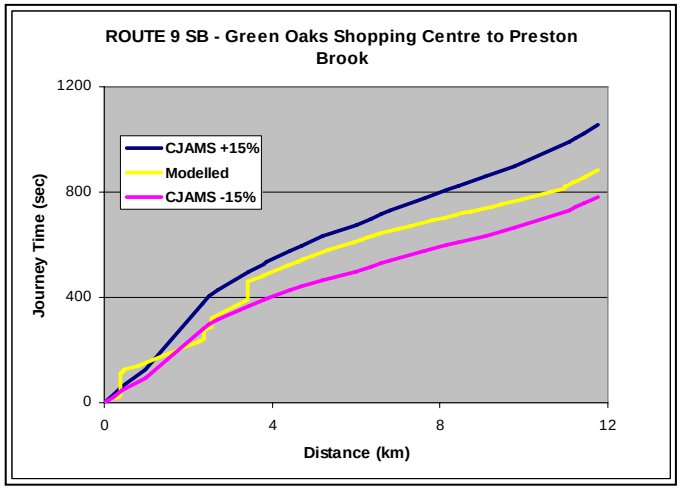


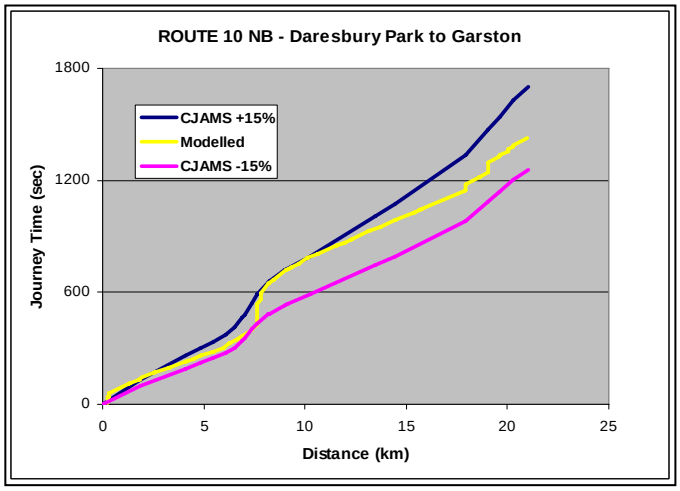


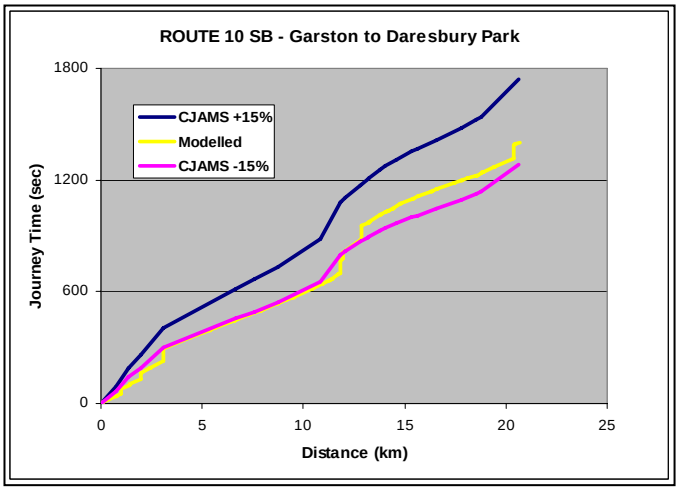


HALTON BOROUGH COUNCIL Mott MacDonald		Design JEH	CAD	Checked HF	Approved
		Drawing Number		Date 16/12/08	
		Project Mersey Gateway	File		
Mersey Gateway Study		**Figure 9.1 Comparison of Journey Times across SJB – AM Peak Hour (Sheet 1 of 2)**			

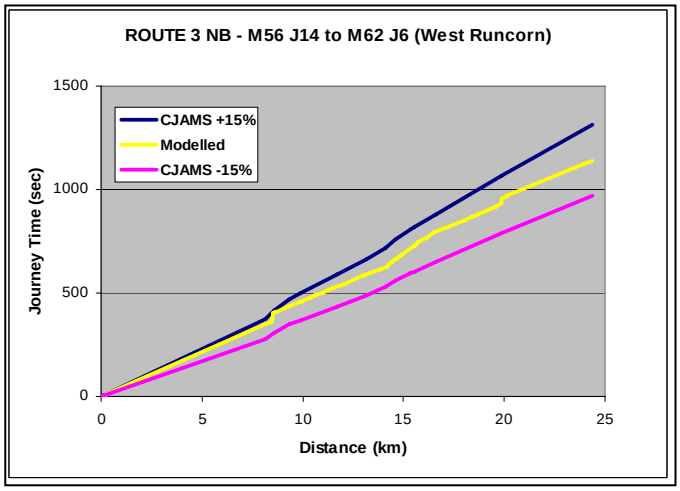


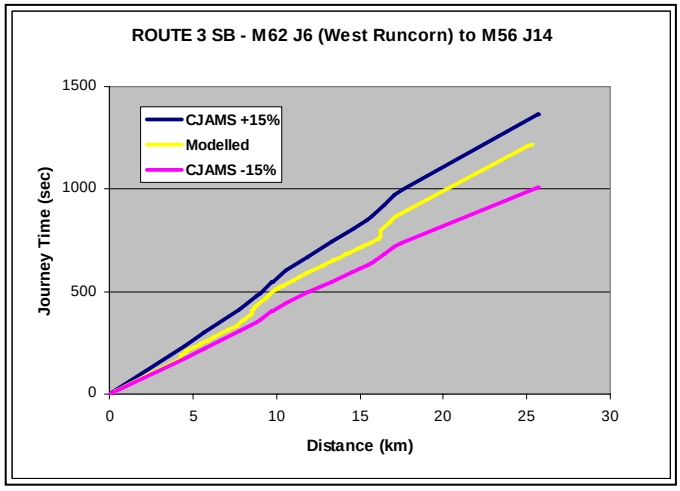


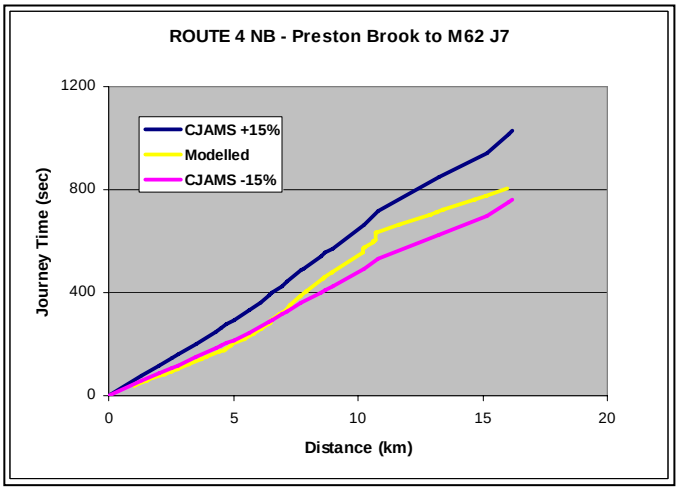


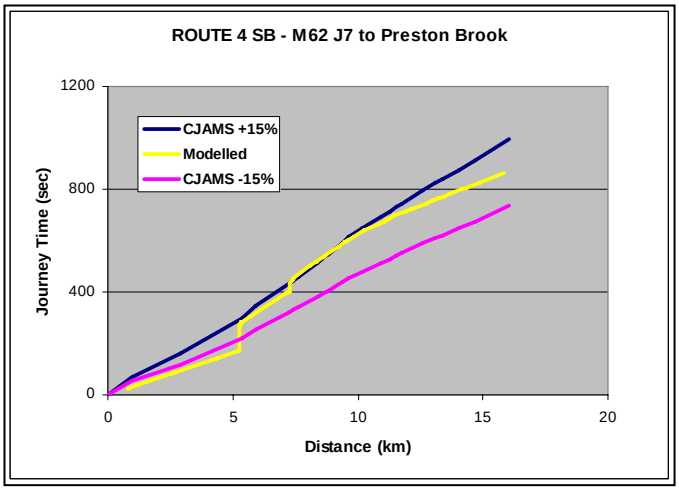


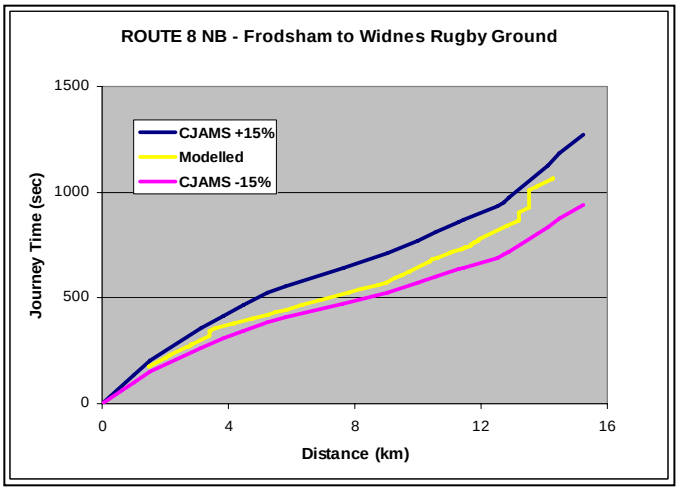
HALTON BOROUGH COUNCIL Mott MacDonald		Design JEH	CAD	Checked HF	Approved
		Drawing Number		Date 16/12/08	
		Project Mersey Gateway	File		
Mersey Gateway Study		**Figure 9.1 Comparison of Journey Times across SJB – AM Peak Hour (Sheet 2 of 2)**			

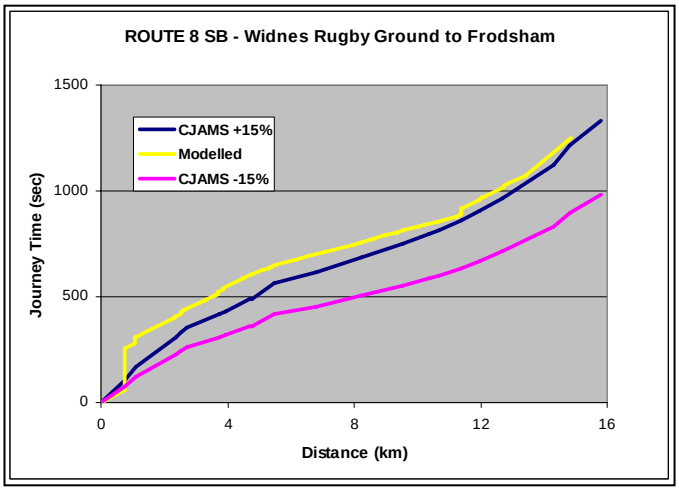




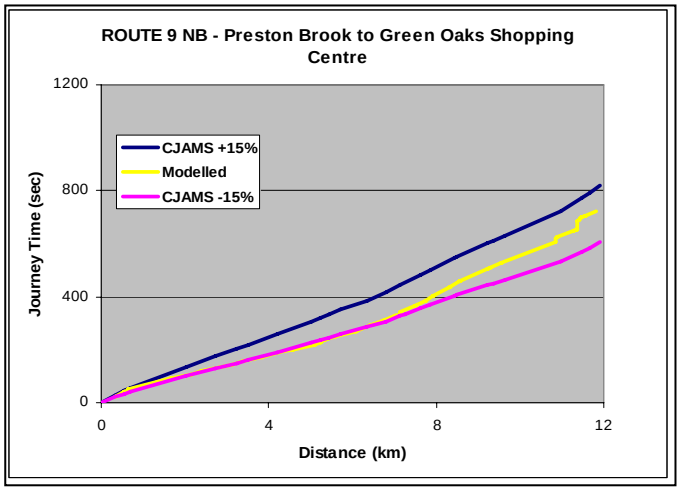


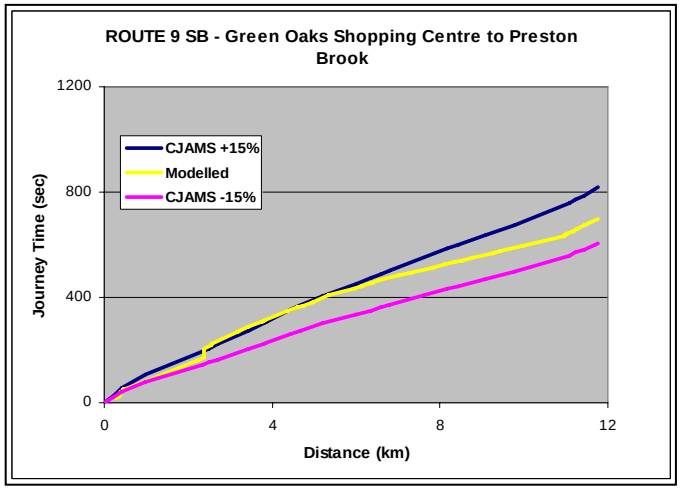


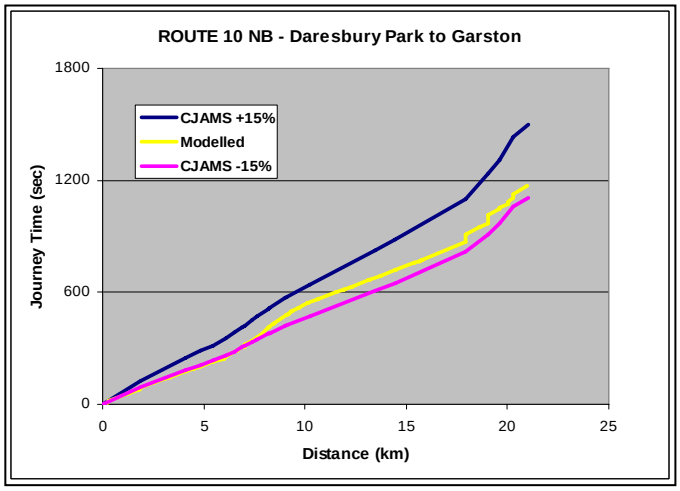


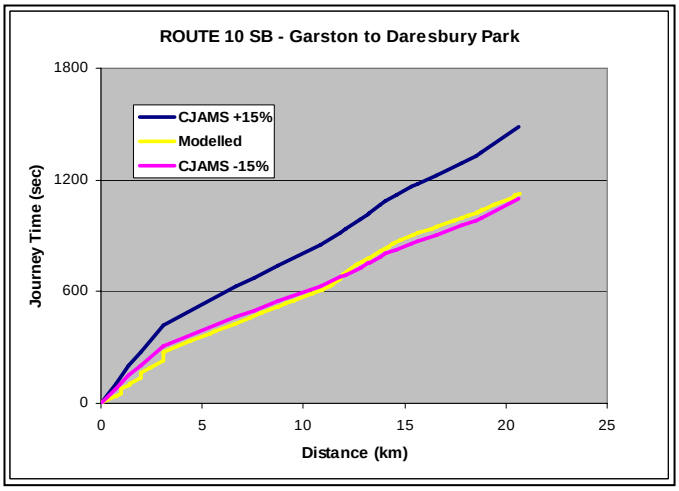


HALTON BOROUGH COUNCIL Mott MacDonald		Design JEH	CAD	Checked HF	Approved
		Drawing Number		Date 16/12/08	
		Project Mersey Gateway	File		
Mersey Gateway Study		**Figure 9.2 Comparison of Journey Times across SJB – Inter Peak Hour (Sheet 1 of 2**			

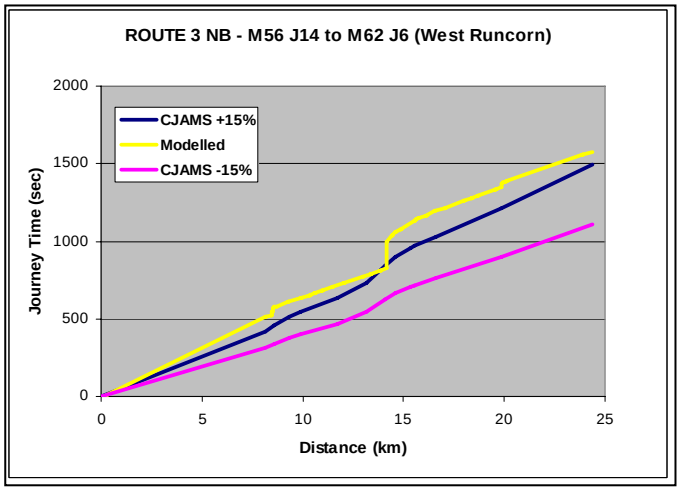


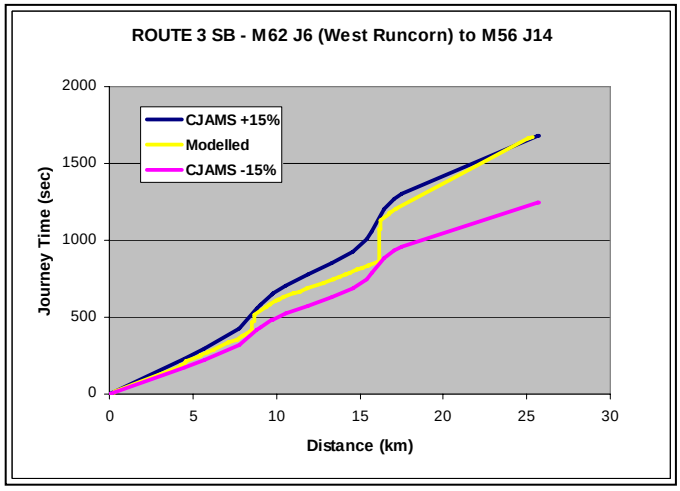


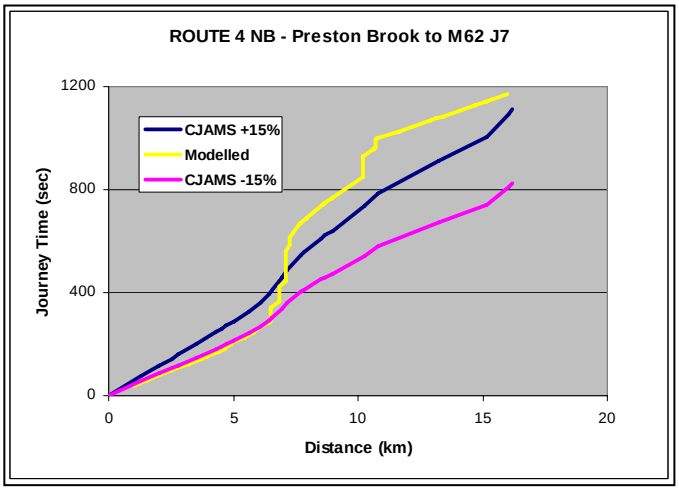


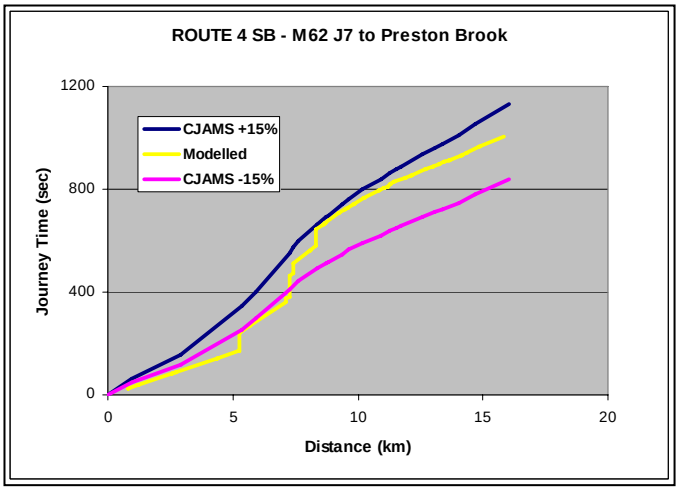


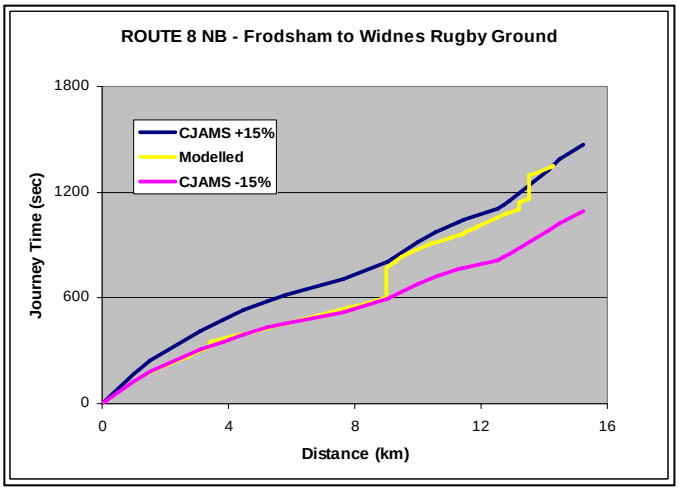
HALTON BOROUGH COUNCIL Mott MacDonald		Design JEH	CAD	Checked HF	Approved
		Drawing Number		Date 16/12/08	
		Project Mersey Gateway	File		
Mersey Gateway Study		**Figure 9.2 Comparison of Journey Times across SJB – Inter Peak Hour (Sheet 2 of 2**			

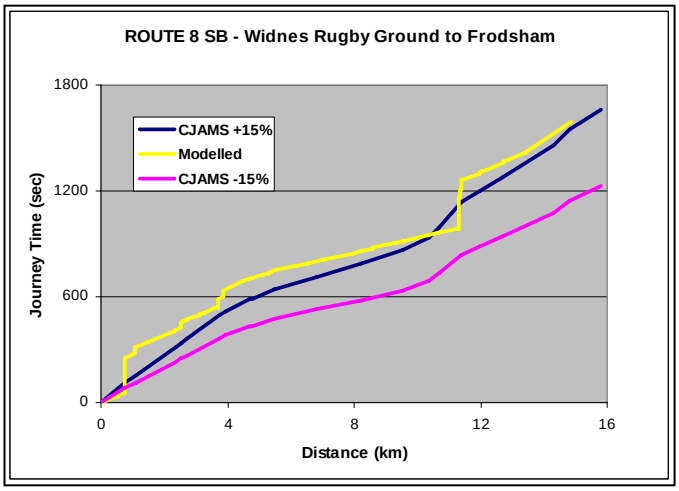












HALTON BOROUGH COUNCIL Mott MacDonald				
		Design JEH	CAD	Checked HF	Approved
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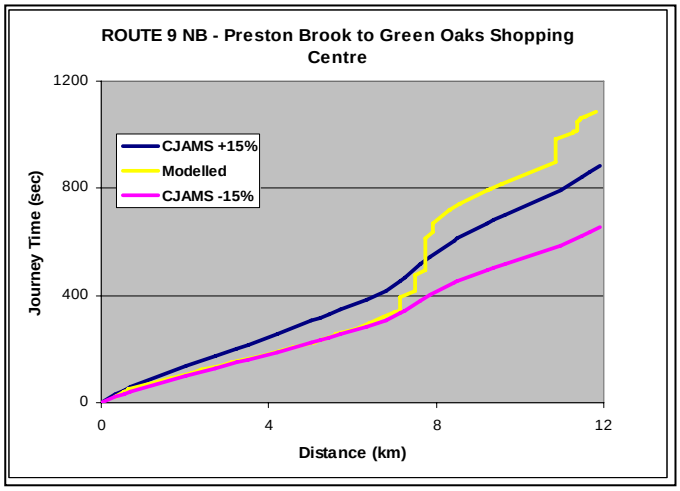
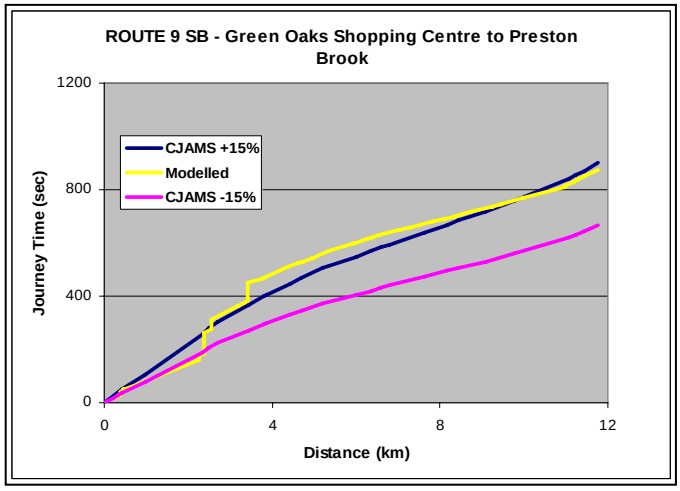
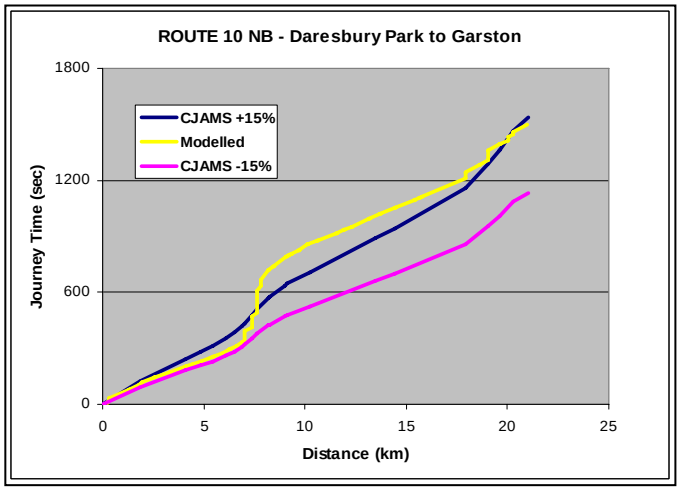
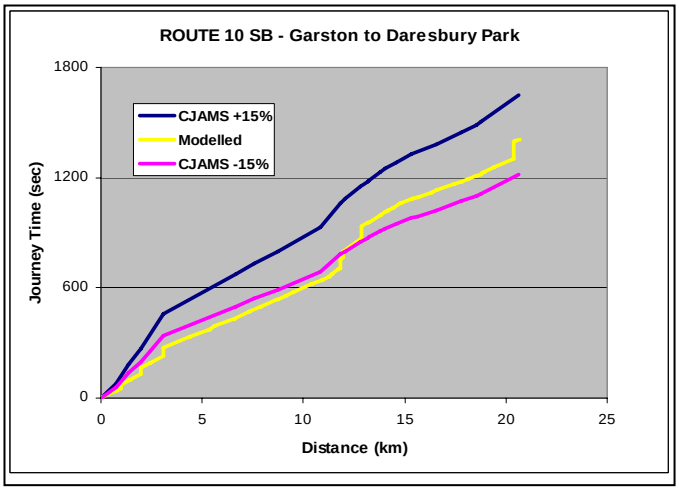
		Project Mersey Gateway	File		
Mersey Gateway Study		**Figure 9.3 Comparison of Journey Times across SJB – PM Peak Hour (Sheet 1 of 2)**			









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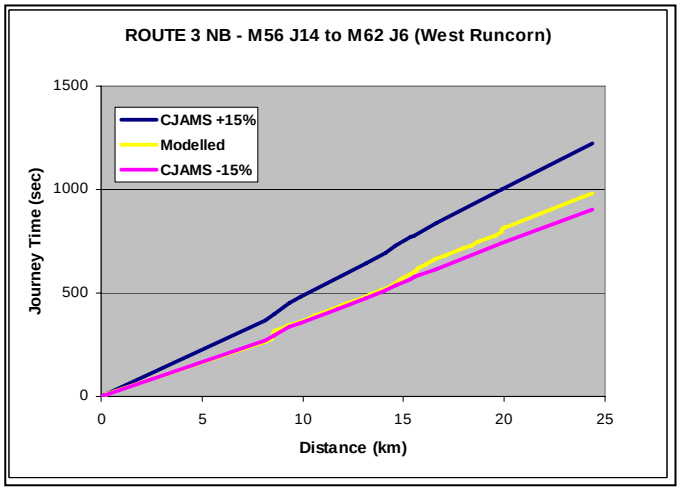
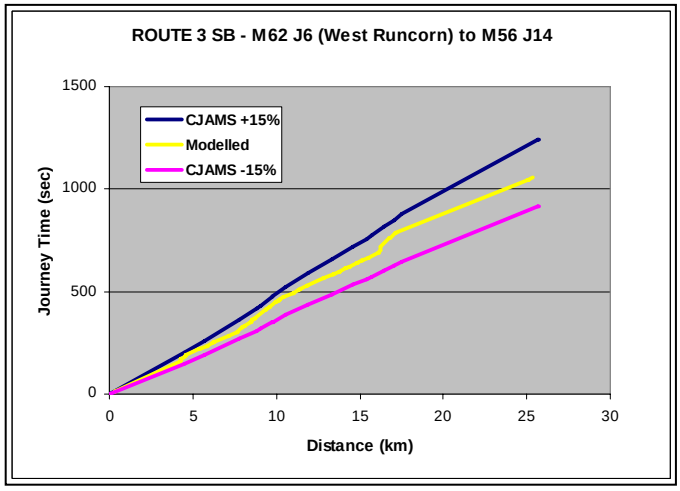
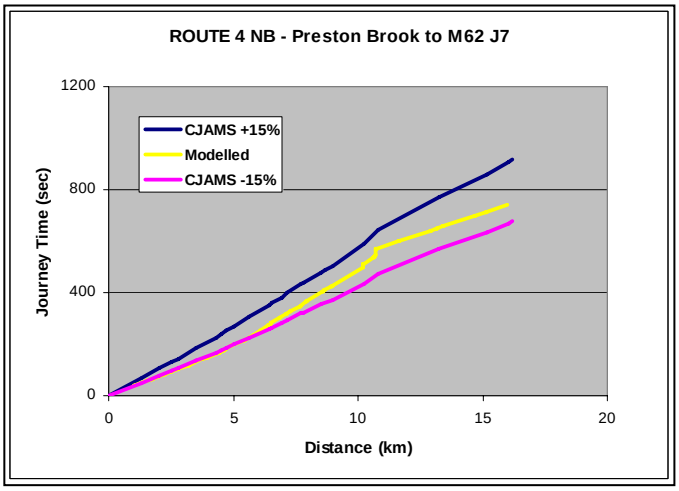
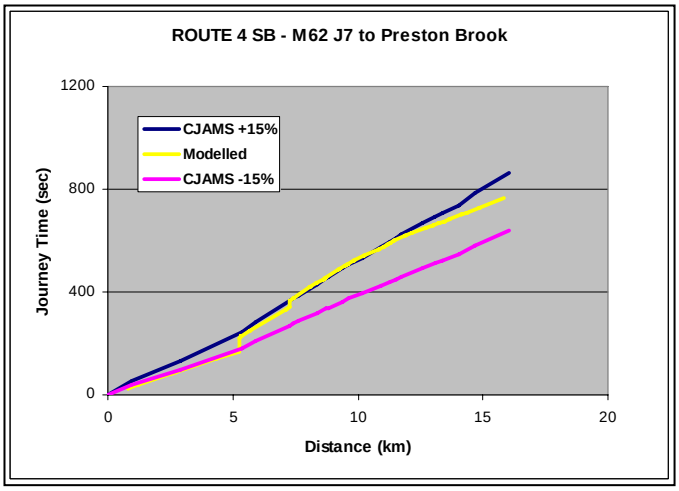
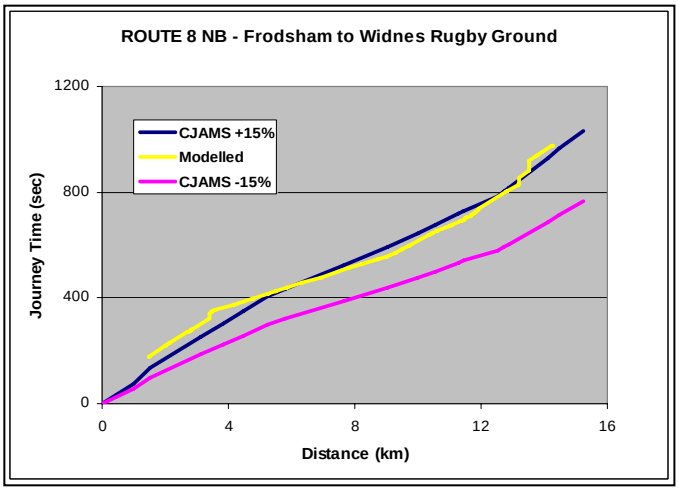
		Project Mersey Gateway	File		
Mersey Gateway Study		**Figure 9.3 Comparison of Journey Times across SJB – PM Peak Hour (Sheet 2 of 2)**			

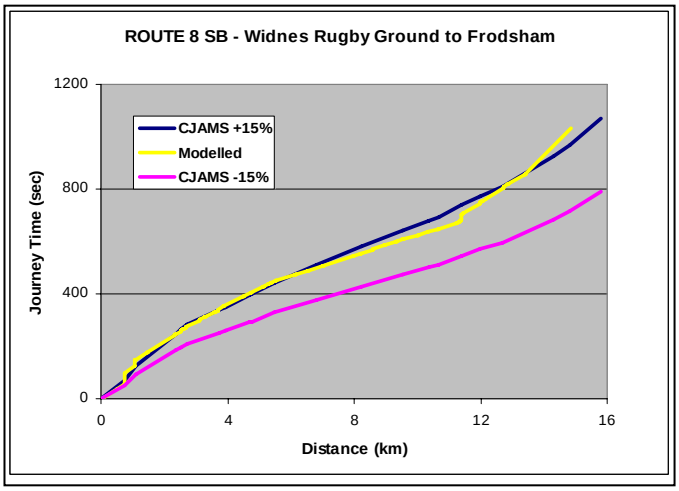












	Design JEH	CAD	Checked HF	Approved
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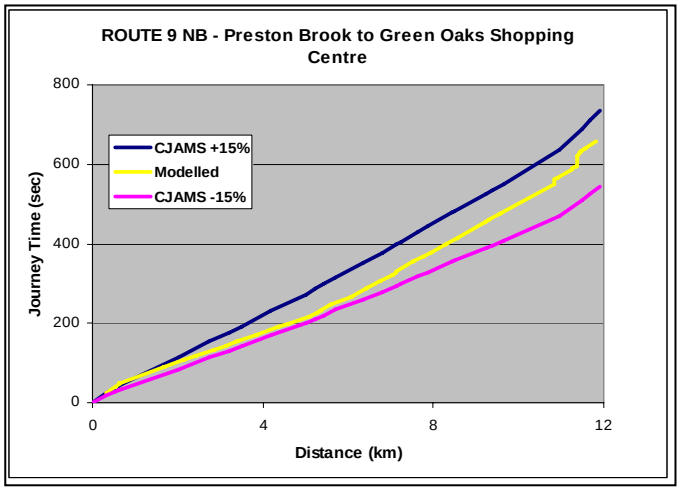
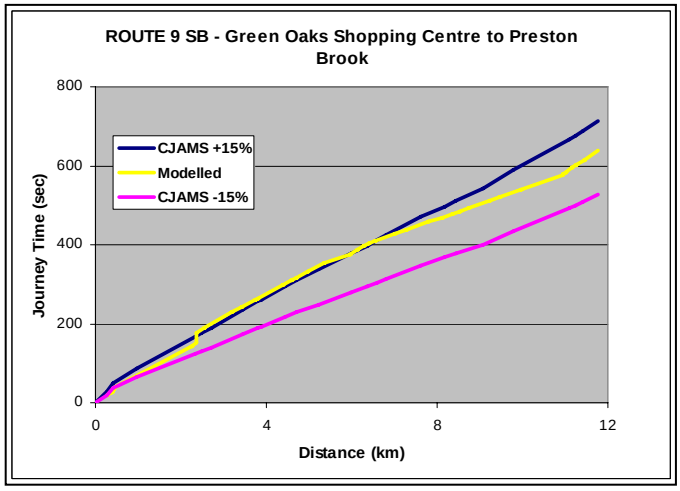
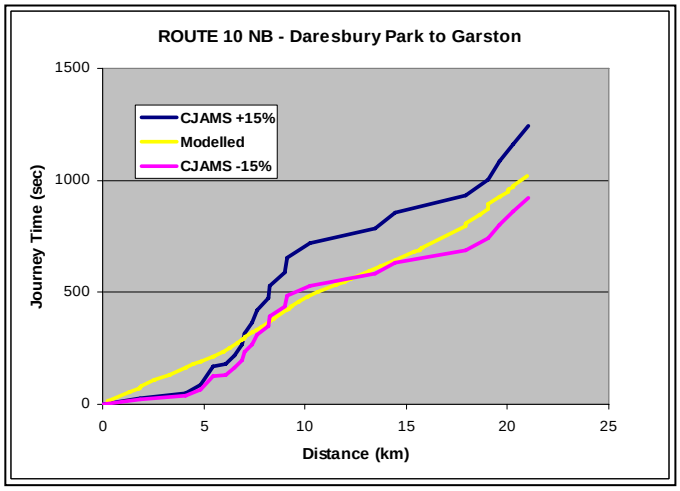
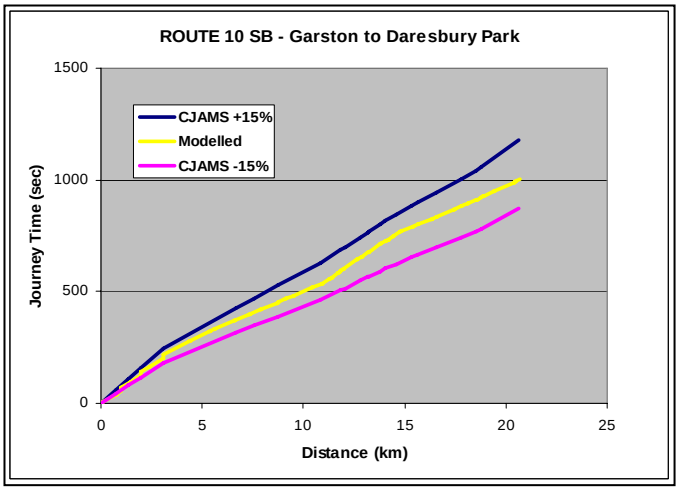
	Project Mersey Gateway		File	
Mersey Gateway Study	**Figure 9.4 Comparison of Journey Times across SJB – Overnight Hour (Sheet 1 of 2)**			









HALTON BOROUGH COUNCIL Mott MacDonald		Design JEH	CAD	Checked HF	Approved
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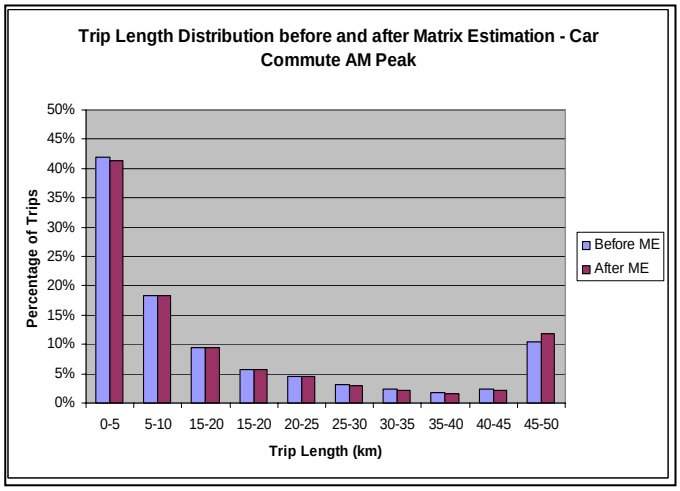
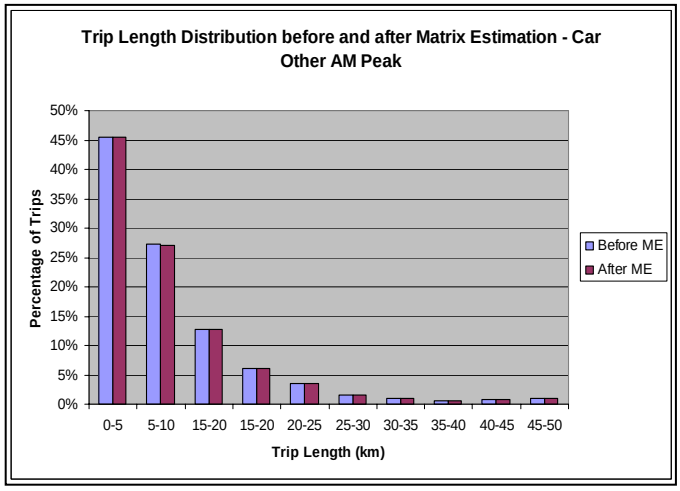
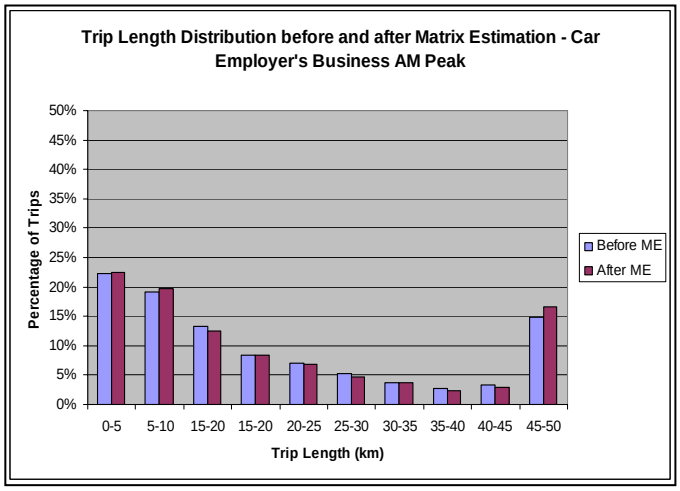
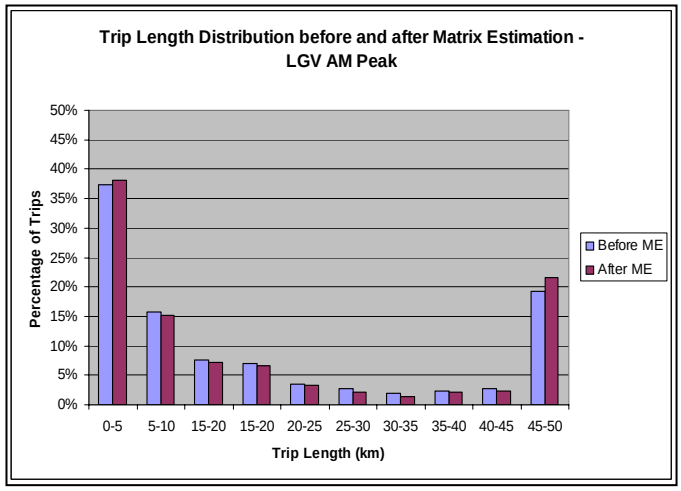
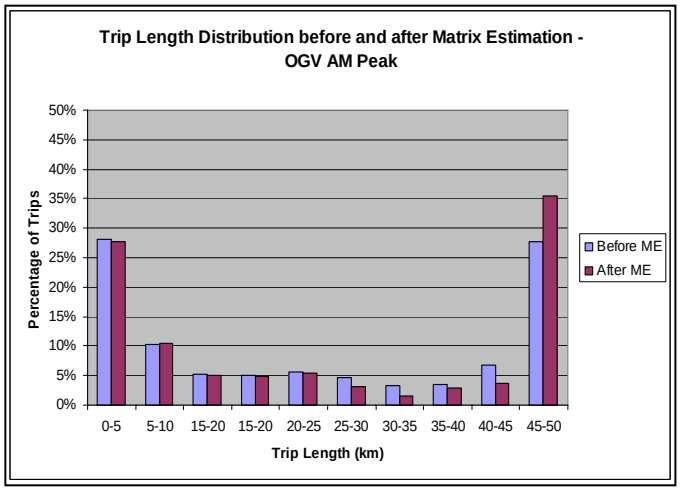
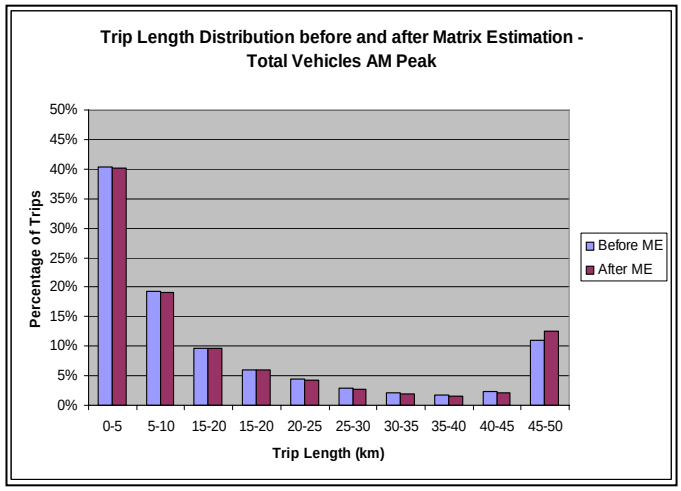




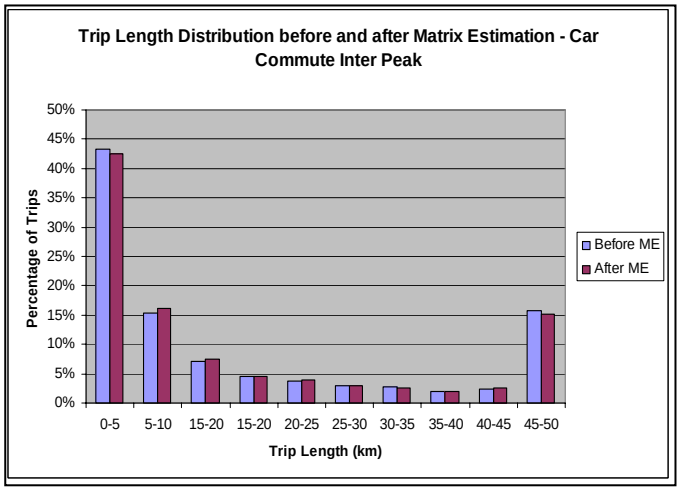


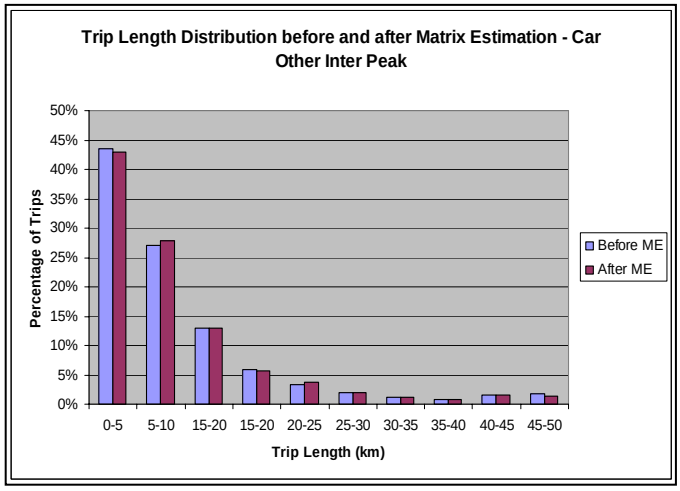


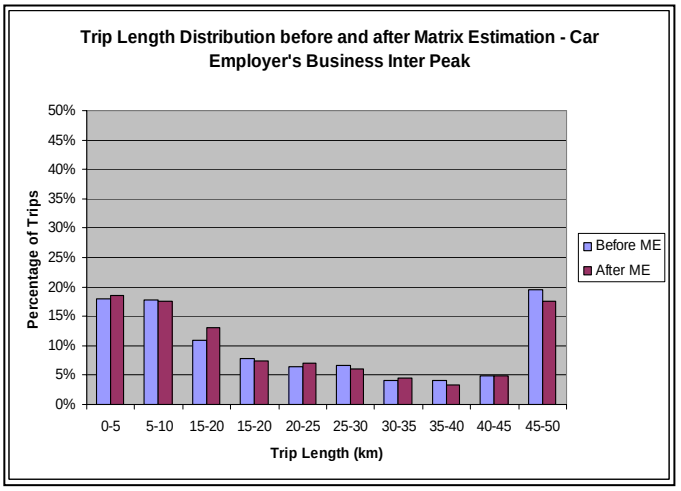


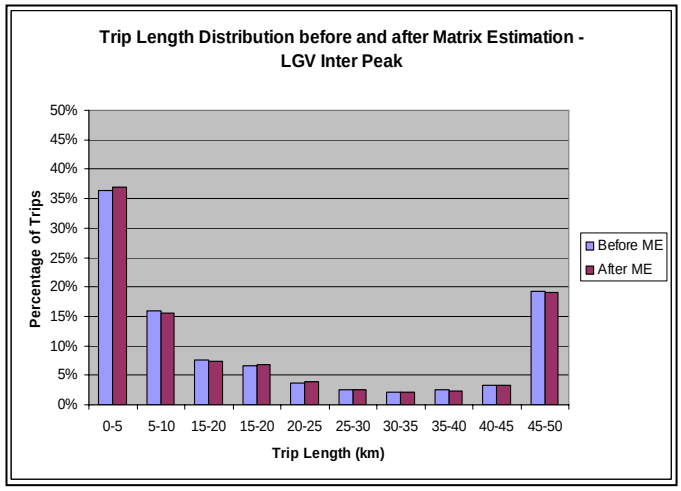


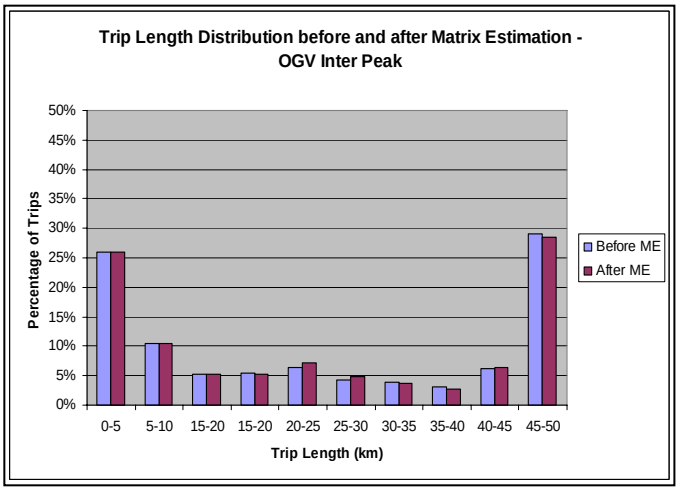
	Design JEH	CAD	Checked HF	Approved
	Drawing Number		Date 16/12/08	
	Project Mersey Gatewey		File	
Mersey Gateway Study	**Figure 9.5 – Comparison of Trip Length Distributions – AM Peak Hour**			

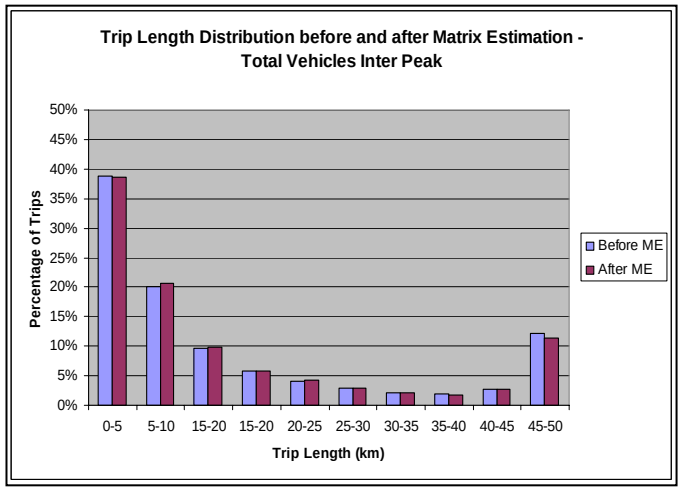




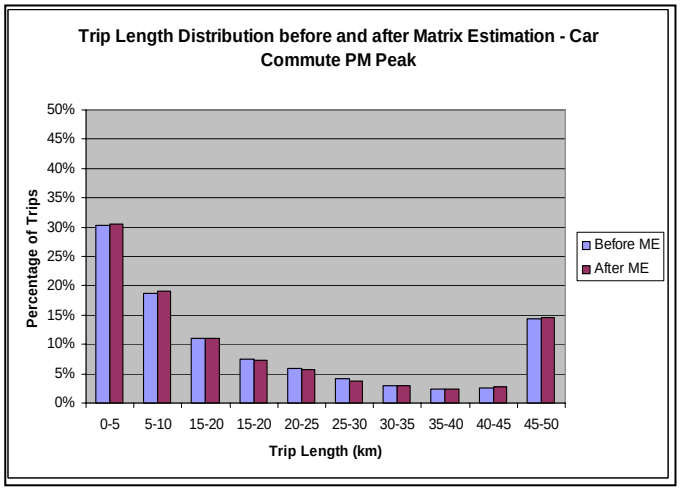


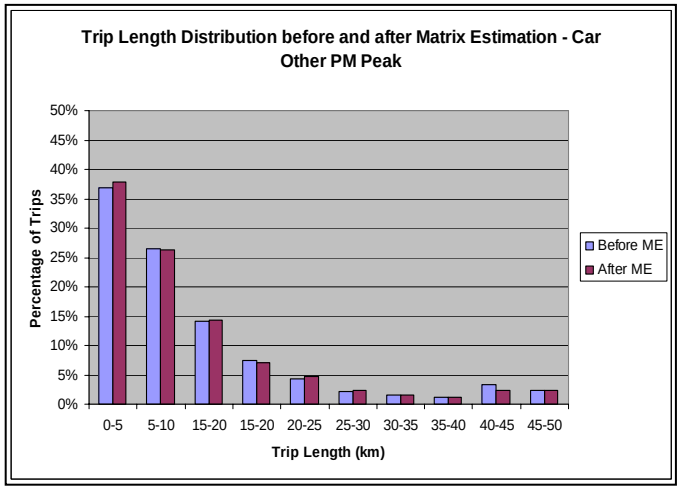


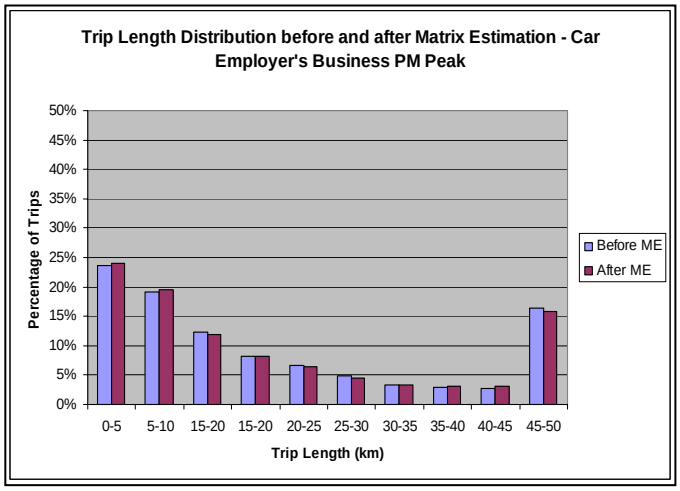


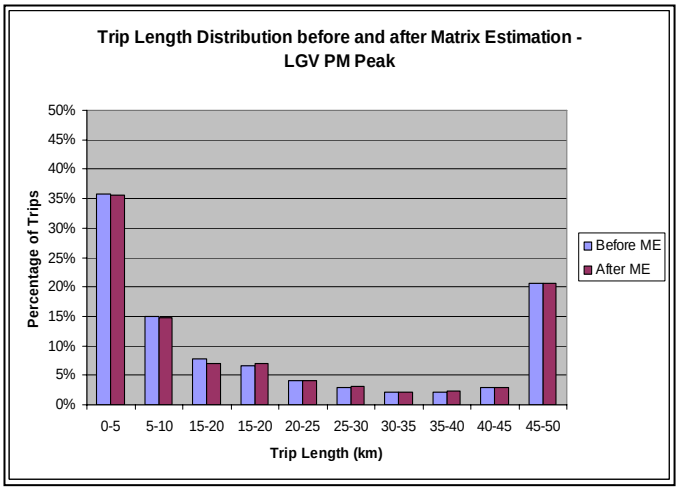


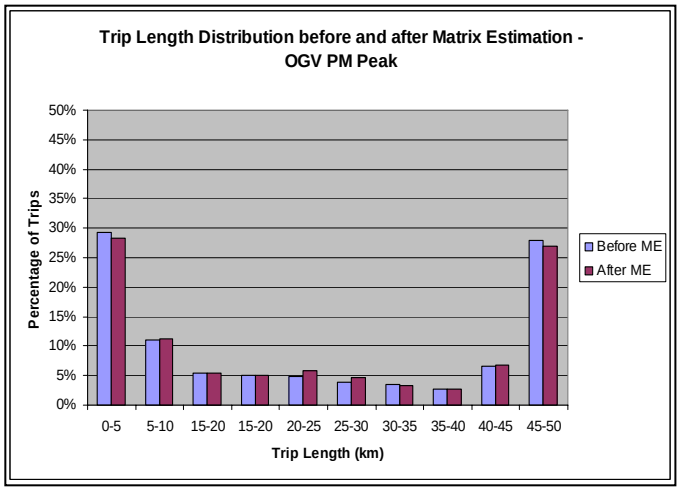
HALTON BOROUGH COUNCIL Mott MacDonald		Design JEH	CAD	Checked HF	Approved
		Drawing Number		Date 16/12/08	
		Project Mersey Gatewey	File		
Mersey Gateway Study		**Figure 9.6 – Comparison of Trip Length Distributions – Inter Peak Hour**			

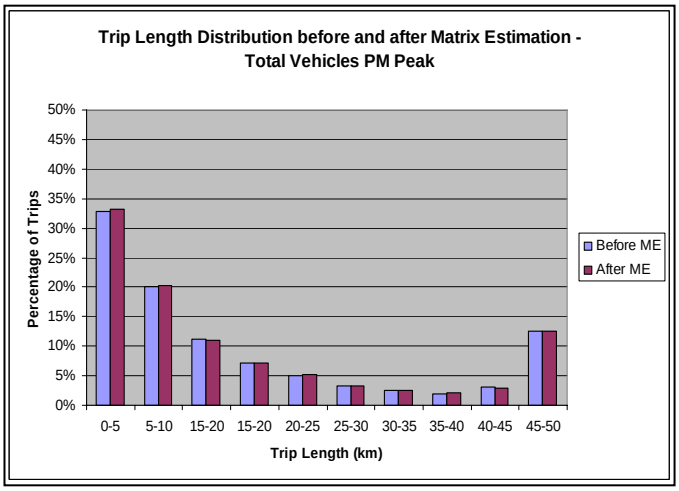












	Design JEH	CAD	Checked HF	Approved
	Drawing Number		Date 16/12/08	
	Project Mersey Gatewey		File	
Mersey Gateway Study	**Figure 9.7 – Comparison of Trip Length Distributions – PM Peak Hour**			

Chapter 10 Tables and Figures

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Table 10.1 - Observed Journey Time Comparisons – AM Peak Hour (minutes)

Description of Route	CJAMS Mean Journey Time A	Modelled Journey Time B	Percentage Difference A v B	Within 15% of CJAMS?	Within 95% Confidence Limits?
Route 1 EB - M53 J1 to M62 J1	27.9	27.7	-0.7%	Y	Y
Route 1 WB - M62 J1 to M53 J1	34.2	31.5	-7.9%	Y	Y
Route 2 NB - M56/M53 Chester to Garston	50.1	48.3	-3.6%	Y	Y
Route 2 SB – Garston to M56/M53 Chester	50.2	46.6	-7.2%	Y	Y
Route 5 NB – M56 J11 to A574 Birchwood	24.8	22.8	-8.1%	Y	Y
Route 5 SB – A574 Birchwood to M56 J11	22.3	20.2	-9.4%	Y	Y
Route 6 EB – M62 J7 to M6 J20	31.8	29.1	-8.5%	Y	Y
Route 6 WB – M6 J20 to M62 J7	29.8	27.8	-6.7%	Y	Y
Route 7 NB – M56 J10 to M62 J9	24.8	20.6	-16.9%	N	Y
Route 7 SB – M62 J9 to M56 J10	22.1	22.1	0.0%	Y	Y
Route 11 EB – M53 J3 to Wavertree Bus. Park (Queensway)	25.6	23.8	-7.0%	Y	Y
Route 11 WB – Wavertree Business Park to M53 J3 (via Queensway)	20.6	19.4	-5.8%	Y	Y
Route 12 EB – M53 J3 to Wavertree Business Park (via Kingsway)	22.0	20.5	-6.8%	Y	Y
Route 12 WB – Wavertree Business Park to M53 J3 (via Kingsway)	25.3	18.9	-25.3%	N	N
Route 13 NB – M56 J10 to M62 J9 (via M6)	12.6	13.5	7.1%	Y	Y
Route 13 SB – M62 J9 to M56 J10 (via M6)	13.8	16.5	19.6%	N	Y
Route 14 NB - M56 J10 to Smith Street (Warrington)	15.5	12.7	-18.1%	N	Y
Route 14 SB - Smith Street (Warrington) to M56 J10	13.9	13.3	-4.3%	Y	Y
Route 15 NB – M6 J20 to A49 Winwick Road	18.9	16.2	-14.3%	Y	Y
Route 15 SB – A49 Winwick Road to M6 J20	17.3	14.8	-14.5%	Y	Y
Route 16 NB – A56 Chester Road to A49 Mersey Street	8.0	9.6	20.0%	N	Y
Route 16 SB – A49 Mersey Street to A56 Chester Road	7.5	8.1	8.0%	Y	Y
Route 17 – A57 Sankey Way to A5060 Chester Road	9.4	11.3	20.2%	N	Y
Route 18 – A5060 Chester Road to A57 Sankey Way	8.3	8.5	2.4%	Y	Y
Route 19 NB - Chester to Knowsley Ind Park (via Kingsway)	50.1	44.6	-11.0%	Y	N
Route19 SB – Knowsley Ind Park to Chester (via Kingsway)	51.4	43.7	-15.0%	N	N
Route 20 NB - Chester to Knowsley Industrial Park (SJB)	39.8	39.8	0.0%	Y	Y
Route 20 SB - Knowsley Industrial Park to Chester (SJB)	42.8	42.5	-0.7%	Y	Y
Total	**720.8**	**674.4**	**-6.4%**		

Table 10.2 - Observed Journey Time Comparisons – Inter Peak Hour (minutes)

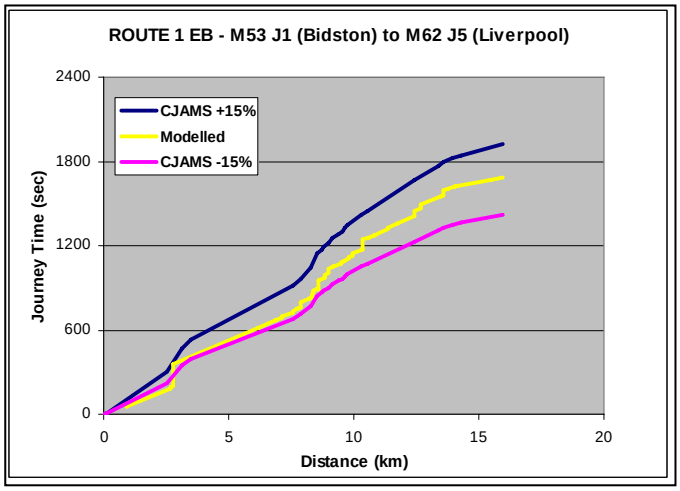
Description of Route	CJAMS Mean Journey Time A	Modelled Journey Time B	Percentage Difference A v B	Within 15% of CJAMS?	Within 95% Confidence Limits?
Route 1 EB - M53 J1 to M62 J1	23.5	23.2	-1.3%	Y	Y
Route 1 WB - M62 J1 to M53 J1	23.9	24.9	4.2%	Y	Y
Route 2 NB - M56/M53 Chester to Garston	43.5	42.4	-2.5%	Y	Y
Route 2 SB – Garston to M56/M53 Chester	43.6	45.5	4.4%	Y	Y
Route 5 NB – M56 J11 to A574 Birchwood	19.3	19.2	-0.5%	Y	Y
Route 5 SB – A574 Birchwood to M56 J11	19.9	18.4	-7.5%	Y	Y
Route 6 EB – M62 J7 to M6 J20	26.5	24.1	-9.1%	Y	Y
Route 6 WB – M6 J20 to M62 J7	25.1	23.6	-6.0%	Y	Y
Route 7 NB – M56 J10 to M62 J9	21.8	20.4	-6.4%	Y	Y
Route 7 SB – M62 J9 to M56 J10	21.5	19.6	-8.8%	Y	Y
Route 11 EB – M53 J3 to Wavertree Bus. Park (Queensway)	18.6	18.3	-1.6%	Y	Y
Route 11 WB – Wavertree Business Park to M53 J3 (via Queensway)	18.7	18.9	1.1%	Y	Y
Route 12 EB – M53 J3 to Wavertree Business Park (via Kingsway)	17.4	16.3	-6.3%	Y	N
Route 12 WB – Wavertree Business Park to M53 J3 (via Kingsway)	18.6	18.2	-2.2%	Y	Y
Route 13 NB – M56 J10 to M62 J9 (via M6)	11.1	11.9	7.2%	Y	Y
Route 13 SB – M62 J9 to M56 J10 (via M6)	12.5	13.0	4.0%	Y	Y
Route 14 NB - M56 J10 to Smith Street (Warrington)	14.2	12.9	-9.2%	Y	Y
Route 14 SB - Smith Street (Warrington) to M56 J10	14.4	12.7	-11.8%	Y	Y
Route 15 NB – M6 J20 to A49 Winwick Road	16.1	14.6	-9.3%	Y	Y
Route 15 SB – A49 Winwick Road to M6 J20	15.3	14.5	-5.2%	Y	Y
Route 16 NB – A56 Chester Road to A49 Mersey Street	7.2	6.9	-4.2%	Y	Y
Route 16 SB – A49 Mersey Street to A56 Chester Road	7.4	7.4	0.0%	Y	Y
Route 17 – A57 Sankey Way to A5060 Chester Road	8.7	9.0	3.4%	Y	Y
Route 18 – A5060 Chester Road to A57 Sankey Way	7.8	7.6	-2.6%	Y	Y
Route 19 NB - Chester to Knowsley Ind Park (via Kingsway)	46.1	38.4	-16.7%	N	N
Route 19 SB – Knowsley Ind Park to Chester (via Kingsway)	46.0	39.0	-15.2%	N	N
Route 20 NB - Chester to Knowsley Industrial Park (SJB)	34.4	31.6	-8.1%	Y	N
Route 20 SB - Knowsley Industrial Park to Chester (SJB)	35.3	32.9	-6.8%	Y	N
Total	**618.4**	**585.4**	**-5.3%**		

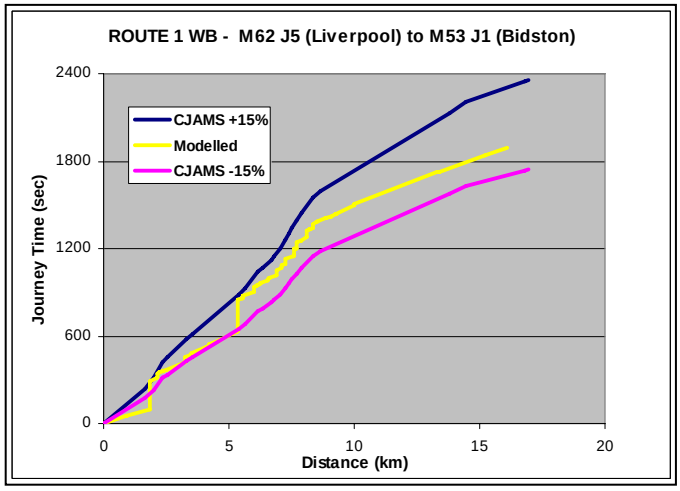
Table 10.3 - Observed Journey Time Comparisons – PM Peak Hour (minutes)

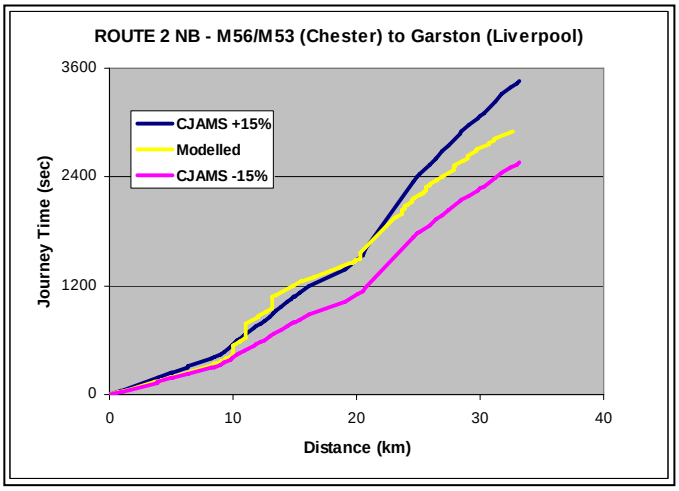
Description of Route	CJAMS Mean Journey Time A	Modelled Journey Time B	Percentage Difference A v B	Within 15% of CJAMS?	Within 95% Confidence Limits?
Route 1 EB - M53 J1 to M62 J1	27.2	28.9	6.3%	Y	Y
Route 1 WB - M62 J1 to M53 J1	25.8	30.1	16.7%	N	N
Route 2 NB - M56/M53 Chester to Garston	45.6	44.3	-2.9%	Y	Y
Route 2 SB – Garston to M56/M53 Chester	48.8	49.8	2.0%	Y	Y
Route 5 NB – M56 J11 to A574 Birchwood	20.9	21.7	3.8%	Y	Y
Route 5 SB – A574 Birchwood to M56 J11	20.8	20.1	-3.4%	Y	Y
Route 6 EB – M62 J7 to M6 J20	29.6	28.1	-5.1%	Y	Y
Route 6 WB – M6 J20 to M62 J7	27.7	29.4	6.1%	Y	Y
Route 7 NB – M56 J10 to M62 J9	25.2	25.2	0.0%	Y	Y
Route 7 SB – M62 J9 to M56 J10	23.9	21.5	-10.0%	Y	Y
Route 11 EB – M53 J3 to Wavertree Bus. Park (Queensway)	19.5	20.0	2.6%	Y	Y
Route 11 WB – Wavertree Business Park to M53 J3 (via Queensway)	19.8	22.5	13.6%	Y	Y
Route 12 EB – M53 J3 to Wavertree Business Park (via Kingsway)	18.3	17.0	-7.1%	Y	Y
Route 12 WB – Wavertree Business Park to M53 J3 (via Kingsway)	19.9	20.9	5.0%	Y	Y
Route 13 NB – M56 J10 to M62 J9 (via M6)	11.6	14.3	23.3%	N	N
Route 13 SB – M62 J9 to M56 J10 (via M6)	12.9	15.3	18.6%	N	N
Route 14 NB - M56 J10 to Smith Street (Warrington)	15.2	14.2	-6.6%	Y	Y
Route 14 SB - Smith Street (Warrington) to M56 J10	16.7	14.0	-16.2%	N	N
Route 15 NB – M6 J20 to A49 Winwick Road	16.8	16.2	-3.6%	Y	Y
Route 15 SB – A49 Winwick Road to M6 J20	17.0	16.6	-2.4%	Y	Y
Route 16 NB – A56 Chester Road to A49 Mersey Street	8.0	8.2	2.5%	Y	Y
Route 16 SB – A49 Mersey Street to A56 Chester Road	7.5	8.7	16.0%	N	N
Route 17 – A57 Sankey Way to A5060 Chester Road	10.6	12.5	17.9%	N	N
Route 18 – A5060 Chester Road to A57 Sankey Way	10.3	9.4	-8.7%	Y	Y
Route 19 NB - Chester to Knowsley Ind Park (via Kingsway)	48.0	42.6	-11.3%	Y	N
Route19 SB – Knowsley Ind Park to Chester (via Kingsway)	48.2	41.9	-13.1%	Y	N
Route 20 NB - Chester to Knowsley Industrial Park (SJB)	37.1	39.8	7.3%	Y	N
Route 20 SB - Knowsley Industrial Park to Chester (SJB)	41.7	41.6	-0.2%	Y	Y
Total	**674.6**	**674.8**	**0.0%**		

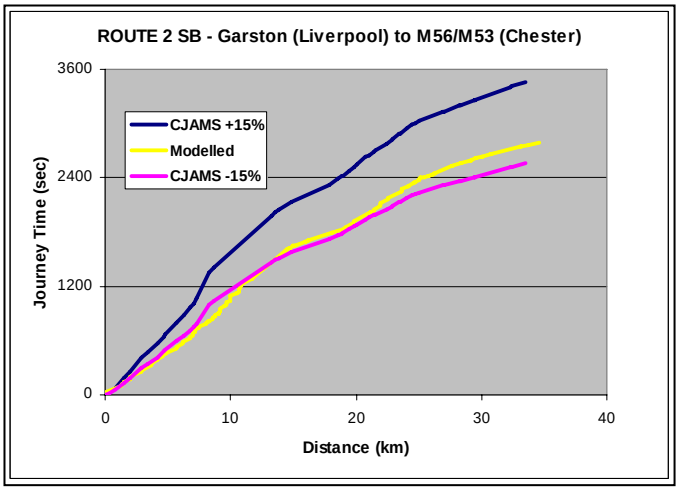
Table 10.4 - Observed Journey Time Comparisons – Overnight Hour (minutes)

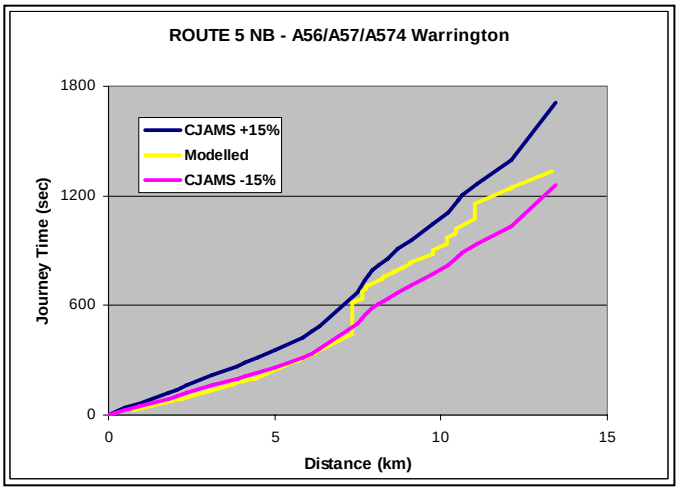
Description of Route	CJAMS Mean Journey Time A	Modelled Journey Time B	Percentage Difference A v B	Within 15% of CJAMS?	Within 95% Confidence Limits?
Route 1 EB - M53 J1 to M62 J1	18.2	19.7	8.2%	Y	Y
Route 1 WB - M62 J1 to M53 J1	17.9	21.4	19.6%	N	N
Route 2 NB - M56/M53 Chester to Garston	34.4	37.4	8.7%	Y	Y
Route 2 SB – Garston to M56/M53 Chester	35.0	40.5	15.7%	N	N
Route 5 NB – M56 J11 to A574 Birchwood	15.4	17.4	13.0%	Y	Y
Route 5 SB – A574 Birchwood to M56 J11	15.1	17.0	12.6%	Y	Y
Route 6 EB – M62 J7 to M6 J20	21.4	23.3	8.9%	Y	Y
Route 6 WB – M6 J20 to M62 J7	19.8	21.3	7.6%	Y	Y
Route 7 NB – M56 J10 to M62 J9	15.5	18.7	20.6%	N	N
Route 7 SB – M62 J9 to M56 J10	14.6	19.0	30.1%	N	N
Route 11 EB – M53 J3 to Wavertree Bus. Park (Queensway)	14.6	15.7	7.5%	Y	Y
Route 11 WB – Wavertree Business Park to M53 J3 (via Queensway)	14.6	16.5	13.0%	Y	Y
Route 12 EB – M53 J3 to Wavertree Business Park (via Kingsway)	16.1	15.1	-6.2%	Y	Y
Route 12 WB – Wavertree Business Park to M53 J3 (via Kingsway)	15.3	16.5	7.8%	Y	Y
Route 13 NB – M56 J10 to M62 J9 (via M6)	11.3	9.6	-15.0%	Y	N
Route 13 SB – M62 J9 to M56 J10 (via M6)	12.5	10.6	-15.2%	Y	Y
Route 14 NB - M56 J10 to Smith Street (Warrington)	9.8	12.1	23.5%	N	N
Route 14 SB - Smith Street (Warrington) to M56 J10	9.4	12.6	34.0%	N	N
Route 15 NB – M6 J20 to A49 Winwick Road	12.3	14.3	16.3%	N	N
Route 15 SB – A49 Winwick Road to M6 J20	12.0	13.9	15.8%	N	N
Route 16 NB – A56 Chester Road to A49 Mersey Street	5.6	6.1	8.9%	Y	Y
Route 16 SB – A49 Mersey Street to A56 Chester Road	5.2	6.5	25.0%	N	N
Route 17 – A57 Sankey Way to A5060 Chester Road	6.2	8.5	37.1%	N	N
Route 18 – A5060 Chester Road to A57 Sankey Way	5.6	6.6	17.9%	N	N
Route 19 NB - Chester to Knowsley Ind Park (via Kingsway)	41.4	36.3	-12.3%	Y	
Route 19 SB – Knowsley Ind Park to Chester (via Kingsway)	40.4	36.8	-8.9%	Y	
Route 20 NB - Chester to Knowsley Industrial Park (SJB)	33.6	28.6	-14.9%	Y	
Route 20 SB - Knowsley Industrial Park to Chester (SJB)	34.3	29.6	-13.7%	Y	
Total	**507.5**	**531.6**	**4.7%**		

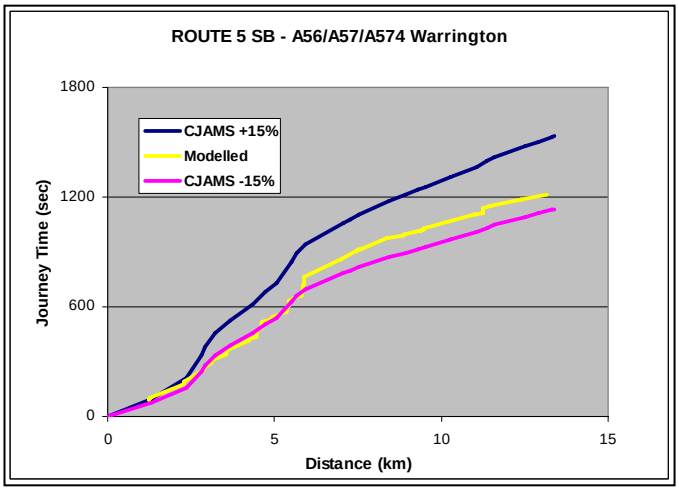












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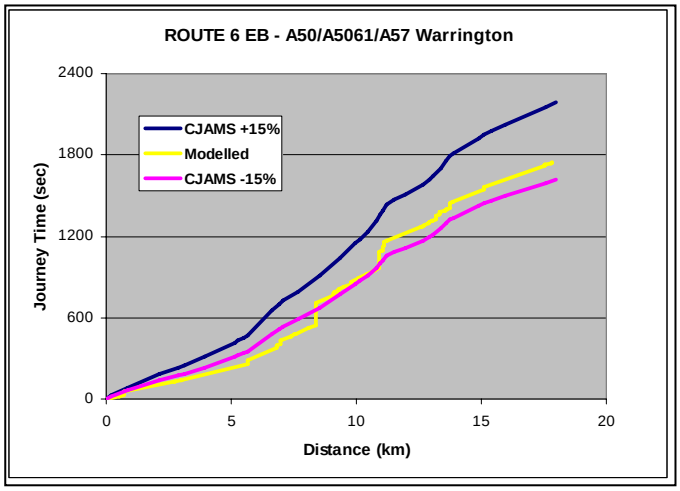
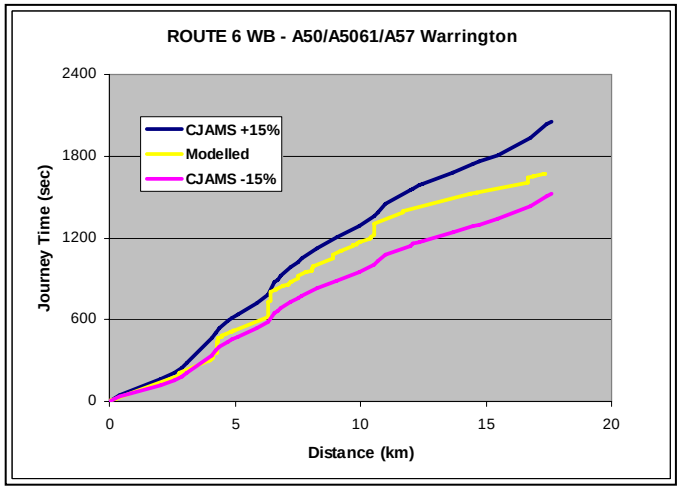
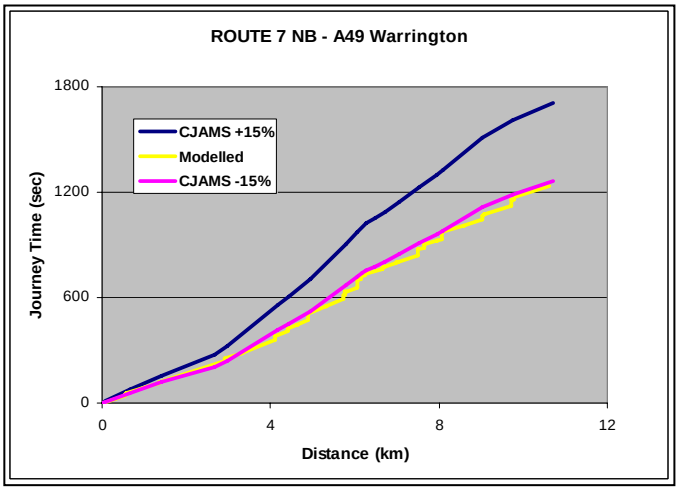
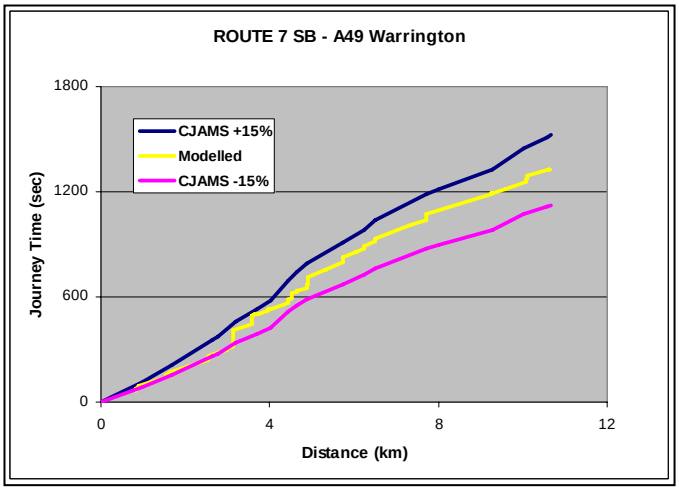
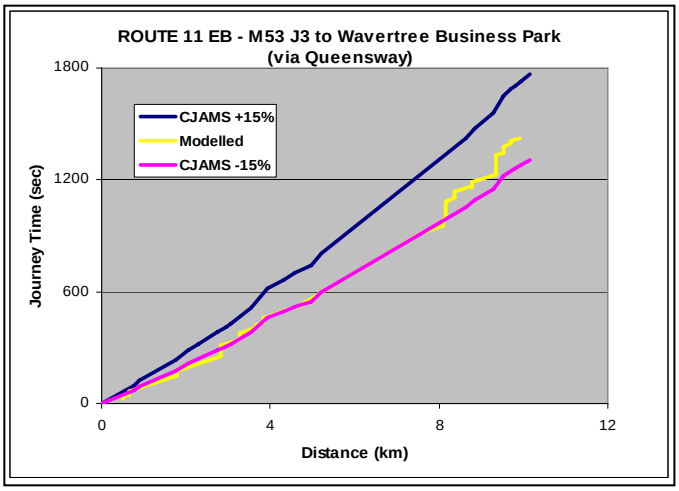
		Project Mersey Gateway		File	
Mersey Gateway Study		Figure 10.1 Comparison of Journey Times – AM Peak Hour (Sheet 1 of 5)			

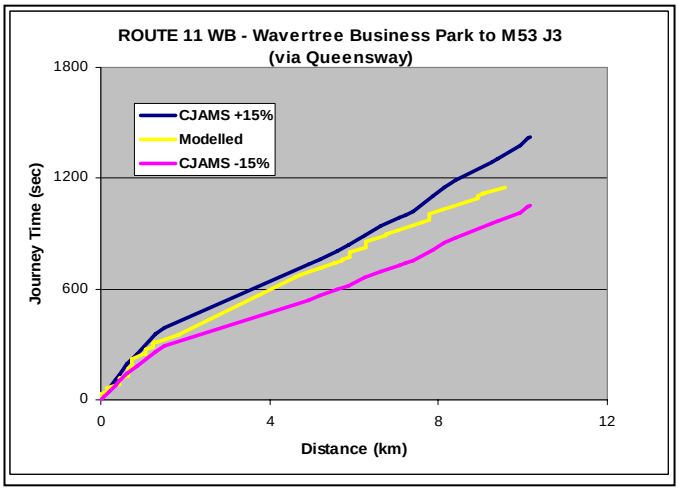












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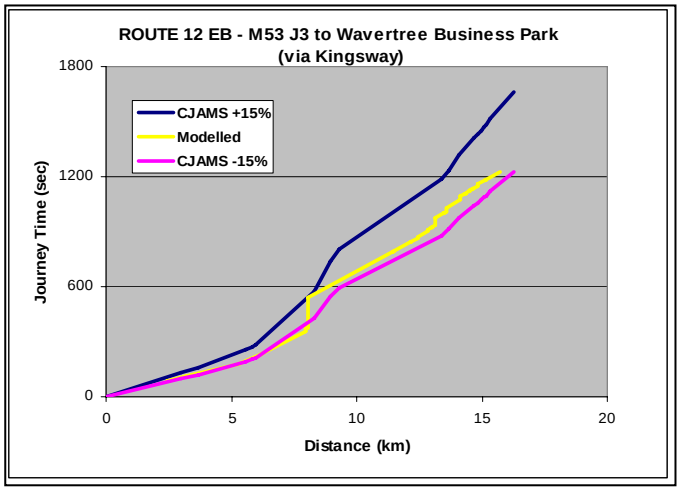

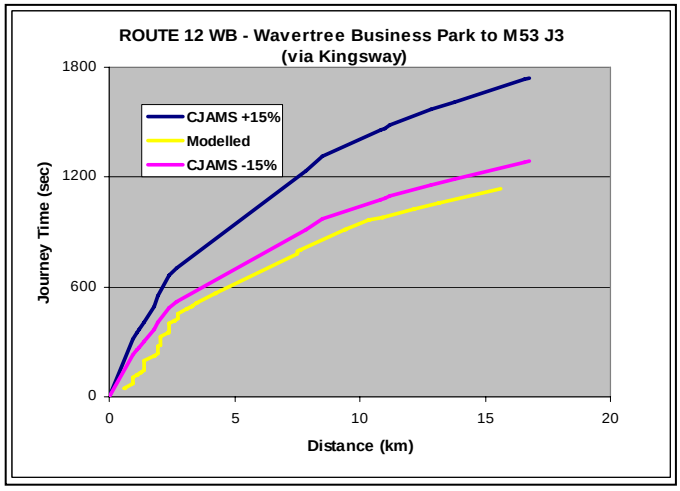

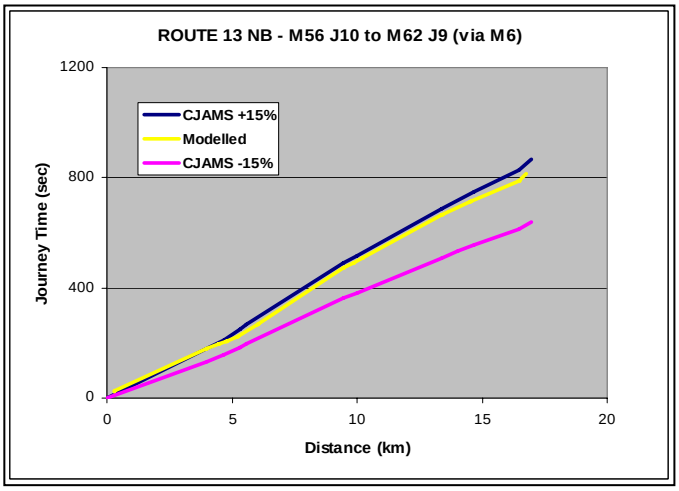

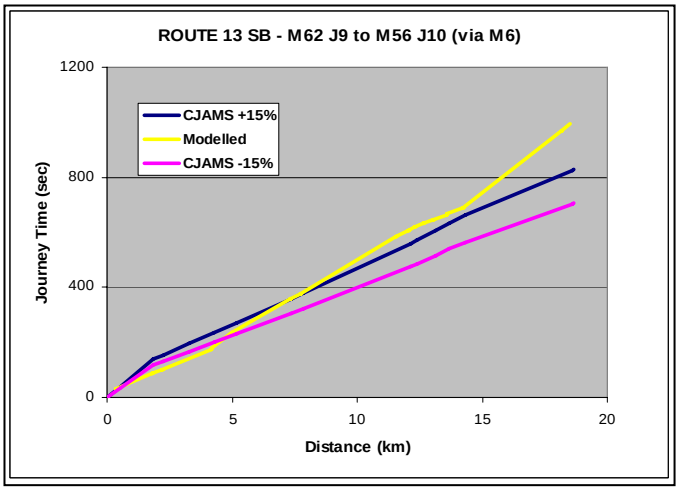

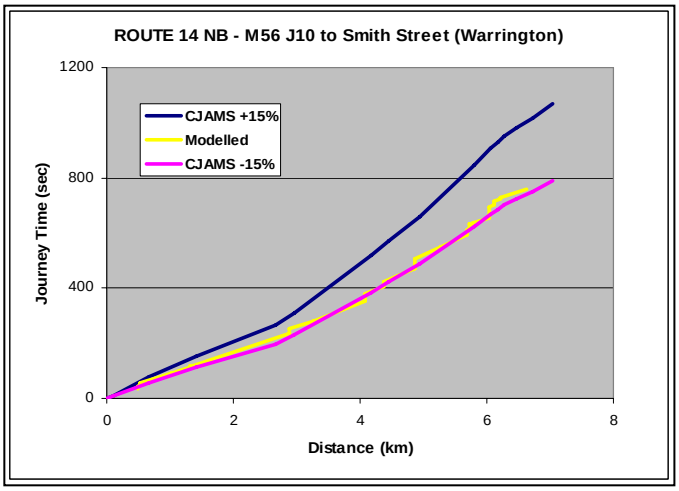

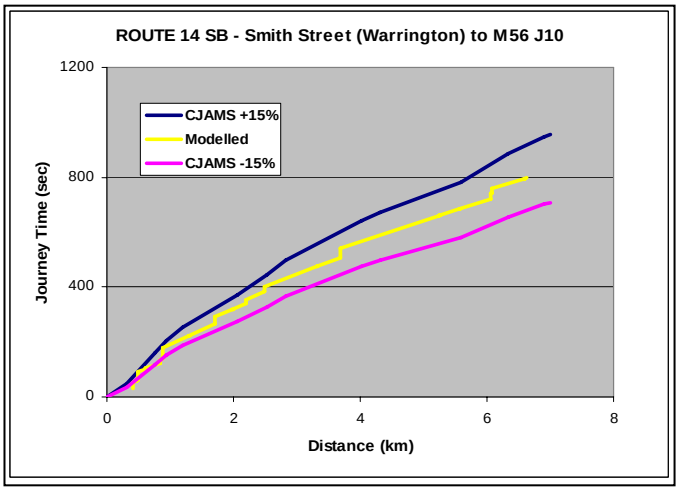

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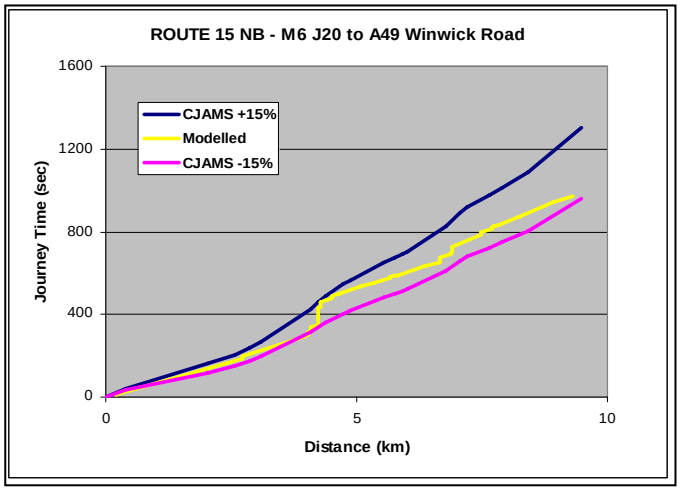
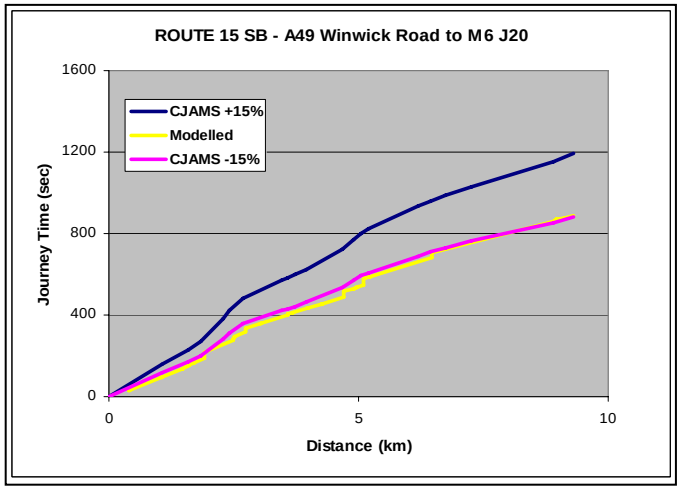
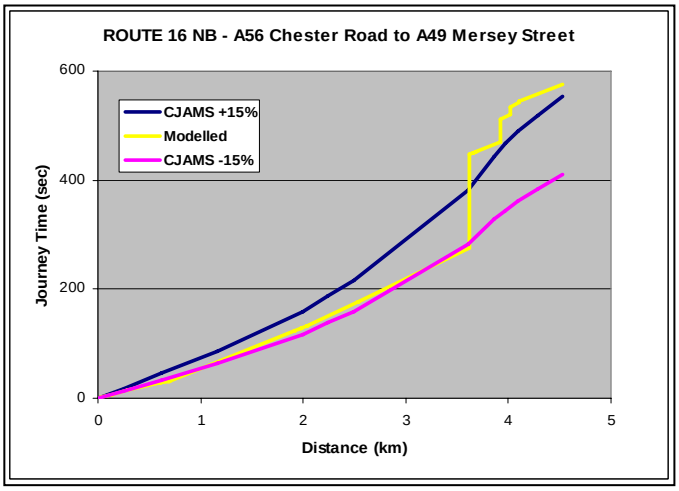
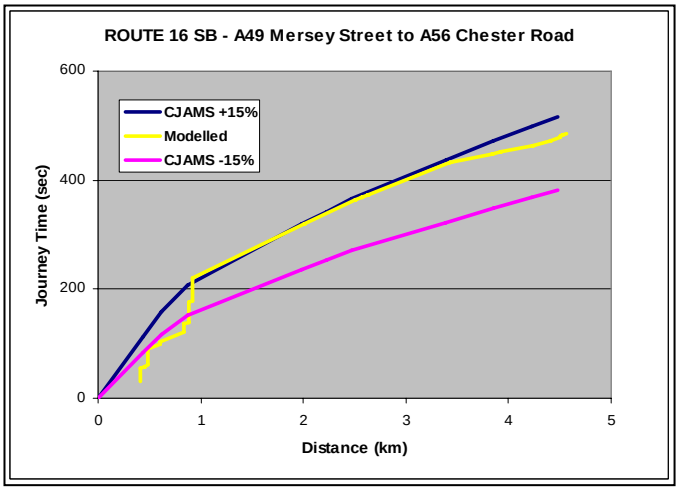
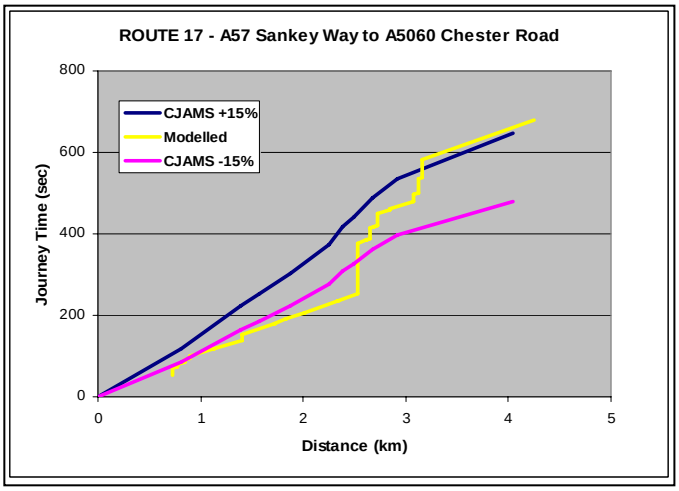
Mersey Gateway Study		Figure 10.1 Comparison of Journey Times – AM Peak Hour (Sheet 3 of 5)			

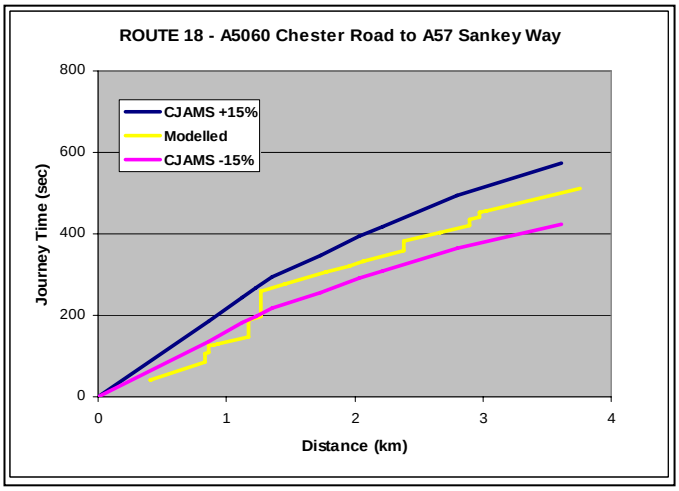












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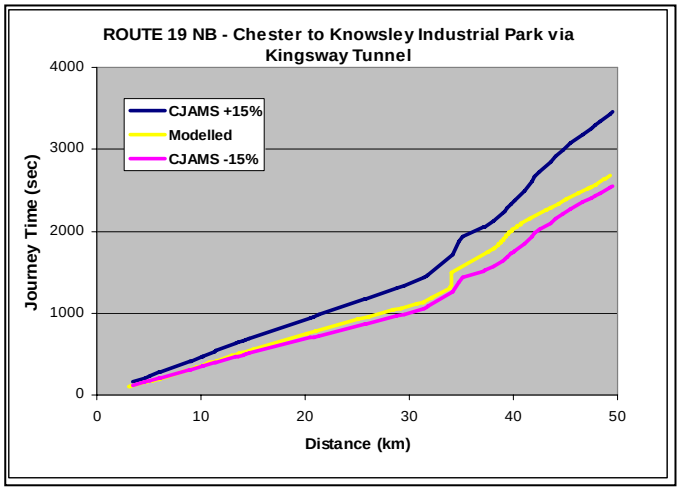
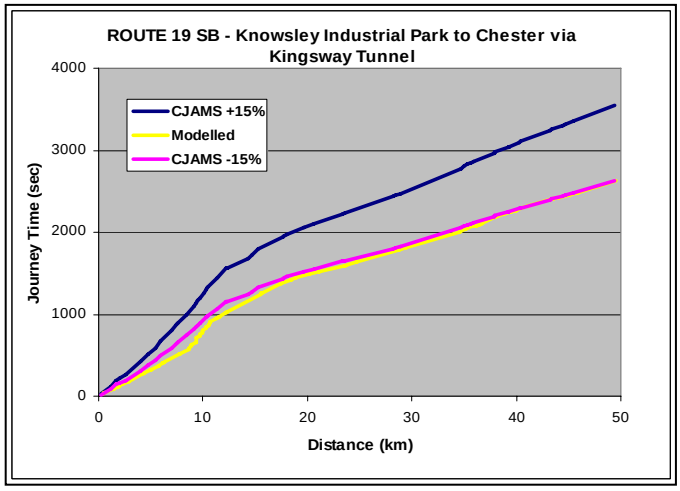
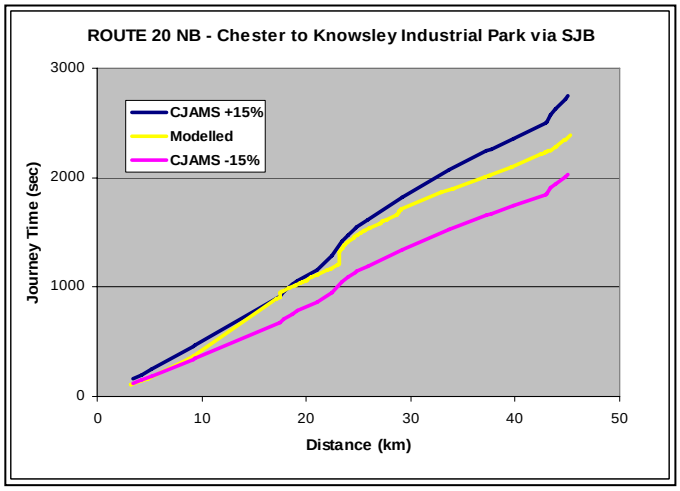
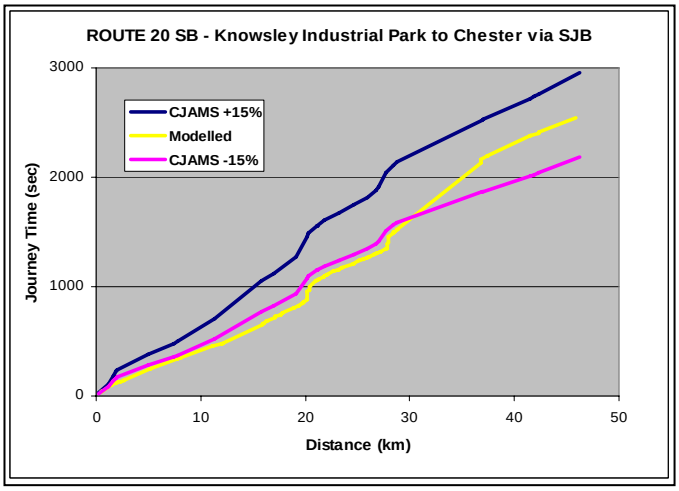
Mersey Gateway Study	Figure 10.1 Comparison of Journey Times – AM Peak Hour (Sheet 4 of 5)		









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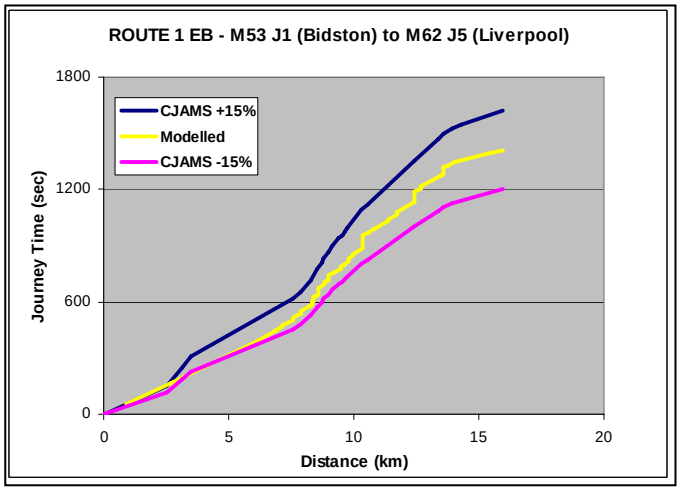
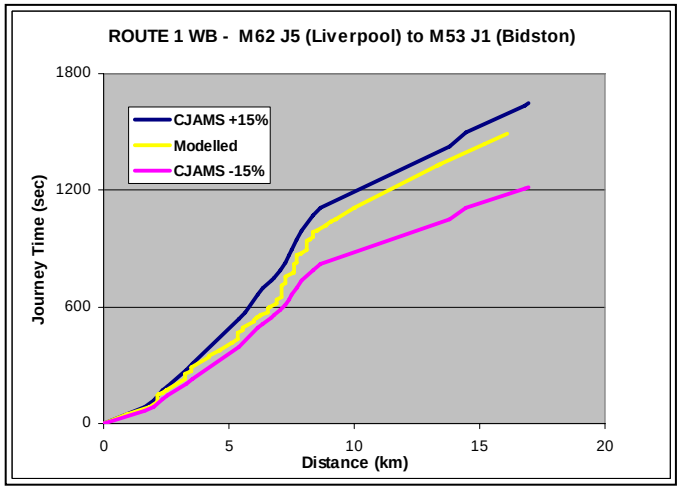
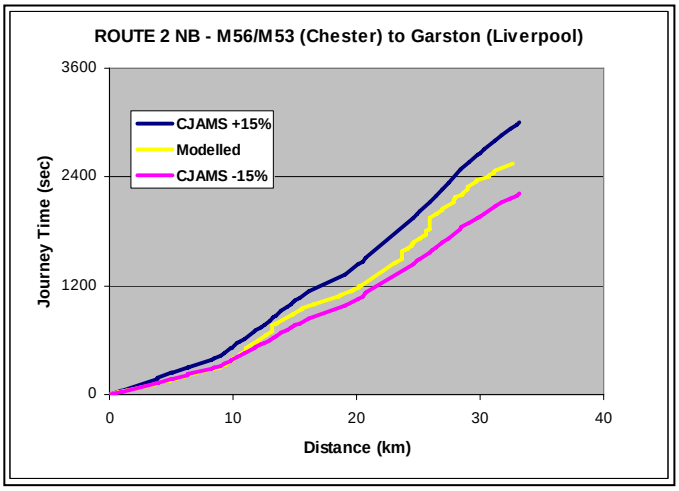
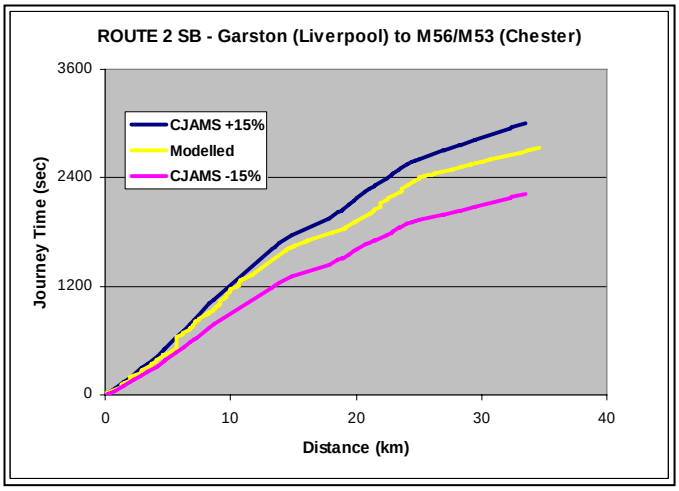
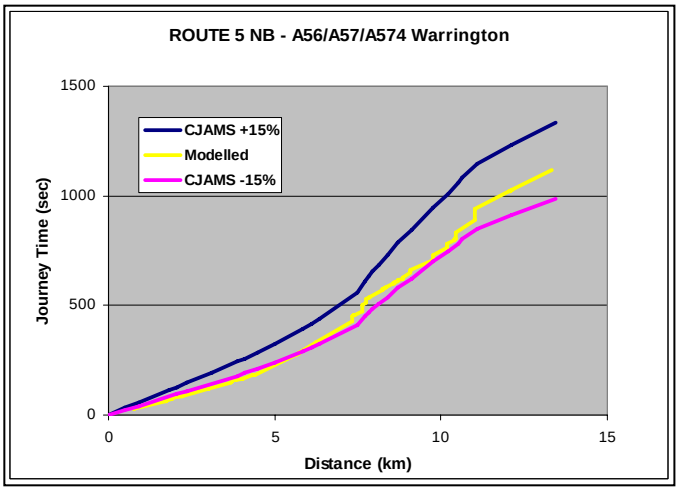
Mersey Gateway Study		Figure 10.1 Comparison of Journey Times – AM Peak Hour (Sheet 5 of 5)			

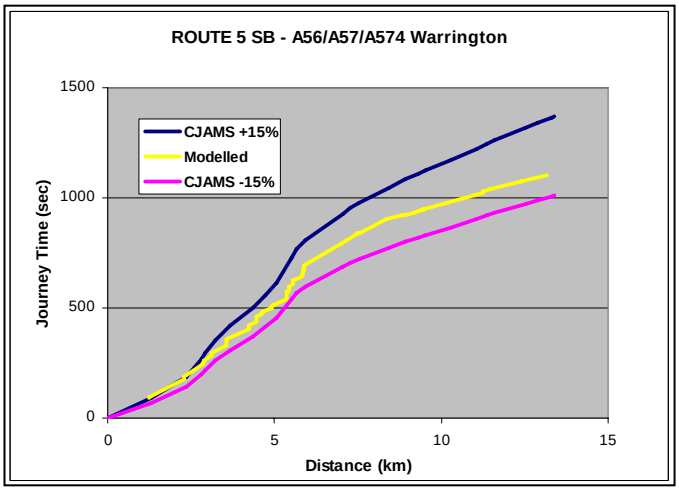












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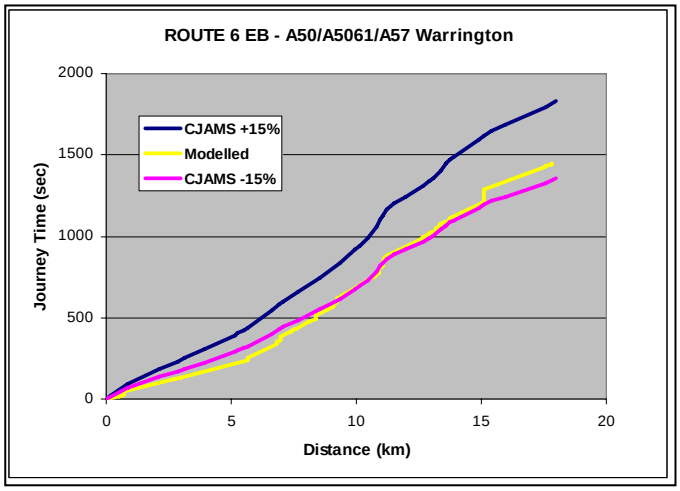
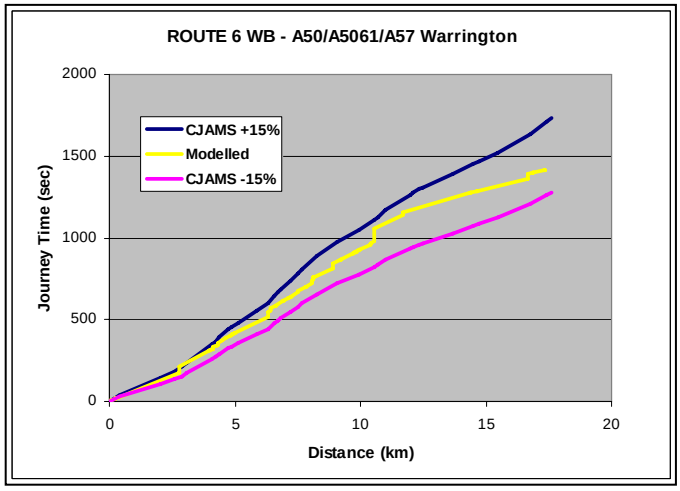
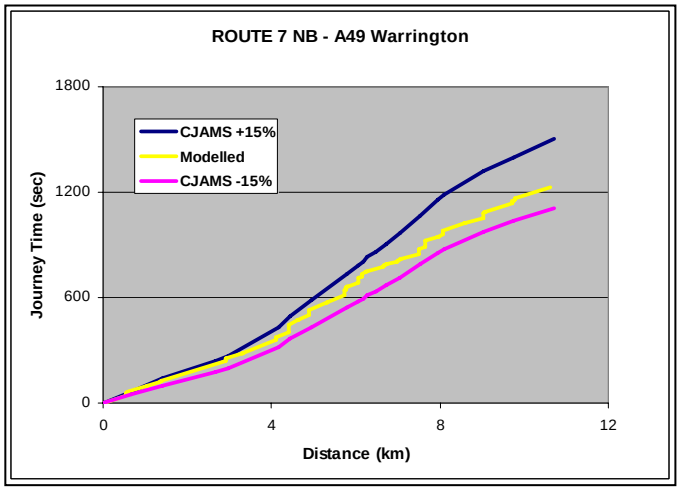
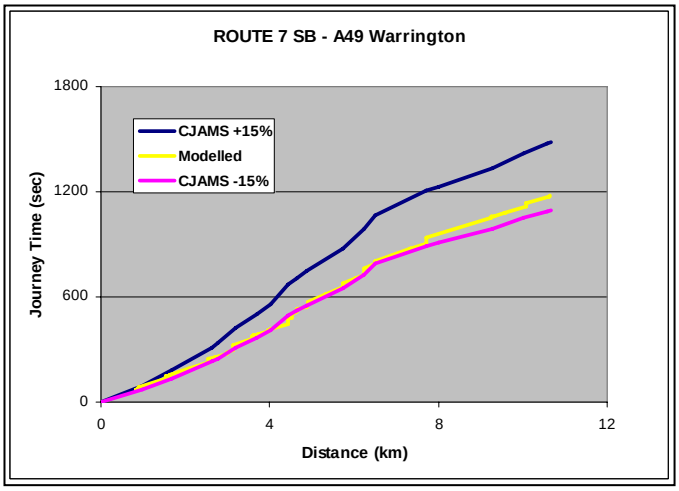
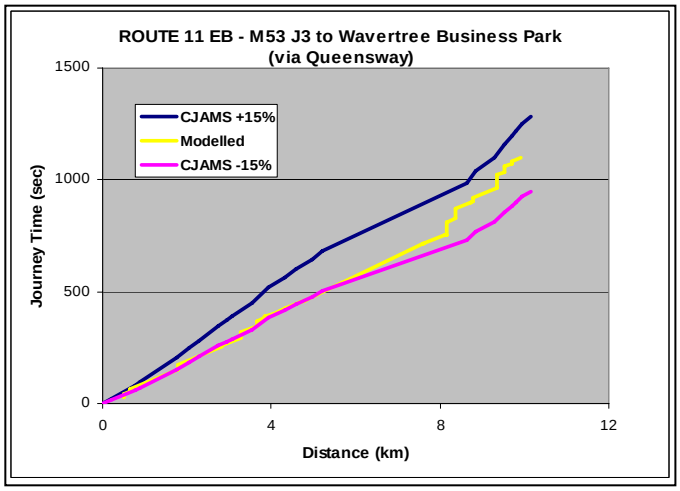
Mersey Gateway Study		Figure 10.2 Comparison of Journey Times – Inter Peak Hour (Sheet 1 of 5)			

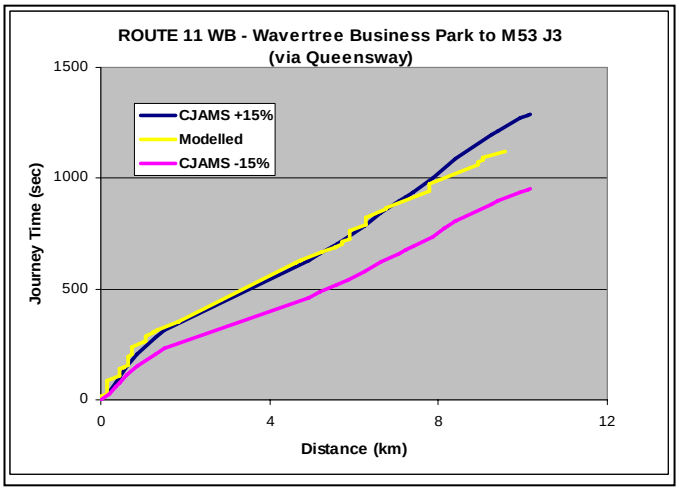












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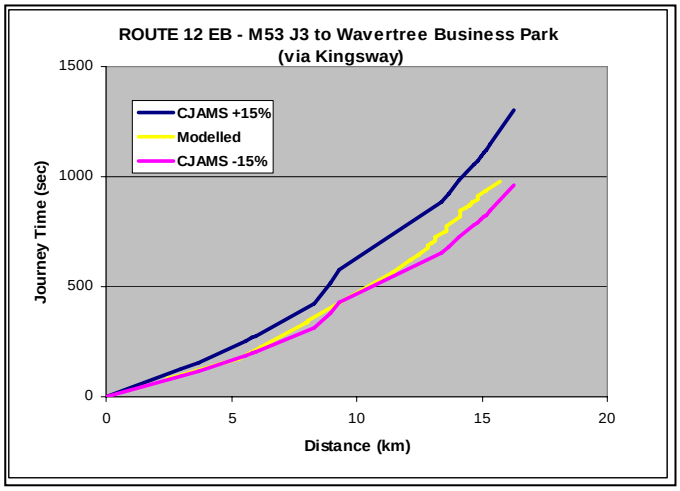
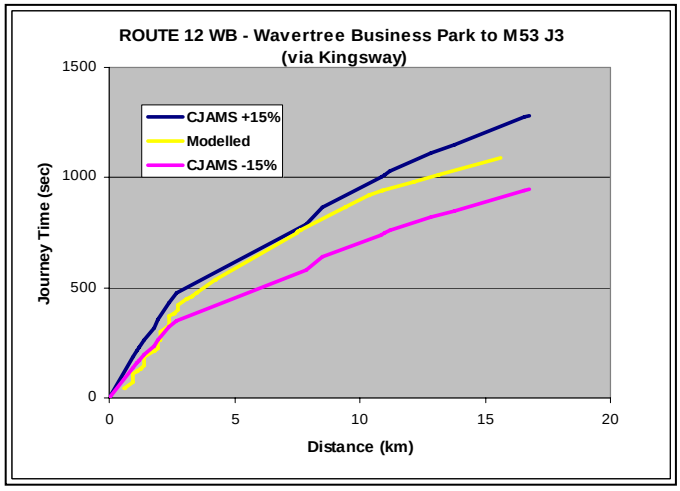
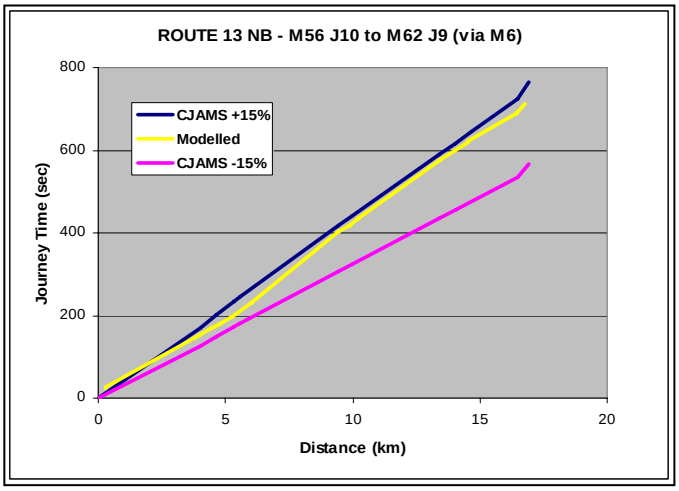
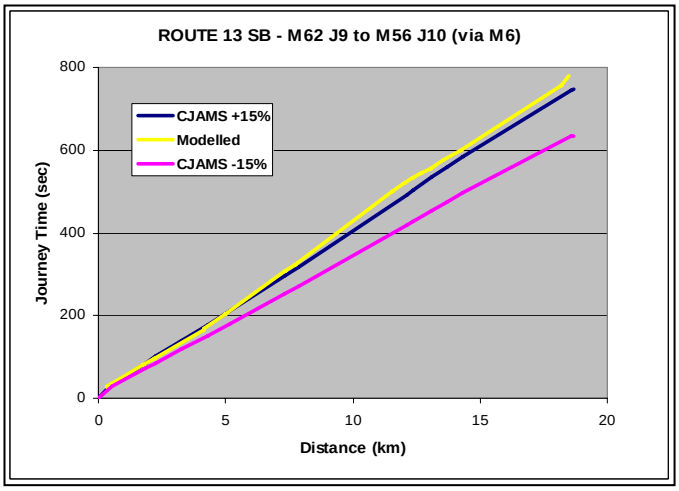
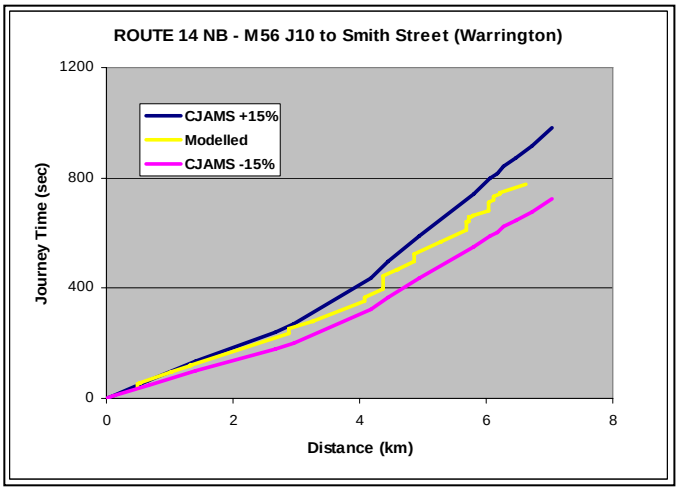
Mersey Gateway Study	Figure 10.2 Comparison of Journey Times – Inter Peak Hour (Sheet 2 of 5)		

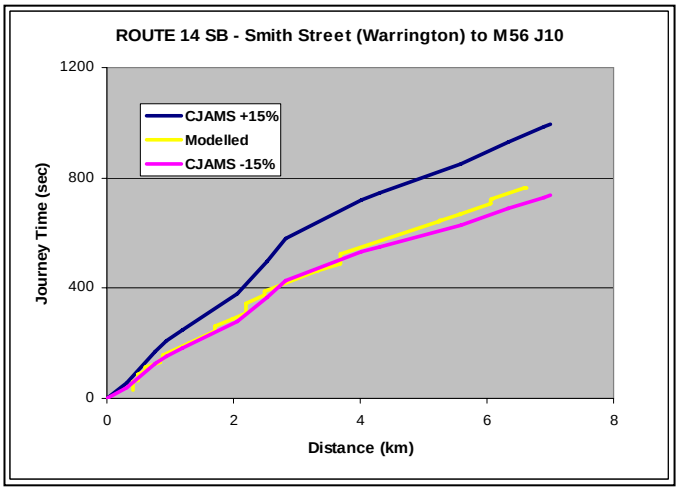












HALTON BOROUGH COUNCIL Mott MacDonald			
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	Drawing Number		Date 16/12/08	
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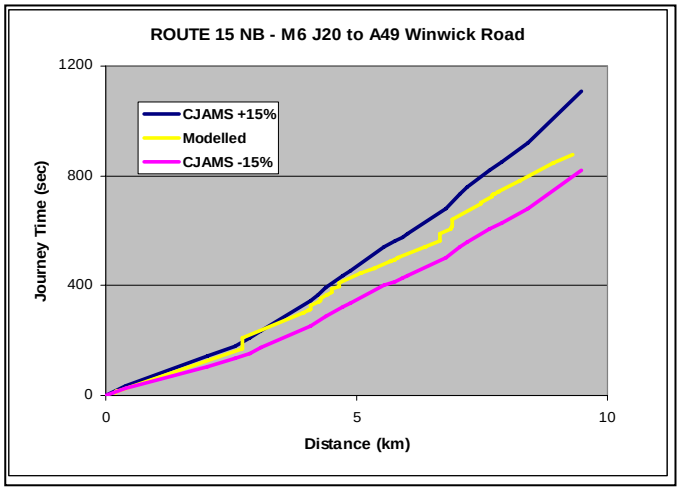
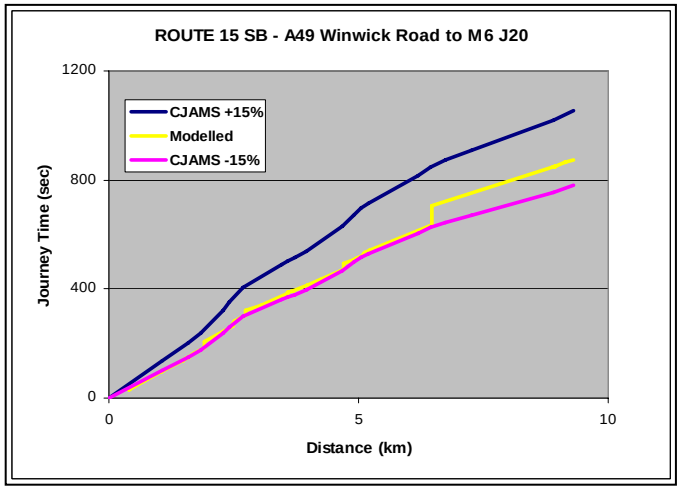
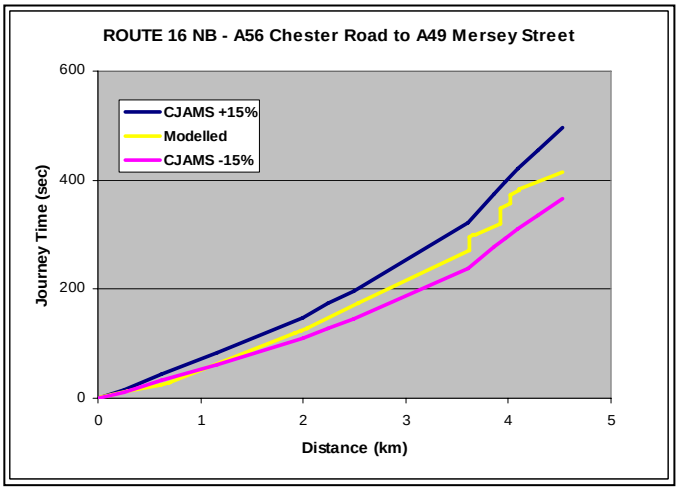
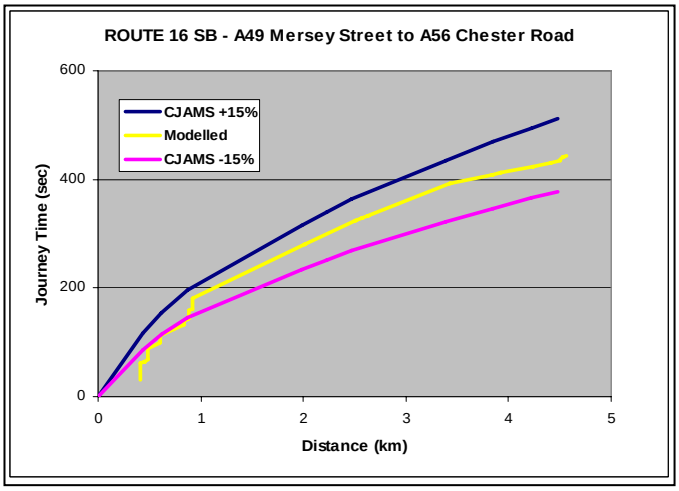
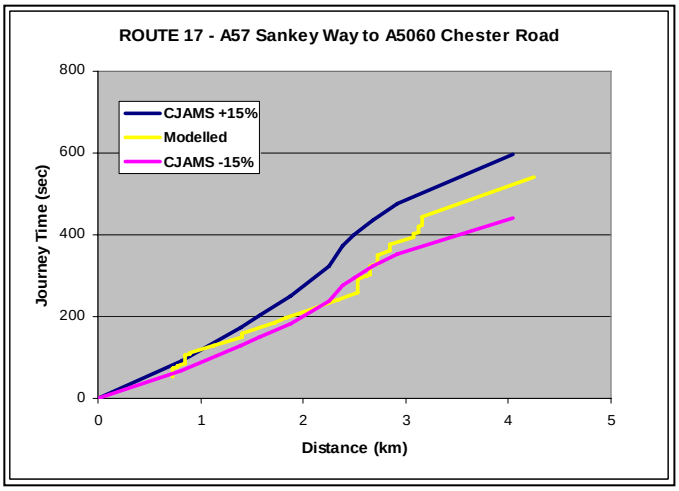
Mersey Gateway Study	Figure 10.2 Comparison of Journey Times – Inter Peak Hour (Sheet 3 of 5)			

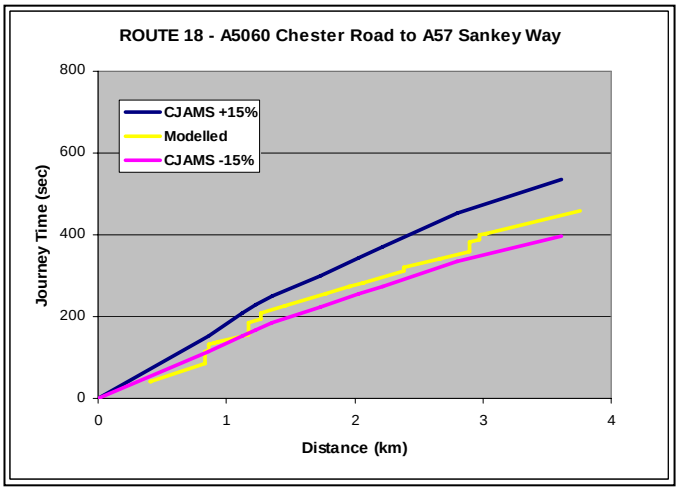












HALTON BOROUGH COUNCIL Mott MacDonald		Design JEH	CAD	Checked HF / Approved
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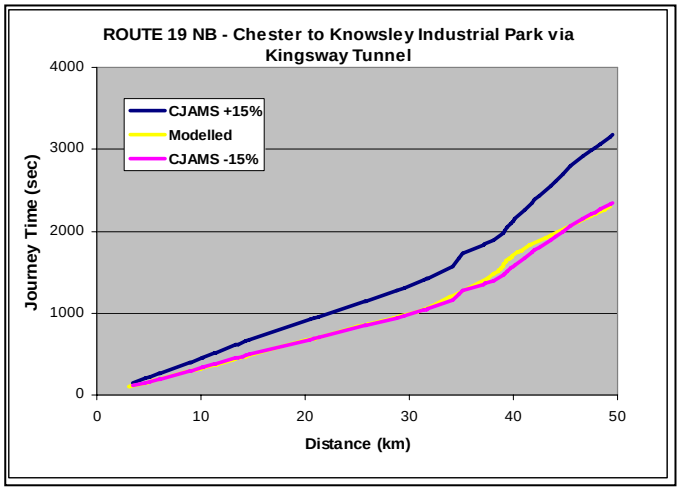
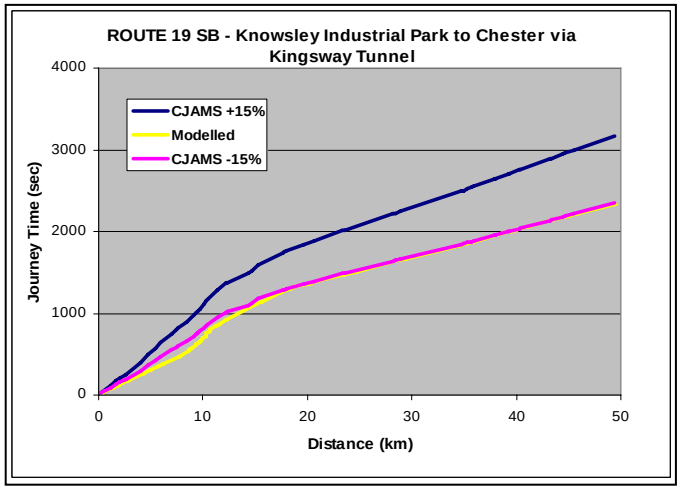
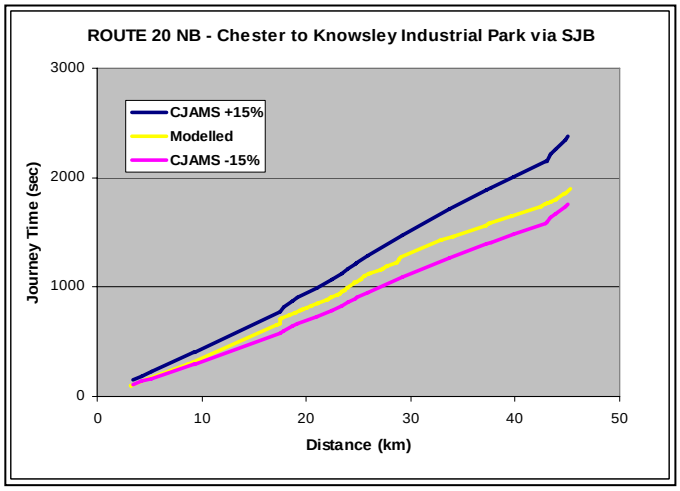
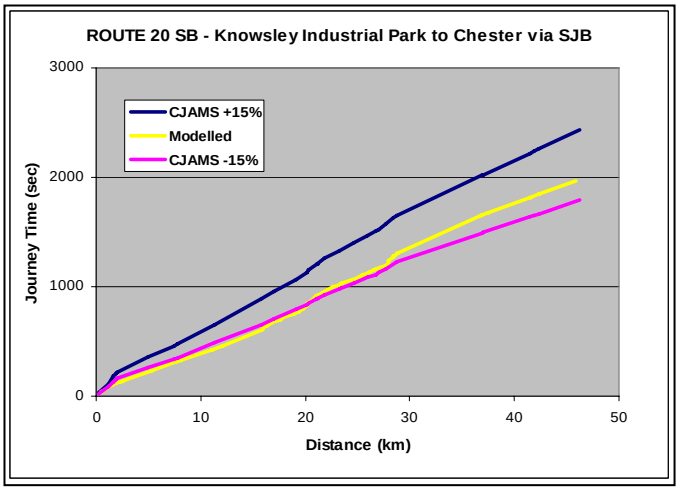
Mersey Gateway Study		Figure 10.2 Comparison of Journey Times – Inter Peak Hour (Sheet 4 of 5)		









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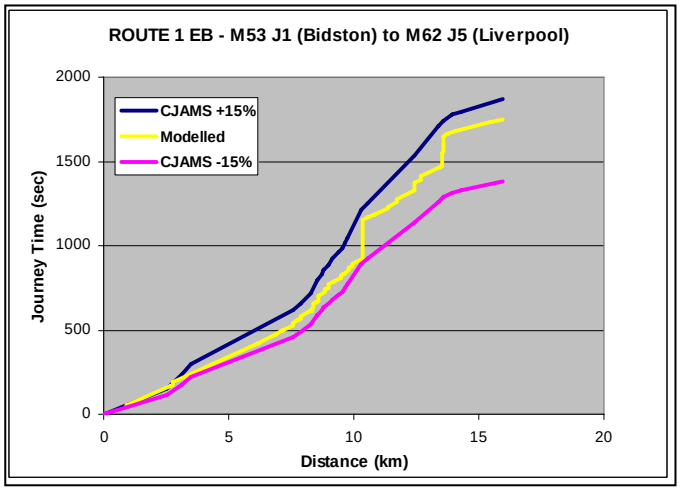
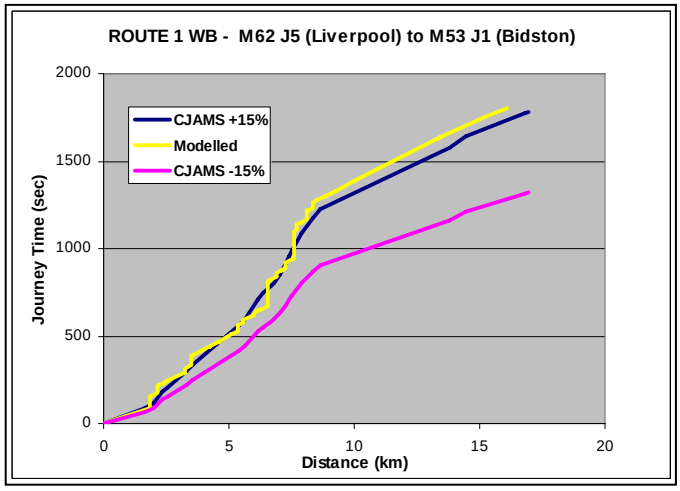
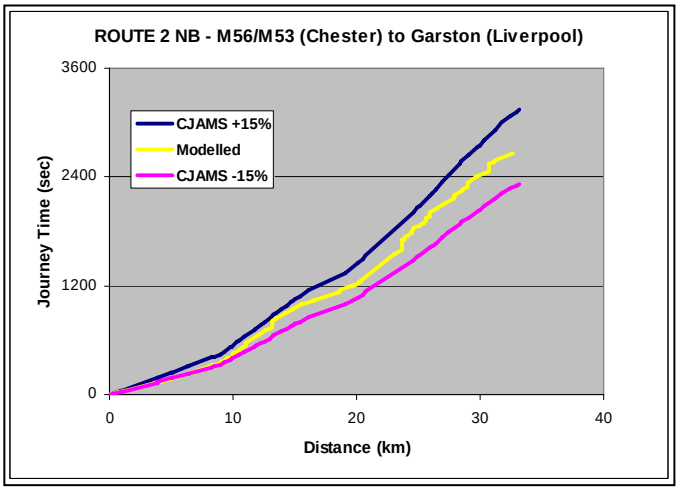
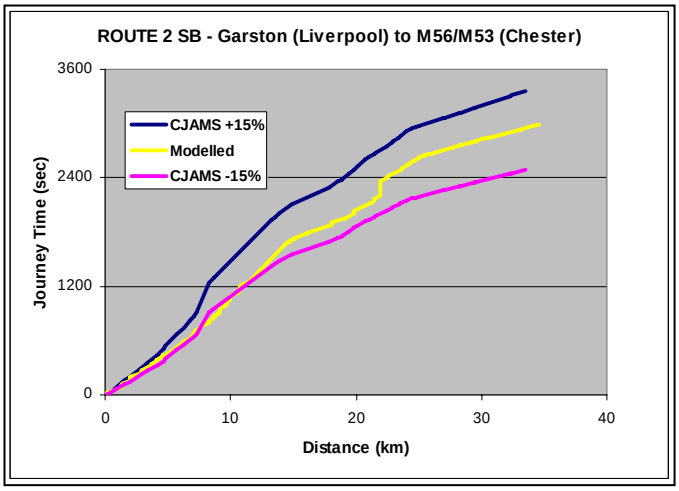
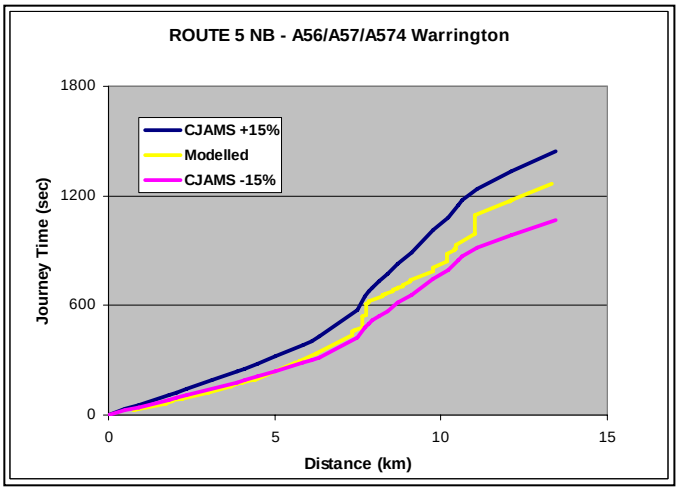
Mersey Gateway Study		Figure 10.2 Comparison of Journey Times – Inter Peak Hour (Sheet 5 of 5)			

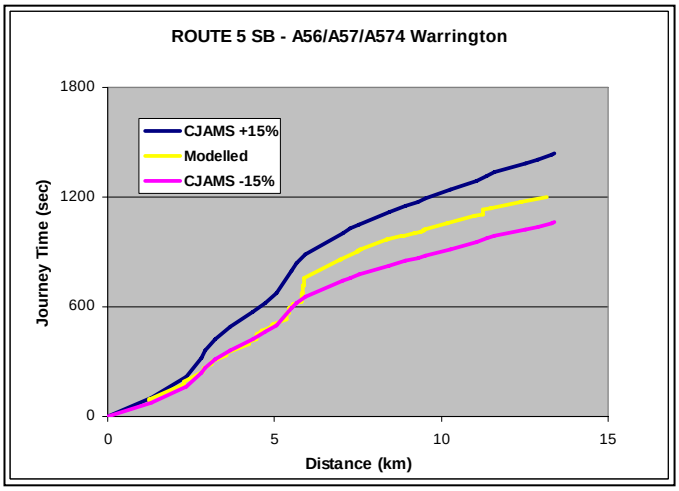












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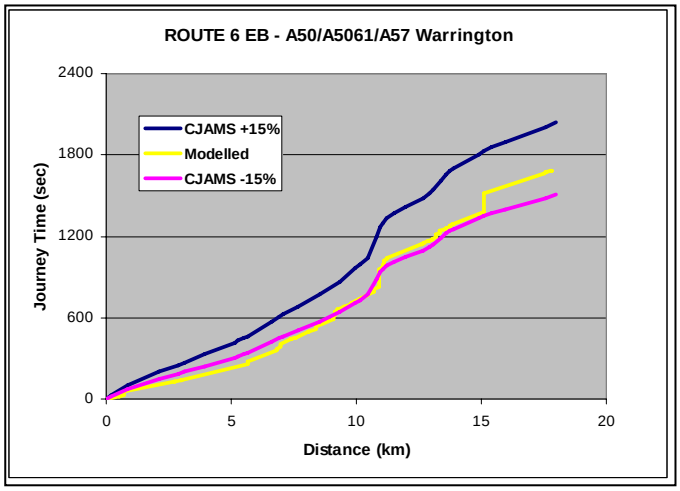
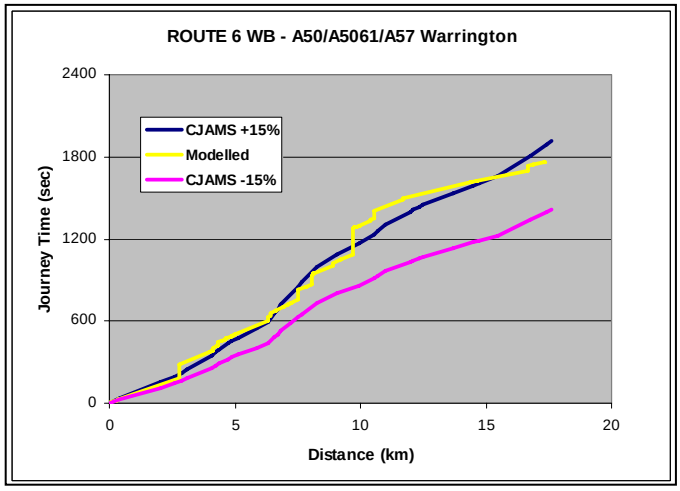
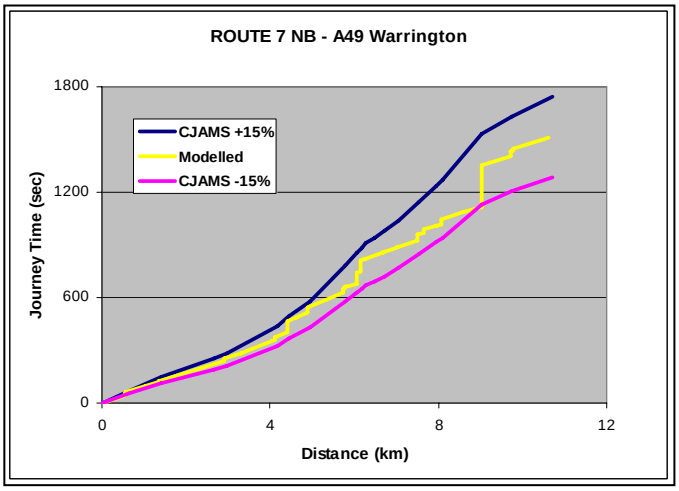
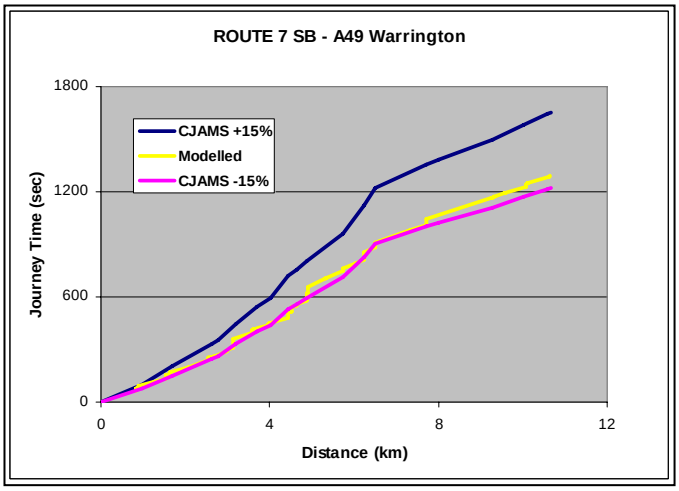
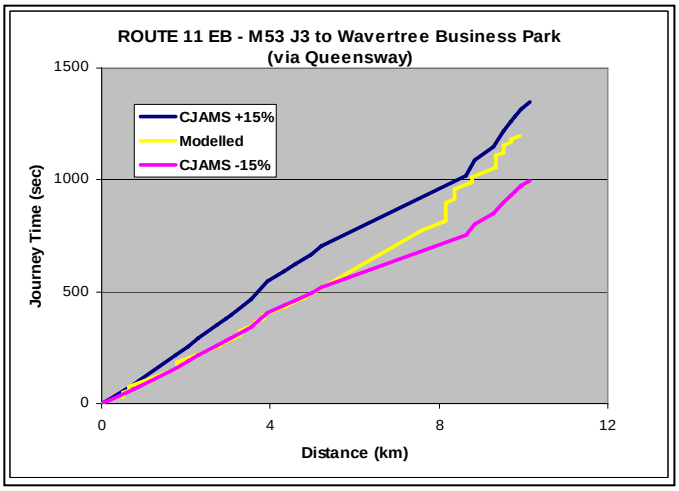
Mersey Gateway Study		Figure 10.3 Comparison of Journey Times – PM Peak Hour (Sheet 1 of 5)			

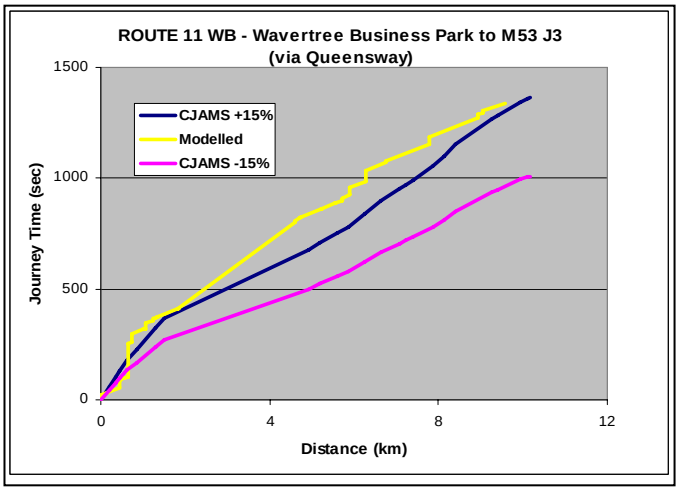












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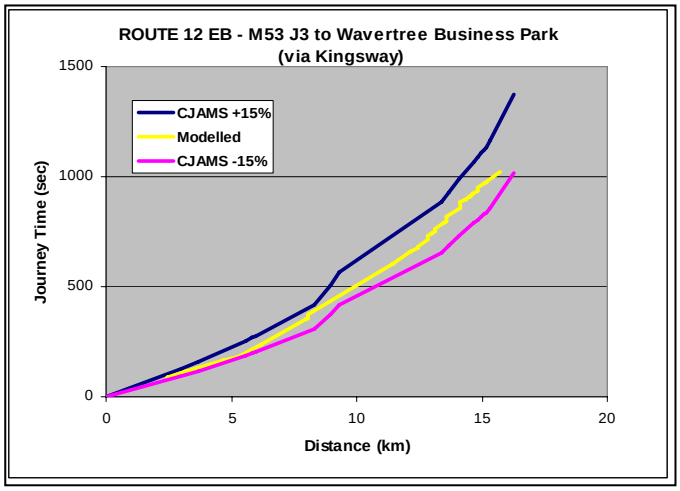
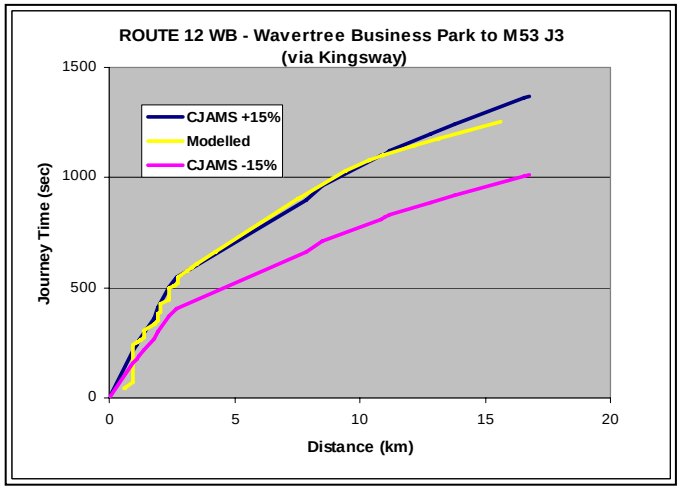
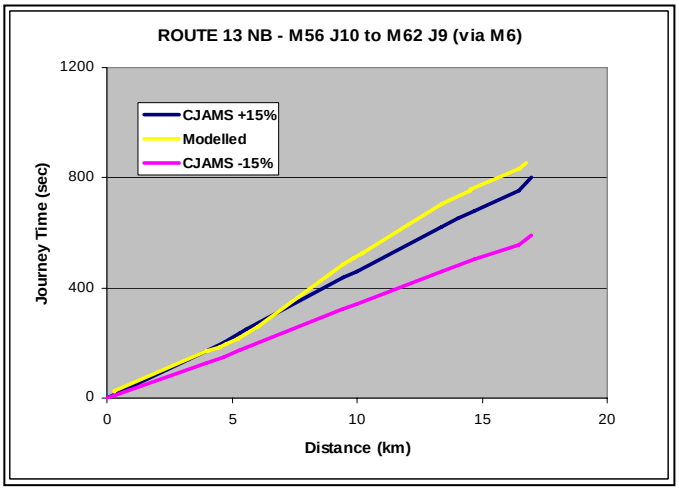
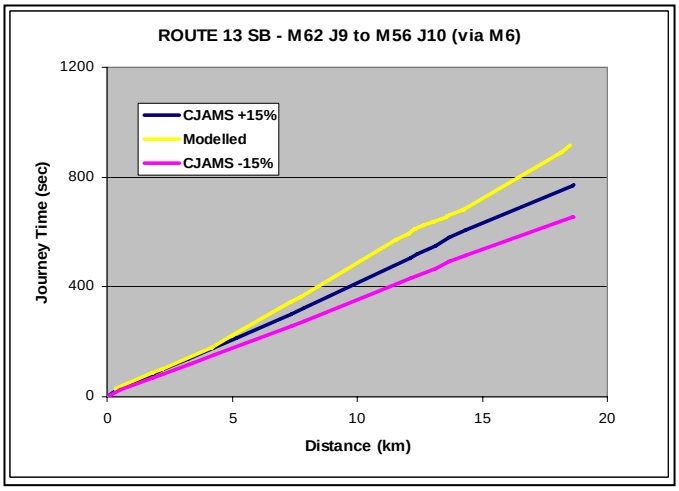
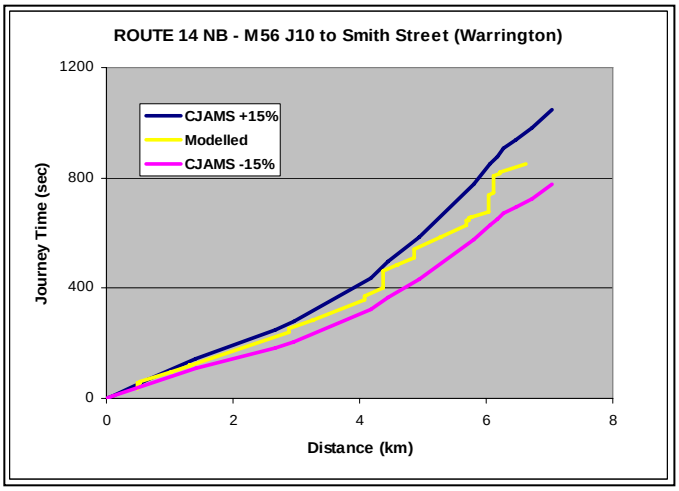
Mersey Gateway Study	Figure 10.3 Comparison of Journey Times – PM Peak Hour (Sheet 2 of 5)		

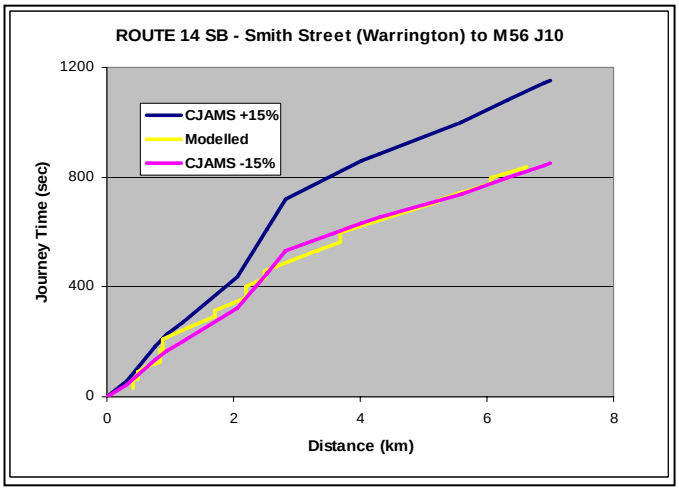












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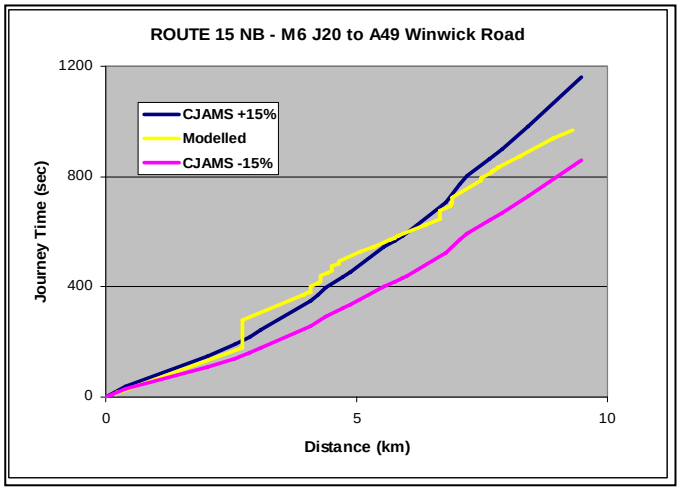
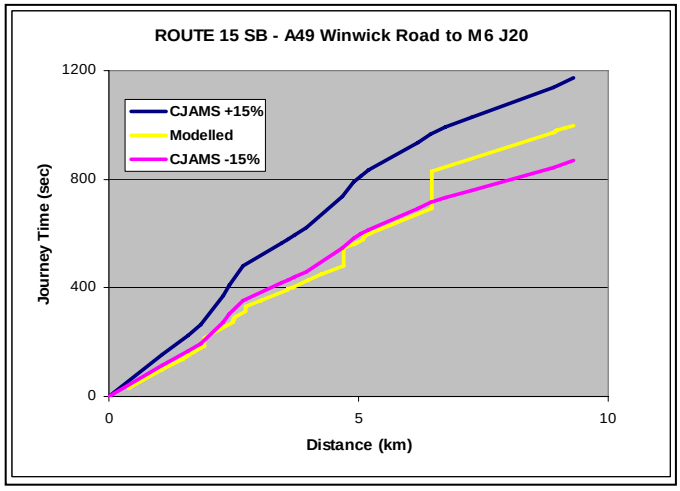
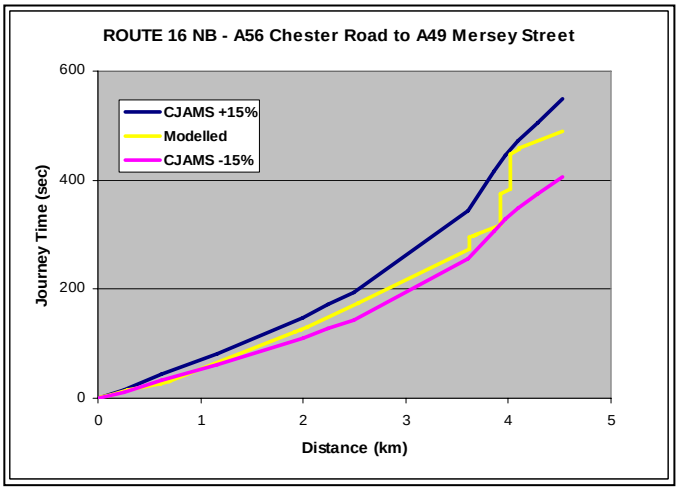
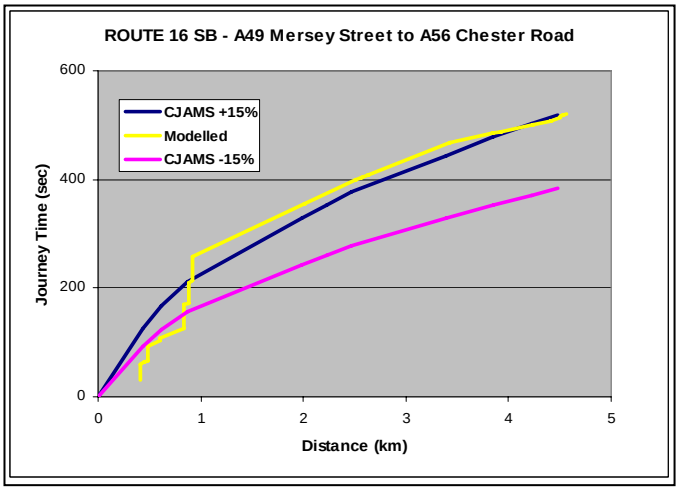
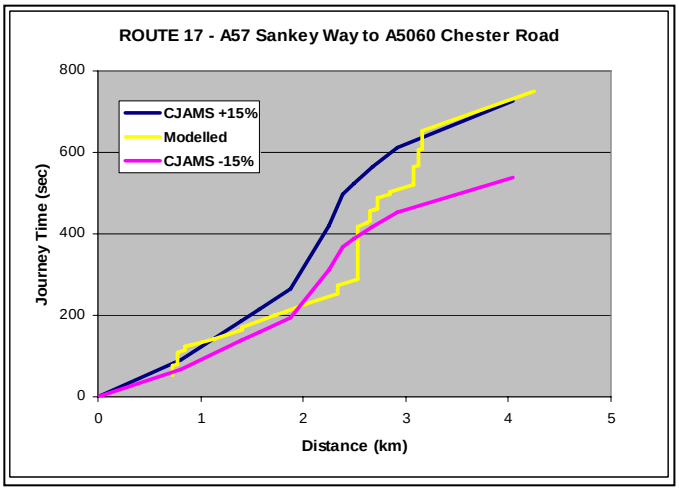
Mersey Gateway Study	Figure 10.3 Comparison of Journey Times – PM Peak Hour (Sheet 3 of 5)			

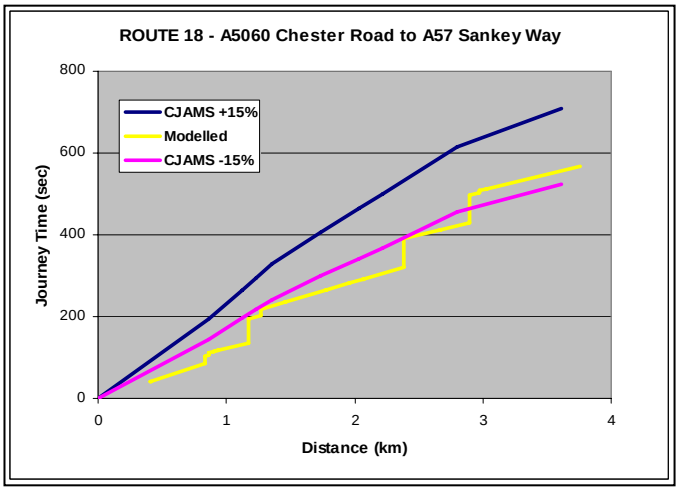












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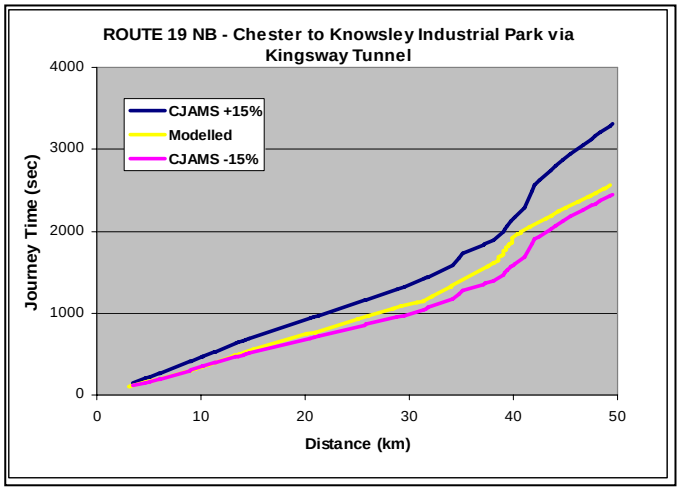
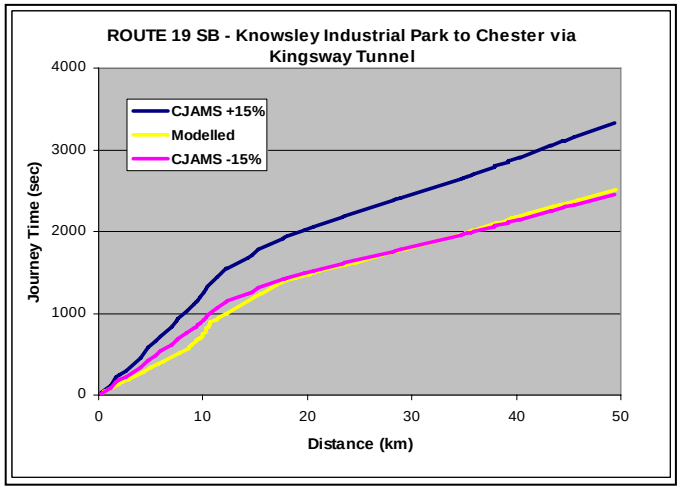
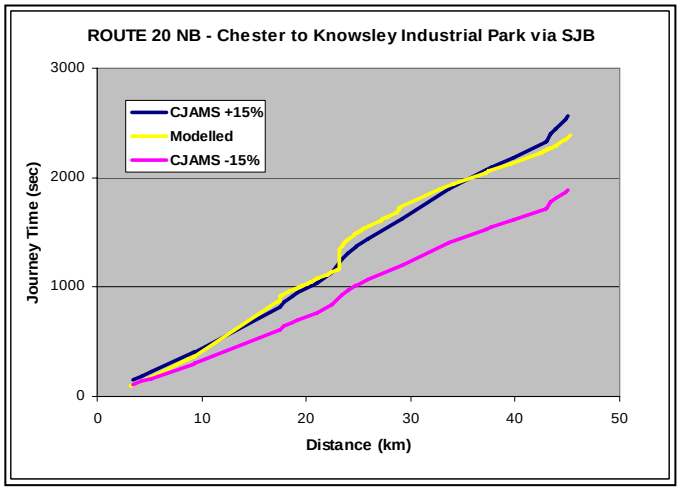
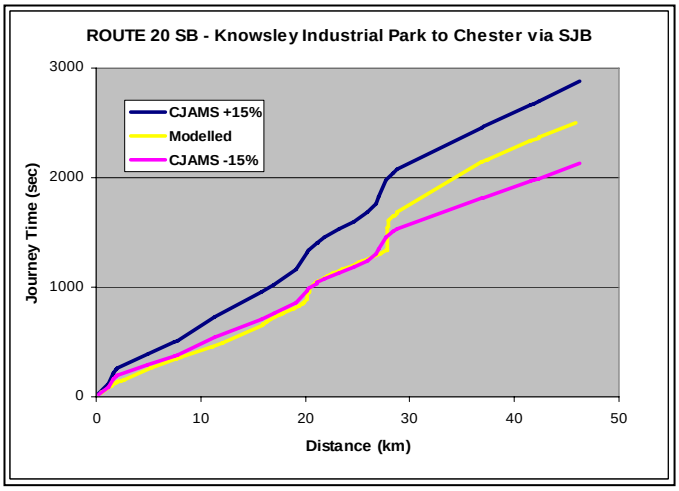
Mersey Gateway Study		Figure 10.3 Comparison of Journey Times – PM Peak Hour (Sheet 4 of 5)			









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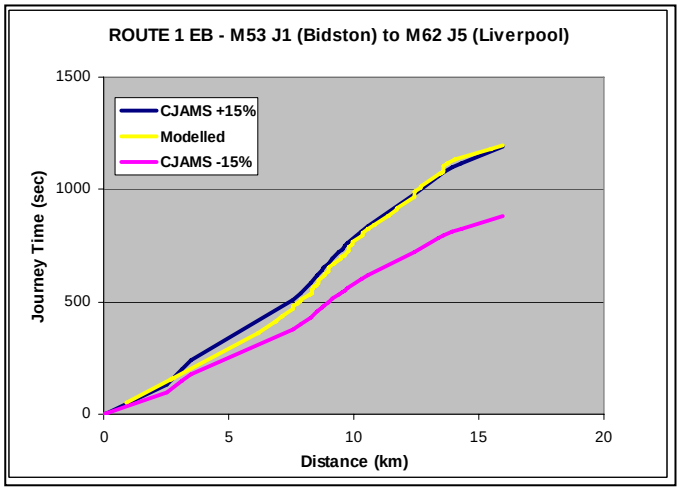
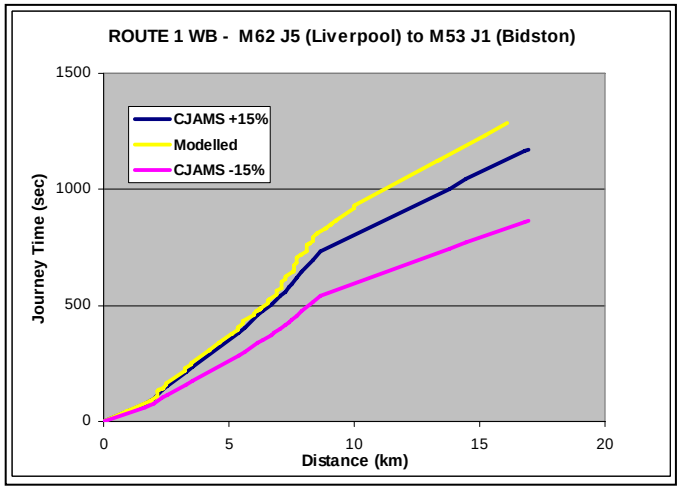
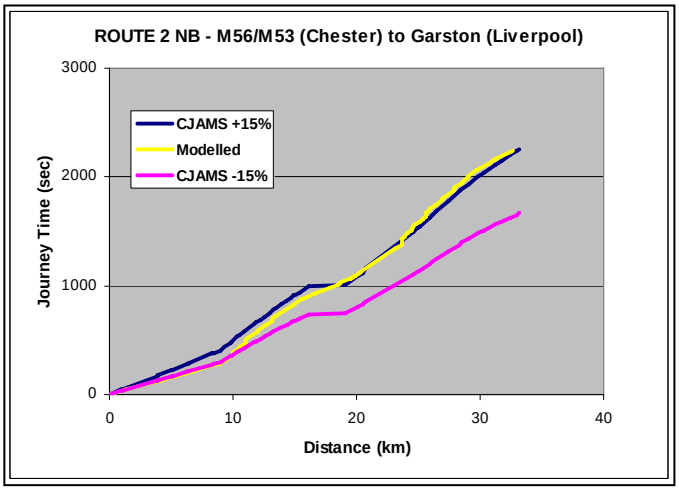
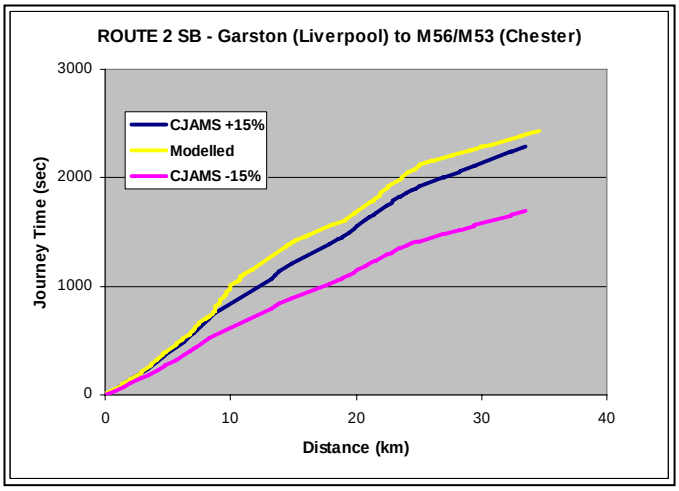
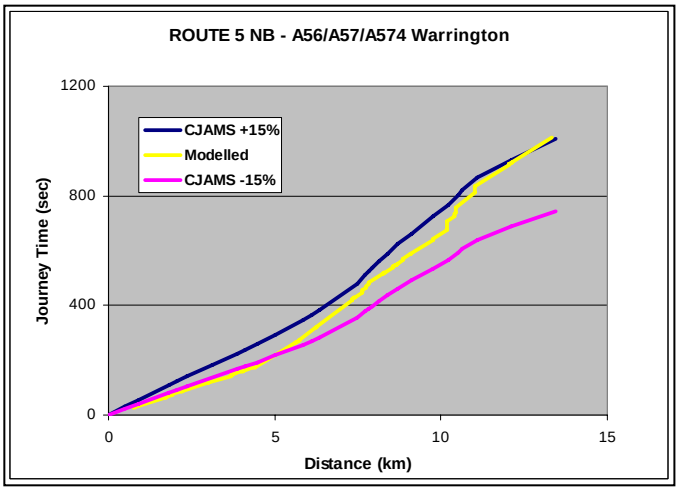
Mersey Gateway Study		Figure 10.3 Comparison of Journey Times – PM Peak Hour (Sheet 5 of 5)			

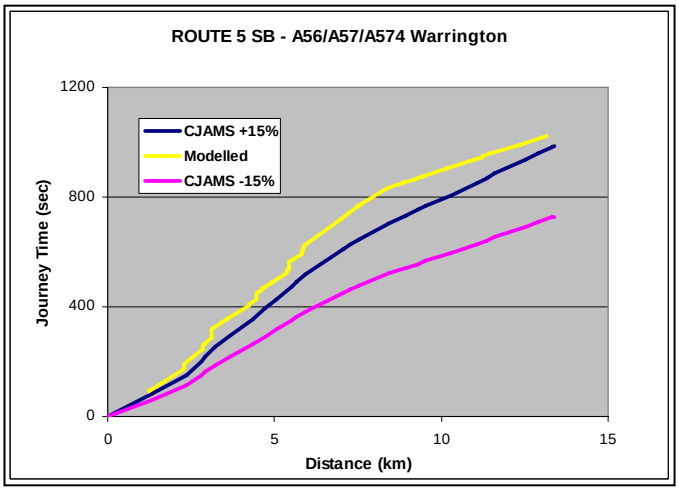












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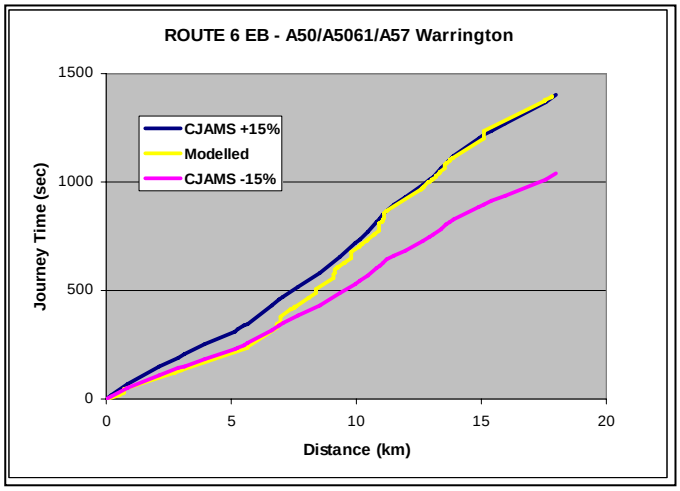
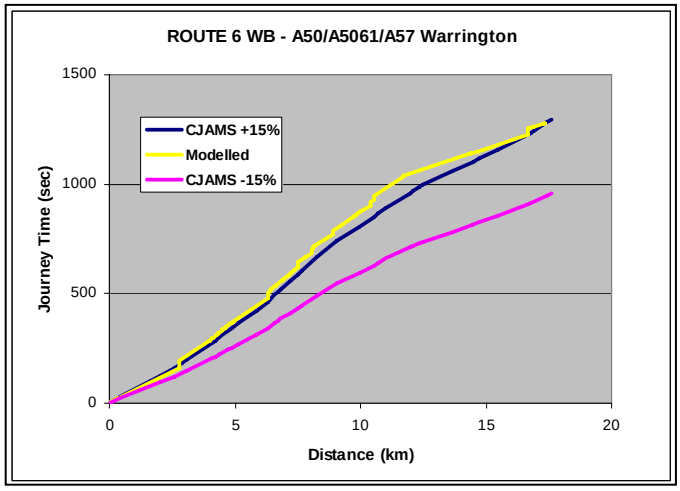
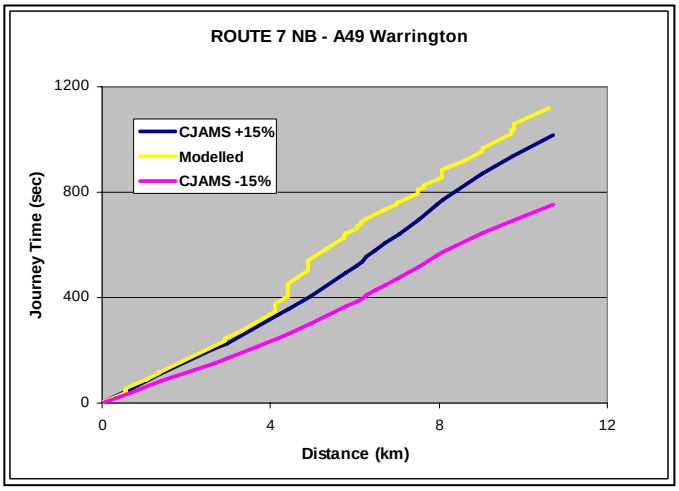
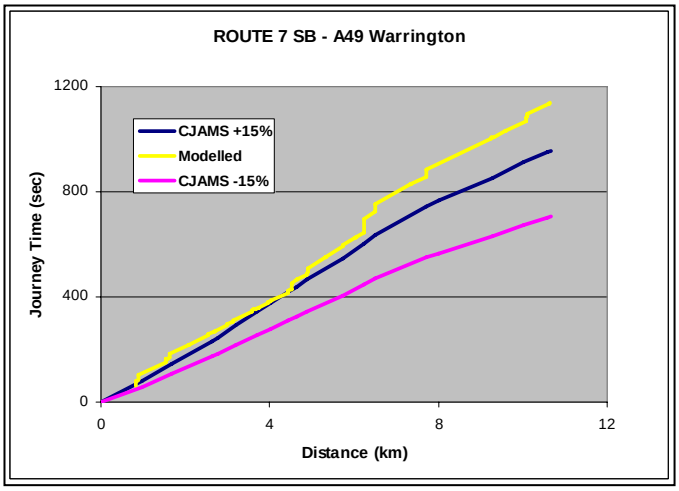
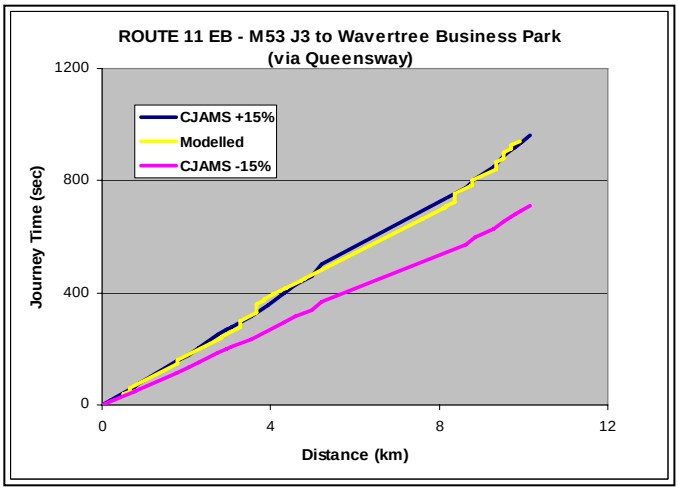
Mersey Gateway Study		Figure 10.4 Comparison of Journey Times – Overnight Hour (Sheet 1 of 5)			

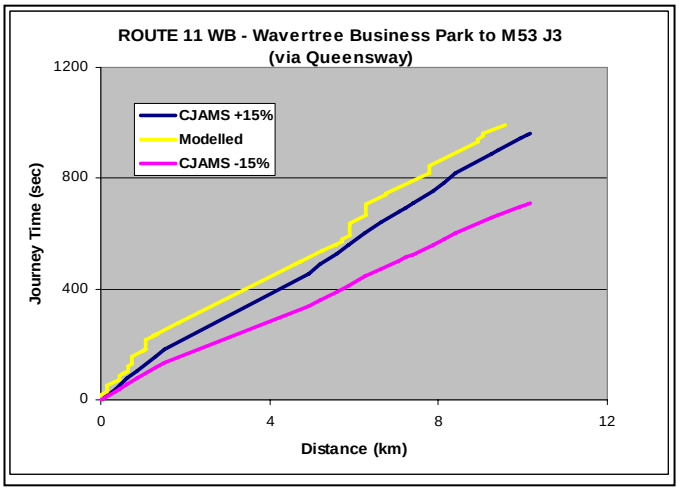












HALTON BOROUGH COUNCIL / Mott MacDonald			
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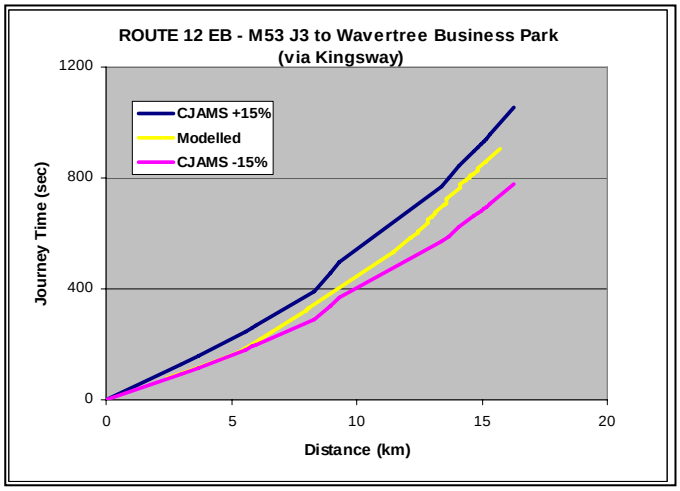
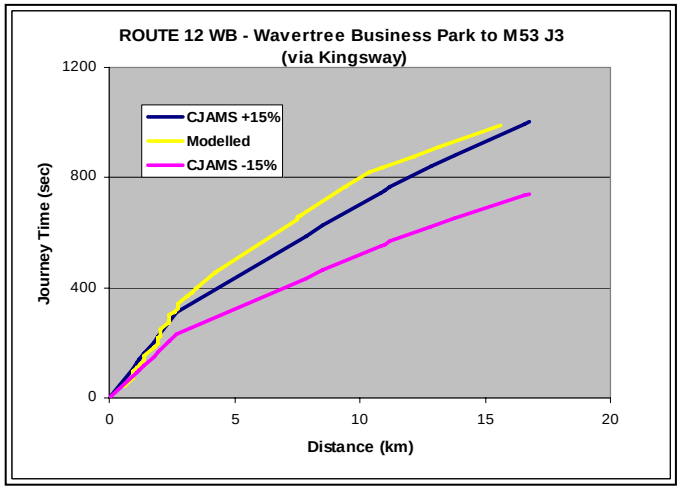
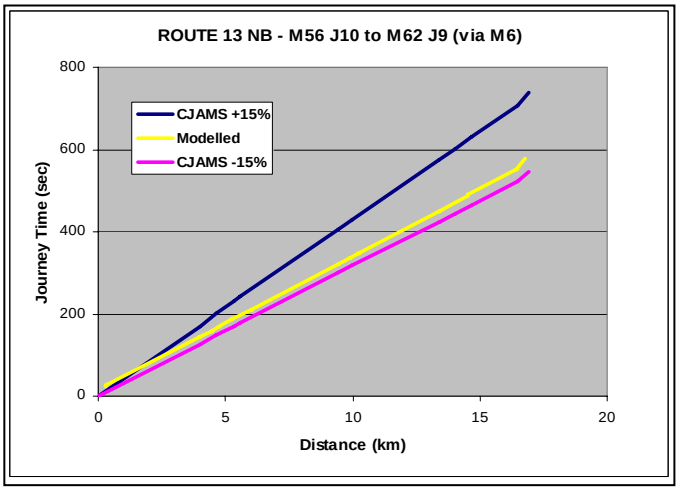
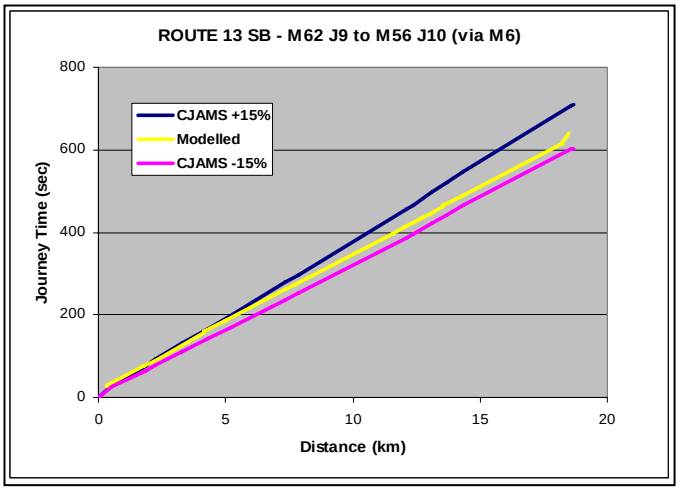
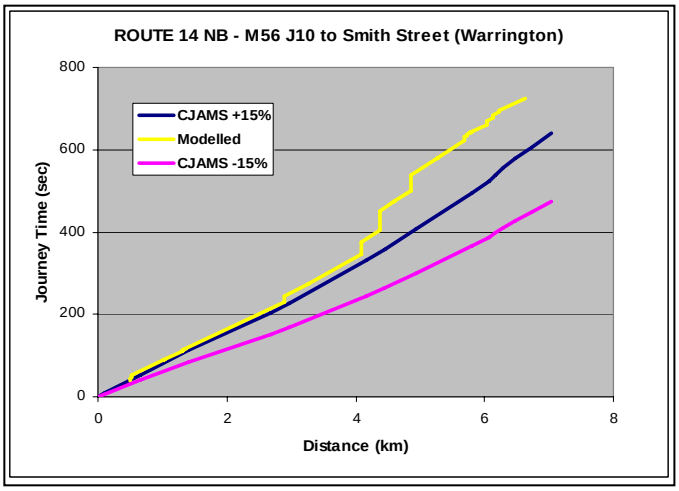
	Project: Mersey Gateway	File	
Mersey Gateway Study	Figure 10.4 Comparison of Journey Times – Overnight Hour (Sheet 2 of 5)		

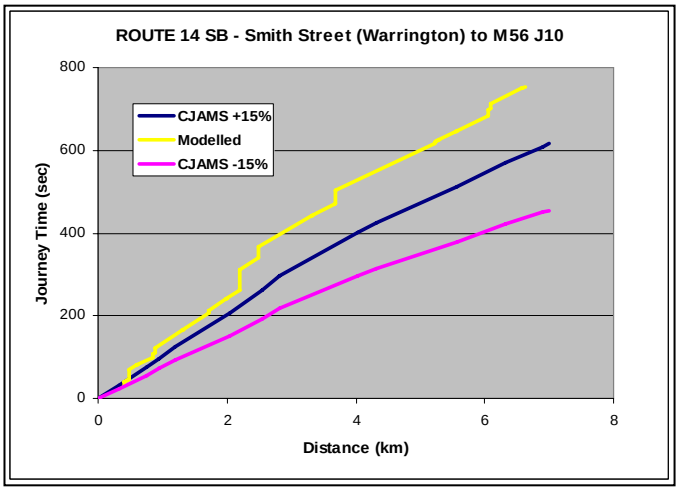












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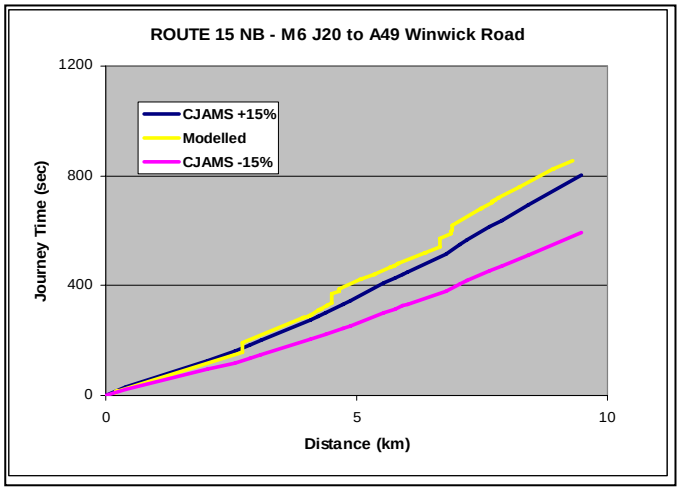
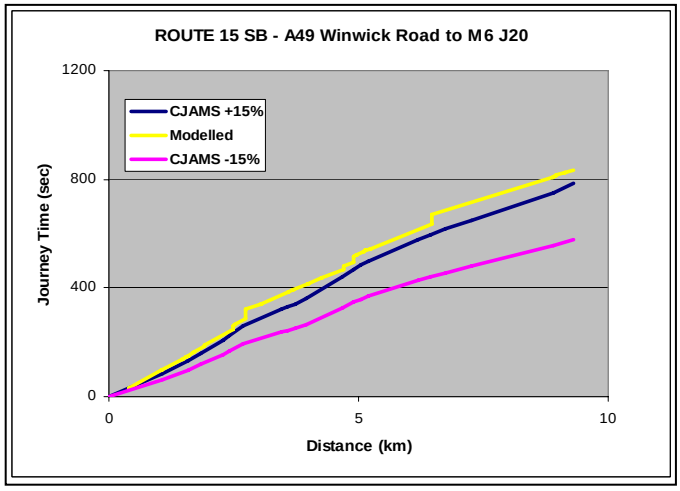
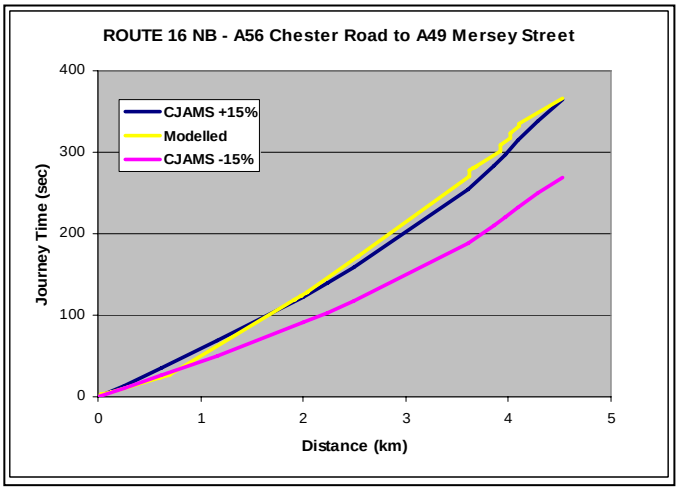
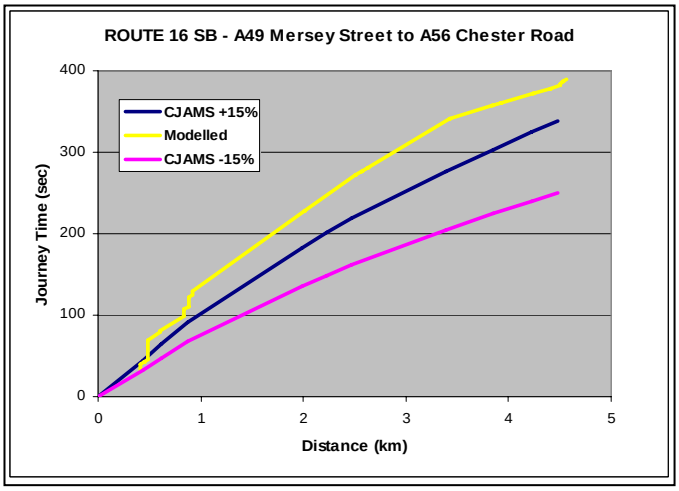
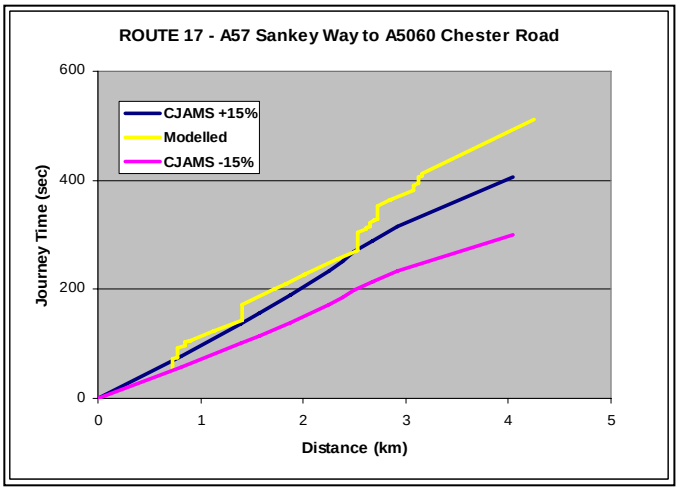
		Drawing Number		Date 16/12/08	
		Project Mersey Gateway	File		
Mersey Gateway Study		Figure 10.4 Comparison of Journey Times – Overnight Hour (Sheet 3 of 5)			

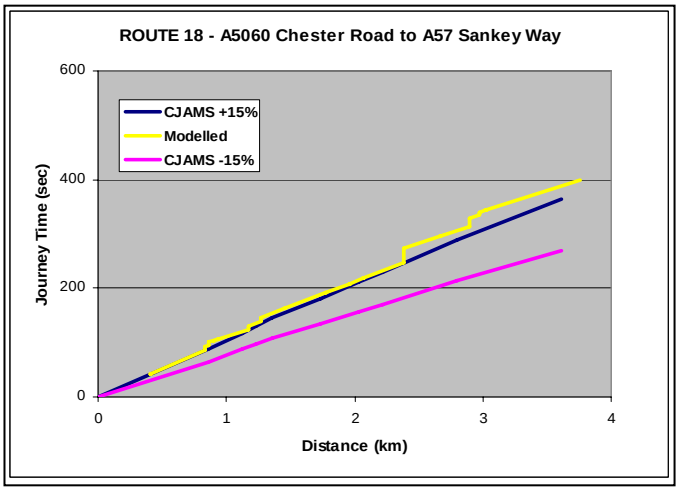












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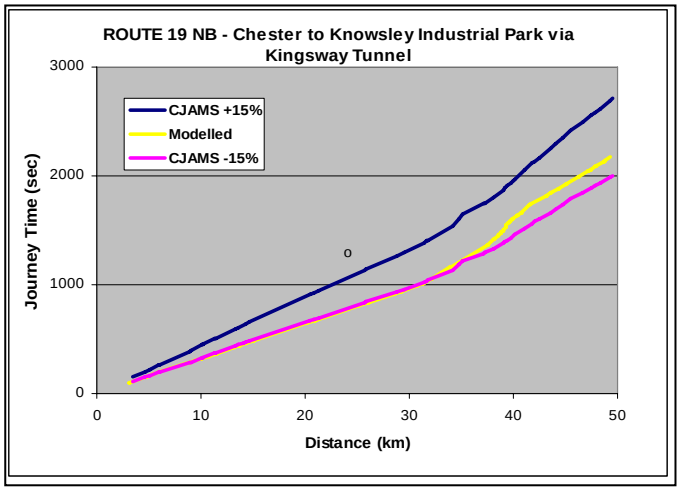
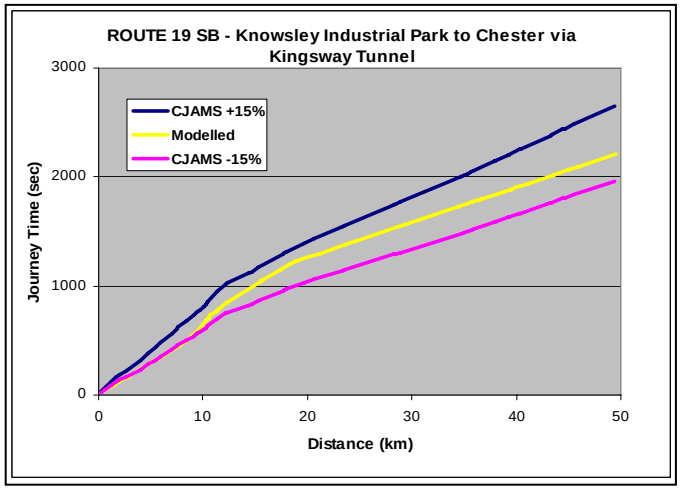
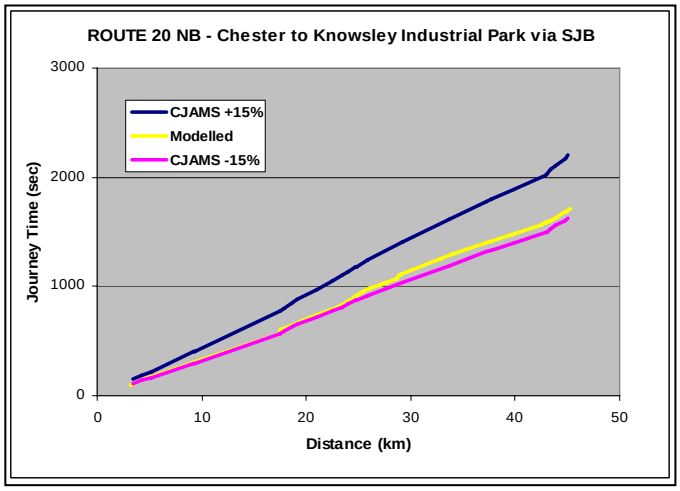
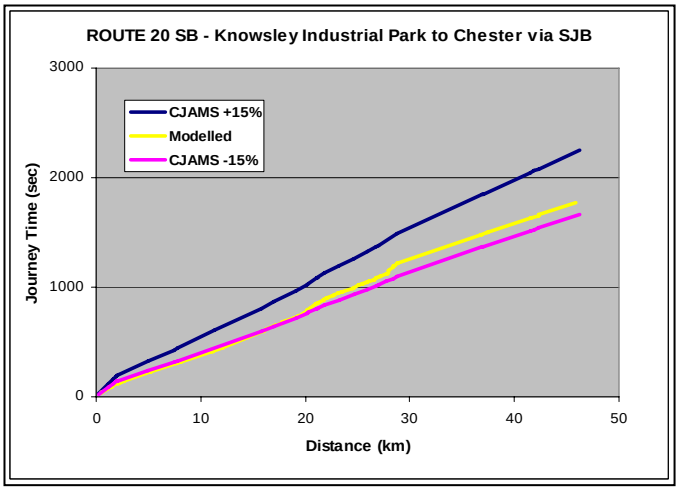
Mersey Gateway Study		Figure 10.4 Comparison of Journey Times – Overnight Hour (Sheet 4 of 5)			









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		Drawing Number		Date 16/12/08	
		Project Mersey Gateway		File	
Mersey Gateway Study		Figure 10.4 Comparison of Journey Times – Overnight Hour (Sheet 5 of 5)			