

DTO Off-peak Model

Calibration of Assignment Models

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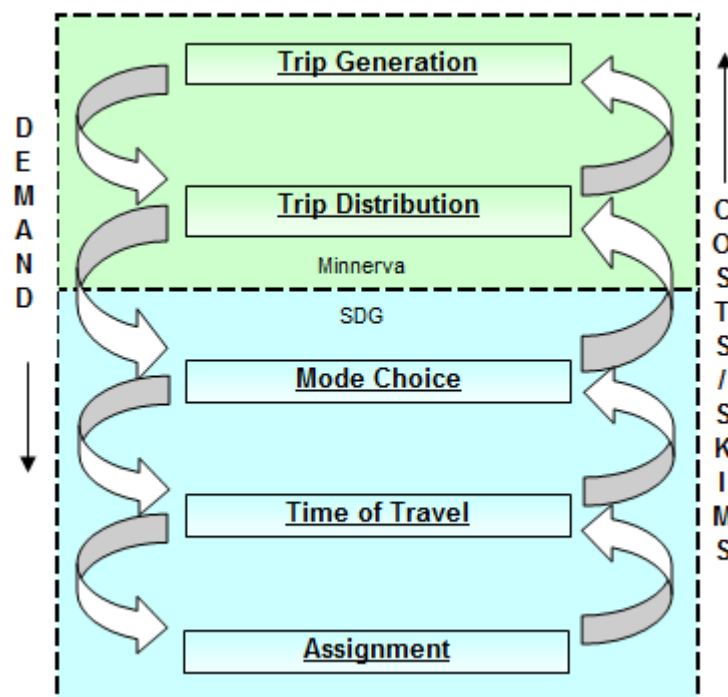
- A PT MODEL CALIBRATION STAGES AND RESULTS**
- B CAR MATRIX ADJUSTMENT STAGES**
- C CAR TRIP RATE COMPARISONS BEFORE AND AFTER MATRIX FACTORING**
- D JOURNEY TIME VALIDATION RESULTS**

1 Introduction

Background

- 1.1 The Dublin Transportation Office (DTO) commissioned our team at Steer Davies Gleave in April 2009 to undertake calibration of their public transport (PT) and highway (HW) assignment models for the off-peak period. The commission also included the task of estimating a mode choice model for the off-peak period.
- 1.2 This commission followed on from the calibration of assignment, time choice and mode choice for the morning peak, which we had undertaken over the previous year. A separate team (at Minnerva) carried out calibration of trip generation (TAGM) and distribution (TDM) models. The outline structure of the AM period model, and the model update tasks carried out by Minnerva and SDG, are illustrated in the figure below.

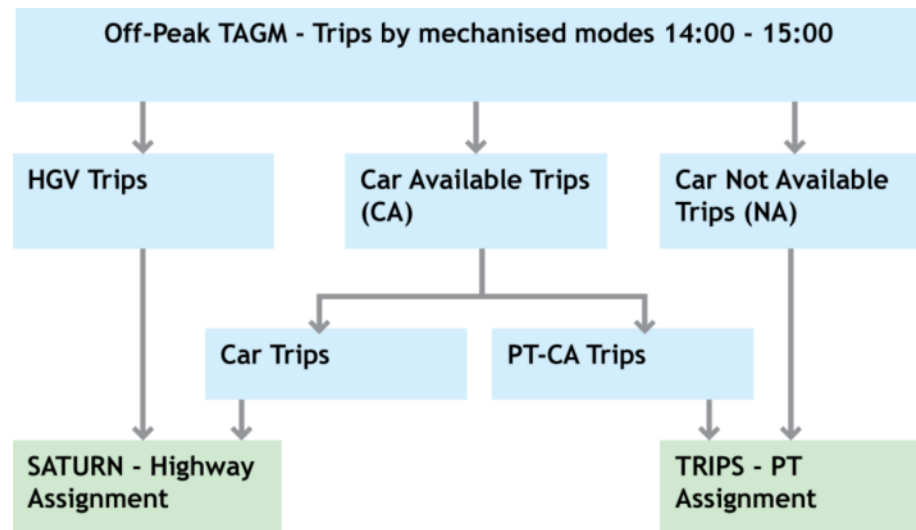
FIGURE 1.1 STRUCTURE OF THE DTO MORNING PEAK MODEL



- 1.3 The off-peak model forms one part of the broader DTO model package. Several updates of the DTO model were undertaken since its first development in 1991 as part of the Dublin Transportation Initiative (DTI) study. However, most of these updates focused on the morning peak only.
- 1.4 The off-peak model at the starting point of this study is still less comprehensive than the morning peak model, and in particular:
 - It has not been updated since 2001;
 - Demand is not split by journey purpose;
 - There is no representation of slow modes; and
 - Forecasting is based on absolute logit rather than a more realistic combination of incremental and absolute logit.

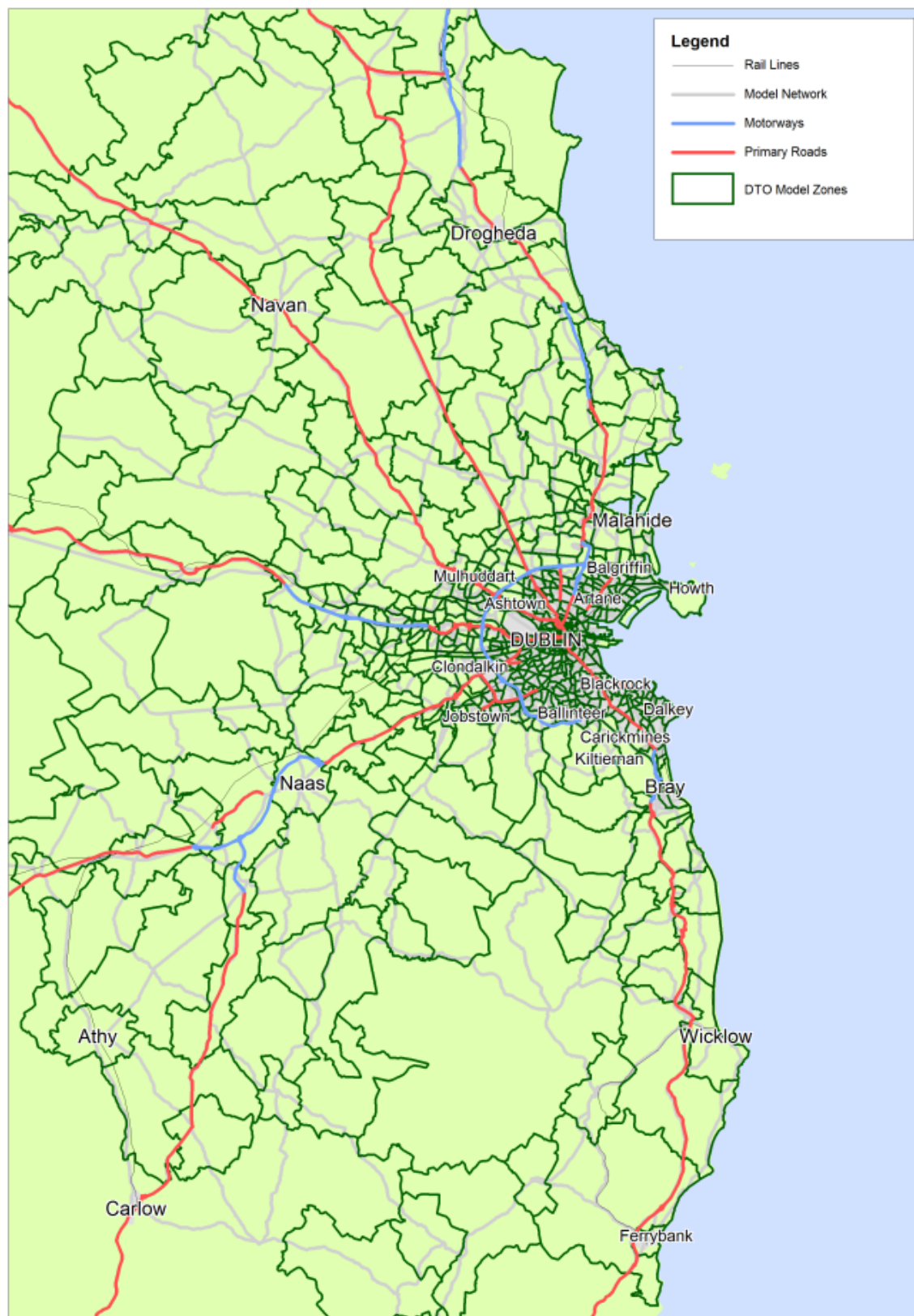
- 1.5 Figure 1.2 below illustrates the existing off-peak model structure.

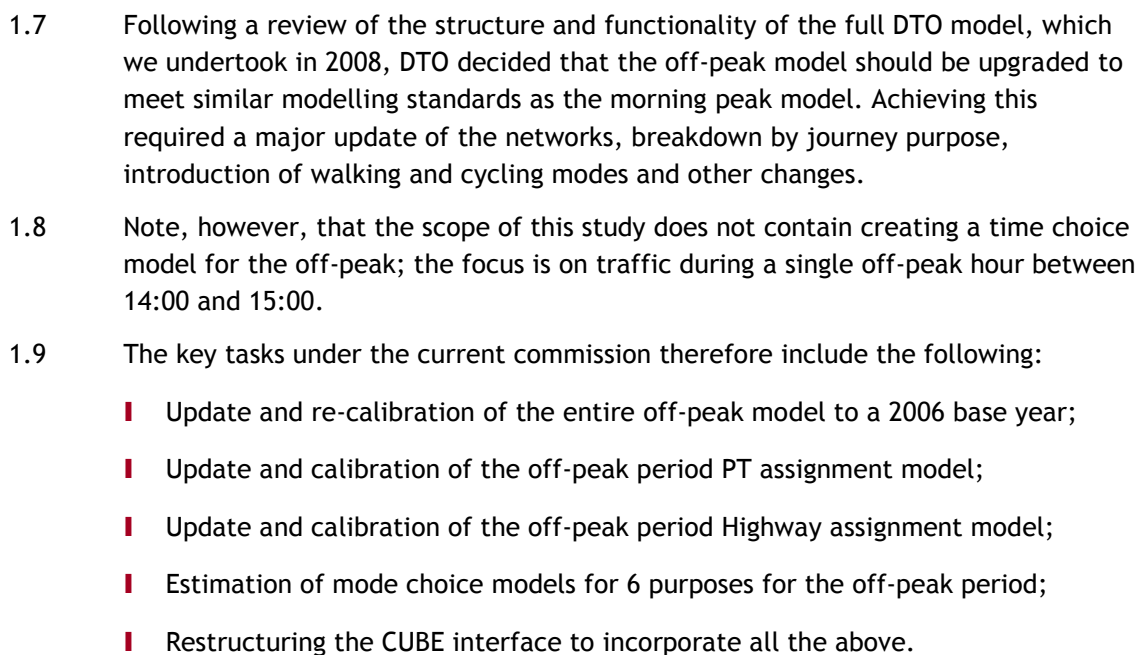
FIGURE 1.2 STRUCTURE OF THE EXISTING OFF-PEAK MODEL



- 1.6 Figure 1.3 and Figure 1.4 below present the wider area zones around Dublin. The zone system of the model is shown as green polygons. The urban area is shaded in grey and rural area in light green. The road network represented in the model is shown in light grey lines.

FIGURE 1.3 DTO MODEL ZONES WIDER AREA





1.10 At the start of this study, matrices from the trip generation model (TAGM) and trip distribution model (TDM) were provided by DTO. These were seen as target matrices in the calibration work.

- 1.11 The target matrices were assigned onto the PT and highway networks. Based on the initial assignment results, initial changes to the networks were made, as well as some matrix adjustments where matrix demand and observed counts did not match satisfactorily (*but note that a Matrix Estimation process was not been used at any point in this process*).
- 1.12 This process was repeated until a good calibration of the networks was reached. High-level adjustments were made during the early stages of the work, while more refined adjustments to specific flows or locations were made in later stages. All adjustments made are described in greater detail in this report.
- 1.13 The final skims from the highway and PT assignment models were also passed to the estimation work of the off-peak mode choice model.

This Report

- 1.14 The remainder of this report is set out as follows:
- Chapter 2 describes the steps taken to adjust the demand matrices to obtain good calibration of the PT and Highway network models. It explains the changes that were required at each stage of this process and the resultant matrices.
 - In Chapter 3 we discuss the process of calibrating the PT assignment model. This begins with the first assignment, before any matrix or network changes were made, and then goes on to discuss further adjustments that were made in order to reach a good level of final calibration.
 - Similarly, Chapter 4 describes the process of calibrating the highway model. It describes the network changes that were found necessary and displays the results of the process at each stage.
 - Chapter 5 summarises main findings and conclusions of this study, as well as some recommendations for future upgrades of the model.

2 Base Year Demand Matrices

- 2.1 This chapter describes the development of the matrices for the new base year (2006), to be used in the detailed calibration of the highway and PT networks. It outlines the processes used to combine different inputs and the high-level changes made to the TAGM/TDM matrices prior to going into the detailed calibration. The more detailed matrix factoring approach used to refine the results of this stage is described in the subsequent chapters.

The Input Matrices

- 2.2 The initial matrices from the TAGM and TDM include hourly demand for a typical off-peak hour (14:00 - 15:00). Some key characteristics of these matrices are:
- They are provided separately for 7 trip purposes (home-based work, home-based education, home-based shopping, home-based other, home-based business, non-home-based business, non-home-based other);
 - Home-based purposes are further split by direction (to and from home);
 - There is further disaggregated by two car availability segments (car available and car not available);
 - They are split by three modes (highway, PT and slow modes);
 - The conversion from the full off-peak period (10:00-16:00) to a representative hour was done by global factoring.
- 2.3 Some summary information from the initial matrices is displayed in the following tables. All the highways matrices were combined to create a single assignment matrix, and so were all the PT matrices. All off-peak matrices discussed in this report refer to the hour between 14:00 and 15:00.
- 2.4 For the highway matrices, an occupancy factor for each journey purpose was applied to the person matrix totals, to produce a PCU matrix for the assignment. The occupancy factors are based on census data and were provided by DTO.

TABLE 2.1 ORIGINAL TAGM/TDM PUBLIC TRANSPORT MATRICES

Trip Purpose	Total Off Peak Demand (Person Trips)
Home to work	1,859
Work to home	6,356
Home to Education	3,188
Education to Home	6,751
Home to Shopping	4,798
Shopping to Home	4,181
Home to Business	280

Business to Home	112
Home to Other	6,174
Other to Home	4,134
Non-home-based Business	218
Non-home-based Other	4,075
Total	42,127

TABLE 2.2 ORIGINAL TAGM/TDM HIGHWAY OFF-PEAK MATRICES

Trip purpose	Person Matrix Totals	Occupancy factor	PCU Matrix Totals
Home to work	6,141	1.09	5,634
Work to home	21,518	1.11	19,386
Home to Education	1,105	1.82	607
Education to Home	9,856	1.73	5,697
Home to Shopping	15,977	1.28	12,482
Shopping to Home	14,776	1.30	11,366
Home to Business	1,793	1.23	1,458
Business to Home	980	1.24	790
Home to Other	21,692	1.60	13,557
Other to Home	14,796	1.56	9,485
Non-home-based Business	2,812	1.06	2,653
Non-home-based Other	22,544	1.12	20,128
Total	133,989		103,242

- 2.5 After the PCU matrix was assigned onto the network, flows were then compared against the observed counts at cordon and screenline levels to give an assessment of the accuracy of the initial TAGM/TDM matrices.
- 2.6 The assignment results showed that assigned flows were much lower compared to observed flows in the highway model and much higher in the PT model. The public transport calibration results for the original matrices are shown in Table 2.3. This was discussed with DTO, and further analysis was carried out on the TAGM/TDM model outputs. Particular focus was given on the comparisons of the TAGM/TDM matrices with trip totals obtained from household survey data.

TABLE 2.3 PUBLIC TRANSPORT CALIBRATION RESULTS FOR ORIGINAL TAGM/TDM MATRICES

PT Mode	Observed	Modelled	% Difference
Bus	27,854	40,447	45%
Rail	27,772	73,302	164%
Luas	34,330	322,877	-4%
Total PT	89,956	146,626	63%

2.7 Subsequently, a modification of the TAGM/TDM by Minnerva produced a new set of matrices. These revised matrices showed a desirable significant increase in the highway matrices and an undesirable slight increase in the PT matrices. Table 2.4 and Table 2.5 show the difference between initial and revised inputs matrices for PT and highway mode respectively.

TABLE 2.4 REVISED PT OFF-PEAK MATRIX TOTALS (PERSON TRIPS)

Trip Purpose	Original	Revised	Difference
Home to work	1,859	1,956	97
Work to home	6,356	5,610	-746
Home to Education	3,188	5,353	2,165
Education to Home	6,751	6,954	203
Home to Shopping	4,798	5,718	920
Shopping to Home	4,181	4,654	473
Home to Business	280	241	-39
Business to Home	112	127	15
Home to Other	6,174	6,002	-172
Other to Home	4,134	4,332	198
Non-home-based Business	218	208	-10
Non-home-based Other	4,075	2,988	-1,087
Total	42,127	44,144	2,017

2.8 After further discussions with DTO it was agreed that trip totals at an individual purpose level from the 2006 household survey should be used as controls for both highway and PT matrices totals.

- 2.9 This was primarily aimed at decreasing the PT matrices, but it was suggested that the impact on the highway calibration is considered, too. Note that by adopting the household survey totals as overall controls, we retain the trip distribution as estimated by the TAGM/TDM models but change the totals.

TABLE 2.5 REVISED HIGHWAY OFF-PEAK PCU MATRIX TOTALS

Trip Purpose	Original	Revised	Difference
Home to work	5,634	8,671	3,037
Work to home	19,386	24,837	5,452
Home to Education	607	13,323	12,716
Education to Home	5,697	18,365	12,668
Home to Shopping	12,482	14,739	2,257
Shopping to Home	11,366	12,491	1,125
Home to Business	1,458	1,014	-443
Business to Home	790	499	-290
Home to Other	13,557	13,096	-461
Other to Home	9,485	9,828	343
Non-home-based Business	2,653	1,934	-719
Non-home-based Other	20,128	14,605	-5,524
Total	103,242	133,404	30,161

PT Matrix Corrections Based on Household Survey Data

- 2.10 The starting point for this stage was comparison of the demand as implied by the household survey data with the revised TAGM/TDM matrix totals (see Table 2.6).

TABLE 2.6 HOUSEHOLD SURVEY PT OFF-PEAK MATRIX TOTALS (PERSON TRIPS)

Trip Purpose	Revised TAGM/TDM PT Matrix Totals	Household Survey Matrix Totals	Difference
Home to work	1,956	1,956	0
Work to home	5,610	5,607	-3
Home to Education	5,353	5,353	0
Education to Home	6,954	6,953	-1
Home to Shopping	5,718	2,861	-2,857
Shopping to Home	4,654	2,566	-2,088
Home to Business	241	132	-109

Business to Home	127	111	-16
Home to Other	6,002	3,803	-2,199
Other to Home	4,332	2,462	-1,870
Non-home-based Business	208	214	6
Non-home-based Other	2,988	3,200	212
Total	44,144	35,218	-8,926

- 2.11 The comparison showed that the revised matrix total for 'Home to shopping', 'shopping to home', 'Home to other' and 'other to home' were significantly higher than the survey totals. Therefore, correction factors were applied to these four trip purpose matrices. The factors applied were calculated by comparing the revised matrix totals to household survey totals. The factors applied and the new matrix totals used in the calibration are shown in Table 2.7.

TABLE 2.7 FACTORED PT OFF PEAK DEMAND MATRIX TOTALS (PERSON TRIPS)

Trip Purpose	Revised Matrix Totals	Factor Applied	Factored Matrix Totals
Home to work	1,956	-	1,956
Work to home	5,610	-	5,610
Home to Education	5,353		5,353
Education to Home	6,954	-	6,954
Home to Shopping	5,718	0.50	2,861
Shopping to Home	4,654	0.55	2,566
Home to Business	241	-	241
Business to Home	127	-	127
Home to Other	6,002	0.63	3,803
Other to Home	4,332	0.57	2,462
Non-home-based Business	208	-	208
Non-home-based Other	2,988	-	2,988
Total	44,144	-	35,130

- 2.12 These factored matrices (combined into one PT matrix) were then assigned on to the PT networks and assignment results were analysed. The factored-down matrices were deemed appropriate for commencing the more detailed calibration. The further adjustments that were required to obtain a good fit against observed counts at a mode and corridor level were carried out in the detailed calibration stages which are discussed in Chapter 3.

Highway Matrix Corrections Based on Household Survey Data

- 2.13 Similar to the PT matrices, the revised highway matrices for the different purposes were factored up or down to match the total number of trips based on the household survey data. Table 2.8 below shows the difference between TAGM/TDM matrix totals and the household survey based totals. The biggest differences reveal an under-prediction of the various “other” trips. The “other” trips are difficult to model, and it was important to make this correction and ensure that they are captured in the model.
- 2.14 In addition, adjustments were made to the number of trips to and from the airport, using information from the airport passenger surveys. To avoid double counting, non-work trips in the TAGM/TDM matrices going to and coming from the airport zone were removed. The process was aimed to strip out all trips except journey to/from work and then add in the surveyed trips.
- 2.15 The different trip purpose matrices were combined into a single matrix for assignment in PCU. A summary of the demand in this matrix is presented in the following tables.
- 2.16 As in the morning peak model calibration, two screenlines were used on the inner canal cordon and outer cordon inside the M50 (see Figure 2.1). Tables 2.9 and 2.10 below show the total cordon assigned flows against observed counts by direction.

TABLE 2.8 HOUSEHOLD SURVEY OFF-PEAK HOUR PCU MATRIX TOTALS

Trip Purpose	Revised TAGM/TDM PCU Matrix Totals	Household Survey Matrix Totals	Difference
Home to work	8,671	8,671	0
Work to home	24,837	24,836	1
Home to Education	13,323	13,323	0
Education to Home	18,365	18,364	1
Home to Shopping	14,739	13,867	-872
Shopping to Home	12,491	12,723	232
Home to Business	1,014	879	-135
Business to Home	499	860	360
Home to Other	13,096	15,361	2,264
Other to Home	9,828	11,900	2,071
Non-home-based Business	1,934	2,662	728
Non-home-based Other	14,605	20,154	5,549
Total	133,404	143,598	10,194

FIGURE 2.1 CALIBRATION CORDONS AND SCREENLINES



TABLE 2.9 CORDON COUNT COMPARISON - REVISED TAGM/TDM OFF PEAK HOUR PCU MATRIX CARS ONLY

Cordon	Direction	Count	Model	Difference	Percentage
Canal	Inbound	12,810	12,119	-691	-5%
	Outbound	14,741	13,603	-1,138	-8%
	Total	27,551	25,722	-1,829	-7%
Outer	Inbound	18,661	13,212	-5,448	-29%
	Outbound	18,743	14,271	-4,472	-24%
	Total	37,404	27,484	-9,920	-27%
Total	Inbound	31,470	25,331	-6,139	-20%
	Outbound	33,484	27,875	-5,610	-17%
	Total	64,954	53,205	-11,749	-18%

**TABLE 2.10 CORDON COUNT COMPARISON - HOUSEHOLD)FF-PEAK HOUR PCU MATRIX
TOTALS CARS ONLY**

Cordon	Direction	Count	Model	Diff	Per
Canal	Inbound	12,810	13,903	1,094	9%
	Outbound	14,741	14,975	234	2%
	Total	27,551	28,878	1,328	5%
Outer	Inbound	18,661	14,558	-4,103	-22%
	Outbound	18,743	15,101	-3,642	-19%
	Total	37,404	29,659	-7,744	-21%
Total	Inbound	31,470	28,461	-3,009	-10%
	Outbound	33,484	30,077	-3,408	-10%
	Total	64,954	58,538	-6,416	-10%

- 2.17 It can be observed that the modelled flows are too low in all directions and across all cordons. The assignment with the matrix based on the household data show modelled flows to be higher at the canal cordon, with outbound modelled flows very close to the observed totals. At the outer cordon, the modelled flows are too low but are better than for the revised total.
- 2.18 Overall, the count comparisons are much better for the household matrix and the balance between inbound and outbound trips is also improved. Hence, the household-based matrices were deemed appropriate for commencing the detailed calibration of the highway network model.

Further Highway Matrix Adjustments

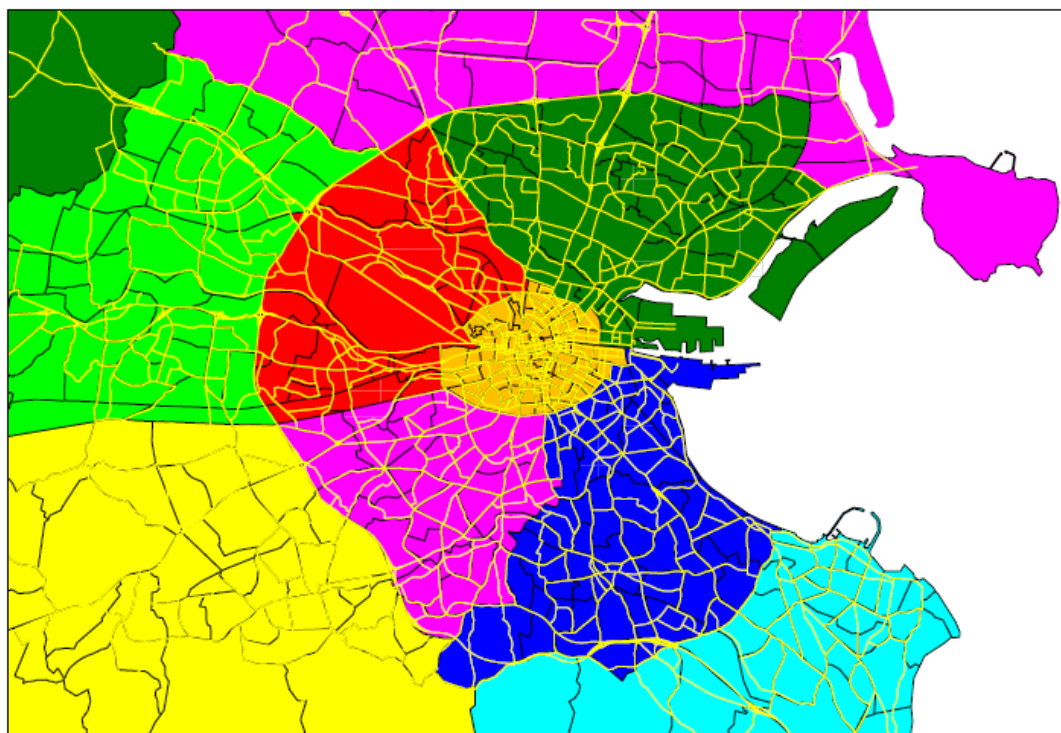
- 2.19 As mentioned earlier, the TAGM/TDM off-peak period matrices are originally developed for a six-hour period (10:00-16:00), and are then converted to a single hour using one global factor. Since in reality the profile of demand for each single off-peak hour varies across the study area, as well as between trip purposes, there was some scope for further modification.
- 2.20 Therefore, as a further analysis of the accuracy of the trip matrix, the assigned flows were compared to observed traffic at the screenline level, with the canal cordon separated into 2 screenlines (north and south) and the outer cordon into 3 screenlines (North, West and South). The cordons are presented in Figure 2.1 above and the analysis done is shown in Table 2.11 below.
- 2.21 The table confirms that the accuracy of the TAGM/TDM matrices varies by area. The majority of the directional screenline flows were within 15% of the observed ones, but with some anomalies:
- The Outer Cordon West flow is very low in both directions (-24% inbound, -41% outbound).
 - The Outer Cordon North outbound flow is 21% lower than the observed.

TABLE 2.11 SCREENLINE OFF-PEAK COUNT COMPARISONS BEFORE REBALANCING (CARS ONLY)

Screenline	Direction	Count	Model	Difference	Difference (%)
South Canal	Inbound	6,516	6,736	220	3%
	Outbound	8,342	8,637	295	4%
	Total	14,858	15,373	516	3%
North Canal	Inbound	6,294	7,167	873	14%
	Outbound	6,399	6,338	-61	-1%
	Total	12,693	13,505	812	6%
Outer cordon - south	Inbound	4,673	4,395	-278	-6%
	Outbound	4,691	4,211	-480	-10%
	Total	9,364	8,606	-758	-8%
Outer cordon - west	Inbound	7,590	5,798	-1,792	-24%
	Outbound	8,242	4,879	-3,363	-41%
	Total	15,832	10,677	-5,155	-33%
Outer cordon - north	Inbound	5,746	5,284	-461	-8%
	Outbound	6,315	5,012	-1,303	-21%
	Total	12,061	10,297	-1,764	-15%

- 2.22 In order to address these imbalances across different screenlines and cordons, it was necessary to introduce a different factoring approach to that employed in the morning peak highway model calibration. In the morning peak model, trips were only adjusted at a very high level, using a sector system that divided the zones into Inner Dublin (within the canal cordon), Outer Dublin (between the Canal and M50), and Outside Dublin. The highway matrix was then factored to ensure that the overall flows crossing the cordons were at the correct level.
- 2.23 In the current study, the different zones were allocated to a much more detailed sector system (see Figure 2.2 below). The Dublin core area (inside M50) is split into 5 sectors, and a further 11 sectors are defined for outer Dublin, so that the factoring process could focus on the correct areas in a more refined manner.

FIGURE 2.2 DETAILED SECTOR SYSTEM - DUBLIN AREA



- 2.24 Factors were then derived to rebalance the trip matrix, to ensure that the directional flows across the cordons and the split between screenlines were correct. All the adjustments at this stage were done on the car matrix only, with the airport trips both from the TAGM/TDM matrices and the airport survey data remaining unchanged. The process was iterative with a number of factors being tested before the best option was derived.
- 2.25 At the end of this process, there was a good match between observed and modelled flows across the screenlines. However, further analysis showed that the modelled flows on the M50 were far too high in the westbound direction and far too low in the eastbound direction. In order to correct this bias, a 'select link' analysis was carried out on the M50. Zone pairs using the motorway were then factored up or down to obtain a better fit to the counts on M50.
- 2.26 Table 2.12 demonstrates that the rebalancing process undertaken improved the screenline count comparisons considerably. The over-supply of inbound traffic in the northern canal cordon has been addressed, and in particular, the considerable underestimation of traffic on the outer cordon has been corrected.

TABLE 2-12 SCREENLINE OFF-PEAK COUNT COMPARISONS AFTER REBALANCING (CARS ONLY)

Screenline	Direction	Count	Model	Difference	Difference (%)
South Canal	Inbound	6,516	6,736	220	3%
	Outbound	8,342	8,637	295	4%
	Total	14,858	15,373	516	3%
North Canal	Inbound	6,294	6,488	194	3%
	Outbound	6,399	6,551	152	2%
	Total	12,693	13,040	347	3%
Outer cordon - south	Inbound	4,673	4,420	-253	-5%
	Outbound	4,691	4,764	73	2%
	Total	9,364	9,184	-180	-2%
Outer cordon - west	Inbound	7,590	7,227	-363	-5%
	Outbound	8,242	7,844	-398	-5%
	Total	15,832	15,071	-761	-5%
Outer cordon - north	Inbound	5,746	6,309	564	10%
	Outbound	6,315	5,667	-648	-10%
	Total	12,061	11,976	-84	-1%

- 2.27 DTO has provided us some additional information on the expected number of trips to St. James Hospital and Tallaght Hospital. The trip attraction to these hospitals by DTO was estimated through a special exercise, which was considered more accurate than the information on these particular locations in the TAGM/TDM matrices. At this stage we have therefore revised the hospital demand in the matrix based on the information provided.
- 2.28 Since a series of changes were made to the original TAGM/TDM matrices, it was important to examine what the overall impact of these changes was on the original TAGM/TDM matrices. Table 2.13 below compares the overall matrix totals of the various stages of the matrix development. Appendix B demonstrates the changes made to the original TAGM/TDM matrices at a sector level in a step by step manner. To ensure that none of the factoring processes distorts the starting matrices in an undesirable manner, we compared the overall trip rates and trip length distribution of the adjusted matrix with the original matrix. The comparisons of trip rates at A zone level is shown in Appendix C.

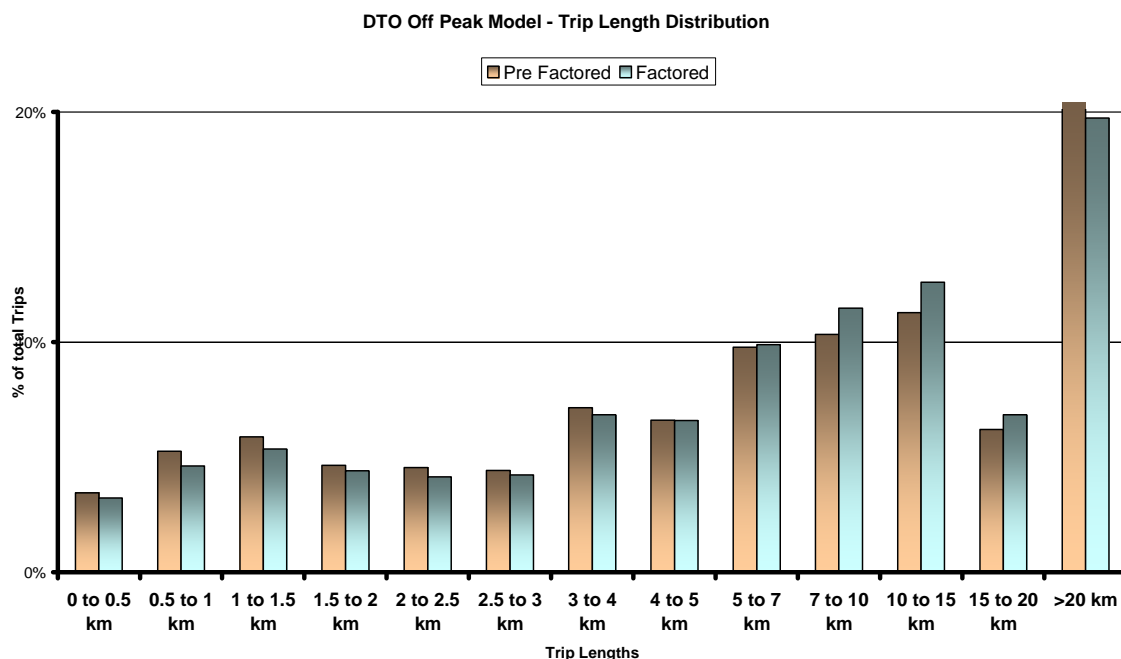
- 2.29 The largest change was from the revised matrix up to the matrix based on the household survey data, where the total demand increased by 8%; but this change was felt well-justified. The factoring process used thereafter only increases the highway matrix size by 3%, which is less than 5000 trips out of more than 140,000.

TABLE 2.13 CHANGES IN OFF-PEAK CAR PCU MATRIX TOTALS

Matrices	Total	Change from Revised TAGM/TDM Matrix	
		Difference	Percentage
Revised TAGM/TDM	133,304	0	0%
Household Survey	143,502	10,198	8%
Matrices	Total	Changes from Household Survey Matrix	
		Difference	Percentage
Household Survey	143,502	0	0%
Factored Household	149,534	6,032	4%
Factored HH with M50 changes	148,196	4,693	3%

- 2.30 When models are estimated from roadside interviews and a Matrix Estimation process, there is a tendency not to capture short-distance trips, and the calibration process often re-introduces many such trips. But the TAGM/TDM matrices were built using a rich source of survey data, including census and household survey data, and therefore the trip length distribution in the original TAGM/TDM matrix is considered quite reliable. This is further supported by the fact that the TAGM/TDM models are built using detailed demographic data and information on land use.
- 2.31 Therefore, the verification that the TAGM/TDM matrices were not distorted too much also compared the trip length distribution before and after the matrix changes.
- 2.32 Figure 2.3 below indicates that the trip length distribution of the TAGM/TDM has not been changed significantly during the adjustment process. Since the overall matrix has grown slightly, and the intra-zonal trips were not changed, the proportion of 0-distance trips in the model has reduced.

FIGURE 2.3 CHANGES IN HIGHWAY OFF-PEAK CAR MATRIX TRIP LENGTH DISTRIBUTION



Summary

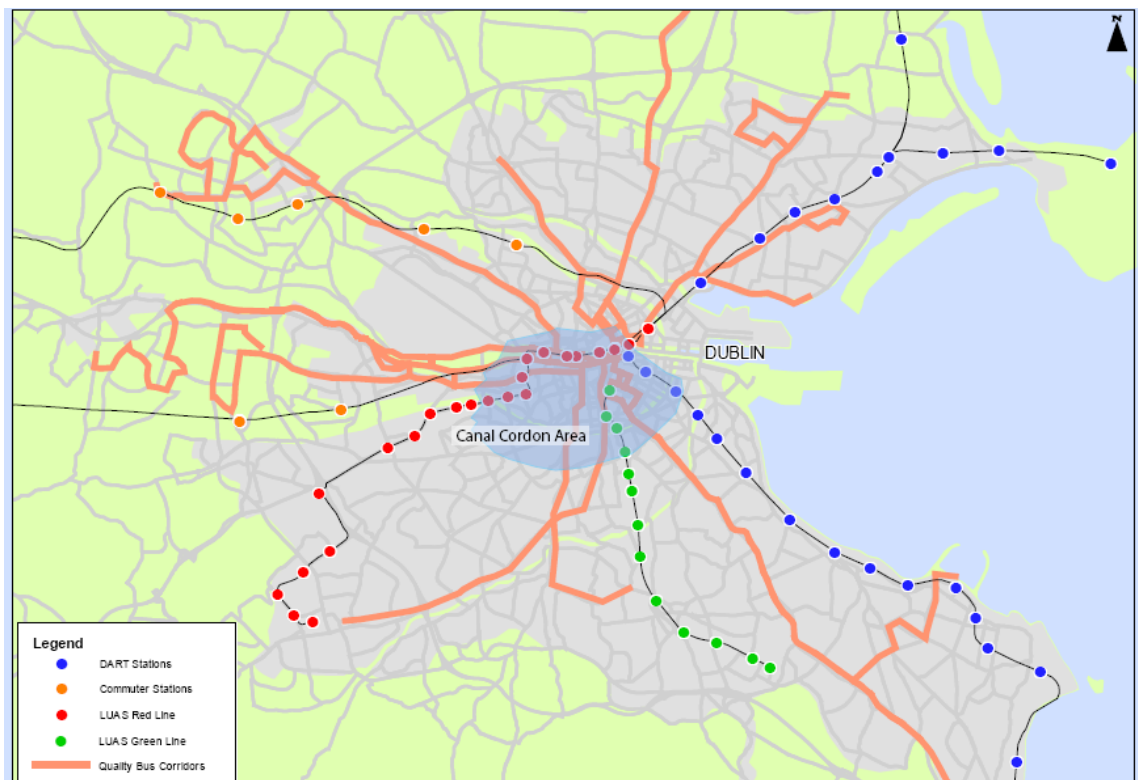
- 2.33 A summary of the matrix building process is therefore as follows:
- Factoring up the revised matrices (by journey purpose) to the household survey totals;
 - Combining the matrices by journey purpose into a single matrix by mode;
 - Factoring the matrix based on detailed sector system to match screenline counts;
 - Undertaking further 'select link' analysis factoring to improve calibration on the M50; and
 - Adding the airport passenger matrix and modifying hospital demand.
- 2.34 Following these steps, the overall matrices (for highways and PT) appeared at the appropriate size and structure to move on to the detailed calibration.
- 2.35 The next two chapters describe how the PT and highway models were calibrated in detail, including any further adjustments made to these matrices.

3 The Public Transport Assignment Model

Introduction

- 3.1 The PT assignment model is housed, like the other components of the DTO model, in the CUBE/TRIPS package. This chapter describes the calibration and validation process of the off-peak PT assignment model. It covers the changes made to the PT network originally received from DTO, changes made to parameters and the modifications made to the matrices.
- 3.2 The PT network defines three main modes only: bus, heavy rail and light rail. The heavy rail model includes DART, commuter rail and intercity services. The coded bus network includes the full set of routes operated in the Dublin area. The light rail services network includes the Luas Green Line from Sandyford to St. Stephen's and the Luas Red Line from Tallaght to Connolly, as shown in Figure 3.1.

FIGURE 3.1 PUBLIC TRANSPORT NETWORK AND CALIBRATION AREAS



- 3.3 The heavy rail services coded are based on the actual services available between 14:00 and 15:00, namely:
- DART service from Howth to Howth-Junction & Donaghmede, north-east of the city centre;
 - DART service from Malahide to Connolly, north to the city centre;
 - DART service from Greystones to Connolly, south east to city centre;
 - Eastbound intercity rail service from Connolly to Sligo;

- Intercity rail service from Cork to Heuston in both northbound and southbound directions;
- Southbound intercity rail service from Heuston to Galloway;
- Suburban rail from Pearse to Maynooth, in both eastbound and westbound directions;
- Suburban rail from Connolly to Drogheda, in both northbound and southbound directions;
- Suburban rail from Newbridge to Heuston, in both northbound and southbound directions;
- Northbound suburban rail from Pearse to Barblingan;
- Southbound suburban rail from Drogheda to Pearse;
- Northbound suburban rail from Kildare to Heuston.

Public Transport Count Data

- 3.4 A large set of recent passenger counts was provided by DTO. This consisted of:
- Bus occupancy counts for various locations in the Dublin city centre and between M50 and the canal cordon, both inbound and outbound. These counts were processed and tagged with model link numbers ('A node' - 'B node').
 - Boarding and alighting counts for Luas and rail services. These were processed to obtain Luas flows on each section, and model link numbers were tagged to them.
- 3.5 The count data was thoroughly checked and analysed before being used in the calibration process. A number of corrections were made to the rail line flows and to bus counts where any inconsistencies were noticed in the processing or tagging of count data.
- 3.6 The bus counts were grouped into two areas: the outer area and canal cordon area. The canal cordon includes arteries such as the North Circular road, South Circular road, Dolphins Barn and Newcomen Road Bridge. Count locations outside this are were defined as the outer area. Similarly, a canal cordon was defined for rail demand, including all rail flows which entered the Dublin city centre at the canal crossings.
- 3.7 Figure 3.2 shows the locations of the count sites by each mode. Note that the availability of bus counts for both inbound and outbound journeys at the canal cordon makes this data superior to the data we used to calibrate the morning peak model, where outbound counts were not available. More information on the counts data is shown in Table 3.1.

FIGURE 3.2 PT COUNT LOCATIONS

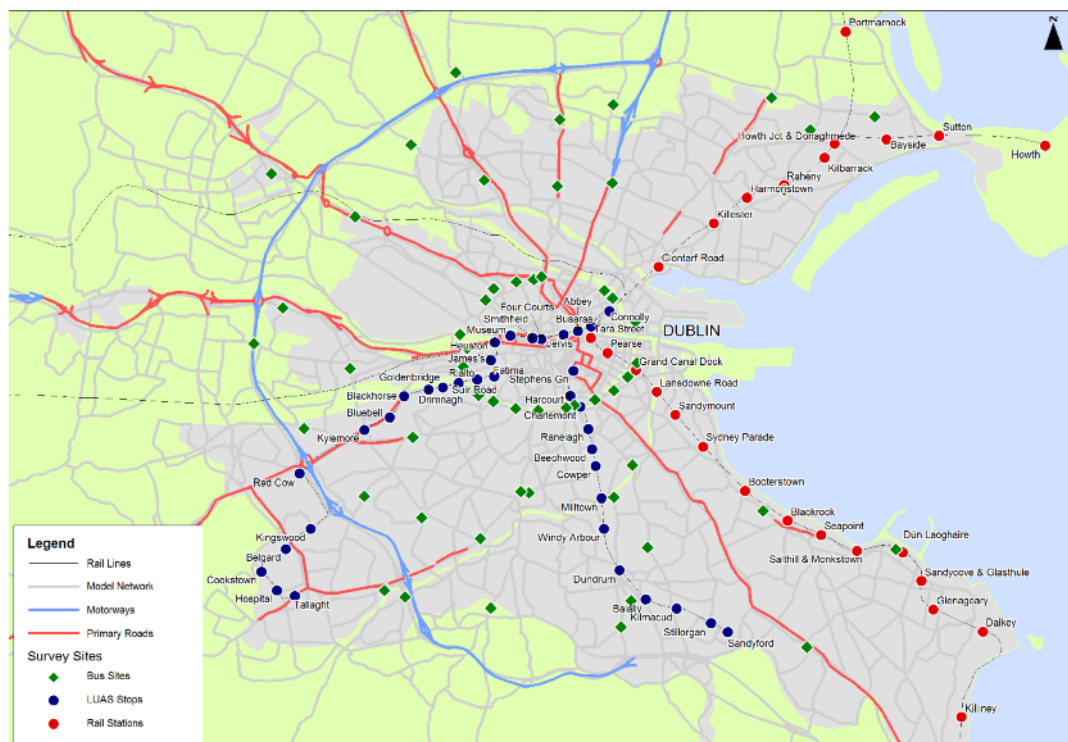


TABLE 3.1 PT MODEL CALIBRATION DATA SOURCES

Data	Description	Volume
Rail and Luas counts	Passenger counts for Luas Red, Luas Green and rail, both outbound and inbound	Luas Red: 23 station surveys Luas Green: 13 station surveys Rail: 59 station surveys
Bus Counts	Passenger counts for the cordon and outer area, both inbound and outbound	Cordon: 21 sites Outer: 30 Sites

Initial Calibration

Initial Demand Matrix

- 3.8 The starting point for the calibration is the PT matrix created through the process described in Chapter 2.

Assignment Parameter Changes

- 3.9 The existing version of the off-peak model, as provided to us by DTO, does not have an explicit function that matches a passenger wait time to different levels of the service frequency. We have created such a curve based on a similar curve we created recently when calibrating the morning peak model.
- 3.10 For bus and rail journeys, wait time is estimated as half the relevant headway when this headway is less than 20, or less when the headway is higher.

- 3.11 Minor adjustments were also made to bus and rail fare calculation, to make this calculation more consistent with the way this is now done in the morning peak model. The Luas fare curve was replaced by one that accounts for the discount fare due to smart card use.

Network Changes

- 3.12 During the development of the morning peak model, a major effort was put into coding of walk access links from zone centroids to PT stops/stations, especially for the large zones in suburban areas outside M50. This effort focused in particular on addressing unreasonably high walk times for PT users from zones in these areas. A large number of walk links were introduced to represent sensible access times.
- 3.13 The new walk links introduced in the work on the morning peak model have now also been incorporated in the off-peak model, to achieve a similar level of accuracy.

Initial Calibration Results

- 3.14 With these changes made we carried out some initial model runs. The results were compared to observed flows at an aggregate level by mode and time period, as shown in Table 3.2.
- 3.15 Note that the flows compared here refer to the sum total of all observed counts and modelled link flows by mode. Hence for Luas and Rail these refer to cumulative link flows observed on all Luas and Rail links therefore the level of error in this comparison is exaggerated.

TABLE 3.2 PUBLIC TRANSPORT INITIAL CALIBRATION RESULTS

PT Mode	Observed	Modelled	% Difference
Bus	27,854	31,711	14%
Rail	27,772	42,582	53%
Luas	34,330	22,449	-35%
Total PT	89,956	96,742	8%

- 3.16 The overall PT matrix exhibits higher demand, compared to the observed counts. Further investigation shown in Table 3.3 also illustrated that for buses, the modelled outbound demand across both the canal cordon and the outer area counts was too high. Modelled suburban rail demand is largely over-predicted. As for Luas, the model shows an under-prediction on both lines; the red line demand is more under-predicted than the green line.

TABLE 3.3 DETAILED RESULTS FOR INTERIM CALIBRATION

Services		Location	Observed	From Model	% Diff
BUS		Cordon Inbound	8,243	7,909	-4%
		Cordon Outbound	7,762	8,542	10%
		Outer- Inbound	5,498	7,035	28%
		Outer- Outbound	6,351	8,225	30%
RAIL		Cordon	3,522	3,679	4%
		Cordon Crossing	2,917	4,042	39%
		Outer	20,736	34,260	65%
LUAS - RED	INBOUND	Cordon	5,969	3,673	-38%
		Cordon Crossing	486	365	-25%
		Outer	3,594	2,964	-18%
	OUTBOUND	Cordon	7,410	2,872	-61%
		Cordon Crossing	534	270	-50%
		Outer	4,155	1,717	-59%
LUAS - GREEN	INBOUND	Cordon	638	305	-52%
		Cordon Crossing	650	419	-36%
		Outer	3,951	4,001	1%
	OUTBOUND	Cordon	1,475	849	-42%
		Cordon Crossing	770	621	-19%
		Outer	4,698	4,393	-6%

Interim Calibration

- 3.17 The results of initial calibration in Table 3.3 showed that model calibration is biased in outbound direction. Therefore, some further changes were made to the PT assignment parameters, and the PT matrix was factored so as the matrix trips are comparable with observed trips. While applying factors to the matrix, care was taken to ensure that the matrix total did not change significantly. The changes carried out for this assignment are discussed below.

Assignment Parameter Adjustments

- 3.18 It was also decided to further reduce the fare curve by 5%, to reflect the difference between off-peak and morning peak fares. The Value of Time for PT users was updated to 9.48 Euros/hour from the previous value of 8.10 Euros/hour (from the 2002 model). All other assignment parameters were kept consistent with the morning peak model. The calibration results summary and demand summary for these adjustments is shown in table A1 and A2 of Appendix A.

- 3.19 Detailed checks on bus and Luas links in competing corridors suggested that the modelled demand was biased towards the bus. In most bus links in corridors parallel to Luas lines, the model assigned a much higher passenger demand than the observed flows, whereas demand on Luas lines was under-predicted.
- 3.20 This led us to further investigation of modelled bus speeds. The bus speeds in the PT model are derived from the highway network speeds, and then a factor is applied to reflect the time spent at stops. This is an automated process within the CUBE interface of the model; therefore an increase in highway network speeds (compared to the morning peak), due to reduced congestion in the off-peak period, meant that off-peak bus speeds were also increasing. While this is logical in theory, the extent of increase appeared too high, and resulted in excessive shift of PT demand from Luas to bus.
- 3.21 To address this issue, the in-vehicle time weighting for Luas was reduced to 0.85 from the original value of 1, and for buses it was increased from 1.47 to 1.5. This adjustment resulted in a much improved fit for the Luas green line in both directions. The Luas red line fit improved, but demand on this line was still under-predicted.

Further Adjustments to PT Matrix

- 3.22 In discussions with the DTO team it was decided that the PT matrices required a sector-by-sector factoring process. This process is complicated by the fact that the Luas lines run across a number of sectors and therefore cannot be easily isolated. Luas corridors therefore had to be treated separately in this phase of the analysis.
- 3.23 Detailed examination of initial calibration also showed high-over prediction of rail and bus demand due to excessive demand in the external zones. We undertook a series of tests where, based on observed demand, a set of factors was applied to external zones of the PT matrix only (excluding airport trips). These factors were adjusted on trial and error method. Table 3.4 below shows the calibration result for final set of external zone factors. The demand summary for this test is shown in table A3 of appendix PT Tests.

TABLE 3.4 PUBLIC TRANSPORT TEST 7.9 CALIBRATION RESULT

PT Mode	Observed	Modelled	% Difference
Bus	27,854	27,872	0%
Rail	44,109	50,432	14%
Luas	34,330	36,576	7%
Total PT	106,293	116,717	10%

Luas 'Select Link' Analysis

- 3.24 Although the additional trip information for St. James and Tallaght hospitals improved the Luas red line calibration, there was still some under-prediction of modelled trips in the Dublin city centre between Heuston and Jervis on this line, in both directions.

- 3.25 When compared to observed data, the modelled boarding at Tallaght Hospital on to the Luas red line was very high. To overcome this, trips between the hospital and Cookstown on the red line were factored down based on a 'select link' analysis. Summary of calibration results summary and demand summary for the select link analysis is shown in table A4 and A5 of Appendix A.

Interim Calibration Results

- 3.26 Following these steps, a new assignment was carried out. We display the results of this in Table 3.5.

TABLE 3.5 PUBLIC TRANSPORT INTERIM CALIBRATION RESULT

PT Mode	Observed	Modelled	% Difference
Bus	27,854	28,388	2%
Rail	44,109	53,113	20%
Luas	34,330	35,216	3%
Total PT	106,293	116,717	10%

- 3.27 Detailed analysis of the new results suggested a significant improvement of the model fit. The calibration showed an overall good match for buses and Luas, although there was still over-prediction of rail demand.
- 3.28 Closer investigation showed an under-prediction of bus flows and over-prediction of rail flows at the canal cordon level. For the outer area, both bus and rail flows were over-predicted. For the Luas red and green lines, the overall calibration results showed fairly good match, with a slight under-prediction on the red line in the city centre in both directions.
- 3.29 Analysis of station-to-station boarding and alighting and Luas line loading showed that this under-prediction was mainly due to problems with walk access and egress, similar to the problem previously encountered in the morning peak model. This is primarily driven by walking seen by the model as the preferred alternative over Luas for short trips within the city centre.
- 3.30 The Luas red line links several large trip generators, such as the shopping and office areas at Jervis and Abbey stations, as well as major rail interchange points at Heuston and Connolly. This line is used in Dublin city centre as a shuttle service for moving quickly between these locations. This is facilitated by good integration between Luas and the heavy rail at Heuston and Connolly, and by integrated ticketing.
- 3.31 In the model, however, users arriving or departing at these points in the city centre are assigned as walk-only trips. The generalised cost of boarding Luas is affected by a waiting time penalty, boarding penalty and a full fare charge. These model assumptions are essential for obtaining sensible model flows and costs from the rest of the PT network. The modelling of discounted fare on Luas due to integrated ticketing will require a major structural change in the PT assignment procedure.
- 3.32 Hence the model assigns majority of such short trips as walk-only trips, thus causing an under-prediction in the Luas demand in city centre in both directions.

- 3.33 This issue requires more fundamental change to the model structure and model assumptions, especially those relating to fares and integrated ticketing, which are beyond the scope of this study. This anomaly is therefore not resolved here.

Final Calibration

- 3.34 Although the interim calibration showed good results, there were still some remaining issues that needed resolving before finalising the PT assignment calibration. These particularly concerned rail demand.

Changes to PT Network File

- 3.35 The interim calibration results showed a mix of over-prediction and under-prediction on different rail links. The rail link calibration for interim results is shown in Table 3.6 and Table 3.7, for both inbound and outbound direction respectively. The key reason for the discrepancy between observed and modelled flows had to do with the representation of service patterns, and not with the demand matrix.

TABLE 3.6 CORDON CROSSING RAIL DEMAND INTERIM CALIBRATION - INBOUND

		Observed Flows				Modelled Flows				
From	To	DART	Suburban Rail	Intercity	Total	DART	Suburban Rail	Intercity	Total	% Diff
Lansdowne Road	Grand Canal Dock	681	-	-	681	657	-	-	657	-4%
Clontarf Road	Connolly	315	120	184	619	364	245	238	848	37%
Drumcondra	Connolly	-	81	49	130	-	208	83	291	124%
Cherry Orchard/ Parkwest	Heuston	-	53	461	514	-	145	146	291	-43%
Total		996	254	694	1,944	1,020	598	467	2,086	7%

TABLE 3.7 CORDON CROSSING RAIL DEMAND INTERIM CALIBRATION - OUTBOUND

		Observed Flows				Modelled Flows				
From	To	DART	Suburban Rail	Intercity	Total	DART	Suburban Rail	Intercity	Total	% Diff
Grand Canal Dock	Lansdowne Road	688	-	-	688	654	-	-	654	-5%
Connolly	Clontarf Road	553	330	-	883	568	557	-	1,126	28%
Connolly	Drumcondra	-	179	176	335	-	459	273	731	106%
Heuston	Cherry Orchard/ Parkwest	-	90	826	916	-	304	40	345	-62%
Total		1,241	599	1,002	2,842	1,223	1,321	313	2,856	1%

- 3.36 Analysis of rail demand by service type (DART, suburban rail and Intercity) showed that:
- On **DART**, both the modelled demand and the number of services in the model match observed data in both directions.
 - For **suburban rail**, the model overestimates the demand, primarily because the modelled service frequency was higher than the actual. Only two links in the outbound direction had the correct modelled frequencies, and on these two links rail demand was over estimated.
 - For **intercity rail**, it was noted that the PT network file did not have any intercity service modelled. As a result, the demand from external zones was loaded on to the suburban rail services.
- 3.37 After discussions with DTO, it was agreed to make major changes in the PT network file. To reflect the services that pass the Dublin city cordon during off-peak hour, the file was updated to match the observed data services. This was an extensive coding and checking exercise, where all existing services were matched with observed services and any missing services were coded afresh. Calibration result summary for model run with new PT line file is shown in table A6 and demand summary in A7 of Appendix A.
- ‘Select Link’ Analysis for Rail Services**
- 3.38 After updating the network file with the correct services, some further adjustments were made at link level. To adjust demand flows at the cordon level, the model demand to or from the external zones was also adjusted to match observed intercity demand. A series of test was carried out for this adjustment. Calibration results for final adjusted link demand and demand summary are shown in table A8 and A9 of Appendix A.
- Final Calibration Results**
- 3.39 The calibration results from the final assignments with updated PT services and final adjustment to matrices are shown in Table 3.8.

TABLE 3.8 PUBLIC TRANSPORT FINAL CALIBRATION RESULT

PT Mode	Observed	Modelled	% Difference
Bus	27,854	27,592	-1%
Rail	32,442	35,228	9%
Luas	34,330	34,022	-1%
Total PT	94,626	96,842	2%

- 3.40 These results demonstrate a general good match, with a slight over-prediction rail demand. At an individual cordon crossing level, the fit between modelled and observed rail demand was found well within $\pm 25\%$, which is the UK criterion for PT model validation (as specified in WebTAG).

Detailed Analysis of Bus Calibration

- 3.41 The detailed analysis of previous calibration stages had shown an under-prediction of bus flows in the city cordon area. One of the reasons for this was that too many rail services were modelled going into the city centre during the modelled off-peak hour. After the PT network file was updated with correct rail services, this was resolved in most cases. The results of the bus cordon calibration are shown in Table 3.9.

TABLE 3.9 BUS CORDON CALIBRATION

BUS	Observed	From Model	Absolute Diff	% Diff
Cordon Inbound	8,243	7,510	-733	-9%
Cordon Outbound	7,762	7,318	-444	-6%
Outer- Inbound	5,498	5,796	298	5%
Outer- Outbound	6,351	6,968	617	10%
Total	27,854	27,592	-262	-1%

- 3.42 The results of bus cordon calibration shows a good match across all cordons in both directions. Though there is a small under-prediction in the inner cordon area, this is within the acceptable range of $\pm 10\%$.
- 3.43 Figure 3.3 illustrates the screenlines used to analyse bus flows. To create these screenlines, the counts at both cordons were grouped into four directions.
- 3.44 GEH analysis for bus flows by screenline for the canal cordon area and the outer area was carried out, as illustrated in Table 3.10 and Table 3.11 respectively.

FIGURE 3.3 BUS COUNTS INNER SCREENLINES

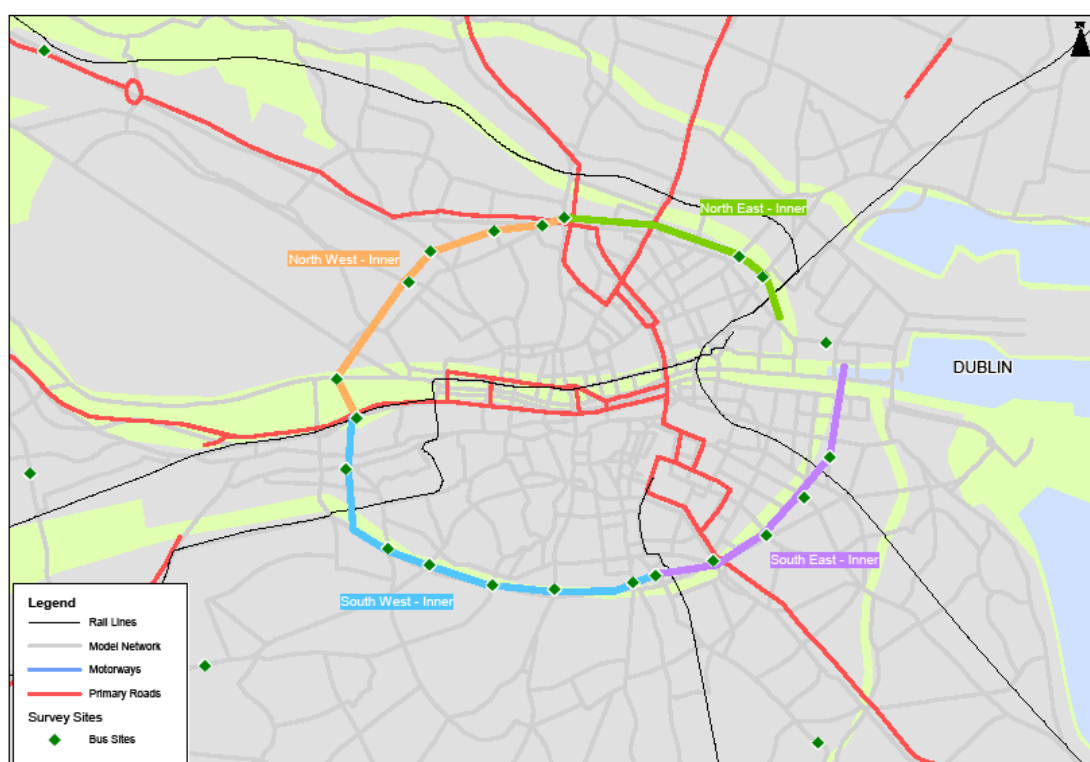


TABLE 3.10 BUS INNER CORDON SCREENLINES GEH COMPARISON

	Inbound			Outbound		
	Modelled	Observed	GEH	Modelled	Observed	GEH
South West	1583	1769	3.2	1376	1542	3.1
South East	1904	2189	4.5	1638	1780	2.4
North West	1695	1908	3.5	2034	1987	0.7
North East	2328	2377	0.7	2270	2453	2.7

TABLE 3.11 BUS OUTER CORDON SCREENLINES GEH COMPARISON

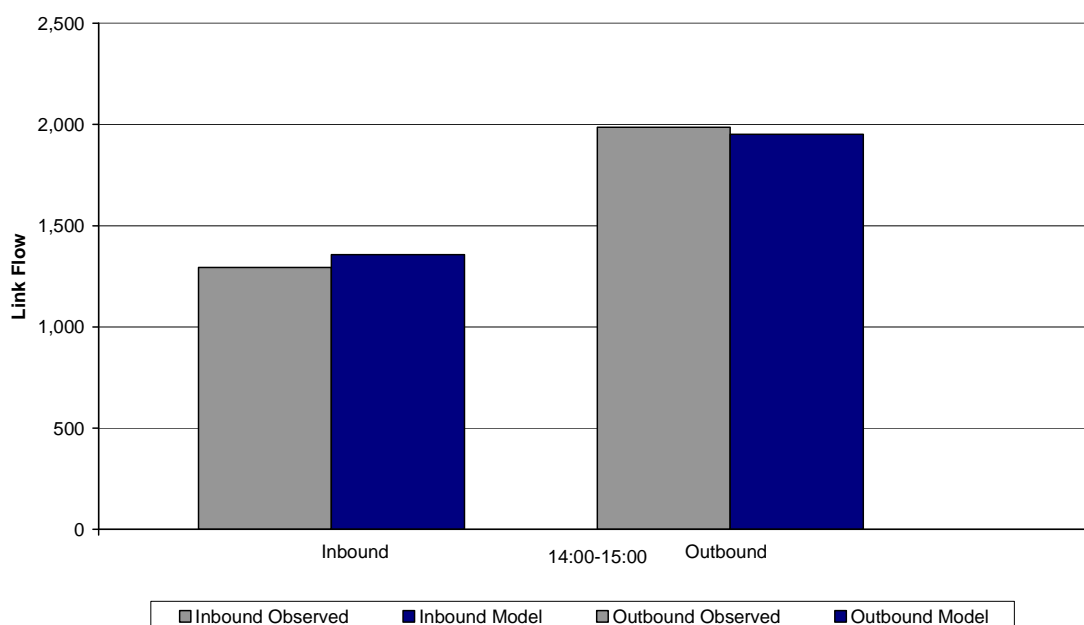
	Inbound			Outbound		
	Modelled	Observed	GEH	Modelled	Observed	GEH
South West	1235	1255	0.4	1764	1495	4.7
South East	663	595	1.9	784	638	3.9
North West	1955	1322	11.1	2182	1668	8.3
North East	1576	1433	2.6	1877	1409	8.2

- 3.45 The analysis demonstrates that for the city centre canal cordon area, both inbound and outbound GEH values for all four screenlines are within the acceptable range of less than 5.0 (shown in blue). This is also true for the south west and south east screen line of the outer cordon area.
- 3.46 However, in the outer cordon area, the north west and north east outbound flows have slightly higher GEH values (shown in orange). These required some further investigation. The GEH value for the inbound flow in the north west direction is greater than 10.0 (shown in red), which means that there could be problem with either the travel demand model or the observed data.
- 3.47 Comparing the results of the inner cordon and the outer cordon area showed that a balance exists between inner and outer screenlines. Namely, those which are outside the acceptable range in outer cordon, are within the acceptable range in the inner cordon area. There seems to be a reasonable balance between calibration at outer and inner screenlines, and therefore the calibration achieved can be considered satisfactory.

Detailed Analysis of Rail Calibration

- 3.48 The interim model calibration resulted in a good match between observed and modelled flows across all city centre rail links. The suburban and intercity rail demand required further adjustments, though. After going through a number of iterations of adjusting the rail demand at a link level for each corridor, a good fit across all corridors was achieved. A link volume analysis for rail demand entering and leaving the city centre is shown in Figure 3.4.

FIGURE 3.4 RAIL LINK FLOWS



- 3.49 The good fit between observed and modelled flows is achieved at the expense of some over-estimation on outer links. This is especially the case for the more remote suburban areas, where less detailed data is available. This was discussed with the DTO team, and it was agreed that for our key purposes, good fit in the central area and around the cordons is more important, even if a slight over-prediction elsewhere is implied.
- 3.50 Table 3.12 and Table 3.13 display a summary of rail demand at the cordon crossing by link and service type.

TABLE 3.12 CORDON CROSSING RAIL DEMAND FINAL CALIBRATION - INBOUND

From	To	Observed Flows				Modelled Flows				
		DART	Suburban Rail	Intercity	Total	DART	Suburban Rail	Intercity	Total	% Diff
Lansdowne Road	Grand Canal Dock	681	-	-	681	635	-	-	635	-7%
Clontarf Road	Connolly	315	120	-	435	352	167	-	518	19%
Drumcondra	Connolly	-	81	-	81	-	109	-	109	34%
Cherry Orchard/ Parkwest	Heuston	-	44	53	97	-	43	52	95	-2%
Total		996	245	53	1,294	986	319	52	1,357	5%

TABLE 3.13 CORDON CROSSING RAIL DEMAND FINAL CALIBRATION - OUTBOUND

From	To	Observed Flows				Modelled Flows				
		DART	Suburban Rail	Intercity	Total	DART	Suburban Rail	Intercity	Total	% Diff
Grand Canal Dock	Lansdowne Road	688	-	-	688	661	-	-	661	-4%
Connolly	Clontarf Road	553	330	-	883	553	247	-	800	-9%
Connolly	Drumcondra	-	114	65	179	-	142	48	190	6%
Heuston	Cherry Orchard/ Parkwest	-	52	185	237	-	170	129	299	26%
Total		1,241	496	250	1,987	1,214	560	177	1,950	

- 3.51 The analysis implies a good fit at a link level for rail links entering the city centre. Of all the links, only the Heuston to Cherry Orchard/Parkwest flow, which is an outbound flow, does not meet the WebTAG criterion of up to 25% difference to the observed flow.

- 3.52 The summary analysis by service type (DART, suburban or intercity) also indicates satisfactory fit.

Detailed Analysis of Luas Calibration

- 3.53 Boarding, alighting and line loading analysis was carried out for the Luas lines. As in the calibration of the morning peak model, for each station the observed volume was compared with modelled volume. This was then used to build observed and modelled volume profiles across the Luas lines. Figure 3.5 and Figure 3.6 show the results of this analysis for the green line.

FIGURE 3.5 LUAS GREEN SANDYFORD TO STEPHENS GREEN

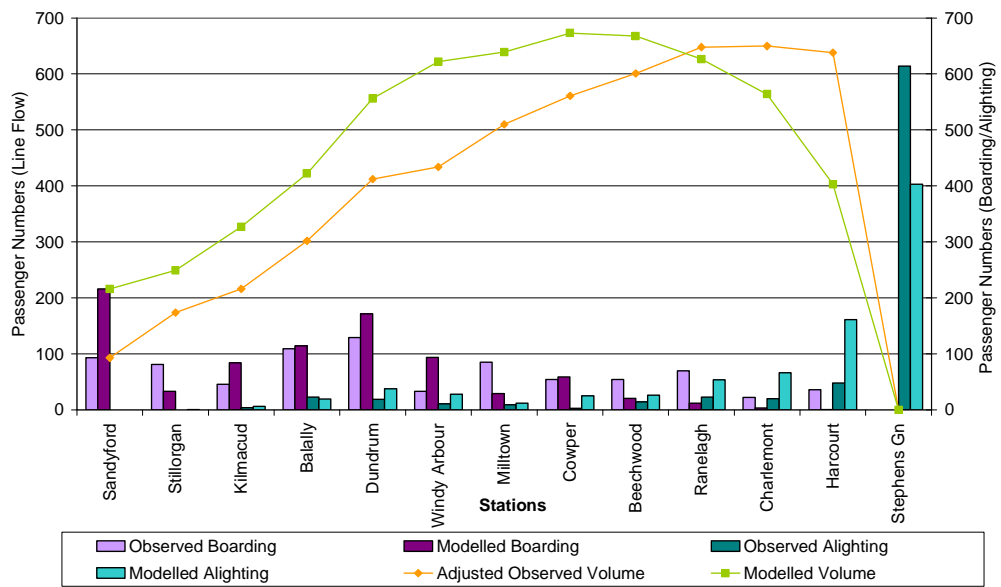
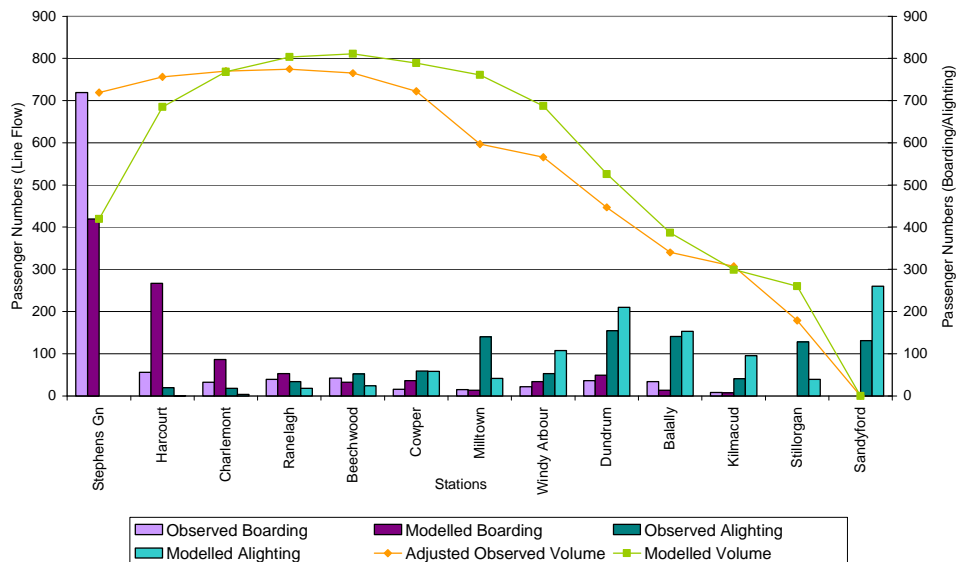


FIGURE 3.6 LUAS GREEN STEPHENS GREEN TO SANDYFORD



3.54 Both figures show a good match between the observed and modelled profiles, as well as the boarding and alighting figures. There is a mismatch, though, between St. Stephen's Green and Harcourt station. Both these stations serve very similar zones, and the model often finds a longer walk in this area better (in generalised cost terms) than using the tram for one additional stop. Since this is a relatively microscopic problem at a specific location, it could not be fully resolved within the current scope of work.

3.55 Figure 3.7 and Figure 3.8 present a similar analysis for the Luas red line.

FIGURE 3.7 LUAS RED TALLAGHT TO CONNOLLY

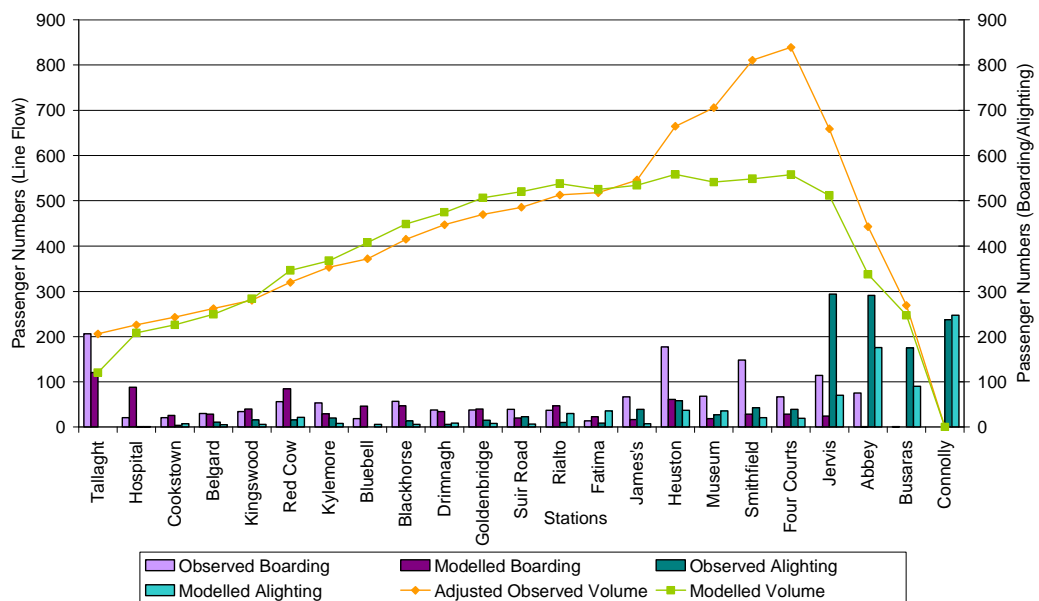
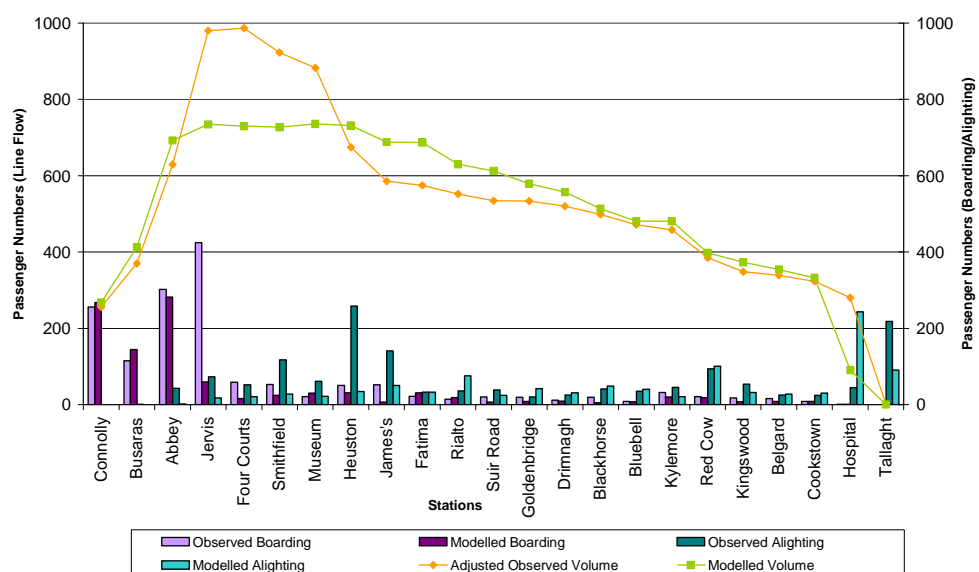


FIGURE 3.8 LUAS RED CONNOLLY TO TALLAGHT



- 3.56 It appears that the modelled profile for the red line is very similar to the observed profile, except within the city centre between Jervis and Heuston. This is likely to be a result of the issue with walk access, as explained in the results of interim calibration.
- 3.57 Another issue with the red line has to do with access at the Tallaght Centre and Tallaght Hospital stations. In the model, all zones in this area are connected to both stations, which are close to each other. The model assigns more demand to the Hospital station since it is closer to the city centre, which is the trip destination or origin for many travellers. Zone connectors in this model are created automatically, using a distance-based approach, and therefore there is little room for further adjustments during the calibration stage to correct this. This issue was partially addressed by modifying the allocation of trips using a 'select link' analysis.
- 3.58 A summary of boarding and alighting for both Luas lines is presented in Table 3.14.

TABLE 3.14 LUAS BOARDING AND ALIGHTING PASSENGERS

Luas Line	Boarding & Alighting Passengers		
	Observed	Modelled	% Diff
Green Inbound	788	838	6.4%
Green Outbound	971	1,012	4.2%
Red Inbound	1,348	853	-36.7%
Red Outbound	1,478	1,009	-31.7%
Total	4,585	3,712	-19.0%

- 3.59 This demonstrates a good match on the green line and a considerable under-estimation on the red line. However, inspection by station reveals again that the under-estimation is mainly due to the abovementioned local issue between Heuston and Jervis. Therefore, despite some inaccuracies of a very local nature, we find that satisfactory fit is demonstrated for both Luas lines.

PT Model Calibration Summary

- 3.60 In summary, the calibration of the PT assignment model has:
- brought the off-peak to a 2006 base year;
 - reached a satisfactory level of goodness-of-fit with observed data for all PT modes;
 - reached good fit at the cordon, screenline and corridor levels; and
 - under-predicted the Luas red line demand in the city centre due to the same reasons identified in the morning peak model.

4 The Highway Assignment Model

Introduction

- 4.1 This chapter describes the process carried out to calibrate the SATURN highway assignment model for the off-peak period. The process includes changes to the matrices as well as changes on the network, including capacities and signal optimisation. We also present some final validation results.

The Input Data

- 4.2 A large amount of data was used for the calibration process. On the demand side, the starting point was TAGM/TDM matrices after the various modifications described in Chapter 2.
- 4.3 We also used a large number of traffic counts (from 2005, 2006, 2007) and journey time surveys (from 2006) for the modelled off-peak hour.

Highway Count Data

- 4.4 The set of count data supplied by the DTO contained hundreds of link and turning counts. A considerable amount of analysis has been undertaken to clean the counts to remove errors and inconsistencies. For example, 2007 counts in the tunnel area have been removed as the tunnel was not in place in 2006 the base year. The locations of those counts used in the calibration process are shown in the Figure 4.1 below.
- 4.5 A number of these have been selected and combined where appropriate to provide a set of cordons and screenlines across the network. These are listed in the Table 4.1.
- 4.6 For the purpose of the initial calibration, the canal and outer cordons have been used to check the overall levels of traffic by direction. The two cordons are almost complete in that they cover the majority of links in the model into the city centre and within the M50 towards Dublin. This coverage means that even if the routing is not accurate, it can be used effectively to check the matrix levels and directional flows.

Journey Time Data

- 4.7 A total of twenty-six off-peak peak journey time routes have been surveyed by DTO within the Greater Dublin Area between October 2006 and January 2007. Routes *one* to *sixteen* were in the inbound direction only, whilst the remaining surveys were on orbital routes in both directions. Table 4.2 describes the routes and the number of runs undertaken and Figure 4.2 shows these routes on the road network.

FIGURE 4.1 HIGHWAY COUNT SITES

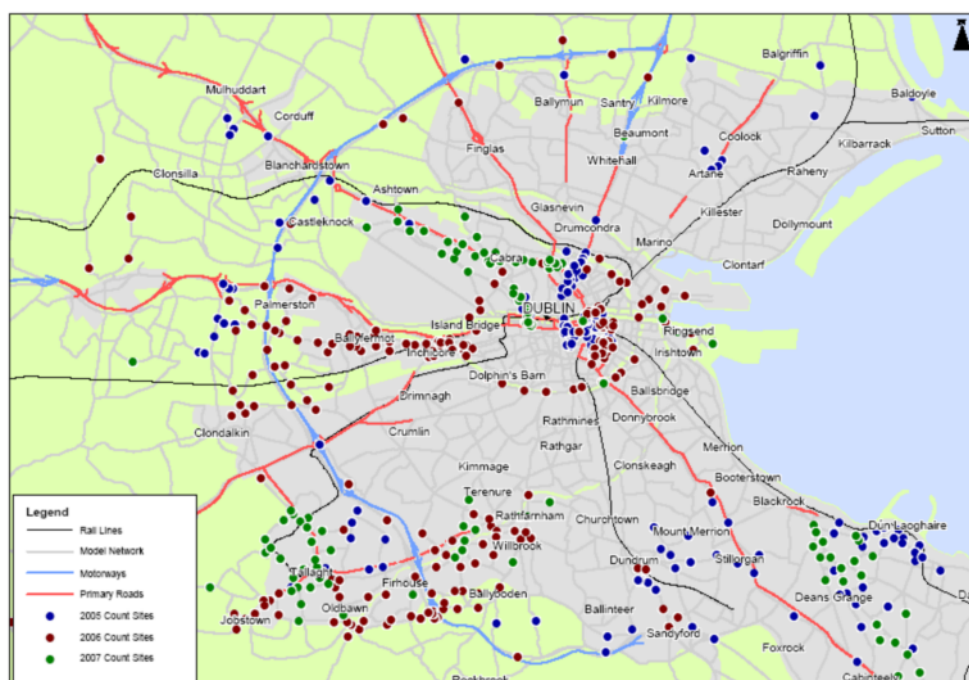


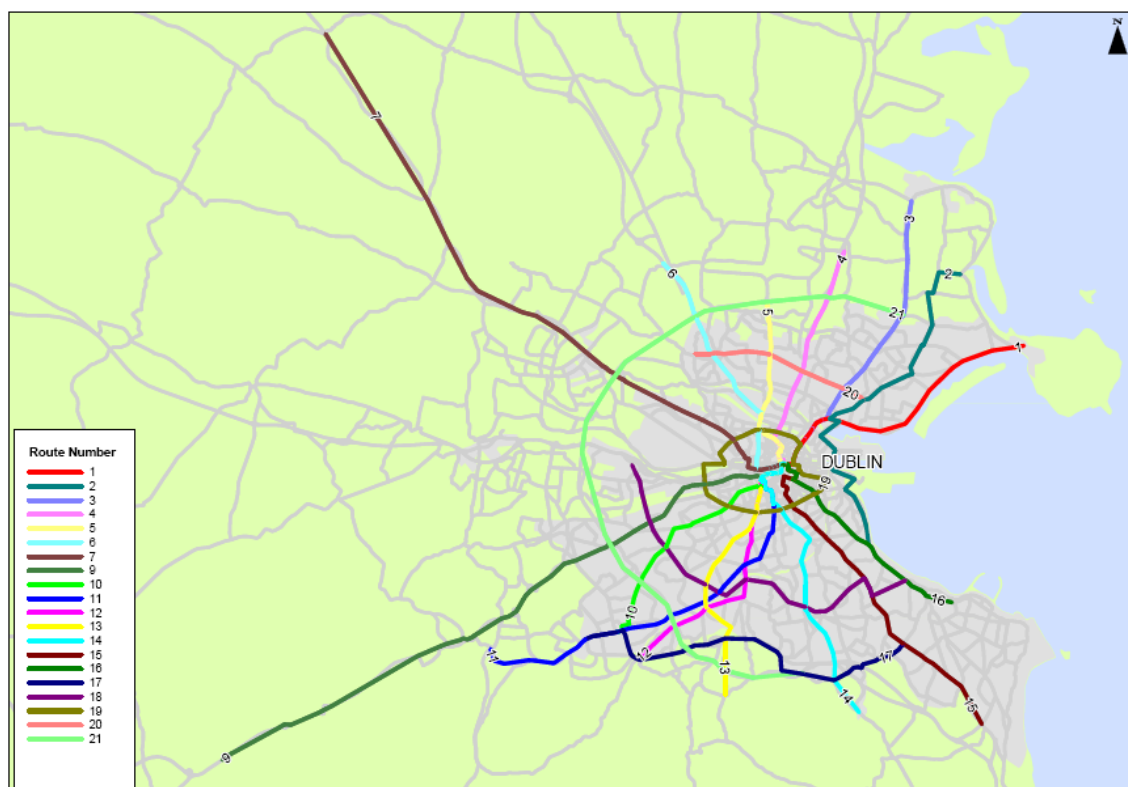
TABLE 4.1 HIGHWAY SCREENLINES AND CORDONS

ID	Name	Description
1	South Canal Screenline	Counts on the canal cordon to the south of the River Liffey
2	North Canal Screenline	Counts on the canal cordon to the north of the River Liffey
3	Canal Cordon	Combination of South Canal and North Canal Screenlines
4	Outer Screenline North	Screenline inside the M50 to the north of Dublin City Centre
5	Outer Screenline South	Screenline inside the M50 to the south of Dublin City Centre
6	Outer Screenline West	Screenline inside the M50 to the west of Dublin City Centre
7	Outer Cordon	Combination of North, South and West Outer Screenlines
8	M50 Counts	Counts on the M50

TABLE 4.2 JOURNEY TIMES SURVEY ROUTES

ID	From	To	Direction	Month of Survey	Runs
1	Sutton	City Centre	Inbound	November 2006	3
2	Portmarnock	City Centre	Inbound	November 2006	3
3	Swords	City Centre	Inbound	November 2006	5
4	Airport	City Centre	Inbound	November 20 06	4
5	Santry	City Centre	Inbound	November 20 06	4
6	Finglas	City Centre	Inbound	November 2006	4
7	Dunshaughlin	City Centre	Inbound	November 2006	5
8	Cooldrinagh	City Centre	Inbound	November 2006	5
9	Kill	City Centre	Inbound	November 2006	5
10	Tallaght	City Centre	Inbound	November 2006	3
11	Saggart	City Centre	Inbound	November 2006	4
12	Oldtown	City Centre	Inbound	November 2006	4
13	Edmondstown	City Centre	Inbound	November 2006	4
14	Stepaside	City Centre	Inbound	October 2006	4
15	Loughlinstown	City Centre	Inbound	November 2006	4
16	Monkstown	City Centre	Inbound	November 2006	5
17A	Orbital	Tallaght	WB	November 2006	3
17B	Orbital	Tallaght	EB	November 2006	6
18A	Orbital	Palmerstown	WB	November 2006	3
18B	Orbital	Palmerstown	EB	November 2006	5
19A	Orbital	City Centre	WB	Nov 2006 - Jan 2007	5
19B	Orbital	City Centre	EB	November 2006	5
20A	Orbital	Collins Avenue	WB	October 2006	1
20B	Orbital	Collins Avenue	EB	November 2006	3
21A	Orbital	M50	WB	November 2006	4
21B	Orbital	M50	EB	November 2006	5

FIGURE 4.2 JOURNEY TIME SURVEY ROUTES



- 4.8 For each of the routes, the node paths were coded into SATURN and a subsequent joy ride was taken through the network. This allows the modelled journey time to be extracted for each of the routes. This data is then compared against the observed values.

Network Calibration

- 4.9 While the matrix factoring process described in Chapter 2 produced a matrix that matched the observed flows, it was still necessary to adjust the network to reflect the traffic conditions in the off-peak hour.
- 4.10 In effect, much of the matrix manipulation and network changes were done in parallel, as changes to the matrix affect the performance of the modelled network, and changes to the network affect routing and hence they also affect the level and location of the factoring required. This section focuses on the network editing we have undertaken.

Network updates

- 4.11 The first decision on the network side was which network to use as a starting point. The choice was between:
- The calibrated 2002 off-peak network, with some further alterations; or
 - The calibrated 2006 morning peak network, developed during the recent morning peak model update.

- 4.12 Choosing the former would have had the advantage that the network had already been adjusted to the off-peak conditions, while choosing the latter would have had the advantage of using a network that has recently been updated thoroughly.
- 4.13 At various stages during the matrix development, both networks models were run using the same matrix inputs and compared against the cordon counts and the journey time data. The results were as follows:
- Count calibration was very similar at the cordon level;
 - Journey time calibration was slightly better for the morning peak network.
- 4.14 It was therefore decided to adopt the morning peak network as a starting point, because the journey time calibration was better and since it assured a level of compatibility within the overall DTO model package. A number of updates were then made to the model to ensure that it reflected the off-peak network conditions. The changes were as follows:
- Cycle time for signals over 90 seconds reduced to 90 seconds (since there tend to be shorter cycle times in the off-peak);
 - Adjusting signal settings to reflect change in directional flows;
 - Changes to link capacities to reflect off-peak conditions; and
 - Other ad-hoc improvements to network.
- HGV Matrix Estimation (ME)**
- 4.15 As mentioned previously, a detailed factoring process was applied to the car PCU matrix of light vehicles. Following this, the heavy goods vehicles (HGV's) were added to the demand matrices, after applying a Matrix Estimation process to the demand by these vehicles only.
- 4.16 The initial HGV matrix used in the study came directly from the 2002 DTO calibrated model. The matrix was originally derived using a gravity model and then updated using Matrix Estimation. While this was a good starting point, it was important to understand how accurate the HGV matrix was. Table 4.3 below illustrates that the modelled flows were considerably higher than those observed on the canal cordon, but much lower on the outer cordon.

TABLE 4.3 HGV FLOWS BEFORE MATRIX ESTIMATION

Direction	Canal Cordon			Outer Cordon		
	Observed	Modelled	Percentage Difference	Observed	Modelled	Percentage Difference
Inbound	1,956	2,857	46%	4,288	3,416	-20%
Outbound	2,381	2,589	9%	4,127	3,121	-24%
Total	4,337	5,446	26%	8,415	6,537	-22%

- 4.17 As mentioned, a Matrix Estimation process was carried out for HGV traffic only, to achieve a better flow validation. Where sufficient data exists from reliable sources we generally prefer to avoid Matrix Estimation processes. But unlike the car matrix, which has been derived based on a comprehensive set of surveys, the HGV matrix is not underpinned by such detailed observations. Therefore, Matrix Estimation appeared an appropriate way of producing a matrix based on the available observed data.
- 4.18 Due care was taken that the estimation process does not generate irrational estimates of HGV demand, such as large numbers of HGV trips originating from residential areas.
- 4.19 Some further steps were taken to ensure that the prior matrix trip patterns were not distorted:
- Using the standard recommend SATURN parameter XAMAX = 5.0. This limits the factor which can be applied to fix the flows to a count, to no more than 5.
 - Freezing HGV trips to and from residential zones, in order to prevent an unrealistic growth in HGV flows from these zones.
- 4.20 The results from the final assignment can be seen in Table 4.4 for HGV flows crossing the cordons.
- 4.21 The results demonstrate that the flow validation for HGV's across the cordons have improved considerably. While in percentage terms the error appears high, these flows are relatively low when it is considered that they are measured across the whole cordon. When the flows on individual links are at this order of magnitude, the results appear acceptable.

TABLE 4.4 HGV FLOWS AFTER MATRIX ESTIMATION

Direction	Canal Cordon			Outer Cordon		
	Observed	Modelled	Percentage Difference	Observed	Modelled	Percentage Difference
Inbound	1,956	2,269	16%	4,288	3,619	-16%
Outbound	2,381	2,156	-9%	4,127	3,270	-21%
Total	4,337	4,425	2%	8,415	6,889	-18%

- 4.22 Table 4.5 compares the quality of the calibration of HGV flows before and after the Matrix Estimation process. The figures displayed are the proportion of flows where the GEH measure is less than 5, indicating a good level of fit.

TABLE 4.5 HGV CALIBRATIONS - THE PROPORTION OF FLOWS WITH GEH<5

Direction	Before Matrix Estimation	After Matrix Estimation
Inbound	56%	78%
Outbound	39%	80%
Total	54%	79%

Final Calibration Results

Overview

- 4.23 The final calibration results are presented in Table 4.6 below for flows crossing the cordons. The overall flows crossing the cordons provide a good match to the observed counts for the whole of the modelled period. A detailed comparison of modelled and links flows can be seen in the appendix.

TABLE 4.6 FINAL CALIBRATION RESULTS

Direction	Observed	Modelled	Percentage Difference
Inbound	37,714	37,124	-2%
Outbound	39,992	38,295	-4%
Total	77,706	75,419	-3%

- 4.24 Table 4.7 presents a summary of the GEH statistic comparing between observed and modelled flows. A GEH less than 5 is considered an excellent match against the observed counts; GEH below 7.5 indicates a good match, and GEH below 10 shows a reasonable match.

TABLE 4.7 PROPORTIONS OF COUNTS MATCHING GEH CRITERIA ON THE CORDONS

	Canal Cordon			Outer Cordon		
	GEH <5	GEH <7.5	GEH <10	GEH <5	GEH <7.5	GEH <10
Inbound	43%	71%	82%	38%	58%	81%
Outbound	43%	61%	68%	35%	58%	73%

- 4.25 Since no Matrix Estimation has been carried with the input matrices, the level of calibration that has been achieved at an individual count level is considered acceptable. Furthermore, due to the limited number of repeated observations at the same count locations across a number of days, the individual count level calibration is likely to be affected by day-to-day variations in the count data and not by a modelling error.
- 4.26 The level of validation reflected by the table above is similar to that achieved in the calibration of the morning peak model, and also meet the same standards achieved in network models we (or other consultants) have built for various other cities. For example, the strategic models for Scotland (TMfS), London (LTS) and West Midlands (PRISM) in the UK exhibit similar level of validation at the individual link level, in both the AM and off-peak periods.

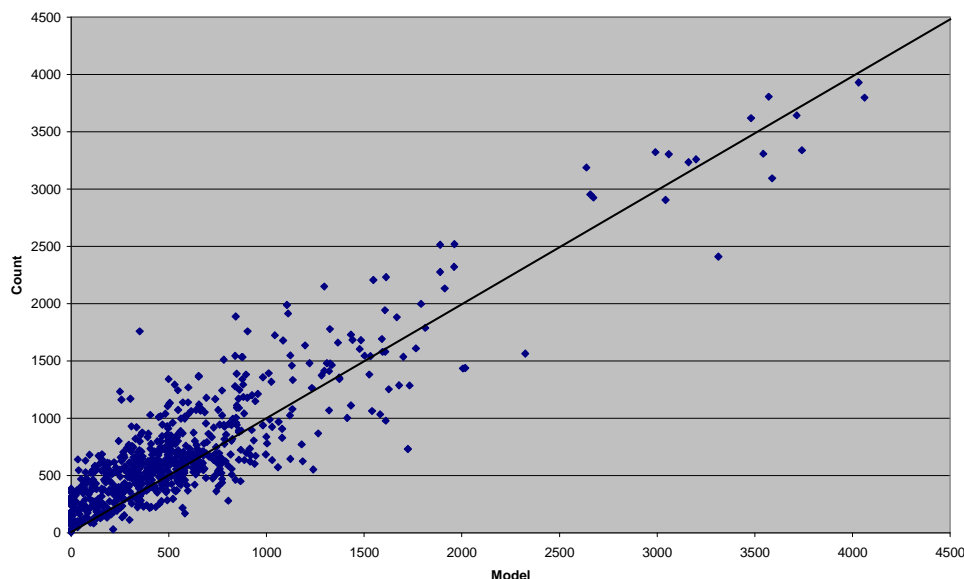
Independent Count Comparisons

- 4.27 As a further check of the accuracy of the model, all counts other than the cordoned counts were compared to their equivalent flows in the model.
- 4.28 Firstly, the route mean squared normalized error (*RMSNE*) was used on counts across the network. *RMSNE* is a useful way of measuring the goodness of fit of a large number of observations. This measure heavily penalises large errors, and is calculated as follows (x_i are modelled flows, y_i are observed flows, and N is the number of compared measurements):

$$\sqrt{\frac{1}{N} \sum_{i=1}^N \left(\frac{x_i - y_i}{y_i} \right)^2}$$

- 4.29 The nearer the value of the *RMNSE* to zero, the better the fit indicated by the model. In the context of traffic data, values under 1 are considered an indication of a reasonable level of fit. The value obtained in our case is 0.534, implying that the level of calibration is satisfactory.
- 4.30 A similar way of looking at the same measurements is by plotting modelled flows versus observed flows in a 'scatter-plot'. This is presented in the figure below, where each data point represents a single origin-destination pair. The diagonal line represents a perfect fit, where the observed and modelled numbers are identical.
- 4.31 It can be seen that the data points are clustered around the diagonal, indicating that the model replicated the observed conditions well.

FIGURE 4.3 COMPARISON OF FLOWS



Final Journey Time Analysis

4.32

Table 4.8 presents the journey time comparisons for the final calibrated highway network. A total of 22 routes, out of the 26 surveyed, meet the standard criterion of being within 15% of the observed journey times. Appendix D contains the full journey time route summaries comparing in detail all the timing points along the route against the modelled times. These show that as well as matching the overall journey times, the model also replicates the delay profiles across the network as a whole.

TABLE 4.8 FINAL HIGHWAY JOURNEY TIME COMPARISON

Route	Observed (seconds)	Modelled (seconds)	Difference (seconds)	Percentage Difference
1	1828	1787	-41	-2%
2	2305	2002	-303	-13%
3	1962	1930	-32	-2%
4	1652	1670	18	1%
5	1989	1828	-161	-8%
6	2156	1859	-297	-14%
7	2681	2888	207	8%
8	2166	2243	77	4%
9	2337	2647	310	13%
10	1947	2375	428	22%
11	3462	3026	-436	-13%
12	2057	2177	120	6%
13	1696	2198	502	30%
14	2421	2543	122	5%
15	2262	2203	-59	-3%
16	1935	1828	-107	-6%
17A	2088	1549	-539	-26%
17B	1833	1933	100	5%
18A	2495	2144	-351	-14%
18B	2731	2060	-671	-25%
19A	3102	3455	353	11%
19B	3410	3797	387	11%
20A	1438	1238	-200	-14%

Route	Observed (seconds)	Modelled (seconds)	Difference (seconds)	Percentage Difference
20B	1456	1316	-140	-10%
21A	1831	2059	228	12%
21B	1779	1920	141	8%
No of Routes within 15% of observed times			22 routes	
Percentage within 15% of observed times			85%	

Highway Model Calibration Summary

- 4.33 The results presented in this chapter demonstrate that the recalibrated highway model for the off-peak period is fit for purpose:
- The model matches the directional flows in and out of Dublin at a macro level;
 - It has a good match against individual counts; and
 - Accurately recreates network speeds and delays by matching the journey time surveys.
- 4.34 It should be noted that this has been achieved while avoiding major changes to the demand data as estimated by the TAGM/TDM. This means that the most trip distribution patterns, as captured by the TAGM/TDM, have been retained.

5 Conclusions and Recommendations

Conclusions

- 5.1 A comprehensive upgrade and re-calibration of the off-peak component of the DTO model has been carried out, covering both its highway network element and PT network element. The model has been set up so that its new base year is 2006.
- 5.2 For the highway SATURN model -
- Matrices have been created using:
 - Matrices from TAGM /TDM, adjusted to totals from the household survey;
 - Factoring approach based on a detailed sector system;
 - HGV Matrix Estimation with logical constraints.
 - The networks have been updated using:
 - The morning peak network recently calibrated to 2006 conditions, as a starting point;
 - Signal settings adjusted to reflect off-peak conditions;
 - Some changes to link capacities.
 - Final calibration results:
 - The level of fit is similar to that of the morning peak model;
 - Good level of validation across the cordons and screenlines;
 - 85% of the modelled journey times are within $\pm 15\%$ of the observed times.
- 5.3 For the public transport CUBE/TRIPS model -
- Matrices have been created using:
 - Matrices from TAGM /TDM, adjusted to totals from the household survey;
 - Factoring approach as above, based on a detailed sector system;
 - Further adjustments due to hospital demand;
 - Minor factoring to address the over-prediction of rail demand;
 - Minor factoring to address the under-prediction of bus demand at the inner cordon area.
 - The networks have been updated using:
 - The off-peak network coded by the DTO team;
 - Network updates, to incorporate improvements made to the morning peak network, such as improved access links;
 - Extensive update of the rail network coding, to improve the representation of rail demand arriving at (or departing from) the Dublin city centre.

■ Final calibration results:

- A good level of fit achieved for all PT modes at cordon, screenline and corridor levels;
- Under-prediction of the Luas red line demand in the city centre due to the same reasons identified during the calibration of the morning peak model, concerning very short journeys in the centre.

Recommendations

5.4 During the work with the model we noted a number of areas for improvement and possible enhancements in future versions of the model. Some recommendations for such future changes were presented in the summary report of the morning peak model calibration. Those recommendations focused on:

- The need for additional count data with more repeated observations;
- The need to restructure the PT Model to allow representation of rebated Luas fares; and
- Possible improvement of the network coverage in large zones outside of M50.

5.5 All these recommendations are also valid for the off-peak model. In addition, the following are some further recommendations that would make the model more powerful when testing schemes and strategies:

- Bus passenger count data should be collected in both directions, especially around the canal cordon, at all times of day.
- When testing PT schemes, care needs to be taken when interpreting model estimates of boarding/alighting passengers per station, as this is heavily dependent on zone sizes, and sensitivity to the differences in the ease of access between adjacent stations.
- Care also needs to be taken when using estimates of rail demand at suburban stations. In the calibration work described here, higher priority was given to achieving good fit in and around the city centre.

APPENDIX

A

PT MODEL CALIBRATION STAGES AND RESULTS

TABLE A1 PUBLIC TRANSPORT TEST- 6 CALIBRATION RESULTS

PT Mode	Observed	Modelled	% Difference
Bus	27,854	29,328	5%
Rail	44,109	51,620	17%
Luas	34,330	37,986	11%
Total PT	106,293	118,934	12%

TABLE A2 PUBLIC TRANSPORT TEST- 6 DEMAND SUMMARY RESULTS

BUS

	Observed	Modelled	% Difference
Cordon Inbound	8,243	7,628	-7%
Cordon Outbound	7,762	7,974	3%
Outer- Inbound	5,498	6,507	18%
Outer- Outbound	6,351	7,218	14%
Bus Total	27,854	29,328	5%

RAIL

Cordon Crossing Inbound	1,891	2,139	13%
Cordon Crossing Outbound	2,842	2,759	-3%
Rail Total	4,733	4,898	3%

LUAS

Green IN	788	825	5%
Green Out	971	959	-1%
Red In	1,348	1,229	-9%
Red Out	1,478	1,001	-32%
Luas Total	4,585	4,013	-12%
Total PT	89,956	96,742	8%

TABLE A3 PUBLIC TRANSPORT TEST-7.9 DEMAND SUMMARY RESULTS

BUS			
	Observed	Modelled	% Difference
Cordon Inbound	8,243	7,056	-14%
Cordon Outbound	7,762	7,942	2%
Outer- Inbound	5,498	5,868	7%
Outer- Outbound	6,351	7,005	10%
Bus Total	27,854	27,872	0%
RAIL			
Cordon Crossing Inbound	1,891	2,060	9%
Cordon Crossing Outbound	2,842	2,719	-4%
Rail Total	4,733	4,778	1%
LUAS			
Green IN	788	822	4%
Green Out	971	957	-1%
Red In	1,348	1,118	-17%
Red Out	1,478	970	-34%
Luas Total	4,585	3,866	-16%
Total PT	37,172	36,516	-2%

TABLE A4 PUBLIC TRANSPORT TEST- 8.1 CALIBRATION RESULTS

PT Mode	Observed	Modelled	% Difference
Bus	16,005	28,247	76%
Rail	44,109	50,044	13%
Luas	34,330	35,014	2%
Total PT	94,444	113,305	20%

TABLE A5 PUBLIC TRANSPORT TEST- 8.1 DEMAND SUMMARY RESULTS

BUS

	Observed	Modelled	% Difference
Cordon Inbound	8,243	7,326	-11%
Cordon Outbound	7,762	7,914	2%
Outer- Inbound	5,498	5,986	9%
Outer- Outbound	6,351	7,021	11%
Bus Total	27,854	28,247	1%

RAIL

Cordon Crossing Inbound	1,891	2,072	10%
Cordon Crossing Outbound	2,842	2,685	-6%
Rail Total	4,733	4,756	0%

LUAS

Green IN	788	824	5%
Green Out	971	957	-1%
Red In	1,348	1,034	-23%
Red Out	1,478	986	-33%
Luas Total	4,585	3,800	-17%
Total PT	37,172	36,804	-1%

TABLE A6 PUBLIC TRANSPORT TEST- 11.0 CALIBRATION RESULTS

PT Mode	Observed	Modelled	% Difference
Bus	27,854	28,612	3%
Rail	31,336	50,567	61%
Luas	34,330	35,155	2%
Total PT	93,520	114,335	22%

TABLE A7 PUBLIC TRANSPORT TEST- 11.0 DEMAND SUMMARY RESULTS

BUS

	Observed	Modelled	% Difference
Cordon Inbound	8,243	7,603	-8%
Cordon Outbound	7,762	7,793	0%
Outer- Inbound	5,498	6,168	12%
Outer- Outbound	6,351	7,049	11%
Bus Total	27,854	28,612	3%

RAIL

Cordon Crossing Inbound	1,150	1,787	55%
Cordon Crossing Outbound	1,987	3,036	53%
Rail Total	3,137	4,823	54%

LUAS

Green IN	788	826	5%
Green Out	971	959	-1%
Red In	1,348	1,018	-24%
Red Out	1,478	964	-35%
Luas Total	4,585	3,767	-18%
Total PT	35,576	37,202	5%

TABLE A8 PUBLIC TRANSPORT TEST- 13.6 CALIBRATION RESULTS

PT Mode	Observed	Modelled	% Difference
Bus	27,854	27,456	-1%
Rail	32,442	39,692	22%
Luas	34,330	33,566	-2%
Total PT	94,626	100,713	6%

TABLE A9 PUBLIC TRANSPORT TEST- 13.6 DEMAND SUMMARY RESULTS

BUS

	Observed	Modelled	% Difference
Cordon Inbound	8,243	7,129	-14%
Cordon Outbound	7,762	7,479	-4%
Outer- Inbound	5,498	5,926	8%
Outer- Outbound	6,351	6,922	9%
Bus Total	27,854	27,456	-1%

RAIL

Cordon Crossing Inbound	1,294	1,369	6%
Cordon Crossing Outbound	1,987	2,390	20%
Rail Total	3,281	3,759	15%

LUAS

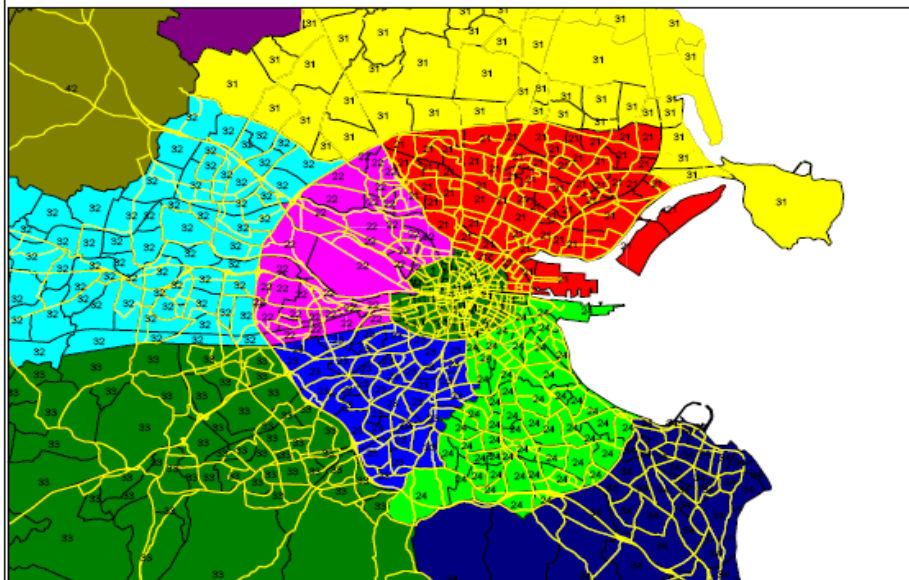
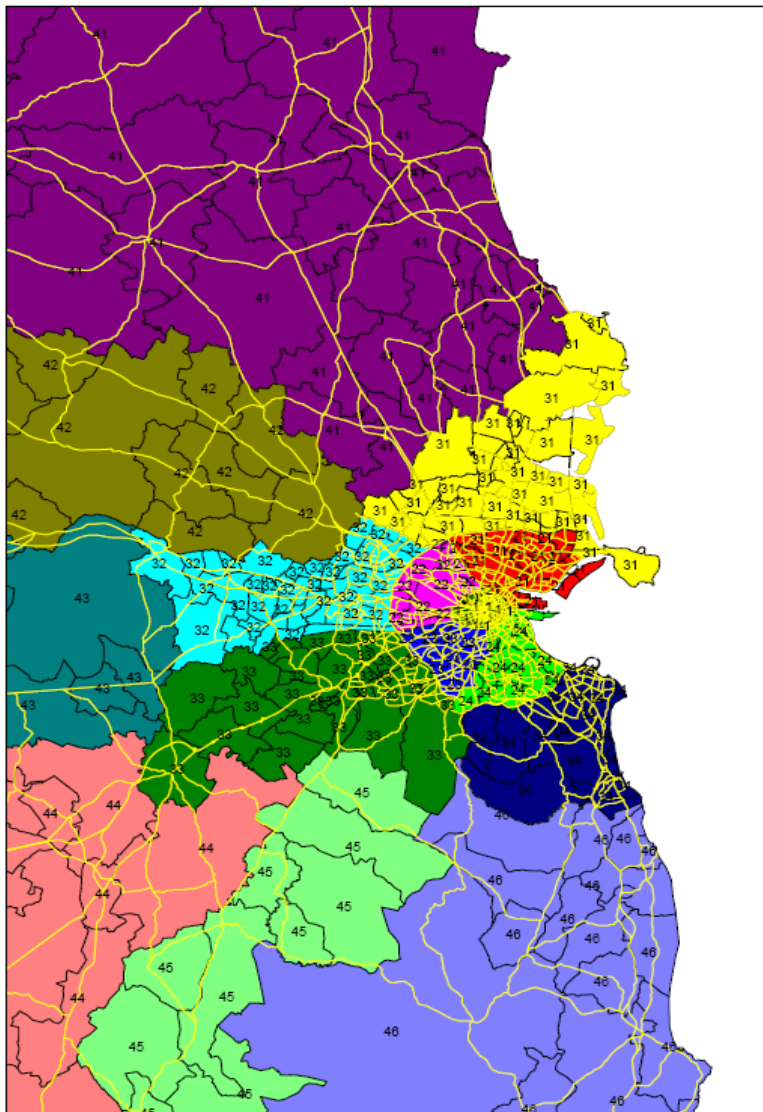
Green IN	788	820	4%
Green Out	971	941	-3%
Red In	1,348	935	-31%
Red Out	1,478	928	-37%
Luas Total	4,585	3,623	-21%
Total PT	35,720	34,838	-2%

APPENDIX

B

CAR MATRIX ADJUSTMENT STAGES

Detailed Sector System Discription



Sector Location

- 1 Inside Canal
- 21 Between Canal and M50 - North of City Centre
- 22 Between Canal and M50 - North West of City Centre
- 23 Between Canal and M50 - South West of City Centre
- 24 Between Canal and M50 - South of City Centre
- 31 Outside M50 - Immediately north of M50
- 32 Outside M50 - Immediately north west of M50
- 33 Outside M50 - Immediately south west of M50
- 34 Outside M50 - Immediately south of M50
- 41 Outside M50 - Rural north
- 42 Outside M50 - Rural north west
- 43 Outside M50 - Rural west
- 44 Outside M50 - Rural south west (north)
- 45 Outside M50 - Rural south west (south)
- 46 Outside M50 - Rural south
- 61 Outside M50 - Outside Dublin region
- 339 Airport

Development of matrices from household totals to final calibrated totals

Household survey matrix

	1	21	22	23	24	31	32	33	34	41	42	43	44	45	46	61	339
1	4268	2252	1265	2571	2021	511	686	519	1084	354	184	154	161	34	380	97	1
21	2769	9759	1084	213	102	1630	265	96	60	555	90	18	32	7	27	30	19
22	1777	755	2384	330	150	368	1717	73	359	130	51	617	157	28	56	13	14
23	1678	271	466	3678	1141	396	468	1437	298	357	77	46	142	78	141	81	12
24	1842	285	198	1193	5788	289	225	553	2419	245	43	25	79	48	319	74	9
31	834	1786	420	166	89	5559	415	159	74	508	78	18	40	7	37	49	19
32	983	445	1074	540	252	530	7687	825	126	462	394	237	145	26	47	128	22
33	714	639	1688	2688	1199	108	322	6910	202	77	22	217	631	191	100	55	39
34	1003	322	83	210	2654	131	87	144	6026	29	4	10	26	17	750	14	2
41	729	356	211	85	55	324	252	103	55	6078	408	13	17	15	17	126	13
42	252	75	87	36	22	14	318	50	20	425	1539	38	14	1	4	55	4
43	98	63	64	30	26	37	213	166	15	21	49	828	161	8	5	40	3
44	75	16	149	87	86	20	185	552	58	10	16	173	3783	113	26	238	2
45	44	8	21	47	42	2	10	150	21	5	1	8	105	545	50	29	0
46	192	60	51	141	231	56	36	64	666	21	3	3	15	39	4032	152	4
61	41	28	45	65	60	41	61	37	53	115	25	37	143	20	115	0	11
339	12	21	48	53	24	14	108	53	37	6	19	8	15	2	13	36	0

Factored Household survey matrix

	1	21	22	23	24	31	32	33	34	41	42	43	44	45	46	61	339
1	4268	2252	1012	2571	2021	684	686	519	1084	354	184	154	161	34	380	97	1
21	1681	9759	1084	213	102	3750	345	124	60	1000	163	23	42	7	27	30	19
22	1066	755	2384	330	150	663	2233	429	73	634	208	66	88	15	28	56	13
23	1007	271	466	3678	1141	554	609	1868	298	500	108	60	184	78	141	81	12
24	1842	285	198	1193	5788	384	293	718	3145	343	60	33	103	48	319	74	9
31	834	1786	252	100	54	5559	415	159	74	508	78	18	40	7	37	49	19
32	983	1247	3008	1513	705	159	2306	825	126	139	118	237	145	26	47	38	22
33	714	639	1688	2688	1199	108	322	6910	202	77	22	217	631	191	100	55	39
34	1003	322	83	210	2654	39	26	144	6026	29	4	10	26	17	750	14	2
41	729	356	211	85	55	324	252	103	55	6078	408	13	17	15	17	126	13
42	252	75	87	36	22	14	318	50	20	425	1539	38	14	1	4	55	4
43	98	176	180	84	73	11	213	166	15	21	49	828	161	8	5	40	3
44	75	45	417	243	268	3	16	173	3783	113	26	238	2	115	0	11	0
45	44	8	21	47	42	2	10	150	21	5	1	8	105	545	50	29	0
46	192	60	51	141	231	17	11	64	666	5	1	3	15	39	4032	152	4
61	41	28	45	65	60	12	24	37	53	115	25	37	143	20	115	0	11
339	12	21	48	53	24	14	108	53	37	6	19	8	15	2	13	36	0

Factored Household survey matrix (with M50 alterations)

	1	21	22	23	24	31	32	33	34	41	42	43	44	45	46	61	339
1	4268	2252	1012	2571	2021	555	686	519	1084	273	184	154	161	34	380	97	1
21	1675	9731	1114	224	104	3528	377	140	62	997	195	26	48	8	29	34	17
22	1066	703	2384	330	150	360	2233	429	73	634	208	66	88	15	28	56	13
23	1007	236	466	3678	1141	275	609	1868	298	349	108	60	184	78	141	80	5
24	1842	281	198	1193	5788	209	293	718	3145	230	60	33	103	48	319	73	9
31	1070	1132	349	136	72	5547	618	220	105	507	92	23	57	10	51	64	122
32	983	911	3008	1513	705	98	2306	825	126	120	118	237	145	26	47	38	9
33	714	447	1688	2688	1199	55	322	6910	202	77	22	217	631	191	100	55	39
34	1003	314	83	210	2654	19	26	144	6026	19	4	10	26	17	750	14	2
41	891	331	252	105	65	319	271	128	69	6078	411	14	21	15	20	128	13
42	252	51	87	36	22	10	318	50	20	420	1539	38	14	1	4	55	4
43	98	124	180	84	73	5	213	166	15	20	49	828	161	8	5	40	1
44	75	31	417	243	268	3	16	173	3783	113	26	238	2	115	0	11	0
45	44	8	21	47	42	2	10	150	21	5	1	8	105	545	50	29	0
46	192	54	51	141	231	9	11	64	666	5	1	3	15	39	4032	152	4
61	41	28	45	65	60	12	24	37	53	115	25	37	143	20	115	0	11
339	18	21	76	83	37	14	171	84	58	6	30	13	23	3	20	58	0

Factors Applied to Household Survey Matrix

	1	21	22	23	24	31	32	33	34	41	42	43	44	45	46	61	339
1	1.0	1.2	0.9	1.0	1.0	1.3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
21	0.8	1.0	1.0	1.0	1.0	2.3	1.3	1.3	1.0	1.8	1.8	1.3	1.3	1.0	1.0	1.0	1.0
22	0.8	0.9	1.0	1.0	1.0	1.3	1.3	1.3	1.0	1.8	1.8	1.3	1.3	1.0	1.0	1.0	1.0
23	0.8	1.0	1.0	1.0	1.0	1.4	1.3	1.3	1.0	1.4	1.4	1.3	1.3	1.0	1.0	1.0	1.0
24	1.0	1.0	1.0	1.0	1.0	1.4	1.3	1.3	1.3	1.4	1.4	1.3	1.3	1.0	1.0	1.0	1.0
31	1.0	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
32	1.0	2.8	2.8	2.8	2.8	0.3	0.3	1.0	1.0	0.3	0.3	1.0	1.0	1.0	1.0	0.3	1.0
33	1.0	2.8	2.8	2.8	2.8	0.3	0.3	1.0	1.0	0.3	0.3	1.0	1.0	1.0	1.0	0.3	1.0
34	1.0	1.0	1.0	1.0	1.0	0.3	0.3	1.0	1.0	0.3	0.3	1.0	1.0	1.0	1.0	0.3	1.0
41	1.0	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
42	1.0	2.8	2.8	2.8	2.8	0.3	0.3	1.0	1.0	0.3	0.3	1.0	1.0	1.0	1.0	0.3	1.0
43	1.0	2.8	2.8	2.8	2.8	0.3	0.3	1.0	1.0	0.3	0.3	1.0	1.0	1.0	1.0	0.3	1.0
44	1.0	2.8	2.8	2.8	2.8	0.3	0.3	1.0	1.0	0.3	0.3	1.0	1.0	1.0	1.0	0.3	1.0
45	1.0	1.0	1.0	1.0	1.0	0.3	0.3	1.0	1.0	0.3	0.3	1.0	1.0	1.0	1.0	0.3	1.0
46	1.0	1.0	1.0	1.0	1.0	0.3	0.3	1.0	1.0	0.3	0.3	1.0	1.0	1.0	1.0	0.3	1.0
61	1.0	1.0	1.0	1.0	1.0	0.3	0.3	1.0	1.0	0.3	0.3	1.0	1.0	1.0	1.0	0.3	1.0
339	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Final proportional changes after M50 alterations

	1	21	22	23	24	31	32	33	34	41	42	43	44	45	46	61	339
1	1.0	1.2	0.9	1.0	1.0	1.1	1.0	1.0	1.0	0.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0
21	0.8	1.0	1.0	1.0	1.0	2.2	1.4	1.3	1.0	1.8	2.2	1.3	1.3	1.0	1.0	1.0	1.0
22	0.8	0.9	1.0	1.0	1.0	1.3	1.3	1.3	1.0	1.8	2.2	1.3	1.3	1.0	1.0	1.0	1.0
23	0.8	0.9	1.0	1.0	1.0	1.3	1.3	1.3	1.0	1.4	1.3	1.3	1.3	1.0	1.0	1.0	1.0
24	1.0	1.0	1.0	1.0	1.0	0.7	1.3	1.3	1.3	0.9	1.4	1.3	1.3	1.0	1.0	1.0	1.0
31	1.0	0.8	0.8	0.8	0.8	1.0	1.0	1.4	1.4	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
32	1.0	2.0	2.0	2.0	2.0	0.2	0.2	1.0	1.0	0.2	0.2	1.0	1.0	1.0	1.0	0.2	1.0
33	1.0	2.0	2.0	2.0	2.0	0.2	0.2	1.0	1.0	0.2	0.2	1.0	1.0	1.0	1.0	0.2	1.0
34	1.0	1.0	1.0	1.0	1.0	0.2	0.2	1.0	1.0	0.2	0.2	1.0	1.0	1.0	1.0	0.2	1.0
41	1.0	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
42	1.0	2.0	2.0	2.0	2.0	0.2	0.2	1.0	1.0	0.2	0.2	1.0	1.0	1.0	1.0	0.2	1.0
43	1.0	2.0	2.0	2.0	2.0	0.2	0.2	1.0	1.0	0.2	0.2	1.0	1.0	1.0	1.0	0.2	1.0
44	1.0	2.0	2.0	2.0	2.0	0.2	0.2	1.0	1.0	0.2	0.2	1.0	1.0	1.0	1.0	0.2	1.0
45	1.0	2.0	2.0	2.0	2.0	0.2	0.2	1.0	1.0	0.2	0.2	1.0	1.0	1.0	1.0	0.2	1.0
46	1.0	0.9	1.0	1.0	1.0	0.2	0.2	1.0	1.0	0.2	0.2	1.0	1.0	1.0	1.0	0.2	1.0
61	1.0	0.9	1.0	1.0	1.0	0.2	0.2	1.0	1.0	0.2	0.2	1.0	1.0	1.0	1.0	0.2	1.0
339	1.0	1.0	1.0	1.0	1.0	0.2	0.2	1.0	1.0	0.2	0.2	1.0	1.0	1.0	1.0	0.2	1.0

APPENDIX

C

CAR TRIP RATE COMPARISONS BEFORE AND AFTER MATRIX FACTORING

Comparison of zone origin totals before and after factoring

HW_zones	Model zones	Pop	Ed+Emp	Pre factored			Post factored			Trip rates generated by pop.			Trip rates generated by Ed+Emp.		
				origin totals	origin totals	Change	origin totals	origin totals	Change	Pre	Post	Abs. Diff	Pre	Post	Abs. Diff
11101	1	1200	398	101	85	-16%	0.1	0.1	0.01	0.3	0.2	0.04			
11103	2	41	2588	116	126	9%	2.8	3.1	0.25	0.0	0.0	0.00			
11104	3	380	5019	121	149	24%	0.3	0.4	0.08	0.0	0.0	0.01			
11105	4	3124	923	189	184	-3%	0.1	0.1	0.00	0.2	0.2	0.01			
11106	5	146	3867	71	74	5%	0.5	0.5	0.02	0.0	0.0	0.00			
13101	6	937	301	90	89	-1%	0.1	0.1	0.00	0.3	0.3	0.00			
13102	7	1085	438	106	109	3%	0.1	0.1	0.00	0.2	0.2	0.01			
13103	8	1739	3020	208	244	18%	0.1	0.1	0.02	0.1	0.1	0.01			
13111	9	1466	1400	148	156	5%	0.1	0.1	0.01	0.1	0.1	0.01			
13112	10	1980	692	176	174	-1%	0.1	0.1	0.00	0.3	0.3	0.00			
13121	11	847	1336	215	216	0%	0.3	0.3	0.00	0.2	0.2	0.00			
13122	12	319	3386	483	480	-1%	1.5	1.5	0.01	0.1	0.1	0.00			
13123	13	822	4131	367	403	10%	0.4	0.5	0.04	0.1	0.1	0.01			
13124	14	972	4516	325	346	6%	0.3	0.4	0.02	0.1	0.1	0.00			
13125	15	812	3664	232	247	7%	0.3	0.3	0.02	0.1	0.1	0.00			
13126	16	96	5022	204	256	25%	2.1	2.7	0.53	0.0	0.1	0.01			
13131	17	1694	2871	258	313	22%	0.2	0.2	0.03	0.1	0.1	0.02			
13132	18	807	6138	253	331	31%	0.3	0.4	0.10	0.0	0.1	0.01			
13133	19	1678	4437	313	392	25%	0.2	0.2	0.05	0.1	0.1	0.02			
13141	20	1403	1610	224	222	-1%	0.2	0.2	0.00	0.1	0.1	0.00			
13142	21	1663	2376	184	192	5%	0.1	0.1	0.00	0.1	0.1	0.00			
13143	22	1605	1567	243	233	-4%	0.2	0.1	0.01	0.2	0.1	0.01			
13151	23	758	1449	171	178	4%	0.2	0.2	0.01	0.1	0.1	0.00			
13152	24	1379	18368	215	226	5%	0.2	0.2	0.01	0.0	0.0	0.00			
14101	25	1502	522	132	144	9%	0.1	0.1	0.01	0.3	0.3	0.02			
14111	26	982	1109	153	150	-2%	0.2	0.2	0.00	0.1	0.1	0.00			
14112	27	267	1010	67	65	-3%	0.3	0.2	0.01	0.1	0.1	0.00			
14113	28	2442	2012	261	259	-1%	0.1	0.1	0.00	0.1	0.1	0.00			
14121	29	3	80	5	5	0%	1.5	1.5	0.01	0.1	0.1	0.00			
14122	30	2185	737	183	176	-4%	0.1	0.1	0.00	0.2	0.2	0.01			
14123	31	1526	1743	196	188	-4%	0.1	0.1	0.01	0.1	0.1	0.00			
14131	32	1575	57	140	135	-3%	0.1	0.1	0.00	2.4	2.4	0.09			
14132	33	1063	120	94	90	-4%	0.1	0.1	0.00	0.8	0.7	0.03			
14133	34	961	468	80	78	-3%	0.1	0.1	0.00	0.2	0.2	0.01			
14141	35	1426	484	142	137	-3%	0.1	0.1	0.00	0.3	0.3	0.01			
14142	36	1463	167	87	79	-9%	0.1	0.1	0.01	0.5	0.5	0.05			
14151	37	1391	3706	229	242	6%	0.2	0.2	0.01	0.1	0.1	0.00			
14152	38	2324	141	162	163	1%	0.1	0.1	0.00	1.1	1.2	0.01			
14161	39	1629	1948	183	192	5%	0.1	0.1	0.01	0.1	0.1	0.00			
14162	40	1484	458	156	159	2%	0.1	0.1	0.00	0.3	0.3	0.01			
14171	41	893	509	146	145	0%	0.2	0.2	0.00	0.3	0.3	0.00			
14172	42	1315	736	173	172	-1%	0.1	0.1	0.00	0.2	0.2	0.00			
14173	43	463	2204	131	130	-1%	0.3	0.3	0.00	0.1	0.1	0.00			
16109	44	3624	1104	281	273	-3%	0.1	0.1	0.00	0.3	0.2	0.01			
16110	45	3215	1476	266	289	9%	0.1	0.1	0.01	0.2	0.2	0.02			
16145	46	2087	2732	235	277	18%	0.1	0.1	0.02	0.1	0.1	0.02			
16146	47	2336	108	146	140	-4%	0.1	0.1	0.00	1.4	1.3	0.05			
16147	48	3945	3385	335	353	5%	0.1	0.1	0.00	0.1	0.1	0.01			
16148	49	1369	534	99	90	-9%	0.1	0.1	0.01	0.2	0.2	0.02			
16224	50	2375	974	269	345	28%	0.1	0.1	0.03	0.3	0.4	0.08			
16225	51	2099	169	142	160	13%	0.1	0.1	0.01	0.8	0.9	0.11			
16226	52	3597	94	224	238	6%	0.1	0.1	0.00	2.4	2.5	0.15			
16242	53	3446	1376	254	288	14%	0.1	0.1	0.01	0.2	0.2	0.03			
16243	54	2398	633	152	167	10%	0.1	0.1	0.01	0.2	0.3	0.02			
16244	55	3503	2519	241	272	13%	0.1	0.1	0.01	0.1	0.1	0.01			
16258	56	5927	3150	425	466	10%	0.1	0.1	0.01	0.1	0.1	0.01			
16293	57	2584	833	170	189	11%	0.1	0.1	0.01	0.2	0.2	0.02			
16337	58	3237	2292	309	363	17%	0.1	0.1	0.02	0.1	0.2	0.02			
16338	59	6637	1312	456	383	-16%	0.1	0.1	0.01	0.3	0.3	0.06			
16339	60	2993	3020	327	355	8%	0.1	0.1	0.01	0.1	0.1	0.01			
16340	61	2720	551	158	169	7%	0.1	0.1	0.00	0.3	0.3	0.02			
16341	62	1634	606	103	113	9%	0.1	0.1	0.01	0.2	0.2	0.02			
16385	63	2547	861	175	212	21%	0.1	0.1	0.01	0.2	0.2	0.04			
16386	64	2283	716	196	263	34%	0.1	0.1	0.03	0.3	0.4	0.09			
16387	65	3301	1244	219	260	19%	0.1	0.1	0.01	0.2	0.2	0.03			
16408	66	5344	950	381	461	21%	0.1	0.1	0.02	0.4	0.5	0.08			
16450	67	2758	857	226	269	19%	0.1	0.1	0.02	0.3	0.3	0.05			
16461	68	3305	726	311	424	36%	0.1	0.1	0.03	0.4	0.6	0.16			
16462	69	4214	1389	290	356	23%	0.1	0.1	0.02	0.2	0.3	0.05			
16463	70	2662	348	163	194	19%	0.1	0.1	0.01	0.5	0.6	0.09			
16464	71	2823	1373	371	331	-11%	0.1	0.1	0.01	0.3	0.2	0.03			
16465	72	2636	713	150	166	10%	0.1	0.1	0.01	0.2	0.2	0.02			
16466	73	1296	75	160	214	34%	0.1	0.2	0.04	2.1	2.9	0.72			
16467	74	5754	1491	395	518	31%	0.1	0.1	0.02	0.3	0.3	0.08			
16468	75	1473	611	89	123	38%	0.1	0.1	0.02	0.1	0.2	0.05			
16469	76	1397	732	143	198	39%	0.1	0.1	0.04	0.2	0.3	0.08			

Comparison of zone origin totals before and after factoring

16571	77	1458	4494	318	449	41%	0.2	0.3	0.09	0.1	0.1	0.03
16580	78	1581	2919	185	282	52%	0.1	0.2	0.06	0.1	0.1	0.03
16581	79	2882	46	149	167	12%	0.1	0.1	0.01	3.2	3.6	0.38
16582	80	3557	1599	237	295	24%	0.1	0.1	0.02	0.1	0.2	0.04
16583	81	2760	2189	214	241	13%	0.1	0.1	0.01	0.1	0.1	0.01
16584	82	2731	87	160	204	27%	0.1	0.1	0.02	1.8	2.3	0.50
16621	83	2617	143	173	189	9%	0.1	0.1	0.01	1.2	1.3	0.11
16622	84	5062	6070	747	815	9%	0.1	0.2	0.01	0.1	0.1	0.01
16623	85	3044	787	225	283	26%	0.1	0.1	0.02	0.3	0.4	0.07
16669	86	3502	121	269	335	24%	0.1	0.1	0.02	2.2	2.8	0.54
16670	87	2801	675	167	196	17%	0.1	0.1	0.01	0.2	0.3	0.04
16672	88	2258	830	133	157	18%	0.1	0.1	0.01	0.2	0.2	0.03
17127	89	3091	3732	403	406	1%	0.1	0.1	0.00	0.1	0.1	0.00
17128	90	3214	1014	276	252	-9%	0.1	0.1	0.01	0.3	0.2	0.02
17129	91	2098	572	170	139	-18%	0.1	0.1	0.01	0.3	0.2	0.05
17149	92	3323	4268	351	346	-1%	0.1	0.1	0.00	0.1	0.1	0.00
17206	93	7715	3246	554	519	-6%	0.1	0.1	0.00	0.2	0.2	0.01
17207	94	2537	860	159	147	-7%	0.1	0.1	0.00	0.2	0.2	0.01
17230	95	5366	5004	514	471	-8%	0.1	0.1	0.01	0.1	0.1	0.01
17231	96	3542	999	276	245	-11%	0.1	0.1	0.01	0.3	0.2	0.03
17232	97	3352	913	242	199	-18%	0.1	0.1	0.01	0.3	0.2	0.05
17233	98	1564	987	123	115	-7%	0.1	0.1	0.01	0.1	0.1	0.01
17234	99	2644	1052	183	163	-11%	0.1	0.1	0.01	0.2	0.2	0.02
17235	100	2865	1405	388	267	-31%	0.1	0.1	0.04	0.3	0.2	0.09
17236	101	2815	1053	205	175	-15%	0.1	0.1	0.00	0.2	0.2	0.03
17279	102	1568	3844	331	356	8%	0.2	0.2	0.02	0.1	0.1	0.01
17311	103	3342	1409	224	214	-5%	0.1	0.1	0.00	0.2	0.2	0.01
17312	104	1809	1840	214	214	0%	0.1	0.1	0.00	0.1	0.1	0.00
17314	105	2488	128	157	147	-6%	0.1	0.1	0.00	1.2	1.1	0.08
17351	106	3472	618	210	200	-5%	0.1	0.1	0.00	0.3	0.3	0.02
17352	107	2955	1003	268	263	-2%	0.1	0.1	0.00	0.3	0.3	0.00
17353	108	3057	3432	279	290	4%	0.1	0.1	0.00	0.1	0.1	0.00
17354	109	2634	1806	195	196	1%	0.1	0.1	0.00	0.1	0.1	0.00
17355	110	3322	1920	324	308	-5%	0.1	0.1	0.00	0.2	0.2	0.01
17356	111	2600	26	157	147	-6%	0.1	0.1	0.00	6.0	5.7	0.39
17357	112	2186	524	166	157	-5%	0.1	0.1	0.00	0.3	0.3	0.02
17413	113	3575	2657	342	339	-1%	0.1	0.1	0.00	0.1	0.1	0.00
17490	114	3959	10204	336	340	1%	0.1	0.1	0.00	0.0	0.0	0.00
17491	115	4120	1731	340	344	1%	0.1	0.1	0.00	0.2	0.2	0.00
17492	116	2179	2524	408	458	12%	0.2	0.2	0.02	0.2	0.2	0.02
17515	117	2101	673	128	126	-2%	0.1	0.1	0.00	0.2	0.2	0.00
17516	118	3949	1193	279	273	-2%	0.1	0.1	0.00	0.2	0.2	0.01
17517	119	5921	1423	363	375	3%	0.1	0.1	0.00	0.3	0.3	0.01
17518	120	3522	2644	371	370	-1%	0.1	0.1	0.00	0.1	0.1	0.00
17519	121	1550	73	112	107	-4%	0.1	0.1	0.00	1.5	1.5	0.06
17520	122	2474	207	168	162	-4%	0.1	0.1	0.00	0.8	0.8	0.03
20101	123	288	2766	108	117	9%	0.4	0.4	0.03	0.0	0.0	0.00
20102	124	640	3198	146	159	9%	0.2	0.2	0.02	0.0	0.0	0.00
20103	125	897	2674	128	140	9%	0.1	0.2	0.01	0.0	0.1	0.00
20104	126	1949	1487	185	197	6%	0.1	0.1	0.01	0.1	0.1	0.01
20105	127	2	17016	66	71	7%	33.1	35.5	2.42	0.0	0.0	0.00
20106	128	686	4913	179	196	10%	0.3	0.3	0.03	0.0	0.0	0.00
20111	129	59	4801	240	242	1%	4.1	4.1	0.02	0.1	0.1	0.00
20112	130	62	4787	141	146	3%	2.3	2.3	0.08	0.0	0.0	0.00
20113	131	30	3664	106	114	8%	3.5	3.8	0.29	0.0	0.0	0.00
20114	132	298	3172	124	127	2%	0.4	0.4	0.01	0.0	0.0	0.00
20115	133	114	3901	92	94	2%	0.8	0.8	0.02	0.0	0.0	0.00
20116	134	307	3305	119	134	13%	0.4	0.4	0.05	0.0	0.0	0.00
20121	135	1074	841	179	178	0%	0.2	0.2	0.00	0.2	0.2	0.00
20122	136	696	3668	238	256	8%	0.3	0.4	0.03	0.1	0.1	0.01
20123	137	203	1731	84	84	0%	0.4	0.4	0.00	0.0	0.0	0.00
20124	138	183	1879	83	82	-1%	0.5	0.5	0.00	0.0	0.0	0.00
20125	139	27	1779	63	69	10%	2.3	2.6	0.23	0.0	0.0	0.00
20126	140	1033	1672	140	140	0%	0.1	0.1	0.00	0.1	0.1	0.00
20127	141	385	1738	90	87	-4%	0.2	0.2	0.01	0.1	0.1	0.00
20131	142	205	1536	104	109	5%	0.5	0.5	0.02	0.1	0.1	0.00
20132	143	77	3690	244	249	2%	3.2	3.2	0.07	0.1	0.1	0.00
20133	144	499	2791	220	221	0%	0.4	0.4	0.00	0.1	0.1	0.00
20134	145	1241	1408	164	175	7%	0.1	0.1	0.01	0.1	0.1	0.01
20151	146	660	895	97	97	0%	0.1	0.1	0.00	0.1	0.1	0.00
20152	147	497	4603	139	148	6%	0.3	0.3	0.02	0.0	0.0	0.00
20153	148	105	4028	107	108	1%	1.0	1.0	0.01	0.0	0.0	0.00
20154	149	223	2874	102	102	0%	0.5	0.5	0.00	0.0	0.0	0.00
20155	150	2527	536	273	273	0%	0.1	0.1	0.00	0.5	0.5	0.00
20156	151	1194	4902	258	265	3%	0.2	0.2	0.01	0.1	0.1	0.00
20161	152	1525	2458	170	178	5%	0.1	0.1	0.01	0.1	0.1	0.00
20162	153	920	1435	136	140	2%	0.1	0.2	0.00	0.1	0.1	0.00
20163	154	1538	4680	222	230	4%	0.1	0.1	0.01	0.0	0.0	0.00
20164	155	561	4226	192	194	1%	0.3	0.3	0.00	0.0	0.0	0.00

Comparison of zone origin totals before and after factoring

20165	156	184	4901	158	161	2%	0.9	0.9	0.02	0.0	0.0	0.00
20166	157	394	2878	119	122	2%	0.3	0.3	0.01	0.0	0.0	0.00
22126	158	4727	1408	295	309	5%	0.1	0.1	0.00	0.2	0.2	0.01
22127	159	27	640	23	30	33%	0.8	1.1	0.28	0.0	0.0	0.01
25101	160	774	614	120	114	-5%	0.2	0.1	0.01	0.2	0.2	0.01
25102	161	1154	1671	351	306	-13%	0.3	0.3	0.04	0.2	0.2	0.03
25121	162	15	290	21	20	-1%	1.4	1.4	0.02	0.1	0.1	0.00
25122	163	1240	654	110	105	-4%	0.1	0.1	0.00	0.2	0.2	0.01
25131	164	1730	2897	190	190	0%	0.1	0.1	0.00	0.1	0.1	0.00
25132	165	1359	242	126	127	1%	0.1	0.1	0.00	0.5	0.5	0.00
25141	166	1658	220	203	204	0%	0.1	0.1	0.00	0.9	0.9	0.00
25151	167	1934	401	193	193	0%	0.1	0.1	0.00	0.5	0.5	0.00
25161	168	2188	619	153	154	0%	0.1	0.1	0.00	0.2	0.2	0.00
25162	169	1049	4555	240	243	1%	0.2	0.2	0.00	0.1	0.1	0.00
25201	170	1542	1649	172	170	-1%	0.1	0.1	0.00	0.1	0.1	0.00
25202	171	520	1099	83	82	-2%	0.2	0.2	0.00	0.1	0.1	0.00
25211	172	1891	737	143	140	-2%	0.1	0.1	0.00	0.2	0.2	0.00
25212	173	2010	1117	235	238	1%	0.1	0.1	0.00	0.2	0.2	0.00
25231	174	1567	1232	234	237	1%	0.1	0.2	0.00	0.2	0.2	0.00
25232	175	1283	1123	159	161	1%	0.1	0.1	0.00	0.1	0.1	0.00
25241	176	1334	216	137	137	0%	0.1	0.1	0.00	0.6	0.6	0.00
25242	177	725	861	111	111	0%	0.2	0.2	0.00	0.1	0.1	0.00
25251	178	2369	1180	245	248	1%	0.1	0.1	0.00	0.2	0.2	0.00
25261	179	2459	1236	305	310	2%	0.1	0.1	0.00	0.2	0.3	0.00
25271	180	0	1837	59	57	-4%	#DIV/0!	#DIV/0!	#DIV/0!	0.0	0.0	0.00
25272	181	1482	1223	172	171	-1%	0.1	0.1	0.00	0.1	0.1	0.00
25273	182	1261	343	129	129	-1%	0.1	0.1	0.00	0.4	0.4	0.00
25281	183	1556	258	135	135	0%	0.1	0.1	0.00	0.5	0.5	0.00
25282	184	1951	446	166	166	0%	0.1	0.1	0.00	0.4	0.4	0.00
28104	185	2840	115	219	221	1%	0.1	0.1	0.00	1.9	1.9	0.01
28106	186	1977	2507	175	180	3%	0.1	0.1	0.00	0.1	0.1	0.00
28108	187	2422	123	157	165	5%	0.1	0.1	0.00	1.3	1.3	0.07
28109	188	1682	1115	149	144	-4%	0.1	0.1	0.00	0.1	0.1	0.00
28110	189	4250	1530	310	293	-5%	0.1	0.1	0.00	0.2	0.2	0.01
28194	190	3034	2733	325	340	5%	0.1	0.1	0.01	0.1	0.1	0.01
28205	191	3538	3509	417	486	16%	0.1	0.1	0.02	0.1	0.1	0.02
28217	192	2603	1706	190	217	14%	0.1	0.1	0.01	0.1	0.1	0.02
28218	193	84	1667	72	80	10%	0.9	0.9	0.09	0.0	0.0	0.00
28295	194	2861	1697	277	341	23%	0.1	0.1	0.02	0.2	0.2	0.04
28296	195	2694	387	223	281	26%	0.1	0.1	0.02	0.6	0.7	0.15
28298	196	3408	128	169	168	-1%	0.0	0.0	0.00	1.3	1.3	0.01
28299	197	386	4724	216	257	19%	0.6	0.7	0.11	0.0	0.1	0.01
28302	198	2806	1857	189	180	-5%	0.1	0.1	0.00	0.1	0.1	0.00
28303	199	3102	1684	257	260	1%	0.1	0.1	0.00	0.2	0.2	0.00
28307	200	1831	3082	237	241	2%	0.1	0.1	0.00	0.1	0.1	0.00
28358	201	1968	4660	336	361	7%	0.2	0.2	0.01	0.1	0.1	0.01
28359	202	1804	626	143	146	2%	0.1	0.1	0.00	0.2	0.2	0.00
28398	203	3784	574	222	209	-6%	0.1	0.1	0.00	0.4	0.4	0.02
28399	204	3130	2422	345	338	-2%	0.1	0.1	0.00	0.1	0.1	0.00
28400	205	2403	2466	246	167	-32%	0.1	0.1	0.03	0.1	0.1	0.03
28401	206	3994	905	305	286	-6%	0.1	0.1	0.00	0.3	0.3	0.02
28411	207	2024	461	147	142	-4%	0.1	0.1	0.00	0.3	0.3	0.01
28412	208	3680	232	223	187	-16%	0.1	0.1	0.01	1.0	0.8	0.16
28413	209	2898	1799	241	227	-6%	0.1	0.1	0.00	0.1	0.1	0.01
28414	210	2599	1510	223	217	-3%	0.1	0.1	0.00	0.1	0.1	0.00
28415	211	3399	978	232	217	-7%	0.1	0.1	0.00	0.2	0.2	0.02
28460	212	2138	649	169	174	3%	0.1	0.1	0.00	0.3	0.3	0.01
28533	213	4847	3466	413	411	-1%	0.1	0.1	0.00	0.1	0.1	0.00
28538	214	5080	3553	478	422	-12%	0.1	0.1	0.01	0.1	0.1	0.02
28541	215	3231	822	207	200	-4%	0.1	0.1	0.00	0.3	0.2	0.01
28542	216	3273	1080	234	244	4%	0.1	0.1	0.00	0.2	0.2	0.01
28543	217	2849	1523	194	196	1%	0.1	0.1	0.00	0.1	0.1	0.00
28548	218	3357	1112	267	259	-3%	0.1	0.1	0.00	0.2	0.2	0.01
28549	219	3293	1799	237	237	0%	0.1	0.1	0.00	0.1	0.1	0.00
28550	220	1780	1245	151	163	9%	0.1	0.1	0.01	0.1	0.1	0.01
28551	221	807	271	68	69	1%	0.1	0.1	0.00	0.3	0.3	0.00
29126	222	3480	2165	254	276	9%	0.1	0.1	0.01	0.1	0.1	0.01
29127	223	3761	996	201	225	12%	0.1	0.1	0.01	0.2	0.2	0.02
29128	224	4369	7445	477	524	10%	0.1	0.1	0.01	0.1	0.1	0.01
29129	225	3619	4221	275	309	12%	0.1	0.1	0.01	0.1	0.1	0.01
29130	226	4262	2893	163	180	11%	0.0	0.0	0.00	0.1	0.1	0.01
29131	227	3306	6080	265	284	7%	0.1	0.1	0.01	0.0	0.0	0.00
29132	228	4279	8808	362	382	6%	0.1	0.1	0.00	0.0	0.0	0.00
29234	229	4241	2191	227	239	5%	0.1	0.1	0.00	0.1	0.1	0.01
29235	230	5376	4949	465	505	9%	0.1	0.1	0.01	0.1	0.1	0.01
29236	231	3400	618	199	214	7%	0.1	0.1	0.00	0.3	0.3	0.02
29237	232	2738	2064	256	270	6%	0.1	0.1	0.01	0.1	0.1	0.01
29239	233	3275	2249	284	311	10%	0.1	0.1	0.01	0.1	0.1	0.01
29240	234	2633	974	188	202	7%	0.1	0.1	0.01	0.2	0.2	0.01

Comparison of zone origin totals before and after factoring

34205	235	3148	2333	285	262	-8%	0.1	0.1	0.01	0.1	0.1	0.01
34206	236	50	162	10	9	-11%	0.2	0.2	0.02	0.1	0.1	0.01
34212	237	4955	3488	517	381	-26%	0.1	0.1	0.03	0.1	0.1	0.04
34214	238	1831	2390	403	444	10%	0.2	0.2	0.02	0.2	0.2	0.02
34218	239	9261	1216	473	428	-9%	0.1	0.0	0.00	0.4	0.4	0.04
34220	240	829	271	89	111	25%	0.1	0.1	0.03	0.3	0.4	0.08
34222	241	3081	2290	302	329	9%	0.1	0.1	0.01	0.1	0.1	0.01
34223	242	795	623	60	59	-1%	0.1	0.1	0.00	0.1	0.1	0.00
34224	243	129	178	14	15	9%	0.1	0.1	0.01	0.1	0.1	0.01
34225	244	7195	2299	437	363	-17%	0.1	0.1	0.01	0.2	0.2	0.03
34226	245	3579	6798	975	660	-32%	0.3	0.2	0.09	0.1	0.1	0.05
34228	246	23	944	36	32	-11%	1.6	1.4	0.18	0.0	0.0	0.00
34229	247	4783	564	280	230	-18%	0.1	0.0	0.01	0.5	0.4	0.09
34230	248	5	3228	66	63	-4%	13.2	12.7	0.51	0.0	0.0	0.00
34231	249	2780	686	180	134	-25%	0.1	0.0	0.02	0.3	0.2	0.07
34232	250	25	3949	183	142	-23%	7.3	5.7	1.65	0.0	0.0	0.01
34233	251	1534	926	90	69	-22%	0.1	0.0	0.01	0.1	0.1	0.02
34234	252	110	786	46	49	7%	0.4	0.4	0.03	0.1	0.1	0.00
34235	253	4285	1232	330	388	18%	0.1	0.1	0.01	0.3	0.3	0.05
34236	254	5714	1166	254	197	-23%	0.0	0.0	0.01	0.2	0.2	0.05
34237	255	5757	1977	463	295	-36%	0.1	0.1	0.03	0.2	0.1	0.08
34238	256	10727	890	471	481	2%	0.0	0.0	0.00	0.5	0.5	0.01
34239	257	6987	1026	506	486	-4%	0.1	0.1	0.00	0.5	0.5	0.02
34240	258	6771	1458	318	395	24%	0.0	0.1	0.01	0.2	0.3	0.05
34241	259	276	257	25	35	41%	0.1	0.1	0.04	0.1	0.1	0.04
34242	260	291	17	10	7	-24%	0.0	0.0	0.01	0.6	0.4	0.14
34243	261	67	15	4	5	29%	0.1	0.1	0.02	0.2	0.3	0.07
34244	262	112	6	9	10	12%	0.1	0.1	0.01	1.5	1.7	0.19
34245	263	112	61	7	9	31%	0.1	0.1	0.02	0.1	0.2	0.04
34246	264	90	38	6	8	34%	0.1	0.1	0.02	0.2	0.2	0.05
34247	265	56	0	2	2	6%	0.0	0.0	0.00	#DIV/0!	#DIV/0!	#DIV/0!
34248	266	369	373	45	64	43%	0.1	0.2	0.05	0.1	0.2	0.05
34249	267	67	0	6	4	-29%	0.1	0.1	0.02	#DIV/0!	#DIV/0!	#DIV/0!
35305	268	1555	175	120	108	-10%	0.1	0.1	0.01	0.7	0.6	0.07
35306	269	4387	4696	389	336	-14%	0.1	0.1	0.01	0.1	0.1	0.01
35324	270	8196	3751	616	582	-6%	0.1	0.1	0.00	0.2	0.2	0.01
35335	271	5914	2412	440	376	-14%	0.1	0.1	0.01	0.2	0.2	0.03
35406	272	68	1728	96	129	35%	1.4	1.9	0.49	0.1	0.1	0.02
35409	273	39	8	3	3	5%	0.1	0.1	0.00	0.3	0.3	0.02
35410	274	92	47	18	17	-7%	0.2	0.2	0.01	0.4	0.4	0.03
35411	275	281	378	36	34	-8%	0.1	0.1	0.01	0.1	0.1	0.01
35412	276	121	78	16	15	-4%	0.1	0.1	0.01	0.2	0.2	0.01
35413	277	97	23	10	9	-10%	0.1	0.1	0.01	0.4	0.4	0.05
35414	278	29	6	2	1	-6%	0.1	0.0	0.00	0.3	0.2	0.02
35415	279	39	11	2	3	61%	0.1	0.1	0.03	0.2	0.3	0.11
35416	280	146	188	12	11	-5%	0.1	0.1	0.00	0.1	0.1	0.00
35427	281	140	1503	70	74	6%	0.5	0.5	0.03	0.0	0.0	0.00
35428	282	5386	1197	308	289	-6%	0.1	0.1	0.00	0.3	0.2	0.02
35429	283	6213	4243	593	593	0%	0.1	0.1	0.00	0.1	0.1	0.00
35430	284	6271	1406	491	491	0%	0.1	0.1	0.00	0.3	0.3	0.00
35431	285	4588	1005	296	288	-3%	0.1	0.1	0.00	0.3	0.3	0.01
35434	286	3426	1791	170	165	-3%	0.0	0.0	0.00	0.1	0.1	0.00
35435	287	96	2	20	19	-2%	0.2	0.2	0.00	9.8	9.6	0.20
35442	288	1723	1971	171	196	15%	0.1	0.1	0.01	0.1	0.1	0.01
35520	289	2243	346	210	223	6%	0.1	0.1	0.01	0.6	0.6	0.04
35521	290	5357	2685	392	413	5%	0.1	0.1	0.00	0.1	0.2	0.01
35540	291	2514	6558	681	690	1%	0.3	0.3	0.00	0.1	0.1	0.00
35541	292	3341	3626	290	311	7%	0.1	0.1	0.01	0.1	0.1	0.01
35542	293	2593	378	180	186	3%	0.1	0.1	0.00	0.5	0.5	0.02
35543	294	43	55	26	24	-9%	0.6	0.6	0.06	0.5	0.4	0.04
35544	295	10630	2935	622	610	-2%	0.1	0.1	0.00	0.2	0.2	0.00
35545	296	1590	44	63	60	-5%	0.0	0.0	0.00	1.4	1.4	0.07
35546	297	181	207	25	26	3%	0.1	0.1	0.00	0.1	0.1	0.00
35547	298	138	79	6	6	-11%	0.0	0.0	0.00	0.1	0.1	0.01
35548	299	3580	160	235	230	-2%	0.1	0.1	0.00	1.5	1.4	0.03
35549	300	4082	1541	353	356	1%	0.1	0.1	0.00	0.2	0.2	0.00
35550	301	483	48	15	13	-13%	0.0	0.0	0.00	0.3	0.3	0.04
35551	302	121	3	69	70	1%	0.6	0.6	0.01	23.0	23.4	0.34
35552	303	199	117	11	12	10%	0.1	0.1	0.01	0.1	0.1	0.01
35553	304	181	111	11	9	-16%	0.1	0.1	0.01	0.1	0.1	0.02
35554	305	60	774	138	138	0%	2.3	2.3	0.01	0.2	0.2	0.00
35555	306	155	985	45	48	8%	0.3	0.3	0.02	0.0	0.0	0.00
35556	307	7873	1083	373	392	5%	0.0	0.0	0.00	0.3	0.4	0.02
35628	308	85	1551	106	113	6%	1.3	1.3	0.08	0.1	0.1	0.00
35629	309	276	65	15	19	29%	0.1	0.1	0.02	0.2	0.3	0.07
35630	310	1058	301	73	56	-23%	0.1	0.1	0.02	0.2	0.2	0.06
35631	311	127	692	44	28	-36%	0.3	0.2	0.13	0.1	0.0	0.02
35632	312	1329	590	89	81	-9%	0.1	0.1	0.01	0.2	0.1	0.01
35633	313	752	969	89	77	-14%	0.1	0.1	0.02	0.1	0.1	0.01

Comparison of zone origin totals before and after factoring

35634	314	1291	225	76	61	-20%	0.1	0.0	0.01	0.3	0.3	0.07
35635	315	296	26	22	17	-22%	0.1	0.1	0.02	0.8	0.7	0.18
35636	316	614	163	25	21	-16%	0.0	0.0	0.01	0.2	0.1	0.03
35645	317	508	204	25	21	-17%	0.1	0.0	0.01	0.1	0.1	0.02
35646	318	169	461	23	18	-21%	0.1	0.1	0.03	0.1	0.0	0.01
35647	319	203	2098	94	80	-15%	0.5	0.4	0.07	0.0	0.0	0.01
35648	320	0	334	13	15	12%	#DIV/0!	#DIV/0!	#DIV/0!	0.0	0.0	0.00
35649	321	321	59	11	10	-15%	0.0	0.0	0.01	0.2	0.2	0.03
35650	322	237	54	30	28	-5%	0.1	0.1	0.01	0.5	0.5	0.03
35651	323	2878	694	166	149	-10%	0.1	0.1	0.01	0.2	0.2	0.02
35652	324	491	273	26	22	-15%	0.1	0.0	0.01	0.1	0.1	0.01
35653	325	119	2377	95	83	-13%	0.8	0.7	0.10	0.0	0.0	0.01
35654	326	254	5500	210	184	-12%	0.8	0.7	0.10	0.0	0.0	0.00
35702	327	9615	2280	430	461	7%	0.0	0.0	0.00	0.2	0.2	0.01
35703	328	6731	4478	431	442	3%	0.1	0.1	0.00	0.1	0.1	0.00
35707	329	653	409	24	26	8%	0.0	0.0	0.00	0.1	0.1	0.00
35723	330	3154	1182	213	223	5%	0.1	0.1	0.00	0.2	0.2	0.01
35729	331	767	187	31	33	8%	0.0	0.0	0.00	0.2	0.2	0.01
35730	332	6281	2151	370	391	6%	0.1	0.1	0.00	0.2	0.2	0.01
35733	333	8280	2539	545	571	5%	0.1	0.1	0.00	0.2	0.2	0.01
35734	334	8175	3470	630	659	5%	0.1	0.1	0.00	0.2	0.2	0.01
35806	335	950	533	70	68	-3%	0.1	0.1	0.00	0.1	0.1	0.00
35818	336	625	359	39	36	-8%	0.1	0.1	0.00	0.1	0.1	0.01
35821	337	1182	399	49	70	44%	0.0	0.1	0.02	0.1	0.2	0.05
35822	338	998	379	65	60	-8%	0.1	0.1	0.01	0.2	0.2	0.01
36602	339	664	10265	468	1621	246%	0.7	2.4	1.74	0.0	0.2	0.11
36603	340	695	363	51	33	-36%	0.1	0.0	0.03	0.1	0.1	0.05
36604	341	252	2427	104	122	18%	0.4	0.5	0.07	0.0	0.1	0.01
42202	342	5200	2108	407	412	1%	0.1	0.1	0.00	0.2	0.2	0.00
42211	343	5656	1233	394	411	4%	0.1	0.1	0.00	0.3	0.3	0.01
42213	344	4014	2755	406	409	1%	0.1	0.1	0.00	0.1	0.1	0.00
42215	345	3407	446	277	270	-3%	0.1	0.1	0.00	0.6	0.6	0.02
42217	346	6945	1422	527	687	30%	0.1	0.1	0.02	0.4	0.5	0.11
42218	347	3806	1508	437	612	40%	0.1	0.2	0.05	0.3	0.4	0.12
42219	348	3174	182	193	267	38%	0.1	0.1	0.02	1.1	1.5	0.41
42220	349	30	60	3	7	118%	0.1	0.2	0.12	0.1	0.1	0.06
42222	350	2494	847	225	238	6%	0.1	0.1	0.01	0.3	0.3	0.02
42223	351	3286	447	222	254	15%	0.1	0.1	0.01	0.5	0.6	0.07
42224	352	4610	1890	371	393	6%	0.1	0.1	0.00	0.2	0.2	0.01
42225	353	3924	992	301	302	1%	0.1	0.1	0.00	0.3	0.3	0.00
42226	354	3038	937	221	227	2%	0.1	0.1	0.00	0.2	0.2	0.01
42341	355	2949	1584	296	321	8%	0.1	0.1	0.01	0.2	0.2	0.02
42342	356	4267	2324	399	404	1%	0.1	0.1	0.00	0.2	0.2	0.00
42343	357	3658	2429	351	360	2%	0.1	0.1	0.00	0.1	0.1	0.00
42344	358	2308	67	144	146	1%	0.1	0.1	0.00	2.2	2.2	0.02
42345	359	2560	1127	156	160	2%	0.1	0.1	0.00	0.1	0.1	0.00
42346	360	1957	1184	152	154	1%	0.1	0.1	0.00	0.1	0.1	0.00
42347	361	2247	818	161	161	0%	0.1	0.1	0.00	0.2	0.2	0.00
42348	362	2886	384	194	189	-3%	0.1	0.1	0.00	0.5	0.5	0.01
42349	363	2822	1488	226	236	5%	0.1	0.1	0.00	0.2	0.2	0.01
42405	364	1829	1018	103	117	14%	0.1	0.1	0.01	0.1	0.1	0.01
42406	365	218	5901	237	251	6%	1.1	1.2	0.07	0.0	0.0	0.00
42428	366	1566	391	158	173	10%	0.1	0.1	0.01	0.4	0.4	0.04
42431	367	1242	1252	164	220	34%	0.1	0.2	0.04	0.1	0.2	0.04
42432	368	4833	964	304	397	31%	0.1	0.1	0.02	0.3	0.4	0.10
42433	369	112	6963	282	301	7%	2.5	2.7	0.18	0.0	0.0	0.00
42437	370	3551	682	344	603	75%	0.1	0.2	0.07	0.5	0.9	0.38
42440	371	5133	3747	427	528	24%	0.1	0.1	0.02	0.1	0.1	0.03
42441	372	4	1990	88	109	24%	22.0	27.3	5.29	0.0	0.1	0.01
42442	373	4363	1877	441	744	69%	0.1	0.2	0.07	0.2	0.4	0.16
42443	374	3426	658	169	238	41%	0.0	0.1	0.02	0.3	0.4	0.10
42444	375	533	8967	304	361	19%	0.6	0.7	0.11	0.0	0.0	0.01
42445	376	193	6755	266	284	7%	1.4	1.5	0.09	0.0	0.0	0.00
42446	377	7683	1340	461	507	10%	0.1	0.1	0.01	0.3	0.4	0.03
42447	378	0	4912	479	513	7%	#DIV/0!	#DIV/0!	#DIV/0!	0.1	0.1	0.01
42448	379	56	345	21	21	1%	0.4	0.4	0.01	0.1	0.1	0.00
42449	380	1794	373	105	111	5%	0.1	0.1	0.00	0.3	0.3	0.02
42533	381	4135	1407	289	316	10%	0.1	0.1	0.01	0.2	0.2	0.02
42535	382	6426	896	551	743	35%	0.1	0.1	0.03	0.6	0.8	0.21
42536	383	107	5675	272	243	-11%	2.5	2.3	0.27	0.0	0.0	0.01
42538	384	1478	58	85	99	16%	0.1	0.1	0.01	1.5	1.7	0.24
42539	385	360	1086	167	198	19%	0.5	0.6	0.09	0.2	0.2	0.03
42540	386	10739	2401	532	591	11%	0.0	0.1	0.01	0.2	0.2	0.02
42541	387	23	14	47	51	9%	2.1	2.2	0.18	3.4	3.7	0.30
42542	388	3574	1291	180	189	5%	0.1	0.1	0.00	0.1	0.1	0.01
42543	389	2896	768	166	169	2%	0.1	0.1	0.00	0.2	0.2	0.00
42601	390	742	897	48	58	22%	0.1	0.1	0.01	0.1	0.1	0.01
42603	391	4272	801	255	406	59%	0.1	0.1	0.04	0.3	0.5	0.19
42620	392	365	4274	186	156	-16%	0.5	0.4	0.08	0.0	0.0	0.01

Comparison of zone origin totals before and after factoring

42622	393	108	555	29	25	-15%	0.3	0.2	0.04	0.1	0.0	0.01
42623	394	16	14	1	2	27%	0.1	0.1	0.02	0.1	0.1	0.03
42624	395	140	59	9	9	-4%	0.1	0.1	0.00	0.2	0.1	0.01
42625	396	53	3	2	2	-27%	0.0	0.0	0.01	0.7	0.5	0.19
42626	397	1137	1115	101	99	-2%	0.1	0.1	0.00	0.1	0.1	0.00
42628	398	550	365	34	36	6%	0.1	0.1	0.00	0.1	0.1	0.01
42629	399	458	991	73	72	-2%	0.2	0.2	0.00	0.1	0.1	0.00
42630	400	274	49	16	18	12%	0.1	0.1	0.01	0.3	0.4	0.04
42631	401	318	153	14	16	12%	0.0	0.1	0.01	0.1	0.1	0.01
42632	402	1361	419	96	110	15%	0.1	0.1	0.01	0.2	0.3	0.03
42633	403	2464	1262	221	238	7%	0.1	0.1	0.01	0.2	0.2	0.01
42634	404	602	873	43	49	14%	0.1	0.1	0.01	0.0	0.1	0.01
42635	405	548	818	58	60	4%	0.1	0.1	0.00	0.1	0.1	0.00
42636	406	502	522	74	68	-8%	0.1	0.1	0.01	0.1	0.1	0.01
42637	407	309	221	21	22	3%	0.1	0.1	0.00	0.1	0.1	0.00
43309	408	4187	951	244	265	9%	0.1	0.1	0.01	0.3	0.3	0.02
43313	409	210	2565	110	82	-25%	0.5	0.4	0.13	0.0	0.0	0.01
43314	410	10663	4549	834	897	7%	0.1	0.1	0.01	0.2	0.2	0.01
43315	411	82	359	16	16	-2%	0.2	0.2	0.00	0.0	0.0	0.00
43316	412	30	177	56	64	16%	1.9	2.1	0.29	0.3	0.4	0.05
43317	413	8607	4566	518	618	19%	0.1	0.1	0.01	0.1	0.1	0.02
43318	414	10	3446	133	139	5%	13.3	13.9	0.60	0.0	0.0	0.00
43319	415	23	5188	211	219	4%	9.2	9.5	0.34	0.0	0.0	0.00
43320	416	5105	2230	318	401	26%	0.1	0.1	0.02	0.1	0.2	0.04
43321	417	314	2135	89	97	9%	0.3	0.3	0.03	0.0	0.0	0.00
43322	418	547	1	36	42	16%	0.1	0.1	0.01	36.2	42.0	5.81
43323	419	8540	1759	538	705	31%	0.1	0.1	0.02	0.3	0.4	0.10
43324	420	1790	1222	154	190	23%	0.1	0.1	0.02	0.1	0.2	0.03
43325	421	1105	1213	82	72	-13%	0.1	0.1	0.01	0.1	0.1	0.01
43326	422	820	141	43	45	5%	0.1	0.1	0.00	0.3	0.3	0.01
43419	423	3775	3428	319	338	6%	0.1	0.1	0.01	0.1	0.1	0.01
43423	424	2155	1753	197	191	-3%	0.1	0.1	0.00	0.1	0.1	0.00
43424	425	6808	1146	312	288	-8%	0.0	0.0	0.00	0.3	0.3	0.02
43425	426	9277	915	380	410	8%	0.0	0.0	0.00	0.4	0.4	0.03
43426	427	4859	128	364	282	-23%	0.1	0.1	0.02	2.8	2.2	0.64
43427	428	2699	450	158	138	-13%	0.1	0.1	0.01	0.4	0.3	0.04
43428	429	30	153	6	4	-33%	0.2	0.1	0.07	0.0	0.0	0.01
43429	430	8	59	7	8	9%	0.9	1.0	0.08	0.1	0.1	0.01
43430	431	3969	3984	333	274	-18%	0.1	0.1	0.01	0.1	0.1	0.01
43431	432	1283	1910	166	108	-35%	0.1	0.1	0.05	0.1	0.1	0.03
43432	433	38	124	6	4	-37%	0.2	0.1	0.06	0.0	0.0	0.02
43433	434	568	534	214	128	-40%	0.4	0.2	0.15	0.4	0.2	0.16
43434	435	74	238	14	10	-25%	0.2	0.1	0.05	0.1	0.0	0.01
43435	436	1309	103	62	44	-29%	0.0	0.0	0.01	0.6	0.4	0.18
43436	437	20	161	9	7	-16%	0.4	0.4	0.07	0.1	0.0	0.01
43437	438	1226	736	154	92	-40%	0.1	0.1	0.05	0.2	0.1	0.08
43438	439	3343	928	269	200	-26%	0.1	0.1	0.02	0.3	0.2	0.07
43439	440	16	382	12	9	-27%	0.8	0.6	0.21	0.0	0.0	0.01
43440	441	77	1094	44	47	8%	0.6	0.6	0.04	0.0	0.0	0.00
43441	442	4	2309	368	379	3%	92.1	94.7	2.64	0.2	0.2	0.00
43442	443	2584	959	152	152	0%	0.1	0.1	0.00	0.2	0.2	0.00
43443	444	966	1434	98	105	7%	0.1	0.1	0.01	0.1	0.1	0.00
43444	445	4089	298	239	250	5%	0.1	0.1	0.00	0.8	0.8	0.04
50208	446	2975	2768	200	222	11%	0.1	0.1	0.01	0.1	0.1	0.01
50209	447	5577	1073	387	431	11%	0.1	0.1	0.01	0.4	0.4	0.04
50210	448	3637	3021	397	440	11%	0.1	0.1	0.01	0.1	0.1	0.01
50211	449	1877	413	110	124	13%	0.1	0.1	0.01	0.3	0.3	0.03
50212	450	3062	1551	361	360	0%	0.1	0.1	0.00	0.2	0.2	0.00
50213	451	2121	198	140	136	-3%	0.1	0.1	0.00	0.7	0.7	0.02
50214	452	1332	673	158	154	-2%	0.1	0.1	0.00	0.2	0.2	0.01
50215	453	2360	695	176	174	-1%	0.1	0.1	0.00	0.3	0.3	0.00
50216	454	2675	3449	383	442	15%	0.1	0.2	0.02	0.1	0.1	0.02
50217	455	2454	3860	370	423	14%	0.2	0.2	0.02	0.1	0.1	0.01
50268	456	2036	113	124	132	6%	0.1	0.1	0.00	1.1	1.2	0.07
50342	457	1855	3804	296	298	1%	0.2	0.2	0.00	0.1	0.1	0.00
50351	458	1708	2619	163	162	-1%	0.1	0.1	0.00	0.1	0.1	0.00
50352	459	2029	5030	299	286	-4%	0.1	0.1	0.01	0.1	0.1	0.00
50432	460	1411	560	105	108	3%	0.1	0.1	0.00	0.2	0.2	0.01
50433	461	1694	229	104	101	-3%	0.1	0.1	0.00	0.5	0.4	0.01
50434	462	1403	1830	181	178	-2%	0.1	0.1	0.00	0.1	0.1	0.00
50435	463	1439	391	94	92	-2%	0.1	0.1	0.00	0.2	0.2	0.01
50436	464	2136	128	146	147	1%	0.1	0.1	0.00	1.1	1.2	0.01
50443	465	2634	1203	233	231	-1%	0.1	0.1	0.00	0.2	0.2	0.00
50444	466	1992	486	162	161	-1%	0.1	0.1	0.00	0.3	0.3	0.00
50445	467	1975	2554	157	154	-2%	0.1	0.1	0.00	0.1	0.1	0.00
50446	468	1608	556	187	190	2%	0.1	0.1	0.00	0.3	0.3	0.01
50447	469	2917	2573	385	379	-1%	0.1	0.1	0.00	0.1	0.1	0.00
50448	470	1384	267	102	101	-1%	0.1	0.1	0.00	0.4	0.4	0.00
50449	471	1982	451	145	143	-1%	0.1	0.1	0.00	0.3	0.3	0.00

Comparison of zone origin totals before and after factoring

50450	472	3734	766	206	201	-2%	0.1	0.1	0.00	0.3	0.3	0.01
50458	473	3237	890	243	246	1%	0.1	0.1	0.00	0.3	0.3	0.00
50459	474	6351	1405	422	418	-1%	0.1	0.1	0.00	0.3	0.3	0.00
50507	475	3190	523	189	186	-2%	0.1	0.1	0.00	0.4	0.4	0.01
50518	476	2432	1181	155	154	-1%	0.1	0.1	0.00	0.1	0.1	0.00
50519	477	2977	1825	237	238	1%	0.1	0.1	0.00	0.1	0.1	0.00
50521	478	4860	3838	527	519	-2%	0.1	0.1	0.00	0.1	0.1	0.00
50553	479	1711	192	105	103	-2%	0.1	0.1	0.00	0.5	0.5	0.01
50555	480	2470	1525	275	273	-1%	0.1	0.1	0.00	0.2	0.2	0.00
50556	481	1379	867	99	104	5%	0.1	0.1	0.00	0.1	0.1	0.01
50557	482	2857	1095	224	218	-3%	0.1	0.1	0.00	0.2	0.2	0.01
50558	483	3125	2305	444	431	-3%	0.1	0.1	0.00	0.2	0.2	0.01
51201	484	3152	2177	309	324	5%	0.1	0.1	0.00	0.1	0.1	0.01
51202	485	2118	370	127	134	6%	0.1	0.1	0.00	0.3	0.4	0.02
51203	486	2443	98	162	166	3%	0.1	0.1	0.00	1.7	1.7	0.05
51204	487	1587	162	102	107	4%	0.1	0.1	0.00	0.6	0.7	0.03
51205	488	1984	76	114	117	3%	0.1	0.1	0.00	1.5	1.5	0.04
51206	489	4305	209	240	249	3%	0.1	0.1	0.00	1.2	1.2	0.04
51222	490	1244	586	110	115	5%	0.1	0.1	0.00	0.2	0.2	0.01
51223	491	1198	831	102	106	4%	0.1	0.1	0.00	0.1	0.1	0.00
51224	492	3100	1791	387	409	6%	0.1	0.1	0.01	0.2	0.2	0.01
51225	493	1871	596	126	135	7%	0.1	0.1	0.00	0.2	0.2	0.01
51226	494	1323	379	111	116	4%	0.1	0.1	0.00	0.3	0.3	0.01
51228	495	1483	231	119	125	5%	0.1	0.1	0.00	0.5	0.5	0.03
51240	496	1890	1857	193	202	5%	0.1	0.1	0.01	0.1	0.1	0.01
51327	497	2442	29580	532	566	6%	0.2	0.2	0.01	0.0	0.0	0.00
51329	498	1915	227	128	133	4%	0.1	0.1	0.00	0.6	0.6	0.02
51330	499	2037	307	134	148	10%	0.1	0.1	0.01	0.4	0.5	0.05
51331	500	2510	2216	283	315	11%	0.1	0.1	0.01	0.1	0.1	0.01
51341	501	2583	182	189	206	9%	0.1	0.1	0.01	1.0	1.1	0.09
51438	502	2981	1597	295	308	4%	0.1	0.1	0.00	0.2	0.2	0.01
51440	503	1203	1763	426	449	5%	0.4	0.4	0.02	0.2	0.3	0.01
51441	504	3698	1909	266	277	4%	0.1	0.1	0.00	0.1	0.1	0.01
51442	505	943	235	106	110	4%	0.1	0.1	0.00	0.5	0.5	0.02
51443	506	3537	975	248	269	9%	0.1	0.1	0.01	0.3	0.3	0.02
51444	507	322	12466	471	510	8%	1.5	1.6	0.12	0.0	0.0	0.00
51445	508	1035	146	92	94	2%	0.1	0.1	0.00	0.6	0.6	0.01
51463	509	2828	1602	281	303	8%	0.1	0.1	0.01	0.2	0.2	0.01
51464	510	3842	1065	231	247	7%	0.1	0.1	0.00	0.2	0.2	0.01
51465	511	2067	310	123	138	12%	0.1	0.1	0.01	0.4	0.4	0.05
51466	512	2859	2399	362	391	8%	0.1	0.1	0.01	0.2	0.2	0.01
51467	513	2386	2470	366	399	9%	0.2	0.2	0.01	0.1	0.2	0.01
51521	514	2185	2477	207	187	-10%	0.1	0.1	0.01	0.1	0.1	0.01
51522	515	361	49	28	27	-4%	0.1	0.1	0.00	0.6	0.5	0.02
51558	516	836	4560	244	204	-16%	0.3	0.2	0.05	0.1	0.0	0.01
51559	517	7630	1922	665	662	0%	0.1	0.1	0.00	0.3	0.3	0.00
51561	518	3362	649	184	182	-1%	0.1	0.1	0.00	0.3	0.3	0.00
51563	519	2200	1675	221	215	-3%	0.1	0.1	0.00	0.1	0.1	0.00
51564	520	1297	624	96	91	-5%	0.1	0.1	0.00	0.2	0.1	0.01
51565	521	1105	846	76	73	-4%	0.1	0.1	0.00	0.1	0.1	0.00
51566	522	3626	367	292	286	-2%	0.1	0.1	0.00	0.8	0.8	0.02
51567	523	1669	770	141	137	-3%	0.1	0.1	0.00	0.2	0.2	0.01
51568	524	5459	721	287	287	0%	0.1	0.1	0.00	0.4	0.4	0.00
51569	525	827	552	33	33	-1%	0.0	0.0	0.00	0.1	0.1	0.00
60007	526	1035	335	53	48	-9%	0.1	0.0	0.00	0.2	0.1	0.01
60008	527	8408	4651	595	553	-7%	0.1	0.1	0.00	0.1	0.1	0.01
60009	528	8702	5180	665	611	-8%	0.1	0.1	0.01	0.1	0.1	0.01
60010	529	5245	3913	465	438	-6%	0.1	0.1	0.01	0.1	0.1	0.01
60011	530	2670	1854	199	185	-7%	0.1	0.1	0.01	0.1	0.1	0.01
60012	531	1072	303	46	42	-10%	0.0	0.0	0.00	0.2	0.1	0.01
60014	532	1427	472	89	85	-5%	0.1	0.1	0.00	0.2	0.2	0.01
60016	533	8805	2556	497	465	-7%	0.1	0.1	0.00	0.2	0.2	0.01
60017	534	1068	168	38	34	-9%	0.0	0.0	0.00	0.2	0.2	0.02
61010	535	7397	2908	429	407	-5%	0.1	0.1	0.00	0.1	0.1	0.01
61020	536	2811	836	140	131	-6%	0.0	0.0	0.00	0.2	0.2	0.01
61030	537	3785	1745	224	210	-6%	0.1	0.1	0.00	0.1	0.1	0.01
61079	538	3520	1654	216	205	-5%	0.1	0.1	0.00	0.1	0.1	0.01
61081	539	3175	1255	144	129	-11%	0.0	0.0	0.00	0.1	0.1	0.01
61092	540	7897	4903	667	637	-4%	0.1	0.1	0.00	0.1	0.1	0.01
61130	541	3716	1182	224	217	-3%	0.1	0.1	0.00	0.2	0.2	0.01
61140	542	6132	2353	370	360	-3%	0.1	0.1	0.00	0.2	0.2	0.00
61150	543	4224	1234	213	198	-7%	0.1	0.0	0.00	0.2	0.2	0.01
61210	544	10162	2525	575	606	5%	0.1	0.1	0.00	0.2	0.2	0.01
61220	545	1064	456	43	39	-9%	0.0	0.0	0.00	0.1	0.1	0.01
61244	546	4366	1782	293	282	-4%	0.1	0.1	0.00	0.2	0.2	0.01
61247	547	9044	1877	293	325	11%	0.0	0.0	0.00	0.2	0.2	0.02
61248	548	3844	1587	216	226	5%	0.1	0.1	0.00	0.1	0.1	0.01
61256	549	2705	1334	199	195	-2%	0.1	0.1	0.00	0.1	0.1	0.00
61300	550	6094	2184	351	326	-7%	0.1	0.1	0.00	0.2	0.1	0.01

Comparison of zone origin totals before and after factoring

61302	551	26849	16408	2327	2268	-3%	0.1	0.1	0.00	0.1	0.1	0.00
61340	552	5581	2790	458	458	0%	0.1	0.1	0.00	0.2	0.2	0.00
61426	553	5922	4404	501	485	-3%	0.1	0.1	0.00	0.1	0.1	0.00
61450	554	1884	747	122	116	-5%	0.1	0.1	0.00	0.2	0.2	0.01
61460	555	3886	2185	300	289	-4%	0.1	0.1	0.00	0.1	0.1	0.00
61461	556	341	55	12	10	-11%	0.0	0.0	0.00	0.2	0.2	0.02
71041	557	1449	982	122	85	-31%	0.1	0.1	0.03	0.1	0.1	0.04
71042	558	479	373	43	31	-27%	0.1	0.1	0.02	0.1	0.1	0.03
71043	559	231	215	18	17	-3%	0.1	0.1	0.00	0.1	0.1	0.00
71044	560	140	32	6	4	-28%	0.0	0.0	0.01	0.2	0.1	0.05
71045	561	2713	207	124	82	-34%	0.0	0.0	0.02	0.6	0.4	0.20
71046	562	91	1	15	11	-27%	0.2	0.1	0.05	15.5	11.2	4.21
71047	563	580	356	60	43	-28%	0.1	0.1	0.03	0.2	0.1	0.05
71051	564	116	13	6	4	-36%	0.1	0.0	0.02	0.4	0.3	0.16
71052	565	3479	372	154	94	-39%	0.0	0.0	0.02	0.4	0.3	0.16
71053	566	35	2642	117	80	-31%	3.3	2.3	1.04	0.0	0.0	0.01
71054	567	7638	3097	439	275	-37%	0.1	0.0	0.02	0.1	0.1	0.05
71055	568	3550	2558	291	160	-45%	0.1	0.0	0.04	0.1	0.1	0.05
71056	569	116	9	4	3	-19%	0.0	0.0	0.01	0.5	0.4	0.09
71083	570	69	19	5	4	-27%	0.1	0.1	0.02	0.3	0.2	0.07
71084	571	85	27	3	2	-21%	0.0	0.0	0.01	0.1	0.1	0.02
71085	572	12	6025	205	132	-36%	17.1	11.0	6.11	0.0	0.0	0.01
71086	573	4668	1750	346	199	-42%	0.1	0.0	0.03	0.2	0.1	0.08
71087	574	2967	471	161	111	-31%	0.1	0.0	0.02	0.3	0.2	0.11
71088	575	6116	2016	313	206	-34%	0.1	0.0	0.02	0.2	0.1	0.05
71089	576	915	930	109	61	-44%	0.1	0.1	0.05	0.1	0.1	0.05
71090	577	87	15	3	3	-10%	0.0	0.0	0.00	0.2	0.2	0.02
71091	578	1656	9088	240	138	-43%	0.1	0.1	0.06	0.0	0.0	0.01
71092	579	1071	2342	239	107	-55%	0.2	0.1	0.12	0.1	0.0	0.06
71093	580	148	189	11	8	-28%	0.1	0.1	0.02	0.1	0.0	0.02
71094	581	4833	299	189	130	-31%	0.0	0.0	0.01	0.6	0.4	0.20
71095	582	3346	203	188	108	-42%	0.1	0.0	0.02	0.9	0.5	0.39
71096	583	142	127	13	9	-30%	0.1	0.1	0.03	0.1	0.1	0.03
71097	584	146	63	7	5	-22%	0.0	0.0	0.01	0.1	0.1	0.02
71098	585	71	761	33	20	-41%	0.5	0.3	0.19	0.0	0.0	0.02
71210	586	6127	2412	402	477	18%	0.1	0.1	0.01	0.2	0.2	0.03
71220	587	6283	1699	380	425	12%	0.1	0.1	0.01	0.2	0.2	0.03
71230	588	3918	1004	207	245	18%	0.1	0.1	0.01	0.2	0.2	0.04
71238	589	4697	3035	385	247	-36%	0.1	0.1	0.03	0.1	0.1	0.05
71240	590	2265	1124	180	209	16%	0.1	0.1	0.01	0.2	0.2	0.03
71262	591	6106	3766	485	535	10%	0.1	0.1	0.01	0.1	0.1	0.01
71264	592	2573	1192	172	193	12%	0.1	0.1	0.01	0.1	0.2	0.02
71303	593	21761	14437	1721	1864	8%	0.1	0.1	0.01	0.1	0.1	0.01
71310	594	5916	2797	439	495	13%	0.1	0.1	0.01	0.2	0.2	0.02
71320	595	3161	1152	178	195	9%	0.1	0.1	0.01	0.2	0.2	0.01
71327	596	3649	1829	249	280	12%	0.1	0.1	0.01	0.1	0.2	0.02
71349	597	1931	1619	191	199	4%	0.1	0.1	0.00	0.1	0.1	0.00
71350	598	5566	5185	443	467	5%	0.1	0.1	0.00	0.1	0.1	0.00
71366	599	19015	11813	1382	1468	6%	0.1	0.1	0.00	0.1	0.1	0.01
71371	600	8791	5106	696	743	7%	0.1	0.1	0.01	0.1	0.1	0.01
71401	601	8783	4120	688	748	9%	0.1	0.1	0.01	0.2	0.2	0.01
71410	602	6867	2369	411	467	14%	0.1	0.1	0.01	0.2	0.2	0.02
71420	603	1876	1030	101	117	15%	0.1	0.1	0.01	0.1	0.1	0.01
71430	604	3901	1470	278	306	10%	0.1	0.1	0.01	0.2	0.2	0.02
71470	605	3022	1797	245	269	10%	0.1	0.1	0.01	0.1	0.1	0.01
71559	606	3734	1137	237	244	3%	0.1	0.1	0.00	0.2	0.2	0.01
71572	607	3734	1973	276	302	9%	0.1	0.1	0.01	0.1	0.2	0.01
71576	608	552	352	31	37	18%	0.1	0.1	0.01	0.1	0.1	0.02
71582	609	690	357	35	37	6%	0.1	0.1	0.00	0.1	0.1	0.01
71613	610	1920	1146	160	174	9%	0.1	0.1	0.01	0.1	0.2	0.01
71630	611	2549	666	133	150	12%	0.1	0.1	0.01	0.2	0.2	0.02
81009	612	2392	1922	243	239	-2%	0.1	0.1	0.00	0.1	0.1	0.00
81010	613	4001	2105	274	268	-2%	0.1	0.1	0.00	0.1	0.1	0.00
81011	614	1542	580	63	59	-6%	0.0	0.0	0.00	0.1	0.1	0.01
81020	615	1527	608	102	91	-12%	0.1	0.1	0.01	0.2	0.1	0.02
81021	616	982	469	69	71	2%	0.1	0.1	0.00	0.1	0.2	0.00
81022	617	763	201	41	39	-4%	0.1	0.1	0.00	0.2	0.2	0.01
81029	618	1753	1117	173	177	2%	0.1	0.1	0.00	0.2	0.2	0.00
81030	619	302	166	10	9	-8%	0.0	0.0	0.00	0.1	0.1	0.00
81040	620	1592	553	80	77	-4%	0.1	0.0	0.00	0.1	0.1	0.01
81050	621	4287	1299	248	249	1%	0.1	0.1	0.00	0.2	0.2	0.00
81060	622	1240	366	73	73	0%	0.1	0.1	0.00	0.2	0.2	0.00
81103	623	1700	1113	191	187	-2%	0.1	0.1	0.00	0.2	0.2	0.00
81104	624	6305	7695	759	744	-2%	0.1	0.1	0.00	0.1	0.1	0.00
81105	625	6557	1506	365	361	-1%	0.1	0.1	0.00	0.2	0.2	0.00
81106	626	14551	6322	841	821	-2%	0.1	0.1	0.00	0.1	0.1	0.00
81232	627	5158	1388	538	534	-1%	0.1	0.1	0.00	0.4	0.4	0.00
81233	628	2696	1288	280	276	-2%	0.1	0.1	0.00	0.2	0.2	0.00
81234	629	7044	3136	623	616	-1%	0.1	0.1	0.00	0.2	0.2	0.00

Comparison of zone origin totals before and after factoring

81235	630	1652	965	192	187	-3%	0.1	0.1	0.00	0.2	0.2	0.01
81236	631	773	272	35	38	8%	0.0	0.0	0.00	0.1	0.1	0.01
81237	632	303	88	10	9	-5%	0.0	0.0	0.00	0.1	0.1	0.01
81247	633	283	37	8	12	45%	0.0	0.0	0.01	0.2	0.3	0.10
81256	634	6832	2422	363	354	-3%	0.1	0.1	0.00	0.1	0.1	0.00
81257	635	1010	608	112	110	-2%	0.1	0.1	0.00	0.2	0.2	0.00
81260	636	2098	994	134	129	-4%	0.1	0.1	0.00	0.1	0.1	0.00
81261	637	3161	839	160	153	-5%	0.1	0.0	0.00	0.2	0.2	0.01
81264	638	909	448	71	70	-2%	0.1	0.1	0.00	0.2	0.2	0.00
81301	639	11712	5398	863	826	-4%	0.1	0.1	0.00	0.2	0.2	0.01
81307	640	12802	6441	959	941	-2%	0.1	0.1	0.00	0.1	0.1	0.00
81340	641	5096	2930	366	354	-3%	0.1	0.1	0.00	0.1	0.1	0.00
81350	642	4477	1907	289	274	-5%	0.1	0.1	0.00	0.2	0.1	0.01
81363	643	2237	1674	218	215	-2%	0.1	0.1	0.00	0.1	0.1	0.00
81439	644	1440	722	92	89	-3%	0.1	0.1	0.00	0.1	0.1	0.00
81470	645	1552	512	88	82	-6%	0.1	0.1	0.00	0.2	0.2	0.01
81471	646	1573	1305	134	124	-7%	0.1	0.1	0.01	0.1	0.1	0.01
81480	647	2384	1570	139	111	-20%	0.1	0.0	0.01	0.1	0.1	0.02
81482	648	1508	699	122	117	-4%	0.1	0.1	0.00	0.2	0.2	0.01
91009	649	6927	3467	24	22	-9%	0.0	0.0	0.00	0.0	0.0	0.00
91010	650	7231	1396	17	18	6%	0.0	0.0	0.00	0.0	0.0	0.00
91020	651	8318	3443	27	31	12%	0.0	0.0	0.00	0.0	0.0	0.00
91027	652	777	134	10	11	5%	0.0	0.0	0.00	0.1	0.1	0.00
91030	653	9591	1871	18	21	14%	0.0	0.0	0.00	0.0	0.0	0.00
91040	654	3504	447	5	4	-10%	0.0	0.0	0.00	0.0	0.0	0.00
91041	655	32995	22338	247	265	7%	0.0	0.0	0.00	0.0	0.0	0.00
91050	656	33292	27339	44	46	4%	0.0	0.0	0.00	0.0	0.0	0.00
91060	657	8632	1873	7	7	12%	0.0	0.0	0.00	0.0	0.0	0.00
98100	658	0	0	9	150	1535%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
98200	659	0	0	38	75	98%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
98300	660	64003	30549	117	142	21%	0.0	0.0	0.00	0.0	0.0	0.00
98400	661	306842	140063	66	117	77%	0.0	0.0	0.00	0.0	0.0	0.00
98500	662	311016	157380	142	155	9%	0.0	0.0	0.00	0.0	0.0	0.00
98600	663	70868	31257	81	102	26%	0.0	0.0	0.00	0.0	0.0	0.00
98700	664	1132438	558489	247	403	63%	0.0	0.0	0.00	0.0	0.0	0.00
98800	665	245868	123705	180	218	21%	0.0	0.0	0.00	0.0	0.0	0.00
98900	666	131749	61891	132	189	43%	0.0	0.0	0.00	0.0	0.0	0.00
		4036598	2320580	143502	148196	3%	0.0	0.0	0%	0.1	0.1	0%

Comparison of zone destination totals before and after factoring

				Pre factored	Post factored	Trip rates attracted by Pop				Trip rates attracted by Ed+Emp.		
HW_zones	Model zones	Pop	Ed+Emp	dest. totals	dest totals	Change	Pre	Post	Abs. Diff	Pre	Post	Abs. Diff
11101	1	1200	398	158	187	18%	0.1	0.2	0.02	0.4	0.5	0.07
11103	2	41	2588	89	98	10%	2.2	2.4	0.21	0.0	0.0	0.00
11104	3	380	5019	88	97	11%	0.2	0.3	0.02	0.0	0.0	0.00
11105	4	3124	923	151	169	12%	0.0	0.1	0.01	0.2	0.2	0.02
11106	5	146	3867	50	64	29%	0.3	0.4	0.10	0.0	0.0	0.00
13101	6	937	301	143	123	-14%	0.2	0.1	0.02	0.5	0.4	0.07
13102	7	1085	438	157	135	-14%	0.1	0.1	0.02	0.4	0.3	0.05
13103	8	1739	3020	245	226	-7%	0.1	0.1	0.01	0.1	0.1	0.01
13111	9	1466	1400	188	168	-11%	0.1	0.1	0.01	0.1	0.1	0.01
13112	10	1980	692	234	192	-18%	0.1	0.1	0.02	0.3	0.3	0.06
13121	11	847	1336	310	264	-15%	0.4	0.3	0.05	0.2	0.2	0.03
13122	12	319	3386	425	346	-19%	1.3	1.1	0.25	0.1	0.1	0.02
13123	13	822	4131	366	320	-13%	0.4	0.4	0.06	0.1	0.1	0.01
13124	14	972	4516	311	267	-14%	0.3	0.3	0.05	0.1	0.1	0.01
13125	15	812	3664	247	212	-14%	0.3	0.3	0.04	0.1	0.1	0.01
13126	16	96	5022	151	141	-7%	1.6	1.5	0.11	0.0	0.0	0.00
13131	17	1694	2871	134	104	-22%	0.1	0.1	0.02	0.0	0.0	0.01
13132	18	807	6138	100	90	-10%	0.1	0.1	0.01	0.0	0.0	0.00
13133	19	1678	4437	176	144	-18%	0.1	0.1	0.02	0.0	0.0	0.01
13141	20	1403	1610	310	273	-12%	0.2	0.2	0.03	0.2	0.2	0.02
13142	21	1663	2376	225	201	-11%	0.1	0.1	0.01	0.1	0.1	0.01
13143	22	1605	1567	367	286	-22%	0.2	0.2	0.05	0.2	0.2	0.05
13151	23	758	1449	135	114	-16%	0.2	0.2	0.03	0.1	0.1	0.01
13152	24	1379	18368	190	164	-14%	0.1	0.1	0.02	0.0	0.0	0.00
14101	25	1502	522	131	122	-7%	0.1	0.1	0.01	0.3	0.2	0.02
14111	26	982	1109	112	98	-12%	0.1	0.1	0.01	0.1	0.1	0.01
14112	27	267	1010	49	43	-11%	0.2	0.2	0.02	0.0	0.0	0.01
14113	28	2442	2012	225	205	-9%	0.1	0.1	0.01	0.1	0.1	0.01
14121	29	3	80	15	14	-8%	5.0	4.6	0.41	0.2	0.2	0.02
14122	30	2185	737	170	148	-13%	0.1	0.1	0.01	0.2	0.2	0.03
14123	31	1526	1743	151	130	-14%	0.1	0.1	0.01	0.1	0.1	0.01
14131	32	1575	57	237	194	-18%	0.2	0.1	0.03	4.2	3.4	0.75
14132	33	1063	120	142	109	-23%	0.1	0.1	0.03	1.2	0.9	0.28
14133	34	961	468	92	73	-21%	0.1	0.1	0.02	0.2	0.2	0.04
14141	35	1426	484	176	136	-23%	0.1	0.1	0.03	0.4	0.3	0.08
14142	36	1463	167	183	150	-18%	0.1	0.1	0.02	1.1	0.9	0.20
14151	37	1391	3706	153	139	-9%	0.1	0.1	0.01	0.0	0.0	0.00
14152	38	2324	141	484	432	-11%	0.2	0.2	0.02	3.4	3.1	0.37
14161	39	1629	1948	169	159	-6%	0.1	0.1	0.01	0.1	0.1	0.01
14162	40	1484	458	164	141	-14%	0.1	0.1	0.02	0.4	0.3	0.05
14171	41	893	509	131	115	-12%	0.1	0.1	0.02	0.3	0.2	0.03
14172	42	1315	736	180	157	-13%	0.1	0.1	0.02	0.2	0.2	0.03
14173	43	463	2204	94	84	-11%	0.2	0.2	0.02	0.0	0.0	0.00
16109	44	3624	1104	315	341	8%	0.1	0.1	0.01	0.3	0.3	0.02
16110	45	3215	1476	260	288	11%	0.1	0.1	0.01	0.2	0.2	0.02
16145	46	2087	2732	238	252	6%	0.1	0.1	0.01	0.1	0.1	0.01
16146	47	2336	108	197	205	4%	0.1	0.1	0.00	1.8	1.9	0.07
16147	48	3945	3385	291	310	7%	0.1	0.1	0.00	0.1	0.1	0.01
16148	49	1369	534	190	222	17%	0.1	0.2	0.02	0.4	0.4	0.06
16224	50	2375	974	345	322	-6%	0.1	0.1	0.01	0.4	0.3	0.02
16225	51	2099	169	189	191	1%	0.1	0.1	0.00	1.1	1.1	0.01
16226	52	3597	94	248	247	-1%	0.1	0.1	0.00	2.6	2.6	0.01
16242	53	3446	1376	236	221	-6%	0.1	0.1	0.00	0.2	0.2	0.01
16243	54	2398	633	169	155	-8%	0.1	0.1	0.01	0.3	0.2	0.02
16244	55	3503	2519	225	237	6%	0.1	0.1	0.00	0.1	0.1	0.00
16258	56	5927	3150	373	382	2%	0.1	0.1	0.00	0.1	0.1	0.00
16293	57	2584	833	168	162	-3%	0.1	0.1	0.00	0.2	0.2	0.01
16337	58	3237	2292	342	331	-3%	0.1	0.1	0.00	0.1	0.1	0.00
16338	59	6637	1312	471	455	-3%	0.1	0.1	0.00	0.4	0.3	0.01
16339	60	2993	3020	278	263	-6%	0.1	0.1	0.01	0.1	0.1	0.01
16340	61	2720	551	161	150	-7%	0.1	0.1	0.00	0.3	0.3	0.02
16341	62	1634	606	123	116	-6%	0.1	0.1	0.00	0.2	0.2	0.01
16385	63	2547	861	179	168	-6%	0.1	0.1	0.00	0.2	0.2	0.01
16386	64	2283	716	206	182	-12%	0.1	0.1	0.01	0.3	0.3	0.03
16387	65	3301	1244	286	262	-8%	0.1	0.1	0.01	0.2	0.2	0.02
16408	66	5344	950	433	411	-5%	0.1	0.1	0.00	0.5	0.4	0.02
16450	67	2758	857	238	216	-9%	0.1	0.1	0.01	0.3	0.3	0.03
16461	68	3305	726	394	359	-9%	0.1	0.1	0.01	0.5	0.5	0.05
16462	69	4214	1389	310	287	-8%	0.1	0.1	0.01	0.2	0.2	0.02
16463	70	2662	348	197	184	-7%	0.1	0.1	0.01	0.6	0.5	0.04
16464	71	2823	1373	211	205	-3%	0.1	0.1	0.00	0.2	0.1	0.00
16465	72	2636	713	156	143	-8%	0.1	0.1	0.00	0.2	0.2	0.02
16466	73	1296	75	208	183	-12%	0.2	0.1	0.02	2.8	2.4	0.33
16467	74	5754	1491	453	416	-8%	0.1	0.1	0.01	0.3	0.3	0.02
16468	75	1473	611	110	97	-12%	0.1	0.1	0.01	0.2	0.2	0.02
16469	76	1397	732	185	161	-13%	0.1	0.1	0.02	0.3	0.2	0.03

Comparison of zone destination totals before and after factoring

16571	77	1458	4494	407	356	-13%	0.3	0.2	0.04	0.1	0.1	0.01
16580	78	1581	2919	139	129	-7%	0.1	0.1	0.01	0.0	0.0	0.00
16581	79	2882	46	190	185	-3%	0.1	0.1	0.00	4.1	4.0	0.11
16582	80	3557	1599	223	214	-4%	0.1	0.1	0.00	0.1	0.1	0.01
16583	81	2760	2189	205	197	-4%	0.1	0.1	0.00	0.1	0.1	0.00
16584	82	2731	87	217	204	-6%	0.1	0.1	0.00	2.5	2.3	0.15
16621	83	2617	143	180	183	2%	0.1	0.1	0.00	1.3	1.3	0.02
16622	84	5062	6070	522	492	-6%	0.1	0.1	0.01	0.1	0.1	0.00
16623	85	3044	787	309	276	-11%	0.1	0.1	0.01	0.4	0.4	0.04
16669	86	3502	121	326	281	-14%	0.1	0.1	0.01	2.7	2.3	0.37
16670	87	2801	675	193	175	-9%	0.1	0.1	0.01	0.3	0.3	0.03
16672	88	2258	830	158	148	-6%	0.1	0.1	0.00	0.2	0.2	0.01
17127	89	3091	3732	421	453	8%	0.1	0.1	0.01	0.1	0.1	0.01
17128	90	3214	1014	278	328	18%	0.1	0.1	0.02	0.3	0.3	0.05
17129	91	2098	572	195	221	13%	0.1	0.1	0.01	0.3	0.4	0.04
17149	92	3323	4268	286	311	9%	0.1	0.1	0.01	0.1	0.1	0.01
17206	93	7715	3246	578	577	0%	0.1	0.1	0.00	0.2	0.2	0.00
17207	94	2537	860	145	216	49%	0.1	0.1	0.03	0.2	0.3	0.08
17230	95	5366	5004	430	461	7%	0.1	0.1	0.01	0.1	0.1	0.01
17231	96	3542	999	237	249	5%	0.1	0.1	0.00	0.2	0.2	0.01
17232	97	3352	913	168	178	6%	0.1	0.1	0.00	0.2	0.2	0.01
17233	98	1564	987	105	111	5%	0.1	0.1	0.00	0.1	0.1	0.01
17234	99	2644	1052	162	167	3%	0.1	0.1	0.00	0.2	0.2	0.00
17235	100	2865	1405	374	326	-13%	0.1	0.1	0.02	0.3	0.2	0.03
17236	101	2815	1053	154	180	17%	0.1	0.1	0.01	0.1	0.2	0.02
17279	102	1568	3844	795	1211	52%	0.5	0.8	0.27	0.2	0.3	0.11
17311	103	3342	1409	223	268	20%	0.1	0.1	0.01	0.2	0.2	0.03
17312	104	1809	1840	202	227	12%	0.1	0.1	0.01	0.1	0.1	0.01
17314	105	2488	128	219	231	6%	0.1	0.1	0.00	1.7	1.8	0.09
17351	106	3472	618	186	214	15%	0.1	0.1	0.01	0.3	0.3	0.05
17352	107	2955	1003	276	312	13%	0.1	0.1	0.01	0.3	0.3	0.04
17353	108	3057	3432	221	266	20%	0.1	0.1	0.01	0.1	0.1	0.01
17354	109	2634	1806	187	215	15%	0.1	0.1	0.01	0.1	0.1	0.02
17355	110	3322	1920	321	358	12%	0.1	0.1	0.01	0.2	0.2	0.02
17356	111	2600	26	185	215	16%	0.1	0.1	0.01	7.1	8.3	1.13
17357	112	2186	524	177	199	12%	0.1	0.1	0.01	0.3	0.4	0.04
17413	113	3575	2657	274	301	10%	0.1	0.1	0.01	0.1	0.1	0.01
17490	114	3959	10204	245	277	13%	0.1	0.1	0.01	0.0	0.0	0.00
17491	115	4120	1731	282	307	9%	0.1	0.1	0.01	0.2	0.2	0.01
17492	116	2179	2524	426	408	-4%	0.2	0.2	0.01	0.2	0.2	0.01
17515	117	2101	673	119	137	15%	0.1	0.1	0.01	0.2	0.2	0.03
17516	118	3949	1193	260	298	15%	0.1	0.1	0.01	0.2	0.3	0.03
17517	119	5921	1423	323	352	9%	0.1	0.1	0.00	0.2	0.2	0.02
17518	120	3522	2644	380	425	12%	0.1	0.1	0.01	0.1	0.2	0.02
17519	121	1550	73	140	161	15%	0.1	0.1	0.01	1.9	2.2	0.29
17520	122	2474	207	180	206	14%	0.1	0.1	0.01	0.9	1.0	0.13
20101	123	288	2766	100	94	-7%	0.3	0.3	0.02	0.0	0.0	0.00
20102	124	640	3198	138	125	-9%	0.2	0.2	0.02	0.0	0.0	0.00
20103	125	897	2674	111	99	-11%	0.1	0.1	0.01	0.0	0.0	0.00
20104	126	1949	1487	207	197	-5%	0.1	0.1	0.01	0.1	0.1	0.01
20105	127	2	17016	38	36	-3%	18.9	18.2	0.65	0.0	0.0	0.00
20106	128	686	4913	106	99	-7%	0.2	0.1	0.01	0.0	0.0	0.00
20111	129	59	4801	207	183	-12%	3.5	3.1	0.41	0.0	0.0	0.01
20112	130	62	4787	83	77	-8%	1.3	1.2	0.10	0.0	0.0	0.00
20113	131	30	3664	57	55	-4%	1.9	1.8	0.07	0.0	0.0	0.00
20114	132	298	3172	62	58	-7%	0.2	0.2	0.01	0.0	0.0	0.00
20115	133	114	3901	49	46	-6%	0.4	0.4	0.02	0.0	0.0	0.00
20116	134	307	3305	70	68	-3%	0.2	0.2	0.01	0.0	0.0	0.00
20121	135	1074	841	347	303	-13%	0.3	0.3	0.04	0.4	0.4	0.05
20122	136	696	3668	241	218	-10%	0.3	0.3	0.03	0.1	0.1	0.01
20123	137	203	1731	95	84	-12%	0.5	0.4	0.05	0.1	0.0	0.01
20124	138	183	1879	72	64	-11%	0.4	0.4	0.04	0.0	0.0	0.00
20125	139	27	1779	57	51	-11%	2.1	1.9	0.24	0.0	0.0	0.00
20126	140	1033	1672	138	124	-11%	0.1	0.1	0.01	0.1	0.1	0.01
20127	141	385	1738	100	90	-10%	0.3	0.2	0.03	0.1	0.1	0.01
20131	142	205	1536	129	114	-12%	0.6	0.6	0.08	0.1	0.1	0.01
20132	143	77	3690	251	220	-12%	3.3	2.9	0.40	0.1	0.1	0.01
20133	144	499	2791	234	206	-12%	0.5	0.4	0.06	0.1	0.1	0.01
20134	145	1241	1408	229	206	-10%	0.2	0.2	0.02	0.2	0.1	0.02
20151	146	660	895	124	113	-9%	0.2	0.2	0.02	0.1	0.1	0.01
20152	147	497	4603	117	108	-8%	0.2	0.2	0.02	0.0	0.0	0.00
20153	148	105	4028	57	52	-9%	0.5	0.5	0.05	0.0	0.0	0.00
20154	149	223	2874	240	236	-2%	1.1	1.1	0.02	0.1	0.1	0.00
20155	150	2527	536	437	367	-16%	0.2	0.1	0.03	0.8	0.7	0.13
20156	151	1194	4902	423	423	0%	0.4	0.4	0.00	0.1	0.1	0.00
20161	152	1525	2458	117	114	-3%	0.1	0.1	0.00	0.0	0.0	0.00
20162	153	920	1435	125	116	-7%	0.1	0.1	0.01	0.1	0.1	0.01
20163	154	1538	4680	144	138	-4%	0.1	0.1	0.00	0.0	0.0	0.00
20164	155	561	4226	270	239	-12%	0.5	0.4	0.06	0.1	0.1	0.01

Comparison of zone destination totals before and after factoring

20165	156	184	4901	57	53	-7%	0.3	0.3	0.02	0.0	0.0	0.00
20166	157	394	2878	61	60	-2%	0.2	0.2	0.00	0.0	0.0	0.00
22126	158	4727	1408	283	302	6%	0.1	0.1	0.00	0.2	0.2	0.01
22127	159	27	640	29	34	15%	1.1	1.2	0.16	0.0	0.1	0.01
25101	160	774	614	59	63	7%	0.1	0.1	0.01	0.1	0.1	0.01
25102	161	1154	1671	340	305	-10%	0.3	0.3	0.03	0.2	0.2	0.02
25121	162	15	290	24	22	-7%	1.6	1.5	0.10	0.1	0.1	0.01
25122	163	1240	654	221	182	-18%	0.2	0.1	0.03	0.3	0.3	0.06
25131	164	1730	2897	146	144	-2%	0.1	0.1	0.00	0.1	0.0	0.00
25132	165	1359	242	151	148	-2%	0.1	0.1	0.00	0.6	0.6	0.01
25141	166	1658	220	233	159	-32%	0.1	0.1	0.04	1.1	0.7	0.33
25151	167	1934	401	177	161	-9%	0.1	0.1	0.01	0.4	0.4	0.04
25161	168	2188	619	166	157	-6%	0.1	0.1	0.00	0.3	0.3	0.01
25162	169	1049	4555	284	294	4%	0.3	0.3	0.01	0.1	0.1	0.00
25201	170	1542	1649	196	171	-13%	0.1	0.1	0.02	0.1	0.1	0.02
25202	171	520	1099	95	83	-13%	0.2	0.2	0.02	0.1	0.1	0.01
25211	172	1891	737	165	147	-11%	0.1	0.1	0.01	0.2	0.2	0.03
25212	173	2010	1117	286	252	-12%	0.1	0.1	0.02	0.3	0.2	0.03
25231	174	1567	1232	200	192	-4%	0.1	0.1	0.01	0.2	0.2	0.01
25232	175	1283	1123	180	166	-8%	0.1	0.1	0.01	0.2	0.1	0.01
25241	176	1334	216	147	134	-9%	0.1	0.1	0.01	0.7	0.6	0.06
25242	177	725	861	110	101	-8%	0.2	0.1	0.01	0.1	0.1	0.01
25251	178	2369	1180	193	182	-6%	0.1	0.1	0.00	0.2	0.2	0.01
25261	179	2459	1236	211	193	-9%	0.1	0.1	0.01	0.2	0.2	0.01
25271	180	0	1837	31	28	-12%	#DIV/0!	#DIV/0!	#DIV/0!	0.0	0.0	0.00
25272	181	1482	1223	258	232	-10%	0.2	0.2	0.02	0.2	0.2	0.02
25273	182	1261	343	197	173	-12%	0.2	0.1	0.02	0.6	0.5	0.07
25281	183	1556	258	144	135	-6%	0.1	0.1	0.01	0.6	0.5	0.03
25282	184	1951	446	171	160	-7%	0.1	0.1	0.01	0.4	0.4	0.03
28104	185	2840	115	280	652	133%	0.1	0.2	0.13	2.4	5.7	3.24
28106	186	1977	2507	116	159	36%	0.1	0.1	0.02	0.0	0.1	0.02
28108	187	2422	123	196	281	43%	0.1	0.1	0.04	1.6	2.3	0.69
28109	188	1682	1115	136	177	30%	0.1	0.1	0.02	0.1	0.2	0.04
28110	189	4250	1530	277	384	39%	0.1	0.1	0.03	0.2	0.3	0.07
28194	190	3034	2733	270	386	43%	0.1	0.1	0.04	0.1	0.1	0.04
28205	191	3538	3509	355	495	40%	0.1	0.1	0.04	0.1	0.1	0.04
28217	192	2603	1706	253	394	56%	0.1	0.2	0.05	0.1	0.2	0.08
28218	193	84	1667	49	105	117%	0.6	1.3	0.68	0.0	0.1	0.03
28295	194	2861	1697	163	247	51%	0.1	0.1	0.03	0.1	0.1	0.05
28296	195	2694	387	173	263	52%	0.1	0.1	0.03	0.4	0.7	0.23
28298	196	3408	128	187	298	60%	0.1	0.1	0.03	1.5	2.3	0.87
28299	197	386	4724	130	262	102%	0.3	0.7	0.34	0.0	0.1	0.03
28302	198	2806	1857	199	232	16%	0.1	0.1	0.01	0.1	0.1	0.02
28303	199	3102	1684	274	328	20%	0.1	0.1	0.02	0.2	0.2	0.03
28307	200	1831	3082	155	282	82%	0.1	0.2	0.07	0.1	0.1	0.04
28358	201	1968	4660	271	415	53%	0.1	0.2	0.07	0.1	0.1	0.03
28359	202	1804	626	173	236	37%	0.1	0.1	0.04	0.3	0.4	0.10
28398	203	3784	574	234	279	19%	0.1	0.1	0.01	0.4	0.5	0.08
28399	204	3130	2422	333	371	11%	0.1	0.1	0.01	0.1	0.2	0.02
28400	205	2403	2466	202	218	8%	0.1	0.1	0.01	0.1	0.1	0.01
28401	206	3994	905	309	345	12%	0.1	0.1	0.01	0.3	0.4	0.04
28411	207	2024	461	189	239	26%	0.1	0.1	0.02	0.4	0.5	0.11
28412	208	3680	232	266	294	11%	0.1	0.1	0.01	1.1	1.3	0.12
28413	209	2898	1799	206	236	15%	0.1	0.1	0.01	0.1	0.1	0.02
28414	210	2599	1510	222	248	12%	0.1	0.1	0.01	0.1	0.2	0.02
28415	211	3399	978	247	279	13%	0.1	0.1	0.01	0.3	0.3	0.03
28460	212	2138	649	184	281	52%	0.1	0.1	0.05	0.3	0.4	0.15
28533	213	4847	3466	311	370	19%	0.1	0.1	0.01	0.1	0.1	0.02
28538	214	5080	3553	436	497	14%	0.1	0.1	0.01	0.1	0.1	0.02
28541	215	3231	822	216	267	24%	0.1	0.1	0.02	0.3	0.3	0.06
28542	216	3273	1080	232	291	25%	0.1	0.1	0.02	0.2	0.3	0.05
28543	217	2849	1523	187	233	24%	0.1	0.1	0.02	0.1	0.2	0.03
28548	218	3357	1112	273	302	11%	0.1	0.1	0.01	0.2	0.3	0.03
28549	219	3293	1799	278	311	12%	0.1	0.1	0.01	0.2	0.2	0.02
28550	220	1780	1245	146	174	20%	0.1	0.1	0.02	0.1	0.1	0.02
28551	221	807	271	84	111	32%	0.1	0.1	0.03	0.3	0.4	0.10
29126	222	3480	2165	241	258	7%	0.1	0.1	0.00	0.1	0.1	0.01
29127	223	3761	996	204	213	5%	0.1	0.1	0.00	0.2	0.2	0.01
29128	224	4369	7445	504	514	2%	0.1	0.1	0.00	0.1	0.1	0.00
29129	225	3619	4221	196	203	4%	0.1	0.1	0.00	0.0	0.0	0.00
29130	226	4262	2893	252	287	14%	0.1	0.1	0.01	0.1	0.1	0.01
29131	227	3306	6080	330	360	9%	0.1	0.1	0.01	0.1	0.1	0.00
29132	228	4279	8808	378	422	12%	0.1	0.1	0.01	0.0	0.0	0.01
29234	229	4241	2191	210	241	15%	0.0	0.1	0.01	0.1	0.1	0.01
29235	230	5376	4949	355	377	6%	0.1	0.1	0.00	0.1	0.1	0.00
29236	231	3400	618	167	186	11%	0.0	0.1	0.01	0.3	0.3	0.03
29237	232	2738	2064	254	290	14%	0.1	0.1	0.01	0.1	0.1	0.02
29239	233	3275	2249	286	332	16%	0.1	0.1	0.01	0.1	0.1	0.02
29240	234	2633	974	181	215	18%	0.1	0.1	0.01	0.2	0.2	0.03

Comparison of zone destination totals before and after factoring

34205	235	3148	2333	242	172	-29%	0.1	0.1	0.02	0.1	0.1	0.03
34206	236	50	162	20	16	-21%	0.4	0.3	0.08	0.1	0.1	0.03
34212	237	4955	3488	453	245	-46%	0.1	0.0	0.04	0.1	0.1	0.06
34214	238	1831	2390	385	279	-27%	0.2	0.2	0.06	0.2	0.1	0.04
34218	239	9261	1216	493	355	-28%	0.1	0.0	0.01	0.4	0.3	0.11
34220	240	829	271	130	98	-25%	0.2	0.1	0.04	0.5	0.4	0.12
34222	241	3081	2290	328	574	75%	0.1	0.2	0.08	0.1	0.3	0.11
34223	242	795	623	45	60	32%	0.1	0.1	0.02	0.1	0.1	0.02
34224	243	129	178	11	15	33%	0.1	0.1	0.03	0.1	0.1	0.02
34225	244	7195	2299	385	235	-39%	0.1	0.0	0.02	0.2	0.1	0.06
34226	245	3579	6798	1054	637	-40%	0.3	0.2	0.12	0.2	0.1	0.06
34228	246	23	944	27	22	-16%	1.2	1.0	0.18	0.0	0.0	0.00
34229	247	4783	564	271	164	-39%	0.1	0.0	0.02	0.5	0.3	0.19
34230	248	5	3228	64	48	-26%	12.9	9.5	3.35	0.0	0.0	0.01
34231	249	2780	686	181	109	-40%	0.1	0.0	0.03	0.3	0.2	0.10
34232	250	25	3949	95	64	-33%	3.8	2.6	1.26	0.0	0.0	0.01
34233	251	1534	926	56	32	-42%	0.0	0.0	0.02	0.1	0.0	0.03
34234	252	110	786	51	55	7%	0.5	0.5	0.03	0.1	0.1	0.00
34235	253	4285	1232	289	514	78%	0.1	0.1	0.05	0.2	0.4	0.18
34236	254	5714	1166	283	188	-33%	0.0	0.0	0.02	0.2	0.2	0.08
34237	255	5757	1977	510	271	-47%	0.1	0.0	0.04	0.3	0.1	0.12
34238	256	10727	890	444	283	-36%	0.0	0.0	0.01	0.5	0.3	0.18
34239	257	6987	1026	517	368	-29%	0.1	0.1	0.02	0.5	0.4	0.14
34240	258	6771	1458	267	179	-33%	0.0	0.0	0.01	0.2	0.1	0.06
34241	259	276	257	38	32	-15%	0.1	0.1	0.02	0.1	0.1	0.02
34242	260	291	17	10	6	-41%	0.0	0.0	0.01	0.6	0.4	0.24
34243	261	67	15	4	2	-36%	0.1	0.0	0.02	0.2	0.1	0.08
34244	262	112	6	9	5	-48%	0.1	0.0	0.04	1.6	0.8	0.75
34245	263	112	61	5	3	-41%	0.0	0.0	0.02	0.1	0.1	0.04
34246	264	90	38	5	3	-29%	0.1	0.0	0.02	0.1	0.1	0.04
34247	265	56	0	2	1	-36%	0.0	0.0	0.01	#DIV/0!	#DIV/0!	#DIV/0!
34248	266	369	373	42	29	-32%	0.1	0.1	0.04	0.1	0.1	0.04
34249	267	67	0	11	7	-39%	0.2	0.1	0.06	#DIV/0!	#DIV/0!	#DIV/0!
35305	268	1555	175	135	181	34%	0.1	0.1	0.03	0.8	1.0	0.26
35306	269	4387	4696	298	471	58%	0.1	0.1	0.04	0.1	0.1	0.04
35324	270	8196	3751	659	900	37%	0.1	0.1	0.03	0.2	0.2	0.06
35335	271	5914	2412	382	612	60%	0.1	0.1	0.04	0.2	0.3	0.10
35406	272	68	1728	67	28	-58%	1.0	0.4	0.56	0.0	0.0	0.02
35409	273	39	8	8	4	-46%	0.2	0.1	0.09	1.0	0.5	0.45
35410	274	92	47	21	25	18%	0.2	0.3	0.04	0.4	0.5	0.08
35411	275	281	378	25	37	44%	0.1	0.1	0.04	0.1	0.1	0.03
35412	276	121	78	20	25	27%	0.2	0.2	0.04	0.3	0.3	0.07
35413	277	97	23	13	19	43%	0.1	0.2	0.06	0.6	0.8	0.25
35414	278	29	6	2	3	18%	0.1	0.1	0.02	0.4	0.5	0.08
35415	279	39	11	2	2	19%	0.1	0.1	0.01	0.2	0.2	0.04
35416	280	146	188	8	11	46%	0.1	0.1	0.02	0.0	0.1	0.02
35427	281	140	1503	41	35	-15%	0.3	0.2	0.04	0.0	0.0	0.00
35428	282	5386	1197	335	379	13%	0.1	0.1	0.01	0.3	0.3	0.04
35429	283	6213	4243	570	653	15%	0.1	0.1	0.01	0.1	0.2	0.02
35430	284	6271	1406	569	586	3%	0.1	0.1	0.00	0.4	0.4	0.01
35431	285	4588	1005	329	414	26%	0.1	0.1	0.02	0.3	0.4	0.08
35434	286	3426	1791	169	221	31%	0.0	0.1	0.02	0.1	0.1	0.03
35435	287	96	2	33	36	9%	0.3	0.4	0.03	16.6	18.0	1.42
35442	288	1723	1971	128	124	-3%	0.1	0.1	0.00	0.1	0.1	0.00
35520	289	2243	346	312	256	-18%	0.1	0.1	0.02	0.9	0.7	0.16
35521	290	5357	2685	343	312	-9%	0.1	0.1	0.01	0.1	0.1	0.01
35540	291	2514	6558	627	576	-8%	0.2	0.2	0.02	0.1	0.1	0.01
35541	292	3341	3626	249	208	-16%	0.1	0.1	0.01	0.1	0.1	0.01
35542	293	2593	378	209	209	0%	0.1	0.1	0.00	0.6	0.6	0.00
35543	294	43	55	42	42	-1%	1.0	1.0	0.01	0.8	0.8	0.01
35544	295	10630	2935	632	603	-5%	0.1	0.1	0.00	0.2	0.2	0.01
35545	296	1590	44	82	80	-2%	0.1	0.1	0.00	1.9	1.8	0.04
35546	297	181	207	38	34	-11%	0.2	0.2	0.02	0.2	0.2	0.02
35547	298	138	79	8	9	13%	0.1	0.1	0.01	0.1	0.1	0.01
35548	299	3580	160	282	291	3%	0.1	0.1	0.00	1.8	1.8	0.06
35549	300	4082	1541	356	336	-6%	0.1	0.1	0.00	0.2	0.2	0.01
35550	301	483	48	22	24	6%	0.0	0.0	0.00	0.5	0.5	0.03
35551	302	121	3	94	92	-2%	0.8	0.8	0.02	31.4	30.6	0.78
35552	303	199	117	8	6	-28%	0.0	0.0	0.01	0.1	0.0	0.02
35553	304	181	111	10	11	6%	0.1	0.1	0.00	0.1	0.1	0.01
35554	305	60	774	155	149	-4%	2.6	2.5	0.09	0.2	0.2	0.01
35555	306	155	985	29	14	-53%	0.2	0.1	0.10	0.0	0.0	0.02
35556	307	7873	1083	422	381	-10%	0.1	0.0	0.01	0.4	0.4	0.04
35628	308	85	1551	125	145	16%	1.5	1.7	0.24	0.1	0.1	0.01
35629	309	276	65	11	15	27%	0.0	0.1	0.01	0.2	0.2	0.05
35630	310	1058	301	47	111	138%	0.0	0.1	0.06	0.2	0.4	0.21
35631	311	127	692	28	43	51%	0.2	0.3	0.11	0.0	0.1	0.02
35632	312	1329	590	111	120	8%	0.1	0.1	0.01	0.2	0.2	0.02
35633	313	752	969	108	183	69%	0.1	0.2	0.10	0.1	0.2	0.08

Comparison of zone destination totals before and after factoring

35634	314	1291	225	74	132	79%	0.1	0.1	0.05	0.3	0.6	0.26
35635	315	296	26	23	40	74%	0.1	0.1	0.06	0.9	1.5	0.65
35636	316	614	163	26	55	110%	0.0	0.1	0.05	0.2	0.3	0.18
35645	317	508	204	15	17	17%	0.0	0.0	0.01	0.1	0.1	0.01
35646	318	169	461	9	10	6%	0.1	0.1	0.00	0.0	0.0	0.00
35647	319	203	2098	32	28	-12%	0.2	0.1	0.02	0.0	0.0	0.00
35648	320	0	334	9	12	39%	#DIV/0!	#DIV/0!	#DIV/0!	0.0	0.0	0.01
35649	321	321	59	7	9	22%	0.0	0.0	0.00	0.1	0.1	0.03
35650	322	237	54	33	30	-10%	0.1	0.1	0.01	0.6	0.6	0.06
35651	323	2878	694	190	164	-14%	0.1	0.1	0.01	0.3	0.2	0.04
35652	324	491	273	17	19	13%	0.0	0.0	0.00	0.1	0.1	0.01
35653	325	119	2377	46	41	-10%	0.4	0.3	0.04	0.0	0.0	0.00
35654	326	254	5500	66	59	-11%	0.3	0.2	0.03	0.0	0.0	0.00
35702	327	9615	2280	471	380	-19%	0.0	0.0	0.01	0.2	0.2	0.04
35703	328	6731	4478	482	412	-15%	0.1	0.1	0.01	0.1	0.1	0.02
35707	329	653	409	36	26	-28%	0.1	0.0	0.02	0.1	0.1	0.03
35723	330	3154	1182	211	200	-5%	0.1	0.1	0.00	0.2	0.2	0.01
35729	331	767	187	33	26	-21%	0.0	0.0	0.01	0.2	0.1	0.04
35730	332	6281	2151	377	336	-11%	0.1	0.1	0.01	0.2	0.2	0.02
35733	333	8280	2539	576	530	-8%	0.1	0.1	0.01	0.2	0.2	0.02
35734	334	8175	3470	661	602	-9%	0.1	0.1	0.01	0.2	0.2	0.02
35806	335	950	533	74	76	3%	0.1	0.1	0.00	0.1	0.1	0.00
35818	336	625	359	39	46	18%	0.1	0.1	0.01	0.1	0.1	0.02
35821	337	1182	399	59	67	13%	0.1	0.1	0.01	0.1	0.2	0.02
35822	338	998	379	71	73	3%	0.1	0.1	0.00	0.2	0.2	0.01
36602	339	664	10265	175	2372	1259%	0.3	3.6	3.31	0.0	0.2	0.21
36603	340	695	363	47	48	2%	0.1	0.1	0.00	0.1	0.1	0.00
36604	341	252	2427	72	80	11%	0.3	0.3	0.03	0.0	0.0	0.00
42202	342	5200	2108	412	475	15%	0.1	0.1	0.01	0.2	0.2	0.03
42211	343	5656	1233	401	471	17%	0.1	0.1	0.01	0.3	0.4	0.06
42213	344	4014	2755	431	488	13%	0.1	0.1	0.01	0.2	0.2	0.02
42215	345	3407	446	331	393	19%	0.1	0.1	0.02	0.7	0.9	0.14
42217	346	6945	1422	591	663	12%	0.1	0.1	0.01	0.4	0.5	0.05
42218	347	3806	1508	372	420	13%	0.1	0.1	0.01	0.2	0.3	0.03
42219	348	3174	182	179	204	13%	0.1	0.1	0.01	1.0	1.1	0.13
42220	349	30	60	11	13	17%	0.4	0.4	0.06	0.2	0.2	0.03
42222	350	2494	847	230	287	25%	0.1	0.1	0.02	0.3	0.3	0.07
42223	351	3286	447	273	402	48%	0.1	0.1	0.04	0.6	0.9	0.29
42224	352	4610	1890	404	508	26%	0.1	0.1	0.02	0.2	0.3	0.06
42225	353	3924	992	327	418	28%	0.1	0.1	0.02	0.3	0.4	0.09
42226	354	3038	937	211	257	22%	0.1	0.1	0.02	0.2	0.3	0.05
42341	355	2949	1584	297	400	35%	0.1	0.1	0.03	0.2	0.3	0.06
42342	356	4267	2324	380	461	21%	0.1	0.1	0.02	0.2	0.2	0.03
42343	357	3658	2429	357	493	38%	0.1	0.1	0.04	0.1	0.2	0.06
42344	358	2308	67	174	221	27%	0.1	0.1	0.02	2.6	3.3	0.69
42345	359	2560	1127	168	221	32%	0.1	0.1	0.02	0.1	0.2	0.05
42346	360	1957	1184	182	226	24%	0.1	0.1	0.02	0.2	0.2	0.04
42347	361	2247	818	193	265	37%	0.1	0.1	0.03	0.2	0.3	0.09
42348	362	2886	384	209	255	22%	0.1	0.1	0.02	0.5	0.7	0.12
42349	363	2822	1488	209	371	78%	0.1	0.1	0.06	0.1	0.2	0.11
42405	364	1829	1018	80	89	12%	0.0	0.0	0.01	0.1	0.1	0.01
42406	365	218	5901	121	238	97%	0.6	1.1	0.54	0.0	0.0	0.02
42428	366	1566	391	203	206	2%	0.1	0.1	0.00	0.5	0.5	0.01
42431	367	1242	1252	177	184	4%	0.1	0.1	0.01	0.1	0.1	0.01
42432	368	4833	964	299	321	7%	0.1	0.1	0.00	0.3	0.3	0.02
42433	369	112	6963	141	265	87%	1.3	2.4	1.10	0.0	0.0	0.02
42437	370	3551	682	340	390	15%	0.1	0.1	0.01	0.5	0.6	0.07
42440	371	5133	3747	381	410	7%	0.1	0.1	0.01	0.1	0.1	0.01
42441	372	4	1990	55	62	13%	13.7	15.5	1.80	0.0	0.0	0.00
42442	373	4363	1877	323	358	11%	0.1	0.1	0.01	0.2	0.2	0.02
42443	374	3426	658	177	192	9%	0.1	0.1	0.00	0.3	0.3	0.02
42444	375	533	8967	212	234	10%	0.4	0.4	0.04	0.0	0.0	0.00
42445	376	193	6755	106	115	9%	0.5	0.6	0.05	0.0	0.0	0.00
42446	377	7683	1340	453	482	6%	0.1	0.1	0.00	0.3	0.4	0.02
42447	378	0	4912	544	591	9%	#DIV/0!	#DIV/0!	#DIV/0!	0.1	0.1	0.01
42448	379	56	345	26	29	10%	0.5	0.5	0.05	0.1	0.1	0.01
42449	380	1794	373	129	139	7%	0.1	0.1	0.01	0.3	0.4	0.03
42533	381	4135	1407	302	320	6%	0.1	0.1	0.00	0.2	0.2	0.01
42535	382	6426	896	411	451	10%	0.1	0.1	0.01	0.5	0.5	0.04
42536	383	107	5675	122	134	9%	1.1	1.2	0.10	0.0	0.0	0.00
42538	384	1478	58	122	130	7%	0.1	0.1	0.01	2.1	2.2	0.14
42539	385	360	1086	230	243	6%	0.6	0.7	0.04	0.2	0.2	0.01
42540	386	10739	2401	480	504	5%	0.0	0.0	0.00	0.2	0.2	0.01
42541	387	23	14	75	78	4%	3.2	3.4	0.12	5.3	5.5	0.20
42542	388	3574	1291	176	184	4%	0.0	0.1	0.00	0.1	0.1	0.01
42543	389	2896	768	191	199	4%	0.1	0.1	0.00	0.2	0.3	0.01
42601	390	742	897	46	50	10%	0.1	0.1	0.01	0.1	0.1	0.01
42603	391	4272	801	289	323	12%	0.1	0.1	0.01	0.4	0.4	0.04
42620	392	365	4274	68	74	9%	0.2	0.2	0.02	0.0	0.0	0.00

Comparison of zone destination totals before and after factoring

42622	393	108	555	17	18	8%	0.2	0.2	0.01	0.0	0.0	0.00
42623	394	16	14	3	3	9%	0.2	0.2	0.02	0.2	0.2	0.02
42624	395	140	59	7	8	4%	0.1	0.1	0.00	0.1	0.1	0.01
42625	396	53	3	3	4	8%	0.1	0.1	0.00	1.1	1.2	0.09
42626	397	1137	1115	82	87	5%	0.1	0.1	0.00	0.1	0.1	0.00
42628	398	550	365	39	41	6%	0.1	0.1	0.00	0.1	0.1	0.01
42629	399	458	991	59	62	5%	0.1	0.1	0.01	0.1	0.1	0.00
42630	400	274	49	24	25	6%	0.1	0.1	0.01	0.5	0.5	0.03
42631	401	318	153	11	12	7%	0.0	0.0	0.00	0.1	0.1	0.01
42632	402	1361	419	91	95	5%	0.1	0.1	0.00	0.2	0.2	0.01
42633	403	2464	1262	206	215	5%	0.1	0.1	0.00	0.2	0.2	0.01
42634	404	602	873	46	50	8%	0.1	0.1	0.01	0.1	0.1	0.00
42635	405	548	818	48	50	4%	0.1	0.1	0.00	0.1	0.1	0.00
42636	406	502	522	57	58	3%	0.1	0.1	0.00	0.1	0.1	0.00
42637	407	309	221	19	20	5%	0.1	0.1	0.00	0.1	0.1	0.00
43309	408	4187	951	247	165	-33%	0.1	0.0	0.02	0.3	0.2	0.09
43313	409	210	2565	39	42	8%	0.2	0.2	0.01	0.0	0.0	0.00
43314	410	10663	4549	797	844	6%	0.1	0.1	0.00	0.2	0.2	0.01
43315	411	82	359	23	26	13%	0.3	0.3	0.04	0.1	0.1	0.01
43316	412	30	177	74	79	7%	2.5	2.6	0.17	0.4	0.4	0.03
43317	413	8607	4566	463	499	8%	0.1	0.1	0.00	0.1	0.1	0.01
43318	414	10	3446	64	117	83%	6.4	11.7	5.31	0.0	0.0	0.02
43319	415	23	5188	151	285	88%	6.6	12.4	5.80	0.0	0.1	0.03
43320	416	5105	2230	294	213	-28%	0.1	0.0	0.02	0.1	0.1	0.04
43321	417	314	2135	67	48	-28%	0.2	0.2	0.06	0.0	0.0	0.01
43322	418	547	1	71	89	26%	0.1	0.2	0.03	71.0	89.3	18.32
43323	419	8540	1759	455	496	9%	0.1	0.1	0.00	0.3	0.3	0.02
43324	420	1790	1222	152	167	10%	0.1	0.1	0.01	0.1	0.1	0.01
43325	421	1105	1213	75	48	-37%	0.1	0.0	0.03	0.1	0.0	0.02
43326	422	820	141	39	22	-43%	0.0	0.0	0.02	0.3	0.2	0.12
43419	423	3775	3428	262	380	45%	0.1	0.1	0.03	0.1	0.1	0.03
43423	424	2155	1753	242	214	-12%	0.1	0.1	0.01	0.1	0.1	0.02
43424	425	6808	1146	336	236	-30%	0.0	0.0	0.01	0.3	0.2	0.09
43425	426	9277	915	381	300	-21%	0.0	0.0	0.01	0.4	0.3	0.09
43426	427	4859	128	457	235	-49%	0.1	0.0	0.05	3.6	1.8	1.74
43427	428	2699	450	218	148	-32%	0.1	0.1	0.03	0.5	0.3	0.15
43428	429	30	153	10	8	-23%	0.3	0.3	0.08	0.1	0.1	0.02
43429	430	8	59	17	14	-17%	2.1	1.8	0.37	0.3	0.2	0.05
43430	431	3969	3984	278	159	-43%	0.1	0.0	0.03	0.1	0.0	0.03
43431	432	1283	1910	153	77	-50%	0.1	0.1	0.06	0.1	0.0	0.04
43432	433	38	124	12	9	-30%	0.3	0.2	0.10	0.1	0.1	0.03
43433	434	568	534	285	141	-50%	0.5	0.2	0.25	0.5	0.3	0.27
43434	435	74	238	16	12	-29%	0.2	0.2	0.06	0.1	0.0	0.02
43435	436	1309	103	74	39	-47%	0.1	0.0	0.03	0.7	0.4	0.34
43436	437	20	161	10	7	-31%	0.5	0.4	0.16	0.1	0.0	0.02
43437	438	1226	736	148	65	-56%	0.1	0.1	0.07	0.2	0.1	0.11
43438	439	3343	928	286	148	-48%	0.1	0.0	0.04	0.3	0.2	0.15
43439	440	16	382	13	11	-19%	0.8	0.7	0.16	0.0	0.0	0.01
43440	441	77	1094	37	28	-24%	0.5	0.4	0.12	0.0	0.0	0.01
43441	442	4	2309	471	454	-4%	117.8	113.5	4.36	0.2	0.2	0.01
43442	443	2584	959	156	130	-16%	0.1	0.1	0.01	0.2	0.1	0.03
43443	444	966	1434	67	105	58%	0.1	0.1	0.04	0.0	0.1	0.03
43444	445	4089	298	255	367	44%	0.1	0.1	0.03	0.9	1.2	0.38
50208	446	2975	2768	180	189	5%	0.1	0.1	0.00	0.1	0.1	0.00
50209	447	5577	1073	395	420	6%	0.1	0.1	0.00	0.4	0.4	0.02
50210	448	3637	3021	436	449	3%	0.1	0.1	0.00	0.1	0.1	0.00
50211	449	1877	413	138	143	4%	0.1	0.1	0.00	0.3	0.3	0.01
50212	450	3062	1551	189	211	11%	0.1	0.1	0.01	0.1	0.1	0.01
50213	451	2121	198	166	192	15%	0.1	0.1	0.01	0.8	1.0	0.13
50214	452	1332	673	156	171	9%	0.1	0.1	0.01	0.2	0.3	0.02
50215	453	2360	695	165	182	10%	0.1	0.1	0.01	0.2	0.3	0.02
50216	454	2675	3449	347	378	9%	0.1	0.1	0.01	0.1	0.1	0.01
50217	455	2454	3860	307	316	3%	0.1	0.1	0.00	0.1	0.1	0.00
50268	456	2036	113	140	149	6%	0.1	0.1	0.00	1.2	1.3	0.08
50342	457	1855	3804	454	535	18%	0.2	0.3	0.04	0.1	0.1	0.02
50351	458	1708	2619	118	130	10%	0.1	0.1	0.01	0.0	0.0	0.00
50352	459	2029	5030	526	608	16%	0.3	0.3	0.04	0.1	0.1	0.02
50432	460	1411	560	94	99	5%	0.1	0.1	0.00	0.2	0.2	0.01
50433	461	1694	229	116	123	6%	0.1	0.1	0.00	0.5	0.5	0.03
50434	462	1403	1830	159	167	5%	0.1	0.1	0.01	0.1	0.1	0.00
50435	463	1439	391	101	107	6%	0.1	0.1	0.00	0.3	0.3	0.01
50436	464	2136	128	149	159	6%	0.1	0.1	0.00	1.2	1.2	0.07
50443	465	2634	1203	200	212	6%	0.1	0.1	0.00	0.2	0.2	0.01
50444	466	1992	486	150	160	7%	0.1	0.1	0.00	0.3	0.3	0.02
50445	467	1975	2554	160	183	15%	0.1	0.1	0.01	0.1	0.1	0.01
50446	468	1608	556	182	194	7%	0.1	0.1	0.01	0.3	0.3	0.02
50447	469	2917	2573	350	367	5%	0.1	0.1	0.01	0.1	0.1	0.01
50448	470	1384	267	113	120	6%	0.1	0.1	0.00	0.4	0.4	0.02
50449	471	1982	451	142	152	7%	0.1	0.1	0.01	0.3	0.3	0.02

Comparison of zone destination totals before and after factoring

50450	472	3734	766	208	220	6%	0.1	0.1	0.00	0.3	0.3	0.02
50458	473	3237	890	229	240	5%	0.1	0.1	0.00	0.3	0.3	0.01
50459	474	6351	1405	351	367	5%	0.1	0.1	0.00	0.2	0.3	0.01
50507	475	3190	523	187	198	6%	0.1	0.1	0.00	0.4	0.4	0.02
50518	476	2432	1181	168	178	6%	0.1	0.1	0.00	0.1	0.2	0.01
50519	477	2977	1825	248	262	6%	0.1	0.1	0.00	0.1	0.1	0.01
50521	478	4860	3838	448	476	6%	0.1	0.1	0.01	0.1	0.1	0.01
50553	479	1711	192	128	138	8%	0.1	0.1	0.01	0.7	0.7	0.05
50555	480	2470	1525	243	267	10%	0.1	0.1	0.01	0.2	0.2	0.02
50556	481	1379	867	91	102	12%	0.1	0.1	0.01	0.1	0.1	0.01
50557	482	2857	1095	182	199	9%	0.1	0.1	0.01	0.2	0.2	0.01
50558	483	3125	2305	445	476	7%	0.1	0.2	0.01	0.2	0.2	0.01
51201	484	3152	2177	301	349	16%	0.1	0.1	0.02	0.1	0.2	0.02
51202	485	2118	370	151	177	17%	0.1	0.1	0.01	0.4	0.5	0.07
51203	486	2443	98	238	277	16%	0.1	0.1	0.02	2.4	2.8	0.39
51204	487	1587	162	140	159	14%	0.1	0.1	0.01	0.9	1.0	0.12
51205	488	1984	76	139	158	14%	0.1	0.1	0.01	1.8	2.1	0.25
51206	489	4305	209	270	298	10%	0.1	0.1	0.01	1.3	1.4	0.13
51222	490	1244	586	102	119	17%	0.1	0.1	0.01	0.2	0.2	0.03
51223	491	1198	831	108	124	16%	0.1	0.1	0.01	0.1	0.1	0.02
51224	492	3100	1791	415	486	17%	0.1	0.2	0.02	0.2	0.3	0.04
51225	493	1871	596	120	140	17%	0.1	0.1	0.01	0.2	0.2	0.03
51226	494	1323	379	127	148	16%	0.1	0.1	0.02	0.3	0.4	0.05
51228	495	1483	231	151	166	10%	0.1	0.1	0.01	0.7	0.7	0.06
51240	496	1890	1857	192	233	21%	0.1	0.1	0.02	0.1	0.1	0.02
51327	497	2442	29580	313	339	8%	0.1	0.1	0.01	0.0	0.0	0.00
51329	498	1915	227	147	159	8%	0.1	0.1	0.01	0.6	0.7	0.05
51330	499	2037	307	126	131	4%	0.1	0.1	0.00	0.4	0.4	0.02
51331	500	2510	2216	230	305	33%	0.1	0.1	0.03	0.1	0.1	0.03
51341	501	2583	182	185	199	8%	0.1	0.1	0.01	1.0	1.1	0.08
51438	502	2981	1597	303	322	6%	0.1	0.1	0.01	0.2	0.2	0.01
51440	503	1203	1763	591	675	14%	0.5	0.6	0.07	0.3	0.4	0.05
51441	504	3698	1909	266	291	9%	0.1	0.1	0.01	0.1	0.2	0.01
51442	505	943	235	130	135	4%	0.1	0.1	0.01	0.6	0.6	0.02
51443	506	3537	975	266	301	13%	0.1	0.1	0.01	0.3	0.3	0.04
51444	507	322	12466	204	276	35%	0.6	0.9	0.22	0.0	0.0	0.01
51445	508	1035	146	118	122	3%	0.1	0.1	0.00	0.8	0.8	0.02
51463	509	2828	1602	278	294	6%	0.1	0.1	0.01	0.2	0.2	0.01
51464	510	3842	1065	228	244	7%	0.1	0.1	0.00	0.2	0.2	0.02
51465	511	2067	310	134	149	11%	0.1	0.1	0.01	0.4	0.5	0.05
51466	512	2859	2399	306	318	4%	0.1	0.1	0.00	0.1	0.1	0.01
51467	513	2386	2470	336	357	7%	0.1	0.1	0.01	0.1	0.1	0.01
51521	514	2185	2477	138	149	7%	0.1	0.1	0.00	0.1	0.1	0.00
51522	515	361	49	36	38	5%	0.1	0.1	0.00	0.7	0.8	0.03
51558	516	836	4560	195	221	13%	0.2	0.3	0.03	0.0	0.0	0.01
51559	517	7630	1922	660	746	13%	0.1	0.1	0.01	0.3	0.4	0.04
51561	518	3362	649	208	218	5%	0.1	0.1	0.00	0.3	0.3	0.02
51563	519	2200	1675	197	205	4%	0.1	0.1	0.00	0.1	0.1	0.00
51564	520	1297	624	118	122	3%	0.1	0.1	0.00	0.2	0.2	0.01
51565	521	1105	846	56	59	5%	0.1	0.1	0.00	0.1	0.1	0.00
51566	522	3626	367	344	353	3%	0.1	0.1	0.00	0.9	1.0	0.03
51567	523	1669	770	173	177	2%	0.1	0.1	0.00	0.2	0.2	0.01
51568	524	5459	721	306	342	12%	0.1	0.1	0.01	0.4	0.5	0.05
51569	525	827	552	43	49	15%	0.1	0.1	0.01	0.1	0.1	0.01
60007	526	1035	335	51	46	-10%	0.0	0.0	0.01	0.2	0.1	0.02
60008	527	8408	4651	578	666	15%	0.1	0.1	0.01	0.1	0.1	0.02
60009	528	8702	5180	616	578	-6%	0.1	0.1	0.00	0.1	0.1	0.01
60010	529	5245	3913	432	426	-2%	0.1	0.1	0.00	0.1	0.1	0.00
60011	530	2670	1854	179	188	5%	0.1	0.1	0.00	0.1	0.1	0.00
60012	531	1072	303	55	57	5%	0.1	0.1	0.00	0.2	0.2	0.01
60014	532	1427	472	86	72	-16%	0.1	0.1	0.01	0.2	0.2	0.03
60016	533	8805	2556	521	544	4%	0.1	0.1	0.00	0.2	0.2	0.01
60017	534	1068	168	49	39	-19%	0.0	0.0	0.01	0.3	0.2	0.06
61010	535	7397	2908	428	408	-5%	0.1	0.1	0.00	0.1	0.1	0.01
61020	536	2811	836	146	132	-10%	0.1	0.0	0.00	0.2	0.2	0.02
61030	537	3785	1745	231	222	-4%	0.1	0.1	0.00	0.1	0.1	0.00
61079	538	3520	1654	224	226	1%	0.1	0.1	0.00	0.1	0.1	0.00
61081	539	3175	1255	156	139	-11%	0.0	0.0	0.01	0.1	0.1	0.01
61092	540	7897	4903	703	714	2%	0.1	0.1	0.00	0.1	0.1	0.00
61130	541	3716	1182	241	245	2%	0.1	0.1	0.00	0.2	0.2	0.00
61140	542	6132	2353	389	403	4%	0.1	0.1	0.00	0.2	0.2	0.01
61150	543	4224	1234	232	232	0%	0.1	0.1	0.00	0.2	0.2	0.00
61210	544	10162	2525	633	545	-14%	0.1	0.1	0.01	0.3	0.2	0.03
61220	545	1064	456	51	56	10%	0.0	0.1	0.00	0.1	0.1	0.01
61244	546	4366	1782	317	331	4%	0.1	0.1	0.00	0.2	0.2	0.01
61247	547	9044	1877	348	250	-28%	0.0	0.0	0.01	0.2	0.1	0.05
61248	548	3844	1587	237	197	-17%	0.1	0.1	0.01	0.1	0.1	0.03
61256	549	2705	1334	214	225	5%	0.1	0.1	0.00	0.2	0.2	0.01
61300	550	6094	2184	357	384	7%	0.1	0.1	0.00	0.2	0.2	0.01

Comparison of zone destination totals before and after factoring

61302	551	26849	16408	2412	2449	2%	0.1	0.1	0.00	0.1	0.1	0.00
61340	552	5581	2790	447	449	0%	0.1	0.1	0.00	0.2	0.2	0.00
61426	553	5922	4404	495	495	0%	0.1	0.1	0.00	0.1	0.1	0.00
61450	554	1884	747	134	137	2%	0.1	0.1	0.00	0.2	0.2	0.00
61460	555	3886	2185	291	285	-2%	0.1	0.1	0.00	0.1	0.1	0.00
61461	556	341	55	20	21	4%	0.1	0.1	0.00	0.4	0.4	0.01
71041	557	1449	982	115	59	-48%	0.1	0.0	0.04	0.1	0.1	0.06
71042	558	479	373	49	26	-47%	0.1	0.1	0.05	0.1	0.1	0.06
71043	559	231	215	14	9	-35%	0.1	0.0	0.02	0.1	0.0	0.02
71044	560	140	32	7	4	-42%	0.1	0.0	0.02	0.2	0.1	0.10
71045	561	2713	207	129	62	-52%	0.0	0.0	0.02	0.6	0.3	0.33
71046	562	91	1	28	29	3%	0.3	0.3	0.01	28.3	29.2	0.98
71047	563	580	356	48	50	3%	0.1	0.1	0.00	0.1	0.1	0.00
71051	564	116	13	7	4	-47%	0.1	0.0	0.03	0.6	0.3	0.27
71052	565	3479	372	167	85	-49%	0.0	0.0	0.02	0.4	0.2	0.22
71053	566	35	2642	45	25	-44%	1.3	0.7	0.57	0.0	0.0	0.01
71054	567	7638	3097	497	235	-53%	0.1	0.0	0.03	0.2	0.1	0.08
71055	568	3550	2558	258	121	-53%	0.1	0.0	0.04	0.1	0.0	0.05
71056	569	116	9	13	10	-21%	0.1	0.1	0.02	1.4	1.1	0.31
71083	570	69	19	5	2	-54%	0.1	0.0	0.04	0.3	0.1	0.15
71084	571	85	27	3	2	-45%	0.0	0.0	0.02	0.1	0.1	0.05
71085	572	12	6025	49	26	-46%	4.0	2.2	1.86	0.0	0.0	0.00
71086	573	4668	1750	385	179	-54%	0.1	0.0	0.04	0.2	0.1	0.12
71087	574	2967	471	179	95	-47%	0.1	0.0	0.03	0.4	0.2	0.18
71088	575	6116	2016	314	169	-46%	0.1	0.0	0.02	0.2	0.1	0.07
71089	576	915	930	105	51	-51%	0.1	0.1	0.06	0.1	0.1	0.06
71090	577	87	15	9	6	-30%	0.1	0.1	0.03	0.6	0.4	0.17
71091	578	1656	9088	190	91	-52%	0.1	0.1	0.06	0.0	0.0	0.01
71092	579	1071	2342	216	99	-54%	0.2	0.1	0.11	0.1	0.0	0.05
71093	580	148	189	13	9	-33%	0.1	0.1	0.03	0.1	0.0	0.02
71094	581	4833	299	200	108	-46%	0.0	0.0	0.02	0.7	0.4	0.31
71095	582	3346	203	233	107	-54%	0.1	0.0	0.04	1.1	0.5	0.62
71096	583	142	127	17	10	-41%	0.1	0.1	0.05	0.1	0.1	0.06
71097	584	146	63	6	4	-37%	0.0	0.0	0.02	0.1	0.1	0.04
71098	585	71	761	14	6	-56%	0.2	0.1	0.11	0.0	0.0	0.01
71210	586	6127	2412	419	432	3%	0.1	0.1	0.00	0.2	0.2	0.01
71220	587	6283	1699	411	421	2%	0.1	0.1	0.00	0.2	0.2	0.01
71230	588	3918	1004	226	233	3%	0.1	0.1	0.00	0.2	0.2	0.01
71238	589	4697	3035	383	209	-46%	0.1	0.0	0.04	0.1	0.1	0.06
71240	590	2265	1124	179	185	3%	0.1	0.1	0.00	0.2	0.2	0.00
71262	591	6106	3766	474	492	4%	0.1	0.1	0.00	0.1	0.1	0.00
71264	592	2573	1192	177	183	4%	0.1	0.1	0.00	0.1	0.2	0.01
71303	593	21761	14437	1654	1713	4%	0.1	0.1	0.00	0.1	0.1	0.00
71310	594	5916	2797	443	461	4%	0.1	0.1	0.00	0.2	0.2	0.01
71320	595	3161	1152	196	201	2%	0.1	0.1	0.00	0.2	0.2	0.00
71327	596	3649	1829	251	257	2%	0.1	0.1	0.00	0.1	0.1	0.00
71349	597	1931	1619	192	195	1%	0.1	0.1	0.00	0.1	0.1	0.00
71350	598	5566	5185	352	362	3%	0.1	0.1	0.00	0.1	0.1	0.00
71366	599	19015	11813	1374	1403	2%	0.1	0.1	0.00	0.1	0.1	0.00
71371	600	8791	5106	689	704	2%	0.1	0.1	0.00	0.1	0.1	0.00
71401	601	8783	4120	695	707	2%	0.1	0.1	0.00	0.2	0.2	0.00
71410	602	6867	2369	411	427	4%	0.1	0.1	0.00	0.2	0.2	0.01
71420	603	1876	1030	110	114	3%	0.1	0.1	0.00	0.1	0.1	0.00
71430	604	3901	1470	305	311	2%	0.1	0.1	0.00	0.2	0.2	0.00
71470	605	3022	1797	248	254	2%	0.1	0.1	0.00	0.1	0.1	0.00
71559	606	3734	1137	263	271	3%	0.1	0.1	0.00	0.2	0.2	0.01
71572	607	3734	1973	263	276	5%	0.1	0.1	0.00	0.1	0.1	0.01
71576	608	552	352	34	37	8%	0.1	0.1	0.01	0.1	0.1	0.01
71582	609	690	357	32	33	5%	0.0	0.0	0.00	0.1	0.1	0.00
71613	610	1920	1146	165	168	2%	0.1	0.1	0.00	0.1	0.1	0.00
71630	611	2549	666	142	146	2%	0.1	0.1	0.00	0.2	0.2	0.00
81009	612	2392	1922	224	224	0%	0.1	0.1	0.00	0.1	0.1	0.00
81010	613	4001	2105	298	302	2%	0.1	0.1	0.00	0.1	0.1	0.00
81011	614	1542	580	75	76	1%	0.0	0.0	0.00	0.1	0.1	0.00
81020	615	1527	608	101	102	0%	0.1	0.1	0.00	0.2	0.2	0.00
81021	616	982	469	65	65	0%	0.1	0.1	0.00	0.1	0.1	0.00
81022	617	763	201	42	42	0%	0.1	0.1	0.00	0.2	0.2	0.00
81029	618	1753	1117	183	185	1%	0.1	0.1	0.00	0.2	0.2	0.00
81030	619	302	166	17	17	2%	0.1	0.1	0.00	0.1	0.1	0.00
81040	620	1592	553	84	85	1%	0.1	0.1	0.00	0.2	0.2	0.00
81050	621	4287	1299	256	259	1%	0.1	0.1	0.00	0.2	0.2	0.00
81060	622	1240	366	78	78	1%	0.1	0.1	0.00	0.2	0.2	0.00
81103	623	1700	1113	200	205	2%	0.1	0.1	0.00	0.2	0.2	0.00
81104	624	6305	7695	695	709	2%	0.1	0.1	0.00	0.1	0.1	0.00
81105	625	6557	1506	399	410	3%	0.1	0.1	0.00	0.3	0.3	0.01
81106	626	14551	6322	625	632	1%	0.0	0.0	0.00	0.1	0.1	0.00
81232	627	5158	1388	562	564	0%	0.1	0.1	0.00	0.4	0.4	0.00
81233	628	2696	1288	275	288	5%	0.1	0.1	0.00	0.2	0.2	0.01
81234	629	7044	3136	640	645	1%	0.1	0.1	0.00	0.2	0.2	0.00

Comparison of zone destination totals before and after factoring

81235	630	1652	965	337	339	1%	0.2	0.2	0.00	0.3	0.4	0.00
81236	631	773	272	41	42	3%	0.1	0.1	0.00	0.1	0.2	0.00
81237	632	303	88	11	11	1%	0.0	0.0	0.00	0.1	0.1	0.00
81247	633	283	37	10	11	4%	0.0	0.0	0.00	0.3	0.3	0.01
81256	634	6832	2422	395	398	1%	0.1	0.1	0.00	0.2	0.2	0.00
81257	635	1010	608	108	108	1%	0.1	0.1	0.00	0.2	0.2	0.00
81260	636	2098	994	130	131	0%	0.1	0.1	0.00	0.1	0.1	0.00
81261	637	3161	839	161	162	1%	0.1	0.1	0.00	0.2	0.2	0.00
81264	638	909	448	94	94	1%	0.1	0.1	0.00	0.2	0.2	0.00
81301	639	11712	5398	920	926	1%	0.1	0.1	0.00	0.2	0.2	0.00
81307	640	12802	6441	991	994	0%	0.1	0.1	0.00	0.2	0.2	0.00
81340	641	5096	2930	341	342	0%	0.1	0.1	0.00	0.1	0.1	0.00
81350	642	4477	1907	301	303	1%	0.1	0.1	0.00	0.2	0.2	0.00
81363	643	2237	1674	224	226	1%	0.1	0.1	0.00	0.1	0.1	0.00
81439	644	1440	722	99	99	1%	0.1	0.1	0.00	0.1	0.1	0.00
81470	645	1552	512	90	94	4%	0.1	0.1	0.00	0.2	0.2	0.01
81471	646	1573	1305	129	131	1%	0.1	0.1	0.00	0.1	0.1	0.00
81480	647	2384	1570	137	138	0%	0.1	0.1	0.00	0.1	0.1	0.00
81482	648	1508	699	126	127	0%	0.1	0.1	0.00	0.2	0.2	0.00
91009	649	6927	3467	39	38	-3%	0.0	0.0	0.00	0.0	0.0	0.00
91010	650	7231	1396	41	26	-37%	0.0	0.0	0.00	0.0	0.0	0.01
91020	651	8318	3443	49	31	-36%	0.0	0.0	0.00	0.0	0.0	0.01
91027	652	777	134	27	15	-43%	0.0	0.0	0.02	0.2	0.1	0.09
91030	653	9591	1871	35	18	-47%	0.0	0.0	0.00	0.0	0.0	0.01
91040	654	3504	447	12	11	-10%	0.0	0.0	0.00	0.0	0.0	0.00
91041	655	32995	22338	292	198	-32%	0.0	0.0	0.00	0.0	0.0	0.00
91050	656	33292	27339	53	33	-37%	0.0	0.0	0.00	0.0	0.0	0.00
91060	657	8632	1873	18	10	-47%	0.0	0.0	0.00	0.0	0.0	0.00
98100	658	0	0	7	71	875%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
98200	659	0	0	46	57	23%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
98300	660	64003	30549	134	139	4%	0.0	0.0	0.00	0.0	0.0	0.00
98400	661	306842	140063	84	111	33%	0.0	0.0	0.00	0.0	0.0	0.00
98500	662	311016	157380	197	202	2%	0.0	0.0	0.00	0.0	0.0	0.00
98600	663	70868	31257	147	141	-4%	0.0	0.0	0.00	0.0	0.0	0.00
98700	664	1132438	558489	349	357	2%	0.0	0.0	0.00	0.0	0.0	0.00
98800	665	245868	123705	231	188	-19%	0.0	0.0	0.00	0.0	0.0	0.00
98900	666	131749	61891	224	169	-24%	0.0	0.0	0.00	0.0	0.0	0.00
		4036598	2320580	143502	148196	3%	0.0	0.0	0%	0.1	0.1	0%

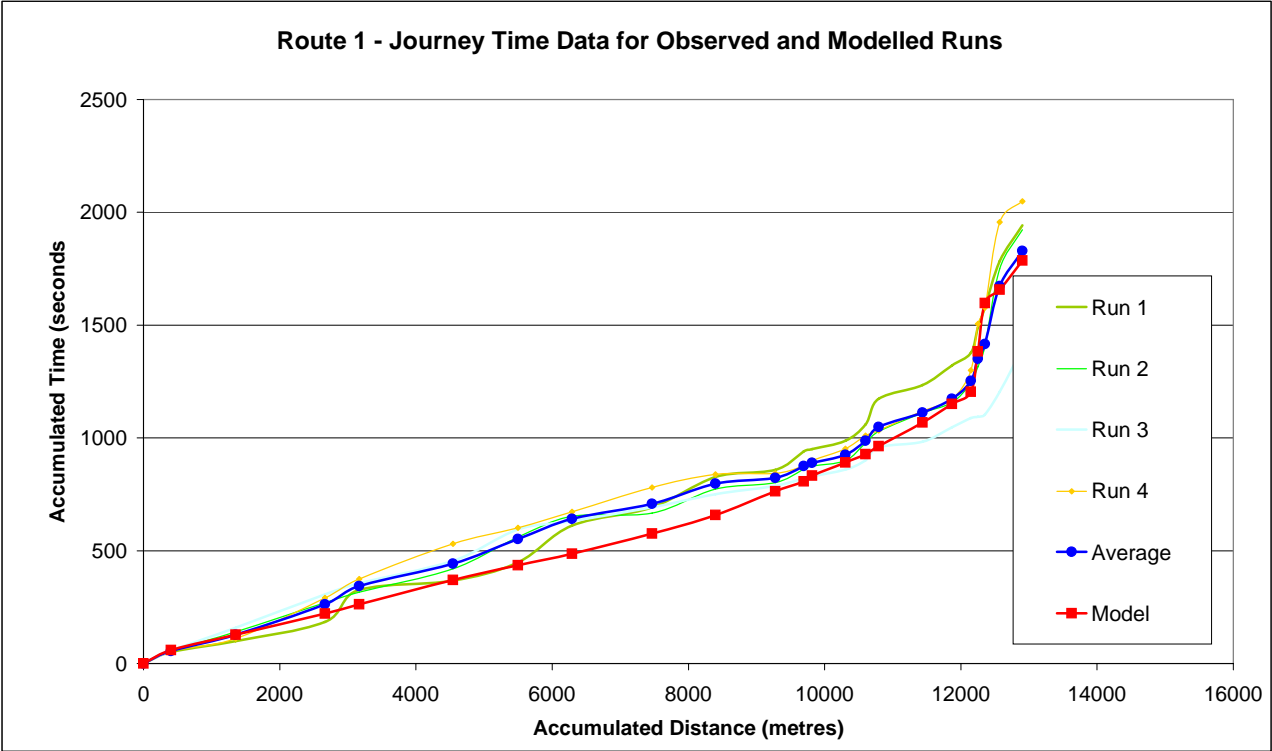
APPENDIX

D

JOURNEY TIME VALIDATION RESULTS

Route 1

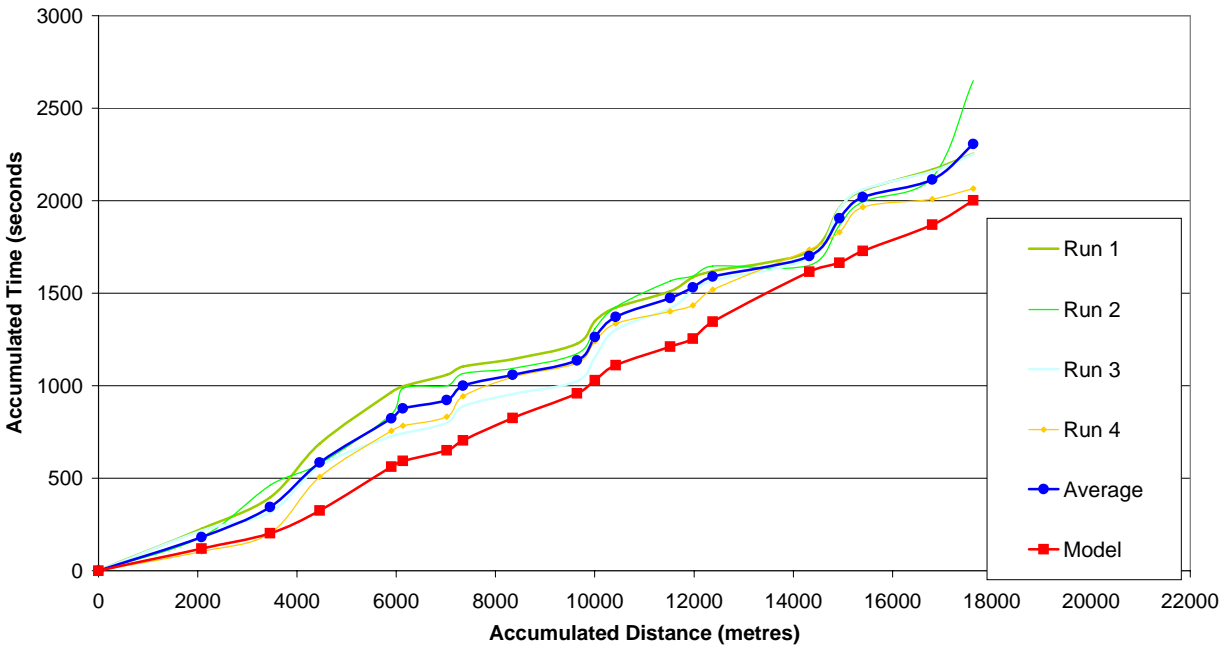
From	To	A Node	B Node	Distance (metres)	Observed Journey Time					Average	Model
					Run 1	Run 2	Run 3	Run 4			
Approach Howth Road / Church Road	Approach Howth Road / Church Road	3503	3503	0	0	0	0	0	0	0	0
Approach Howth Road / Church Road	Station Rd/ Greenfield Rd - Sutton Cross	3503	3502	405	51	56	57	56	55	60	60
Station Rd/ Greenfield Rd - Sutton Cross	Baldoyle Rd/ Dublin Rd	3502	3501	1352	99	140	159	110	127	128	128
Baldoyle Rd/ Dublin Rd	Kilbarack Rd/ Dublin Rd	3501	1613	2663	184	269	306	291	263	222	222
Kilbarack Rd/ Dublin Rd	Howth Rd/ James Larkin Rd	1613	1612	3165	326	317	356	375	343	262	262
Howth Rd/ James Larkin Rd	Watermill Rd/ James Larkin Rd	1612	1611	4543	368	420	455	530	443	370	370
Watermill Rd/ James Larkin Rd	Prospect Ave/ James Larkin Rd	1611	1610	5497	449	560	595	601	551	435	435
Prospect Ave/ James Larkin Rd	Clontarf Rd/ Bull Wall	1610	1609	6290	611	652	632	672	642	486	486
Clontarf Rd/ Bull Wall	Clontarf Rd/ Vernon Ave	1609	1608	7465	692	667	692	780	708	576	576
Clontarf Rd/ Vernon Ave	Clontarf Rd/ St. Lawrence Rd	1608	1607	8395	827	773	750	839	797	659	659
Clontarf Rd/ St. Lawrence Rd	Clontarf Rd/ Alfie Byrne Rd	1607	1605	9276	859	801	788	843	823	763	763
Clontarf Rd/ Alfie Byrne Rd	Fairview Rd/ Howth Rd	1605	1604	9693	941	862	822	877	876	807	807
Fairview Rd/ Howth Rd	Fairview Rd/ Malahide Rd	1604	1603	9816	951	876	830	900	889	833	833
Fairview Rd/ Malahide Rd	Fairview Strand / Fairview Ave	1603	1601	10304	988	900	860	952	925	891	891
Fairview Strand / Fairview Ave	East Wall Rd/ Poplar Row	1601	1133	10599	1060	978	901	1010	987	928	928
East Wall Rd/ Poplar Row	Ossory Rd/ North Strand Road	1133	1132	10792	1174	1028	959	1033	1049	964	964
Ossory Rd/ North Strand Road	Portland Row/ Seville Place	1132	1319	11438	1234	1111	983	1120	1112	1069	1069
Portland Row/ Seville Place	Talbot Street/ Amiens St	1319	1316	11869	1321	1157	1047	1171	1174	1151	1151
Talbot Street/ Amiens St	Memorial Rd/ Amiens St	1316	1314	12145	1377	1245	1088	1300	1253	1205	1205
Memorial Rd/ Amiens St	Memorial Rd/ Custom House Quay	1314	1304	12251	1489	1315	1094	1506	1351	1384	1384
Memorial Rd/ Custom House Quay	George's Quay/ Moss St.	1304	2173	12355	1578	1406	1104	1578	1417	1597	1597
George's Quay/ Moss St.	Burgh Quay/ Tara St.	2173	2172	12568	1784	1749	1204	1956	1673	1657	1657
Burgh Quay/ Tara St.	Finish turning onto O'Connell Bridge	2172	1301	12904	1943	1923	1398	2049	1828	1787	1787



Route 2

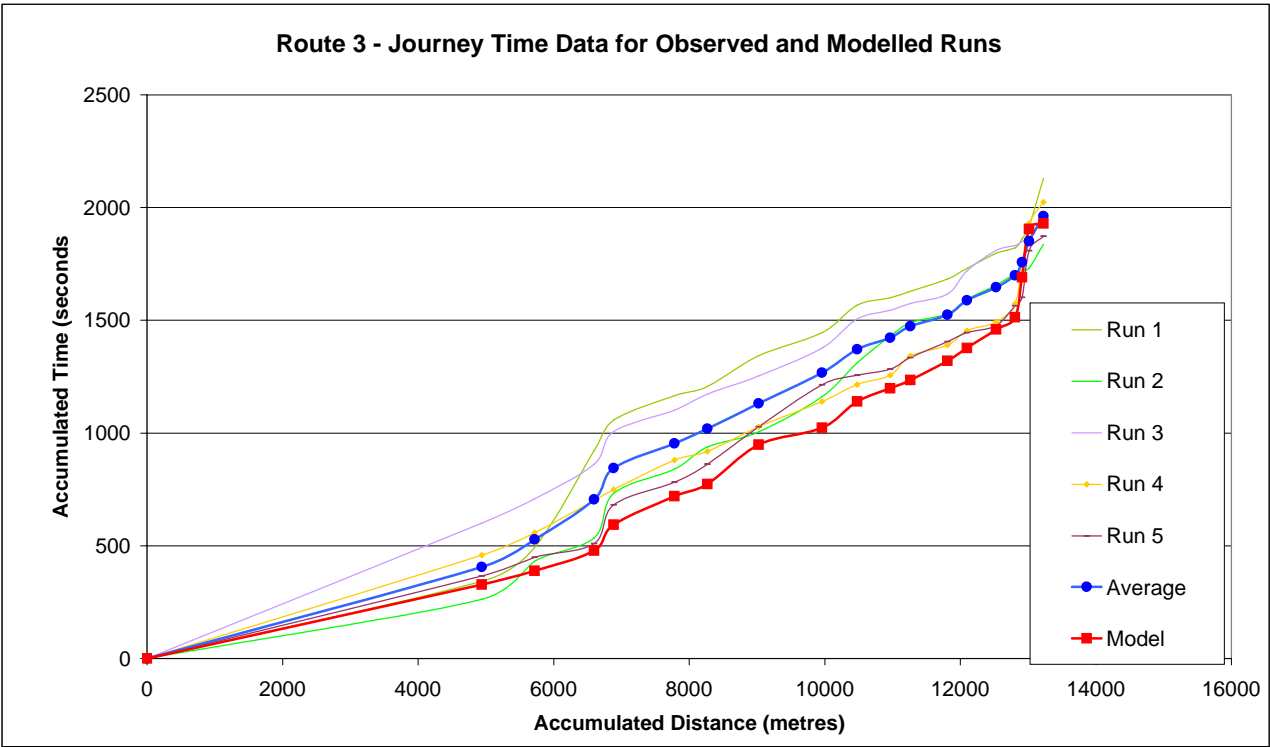
From	To	A Node	B Node	Distance (metres)	Observed Journey Time					Model
					Run 1	Run 2	Run 3	Run 4	Average	
Approach Strand Rd/ Station Rd	Approach Strand Rd/ Station Rd	3507	3507	0	0	0	0	0	0	0
Approach Strand Rd/ Station Rd	Hole In The Wall Rd/ Balgriffin Rd	3507	3511	2075	227	182	217	103	182	119
Hole In The Wall Rd/ Balgriffin Rd	Grange Rd/ Hole in the Wall Rd	3511	1667	3454	396	461	315	202	344	202
Grange Rd/ Hole in the Wall Rd	Grange Rd/ Tonlegee	1667	1665	4455	687	578	566	507	585	326
Grange Rd/ Tonlegee	Station Rd/ Howth Rd	1665	1638	5903	966	846	726	756	824	562
Station Rd/ Howth Rd	Watermill Rd/ Howth Rd	1638	1637	6135	996	986	743	784	877	594
Watermill Rd/ Howth Rd	All Saint's Rd/ Howth Rd	1637	1636	7018	1058	1000	799	832	922	651
All Saint's Rd/ Howth Rd	Sybil Hill Rd/ Howth Rd	1636	1635	7346	1104	1065	889	942	1000	705
Sybil Hill Rd/ Howth Rd	Collins Ave/ Howth Rd	1635	1633	8347	1144	1093	954	1047	1060	825
Collins Ave/ Howth Rd	Copeland Ave/ Howth Rd	1633	1631	9643	1227	1173	1024	1123	1137	959
Copeland Ave/ Howth Rd	Clontarf Rd/ Howth Rd	1631	1604	10005	1350	1307	1154	1240	1263	1029
Clontarf Rd/ Howth Rd	Alfie Byrne/ Clontarf Rd	1604	1605	10422	1422	1426	1303	1336	1372	1110
Alfie Byrne/ Clontarf Rd	Alfie Byrne/ East Wall Rd	1605	1123	11517	1510	1565	1419	1402	1474	1211
Alfie Byrne/ East Wall Rd	East Wall Rd/ East Rd	1123	1121	11974	1586	1591	1514	1434	1531	1255
East Wall Rd/ East Rd	East Wall Rd/ Tolka Quay	1121	1105	12378	1620	1647	1570	1519	1589	1346
East Wall Rd/ Tolka Quay	South Bank Rd / Sean Moore Rd	1105	2213	14328	1725	1651	1690	1736	1701	1616
South Bank Rd / Sean Moore Rd	Bath St/ Beach Rd/ Sean Moore Rd	2213	2205	14932	1962	1868	1959	1830	1905	1664
Bath St/ Beach Rd/ Sean Moore Rd	Beach Rd/ Marine Dr.	2205	2206	15403	2056	1995	2060	1965	2019	1729
Beach Rd/ Marine Dr.	Strand Rd/ St Johns Rd	2206	2992	16802	2167	2124	2160	2008	2115	1870
Strand Rd/ St Johns Rd	Strand Rd/ Merriem Rd	2992	2970	17629	2255	2648	2253	2065	2305	2002

Route 2 - Journey Time Data for Observed and Modelled Runs



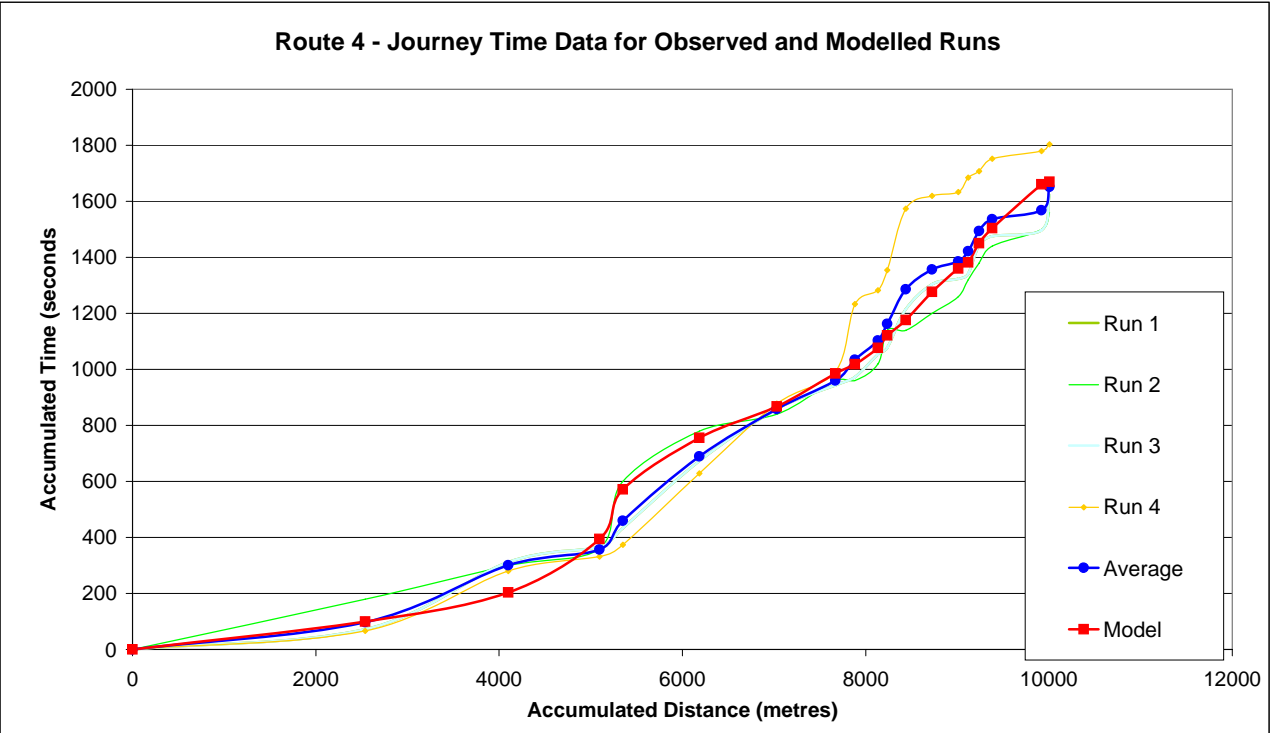
Route 3

From	To	A Node	B Node	Distance (metres)	Observed Journey Time						Model
					Run 1	Run 2	Run 3	Run 4	Run 5	Average	
Start on approach to Swords Rd. / Dublin R.	Start on approach to Swords Rd. / Dublin Rd.	3517	3517	0	0	0	0	0	0	0	0
Start on approach to Swords Rd. / Dublin Rd.	Malahide Rd/ N32	3517	1682	4942	342	263	601	458	366	406	328
Malahide Rd/ N32	Malahide Rd/ Blunden Dr.	1682	1680	5717	492	432	709	558	449	528	389
Malahide Rd/ Blunden Dr.	Malahide Rd/ Greencastle Dr.	1680	1679	6596	923	535	862	701	509	706	479
Malahide Rd/ Greencastle Dr.	Malahide Rd/ Oscar Traynor Rd	1679	1678	6887	1058	732	1007	749	681	845	594
Malahide Rd/ Oscar Traynor Rd	Malahide Rd/ Ardlea Rd Roundabout	1678	1676	7784	1166	841	1102	880	782	954	720
Malahide Rd/ Ardlea Rd Roundabout	Malahide Rd/ Kilmore Rd	1676	1675	8270	1206	939	1173	918	862	1020	774
Malahide Rd/ Kilmore Rd	Malahide Rd/ Collins Ave	1675	1673	9024	1343	1005	1254	1028	1028	1132	948
Malahide Rd/ Collins Ave	Malahide Rd/ Griffith Ave	1673	1672	9958	1445	1161	1377	1140	1214	1267	1024
Malahide Rd/ Griffith Ave	Malahide Rd/ Fairview Rd	1672	1603	10478	1568	1312	1506	1215	1257	1372	1140
Malahide Rd/ Fairview Rd	Fairview Strand / Fairview Ave	1603	1601	10966	1600	1430	1544	1257	1283	1423	1198
Fairview Strand / Fairview Ave	North Strand Rd/ Poplar Row	1601	1133	11261	1628	1489	1574	1341	1335	1473	1235
North Strand Rd/ Poplar Row	North Strand Rd/ Ossory Rd	1133	1131	11809	1684	1529	1617	1390	1405	1525	1320
North Strand Rd/ Ossory Rd	Amien St./ Portland Row	1131	1319	12100	1731	1593	1719	1454	1445	1588	1377
Amien St./ Portland Row	Amien St./ Talbot St.	1319	1316	12531	1797	1657	1810	1494	1476	1647	1459
Amien St./ Talbot St.	Amien St./ Memorial Row	1316	1314	12807	1821	1706	1832	1573	1565	1699	1513
Amien St./ Memorial Row	Memorial Row/ Custom house Quay	1314	1304	12913	1861	1720	1850	1754	1601	1757	1691
Memorial Row/ Custom house Quay	George Quay/ Moss St	1304	2173	13017	1918	1732	1866	1929	1808	1851	1905
George Quay/ Moss St	Burgh Quay/ Tara St.	2173	2172	13230	2129	1837	1947	2025	1873	1962	1930



Route 3

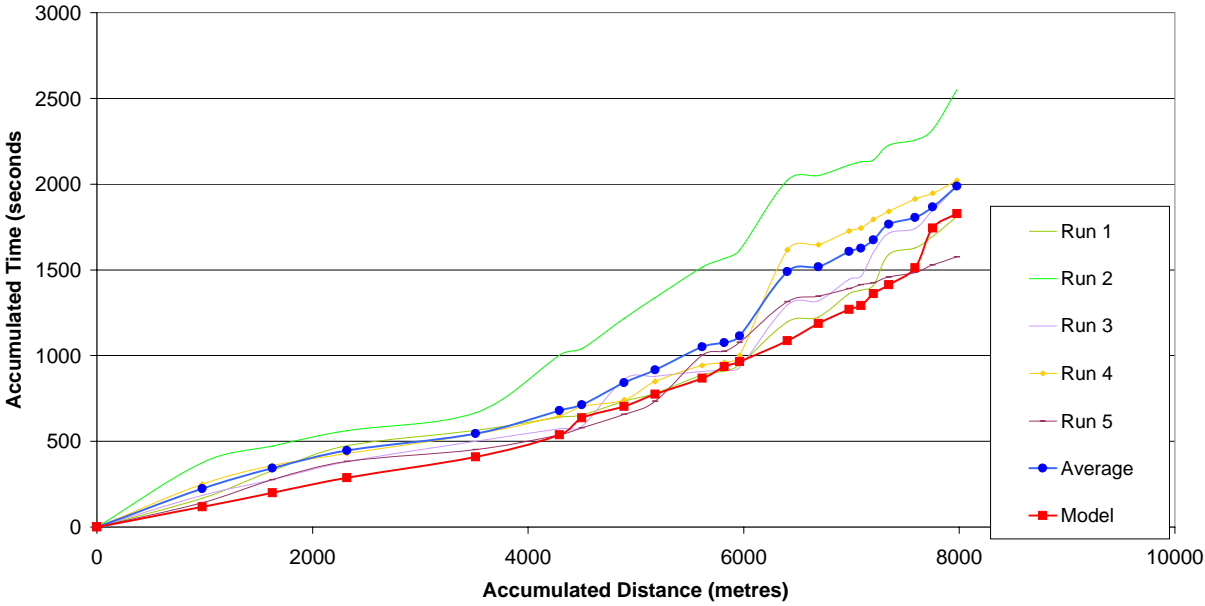
From	To	A Node	B Node	Distance (metres)	Observed Journey Time				Average	Model
					Run 1	Run 2	Run 3	Run 4		
Airport Roundabout	Airport Roundabout	3555	3555	0	0	0	0	0	0	0
Airport Roundabout	M1/ M50/ N32	3555	3531	2538	72	180	72	66	97	100
M1/ M50/ N32	Coolock Lane/ M1	3531	1871	4100	312	300	312	280	301	204
Coolock Lane/ M1	Swords Rd/ Collins Ave West	1871	1861	5096	367	360	367	332	356	394
Swords Rd/ Collins Ave West	Drumcondra Rd Upr./ Griffith Ave	1861	1858	5349	433	600	433	374	460	571
Drumcondra Rd Upr./ Griffith Ave	Drumcondra Rd Upr./ Richmond Rd	1858	1857	6185	673	780	673	629	689	756
Drumcondra Rd Upr./ Richmond Rd	Drumcondra Rd Upr./ Clonliffe Rd	1857	1855	7030	858	840	858	878	858	868
Drumcondra Rd Upr./ Clonliffe Rd	Drumcondra Rd/ Portland Place	1855	1852	7671	943	960	943	992	959	985
Drumcondra Rd/ Portland Place	Upper Dorset St./ North Circular Rd	1852	1851	7883	973	960	973	1233	1035	1018
Upper Dorset St./ North Circular Rd	Upper Dorset St./ Gardiner Street Upper	1851	1394	8134	1054	1020	1054	1282	1103	1077
Upper Dorset St./ Gardiner Street Upper	Dorset Street/ Eccles Street	1394	1393	8234	1078	1140	1078	1354	1162	1121
Dorset Street/ Eccles Street	Temple Street/ Hill Street	1393	1392	8437	1215	1140	1215	1574	1286	1176
Temple Street/ Hill Street	Hill Street/ Parnell Street	1392	1359	8725	1304	1200	1304	1619	1357	1277
Hill Street/ Parnell Street	Parnell St./ Marlborough St.	1359	1358	9009	1324	1260	1324	1633	1385	1360
Parnell St./ Marlborough St.	Marlborough St./ Cathal Brugha Street	1358	1356	9119	1342	1320	1342	1685	1422	1382
Marlborough St./ Cathal Brugha Street	O'Connell St./ Cathal Brugha St.	1356	1355	9236	1444	1380	1444	1707	1494	1450
O'Connell St./ Cathal Brugha St.	O'Connell St./ Earl St. North	1355	1365	9379	1475	1440	1475	1752	1535	1504
O'Connell St./ Earl St. North	O'Connell St./ Abbey St.	1365	1351	9919	1497	1500	1497	1780	1569	1661
O'Connell St./ Abbey St.	Finish Turning onto O'Connell St.	1351	1302	10007	1622	1560	1622	1804	1652	1670



Route 5

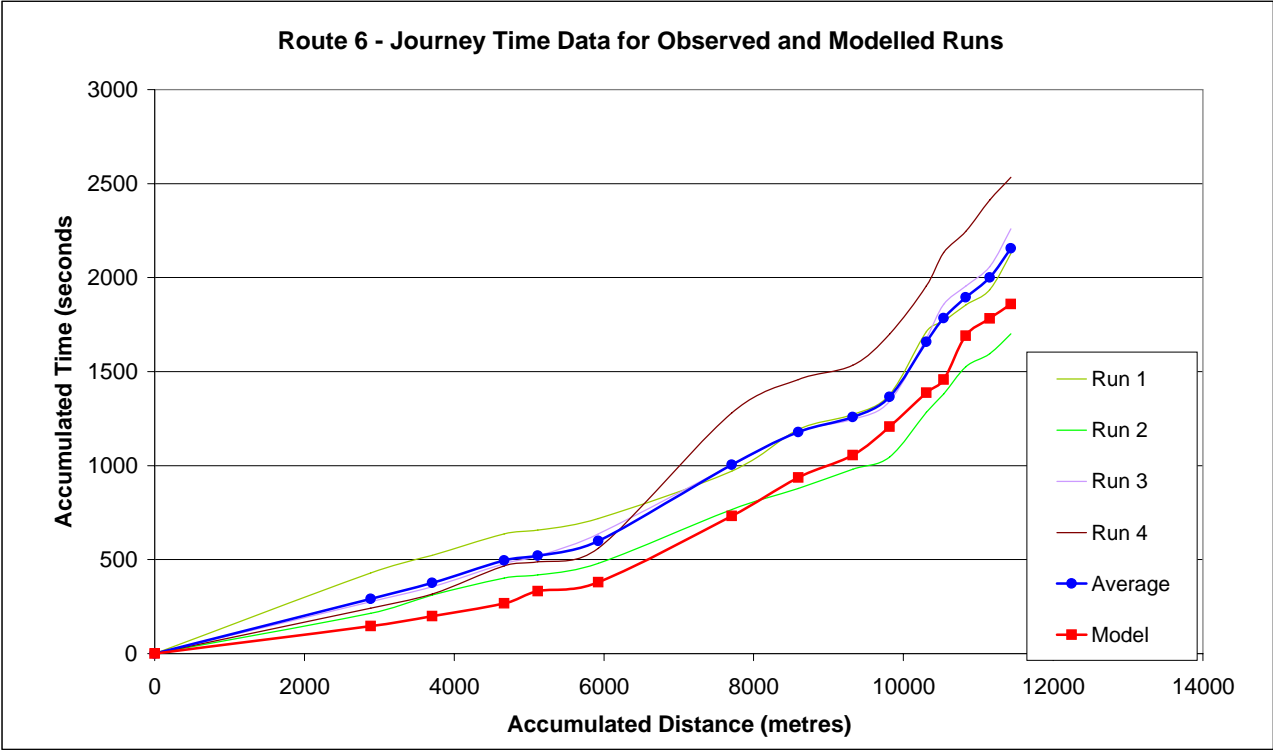
From	To	A Node	B Node	Distance (metres)	Observed Journey Time					Average	Model
					Run 1	Run 2	Run 3	Run 4	Run 5		
Start on approach to Ballymun Junction of M50 & R108	Start on approach to Ballymun Junction of M50 & R108	3648	3648	0	0	0	0	0	0	0	0
Start on approach to Ballymun Junction of M50 & R108	Ballymun Rd/ St. Margaret's Rd	3648	1728	978	168	376	185	250	142	224	117
Ballymun Rd/ St. Margaret's Rd	Ballymun Rd/ Shangan Rd Roundabout	1728	1727	1627	329	473	276	358	277	343	199
Ballymun Rd/ Shangan Rd Roundabout	Ballymun Rd/ Collins Ave Extension	1727	1725	2320	475	561	381	429	382	446	287
Ballymun Rd/ Collins Ave Extension	St. Mobhi/ Griffith Ave	1725	1721	3511	563	666	500	542	451	544	409
St. Mobhi/ Griffith Ave	St. Mobhi/ Botanic Ave	1721	1717	4290	640	1002	573	649	537	680	538
St. Mobhi/ Botanic Ave	Botanic Rd/ Glasnevin Hill Rd	1717	1716	4499	654	1040	587	703	578	712	636
Botanic Rd/ Glasnevin Hill Rd	Botanic Rd/ Prospect Way	1716	1714	4889	734	1217	862	741	658	842	704
Botanic Rd/ Prospect Way	Prospect Rd/ Whitworth Rd	1714	1711	5179	781	1338	879	850	733	916	775
Prospect Rd/ Whitworth Rd	North Circular Rd/ Phibsborough - Doyles Corner	1711	1428	5616	887	1516	908	943	1002	1051	868
North Circular Rd/ Phibsborough - Doyles Corner	Berkely Rd/ NCR	1428	1415	5818	910	1566	914	959	1025	1075	936
Berkely Rd/ NCR	Berkely Rd/ Eccles St.	1415	1408	5962	946	1615	931	1000	1077	1114	966
Berkely Rd/ Eccles St.	Eccles St. / Dorset St.	1408	1392	6405	1196	2023	1295	1616	1315	1489	1086
Eccles St. / Dorset St.	Temple St. / Hill St.	1392	1359	6693	1224	2049	1320	1646	1346	1517	1187
Temple St. / Hill St.	Hill St. / Parnell St.	1359	1358	6977	1360	2112	1445	1727	1390	1607	1270
Hill St. / Parnell St.	Parnell St. / Marlborough St.	1356	1356	7087	1381	2130	1462	1743	1414	1626	1292
Parnell St. / Marlborough St.	Marlborough St. / Cathal Brugha St.	1358	1355	7204	1409	2142	1602	1794	1424	1674	1360
Marlborough St. / Cathal Brugha St.	O'Connell St. / Cathal Brugha St.	1356	1365	7347	1590	2227	1713	1840	1458	1766	1414
O'Connell St. / Cathal Brugha St.	O'Connell St. / Earl St. North	1355	1363	7589	1628	2257	1741	1913	1484	1805	1512
O'Connell St. / Earl St. North	O'Connell St. / Abbey Street	1365	1361	7753	1695	2319	1846	1947	1529	1867	1743
O'Connell St. / Abbey Street	Finish turning onto O'Connell St.	1361	1302	7979	1810	2551	1986	2022	1576	1989	1828

Route 5 - Journey Time Data for Observed and Modelled Runs



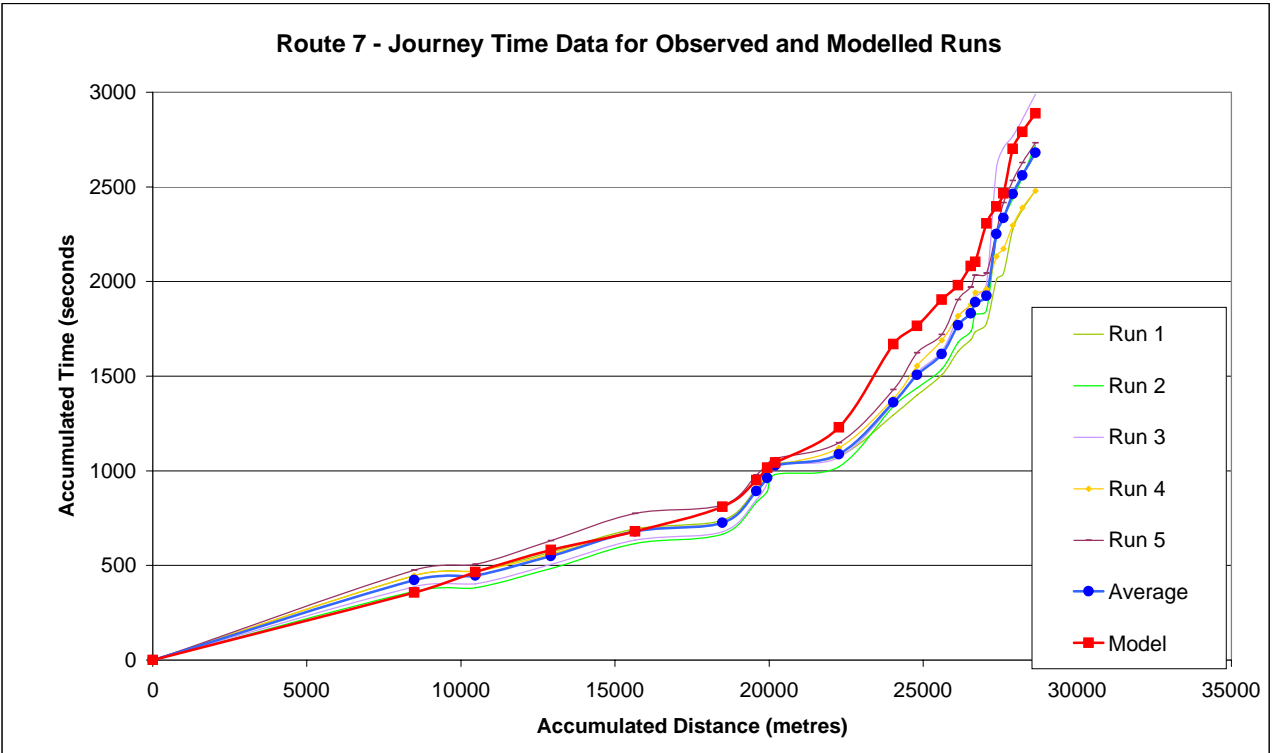
Route 6

From	To	A Node	B Node	Distance (metres)	Observed Journey Time					Average	Model
					Run 1	Run 2	Run 3	Run 4			
Kilshane Cross	Kilshane Cross	3793	3793	0	0	0	0	0	0	0	
Kilshane Cross	M50	3793	3751	2884	429	214	276	242	290	147	
M50	North RD/ St. Margaret's Rd	3751	1776	3707	522	311	355	317	376	200	
North RD/ St. Margaret's Rd	Finglas Bypass / Ballygall Rd	1776	1771	4668	636	401	478	467	496	267	
Finglas Bypass / Ballygall Rd	Finglas Rd/ Finglas Place	1771	1764	5118	656	419	520	489	521	332	
Finglas Rd/ Finglas Place	Finglas Rd/ Tolka Valley Rd	1764	1763	5925	718	480	636	561	599	379	
Finglas Rd/ Tolka Valley Rd	Finglas Rd/ Prospect Road	1763	1715	7707	970	766	1003	1281	1005	732	
Finglas Rd/ Prospect Road	Phibsborough Rd/ North Circular Rd - Doyles Corner	1715	1428	8597	1191	879	1182	1458	1178	937	
Phibsborough Rd/ North Circular Rd - Doyles Corner	Phibsborough Rd/ Western Way	1428	1426	9325	1271	981	1247	1534	1258	1056	
Phibsborough Rd/ Western Way	Church St./ King St Nth	1426	1424	9814	1377	1046	1342	1699	1366	1208	
Church St./ King St Nth	Church St./ Arran Quay	1424	1421	10306	1713	1284	1679	1956	1658	1388	
Church St./ Arran Quay	Chancery Place/ Ormond Quay	1421	1401	10538	1769	1381	1857	2133	1785	1457	
Chancery Place/ Ormond Quay	Capel St./ Ormond Quay	1401	1382	10832	1854	1526	1955	2246	1895	1691	
Capel St./ Ormond Quay	Liffey St./ Bachelors Walk	1382	1373	11151	1936	1596	2058	2412	2001	1782	
Liffey St./ Bachelors Walk	Finish turning onto O'Connell Bridge	1373	1301	11433	2128	1701	2259	2534	2156	1859	



Route 7

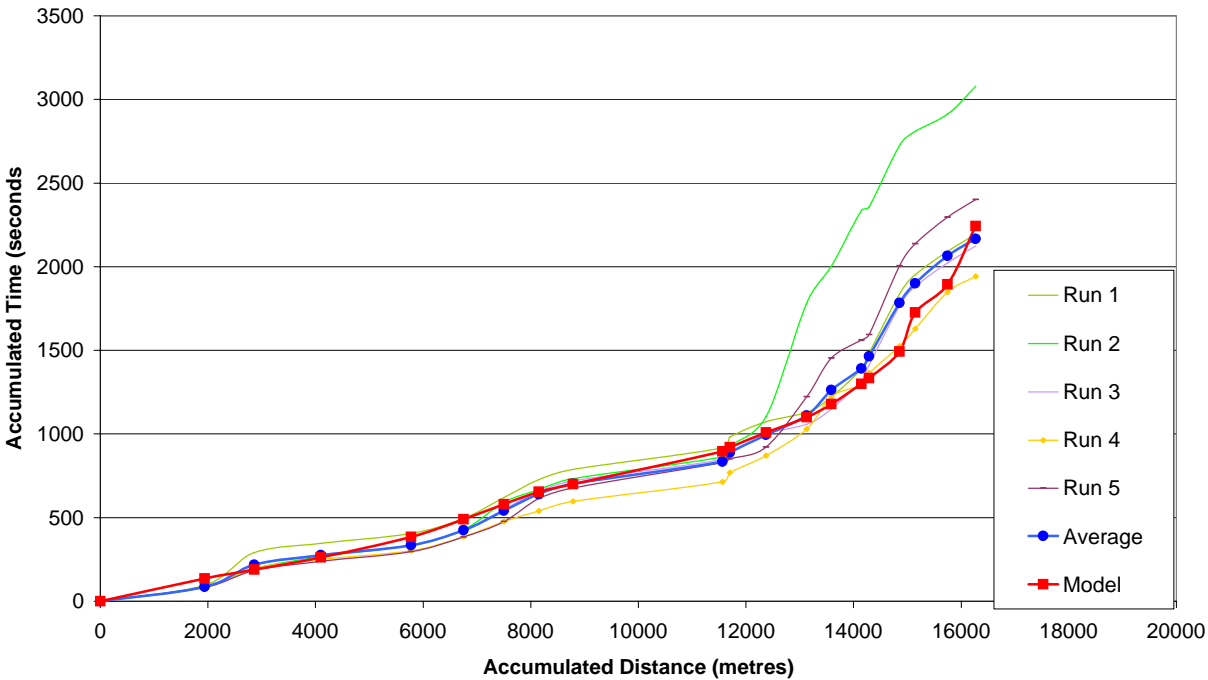
From	To	A Node	B Node	Distance (metres)	Observed Journey Time						Average	Model
					Run 1	Run 2	Run 3	Run 4	Run 5			
N3 / R154	Start on N3 approach Dunshaughlun N3 / R125 Junction	6134	6134	0	0	0	0	0	0	0	0	0
N3 / R154	N3 / R154	6134	6133	8487	447	363	387	446	475	424	357	
N3 / R155	N3 / R155	6133	6132	10464	472	382	403	468	506	446	465	
N3 / R157	N3 / R157	6132	3466	12922	570	484	505	560	630	550	582	
N3 / R156 - Clonee Bypass first bridge	N3 / R156 - Clonee Bypass first bridge	3466	3461	15648	694	616	634	685	774	681	679	
Clonee Bypass second bridge (Littlepace)	Clonee Bypass second bridge (Littlepace)	3461	3441	18486	739	665	678	729	819	726	810	
N3 / Snugborough Road Slip lane	N3 / Snugborough Road Slip lane	3441	3433	19585	905	833	848	903	978	893	951	
Blanchardstown Bypass/ River Rd	Blanchardstown Bypass/ River Rd	3433	3438	19936	963	891	934	991	1035	963	1017	
Blanchardstown Bypass/ M50 R 'about	Blanchardstown Bypass/ M50 R 'about	3438	3394	20199	1036	980	1031	1027	1066	1028	1043	
Blanchardstown Bypass/ Dunsink Lane	Blanchardstown Bypass/ Dunsink Lane	3394	3421	22267	1078	1022	1071	1121	1148	1088	1230	
Navan Rd/ Kinvara Ave	Navan Rd/ Kinvara Ave	3421	1915	24033	1296	1341	1355	1382	1429	1361	1669	
Navan Rd/ Nephin Rd	Navan Rd/ Nephin Rd	1915	1914	24798	1401	1438	1518	1554	1623	1507	1765	
Navan Rd/ Cabra Rd	Navan Rd/ Cabra Rd	1914	1469	25600	1507	1538	1632	1690	1720	1617	1904	
Old Cabra Rd/ North Circular Rd	Old Cabra Rd/ North Circular Rd	1469	1468	26127	1630	1677	1812	1818	1904	1768	1980	
Prussia Rd/ Manor St/ Aughrim	Prussia Rd/ Manor St/ Aughrim	1468	1465	26544	1693	1736	1877	1878	1970	1831	2081	
Blackhall Place/ King St.	Blackhall Place/ King St.	1465	1455	26691	1735	1827	1919	1941	2033	1891	2104	
Queen St / King St.	Queen St / King St.	1455	1451	27050	1779	1849	1987	1960	2044	1924	2307	
Queen St/ Arran Quay	Queen St/ Arran Quay	1451	1421	27378	2011	2240	2603	2133	2264	2250	2396	
Inns Quay / Church St.	Inns Quay / Church St.	1421	1401	27610	2043	2339	2706	2173	2417	2336	2465	
Chancery Place/ Ormond Quay	Chancery Place/ Ormond Quay	1401	1382	27904	2276	2437	2768	2296	2534	2462	2700	
Capel St/ Ormond Quay	Capel St/ Ormond Quay	1382	1373	28223	2377	2553	2857	2390	2628	2561	2791	
Liffey St/ Bachelors Walk	Liffey St/ Bachelors Walk	1373	1302	28640	2484	2720	2990	2479	2733	2681	2888	



Route 8

From	To	A Node	B Node	Distance (metres)	Observed Journey Time						Model
					Run 1	Run 2	Run 3	Run 4	Run 5	Average	
Start on approach from Leixlip to R148 / R403	Start on approach from Leixlip to R148 / R403 roundabout	4376	4376	0	0	0	0	0	0	0	
Start on approach from Leixlip to R148 / R403	Adamstown Rd / Newcastle Rd	4376	4351	1937	95	87	85	82	84	87	
Adamstown Rd / Newcastle Rd	N4 / Esker Lane	4351	4303	2859	290	196	220	198	183	217	
N4 / Esker Lane	N4 / Ballyowen Rd	4303	4342	4097	347	266	277	250	240	276	
N4 / Ballyowen Rd	Lucan Rd / Fonthill Rd	4342	4331	5774	405	336	335	303	297	335	
Lucan Rd / Fonthill Rd	Lucan Rd/ M50 R'about	4331	4328	6752	496	429	426	387	384	424	
Lucan Rd/ M50 R'about	Lucan Rd/ Kennelsfort Rd	4328	4311	7499	619	592	549	476	476	542	
N4 / The Oval	N4 / Lucan Road Slip	4311	2814	8149	727	667	657	539	615	641	
N4 / Lucan Road Slip	Chapelizod Bypass/ Kylemore Rd - Over bridge	2814	2813	8786	789	732	719	597	678	703	
Chapelizod Bypass/ Kylemore Rd - Over bridge	Chapelizod Bypass / Con Colbert Road	2813	2812	11564	917	863	847	713	829	834	
Chapelizod Bypass / Con Colbert Road	Con Colbert Rd/ Inchicore Rd T-Junction	2812	2811	11700	982	929	912	769	851	889	
Con Colbert Rd/ Inchicore Rd T-Junction	Con Colbert Rd/ South Circular Rd	2811	2317	12375	1073	1104	1003	870	923	995	
Con Colbert Rd/ South Circular Rd	St. Johns Rd West/ Military Rd	2317	2306	13130	1128	1782	1058	1030	1223	1110	
St. Johns Rd West/ Military Rd	St. Johns Rd West/ Wolfe Tone Quay	2306	1479	13589	1220	2003	1150	1223	1455	1262	
St. Johns Rd West/ Wolfe Tone Quay	Ellis Quay/ Blackhall Place	1479	1461	14146	1389	2336	1319	1294	1562	1391	
Ellis Quay/ Blackhall Place	Aran Quay/ Queen St	1461	1451	14292	1482	2358	1412	1365	1594	1463	
Aran Quay/ Queen St	Chancery Place/ Ormond Quay	1451	1401	14852	1837	2725	1767	1526	2005	1784	
Chancery Place/ Ormond Quay	Capel St./ Ormond Quay	1401	1382	15146	1951	2810	1881	1628	2138	1900	
Capel St./ Ormond Quay	Liffey St./ Bachelors Walk	1382	1301	15747	2092	2912	2022	1848	2296	2065	
Liffey St./ Bachelors Walk	Finish turning onto O'Connell Bridge	1301	1304	16271	2195	3079	2125	1942	2402	2166	

Route 8 - Journey Time Data for Observed and Modelled Runs



Route 9

From	To	A Node	B Node	Distance (metres)	Observed Journey Time					Model
					Run 1	Run 2	Run 3	Run 4	Average	
Approach along N7 at Kill	Approach along N7 at Kill	6211	6211	0	0	0	0	0	0	0
Approach along N7 at Kill	Naas Rd/ Boot Rd	6211	4234	14240	502	502	496	553	513	594
Naas Rd/ Boot Rd	Naas Rd/ Belgard Rd - Newlands Cross	4234	4233	14722	603	668	619	696	646	746
Naas Rd/ Belgard Rd - Newlands Cross	Naas Rd/ Monastery Rd	4233	4231	16086	697	762	740	845	761	852
Naas Rd/ Monastery Rd	Naas Rd/ M50	4231	4227	16260	796	857	816	885	838	879
Naas Rd/ M50	Naas Rd/ Long Mile Rd	4227	5501	17546	921	998	924	976	955	1029
Naas Rd/ Long Mile Rd	Naas Rd/ Kylemore Rd	5501	2845	18311	969	1034	1032	1040	1019	1155
Naas Rd/ Kylemore Rd	Naas Rd/ Tyrconnell Rd	2845	2843	19628	1141	1175	1169	1131	1154	1332
Naas Rd/ Tyrconnell Rd	Tyrconnell Rd/ Grattan Crescent	2843	2842	20410	1270	1322	1320	1245	1289	1500
Tyrconnell Rd/ Grattan Crescent	Emmet Rd/ SCR	2842	2338	21331	1442	1475	1436	1370	1431	1613
Emmet Rd/ SCR	Steven's Lane/ James's St	2338	2334	22565	1594	1598	1775	1539	1627	1817
Steven's Lane/ James's St	Thomas St. West/ Bridgefoot St.	2334	2331	23127	1727	1760	1918	1620	1756	1962
Thomas St. West/ Bridgefoot St.	Commaket / Francis St.	2331	2412	23584	1780	1840	2011	1698	1832	2103
Commaket / Francis St.	Winetavern / High St/ Nicholas St	2412	2411	23804	1917	1981	2128	1732	1940	2178
Winetavern / High St/ Nicholas St	Dame St / Parliment St	2411	2018	24161	2000	2094	2223	1796	2028	2281
Dame St / Parliment St	Dame St / St. George's St	2018	2016	24344	2037	2225	2279	1855	2099	2354
Dame St / St. George's St	Dame St / Suffolk St.	2016	2014	24582	2073	2266	2301	1921	2140	2429
Dame St / Suffolk St.	Finish turning onto O'Connell Bridge	2014	1302	25159	2195	2471	2445	2237	2337	2647



Route 10

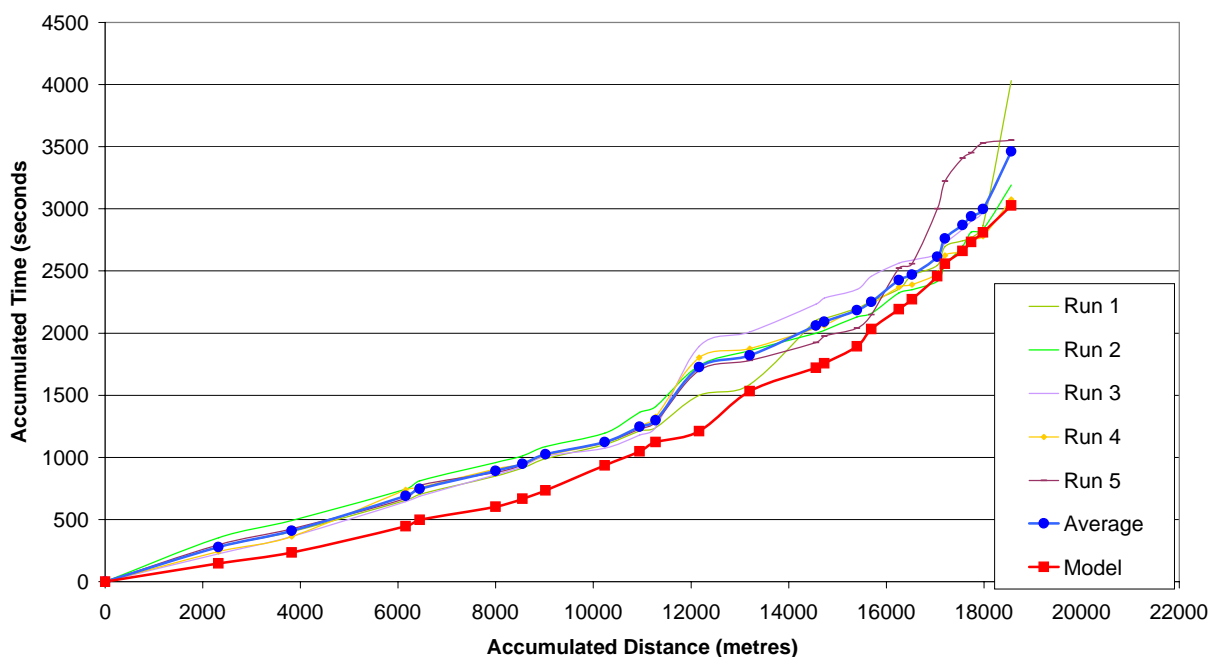
From	To	A Node	B Node	Distance (metres)	Observed Journey Time			
					Run 1	Run 2	Average	Model
Approach N81 Tallaght / Belgard Rd.	Approach N81 Tallaght / Belgard Rd.	4185	4185	0	0	0	0	0
Approach N81 Tallaght / Belgard Rd.	N81 Tallaght / Old Bawn Road	4185	4184	290	104	34	69	18
N81 Tallaght / Old Bawn Road	Greenhills Rd/ Tallaght Main St.	4184	4126	799	184	81	132	166
Greenhills Rd/ Tallaght Main St.	Greenhills Rd/ Airton Rd	4126	4125	1447	393	173	283	247
Greenhills Rd/ Airton Rd	Greenhills Rd/ Mayberry Rd	4125	4124	1973	446	290	368	318
Greenhills Rd/ Mayberry Rd	Greenhills Rd/ Tymon Rd	4124	4123	2351	482	344	413	420
Greenhills Rd/ Tymon Rd	Greenhills Rd/Ballymount Rd Upper	4123	4275	2984	627	430	528	493
Greenhills Rd/Ballymount Rd Upper	Greenhills Rd/ Walkinstown Ave - Walkinstown Roundabout	4275	2877	4626	692	657	674	774
Greenhills Rd/ Walkinstown Ave - Walkinstown Roundabout	Walkinstown Ave/ Drimmagh	2877	2866	5477	839	804	821	897
Walkinstown Ave/ Drimmagh	Drimnagh Rd/ Crumlin Rd @ Hospital	2866	2865	5954	963	862	912	970
Drimnagh Rd/ Crumlin Rd @ Hospital	Crumlin Rd/ Sundrive Rd	2865	2862	7608	1249	1188	1218	1219
Crumlin Rd/ Sundrive Rd	Crumlin Rd/ Dolphin Rd/ Grand Canal	2862	2861	7989	1294	1251	1272	1318
Crumlin Rd/ Dolphin Rd/ Grand Canal	Dolphins Barn/ SCR	2861	2363	8198	1344	1275	1309	1402
Dolphins Barn/ SCR	Dolphins Barn/ Marrowbone/ Donore	2363	2361	8749	1483	1319	1401	1521
Dolphins Barn/ Marrowbone/ Donore	Cork St./ Ardee St.	2361	2429	9242	1523	1383	1453	1615
Cork St./ Ardee St.	Dean St./ Patrick St.	2429	2424	9740	1612	1512	1562	1703
Dean St./ Patrick St.	Winetavern / High St/ Nicholas St	2424	2411	10195	1749	1583	1666	1907
Winetavern / High St/ Nicholas St	Dame St / Parliament St	2411	2018	10552	1821	1611	1716	2010
Dame St / Parliament St	Dame St / St. George's St	2018	2016	10735	1915	1629	1772	2082
Dame St / St. George's St	Dame St / Suffolk St. St.	2016	2014	10973	1945	1659	1802	2158
Dame St / Suffolk St. St.	Finish turning onto O'Connell Bridge	2014	1302	11550	2158	1737	1947	2375



Route 11

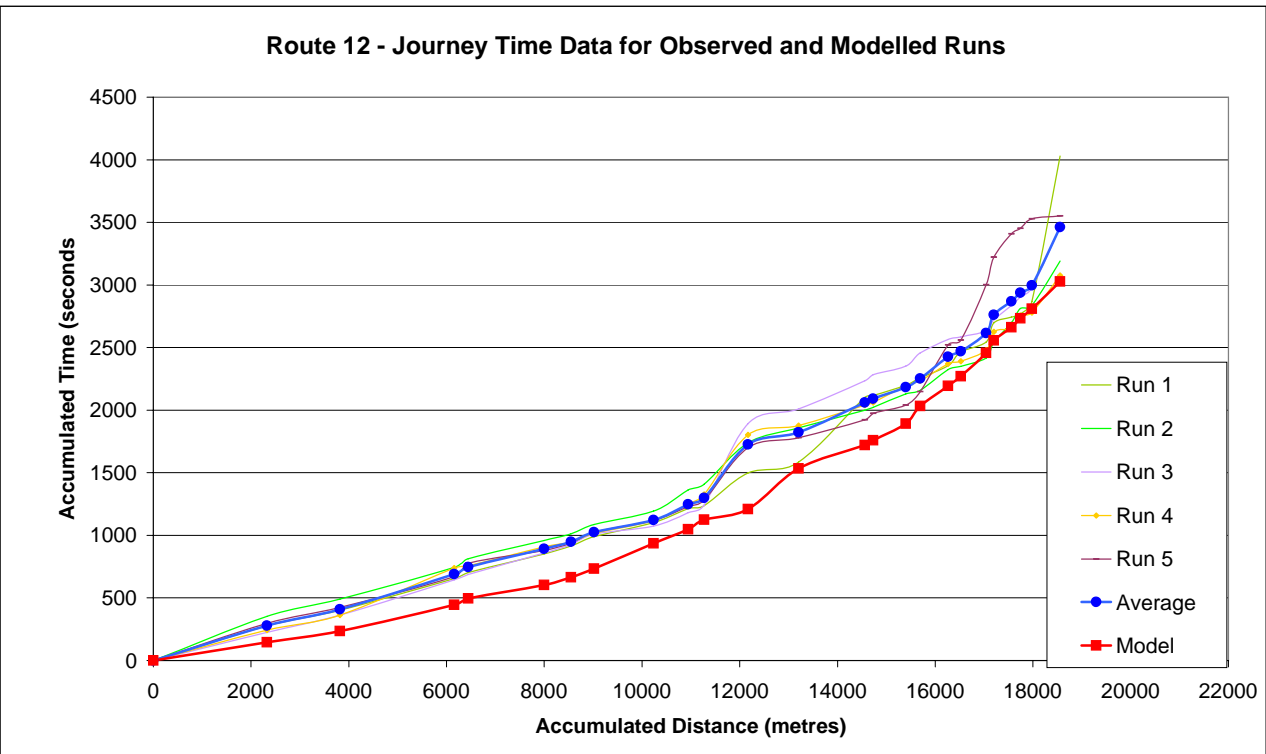
From	To	A Node	B Node	Distance (metres)	Observed Journey Time						Average	Model
					Run 1	Run 2	Run 3	Run 4	Run 5			
Approach Saggart Village crossroads from Rathcoole	Approach Saggart Village crossroads from Rathcoole	4119	4119	0	0	0	0	0	0	0	0	
Approach Saggart Village crossroads from Rathcoole	Blessington Rd. / N82	4119	4192	2322	277	353	224	243	296	279	146	
Blessington Rd. / N82	Blessington Road / Fortunestown Road	4192	4191	3819	402	491	362	364	425	409	234	
Blessington Road / Fortunestown Road	N81 Tallaght / Belgard	4191	4185	6155	655	745	644	738	670	690	445	
N81 Tallaght / Belgard	N81 Tallaght / Oldbawn Rd	4185	4184	6445	703	812	687	758	776	747	496	
N81 Tallaght / Oldbawn Rd	Tallaght Bypass/ Tallaght Rd - Roundabout	4184	4181	8000	851	959	860	907	879	891	604	
Tallaght Bypass/ Tallaght Rd - Roundabout	Tallaght Rd/ M50 Western Parkway	4181	4177	8546	915	1013	926	945	939	948	666	
Tallaght Rd/ M50 Western Parkway	Tallaght Rd/ Wellington Lane - Spawell Roundabout	4177	4171	9022	990	1087	1010	1014	1026	1025	733	
Tallaght Rd/ Wellington Lane - Spawell Roundabout	Tallaght Rd/ Cypress Grove Rd - Templeogue Bridge	4171	4162	10234	1103	1194	1075	1118	1121	1122	935	
Tallaght Rd/ Cypress Grove Rd - Templeogue Bridge	Templeogue Rd/ Templeville Rd	4162	4161	10947	1214	1363	1180	1251	1229	1247	1049	
Templeogue Rd/ Templeville Rd	Templeogue Rd/ Fortfield Rd	4161	2899	11274	1238	1408	1242	1326	1282	1299	1124	
Templeogue Rd/ Fortfield Rd	Templeogue Rd/ Terenure Rd - Terenure Cross	2899	2889	12170	1499	1738	1892	1803	1701	1727	1210	
Templeogue Rd/ Terenure Rd - Terenure Cross	Terenure Rd East/ Rathgar Ave/ Orwell Road	2889	2717	13202	1586	1859	2010	1876	1780	1822	1533	
Terenure Rd East/ Rathgar Ave/ Orwell Road	Rathmines Rd/ Castlewood Ave - Swan Centre	2717	2713	14559	2101	2000	2234	2041	1923	2060	1720	
Rathmines Rd/ Castlewood Ave - Swan Centre	Rathmines Rd/ Leinster Rd	2713	2712	14733	2117	2022	2282	2061	1975	2091	1758	
Rathmines Rd/ Leinster Rd	Rathmines Rd/ Canal Rd	2712	2711	15398	2200	2129	2352	2196	2040	2183	1893	
Rathmines Rd/ Canal Rd	Richmond St/ Adelaide Rd/ Harrington St	2711	2057	15694	2257	2159	2457	2235	2149	2251	2032	
Richmond St/ Adelaide Rd/ Harrington St	Wexford St/ Cuffe St	2057	2048	16260	2354	2324	2564	2371	2521	2427	2193	
Wexford St/ Cuffe St	Kevin Street Lower / Bride Street	2048	2023	16525	2464	2350	2586	2391	2559	2470	2271	
Kevin Street Lower / Bride Street	Kevin St/ Patrick Street	2023	2421	17045	2545	2417	2634	2480	3002	2616	2457	
Kevin St/ Patrick Street	Winetavern / High St/ Nicholas St	2421	2411	17202	2698	2542	2721	2625	3222	2762	2558	
Winetavern / High St/ Nicholas St	Dame St / Parliament St	2411	2018	17559	2743	2700	2836	2657	3407	2869	2661	
Dame St / Parliament St	Dame St / St. George's St	2018	2016	17742	2769	2813	2901	2756	3452	2938	2733	
Dame St / St. George's St	Dame St / Suffolk St	2016	2014	17980	2868	2836	2977	2780	3528	2998	2809	
Dame St / Suffolk St	Finish turning onto O'Connell Bridge	2014	1302	18557	4030	3191	3464	3076	3551	3462	3026	

Route 11 - Journey Time Data for Observed and Modelled Runs



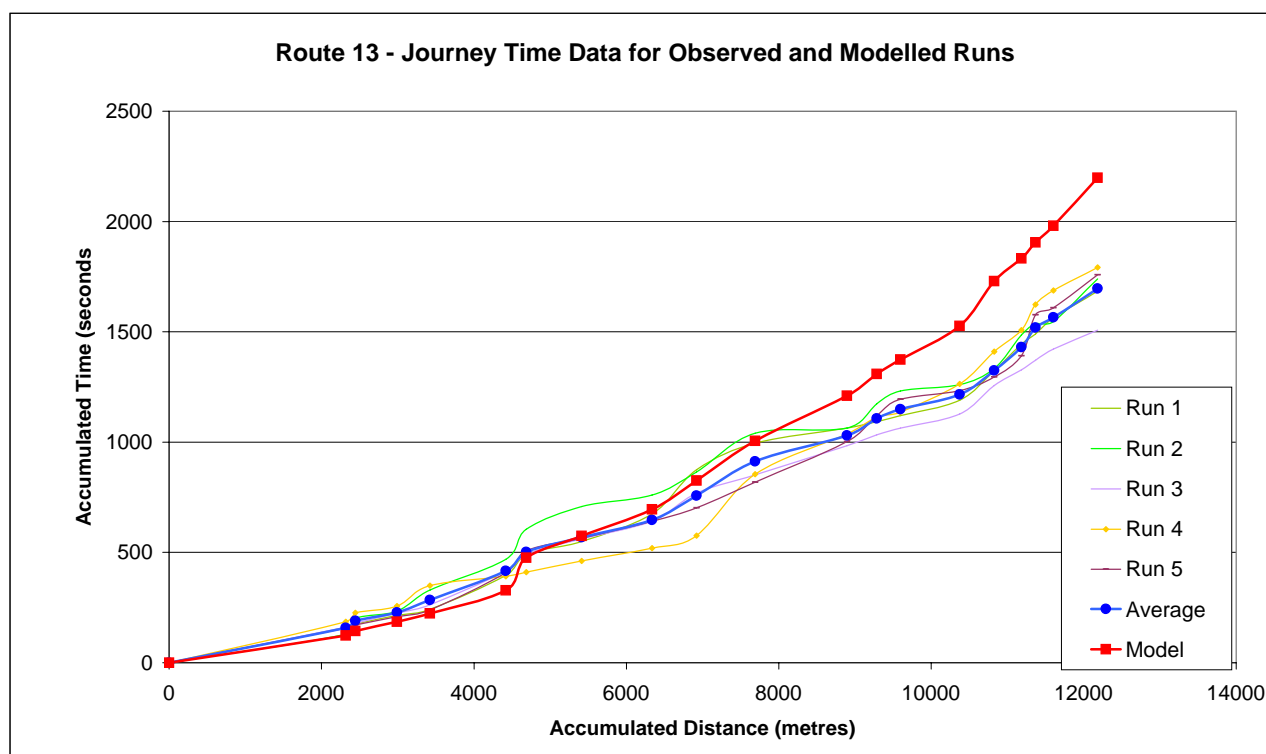
Route 12

From	To	A Node	B Node	Distance (metres)	Observed Journey Time					Model
					Run 1	Run 2	Run 3	Run 4	Average	
Bohernabreena Rd/ Firhouse Rd - Brigid Bu	Bohernabreena Rd/ Firhouse Rd - Brigid Burkes Roundabo	4021	4021	0						
Bohernabreena Rd/ Firhouse Rd - Brigid Burkes Roundabout	Firhouse Rd/ Ballycullen Rd	4021	4019	2007	165	120	165	195	161	142
Firhouse Rd/ Ballycullen Rd	Firhouse Rd/ Delafoird Ave	4019	4017	2283	185	180	199	229	198	168
Firhouse Rd/ Delafoird Ave	Firhouse Rd/ Knocknolly Rd	4017	4015	3492	304	240	292	334	293	315
Firhouse Rd/ Knocknolly Rd	Firhouse Rd/ Butterfield Ave/ Ballyroan Rd - Blue Haven	4015	4014	3764	328	300	370	360	340	375
Firhouse Rd/ Butterfield Ave/ Ballyroan Rd - Blue Haven	Butterfield Ave/ Fairways	4014	4012	4664	405	420	455	566	487	530
Butterfield Ave/ Fairways	Butterfield Ave/ Rathfarnham Rd	4012	4062	5460	575	600	573	637	596	630
Butterfield Ave/ Rathfarnham Rd	Rathfarnham Rd/ Dodder Park Rd	4062	4061	6219	676	720	732	786	728	768
Rathfarnham Rd/ Dodder Park Rd	Rathfarnham Rd/ Bushy Park Rd	4061	2721	6542	703	780	787	808	770	812
Rathfarnham Rd/ Bushy Park Rd	Terenure Rd North/ Terenure Rd East - Terenure Cross	2721	2897	6843	743	844	922	852	839	931
Terenure Rd North/ Terenure Rd East - Terenure Cross	Harolds Cross Rd/ Rathgar Ave/ Kennilworth - Five Roads	2897	2896	7882	896	1440	1023	959	1080	1115
Harolds Cross Rd/ Rathgar Ave/ Kennilworth - Five Roads	Harolds Cross Rd/ Lower Harolds Cross Rd - Harolds Cross	2896	2892	8758	1046	1500	1156	1058	1190	1294
Harolds Cross Rd/ Lower Harolds Cross Rd - Harolds Cross	Harolds Cross Rd/ Grove Rd @ Canal	2892	2891	9149	1084	1620	1256	1138	1275	1393
Harolds Cross Rd/ Grove Rd @ Canal	Dean St./ Patrick St.	2891	2424	10235	1227	2205	1406	1315	1538	1609
Dean St./ Patrick St.	High St./ Nicholas St.	2424	2411	10690	1378	2377	1557	1511	1706	1814
High St./ Nicholas St.	Dame St./ St. George's St	2411	2016	11230	1551	2439	1694	1737	1855	1989
Dame St./ St. George's St	Dame St./ Suffolk St.	2016	2014	11468	1580	2513	1790	1767	1913	2065
Dame St./ Suffolk St.	Finish turning onto O'Connell Bridge	2014	2001	11845	1835	2622	1944	1828	2057	2177



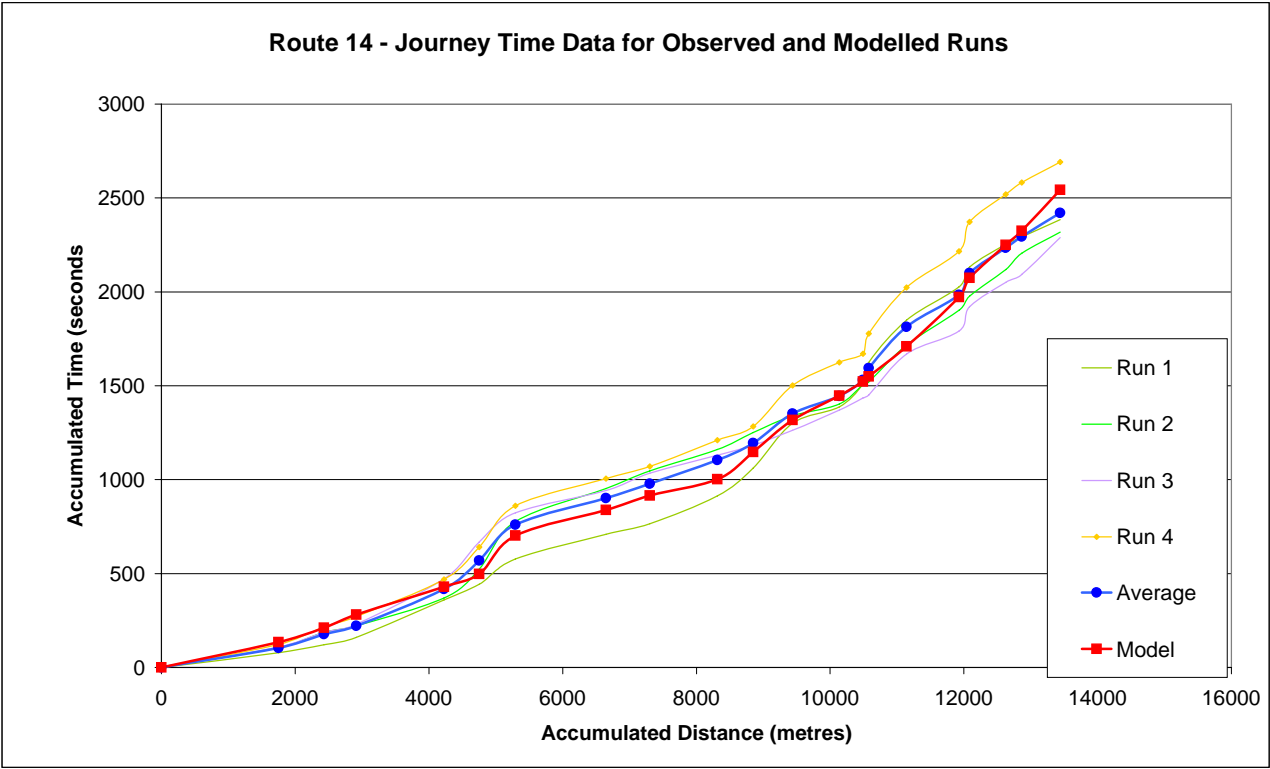
Route 13

From	To	A Node	B Node	Distance (metres)	Observed Journey Time						Average	Model
					Run 1	Run 2	Run 3	Run 4	Run 5			
Approach Tibbradden rd. / Edmonstown Junction	Approach Tibbradden rd. / Edmonstown Junction	4068	4068	0	0	0	0	0	0	0	0	
Approach Tibbradden rd. / Edmonstown Junction	Edmondstown Rd / Scholarstown Rd	4068	4067	2319	160	129	161	186	156	158	124	
Edmondstown Rd / Scholarstown Rd	Taylor's Lane / Ballyboden Rd Roundabout	4067	4066	2443	175	201	179	227	171	191	143	
Taylor's Lane / Ballyboden Rd Roundabout	Ballyroan Rd/ Ballyboden Rd	4066	4065	2988	215	234	225	257	209	228	186	
Ballyroan Rd/ Ballyboden Rd	Ballyroan Rd/ Marian Rd	4065	4031	3424	242	329	262	350	239	284	224	
Ballyroan Rd/ Marian Rd	Ballyroan Rd/ Butterfield Ave - Blue Haven	4031	4014	4419	396	468	415	392	408	416	328	
Ballyroan Rd/ Butterfield Ave - Blue Haven	Old Bridge Rd/ Templeogue Rd - N81	4014	4162	4686	492	605	492	411	508	502	476	
Old Bridge Rd/ Templeogue Rd - N81	Templeville Rd/ Wainfort Rd Roundabout	4162	4284	5412	550	708	561	461	564	569	575	
Templeville Rd/ Wainfort Rd Roundabout	Wainfort Rd/ Fortfield Rd	4284	2888	6338	675	761	641	520	642	648	695	
Wainfort Rd/ Fortfield Rd	Kimmage Rd/ Terenure Rd @ KCR	2888	2886	6921	875	865	669	576	702	757	825	
Kimmage Rd/ Terenure Rd @ KCR	Kimmage Rd Lower/ Larkfield park/ Sundrive	2886	2885	7688	996	1041	852	854	819	912	1006	
Kimmage Rd Lower/ Larkfield park/ Sundrive	Harolds Cross Rd/ Lower Harolds Cross Rd - Harolds Cross	2885	2892	8894	1064	1063	984	1037	1002	1030	1210	
Harolds Cross Rd/ Lower Harolds Cross Rd - Harolds Cross	Harolds Cross Rd/ Grove Rd @ Canal	2892	2891	9285	1093	1174	1033	1114	1120	1107	1309	
Harolds Cross Rd/ Grove Rd @ Canal	Clanbrassil St/ SCR	2891	2443	9593	1121	1232	1063	1136	1194	1149	1374	
Clanbrassil St/ SCR	Patrick St/ Dean St.	2443	2424	10371	1190	1261	1128	1264	1234	1215	1526	
Patrick St/ Dean St.	High Street / Nicholas St	2424	2411	10826	1325	1334	1256	1411	1295	1324	1730	
High Street / Nicholas St	Dame St / Parliament St	2411	2018	11183	1444	1486	1327	1507	1391	1431	1833	
Dame St / Parliament St	Dame St / St. George's St	2018	2016	11366	1490	1536	1371	1624	1577	1520	1905	
Dame St / St. George's St	Dame St / Suffolk St.	2016	2014	11604	1562	1547	1422	1687	1609	1565	1981	
Dame St / Suffolk St.	Finish turning onto O'Connell Bridge	2014	1302	12181	1684	1739	1507	1792	1758	1696	2198	



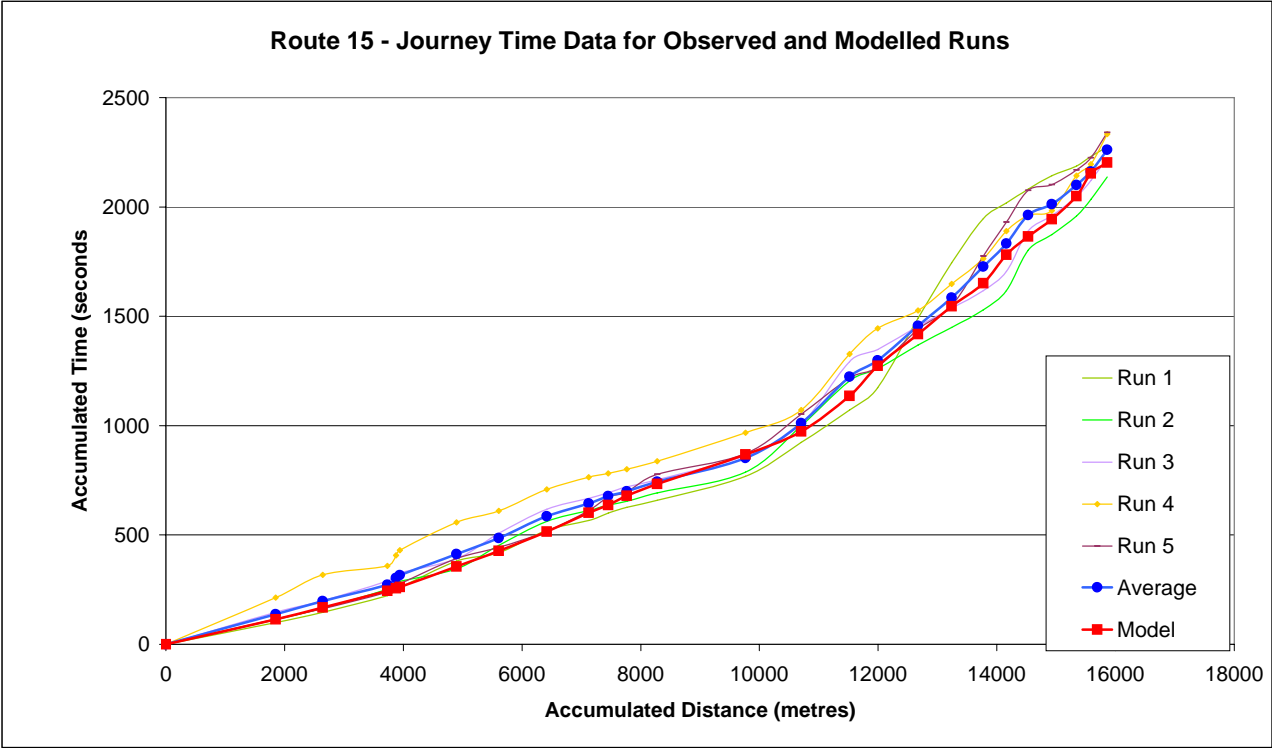
Route 14

From	To	A Node	B Node	Distance (metres)	Observed Journey Time					Model
					Run 1	Run 2	Run 3	Run 4	Average	
Eniskerry Rd / Burrow Rd	Eniskerry Rd / Burrow Rd	5139	5139	0	0	0	0	0	0	0
Eniskerry Rd / Burrow Rd	Blackglan rd / Hillcrest Rd	5139	5138	1754	78	105	109	123	104	134
Blackglan rd / Hillcrest Rd	Sandyford Rd/ Kilgobbin Rd - Sandyford Village	5138	5137	2431	121	187	187	216	178	211
Sandyford Rd/ Kilgobbin Rd - Sandyford Villag	Sandyford Rd/ Blackthorn Drive - Sandyford Industrial Estate	5137	5136	2917	161	221	230	271	221	281
Sandyford Rd/ Blackthorn Drive - Sandyford In	Sandyford Rd/ Wyckham	5136	5127	4227	359	370	472	468	417	429
Sandyford Rd/ Wyckham	Main St / Ballinteer rd/ Upper Kilmacud Rd	5127	5134	4754	443	523	669	641	569	498
Main St/ Ballinteer rd/ Upper Kilmacud Rd	Dundrum Rd/ Churchtown Rd Upr @ Taney Cross	5134	5132	5295	578	778	823	861	760	702
Dundrum Rd/ Churchtown Rd Upr @ Taney Cr	Dundrum Rd/ Bird Ave	5132	5131	6650	709	953	943	1005	902	838
Dundrum Rd/ Bird Ave	Dundrum Rd/ Milltown Rd	5131	2908	7304	765	1046	1034	1071	979	915
Dundrum Rd/ Milltown Rd	Milltown Rd/ Sandford Rd	2908	2919	8313	914	1161	1130	1210	1104	1003
Milltown Rd/ Sandford Rd	Sandford Rd / Marlborough Rd	2919	2917	8851	1062	1251	1183	1284	1195	1147
Sandford Rd / Marlborough Rd	Ranelagh/ Charleston rd	2917	2913	9437	1301	1339	1263	1501	1351	1317
Ranelagh/ Charleston rd	Ranelagh/ Canal Rd	2913	2911	10136	1388	1402	1370	1624	1446	1447
Ranelagh/ Canal Rd	Charlemont St/ Harcourt Rd	2911	2055	10489	1512	1506	1436	1670	1531	1523
Charlemont St/ Harcourt Rd	Harrington St/ Richmond St	2055	2057	10578	1625	1520	1450	1777	1593	1549
Harrington St/ Richmond St	Aungier St/ Cuffe St	2057	2048	11144	1850	1716	1668	2023	1814	1710
Aungier St/ Cuffe St	Kevin Street / Patrick St	2048	2421	11929	2026	1903	1792	2216	1984	1973
Kevin Street / Patrick St	Nicholas St / High St	2421	2411	12086	2133	1977	1921	2372	2101	2075
Nicholas St / High St	Dame St / St. George's St	2411	2016	12626	2254	2119	2050	2519	2236	2250
Dame St / St. George's St	Dame St / Suffolk St	2016	2014	12864	2292	2205	2094	2583	2294	2325
Dame St / Suffolk St	Finish turning onto O'Connell Bridge	2014	1302	13441	2385	2318	2289	2692	2421	2543



Route 15

From	To	A Node	B Node	Distance (metres)	Observed Journey Time						Average	Model
					Run 1	Run 2	Run 3	Run 4	Run 5			
N11 / Wyatville Rd	N11 / Wyatville Rd	5028	5028	-	0	0	0	0	0	0	0	
N11 / Wyatville Rd	N11 / Johnstown Rd	5028	5027	1852	100	113	147	214	116	138	114	
N11 / Johnstown Rd	N11 / Clonkeen Rd	5027	5026	2641	147	165	199	318	162	198	168	
N11 / Clonkeen Rd	N11 / Mart Lane	5026	5024	3733	223	252	290	359	239	273	245	
N11 / Mart Lane	N11 / Westminster Rd	5024	-	3875	249	277	318	407	262	303	257	
N11 / Westminster Rd	N11 / Kill Lane	-	5023	3941	259	289	328	431	276	317	262	
N11 / Kill Lane	Stillorgan Rd/ Leopardstown Rd - Whites Cross	5023	5022	4899	380	345	391	558	393	413	356	
Stillorgan Rd/ Leopardstown Rd - Whites Cross	Stillorgan Rd/ Brewery Rd	5022	5021	5610	418	453	508	610	443	486	427	
Stillorgan Rd/ Brewery Rd	Stillorgan Rd/ Lower Kilmacud Rd	5021	5019	6416	521	562	617	708	517	585	515	
Stillorgan Rd/ Lower Kilmacud Rd	Stillorgan Rd/ Lower Trees Rd	5019	5018	7126	567	612	667	764	612	644	602	
Stillorgan Rd/ Lower Trees Rd	Stillorgan Rd/ Mount Merrion Ave	5018	5017	7451	600	636	694	781	674	677	637	
Stillorgan Rd/ Mount Merrion Ave	Stillorgan Rd/ Booterstown Ave	5017	5016	7765	626	654	720	801	696	699	679	
Stillorgan Rd/ Booterstown Ave	Stillorgan Rd/ Fosters Ave	5016	5015	8280	658	692	752	837	777	743	734	
Stillorgan Rd/ Fosters Ave	Stillorgan Rd/ Nutley lane	5015	2944	9767	769	787	864	967	872	852	868	
Stillorgan Rd/ Nutley lane	Stillorgan Rd/ Eglinton Road	2944	2942	10704	923	1000	1009	1072	1053	1011	974	
Stillorgan Rd/ Eglinton Road	Donnybrook Rd/ Marlborough Rd	2942	2940	11516	1072	1205	1293	1327	1218	1223	1136	
Donnybrook Rd/ Marlborough Rd	Leeson St Upr/ Appian Way	2940	2938	11993	1174	1260	1348	1444	1269	1299	1273	
Leeson St Upr/ Appian Way	Leeson St Lwr/ Mespil Rd	2938	2931	12673	1492	1368	1456	1527	1441	1457	1418	
Leeson St Lwr/ Mespil Rd	Leeson St Lwr/ St. Stephens Green East	2931	2106	13241	1745	1449	1537	1648	1549	1586	1546	
Leeson St Lwr/ St. Stephens Green East	St. Stephens Green North/Dawson Street	2106	2085	13774	1946	1530	1618	1764	1776	1727	1651	
St. Stephens Green North/Dawson Street	Dawson Street / Nassau Street	2085	2082	14161	2019	1618	1706	1889	1930	1832	1781	
Dawson Street / Nassau Street	Lincoln Place / Westland Row	2082	2131	14528	2081	1802	1890	1962	2076	1962	1865	
Lincoln Place / Westland Row	Westland Row / Pearse Street	2131	2154	14925	2143	1873	1961	1984	2102	2013	1944	
Westland Row / Pearse Street	Pearse Street / Tara Street	2154	2152	15339	2187	1958	2046	2143	2169	2100	2049	
Pearse Street / Tara Street	Tara Street / Burgh Quay	2152	2172	15586	2230	2034	2122	2196	2225	2161	2153	
Tara Street / Burgh Quay	Burgh Quay / O'Connell Bridge	2172	2001	15857	2274	2137	2225	2333	2341	2262	2203	



Route 16

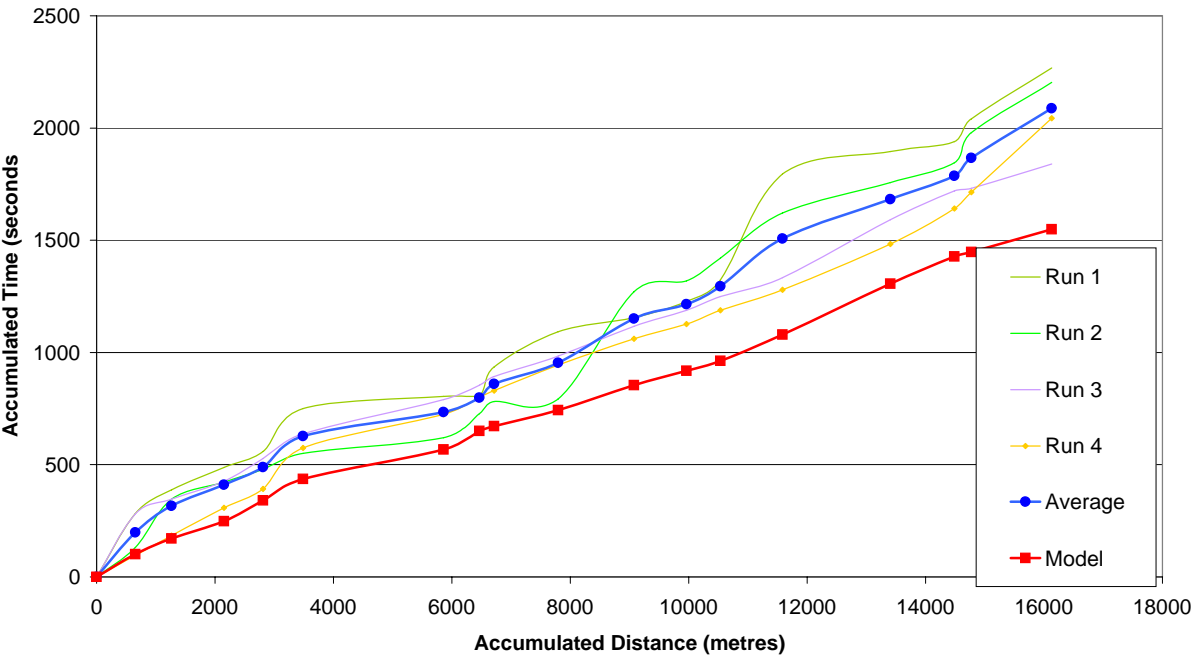
From	To	A Node	B Node	Distance (metres)	Observed Journey Time						Model
					Run 1	Run 2	Run 3	Run 4	Run 5	Average	
Approach Monkstown Crescent / Carrick Brennan Rd	Approach Monkstown Crescent / Carrick Brennan Rd	5081	5081	0	0	0	0	0	0	0	0
Approach Monkstown Crescent / Carrick Brennan Rd	Monkstown Rd / Temple Hill/ Stradbrook	5081	5047	1252	179	134	139	125	107	137	151
Monkstown Rd / Temple Hill/ Stradbrook	Frascati Rd / Carysfort Rd	5047	5045	1882	286	384	242	339	367	324	250
Frascati Rd / Carysfort Rd	Rock Rd/ Mt. Merrion Ave	5045	5043	2249	372	635	278	542	647	495	483
Rock Rd/ Mt. Merrion Ave	Rock Rd/ Booterstown Ave	5043	5042	3424	523	967	386	1187	969	806	633
Rock Rd/ Booterstown Ave	Rock Rd/ Trimelston Rd	5042	5041	3859	575	1207	426	1370	1026	921	714
Rock Rd/ Trimelston Rd	Rock Rd/Strand Rd - Merrion Gate	5041	2970	4443	620	1237	467	1412	1066	960	783
Rock Rd/Strand Rd - Merrion Gate	Merrion Rd/ Nutley Lane	2970	2969	4999	701	1280	543	1462	1108	1019	842
Merrion Rd/ Nutley Lane	Merrion Rd/ Ailesbury Rd	2969	2968	5282	723	1320	581	1525	1189	1068	882
Merrion Rd/ Ailesbury Rd	Merrion Rd/ Sandymount Ave/ Simmonscourt	2968	2967	6183	846	1381	694	1624	1276	1164	980
Merrion Rd/ Sandymount Ave/ Simmonscourt	Merrion Rd/ Serpentine Ave	2967	2966	6418	862	1470	730	1646	1293	1200	1032
Merrion Rd/ Serpentine Ave	Merrion Rd/ Angelsea Rd	2966	2965	6690	884	1484	804	1672	1311	1231	1087
Merrion Rd/ Angelsea Rd	Northumberland Rd / Pembroke Rd	2965	2962	7188	966	1506	850	1748	1377	1289	1172
Northumberland Rd / Pembroke Rd	Northumberland Rd / Haddington Rd	2962	2961	7655	1037	1573	896	1877	1476	1372	1245
Northumberland Rd / Haddington Rd	Mount St/ Warrington Place	2961	2134	7894	1083	1658	961	1939	1553	1439	1315
Mount St/ Warrington Place	Mount St/ Holles St.	2134	2133	8346	1190	1672	1061	1994	1615	1506	1398
Mount St/ Holles St.	Merrion Sq/ Clare St	2133	2132	8674	1218	1719	1099	2080	1649	1553	1452
Merrion Sq/ Clare St	Lincoln Place / Westland Row	2132	2141	8959	1293	1745	1196	2161	1716	1622	1513
Lincoln Place / Westland Row	Westland Row / Pearse St.	2141	2154	9212	1339	1818	1222	2231	1790	1680	1569
Westland Row / Pearse St.	Pearse St / Tara St.	2154	2152	9626	1403	1854	1304	2312	1877	1750	1674
Pearse St / Tara St.	Burgh Quay/ Tara St.	2152	2172	9873	1472	1929	1354	2352	1972	1816	1778
Burgh Quay/ Tara St.	Finish turning onto O'Connell Bridge	2172	2001	10144	1591	2119	1425	2386	2154	1935	1828



Route 17A

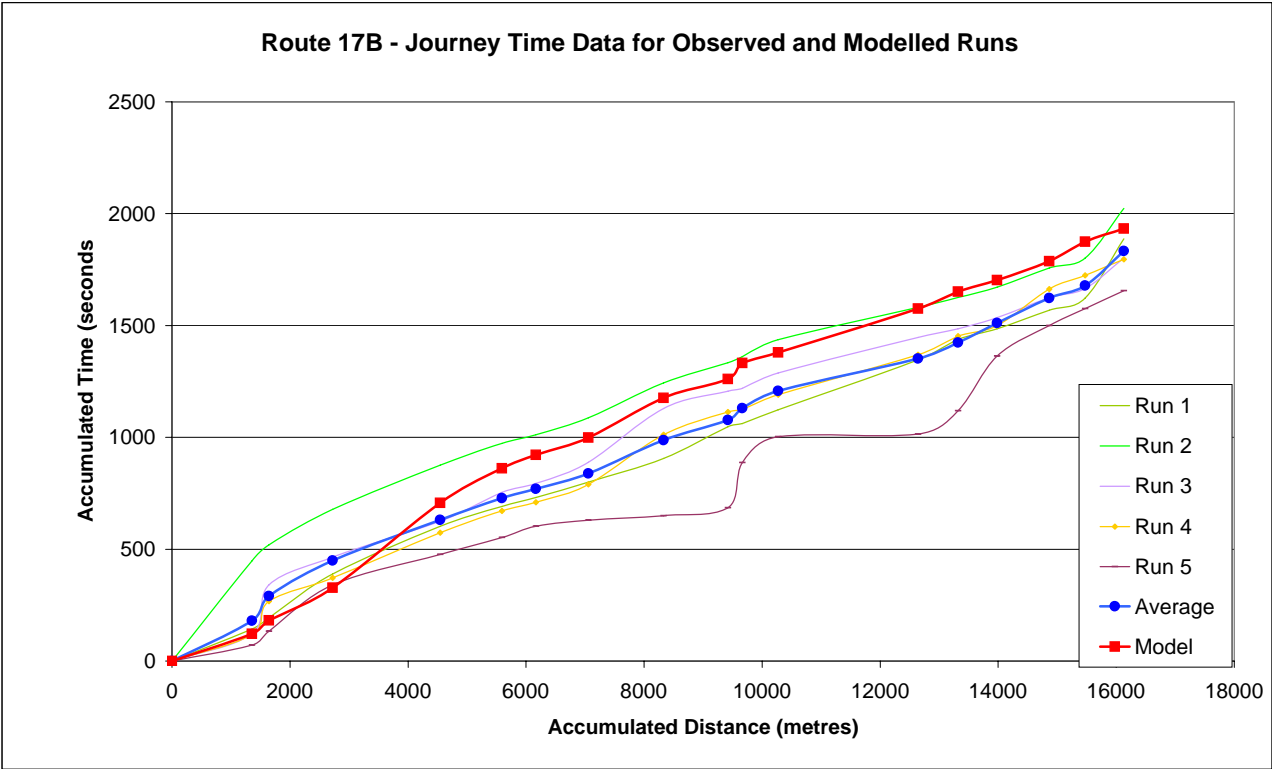
From	To	A Node	B Node	Distance (metres)	Observed Journey Time					Model
					Run 1	Run 2	Run 3	Run 4	Average	
Start approaching Newtown Park Avenue /	Start approaching Newtown Park Avenue / N11	5022	5022	0	0	0	0	0	0	0
Start approaching Newtown Park Avenue / N11	Leopardstown Rd / Torquay Rd	5022	5001	655	283	131	281	96	198	101
Leopardstown Rd / Torquay Rd	Leopardstown Rd / Brewery Rd Roundabout	5001	5186	1263	388	347	346	185	316	171
Leopardstown Rd / Brewery Rd Roundabout	Leopardstown Rd / Murphystown Rd	5186	9568	2149	488	422	426	308	411	248
Leopardstown Rd / Murphystown Rd	Hillcrest / Kilgobbin Rd	9568	5415	2811	559	479	527	393	489	341
Hillcrest / Kilgobbin Rd	Sandyford Rd / Blackglen Rd / Enniskerry	5415	5138	3488	750	550	638	575	628	436
Sandyford Rd / Blackglen Rd / Enniskerry	Harolds Grange Rd / Grange Rd	5138	5109	5859	804	620	790	725	735	568
Harolds Grange Rd / Grange Rd	Grange Rd / Brehon Field Road	5109	5108	6465	810	728	854	801	798	651
Grange Rd / Brehon Field Road	Grange Rd / Stonemasons Way	5108	5107	6711	936	781	893	830	860	671
Grange Rd / Stonemasons Way	Grange Rd / Taylors lane	5107	4083	7797	1093	793	984	945	954	743
Grange Rd / Taylors lane	Taylors Lane / Ballyboden Rd	4083	4066	9075	1155	1271	1117	1062	1151	854
Taylors Lane / Ballyboden Rd	Scholarstown Rd / Knocklyon Rd	4066	4035	9964	1228	1319	1188	1127	1215	918
Scholarstown Rd / Knocklyon Rd	Scholarstown Rd / Knocklyon Rd	4035	4034	10537	1323	1420	1250	1188	1295	962
Scholarstown Rd / Knocklyon Rd	Scholarstown Link Rd / Ballycullen Rd	4034	4042	11584	1795	1622	1333	1279	1507	1079
Scholarstown Link Rd / Ballycullen Rd	Oldbawn Rd / Firhouse Rd	4042	4002	13407	1896	1757	1592	1484	1682	1306
Oldbawn Rd / Firhouse Rd	Oldbawn Rd / N81 Tallaght Bypass	4002	4184	14484	1940	1846	1720	1642	1787	1427
Oldbawn Rd / N81 Tallaght Bypass	Belgard Rd / N81 Tallaght Bypass	4184	4185	14774	2041	1980	1732	1715	1867	1447
Belgard Rd / N81 Tallaght Bypass	Finish at The Square (N81 / Whitestown Way)	4185	4188	16129	2267	2203	1840	2044	2088	1549

Route 17A - Journey Time Data for Observed and Modelled Runs



Route 17B

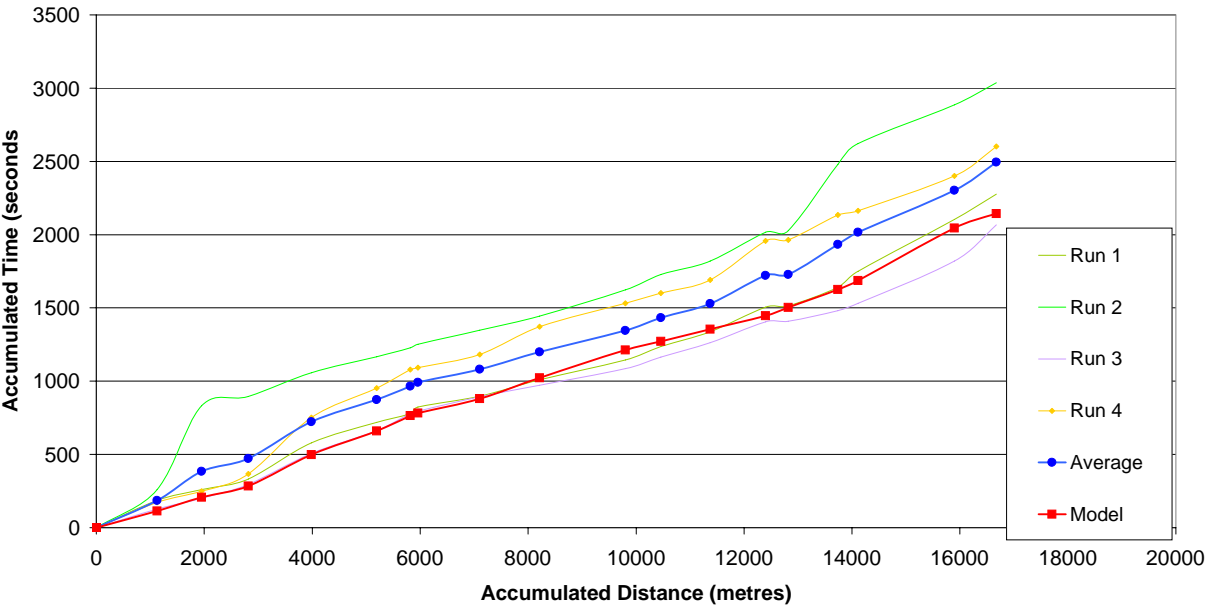
From	To	A Node	B Node	Distance (metres)	Observed Journey Time						Model
					Run 1	Run 2	Run 3	Run 4	Run 5	Average	
Start at The Square (N81 / Whitestown Way)	Start at The Square (N81 / Whitestown Way)	4188	4188		0	0	0	0	0	0	0
Start at The Square (N81 / Whitestown Way)	Belgard Rd / N81 Tallaght Bypass	4188	4185	1355	143	448	122	117	71	180	122
Belgard Rd / N81 Tallaght Bypass	Oldbawn Rd / N81 Tallaght Bypass	4185	4184	1645	193	519	341	268	133	291	182
Oldbawn Rd / N81 Tallaght Bypass	Oldbawn Rd / Firhouse Rd	4184	4002	2722	389	678	465	372	340	449	328
Oldbawn Rd / Firhouse Rd	Scholarstown Link Rd. / Ballycullen Rd.	4002	4042	4545	603	876	625	574	477	631	707
Scholarstown Link Rd. / Ballycullen Rd.	Scholarstown Rd / Knocklyon Rd	4042	4034	5592	691	973	754	671	552	728	862
Scholarstown Rd / Knocklyon Rd	Scholarstown R' about	4034	4035	6165	731	1012	794	710	603	770	921
Scholarstown R' about	Taylor's Lane / Ballyboden Rd	4035	4066	7054	800	1087	889	790	630	839	999
Taylor's Lane / Ballyboden Rd	Grange Rd / Taylor's lane	4066	4083	8332	906	1243	1129	1012	650	988	1176
Grange Rd / Taylor's lane	Grange Rd / Stonemasons Way	4083	5107	9418	1047	1334	1207	1113	686	1077	1261
Grange Rd / Stonemasons Way	Grange Rd / Brehon Field Rd.	5107	5108	9664	1062	1361	1219	1125	887	1131	1332
Grange Rd / Brehon Field Rd.	Harolds Grange Rd / Grange Rd	5108	5109	10270	1124	1437	1288	1190	1003	1208	1380
Harolds Grange Rd / Grange Rd	Sandyford Rd / Blackglen Rd	5109	5138	12641	1347	1581	1447	1370	1015	1352	1576
Sandyford Rd / Blackglen Rd	Hillcrest / Kilgobbin Rd	5138	5415	13318	1438	1626	1485	1453	1119	1424	1652
Hillcrest / Kilgobbin Rd	Leopardstown Rd/ Murphystown Rd	5415	9568	13980	1486	1672	1535	1500	1364	1511	1703
Leopardstown Rd/ Murphystown Rd	Leopardstown Rd/ Brewery Rd	9568	5186	14866	1569	1757	1624	1663	1499	1622	1788
Leopardstown Rd/ Brewery Rd	Leopardstown Rd/ Torquay Rd	5186	5001	15474	1623	1802	1666	1725	1575	1678	1874
Leopardstown Rd/ Torquay Rd	Finish at the Junction of New Town Park Ave and Stillorgan Rd.	5001	5022	16129	1888	2023	1802	1796	1656	1833	1933



Route 18A

From	To	A Node	B Node	Distance (metres)	Observed Journey Time					Average	Model
					Run 1	Run 2	Run 3	Run 4			
Mount Merrion Ave / Cross Ave	Mount Merrion Ave / Cross Ave	5043	5032	0	0	0	0	0	0	0	
Mount Merrion Ave / Cross Ave	Mount Merrion Ave / Stillorgan Rd	5032	5017	1124	185	259	127	173	186	113	
Mount Merrion Ave / Stillorgan Rd	Stillorgan Rd / Fosters Ave	5017	5015	1953	259	832	201	250	385	208	
Stillorgan Rd / Fosters Ave	Fosters Ave / Roebuck Rd	5015	5172	2815	331	896	295	366	472	284	
Fosters Ave / Roebuck Rd	Mount Anville Rd / Goatstown Rd @ The Goat	5172	5165	3986	579	1057	507	752	724	499	
Mount Anville Rd / Goatstown Rd @ The Goat	Churchtown Rd Upper / Dundrum Rd @ Taney Cross	5165	5132	5192	718	1166	661	953	874	659	
Churchtown Rd Upper / Dundrum Rd @ Taney Cross	Churchtown Rd Upper / Churchtown Rd Lwr	5132	5112	5814	778	1228	780	1079	966	764	
Churchtown Rd Upper / Churchtown Rd Lwr	Churchtown Rd Upper / Beaumont Ave	5112	5113	5958	824	1252	796	1093	991	782	
Churchtown Rd Upper / Beaumont Ave	Braemor Rd / Braemor Park	5113	5102	7102	897	1349	894	1182	1080	880	
Braemor Rd / Braemor Park	Dodder Park Rd (N81) / Rathfarnham Rd	5102	4061	8211	1009	1445	972	1372	1199	1022	
Dodder Park Rd (N81) / Rathfarnham Rd	Templeville Rd / Templeogue Rd	4061	4161	9799	1145	1624	1085	1531	1346	1212	
Templeville Rd / Templeogue Rd	Templeville Rd / Wainsfort Rd - Roundabout	4161	4284	10462	1236	1728	1165	1602	1433	1272	
Templeville Rd / Wainsfort Rd - Roundabout	Templeville Rd / Whitehall Rd	4284	4283	11375	1338	1821	1263	1692	1528	1355	
Templeville Rd / Whitehall Rd	St. Peter's Rd / Greenhills Rd	4283	4281	12400	1505	2017	1404	1957	1721	1447	
St. Peter's Rd / Greenhills Rd	Walkinstown Roundabout	4282	2877	12817	1515	2027	1410	1965	1729	1503	
Walkinstown Roundabout	Walkinstown Ave / Long Mile Rd	2877	2867	13740	1641	2479	1482	2134	1934	1626	
Walkinstown Ave / Long Mile Rd	Kylemore Rd / Naas Rd	2867	2845	14113	1750	2622	1532	2162	2016	1686	
Kylemore Rd / Naas Rd	Kylemore Rd / Ballyfermot Rd	2845	2826	15898	2105	2887	1820	2401	2303	2044	
Kylemore Rd / Ballyfermot Rd	Finish at Kylemore Rd / Lucan Rd @ T-Junction	2826	2816	16676	2277	3036	2066	2602	2495	2144	

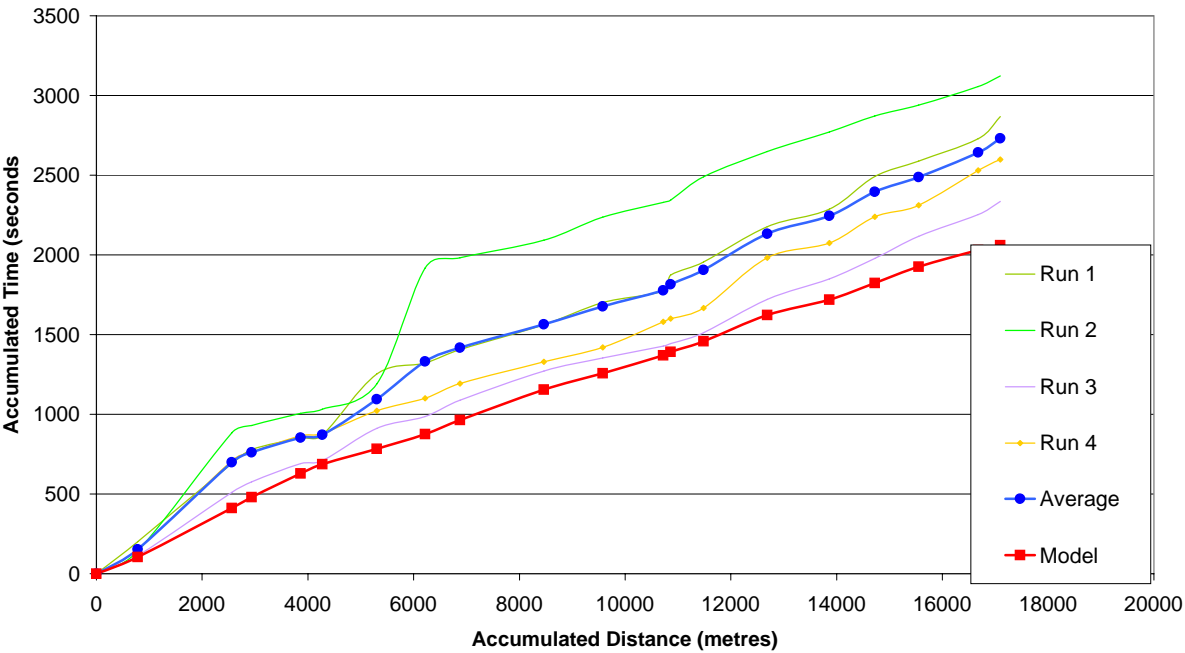
Route 18A - Journey Time Data for Observed and Modelled Runs



Route 18B

From	To	A Node	B Node	Distance (metres)	Observed Journey Time					Average	Model
					Run 1	Run 2	Run 3	Run 4			
Kylemore Rd/ Lucan Rd @ T-Junction	Kylemore Rd/ Lucan Rd @ T-Junction	2816	2816	0	0	0	0	0	0	0	
Kylemore Rd/ Lucan Rd @ T-Junction	Kylemore Rd/ Ballyfermot Rd	2816	2826	778	201	141	113	153	152	105	
Kylemore Rd / Ballyfermot Rd	Kylemore Rd / Naas Rd	2826	2845	2563	692	883	511	708	698	411	
Kylemore Rd / Naas Rd	Walkinstown Ave / Long Mile Rd	2845	2867	2936	779	930	576	763	762	479	
Walkinstown Ave / Long Mile Rd	Walkinstown Roundabout	2867	2877	3859	851	1006	690	865	853	628	
Walkinstown Roundabout	St. Peter's Rd / Greenhills Rd	2877	4281	4276	869	1032	708	879	872	686	
St. Peter's Rd / Greenhills Rd	Templeville Rd / Whitehall Rd	4281	4283	5301	1253	1190	911	1023	1094	783	
Templeville Rd / Whitehall Rd	Templeville Rd / Wainsfort Rd - Roundabout	4283	4284	6214	1321	1917	986	1100	1331	875	
Templeville Rd / Wainsfort Rd - Roundabout	Templeville Rd / Templeogue Rd	4284	4161	6877	1407	1982	1088	1192	1417	963	
Templeville Rd / Templeogue Rd	Dodder Park Road/ Rathfarnham Rd	4161	4061	8465	1562	2093	1271	1329	1564	1154	
Dodder Park Road/ Rathfarnham Rd	Braemor Rd / Braemor Park	4061	5102	9574	1701	2236	1353	1419	1677	1258	
Braemor Rd / Braemor Park	Churchtown Rd Upper / Beaumont Ave	5102	5113	10718	1773	2330	1427	1580	1778	1370	
Churchtown Rd Upper / Beaumont Ave	Churchtown Rd Upper / Churchtown Rd Lwr	5113	5112	10862	1873	2343	1443	1600	1815	1392	
Churchtown Rd Upper / Churchtown Rd Lwr	Churchtown Rd Upper / Dundrum Rd @ Taney Cross	5112	5132	11484	1956	2489	1512	1666	1906	1457	
Churchtown Rd Upper / Dundrum Rd @ Taney Cross	Mount Anville Rd / Goatstown Rd @ The Goat	5132	5165	12690	2177	2649	1720	1981	2132	1622	
Mount Anville Rd / Goatstown Rd @ The Goat	Fosters Ave / Roebuck Rd	5165	5172	13861	2287	2772	1849	2075	2246	1719	
Fosters Ave / Roebuck Rd	Stillorgan Rd / Fosters Ave	5172	5015	14723	2492	2872	1977	2238	2395	1824	
Stillorgan Rd / Fosters Ave	Mount Merrion Ave / Stillorgan Rd	5015	5017	15552	2588	2939	2116	2312	2489	1926	
Mount Merrion Ave / Stillorgan Rd	Mount Merrion Ave / Cross Ave	5017	5032	16676	2729	3056	2254	2531	2642	2030	
Mount Merrion Ave / Cross Ave	Junction of mount Merrion Ave & Rock Rd	5032	5043	17095	2867	3122	2335	2599	2731	2060	

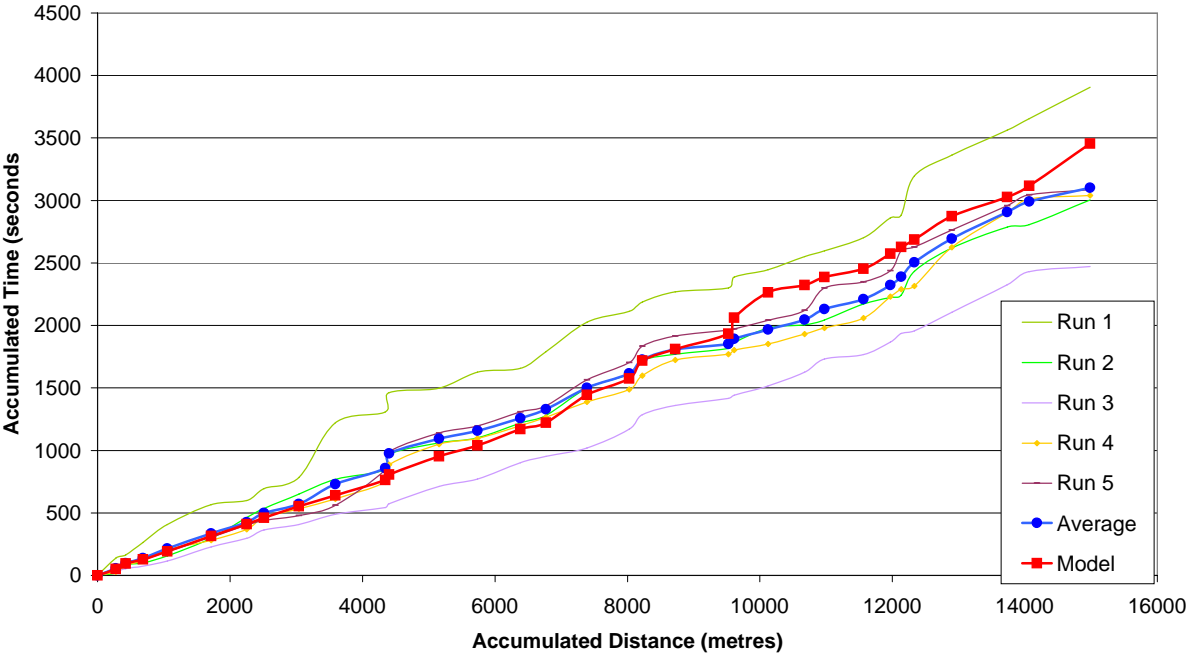
Route 18B - Journey Time Data for Observed and Modelled Runs



Route 19A

From	To	A Node	B Node	Distance (metres)	Observed Journey Time						Model
					Run 1	Run 2	Run 3	Run 4	Run 5	Average	
Approach City Quay / Moss St from bridge	Approach City Quay / Moss St from bridge	2173	2173	0	0	0	0	0	0	0	0
Approach City Quay / Moss St from bridge	City Quay/ Lombard St	2173	2174	274	139	20	30	28	59	55	51
City Quay/ Lombard St	Townsend St / Lombard St	2174	2166	427	163	83	53	83	111	99	95
Townsend St / Lombard St	Sandwith/ Pearse	2166	2155	687	264	101	75	117	129	137	128
Sandwith/ Pearse	Pearse St / Macken St	2155	2157	1053	406	155	116	205	189	214	192
Pearse St / Macken St	Ringsend St / South Lotts Rd	2157	2158	1716	565	296	227	283	308	336	314
Ringsend St / South Lotts Rd	Haddington Rd / Shelbourne Rd	2158	2981	2253	599	464	296	370	403	426	409
Haddington Rd / Shelbourne Rd	Haddington Rd / Northumberland Rd	2981	2961	2515	694	536	364	464	441	500	460
Haddington Rd / Northumberland Rd	Mespil Rd / Baggot Street Upper	2961	2951	3038	784	651	407	533	479	571	553
Mespil Rd / Baggot Street Upper	Lesson Street / Grand Parade	2951	2931	3589	1221	768	488	612	562	730	641
Lesson Street / Grand Parade	Ranelagh/ Canal Rd	2931	2901	4342	1310	846	544	749	844	859	764
Ranelagh/ Canal Rd	Rathmines Rd Lower / Canal Rd	2901	2711	4400	1463	971	573	886	992	977	806
Rathmines Rd Lower / Canal Rd	Harold's Cross Rd / Grove Rd	2711	2891	5157	1499	1060	711	1051	1141	1092	952
Harold's Cross Rd / Grove Rd	Harold's Cross Rd / Clogher Rd	2891	2871	5736	1626	1102	770	1095	1196	1158	1039
Harold's Cross Rd / Clogher Rd	Crumlin Rd / Dolphin Rd	2871	2861	6383	1656	1219	901	1198	1310	1257	1171
Crumlin Rd / Dolphin Rd	Dolphin Rd / Herberton Rd	2861	2851	6770	1789	1280	953	1265	1357	1329	1221
Dolphin Rd / Herberton Rd	Dolphin Rd / Suir Rd/ Davitt Rd	2851	2353	7391	2026	1499	1020	1389	1564	1500	1444
Dolphin Rd / Suir Rd/ Davitt Rd	Emmet Rd / South Circular Rd	2353	2326	8028	2113	1612	1171	1488	1702	1617	1574
Emmet Rd / South Circular Rd	South Circular Rd / Con Colbert Rd	2326	2316	8224	2187	1720	1286	1599	1834	1725	1719
South Circular Rd / Con Colbert Rd	South Circular Rd / Conyngham Rd	2316	1942	8722	2268	1771	1361	1724	1915	1808	1810
South Circular Rd / Conyngham Rd	Main Rd/ Parkgate St @ Phoenix Park Gates	1942	1941	9524	2300	1815	1416	1770	1961	1852	1934
Main Rd/ Parkgate St @ Phoenix Park Gates	Parkgate St / Infirmary Rd	1941	1484	9610	2386	1861	1442	1803	1973	1893	2061
Parkgate St / Infirmary Rd	Infirmary Rd / NCR	1484	1486	10122	2447	1980	1517	1851	2042	1967	2264
Infirmary Rd / NCR	Blackhorse Ave / NCR	1486	1471	10675	2551	2006	1627	1932	2120	2047	2322
Blackhorse Ave / NCR	Old Cabra Rd / Prussia St/ NCR	1471	1469	10972	2596	2044	1731	1980	2301	2130	2387
Old Cabra Rd / Prussia St/ NCR	NCR / Rathdown Rd	1469	1459	11564	2703	2172	1768	2059	2348	2210	2454
NCR / Rathdown Rd	NCR / Dalymount	1459	1431	11968	2860	2222	1868	2230	2438	2324	2574
NCR / Dalymount	NCR / Phibsborough	1431	1428	12132	2885	2244	1937	2289	2599	2391	2628
NCR / Phibsborough	NCR / Berkely Road	1428	1415	12334	3196	2432	1958	2315	2627	2506	2686
NCR / Berkely Road	NCR / Dorset St. Lwr	1415	1394	12900	3363	2619	2106	2624	2764	2695	2873
NCR / Dorset St. Lwr	NCR Summerhill Parade	1394	1329	13735	3563	2787	2325	2901	2958	2907	3028
NCR Summerhill Parade	Portland Row / Amiens St	1329	1319	14068	3656	2807	2431	3012	3045	2990	3116
Portland Row / Amiens St	Finish at City Quay / Moss St	1319	2173	14985	3905	3005	2471	3040	3087	3102	3455

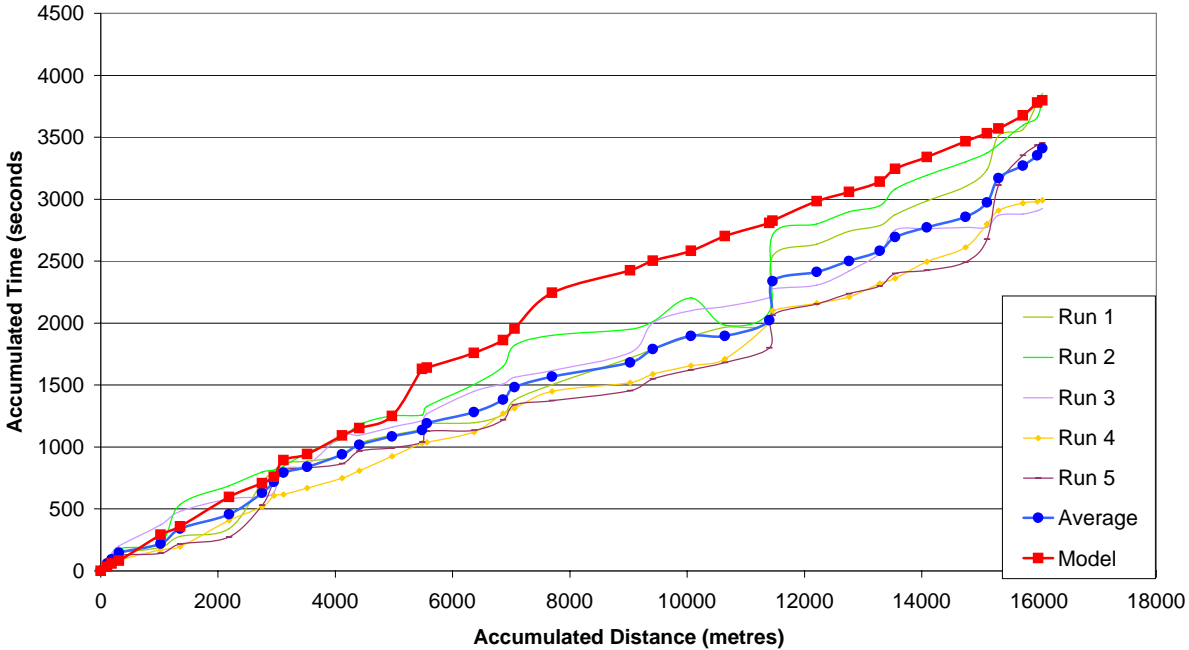
Route 19A - Journey Time Data for Observed and Modelled Runs



Route 19B

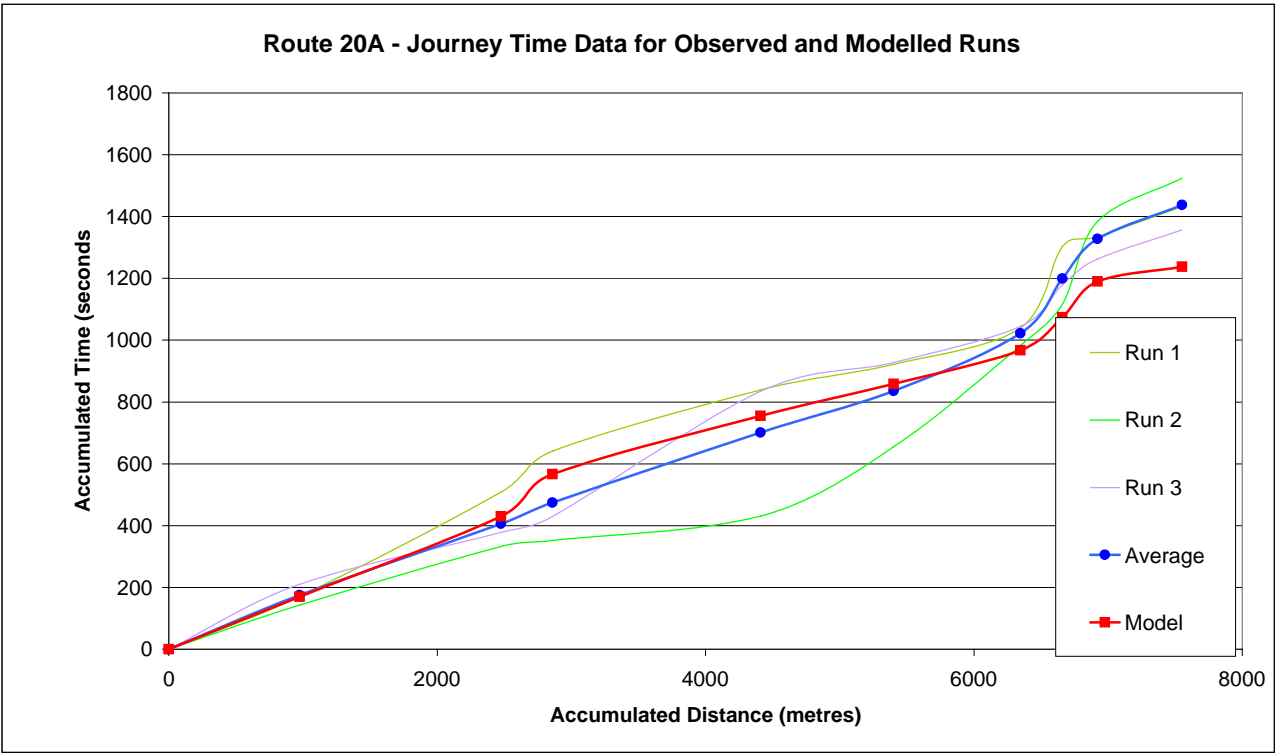
From	To	A Node	B Node	Distance (metres)	Observed Journey Time						Average	Model
					Run 1	Run 2	Run 3	Run 4	Run 5			
Approach Eden Quay / Beresford Place from Approach Eden Quay / Beresford Place from Butt Bridge		1303	1303	0	0	0	0	0	0	0	0	
Approach Eden Quay / Beresford Place from Butt Bridge	Beresford Place / Abbey St	1303	1311	110	84	48	54	43	68	59	33	
Beresford Place / Abbey St	Beresford Place / Gardiner St	1311	1312	183	137	56	141	55	76	93	59	
Beresford Place / Gardiner St	Beresford Place / Amiens St	1312	1314	312	149	177	201	87	127	148	82	
Beresford Place / Amiens St	Amiens St / Portland Row @ Five Lamps	1314	1319	1019	191	225	371	170	141	220	291	
Amiens St / Portland Row @ Five Lamps	NCR / Summerhill Parade	1319	1329	1352	278	538	480	196	218	342	359	
NCR / Summerhill Parade	NCR / Lwr Dorset St	1329	1394	2187	340	688	581	409	274	458	596	
NCR / Lwr Dorset St	NCR / Berkeley Rd	1394	1415	2753	713	797	598	516	530	631	708	
NCR / Berkeley Rd	NCR / Phibsborough	1415	1428	2955	808	815	636	607	723	718	759	
NCR / Phibsborough	NCR / Dalymount	1428	1431	3119	870	846	822	617	813	794	893	
NCR / Dalymount	NCR / Rathdown Rd	1431	1459	3523	886	957	854	669	831	839	943	
NCR / Rathdown Rd	Old Cabra Rd / Prussia St	1459	1469	4115	927	1070	1092	748	866	941	1094	
Old Cabra Rd / Prussia St	Blackhorse Ave / NCR	1469	1471	4412	1031	1182	1096	808	966	1017	1153	
Blackhorse Ave / NCR	Infirmary Rd / NCR	1471	1486	4965	1096	1249	1159	926	991	1084	1249	
Infirmary Rd / NCR	Parkgate St / Infirmary Rd	1486	1484	5477	1144	1257	1213	1031	1039	1137	1629	
Parkgate St / Infirmary Rd	Parkgate St @ phoenix park gates	1484	1941	5563	1187	1327	1269	1039	1127	1190	1640	
Parkgate St @ phoenix park gates	South Circular Rd / Conyngham Rd	1941	1942	6365	1197	1504	1450	1121	1135	1281	1758	
South Circular Rd / Conyngham Rd	South Circular Rd / Con Colbert Rd	1942	2316	6863	1260	1650	1509	1270	1220	1382	1862	
South Circular Rd / Con Colbert Rd	Emmet Rd / South Circular Rd	2316	2326	7059	1379	1821	1564	1311	1340	1483	1955	
Emmet Rd / South Circular Rd	Dolphin Rd / Suir Rd	2326	2353	7696	1504	1902	1616	1449	1374	1569	2245	
Dolphin Rd / Suir Rd	Dolphin Rd / Herberton Rd	2353	2851	9030	1717	1950	1763	1520	1455	1681	2426	
Dolphin Rd / Herberton Rd	Crumlin Rd / Dolphin Rd	2851	2861	9417	1791	2013	2002	1588	1551	1789	2504	
Crumlin Rd / Dolphin Rd	Harold's Cross Rd / Clogher Rd	2861	2871	10064	1894	2204	2101	1655	1622	1895	2583	
Harold's Cross Rd / Clogher Rd	Harold's Cross Rd / Grove Rd	2871	2891	10643	1967	1985	2133	1709	1682	1895	2701	
Harold's Cross Rd / Grove Rd	Rathmines Rd Lower / Canal Rd	2891	2711	11400	2017	2094	2206	2002	1800	2024	2808	
Rathmines Rd Lower / Canal Rd	Ranelagh Rd / Canal Rd	2711	2901	11458	2540	2712	2275	2101	2061	2338	2826	
Ranelagh Rd / Canal Rd	Lesson Street / Grand Parade	2901	2931	12211	2637	2799	2308	2159	2155	2412	2984	
Lesson Street / Grand Parade	Mespil Rd / Baggot Street Upper	2931	2951	12762	2740	2898	2421	2211	2236	2501	3059	
Mespil Rd / Baggot Street Upper	Haddington Rd / Northumberland Rd	2951	2961	13285	2787	2948	2562	2320	2298	2583	3142	
Haddington Rd / Northumberland Rd	Haddington Rd / Shelbourne Rd	2961	2981	13547	2875	3083	2751	2361	2401	2694	3245	
Haddington Rd / Shelbourne Rd	Ringsend St / South Lotts Rd	2981	2158	14084	2986	3193	2761	2496	2425	2772	3340	
Ringsend St / South Lotts Rd	Pearse St / Macken St	2158	2157	14747	3102	3301	2771	2611	2494	2856	3467	
Pearse St / Macken St	Pearse St / Sandwith St	2157	2155	15113	3239	3373	2775	2800	2677	2973	3531	
Pearse St / Sandwith St	Pearse St / Lombard St	2155	2154	15308	3512	3440	2870	2908	3113	3169	3571	
Pearse St / Lombard St	Pearse St / Tara St	2154	2152	15722	3561	3595	2880	2967	3353	3271	3676	
Pearse St / Tara St	Tara St / Burgh Quay	2152	2172	15969	3782	3660	2905	2981	3435	3353	3780	
Tara St / Burgh Quay	Finish @ Eden Quay / Beresford Place	2172	1303	16059	3854	3828	2923	2991	3453	3410	3797	

Route 19A - Journey Time Data for Observed and Modelled Runs



Route 20A

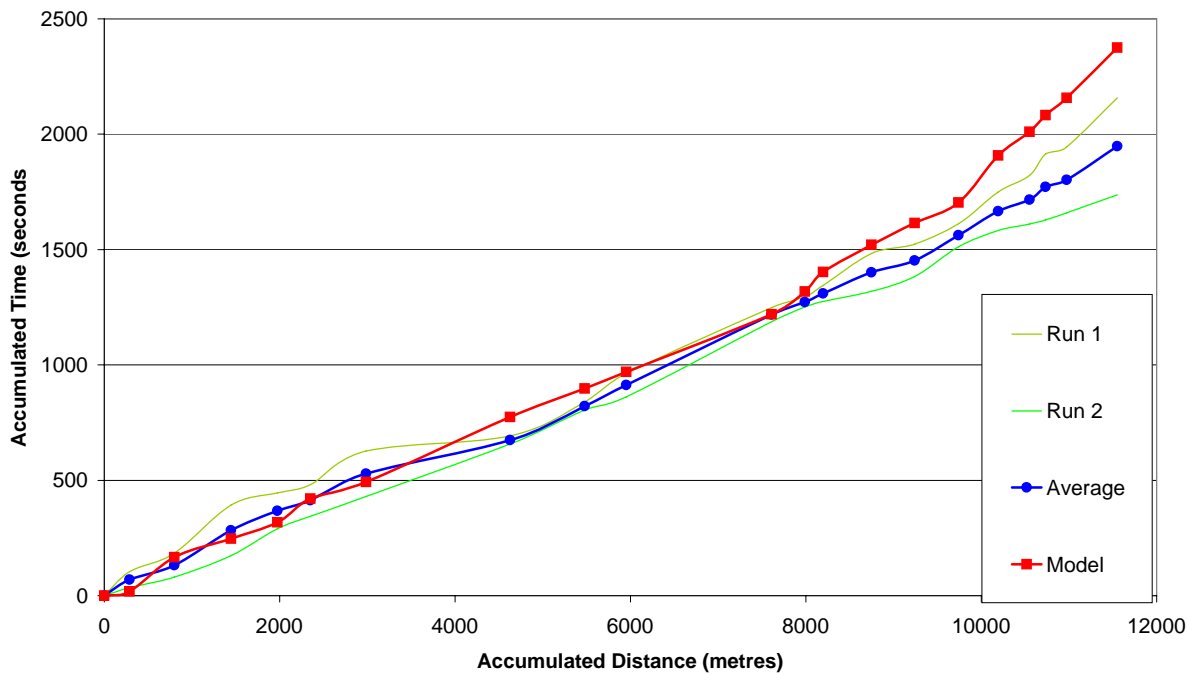
From	To	A Node	B Node	Distance (metres)	Observed				Model
					Run 1	Run 2	Run 3	Average	
Howth Rd/ Collins Ave	Howth Rd/ Collins Ave	1633	1633	0	0	0	0	0	0
Howth Rd/ Collins Ave	Malahide Rd/ Collins Ave	1633	1673	976	171	143	210	175	170
Malahide Rd/ Collins Ave	Grace Park Rd/ Collins Ave	1673	1813	2476	508	332	378	406	430
Grace Park Rd/ Collins Ave	Swords Rd/ Collins Ave	1813	1858	2861	641	352	430	474	567
Swords Rd/ Collins Ave	Ballymun Rd/ Collins Ave	1858	1725	4411	839	431	835	702	755
Ballymun Rd/ Collins Ave	Beneavan Drive/ Glasnevin Ave - Roundabout	1725	1744	5403	922	656	928	835	859
Beneavan Drive/ Glasnevin Ave - Roundabout	Ballygall Rd West/ Clune Rd/ Glasanaon	1744	1743	6348	1040	983	1045	1023	967
Ballygall Rd West/ Clune Rd/ Glasanaon	Seamus Ennis Rd/ McKee Avenue	1743	1742	6659	1303	1116	1179	1199	1074
Seamus Ennis Rd/ McKee Avenue	Seamus Ennis Rd/ N2	1742	1772	6922	1335	1385	1262	1327	1190
Seamus Ennis Rd/ N2	Finish at the Junction of Mellows Rd and Cappagh Rd	1772	1788	7552	1432	1524	1357	1438	1238



Route 20B

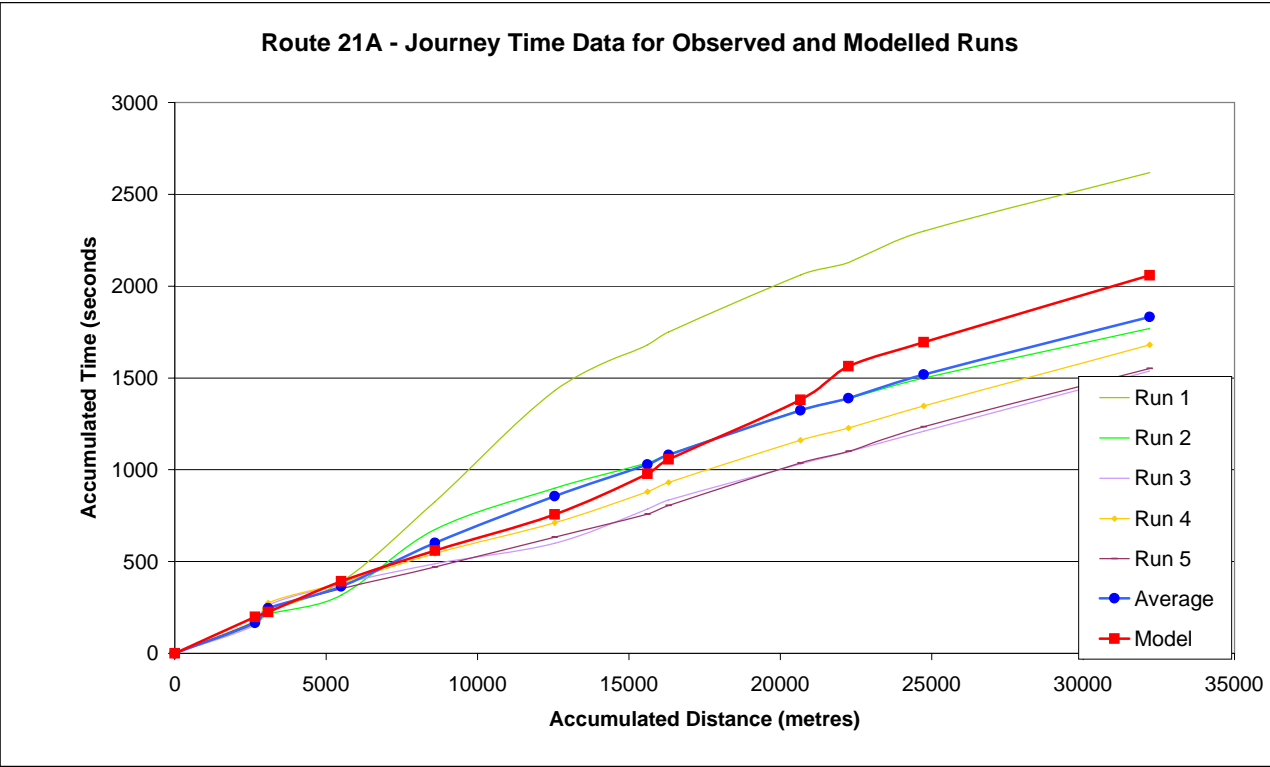
From	To	A Node	B Node	Distance (metres)	Observed Journey Time			
					Run 1	Run 2	Average	Model
Approach junction of Mellowes Rd / Cappagh	Approach junction of Mellowes Rd / Cappagh Rd	1788	1788	0	0	0	0	0
Approach junction of Mellowes Rd / Cappagh Rd	Mellowes Rd / North Road N2	1788	1772	630	111	197	154	91
Mellowes Rd / North Road N2	Seamus Ennis Rd / McKee Avenue	1772	1742	893	208	386	297	224
Seamus Ennis Rd / McKee Avenue	Ballygall Rd West / Clune Rd	1742	1743	1204	253	406	329	281
Ballygall Rd West / Clune Rd	Beneavin Drive / Glasnevin Ave	1743	1744	2149	352	485	418	366
Beneavin Drive / Glasnevin Ave	Ballymun Rd / Collins Ave	1744	1725	3141	612	710	661	537
Ballymun Rd / Collins Ave	Swords Rd / Collins Ave	1725	1858	4691	934	1037	985	852
Swords Rd / Collins Ave	Grace Park Rd / Collins Ave	1858	1813	5076	1012	1170	1091	938
Grace Park Rd / Collins Ave	Malahide Rd / Collins Ave	1813	1673	6576	1213	1439	1326	1237
Malahide Rd / Collins Ave	The Howth Rd and Collins Ave.	1673	1633	7552	1334	1578	1456	1316

Route 20B - Journey Time Data for Observed and Modelled Runs



Route 21A

From	To	A Node	B Node	Distance (metres)	Observed Journey Time							
					Run 1	Run 2	Run 3	Run 4	Run 5	Average	Model	
Approach N32 / Malahide Rd	Approach N32 / Malahide Rd	1682	1682									
Approach N32 / Malahide Rd	N32 / Clonsaugh Rd	1682	1847	2651	175	163	154	167	172	166	198	
N32 / Clonsaugh Rd	M50 / M1	1847	3537	3091	230	215	263	276	242	245	224	
M50 / M1	M50 / R108	3537	3644	5493	389	318	379	385	352	365	392	
M50 / St. Margaret's Road	M50 / N2	3644	3754	8591	827	674	488	543	471	601	559	
M50 / N2	M50 / N3	3754	3434	12548	1432	900	600	712	633	855	757	
M50 / N3	M50 / Toll Bridge	3434	3360	15616	1681	1038	786	880	758	1029	978	
M50 / Toll Bridge	M50 / N4	3360	4324	16316	1750	1084	835	931	805	1081	1056	
M50 / N4	M50 / Naas Rd	4324	4224	20661	2060	1324	1032	1161	1038	1323	1381	
M50 / Naas Rd	M50 / Ballymount Interchange	4224	4291	22256	2129	1388	1099	1227	1100	1389	1564	
M50 / Ballymount Interchange	M50 / N81 Tallaght Rd	4291	4174	24738	2300	1499	1210	1347	1235	1518	1695	
M50 / N81 Tallaght Rd	End of M50 @ Ballinteer Road	4174	4097	32202	2619	1770	1537	1680	1551	1831	2059	



Route 21B

From	To	A Node	B Node	Distance (metres)	Observed Journey Time						Model
					Run 1	Run 2	Run 3	Run 4	Average		
Approach Start of M50 from Ballinteer Rd	Approach Start of M50 from Ballinteer Rd	4097	4097	0	0	0	0	0	0	0	
Approach Start of M50 from Ballinteer Rd	M50 / N81 Tallaght Rd	4097	4174	7464	314	293	313	275	299	319	
M50 / N81 Tallaght Rd	M50 / Ballymount Interchange	4174	4291	9946	426	458	446	396	432	438	
M50 / Ballymount Interchange	M50 / Naas Rd	4291	4224	11541	480	520	511	464	494	549	
M50 / Naas Rd	M50 / N4	4224	4324	15886	827	922	842	710	825	867	
M50 / N4	M50 / Toll Bridge	4324	3360	16586	1049	1199	1042	783	1018	937	
M50 / Toll Bridge	M50 / N3	3360	3434	19654	1156	1304	1147	896	1126	1165	
M50 / N3	M50 / N2	3434	3754	23611	1331	1469	1295	1051	1287	1386	
M50 / N2	M50 / St. Margaret's Rd	3754	3728	24350	1361	1497	1318	1079	1314	1428	
M50 / St. Margaret's Rd	M50 / R 108	3713	3644	26709	1450	1606	1394	1153	1401	1561	
M50 / R 108	M50 / M1	3644	3537	29136	1559	1759	1533	1338	1547	1718	
M50 / M1	Clonsaugh Rd / N32	3537	1847	29576	1591	1797	1578	1382	1587	1761	
Clonsaugh Rd / N32	N32 / Malahide Rd	1847	1682	32227	1871	1958	1753	1532	1779	1920	



