

HIGHWAYS AGENCY PINCH POINT SCHEMES A1(M) JUNCTION 6 & JUNCTION 7

Local Model Validation Report

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Highways Agency Pinch Point Schemes A1(M) Junction 6 & Junction 7

Local Model Validation Report

24/10/2012

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1 Introduction

1.1 Foreword

- 1.1.1 WSP has been commissioned by the Highways Agency (HA) to prepare a transport model of the A1(m) Junction 6 at Welwyn Garden City and Junction 7 at Stevenage, to support the economic analysis of proposed improvement schemes to the junctions. This report details the development of a single model that covers both junctions. It can then be used for the separate analysis of each scheme or junction to feed into an economic appraisal. The proposed schemes form part of the Area 8 Pinch Point appraisals.
- 1.1.2 The location of the A1(m) junctions is shown on Figure 1. Junction 6 is the junction of the A1(m) at Welwyn and the A1000 and is located to the north-west of Welwyn Garden City. Junction 7 is located at southern Stevenage where it meets the A602.

1.2 Scoping Report

- 1.2.1 WSP issued a Transport Modelling Methodology Note to the HA on 28th March 2012, which together with subsequent correspondence forms the agreed methodology for the assessment of the Area 8 Pinch Point Schemes. The methodology report sets out the scope, methodology and assumptions to be used in the traffic modelling process that will subsequently be used to assess the impact of the proposed schemes.
- 1.2.2 The model development and this report are consistent with the methodology set out within the agreed methodology report.

1.3 Report Purpose and Structure

- 1.3.1 This report provides the Local Model Validation Report (LMVR) for the transport model which is to provide the basis for the future scheme assessment. It demonstrates the ability of the model to replicate observed traffic conditions and its suitability to be used as a forecasting tool for the assessment of the potential improvement schemes.
- 1.3.2 The model's performance is assessed against the range of criteria set out in the Design Manual for Roads and Bridges (DMRB) Volume 12, Section 2 Traffic Appraisal in Urban Areas.
- 1.3.3 This LMVR is structured as follows:
 - Section 2 describes the data collected for use in the model;
 - Section 3 describes the development of the base traffic network in the model;
 - Section 4 describes the development of the traffic flow matrices used in the model;
 - Section 5 describes the calibration of the model against observed data;
 - Section 6 describes the validation of the model against observed data; and
 - Section 7 provides a summary of the main conclusions of the LMVR and an overall conclusion as to the suitability of the model for use in the future option testing.



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2 Data Collection

2.1 Introduction

- 2.1.1 For the purpose of network matrix construction, model calibration and validation a wide variety of traffic data has been collected through the following survey methods:
 - Traffic count surveys;
 - Queue surveys;
 - Automatic number plate recognition (ANPR); and
 - Journey time surveys.
- 2.1.2 The traffic data collection was commissioned by URS on behalf of the HA and all the above data was collected by Sky High Count on Us (Sky High) on Wednesday 22 May 2012. The data that was collected is described in more detail below.

2.2 Traffic Count Surveys

- 2.2.1 Automatic traffic count (ATC) data was collected at each location that represents an entry or exit point from the model during the week commencing 21 May 2012. This was included in the data collection exercise to establish a cordon around the model area to ensure the correct order of trips were included in the matrix. The following locations were surveyed:
 - Great North Road;
 - Church Street;
 - # A1000 Welwyn Bypass Road North of Lockleys Drive
 - A1000 Hertford Road southbound
 - A1000 between Hertford Road roundabout and northbound off slip roundabout
 - # A1000 Hertford Road northbound
 - Parkside
 - Maran Avenue
 - B197 Welwyn Bypass Road
 - # A1072 Gunnelswood Road, south of Leyden Road
 - A602 Broadhall Way
 - A1072 Gunnelswood Road, Glaxo Smithkline

(# these sites collected incomplete ATC data but other survey data was available for these model entry points)

- 2.2.2 Manual classified turning counts were undertaken using video cameras at the following locations and are illustrated on Figure 2 of Appendix A:
 - A1 Junction 6, B197, A1000 Welwyn Bypass roundabout;
 - A1000 / Hertford Road roundabout;
 - B656 Link Road / A1000 / B197 roundabout;
 - A1 Junction 7 / A602 Broadhall Way roundabout;



- A602 Broadhall Way / A1072 Gunnelswood Road.
- 2.2.3 The traffic count data was collected for the following time periods:
 - Morning peak period (06:00 10:00); and
 - Evening peak period (16:00 20:00).
- 2.2.4 The following vehicle classes were counted
 - Cars and motorcycles;
 - Light Goods Vehicles (LGV);
 - Other Goods Vehicles (OGV1, OGV2);
 - Public Service Vehicles (PSV).
- 2.2.5 The number of pedal cycles passing through the junction was also counted; however the volume of pedal cycles was insignificant.

2.3 Queue Surveys

- 2.3.1 Queue surveys were undertaken at the five MCC sites identified above. The queues were recorded using video cameras and in each lane on the approaches to the junction.
- 2.3.2 The queue data was collected in terms of maximum queue length in metres in each lane in each five minute time interval between:
 - Morning peak period (06:00 10:00)
 - Evening peak period (16:00 20:00)

2.4 Journey Time Surveys

- 2.4.1 Journey time surveys were undertaken 22 May 2012. The data was collected for the following time periods:
 - Morning peak period 06:00 10:00; and
 - Evening peak period 16:00 20:00.
- 2.4.2 The journey times were measured by survey vehicles driving along nine survey routes, which are shown on Figure 3 of Appendix A. All the survey vehicles carried a GPS receiver that recorded the position and speed of that vehicle at approximately one second intervals. The journey time on each section has been obtained from these GPS records.

2.5 ANPR Data

- 2.5.1 Automatic number plate recognition cameras were set up at five locations in the model area, as shown on Figure 4 of Appendix A. These locations are as follows:
 - A1(m) Junction 5 main carriageway northbound and southbound
 - A1(m) Junction 6 northbound off-slip;
 - A1(m) Junction 6 northbound on-slip;

- A1(m Junction 8 main carriageway northbound and southbound;
- A1(m) Junction 7 eastbound and westbound on A602.
- 2.5.2 The ANPR cameras were located to identify the frequency of traffic using the local roads as an alternative route to the A1(m) at junction 6 when the main carriageway is congested, particularly during the evening peak period.

2.6 Other Data

- 2.6.1 The traffic signals at the Junction 7 currently operate under SCOOT control. The SCOOT datasets, signal controller data and the SCOOT controller logs, were obtained from Hertfordshire County Council and were used in the model as fixed times to replicate the observed signal timings.
- 2.6.2 The traffic signal operation for the junction of A1000 Hertford Road / Welwyn Bypass Road have also been obtained from Hertfordshire County Council and included in the model appropriately.
- 2.6.3 Bus route information for bus services in the vicinity of the junction was obtained from the Traveline website. The bus timetable/ map information was included in the model acordingly.
- 2.6.4 The base mapping for the model development is based on Ordnance Survey 1:1250 scale mapping. Road markings have been added based on information received from CarillionWSP, as built drawings of the junction and from the aerial / street view photographs available on Google supplemented with information recorded from site visits.



3 Network Development

3.1 Introduction

3.1.1 This section sets out the methodology and processes used for the development of the S-Paramics model network. The development of the trip matrices used within the model is described in section 4.

3.2 Study Area

- 3.2.1 The study area of the model is defined based on the following items:
 - Local knowledge with regard to network performance;
 - Discussions with HA;
 - Scale of proposed improvement scheme; and
 - Interaction of local junctions.
- 3.2.2 The approximate extents of the model are shown on Figure 5 of Appendix A.

3.3 Time Periods

- 3.3.1 The model has been developed for the morning and evening peak periods. This enables loading of vehicles prior to the assessment period and the completion of trips post the assessment period. The modelled periods are:
 - 06:00 10:00; and
 - 16:00 20:00
- 3.3.2 The first and last half hour time periods of the models are warm-up / cool-down periods to ensure that the model has sufficient traffic in the assessment periods. The hours for detailed assessment and model validation are:
 - AM Peak 07:30 08:30;
 - AM Period 06:30 09:30;
 - PM Peak 17:00 18:00; and
 - PM Period 16:30 19:30.
- 3.3.3 The peak hours have been identified by summing the total observed traffic movements within the study area for each 15 minute period and identifying the highest combined flow of four consecutive 15 minute periods.

3.4 Road Network Development

- 3.4.1 The road network within S-Paramics has been constructed using:
 - detailed 1:1250 mapping provided by the HA for the entire study area;
 - site visits;
 - video surveys of the junctions;
 - as built drawings for junctions (where available); and

- aerial photography and "Streetview" photographs from Google Maps
- detailed knowledge ascertained from site visits.
- 3.4.2 The links have been categorised as either highway or urban and using their designated speed limit in the model network. The geometry of the junctions and the stoplines has also been replicated in the model to ensure vehicles are stopping on the junction approaches and travelling through the junctions as observed in reality.

3.5 Signal Timings

- 3.5.1 The signal timings for the SCOOT controlled Junction 7 have been replicated in the model using observed average signal timings from the survey day. The as built drawings were used to replicate the positions of the loops and a signal plan was written which changes the signal timings depending on the time of day and the traffic conditions.
- 3.5.2 The part time signal timings for the A1000 / Welwyn Bypass Road have been included in the model along with the positioning of the loop detectors. A 'plans' file has been created which alters the signal timings depending on the time of day and the traffic conditions to ensure the signals perform in the same way as they do on the ground.

3.6 Public Transport Services

- 3.6.1 The bus routes have been included directly in the model using the bus routes editor rather than having a separate matrix for these vehicles. The service frequencies and times have been taken directly from the timetables of the relevant bus services. The bus routes that have been included are as follows:
 - 797 Stevenage / Hitchin to London
 - 314 Hitchin to Welwyn Garden City
 - 300/301 Stevenage to Hemel Hempstead
 - 5/50 Stevenage local circular route
 - 4/40 Stevenage local circular route.
- 3.6.2 These were the routes which had frequent service times which fell within the four hour modelled periods. All journeys were included in the model within the relevant time periods.

3.7 Differences Between the AM and PM Models

3.7.1 The network construction and node and link positioning within both the AM and PM models are identical. However, it was necessary to split the models due to the tidal nature of the flows through the model network. This meant that aggressive behaviour accepting low levels of gap acceptance was observed in one period at certain junction approaches but the same characteristics were not required at the junction in the other time period.



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4 Matrix Development

4.1 Introduction

4.1.1 Section 2 described the data collection sources and details of the data collected. This section describes how this data has been used to develop the trip matrices used in the S-Paramics model, including the development of the prior matrix from the observed traffic counts, the estimation of additional traffic demand from the queue data and the suitability of the estimated matrix for use in the 2012 validation models.

4.2 Prior Matrix Structure

- 4.2.1 The S-Paramics model comprises sixteen zones, as shown on Figure 6 of Appendix A, namely:
 - Zone 2 A1(m) Junction 8 main carriageway north and south bound;
 - Zone 3 A602 Broadhall Way;
 - Zone 4 Glaxo-SmithKline entry/exit;
 - Zone 5 A1072 Gunnelswood Road
 - Zone 6 Whittle Way (inbound only)
 - Zone 7 Glaxo-SmithKline entry from Junction 7 roundabout (inbound only)
 - Zone 8 Knebwoth House / Novotel
 - Zone 9 B197 Great North Road
 - Zone 10 B656 Church Street
 - Zone 11 Parkside
 - Zone 12 A1000 Hertford Road (outbound only)
 - Zone 13 A1000 Welwyn Bypass Road (inbound only)
 - Zone 14 Maran Avenue
 - Zone 15 B197 Welwyn Bypass Road
 - Zone 16 A1(m) north of junction 5 northbound (outbound only)
 - Zone 17 A1(m) south of junction 7 southbound (inbound only)
- 4.2.2 These zones represent the entry/ exit points from the model network. Matrices have been developed for the four vehicle classes in fifteen minute intervals for the two four-hour model periods. The following vehicle classes have been used:
 - Cars (and motorcycles);
 - LGV;
 - OGV1;
 - OGV2.
- 4.2.3 PSV does not have a separate matrix because these have been included directly in the model as bus routes connected to the bus stops.



- 4.2.4 The matrices have been identified for the following time periods, which have been further broken down through the development of a 'profiles' file:
 - 06:00 10:00
 - 16:00 20:00.

4.3 Prior Matrix

4.3.1 The prior matrix is fully based on the observed traffic movements at the junctions which have traffic data collected for the turn counts, taken from the traffic count data. Where the data is not directly known from the turn counts some of the remaining cells in the matrix have been completed by using the ANPR data. Where ANPR data and turn count data is not available the turning proportions have been used to provide a prior matrix.

4.4 Matrix Development Methodology

- 4.4.1 The matrix has been developed in a number of stages making best use of the data available, with the most reliable data having the highest priority. The list below sets out a summary of the development process of the trip matrices, which is considered in detail with the remainder of this section:
 - Identify zone arrival and departure targets;
 - Identify all known movements;
 - Add ANPR data;
 - Add proportional traffic count data;
 - Furness matrix; and
 - Add additional demand.

4.5 Zone Arrival and Departure Targets

- 4.5.1 MCC data has been used to identify arrival and departures targets for each of the zones within the model.
- 4.5.2 The observed traffic flow data has some minor inconsistencies between adjacent junctions. Where this has been identified (with no intermediate junction), the traffic flows have been balanced to ensure consistent data is used within the model.
- 4.5.3 Inconsistent traffic movements cannot be replicated in a model which uses origin destination (OD) pairings and data inconsistencies should be resolved prior to the use of the data.
- 4.5.4 For the purpose of this study, there were no significant inconsistencies in the data between the junctions.
- 4.5.5 Once this process was completed, the arrivals and departures have been balanced to ensure the entry and exit flows within the model are equal.

4.6 Known Movements

4.6.1 All known zone to zone movements directly observed within the study area are directly input to the matrices as fixed values which cannot be changed.

4.6.2 Additionally, all movements known to be impossible or illogical are set to a 0 value which cannot be changed in the furness process.

4.7 ANPR Data

- 4.7.1 The ANPR data has been used to identify the proportional distribution of trips for each OD pairing within the model where the data is available.
- 4.7.2 This proportion is then applied to the observed departure trip target, with the known movements removed.

4.8 Proportional Traffic Data

4.8.1 For any remaining OD pair without a value, observed turning count data has been portioned, assuming that the origin of the trip does not influence the destination. This enables a % distribution for each destination from each origin to be identified.

4.9 Furness

- 4.9.1 The ANPR data and proportional traffic data use the departure flows for the distribution of trips. Due to this process, although all matrix departure targets would be met, the arrival targets do not exactly match the target values. To balance the matrix, and apply equal weight to both observed origin and destination totals, a furness process has been used.
- 4.9.2 Firstly all known movements have been removed from the matrix and targets as these should not be changed through the process. The furness process then used an iterative technique to balance origin and destination flows using the proportional size of the pairings.
- 4.9.3 Once this process was completed, the known movements were added back into the matrix.

4.10 Additional Demand

- 4.10.1 Following the process identified above, an initial matrix was completed which replicated all of the observed movements from the traffic data. It does not incorporate the additional demand that may not have been captured through queued traffic on an entry zone to the model. It does not affect internal junctions.
- 4.10.2 The turning movements counted in each fifteen minute time segment are only the traffic that passed through the junction during that time period. The traffic counts do not include any demand that could not pass through the junction in a time segment due to queuing. For example, if the length of a queue extends during a 15 minute time segment, this means that the traffic demand is higher than observed in the traffic counts, with a lower demand than observed if the queue length reduces.



- 4.10.3 This suppressed demand therefore needs to be added into the matrix to ensure that queue lengths can be more easily replicated in the model. The additional traffic demand has therefore been estimated based on the change in queue length observed in the queue surveys, as follows:
 - The observed queue length on an arm at the start of a time period is subtracted from the observed queue length at the end of a time period;
 - The difference in queue length is then divided by a vehicle factor to convert the queue from metres into vehicles;
 - The queue demand is proportioned across the movements in each time period; and
 - The queue demand is then added to the prior matrix.

4.11 Matrix Rounding

4.11.1 The matrix process introduced a number of proportional trips of less than 1 which cannot be used within the micro-simulation model. The matrix was therefore converted to an integer matrix, with a rounding factor applied to ensure the total number of trip remains constant.

4.12 Analysis of Final Matrix

4.12.1 The final matrix is the addition of the prior matrix known movements, the furnessed matrix and the additional demand. As described within this section, the matrices are fully based on the observed turning count data, with minor adjustments to represent the traffic demand that was suppressed due to queuing. As a result it is considered that the matrices adequately represent the observed traffic conditions as they are entirely based upon directly observed values.

AM Period	Total
Cars	32,591
LGV	5,858
OGV1	1,033
OGV2	834
Total	40,316

Table 4-1 - Summary of AM Peak Matrix

4.12.2 This compares with a total number of trips entering the network in the four hour morning peak period, taken from the observed data, being 40,496 trips for the equivalent vehicle types (excludes PSV).

PM Period	Total
Cars	35,280
LGV	4,544
OGV1	372
OGV2	477
Total	40,673

Table 4-2 - Summary of PM Peak Matrix

4.12.3 In the PM peak four hour model matrix, the equivalent total number of trips observed in the surveys was 40,724, which is well represented by the final matrix. The row and column totals match well against the observed counts from the traffic surveys.

4.13 Matrix Profiles

4.13.1 15 minute matrices for each vehicle type were created to provide fully profiled model demand which gives a more accurate release of the demand into the network. Profiles of demand releases into the network for each origin-destination pairing have been created for each vehicle type with the result that 484 profiles have been created and assigned to the appropriate model zones and vehicle types.



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5 Calibration

5.1 Model Calibration Process

- 5.1.1 Calibration of the S-Paramics model involves ensuring that it represents the on-site observed traffic conditions by adjusting model inputs and parameters. This process involves examination of the model network, checking for errors and improving the performance of the model in terms of comparisons with observed data. The adjustments that have been made included the following:
 - Adjustment to stoplines and use of next lanes / stay in lane functions as necessary to achieve the required driver behaviour;
 - Iterative adjustments to the trip matrices to adjust the model traffic demand to match the observed traffic conditions;
 - Adjustments to the default signposted lane changes distances on nodes to better reflect lane changing and vehicle interaction;
 - Adjustments to default driving behaviour parameters (headway time) to better reflect on-site behaviour;
 - Adjustments to the characteristics through the link editor including: visibility; lane cross; lane merge; and path cross parameters on roundabout approach links to achieve the desired behaviour on the approach to roundabouts.

5.2 Traffic Assignment

- 5.2.1 Traffic is introduced to the network using the "dynamic assignment" feature of S-Paramics, rather than static routing. Vehicles are loaded onto the network in the form of a matrix specific to a vehicle type and 15-minute time period.
- 5.2.2 In dynamic routing, each individual vehicle calculates its own route between its given origin and destination zone and this has been used in this model to reflect the route choice that is available around junction 6. A feedback interval of 5 minutes has been assumed.

5.3 Turning Count Calibration

- 5.3.1 All of the available observed turning count data was used in the process of developing the trip matrices for the S-Paramics model to improve the quality of the matrix developed. As result no turning count data remained independent for model validation. Instead all turning count data is reported as part of the calibration process against DMRB validation criteria. The DMRB criteria is set out below, each test must be satisfied in 85% of cases:
 - 1. Individual link flows within 15% for flows between 700 and 2,700 vehicles;
 - 2. Individual link flows within 100 vehicles per hour for flows < 700 vehicles per hour;
 - 3. Individual link flows within 400 vehicles per hour for flows >2,700 vehicles per hour; and
 - 4. GEH statistic for individual flows < 5.



5.3.2 Table 5.1 below sets out the link flow statistics for tests 1-3 in all time periods assessed.

Period .	Flow < 700		700 < Flow < 2700			Flow > 2700			
Fenou	Total	Pass	%	Total	Pass	%	Total	Pass	%
07:30-08:30	66	64	97%	8	8	100%	0	0	n/a
06:30-09:30	54	54	100%	15	14	93%	5	5	100%
17:00-18:00	62	62	100%	12	12	100%	0	0	n/a
16:30-19:30	56	56	100%	12	12	100%	3	3	100%

Table 5.1Link flow calibration statistics (3 hour and 1 hour)

5.3.3 Table 5.1 demonstrates that for the all of the time periods assessed, the DRMB requirement of 85% or more passes is significantly exceeded, with many periods achieving a 100% pass rate. Table 5.2 below provides the corresponding statistics for the GEH criteria:

Time Period	Total No.	Pass	GEH < 5
07:30-08:30	74	71	95.9%
06:30-09:30	74	71	95.9%
17:00-18:00	74	74	100%
16:30-19:30	74	73	98.6%

Table 5.2GEH calibration statistics

- 5.3.4 Table 5.2 demonstrates that for all time periods assessed, the DRMB requirement of 85% or more passes is significantly exceeded with all periods achieving close to a 100% pass rate. It is therefore considered that the traffic data within the model is representative of the observed traffic conditions.
- 5.3.5 Appendix B of this report provides full turning count calibrations statistics on a link by link basis, including observed flow, modelled flow, difference, % difference and GEH statistic.

5.4 Queue Length Calibration

- 5.4.1 It is recommended in DMRB that queue levels should not be calibrated against observed data in terms of values, but rather in terms of the fit of the profile and magnitude over the course of the modelled period. In addition, the modelled queue lengths are based on an average maximum queue across 10 model runs which has a natural smoothing of reported queues as individual assessment peaks are averaged across a number of runs.
- 5.4.2 However, queue lengths still provide a useful calibration tool when used appropriately. The model has been calibrated using queue length surveys for the three hour periods of assessment in both the morning and evening peak period. Where required adjustments have been made to headway and gap acceptance parameters to replicate observed queuing behaviour.
- 5.4.3 Excess demand recorded within observed queues has been added to the corresponding time periods within the matrix build process. This is because observed turning counts only record the traffic that passes through the junction, not the total demand. Without this modification queues within the model would not replicate those observed without inappropriate changes to model parameters.

- 5.4.4 Of particular note in the morning peak period, the video survey showed that an incident occurred on the southbound carriageway at junction 7 before the merge and therefore the queue at this location should be discounted from the analysis.
- 5.4.5 Appendix C contains the charts that show plots of the observed and modelled queue lengths on the junctions where queue data was collected in the morning and evening peak periods. The graphs show that the modelled queues generally seem to be representative of the observed data. The queue data comparison is used as a guideline for the model performance and the turn counts and journey time comparisons provide a more easily tested goodness of fit for the model, because detailed guidance on how these should be compared and assessed is available from DMRB.
- 5.4.6 The queue comparison is therefore used as an additional check for the overall model performance and used to highlight specific potential areas where the model needs to be looked at in greater detail. Where the queues differ significantly in the model from those that were observed, the specific area of the model has been interrogated and amended to better reflect the queues, but only to a point where the impact on the other model statistics (turn counts and journey times) still meet the required standards. Where the shortfall appears significant, reasons for this have been checked and sought from the collected survey data (eg, video surveys to highlight unusual activity). Notably this occurred on the A1(m) southbound section at junction 7 before the merge.
- 5.4.7 In the morning peak, the modelled queues reflect the observed queues very well, except for the observed queue on the southbound carriageway at junction 7. Also the observed queue at the Gunnelswood Road / Broadhall Way roundabout approach from the east the modelled queue exceeds the observed queue. However, since the turn counts meet GEH requirements this is not considered significant. The path cross, lane merge and path cross link modifiers have been tested and changed to get the best throughput at this location. The survey data does show that the maximum queue was not recorded where the graph line flattens at its peak, so it could be expected that the queue extent was longer than that recorded. Similarly at the A1000 Hertford Road from the north in the AM and from the south in the PM the observed line on the graph flattens at its peak indicating that the full extent of the queue could no longer be observed. It can therefore be reasonably assumed that the queue was longer than that recorded.
- 5.4.8 In the evening peak, the queues are generally of the right order and build-up profile, with no significant variations.

5.5 Calibration Summary

- 5.5.1 The analysis contained within this section has set out the assignment process used by the model, identified strong model against turning count calibration (in excess of DMRB requirements) and good performance against observed queue surveys.
- 5.5.2 The modifications made to model parameters to achieve the level of calibration identified have been set out in detail, with all changes necessary to replicate observed data recorded.
- 5.5.3 All parameters have the same values in both the morning and evening peak periods.



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6 Validation

6.1 Introduction

- 6.1.1 Observed turning count data has been used during matrix development and observed queue data has been used to undertake model calibration. As a result the only remaining independent data that can be used for model validation is the journey time surveys.
- 6.1.2 Journey time surveys represent the best data for micro-simulation model validation, as to replicate observed journey times, vehicle quantities in the model, queue lengths and delay must all be adequately represented.
- 6.1.3 For all of the assessments within this section, 10 model runs of each model have been undertaken using different random seeds.

6.2 Methodology

- 6.2.1 The DMRB requires that 85% or more of all journey time survey routes in each peak period should be within 15% of observed (or 1 minute if higher). To demonstrate performance against DMRB the performance of the model has been assessed against these exact criteria in the following sections.
- 6.2.2 In addition, as many of the survey routes in the model are quite short and the DMRB guidelines are designed for larger strategic models, a comparison has also been made against the confidence intervals for the observed journey times.
- 6.2.3 Confidence intervals take into account the variation in observed measurements recorded. Results are presented against the guidelines set out in section 11.4 of the Traffic Appraisal Manual which report whether the modelled journey times fall with 10% of the confidence interval for the observed dataset.
- 6.2.4 In total 32 partial journey time survey routes have been generated from the 9 observed routes. The full routes are illustrated on Figure 3 and the intermediate timing points are illustrated on Figures 7-15 of Appendix A for routes 1 to 9 respectively. The routes covered are:
 - Route 1 Southbound A1(m)
 - Route 2 Northbound A1(m)
 - Route 3 Southbound A1(m) to Braodhall Way
 - Route 4 Broadhall Way to Northbound A1(m)
 - Route 5 Southbound from Gunnelswood Road to A1(m)
 - Route 6 Northbound A1(m) to Gunnelswood Road (via Welwyn Bypass Road)
 - Route 7 Northbound from Digswell Hill to Great North Road
 - Route 8 Southbound from Great North Road to Digswell Hill
 - Route 9 Church Street to A1(m) Junction 6 southbound off-slip roundabout and return



- 6.2.5 Route 9 is only included in the results as a partial route because the whole route (including a section which loops around junction 6 southbound off-slip) is not included in the model network. In the AM peak route 1 and route 3 have been discounted from the assessment because they are influenced by an incident which occurred on the southbound mainline at junction 7.
- 6.2.6 The validation has been completed for both the 3 hour period, and the identified peak hour within the period for both the complete routes and partial routes for both the morning and evening periods. In total 4 sets of validation statistics are provided for each time period as set out below:
 - 3 hour complete routes;
 - 3 hour partial routes;
 - Peak hour complete routes; and
 - Peak hour partial routes.

6.3 AM Peak Validation

6.3.1 Performance of the model against DMRB validation criteria are set out in Table 6.1 below:

Table 6-1 - AM Peak Journey Time Validation	
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Time Interval	Scenario	Within Confidence Interval	Within 15%	Within 60 Seconds	Pass DMRB
06:30-09:30	Full Route	88%	58%	96%	96%
06:30-09:30	Partial Route	84%	56%	94%	94%
07:30-08:30	Full Route	80%	80%	80%	80%
07:30-08:30	Partial Route	100%	71%	100%	100%

- 6.3.2 Table 6.1 demonstrates that in the 3 hour period between 96% and 94% DMRB pass rate is achieved for the full and partial routes. Further, 88% and 84% of routes are within the confidence interval for the full and partial routes respectively.
- 6.3.3 For the peak hour of the period, DMRB criteria is satisfied for the partial routes, but fails for the full route assessment. 80% represents 1 route failing which is route 5.
- 6.3.4 The model performs well against the confidence interval assessments for all time periods assessed and reflects the variability in journey times identified within the observed data.
- 6.3.5 Appendix D of this report provides tables illustrating a detailed breakdown of the performance of each partial and full routes.

6.4 PM Peak Validation

6.4.1	Performance of the model against DMRB validation criteria are set out in Table 6.2 below:
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Table 6-2 - PM Peak Journey Time Validation

Time Interval	Scenario	Within Confidence Interval	Within 15%	Within 60 Seconds	Pass DMRB
16:30-19:30	Full Route	84%	66%	91%	91%
16:30-19:30	Partial Route	88%	69%	97%	97%
17:00-18:00	Full Route	75%	50%	88%	88%
17:00-18:00	Partial Route	88%	75%	88%	88%

- 6.4.2 Table 6.2 demonstrates that for the 3 hour peak period a 91% DMRB pass rate is achieved for the full routes and for the partial routes a 97% pass rate is achieved. For the PM peak hour, 88% of the full and partial routes pass DMRB requirements.
- 6.4.3 For the confidence interval tests, although the full routes are less than 85%, further examination of the detailed data identifies that of the routes which fail they are generally within seconds of passing the required tests.
- 6.4.4 Appendix E of this report provides tables illustrating a detailed breakdown of the performance of each partial and full routes.

6.5 Summary

- 6.5.1 The analysis provided within this section demonstrates that the model performs well against DMRB journey time validation criteria against observed data. Despite in some time periods failing to achieve full DMRB compliance, further investigation of the data indicates this is by a matter of seconds on the failing of routes.
- 6.5.2 The model will therefore adequately be able to assess proposed mitigation schemes at the A1(m) junction 6 and Junction 7.



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7 Summary and Conclusions

7.1 Summary

- 7.1.1 This report has set out the methodology and assumptions in developing the validation model to be used as a forecasting tool to assess the proposed Pinch Point Scheme at the A1(m) junction 6 and junction 7 roundabout.
- 7.1.2 The model has been developed to be consistent with Transport Modelling Methodology Note Issued to the HA on 28th March 2012, which together with subsequent correspondence forms the agreed methodology for the assessment of the Area 8 Pinch Point Schemes.
- 7.1.3 Detailed model output has been provided within this report to demonstrate the performance of the model against observed traffic behaviour. This has been assessed against the requirements set out within the DMRB for transport models.

7.2 Conclusions

- 7.2.1 The model has been assessed across 4 time periods in terms of turning counts, queue lengths and journey time surveys.
- 7.2.2 Turning count calibration has demonstrated that the model significantly exceeds DMRB criteria in all of the periods assessed for both link flow and GEH criteria.
- 7.2.3 Modelled queues typically represent the observed data very well, particularly in respect of the key routes in the model area.
- 7.2.4 Journey times have also been assessed against DMRB criteria and the confidence intervals of the survey data, which would be desired to also be above an 85% pass rate. In one case this has not been achieved (3 hour period AM full route). Where routes do fail any of the tests it is mainly by only a matter of seconds and not therefore not considered to be significant on the ability of the model to assess the proposed scheme.
- 7.2.5 The model has been demonstrated to be suitable for the assessment of the impact of the proposed development scheme on the highway network within the study area. The model is therefore deemed 'fit for purpose' to undertake an economic analysis of the impact of the proposed improvement scheme at the A1(m) Junction 6 and Junction 7.

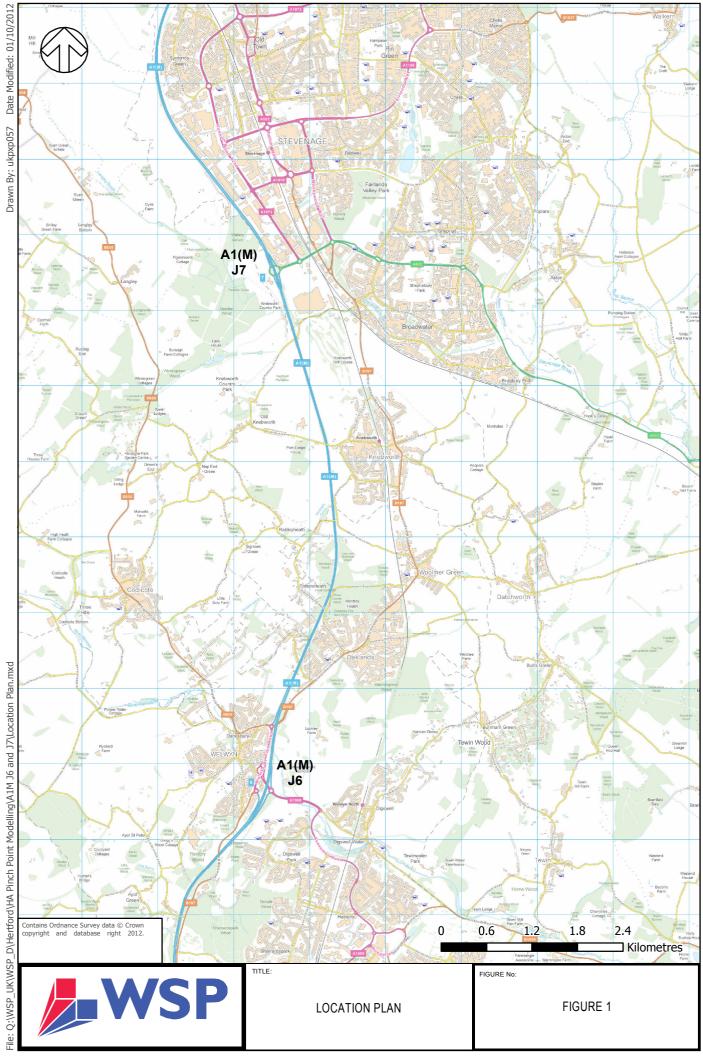


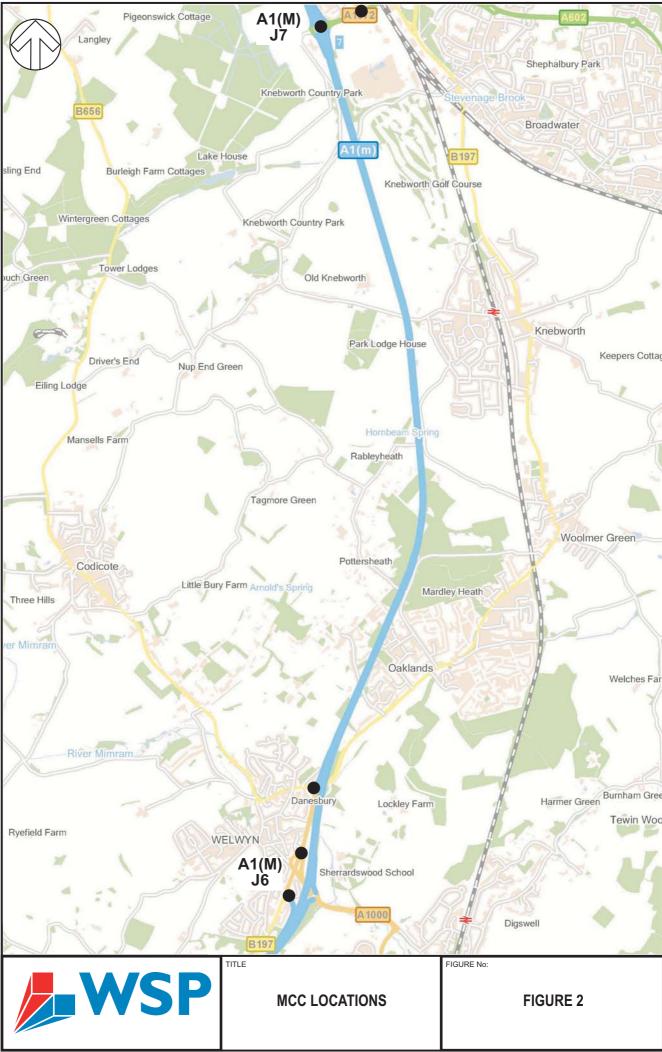
Project number: 10579218(SO3413) 10579220(SO3423) 10579222(SO3499) Dated: 24/10/2012 Revised:

APPENDIX A

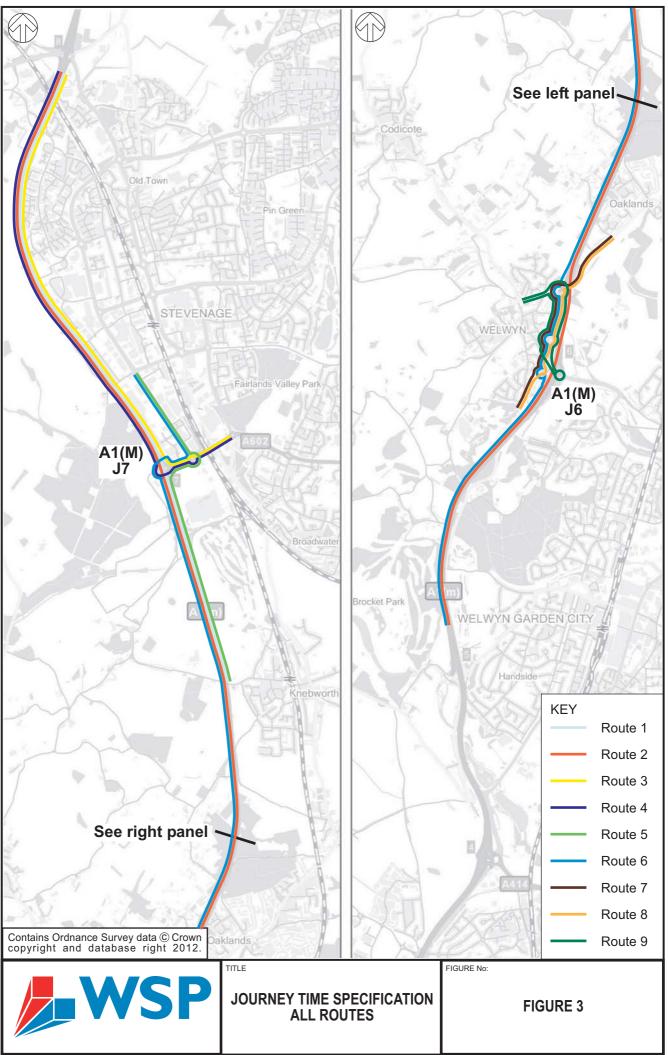
Figures



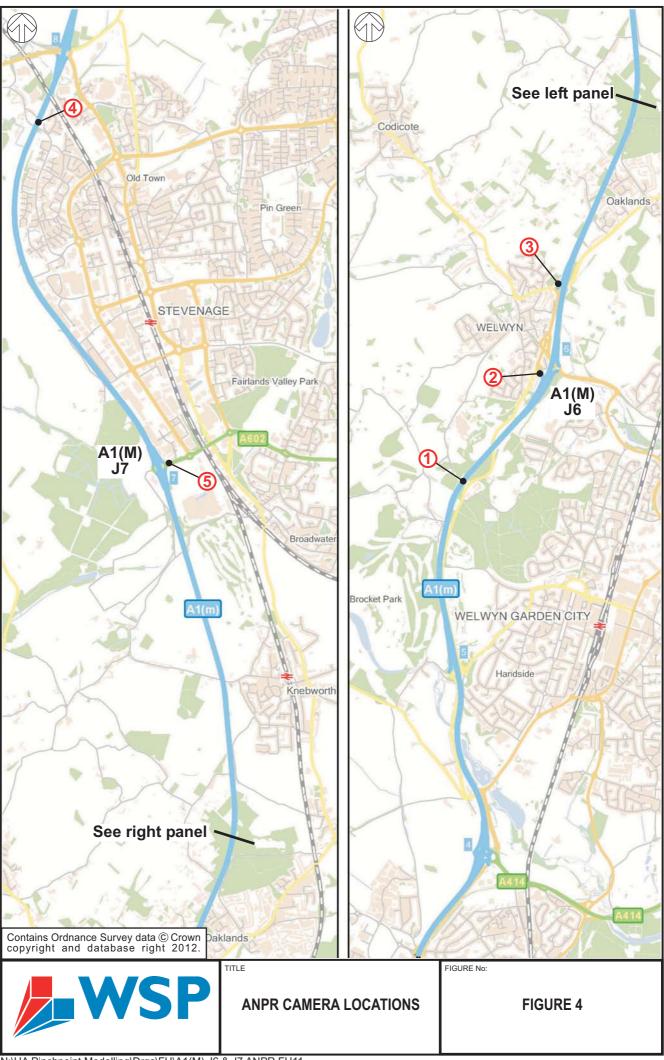




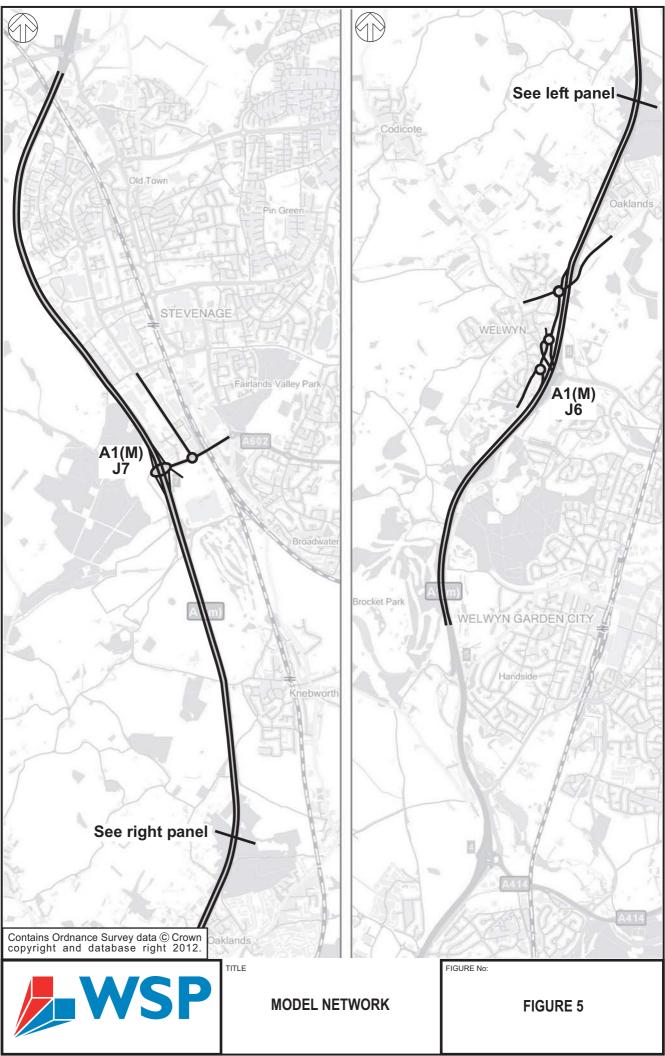
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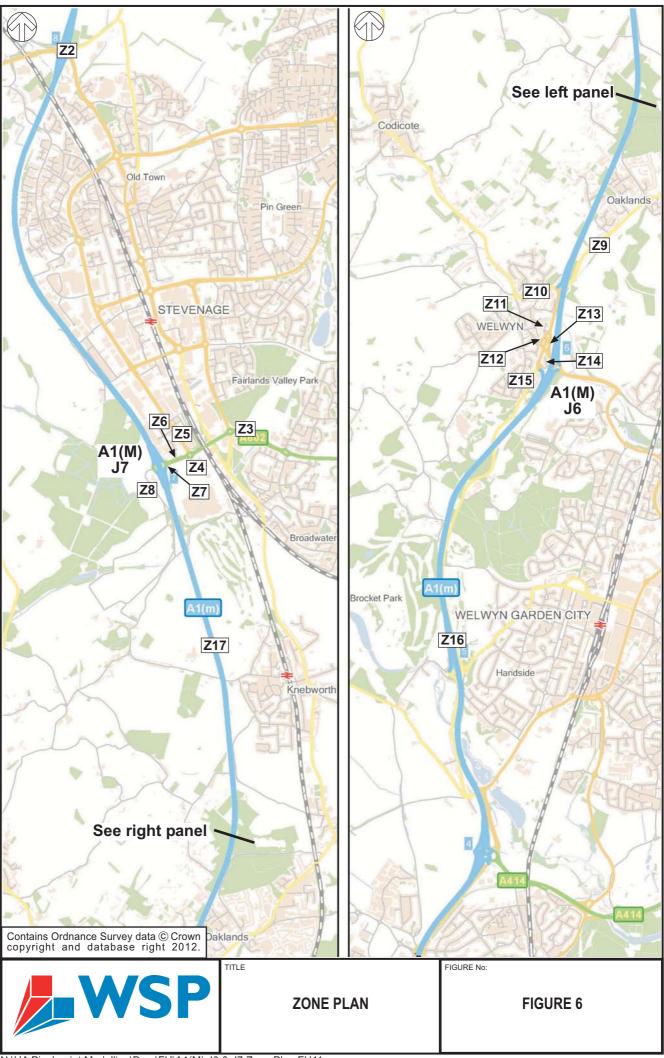
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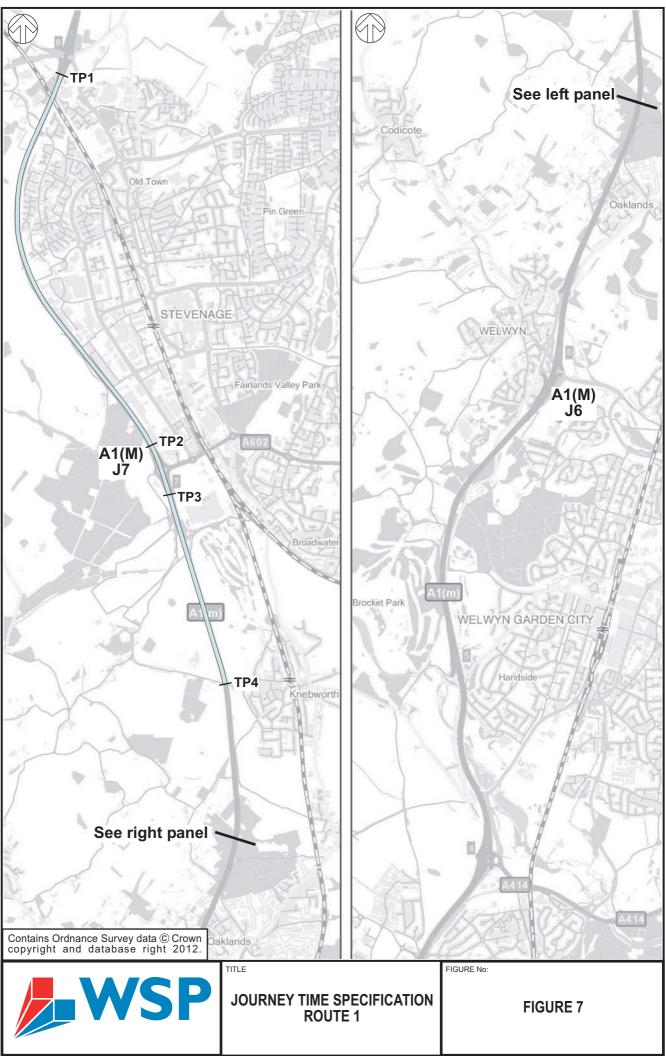
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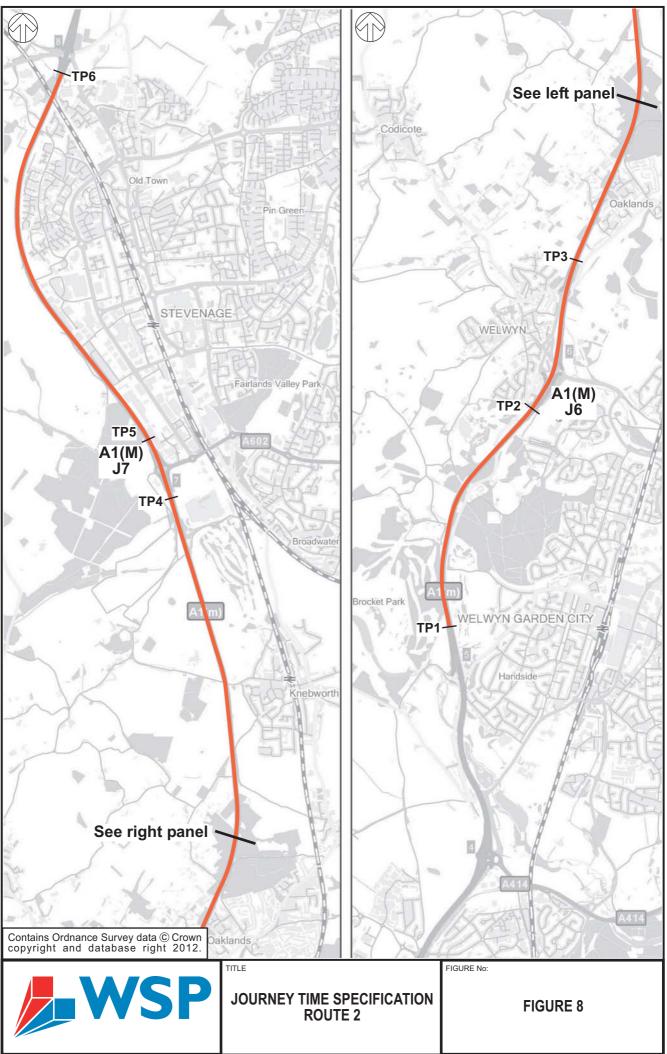
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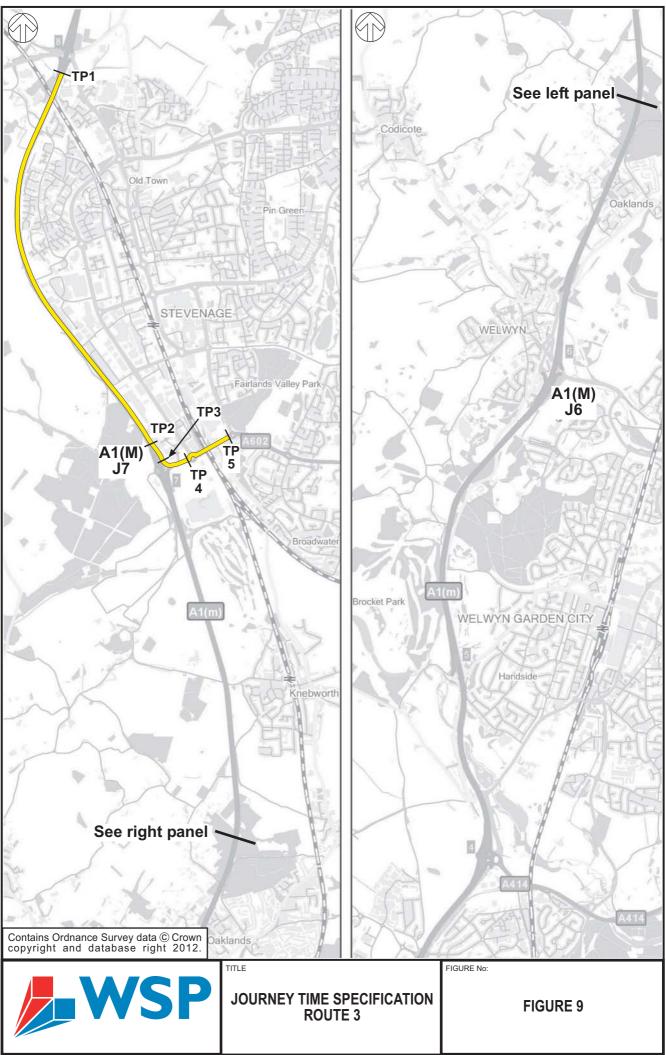
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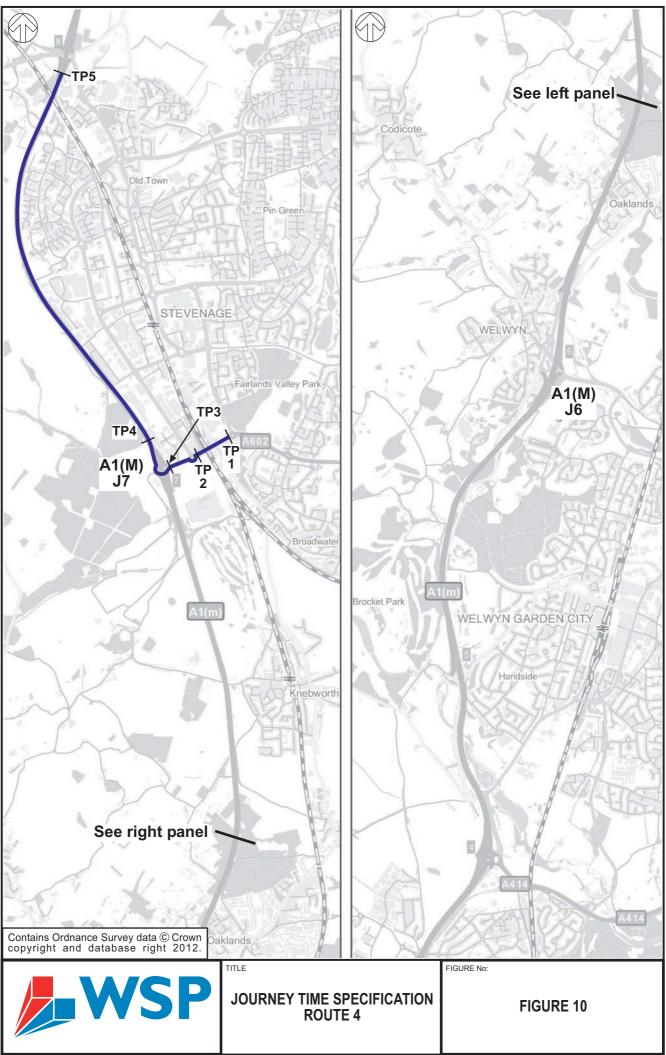
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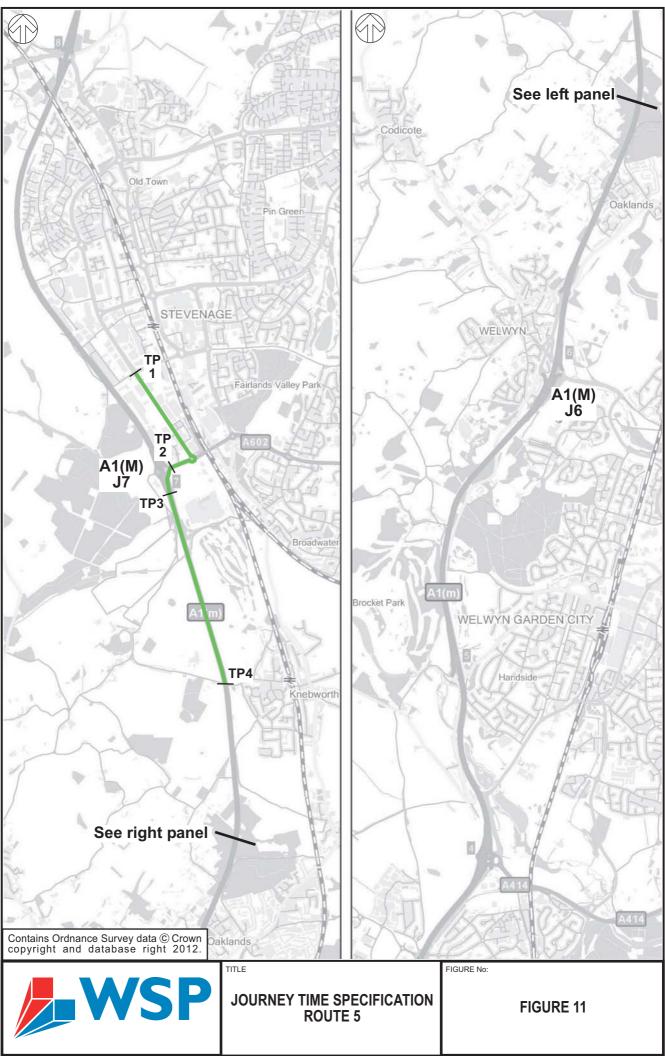
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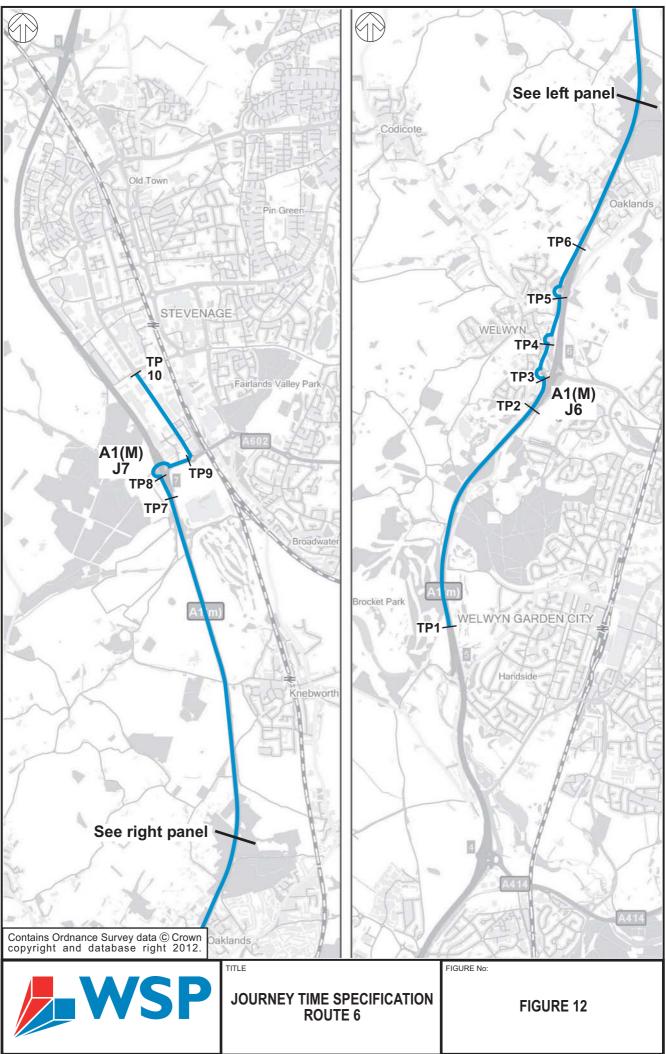
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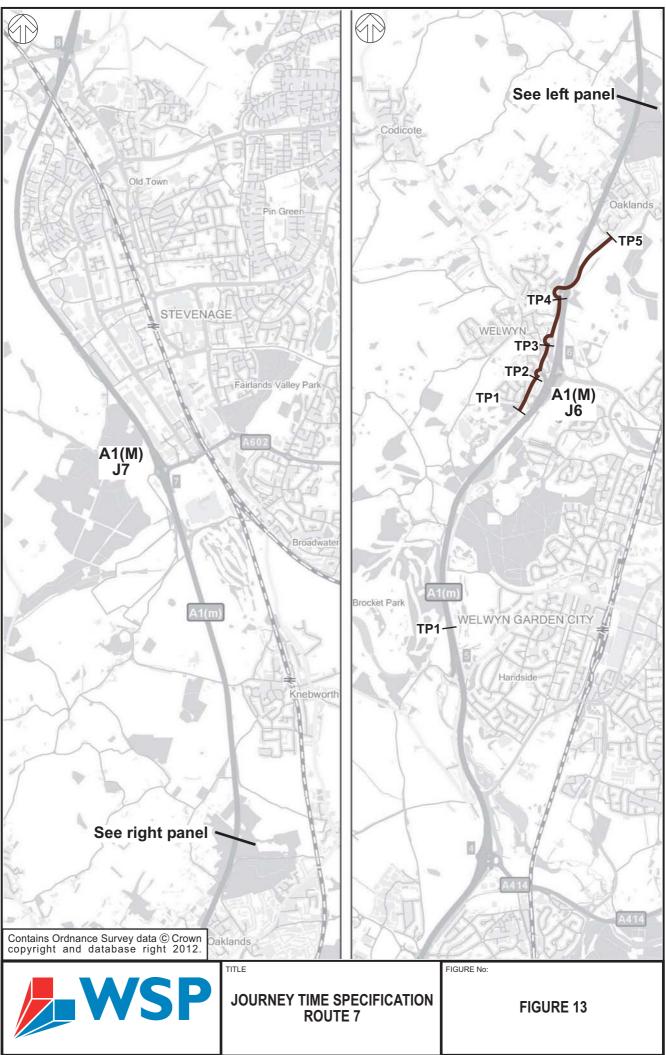
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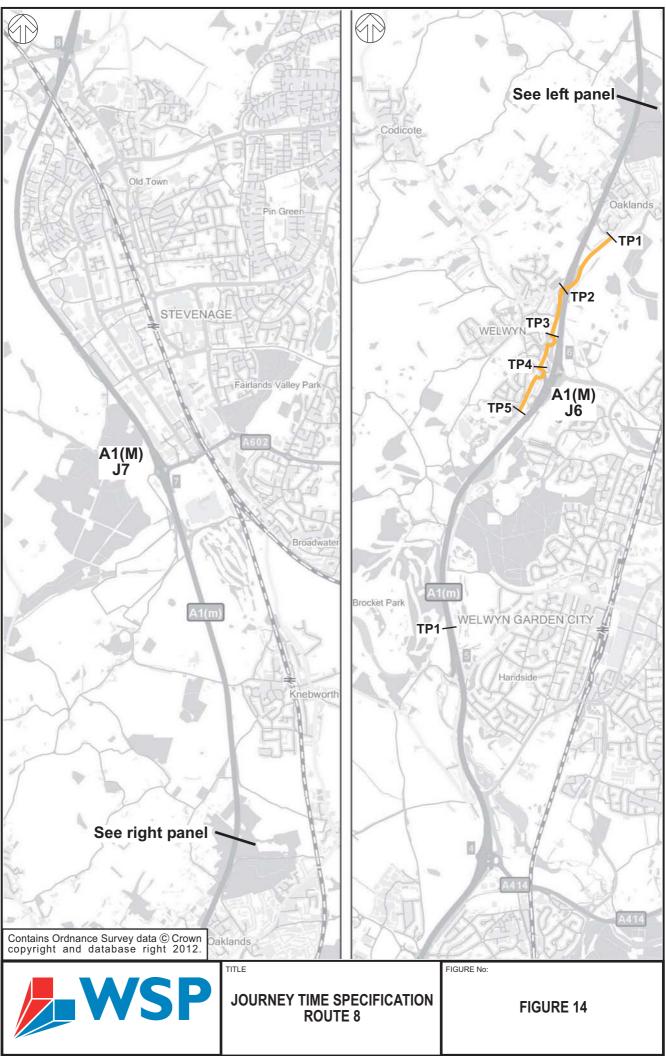
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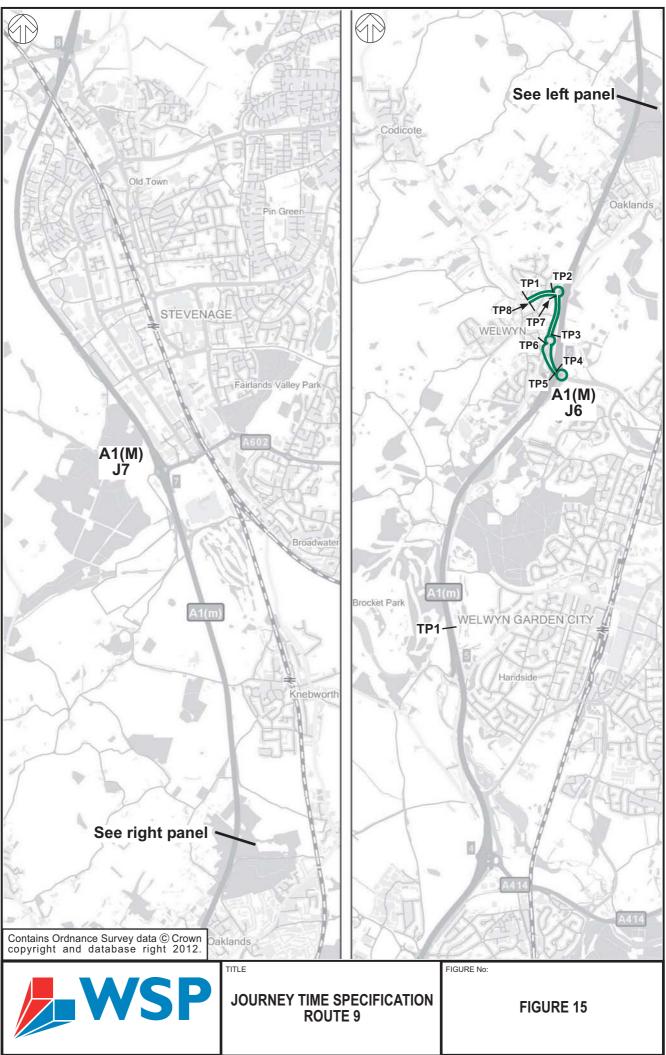
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APPENDIX B Turning Count Calibration Statistics



1 NOTE EAST 31-14 333 330 </th <th>1</th> <th>Index</th> <th></th> <th>Origin</th> <th>Destination</th> <th>A Node</th> <th>B Node</th> <th>Reference</th> <th>Observed Flow</th> <th>Modelled Flow</th> <th>Difference</th> <th>% Difference</th> <th>G.E.H</th>	1	Index		Origin	Destination	A Node	B Node	Reference	Observed Flow	Modelled Flow	Difference	% Difference	G.E.H
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3. <		2	1							2			0.00
4. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5.			1							11	11		4.69
Set 10 Solution (1) Solution (1)			1										0.22
Ref 6 - - - - - - - - - - - - - - - - - - -			1										0.00
Ref 7 64.57 80/11H 61.16 14.20 15.24 16.81 16.81 16.90 3.30 Ref 10 Attimi Juncion 7 EAST 65.10 16.25 16.24 16.25 16.24 16.25 16.24 16.25 16.24 16.25 16.24 16.25 16.24 16.25 16.24 16.25 16.24 16.25 16.24 16.25 16.24 16.25 16.24 16.25 16.24 16.25 16.24 16.25 16.24 16.25 16.24 16.25 16.24 16.25 16.2			1										0.00
Ref B EAST WEST 63.12 12.2 12.3 12.3 13.3 13.3 13.3 Ref T EAST WORTH EAST WORTH 13.3 13.3 13.3 13.3 13.3 11.1 SOUTH WEST 10.3 13.4 13.4 13.5 13.3 13.0 13.4 43.0			1										3.49
9 0.637 0.06711 0.612 1.92 61-0 0.00 0.0 0.00 0.0 0.00 <th< td=""><td></td><td></td><td>+</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.65</td></th<>			+										0.65
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11 16 16 16 16 16 16 16 16 16 16 16 16 1	PBT		A1(m) Junction 7										0.00
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13 10 10 10 10 10 10 10 10 10 10 10 10 10			-										2.00
H4 19 19 19 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10			-										3.15
Internal SOUTH			-										0.67
16 10 WEST NORTH 26:146 14727 9 9 9 0 0.00%. 10 WEST EXAMP 61:44 14352 26:14:14:142 9 9 0 0.00%. 10 WEST EXAMP 05:14:14:14:14 14352 26:14:13:14:14 0			-										2.83
17 17 18 1 5.88% 19 90 00 0 00<			-							-			0.00
18 WEST East for GSK) 20:14 16:16 16:19:42 0 0 0 0 00 00 00 000000 20 WEST SOUTH 20:14 20:14:12:12:12:12:12:12:12:12:12:12:12:12:12:			-										0.00
16 WEST SOUTH 26:14 14:24 10 10 10 0 0.00 21 NORTH EXST 15:20 20:20 19:20:20:20 20:20 19:21:41:10:17 20:50 19:20 20:50 19:21:41:10:17 20:50 19:20 20:50 19:21:41:10:17 20:50 19:20 20:50 19:21:41:10:17 20:50 19:20 20:50 19:21:41:10:10 10:0 0:0 7:3:40% 24 50:00TH 20:21:42 14:10 12:11:41:14:11 11:11:41:14:14:14:14:14:14:14:14:14:14:1			-	WEST									0.24
AD NORTH EAST 193.20 202.00 236 226 228 7.7 2.97% 24 24 100 100.001H 121.44 107.16 122.14 121.10 120.001H 121.44 110.11 110.001 100.00			-										0.00
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RBT 22 (1) 25 (2)			-		EAST								
Base NORTH NORTH NORTH 212:142 114:19 212:142 144:19 212:142 144:19 212:142 144:19 212:142 144:19 212:142 144:19 212:142 144:19 212:142 144:17 152:141		21	ł										0.49
RBT 24 20 20 30 30 30 30 30 30 30 30 30 30 30 30 30			ł										0.57
ES EAST WEST 213:14 14:17 213:24:14:14:19 651 401 150 -34:58% 20 Broadhall Way / Gunds EAST NORTH 213:14:16 14:10 372:14:14:14:13 0			ł										
RBT 28 23 24 25 25 25 26 26 27 26 27 27 27 27 Bradhall Way / Gands EAST NORTH 212:141 141:19 212:141.14 141:19 212:141.14 141:19 212:141.14 141:19 212:141.14 141:19 212:141.14 141:19 212:141.14 141:19 212:141.14 141:19 212:141.14 141:19 212:141.14 141:19 212:141.14 141:19 121:14 141:11 141:17 141:11 141:11 <			ł										5.11
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28 Wool Node SOUTH Mesh 11.11 <th< td=""><td>RBT</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.00</td></th<>	RBT												0.00
30 32 32 33 30 30 30 30 30			Wood Road										0.60
31 33 34 SOUTH SOUTH 1014 107:16 16:44:17:16 0 0 0 PD/V000 33 34 WEST NORTH 211:81 12:221 11:03 985 98 88 8.37%. 34 WEST EAST 220:14e 14:13 220:14e 14:13 220:14e 14:13 16:3.25%. 98 98 98 8.37%. 35 WEST SOUTH 220:14e 14:13 220:14e 14:13 10:05 11:16 10:25%. 98 98 98 3.25%. 98 <t< td=""><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1.07</td></t<>			1										1.07
32 34 34 WEST NORTH 21:18 18:221 10:03 995 -90 8.87% 34 WEST EAST 20:144 14:13 20:144 14:13 20:144 14:13 20:144 14:13 20:144 14:13 20:144 14:17 20:144 14:17 20:144 14:17 20:144 14:17 20:144 14:17 20:144 14:17 20:144 14:17 20:144 14:17 20:144 14:17 20:144 14:17 20:144 14:17 20:144 14:17 20:144 14:17 20:144 14:17 20:141 14:17 20:141 14:17 20:141 14:17 20:144 14:17 20:144 14:17 20:141 14:17 20:141 14:17 14:17 20:141 14:17 20:141 14:17 20:141 14:17 20:144 14:17 20:144 14:17 20:144 14:17 20:144 14:17 20:144 14:17 14:14 14:14 14:14 14:14 14:17 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.00</td></t<>													0.00
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35 WEST WEST 220::14 144.17 200 0 PD/V01 37 37 5 EAST SOUTH 98.87c 874.93 98.67c.874.99 1156 1143 1.12% 38 40 Wellyn by-pass road EAST NORTH 98.87c 871.91 68.67c.871.91 207 199 -8 3.36% 40 Wellyn by-pass road EAST NORTH 98.87c 871.91 86.87c.871.97 0 0 0 eD/V01 41 Wellyn by-pass road SOUTH WEST 18.8367 871.91 18.357e.871.86 6830 5.67 7 -2.100 0 <td< td=""><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.04</td></td<>			1										0.04
36 38 39 40 EAST SOUTH 96.87c.37c89 96.87c37c89 1156 1143 13 1.12% 38 40 EAST WEST 96.87c 87.91 96.87c37c191 207 199 -8.36% 40 Welwyn by-pass road (Herdrod Road A1000) EAST NORTH 96.87c 87.95 96.87c37c196 63 64 1 1.59% 41 Welwyn by-pass road (Herdrod Road A1000) SOUTH NORTH 183.87c 87.91 18.357c.87c31 142 1.36 -6 4.4.23% 42 (Herdrod Road A1000) SOUTH NORTH 18.357c 87.91 18.357c.87c37 0													1.17
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41 (Herdord Road A1000) SOUTH NORTH 183.87e 87a.166 153.87e 57a.166 580 587 7 1<21% (Herdord Road A1000) 43 44 45 45 46 46 43 46 50UTH EAST 153.87e 877.97 151 150.97 151 100.0 11 100.0 11 49.91 92.87g.871.99 111 100.0 111 49.91 49 50 NORTH SOUTH Hortod Road for A1(m) 74.67b 676.77 74.87b.67d.73 449.9 469 0 0.00% 51 51 51 53 NORTH SOUTH Hortod Road for A1(m) 74.67b 676.70 72.67e.672.71 3 1 0 0 0 0.00% 0 0.00% 0.00% 0.00%<													0.00
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42 (Hertford Road A1000) SUUTH EAST 1338/e 8/10:97 292 228 -/ 2-2405 44	PBT										'		0.29
44 45 46 46 47 WEST NORTH 92.87a 92.87a 87b:97 287a;87b:97 111 100 1-1 -5 -5.68% 46 47 WEST SOUTH 92.87a 87b:97 92.87a;87b:97 111 100 -11 -9.91% 46 WEST SOUTH 92.87a 87b:97 92.87a;87b:97 700 662 -48 -8.86% 47 WEST WEST 92.87a 87b:97 92.87a;87b:97 1314 1320 6 0.46% 49 NORTH SOUTH (Hetrod Road for At(m)) 74.67b 67d:73 74.67b:87d:73 469 469 0 0.0% 51 NORTH WORTH WEST 74.67b 67d:70 74.67b:87d:73 0 0 0 0.00% 52 SOUTH (At000) NORTH WEST 72.67c 67d:70 1 1 0 0.00% 53 SOUTH (At000) SOUTH (Hetrod Road for At(m)) 72.67c 67d:73 72.67c 67d:73 72.67c 67d:			(Hertford Road A1000)							285			0.41
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46 47 WEST SOUTH 92:870 WEST 97:870 92:70 92:													0.54
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50 51 52 53 54 55 55 56 66 75 NORTH WEST NORTH 74:67b NORTH 67g:70 74:67b:67g:70 3 74:67b:67g:70 1 0 0 0 <					SOUTH (Hertford Road for A1(m))	74:67b	67c:78	74:67b:67c:78			6		0.17
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53 55 55 56 56 57 Welwyn by-pass road 55 56 57 SOUTH (A1000) NORTH 72.67e 67.27e 72.67e.67a.75 320 305 -1.6 -4.68% -35 66 57 56 (Hertford Road A1000) SOUTH (Hertford Road for A1(m)) VEST 67.27e 67.27e 67.27b 72.67e.67a.73 321 206 -35 -10.57%, 301 206 -35 -10.57%, SOUTH (Hertford Road for A1(m)) WEST 68.671 67.275 72.67e.67a.73 0 0 0 0 0 0 0 0.00% 57 58 59 SOUTH (Hertford Road for A1(m)) WOTH (Hertford Road for A1(m)) SOUTH (Hertford Road for A1(m))<		52		SOUTH (A1000)	WEST					1	0		0.00
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FBT 55 56 (Hertford Road Å1000) SOUTH (A1000) SOUTH (A1000) 72:67e 67:73 72:67e:67:67:73 0 0 0 #DIV/01 57 58 SOUTH (Hertford Road for A1(m)) WEST 68:671 67:70 68:671:67:73 710 704 -6 -0.085% 59 59 SOUTH (Hertford Road for A1(m)) SOUTH (Hertford Road for A1(m)) SOUTH (Hertford Road for A1(m)) 68:671 67:73 86:671:67:73 70 62 -1.98% 60 SOUTH (Hertford Road for A1(m)) SOUTH (Hertford Road for A1(m)) SOUTH (Hertford Road for A1(m)) 66:671 67:73 86:671:67:73 70 62 -8 -1.143% 61 WEST SOUTH (Hertford Road for A1(m)) SOUTH (Hertford Road for A1(m)) 70:67g 67:73 70 62 -1 -16.67% 62 WEST SOUTH (Hertford Road for A1(m)) 70:67g 67:73 70 0 0.00% 64 NORTH SOUTH 39:34z1 34:40:342:342:37 539 53 -4 -0.74% <tr< td=""><td></td><td>54</td><td>Woluon by peec rec.d</td><td>SOUTH (A1000)</td><td>SOUTH (Hertford Road for A1(m))</td><td>72:67e</td><td></td><td></td><td>331</td><td>296</td><td>-35</td><td>-10.57%</td><td>1.98</td></tr<>		54	Woluon by peec rec.d	SOUTH (A1000)	SOUTH (Hertford Road for A1(m))	72:67e			331	296	-35	-10.57%	1.98
66 57 57 58 59 60 60 61 (Hention Road A 1000) 58 59 60 60 61 SOUTH (Hention Road for A1(m)) SOUTH	RBT			SOUTH (A1000)									0.00
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59 60 61 SOUTH (Hertford Road for A1(m)) SOUTH (A1000) 68.671 674:73 68.671/674:73 70 62 8 -11.43% 61 WEST NORTH 70.67g 67a:75 70.67g;67a:75 6 5 -1 -16.67% 62 WEST SOUTH (Hertford Road for A1(m)) 70.67g;67a:73 5 6 0 0.00% 63 NORTH EXEST SOUTH (A1000) 70:67g;67a:73 5 5 0 0.00% 64 NORTH EXEST 39:34z1 39:34z1 39:34z1:38:40 0			İ										0.32
60 WEST NORTH 70:67g 67:77 70:67g:67:275 6 5 1 1-667% 61 WEST SOUTH (Hertord Read for At(m)) 70:67g 67:778 6 6 0 0.00% 62 WEST SOUTH (A1000) 70:67g 67:778 6 6 0 0.00% 63 WEST SOUTH (A1000) 70:67g 67:78 6 0 0.00% 64 NORTH EAST 39:3421 188:40 39:3421:342:37 539 535 -4 -0.74% 65 NORTH WEST 39:3421:342:37 7 7 0 0.00% 66 EAST WEST 40:342:342:342:37 7 7 0 0.00% 67 68 Welwyn by-pass road EAST NORTH 40:342:342:342:37 38:3421:342:37 38:3421:342:37 38:3421:342:342:38 1 1 0 0.00% 69 (B197) EAST NORTH 40:342:342:342:37 <t< td=""><td></td><td></td><td>İ</td><td></td><td></td><td></td><td>67d:73</td><td></td><td></td><td></td><td>-8</td><td></td><td>0.98</td></t<>			İ				67d:73				-8		0.98
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		GEH < 5	GEH < 6			GEH < 7	GEg] < 8
otal Numb	No. Pass	%	No. Pass	%	No. Pass	%	No. Pass	%
74	71	95.9%	72	97.3%	73	98.6%	73	98.6%
			•					
	Flow <	: 700	700 < Flow <				Flow > 2700 Pass	
Number	Flow < No. Pass	× 700 %	700 < Flow < Number	2700 No. Pass	%	Number	Flow > 2700 Pass No. Pass	%

1 NORTH EAST 2016 1982 2016 1982 2016 1992 100 0 600 100 200 4. 5. -		Index	tion	Origin	Destination	A Node	B Node	Reference	Observed Flow	Modelled Flow	Difference	% Difference
Rat 2 NORTH Deal of CSN 23:16 16:16 0 <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>-2.50%</td>		1										-2.50%
3 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0		2	ĺ	NORTH	East (for GSK)	28:148						#DIV/0!
NBT Sol (1) Sol (1) Sol (2) So		3		NORTH	SOUTH		143:24	28:148:143:24	0	0	0	#DIV/0!
Rat 6 -9 -9 -9 -9 -9 -9 -9 -9 -9 -9 -9 -9 -9		4				28:148	145:26	28:148:145:26		8		14.29%
Rat Sol Sol <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td></td> <td>#DIV/0!</td>										0		#DIV/0!
Rat Section Se												-100.00%
9 10 12 12 13 13 14 15 15 15 15 15 15 15 15 15 15 15 15 15												0.87%
R0T 10 10 10 10 10 10 10 10 10 10 10 10 10 1												0.00%
Internal interna												-1.04%
12 10 10 10 10 10 10 10 10 10 10 10 10 10	RRI		A1(m) Junction 7									#DIV/0!
Ret 13 10 10 10 10 10 10 10 10 10 10 10 10 10												
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16 10 SOUTH SOUTH 163/14/14/324 2 0 -2 100.0 10 10 10 10 0												
Int Int <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>-100.00%</td>												-100.00%
IT EAST EAST EAST EAST EAST East It It< It< It<												0.00%
16 WeST Ease (for GSG) 2014 1616 142 (142) 0												-7.14%
19 WEST SOUTH 28:146 143.24 7 7 7 0 0.00 21 NORTH EXST SOUTH 21.21 100:10 9 100:10 9 100:10				WEST								#DIV/0!
20 10 23 24 25 25 25 26 26 26 27 26 27 26 27 27 27 27 27 27 27 27 27 27 27 27 27									7	7		0.00%
21 -0.0 NORTH SOUTH 212:140 71:17 0 4 -5 -55 23.1 -0.0 23.1 -0.0 23.1 -0.0 23.1 -0.0 23.1 -0.0 17.6 11.6 71.0 0.00 0.0		20		NORTH	EAST	193:20	20:209y	193:20:20:209y	461	460		-0.22%
RBT 22 -25 -25 -25 -25 -25 -25 -25 -25 -26 -27 -27 INORTH WEST 212:140 -1411 14110 -1411 212:140 -1411 14110 -1411 212:140 -1411 14110 -1411 213:140 -14117 1135 -1411 71 -1411 0 -1411 0		21		NORTH			167:16	212z:14g:167:16	9	4	-5	-55.56%
24 800 25 90 EAST SOUTH 292142 2914224216 8 8 0 0.00 20 90 Boodhall Way / Currels 20 90 EAST WCR17 213:140 141:17 121:241.01 141:17 121:241.01 141:17 121:241.01 141:17 121:241.01 141:17 121:241.01 141:17 121:241.01 141:17 121:241.01 141:17							14d:17	212z:14g:14d:17		1183		0.60%
E8T EAST WEST 213:c140.114:17 769 768 1 0.13 27 Broadhall Way/ Gunnels EAST NORTH 213:c140.114:13 213:c140.114:13 200 0 0 100 30												#DIV/0!
Bea EAST INORTH 213:2:14:11:11:11:11:11:11:11:11:11:11:11:11:												0.00%
RBT 27 20 20 20 30 30 30 30 30 30 30 30 30 30 30 30 30												-0.13%
RBT 28 30 31 32 Wook Road SOUTH WERT 171:17 171:1												-1.58%
Bit Production South No. No.	RBT											#DIV/0!
30 32 33 34 SOUTH EAST 16:14: 16:			Wood Road									
31 33 34 SOUTH SOUTH 16:14::167:16 16:14::167:16 0 0 0 PB/P 33 34 WEST NORTH 21:16 16:14::167:16 16:14::167:16 17:16												
32 34 WEST NORTH 211:18:18:221 762 773 449 6.43 34 WEST EAST 20:14:14:13 20:14:44:13 1176 1155 -21 1.77 34 WEST SOUTH 20:14:14:13 20:14:44:13 1176 1155 -21 1.77 36 WEST SOUTH 20:14:14:17 20:14:14:17 10:10:10:10:10:10:10:10:10:10:10:10:10:1												
33 35 36 36 37 37 37 37 37 38 38 37 37 38 38 37 37 38 38 37 37 38 38 37 37 38 38 37 37 38 38 39 37 39 38 39 39 40 40 40 40 40 40 40 40 40 40 40 40 40												
34 WEST SOUTH 202:14e 167:16 202:14e 167:16 202:14e 167:16 202:14e 167:16 8 6 0 0.007 36 WEST WEST 202:14e 164:17 202:14e 164:17 0 0 0 400 37 EAST WEST 96:87.6 87:19 66:87.67:819 102 102 0 0.007 39 EAST WEST 96:87.6 87:19 66:87:67:97 0												
35 WEST WEST 220::14e 141:17 20::14e 141:17 20::15e 163::15e 37::13e 37::13e 38::15e 37::13e 38::15e 37::13e 141:14e 141:15e 11:14e 143:15e 17::13e 17::14e 144:13e 14::15e 14												0.00%
36 38 38 39 40 EAST EAST SOUTH Webyn by-pass road EAST SOUTH Webyn by-pass road EAST SOUTH Webyn by-pass road EAST Webyn by-pass road EAST NORTH Webyn by-pass road SOUTH 96:87c. B7:819 87:85 97:8 37:6 -2 -0.03 40 Webyn by-pass road 42 (Hertord Road A1000) SOUTH WEST 96:87c. 183:87e 87:91 183:87c. 87:87:97 183:87c. 87:87 184:41 144:53 30:30 30:30 00 10:00 10:00 10:00 10:00 10:00 10:00 10:00 10:00 10:00 10:00 10:00										0		#DIV/0!
RBT 37 30 40 40 41 38 40 41 Key multiply pass road (Hertford Road A1000) EAST EAST EAST EAST WEST EAST EAST EAST 96.87 50.87 97.91 96.87c.871.86 19 96.87c.871.97 102 96.87c.871.97 102 0 100 0 00 0 00 00										376		-0.53%
39 40 41 41 41 41 41 41 41 41 41 41 41 41 41					WEST		87f:91			102	0	0.00%
40 42 42 43 44 44 44 44 44 45 Welwyn by-pass road 45 45 SOUTH 1414 WEST 43 44 44 SOUTH 1414 WEST 44 13376 45 87:161 83376 87:168 13376 87:168 380 13376 87:168 380 13376 87:168 380 13376 87:168 380 13376 87:168 380 13376 87:168 380 141 380 43 322 3287 3376 320 327 327 327 327 327 327 327 327 327 327		38		EAST	NORTH	96:87c	87a:186	96:87c:87a:186	19	16	-3	-15.79%
41 42 43 43 44 44 44 44 45 46 46 Welwyn by-pass road 45 45 46 SOUTH 144 47 46 SOUTH 143376 133376 133376 133376 133376 133376 133376 133376 13337677 133377186 11347 1134777 1134 133376 133376 133376777 13377186 113477 1134 1133776777 13377186 1144 1414 44 43 32 237 3371186 144 44 42 42 42 40 40 40 40 40 40 40 40 40 40 40 40 40		39		EAST		96:87c	87b:97	96:87c:87b:97	0		0	#DIV/0!
HB1 42 43 44 44 45 (Hertford Road A1000) 46 SOUTH EAST 18387e 197.97 18387e 198.97e87b379 87489 198.97e87b379 19144 1145 -39 40 -32 40 44						183:87e	87f:91	183:87e:87f:91	380			-2.11%
42 43 44 44 44 44 44 45 46 46 46 46 46 46 46 46 46 46 47 (Pertord Road A1000) 44 46 46 46 46 46 46 46 46 46 46 46 46	PRT											-3.62%
44 WEST NORTH 92.87g 87.8166 40 40 0 0.000 46 WEST EAST 92.87g 87.971 138 134 -4 -2.90 47 WEST SOUTH 92.87g 87.919 92.87g.871.91 0 0 0 70 48 NORTH SOUTH (Hentront Road for A1(m)) 74.67b 676.728 346.756.778 332.2 381 -11 -2.81 49 NORTH SOUTH (Hentront Road for A1(m)) 74.67b 676.778 146.705.676.73 179 176 -3 -4.68 50 NORTH WENT 72.67b 672.07 74.67b.676.73 149.75b.777.7 -1 0 0.00 -1.68 51 NORTH NORTH NORTH 72.67b 677.70 1 1 0 0.00 -1.62 52 SOUTH (A1000) NORTH NORTH 72.67b 677.70 1 1 0 0.00 53 SOUTH (Hentron Road for A1(m)) <td></td> <td></td> <td>(Hertford Road A1000)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>-3.29%</td>			(Hertford Road A1000)									-3.29%
45 46 47 WEST EAST 92:87g 87b:97 92:87g:87b:97 138 134 -4 2.900 47 WEST SOUTH 92:87g 87te91 92:87g:87te99 200 188 -12 -6.00 47 WEST WEST 92:87g 87te91 92:87g:87te91 0 0 0 400 49 NORTH SOUTH (Hertord Road for A1(m)) 74:67b 67c.78 74:67b:67d.73 179 176 -3 -1.68 50 NORTH SOUTH (A1000) WEST 74:67b:67g.77 74:67b:67d.73 179 176 -3 -1.68 51 NORTH NORTH NORTH 74:67b 67g.77 74:67b:67d.75 1448 147 3 2.0 0												#DIV/0!
46 47 WEST SOUTH 92:87g 87:89 92:87g/87:89:9 200 188 1:2 6.00 48 WEST 92:87g 87:91 92:87g/87:91 0 0 0 400// 49 NORTH SOUTH (Hertford Road for A1(m)) 74:67b 67:73 74:67b:67c.778 392 381 -11 -2.81 50 NORTH SOUTH (Hertford Road for A1(m)) 74:67b 67:73 74:67b:67c.773 3 3 0 0.00 51 NORTH SOUTH (A1000) 74:67b 67:77 74:67b:67z.75 0 0 0 49 53 SOUTH (A1000) WEST 72:67e 67z.75 72:67e67z.75 1 1 0 0 0 49D//// 54 Welwyn by-pass road SOUTH (A1000) SOUTH (Hertford Road for A1(m)) 72:67e 67z.75 72:67e67z.75 1488 1377 -91 -6.20 55 SOUTH (Hertford Road for A1(m)) SOUTH (Hertford Road for A1(m)) SOUTH (Hertford Road for A1(m))												
47 WEST WEST 92.870 871:91 92.870 871:91 0 0 0 47 48 NORTH SOUTH (Hertford Road for At(m)) 74:67b 672:78 332 381:11 -2.81 50 NORTH SOUTH (A1000) 74:67b 672:73 74:67b:672:73 179 176 -3 -1.68 50 NORTH WEST 74:67b 672:73 74:67b:672:73 0 0 0 0.00 51 NORTH WEST 74:67b 672:75 74:67b:672:75 1 1 0 0.00 0												
48 NORTH SOUTH (Hertford Road for A1(m)) 74:67b 67C:78 74:67b:67c:78 392 381 -11 2.81 50 50 NORTH SOUTH (Hertford Road for A1(m)) 74:67b 67C:73 74:67b:67d:73 179 176 -3 -168 51 NORTH WEST 74:67b 67C:73 74:67b:67d:73 179 176 -3 -168 52 SOUTH (A1000) WEST 72:67e 672:70 1 1 0 0.000 SOUTH (A1000) WEST 72:67e 672:77 72:67e:67a:75 1448 1377 -91 62.00 SOUTH (A1000) SOUTH (Hertford Road for A1(m)) SOUTH (A1000) SOUTH (A1000) 2001TH (A1000) 72:67e 672:77 1.44 147 3 2.08 55 SOUTH (Hertford Road for A1(m)) SOUTH (Hertford Road for A1(m)) WEST 676:77 68:67f 676:73 0 0 0 0 0 0 0 0 0 0 0 0<												
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50 51 52 53 53 54 NORTH WEST 74:67b 67g:70 74:67b:67g:70 3 3 0 0.00 52 53 SOUTH NORTH NORTH 74:67b:67g:75 0 0 0 0.00 54 Welwyn by-pass road (Herrford Road A1000) SOUTH (A1000) NORTH 72:67e 67g:70 72:67e:67g:72. 1.44 1.47 2.06' 55 (Herrford Road A1000) SOUTH (A1000) SOUTH (A1000) T2:67e 67c:78 72:67e:67d:73 0 0 0 #DW/W 56 (Herrford Road for A1(m)) WEST 68:671 67c:78 1:64:4 1:32 -4 -0.30 50 SOUTH (Herrford Road for A1(m)) WEST 68:671 67c:78 1:54 1:53 -1 -0.66 50 SOUTH (Herrford Road for A1(m))												
51 52 53 53 54 54 55 55 56 56 57 57 57 57 57 57 57 58 59 59 59 59 59 59 59 59 59 59 59 59 59												
52 53 54 55 56 56 56 56 56 56 57 Welwyn by-pass road (Hertford Road A1000) SOUTH (A1000) SOUTH (A1000) WEST SOUTH (A1000) WEST SOUTH (A1000) SOUTH (A1000) SOUTH (A1000) WEST SOUTH (A1000) SOUTH (A1000) SOUTH (Hertford Road for A1(m)) SOUTH (A1000) SOUTH (Hertford Road for A1(m)) WEST SOUTH (Hertford Road for A1(m)) SOUTH												
53 54 (Hertford Road A1000) SOUTH (A1000) NORTH 72.67e 67a.75 72.67e.67a.75 1448 1377 -9.1 62.00 55 55 (Hertford Road A1000) SOUTH (A1000) SOUTH (A1000) SOUTH (A1000) 72.67e 67c.77 72.67e.67a.77.8 144 1447 3 2.08 56 (Hertford Road A1000) SOUTH (A1000) SOUTH (A1000) 72.67e 67c.77 72.67e.67a.77.3 0 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.00%</td></td<>												0.00%
54 55 56 56 57 56 56 57 58 59 60 60 61 Welwyn by-pass road (Hertford Road A1000) SOUTH (Hattoro Road for A1(m)) 72.67e 50 67c.78 72.67e.67c.778 144 147 3 20.08 56 59 59 60 57 60 56 59 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 50 144 147 3 2.08 58 50 59 50 50 50 50 50 50 1336 1332 4 -0.53 50 60 60 50 50 50 50 50 50 100 50												-6.20%
RBT 55 56 (Hertford Road A1000) SOUTH (A1000) SOUTH (A1000) T2:67e 67d:73 72:57e 0 <th< td=""><td></td><td></td><td>Mahara hu nana i</td><td>SOUTH (A1000)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2.08%</td></th<>			Mahara hu nana i	SOUTH (A1000)								2.08%
56 (Hertford Koab A1000) SOUTH (Hertford Road for A1(m)) WEST 68:671 67g:70 8 8 0 0.000 57 50 SOUTH (Hertford Road for A1(m)) NORTH 68:671 67g:70 8 8 0 0.030 58 SOUTH (Hertford Road for A1(m)) 68:671 67c:78 68:671:67c:73 154 153 -1 -0.65 60 WEST NORTH 70:79 67:78 70:67g:67c:75 5 3 -2 -40.00 61 WEST SOUTH (Hertford Road for A1(m)) SOUTH (Mith Road for A1(m)) 70:67g:67c:75 5 3 -2 -40.00 62 WEST SOUTH (Mith Road for A1(m)) 70:67g:67c:77 70:67g:67c:73 1 1 0 0.000 64 NORTH EAST 39:34z! 34z:37 239 237 -2 -0.44 66 NORTH WEST 39:34z! 39:34z!	RBT											#DIV/0!
57 58 59 60 SOUTH (Hertford Road for A1(m)) SOUTH (Hertford Road for A1(m)) WEST 66: 70: 70: 70 67: 75 68: 671: 672: 75 5 3 -2 -40.00 63 NORTH SOUTH (Hertford Road for A1(m)) 70: 672; 672: 78 70: 70: 670; 672: 78 2 2 0 0.000 64 NORTH EAST 39:342: 188:40 1 1 0 0.000 66 NORTH EAST 39:342: 342:33 39:342: 342:33 0 0.00 #BDV/ 67 70 G8 F68: 40 1 1 0 0 0 #DV/ 71 72 Welwyn by-pass road (B197) EAST NORTH 40:342: 342: 342: 342: 342: 342: 342: 342:		56	(meittora Road A1000)			68:67f	67g:70		8	8	0	0.00%
59 60 61 SOUTH (Hertford Road for A1(m)) SOUTH (A1000) 68:671 67d:73 62 61 -1 -161 61 WEST NORTH 70:67g 67a:75 5 3 -2 40:0 62 WEST SOUTH (Hertford Road for A1(m)) 70:67g 67a:75 70:67g:67a:75 5 3 -2 40:0 62 WEST SOUTH (Hertford Road for A1(m)) 70:67g 67a:75 70:67g:67d:73 1 1 0 0.000 63 NORTH EAST 39:34zt 18:40 1 1 0 0.000 64 NORTH EAST 39:34zt 18:40 1 1 0 0.000 65 NORTH WEST 39:34zt 39:34zt 39:34zt 39:34zt 39:34zt 39:34zt 39:34zt 30:34zt 32:34zt 30:3								68:67f:67a:75				-0.30%
60 61 WEST NORTH 70.67g 67a.75 70.67g.67a.75 5 3 -2 4-0.00 61 WEST SOUTH (Hertford Road for A1(m)) 70.67g 67a.75 70.67g.67a.75 5 3 -2 4-0.00 62 WEST SOUTH (A1000) 70.67g 67c.73 70.67g.67a.73 1 1 0 0.000 63 NORTH EAST 39.34z1 168.40 93.34z1.7168.40 1 1 0 0.000 64 NORTH WEST 39.34z1 34zc3.31 39.34z1.34zc3.77 239 237 -2 0.04 65 NORTH WEST 39.34z1 34zc3.31 39.34z1.34zc3.77 239 237 -2 0.04 66 KORTH NORTH WEST 39.34z1 34zc3.31 39.34z1.34zc3.37 3 0 0.000 67 KEAST WEST MORTH 40.34za 34zc3.31 49.34zc3.34zc3.37 3 0 0.000							67c:78					-0.65%
61 WEST SOUTH (Hertford Road for A1(m)) 70.67g 67c.78 70.7067g.67c.78 2 2 0 0.000 62 WEST SOUTH (Hertford Road for A1(m)) 70.67g 67c.78 70.67g.67c.78 2 2 0 0.000 62 WEST SOUTH (A1000) 70.67g 67d.73 70.67g.67c.78 1 1 0 0.000 63 NORTH EAST 39.34z1 34c.03 39.34z1/34c.037 239 237 -2 0.84 64 NORTH WEST 39.34z1 34c.03 39.34z1/34c.037 239 237 -2 0.84 65 NORTH WEST 39.34z1 34c.03 39.34z1/34c.037 3 0 0.007 66 NORTH NORTH 40.34za 34za.34z.037 3 3 0 0.007 67 F EAST NORTH 40.34za.148.44 40.34za.34z.34z.34z.34z 16.40 0 0 0 0 0 0.007												-1.61%
62 WEST SOUTH 70.67a 67d:73 70.67a 71 1 1 0 0.000 63 NORTH EAST 39:34z1 188:40 39:34z1 184:00 1 1 0 0.000 64 NORTH EAST 39:34z1 182:40 1 1 0 0.000 65 NORTH WEST 39:34z1 34z0:37 39:34z1/34z0:37 239 237 -2 -0.84 65 NORTH WEST 39:34z1 34z0:37 39:34z1/34z0:38 0 0 0 ##DV 66 EAST WEST 40:34za 34z0:37 30:34z1 30:0 0.000 67 EAST WEST 40:34za 34z0:37 3 0 0.000 68 Welwyn by-pass road EAST EAST 40:34za 168:40 0 0 0 0 0 0 0 0 0 0 0 0 0												-40.00%
63 NORTH EAST 39:34z1 108:40 39:34z1/188:40 1 1 0 0.007 64 NORTH WEST 39:34z1 34z:37 39:34z1/34z:37 229 237 -2 -0.04 65 NORTH WEST 39:34z1 34z:37 39:34z1/34z:37 239 237 -2 -0.04 66 66 EAST WEST 40:34za 34z:37 39:34z1/34ze:38 0												0.00%
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65 NORTH NORTH 39:34zl 34zc:38 39:34zl:34zc:38 0 0 #DV 66 66 EAST WEST 40:34za 34zc:37 10:34za:34zc:37 3 3 0 0.000 67 EAST WEST 40:34za 34zc:37 10:34za:34zc:37 3 3 0 0.000 68 (B197) EAST EAST 40:34za 34zc:37 35:34zb:34zc:37 211 -11 0 -1 +00.00 70 SOUTH WEST 35:34zb 34zc:38 35:34zb:34zc:37 211 211 0 0.000 70 SOUTH NORTH 35:34zb 34zc:38 35:34zb:34zc:37 211 211 0 0.000 70 SOUTH NORTH 35:34zb 34zc:38 35:34zb:34zc:37 75:34zb:34zc:37 55:34zb:34zc:37 55:44zb:34zc:37 55:44zb:34zc:37 55:44zb:34zc:37 55:44zb:34zc:37 55:44zb:34zc:37 55:44zb:34zc:37 55:44zb:34zc:37 55:44zb:34zc:37 55:44zb												
66 67 68 69 70 71 73 Welwyn by-pass road (B197) EAST EAST EAST EAST SOUTH WEST EAST EAST EAST EAST EAST EAST EAST 8534zb 40:34za 42z:33 42z:33 42z:34 40:34za 168:40 40:34za 0.34za 3 0 0 0.000 68 69 70 71 72 Welwyn by-pass road (B197) EAST SOUTH EAST VEST SOUTH 40:34za 42z:37 16:40 35:34zb 40:34za:34za:34za 1 0 -1 -100.0 70 71 SOUTH WEST SOUTH 35:34zb 34za:37 25:34zb:34za:37 211 211 0 0.002 71 72 SOUTH WEST 35:34zb 35:34zb:34za:34za:34za:34za:34za:34za:34za:34za												
67 68 (B197) EAST NORTH 40:34za 34za:34z 1 0 -1 +10:00 70 68 (B197) EAST EAST 40:34za 168:40 0 0 0 #DIV/ 70 70 SOUTH WEST 35:34zb 34zc:37 35:34zb:34zc:37 211 211 0 0.00 70 SOUTH NORTH 35:34zb 34zc:34 168:40 0 0 0 #DIV/ 71 SOUTH NORTH 35:34zb 34zc:34z 168:40 0 0 0 #DIV/ 72 WEST NORTH EAST 35:34zb 168:40 0 0 0 #DIV/ 73 WEST NORTH 185:34zb 188:34zb:34zc:34zc:34zc:34zc:34zc:34zc:34zc:34zc												
68 69 70 Welwyn by-pass road (B197) EAST EAST 40:34za 188:40 40:34za:168:40 0 0 0 #DIV/ 70 SOUTH WEST 35:34zb 34zc:37 211 211 0 0.00 #DIV/ 70 SOUTH WEST 35:34zb 34zc:37 35:34zb-34zc:37 211 211 0 0.00 0 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>												
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TO SOUTH NORTH 35:34zb 34ze:38 35:34zb:34ze:38 1027 973 -54 -5.26 71 SOUTH EAST 35:34zb 168:40 35:34zb:168:40 0 0 #DIV/ 72 WEST NORTH 185:34zd 342e:38 185:34zd:34zd:34zd:38 581 576 -5 -0.86 73 WEST EAST 185:34zd 186:34zd:168:40 6 6 0 0.000	RBT											#DIV/0!
71 SOUTH EAST 35:34zb 168:40 35:34zb:168:40 0 0 0 #DIV/ 72 WEST NORTH 185:34zd 342:38 186:34zd:34zd:34zd:34zd:34zd:34zd:34zd:34zd			(0131)									-5.26%
72 WEST NORTH 185:34zd 34ze:38 185:34zd:34ze:38 581 576 -5 -0.86 73 WEST EAST 185:34zd 168:40 185:34zd:168:40 6 6 0 0.009												#DIV/0!
73 WEST EAST 185:34zd 168:40 185:34zd:168:40 6 6 0 0.009												-0.86%
												0.00%
												#DIV/0!
									•			

		GEH < 5	GEH < 6			GEH < 7	GE	< 8
otal Numb	No. Pass			%	No. Pass	%	No. Pass	%
74	74	100.0%	74	100.0%	74	100.0%	74	100.0%
	Flow <	: 700	700 < Flow < 2700			F	low > 2700 Pass	
Number	No. Pass	%	Number	No. Pass	%	Number	No. Pass	%
62	62	100.0%	12	12	100.0%	0	0	#DIV/0!

L I	Index		Origin	Destination	A Node	B Node	Reference	Observed Flow	Modelled Flow	Difference	% Difference	G.E.H
	1		NORTH	EAST	28:148	149:56	28:148:149:56	1344	1308	-36	-2.68%	0.99
	2		NORTH	East (for GSK)	28:148	166:194z		4	4	0	0.00%	0.00
1	3		NORTH	SOUTH	28:148		28:148:143:24	0	13	13	#DIV/0!	5.10
1 -	4		NORTH	WEST	28:148		28:148:145:26	62	61	-1	-1.61%	0.13
1 -	5 6	-	NORTH EAST	NORTH East (for GSK)	28:148 55:142		28:148:147:27 55:142:166:194z	0	0	0	#DIV/0! 0.00%	0.00
1 1	7	-	EAST	SOUTH	55:142		55:142:143:24	4263	4136	-127	-2.98%	1.96
1 1	8		EAST	WEST	55:142	145:26	55:142:145:26	4203	70	-10	-12.50%	1.15
1 1	9	1	EAST	NORTH	55:142	147:27	55:142:147:27	1415	1281	-134	-9.47%	3.65
RBT	10	A1(m) Junction 7	EAST	EAST	55:142	149:56	55:142:149:56	0	0	0	#DIV/0!	0.00
1 1	11	. ,	SOUTH	WEST	163:144	145:26	163:144:145:26	27	25	-2	-7.41%	0.39
1	12		SOUTH	NORTH	163:144	147:27	163:144:147:27	3	0	-3	-100.00%	2.45
1 [13		SOUTH	EAST	163:144	149:56	163:144:149:56	3497	3457	-40	-1.14%	0.68
1	14		SOUTH	East (for GSK)	163:144	166:194z	163:144:166:194z	23	21	-2	-8.70%	0.43
	15		SOUTH	SOUTH	163:144	143:24	163:144:143:24	12	0	-12	-100.00%	4.90
1	16		WEST	NORTH	26:146	147:27	26:146:147:27	20	20	0	0.00%	0.00
1	17		WEST	EAST	26:146	149:56	26:146:149:56	49	50	1	2.04%	0.14
1 -	18	-	WEST	East (for GSK)	26:146	166:194z		1	1	0	0.00%	0.00
L	19 20		WEST	SOUTH	26:146		26:146:143:24	29 582	29	-	0.00%	0.00
1	20	-	NORTH NORTH	EAST SOUTH	193:20 212z:14g		193:20:20:209y 212z:14g:167:16	374	361	-15 -13	-2.58%	0.63
1 -	21	-	NORTH	WEST	2122.14g	14d:17	2122:14g:167.16 212z:14g:14d:17	3495	3469	-13	-0.74%	0.68
1 1	22	-	NORTH	NORTH	2122:14g	14f:19	212z:14g:14d:17 212z:14g:14f:19	0	0	0	#DIV/0!	0.44
1 1	24	-	EAST	SOUTH	29:214z	214z:16		381	304	-77	-20.21%	4.16
1 1	25	1	EAST	WEST	213z:14b	14d:17	213z:14b:14d:17	2237	2004	-233	-10.42%	5.06
1 1	26	1	EAST	NORTH	213z:14b	14f:19	213z:14b:14f:19	1081	866	-215	-19.89%	6.89
DOT	27	Broadhall Way / Gunnels	EAST	EAST	213z:14b	14a:13	213z:14b:14a:13	0	000	0	#DIV/0!	0.00
RBT	28	Wood Road	SOUTH	WEST	171:17	17:172	171:17:17:172	31	29	-2	-6.45%	0.37
1 1	29	I	SOUTH	NORTH	16:14c	14f:19	16:14c:14f:19	38	31	-7	-18.42%	1.19
1 [30		SOUTH	EAST	16:14c	14a:13	16:14c:14a:13	24	23	-1	-4.17%	0.21
1 [31		SOUTH	SOUTH	16:14c	167:16	16:14c:167:16	0	0	0	#DIV/0!	0.00
1	32		WEST	NORTH	21:18	18:221	21:18:18:221	2710	2646	-64	-2.36%	1.24
1	33		WEST	EAST	220z:14e	14a:13	220z:14e:14a:13	1639	1602	-37	-2.26%	0.92
1	34		WEST	SOUTH	220z:14e		220z:14e:167:16	508	493	-15	-2.95%	0.67
\vdash	35		WEST	WEST	220z:14e	14d:17	220z:14e:14d:17	0	0	0	#DIV/0!	0.00
1 -	36	-	EAST EAST	SOUTH WEST	96:87c		96:87c:87d:89	2631	2577	-54	-2.05%	1.06
1	37 38	-	EAST	NORTH	96:87c 96:87c	87f:91 87a:186	96:87c:87f:91 96:87c:87a:186	432 124	424 145	-8	-1.85%	0.39
1 -	30	-	EAST	EAST	96:87c	87b:97	96:87c:87b:97	0	145	0	#DIV/0!	1.81
1 1	40	-	SOUTH	WEST	183:87e	87f:91	183:87e:87f:91	363	361	-2	-0.55%	0.00
1 1	41	Welwyn by-pass road	SOUTH	NORTH	183:87e	87a:186	183:87e:87a:186	1260	1292	32	2.54%	0.90
RBT	42	(Hertford Road A1000)	SOUTH	EAST	183:87e	87b:97	183:87e:87b:97	791	775	-16	-2.02%	0.57
1	43	(SOUTH	SOUTH	183:87e	87d:89	183:87e:87d:89	0	0	0	#DIV/0!	0.00
1 1	44		WEST	NORTH	92:87g	87a:186	92:87g:87a:186	218	251	33	15.14%	2.15
1 1	45		WEST	EAST	92:87g	87b:97	92:87g:87b:97	264	259	-5	-1.89%	0.31
1 [46		WEST	SOUTH	92:87g	87d:89	92:87g:87d:89	1656	1584	-72	-4.35%	1.79
	47		WEST	WEST	92:87g	87f:91	92:87g:87f:91	4	0	-4	-100.00%	2.83
	48		NORTH	SOUTH (Hertford Road for A1(m))	74:67b	67c:78	74:67b:67c:78	3009	3104	95	3.16%	1.72
1	49		NORTH	SOUTH (A1000)	74:67b	67d:73	74:67b:67d:73	1027	1047	20	1.95%	0.62
1	50	ļ	NORTH	WEST	74:67b		74:67b:67g:70	4	2	-2	-50.00%	1.15
1	51	ļ	NORTH	NORTH	74:67b		74:67b:67a:75	0	0	0	#DIV/0!	0.00
1	52	ł	SOUTH (A1000)	WEST	72:67e	67g:70	72:67e:67g:70	4	3	-1	-25.00%	0.53
1 -	53	ł	SOUTH (A1000)	NORTH	72:67e	67a:75	72:67e:67a:75	791 703	775 607	-16 -96	-2.02%	0.57
RBT	54 55	Welwyn by-pass road	SOUTH (A1000) SOUTH (A1000)	SOUTH (Hertford Road for A1(m)) SOUTH (A1000)	72:67e 72:67e	67c:78 67d:73	72:67e:67c:78 72:67e:67d:73	703	607	-96	-13.66% #DIV/0!	3.75 0.00
	55	(Hertford Road A1000)	SOUTH (A1000) SOUTH (Hertford Road for A1(m))	WEST	72:67e 68:67f		68:67f:67g:70	4	4	0	#DIV/0!	0.00
1 F	50	ł	SOUTH (Hertford Road for A1(m))	NORTH	68:67f	67g.70 67a:75	68:67f:67a:75	4 1646	4 1648	2	0.12%	0.00
1 [†]	58	t	SOUTH (Hertford Road for A1(m))		68:67f	67c:78	68:67f:67c:78	629	620	-9	-1.43%	0.36
1 1	59	t	SOUTH (Hertford Road for A1(m))	SOUTH (A1000)	68:67f		68:67f:67d:73	211	187	-24	-11.37%	1.70
1 1	60	t	WEST	NORTH	70:67g	67a:75	70:67g:67a:75	11	11	0	0.00%	0.00
1 1	61	T	WEST	SOUTH (Hertford Road for A1(m))	70:67g	67c:78	70:67g:67c:78	12	12	0	0.00%	0.00
!	62	[WEST	SOUTH (A1000)	70:67g	67d:73	70:67g:67d:73	8	7	-1	-12.50%	0.37
1	63		NORTH	EAST	39:34zf	168:40	39:34zf:168:40	1	0	-1	-100.00%	1.41
1 [64	l	NORTH	WEST	39:34zf	34zc:37	39:34zf:34zc:37	1241	1239	-2	-0.16%	0.06
1 [65	l	NORTH	NORTH	39:34zf		39:34zf:34ze:38	0	0	0	#DIV/0!	0.00
1 [66	ļ	EAST	WEST	40:34za		40:34za:34zc:37	21	21	0	0.00%	0.00
1	67		EAST	NORTH	40:34za	34ze:38		4	2	-2	-50.00%	1.15
RBT	68	Welwyn by-pass road	EAST	EAST	40:34za	168:40	40:34za:168:40	0	0	0	#DIV/0!	0.00
	69	(B197)	SOUTH	WEST	35:34zb	34zc:37	35:34zb:34zc:37	83	81	-2	-2.41%	0.22
1	70	ł	SOUTH	NORTH	35:34zb	34ze:38	35:34zb:34ze:38	920	813	-107	-11.63%	3.63
		1	SOUTH	EAST	35:34zb	168:40	35:34zb:168:40	3	3 575	0	0.00%	0.00
!	71	+	WEST	NODTU	105-24							
	72	-	WEST	NORTH	185:34zd		185:34zd:34ze:38	585	5/5	-10	-1.71%	0.42
		+ + +	WEST WEST WEST	NORTH EAST WEST	185:34zd	168:40	185:34zd:34ze:38 185:34zd:168:40 185:34zd:34zc:37	585 2 0	2	0	-1.71% 0.00% #DIV/0!	0.42

		GEH < 5	GEH < 6			GEH < 7	GEH	1 < 8
otal Numb	No. Pass	%	No. Pass	%	No. Pass	%	No. Pass	%
74	71	95.9%	73 98.6%		74	100.0%	74	100.0%
	Flow <	< 700	700 < Flow < 27	'00		F	low > 2700 Pass	
Number	No. Pass	%	Number	No. Pass	%	Number	No. Pass	%
54	54	100.0%	15	14	93.3%	5	5	100.0%

1 NORTH EAST #1485 #151558 1007 1008 42 1.7756 4 5 <td< th=""><th>1</th><th>Index</th><th>tion</th><th>Origin</th><th>Destination</th><th>A Node</th><th>B Node</th><th>Reference</th><th>Observed Flow</th><th>Modelled Flow</th><th>Difference</th><th>% Difference</th><th>G.E.H</th></td<>	1	Index	tion	Origin	Destination	A Node	B Node	Reference	Observed Flow	Modelled Flow	Difference	% Difference	G.E.H
Rat 2 		1											0.71
ABT Solution		2			East (for GSK)	28:148		28:148:166:194z		0	0	#DIV/0!	0.00
4 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0										0	0		0.00
5 5 5000000000000000000000000000000000000									25	25	0		0.00
6 9 6 10 10					NORTH								0.00
Raft 7 10 10 10 10 10 10 10 10 10 10 10 10 10										2			1.15
B CAST WEST 61.12 14.24 15.42									2914	2943			0.54
State North Bits North Bits Parts P		8		FAST			145:26						0.10
No. Allmi Juncision 7 EAST													0.36
11 10 10 10 10 10 10 10 10 10 10 10 10 1	RBT		A1(m) Junction 7										0.00
12 10 10 10 10 10 10 10 10 10 10 10 10 10													0.16
Rat SOUTH EAST 183:141 144:249 33:26 30:56 119 3.4% 10 500/H1 East (0.753) 163:141 163:141 161 1 0 0.00% 10 WEST NORTH 201:46 163:22 161:41-127 47 47 0 0 0.00% 10 WEST NORTH 201:40 162:52 214:41:42:56 33 38 0 0.00% 10 WEST EAST 214:41:41:52 214:41:41:52 0												-100.00%	2.83
Int SOUTH First for SSN0 163:144 161:164 1 1 0 0.00% 10 SOUTH SOUTH SOUTH 163:144 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>3.46%</td> <td>2.01</td>												3.46%	2.01
Ins Ins SOUTH SOUTH ISSUE HE3144 HE314													0.00
Int WEST NORTH 26:146 1472 47 48 47 48 47 48 48 48 48 48 48 48 48 48 48 48 48 48 48 48 48													5.48
Inf Weight EAST Devide Bit Med 1485 38 38 0 0.00% 10 Weight East for GSN, 2614 1465 148, 2014 0 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.00</td></t<>													0.00
16 WEST East (pr GSk) 26:14 06:1942 0<													0.00
19 WEST SOUTH 28:146 14:24 19 15 0 0.00% 21 NORTH EXST 19:20 20:20% 19:20:20:20% 19:20:20:20% 19:20:20:20% 19:20:20:20% 19:20:20:20% 19:20:20:20% 19:20:20:20% 19:20:20:20% 19:20:20:20% 19:20:20:20% 19:20:20 10:20 20:20% 19:20:20:20% 19:20:20:20% 19:20:20 19:20 20:20% 19:20 20:20% 19:20 20:20% 19:20 20:20% 19:20 20:20% 19:20 20:20% 10:20% <													0.00
Part Part <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.00</td></th<>													0.00
21 23 24 24 24 25 25 26 26 26 26 27 26 27 27 28 28 28 28 28 28 28 28 28 28 28 28 29 29 29 29 29 29 29 29 29 29 20 20 20 20 20 20 20 20 20 20 20 20 20	-												0.00
22 34 35 36 36 37 37 37 37 37 37 37 37 37 37 37 37 37													2.67
23 Boachtall Way / Gunets NORTH NORTH 212:14g 141:19 141:11 141:14													
Area EAST SOUTH 29214/21/214-16 9214/21/214-16 91 10 0 0.00% RBT Z Broachall Way / Cannels EAST WCST 213:16 14:17 213:14 14:17 213:14 14:17 213:14 14:17 213:14 14:17 213:14 14:17 213:14 14:17 213:14 14:17 213:14 14:17 213:14 14:17 213:14 14:17 213:14 14:17 213:14 14:17 213:14 14:17 213:14 14:17 14:14 14:17 14:14 14:17 14:14 14:17 14:14 14:17 14:14 14:17 14:14 14:17 14:14 14:17 14:14 14:17 14:14 14:17 14:14 14:17 14:14 14:17 14:14 14:17 14:14 14:17 14:14 14:17 14:14 14:17 14:14 14:17 14:14 14:17 14:14 14:14 14:14 14:14 14:14 14:14 14:14 14:14		22											0.23
Base East 277 370 Broadhall Way / Guines Wood Road East East East 371 WEST 121:161 121:161 1417 121:161 141 121:17													
RBT 28 23 24 25 25 26 26 27 26 27 27 27 27 27 Beadaful Way / Games Wood Road EAST NORTH 212:140 14:19 212:14:14 14:19 212:14:14 14:19 212:14:14 14:11 212:14:14 14:11 212:14:14 14:11 212:14:14 14:11 212:14:14 14:11 14:													0.00
RBT 27 83 Booknall Way / Gumels Wood Road EAST EAST 2132 (132) (13													0.17
RB1 28 30 30 30 30 30 30 30 30 30 30 30 30 30		20	Broadhall May / Currents										0.31
28 Wook Node SOUTH Otts H 11/11/2 11/11/2 11/11/2 15/50 5/51 -2 4 4.98% 31 SOUTH EAST 15/14 16/14 </td <td>RBT</td> <td></td> <td>0.00</td>	RBT												0.00
30 32 33 SOUTH EAST 10:14 10:14 10:14 14:14:13 10:14:16:16:14:10:13 212 22:12 208 4 4-4 1.980/ 10:00 32 33 SOUTH SOUTH 10:14:16:12:10:12:10:16:12:10:10:10:10:10:10:10:10:10:10:10:10:10:			WOOD ROAD										0.08
31 33 34 SOUTH SOUTH 10:14 16:71:6 16:14:16:71:6 0 0 0 PD/VDI PD/VDI PD/VDI 221 33 34 WEST NORTH 21:16 16:22:14:16:14:13 3191 3221 30 0.94% 35 WEST SOUTH 220:14:16:14:14:13 3191 3221 30 0.94% 36 WEST SOUTH 220:14:14:14:17 20:14:14:14:17 0 0 0 0.00% 37 WEST SOUTH 98:07 77:16 88:07 10:055 10:05 10:05 10:05 10:05 10:0 <													
32 34 34 WEST NORTH 21:18 18:221 1962 1962 1985 23 1.17% 34 WEST EAST 20:144 14:31 320:144 14:31 320:144 14:31 320:144 14:31 320:144 16:16 220:144 17:30 0.00% 36 B37 SOUTH WEST SOUTH 98:67: 67:48 98:67:67:191 0.05 1092 -3 0.27% 36 EAST SOUTH 98:67: 67:49 98:67:67:191 0.05 1092 -3 0.27% 40 Welwyn by-pass rod EAST WEST 18:376 67:191 98:67:67:191 0.05 0.00 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.28</td>													0.28
33 35 36 36 37 37 37 37 38 38 39 40 40 40 40 40 40 40 40 40 40 40 40 40													0.00
34 WEST SOUTH 220:14 167:16 221 21 21 0 0.00% 36 WEST WEST 220:14 161:71 0 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.52</td>													0.52
35 WEST WEST 2202:14 14417 200:14:14:1417 0 0 0 PBD/VI 37 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.53</td></td<>													0.53
36 37 38 39 40 EAST SOUTH 96.87C. 87.499 10055 1092 -3. 0.27% 0.38% 39 40 EAST WEST 96.87C. 87.199 10055 1092 -3. 0.27% 0.38% 40 Welwyn by-pass road (Hertoort Road A10000) EAST NORTH 96.87C. 87.19 87.57 96.87C.87.196 61 54 -7 -11.43% 42 (Hertoort Road A10000) SOUTH WEST 183.87c.87.191 92.1 92.1 0 0.00% 44 SOUTH NORTH 183.87c.87.191 92.1 92.1 0 0.00% 44 SOUTH NORTH 183.87c.87.191 92.1 92.1 0 0.00% 44 WEST EAST SOUTH 183.87c.87.191 92.1 0 0 0.00% 46 WEST EAST 92.870 87.161 83.87c.87.191 92.21 0 2 100.00% 51 SOUTH SOUTH SOUTH 80.876 87.191.83.87c.87.191 92.2<													0.00
BRT 37 30 40 40 40 41 37 40 40 41 38 40 41 Weisyn by-pass road 41 EAST WEIST 96.87 40 871:91 96.87/c.871:91 279 278 1 0.398/ 40 41 Weisyn by-pass road 43 41 Weisyn by-pass road 43 EAST EAST 96.87/c.871:80 871:91 96.87/c.871:80 0 0													0.00
RBT 33 40 40 40 40 41 Melwyn by-pass road 42 42 42 43 EAST Welwyn by-pass road 43 44 EAST SOUTH 44 NORTH WEST 50UTH 44 Welsyn by-pass road 50UTH 44 EAST 50UTH 50UTH 50UTH 44 NORTH WEST 50UTH 50UT					SOUTH								0.09
39 40 41 South EAST 6AST 96:87:97 96:87:87:97 0				EAST	WEST								0.06
40 41 42 42 43 44 44 44 44 44 44 44 44 44 44 45 Welwyn by-pass road (Hertford Road A1000) SOUTH SOUTH F WEST 1837 87 80 1837 87 80 1837 87 87 87 87 87 87 87 87 87 87 87 87 87													0.92
41 42 43 44 44 45 46 46 47 47 46 47 47 47 47 47 47 47 47 47 47 47 47 48 48 49 49 49 49 49 49 49 49 49 49 49 49 49													0.00
HBI 42 43 44 44 45 (Hertford Road A1000) 44 SOUTH EAST 50UTH 19337e 37:e37:b97 2730 2740 10 0.37% 0 44 45 SOUTH SOUTH 19337e 37:e37:b97 2330 244 5 3.887 45 WEST NORTH 92.87g 874:59 92.87g.87b:97 382 379 -3 -7.9% 46 WEST SOUTH 92.87g 874:59 92.87g.87b:97 382 379 -3 -7.9% 47 WEST SOUTH 92.87g 874:59 92.87g.87b:97 382 364 -8 -1.03% 49 NORTH SOUTH (Hertford Road for A1(m)) 74.67b 674.73 7510 511 1 0.20% 51 NORTH SOUTH (Hertford Road for A1(m)) 74.67b 674.73 7510 511 1 0.20% 52 NORTH NORTH NORTH 74.67b 674.73 750 0 0 0 #D10//00 53													0.00
42 (Hentroid Road A1000) SUDITH EASI 1 183.87e 87.957 22.90 22.40 100 0.37% 44 44 44 53.77 53.77 67.475 183.87e 87.957 92.87g.87c.97e 90 0	PBT												3.43
44 45 46 46 47 West 46 West 46 West 47 West 47 West 47 South 48 92.87g 47.878.879.97 38.2 37.97 32.379 32.377.871.99 32.379 32.377.871.99 32.377.97 33.37 48 49 West 49 West 49 NORTH SOUTH (Hertod Road for A1(m)) 74.67b.67c.78 74.67b.67c.78 148.00 51.0 52.0 52.0 53.0 0.20% 51.1 1 0.20% 50.0 0.00% </td <td>ND1</td> <td></td> <td>(Hertford Road A1000)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.19</td>	ND1		(Hertford Road A1000)										0.19
45 WEST E.AST 92:87g 87b:97 92:87g:87b:97 382 379 -3 -0.73% 47 WEST SOUTH 92:87g 87b:97 92:87g:87b:97 382 379 -3 -0.73% 47 WEST WEST 92:87g:87b:97 92:87g:87b:97 22:70g:87b:97 2 0 -2 -100.00% 49 NORTH SOUTH (Hetriord Road for A1(m)) 74:67b 67c:78 74:67b:67c:73 510 511 1 0.20% 51 NORTH NORTH NORTH NORTH 74:67b:67c:75 0 0 0 000% 52 NORTH NORTH NORTH 72:67e:67d:75 3029 3088 59 1.95% 53 SOUTH (A1000) NORTH NORTH 72:67e:67d:73 0 0 0 0 0 0 90 0 0.00% 54 Welwyn by-pass road SOUTH (A1000) SOUTH (A1000) 72:67e:67d:73 0 0 0							87d:89	183:87e:87d:89					0.00
46 WEST SOUTH 92:87g 87:489 92:87g:87:489 602 594 -8 -1.33% 47 WEST WEST 92:87g 87:491 2 0 -2 -100.00% 49 NORTH SOUTH (Hord Read for AI(m)) 74:67b:67:73 510 511 161 -0.29% 50 NORTH SOUTH (A1000) WEST 72:67b:67;70 74:67b:67;73 50 0 0 0.00% 52 SOUTH (A1000) WEST 72:67b:67;70 74:67b:67;70 3 4 1 33:3% 54 Welwyn by-pass road SOUTH (A1000) SOUTH (A1000) SOUTH (A1000) 72:67e 67:77:8 3:029 30:088 59 1.95% 55 SOUTH (Hortior Road for A1(m)) WEST 72:67e 67:78 72:67e:67:73 414 428 14 3:3% 56 SOUTH (Hortior Road for A1(m)) WEST SOUTH (Hortior Road for A1(m)) 70:67e 67:77:70 25 25 0 0.00% <td< td=""><td></td><td></td><td></td><td></td><td></td><td>92:87g</td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.44</td></td<>						92:87g							0.44
46 WEST SOUTH 92:87g 87:89 92:87g:87:89 602 594 -8 -1.33% 47 WEST WEST 92:87g 87:89 92:87g:87:91 2 0 -2 -100.00% 49 NORTH SOUTH (4000 Rad for A1(m)) 74:67b:67:73 74:67b:67:73 510 511 16 -0.29% 52 NORTH SOUTH (A1000) WEST 72:67e 672:70 74:67b:672:70 3 4 1 33:3% 53 NORTH NORTH NORTH 72:67e 672:70 74:67b:672:70 3 4 1 33:3% 54 Welwyn by-pass road SOUTH (A1000) NORTH 72:67e 672:78 72:67e:672:78 30:29 30:88 59 30:00TH (A1000) SOUTH (A1000) 72:67e 672:78 30:29 30:88 30:9 30:9 30:88 30:9 30:9 30:88 30:9 30:9 30:88 30:89 30:89 30:88 30:89 30:9 30:9						92:87g							0.15
47 WEST WEST 92.87g 871:91 92.87g,871:91 2 0 -2 -10.00% 49 NORTH SOUTH (Hertford Road for A1(m)) 74.67b.67c.78 1183 1167 -16 -1.33% 50 NORTH SOUTH (A1000) 74.67b. 67c.70 9 9 0 0.00% 51 NORTH WEST 74.67b. 67c.75 74.67b.67a.75 0 0 0 0.00% 53 SOUTH (A1000) WEST 72.67e.67a.75 0.029 308 59 1.95% 54 Welwyn by-pass road SOUTH (A1000) SOUTH (A1000) 72.67e.67a.75 72.67e.67c.73 0 0 0 0.00% 55 (Hertford Road for A1(m)) SOUTH (Mettord Road for A1(m)) SOUTH (Mettord Road for A1(m)) 72.67e.67c.73 72.67e.67c.73 0 0 0 0.00% 50 SOUTH (Hertford Road for A1(m)) SOUTH (Mettord Road for A1(m)) SOUTH (Mettord Road for A1(m)) SOUTH (Mettord Road for A1(m)) SOUTH (Mettord Road for A1(m)) SOUTH (Met						92:87g							0.33
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51 52 53 53 54 55 55 56 56 56 56 57 57 57 57 57 57 57 57 57 57 57 57 57										511			0.04
52 53 54 55 56 56 56 56 56 56 57 57 Welwyn by-pass road (Hertford Road A1000) WEST 50UTH (A1000) WEST 50UTH (A1000) WEST 50UTH (A1000) C2:67e 57 67c,73 72:67e:67c,775 30:29 72:67e:67c,775 414 428 14 33:3% 30:29 56 57 56 58 SOUTH (A1000) SOUTH (A1000) SOUTH (A1000) 72:67e 67c,73 72:67e:67c,773 0 0 0 #DIV/01 56 SOUTH (Hertford Road for A1(m)) WEST 68:671 67c,78 72:67e:67c,770 25 25 0 0.00% SOUTH (Hertford Road for A1(m)) SOUTH (A1000) 70:67g 67:67:73 10 7 3:3:3:3:3:3:3:3:3:3:3:3:3:3:3:3:3:3:3:		50		NORTH	WEST	74:67b	67g:70	74:67b:67g:70		9	0	0.00%	0.00
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54 55 56 56 57 57 58 58 59 60 60 60 60 60 60 60 60 60 60 60 60 60											59		1.07
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56 57 57 58 (Hertford Road A1000) SOUTH (Hertford Road for A1(m)) WEST 68.671 672,70 68.671;672,70 25 25 0 0.00% 57 58 SOUTH (Hertford Road for A1(m)) NORTH 68.671 672,70 68.671;672,75 3171 3163 -8 -0.25% 58 SOUTH (Hertford Road for A1(m)) SOUTH (Hortford Road for A1(m)) SOUTH (Hertford Road for A1(m)) SOUTH (SOUTH (Hortford Road for A1(m)) SOUTH (Hertford Road for A1(m)) SOUTH (SOUTH A1(m)) SOUTH (SOUTH A1(m)) SOUTH (SOUTH A1(m)) SOUTH (SOUTH A1(m)) SOUTH (SOUTH A1(m)) SOUTH (SOUTH A1(m)) SOUTH (SOUTH A1(m)) SOUTH (SOUTH A1(m)) SOUTH (SOUTH A1(m)) SOUTH (SOUTH A1(m)) <	RBT												0.00
57 58 59 60 SOUTH (Hertford Road for A1(m)) SOUTH (Hertford Road for A1(m)) For g for Cr.78 SOUTH NORTH FAST FOR GT (HORT) FOR			(nentrora Road A1000)				67g:70		25	25	0	0.00%	0.00
58 SOUTH (Hertford Road for A1(m)) SOUTH (Hertford Road for A1(m)) 68:671 67:77.8 368 368 0 0.00% 60 SOUTH (Hertford Road for A1(m)) SOUTH (Hertford Road for A1(m)) SOUTH (Hertford Road for A1(m)) 66:671 67:77.8 368 75:77.77.7 10 7 -3 -30.00% 61 WEST SOUTH (Hertford Road for A1(m)) 70:67g 67:77.7 70:67g:67:7.75 10 7 -3 -30.00% 62 WEST SOUTH (Hertford Road for A1(m)) 70:67g:67:7.75 5 5 0 0.00% 64 WEST SOUTH (Hertford Road for A1(m)) 70:67g:67:7.3 5 5 0 0.00% 65 MORTH EAST 39:34:1 168:40 39:34:14:342:37 690 697 7 1.01% 66 MORTH WEST 39:34:1 342:33 39:34:1:42:37 14 14 0 0.00% 67 (B197) SOUTH WEST 40:34:23 342:34:34:237 14 14 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.14</td>													0.14
59 60 61 SOUTH (Hertford Road for A1(m)) SOUTH (A1000) 68:671 67:73 67:67:67:73 179 184 5 2.79% 61 WEST NORTH 70:67g 67a:75 70:67g:67a:75 10 7 -3 -3:0.00% 62 WEST SOUTH (Hertford Road for A1(m)) 70:67g 67a:75 70:67g:67a:73 5 5 0 0.00% 63 NORTH EAST SOUTH (A1000) 70:67g 67a:73 70:67g:67a:73 5 5 0 0.00% 64 NORTH EAST 39:34zt 39:34zt 39:34zt 39:34zt 324:342:37 680 697 7 1.01% 66 66 EAST NORTH WEST 40:34za 34za:37 0:34zt 34za:34z:37 14 14 0 0.00% 67 68 Welwyn by-pass road EAST NORTH 40:34za 34za:37 0:34zt 34zb:34zb:34zb:37 344 346 2 0.59% 70 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.00</td>													0.00
60 WEST NORTH 70.67g 672.75 10 7 3 300.0% 61 WEST SOUTH (Hertford Read for A1(m)) 70.67g 672.78 9 9 0 0.00% 62 WEST SOUTH (A1000) 77.67g 672.78 70.67g.67d.73 5 5 0 0.00% 63 WEST SOUTH (A1000) 77.67g 672.78 70.67g.67d.73 5 5 0 0.00% 64 NORTH EAST 39.342 168:40 38.342/168:40 6 4 -2 -33.33% 65 NORTH WEST 39.342 342.37 690 697 7 1.01% 66 EAST WEST 40.342.342.37 40.342.342.37 14 14 0 0.00% 67 (B197) SOUTH WEST 35.342 342.342.342.37 344 342.33 3 1 -2 -666.67% 68 (B197) SOUTH WEST <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.37</td></t<>													0.37
61 WEST SOUTH (Hentral Road for At(m)) 70.67g 67c.78 9 9 0 0.00% 62 WEST SOUTH (Antral Road for At(m)) 70.67g 67c.78 70.67g.67c.78 9 9 0 0.00% 63 WEST SOUTH (Antral Road for At(m)) 70.67g 67c.77 5 5 0 0.00% 64 NORTH EAST 39.34z1 168:40 39.34z1:168:40 6 4 2 -33.33% 65 NORTH WEST 39.34z1 34ze.37 690 697 7 101% 66 NORTH NORTH 39.34z1 34ze.37 690 697 7 101% 67 KAST WEST 39.34z1 34ze.37 14 14 0 0.00% 67 EAST NORTH 40.34za 34za.334za.34za.34za.34za.34za.34za.34za													1.03
62 WEST SOUTH 76.7g 67d.73 70.67g.67d.73 5 5 0 0.00% 63 NORTH EAST 39.34z1 168.40 39.34z1													0.00
63 NORTH EAST 39:34z1 168:40 96 4 -2 -33:33% 64 NORTH WEST 39:34z1 39:34z3 39:34z3 39:34z3 60 60 67 7 1.01% 65 66 EAST WEST 40:34za 34zc:37 60 60 67 7 1.01% 67 EAST WEST 40:34za 34zc:38 40:34za:34zc:37 1.4 1.4 0 0.00% 67 EAST WORTH 40:34za 34zc:33 40:34za:34zc:38 3 1 -2 -6.67% 68 Welwyn by-pass road EAST NORTH 40:34za 34za:34 34za:34za:34za:38 3 1 -2 -6.67% 70 (B197) SOUTH WCST 35:34zb:34za:37 34:4 346 2 0.58% 71 SOUTH WORTH 35:34zb:34zb:34za:38 35:34zb:34zb:34za:38 1212 2199 74 3.4%% 72 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.00</td>													0.00
64 65 66 66 67 67 67 68 68 69 70 70 70 73 NORTH WEST 39:34z1 34z:37 39:34z34z:34z:37 690 39:34z1 697 70 7 10% 73 680 697 7 10% NORTH NORTH 39:34z1 34z:37 39:34z1 34z:38 0 0 0 #DIV/01 66 0 67 Wellyn by-pass road (B197) EAST NORTH 40:34za 34ze:37 40:34za: 34ze:38 3 1 -2 -66.67% 70 EAST NORTH 40:34za 34ze:37 40:34za:34ze:37 344 346 2 0.58% 71 SOUTH WEST 35:34zb 36:34zb:34ze:38 2125 2199 74 3.48% 73 WEST NORTH 185:34zb 36:34zb:34ze:38 2125 2199 74 3.48% 73 WEST NORTH 185:34zb 168:40 1 1 0 0.00%													0.89
65 NORTH NORTH 39:34zl 34z:38 39:34zl 34z:34z:38 0 0 0 #DIV/01 66 EAST WEST 40:34za 34z:34 34z:34z:38 0 0 0 #DIV/01 67 EAST WEST 40:34za 34z:34 34z:38 40:34za:34z:37 14 14 0 0.00% 67 EAST NORTH 40:34za 34z:38 40:34za:34z:38 3 1 -2 -66.67% 69 (B197) EAST EAST 40:34za 168:40 40:34za:169.40 0 0 0 #DV/01 70 SOUTH WEST 35:4zb 34z:37 36:44b 34zb:34z:37 344 346 2 0.65% 71 SOUTH NORTH 35:34zb 34zb:34z:34z:34z:34z:38 2125 2199 74 3.44% 72 WEST NORTH 185:34zb 35:34zb:34zb:34zb:34zb:34zb:34zb:34zb:34zb													0.27
66 67 68 69 70 71 72 Welwyn by-pass road (B197) EAST EAST EAST EAST EAST SOUTH WEST ACT EAST EAST EAST AU34za 40:34za 34zc:37 40:34za 31 40:34za:34zc:38 40:34za:34zc:38 33 14 33 14 40 00 40 000% 40:00% 68 69 70 71 72 Welwyn by-pass road (B197) EAST AST AUX EAST AST AUX 40:34za:168:40 40:34za 14 40:34za:168:40 40:34za 14 40:34za:168:40 40:34za 14 40:34za:168:40 40:34za 0 40 0 40 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.00</td>													0.00
67 68 (B197) Welwyn by-pass road (B197) EAST EAST NORTH 40/34za 34za:34/2a:34za:34za:34 3 1 -2 -6667% 70 (B197) EAST EAST 40/34za 168:40 0 0 0 00 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0.00</td></t<>													0.00
68 69 (B197) Welwyn by-pass road (B197) EAST 40:34za 40:34za 168:40 40:34za:168:40 0 0 #DIV/01 70 70 SOUTH WEST 35:34zh 34zc:37 33:42b:34zc:37 344 346 2 0.56% 70 SOUTH NORTH 35:34zh 34zc:37 344 346 2 0.56% 71 SOUTH NORTH 35:34zh 36:34zb:186:40 1 1 0 0.00% 72 WEST NORTH 185:34zd:186:40 1 1 0 0.00% 73 WEST NORTH 185:34zd:186:40 16 16 0 0.00%													1.41
KBI 69 (B197) SOUTH WEST 35:34zb 34zc:37 35:44zb:34zc:37 344 346 2 0.58% 70 70 SOUTH NORTH 35:34zb 34zc:37 35:44zb:34zc:37 344 346 2 0.58% 71 SOUTH NORTH 35:34zb 36:34zb:34zc:38 2125 2199 74 3.48% 71 SOUTH EAST 35:34zb 168:40 1 1 0 0.00% 72 WEST NORTH 185:34zd 168:40 1313 1317 4 0.30% 73 WEST EAST 185:34zd 168:40 16 16 0.00%			Welwyn by-pass road	FAST									0.00
TO SOUTH NORTH 35:34zb 34ze:38 2125 2199 74 3.48% 71 SOUTH EAST 35:34zb 168:40 35:34zb:168:40 1 1 0 0.00% 72 WEST NORTH 185:34zd 34ze:38 1313 1317 4 0.30% 73 WEST EAST 185:34zd 185:34zd:168:40 16 16 0 0.00%	RBT												0.11
71 SOUTH EAST 35:34zb 168:40 35:34zb:168:40 1 1 0 0.00%. 72 WEST NORTH 186:34zd 34zb:168:40 1313 1317 4 0.30%. 73 WEST EAST 185:34zd 185:34zd 185:34zd 168:40 16 16 0 0.00%.			(5.07)										1.59
72 WEST NORTH 185:34zd 34ze:38 185:34zd.34ze:38 1313 1317 4 0.30% 73 WEST EAST 185:34zd 185:34zd.168:40 16 16 0 0.00%									1	1			0.00
73 WEST EAST 185:34zd 168:40 185:34zd:168:40 16 16 0 0.00%									1313	1317			0.00
74 WEST WEST 186:3420 342:37 185:3422 37 0 0 0 #00/00													0.00
					WEST								0.00
	L					. 50.0 120	5 120.01				•		0.00

		GEH < 5	GEH < 6			GEH < 7	GEi	< 8
otal Numb	No. Pass	%	No. Pass	%	No. Pass	%	No. Pass	%
74	73	98.6%	74 100		74	100.0%	74	100.0%
	Flow <	: 700	700 < Flow < 27	'00		F	Flow > 2700 Pass	
Number	No. Pass	%	Number	No. Pass	%	Number	No. Pass	%
56	56	100.0%	12	12	100.0%	6	6	100.0%

APPENDIX C Queue Length Calibration Statistics





400

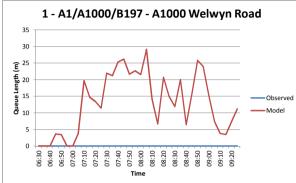
350

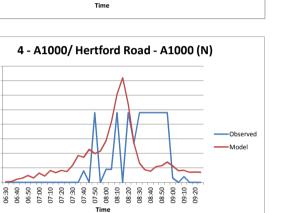
300

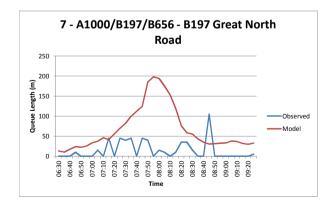
a 150

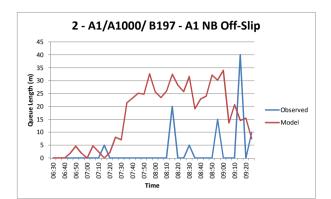
ಕ ₁₀₀

50









5 - A1000/ Hertford Road - A1000 (S)

Observed

-Model

40

35

30

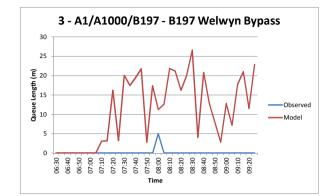
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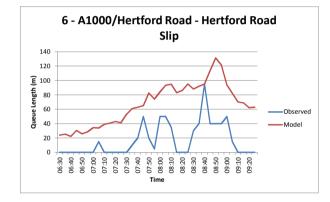
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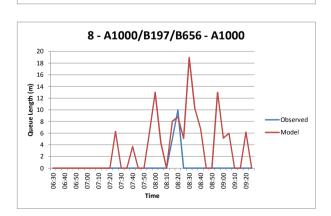
5

0

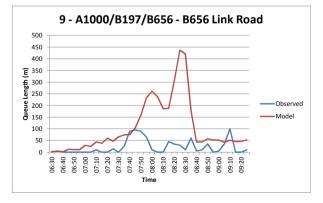
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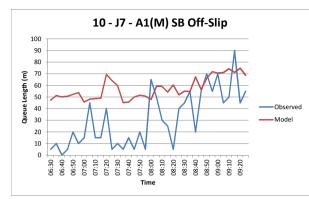


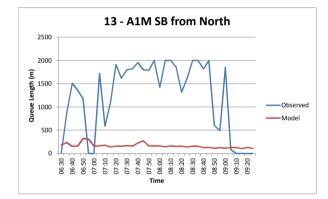


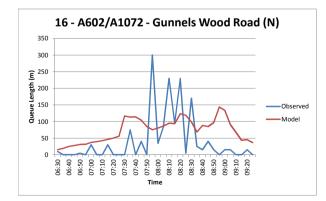
Time

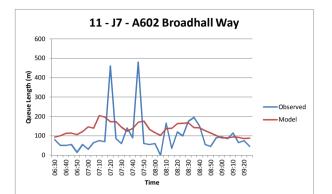












14 - J7 - A1(M) NB Off-slip

Observed

-Model

120 100

Length (m) 80 60

Queue

40

20

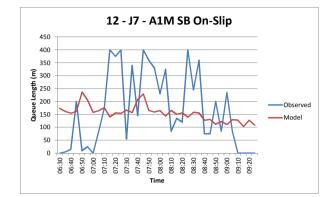
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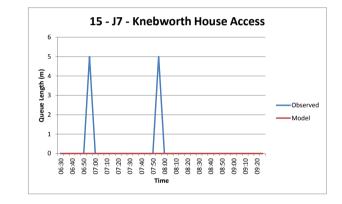
06:30 \$ 20

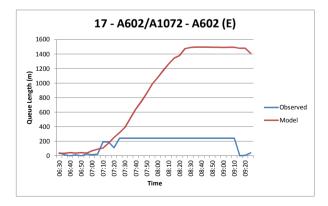
90

8 07:10 20

5

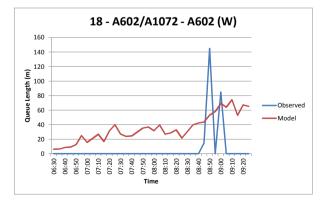


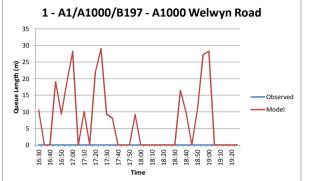


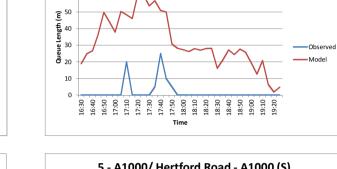


07:30 07:50 07:50 08:00 08:10 08:30 08:30 08:30 08:30 08:30 08:30 08:30 08:30 08:30 08:50 09:10 09:10

Time

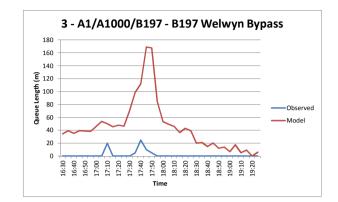


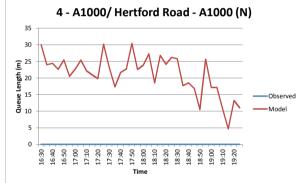


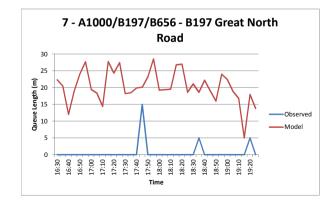


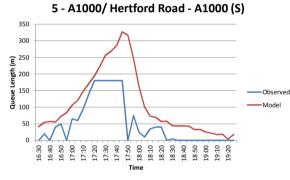
70

60

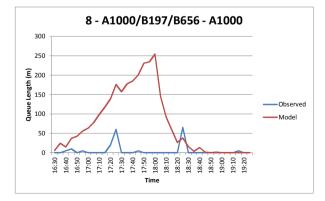


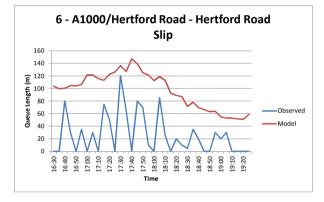


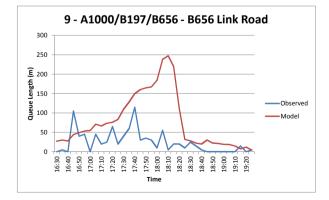


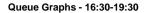


2 - A1/A1000/ B197 - A1 NB Off-Slip

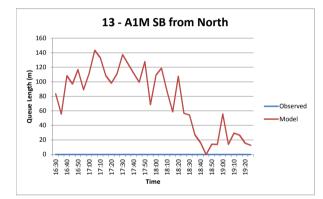


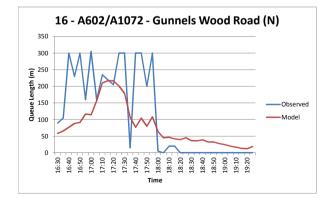


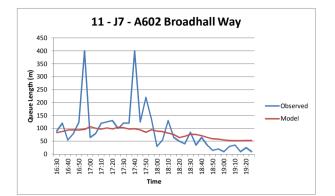












14 - J7 - A1(M) NB Off-slip

(6540) (17:00) (17:10) (17:20) (17:50)

Time

Observed

-Model

120

100

60

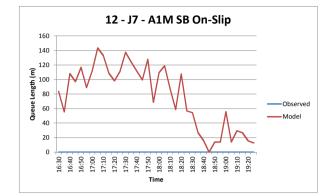
40

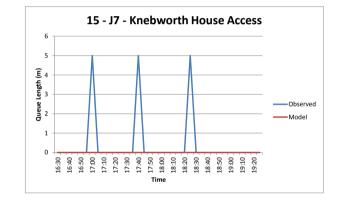
20

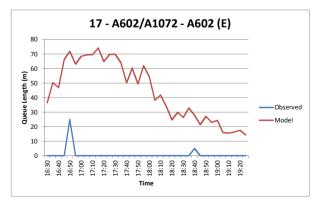
0

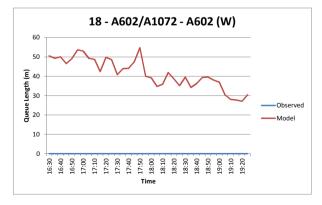
16:30

Queue Length (m) 80









APPENDIX D AM Peak Validation Journey Times



Journey Time Summary Stats AM Peak

Central Hour

Journov Dath			Obs	erved			Modelled	% Difference	In Interval	<15%	<60s	DMRB
Journey Path	Observed	St. Dev	Confidence	Confidence+1	Low	High	Mean	% Difference	in interval	<15%	<005	DIVIRD
1 (Total)												
2 (Total)	424.5	25.1	20.1	62.5	362.0	487.0	382.0	-10.0%	Y	Y	Y	Y
3 (Total)												
4 (Total)	249.7	33.0	26.4	51.4	198.3	301.1	264.5	6.0%	Y	Y	Y	Y
5 (Total)	356.1	36.3	26.9	62.5	293.6	418.7	289.3	-18.8%	N	N	N	N
7 (Total)	167.5	23.3	32.3	49.1	118.4	216.6	150.8	-10.0%	Y	Y	Y	Y
8 (Total)	264.6	150.9	104.5	131.0	133.6	395.6	227.8	-13.9%	Y	Y	Y	Y
								TRUE	4	4	4	4
								FALSE	1	1	1	1
Three Hour								% True	80%	80%	80%	80%

			Obse	erved			Modelled					
Journey Path	Observed Mean	St. Dev	Confidence	Confidence+1 0%	Low	High	Mean	% Difference	In Interval	<15%	<60s	DMRB
1 (Total)	345	103	76	111	235	456	311	-9.8%	Y	Y	Y	Y
2 (Total)	415	31	14	56	359	470	387	-6.5%	Y	Y	Y	Y
3 (Total)	263	61	45	72	192	335	223	-15.2%	Y	N	Y	Y
4 (Total)	259	27	12	38	221	298	258	-0.6%	Y	Y	Y	Y
5 (Total)	319	63	30	62	257	381	280	-12.3%	Y	Y	Y	Y
7 (Total)	153	15	9	24	128	177	148	-3.2%	Y	Y	Y	Y
8 (Total)	224	112	55	77	147	302	186	-16.8%	Y	N	Y	Y
								TRUE	7	5	7	7
								FALSE	0	2	0	0
Three Hour								% True	100%	71%	100%	100%

Journey Time Summary Stats AM Peak

Central Hour

Jauman Dath			Obs	erved			Modelled		In Internal	.4 50/	<60s	DMRB
Journey Path	Observed	St. Dev	Confidence	Confidence+1	Low	High	Mean	% Difference	In Interval	<15%	<605	DIVIRB
1a												0
1b												0
1c												0
2a	226.7	14.1	11.3	34.0	192.7	260.6	211	-7.0%	Y	Y	Y	Y
2b	20.7	1.5	1.2	3.3	17.4	23.9	18	-11.4%	Y	Y	Y	Y
2c	177.2	11.7	9.3	27.0	150.1	204.2	166	-6.5%	Y	Y	Y	Y
3a												0
3b												0
3c												0
4a	41.3	12.8	10.2	14.4	27.0	55.7	48	15.9%	Y	N	Y	Y
4b	38.3	6.3	5.0	8.8	29.5	47.2	41	7.4%	Y	Y	Y	Y
4c	170.0	23.5	18.8	35.8	134.2	205.8	166	-2.5%	Y	Y	Y	Y
5a	97.0	12.5	9.3	19.0	78.0	116.0	82	-15.0%	Y	Y	Y	Y
5b	48.9	10.7	7.9	12.8	36.1	61.7	53	7.8%	Y	Y	Y	Y
5c	68.4	19.4	14.4	21.2	47.2	89.6	46	-33.4%	Ν	Ν	Y	Y
5d	141.9	8.1	6.0	20.1	121.7	162.0	95	-33.1%	N	N	Y	Y
6a	73.0	1.4	2.0	9.3	63.7	82.3	77	5.6%	Y	Y	Y	Y
6b	188.0	131.5	182.3	201.1	-13.1	389.1	98	-47.9%	Y	N	N	N
6c	350.0	39.6	54.9	89.9	260.1	439.9	402	14.7%	Y	Y	Y	Y
7a	27.0	1.4	2.0	4.7	22.3	31.7	25	-8.2%	Y	Y	Y	Y
7b	29.0	7.1	9.8	12.7	16.3	41.7	33	12.7%	Y	Y	Y	Y
7c	46.5	9.2	12.7	17.4	29.1	63.9	34	-26.7%	Y	Ν	Y	Y
7d	65.0	8.5	11.8	18.3	46.7	83.3	50	-23.7%	Y	N	Y	Y
8a	85.9	34.0	23.5	32.1	53.7	118.0	87	1.5%	Y	Y	Y	Y
8b	96.1	145.0	100.5	110.1	-14.0	206.2	68	-29.3%	Y	N	Y	Y
8c	42.3	21.3	14.8	19.0	23.2	61.3	28	-32.7%	Y	N	Y	Y
8d	40.4	2.1	1.4	5.5	34.9	45.8	36	-10.6%	Y	Y	Y	Y
9a	89.6	30.4	21.0	30.0	59.6	119.6	107	19.6%	Y	Ν	Y	Y
9b	58.6	13.2	9.2	15.0	43.6	73.7	72	22.8%	Y	Ν	Y	Y
9e	45.8	11.4	7.9	12.5	33.3	58.2	40	-12.8%	Y	Y	Y	Y
9f	42.1	3.5	2.4	6.7	35.5	48.8	34	-19.0%	Ν	Ν	Y	Y
9g	31.0	0.9	0.6	3.7	27.3	34.7	28	-9.3%	Y	Y	Y	Y
								TRUE	23	15	25	25
								FALSE	3	11	1	1
								% True	88%	58%	96%	96%

Journey Time Summary Stats AM Peak

Three Hour

			Obs	erved			Modelled					
Journey Path	Observed Mean	St. Dev	Confidence	Confidence+1 0%	Low	High	Mean	% Difference	In Interval	<15%	<60s	DMRB
1a	215.0	75.2	55.7	77.2	137.8	292.2	174	-18.9%	Y	N	Y	Y
1b	29.1	13.0	9.7	12.6	16.6	41.7	47	62.0%	Ν	Ν	Y	Y
1c	101.0	25.3	18.8	28.9	72.1	129.9	95	-6.0%	Y	Y	Y	Y
2a	220.1	15.8	7.5	29.5	190.5	249.6	216	-1.9%	Y	Y	Y	Y
2b	19.9	1.8	0.9	2.9	17.1	22.8	18	-7.7%	Y	Y	Y	Y
2c	174.5	14.8	7.0	24.5	150.0	199.0	165	-5.6%	Y	Y	Y	Y
3a	202.0	69.2	51.3	71.5	130.5	273.5	170	-15.6%	Y	N	Y	Y
3b	36.3	13.8	10.2	13.8	22.5	50.1	29	-20.4%	Y	N	Y	Y
3c	24.9	2.0	1.5	4.0	20.9	28.9	22	-12.2%	Y	Y	Y	Y
4a	40.3	13.0	5.9	9.9	30.4	50.2	46	14.3%	Y	Y	Y	Y
4b	41.8	13.9	6.2	10.4	31.4	52.3	40	-5.1%	Y	Y	Y	Y
4c	177.3	21.8	9.8	27.6	149.8	204.9	165	-7.1%	Y	Y	Y	Y
5a	90.1	15.6	7.4	16.4	73.6	106.5	77	-14.4%	Y	Y	Y	Y
5b	47.5	12.7	6.0	10.8	36.7	58.2	52	8.7%	Y	Y	Y	Y
5c	51.6	26.3	12.5	17.7	34.0	69.3	45	-11.9%	Y	Y	Y	Y
5d	129.9	30.7	14.6	27.6	102.3	157.6	95	-27.0%	Ν	Ν	Y	Y
6a	73.0	1.4	2.0	9.3	63.7	82.3	76	3.9%	Y	Y	Y	Y
6b	188.0	131.5	182.3	201.1	-13.1	389.1	75	-59.9%	Y	Ν	N	N
6c	350.0	39.6	54.9	89.9	260.1	439.9	77	-78.1%	Ν	Ν	N	N
7a	29.1	10.7	6.3	9.2	19.9	38.3	25	-15.6%	Y	Ν	Y	Y
7b	24.4	3.5	2.1	4.5	19.9	28.9	32	31.7%	Ν	Ν	Y	Y
7c	41.5	9.5	5.6	9.7	31.8	51.3	33	-20.1%	Y	Ν	Y	Y
7d	57.7	5.1	3.0	8.8	48.9	66.5	50	-14.1%	Y	Y	Y	Y
8a	81.3	28.8	14.1	22.2	59.1	103.5	66	-18.9%	Y	Ν	Y	Y
8b	64.9	104.2	51.1	57.6	7.4	122.5	46	-29.7%	Y	Ν	Y	Y
8c	37.4	15.6	7.6	11.4	26.0	48.7	28	-24.7%	Y	Ν	Y	Y
8d	40.6	4.7	2.3	6.4	34.3	47.0	36	-11.2%	Y	Y	Y	Y
9a	76.1	25.7	12.6	20.2	55.8	96.3	68	-10.0%	Y	Y	Y	Y
9b	57.8	29.9	14.6	20.4	37.4	78.2	50	-13.2%	Y	Y	Y	Y
9e	41.1	9.4	4.6	8.7	32.4	49.8	40	-1.8%	Y	Y	Y	Y
9f	41.6	3.3	1.6	5.8	35.8	47.4	33	-20.2%	Ν	Ν	Y	Y
9g	31.2	1.4	0.7	3.8	27.4	35.0	28	-9.7%	Y	Y	Y	Y
			•	• I		•	•	TRUE	27	18	30	30
								FALSE	5	14	2	2
								% True	84%	56%	94%	94%

APPENDIX E PM Peak Validation Journey Times



Journey Time Summary Stats PM Peak

Central Hour

Journov Both			Obs	erved			Modelled	% Difference	In Interval	<15%	<60s	DMRB	
Journey Path	Observed	St. Dev	Confidence	Confidence+1	Low	High	Mean	% Difference	în întervai	<13%	<005	DIVIRD	
1 (Total)	277.6	20.6	15.2	43.0	234.6	320.6	254.2	-8.4%	Y	Y	Y	Y	
2 (Total)	474.0	42.7	31.6	79.0	395.0	553.0	462.9	-2.3%	Y	Y	Y	Y	
3 (Total)	258.7	36.9	25.6	51.4	207.3	310.2	207.1	-19.9%	N	N	Y	Y	
4 (Total)	288.4	21.6	16.0	44.8	243.6	333.3	265.3	-8.0%	Y	Y	Y	Y	
5 (Total)	283.6	44.0	30.5	58.9	224.8	342.5	249.2	-12.2%	Y	Y	Y	Y	
6 (Total)	725.3	27.1	16.8	89.3	636.0	814.6	254.2	-65.0%	N	N	N	N	
7 (Total)	265	49.3	39.5	66.0	199.2	331	324	22.3%	Y	N	Y	Y	
8 (Total)	179.5	32.6	31.9	49.9	129.6	229.4	150.7	-16.0%	Y	N	Y	Y	
								TRUE	6	4	7	7	
								FALSE	2	4	1	1	
Three Hour								% True	75%	50%	88%	88%	

			Observed Modelled									
Journey Path	Observed Mean	St. Dev	Confidence	Confidence+1 0%	Low	High	Mean	% Difference	In Interval	<15%	<60s	DMRB
1 (Total)	272.7	27.4	12.3	39.6	233.1	312.3	249.82	-8.4%	Y	Y	Y	Y
2 (Total)	476.9	41.6	19.8	67.5	409.4	544.4	437.208	-8.3%	Y	Y	Y	Y
3 (Total)	239.7	32.3	14.9	38.9	200.9	278.6	204.144	-14.8%	Y	Y	Y	Y
4 (Total)	273.2	29.5	14.0	41.3	231.9	314.6	257.404	-5.8%	Y	Y	Y	Y
5 (Total)	263.9	53.8	26.4	52.8	211.2	316.7	223.469	-15.3%	Y	N	Y	Y
6 (Total)	748.6	40.1	17.1	92.0	656.6	840.6	149.888	-80.0%	Ν	N	N	N
7 (Total)	205.5	57.0	27.9	48.5	157.0	254.0	236.086	14.9%	Y	Y	Y	Y
8 (Total)	165.7	23.5	12.8	29.3	136.4	195.0	150.317	-9.3%	Y	Y	Y	Y
								TRUE	7	6	7	7
								FALSE	1	2	1	1
Three Hour								% True	88%	75%	88%	88%

Journey Time Summary Stats PM Peak

Central Hour

Journey Deth			Obs	erved			Modelled	% Difference	In Interval	<15%	<60s	DMRB
Journey Path	Observed	St. Dev	Confidence	Confidence+1	Low	High	Mean	% Difference	In Interval	<15%	<005	DIVIRD
1a	176.0	12.4	9.2	26.8	149.2	202.8	158	-10.0%	Y	Y	Y	Y
1b	20.6	2.0	1.5	3.5	17.0	24.1	20	-4.9%	Y	Y	Y	Y
1c	81.0	7.5	5.6	13.7	67.3	94.7	80	-1.4%	Y	Y	Y	Y
2a	265.7	22.6	16.8	43.3	222.4	309.1	296	11.4%	Y	Y	Y	Y
2b	21.6	4.8	3.5	5.7	15.9	27.3	19	-11.5%	Y	Y	Y	Y
2c	186.7	19.3	14.3	33.0	153.7	219.7	175	-6.3%	Y	Y	Y	Y
3a	203.2	23.6	16.4	36.7	166.5	240.0	158	-22.1%	N	N	Y	Y
3b	30.6	17.5	12.1	15.2	15.4	45.8	27	-10.2%	Y	Y	Y	Y
3c	24.9	2.3	1.6	4.1	20.8	29.0	21	-14.8%	Y	Y	Y	Y
4a	38.1	10.0	7.4	11.2	26.9	49.4	34	-11.1%	Y	Y	Y	Y
4b	51.6	11.2	8.3	13.5	38.1	65.0	44	-15.0%	Y	Y	Y	Y
4c	198.7	24.4	18.1	37.9	160.8	236.6	175	-11.9%	Y	Y	Y	Y
5a	134.5	37.1	25.7	39.1	95.4	173.6	111	-17.8%	Y	N	Y	Y
5b	49.4	17.7	12.3	17.2	32.2	66.6	37	-25.2%	Y	N	Y	Y
5c	15.6	1.4	1.0	2.5	13.1	18.2	14	-11.3%	Y	Y	Y	Y
5d	84.1	8.7	6.0	14.4	69.7	98.5	80	-5.1%	Y	Y	Y	Y
6a	96.3	16.6	10.3	19.9	76.4	116.2	158	64.6%	Ν	N	N	N
6b	141.1	42.5	26.4	40.5	100.6	181.6	20	-86.1%	Ν	Ν	N	N
6c	487.9	35.8	22.2	71.0	416.9	558.9	80	-83.6%	Ν	Ν	N	N
7a	45.0	15.9	12.7	17.2	27.8	62.2	49	9.9%	Y	Y	Y	Y
7b	98.0	29.7	23.8	33.6	64.4	131.6	122	25.0%	Y	Ν	Y	Y
7c	66.3	15.0	12.0	18.7	47.7	85.0	63	-4.5%	Y	Y	Y	Y
7d	55.8	2.0	1.6	7.2	48.6	63.0	50	-10.4%	Y	Y	Y	Y
8a	82.3	31.9	31.2	39.4	42.8	121.7	49	-41.0%	Y	N	Y	Y
8b	28.8	2.6	2.6	5.5	23.3	34.2	29	-0.5%	Y	Y	Y	Y
8c	30.7	5.9	5.7	8.8	21.9	39.6	27	-11.7%	Y	Y	Y	Y
8d	37.8	2.5	2.4	6.2	31.5	44.0	36	-4.9%	Y	Y	Y	Y
9a	129.3	50.7	37.6	50.5	78.8	179.8	162	25.6%	Y	Ν	Y	Y
9b	42.0	2.4	1.8	6.0	36.0	48.0	34	-18.4%	Ν	Ν	Y	Y
9e	66.3	21.7	16.1	22.7	43.6	89.0	55	-16.9%	Y	Ν	Y	Y
9f	56.6	11.8	8.7	14.4	42.2	71.0	63	12.0%	Y	Y	Y	Y
9g	29.9	2.5	1.8	4.8	25.0	34.7	28	-6.1%	Y	Y	Y	Y
U U			•			•	•	TRUE	27	21	29	29
								FALSE	5	11	3	3
								% True	84%	66%	91%	91%

Journey Time Summary Stats PM Peak

Three Hour

			Obs	erved			Modelled					
Journey Path	Observed Mean	St. Dev	Confidence	Confidence+1 0%	Low	High	Mean	% Difference	In Interval	<15%	<60s	DMRB
1a	170.9	17.1	7.7	24.8	146.1	195.7	157	-8.2%	Y	Y	Y	Y
1b	20.0	2.4	1.1	3.1	16.9	23.1	19	-3.4%	Y	Y	Y	Y
1c	81.8	10.6	4.8	12.9	68.8	94.7	77	-6.0%	Y	Y	Y	Y
2a	271.8	38.7	18.4	45.6	226.3	317.4	269	-1.2%	Y	Y	Y	Y
2b	21.1	3.3	1.6	3.7	17.4	24.7	19	-11.4%	Y	Y	Y	Y
2c	184.0	14.5	6.9	25.3	158.7	209.3	171	-6.9%	Y	Y	Y	Y
3a	184.9	29.7	13.7	32.2	152.7	217.1	157	-15.3%	Y	N	Y	Y
3b	27.4	17.0	7.9	10.6	16.8	38.0	28	0.7%	Y	Y	Y	Y
3c	27.4	8.1	3.8	6.5	20.9	33.9	20	-26.7%	N	N	Y	Y
4a	35.2	9.5	4.5	8.0	27.2	43.3	31	-11.1%	Y	Y	Y	Y
4b	49.3	11.3	5.4	10.3	39.0	59.6	44	-11.4%	Y	Y	Y	Y
4c	188.7	25.4	12.1	30.9	157.8	219.6	171	-9.2%	Y	Y	Y	Y
5a	124.9	47.9	23.4	35.9	89.0	160.9	89	-28.4%	Y	N	Y	Y
5b	41.4	15.2	7.4	11.6	29.8	53.0	35	-15.6%	Y	N	Y	Y
5c	15.3	1.2	0.6	2.1	13.1	17.4	14	-10.3%	Y	Y	Y	Y
5d	82.4	7.8	3.8	12.0	70.3	94.4	77	-6.6%	Y	Y	Y	Y
6a	94.9	20.3	8.7	18.2	76.7	113.1	126	33.3%	N	N	Y	Y
6b	147.0	44.1	18.8	33.5	113.4	180.5	123	-16.3%	Y	N	Y	Y
6c	506.7	56.4	24.1	74.8	431.9	581.5	140	-72.4%	N	N	N	N
7a	34.0	13.1	6.4	9.8	24.2	43.8	37	9.0%	Y	Y	Y	Y
7b	59.0	36.2	17.7	23.6	35.4	82.6	77	31.1%	Y	N	Y	Y
7c	56.4	15.9	7.8	13.5	43.0	69.9	49	-13.0%	Y	Y	Y	Y
7d	56.1	2.4	1.2	6.8	49.3	62.8	50	-11.0%	Y	Y	Y	Y
8a	66.2	23.9	13.0	19.6	46.5	85.8	48	-26.9%	Y	N	Y	Y
8b	31.5	3.5	1.9	5.1	26.4	36.5	28	-9.6%	Y	Y	Y	Y
8c	30.2	3.6	1.9	5.0	25.2	35.1	27	-9.8%	Y	Y	Y	Y
8d	37.9	3.5	1.9	5.7	32.2	43.6	36	-5.5%	Y	Y	Y	Y
9a	93.8	48.7	21.9	31.3	62.5	125.1	107	13.6%	Y	Y	Y	Y
9b	52.5	17.1	7.7	13.0	39.6	65.5	34	-35.1%	Ν	N	Y	Y
9e	51.6	19.0	8.6	13.7	37.9	65.3	48	-7.5%	Y	Y	Y	Y
9f	46.2	11.1	5.0	9.6	36.6	55.8	49	6.4%	Y	Y	Y	Y
9g	29.9	2.1	0.9	3.9	26.0	33.9	28	-6.5%	Y	Y	Y	Y
				• • •				TRUE	28	22	31	31
								FALSE	4	10	1	1
								% True	88%	69%	97%	97%

APPENDIX F Final Matrices



Prior Matrix Structure before Furnessing

Zor
Zor
Zor

Zone-zone movement not possible Zone-zone movement known from traffic count Zone-zone movment not known from traffic count Estimated Zero Movement

Cars	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
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AM Peak Matrix (06.00-10.00)

CAR 2 3 4 5 6 7 8 9 10 11 12	
	13 14 15 16 17
2 0 427 148 746 16 4 67 0 0 0 0	0 0 0 7341
3 492 0 396 1055 0 1 28 0 0 0 0 4 6 24 0 33 0 0 0 0 0 0 0 0 0	0 0 0 1633 0 0 0 19
4 6 24 0 33 0	0 0 0 0 19 0 0 0 0 2481
7 0 0 0 0 0 0 0 0 0 0	0 0 0 0
8 20 16 6 28 1 2 0 0 0 0 0	0 0 0 33
9 80 19 7 33 1 0 0 0 402 2 0	1975 0 677 0 0
11 4 1 0 2 0 0 2 1 0 0 12 611 144 50 251 5 3 3 382 178 4 0	13 0 9 0 0 610 0 167 0 0
	2 0 19 0 0
15 131 31 11 54 1 1 1 82 38 1 0	259 1 0 0 0
<u>16 3890 916 318 1600 34 21 19 278 130 1 0</u>	318 0 73 0 0
17 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 32591
LGV 2 3 4 5 6 7 8 9 10 11 12	13 14 15 16 17
	0 0 0 0 1700
3 142 0 17 177 0 0 10 0 0 0 0 4 1 2 0 11 0<	0 0 0 0 444 0 0 0 0 2
4 1 2 0 11 0	
7 0 0 0 0 0 0 0 0 0	0 0 0 0
8 4 6 0 3 0 0 0 0 0 0	0 0 0 3
9 10 3 0 2 0 0 0 55 2 0	
10 14 4 0 2 0 0 48 0 1 0 11 1 0 0 0 0 0 1 1 0 0	163 1 42 0 0 1 0 0 0 0
11 1 0 0 0 0 0 1 1 0 0 12 99 30 1 17 1 0 1 84 39 0 0	1 0 0 0 0 78 0 29 0 0
14 0 0 0 0 0 0 0 0 0 0 0	1 0 6 0 0
15 18 5 0 3 0 0 15 7 1 0	22 1 0 0 0
<u>16 596 181 7 101 5 1 6 75 35 2 0</u>	52 3 18 0 0
17 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 5858
OGV1 2 3 4 5 6 7 8 9 10 11 12	13 14 15 16 17
2 0 41 4 26 1 0 2 0 0 0 3 15 0 1 26 0 0 1 0 0 0 0	0 0 0 0 295 0 0 0 0 27
3 15 0 1 26 0 0 1 0	
	0 0 0 0 52
	0 0 0 52 0 0 0 0 0
7 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0
7 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
7 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 16 0 4 0 0 0
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PM Peak Matrix (16.00-20.00)

CAR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
2	0	1185	8	688	9	0	25	0	0	0	0	0	0	0	0	5341	
3	958	0	21	689	0	2	40	0	0	0	0	0	0	0	0	1307	
4	266	252	0		0	1	11	0	0	0	0	0	0	0	0	362	
5	1262	1084	11	0	0	3	53	0	0	0	0	0	0	0	0	1723	
6	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	
/ 8	41	24	0		0	0		0	0	0	0	0	0	0	0	18	
9	40	12	0	7	0	0		0	349	10	0	902	5	382	0	0	
10	106	32	0		0	0		429	0	5	0	500	3	212	0	0	
11	3	1	0	1	0	0		3	1	0	0	13	0	7	0	0	
12	1269	378	2	219	3	0	7	1273	428	27	0	419	3	191	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	1	0	0		0	0		1	0	0	0	0	0	17	0	0	
15	446	133	1	77	1	0	2	447	150	3	0	182	18	0	0	0	
16 17	5778 0	1720 0	11	998 0	13 0	1	32 0	1241 0	417 0	4	0	268 0	1	355 0	0	0	35280
17	0	0	0	0	0	0	0	0	0	0	U	U	0	U	0	0	55280
	-				-1	_		- 1									
LGV 2	2	3 140	4		6 3	7	8	9 0	10 0	11 0	12 0	13 0	14 0	15 0	16 0	17 718	
2	181	140	1	138	3	1		0		0	0	0	0	0	0	718 141	
4	4	6	0		0	0		0	0	0	0	0	0	0	0	3	
5	116	118	0	0	0	0		0	0	0	0	0	0	0	0	90	
6	0	0	0		0	0		0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	
8	9	4	0		0	0		0	0	0	0	0	0	0	0	4	
9	15	5	0		0	0		0	26	1	0	94	0	20	0	0	
10 11	6	2	0		0	0		40 1	0	0	0	60 0	0	13	0	0	
11	88	30	0	19	1	0		93	40	2	0	34	1	23	0	0	
13	0	0	0		0	0		0	0	0	0	0	0	0	0	0	
14	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	
15	25	9	0		0	0		26	12	0	0	25	5	0	0	0	
16 17	1058	362	2	222	8	0		144	63	0	0	84	0	63	0	0	
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		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4544
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OGV1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	4544
			4	5			8		10							ı	4544
<mark>OGV1</mark> 2	2	3	4	5 11 9	6	7	8 1 1	9 0	10 0	11 0	12 0	13 0	14 0	15 0	16 0	17 88	4544
<mark>OGV1</mark> 2 3	2 0 14 1 15	3 6 0 1 4	4 0 0 0 1	5 11 9 1 0	6 1 0 0 0	7 0 0 0 0	8 1 1 0 1	9 0 0 0 0	10 0 0 0	11 0 0 0 0	12 0 0 0	13 0 0 0	14 0 0 0 0	15 0 0 0	16 0 0 0	17 88	4544
OGV1 2 3 4 5 6	2 0 14 1 15 0	3 6 0 1 4 0	4 0 0 0 1 0	5 11 9 1 0 0	6 1 0 0 0 0	7 0 0 0 0 0	8 1 1 0 1 1 0	9 0 0 0 0 0	10 0 0 0 0 0	11 0 0 0 0 0 0	12 0 0 0 0 0	13 0 0 0 0 0	14 0 0 0 0 0	15 0 0 0 0 0	16 0 0 0 0 0	17 88	4544
OGV1 2 3 4 5 6 7	2 0 14 1 15 0 0	3 6 0 1 4 0 0	4 0 0 0 1 0 0	5 11 9 1 1 0 0 0 0	6 1 0 0 0 0 0 0 0 0	7 0 0 0 0 0 0	8 1 1 0 1 1 0 0 0	9 0 0 0 0 0 0 0	10 0 0 0 0 0 0 0	11 0 0 0 0 0 0	12 0 0 0 0 0 0	13 0 0 0 0 0 0	14 0 0 0 0 0 0 0	15 0 0 0 0 0 0 0	16 0 0 0 0 0 0	17 88	4544
OGV1 2 3 4 5 6 7 8	2 0 14 1 15 0 0 0	3 6 0 1 4 0 0 0 0	4 0 0 0 1 1 0 0 0 0	5 11 9 1 0 0 0 0 0	6 1 0 0 0 0 0 0 0 0 0 0	7 0 0 0 0 0 0 0 0 0	8 1 0 1 0 1 0 0 0 0 0	9 0 0 0 0 0 0 0 0 0	10 0 0 0 0 0 0 0 0 0	11 0 0 0 0 0 0 0 0	12 0 0 0 0 0 0 0 0	13 0 0 0 0 0 0 0	14 0 0 0 0 0 0 0 0 0	15 0 0 0 0 0 0 0 0 0	16 0 0 0 0 0 0 0	17 88	4544
OGV1 2 3 4 5 6 7 8 9	2 0 14 15 0 0 1 1	3 6 0 1 4 0 0 0 0 0 0	4 0 0 1 1 0 0 0 0 0 0	5 11 9 1 0 0 0 0 1 1 0	6 1 0 0 0 0 0 0 0 0 0 0 0	7 0 0 0 0 0 0 0 0 0 0 0	8 1 0 1 0 0 0 0 0 0 0	9 0 0 0 0 0 0 0 0 0 0 0	10 0 0 0 0 0 0 0 1	11 0 0 0 0 0 0 0 0 0 0 0	12 0 0 0 0 0 0 0 0 0 0 0	13 0 0 0 0 0 0 0 12	14 0 0 0 0 0 0 0 0 0	15 0 0 0 0 0 0 0 1	16 0 0 0 0 0 0 0 0 0 0	17 88	4544
OGV1 2 3 4 5 6 7 8	2 0 14 1 15 0 0 0	3 6 0 1 4 0 0 0 0	4 0 0 0 1 1 0 0 0 0	5 11 9 1 0 0 0 0 1 1 0 0 0 0	6 1 0 0 0 0 0 0 0 0 0 0	7 0 0 0 0 0 0 0 0 0	8 1 0 1 0 0 0 0 0 0 0 0 0 0	9 0 0 0 0 0 0 0 0 0	10 0 0 0 0 0 0 0 0 0	11 0 0 0 0 0 0 0 0	12 0 0 0 0 0 0 0 0	13 0 0 0 0 0 0 0	14 0 0 0 0 0 0 0 0 0	15 0 0 0 0 0 0 0 0 0	16 0 0 0 0 0 0 0	17 88	4544
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06V1 2 3 4 5 6 7 7 8 9 10 11 12 13	2 0 14 1 5 0 0 0 1 1 1 0 0 0 8 8 0	3 6 0 1 4 0 0 0 0 0 0 0 0 0	4 0 0 1 1 0 0 0 0 0 0 0 0 0 0	5 111 9 1 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0	6 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	8 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	10 0 0 0 0 0 0 0 1 1 0 0 0 1 1 0	11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	13 0 0 0 0 0 0 0 0 12 5 0 0 2 0	14 0 0 0 0 0 0 0 0 0 0 0 0 0	15 0 0 0 0 0 0 0 0 1 1 0 0	16 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	17 88	4544
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