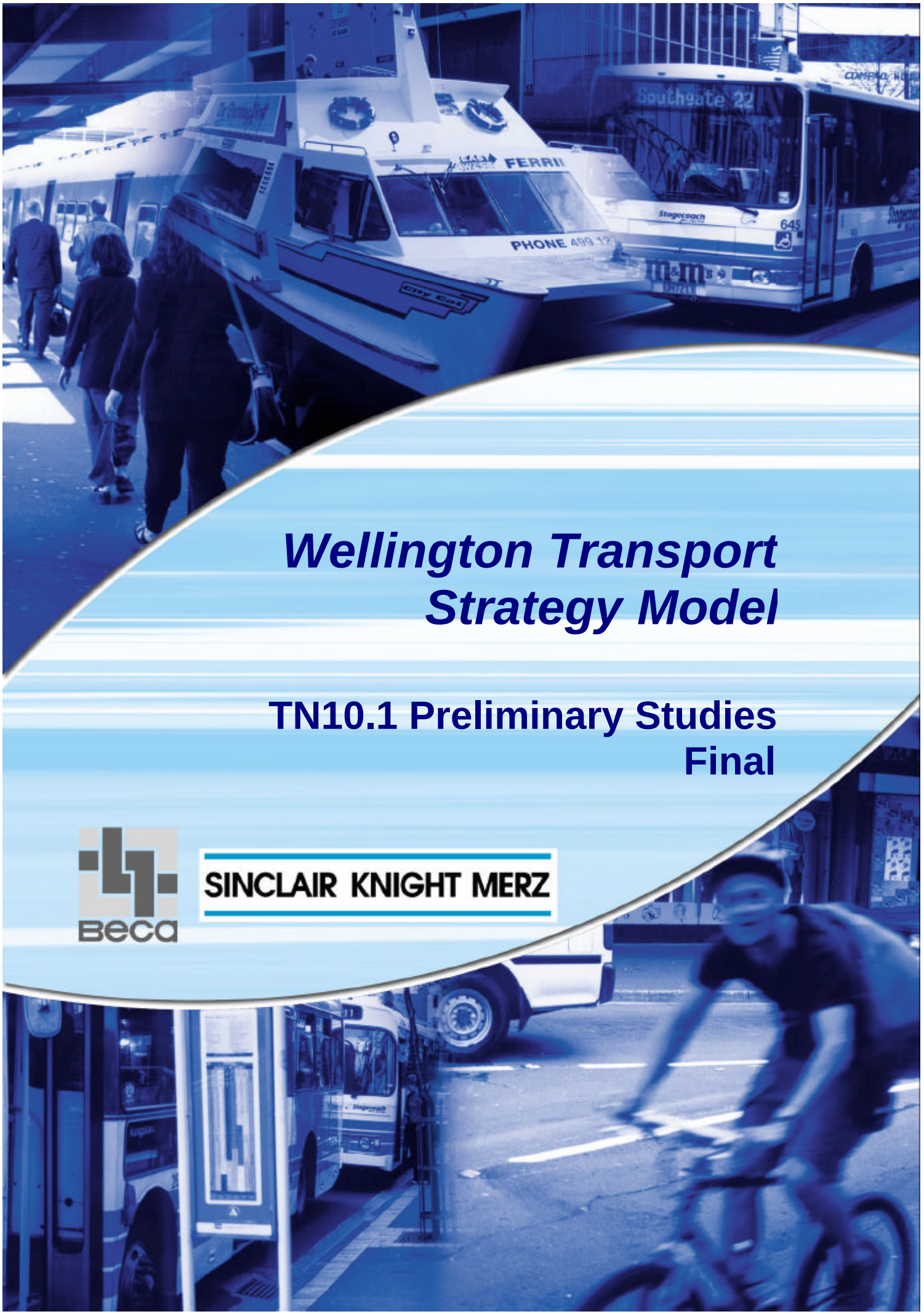


Wellington Transport Strategy Model

TN10.1 Preliminary Studies
Final

Beca

SINCLAIR KNIGHT MERZ

Wellington Transport Strategy Model

TN10.1 Preliminary Studies

Final

November 2002

prepared for

Greater Wellington – The Regional Council

By

Beca Carter Hollings & Ferner Ltd

And

Sinclair Knight Merz

Contents

Document History and Status

Issue	Rev.	Issued To	Qty	Date	Reviewed	Approved
1	1	WRC – Nick Sargent Steve Hewett – Beca Carter	1 electronic	1 November 2002	DJA	DJA

Printed:	1 November, 2002
Last Saved:	1 November, 2002
File Name:	P:\81\8110573\Task 10 - Preliminary Studies\Prelimstudiesv4.Doc
Author:	David Ashley
Project Manager:	Daniel Brown
Name of Organisation:	Wellington Regional Council
Name of Project:	WTSM Recalibration
Name of Document:	Preliminary Studies Report
Document Version:	Final
Project Number:	SF02030

1. Introduction

The Technical Specification outlined a preliminary studies task whose purpose was to undertake preliminary analyses of the survey data in order to inform a number of detailed decisions on the form and structure of the model. This report documents this task.

It is in three parts.

This main text summarises the main conclusions from each sub-task, with the overall conclusions being given at the end of the document.

Appendix A provides tables and figures supporting these conclusions.

Appendix B provides, for reference purposes, the detailed specifications of the analyses for the individual sub-tasks. As such it gives a fuller background to some of the issues. In particular, fuller discussions are given of Tasks 2.10 and 2.11.

For convenient cross-referencing, so far as possible each report uses identical chapter headings/numbers and similar sub-headings/numbers.

A few sections are not yet 100% complete (Review of Performance of Present Model, Generalised Cost and Ports & Airports). It is intended that these modifications will be issued as an addendum to this report at the appropriate time.

2. Task 2.1 Review of Performance of Present Model

The table below contains the observed traffic growth rates across a number of sites on the urban motorways in Wellington.

- **Table 2-1 Observed Traffic Growth Rates (Per Annum) 1992-2001**

Site	Direction	AM Peak	Interpeak	PM Peak	All Day	Weekend
SH1-Paremata	NBnd	4.9%	1.6%	**0.2%**	1.6%	2.4%
	SBnd	**0.8%**	1.6%	1.5%	1.7%	2.2%
	Total	1.8%	1.6%	0.6%	1.7%	2.3%
SH1-Grenada	NBnd	2.4%	3.0%	**1.5%**	2.9%	3.5%
	SBnd	**1.3%**	3.5%	3.4%	2.9%	3.5%
	Total	1.6%	3.2%	2.2%	2.9%	3.5%
SH2-Block Rd	NBnd	0.9%	1.7%	**0.6%**	1.7%	1.7%
	SBnd	**-0.7%**	1.4%	1.4%	0.8%	0.6%
	Total	-0.2%	1.6%	0.9%	1.3%	1.2%
SH2-Ngauranga	NBnd	0.6%	1.0%	**-0.2%**	0.8%	1.7%
	SBnd	**-2.0%**	1.9%	4.1%	1.7%	2.2%
	Total	-0.8%	1.4%	1.9%	1.3%	1.9%
Combined	NBnd	2.0%	1.4%	**-0.4%**	1.3%	2.1%
	SBnd	**-0.9%**	2.6%	4.5%	2.3%	2.6%
	Total	0.2%	2.0%	1.7%	1.8%	2.3%
WATS Model	NBnd					
	SBnd					
	Total				0.2%-0.6%	

Overall traffic has growth has been approximately 1.8% per annum over the 9 years from 1992 to 2001. This is substantially higher than that forecast by the current WTSM at 0.2% for low growth and 0.6% for high growth. This increase is consistent with the overall population and employment growth rates for the region of 0.6% pa (see Table 1-3)

However, the observed counts indicated by bold in the above table, show that the observed traffic counts in the peak period (in the direction of most congestion), are lower, and in fact show negative growth overall. The observed weekend and inter-peak traffic growth has been substantially higher and has driven the overall growth rate. The current model has failed to reproduce this growth, and it is hoped that the new model, including income and vehicle ownership effects will perform better for the interpeak and counterpeak directions as well as increase the overall predicted growth rates.

A number of road projects have been implemented over this period. These include:

- SH1/Te Moana Road intersection Traffic signals 1999
- Kapiti Road/SH1 intersection upgraded to four lane approaches 1997
- SH1: Newlands junction installed (approx 1997/98)
- Waikanae to Otaihanga four laning 1994
- Ewen Bridge four laning 1993/94 - Lower Hutt
- SH1: Ngauranga Gorge ATMS in Feb 2001
- Gibbons St/SH2 intersection signalised 1992
- SH2: Four laning (previously two with no passing lanes) between SH58 and Silverstream bridge (approx 1998)

Table 1-2 shows the decrease in the proportion of peak traffic compared to the all day volumes between 1992 and 2001. Overall the proportion of travel in the two peak periods has decreased from 31% to 29%. This is a decrease of 9% in total (6%

northbound and 12% southbound). In general the largest changes have been at sites further from the Wellington CBD.

■ **Table 2-2 Traffic Counts Peak Proportions 1992 to 2001**

Site	Direction	% In Peak 1992	% In Peak 2001	Change In Peak Amount
SH1-Paremata	NBnd	25%	22%	-15%
	SBnd	34%	27%	-20%
	Total	29%	25%	-16%
SH1-Grenada	NBnd	28%	26%	-7%
	SBnd	36%	33%	-8%
	Total	32%	29%	-7%
SH2-Block Rd	NBnd	28%	29%	2%
	SBnd	32%	27%	-15%
	Total	30%	28%	-7%
SH2-Ngauranga	NBnd	31%	30%	-4%
	SBnd	34%	30%	-11%
	Total	32%	30%	-8%
Combined	NBnd	29%	27%	-6%
	SBnd	34%	30%	-12%
	Total	31%	29%	-9%

■ **Table 2-3 Employment and Population Growth – 1991 to 2001**

Population Trends	1991 Pop	2001 Pop	Pop Growth PA	Employment Growth PA
Kapiti Coast District	35292	42564	1.9%	2.0%
Porirua City	46557	47250	0.1%	0.2%
Upper Hutt City	37068	36657	-0.1%	-0.4%
Lower Hutt City	94536	95157	0.1%	0.0%
Wellington City	150435	167169	1.1%	0.9%
Masterton District	22968	22947	0.0%	0.4%
Carterton District	6903	6873	0.0%	0.9%
South Wairarapa District	9054	8760	-0.3%	0.7%
Total	402813	427377	0.6%	0.6%

Similarly, the modelled growth rate for rail patronage is high compared to that evidenced from 1996-2001. Overall the rail growth at 2.6% pa is higher than the WATS high forecast of 2.1% pa, while the morning peak observed growth is considerably higher at 4.6%.

Tolling

Parking Tests

A number of tolling and pricing strategy tests have been undertaken by BAH using the old WATSM model. Of particular concern was the performance of the model in regards to increased parking in the Central Business District (CBD).

The old model applied a uniform $5 constant for car drivers to the CBD in the mode choice model, and was attributed to parking. This charge reduced to $2.50 for car passengers. In addition this charge is applied to both the inwards and outwards trip.

The parking test applied by BAH involved increasing these charges by 50%, or $2.50 for car drivers and $1.25 for car passengers.

Analysis of the parking data from the household survey and inventory data suggest that the average parking charge is somewhat less than that assumed by BAH. The table below indicate the average parking charge per trip for both the upper and lower CBD, as calculated from the available data.

- **Table 2-4 Average Parking Charges ($)**

Purpose	Lower CBD	Upper CBD
HBW	1.70	2.75
HEB/NHEB	0.59	1.04
Other	0.48	0.96

Assuming these charges are shared equally between the inward and outward trip, and standard occupancies of 1.17 for HBW, 1.12 for EB and around 1.8 for other purposes, the implied charge per trip, per occupant in the vehicle are as shown below.

- **Table 2-5 Applicable Parking Charges Per occupant Per Trip($)**

Purpose	Lower CBD	Upper CBD
HBW	0.76	1.18
HEB/NHEB	0.26	0.46
Other	0.13	0.27

Thus when comparing the increase applied to parking as specified by BAH against the actual average charges paid per trip per occupant as observed from the data ranges from 19 times the average charge (for other purpose trips to the Lower CBD compared to car driver) to 1 times the average charge (for HBW purpose car passenger trips to the upper CBD).

Clearly the parking test applied is outside the bounds for which a reasonable result would be expected. Furthermore, as the estimate of initial parking revenue in the base runs is overestimated (at approximately $5 per vehicle instead of $1-$2 per vehicle), the true modelled parking revenue does in fact increase, by approximately 130%. See the calculation assumptions below.

Base revenue reported = $107,212. Assuming that the true charge is $1 per vehicle rather than the stated $5, the true revenue should in fact be $21,442 (107212/5). The test revenue is reported at $105,920, assuming a test charge of $7.50 per vehicle in the test, with the true charge in fact being $3.50 ($1 base charge + $2.50 increase) the true revenue is $49,429 (105920/7.5 * 3.50). This is with a corresponding increase in charge of 250% ($3.50-$1 on a base of $1).

3. Task 2.2 Initial Tabulations

3.1 Definition of Trip Time

We have a choice of defining the time of a trip as the trip start time, midpoint time or arrival time. We could even use the time at the trip production end or the time at the trip attraction end (implying that it would be the time of arrival at work in the am peak and the time of departure from work in the pm peak).

While these times are well defined in the household survey, this is not the case for intercept surveys and counts where all we have is the time of observation.

As would be expected the travel peaks occur at different times across the network – it is particularly noticeable that the am peak is later nearer the CBD.

Much of the theory on the choice of time of travel time is concerned with the notion of Preferred Arrival Times (PAT) –- and the costs associated with 'schedule delay' where travel congestion leads to arrival after the PAT. Travellers will depart earlier in order to minimise the combined disutility of journey time and scheduled delay. Of course, most of this theory is concerned with the detailed profile of travel within the peak period rather than the interaction between peak and off-peak travel, which is our concern.

Were we looking for a highly sophisticated approach to peak spreading – and there is much of this under development in the UK for project models – then we would need to think quite hard about time representation. However, for the purposes of the strategic model the appropriate compromise seems to be **trip midpoint time**, which gives the best estimate of the time the trip is on the regional transport network.

3.2 Time Period

Key findings from the analysis are as follows.

AM Peak

Rail survey: inbound peak travel is contained within a peak period of 07.15-08.45.

Household survey:

- The HBW peaks are 06.45-09.15 for car and 06.45-08.45 for PT;
- For HBEd a peak period of 07.45-09.00 seems appropriate for PT and car;
- For both HBEd and HBW, the PT peak ends earlier than the car travel peak, so is reasonably consistent with the rail survey;
- The PT time profile for all trips is consistent with a peak period of 07.15-08.45;
- The car time profile for all trip purposes is heavily affected by the rapid build-up of other trips during the latter part of the 07.00-09.00 period, such that by the end they account for the majority of car trips; this has the effect that the period 07.45-09.15 is the peak of the profile (when other trips have reached their peak levels too);
- The Transit and WCC road counts indicate that the typical peak period on the roads is 07.15-09.30, the time varying by location (e.g. 15 minutes later in the CBD and city suburbs than outside the city);

A peak 2 hour period of 07.15-09.15 (or a 2.5 hour period of 07.00-09.30) appear appropriate compromises: all HBEd trips are accommodated; some early HBW trips are lost but this timing picks out the traffic peaks generally.

PM Peak

Household survey:

- HBEd has a distinctive peak in the early afternoon period 15.00-16.00, clearly separate from the HBW peak; there seems to be no value in combining these two peaks in a single period as it will not improve the travel representation to mix two different peaks; therefore we will continue with the usual convention of choosing the HBW peak;
- For car, both HBW and all trips peak 16.00-18.15;
- For PT, HBW peaks 16.15-18.30 while all purpose trips peak 16.00-18.00;
- Traffic counts peak in the period 16.15-18.15.

In conclusion, an appropriate compromise is a peak period of 16.00-18.00 (or a 2.5 hour period of 16.00-18.30).

2 or 2.5 hour peak

After some discussion, we have agreed that it is important that our choice of peak should identify significant traffic peaks in order that WTSM is sensitive to congestion levels. Although there may be some arguments in favour of extending the peak period of 2.5 hours, the consequent dilution of the peak is a greater concern. We also prefer to use clock hours, as this is consistent with much of the way the present models and data are formulated, providing this does not compromise the model specification.

On these arguments our time periods will be:

- **am peak: 07.00-09.00 [actually 07.01-09.00]**
- **interpeak: 09.00-16.00 [actually 09.01-16.00**
- **pm peak: 16.00-18.00 [actually 16.01-18.00].**

3.3 Purpose

Key conclusions on the trip purposes from the tables are:

- The proposed set of trip purposes is generally confirmed; in particular HBEB and NHBEB should be combined, both accounting for small proportions of trips;
- HBSo turns out also to be a relatively small segment and the tables indicate that its characteristics are sufficiently similar to HBO to merge them together (similar trip lengths and mode shares and reasonable zonal correlations).

3.4 Person / Family Structure

Our conclusions are that we should adopt the following segmentation:

- Infant <5: school starts at 5 for virtually all children (~7.5% population);
- Child 5-16: at 16 85% are still at school; at 17 many start to work (25%) and majority have a driving licence (~17.7% of population);
- Young adult 17-25: from 26, 95% are employed;
- Adult 26-65: retirement commences at 60 for women and 65 for men although of course there are early and late retirements in both cases; classification based on latest retirer in effect;
- Retired >65.

Population, Households and Workforce

Consequent on the above and the analysis of Task 2.7, the following are the segmentation, which will be adopted.

We understand that there are 3 non-overlapping definitions of 'usually resident' population:

- Residents in private households
- Institutional residents (i.e. non-private households)
- Overseas visitors

Overseas visitors will be ignored and not included in the figures. All the following data should be produced relating to the population in private households – because this is what we have surveyed. It would be useful to have the same breakdown for the institutional population but, if this involves any real additional cost, then we would be content with some less detailed information on institutional populations. The segmentation required is as follows.

Population classified into:

- infant, age<5
- child, age 5-10 (primary school age)
- child, 11-16
- young adult, age 17-25, in full-time employment
- young adult, age 17-25, in part-time employment
- young adult, age 17-25, other
- adult, age 26-65, in full-time employment
- adult, age 26-65, in part-time employment
- adult, age 26-65, other
- other adult, age >65 in full-time employment
- other adult, age >65 in part-time employment
- other adult, age >65, other

Households classified into:

- 1 adult, full or part time employed
- 1 adult, other
- 2 adults, one or more full or part time employed
- 2 adults, other
- 3+ adults

Adults are persons aged 17 or more.

3.5 Car Availability

Of considerable concern is the mode share data: public transport accounts for 15% of HBW trips, 18% of HBEd trips, 3.5% of HBSh trips and broadly 2% of all other trips.

Analysis of mode shares by car ownership and captivity indicates that:

- The captive/choice/competition segmentation is the best for HBW trips;

- The identification of non-car owning households (i.e. a captive/other segmentation) is sufficient for the other purposes to distinguish high public transport shares.

The table below gives a rough estimate of the unexpanded sample sizes.

Mode	HBW	HBEd	HBSh	HBSo HBO	NHBO	BU	HBSh HBSo HBO NHBO
Car driver & passenger	3300	1550	5400	7350	7300	1850	20000
Public transport	640	230	230	190	30	50	450
% of PT which are captive	10%	15%	45%	25%	15%	10%	33%

For calibration this suggests that:

- HBSh, HBSo, HBO & NHBO will be combined in any mode choice model and any public transport distribution model; for mode choice it may be possible to implement purpose-specific mode constants;
- BU public transport trips will be ignored;
- We need to consider HBEd (see Task 2.7).

More detailed analysis of mode choice by person type also revealed that for 'discretionary' trips (NHBO+HBO+HBSh+HBSo):

- In 0 car households, children had a higher public transport mode share, although 90% of public transport trips were made by adults;
- In car owning households, young adults and children had a higher public transport share and but (older) adults still accounted for almost 50% of PT trips.

It is not expected that we shall be able to reflect these detailed behavioural issues in the model.

4. Task 2.3 Analysis of Parking Data

4.1 Parking Demand

The results are simple and as expected:

- In Wellington City TLA paid parking is used for HBW, but for a minority of commuting trips (14%); only in Lower Hutt TLA is there also use of paid parking for HBW (6%); for all other TLAs it is zero;
- In Wellington City TLA the majority of commuters pay long term parking fees (70%), but some pay parking daily; most is paid by the employee (70%), but some by the employer;
- Within both Wellington City and Lower Hutt TLAs, the paid parking is mostly in the city centres; the prevalence of employer-paid parking is high in Wellington CBD (about 30%);
- There is short term paid parking for other purposes in Wellington City (most common), Lower Hutt City and Masterton TLAs and little else.

We have also investigated where people park in Wellington CBD:

- For HBW, EB and Other respectively, 87%, 95% & 85% park in the same zone as their destination; over 80% park in the same mesh block;
- For HBW, EB and Other respectively, 96%, 99% & 94% park in the same zone as their destination or an adjacent zone.

This generally confirms that:

- We should only have interest in long term modelling in Wellington CBD, although we could also include Lower Hutt;
- There seems little justification in refinement to the modelling of parking location: for the vast majority of trips this is effectively the same as to their destination location.

4.2 Parking Supply

Data on parking supply (no. of spaces, price) in Wellington CBD has been obtained from WRC and is summarised in the tables below. We do not propose to develop similar data for Lower Hutt City.

Wellington CBD	**% trips**			**Average parking duration**			**Average parking cost**					
Parking Type	*HBW*	*BU*	*Other*	*HBW (Days)*	*BU (hrs)*	*Other (hrs)*	*HBW (per day)*		*BU (per hr)*		*Other (per hr)*	
							Upper W.	*Lower W.*	*Upper W.*	*Lower W.*	*Upper W.*	*Lower W.*
residential	2%	15%	1%				-	-	-	-	-	-
public unmetered on street	3%	4%	16%				-	-	-	-	-	-
public unmetered off street	3%	12%	1%				-	-	-	-	-	-
public metered on street	10%	12%	29%	1	1.3	1.2	-	-	-	-	-	-
paid	25%	20%	21%				12.4	7.8	5.9	2.8	5.9	2.8
employer	53%	23%	5%				-	-	-	-	-	-
customer	4%	14%	26%				-	-	-	-	-	-
Total	*100%*	*100%*	*100%*									
Average parking cost/trip							2.75	1.7	0.8	0.45	0.8	0.4

Average parking costs for each trip purpose are given and these will be used in generalised cost. It had been intended to consider using long term car parking as a constraint in the forecasts but according to these statistics there are plentiful spaces and it seems that parking prices and road congestion are the constraining mechanisms for HBW car use.

Wellington CBD	Parking Capacity (Spaces)		Parking Demand (spaces in 2001)		
Parking Type	*Long Term*	*Short term*	*HBW*	*BU*	*Other*
residential	-	-	268	-	769
public unmetered on street	1,442	575	496	2631	9448
public unmetered off street	0	34	412	643	651
public metered on street	1,241	2,756	1642	4327	16760
paid	10,985	-	4010	2201	12619
employer	12,819	-	8642	3656	2931
customer	2,156	-	717	4178	16397
Total	*28,643*	*3,365*	*16,188*	*17,636*	*59,575*

5. Task 2.4 Generalised Cost

These generalised costs apply to the mode choice and distribution modelling. For assignment, routeing parameters representing current best practice in NZ will be tuned to best reproduce observed routeing patterns.

It is possible that, in the public transport assignment, this may imply different weights on bus and rail in-vehicle time; if so, these will be carried forward into the other models.

5.1 Values of Time

The values of time are the latest Transfund perceived values[1]. The model requires average values for persons of a particular segment. These values can very by mode, but only if this reflects some perceived comfort difference. Because the differences in the Transfund modal values also encompass differences between the types of people using each mode, they cannot necessarily be used directly. Note that, apart from trip purpose, we shall also segment by captive and choice. We need also to consider crowding, reliability and congestion effects.

The table below documents the proposed values; they incorporate the following assumptions:

- For each purpose and segment, the values of time are the average for the mode shares observed in 2002 of car and van/ute driver, car and van/ute passenger and public transport values of time; walk and cycle trips have been ignored because they are short distance essentially local/intrazonal;
- The PT VoTs assume 10% standing for HBW trips (which all occur in the peaks);
- Congestion and reliability values of time for cars are not included – while they have been established for evaluation purposes, there are no immediate proposals for including them in behavioural modelling (or assignment);
- We have combined HBSh, HBSo, HBO and NHBO trips, which have similar values of time.

Concerning the variations in values of time:

- Part from EB, the higher HBW values reflect the findings of the recent Transfund research;
- HBEd is lower because of the higher public transport usage, to which a lower VOT applies;
- Captive is also lower because of the higher use of public transport.

WTSM Values of Time (cents/min in 2002)

Purpose	Segment	
	Captive	Choice/ Competition
EB	36.2	39.2
HBW	10.3	13.6
HBEd	6.5	10.2
Other	8.5	12.1

Note: These values are under review and may change

[1] For business trips the Transfund values are simply increased by 2001/2 earnings growth of 2.25%; for other purposes, they are also increased by 15%to give market values.

5.2 Vehicle Driver and Passenger

The generalised cost attributes are time, operating cost, parking charges and tolls:

- The 3 cost items will be divided by standard values of time (see table);
- Operating costs (see table):
  - for non-work travel will refer only to fuel cost but include GST;
  - for business car and commercial vehicle (CV) trips, the full operating costs will be used (with GST assumed to be refunded and therefore excluded);
- The parking charges attributable to a trip will be factored by 0.5, as these charges are shared between the in and out-bound trips;
- Passenger/driver: the approach in London is to divided costs by average car occupancy so that the cost represents the average cost per person and is directly comparable with public transport fares; I would prefer this approach, with its main effect being for shopping and other trips; a table of occupancies is given below.

■ **Operating costs (cents/km) – emboldened figures will be used in WTSM**

Mode	Purpose	
	Business	**Other**
Car	**30**	14.7
LCV	**30**	19.2
Car and LCV average (non-EB trips)*	-	**15.0**
MCV	55	21.5
HCV-I	105	42
HCV-II	160	73.5
Truck average**	**105**	**45**

*Based on 6.8% non-EB vans/utes trips in the household survey
**Based on 39% MCV, 26% HCV-I, 35% HCV-II from WRC classified counts

The formula is thus:

Gen cost = ivt + (parking cost/2 + operating cost + toll)/(VoT* occupancy)

Purpose	Occupancy
HBW	1.17
HBEd	2.18
HBSh	1.54
HBO (& HBSo)	1.83
NHBO	1.81
EB	1.12

5.3 Public Transport Passenger

The generalised cost parameters are in-vehicle time, other time (access, egress & walking times), interchange, waiting time at boarding and interchange, and fare:

- The fare will be divided by standard values of time (see table);
- Other time would be weighted by 2.0 (given that we have gone to some lengths to get centroid connectors reasonable, I think we can weight the times by 2).

I propose that we use interchange penalties of:

- 10 minutes for standard interchanges,
- 8 minutes for purpose-built interchanges, and
- 5 minutes for high quality and/or planned interchanges.

These are APT values and are compatible with the 5-10 minute range in the updated PEM. *We may consider tuning these in the base network by seeking to reflect household and rail survey data on the frequency of interchange.*

A review of waiting time factors is given in the tables below, the first giving the disutility of waiting time and the second the benefits of improving waiting time (indirectly a measure of the sensitivity of the model to headway differences); the table includes various formulae:

- 'Standard' in which waiting time is half the headway and is multiplied by a cost factor of 2.0;
- PDFH are disutilities derived from the UK rail passenger demand forecasting handbook;
- Wardman draws on a review by ITS Leeds;
- BAH is a Booz Allen formula;
- APT is that used in the Auckland model 2*(3+0.22*headway);
- PEM is the that most recently recommended in the PEM;
- WTSM is what is recommended for the WTSM 2*(1.5+0.25*headway).

EMME/2 is constrained in the waiting time functions that can be accepted but a linear formula of a boarding penalty (of 1.5 minutes) and a factor on headways (of 0.25) is feasible. The WTSM formula seems marginally better than that used in the APT.

The generalised cost formula is thus:

Gen cost = ivt +I*interchange penalty +2*(access and egress time) + 2*B*(1.5+0.25* headway) + fare/VoT
Where:
I number of interchanges
B is number of services boarded (=1+I)
Note that walk, car and bus access are not distinguished, all times being weighted by 2.

Generalised Cost (mins) of Headway

Headway (mins)	Standard	PDFH	Wardman	BAH	APT	PEM	WTSM
5	5	5	3	5	8	5	6
10	10	10	6	8	10	7	8
20	20	19	12	14	15	10	13
30	30	25	17	18	19	14	18
40	40	29	22	23	24	18	23
50	50	33	27	27	28	21	28
60	60	36	32	31	32	24	33

Incremental Benefits of Reducing Headway (mins)

Headway (mins)	Standard	PDFH	Wardman	BAH	APT	PEM	WTSM
5	5	5	3	3	2	2	3
10	10	9	6	6	4	3	5
20	10	6	5	5	4	4	5
30	10	4	5	4	4	4	5
40	10	4	5	4	4	3	5
50	10	3	5	4	4	3	5

Note: the benefit is simply the difference in disutility from the next headway in the table
Eg with Wardman if the headway is reduced from 20 to 10 mins the change in generalised costs is 6 minutes

5.4 Walk/Cycle Time

When walk/cycle is the main mode, this will be weighted in the model as 1.0 (but this can be changed if it poses modelling difficulties) – thus we shall use the average values of time by purpose and segment reported above.

6. Task 2.5 Retail Destination Analysis

The findings of the various tabulations of are as follows:

- 23% of shopping trips are to the Wellington CBD;
- A further 22% are to other major CBDs (e.g. Upper Hutt and Lower Hutt)
- The remaining 55% of shopping trips are local or rural centre shopping trips;
- The vast majority of trips to retail centres (87%) are for shopping purposes;
- The top 10 zones in terms of retail destinations contain 44% of shopping trips, the top 30 zones covering 70% of trips; all such zones are either in the Wellington or Hutt CBDs, or in other zones with major shopping centres.

Thus the data are as might be expected. In the trip attraction analysis, there will be the opportunity to establish whether trip rates to the various levels of shopping centre are significantly different.

7. Tasks 2.6 & 2.13 Commercial Travel and Vehicle Types

7.1 Commercial Travel

Key findings, all as expected:

- There are very few trucks possessed by households (1.4% of the vehicles), while vans/utes account for 9% of the vehicles;
- 5% of BU trips are by truck, and most (63%) are for pick-up/delivery of goods;
- 13%of BU trips are by company cars, of which 23% are pick-up/delivery of goods;
- 24% of BU trips are by vans/utes, of which 28% are pick-up/delivery of goods;
- 48% of BU trips are by private cars, of which 8% are pick-up/delivery of goods.

The major point is the importance of van/utes in business travel.

7.2 Vehicle Types

Our data analysis confirms the importance of commercial vans/utes. Our proposed modelling approach will therefore distinguish: cars and 'private vans/utes', commercial vans/utes, trucks (medium and heavy CVs[2]).

The distinction between the different types of van/ute will be made in the household survey on the basis of trip purpose and in the road surveys and counts on the basis of logos on the vehicles. These definitions are not fully compatible but are the best we have to go on.

Medium and heavy CVs will be modelled as a single separate category (Task 2.11).

Apart from the classified counts, the only information which we have available on light CVs is what is in the commercial travel purpose (EB) in the household survey. This is too sparse to consider separating cars and light CVs. We shall therefore develop an EB travel model from the household survey in which cars and light CVs are combined. Subsequently, we shall use simply matrix factors to split light CVs from cars and we shall use matrix estimation on the latter to improve the matrix, our concern being that we are likely to have heavily under sampled light CVs in the household survey (this implies that light CVs will be forecast in conjunction with cars).

[2] Light CVs being vans/utes.

7.3 Summary (including minor modes)

Model	Modes	Comments
Personal Travel	Public transport passenger	
	School bus passenger	Expected to be separated out at matrix stage
	Car driver and passenger	
	Motorcycle driver and passenger	
	Taxi passenger	Treated as car
	Van/ute driver and passenger	EB van/ute trips will be separated at the matrix stage
	Taxi driver	EB purpose (treated as a car)
	Walk and cycle	
Commercial Vehicles	Vans/utes (light CVs)	Extracted from the personal travel model (EB purpose)
	Trucks (other CVs)	
Exclusions	Truck passenger	Not modelled
	Charter bus passenger	Not modelled in the network
	Cable car passenger	Only 1 sampled
	External ferry	Trips included as far as terminal
	Truck driver	Truck matrix will be taken from elsewhere – these are a tiny subset of truck trips
	Other modes	Mainly air trips

It would also be quite helpful to know about the distribution and extent of school bus services and how they are planned – to ensure that we can sensibly extract them at the matrix stage (implying that we would use the public bus networks as a surrogate for the school bus services and this means that school bus routes must be duplicated by public bus routes).

8. Tasks 2.7 & 2.8 Education Modelling, School Buses, Car Passenger Modelling and Escorts

8.1 School Survey

The findings of the tabulations are as follows:

- Walk (26% mode share) is used for very short trips;
- Otherwise the dominant mode for shorter distances is car passenger (45% to school), which only declines for much longer distance access as rail (4%) takes a significant share;
- School bus (13%) is significant for all but the shortest journeys;
- Public bus (6%) is a minor mode which caters for short to medium distance access, losing out to rail beyond this;
- Car driver is insignificant (1%), affecting the last school grade (13) only;
- Bicycle is insignificant (2.5%);
- 20% of children do not go directly home from school;
- Up to grade 6 (primary), access distances are every short (average 1.5kms), but beyond this they progressively increase to 5kms from grade 9;
- Up to grade 6 walk and car passenger are dominant for access.

The implications are:

- A primary/secondary segmentation seems strongly justified because of trip lengths and the different patterns of mode usage, with their being little purpose in strong attempts to model the very short primary school education trips (trip lengths are much higher for secondary;
- For very short trips (primary) the modes are walk and car passenger;
- For other trips (secondary) the modes are walk, school bus, public transport (bus/rail) and car passenger;
- Worth noting that an alternative split would be at grade 9.

8.2 Household Survey

The main findings of the tabulations are summarised below for work and education escorts within the household (we cannot identify the purposes of car passengers from other households).

As indicated in the tables, the implications are:

- We propose to reclassify escort trips by the main purpose which created the trip;
- For HBW multiple tours, we propose to amalgamate these to a single HBW trip if the intermediate stop involves little diversion (for example, over 60% of intermediate shopping stops were for 5 minutes);
- We propose to classify education escort trips as HBEd but retain the possibility of identifying their proportions as this may be of assistance in policy analysis later on.

HBW Trip Analysis

					Driver trip purpose codes		Proposed Recodes	
Tour	Description	Trips	%	HBW	Trip 1	Trip 2	Trip 1	Trip 2
6	Home - work, no passengers	1167	75%	1167	HBW	-	HBW	-
3	Home - work, with passengers	74	5%	74	HBW	-	HBW	-
4 & 5	Home - school drop-off - work	65	4%		[HBEd]	[NHBO](1)	HBEd	NHBO
7	Home - work drop-off - work	35	2%		[HBW]	[NHBEB](2)	HBW	NHBO
7	Home - shopping - work	52	3%		HBSh/[HBSh]	NHBO		
7	Home - work pick-up? - work	14	1%		[HBO]	NHBO/[NHBO]		
7	Home - other escort - work	87	6%		[HBO]	NHBO/[NHBO]		
7	Home - PB - work	34	2%		HBEB/[HBEB]	NHBEB/[NHBO]	HBEB	NHBEB
7	Home - other - work	25	2%		HBO/[HBO]	NHBO/[NHBO]		
	Total	1553		1241				

Education Escort analysis

				Driver trip purpose codes		Proposed Recodes	
Tour	Description	Trips	%	Trip 1	Trip 2	Trip 1	Trip 2
4,5	Home - school drop-off - work	65	22%	[HBEd]	[NHBO]	HBEd'	NHBO
4,5	Home - school drop-off - home	127	44%	[HBEd]	[HBEd]	HBEd'	HBEd'
4,5	Home - school drop-off - other	99	34%	[HBEd]	[NHBO]	HBEd'	NHBO
		291					

[..] escort
(1) may be no passengers!
(2) although in stage 2 this is a journey to work
HBEd' is an identifiable subset of HBEd, combined with HBEd in modelling
compute ratio of total travel distance to home-final destination distance

8.3 Overall Conclusions

It seems appropriate to deal with primary education trips separately; they are very short distance, and will this not much impact on the strategic model, and the modes are walk, car passenger and, for the escort, car driver. We might keep these as fixed matrices in the model, with a Furness growth technique for forecasting future years. There seems little point in either a distribution or mode split model. [The alternative is to leave them as part of the education purpose but ensure that short distance trips are synthesised accurately.]

Ideally we might consider separating secondary and tertiary trips, but it seems unlikely that our data samples could support this. At this stage, it is proposed to treat these trips the same as the other purposes, with the exception of school bus trips.

School bus trips are significant, but it is unhelpful to combine them with other public transport trips, as these models are not designed to work with transport modes, which are not available to everyone. In the mode share element of the modelling we will therefore factor out school bus trips using fixed mode share factors. It will be possible to amend these in forecasting, if there are reasons to do this, and the model will then adjust the remain education trips accordingly.

Finally, we may want to link driver and passenger trips in the mode share model, that is we may want to ensure that the trend in car driver (primarily escort) trips reflects the number of car passengers for this purpose (this is only an approximation of reality – many tertiary car driver education would not be escorting). In fact, this will normally be the case in this type of model.

As noted above there will be some re-classification of escort trips.

8.4 Model Structure Implications

The following are the suggested model refinements.

Trip productions: trip rates will be generated for primary separate from secondary and tertiary (in a marginal refinement to the model proposed in the Tech. Spec.).

Trip attractions: will be for secondary and tertiary only.

Distribution, Mode Shares and the Trip Matrices:

- The model will generally not include primary education trip matrices; these trips by mode will be extracted before distribution/mode choice; their total numbers by mode will be available in 2001 and the trip production model can/could be used to apply growth factors if needed;
- We should check the escort car trips; if, as expected they are mainly intrazonal, then we can ignore them; if however, there is any doubt on this, then the 2001 HBEd car escort matrix for primary scholars will be growth factored by the trip production estimates and can be added into the am peak car trip matrix;
- The secondary/tertiary model includes school bus trips; two options are being considered:
  - In the first, we assume that school buses simply supplement the existing bus services, providing extra capacity, and they are not distinguished from scheduled services until we have generated the public transport trip matrix; at this point matrix factors are applied to remove the estimated school bus users;

quite how these factors are calculated remains to be worked out – while we could use the samples to determine the factors it seems likely that they may be too sparse and some 'average' relationships would be better;

- Alternatively, if the above assumptions are unreasonable, then the school bus trips will be factored out of the trip productions and trip attractions, where again we may need to smooth the sample proportions data in some way.

9. Task 2.9 Weekend Travel

Conclusions:

- Saturday and Sunday purpose splits are very similar; compared to weekday:
  - very low PT mode shares;
  - higher car occupancies
- There is no evidence of a sharp short peak on either day
- Rather there is a constant traffic level through the central period of the day, starting slightly later on a Sunday:
  - Saturday 10.00/11.00-17.00/18.00
  - Sunday: 11.00/12.00-17.00/18.00
  - probably good enough to choose a common period
  - in the urban area, traffic levels are higher on Saturday, but this may not be true elsewhere
- The most notable issue is that HBSh trips tend to peak earlier in the peak period and HBSo later, a difference more marked on Saturday than Sunday.
- HBO trips are uniformly distributed across the peak period
- Trip rates by person type look very similar for Saturday and Sunday
- Trip lengths:
  - HBSh trip lengths are same for both days
  - HBSo, HBO & NHBO very much longer trips on Sunday (ca 40-60% longer): note this fits with higher interurban flows on Sunday and, perhaps, this partially accounts for the low zonal correlations (although it may be just outliers)
- CV less important at the weekend.

10. Task 2.10 Road Pricing/Tolling

Subject to our testing of the performance of the present model we expect the new model to be suitable for the strategic appraisal of road user charging with the emphasis on the effects of road user charging on demand. Such charges will be valued according to the standard values of time, varying by trip purpose, and a peak-spreading module will be developed for congestion pricing tests and linked to the time period factors.

For specific projects, which are to be partially financed by tolls on the new route, where the toll impacts are principally on vehicle routeing, the unadjusted strategic model will be much less reliable. However the structure of WTSM, with separate purpose and vehicle type matrices, will facilitate the use of multi-user assignment techniques in project models developed for this purpose from WTSM.

11. Task 2.11 Commercial Vehicle Modelling

The approach will be based on applying growth factors to a current year CV matrix.

The 2001 CV matrix (for medium and heavy CVs) will be developed from a number of data sources using matrix estimation techniques:

- The matrix from the present model,
- Classified counts for 1996 and a sample for 2002,
- Additional classified counts at major CV generators.

Growth factors will be developed from a trip end model consistent with a number of studies, replacing the present trip end model, which is less than convincing. Such models reflect changes in the distribution of population and employment but not the wider economic and logistics trends. At present it is unclear what evidence van be found for these trends, but part of the project will be to seek such information. We have information on the national vehicle stock as a starter, but we need to establish historic trends, if not for Wellington then for other interurban and urban contexts in NZ.

12. Task 2.12 Use of Intercept Data & Task 1.9 Combined Data Processing

12.1 Introduction

There are four data processing requirements, which may involve combining data from different sources:

- providing trip data for model estimation;
- providing a provisional base road matrix for assigning to the network in order to generate generalised costs for model calibration (Task 8.3);
- providing best estimate public transport matrices for model application;
- incorporating external travel data.

12.2 Survey Data Sources

The table below summarises the available survey sources.

Purpose/Mode	Car	Public Transport
HBW	Household	Household Rail
HBEd	Household School	Household School Rail
Other purposes	Household	Household Rail
Residents' trips to external destinations	Household External roadside	Household
Non-residents' trips to internal destinations	External roadside	Household

Our interest is particularly in using the supplementary school and rail surveys to improve the sample of public transport trips in the household survey. Sampled PT trips in the surveys are shown in the table.

Survey	Approximate Sampling Rate	Mode		
		Rail	Public Bus	School Bus
Household (all purposes)	1.6%	724	827	338
Rail	32.6%	5500	-	-
School (education trips)	6.3%	161	259	445

Additionally, the external road surveys provide data on non-residents' travel into the study area, which is not covered by the household survey.

12.3 Establish General Data Consistency

Prior to reaching final decisions on the use of these additional data, we have looked into the compatibility of the different surveys.

Rail Trips in the Household and Rail Surveys

At a study area and TLA level we have compared the overall trip matrices:

- While there is good compatibility for HBW[3] and HBEd[4] trips, there are 50% fewer other purpose trips (HBSh, HBSo, HBO & NHBO) in the rail survey[5], and the total number of rail trips is approximately 10% lower than the household survey;
- Employers business trips by rail, which account for 6% of rail trips in the household survey[6], were not separately identified in the rail survey, although a few rail survey respondents did note this as the trip purpose;
- The % captive trips by purpose are similar in the two surveys[7]; the rail survey does not allow competition and captive trips to be distinguished for HBW.

As an option for the distribution and mode choice model estimation, we propose to substitute the rail trips in the household survey with those from the rail survey (because of the much larger sample)[8]. For HBW trips, where we need to distinguish competition from choice trips, we shall apply proportions determined from the household survey (this is likely to be a uniform matrix factor unless there is evidence of a systematic variation by TLAs in the proportions).

Bus Trips in the Household and School Surveys

The model will focus on secondary and tertiary education trips. The general compatibility in total bus trips (for primary and secondary education) between the school and household survey is reasonable in the four TLAs common to both surveys, although overall there are 25% fewer trips in the school survey[9]. The split between school and public bus differs – 46% in the household survey and 68% in the school survey are on school buses. It seems plausible that there may have been misunderstandings over the distinction between school and public buses. However, for the immediate purposes of model calibration, we do not need to distinguish these modes.

For the purposes of model calibration, we propose to combine the secondary education trips from the two surveys. The appropriate means would be to weight by the inverse of their variance but an approximation, which may be more reliable for these low samples and which we therefore prefer, would be to weight by the average sampling ratios.

12.4 Model Estimation – Distribution and Mode Choice

It would be normal practice to use the household survey for model estimation because of the more-or-less uniform sampling rate and the common segment definitions.

But, to take advantage of the improved public transport data, we shall also plan the option of calibrating the model on a multi-survey data set. This requires creating the necessary calibration data both solely from the household survey and also from the combined surveys.

[3] Household: 21,600 trips; rail: 22,100 trips; and a high TLA correlation.
[4] Household: 5,400 trips; rail: 5,300 trips; and a high TLA correlation.
[5] Household: 9,100 trips; rail: 4,600 trips.
[6] Household: 2,200 trips.
[7] Household: 10%; rail: 9%; reasonable compatibility by trip purpose.
[8] This will not be done for EB trips, for which we do not expect to develop public transport matrices (the public transport share being tiny).
[9] Household: 23,400 trips; school: 20,300 trips.

A particular issue occurs for the calibration of the distribution and mode choice models, which should normally be on the basis of the unexpanded samples (where these have been uniformly sampled). One possible solution is to factor down the survey samples in the rail and school surveys to create an equivalent 1.6% sample (consistent with the household survey). These technical issues will be further developed prior to calibration.

12.5 Best Estimate Observed Public Transport Matrices

Because the WTSM matrices are for all public transport modes combined, we shall create a best estimate observed public transport matrix by combining best estimate rail and bus matrices:

- The best estimate rail matrix is simply that from the rail survey – there is nothing to be gained from combining this with the household or school surveys whose sampling rates and samples are so much smaller;
- For public bus and school bus, the household and school data can be combined for secondary education trips using an inverse variance approach then added to the tertiary public transport trips from the household survey;
- These combinations will need to allow specifically for any non-residents' travel.

12.6 A Provisional Base Road Matrix for Developing Calibration Generalised Costs

The observed road matrix from the expanded household survey is likely to be sparse and may suffer from under-reporting and it does not include truck trips. Therefore, to create a realistic matrix which will allow us to extract provisional 2001 generalised costs from the loaded networks for model calibration, we will combine the existing model 2001 forecast matrix with the observed matrix from the household survey, as a means of smoothing the household survey trips data. We shall also carry out some preliminary validations against observed counts and matrix adjustments to ensure a reasonable fit (*a full task description is required*).

12.7 External Car and CV Travel Data

This concerns use of the external roadside surveys.

External CV trips

In the base year, external CV trips will simply be added to the original WTSM CV matrices by time period, entirely replacing unreliable synthetic estimates.

External car trips

Non-residents' home-based car trips are not duplicated with any other data source and will be processed to give trip matrices by time period: these will be added to the residents' household survey trip matrices to give fully observed base matrices of all car travel.

Residents' home based trips in the external cordon survey duplicate the household survey, but their sampling rate is very much higher than the household survey. Consequently, in the observed base matrices the external trips will be taken from the external survey.

Non-home based trips: these partially duplicate the household survey combining residents' and non-residents' trips: for the observed base matrix, these trips will simply replace external household survey trips.

Trip Attractions

The observed trip attractions should be adjusted prior to model calibration to include externals.

13. Task 2.14 Model Structure Simplifications

With the expected limited changes in both car ownership and family structure in Wellington within the forecasting period, we do not wish to invest substantial resources in sophisticated treatments of these two aspects of the model.

Practically, there are only limited simplifications, which we can implement while maintaining a credible model structure. They are described below.

We will obtain planning data for the person and household types earlier described in Section 3.4. The trip end and car ownership models will be restricted to these person and household types. The cross-distribution of households and persons will be estimated from the base year distribution (obtained from the household survey or census) using a simplified scaling procedure which ensures (1) that the number of persons by type is correct for each transport zone and (2) that their distributions across household characteristics reflects the forecast trends in those characteristics.

We do not expect changes in accessibility to have any marked effect on future trends in car ownership and will not include this effect in the model (although, of course, the model will reflect all current locational variations in car ownership levels).

14. Task 2.15 Park-&-Ride

The park-&-ride data has been used to derive station access mode shares by access distance. This has been combined with journey time and speed information for the available modes to derive composite access time verses distance functions reflecting the variations in mode shares with access distance.

Additionally, the rail survey data has been used to identify the principal station(s) accesses by residents of each zone.

Thus, zones have been connected to the relevant stations by centroid connectors with realistic average journey times attached.

The standard EMME/2 assignment techniques do not permit alternative station choices to be included within the 'attractive routeing strategy' and thus park-&-ride options will only be included if:

- They are the only option, or
- They are more attractive than the local station, which may well be the case where, in the peak period, express services are provided at another accessible station.

In future, given the set-up described above, it would be possible to change the EMME/2 implementation to enable passengers to be shared between alternative, attractive stations. The approach would require calibration and could be an extensive exercise.

15. Task 2.16 Ports and Airports

15.1 Background

The household survey data in principle includes the airport access trips of resident air passengers and the commutes of airport employees but, in practice, it would not be surprising if we had under-sampled residents' air passenger access trips. The data will not include the airport access trips of visitors.

There seems no reason to distinguish the commuting trips to the airport from any other HBW journeys although, in the HBW models, we could allocate the airport separate coefficients if this seemed justified.

We would expect resident air passenger access trips in the household survey to have been allocated to EB or HBO purposes. We should be able to make a rough guess as to their volume and check this against the household survey to determine whether we should rely on it. If the data seem heavily under-sampled, we might replace it with a synthetic approach to air passenger trips, as we will do for visitors. Ii is assumed in the following that this would be the most sensible approach.

15.2 Model

The concept is to develop a separate base trip matrix of air passenger vehicle trips, forecast this using growth factors and apply time period factors before adding to the other vehicle trip matrices.

15.2.1 Trip Attractions

In the synthetic approach, if we know the number of visiting air passengers and their choice of access mode, we can estimate car/taxi trip rates. There may not be any point in representing public transport access trips because they are mainly on dedicated bus services, which may not be in the WTSM network.

Appendix A illustrates a model of air passenger and commuter trip rates. Many of the model parameters are unavailable, and are therefore judgements based on reasonable expectation. The model is shown to validate reasonably against independent data on:

- number of cars parked,
- taxi flows
- car traffic flows,
- peak traffic flows.

Thus we can estimate air passenger trip generation rates for the airport as:

- 1.01 daily car and taxi trips per passenger,
- of which 73% are leisure and 27% business.

While these trip rates could be further segmented by air passenger type, there seems little advantage in this.

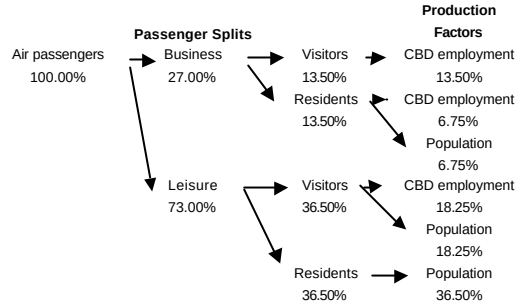
15.2.2 Trip Matrix

These trip attractions will be distributed across origin zones in some necessarily arbitrary approach. Factors to consider are:

- Many visitor trips will start at hotels, primarily in the CBD;

- Many business trips will start in the CBD, related to service employment and the nature of CBD businesses;
- Wealthier households are more likely to generate air travel.

Once we have the base year planning data, the following approach will be implemented as illustrated below, where we have allocated generation factors to each element of the air passenger market.



Implied Trip Rates			
Category	**Air passengers**	**Planning data**	**Trip rate**
CBD employment	0.385	70000	0.0000055
Population	0.615	410000	0.0000015

15.2.3 Forecasting

Using forecasts of air passenger growth (which we need to source through WRC) we can project the matrix into the future.

15.2.4 Time period factors

Analysis of the data suggests that there is no directionality in the peak periods (that is there are as many vehicles arriving as departing). As a result the air passenger OD matrix can be allocated to the time periods as follows:

- am peak: 13%
- interpeak: 45%
- pm peak: 15%

16. Task 2.17 Role of WTSM and Project Models

16.1 Objectives

WTSM's role in project applications is discussed in this section, and the first task is to define the potential range of applications. A provisional list is:

- Roading infrastructure projects, with or without tolls;
- Public transport infrastructure projects (here it is assumed that the focus is rail because of the difficulties in modelling local bus services);
- Policy projects (i.e. the detailed assessment of implementation of policy measures).

This paper raises the issues and need for procedures, to stimulate discussion and ensure that the scope is correct, but it does not attempt to resolve them.

16.2 Principles

Recognising current practice in Wellington, the aim is to make the best use of WTSM in project appraisal and to base most project models directly on WTSM, thus reducing the cost and effort involved in developing the project model.

For infrastructure projects, it is generally expected that the project models will:

- Differ from WTSM in having greater representational detail in the project corridor or study area (finer zones and network);
- Be single mode (i.e. either road or public transport);
- Make use of supplementary data (i.e. more locally-detailed planning data and additional travel data – counts and other surveys – designed to increase matrix accuracy in the area of interest).

In addition, there may need to be specific model refinements to deal with issues particular to the project, tolling being just one example.

16.3 Roading Infrastructure Models

Basic Option

The simplest approach to project modelling with WTSM is the following:

- Define the project corridor;
- Refine the WTSM zone system and road network in the project corridor[10]; expect that some intersections will be specifically modelled;
- Disaggregate[11] the WTSM base year trip matrix to the project zone system;
- Go through some matrix tuning procedure to get the best fit to specially collected data;
- Apply future year growth based on WTSM[12];
- Do fixed matrix assignments etc.

Induced Traffic

We would need to consider how best to address induced travel:

[10] There will be an issue of whether to restrict the study area or include the entire region.
[11] It would be possible to develop procedures to assist with this.
[12] Again procedures could be developed to disaggregate WTSM forecasts.

- Either through Transfund-type elasticities, possibly inferred from WTSM,
- Or some application of WTSM.

In principle, both are feasible.

Road Tolls

Road tolls raise new issues:
- The impacts on routeing, and
- The impacts on the level of travel demand.

For routeing, we need:
- An appropriate range of values of time to apply to model the responses of different user groups to the tolls;
- To be able to separate the vehicle demand into various user groups (at least by purpose and vehicle type);
- While assignment procedures will then respond to the tolls, there may be a need for more sophisticated methods of sharing traffic between tolled and untolled options (using for example logit share models).

For the impacts on travel demand, the same issues apply as for induced travel, although there may be merit in giving consideration in the future to whether formal links between a multi-user project model and WTSM would be useful, so that the differential demand effects on different user groups could be forecast.

16.4 Public Transport Infrastructure Models

In principle, there are parallels with the roading project models in terms of the use of the networks and travel patterns, especially as the collection of rail intercept survey for WTSM will substantially improve its trip matrices.

Multimodal issues are however much more important, with forecasts of decongestion relief and other induced patronage being a key factor in project appraisal (at present). Given the good data collection underlying WTSM, there would appear the possibility of creating a Wellington equivalent of the Auckland Public Transport Model out of WTSM. However, against this, the quality of the WTSM bus data (and therefore matrices) is less good and this will affect public transport corridors presently not served by rail.

If we were to move forward in this area, the discussion suggests that:
- We would design an approach not unlike that for roading projects,
- But with a greater emphasis on dealing with demand changes and impacts on other modes, perhaps drawing on the APT ideas and/or forming a closer link with the WTSM demand models (similar to what was done in London for ‘Railplan”),
- And with greater attention being given to issues of supplementary data collection in bus corridors and the use of bus ETM data.

16.5 Policy Models

We propose at this stage to assume that most policies issues can be initially appraised using WTSM. Because the potential issues are so diverse it is difficult to propose specific methods. In any case, major refinements to WTSM for such purposes may not be straightforward as the following example illustrates.

Policies affect both travel demand and network supply. Road user charging is designed to affect overall car use, but because of the typically discrete charging locations may create pockets of congestion on the network as vehicles seek to by-pass charging locations. Models may thus need to address behavioural responses to charging involving further market segmentation and perhaps greater emphasis on peak spreading, but local traffic models may also be needed to examine the congestion issues.

Parking policy is similar in being designed to affect the level of demand but also impacting on vehicle routeing. Refinement of the representation of parking supply and connected it into the road network model is likely to be needed as well as explicit treatment of different types of demand. Particular attention would need to be paid to alternative formal and informal parking locations and the way in which parking cost is offset against access/egress time to the ultimate destination.

16.6 Functional Requirements in WTSM

To provide the necessary data for use in project models WTSM requires the following functions from WTSM:

- Base year land use data at mesh-block level so that smaller zone systems can be designed using the same data as the WTSM zones (these base year disaggregation factors would be applicable for future years);
- A process for extracting demand matrices for sub-areas (the EMME/2 traversal assignment process is suitable for this task);
- An ability to separate vehicle demand by purpose and vehicle type[13];
- An ability to separate public transport demand between bus and rail[14];
- A process for disaggregating demand matrices to smaller zones; a process similar to that used with the ART model is proposed, using simplistic production/attraction models to disaggregate the trip ends to the smaller zones.

[13] The process used for this will depend on what bias correction factoring is applied to the all-vehicle matrices after each purpose is combined.

[14] This will depend on the public transport assignment method. The current WTSM does not distinguish between bus and rail demand. This sub-mode split is done in the assignment model. If this approach is retained, a select-link type of assignment process will be required to separate the bus and rail demands.

17. Conclusions

The following are the major conclusions for the modelling.

- Use 2 hour peak periods based on trip midpoint time: 07.01-09.00 and 16.01-18.00; interpeak period: 09.01-16.00;
- Purposes: combine HBSo with HBO.
- Person categories:
  - infant (<5);
  - child, primary school age (5-10);
  - child (11-16);
  - young adult (17-25);
  - adult (26-65);
  - retired (>65).
- Car availability modelling:
  - HBW: use captive/choice/competition segmentation;
  - EB: all car;
  - all other trips: use captive/choice+competition segmentation and combine these purposes for mode choice modelling.
- Parking:
  - the focus of parking models should be on Wellington CBD;
  - there is no justification for separating the parking location from the destination in the model;
  - long term parking capacity does not appear to be a constraint on car use;
  - average parking prices have been calculated.
- Generalised costs are fully specified.
- Vehicle types: there will be 3 modelled vehicle types:
  - cars plus vans/utes on personal trips;
  - vans/utes on business trips;
  - trucks.
- Escort trips: some recoding has been done to allocate the passenger's purpose to the escorting driver and to eliminate short stops on a commuting journey.
- HBEd:
  - primary education trips will not be modelled;

  - school bus trips will be retained in the model up to but not including assignment.

- In any weekend model, the specification would have to be able to deal with the differences in (i) traffic level and (ii) trip lengths between Saturday and Sunday – otherwise the characteristics of travel are very similar.
- The model structure is suitable for strategic road user charging analyses and will be designed to facilitate more detailed project work.
- A general CV forecasting methodology has been specified.
- Procedures for combining trip data from the different sources have been broadly specified.
- Model structure simplifications are decided.
- Park-&-ride and public transport network centroid connector issues are decided.
- The role of WTSM in project modelling is specified.

Appendix A Detailed Results – Tables and Figures

Appendix B Preliminary Studies Specification

Contents

Document History and Status

Issue	Rev.	Issued To	Qty	Date	Reviewed	Approved

Printed:	1 November 2002
Last Saved:	1 November 2002
File Name:	P:\81\8110573\Task 10 - Preliminary Studies\Prelimstudiesv4_Appendix A.Doc
Author:	
Project Manager:	Daniel Brown
Name of Organisation:	Wellington Regional Council
Name of Project:	WTSM Recalibration
Name of Document:	Preliminary Studies Results
Document Version:	Final
Project Number:	SF02030

A-1. Introduction

This document contains detailed tables and graphs from the preliminary studies. Wherever possible the chapter and section numbering has been kept consistent with that in the main section of the report.

A-2. Task 2.1 Review of Performance of Present Model

A-2.1 Employment, Population and Car Ownership Trends

- **Table 2-1 Car Ownership Trends**

Area	Year	No Motor Vehicle	One Motor Vehicle	Two Motor Vehicles	Three or More Motor Vehicles	Not Stated
Kapiti Coast District	81-86	49.81%	23.18%	18.80%	0.48%	-58.08%
	86-91	7.69%	13.35%	38.99%	51.66%	28.92%
	91-96	25.35%	7.65%	13.73%	11.88%	112.15%
	96-01	0.18%	8.03%	22.48%	46.65%	-35.24%
Porirua City	81-86	44.31%	17.61%	8.92%	5.99%	-76.49%
	86-91	-0.49%	-2.83%	24.97%	55.22%	12.09%
	91-96	-6.22%	-8.58%	11.88%	9.52%	229.41%
	96-01	-11.57%	2.97%	20.13%	35.81%	-43.45%
Upper Hutt City	81-86	33.16%	5.81%	10.43%	-1.99%	-75.23%
	86-91	-10.15%	-3.59%	17.98%	36.15%	21.82%
	91-96	10.87%	0.85%	1.46%	2.73%	74.63%
	96-01	-6.35%	-4.48%	10.32%	25.36%	-20.51%
Lower Hutt City	81-86	28.66%	6.43%	5.77%	-3.53%	-64.50%
	86-91	-3.46%	-1.84%	14.12%	26.37%	-2.15%
	91-96	2.55%	-2.75%	7.33%	3.62%	67.40%
	96-01	-13.03%	0.04%	8.35%	13.36%	-22.54%
Wellington City	81-86	15.79%	4.93%	12.28%	6.29%	-56.23%
	86-91	-12.61%	-1.07%	22.75%	28.84%	-23.32%
	91-96	0.41%	4.59%	5.93%	12.08%	64.29%
	96-01	-7.41%	3.35%	11.93%	12.04%	6.21%
Masterton District	96-01	-10.42%	-1.76%	7.40%	37.61%	-29.90%
Carterton District	96-01	-15.48%	-5.25%	16.30%	37.23%	-36.11%
South Wairarapa District	96-01	-21.70%	-1.03%	12.36%	23.08%	-43.94%

- **Table 2-2 Employment Trends**

Territorial Authority	86-91	91-96	96-01
Kapiti Coast District	16.62%	5.27%	15.73%
Porirua City	-7.07%	-7.51%	10.62%
Upper Hutt City	-5.92%	-5.23%	1.09%
Lower Hutt City	-6.40%	-2.64%	2.90%
Wellington City	-3.16%	3.36%	5.66%
Masterton District	-5.24%	0.22%	3.42%
Carterton District	0.30%	-0.50%	10.01%
South Wairarapa District	-2.85%	-4.72%	12.09%

Over the past 5 years, employment in the outer lying areas has grown more rapidly than that in inner Wellington. This has been coupled with the relatively high population growth in the Wellington CBD over the same period. However the rail cordon counts have risen quite sharply over the corresponding years.

■ **Table 2-3 Population Trends**

TLA	91-96	96-01
Kapiti Coast District	9.62%	10.02%
Porirua City	-0.35%	1.85%
Upper Hutt City	-0.76%	-0.35%
Lower Hutt City	0.90%	-0.24%
Wellington City	6.46%	4.38%
Masterton District	0.35%	-0.44%
Carterton District	-1.61%	1.19%
South Wairarapa District	-2.22%	-1.05%

■ **Table 2-4 Passenger Growth of Trains at Wellington Station**

Direction	Period	Growth
In	Mar-96 to Mar-01	26.1748%
Out	Mar-96 to Mar-01	15.2548%

A-3. Task 2.2 Initial Tabulations

A-3.1 Definition of Trip Time

No detailed tables produced.

A-3.2 Time Period

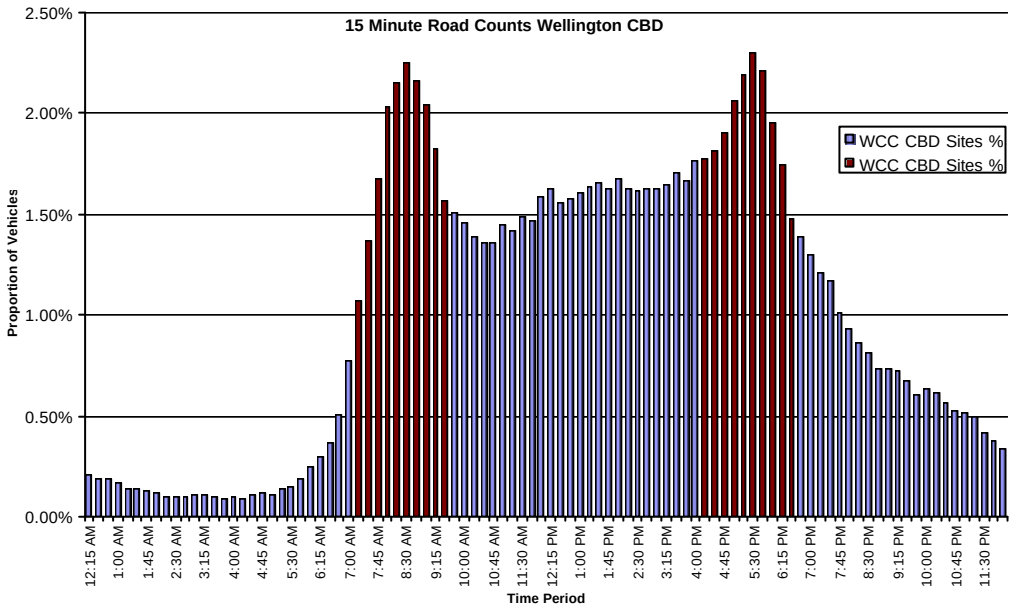
A-3.2.1 Household Data

Attached are a series of charts demonstrating the distribution by time of day for various segments within the expanded household data.

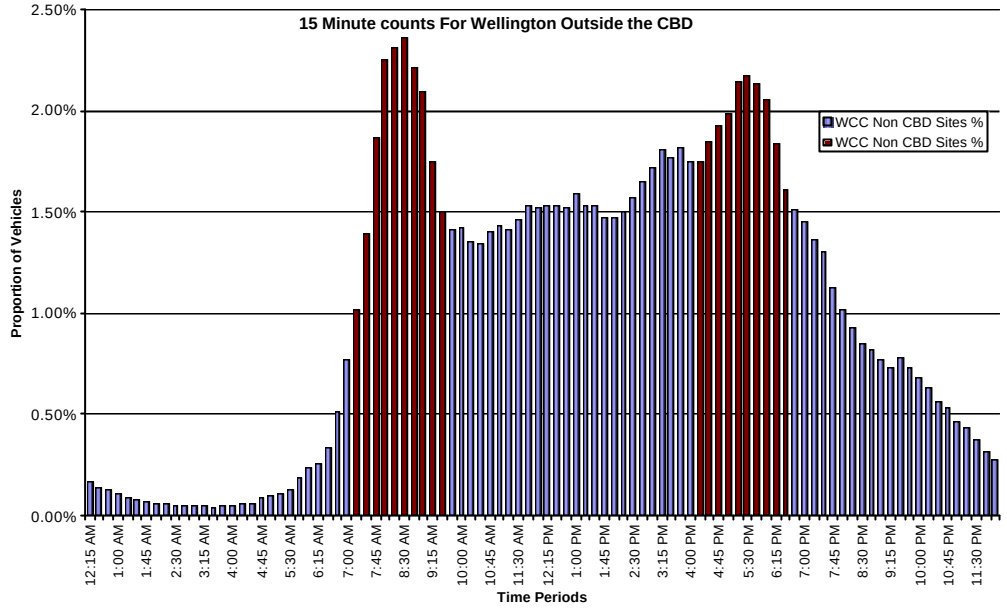
A-3.2.2 Road and Rail Count Data

Below are a series of daily profiles for the three surveyed car sites, and a number of railway stations.

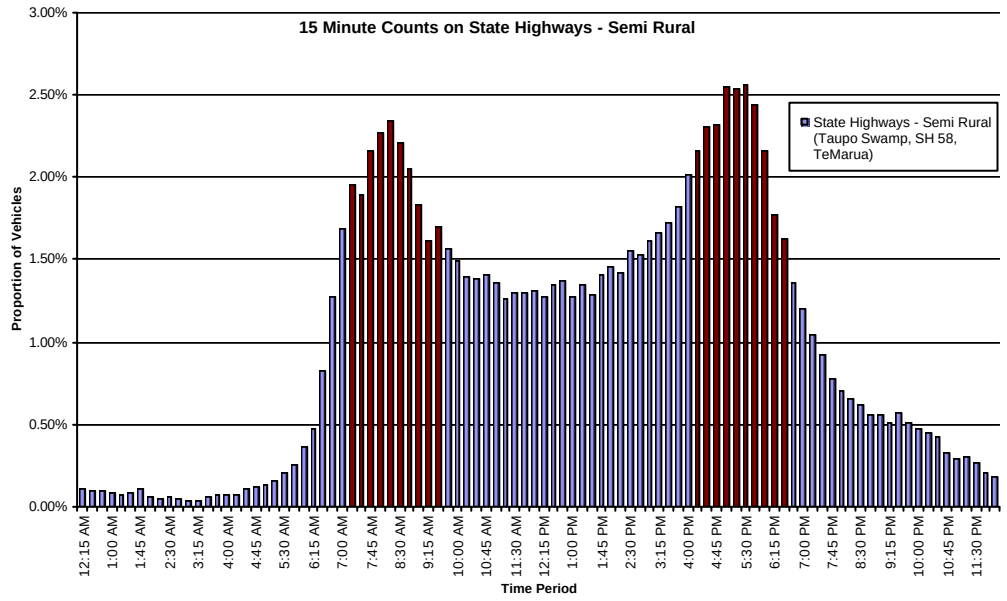
- **Figure 3-1**



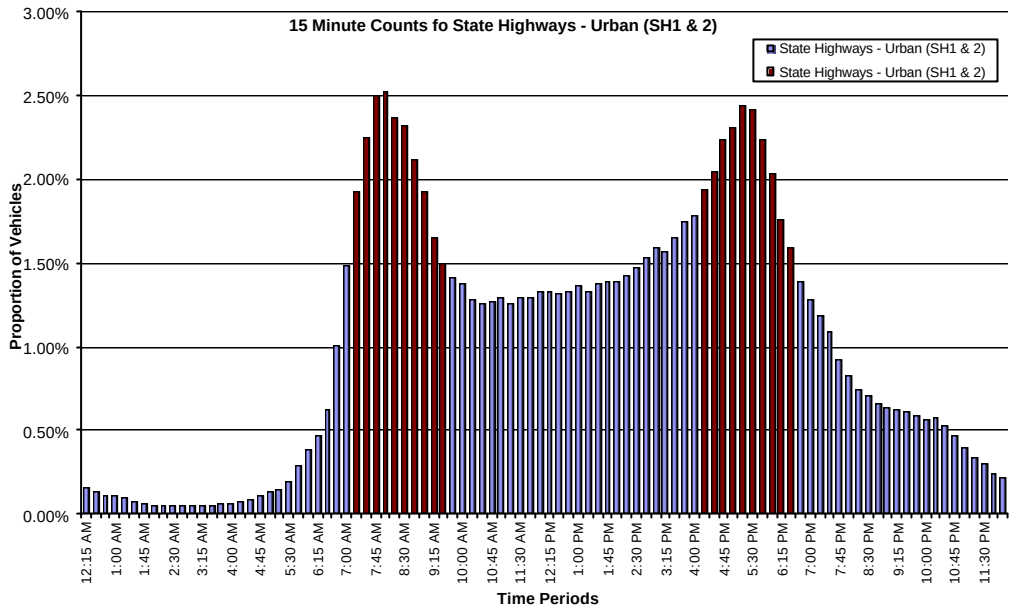
■ **Figure 3-2**



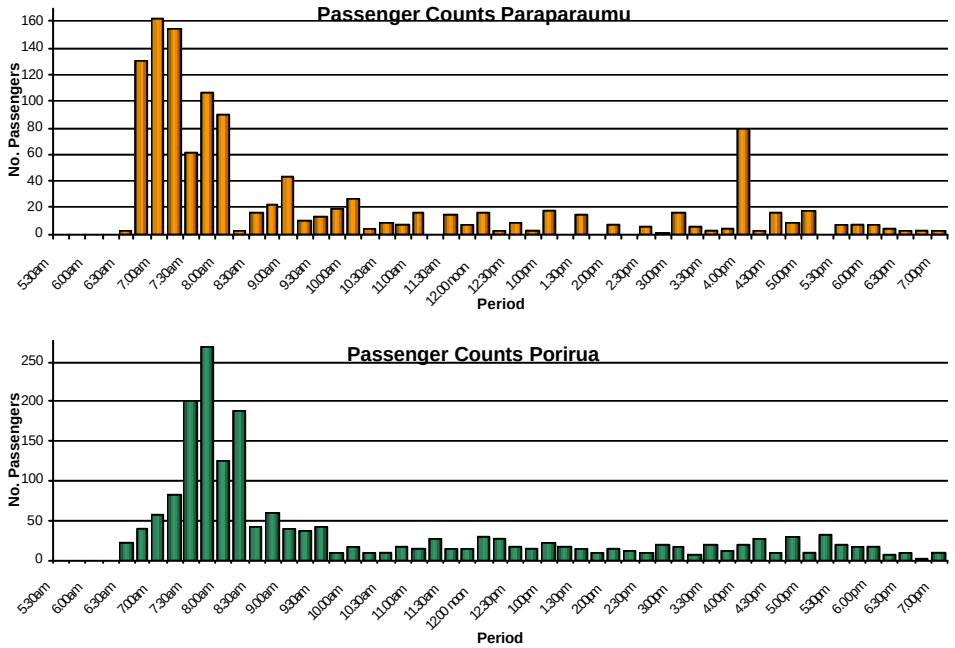
■ **Figure 3-3**

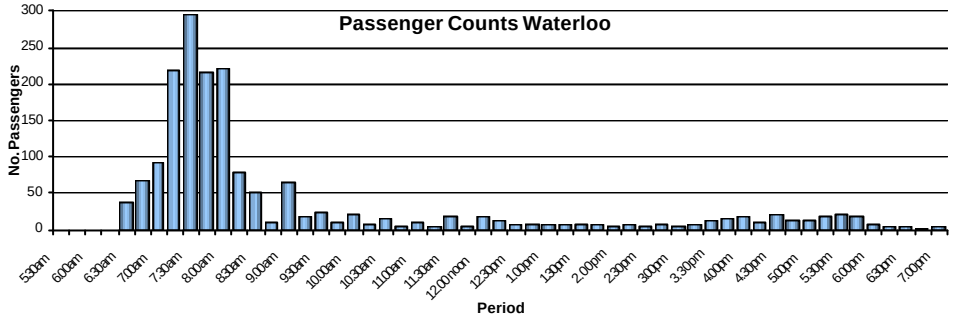


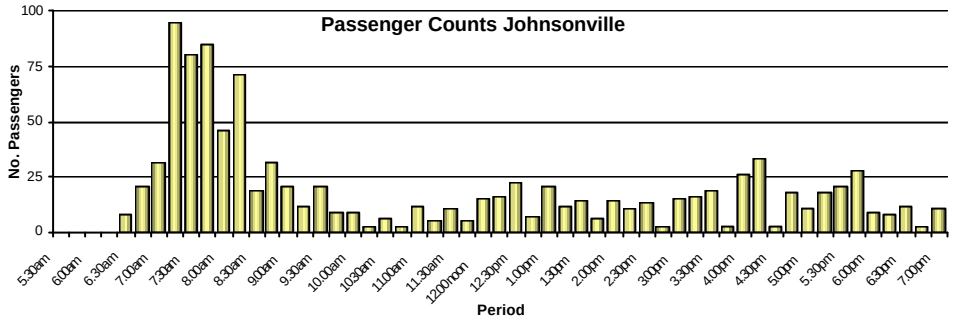
■ **Figure 3-4**



■ **Figure 3-5 Rail Passenger Boardings**







■ Figure 3-6

RAIL SURVEY PEAK PERIOD

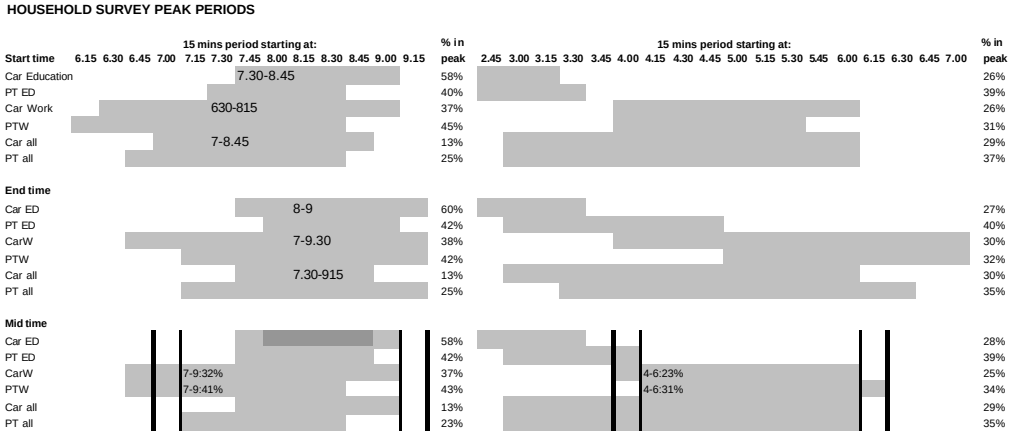
Rail Survey Inbound

15 mins period starting at:

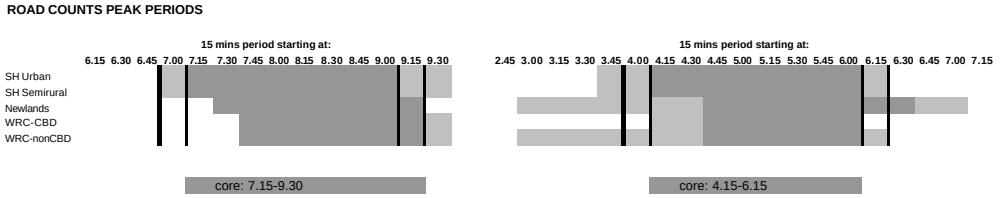
15mins starting:	**6.30**	**6.45**	**7.00**	**7.15**	**7.30**	**7.45**	**8.00**	**8.15**	**8.30**	**8.45**	**9.00**	**9.15**
Start time												
Paraparaumu												
Porirua												
Waterloo												
Johnsonville												
Peaks: 7.00-8.00/6.45-8.15												
Midpoint time												
Paraparaumu												
Porirua												
Waterloo												
Johnsonville												
Peaks: 7.15-8.30/7.00-8.30												
Endpoint time												
Paraparaumu												
Porirua												
Waterloo												
Johnsonville												
Peaks: 7.55-9.00/7.30-9.00												

Core of Peak
Edge of peak

■ **Figure 3-7**

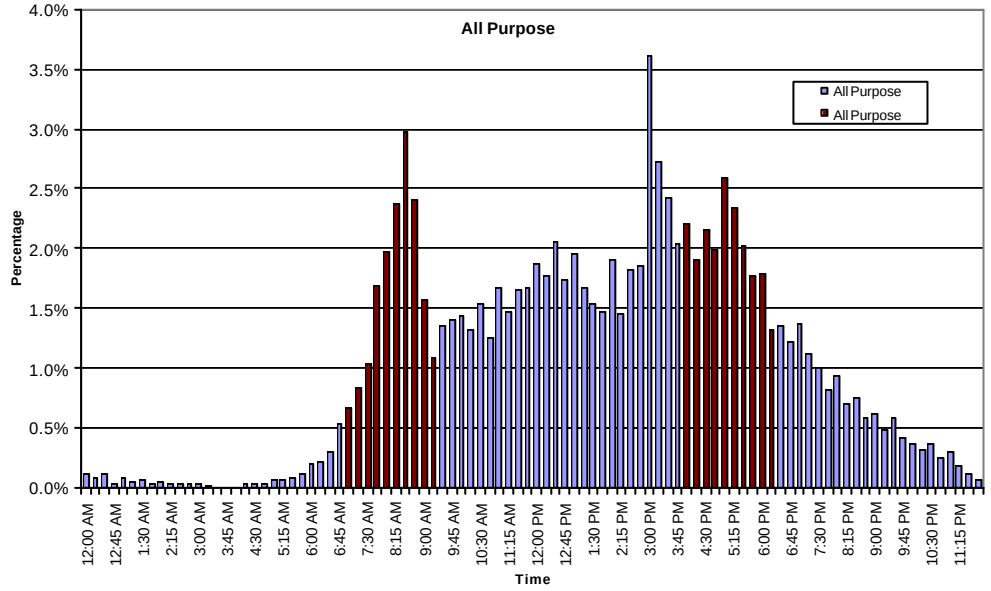


■ **Figure 3-8**

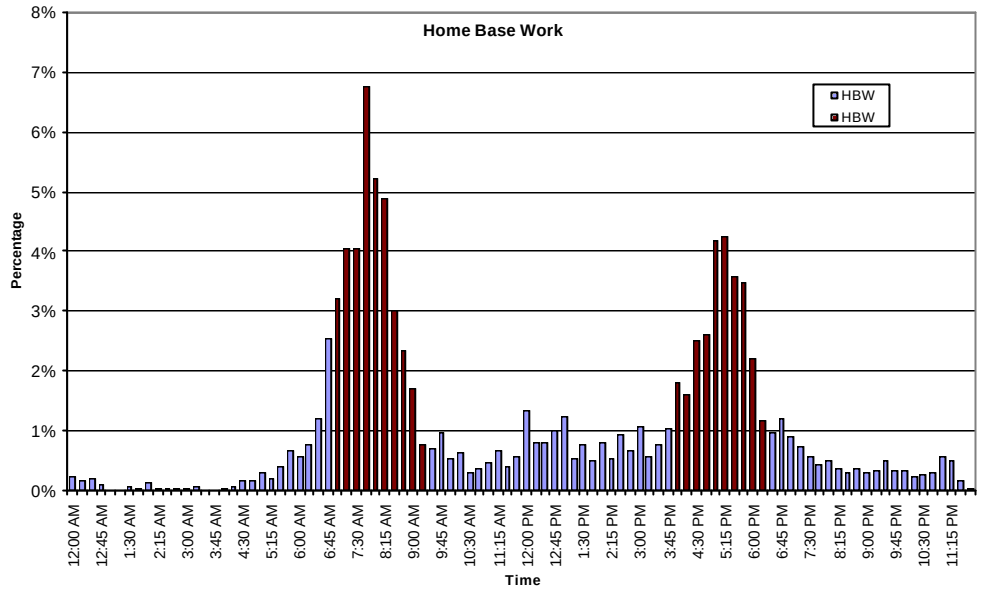


A-3.3 Purpose

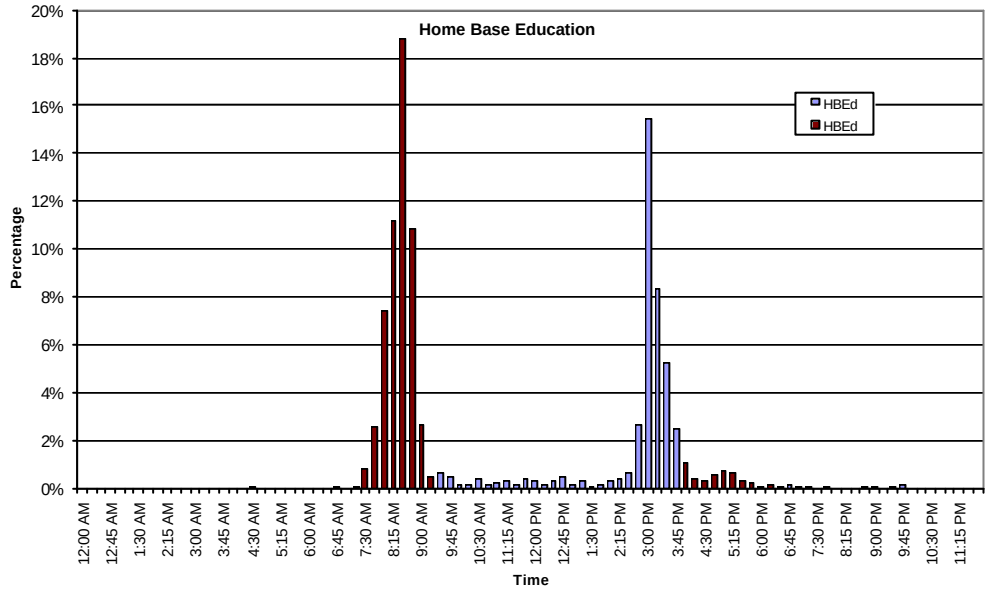
■ **Figure 3-9**



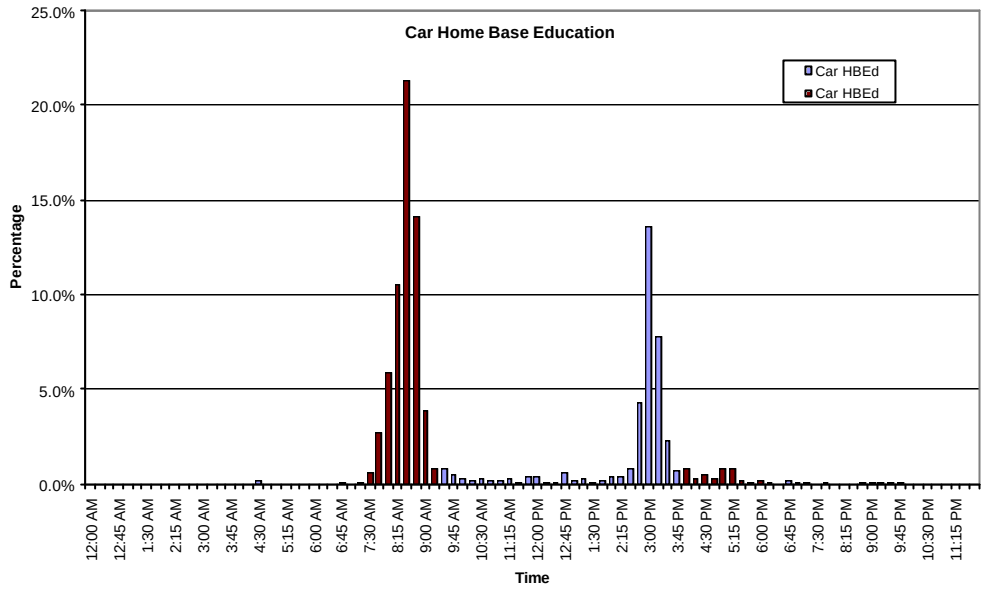
■ **Figure 3-10**



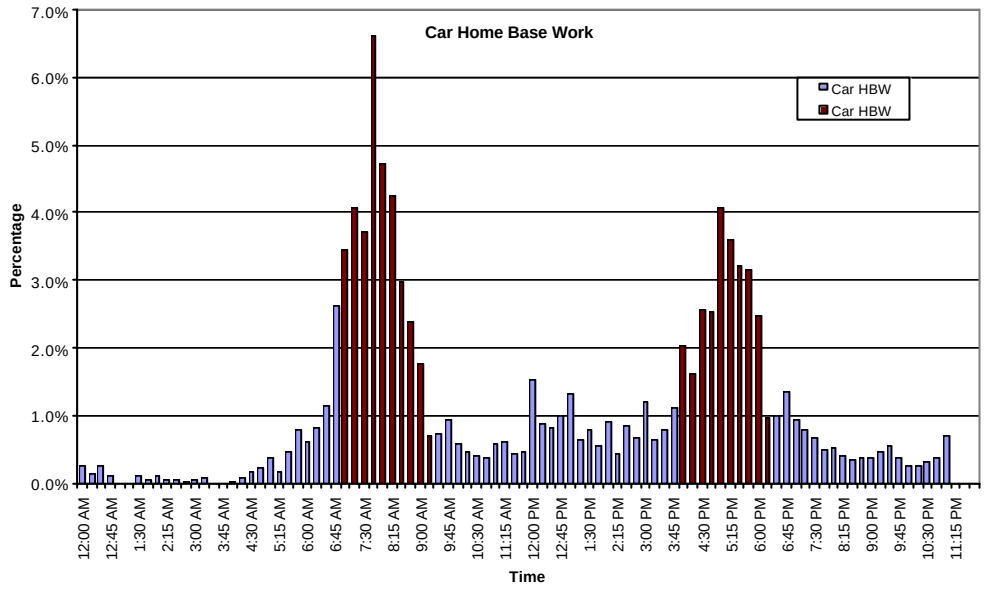
■ **Figure 3-11**



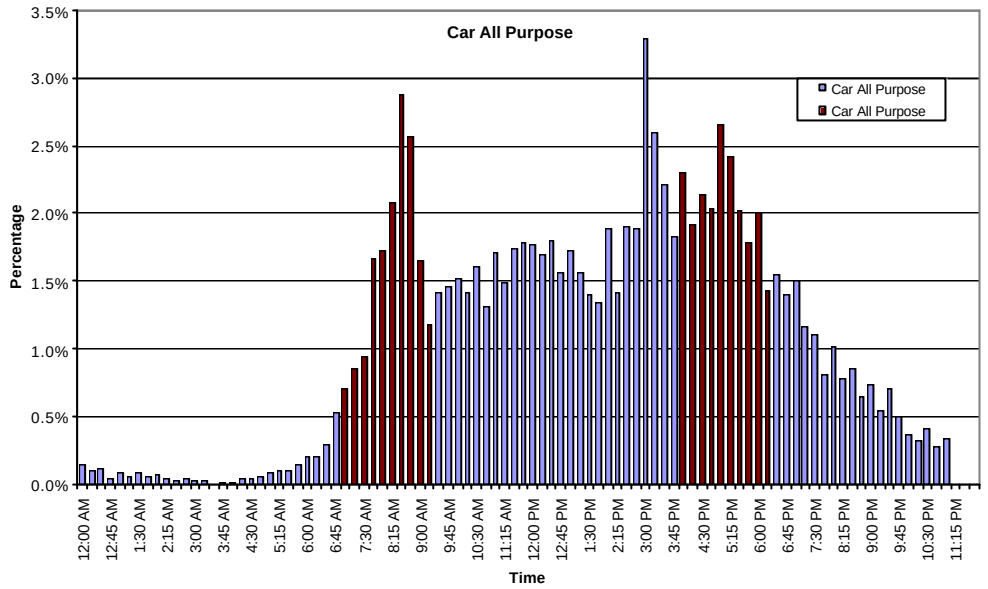
■ **Figure 3-12**



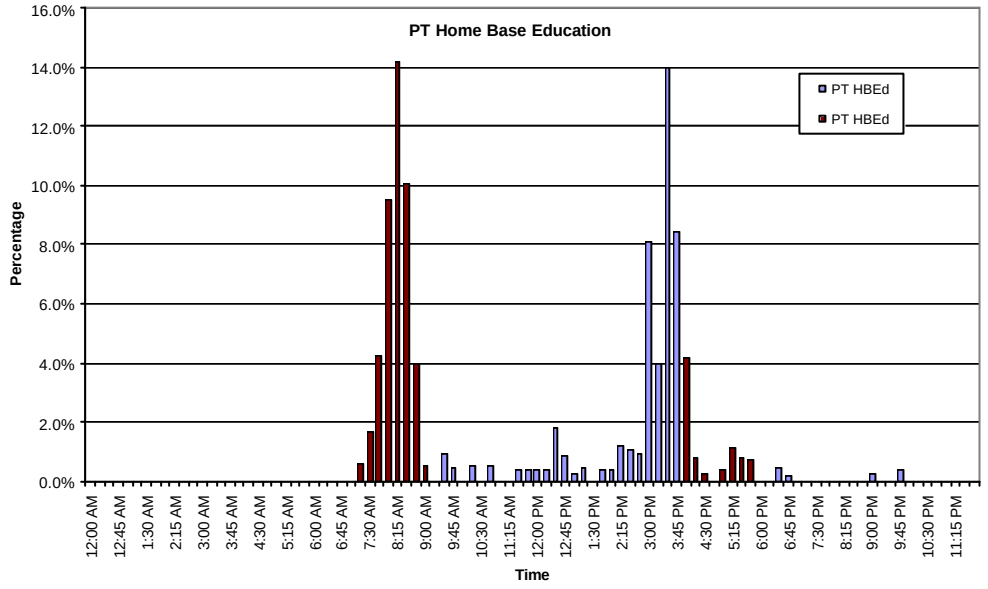
■ **Figure 3-13**



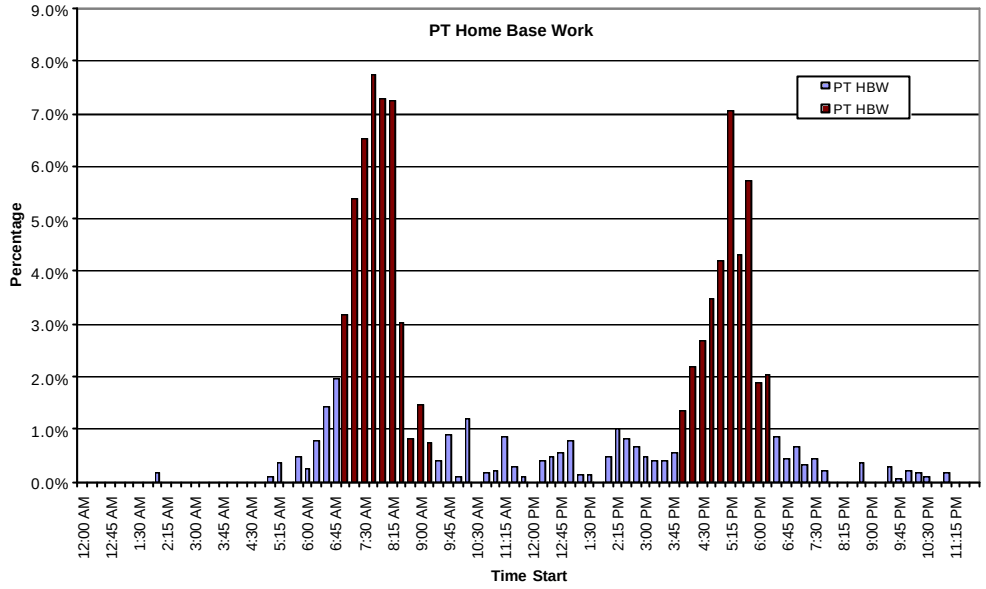
■ **Figure 3-14**



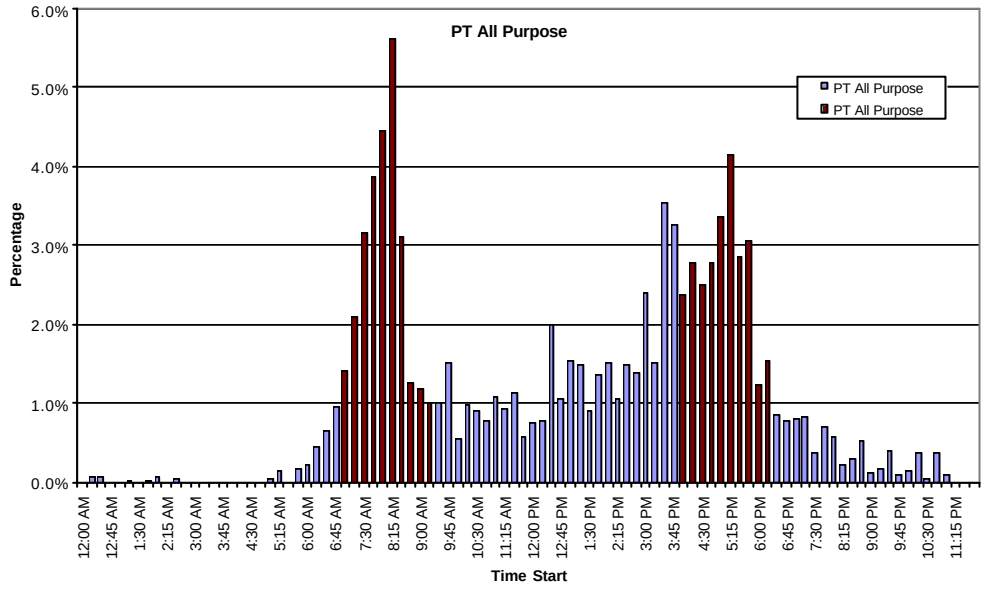
■ **Figure 3-15**



■ **Figure 3-16**



■ **Figure 3-17**



■ **Figure 3-18 Distribution of Trips by Purpose**

Sum of TotalTrip		Percentage	
Purpose	Total	All Purposes	+ Escorts
HBW	283773	12%	12%
HBEd	138870	6%	8%
HBSh	434080	18%	18%
HBSo	174426	7%	7%
HBO	303557	12%	18%
NHBO	506934	21%	28%
HBEB	44484	2%	2%
NHBEB	109715	4%	5%
CV	32553	1%	1%
HBW (E)	21780	1%	NA
HBEd (E)	48463	2%	NA
HBSh (E)	11401	0%	NA
HBSo (E)	10285	0%	NA
HBO (E)	142446	6%	NA
NHBO (E)	195039	8%	NA
HBEB (E)	1464	0%	NA
NHBEB (E)	5075	0%	NA
Grand Total	2464346	100%	100%

Note: (E) indicates Escort Trips

■ **Figure 3-19 Trip Length by Purpose**

Purpose	Average Trip Length	
	All Purposes	+ Escorts
HBW	8.06	7.92
HBEd	3.34	2.98
HBSh	3.73	3.74
HBSo	6.72	6.71
HBO	7.29	6.36
NHBO	4.00	4.32
HBEB	7.72	7.67
NHBEB	5.52	5.52
CV	7.01	7.01
HBW (E)	6.04	NA
HBEd (E)	1.97	NA
HBSh (E)	4.26	NA
HBSo (E)	6.68	NA
HBO (E)	4.37	NA
NHBO (E)	5.16	NA
HBEB (E)	5.95	NA
NHBEB (E)	5.48	NA
Total	5.26	NA

Note: (E) indicates Escort Trips

■ Figure 3-20 Proportion of Trips By Mode by Purpose

	Purpose									
Mode	HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV	Grand Total
Walk	9%	24%	13%	13%	17%	24%	10%	12%	0%	17%
Bicycle	2%	2%	1%	2%	1%	1%	3%	1%	0%	1%
Taxi Passenger	0%	1%	1%	0%	1%	0%	0%	1%	0%	1%
Taxi Driver	0%	0%	0%	0%	0%	1%	0%	0%	2%	0%
Car Passenger	12%	32%	24%	32%	29%	23%	7%	7%	1%	23%
Car Driver	59%	24%	58%	50%	49%	47%	73%	70%	52%	51%
Truck Passenger	0%	0%	0%	0%	0%	0%	1%	0%	1%	0%
Truck Driver	1%	0%	0%	0%	0%	0%	3%	5%	43%	1%
Train	8%	3%	1%	1%	1%	1%	1%	1%	0%	2%
Public Bus	7%	7%	3%	1%	1%	1%	2%	1%	0%	3%
School Bus	0%	8%	0%	0%	0%	1%	0%	1%	0%	1%
Charter Bus	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cable Car	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Motorcycle	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

■ Figure 3-21 Number of Sampled Trips by Purpose / Mode

Sum of TotalTrip	Purpose									
Mode	CV	HBEB	HBEd	HBO	HBSh	HBSo	HBW	NHBEB	NHBO	Grand Total
Walk		60	657	1128	757	333	325	187	2266	5713
Bicycle		26	45	67	46	55	85	16	53	393
Taxi Passenger		2	18	60	37	6	11	20	32	186
Car Driver	228	502	693	3279	3897	1396	2738	1200	5019	18952
Car Passenger	8	40	872	1810	1504	870	560	109	2260	8033
Motorcycle				11	5	3	26		15	60
Truck Driver	215	22	3	12	17	11	46	97	37	460
Truck Passenger	11	4	4	8	3	6	13	6	17	72
Train		9	85	68	36	12	390	23	101	724
Public Bus		8	145	82	192	31	248	7	114	827
School Bus			240	6				10	82	338
Charter Bus			5	13	3				37	58
Taxi Driver	10	2	1	13	1				124	151
Cable Car								1		1
Grand Total	472	675	2768	6557	6498	2723	4442	1676	10157	35968

■ Figure 3-22 Correlations Between Trip Purpose Zonal Totals

Correlation - Production

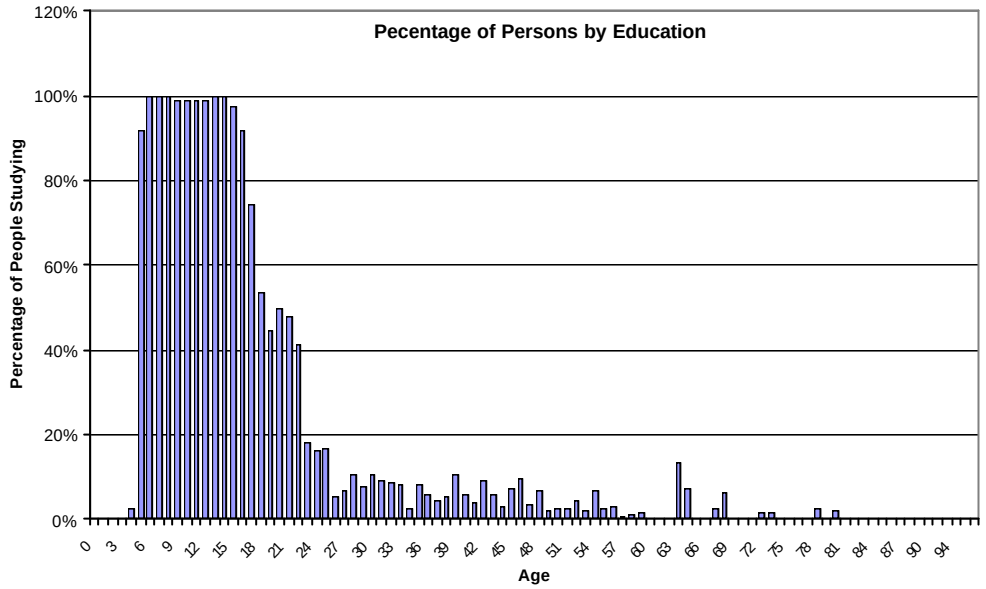
	CV	*HBEB*	*HBEd*	*HBO*	*HBSh*	*HBSo*	*HBW*	*NHBEB*	*NHBO*
CV	1								
HBEB	-0.045682	1							
HBEd	0.05477	0.559755	1						
HBO	0.021845	0.595427	0.773733	1					
HBSh	0.103084	0.560815	0.784698	0.841472	1				
HBSo	0.156103	0.46452	0.727089	0.715421	0.890742	1			
HBW	0.075421	0.640442	0.789873	0.852402	0.858543	0.767365	1		
NHBEB	0.535064	0.019934	0.197838	0.108884	0.329882	0.355801	0.235439	1	
NHBO	0.480032	0.03644	0.26381	0.188383	0.386672	0.41691	0.301975	0.873104	1

Correlation - Attraction

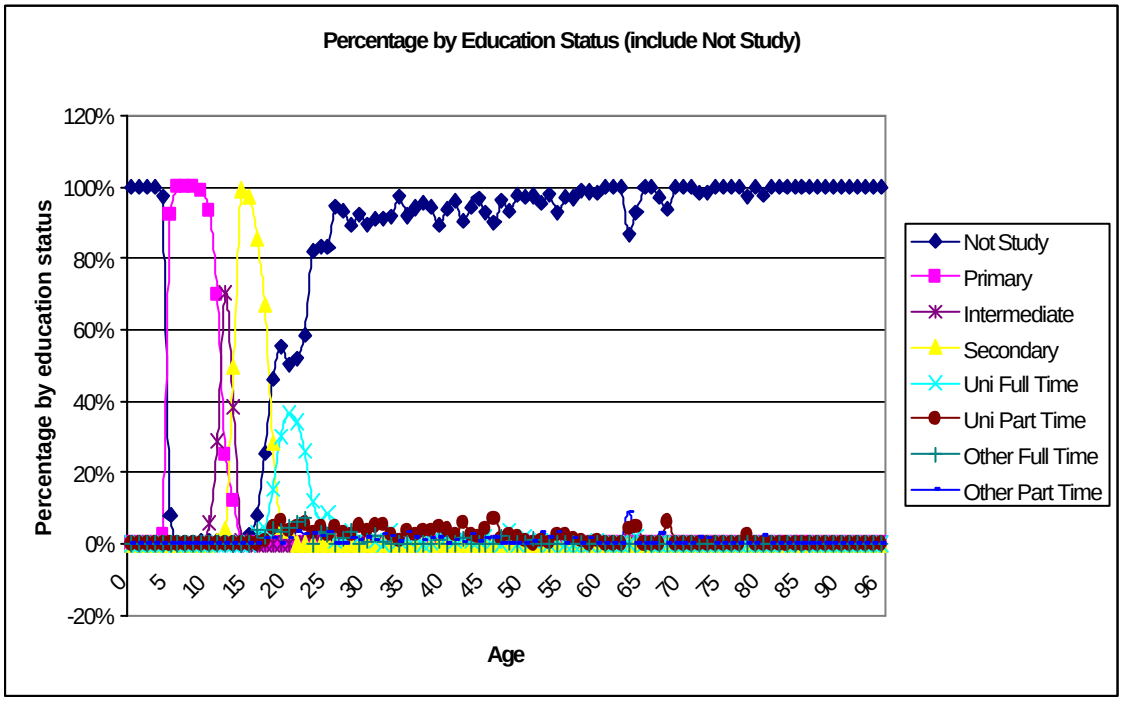
	CV	*HBEB*	*HBEd*	*HBO*	*HBSh*	*HBSo*	*HBW*	*NHBEB*	*NHBO*
CV	1								
HBEB	0.437572	1							
HBEd	0.221722	0.291512	1						
HBO	0.477409	0.518164	0.516985	1					
HBSh	0.396192	0.418178	0.398837	0.659306	1				
HBSo	0.146974	0.354742	0.644631	0.605316	0.454437	1			
HBW	0.552554	0.574888	0.29117	0.548903	0.516222	0.274482	1		
NHBEB	0.560711	0.623983	0.419986	0.643776	0.593318	0.483663	0.899297	1	
NHBO	0.510809	0.583308	0.457799	0.786247	0.843887	0.521152	0.817419	0.856391	1

A-3.4 Person / Family Structure

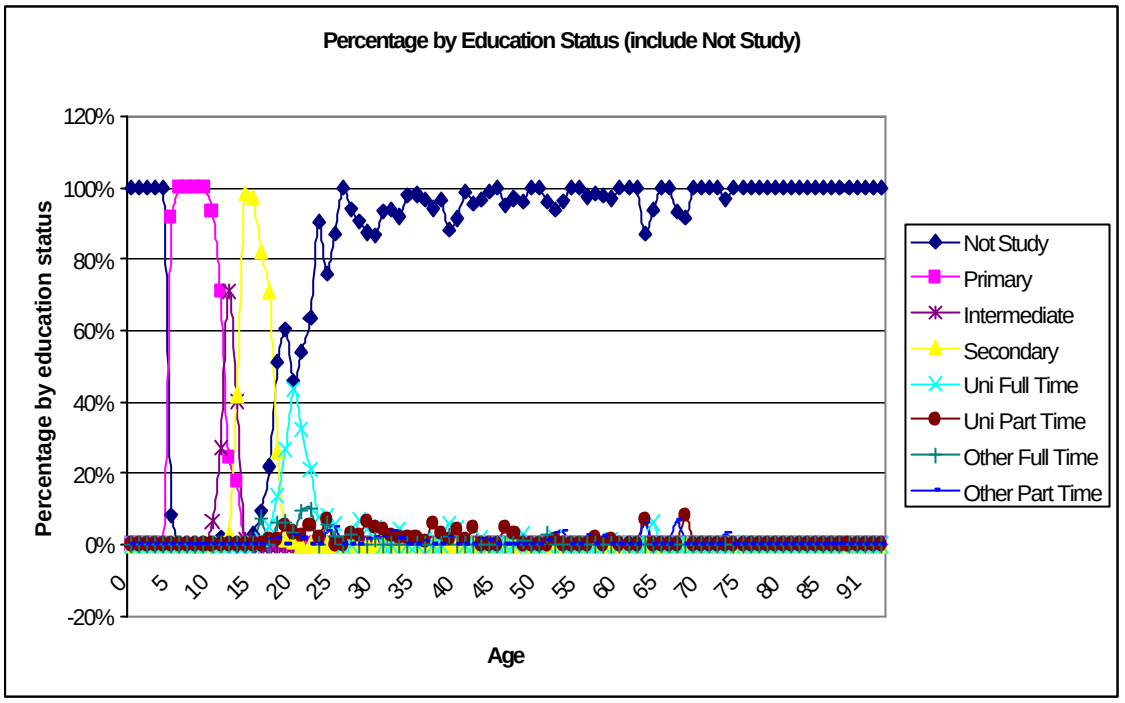
■ **Figure 3-23 Proportion of Persons by Education Status – All Persons All Education Status**



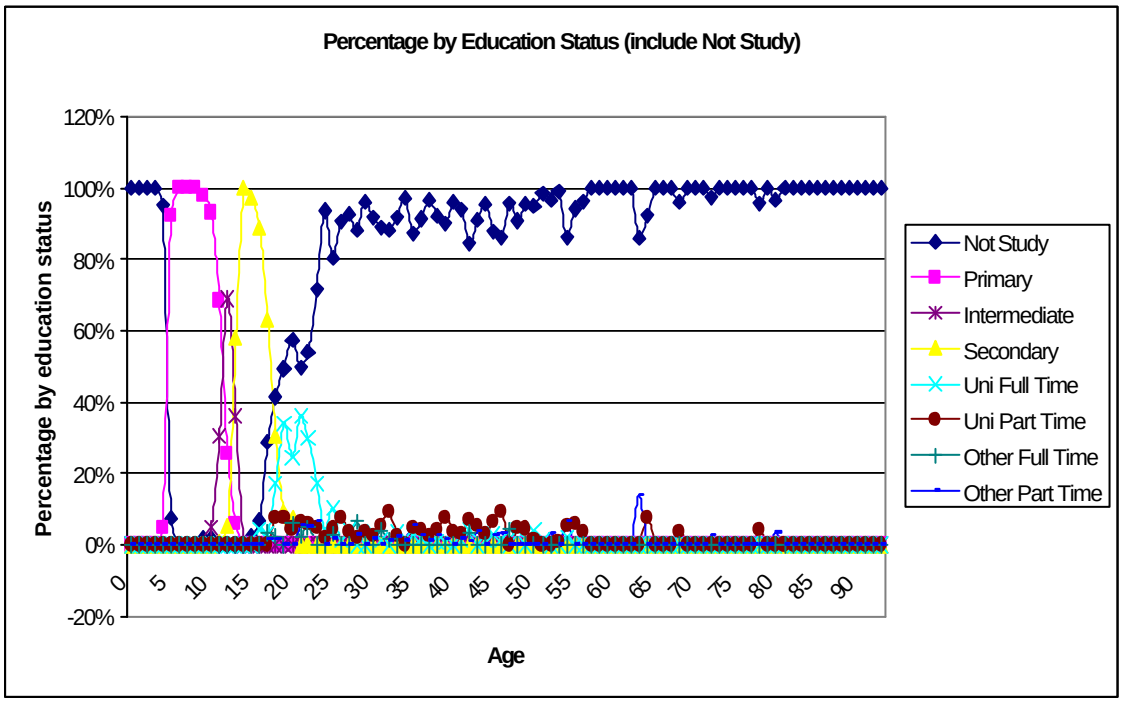
■ **Figure 3-24 Proportion of Persons by Education Status – All Persons**



■ **Figure 3-25 Proportion of Persons by Education Status – Male**

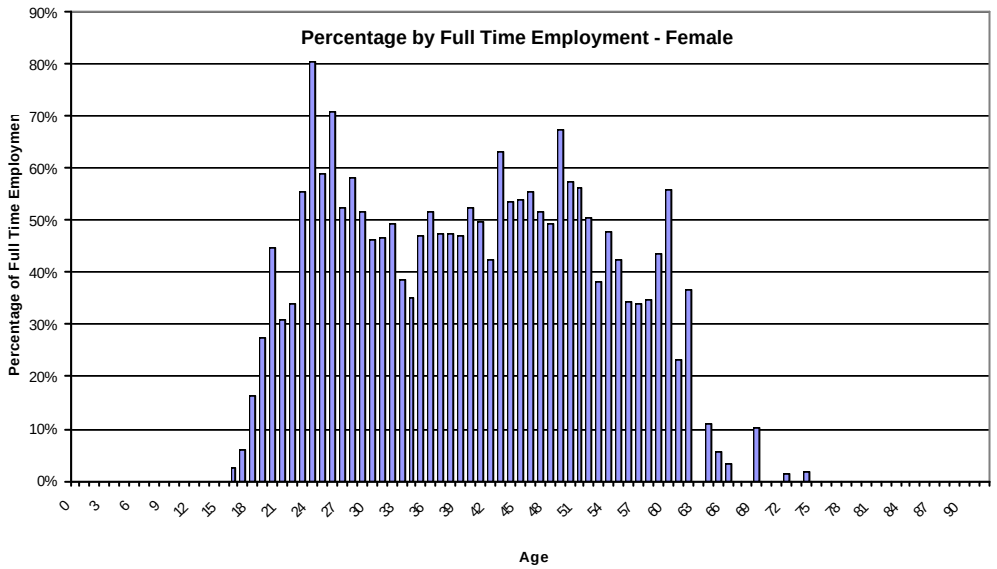


■ **Figure 3-26 Proportion of Persons by Education Status – Female**

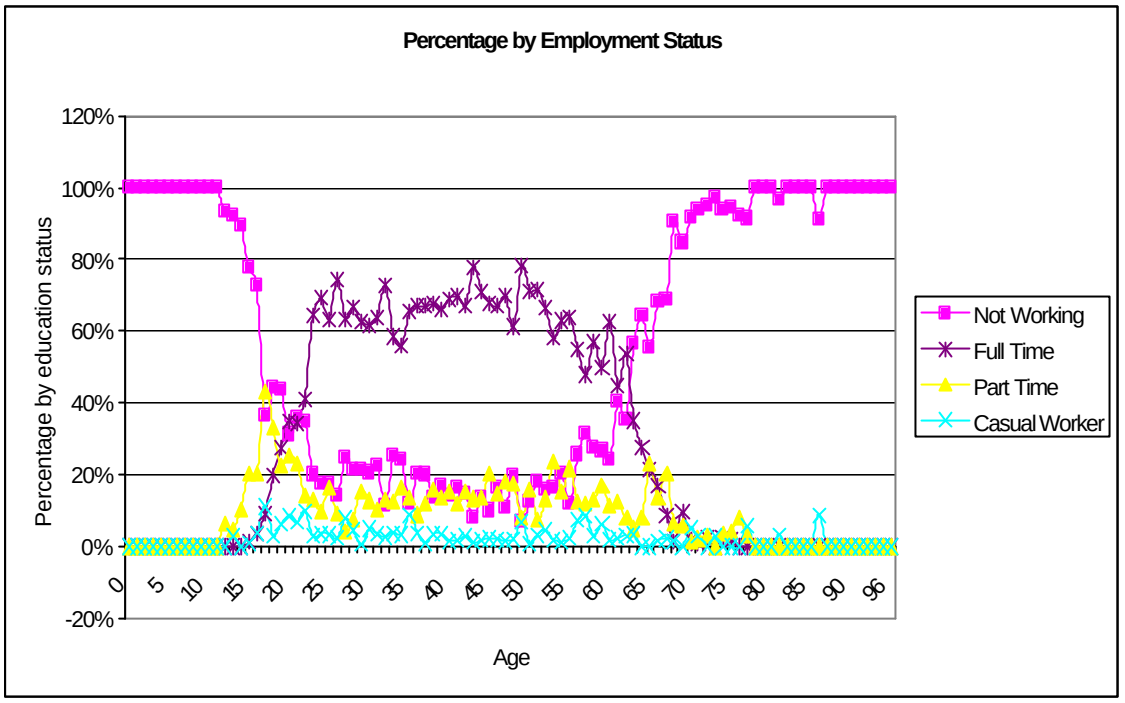


■ **Figure 3-27 Proportion of Persons by Employment Status – Male**

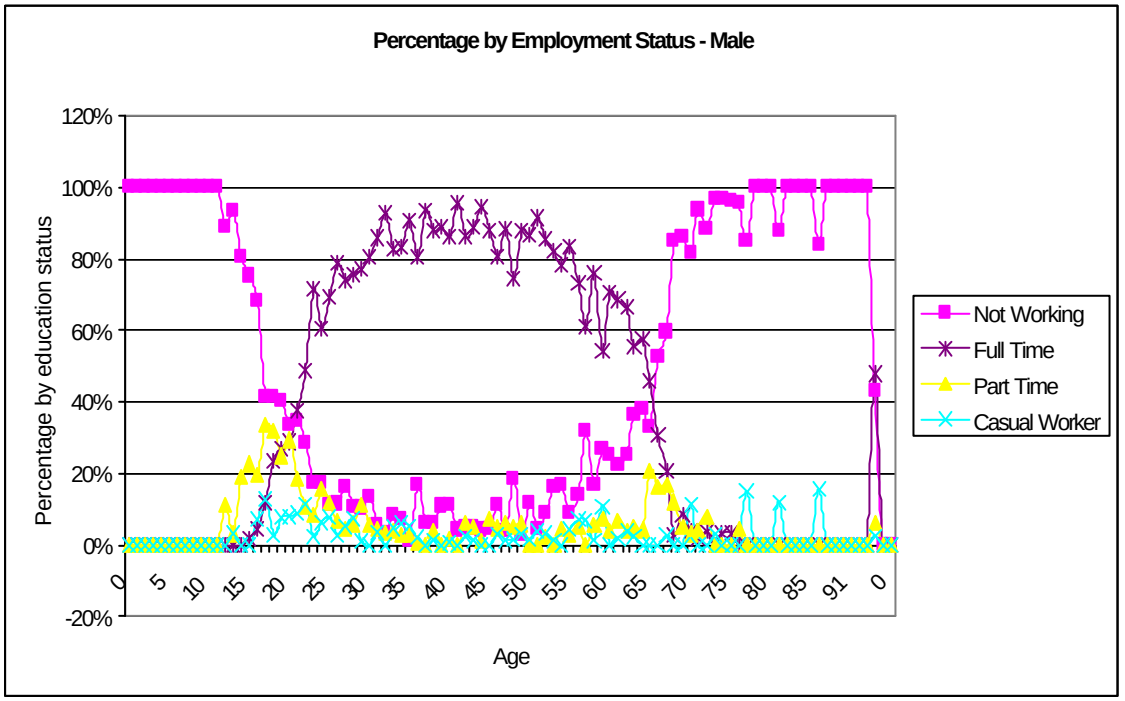
■ **Figure 3-28 Proportion of Persons by Employment Status – Female**



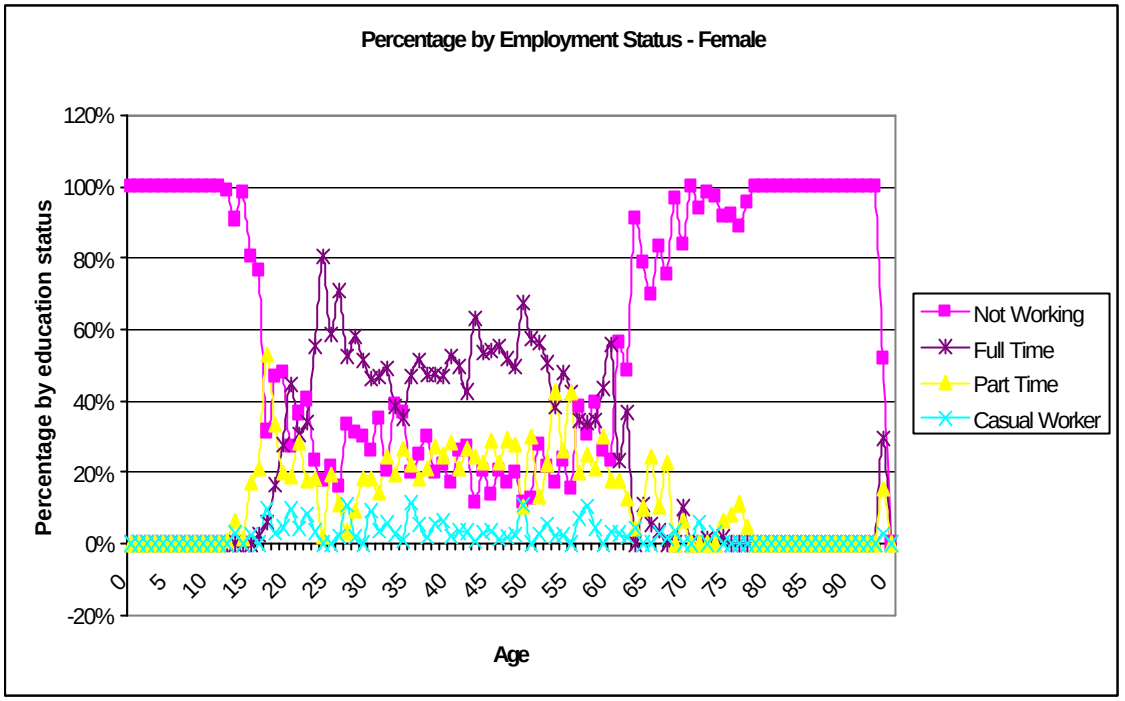
■ **Figure 3-29 Proportion of Persons by Employment Status – All Persons**



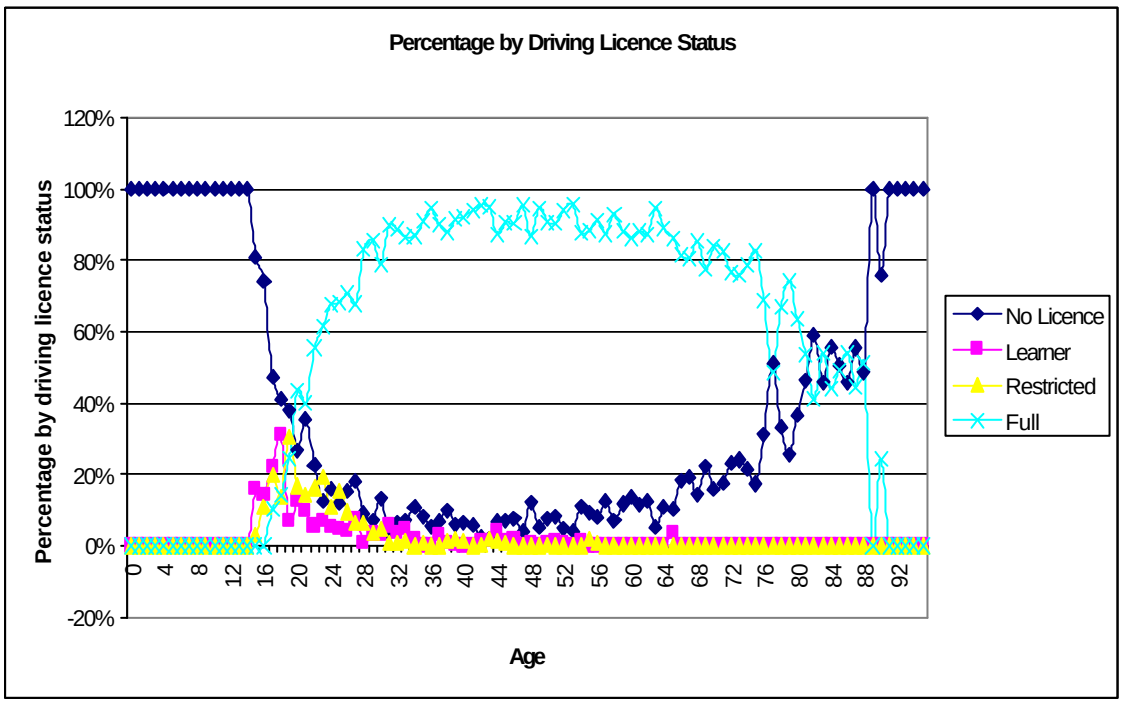
■ **Figure 3-30 Proportion of Persons by Employment Status – Male**



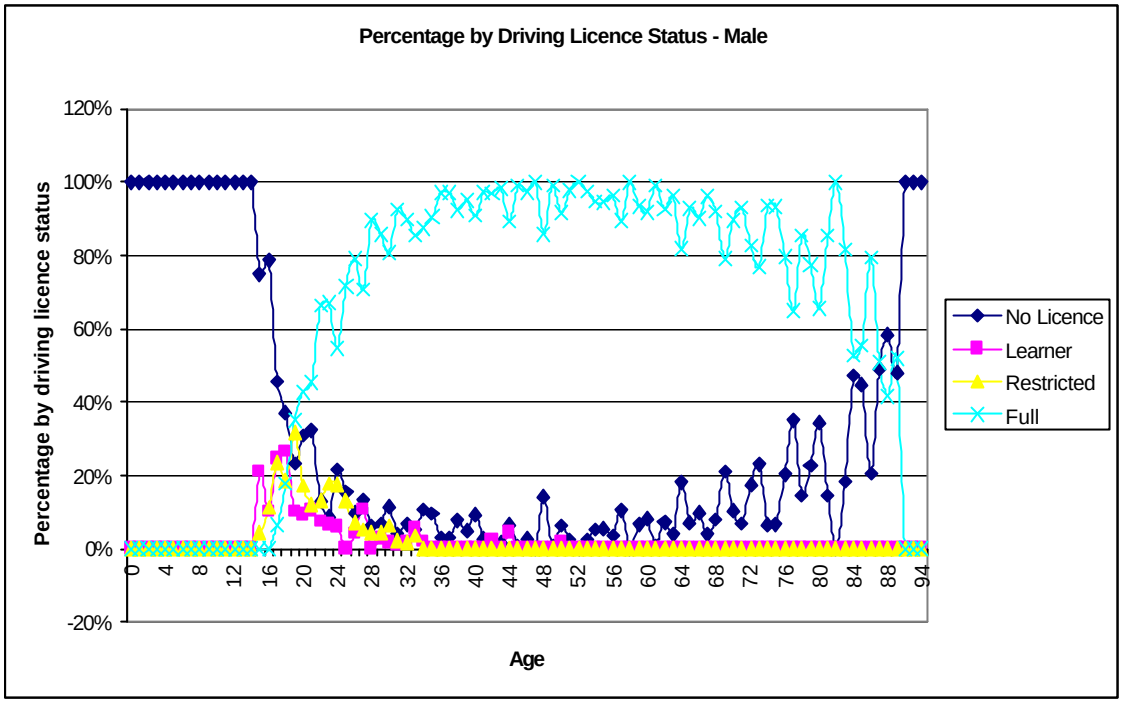
■ **Figure 3-31 Proportion of Persons by Employment Status – Female**



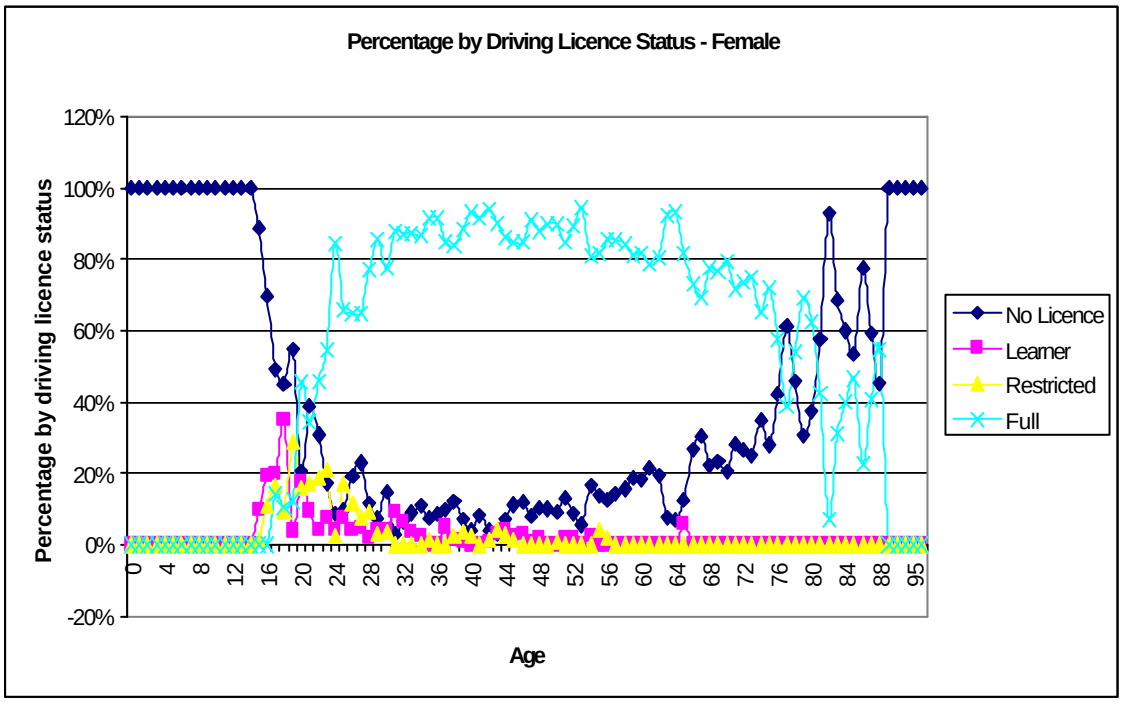
■ **Figure 3-32 Proportion of Persons by Drivers Licence Status – All Persons**



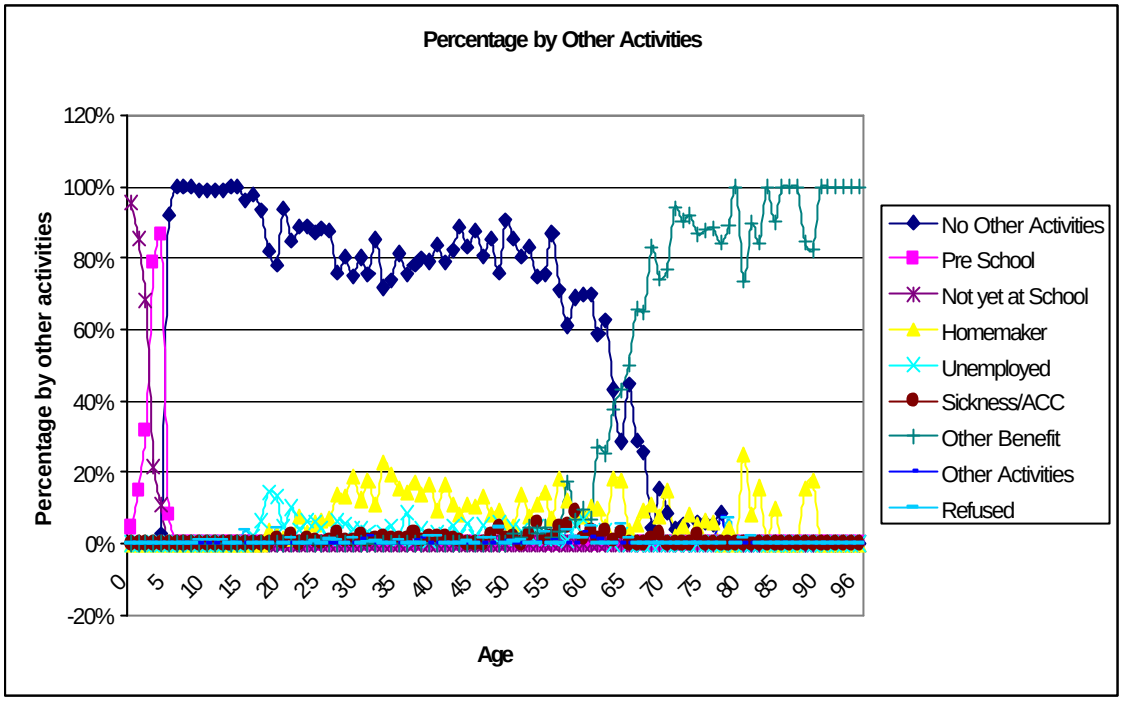
■ **Figure 3-33 Proportion of Persons by Drivers Licence Status – Males**



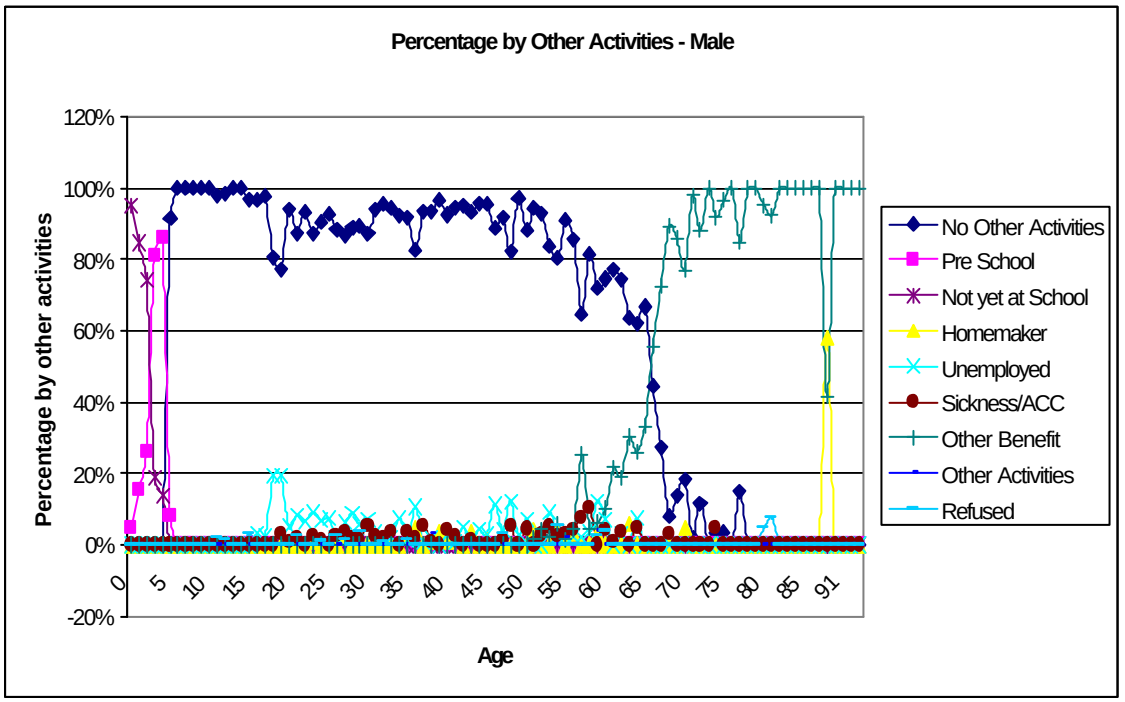
■ **Figure 3-34 Proportion of Persons by Drivers Licence Status – Female**



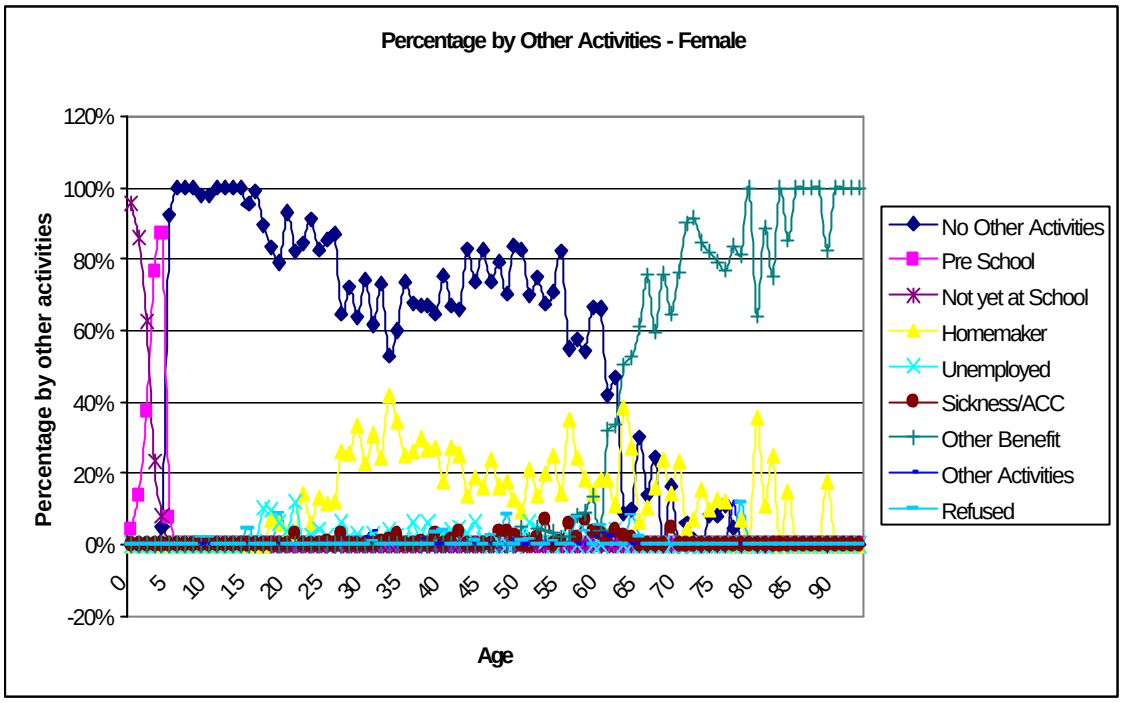
■ **Figure 3-35 Proportion of Persons by Other Status – All Persons**



■ **Figure 3-36 Proportion of Persons by Other Status – Males**



■ **Figure 3-37 Proportion of Persons by Other Status – Females**



■ **Figure 3-38 Car Ownership Levels by TLA**

Car ownership levels	HouseholdVeh				
TLA	0	1	2	3+	Grand Total
Carterton District	6%	29%	31%	34%	100%
Hutt City	11%	42%	34%	13%	100%
Kapiti Coast District	6%	47%	35%	12%	100%
Masterton District	11%	40%	33%	15%	100%
Porirua City	12%	39%	38%	11%	100%
South Wairarapa Distr	5%	40%	38%	17%	100%
Upper Hutt City	10%	35%	36%	19%	100%
Wellington City	12%	44%	34%	10%	100%
Grand Total	11%	42%	35%	13%	100%

A-3.5 Car Availability

Trip by Purpose by Mode by Number of Cars by Adults in Household:

Purpose	HBW

Sum of SumOfExpTrip		ModeGroup			
NumberofCar	NumberofAdult	Car	Other	PT	Grand Total
0	1	514	2471	1193	4178
	2	953	2787	1719	5460
	3+	367	813	1519	2699
1	1	13434	2095	1551	17080
	2	36086	7723	14551	58360
	3+	11755	2921	6728	21404
2	1	2244	0	0	2244
	2	69187	2199	10474	81860
	3+	36925	4287	7584	47796
3+	1	115	0	0	115
	2	16845	214	1311	18370
	3+	37827	2927	5232	45986
Grand Total		225253	28438	51863	305554

Purpose	HBW

Sum of SumOfExpTrip		ModeGroup			
NumberofCar	NumberofAdult	Car	Other	PT	Grand Total
0	1	12%	59%	29%	100%
	2	17%	51%	31%	100%
	3+	14%	30%	56%	100%
1	1	79%	12%	9%	100%
	2	62%	13%	25%	100%
	3+	55%	14%	31%	100%
2	1	100%	0%	0%	100%
	2	85%	3%	13%	100%
	3+	75%	9%	16%	100%
3+	1	100%	0%	0%	100%
	2	92%	1%	7%	100%
	3+	82%	6%	11%	100%
Grand Total		74%	9%	17%	100%

Purpose	HBEd

Sum of SumOfExpTrip		ModeGroup				
NumberofCar	NumberofAdult	Car	Other	PT	School	Grand Total
0	1	55	2665	1262	84	4066
	2	609	4061	1093	254	6017
	3+	0	345	1277	0	1622
1	1	6758	4162	880	886	12686
	2	23195	8292	2313	2434	36233
	3+	5770	4635	3152	1078	14635
2	1	429	142	154	0	725
	2	39396	10506	3207	3239	56348
	3+	14118	6534	5976	2790	29419
3+	1	104	0	0	64	168
	2	6269	1534	472	1141	9415
	3+	9647	1905	1651	2795	15998
Grand Total		106351	44781	21437	14764	187333

Purpose	HBEd

Sum of SumOfExpTrip		ModeGroup				
NumberofCar	NumberofAdult	Car	Other	PT	School	Grand Total
0	1	1%	66%	31%	2%	100%
	2	10%	67%	18%	4%	100%
	3+	0%	21%	79%	0%	100%
1	1	53%	33%	7%	7%	100%
	2	64%	23%	6%	7%	100%
	3+	39%	32%	22%	7%	100%
2	1	59%	20%	21%	0%	100%
	2	70%	19%	6%	6%	100%
	3+	48%	22%	20%	9%	100%
3+	1	62%	0%	0%	38%	100%
	2	67%	16%	5%	12%	100%
	3+	60%	12%	10%	17%	100%
Grand Total		57%	24%	11%	8%	100%

Purpose	HBSh

Sum of SumOfExpTrip		ModeGroup			
NumberofCar	NumberofAdult	Car	Other	PT	Grand Total
0	1	2934	9354	4838	17126
	2	2550	7506	2180	12237
	3+	2100	1864	1569	5534
1	1	33835	6515	752	41102
	2	91102	12802	3681	107585
	3+	16194	5108	1591	22893
2	1	1312	292	0	1605
	2	108029	5590	948	114567
	3+	44637	5489	2233	52359
3+	1	709	109	0	818
	2	19602	895	372	20869
	3+	44346	2974	1466	48786
Grand Total		367352	58499	19630	445480

Purpose	HBSh

Sum of SumOfExpTrip		ModeGroup			
NumberofCar	NumberofAdult	Car	Other	PT	Grand Total
0	1	17%	55%	28%	100%
	2	21%	61%	18%	100%
	3+	38%	34%	28%	100%
1	1	82%	16%	2%	100%
	2	85%	12%	3%	100%
	3+	71%	22%	7%	100%
2	1	82%	18%	0%	100%
	2	94%	5%	1%	100%
	3+	85%	10%	4%	100%
3+	1	87%	13%	0%	100%
	2	94%	4%	2%	100%
	3+	91%	6%	3%	100%
Grand Total		82%	13%	4%	100%

Trip by Purpose by Mode by Number of Cars by Adults in Household:

Purpose	HBSo

Sum of SumOfExpTrip		ModeGroup			
NumberofCar	NumberofAdult	Car	Other	PT	Grand Total
0	1	1304	1778	1696	4778
	2	1313	1183	195	2692
	3+	1040	848	649	2536
1	1	16032	2358	362	18752
	2	35378	4651	249	40278
	3+	6737	2177	905	9818
2	1	1111	0	0	1111
	2	41018	4467	616	46102
	3+	20206	4395	1976	26567
3+	2	10090	899	194	11183
	3+	18941	1678	275	20894
Grand Total		153170	24424	7117	184711

Purpose	HBSo

Sum of SumOfExpTrip		ModeGroup			
NumberofCar	NumberofAdult	Car	Other	PT	Grand Total
0	1	27%	37%	35%	100%
	2	49%	44%	7%	100%
	3+	41%	33%	26%	100%
1	1	85%	13%	2%	100%
	2	88%	12%	1%	100%
	3+	69%	22%	9%	100%
2	1	100%	0%	0%	100%
	2	89%	10%	1%	100%
	3+	76%	17%	7%	100%
3+	2	90%	8%	2%	100%
	3+	91%	8%	1%	100%
Grand Total		83%	13%	4%	100%

Purpose	HBO
2	3

Sum of SumOfExpTrip		ModeGroup				
NumberofCar	NumberofAdult	Car	Other	PT	School	Grand Total
0	1	3096	4742	880	0	8717
	2	1899	5277	1105	0	8282
	3+	1139	2190	797	0	4127
1	1	27093	7066	734	0	34894
	2	76784	17239	3107	0	97130
	3+	18515	5737	2195	0	26447
2	1	1597	355	0	0	1951
	2	112849	15238	2297	306	130690
	3+	49430	9395	3749	0	62574
3+	1	519	0	0	0	519
	2	15160	1945	277	0	17382
	3+	46052	5747	1393	99	53290
Grand Total		354133	74931	16534	405	446004

Purpose	HBO

Sum of SumOfExpTrip		ModeGroup				
NumberofCar	NumberofAdult	Car	Other	PT	School	Grand Total
0	1	36%	54%	10%	0%	100%
	2	23%	64%	13%	0%	100%
	3+	28%	53%	19%	0%	100%
1	1	78%	20%	2%	0%	100%
	2	79%	18%	3%	0%	100%
	3+	70%	22%	8%	0%	100%
2	1	82%	18%	0%	0%	100%
	2	86%	12%	2%	0%	100%
	3+	79%	15%	6%	0%	100%
3+	1	100%	0%	0%	0%	100%
	2	87%	11%	2%	0%	100%
	3+	86%	11%	3%	0%	100%
Grand Total		79%	17%	4%	0%	100%

Purpose	NHBO
2	3

Sum of SumOfExpTrip		ModeGroup				
NumberofCar	NumberofAdult	Car	Other	PT	School	Grand Total
0	1	2804	8072	1368	218	12462
	2	2832	9433	1397	0	13662
	3+	1980	5221	646	0	7847
1	1	46132	11820	738	486	59176
	2	110817	38987	3660	1555	155019
	3+	18385	14570	2508	254	35716
2	1	3965	355	363	0	4682
	2	152702	36379	5151	1522	195754
	3+	64552	21270	3761	690	90273
3+	1	777	50	0	0	826
	2	29474	5502	198	819	35992
	3+	70778	18455	1238	93	90564
Grand Total		505197	170112	21028	5636	701974

Purpose	NHBO

Sum of SumOfExpTrip		ModeGroup				
NumberofCar	NumberofAdult	Car	Other	PT	School	Grand Total
0	1	23%	65%	11%	2%	100%
	2	21%	69%	10%	0%	100%
	3+	25%	67%	8%	0%	100%
1	1	78%	20%	1%	1%	100%
	2	71%	25%	2%	1%	100%
	3+	51%	41%	7%	1%	100%
2	1	85%	8%	6%	0%	100%
	2	78%	19%	3%	1%	100%
	3+	72%	24%	4%	1%	100%
3+	1	94%	6%	0%	0%	100%
	2	82%	15%	1%	2%	100%
	3+	78%	20%	1%	0%	100%
Grand Total		72%	24%	3%	1%	100%

Purpose	HBEB

Sum of SumOfExpTrip		ModeGroup			
NumberofCar	NumberofAdult	Car	Other	PT	Grand Total
0	1	114	480	0	594
	3+	0	50	50	101
1	1	1713	0	0	1713
	2	4724	1810	636	7170
	3+	2005	603	420	3028
2	1	1058	0	0	1058
	2	14420	687	574	15681
	3+	6569	76	761	7406
3+	1	105	0	0	105
	2	3737	144	203	4084
	3+	4274	574	160	5008
Grand Total		38719	4425	2805	45948

Purpose	HBEB

Sum of SumOfExpTrip		ModeGroup			
NumberofCar	NumberofAdult	Car	Other	PT	Grand Total
0	1	19%	81%	0%	100%
	3+	0%	50%	50%	100%
1	1	100%	0%	0%	100%
	2	66%	25%	9%	100%
	3+	66%	20%	14%	100%
2	1	100%	0%	0%	100%
	2	92%	4%	4%	100%
	3+	89%	1%	10%	100%
3+	1	100%	0%	0%	100%
	2	91%	4%	5%	100%
	3+	85%	11%	3%	100%
Grand Total		84%	10%	6%	100%

Purpose	NHBEB

Sum of SumOfExpTrip		ModeGroup				
NumberofCar	NumberofAdult	Car	Other	PT	School	Grand Total
0	1	114	34	151	0	299
	2	54	0	0	0	54
	3+	0	266	402	0	668
1	1	6816	1412	151	0	8380
	2	13513	3560	1816	0	18889
	3+	1813	322	103	0	2238
2	1	3705	0	0	0	3705
	2	33782	6135	286	955	41158
	3+	10785	784	428	0	11996
3+	1	33	0	0	0	33
	2	9342	86	102	0	9529
	3+	16695	845	86	216	17841
Grand Total		96652	13444	3525	1170	114790

Purpose	NHBEB

Sum of SumOfExpTrip		ModeGroup				
NumberofCar	NumberofAdult	Car	Other	PT	School	Grand Total
0	1	38%	11%	50%	0%	100%
	2	100%	0%	0%	0%	100%
	3+	0%	40%	60%	0%	100%
1	1	81%	17%	2%	0%	100%
	2	72%	19%	10%	0%	100%
	3+	81%	14%	5%	0%	100%
2	1	100%	0%	0%	0%	100%
	2	82%	15%	1%	2%	100%
	3+	90%	7%	4%	0%	100%
3+	1	100%	0%	0%	0%	100%
	2	98%	1%	1%	0%	100%
	3+	94%	5%	0%	1%	100%
Grand Total		84%	12%	3%	1%	100%

Trip by Purpose by Mode by Adult Based Car Availability (Choice/ Competition/ Captive):

Purpose	HBW

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	1835	6071	4431	12337
Choice	122863	6124	14740	143726
Competition	100556	16243	32692	149491
Grand Total	225253	28438	51863	305554

Purpose	HBW

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	15%	49%	36%	100%
Choice	85%	4%	10%	100%
Competition	67%	11%	22%	100%
Grand Total	74%	9%	17%	100%

Purpose	HBEd

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	663	7071	3633	338	11705
Choice	57487	17576	6159	6777	87999
Competition	48201	20134	11645	7649	87629
Grand Total	106351	44781	21437	14764	187333

Purpose	HBEd

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	6%	60%	31%	3%	100%
Choice	65%	20%	7%	8%	100%
Competition	55%	23%	13%	9%	100%
Grand Total	57%	24%	11%	8%	100%

Purpose	HBSh

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	7585	18723	8588	34897
Choice	190798	14512	2300	207610
Competition	168968	25263	8742	202974
Grand Total	367352	58499	19630	445480

Purpose	HBSh

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	22%	54%	25%	100%
Choice	92%	7%	1%	100%
Competition	83%	12%	4%	100%
Grand Total	82%	13%	4%	100%

Purpose	HBSo

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	3657	3809	2540	10006
Choice	79687	8086	1222	88995
Competition	69826	12529	3355	85710
Grand Total	153170	24424	7117	184711

Purpose	HBSo

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	37%	38%	25%	100%
Choice	90%	9%	1%	100%
Competition	81%	15%	4%	100%
Grand Total	83%	13%	4%	100%

Purpose	HBO

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	6135	12209	2782	0	21126
Choice	187123	28949	4027	405	220503
Competition	160875	33773	9726	0	204374
Grand Total	354133	74931	16534	405	446004

Purpose	HBO

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	29%	58%	13%	0%	100%
Choice	85%	13%	2%	0%	100%
Competition	79%	17%	5%	0%	100%
Grand Total	79%	17%	4%	0%	100%

Purpose	NHBO

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	7616	22726	3410	218	33971
Choice	275594	61039	7397	2920	346951
Competition	221987	86347	10220	2498	321052
Grand Total	505197	170112	21028	5636	701974

Purpose	NHBO

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	22%	67%	10%	1%	100%
Choice	79%	18%	2%	1%	100%
Competition	69%	27%	3%	1%	100%
Grand Total	72%	24%	3%	1%	100%

Purpose	HBEB

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	114	531	50	695
Choice	23972	974	852	25798
Competition	14633	2920	1903	19455
Grand Total	38719	4425	2805	45948

Purpose	HBEB

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	16%	76%	7%	100%
Choice	93%	4%	3%	100%
Competition	75%	15%	10%	100%
Grand Total	84%	10%	6%	100%

Purpose	NHBEB

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	168	300	553	0	1020
Choice	63650	7815	539	955	72959
Competition	32834	5329	2433	216	40811
Grand Total	96652	13444	3525	1170	114790

Purpose	NHBEB

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	16%	29%	54%	0%	100%
Choice	87%	11%	1%	1%	100%
Competition	80%	13%	6%	1%	100%
Grand Total	84%	12%	3%	1%	100%

Purpose	NHBO

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	7616	22726	3410	218	33971
Choice	275594	61039	7397	2920	346951
Competition	221987	86347	10220	2498	321052
Grand Total	505197	170112	21028	5636	701974

Purpose	NHBO

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	22%	67%	10%	1%	100%
Choice	79%	18%	2%	1%	100%
Competition	69%	27%	3%	1%	100%
Grand Total	72%	24%	3%	1%	100%

Trip by Purpose by Mode by Licence Based Car Availability (Choice/ Competition/ Captive):

Purpose	HBW

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	1835	6071	4431	12337
Choice	154034	10022	21316	185372
Competition	69384	12344	26116	107845
Grand Total	225253	28438	51863	305554

Purpose	HBW

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	15%	49%	36%	100%
Choice	83%	5%	11%	100%
Competition	64%	11%	24%	100%
Grand Total	74%	9%	17%	100%

Purpose	HBEd

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	663	7071	3633	338	11705
Choice	74271	26138	10452	9517	120379
Competition	31416	11572	7352	4909	55249
Grand Total	106351	44781	21437	14764	187333

Purpose	HBEd

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	6%	60%	31%	3%	100%
Choice	62%	22%	9%	8%	100%
Competition	57%	21%	13%	9%	100%
Grand Total	57%	24%	11%	8%	100%

Purpose	HBSh

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	7595	18723	8588	34897
Choice	244363	21809	5167	271339
Competition	115404	17966	5875	139245
Grand Total	367352	58499	19630	445480

Purpose	HBSh

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	22%	54%	25%	100%
Choice	90%	8%	2%	100%
Competition	83%	13%	4%	100%
Grand Total	82%	13%	4%	100%

Purpose	HBSo

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	3657	3809	2540	10006
Choice	100463	11690	1863	114015
Competition	49050	8926	2714	60690
Grand Total	153170	24424	7117	184711

Purpose	HBSo

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	37%	38%	25%	100%
Choice	88%	10%	2%	100%
Competition	81%	15%	4%	100%
Grand Total	83%	13%	4%	100%

Purpose	HBO

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	6135	12209	2782	0	21126
Choice	232304	35672	6017	306	274299
Competition	115695	27049	7735	99	150578
Grand Total	354133	74931	16534	405	446004

Purpose	HBO

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	29%	58%	13%	0%	100%
Choice	85%	13%	2%	0%	100%
Competition	77%	18%	5%	0%	100%
Grand Total	79%	17%	4%	0%	100%

Purpose	NHBO

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	7616	22726	3410	218	33971
Choice	334602	80534	9498	3482	428116
Competition	162979	66853	8119	1936	239887
Grand Total	505197	170112	21028	5636	701974

Purpose	NHBO

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	22%	67%	10%	1%	100%
Choice	78%	19%	2%	1%	100%
Competition	68%	28%	3%	1%	100%
Grand Total	72%	24%	3%	1%	100%

Purpose	HBEB

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	114	531	50	695
Choice	29079	2739	1692	33510
Competition	9525	1155	1063	11743
Grand Total	38719	4425	2805	45948

Purpose	HBEB

Sum of SumOfExpTrip	ModeGroup			
Captive	Car	Other	PT	Grand Total
Captive	16%	76%	7%	100%
Choice	87%	8%	5%	100%
Competition	81%	10%	9%	100%
Grand Total	84%	10%	6%	100%

Purpose	NHBEB

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	168	300	553	0	1020
Choice	71283	8728	984	1170	82164
Competition	25201	4416	1988	0	31606
Grand Total	96652	13444	3525	1170	114790

Purpose	NHBEB

Sum of SumOfExpTrip	ModeGroup				
Captive	Car	Other	PT	School	Grand Total
Captive	16%	29%	54%	0%	100%
Choice	87%	11%	1%	1%	100%
Competition	80%	14%	6%	0%	100%
Grand Total	84%	12%	3%	1%	100%

A-4. Task 2.3 Analysis of Parking Data

A-4.1 Parking Demand

A-4.1.1 Demand Wellington Region

- **Table 4-1 Where People Parked By TLA by Purpose**

TLA	Where Parked	Purpose									Prop. By Where Parked	Prop By TL
		HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV		
Carterton District	Residential	21%	0%	3%	71%	11%	35%	11%	17%	14%	28%	1.30
	Public Unmetered on Street	8%	16%	32%	26%	36%	31%	59%	41%	0%	29%	
	Public Unmetered off Street	4%	0%	0%	0%	12%	3%	0%	0%	0%	3%	
	Work Carpark	64%	0%	0%	0%	0%	5%	18%	25%	72%	11%	
	Customer Carpark	4%	7%	45%	0%	33%	22%	12%	16%	14%	21%	
	Drop off/Pick Up Point	0%	77%	20%	3%	8%	3%	0%	0%	0%	7%	
Kapiti Coast District	Residential	3%	0%	4%	70%	7%	24%	47%	24%	25%	20%	10.08
	Public Unmetered on Street	8%	22%	21%	24%	23%	24%	20%	19%	22%	22%	
	Public Unmetered off Street	19%	0%	18%	1%	23%	11%	15%	17%	0%	14%	
	Public Metered on Street	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Paid Carpark	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	
	Work Carpark	47%	0%	0%	0%	0%	2%	5%	23%	37%	5%	
	Customer Carpark	10%	1%	55%	0%	30%	32%	13%	15%	15%	30%	
	Drop off/Pick Up Point	12%	77%	3%	4%	17%	6%	0%	1%	0%	10%	
Lower Hutt City	Residential	3%	0%	2%	51%	5%	14%	15%	10%	2%	12%	20.80
	Public Unmetered on Street	21%	20%	24%	37%	32%	30%	42%	30%	35%	29%	
	Public Unmetered off Street	5%	7%	6%	2%	17%	6%	0%	4%	3%	7%	
	Public Metered on Street	3%	0%	5%	0%	2%	4%	9%	2%	0%	3%	
	Paid Carpark	3%	1%	0%	0%	0%	1%	3%	1%	0%	1%	
	Work Carpark	49%	0%	0%	0%	1%	5%	16%	31%	29%	9%	
	Customer Carpark	4%	4%	59%	1%	18%	29%	13%	20%	27%	25%	
	Drop off/Pick Up Point	12%	69%	3%	8%	25%	12%	2%	2%	4%	14%	
Masterton District	Residential	9%	0%	4%	54%	11%	20%	50%	5%	33%	17%	6.86
	Public Unmetered on Street	6%	38%	27%	39%	45%	29%	27%	18%	20%	29%	
	Public Unmetered off Street	11%	0%	7%	2%	13%	6%	0%	2%	0%	6%	
	Public Metered on Street	0%	0%	5%	0%	2%	6%	0%	6%	0%	4%	
	Paid Carpark	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Work Carpark	49%	2%	0%	0%	0%	3%	11%	31%	21%	8%	
	Customer Carpark	14%	9%	54%	2%	21%	28%	11%	37%	26%	28%	
	Drop off/Pick Up Point	12%	50%	4%	3%	9%	8%	0%	1%	0%	8%	
Porirua City	Residential	3%	1%	3%	69%	7%	19%	14%	1%	12%	16%	8.84
	Public Unmetered on Street	4%	14%	12%	14%	21%	17%	11%	14%	14%	15%	
	Public Unmetered off Street	12%	7%	17%	4%	20%	13%	25%	14%	2%	14%	
	Public Metered on Street	0%	0%	1%	0%	1%	0%	0%	0%	0%	0%	
	Work Carpark	48%	2%	1%	0%	0%	3%	7%	42%	29%	6%	
	Customer Carpark	11%	8%	64%	2%	28%	39%	39%	26%	40%	35%	
	Drop off/Pick Up Point	24%	69%	2%	11%	22%	7%	3%	3%	4%	13%	
South Wairarapa Distric	Residential	22%	0%	6%	89%	36%	14%	45%	21%	89%	26%	1.58
	Public Unmetered on Street	24%	55%	41%	10%	27%	56%	34%	33%	0%	39%	
	Public Unmetered off Street	5%	30%	26%	0%	10%	3%	0%	6%	0%	8%	
	Work Carpark	32%	0%	0%	0%	0%	1%	21%	15%	6%	4%	
	Customer Carpark	17%	8%	23%	1%	19%	23%	0%	19%	5%	19%	
	Drop off/Pick Up Point	0%	8%	4%	0%	8%	3%	0%	6%	0%	4%	

TLA	Where Parked	Purpose									Prop. By Where Parked	Prop By TL
		HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV		
Upper Hutt City	Residential	1%	0%	2%	55%	6%	15%	53%	13%	27%	14%	7.27%
	Public Unmetered on Street	13%	25%	29%	36%	19%	20%	20%	16%	7%	22%	
	Public Unmetered off Street	9%	2%	21%	1%	22%	9%	5%	9%	0%	12%	
	Public Metered on Street	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	
	Work Carpark	55%	0%	1%	5%	0%	6%	6%	17%	35%	9%	
	Customer Carpark	5%	2%	42%	1%	28%	39%	10%	17%	32%	28%	
	Drop off/Pick Up Point	16%	71%	5%	2%	25%	11%	7%	29%	0%	15%	
Wellington City	Residential	1%	1%	2%	35%	3%	8%	11%	5%	2%	7%	42.47
	Public Unmetered on Street	10%	33%	27%	49%	28%	32%	46%	28%	27%	29%	
	Public Unmetered off Street	4%	5%	3%	4%	14%	5%	6%	4%	4%	6%	
	Public Metered on Street	5%	0%	9%	3%	7%	7%	6%	10%	4%	7%	
	Paid Carpark	9%	1%	3%	0%	8%	4%	5%	5%	2%	5%	
	Work Carpark	43%	0%	1%	0%	1%	4%	7%	23%	17%	8%	
	Customer Carpark	8%	5%	53%	3%	21%	28%	16%	17%	27%	25%	
	Drop off/Pick Up Point	19%	55%	3%	6%	17%	13%	3%	6%	17%	13%	
Proportion of Total Trips by Purpose		8%	4%	15%	7%	16%	41%	1%	6%	2%		

■ Table 4-2 Where People Parked By TLA by Purpose (No Passengers)

TLA	Where Parked	Purpose									Prop. By Where Parked	Prop By TL
		HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV		
Carterton District	Residential	22%	0%	4%	65%	13%	31%	11%	25%	14%	26%	1.40%
	Public Unmetered on Street	7%	34%	31%	30%	45%	34%	57%	44%	0%	32%	
	Public Unmetered off Street	5%	0%	0%	0%	17%	3%	0%	0%	0%	4%	
	Work Carpark	61%	0%	0%	0%	0%	6%	19%	31%	71%	13%	
	Customer Carpark	4%	0%	55%	0%	20%	22%	12%	0%	14%	19%	
	Drop off/Pick Up Point	0%	66%	11%	4%	6%	3%	0%	0%	0%	5%	
Kapiti Coast District	Residential	3%	0%	4%	66%	10%	20%	45%	23%	25%	17%	9.87%
	Public Unmetered on Street	9%	27%	23%	29%	25%	25%	21%	19%	22%	23%	
	Public Unmetered off Street	21%	0%	18%	2%	24%	13%	15%	15%	0%	15%	
	Public Metered on Street	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Paid Carpark	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	
	Work Carpark	50%	0%	0%	0%	0%	4%	6%	25%	37%	7%	
	Customer Carpark	10%	2%	52%	0%	24%	32%	13%	16%	15%	29%	
	Drop off/Pick Up Point	7%	70%	3%	3%	18%	6%	0%	1%	0%	8%	
Lower Hutt City	Residential	3%	0%	2%	50%	3%	12%	19%	10%	2%	10%	20.94
	Public Unmetered on Street	19%	22%	28%	40%	35%	31%	31%	28%	35%	30%	
	Public Unmetered off Street	5%	8%	6%	2%	16%	6%	0%	4%	3%	7%	
	Public Metered on Street	3%	0%	7%	0%	1%	4%	10%	2%	0%	3%	
	Paid Carpark	2%	2%	0%	0%	0%	1%	4%	1%	0%	1%	
	Work Carpark	55%	0%	0%	1%	1%	7%	18%	32%	29%	13%	
	Customer Carpark	5%	5%	54%	2%	18%	28%	16%	21%	27%	25%	
	Drop off/Pick Up Point	7%	64%	3%	5%	26%	10%	2%	2%	4%	11%	
Masterton District	Residential	7%	0%	3%	63%	13%	20%	61%	5%	33%	16%	7.12%
	Public Unmetered on Street	7%	47%	27%	29%	41%	27%	12%	17%	20%	26%	
	Public Unmetered off Street	12%	0%	5%	2%	15%	6%	0%	2%	0%	7%	
	Public Metered on Street	0%	0%	7%	0%	1%	7%	0%	5%	0%	5%	
	Paid Carpark	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Work Carpark	54%	0%	0%	0%	0%	4%	14%	30%	21%	11%	
	Customer Carpark	15%	6%	53%	4%	18%	29%	14%	40%	26%	29%	
	Drop off/Pick Up Point	6%	48%	5%	2%	11%	7%	0%	1%	0%	7%	
Porirua City	Residential	3%	1%	5%	72%	8%	18%	18%	1%	12%	15%	8.11%
	Public Unmetered on Street	4%	16%	12%	12%	22%	19%	5%	15%	16%	16%	
	Public Unmetered off Street	13%	7%	13%	4%	17%	13%	31%	12%	2%	12%	
	Public Metered on Street	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	
	Work Carpark	52%	4%	1%	0%	1%	5%	10%	44%	27%	10%	
	Customer Carpark	11%	17%	66%	3%	24%	38%	32%	27%	38%	35%	
	Drop off/Pick Up Point	17%	56%	2%	8%	27%	7%	4%	1%	4%	12%	
South Wairarapa Distric	Residential	19%	0%	5%	93%	13%	15%	49%	18%	89%	23%	1.59%
	Public Unmetered on Street	25%	63%	45%	5%	38%	51%	28%	26%	0%	38%	
	Public Unmetered off Street	5%	7%	22%	0%	6%	4%	0%	8%	0%	7%	
	Work Carpark	33%	0%	0%	0%	0%	1%	23%	18%	5%	6%	
	Customer Carpark	18%	15%	23%	2%	28%	23%	0%	23%	5%	20%	
	Drop off/Pick Up Point	0%	15%	5%	0%	15%	6%	0%	7%	0%	5%	
Upper Hutt City	Residential	2%	0%	3%	57%	7%	16%	56%	13%	27%	15%	7.61%
	Public Unmetered on Street	14%	28%	30%	33%	21%	22%	15%	16%	8%	23%	
	Public Unmetered off Street	9%	4%	19%	1%	20%	8%	5%	8%	0%	11%	
	Public Metered on Street	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	
	Work Carpark	60%	0%	1%	5%	1%	8%	6%	14%	34%	11%	
	Customer Carpark	6%	0%	45%	2%	24%	35%	11%	18%	32%	27%	

TLA	Where Parked	Purpose									Prop. By Where Parked	Prop By TL
		HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV		
	Drop off/Pick Up Point	10%	68%	3%	2%	28%	10%	7%	31%	0%	14%	
Wellington City	Residential	2%	2%	1%	28%	3%	7%	10%	6%	2%	6%	42.76
	Public Unmetered on Street	11%	37%	27%	59%	30%	31%	46%	28%	28%	30%	
	Public Unmetered off Street	4%	9%	3%	2%	10%	4%	6%	5%	4%	5%	
	Public Metered on Street	6%	0%	9%	3%	7%	7%	6%	11%	4%	7%	
	Paid Carpark	10%	2%	3%	0%	9%	5%	5%	5%	2%	5%	
	Work Carpark	49%	0%	0%	0%	1%	5%	8%	24%	17%	10%	
	Customer Carpark	8%	6%	54%	3%	23%	27%	17%	17%	27%	25%	
	Drop off/Pick Up Point	11%	45%	2%	4%	18%	13%	1%	5%	17%	12%	
Proportion of Total Trips by Purpose		10%	3%	15%	6%	15%	39%	2%	8%	3%		

■ Table 4-3 What Fee People Paid by TLA by Purpose

TLA	Type of Parking Fee	Purpose									Prop. By Parking Fee by TLA	Prop. By TLA
		HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV		
Carterton District	No Fee Paid	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	1.30%
Kapiti Coast District	No Fee Paid	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	10.08%
Lower Hutt City	No Fee Paid	95%	99%	97%	100%	100%	97%	93%	96%	100%	98%	20.80%
	Short Term Fee	3%	0%	3%	0%	0%	2%	4%	2%	0%	2%	
	Daily Fee Paid	2%	1%	0%	0%	0%	0%	3%	1%	0%	0%	
	Weekly/Longer Fee Paid	1%	0%	0%	0%	0%	0%	0%	1%	0%	0%	
Porirua City	No Fee Paid	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	8.87%
	Short Term Fee	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Weekly/Longer Fee Paid	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
South Wairarapa District	No Fee Paid	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	1.58%
Upper Hutt City	No Fee Paid	99%	100%	100%	100%	100%	100%	100%	99%	100%	100%	7.27%
	Daily Fee Paid	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	
	Weekly/Longer Fee Paid	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Wellington City	No Fee Paid	85%	99%	92%	100%	94%	94%	90%	90%	97%	93%	42.47%
	Short Term Fee	1%	0%	7%	0%	5%	4%	10%	6%	3%	4%	
	Daily Fee Paid	4%	0%	0%	0%	1%	0%	0%	1%	0%	1%	
	Weekly/Longer Fee Paid	10%	1%	0%	0%	0%	1%	0%	3%	0%	1%	
Proportion of Total Trips by Purpose		8%	4%	15%	7%	16%	41%	1%	6%	2%	1	

■ Table 4-4 What Fee People Paid by TLA by Purpose (No Passengers)

TLA	Type of Parking Fee	Purpose									Prop. By Parking Fee by TLA	Prop. By TLA
		HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV		
Carterton District	No Fee Paid	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	1.40%
Kapiti Coast District	No Fee Paid	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	9.87%
Lower Hutt City	No Fee Paid	94%	98%	97%	100%	100%	97%	91%	96%	100%	97%	20.94%
	Short Term Fee	3%	1%	3%	0%	0%	2%	5%	2%	0%	2%	
	Daily Fee Paid	2%	1%	0%	0%	0%	0%	4%	1%	0%	0%	
	Weekly/Longer Fee Paid	1%	0%	0%	0%	0%	1%	0%	1%	0%	0%	
Porirua City	No Fee Paid	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	8.12%
	Short Term Fee	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Weekly/Longer Fee Paid	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
South Wairarapa District	No Fee Paid	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	1.59%
Upper Hutt City	No Fee Paid	99%	100%	100%	100%	100%	100%	100%	99%	100%	100%	7.61%
	Daily Fee Paid	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	
	Weekly/Longer Fee Paid	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Wellington City	No Fee Paid	83%	98%	92%	99%	95%	93%	90%	90%	97%	92%	42.76%
	Short Term Fee	2%	0%	8%	1%	4%	5%	10%	6%	3%	5%	
	Daily Fee Paid	4%	0%	0%	0%	1%	0%	0%	1%	0%	1%	
	Weekly/Longer Fee Paid	11%	2%	0%	0%	0%	1%	0%	3%	0%	2%	
Proportion of Total Trips by Purpose		10%	3%	15%	6%	15%	39%	2%	8%	3%	1	

■ Table 4-5 Person who paid the Parking Fee by TLA by Purpose

TLA	ParkPaid	Purpose									Prop. By Who Paid By TLA	Prop. By TLA
		HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV		
Carterton District	No Fee Required	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	1%
Kapiti Coast District	No Fee Required	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	10%
Lower Hutt City	No Fee Required	95%	99%	97%	100%	100%	97%	93%	96%	100%	98%	21%
	Person in Vehicle	5%	1%	3%	0%	0%	3%	6%	2%	0%	2%	
	Employer	1%	0%	0%	0%	0%	0%	2%	1%	0%	0%	
	Someone Else	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Masterton District	No Fee Required	100%	100%	98%	100%	99%	97%	100%	99%	100%	98%	7%
	Person in Vehicle	0%	0%	2%	0%	1%	2%	0%	1%	0%	1%	
	Someone Else	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Porirua City	No Fee Required	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	9%
	Person in Vehicle	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Employer	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
South Wairarapa District	No Fee Required	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	2%
Upper Hutt City	No Fee Required	99%	100%	100%	100%	100%	100%	100%	99%	100%	100%	7%
	Person in Vehicle	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	
	Employer	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Wellington City	No Fee Required	85%	99%	92%	100%	94%	94%	90%	90%	97%	93%	42%
	Person in Vehicle	11%	1%	8%	0%	6%	5%	10%	7%	2%	6%	
	Employer	4%	0%	0%	0%	0%	1%	0%	3%	0%	1%	
	Someone Else	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Proportion of Total Trips by Purpose		8%	4%	15%	7%	16%	41%	1%	6%	2%	1	

■ **Table 4-6 Person who paid the Parking Fee by TLA by Purpose (No Passengers)**

TLA	ParkPaid	HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV	Total	TLA
Carterton District	No Fee Required	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	1%
Kapiti Coast District	No Fee Required	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	10%
Lower Hutt City	No Fee Required	94%	98%	97%	100%	100%	97%	91%	96%	100%	97%	21%
	Person in Vehicle	6%	2%	3%	0%	0%	3%	7%	2%	0%	3%	
	Employer	1%	0%	0%	0%	0%	0%	2%	1%	0%	0%	
	Someone Else	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Masterton District	No Fee Required	100%	100%	98%	100%	99%	97%	100%	99%	100%	98%	7%
	Person in Vehicle	0%	0%	2%	0%	1%	2%	0%	1%	0%	2%	
	Someone Else	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Porirua City	No Fee Required	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	8%
	Person in Vehicle	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Employer	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
South Wairarapa District	No Fee Required	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	2%
Upper Hutt City	No Fee Required	99%	100%	100%	100%	100%	100%	100%	99%	100%	100%	8%
	Person in Vehicle	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	
	Employer	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Wellington City	No Fee Required	83%	98%	92%	99%	95%	93%	90%	90%	97%	92%	43%
	Person in Vehicle	12%	2%	8%	1%	5%	6%	10%	7%	2%	6%	
	Employer	5%	0%	0%	0%	0%	1%	0%	3%	0%	1%	
	Someone Else	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Proportion of Total Trips by Purpose		10%	3%	15%	6%	15%	39%	2%	8%	3%	1	

■ Table 4-7 Where People Parked By TLA By CBD by Purpose

TLA	Where Parked (CBD)	Where Parked	Purpose									Prop. By Where Parked	Prop. By Where Parked CBD
			HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV		
Lower Hutt City	Hutt City CBD	Residential	0%	0%	0%	0%	3%	0%	0%	0%	0%	0%	5%
Lower Hutt City	Hutt City CBD	Public Unmetered on Street	20%	0%	2%	0%	23%	9%	0%	15%	33%	9%	
Lower Hutt City	Hutt City CBD	Public Unmetered off Street	7%	0%	10%	0%	33%	8%	0%	2%	0%	10%	
Lower Hutt City	Hutt City CBD	Public Metered on Street	18%	0%	11%	0%	12%	19%	69%	16%	0%	16%	
Lower Hutt City	Hutt City CBD	Paid Carpark	8%	35%	0%	0%	1%	2%	11%	3%	0%	2%	
Lower Hutt City	Hutt City CBD	Work Carpark	33%	0%	0%	0%	0%	2%	0%	41%	67%	5%	
Lower Hutt City	Hutt City CBD	Customer Carpark	4%	0%	74%	0%	18%	51%	20%	23%	0%	50%	
Lower Hutt City	Hutt City CBD	Drop off/Pick Up Point	10%	65%	3%	0%	9%	8%	0%	0%	0%	6%	
Lower Hutt City	Hutt City Industrial/Commercial	Residential	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	4%
Lower Hutt City	Hutt City Industrial/Commercial	Public Unmetered on Street	20%	59%	18%	68%	45%	20%	15%	15%	11%	23%	
Lower Hutt City	Hutt City Industrial/Commercial	Public Unmetered off Street	3%	0%	1%	0%	17%	1%	0%	0%	0%	3%	
Lower Hutt City	Hutt City Industrial/Commercial	Public Metered on Street	2%	0%	5%	0%	9%	1%	0%	0%	0%	2%	
Lower Hutt City	Hutt City Industrial/Commercial	Work Carpark	48%	0%	0%	12%	0%	5%	35%	43%	39%	14%	
Lower Hutt City	Hutt City Industrial/Commercial	Customer Carpark	4%	0%	75%	7%	20%	67%	49%	37%	50%	50%	
Lower Hutt City	Hutt City Industrial/Commercial	Drop off/Pick Up Point	23%	41%	0%	12%	8%	5%	0%	6%	0%	8%	
Lower Hutt City	Hutt City Inner	Residential	2%	0%	0%	100%	0%	0%	34%	0%	0%	3%	2%
Lower Hutt City	Hutt City Inner	Public Unmetered on Street	9%	40%	82%	0%	36%	35%	0%	19%	100%	32%	
Lower Hutt City	Hutt City Inner	Public Unmetered off Street	5%	0%	0%	0%	2%	4%	0%	5%	0%	3%	
Lower Hutt City	Hutt City Inner	Public Metered on Street	0%	0%	0%	0%	1%	1%	26%	5%	0%	1%	
Lower Hutt City	Hutt City Inner	Paid Carpark	15%	0%	0%	0%	0%	1%	30%	4%	0%	4%	
Lower Hutt City	Hutt City Inner	Work Carpark	48%	0%	0%	0%	0%	6%	0%	49%	0%	13%	
Lower Hutt City	Hutt City Inner	Customer Carpark	3%	0%	13%	0%	37%	44%	11%	19%	0%	29%	
Lower Hutt City	Hutt City Inner	Drop off/Pick Up Point	19%	60%	4%	0%	24%	8%	0%	0%	0%	14%	
Lower Hutt City	Otherwise	Residential	5%	0%	3%	52%	7%	22%	18%	15%	2%	18%	22%
Lower Hutt City	Otherwise	Public Unmetered on Street	24%	15%	39%	37%	30%	37%	55%	38%	40%	34%	
Lower Hutt City	Otherwise	Public Unmetered off Street	5%	8%	4%	2%	18%	7%	0%	5%	4%	7%	
Lower Hutt City	Otherwise	Public Metered on Street	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	
Lower Hutt City	Otherwise	Paid Carpark	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	
Lower Hutt City	Otherwise	Work Carpark	54%	0%	1%	0%	2%	6%	17%	24%	26%	9%	

TLA	Where Parked (CBD)	Where Parked	Purpose									Prop. By Where Parked	Prop. By Where Parked CBD
			HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV		
Lower Hutt City	Otherwise	Customer Carpark	5%	4%	46%	1%	14%	13%	8%	15%	23%	14%	
Lower Hutt City	Otherwise	Drop off/Pick Up Point	7%	72%	5%	7%	29%	14%	2%	2%	5%	16%	
Wellington City	Otherwise	Residential	2%	2%	2%	39%	5%	13%	16%	10%	3%	10%	42%
Wellington City	Otherwise	Public Unmetered on Street	18%	36%	35%	50%	32%	34%	63%	36%	22%	34%	
Wellington City	Otherwise	Public Unmetered off Street	6%	3%	3%	4%	18%	6%	3%	6%	5%	8%	
Wellington City	Otherwise	Public Metered on Street	1%	0%	1%	0%	0%	1%	0%	2%	2%	1%	
Wellington City	Otherwise	Paid Carpark	2%	0%	1%	0%	3%	2%	1%	1%	4%	2%	
Wellington City	Otherwise	Work Carpark	46%	0%	0%	0%	0%	3%	6%	26%	26%	6%	
Wellington City	Otherwise	Customer Carpark	10%	2%	56%	4%	24%	30%	10%	15%	31%	27%	
Wellington City	Otherwise	Drop off/Pick Up Point	14%	57%	2%	4%	18%	11%	2%	4%	7%	12%	
Wellington City	WCC CBD	Residential	1%	0%	0%	20%	0%	0%	0%	0%	0%	0%	16%
Wellington City	WCC CBD	Public Unmetered on Street	3%	65%	9%	13%	12%	18%	8%	13%	34%	14%	
Wellington City	WCC CBD	Public Unmetered off Street	2%	0%	1%	0%	4%	1%	11%	2%	3%	2%	
Wellington City	WCC CBD	Public Metered on Street	7%	0%	32%	0%	24%	22%	19%	23%	7%	21%	
Wellington City	WCC CBD	Paid Carpark	19%	6%	11%	5%	26%	13%	14%	12%	1%	16%	
Wellington City	WCC CBD	Work Carpark	41%	0%	2%	0%	5%	6%	12%	22%	7%	12%	
Wellington City	WCC CBD	Customer Carpark	2%	7%	38%	0%	9%	24%	31%	19%	25%	19%	
Wellington City	WCC CBD	Drop off/Pick Up Point	26%	22%	6%	62%	18%	16%	5%	8%	23%	16%	
Wellington City	WCC Coupon Parking	Residential	1%	0%	4%	10%	1%	3%	21%	3%	4%	3%	10%
Wellington City	WCC Coupon Parking	Public Unmetered on Street	7%	15%	15%	53%	38%	42%	58%	29%	25%	33%	
Wellington City	WCC Coupon Parking	Public Unmetered off Street	1%	11%	1%	4%	6%	2%	0%	4%	4%	3%	
Wellington City	WCC Coupon Parking	Public Metered on Street	9%	0%	9%	22%	10%	13%	0%	9%	2%	11%	
Wellington City	WCC Coupon Parking	Paid Carpark	7%	3%	1%	0%	1%	1%	0%	2%	0%	2%	
Wellington City	WCC Coupon Parking	Work Carpark	41%	1%	1%	0%	0%	4%	0%	19%	16%	8%	
Wellington City	WCC Coupon Parking	Customer Carpark	17%	16%	67%	0%	35%	22%	10%	24%	20%	27%	
Wellington City	WCC Coupon Parking	Drop off/Pick Up Point	17%	53%	2%	11%	10%	13%	11%	9%	29%	14%	
Proportion of Total Trips By Purpose			9%	4%	13%	7%	17%	41%	1%	6%	2%		

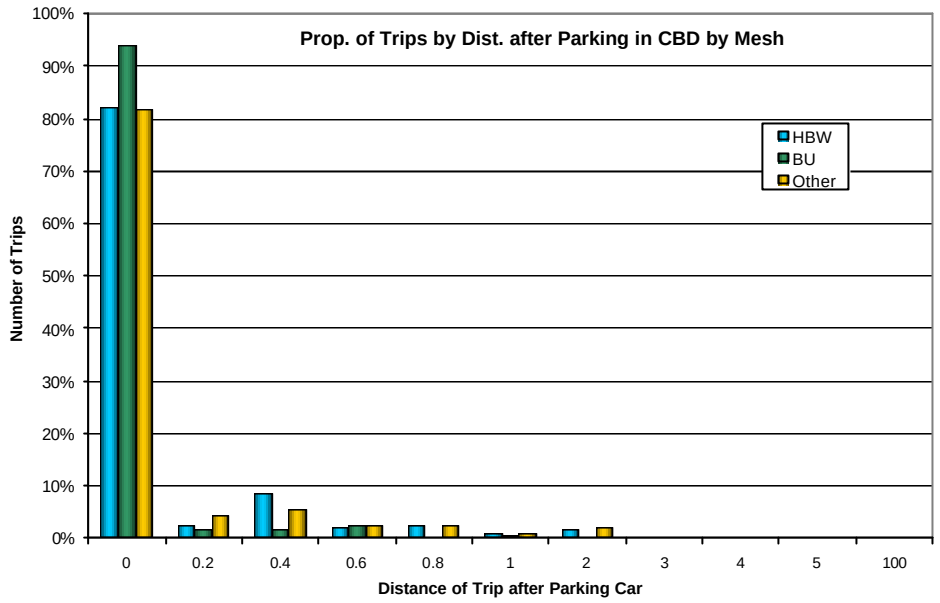
■ Table 4-8 What Fee People Paid by TLA by CBD by Purpose

TLA	Where Parked (CBD)	Parking Fee	Purpose									Prop. By Parking Fee	Prop. By Where Parked CBD
			HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV		
Lower Hutt City	Hutt City CBD	No Fee Paid	72%	65%	95%	0%	97%	88%	66%	79%	100%	89%	5%
Lower Hutt City	Hutt City CBD	Short Term Fee Paid	17%	11%	5%	0%	3%	11%	24%	15%	0%	9%	
Lower Hutt City	Hutt City CBD	Daily Fee Paid	9%	25%	0%	0%	0%	1%	11%	6%	0%	2%	
Lower Hutt City	Hutt City CBD	Weekly/Longer Fee Paid	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Lower Hutt City	Hutt City Industrial/Commercial	No Fee Paid	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	4%
Lower Hutt City	Hutt City Industrial/Commercial	Short Term Fee Paid	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Lower Hutt City	Hutt City Inner	No Fee Paid	95%	100%	100%	100%	100%	99%	44%	92%	100%	97%	2%
Lower Hutt City	Hutt City Inner	Short Term Fee Paid	0%	0%	0%	0%	0%	0%	26%	5%	0%	1%	
Lower Hutt City	Hutt City Inner	Daily Fee Paid	4%	0%	0%	0%	0%	0%	30%	0%	0%	1%	
Lower Hutt City	Hutt City Inner	Weekly/Longer Fee Paid	1%	0%	0%	0%	0%	1%	0%	4%	0%	1%	
Lower Hutt City	Otherwise	No Fee Paid	99%	100%	97%	100%	100%	100%	100%	99%	100%	99%	22%
Lower Hutt City	Otherwise	Short Term Fee Paid	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	
Lower Hutt City	Otherwise	Weekly/Longer Fee Paid	1%	0%	0%	0%	0%	0%	0%	1%	0%	0%	
Wellington City	Otherwise	No Fee Paid	97%	100%	99%	100%	96%	98%	99%	99%	96%	98%	42%
Wellington City	Otherwise	Short Term Fee Paid	0%	0%	1%	0%	3%	1%	0%	0%	4%	1%	
Wellington City	Otherwise	Daily Fee Paid	1%	0%	0%	0%	1%	0%	0%	0%	0%	0%	
Wellington City	Otherwise	Weekly/Longer Fee Paid	1%	0%	0%	0%	0%	0%	0%	1%	0%	0%	
Wellington City	WCC CBD	No Fee Paid	70%	94%	72%	95%	87%	83%	72%	79%	98%	81%	16%
Wellington City	WCC CBD	Short Term Fee Paid	3%	0%	27%	0%	11%	13%	28%	15%	2%	13%	
Wellington City	WCC CBD	Daily Fee Paid	7%	6%	1%	5%	2%	1%	0%	1%	0%	2%	
Wellington City	WCC CBD	Weekly/Longer Fee Paid	19%	0%	0%	0%	0%	3%	0%	5%	0%	4%	
Wellington City	WCC Coupon Parking	No Fee Paid	82%	97%	96%	100%	99%	95%	90%	88%	100%	94%	10%
Wellington City	WCC Coupon Parking	Short Term Fee Paid	1%	0%	4%	0%	1%	3%	10%	4%	0%	2%	
Wellington City	WCC Coupon Parking	Daily Fee Paid	6%	0%	0%	0%	0%	1%	0%	4%	0%	1%	
Wellington City	WCC Coupon Parking	Weekly/Longer Fee Paid	12%	3%	0%	0%	0%	1%	0%	5%	0%	2%	
Proportion of Total Trips By Purpose			9%	4%	13%	7%	17%	41%	1%	6%	2%		

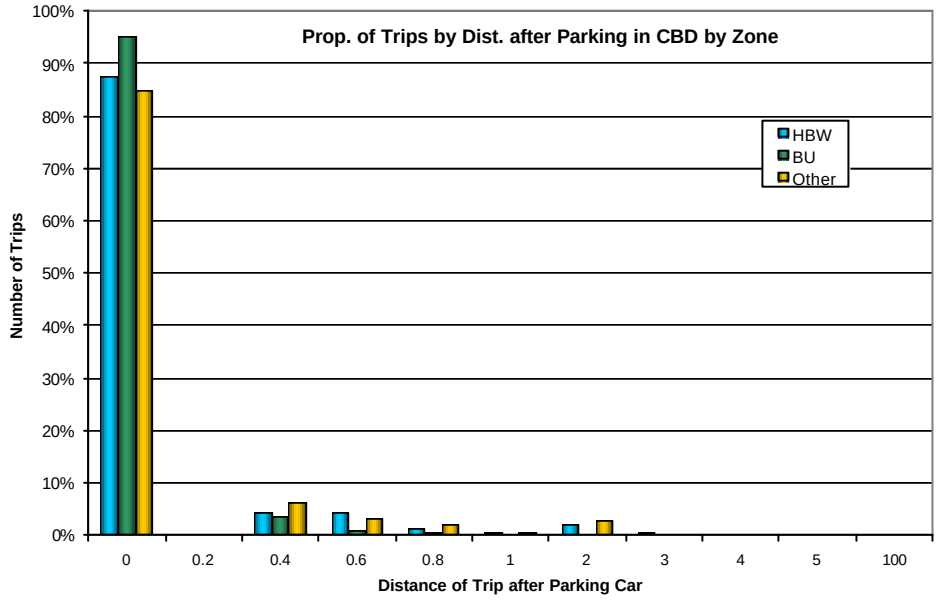
■ Table 4-9 Person who paid the Parking Fee by TLA By CBD by Purpose

TLA	Where Parked (CBD)	Who Paid	Purpose									Prop. By Who Paid	Prop. By Where Parked CBD
			HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV		
Lower Hutt City	Hutt City CBD	No Fee Required	72%	65%	95%	0%	97%	88%	66%	79%	100%	89%	5%
Lower Hutt City	Hutt City CBD	Person in Vehicle	28%	35%	5%	0%	3%	12%	20%	15%	0%	11%	
Lower Hutt City	Hutt City CBD	Employer	0%	0%	0%	0%	0%	0%	14%	6%	0%	0%	
Lower Hutt City	Hutt City CBD	Someone Else	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Lower Hutt City	Hutt City Industrial/Commercial	No Fee Required	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	4%
Lower Hutt City	Hutt City Industrial/Commercial	Person in Vehicle	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Lower Hutt City	Hutt City Inner	No Fee Required	95%	100%	100%	100%	100%	99%	44%	92%	100%	97%	2%
Lower Hutt City	Hutt City Inner	Person in Vehicle	5%	0%	0%	0%	0%	1%	56%	5%	0%	2%	
Lower Hutt City	Hutt City Inner	Employer	0%	0%	0%	0%	0%	1%	0%	4%	0%	1%	
Lower Hutt City	Otherwise	No Fee Required	99%	100%	97%	100%	100%	100%	100%	99%	100%	99%	22%
Lower Hutt City	Otherwise	Person in Vehicle	1%	0%	3%	0%	0%	0%	0%	0%	0%	1%	
Lower Hutt City	Otherwise	Employer	1%	0%	0%	0%	0%	0%	0%	1%	0%	0%	
Wellington City	Otherwise	No Fee Required	97%	100%	99%	100%	96%	98%	99%	99%	96%	98%	42%
Wellington City	Otherwise	Person in Vehicle	2%	0%	1%	0%	4%	2%	1%	1%	4%	2%	
Wellington City	Otherwise	Employer	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Wellington City	WCC CBD	No Fee Required	70%	94%	72%	95%	87%	83%	72%	79%	98%	81%	16%
Wellington City	WCC CBD	Person in Vehicle	20%	6%	28%	5%	12%	15%	27%	16%	1%	17%	
Wellington City	WCC CBD	Employer	9%	0%	0%	0%	1%	2%	1%	5%	1%	3%	
Wellington City	WCC CBD	Someone Else	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Wellington City	WCC Coupon Parking	No Fee Required	82%	97%	96%	100%	99%	95%	90%	88%	100%	94%	10%
Wellington City	WCC Coupon Parking	Person in Vehicle	16%	3%	4%	0%	1%	5%	10%	6%	0%	5%	
Wellington City	WCC Coupon Parking	Employer	1%	0%	0%	0%	0%	1%	0%	6%	0%	1%	
Proportion of Total Trips By Purpose			9%	4%	13%	7%	17%	41%	1%	6%	2%		

■ **Figure 4-1 Proportion of Trips Distance After Parking Car in CBD by Mesh**



■ **Figure 4-2 Proportion of Trips Distance After Parking Car in CBD by Zone**



Parking Type	Average Length Time Spent Parking (Hours)
Pay	1.454622
Not Pay	6.65

A-4.1.2 Demand Wellington CBD

■ Table 4-10 HBW Wellington CBD Where Parked vs Fee Type

Where Parked	No Fee Paid	Short Term Fee Paid	Daily Fee Paid	Weekly/Longer Fee Paid	Total Per Where Parked
Residential	268				268
Public Unmetered on Street	496				496
Public Unmetered off Street	412				412
Public Metered on Street	838	266	399	139	1642
Paid Carpark	472	258	978	2302	4010
Work Carpark	6389	88	28	2137	8642
Customer Carpark	717				717

■ Table 4-11 BU Wellington CBD Where Parked vs Fee Type

Parked	No Fee Paid	Short Term Fee Paid	Daily Fee Paid	Weekly/Longer Fee Paid	Total Per Where Parked
Public Unmetered on Street	2631				2631
Public Unmetered off Street	643				643
Public Metered on Street	2207	2053	67	0	4327
Paid Carpark	737	818	207	439	2201
Work Carpark	3253	0	0	403	3656
Customer Carpark	4057	121	0	0	4178

■ Table 4-12 Other Wellington CBD Where Parked vs Fee Type

Parked	No Fee Paid	Short Term Fee Paid	Daily Fee Paid	Weekly/Longer Fee Paid	Total Per Where Parked
Residential	769				769
Public Unmetered on Street	9448				9448
Public Unmetered off Street	651				651
Public Metered on Street	9483	6732	306	240	16760
Paid Carpark	6159	4989	624	846	12619
Work Carpark	2703	0	0	228	2931
Customer Carpark	15534	863			16397

■ Table 4-13 Lower Wellington CBD Where Parked vs Fee Type

Parked	No Fee Paid	Short Term Fee Paid	Daily Fee Paid	Weekly/Longer Fee Paid	Total Per Where Parked
Residential	757	0	0	0	757
Public Unmetered on Street	8665	0	0	0	8665
Public Unmetered off Street	1351	0	0	0	1351
Public Metered on Street	7227	5747	506	282	13763
Paid Carpark	5658	3237	769	1368	11031
Work Carpark	7585	88	0	1111	8784
Customer Carpark	14783	984	0	0	15767
Drop off/Pick Up Point	5518	0	0	0	5518

■ **Table 4-14 Upper Wellington CBD Where Parked vs Fee Type**

Parked	No Fee Paid	Short Term Fee Paid	Daily Fee Paid	Weekly/Longer Fee Paid	Total Per Where Parked
Residential	280	0	0	0	280
Public Unmetered on Street	3911	0	0	0	3911
Public Unmetered off Street	355	0	0	0	355
Public Metered on Street	5299	3305	266	97	8967
Paid Carpark	1711	2829	1040	2219	7799
Work Carpark	4760	0	28	1657	6446
Customer Carpark	5524	0	0	0	5524
Drop off/Pick Up Point	7607	0	0	0	7607

■ **Table 4-15 Parking Demand in Wellington CBD by Parking Type**

Parking Type	HBW	BU	Other
residential	268	-	769
public unmetered on street	496	2631	9448
public unmetered off street	412	643	651
public metered on street	1642	4327	16760
paid	4010	2201	12619
employer	8642	3656	2931
customer	717	4178	16397
Total	*16,188*	*17,636*	*59,575*

■ **Table 4-16 Average parking duration**

HBW (Days)	BU (hrs)	Other (hrs)
1	1.3	1.2

■ **Table 4-17 Average parking cost ($'s) in Wellington CBD**

Parking Type	HBW (per day)		BU (per hr)		Other (per hr)	
	Upper W.	Lower W.	Upper W.	Lower W.	Upper W.	Lower W.
residential	-	-	-	-	-	-
public unmetered on street	-	-	-	-	-	-
public unmetered off street	-	-	-	-	-	-
public metered on street	-	-	-	-	-	-
paid	12.4	7.8	5.9	2.8	5.9	2.8
employer	-	-	-	-	-	-
customer	-	-	-	-	-	-
Average parking cost/trip	2.75	1.7	0.8	0.45	0.8	0.4

A-4.2 Parking Supply

A-4.2.1 Supply Wellington CBD

■ **Table 4-18 Wellington CBD Available Parking Spaces**

Where Park	Long Term	Short Term	Total
Residential	n/a	n/a	n/a
Public Unmetered on Street	1,442	575	2,017
Public Unmetered off Street	0	34	34
Public Metered on Street	1,241	2,756	3,997
Paid Carpark	10,985	-	10,985
Work Carpark	12,819	-	12,819
Customer Carpark	2,156	-	2,156

■ **Table 4-19 Wellington CBD - HBW Ratio of Parking Trips to Available Spaces**

Where Parked	Number Of Spaces Used	Number of Long Term Parking Spaces	Ratio Num Parking Trips Per Space (Long Term Spaces)
Residential	268	n/a	n/a
Public Unmetered on Street	496	1,442	0.34
Public Unmetered off Street	412	0	n/a
Public Metered on Street	1642	1,241	1.32
Paid Carpark	4010	10,985	0.37
Work Carpark	8642	12,819	0.67
Customer Carpark	717	2,156	0.33

■ **Table 4-20 Wellington CBD - All Purposes Minus HBW Ratio of Parking Trips to Available Spaces After HBW Trips Occupy Spaces**

Where Parked	Number Of Spaces Used	Available Spaces Minus HBW Spaces	Ratio of All Non-HBW Parking Trips Per Space (All Spaces minus HBW Spaces Used)
Residential	769	0	n/a
Public Unmetered on Street	12079	1,521	7.94
Public Unmetered off Street	1294	34	38.05
Public Metered on Street	21088	2,756	7.65
Paid Carpark	14820	6,975	2.12
Work Carpark	6587	4,177	1.58
Customer Carpark	20574	1,439	14.29

A-5. Task2.4 Generalised Cost

No detailed tables produced.

A-6. Task 2.5 Retail Destination Analysis

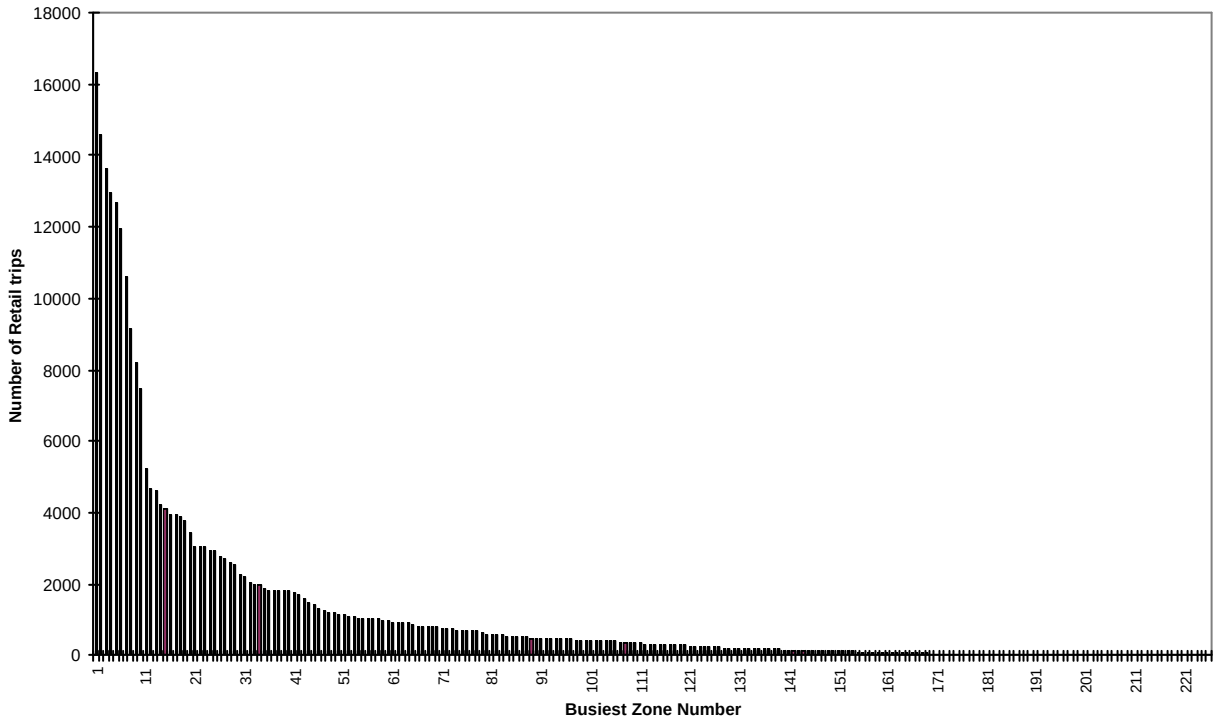
The findings of the various tabulations are as follows:

- There are some 505,700 expanded trips in the dataset with a purpose of 'shopping'
- Of these trips, 23% are to the Wellington CBD, while an additional 22% are to other cbd centres (eg upper and lower hutt cbd's – this does not include the rural cbds such as masterton or paraparmu)
- The remaining 55% of shopping trips are local or rural centre shopping trips.

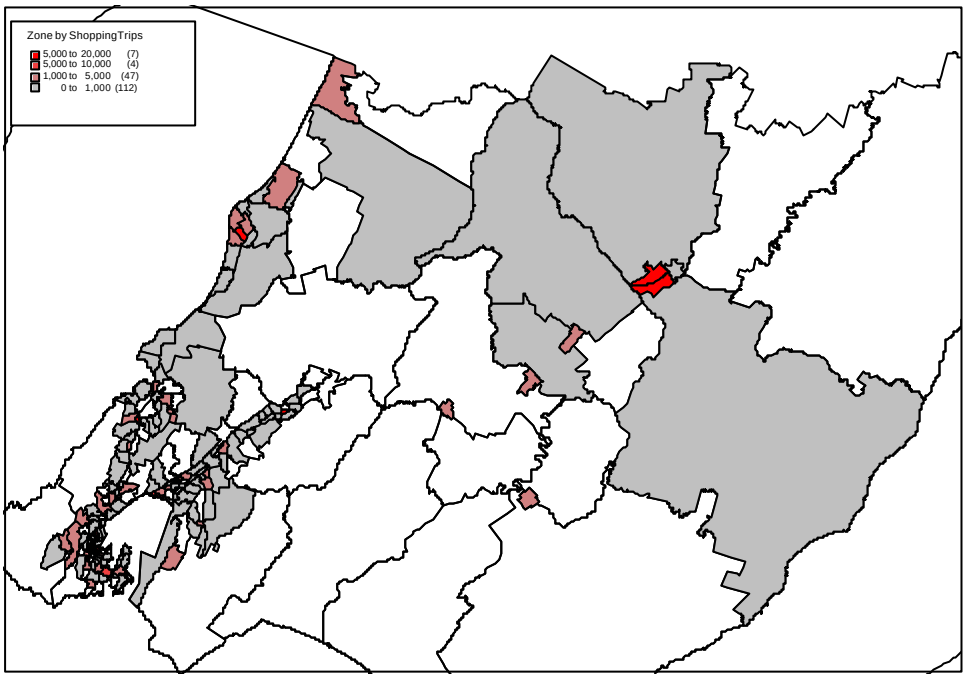
Of the 268,000 trips to a retail/shop, 87% are for shopping purpose – ie the majority of trips to retail centres are for shopping purposes.

The top 10 zones in terms of retail destinations contain 44% of shopping trips. This increases to 70% of trips in the top 30 zones. Of these, all zones are either in the Wellington or hutt cbd's, or in other zones with major shopping centres. The figure below displays this distribution of shopping trips graphically. The Y axis shows the number of trips while the x axis refers to the ith busiest zone. Ie the column at 21 refers to the zone with the 21st most amount of retail trips.

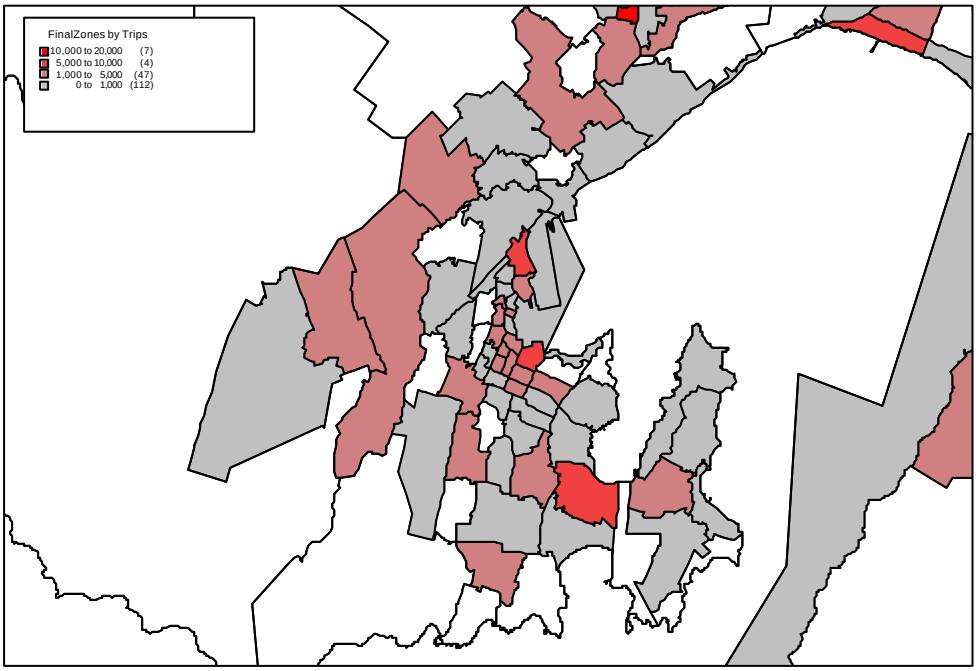
Figure 6-1 Retail Trips by Zone – Sorted From Maximum to Minimum Retail Trips



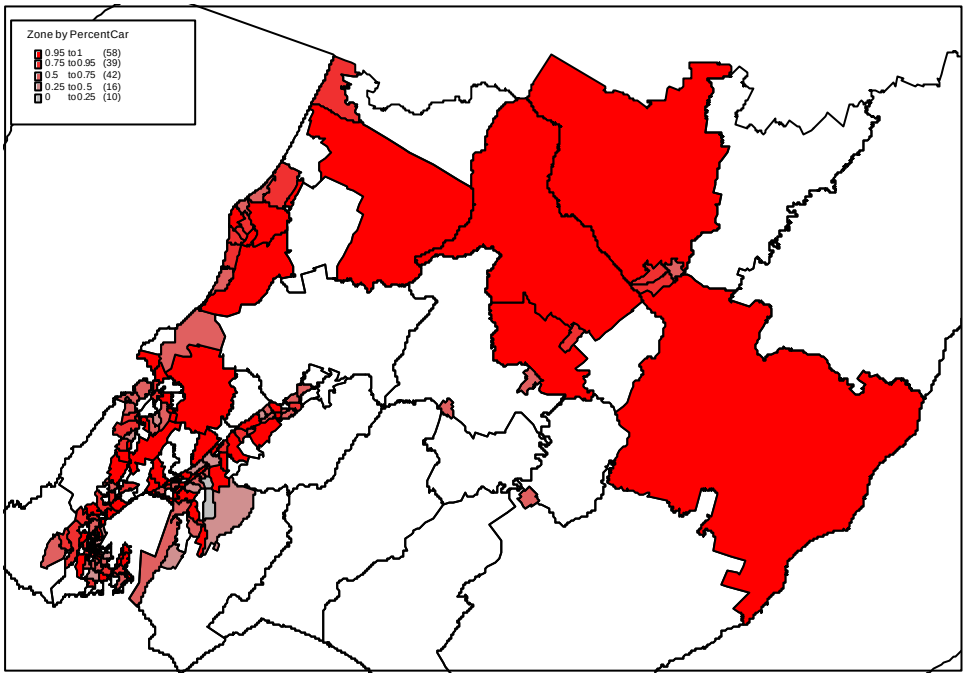
■ **Figure 6-2 Distribution of Shopping Trips in the Wellington Region**



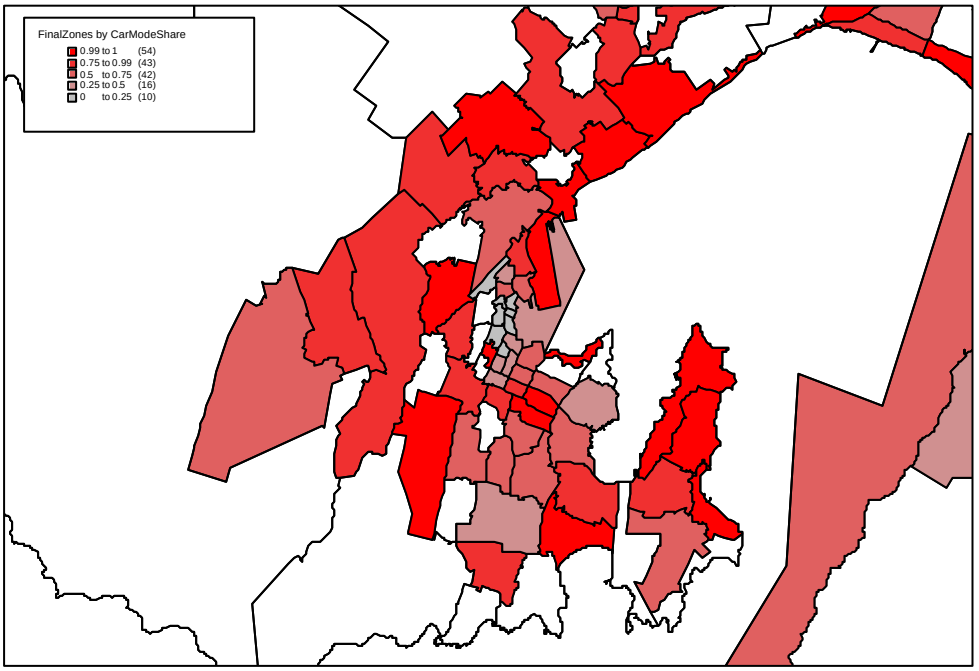
■ **Figure 6-3 Distribution of Shopping Trips in the Wellington Region – WCC and 'Inner' WRC**



■ **Figure 6-4 Proportion Car Travel for Shopping Trips in the Wellington Region**



■ **Figure 6-5 Proportion Car Travel for Shopping Trips in the Wellington Region – WCC and 'Inner' WRC**



A-7. Task 2.6 & 2.13 Commercial Travel and Vehicle Types

A-7.1 Commercial Travel

- **Table 7-1 Business Trips by Purpose by Mode**

Purpose	Mode	Number of Trips	Percentage of Total Business Trips
HBEB	Walk	5551	2.58%
	Bicycle	1783	0.83%
	Taxi - As Passenger	139	0.06%
	Car - Driver	40148	18.67%
	Car - Passenger	3073	1.43%
	Taxi - Driver	154	0.07%
	Truck - Driver	1417	0.66%
	Truck - Passenger	286	0.13%
	Train	581	0.27%
	Public Bus	766	0.36%
	Other Method	71	0.03%
NHBEB	Walk	13695	6.37%
	Bicycle	1311	0.61%
	Taxi - As Passenger	1644	0.76%
	Car - Driver	79990	37.21%
	Car - Passenger	7975	3.71%
	Truck - Driver	5940	2.76%
	Truck - Passenger	454	0.21%
	Train	1426	0.66%
	Ferry	210	0.10%
	School Bus	1170	0.54%
	Public Bus	674	0.31%
	Other Method	5142	2.39%
	Cable Car	41	0.02%
CV	Car - Driver	18975	8.83%
	Car - Passenger	425	0.20%
	Taxi - Driver	770	0.36%
	Truck - Driver	13921	6.48%
	Truck - Passenger	428	0.20%
HBEB (E)	Walk	216	0.10%
	Car - Driver	977	0.45%
	Car - Passenger	467	0.22%
	Truck - Passenger	92	0.04%
NHBEB (E)	Walk	100	0.05%
	Car - Driver	4849	2.26%
	Car - Passenger	54	0.02%
	Train	72	0.03%

Or table below (Note Escort incorporated into numbers)

Purpose	Walk	Bicycle	Taxi - As Passenger	Car – Driver	Car – Passenger	Taxi - Driver	Truck - Driver
HBEB	5766	1783	139	41125	3540	154	1417
NHBEB	13795	1311	1644	84839	8029	0	5940
CV	0	0	0	18975	425	770	13921
Purpose	**Truck - Passenger**	**Train**	**Ferry**	**School Bus**	**Public Bus**	**Other Method**	**Cable Car**
HBEB	379	581	0	0	766	71	0
NHBEB	454	1499	210	1170	674	5142	41
CV	428	0	0	0	0	0	0

Note: The vehicle bodies of 18352 of CV Car Driver's are Van/Ute, and the remaining 623 are Truck.

■ **Table 7-2 Business Trips by Purpose to go to Origin**

OriginPurpose	Vehicle Type								Percentage of Total Trips
	Other	Company Car	Private Car	Something Else	Car	4-Wheel Drive	Van/Ute	Truck	
To get on/off Public Transport	107	0	0	0	0	0	0	0	0.05%
It's My WorkPlace	0	6422	708	2395	16573	2190	5768	1332	16.46%
Pick Up/Deliver Goods	0	5254	0	4615	5030	321	12278	5912	15.54%
On Employer's/Client's Business	0	10578	1446	1877	43297	5157	16897	1531	37.58%
Shopping/Petrol	0	0	0	32	0	0	247	0	0.13%
Social Visit	0	0	0	0	0	0	25	0	0.01%
Recreation/Eating	0	0	0	0	0	0	89	0	0.04%
Personal Business	0	0	0	0	0	0	148	31	0.08%
Accompany Someone	108	0	0	0	0	0	46	0	0.07%
Drop off/Pick Up Someone	0	0	54	0	3092	38	1879	26	2.37%
Home	0	389	782	207	14668	1234	6276	544	11.21%
Other	0	0	0	0	0	0	0	59	0.03%
Dropped Off/Picked Up	40	0	114	0	0	0	0	0	0.07%

■ **Table 7-3 Car/Van/Truck Ownership by TLA**

TLA	Car/Station Wagon	4-Wheel Drive	Van/Ute	Truck
Carterton District	4086	228	519	430
Kapiti Coast District	22597	1691	2656	438
Lower Hutt City	43771	2028	5654	847
Masterton District	10524	947	1995	474
Porirua City	19271	859	1860	215
South Wairarapa District	4125	300	1191	304
Upper Hutt City	17701	1383	2612	439
Wellington City	80574	4004	5153	147
Total	202650	11441	21640	3296

A-7.2 Vehicle Type

■ **Table 7-4 Assumed Mode Hierarchy and Number of Trips by Main Mode**

Rank	Mode	Number of Trips
1	Train	724
2	School Bus	338
3	Charter Bus	58
4	Public Bus	827
5	Truck - Driver	460
6	Car - Driver	18,952
7	Taxi - Driver	151
8	Truck - Passenger	72
9	Car - Passenger	8,033
10	Taxi - Passenger	186
11	Motorcycle	60
12	Bicycle	393
13	Walking	5,713
14	Cable Car	1
15	Ferry	19
16	Other	127

A-7.3 Summary (including minor modes)

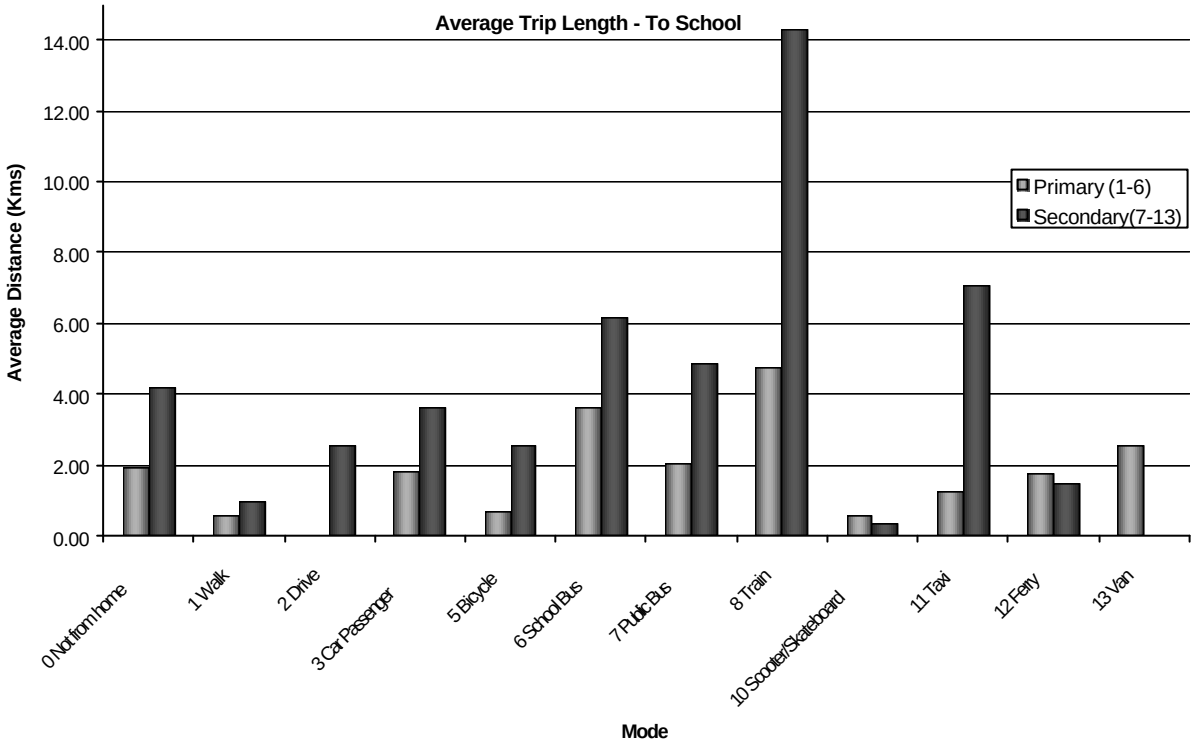
No detailed tables produced.

A-8. Tasks 2.7 & 2.8 Education Modelling, School Buses, Car Passenger Modelling and Escorts

A-8.1 School Survey

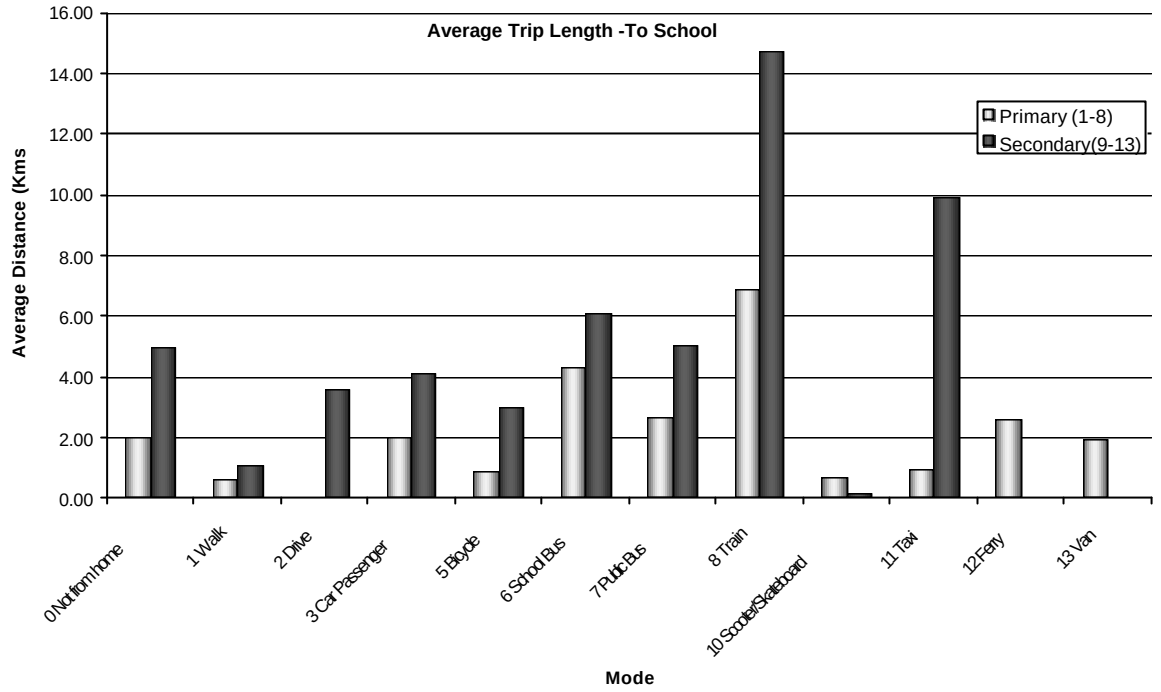
Below are a series of figures describing the school survey data.

- **Figure 8-1**



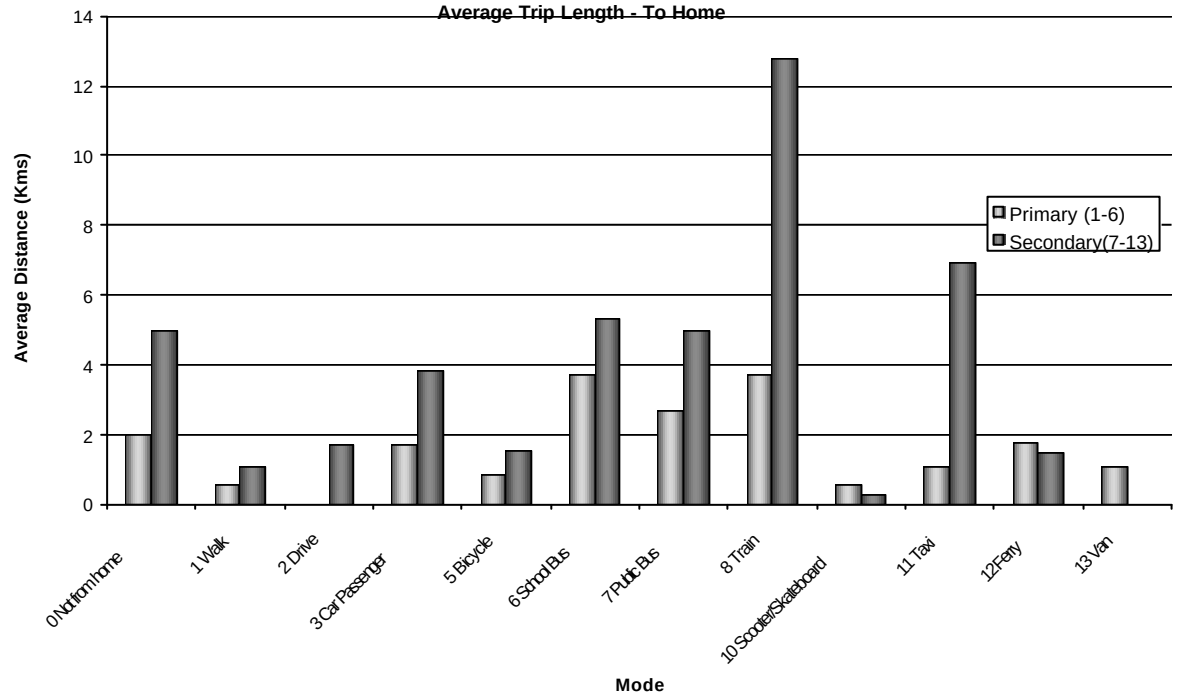
Note: Primary (1-6) - Primary (Years 1–6)
Secondary (7-13) - Intermediate (Years 7 and 8) and Secondary (Years 9–13)

■ **Figure 8-2**



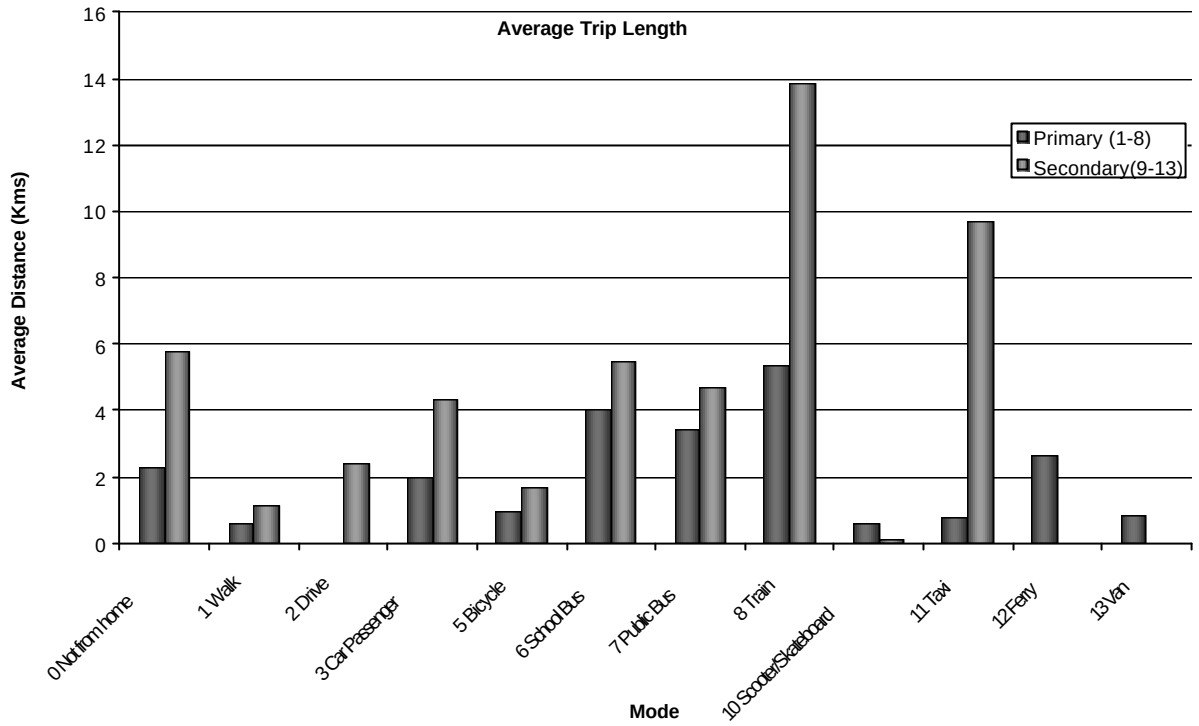
Note: Primary (1-8) - Primary (Years 1–6) and intermediate (Years 7 and 8)
Secondary (9-13) - Secondary (Years 9–13)

■ **Figure 8-3**



Note: Primary (1-6) - Primary (Years 1 – 6)
Secondary (7-13) - Intermediate (Years 7 and 8) and Secondary (Years 9–13)

■ **Figure 8-4**

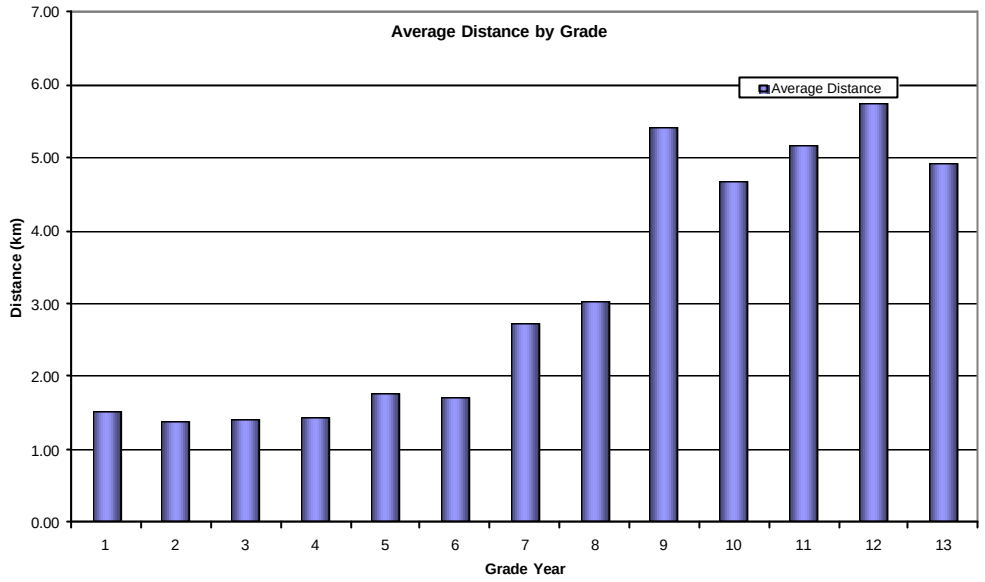


Note: Primary (1-8) - Primary (Years 1–6) and intermediate (Years 7 and 8)
Secondary (9-13) - Secondary (Years 9–13)

■ **Figure 8-5 Average Trip Length by Mode to School and Grade**

	Not from home	Walk	Drive	Car Passenger	Bicycle	School Bus	Public Bus	Train	Scooter/Skateboard	Taxi	Ferry	Van	
GradeYear	0	1	2	3	5	6	7	8	10	11	12	13	Average
1	1.52	0.53	0.00	1.87	0.35	0.94	1.82	0.00	0.00	0.00	0.00	0.00	1.52
2	1.57	0.47	0.00	1.65	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.39
3	2.13	0.56	0.00	1.60	0.33	4.01	2.21	0.00	0.71	0.00	0.00	0.00	1.40
4	1.69	0.55	0.00	1.83	0.44	2.05	1.68	4.15	1.62	1.18	0.00	0.00	1.43
5	0.77	0.59	0.00	2.06	0.86	7.48	2.59	12.43	0.45	4.15	10.41	0.00	1.78
6	3.89	0.60	0.00	1.97	0.91	7.18	3.87	11.82	0.61	2.04	0.00	15.18	1.71
7	2.26	0.82	0.00	2.36	1.64	5.90	4.86	13.07	1.07	0.00	0.00	0.00	2.72
8	2.10	0.68	0.00	2.51	1.20	6.84	4.14	13.59	0.78	0.00	10.23	0.00	3.02
9	9.81	1.02	0.00	4.76	1.93	6.74	4.82	14.09	0.61	10.22	0.00	0.00	5.42
10	4.14	1.12	0.00	4.21	2.72	5.29	4.95	13.73	0.00	0.00	0.00	0.00	4.68
11	5.80	1.14	5.78	4.07	3.52	6.27	5.08	13.48	0.00	35.47	0.00	0.00	5.18
12	3.38	0.99	7.29	2.91	3.80	6.03	5.23	19.22	0.00	1.08	0.00	0.00	5.75
13	1.79	0.98	4.74	4.69	2.98	6.18	5.09	12.92	0.00	2.69	0.00	0.00	4.92
Total	3.36	0.76	5.42	2.65	1.58	6.16	4.63	14.17	0.70	7.04	10.32	15.18	

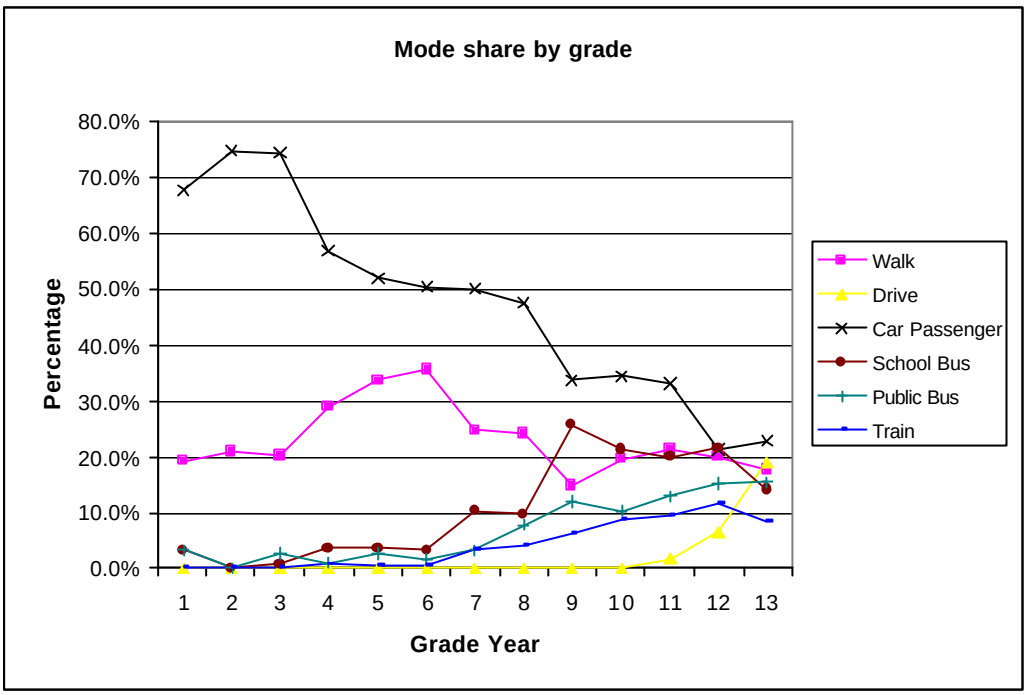
■ Figure 8-6 Average Distance by Grade



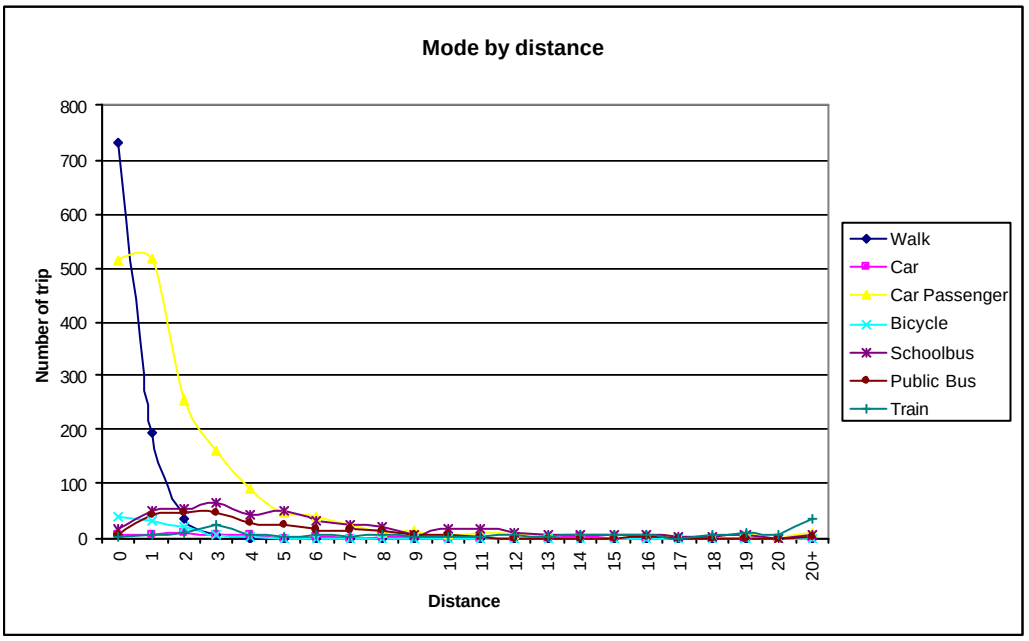
■ Figure 8-7 Mode to School and Grade

	Not from home	Walk	Drive	Car Passenger	Bicycle	School Bus	Public Bus	Train	Scooter/Skateboard	Taxi	Ferry	Van	
GradeYear	0	1	2	3	5	6	7	8	10	11	12	13	Total
1	3.2%	19.4%		67.7%	3.2%	3.2%	3.2%						100%
2	2.1%	20.8%		75.0%	2.1%								100%
3	0.6%	20.1%		74.4%	0.6%	0.6%	2.4%		1.2%				100%
4	2.6%	28.9%		56.8%	1.1%	3.7%	1.1%	0.5%	0.5%	4.7%			100%
5	2.6%	33.9%		52.2%	2.2%	3.6%	2.6%	0.5%	1.7%	0.2%	0.5%		100%
6	1.9%	35.8%		50.4%	3.0%	3.3%	1.6%	0.5%	3.1%	0.3%		0.2%	100%
7	3.1%	24.7%		50.1%	3.8%	10.3%	3.4%	3.1%	1.3%				100%
8	1.9%	24.2%		47.4%	3.6%	9.8%	7.7%	4.0%	1.0%		0.4%		100%
9	2.4%	14.6%		33.9%	3.3%	25.7%	11.9%	6.2%	0.3%	1.6%			100%
10	2.2%	19.5%		34.3%	3.8%	21.2%	10.4%	8.6%					100%
11	0.4%	21.2%	1.6%	32.9%	0.8%	20.0%	12.9%	9.4%		0.8%			100%
12	2.9%	19.9%	6.4%	21.1%	0.6%	21.6%	15.2%	11.7%		0.6%			100%
13	1.8%	17.6%	18.8%	22.9%	0.6%	14.1%	15.3%	8.2%		0.6%			100%
Total	2%	25%	1%	45%	3%	12%	7%	4%	1%	1%	0%	0%	100%

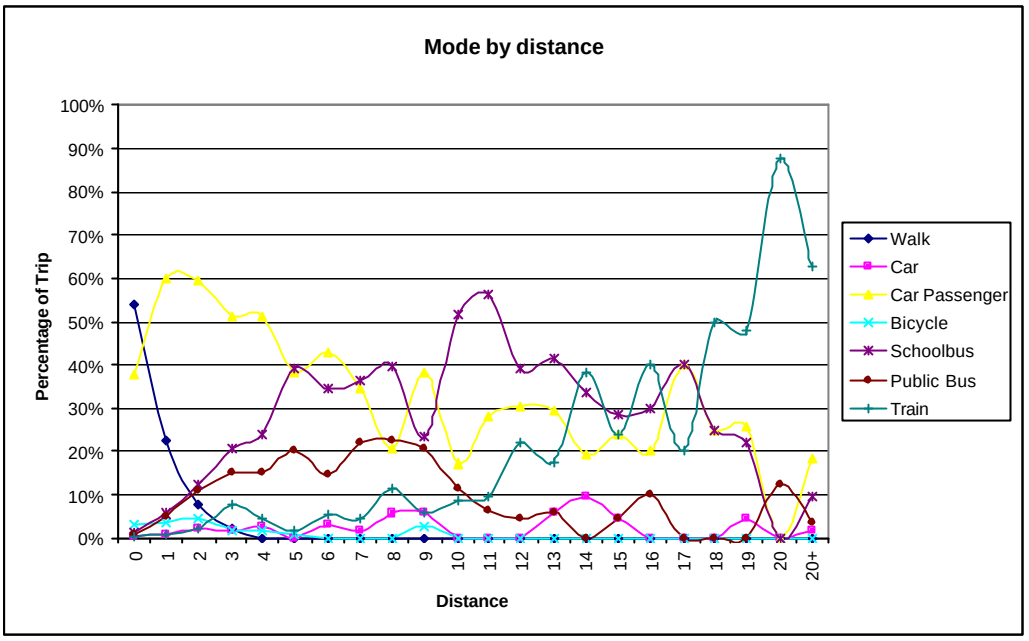
■ **Figure 8-8 Mode to School and Grade Graph**



■ **Figure 8-9 Mode to School by Distance**



■ **Figure 8-10 Mode to School by Distance - Percentage**



A-8.2 Household Survey

No detailed tables produced.

A-8.3 Overall Conclusions

No detailed tables produced.

A-8.4 Model Structure Implications

No detailed tables produced.

A-9. Task 2.9 Weekend Travel

- **Table 9-1 Proportion of Trips by day of the Week by Purpose**

Day	Purpose								
	HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHEBE	CV
Weekday	14.69%	9.82%	16.22%	5.41%	15.40%	28.50%	2.19%	6.08%	1.69%
Saturday	4.86%	0.38%	24.67%	13.00%	24.47%	31.43%	0.84%	0.30%	0.03%
Sunday	4.38%	0.00%	22.10%	14.65%	29.58%	27.20%	0.95%	0.87%	0.28%
Total	10.10%	5.43%	19.47%	9.25%	20.73%	28.85%	1.60%	3.58%	0.99%

Conclusion: Saturday and Sunday purpose splits are very similar.

- **Table 9-2 Proportion of Trips By Mode by Purpose on Weekdays**

Mode	Purpose									Prop. By Mode
	HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHEBE	CV	
Walk	9%	24%	13%	16%	17%	26%	9%	11%	0%	18%
Bicycle	2%	2%	1%	2%	1%	0%	3%	1%	0%	1%
Taxi – Pass	0%	1%	1%	0%	1%	0%	0%	1%	0%	1%
Car – Driver	59%	23%	59%	52%	51%	47%	72%	68%	51%	51%
Car – Pass	12%	32%	21%	27%	26%	19%	7%	7%	1%	20%
Taxi – Driver	0%	0%	0%	0%	0%	2%	0%	0%	2%	1%
Motorcycle	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Truck – Driver	1%	0%	0%	0%	0%	0%	3%	5%	43%	2%
Truck – Pass	0%	0%	0%	0%	0%	0%	1%	0%	1%	0%
Train	9%	3%	1%	1%	1%	1%	1%	1%	0%	2%
Ferry	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
School Bus	0%	8%	0%	0%	0%	1%	0%	1%	0%	1%
Public Bus	7%	7%	4%	1%	2%	1%	2%	1%	0%	3%
Other	0%	0%	0%	0%	0%	1%	0%	2%	0%	0%
Charter Bus	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cable Car	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Prop. By Purpose	15%	10%	16%	5%	15%	28%	2%	6%	2%	

■ **Table 9-3 Proportion of Trips By Mode by Purpose on Saturday**

Mode	Purpose									Prop. By Mode
	HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHEBE	CV	
Walk	6%	16%	14%	14%	14%	20%	6%	13%	0%	16%
Bicycle	2%	0%	1%	1%	2%	0%	7%	0%	0%	1%
Taxi – Pass	1%	0%	1%	0%	3%	1%	0%	0%	0%	1%
Car – Driver	69%	68%	54%	48%	43%	40%	78%	82%	100%	47%
Car – Pass	21%	13%	29%	35%	35%	35%	8%	6%	0%	32%
Taxi – Driver	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Motorcycle	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Truck – Driver	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Truck – Pass	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Train	0%	3%	0%	0%	1%	1%	0%	0%	0%	1%
Ferry	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%
School Bus	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Public Bus	1%	0%	1%	3%	2%	1%	0%	0%	0%	2%
Other	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Charter Bus	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%
Cable Car	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Prop. By Purpose	5%	0%	24%	12%	26%	29%	1%	0%	0%	

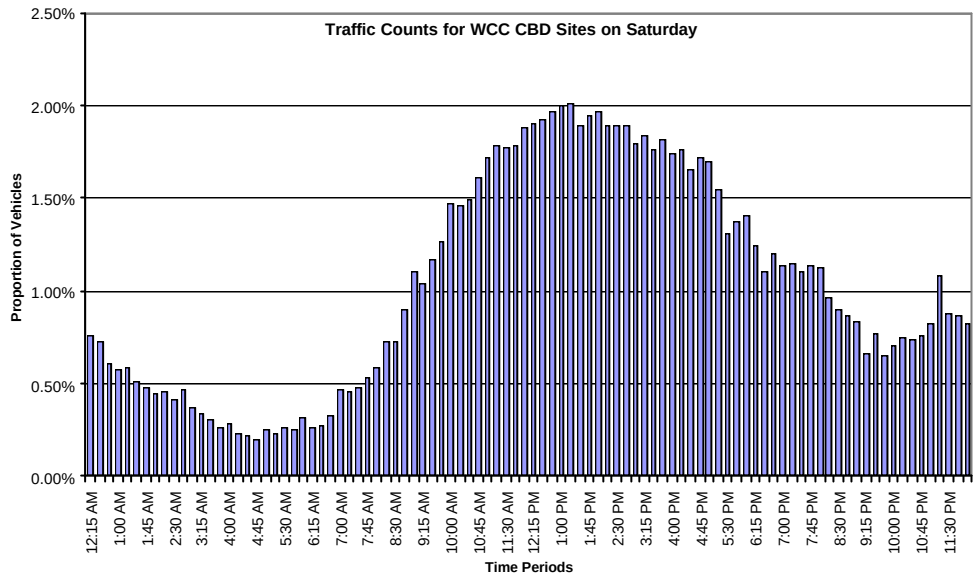
■ **Table 9-4 Proportion of Trips By Mode by Purpose on Sunday**

Mode	Purpose									Prop. By Mode
	HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHEBE	CV	
Walk	13%	0%	11%	7%	18%	12%	20%	4%	0%	13%
Bicycle	1%	0%	0%	2%	2%	2%	0%	0%	0%	2%
Taxi - Pass	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Car - Driver	60%	0%	55%	47%	43%	46%	80%	58%	100%	48%
Car - Pass	18%	0%	32%	42%	34%	36%	0%	0%	0%	34%
Taxi - Driver	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Motorcycle	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Truck - Driver	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Truck - Pass	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%
Train	3%	0%	0%	1%	1%	0%	0%	0%	0%	1%
Ferry	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
School Bus	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Public Bus	2%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Other	0%	0%	0%	0%	0%	1%	0%	38%	0%	1%
Charter Bus	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cable Car	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Prop. By Purpose	4%	0%	22%	15%	30%	27%	1%	1%	0%	

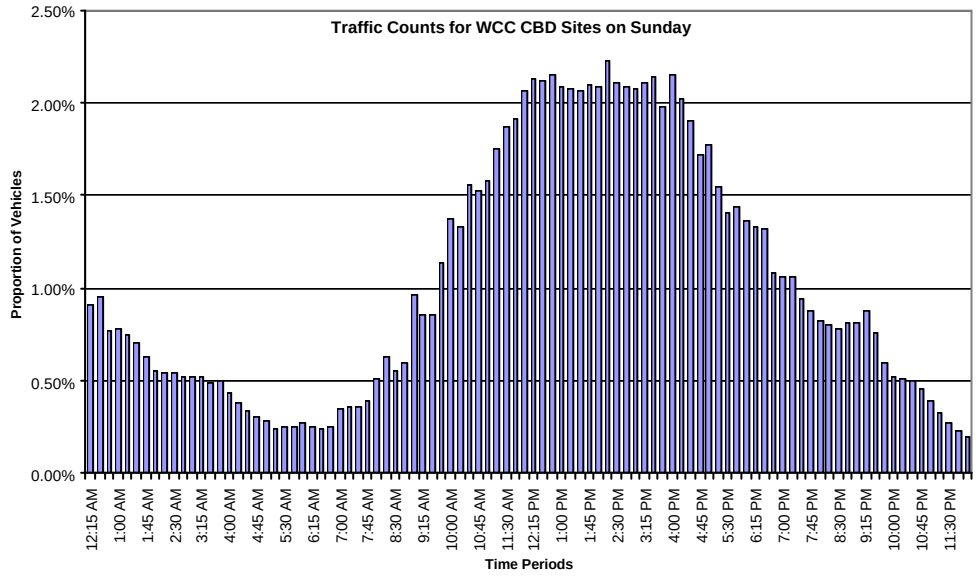
Conclusions: Saturday and Sunday are very similar:

- very low PT mode shares;
- higher car occupancies.

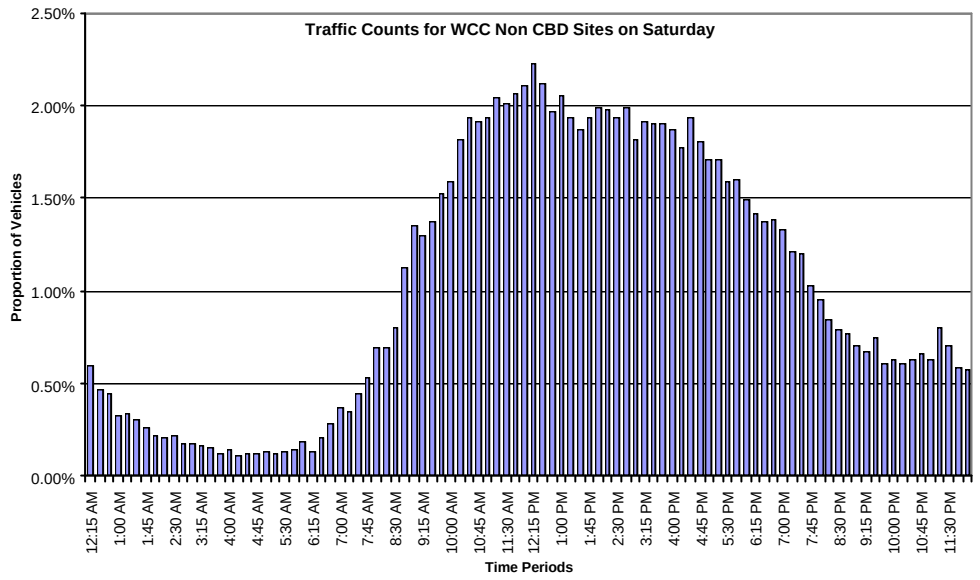
■ **Figure 9-1 Traffic Counts for Wellington CBD on the Saturday**



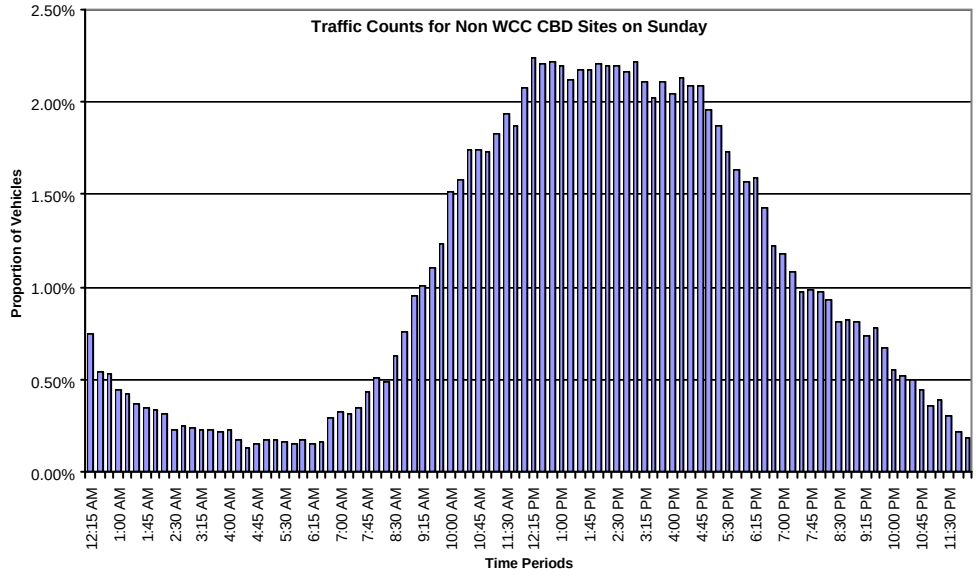
■ **Figure 9-2 Traffic Counts for Wellington CBD on the Sunday**



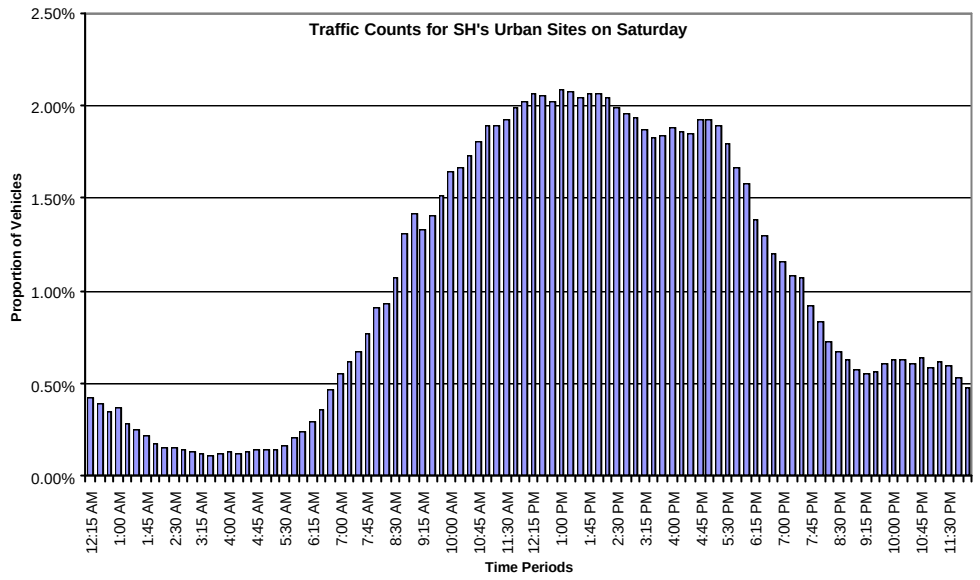
■ **Figure 9-3 Traffic Counts for Wellington Non-CBD on the Saturday**



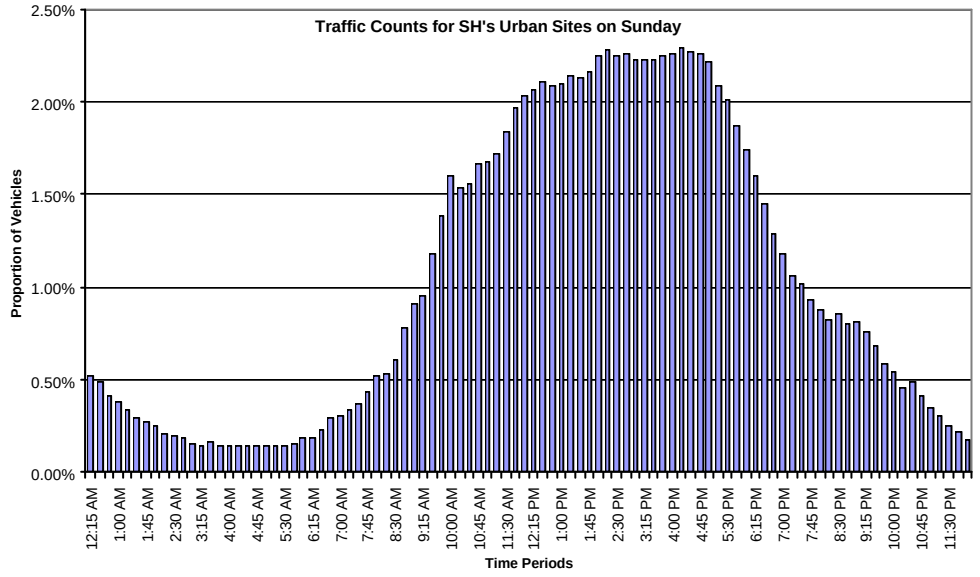
■ **Figure 9-4 Traffic Counts for Wellington Non-CBD on the Sunday**



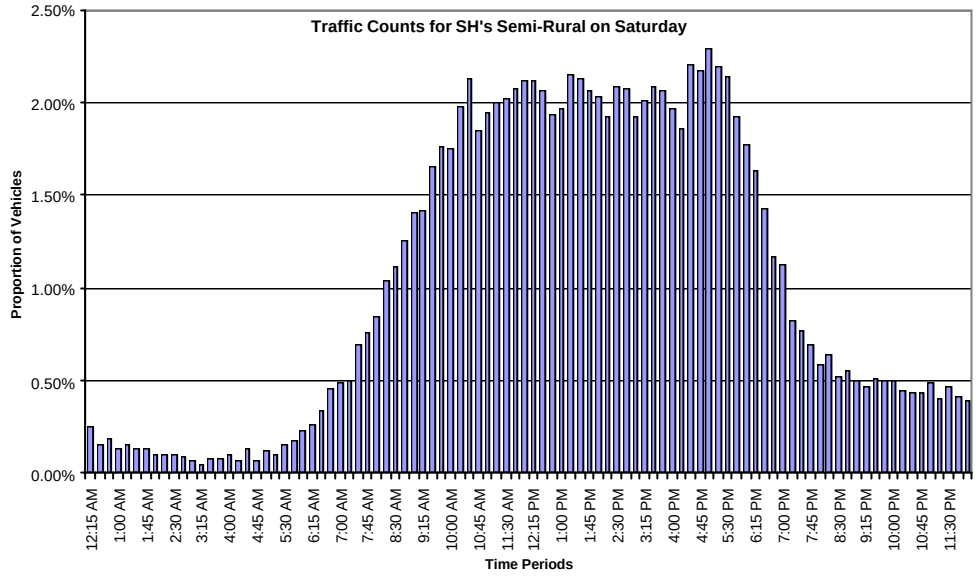
■ **Figure 9-5 Traffic Counts For Urban State Highway's Sites on Saturday**



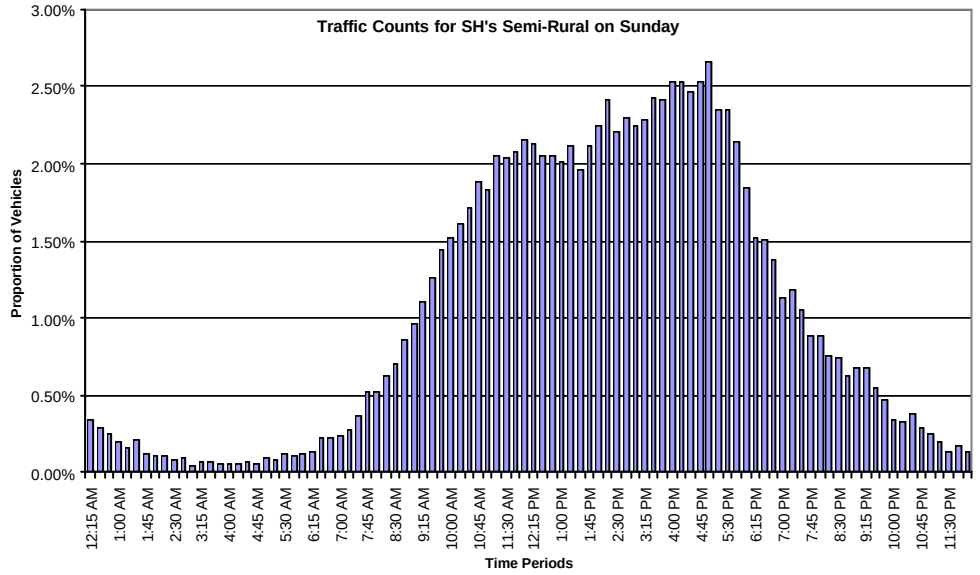
■ **Figure 9-6 Traffic Counts For Urban State Highway's Sites on Sunday**



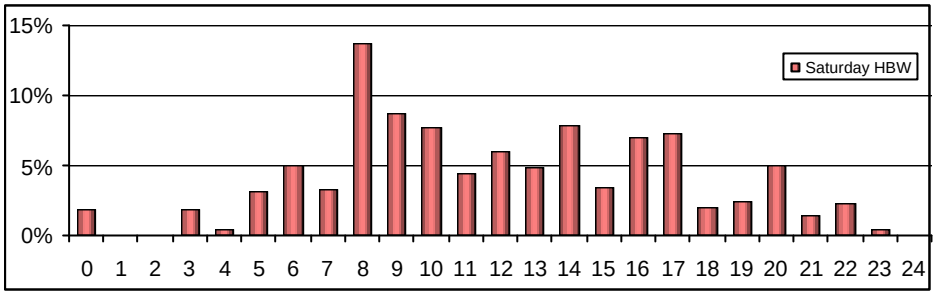
■ **Figure 9-7 Traffic Counts For State Highway's Semi-Rural Sites**



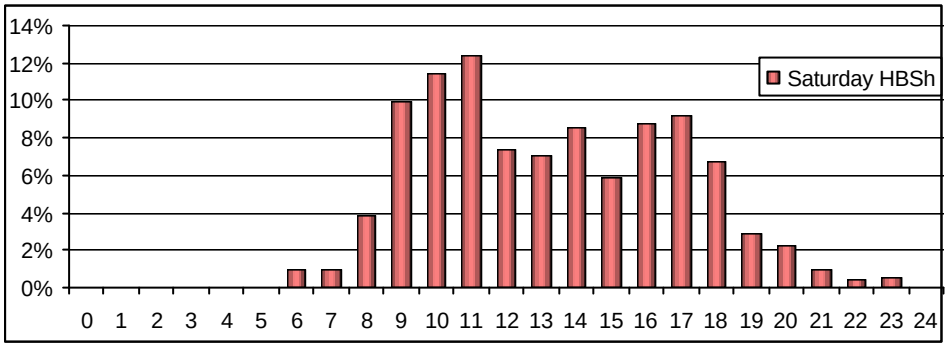
■ **Figure 9-8 Traffic Counts For State Highway's Semi-Rural Sites**



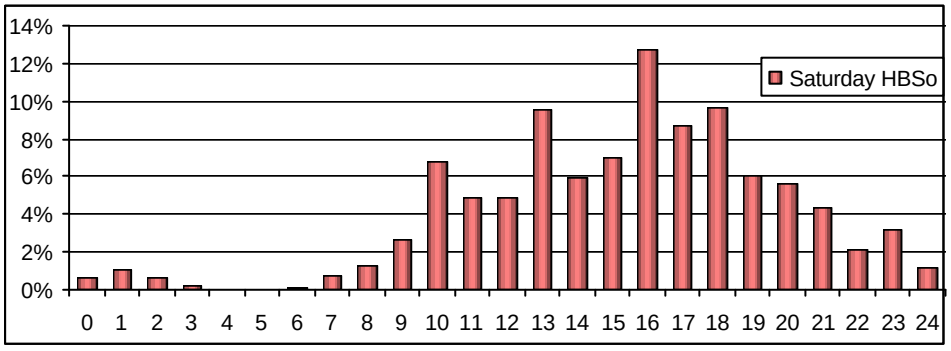
■ **Figure 9-9 Proportion of HBW Trips by Hour on Saturdays**



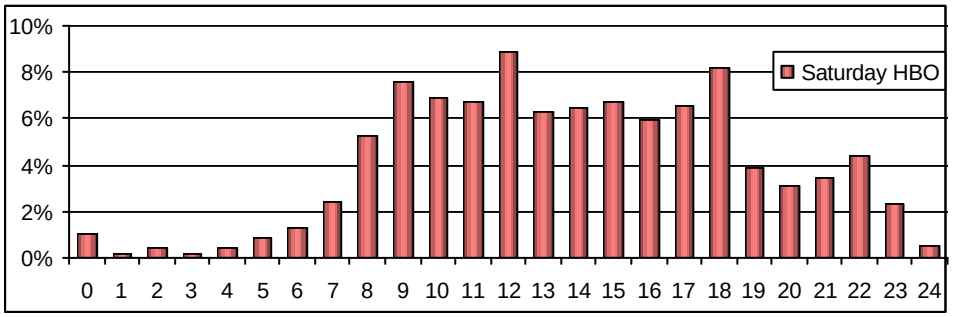
■ **Figure 9-10 Proportion of HBSh Trips by Hour on Saturdays**



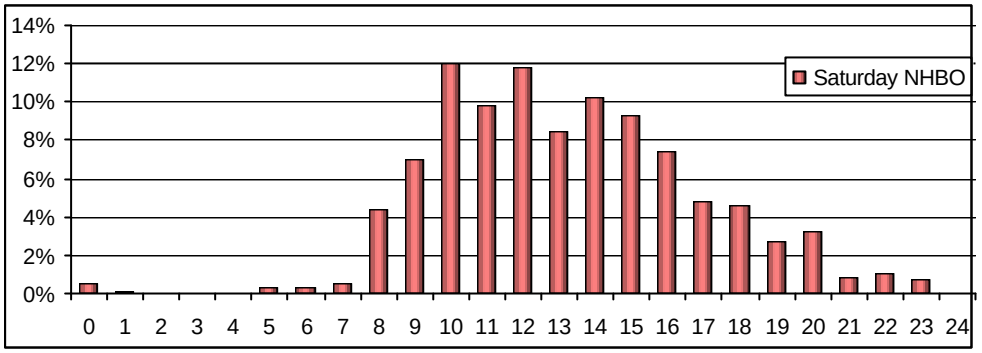
■ **Figure 9-11 Proportion of HBSo Trips by Hour on Saturdays**



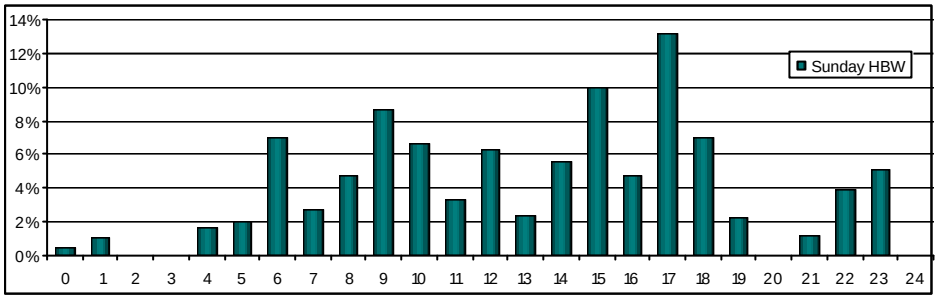
■ **Figure 9-12 Proportion of HBO Trips by Hour on Saturdays**



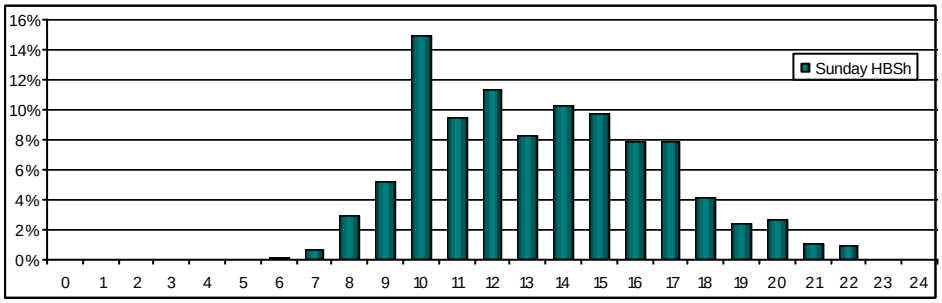
■ **Figure 9-13 Proportion of NHBO Trips by Hour on Saturdays**



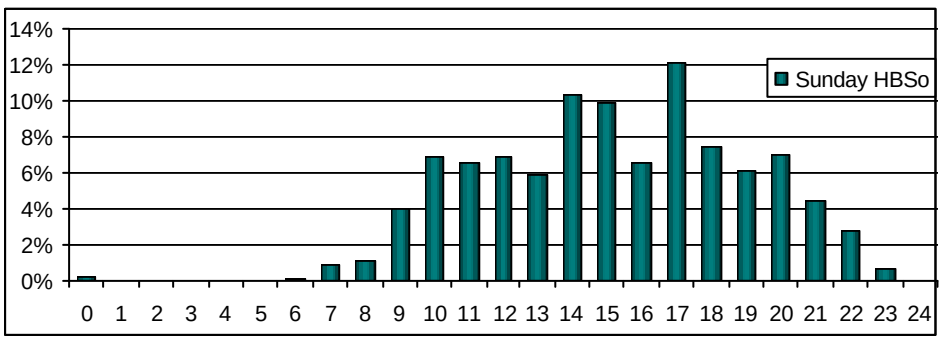
■ **Figure 9-14 Proportion of HBW Trips by Hour on Sundays**



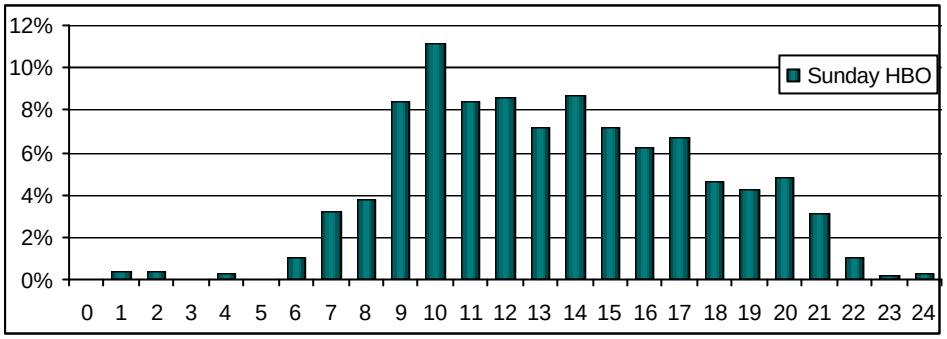
■ **Figure 9-15 Proportion of HBSh Trips by Hour on Sundays**



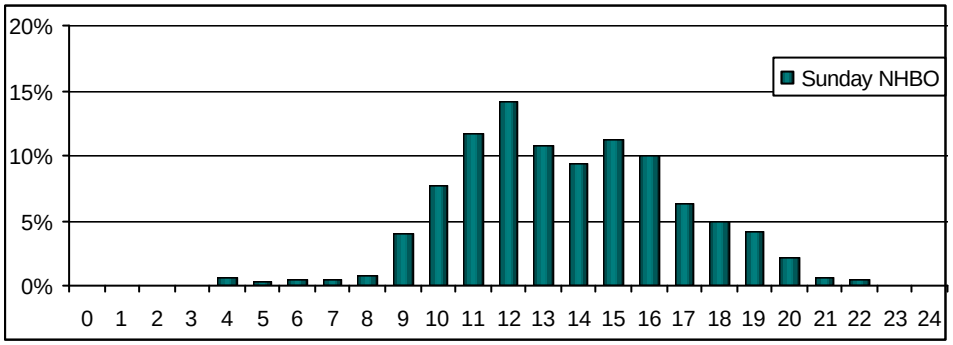
■ **Figure 9-16 Proportion of HBSo Trips by Hour on Sundays**



■ **Figure 9-17 Proportion of HBO Trips by Hour on Sundays**



■ **Figure 9-18 Proportion of NHBO Trips by Hour on Sundays**



■ Table 9-5 Attractions by Zones Correlation Data

HBW		Sat	Sun	WeekDay	Weekend
	Sat	1			
	Sun	0.053606	1		
	WeekDay	0.310263	0.428934	1	
	Weekend	0.709729	0.741508	0.511077	1
HBEd		***Sat***	***Sun***	***WeekDay***	***Weekend***
	Sat	1			
	Sun	#DIV/0!	1		
	WeekDay	0.153259	#DIV/0!	1	
	Weekend	1	#DIV/0!	0.153259	1
HBSh		***Sat***	***Sun***	***WeekDay***	***Weekend***
	Sat	1			
	Sun	0.817009	1		
	WeekDay	0.858021	0.871467	1	
	Weekend	0.953431	0.952879	0.907223	1
HBSo		***Sat***	***Sun***	***WeekDay***	***Weekend***
	Sat	1			
	Sun	0.248768	1		
	WeekDay	0.469431	0.538043	1	
	Weekend	0.779814	0.800324	0.638344	1
HBO		***Sat***	***Sun***	***WeekDay***	***Weekend***
	Sat	1			
	Sun	0.388731	1		
	WeekDay	0.479457	0.579775	1	
	Weekend	0.786342	0.874879	0.6408	1
NHBO		***Sat***	***Sun***	***WeekDay***	***Weekend***
	Sat	1			
	Sun	0.513603	1		
	WeekDay	0.763069	0.687191	1	
	Weekend	0.89724	0.839682	0.836606	1
HBEB		***Sat***	***Sun***	***WeekDay***	***Weekend***
	Sat	1			
	Sun	0.014086	1		
	WeekDay	0.094469	0.006897	1	
	Weekend	0.588269	0.816872	0.060074	1
NHBEB		***Sat***	***Sun***	***WeekDay***	***Weekend***
	Sat	1			
	Sun	0.05838	1		
	WeekDay	0.030395	0.088329	1	
	Weekend	0.368624	0.949513	0.091801	1
CV		***Sat***	***Sun***	***WeekDay***	***Weekend***
	Sat	1			
	Sun	-0.00895	1		
	WeekDay	-0.02904	-0.03053	1	
	Weekend	0.197234	0.978551	-0.03592	1

■ Table 9-6 Productions by Zones Correlation Data

		Sat	Sun	WeekDay	Weekend
HBW	Sat	1			
	Sun	0.343548	1		
	WeekDay	0.390372	0.377864	1	
	Weekend	0.823283	0.815919	0.468715	1
HBEd		**Sat**	**Sun**	**WeekDay**	**Weekend**
	Sat	1			
	Sun	#DIV/0!	1		
	WeekDay	0.250934	#DIV/0!	1	
	Weekend	1	#DIV/0!	0.250934	1
HBSh		**Sat**	**Sun**	**WeekDay**	**Weekend**
	Sat	1			
	Sun	0.319383	1		
	WeekDay	0.661905	0.599566	1	
	Weekend	0.823232	0.800898	0.777444	1
HBSo		**Sat**	**Sun**	**WeekDay**	**Weekend**
	Sat	1			
	Sun	0.323823	1		
	WeekDay	0.609227	0.470885	1	
	Weekend	0.800156	0.826583	0.660927	1
HBO		**Sat**	**Sun**	**WeekDay**	**Weekend**
	Sat	1			
	Sun	0.446237	1		
	WeekDay	0.683446	0.569317	1	
	Weekend	0.837327	0.862898	0.733752	1
NHBO		**Sat**	**Sun**	**WeekDay**	**Weekend**
	Sat	1			
	Sun	0.49888	1		
	WeekDay	0.682706	0.686514	1	
	Weekend	0.879981	0.850682	0.790365	1
HBEB		**Sat**	**Sun**	**WeekDay**	**Weekend**
	Sat	**1**			
	Sun	-0.00821	1		
	WeekDay	0.199496	0.210726	1	
	Weekend	0.45725	0.885554	0.280089	1
NHBEB		**Sat**	**Sun**	**WeekDay**	**Weekend**
	Sat	1			
	Sun	0.104084	1		
	WeekDay	0.059976	0.084669	1	
	Weekend	0.386884	0.957388	0.095918	1
CV		**Sat**	**Sun**	**WeekDay**	**Weekend**
	Sat	1			
	Sun	-0.01038	1		
	WeekDay	-0.01766	-0.01741	1	
	Weekend	0.110225	0.992709	-0.01943	1

Table 9-7 Trips on Saturday by Person Type by Purpose

PersonType	HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV	Prop. By Person Type
AdultFT	50%	26%	43%	32%	38%	37%	56%	54%	100%	39%
AdultOth	2%	8%	9%	13%	9%	11%	0%	0%	0%	10%
AdultPTCas	18%	0%	8%	10%	10%	7%	14%	13%	0%	9%
AdultUnEm	0%	0%	1%	1%	2%	2%	0%	0%	0%	1%
Child	5%	8%	17%	23%	21%	20%	0%	13%	0%	19%
Retired	5%	0%	13%	7%	11%	7%	19%	21%	0%	10%
YoundAdultFT	6%	13%	4%	4%	4%	8%	4%	0%	0%	5%
YoundAdultPTCas	12%	3%	1%	6%	2%	4%	7%	0%	0%	3%
YoungAdultOth	1%	42%	4%	5%	3%	4%	0%	0%	0%	4%
Prop. By Purpose	5%	0%	25%	13%	24%	31%	1%	0%	0%	100%

Table 9-8 Trips on Sunday by Person Type by Purpose

PersonType	HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV	Prop. By Person Type
AdultFT	50%	0%	42%	34%	39%	38%	64%	93%	79%	40%
AdultOth	0%	0%	6%	7%	7%	4%	0%	0%	0%	6%
AdultPTCas	16%	0%	12%	11%	9%	12%	28%	5%	0%	11%
AdultUnEm	4%	0%	2%	0%	2%	1%	0%	0%	0%	1%
Child	3%	0%	16%	24%	17%	20%	0%	0%	0%	18%
Retired	4%	0%	15%	11%	16%	9%	5%	2%	0%	12%
YoundAdultFT	10%	0%	3%	4%	3%	7%	3%	0%	21%	5%
YoundAdultPTCas	14%	0%	2%	5%	4%	4%	0%	0%	0%	4%
YoungAdultOth	0%	0%	3%	3%	2%	4%	0%	0%	0%	3%
Prop. By Purpose	4%	0%	22%	15%	30%	27%	1%	1%	0%	100%

Table 9-9 Trips on Weekdays by Person Type by Purpose

PersonType	HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV	Prop. By Person Type
AdultFT	67%	9%	25%	25%	31%	39%	60%	77%	93%	39%
AdultOth	0%	7%	12%	12%	12%	8%	1%	0%	0%	7%
AdultPTCas	10%	8%	14%	13%	13%	13%	15%	8%	3%	12%
AdultUnEm	0%	1%	3%	3%	3%	2%	0%	0%	0%	2%
Child	1%	63%	10%	18%	16%	12%	6%	0%	0%	15%
Infant	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Retired	7%	1%	25%	13%	15%	14%	10%	8%	4%	13%
YoundAdultFT	9%	1%	2%	5%	3%	4%	4%	6%	0%	4%
YoundAdultPTCas	5%	3%	3%	5%	4%	4%	3%	1%	0%	4%
YoungAdultOth	0%	7%	4%	6%	4%	4%	0%	0%	0%	3%
Prop. By Purpose	15%	10%	16%	5%	15%	28%	2%	6%	2%	100%

Table 9-10 Trips on Weekends by Person Type by Purpose

PersonType	HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHBEB	CV	Prop. By Person Type
AdultFT	50%	26%	42%	33%	38%	38%	60%	83%	81%	39%
AdultOth	1%	8%	7%	10%	8%	8%	0%	0%	0%	8%
AdultPTCas	17%	0%	10%	10%	10%	10%	21%	7%	0%	10%
AdultUnEm	2%	0%	1%	1%	2%	1%	0%	0%	0%	1%
Child	4%	8%	16%	23%	19%	20%	0%	3%	0%	18%
Retired	5%	0%	14%	9%	14%	8%	11%	7%	0%	11%
YoundAdultFT	8%	13%	4%	4%	4%	7%	4%	0%	19%	5%
YoundAdultPTCas	13%	3%	1%	6%	3%	4%	3%	0%	0%	4%
YoungAdultOth	1%	42%	3%	4%	3%	4%	0%	0%	0%	3%
Prop. By Purpose	5%	0%	23%	14%	27%	29%	1%	1%	0%	100%

Table 9-11 Number of People Taking Trips on Respective Day

Person Type	Sat	Sun	WkDay	WkEnd
AdultFT	57278	66735	135305	124012
AdultOth	14278	11528	25101	25806
AdultPTCas	14565	18354	34959	32919
AdultUnEm	2984	2438	6329	5423
Infant	0	0	181	0
Child	31105	34050	76153	65156
Retired	21355	27353	52499	48709
YoundAdultFT	7989	7637	16189	15626
YoundAdultPTCas	5161	8881	14542	14042
YoungAdultOth	7606	5947	15817	13553

Table 9-12 Average Trip Length by Day (in Kms)

Day	AvgTripLength
Saturday	5.69554211
Sunday	8.51396006
Weekday	5.27308223
WeekEnd	7.16607497

Table 9-13 Average Trip Length by Purpose (in Kms)

Day	HBW	HBEd	HBSh	HBSo	HBO	NHBO	HBEB	NHEBE	CV
Saturday	6.04	6.82	3.66	5.87	5.93	7.03	7.34	5.56	1.71
Sunday	5.60	0.00	3.79	10.24	10.87	9.68	2.04	2.54	9.75
WeekDay	8.31	3.09	3.67	6.31	4.74	5.05	8.16	6.37	6.84
WeenEnd	5.82	6.82	3.72	8.35	8.71	8.33	4.55	4.28	8.97

Table 9-14 Proportion of Car/CV Vehicles

Otaki North Bound	Car	CV
WkDay	88%	12%
Sat	94%	6%
Sun	97%	3%
WkEnd	96%	4%
Otaki South Bound	**Car**	**CV**
WkDay	88%	12%
Sat	93%	7%
Sun	97%	3%
WkEnd	95%	5%
Temarua North Bound	**Car**	**CV**
WkDay	93%	7%
Sat	97%	3%
Sun	98%	2%
WkEnd	98%	2%
Temarua South Bound	**Car**	**CV**
WkDay	94%	6%
Sat	98%	2%
Sun	98%	2%
WkEnd	98%	2%
Masterton North Bound	**Car**	**CV**
WkDay	94%	6%
Sat	97%	3%
Sun	97%	3%
WkEnd	97%	3%
Masterton South Bound	**Car**	**CV**
WkDay	95%	5%
Sat	98%	2%
Sun	98%	2%
WkEnd	98%	2%

A-10. Task 2.10 Road Pricing/Tolling

No detailed tables produced.

A-11. Task 2.11 Commercial Vehicle Modelling

No detailed tables produced.

A-12. Task 2.12 Use of Intercept Data & Task 1.9 Combined Data Processing

A-12.1 Introduction

No detailed table produced.

A-12.2 Survey Data Source

No detailed table produced.

A-12.3 Establish General Data Consistency

The following series of tables and charts illustrate the consistency between the various sources of data. In each instance, there is one comparison per page.

Each comparison comprises the two aggregated trip matrices (in production/attraction form), a table illustrating the t-statistics for the comparisons, and a chart plotting one source against the other.

The t-statistic table has been shaded indicating those areas of significant difference (shaded blue or dark) and those area of insignificant difference (shaded yellow or light). Non shaded cells indicate that a t-statistic could not be calculated or was irrelevant.

Home Base Work Rail Trips Comparison (Household Survey and Rail Survey)

Household Survey - Expanded Trip

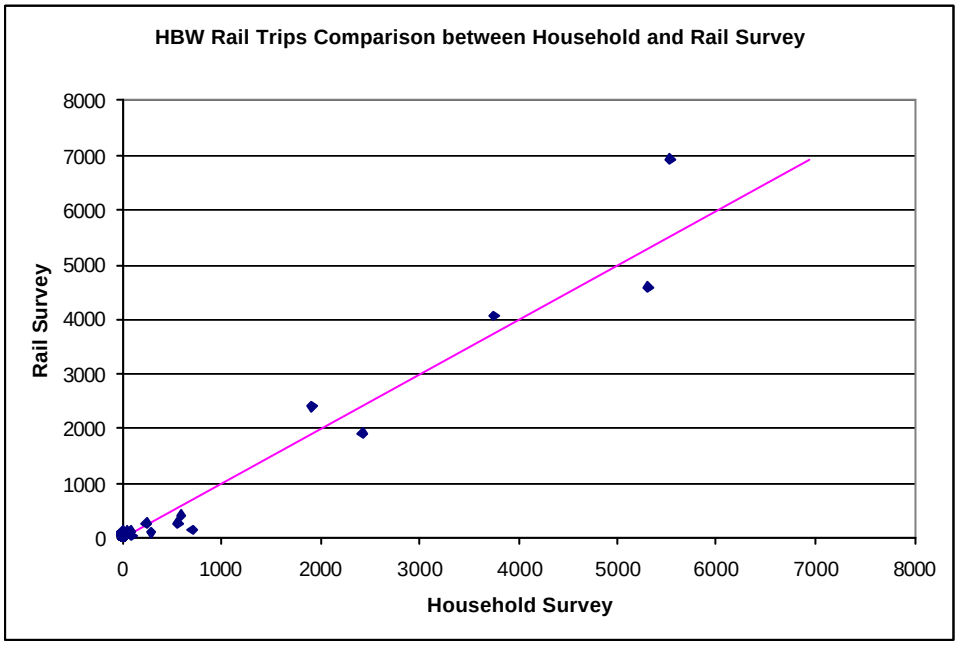
	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	0	0	0	0	0	54	0	54
Kapiti Coast District (KCD)	0	0	0	0	0	0	0	2421	0	2421
Lower Hutt City (LHC)	0	0	702	0	0	0	0	5525	0	6227
Masterton District (MD)	0	0	0	0	0	0	0	246	0	246
Porirua City(PC)	0	0	95	0	289	0	0	3754	0	4138
South Wairarapa District (SWD)	0	0	0	0	0	0	0	588	0	588
Upper Hutt City (UHC)	0	0	64	0	0	0	0	1906	0	1970
Wellington City (WC)	0	0	554	0	79	0	0	5302	0	5934
External (Ext)	0	0	0	0	0	0	0	0	0	0
Total	0	0	1416	0	368	0	0	19795	0	21579

Rail Survey - Expanded Trips

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	41	0	0	0	15	128	0	185
Kapiti Coast District (KCD)	0	5	5	0	75	0	0	1921	0	2005
Lower Hutt City (LHC)	0	12	137	9	21	0	117	6942	0	7238
Masterton District (MD)	0	0	85	0	3	9	44	261	0	401
Porirua City(PC)	0	67	19	0	86	0	0	4051	0	4223
South Wairarapa District (SWD)	0	0	54	0	0	0	26	416	0	496
Upper Hutt City (UHC)	0	0	83	0	0	0	36	2401	0	2519
Wellington City (WC)	0	22	267	0	128	0	60	4567	0	5044
External (Ext)	0	0	0	0	0	0	0	16	0	16
Total	0	106	690	9	313	9	298	20702	0	22126

tstat

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	NA	NA	-3.6	NA	NA	NA	-2.2	-0.8	NA	-1.5
Kapiti Coast District (KCD)	NA	-1.3	-1.2	NA	-4.9	NA	NA	0.9	NA	0.7
Lower Hutt City (LHC)	NA	-2.0	1.8	-1.7	-2.6	NA	-6.2	-1.6	NA	-1.1
Masterton District (MD)	NA	NA	-5.3	NA	-1.1	-1.7	-3.8	-0.1	NA	-0.8
Porirua City(PC)	NA	-4.7	0.7	NA	1.0	NA	NA	-0.4	NA	-0.1
South Wairarapa District (SWD)	NA	NA	-4.2	NA	NA	NA	-2.9	0.6	NA	0.3
Upper Hutt City (UHC)	NA	NA	-0.2	NA	NA	NA	-3.4	-0.9	NA	-1.0
Wellington City (WC)	NA	-2.7	1.0	NA	-0.5	NA	-4.4	0.8	NA	1.0
External (Ext)	NA	NA	NA	NA	NA	NA	NA	-2.3	NA	-2.3
Total	NA	-5.9	1.6	-1.7	0.2	-1.7	-9.8	-0.5	NA	-0.3



Home Base Education Rail Trips Comparison (Household Survey and Rail Survey)

Household Survey - Expanded Trip

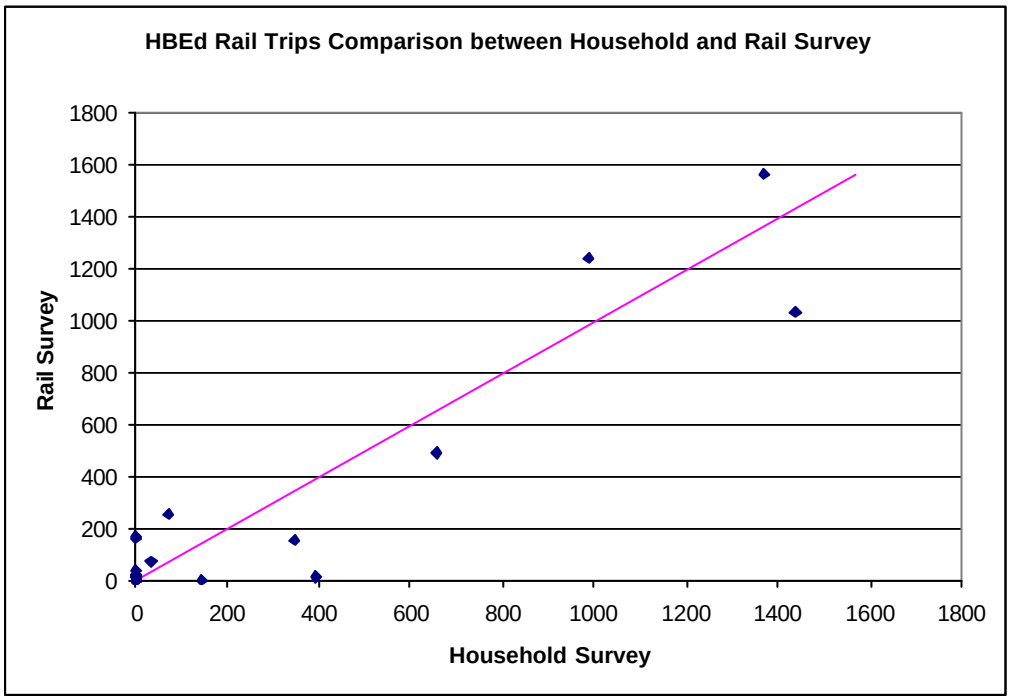
	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	0	0	0	0	0	0	0	0
Kapiti Coast District (KCD)	0	0	0	0	0	0	0	74	0	74
Lower Hutt City (LHC)	0	0	0	0	0	0	0	987	0	987
Masterton District (MD)	0	0	0	0	0	0	0	0	0	0
Porirua City(PC)	0	346	0	0	0	0	0	1439	0	1785
South Wairarapa District (SWD)	0	0	0	0	0	0	0	0	0	0
Upper Hutt City (UHC)	0	0	0	0	0	0	394	654	0	1048
Wellington City (WC)	0	0	35	0	0	0	143	1368	0	1546
External (Ext)	0	0	0	0	0	0	0	0	0	0
Total	0	346	35	0	0	0	537	4523	0	5441

Rail Survey - Expanded Trips

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	6	0	0	0	0	9	0	15
Kapiti Coast District (KCD)	0	0	0	0	19	0	0	254	0	273
Lower Hutt City (LHC)	0	0	167	0	0	0	6	1239	0	1412
Masterton District (MD)	0	0	11	0	0	0	0	39	0	50
Porirua City(PC)	0	158	10	0	14	0	0	1033	0	1215
South Wairarapa District (SWD)	0	0	2	0	0	0	0	19	0	22
Upper Hutt City (UHC)	0	0	22	0	0	0	15	491	0	528
Wellington City (WC)	0	1	76	0	159	0	0	1567	0	1803
External (Ext)	0	0	0	0	0	0	0	0	0	0
Total	0	159	294	0	192	0	21	4652	0	5317

tstat

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	NA	NA	-1.4	NA	NA	NA	NA	-1.7	NA	-2.2
Kapiti Coast District (KCD)	NA	NA	NA	NA	-2.5	NA	NA	-1.7	NA	-1.9
Lower Hutt City (LHC)	NA	NA	-7.4	NA	NA	NA	-1.4	-0.7	NA	-1.1
Masterton District (MD)	NA	NA	-1.9	NA	NA	NA	NA	-3.6	NA	-4.0
Porirua City(PC)	NA	0.9	-1.8	NA	-2.2	NA	NA	0.9	NA	1.1
South Wairarapa District (SWD)	NA	NA	-0.8	NA	NA	NA	NA	-2.5	NA	-2.7
Upper Hutt City (UHC)	NA	NA	-2.7	NA	NA	NA	1.6	0.5	NA	1.4
Wellington City (WC)	NA	-0.6	-0.6	NA	-7.2	NA	1.0	-0.4	NA	-0.5
External (Ext)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	NA	0.8	-3.4	NA	-7.9	NA	1.9	-0.2	NA	0.1



Home Base Shopping Rail Trips Comparison (Household Survey and Rail Survey)

Household Survey - Expanded Trip

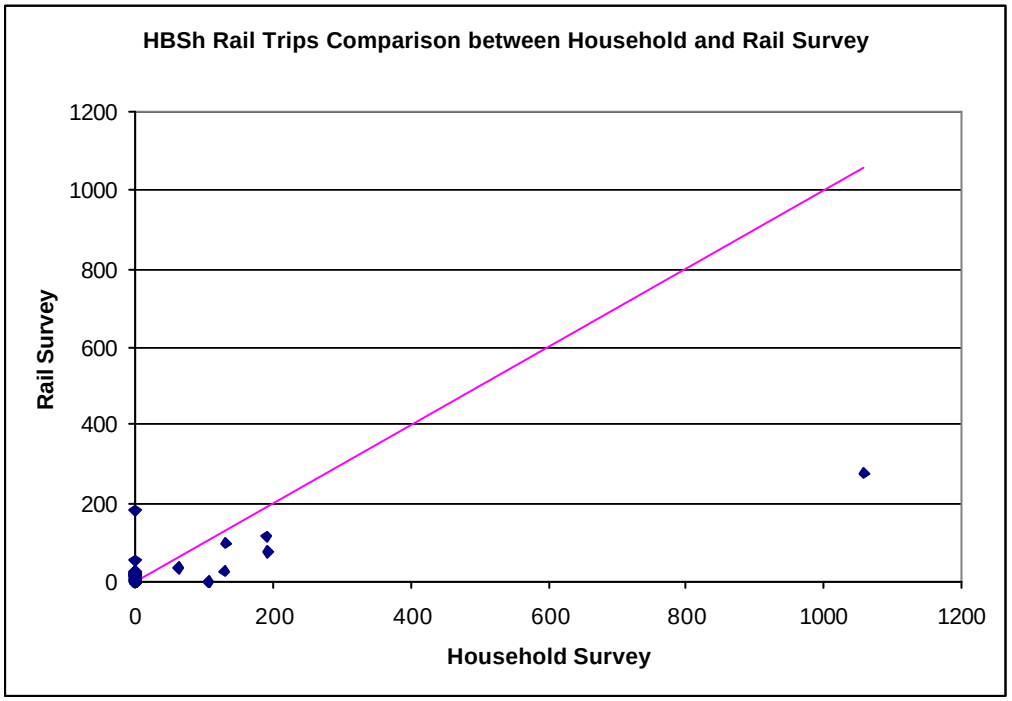
	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	0	0	0	0	0	0	0	0
Kapiti Coast District (KCD)	0	0	0	0	0	0	0	191	0	191
Lower Hutt City (LHC)	0	0	0	0	0	0	0	0	0	0
Masterton District (MD)	0	0	0	0	0	0	0	0	0	0
Porirua City(PC)	0	0	0	0	0	0	0	193	0	193
South Wairarapa District (SWD)	0	0	0	107	0	0	0	0	0	107
Upper Hutt City (UHC)	0	0	0	0	0	0	129	131	0	260
Wellington City (WC)	0	0	0	0	64	0	0	1058	0	1122
External (Ext)	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	107	64	0	129	1573	0	1873

Rail Survey - Expanded Trips

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	3	0	0	0	0	0	0	3
Kapiti Coast District (KCD)	0	15	0	0	12	0	0	114	0	141
Lower Hutt City (LHC)	0	0	52	0	0	0	28	182	0	262
Masterton District (MD)	0	0	22	0	0	0	0	0	0	22
Porirua City(PC)	0	25	0	0	17	0	0	74	0	116
South Wairarapa District (SWD)	0	0	0	0	0	0	4	0	0	4
Upper Hutt City (UHC)	0	0	0	9	0	0	27	100	0	137
Wellington City (WC)	0	14	20	0	34	0	0	278	0	346
External (Ext)	0	0	0	0	0	0	0	0	0	0
Total	0	53	97	9	64	0	59	748	0	1030

tstat

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	NA	NA	-0.9	NA	NA	NA	NA	NA	NA	-0.9
Kapiti Coast District (KCD)	NA	-2.2	NA	NA	-2.0	NA	NA	0.5	NA	0.3
Lower Hutt City (LHC)	NA	NA	-4.1	NA	NA	NA	-3.0	-7.7	NA	-9.2
Masterton District (MD)	NA	NA	-2.7	NA	NA	NA	NA	NA	NA	-2.7
Porirua City(PC)	NA	-2.8	NA	NA	-2.4	NA	NA	0.7	NA	0.5
South Wairarapa District (SWD)	NA	NA	NA	0.9	NA	NA	-1.1	NA	NA	0.8
Upper Hutt City (UHC)	NA	NA	NA	-1.7	NA	NA	0.8	0.2	NA	0.6
Wellington City (WC)	NA	-2.1	-2.5	NA	0.3	NA	NA	2.0	NA	2.0
External (Ext)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	NA	-4.2	-5.6	0.8	0.0	NA	0.5	1.8	NA	1.6



Home Base Other and Social Rail Trips Comparison (Household Survey and Rail Survey)

Household Survey - Expanded Trip

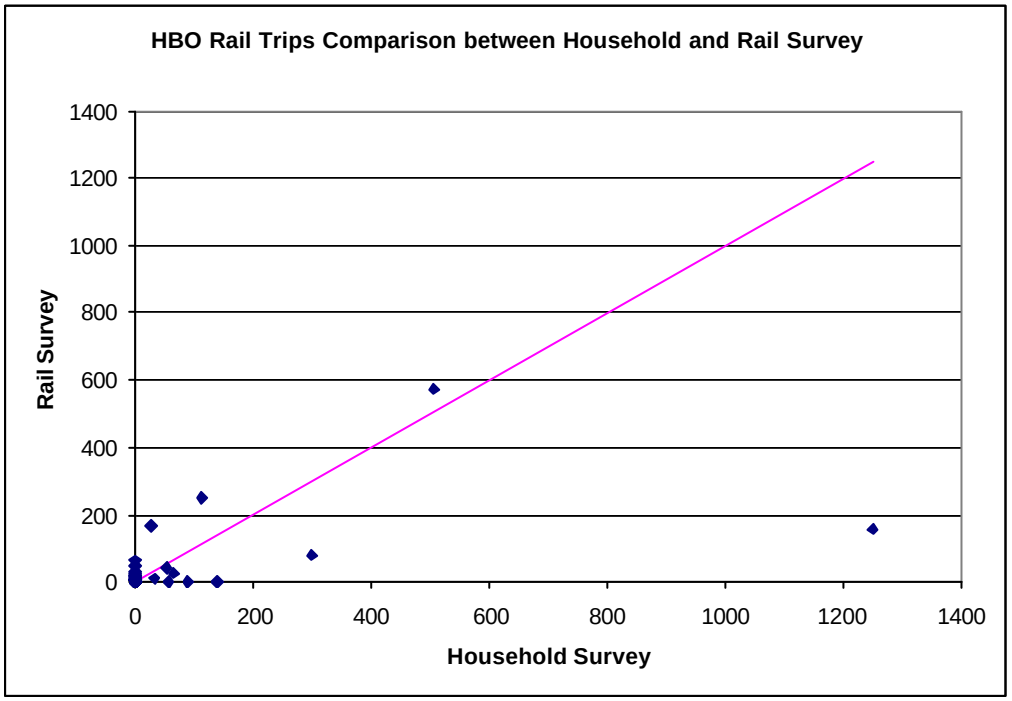
	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	0	0	0	0	0	0	0	0
Kapiti Coast District (KCD)	0	0	0	0	0	0	0	27	0	27
Lower Hutt City (LHC)	0	0	0	0	0	0	89	1249	0	1338
Masterton District (MD)	0	0	0	0	0	0	0	0	0	0
Porirua City(PC)	0	0	0	0	31	0	0	113	0	145
South Wairarapa District (SWD)	0	0	0	0	0	0	0	0	0	0
Upper Hutt City (UHC)	0	0	0	0	0	0	66	299	0	365
Wellington City (WC)	0	0	0	0	52	139	0	506	55	752
External (Ext)	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	84	139	154	2194	55	2626

Rail Survey - Expanded Trips

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	0	0	0	0	0	6	0	6
Kapiti Coast District (KCD)	3	0	12	0	0	0	0	167	0	181
Lower Hutt City (LHC)	0	0	61	0	5	0	0	158	0	224
Masterton District (MD)	0	0	4	0	0	0	0	0	0	4
Porirua City(PC)	0	3	0	0	11	0	0	250	0	263
South Wairarapa District (SWD)	0	0	0	0	0	0	0	30	0	30
Upper Hutt City (UHC)	0	0	47	0	0	0	26	78	0	151
Wellington City (WC)	0	15	18	6	41	0	18	572	0	670
External (Ext)	0	0	0	0	0	0	0	5	0	5
Total	3	17	141	6	57	0	45	1266	0	1535

tstat

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	NA	NA	NA	NA	NA	NA	NA	-1.4	NA	-1.4
Kapiti Coast District (KCD)	-0.9	NA	-2.0	NA	NA	NA	NA	-2.1	NA	-2.3
Lower Hutt City (LHC)	NA	NA	-4.5	NA	-1.3	NA	0.8	2.6	NA	2.6
Masterton District (MD)	NA	NA	-1.2	NA	NA	NA	NA	NA	NA	-1.2
Porirua City(PC)	NA	-0.9	NA	NA	0.3	NA	NA	-1.1	NA	-0.8
South Wairarapa District (SWD)	NA	NA	NA	NA	NA	NA	NA	-3.1	NA	-3.1
Upper Hutt City (UHC)	NA	NA	-3.9	NA	NA	NA	0.4	1.1	NA	0.9
Wellington City (WC)	NA	-2.2	-2.4	-1.4	0.1	1.0	-2.5	-0.2	0.6	0.3
External (Ext)	NA	NA	NA	NA	NA	NA	NA	-1.3	NA	-1.3
Total	-0.9	-2.4	-6.8	-1.4	0.2	1.0	0.7	1.7	0.6	1.8



Employment Business (HB & NHB) Rail Trips Comparison (Household Survey and Rail Survey)

Household Survey - Expanded Trip

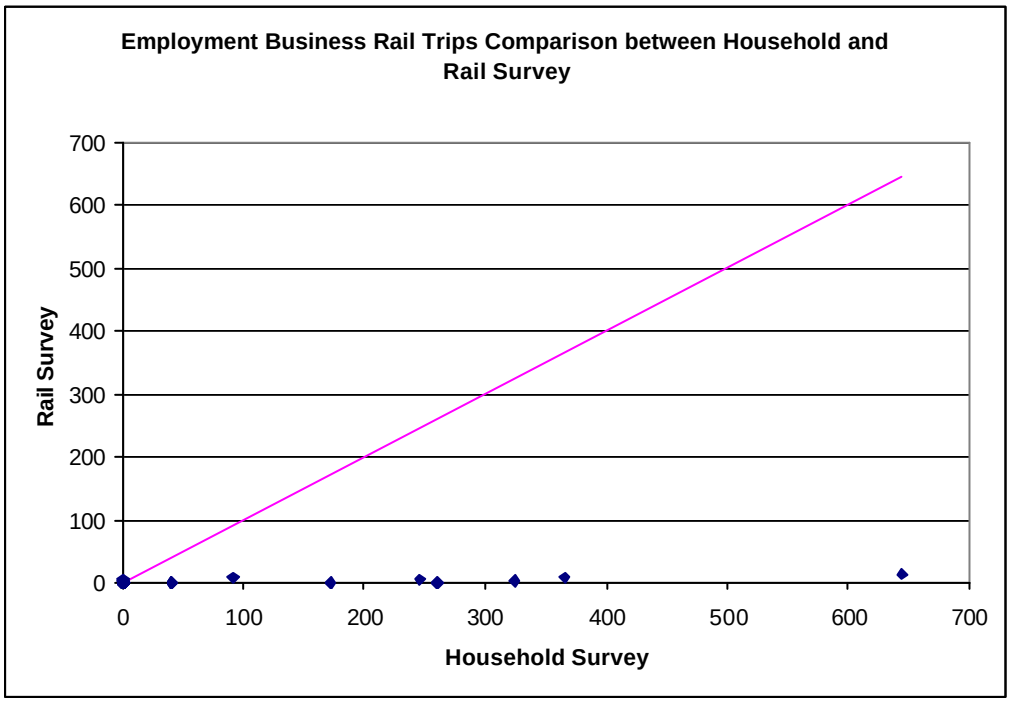
	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	0	0	0	0	0	0	0	0
Kapiti Coast District (KCD)	0	0	0	0	40	0	0	0	0	40
Lower Hutt City (LHC)	0	0	92	0	0	0	0	645	0	736
Masterton District (MD)	0	0	0	0	0	0	0	0	0	0
Porirua City(PC)	0	40	0	0	0	0	0	173	0	212
South Wairarapa District (SWD)	0	0	0	0	0	0	0	0	0	0
Upper Hutt City (UHC)	0	0	0	0	0	0	0	324	0	324
Wellington City (WC)	0	0	366	0	0	0	261	245	0	872
External (Ext)	0	0	0	0	0	0	0	0	0	0
Total	0	40	458	0	40	0	261	1387	0	2185

Rail Survey - Expanded Trips

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	0	0	0	0	0	0	0	0
Kapiti Coast District (KCD)	0	0	0	0	0	0	0	5	0	5
Lower Hutt City (LHC)	0	0	9	0	0	0	0	13	0	21
Masterton District (MD)	0	0	0	0	0	0	0	0	0	0
Porirua City(PC)	0	0	0	0	0	0	0	0	0	0
South Wairarapa District (SWD)	0	0	0	0	0	0	0	0	0	0
Upper Hutt City (UHC)	0	0	0	0	0	0	0	2	0	2
Wellington City (WC)	0	3	7	0	0	0	0	6	0	16
External (Ext)	0	0	0	0	0	0	0	0	0	0
Total	0	3	16	0	0	0	0	26	0	45

tstat

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Kapiti Coast District (KCD)	NA	NA	NA	NA	0.5	NA	NA	-1.3	NA	0.5
Lower Hutt City (LHC)	NA	NA	0.7	NA	NA	NA	NA	2.1	NA	2.2
Masterton District (MD)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Porirua City(PC)	NA	0.5	NA	NA	NA	NA	NA	1.1	NA	1.2
South Wairarapa District (SWD)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Upper Hutt City (UHC)	NA	NA	NA	NA	NA	NA	NA	1.5	NA	1.5
Wellington City (WC)	NA	-1.0	1.6	NA	NA	NA	1.4	1.3	NA	2.5
External (Ext)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	NA	0.5	1.7	NA	0.5	NA	1.4	3.1	NA	3.9



Non Home Base Other Rail Trips Comparison (Household Survey and Rail Survey)

Household Survey - Expanded Trip

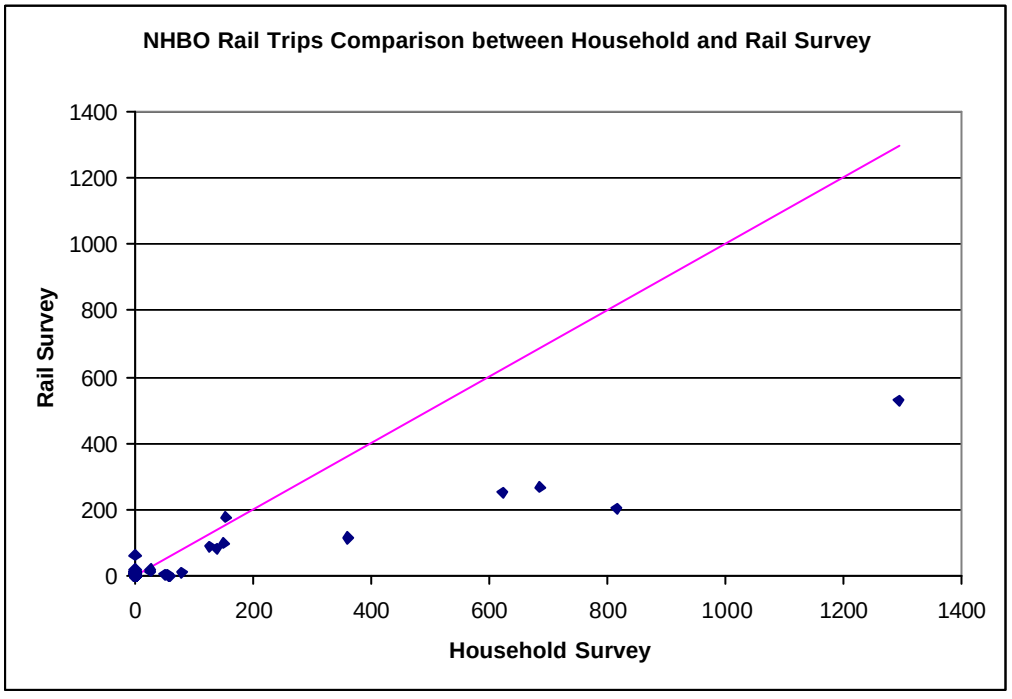
	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	0	0	0	0	0	0	0	0
Kapiti Coast District (KCD)	0	0	0	0	26	0	0	127	0	153
Lower Hutt City (LHC)	0	0	0	0	0	0	0	685	0	685
Masterton District (MD)	0	0	0	0	0	0	0	0	0	0
Porirua City(PC)	0	26	0	0	0	0	0	153	0	179
South Wairarapa District (SWD)	0	0	0	0	0	0	0	51	0	51
Upper Hutt City (UHC)	0	0	0	0	0	0	79	139	0	218
Wellington City (WC)	0	151	624	57	814	58	359	1294	0	3356
External (Ext)	0	0	0	0	0	0	0	0	0	0
Total	0	177	624	57	840	58	439	2448	0	4643

Rail Survey - Expanded Trips

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	0	0	0	0	0	0	0	0
Kapiti Coast District (KCD)	0	5	6	0	20	0	0	87	0	118
Lower Hutt City (LHC)	0	11	65	0	10	4	0	269	0	359
Masterton District (MD)	0	0	0	0	0	0	0	6	0	6
Porirua City(PC)	0	18	7	0	18	0	0	181	0	224
South Wairarapa District (SWD)	0	0	3	0	0	0	0	7	0	10
Upper Hutt City (UHC)	0	0	14	0	0	0	9	84	0	107
Wellington City (WC)	0	100	250	6	203	2	115	528	0	1203
External (Ext)	0	0	0	0	0	0	0	0	0	0
Total	0	134	344	6	252	6	124	1161	0	2027

tstat

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Kapiti Coast District (KCD)	NA	-1.3	-1.4	NA	0.1	NA	NA	0.3	NA	0.2
Lower Hutt City (LHC)	NA	-1.9	-4.6	NA	-1.8	-1.1	NA	1.3	NA	1.0
Masterton District (MD)	NA	NA	NA	NA	NA	NA	NA	-1.4	NA	-1.4
Porirua City(PC)	NA	0.1	-1.5	NA	-2.5	NA	NA	-0.2	NA	-0.3
South Wairarapa District (SWD)	NA	NA	-0.9	NA	NA	NA	NA	0.5	NA	0.5
Upper Hutt City (UHC)	NA	NA	-2.2	NA	NA	NA	0.7	0.4	NA	0.6
Wellington City (WC)	NA	0.3	1.3	0.6	1.8	0.6	1.1	1.8	NA	3.1
External (Ext)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	NA	0.3	0.9	0.6	1.7	0.6	1.3	2.2	NA	3.2



All Rail Trips Comparison (Household Survey and Rail Survey)

Household Survey - Expanded Trip

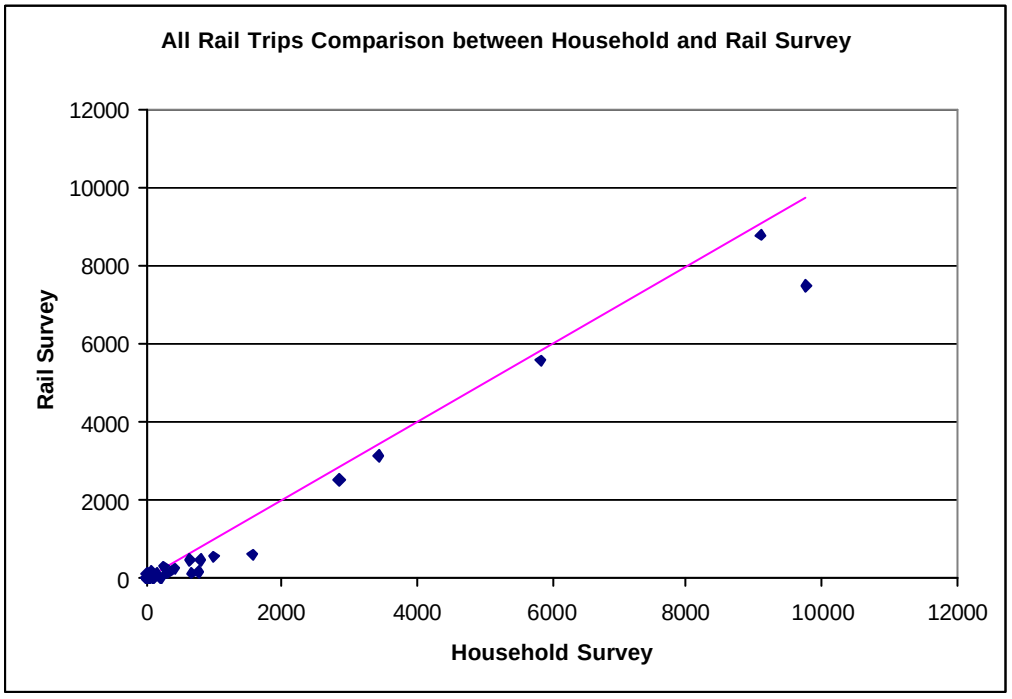
	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	0	0	0	0	0	54	0	54
Kapiti Coast District (KCD)	0	0	0	0	66	0	0	2841	0	2907
Lower Hutt City (LHC)	0	0	794	0	0	0	89	9091	0	9973
Masterton District (MD)	0	0	0	0	0	0	0	246	0	246
Porirua City(PC)	0	412	95	0	321	0	0	5825	0	6653
South Wairarapa District (SWD)	0	0	0	107	0	0	0	639	0	745
Upper Hutt City (UHC)	0	0	64	0	0	0	668	3453	0	4185
Wellington City (WC)	0	151	1579	57	1008	198	763	9773	55	13583
External (Ext)	0	0	0	0	0	0	0	0	0	0
Total	0	563	2532	163	1395	198	1520	31920	55	38347

Rail Survey - Expanded Trips

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	49	0	0	0	15	143	0	208
Kapiti Coast District (KCD)	3	25	22	0	126	0	0	2548	0	2724
Lower Hutt City (LHC)	0	23	491	9	36	4	151	8803	0	9517
Masterton District (MD)	0	0	122	0	3	9	44	305	0	483
Porirua City(PC)	0	269	36	0	147	0	0	5588	0	6040
South Wairarapa District (SWD)	0	0	59	0	0	0	29	473	0	561
Upper Hutt City (UHC)	0	0	165	9	0	0	113	3156	0	3443
Wellington City (WC)	0	155	637	12	564	2	193	7518	0	9081
External (Ext)	0	0	0	0	0	0	0	21	0	21
Total	3	472	1582	30	877	15	546	28555	0	32079

tstat

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	NA	NA	-4.0	NA	NA	NA	-2.2	-1.0	NA	-1.7
Kapiti Coast District (KCD)	-0.9	-2.8	-2.7	NA	-0.6	NA	NA	0.5	NA	0.3
Lower Hutt City (LHC)	NA	-2.8	0.9	-1.7	-3.4	-1.1	-0.6	0.3	NA	0.4
Masterton District (MD)	NA	NA	-6.3	NA	-1.1	-1.7	-3.8	-0.3	NA	-1.3
Porirua City(PC)	NA	0.6	0.5	NA	0.8	NA	NA	0.3	NA	0.6
South Wairarapa District (SWD)	NA	NA	-4.4	0.9	NA	NA	-3.1	0.6	NA	0.6
Upper Hutt City (UHC)	NA	NA	-1.0	-1.7	NA	NA	1.8	0.4	NA	1.0
Wellington City (WC)	NA	0.0	2.0	0.5	1.2	1.2	1.7	1.9	0.6	3.2
External (Ext)	NA	NA	NA	NA	NA	NA	NA	-2.6	NA	-2.6
Total	-0.9	0.3	1.6	0.9	1.2	1.1	2.1	1.6	0.6	2.7



HBEd Public Bus Trip Comparision (Household Survey and School Survey) - Secondary school only

Household Survey

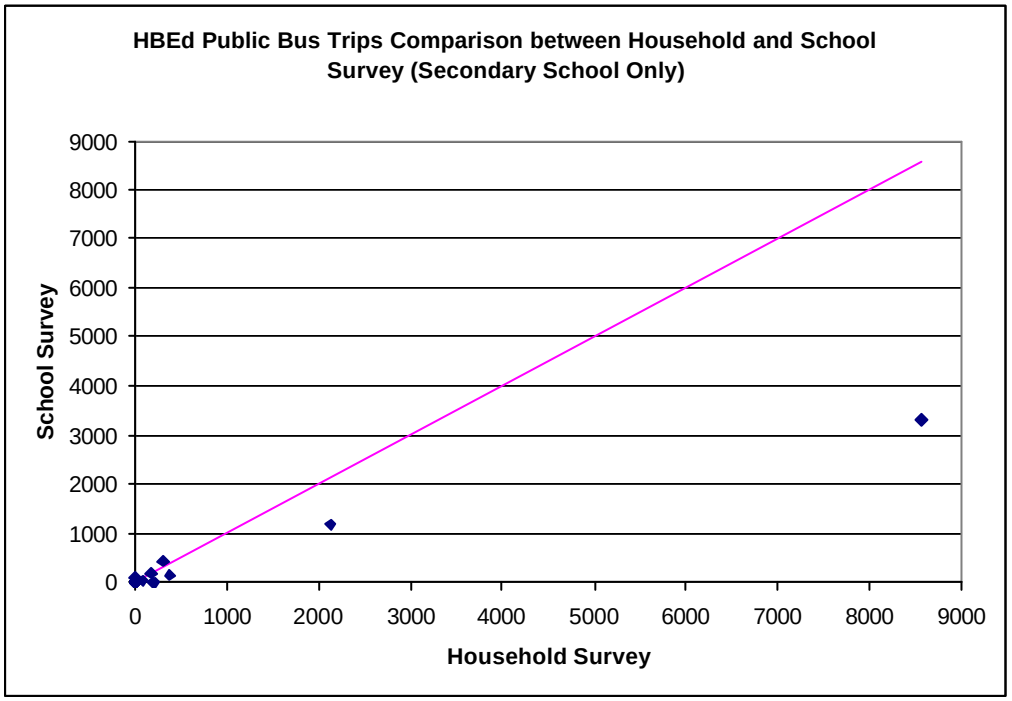
	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	0	0	0	0	0	0	0	
Kapiti Coast District (KCD)	0	247	0	0	0	0	0	0	57	
Lower Hutt City (LHC)	0	0	2123	0	0	0	0	380	0	2503
Masterton District (MD)	0	0	0	0	0	0	0	0	0	
Porirua City(PC)	0	0	0	0	300	0	0	78	0	378
South Wairarapa District (SWD)	0	0	0	0	0	0	0	0	0	
Upper Hutt City (UHC)	0	0	206	0	0	0	165	0	0	371
Wellington City (WC)	0	0	186	0	0	0	0	8558	0	8744
External (Ext)	0	0	0	0	0	0	0	0	0	
Total			2515		300		165	9016		11996

School Survey

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	0	0	0	0	0	0	0	
Kapiti Coast District (KCD)	0	0	0	0	0	0	0	0	0	
Lower Hutt City (LHC)	0	0	1174	0	0	0	124	139	0	1436
Masterton District (MD)	0	0	0	0	0	0	0	0	0	
Porirua City(PC)	0	0	0	0	428	0	0	43	0	471
South Wairarapa District (SWD)	0	0	0	0	0	0	0	0	0	
Upper Hutt City (UHC)	0	0	13	0	0	0	190	9	0	212
Wellington City (WC)	0	0	0	0	0	0	0	3297	0	3297
External (Ext)	0	0	0	0	0	0	0	0	0	
Total			1187		428		314	3487		5415

tstat

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)										
Kapiti Coast District (KCD)										
Lower Hutt City (LHC)			1.7		NA		-2.8	1.0		1.7
Masterton District (MD)										
Porirua City(PC)			NA		-0.6		NA	0.3		-0.4
South Wairarapa District (SWD)										
Upper Hutt City (UHC)			1.1		NA		-0.2	-0.7		0.7
Wellington City (WC)			1.2		NA		NA	4.7		4.8
External (Ext)										
Total			2.2		-0.6		-0.9	4.8		5.0



Note: Secondary School – Years 7 - 13

HBEd School Bus Trip Comparision (Household Survey and School Survey) - Secondary school only

Household Survey

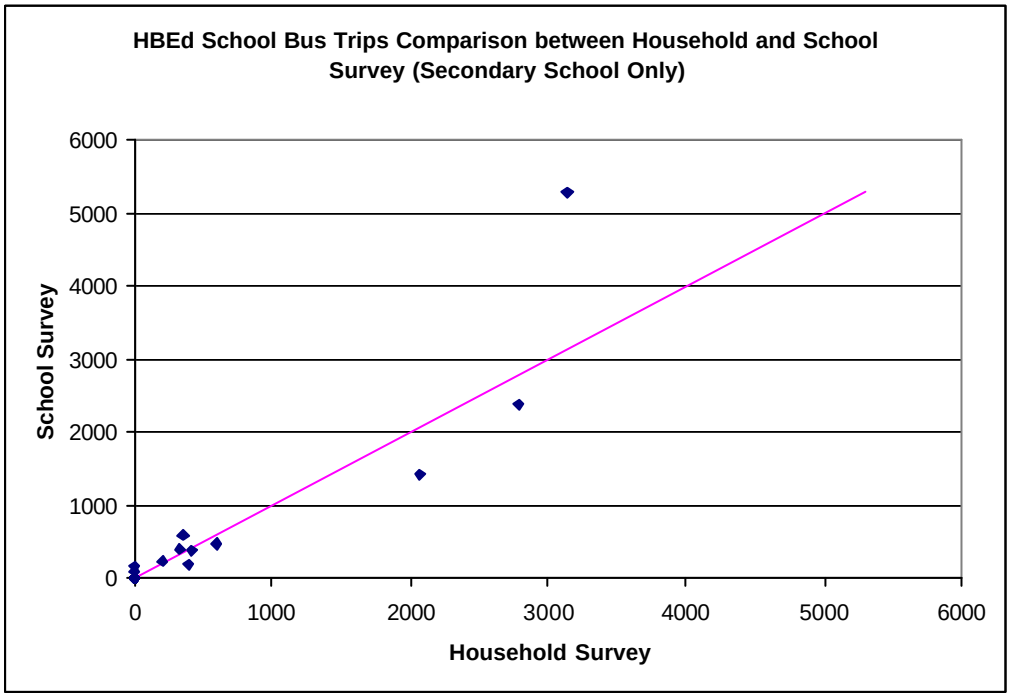
	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	316	0	0	244	0	214	0	0	0	
Kapiti Coast District (KCD)	0	1800	0	0	0	0	0	0	0	
Lower Hutt City (LHC)	0	0	2779	0	0	0	389	0	0	3169
Masterton District (MD)	149	0	0	1052	0	0	0	0	0	
Porirua City(PC)	0	0	419	0	597	0	200	323	0	1539
South Wairarapa District (SWD)	0	0	0	164	0	73	0	86	0	
Upper Hutt City (UHC)	0	0	353	0	0	0	2063	0	0	2416
Wellington City (WC)	0	0	0	0	0	0	0	3134	0	3134
External (Ext)	0	0	0	0	0	0	0	0	0	
Total			3551		597		2653	3458		10259

School Survey

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	0	0	0	0	0	0	0	
Kapiti Coast District (KCD)	0	0	13	0	0	0	0	0	0	
Lower Hutt City (LHC)	0	0	2374	0	0	0	183	170	0	2728
Masterton District (MD)	0	0	0	0	0	0	0	0	0	
Porirua City(PC)	0	0	376	0	486	0	228	393	0	1484
South Wairarapa District (SWD)	0	0	0	0	0	0	0	0	0	
Upper Hutt City (UHC)	0	0	585	0	0	0	1440	9	0	2034
Wellington City (WC)	0	0	99	0	0	0	0	5290	0	5389
External (Ext)	0	0	0	0	0	0	0	0	0	
Total			3434		486		1852	5862		11634

tstat

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)										
Kapiti Coast District (KCD)										
Lower Hutt City (LHC)			0.6		NA		0.9	-3.2		0.6
Masterton District (MD)										
Porirua City(PC)			0.2		0.4		-0.2	-0.3		0.1
South Wairarapa District (SWD)										
Upper Hutt City (UHC)			-1.0		NA		1.1	-0.7		0.6
Wellington City (WC)			-2.5		NA		NA	-3.0		-3.1
External (Ext)										
Total			0.2		0.4		1.3	-3.2		-1.1



Note: Secondary School – Years 7 - 13

HBEd All Bus Trip Comparision (Household Survey and School Survey) - Secondary school only

Household Survey

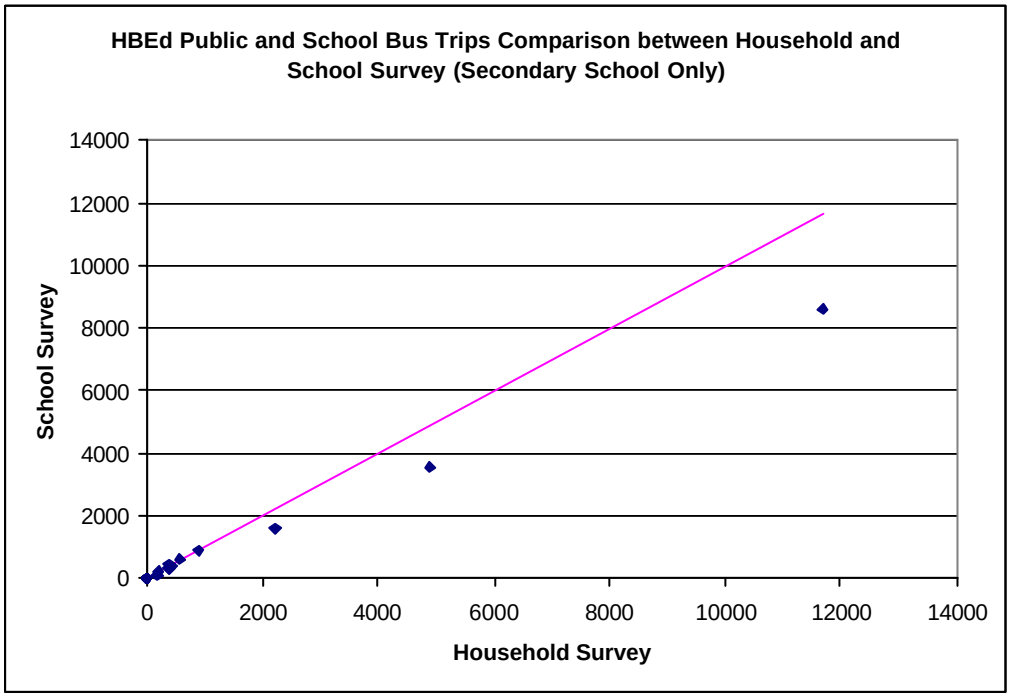
	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	316	0	0	244	0	214	0	0	0	
Kapiti Coast District (KCD)	0	2047	0	0	0	0	0	0	57	
Lower Hutt City (LHC)	0	0	4903	0	0	0	389	380	0	5672
Masterton District (MD)	149	0	0	1052	0	0	0	0	0	
Porirua City(PC)	0	0	419	0	897	0	200	402	0	1917
South Wairarapa District (SWD)	0	0	0	164	0	73	0	86	0	
Upper Hutt City (UHC)	0	0	559	0	0	0	2228	0	0	2787
Wellington City (WC)	0	0	186	0	0	0	0	11692	0	11878
External (Ext)	0	0	0	0	0	0	0	0	0	
Total			6066		897		2818	12474		22255

School Survey

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	0	0	0	0	0	0	0	
Kapiti Coast District (KCD)	0	0	13	0	0	0	0	0	0	
Lower Hutt City (LHC)	0	0	3548	0	0	0	307	309	0	4163
Masterton District (MD)	0	0	0	0	0	0	0	0	0	
Porirua City(PC)	0	0	376	0	915	0	228	436	0	1955
South Wairarapa District (SWD)	0	0	0	0	0	0	0	0	0	
Upper Hutt City (UHC)	0	0	598	0	0	0	1630	17	0	2245
Wellington City (WC)	0	0	99	0	0	0	0	8586	0	8685
External (Ext)	0	0	0	0	0	0	0	0	0	
Total			4621		915		2165	9348		17049

tstat

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)										
Kapiti Coast District (KCD)										
Lower Hutt City (LHC)			1.6		NA		0.3	0.3		1.6
Masterton District (MD)										
Porirua City(PC)			0.2		0.0		-0.2	-0.1		-0.1
South Wairarapa District (SWD)										
Upper Hutt City (UHC)			-0.1		NA		1.0	-1.0		0.8
Wellington City (WC)			0.5		NA		NA	2.3		2.4
External (Ext)										
Total			1.5		0.0		1.0	2.3		2.8



Note: Secondary School – Years 7 - 13

A-12.4 Mode Estimation

No detailed table produced.

A-12.5 A Provisional Base Road Matrix for Developing Calibration

Car Trip Comparision between Household Survey and Existing WTSM Model - AM Period

Household Survey

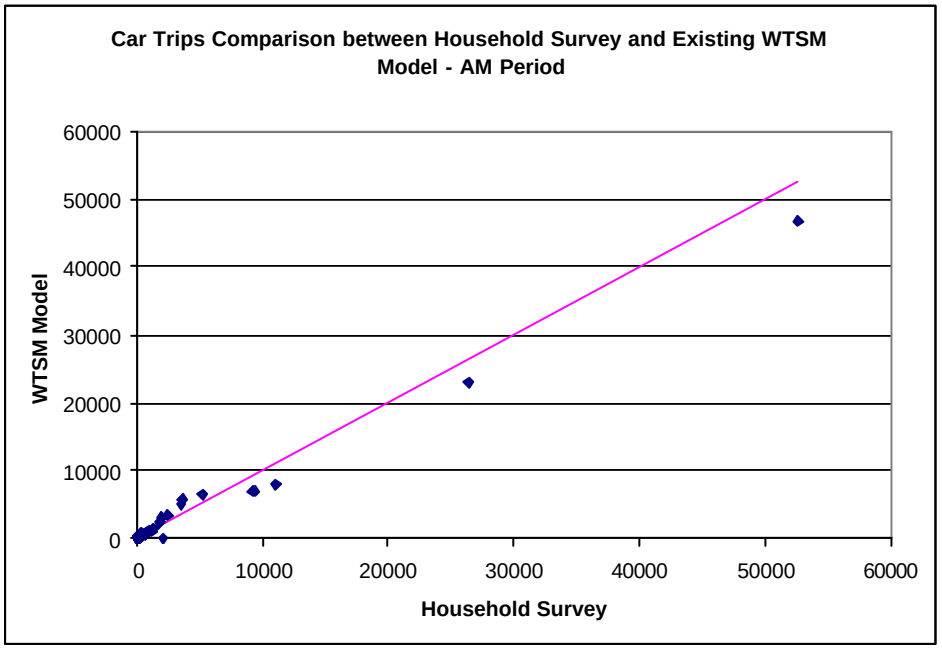
	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	886	0	36	616	27	62	0	0	154	
Kapiti Coast District (KCD)	0	11023	378	0	440	0	88	958	229	13117
Lower Hutt City (LHC)	0	82	26423	0	322	0	1804	5207	0	33839
Masterton District (MD)	420	0	93	10178	0	15	0	143	168	
Porirua City(PC)	0	164	1167	0	9156	0	277	3620	28	14413
South Wairarapa District (SWD)	62	0	34	202	0	2061	0	110	22	2491
Upper Hutt City (UHC)	0	0	2423	107	447	0	9296	1265	29	13566
Wellington City (WC)	0	181	3527	114	1883	27	683	52644	157	59215
External (Ext)	0	0	0	0	0	0	0	0	0	
Total		11451	34082		12275	2165	12148	63946		136642

WTSM Model

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	0	2	0	0	0	1	2	0	
Kapiti Coast District (KCD)	0	8032	255	0	918	6	82	1166	0	10460
Lower Hutt City (LHC)	2	189	23018	0	514	39	2363	6478	0	32603
Masterton District (MD)	0	0	0	0	0	0	0	0	0	
Porirua City(PC)	0	430	896	0	6907	3	295	5715	0	14246
South Wairarapa District (SWD)	0	8	51	0	5	0	29	48	0	143
Upper Hutt City (UHC)	1	48	3473	0	327	17	7047	1505	0	12419
Wellington City (WC)	2	496	4940	0	3179	35	469	46693	0	55813
External (Ext)	0	0	0	0	0	0	0	0	0	
Total		9203	32636		11850	101	10288	61608		125683

tstat

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)										
Kapiti Coast District (KCD)		0.5	0.4		-0.6	-0.2	0.0	-0.2		0.3
Lower Hutt City (LHC)		-0.5	0.2		-0.4	-0.5	-0.3	-0.3		0.1
Masterton District (MD)										
Porirua City(PC)		-0.6	0.3		0.4	-0.2	-0.1	-0.5		0.0
South Wairarapa District (SWD)		-0.2	-0.2		-0.2	3.8	-0.4	0.4		3.8
Upper Hutt City (UHC)		-0.5	-0.4		0.3	-0.3	0.4	-0.2		0.1
Wellington City (WC)		-0.7	-0.4		-0.5	-0.1	0.4	0.2		0.1
External (Ext)										
Total		0.3	0.1		0.0	3.6	0.2	0.1		0.1



Car Trip Comparision between Household Survey and Existing WTSM Model - IP Period

Household Survey

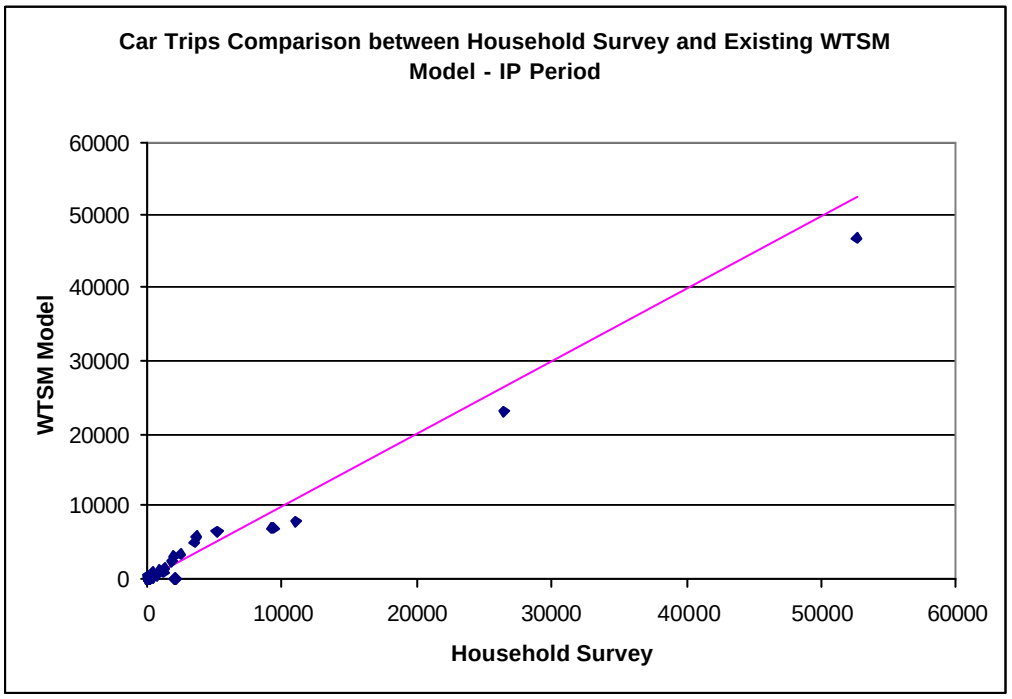
	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	4407	0	0	1976	0	760	0	27	0	
Kapiti Coast District (KCD)	0	51470	304	0	645	0	101	1017	821	54358
Lower Hutt City (LHC)	36	319	77226	92	998	115	3722	8929	0	91437
Masterton District (MD)	1657	0	173	36910	0	710	58	63	111	
Porirua City(PC)	0	629	1213	0	32347	0	550	5799	0	40538
South Wairarapa District (SWD)	918	0	97	624	0	5541	103	175	0	7459
Upper Hutt City (UHC)	0	85	4396	59	290	177	28568	1494	28	35097
Wellington City (WC)	263	1280	8734	85	7081	213	1195	165346	212	184408
External (Ext)	0	817	75	247	0	35	0	137	59	
Total		54599	92217		41361	7551	34297	182988		413296

WTSM Model

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)	0	1	8	0	1	0	5	8	0	
Kapiti Coast District (KCD)	2	24975	715	0	1152	36	194	2091	0	29165
Lower Hutt City (LHC)	11	755	64283	0	1570	238	6625	12859	0	86340
Masterton District (MD)	0	0	0	0	0	0	0	0	0	
Porirua City(PC)	1	1685	1594	0	20464	20	635	10452	0	34851
South Wairarapa District (SWD)	0	30	178	0	17	0	101	167	0	493
Upper Hutt City (UHC)	5	190	6776	0	738	105	19522	1901	0	29237
Wellington City (WC)	10	2175	15684	0	10410	212	1904	127149	0	157545
External (Ext)	0	0	0	0	0	0	0	0	0	
Total		29812	89239		34352	611	28987	154627		337633

tstat

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)										
Kapiti Coast District (KCD)		1.5	-0.7		-0.5	-0.5	-0.4	-0.7		1.2
Lower Hutt City (LHC)		-0.7	0.3		-0.5	-0.4	-0.6	-0.4		0.1
Masterton District (MD)										
Porirua City(PC)		-0.8	-0.3		0.8	-0.4	-0.1	-0.6		0.2
South Wairarapa District (SWD)		-0.4	-0.3		-0.3	6.3	0.0	0.0		6.3
Upper Hutt City (UHC)		-0.4	-0.5		-0.7	0.3	0.6	-0.3		0.3
Wellington City (WC)		-0.5	-0.6		-0.4	0.0	-0.5	0.4		0.2
External (Ext)										
Total		1.2	0.0		0.3	6.0	0.3	0.3		0.3



A-12.6 Best Estimate Observed Public Transport Matrices

A-12.6.1 Resident External Home Base Purpose Car Trip Comparisons

Resident Home Base Work External Car Trips Comparison (Household and Screenline Survey)

Household Survey

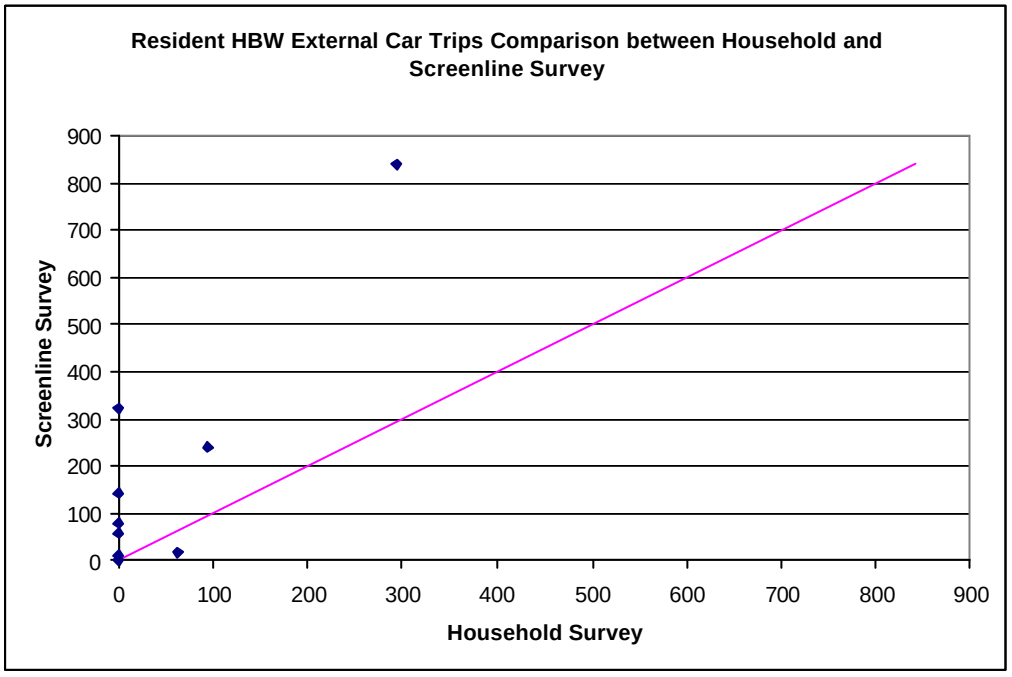
	Ext
Carterton District (CD)	63
Kapiti Coast District (KCD)	294
Lower Hutt City (LHC)	0
Masterton District (MD)	0
Porirua City(PC)	0
South Wairarapa District (SWD)	0
Upper Hutt City (UHC)	0
Wellington City (WC)	94
External (Ext)	0
Total	451

Screenline Survey

	Ext
Carterton District (CD)	18
Kapiti Coast District (KCD)	840
Lower Hutt City (LHC)	144
Masterton District (MD)	321
Porirua City(PC)	78
South Wairarapa District (SWD)	12
Upper Hutt City (UHC)	58
Wellington City (WC)	241
External (Ext)	0
Total	1713

tstat

	Ext
Carterton District (CD)	0.5
Kapiti Coast District (KCD)	-2.6
Lower Hutt City (LHC)	-6.2
Masterton District (MD)	-9.2
Porirua City(PC)	-4.6
South Wairarapa District (SWD)	-1.8
Upper Hutt City (UHC)	-3.9
Wellington City (WC)	-1.2
External (Ext)	NA
Total	-4.8



Resident Home Base Shopping External Car Trips Comparison (Household and Screenline Survey)

Household Survey

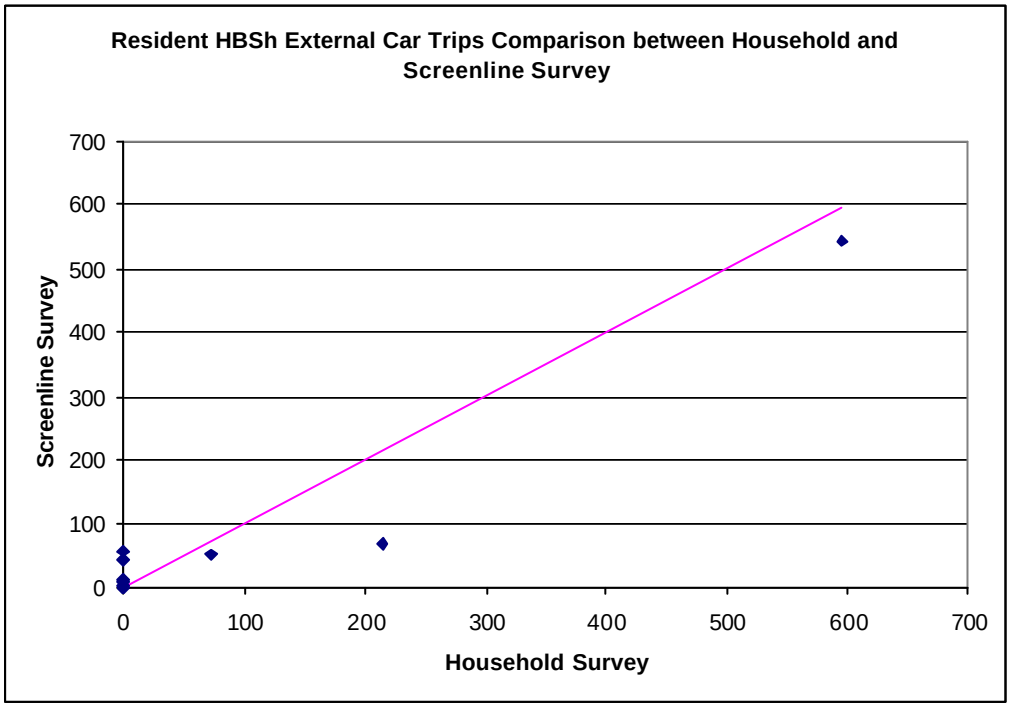
	Ext
Carterton District (CD)	0
Kapiti Coast District (KCD)	596
Lower Hutt City (LHC)	0
Masterton District (MD)	215
Porirua City(PC)	0
South Wairarapa District (SWD)	0
Upper Hutt City (UHC)	0
Wellington City (WC)	72
External (Ext)	0
Total	883

Screenline Survey

	Ext
Carterton District (CD)	2
Kapiti Coast District (KCD)	544
Lower Hutt City (LHC)	57
Masterton District (MD)	68
Porirua City(PC)	45
South Wairarapa District (SWD)	9
Upper Hutt City (UHC)	15
Wellington City (WC)	53
External (Ext)	0
Total	793

tstat

	Ext
Carterton District (CD)	-0.7
Kapiti Coast District (KCD)	0.2
Lower Hutt City (LHC)	-3.9
Masterton District (MD)	0.8
Porirua City(PC)	-3.5
South Wairarapa District (SWD)	-1.5
Upper Hutt City (UHC)	-2.0
Wellington City (WC)	0.2
External (Ext)	NA
Total	0.3



Resident Home Base Employer Business External Car Trips Comparison (Household and Screenline Survey)

Household Survey

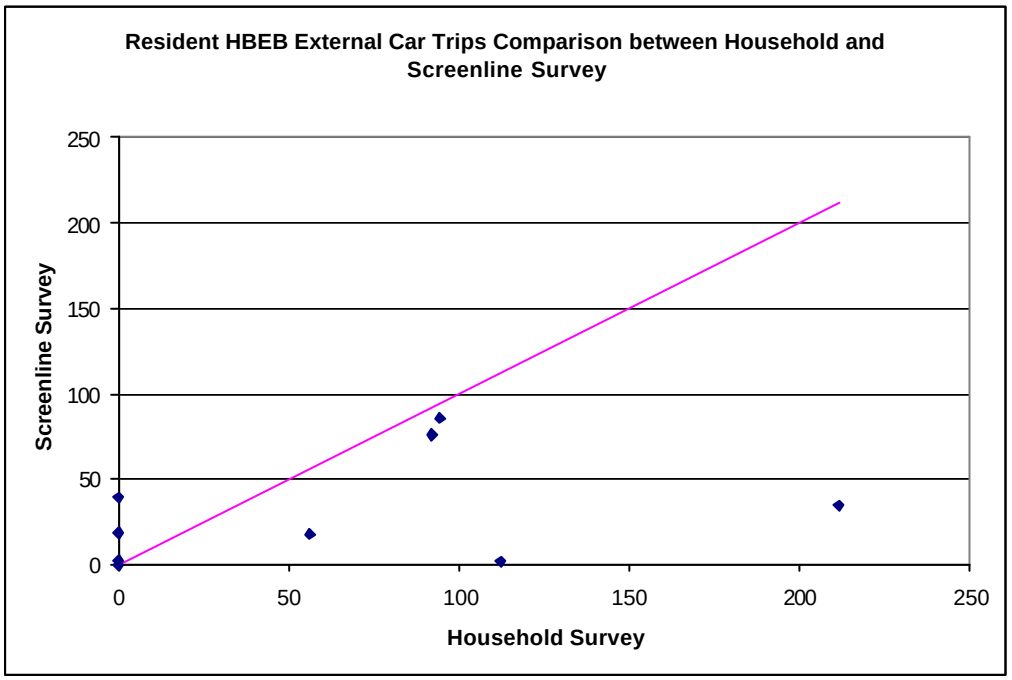
	Ext
Carterton District (CD)	112
Kapiti Coast District (KCD)	92
Lower Hutt City (LHC)	211
Masterton District (MD)	0
Porirua City(PC)	56
South Wairarapa District (SWD)	0
Upper Hutt City (UHC)	0
Wellington City (WC)	94
External (Ext)	0
Total	566

Screenline Survey

	Ext
Carterton District (CD)	2
Kapiti Coast District (KCD)	76
Lower Hutt City (LHC)	35
Masterton District (MD)	39
Porirua City(PC)	18
South Wairarapa District (SWD)	3
Upper Hutt City (UHC)	18
Wellington City (WC)	86
External (Ext)	0
Total	277

tstat

	Ext
Carterton District (CD)	0.9
Kapiti Coast District (KCD)	0.1
Lower Hutt City (LHC)	1.0
Masterton District (MD)	-3.2
Porirua City(PC)	0.4
South Wairarapa District (SWD)	-0.9
Upper Hutt City (UHC)	-2.2
Wellington City (WC)	0.1
External (Ext)	NA
Total	1.0



Resident Home Base Other and Social External Car Trips Comparison (Household and Screenline Survey)

Household Survey

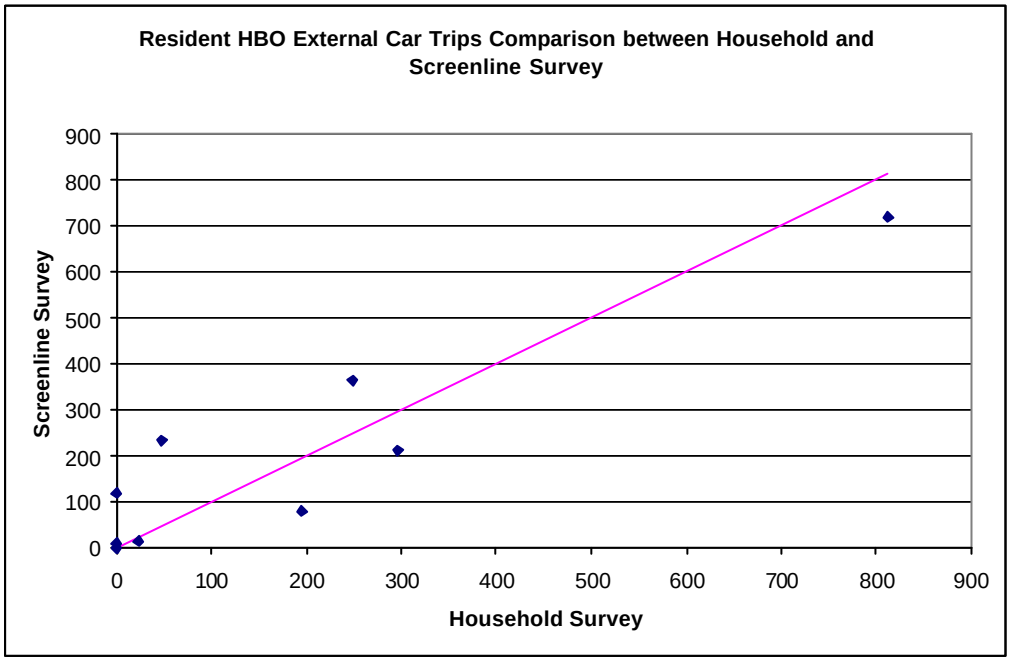
	Ext
Carterton District (CD)	0
Kapiti Coast District (KCD)	812
Lower Hutt City (LHC)	297
Masterton District (MD)	47
Porirua City(PC)	0
South Wairarapa District (SWD)	22
Upper Hutt City (UHC)	195
Wellington City (WC)	248
External (Ext)	0
Total	1622

Screenline Survey

	Ext
Carterton District (CD)	11
Kapiti Coast District (KCD)	719
Lower Hutt City (LHC)	214
Masterton District (MD)	236
Porirua City(PC)	120
South Wairarapa District (SWD)	15
Upper Hutt City (UHC)	81
Wellington City (WC)	366
External (Ext)	0
Total	1761

tstat

	Ext
Carterton District (CD)	-1.7
Kapiti Coast District (KCD)	0.3
Lower Hutt City (LHC)	0.4
Masterton District (MD)	-2.2
Porirua City(PC)	-5.7
South Wairarapa District (SWD)	0.1
Upper Hutt City (UHC)	0.7
Wellington City (WC)	-0.6
External (Ext)	NA
Total	-0.3



Resident All Home Base External Car Trips Comparison (Household and Screenline Survey)

Household Survey

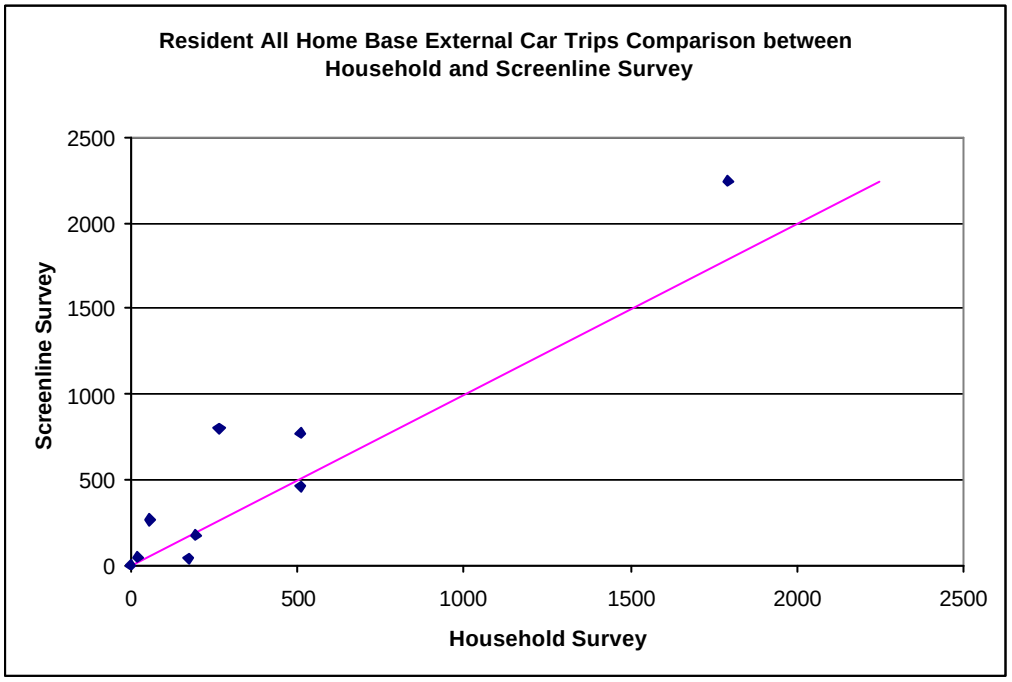
	Ext
Carterton District (CD)	175
Kapiti Coast District (KCD)	1794
Lower Hutt City (LHC)	508
Masterton District (MD)	262
Porirua City(PC)	56
South Wairarapa District (SWD)	22
Upper Hutt City (UHC)	195
Wellington City (WC)	509
External (Ext)	0
Total	3522

Screenline Survey

	Ext
Carterton District (CD)	43
Kapiti Coast District (KCD)	2247
Lower Hutt City (LHC)	467
Masterton District (MD)	802
Porirua City(PC)	262
South Wairarapa District (SWD)	45
Upper Hutt City (UHC)	174
Wellington City (WC)	771
External (Ext)	0
Total	4811

tstat

	Ext
Carterton District (CD)	0.8
Kapiti Coast District (KCD)	-0.9
Lower Hutt City (LHC)	0.2
Masterton District (MD)	-2.7
Porirua City(PC)	-2.2
South Wairarapa District (SWD)	-0.4
Upper Hutt City (UHC)	0.1
Wellington City (WC)	-1.0
External (Ext)	NA
Total	-1.8



A-12.6.2 External CV (Non Home Base Employer Business) Comparisons

CV (NHBEB) External Trips Comparison (Household Survey and Screenline Survey)

Household Survey

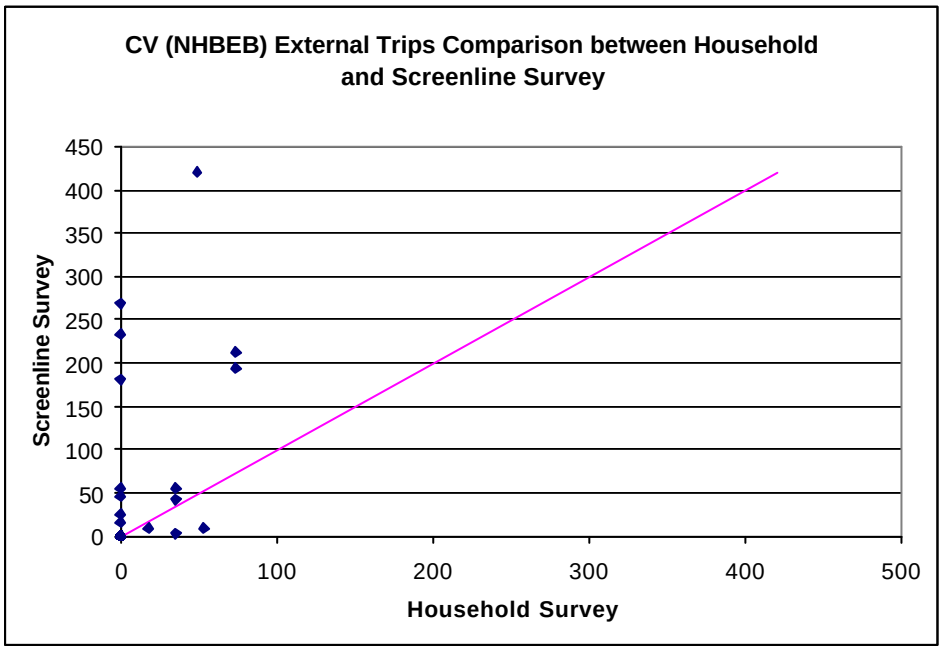
	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)									53	53
Kapiti Coast District (KCD)									0	0
Lower Hutt City (LHC)									0	0
Masterton District (MD)									35	35
Porirua City(PC)									0	0
South Wairarapa District (SWD)									0	0
Upper Hutt City (UHC)									0	0
Wellington City (WC)									74	74
External (Ext)	18	49	0	35	0	35	0	74	0	211
Total	18	49	0	35	0	35	0	74	162	374

Screenline Survey

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)									10	10
Kapiti Coast District (KCD)									233	233
Lower Hutt City (LHC)									182	182
Masterton District (MD)									55	55
Porirua City(PC)									47	47
South Wairarapa District (SWD)									0	0
Upper Hutt City (UHC)									26	26
Wellington City (WC)									194	194
External (Ext)	10	421	269	44	57	5	17	212	0	1035
Total	10	421	269	44	57	5	17	212	747	1782

tstat

	CD	KCD	LHC	MD	PC	SWD	UHC	WC	Ext	Total
Carterton District (CD)									0.5	0.5
Kapiti Coast District (KCD)									-7.9	-7.9
Lower Hutt City (LHC)									-7.0	-7.0
Masterton District (MD)									-0.3	-0.3
Porirua City(PC)									-3.5	-3.5
South Wairarapa District (SWD)									NA	NA
Upper Hutt City (UHC)									-2.6	-2.6
Wellington City (WC)									-1.1	-1.1
External (Ext)	0.2	-4.0	-8.5	-0.1	-3.9	0.4	-2.1	-1.3	NA	-4.5
Total	0.2	-4.0	-8.5	-0.1	-3.9	0.4	-2.1	-1.3	-3.7	-5.8



A-13. Task 2.14 Model Structure Simplifications

No detailed tables produced.

A-14. Task 2.15 Park-&-Ride

A-14.1 Rail Survey

- **Table 14-1 Average Car Trip Distance To Train Station**

Station	AvgDist	Station	AvgDist	Station	AvgDist	Station	AvgDist
AVA	6.7	MANA	0.9	PETONE	3.4	TAWA	2.9
BOX HILL	0.9	MANOR PARK	3.0	PLIMMERTON	3.1	TRENTHAM	1.1
CARTERTON	3.4	MASTERTON	2.3	PORIRUA	3.4	UPPER HUTT	3.6
CROFTON DOWNS	2.2	MATARAWA	4.1	RAROA	1.1	WAIKANAE	6.9
EPUNI	5.1	MELLING	2.3	REDWOOD	1.2	WALLACEVILLE	1.2
FEATHERSTON	7.1	NAENA E	1.1	RENALL ST	2.8	WATERLOO	4.1
HERETAUNGA	7.0	NGAIO	1.8	SILVERSTREAM	1.5	WESTERN HUTT	1.0
JOHNSONVILLE	1.7	OTAKI	5.3	SIMLA CRES	1.3	WINGATE	0.5
KENEPURU	0.7	PAEKAKARIKI	3.8	SOLWAY	1.9	WOBURN	2.3
KHANDALLAH	0.5	PARAPARAUMU	4.3	TAITA	2.5	WOODSIDE	5.3
LINDEN	1.0	PAREMATA	2.1	TAKAPU ROAD	2.8		

- **Table 14-1 Average Distance To Train Station All Modes**

Station	AvgDist	Station	AvgDist	Station	AvgDist	Station	AvgDist
AVA	2.1	MANA	1.4	PAREMATA	1.9	TAITA	2.0
BOX HILL	0.5	MANOR PARK	1.5	PETONE	2.5	TAKAPU ROAD	1.3
CARTERTON	2.4	MASTERTON	2.4	PLIMMERTON	1.9	TAWA	1.5
CROFTON DOWNS	0.9	MATARAWA	4.7	POMARE	1.5	TRENTHAM	1.0
EPUNI	1.5	MELLING	2.6	PORIRUA	3.1	UPPER HUTT	2.3
FEATHERSTON	4.9	MURI	0.4	PUKERUA BAY	0.4	WAIKANAE	4.2
HERETAUNGA	0.8	NAENAE	0.9	RAROA	0.5	WALLACEVILLE	0.9
JOHNSONVILLE	1.0	NGAIO	0.8	REDWOOD	0.8	WATERLOO	2.8
KAIWHARAWHARA	10.2	NGAURANGA	2.5	RENALL ST	1.4	WESTERN HUTT	0.7
KENEPURU	0.8	OTAKI	4.1	SILVERSTREAM	1.1	WINGATE	0.8
KHANDALLAH	0.4	PAEKAKARIKI	1.7	SIMLA CRES	0.5	WOBURN	1.2
LINDEN	0.7	PARAPARAUMU	3.6	SOLWAY	2.1	WOODSIDE	5.0

■ **Figure 14-2 Number of Car Trips To each Railway Station**

Station	Number of Trips	Available Spaces	Station	Number of Trips	Available Spaces
AVA	64	-	PETONE	319	221
BOX HILL	5	-	PLIMMERTON	165	35
CARTERTON	50	44	PORIRUA	553	166
CROFTON DOWNS	86	44	RAROA	10	8
EPUNI	20	-	REDWOOD	77	97
FEATHERSTON	67	120	RENALL ST	7	-
HERETAUNGA	2	-	SILVERSTREAM	103	60
JOHNSONVILLE	136	43	SIMLA CRES	23	6
KENEPURU	5	-	SOLWAY	27	20
KHANDALLAH	10	7	TAITA	199	127
LINDEN	65	-	TAKAPU ROAD	67	63
MANA	27	20	TAWA	94	-
MANOR PARK	11	-	TRENTHAM	80	64
MASTERTON	73	75	UPPER HUTT	175	156
MATARAWA	6	-	WAIKANAE	34	50
MELLING	114	100	WALLACEVILLE	32	100
NAENAE	43	-	WATERLOO	639	535
NGAIO	73	25	WESTERN HUTT	29	-
OTAKI	23	-	WINGATE	4	-
PAEKAKARIKI	51	62	WOBURN	174	104
PARAPARAUMU	504	300	WOODSIDE	41	42
PAREMATA	244	230			

Note :“-” indicates the number of spaces is unknown

■ **Table 14-2 Proprtion of Car Driver To Station Trips by Distance**

Dist (Kms) (Inclusive)	Station								
	CROFTON DOWNS	JOHNSON VILLE	MASTERTON	MELLING	NGAIO	PARAPARAUMU	PAREMATA	PETONE	PLIMMERTON
1	57%	41%	0%	28%	78%	13%	19%	19%	34%
2	17%	37%	25%	28%	15%	12%	26%	25%	50%
3	0%	16%	75%	19%	0%	21%	32%	25%	0%
4	12%	2%	0%	9%	0%	15%	18%	5%	0%
5	2%	0%	0%	9%	0%	10%	2%	10%	4%
10	7%	2%	0%	4%	0%	24%	3%	10%	4%
15	0%	3%	0%	3%	0%	1%	0%	3%	2%
20	5%	0%	0%	0%	3%	1%	0%	2%	0%
25	0%	0%	0%	0%	4%	4%	0%	1%	3%
100	0%	0%	0%	0%	0%	0%	0%	0%	3%
Dist (Kms) (Inclusive)	**PORIRUA**	**REDWOOD**	**SILVERSTREAM**	**TAITA**	**TAWA**	**TRENTHAM**	**UPPER HUTT**	**WATERLOO**	**WOBURN**
1	7%	64%	37%	15%	58%	38%	7%	13%	40%
2	11%	31%	53%	17%	31%	59%	17%	27%	29%
3	12%	0%	0%	53%	0%	3%	11%	12%	2%
4	42%	0%	3%	11%	4%	0%	39%	13%	7%
5	17%	0%	0%	0%	0%	0%	13%	10%	5%
10	10%	5%	7%	0%	2%	0%	11%	20%	17%
15	1%	0%	0%	1%	0%	0%	0%	1%	0%
20	0%	0%	0%	2%	0%	0%	0%	3%	0%
25	0%	0%	0%	0%	0%	0%	0%	1%	0%
100	0%	0%	0%	0%	4%	0%	1%	0%	0%

A-14.2 WRC Park and Ride Survey

■ **Table 14-3 Average Car Trip Distance To Train Station WRC Data**

Station	AvgDist	Station	AvgDist	Station	AvgDist	Station	AvgDist
CARTERTON	3.8	MELLING	2.5	PUKERUA BAY	19.6	TAWA	0.9
CROFTON DOWNS	1.7	NGAIO	0.5	RAROA	1.2	TRENTHAM	1.3
FEATHERSTON	6.4	PAEKAKARIKI	3.0	REDWOOD	1.2	UPPER HUTT	3.7
JOHNSONVILLE	1.6	PARAPARAUMU	4.7	SILVERSTREAM	1.7	WAIKANAE	3.9
KAIWHARAWHARA	2.5	PAREMATA	2.5	SIMLA CRES	1.1	WALLACEVILLE	1.3
KHANDALLAH	0.4	PETONE	3.3	SOLWAY	1.2	WATERLOO	4.1
MANA	0.8	PLIMMERTON	1.0	TAITA	2.6	WOBURN	3.6
MASTERTON	5.1	PORIRUA	3.6	TAKAPU ROAD	3.2	WOODSIDE	7.6

Table 14-4 Proprtion of Car Driver To Station Trips by Distance WRC Data

Dist (Kms) (Inclusive)	CROFTON DOWNS	JOHNSON VILLE	MASTERTON	MELLING	NGAIO	PARAPARAUMU	PAREMATA	PETONE	PLIMMERTON
1	52%	52%	8%	20%	94%	8%	13%	14%	67%
2	19%	33%	42%	43%	6%	14%	21%	35%	25%
3	14%	11%	17%	15%	0%	21%	32%	25%	0%
4	0%	0%	0%	7%	0%	17%	29%	4%	0%
5	5%	0%	0%	7%	0%	9%	0%	2%	8%
10	10%	0%	17%	6%	0%	25%	4%	13%	0%
15	0%	4%	8%	0%	0%	2%	0%	3%	0%
20	0%	0%	8%	0%	0%	1%	0%	2%	0%
25	0%	0%	0%	2%	0%	4%	1%	1%	0%
100	0%	0%	0%	0%	0%	1%	0%	0%	0%

Dist (Kms) (Inclusive)	PORIRUA	REDWOOD	SILVERSTREAM	TAITA	TAWA	TRENTHAM	UPPER HUTT	WATERLOO	WOBURN
1	5%	63%	54%	9%	71%	30%	18%	5%	19%
2	12%	26%	31%	18%	29%	61%	24%	24%	16%
3	16%	7%	0%	56%	0%	9%	16%	19%	6%
4	36%	0%	3%	15%	0%	0%	8%	12%	23%
5	21%	2%	0%	0%	0%	0%	8%	13%	6%
10	8%	2%	13%	0%	0%	0%	24%	23%	26%
15	1%	0%	0%	3%	0%	0%	0%	2%	3%
20	0%	0%	0%	0%	0%	0%	0%	1%	0%
25	0%	0%	0%	0%	0%	0%	0%	0%	0%
100	1%	0%	0%	0%	0%	0%	3%	0%	0%

A-15. Task 2.16 Ports and Airports

Proposed Model of Airport Trip Rates

Airport Trip Rates - Annual Data

Passengers									Mode Shares (%)						Trip rate per
Flights		**Residence**		**Purpose**		**Proportion**	**Group size**	**Ratio**	**Parked Car**	**Car Escort**	**Taxi**	**PT**	**Hire car**	**Total**	**Pax**
International	10%	Local residents	50%	Business	30%	1.5%	1.1	0.01	40%	10%	50%	0%	0%	100%	1.0
				Leisure	70%	3.5%	1.5	0.02	20%	40%	35%	5%	0%	100%	0.9
		Other	50%	Business	30%	1.5%	1.1	0.01	0%	10%	80%	0%	10%	100%	0.9
				Leisure	70%	3.5%	1.5	0.02	0%	45%	40%	5%	10%	100%	0.9
Domestic	90%	Local residents	50%	Business	30%	13.5%	1.1	0.12	40%	10%	50%	0%	0%	100%	1.0
				Leisure	70%	31.5%	1.5	0.21	20%	40%	35%	5%	0%	100%	0.9
		Other	50%	Business	30%	13.5%	1.1	0.12	0%	10%	80%	0%	10%	100%	0.9
				Leisure	70%	31.5%	1.5	0.21	0%	45%	40%	5%	10%	100%	0.9
						100%									
Mean vehicle trip rate									0.10	0.45	0.42	0.00	0.04	**1.01**	
Mode Share									13%	33%	46%	4%	5%	100%	
2001 pax														3,700,000	
														Model	**Actual**
Exited car park										40%				**9,577**	**11496**

Mean vehicle trip rate by purpose						**Total**
BU	0.05	0.03	0.18	0.00	0.01	**0.27**
HBO	0.05	0.42	0.25	0.00	0.02	**0.74**

A-16. Task 2.17 Role of WTSM and Project Models

No detailed table produced.

Contents

Document History and Status

Issue	Rev.	Issued To	Qty	Date	Reviewed	Approved

Printed:	1 November 2002
Last Saved:	1 November 2002
File Name:	P:\81\8110573\Task 10 - Preliminary Studies\Prelimstudiesv4_Appendix B.Doc
Author:	
Project Manager:	David Ashley
Name of Organisation:	Wellington Regional Council
Name of Project:	
Name of Document:	Further Specification Details for Task 2 Preliminary Studies
Document Version:	Final
Project Number:	ME02030.800

B-1. Introduction

This appendix provides the detailed specification of each preliminary study. Where appropriate the material has been lifted out of this appendix and placed in the main body of the report.

B-2. Task 2.1 Review of Performance of Present Model

B-2.1 Introduction

WRC have found that the existing WTSM does not predict the levels of future traffic growth on the motorway system that would seem to expected given past traffic growth rates. We need analyses which help us understand why the model is failing so that we can correct for this in the update.

An analysis by Dan Jones is reported in TN1.0, and this needs extending for our purposes, if feasible.

Much of the note is background, useful but not relevant to our purposes. The critical issues which we need to understand are:

- What have been the road traffic and rail passenger growth rates in the pasts and how well does WTSM reproduce them?
- How consistent and with reasonable expectations are WTSM forecast growth rates?

To this end Dan examines:

- 24 hour road traffic trends by year (Section 6, Attachment 5),
- "notional" road capacity (Section 7),
- conflicting rail evidence in Section 9, Attachments 10 & 11,
- WTSM forecasts in Section 13 and 14.

These aspects of the note are unsatisfactory in a number of respects:

- given the constrained road capacity, we might expect that there would be a constraint on peak hour (or period) growth rates in future, but no such constraint at other time periods;
- indeed we might expect peak-spreading to occur enabling peak traffic growth demands to be satisfied;
- the conflicting rail evidence is unresolved, nor is it split into peak and offpeak;
- Attachment 13, which relates to peak hour flows, argues that capacity will bring the forecasts 'into line' and seems less than convincing, given the peak-spreading point and the fact that it ignores the interpeak traffic.

B-2.2 Inputs

WRC Technical Note 1, Dan Jones, February 2001
New data: historic road traffic flows split into peak and other times
Possibly seek rail data similarly (bus is of little interest)
Historic car ownership, demographic (and employment?) data relating to the region over the counting period

B-2.3 Processing

Data Processing
The purpose of the processing is to seek measures of the following:

- historic rates of road traffic growth in peak and off-peak periods

- evidence for peak spreading (for which we will require a suitable peak-spreading indicator, which will not be straightforward and may require a literature search)
- reconciliation of the conflicting evidence on rail passenger growth.

Review of Capacity
Given the up and down stream bottlenecks on the Wellington motorway system we need to ensure that our approach to measures of capacity is rational.

We also need to obtain historic data on increases in road and rail capacity and service levels which have occurred over the counting period, and consider how these might have influenced traffic growth.

Planning information
Similarly we need to obtain aggregate (TLA?) population statistics and car ownership statistics to understand how these factors may have contributed to traffic growth.

B-2.4 Outputs

The following outputs are required for the motorway corridors:
- historic road traffic growth rates, peak and off peak;
- historic rail passenger growth rates peak and off peak;
- historic trend in length of peak periods (peak-spreading);
- historic trends in population, car ownership and possibly employment catchments for motorways;
- assessment of road capacity (if feasible) and record of changes in road and rail level-of-service over the counting period;
- with the above data, it should be possible to comment as follows:
  - unconstrained traffic growth rates (offpeak)
  - potential constrained traffic growth (peaks)
  - significant of peak-spreading
  - whether these growth rates appear to be explained by demographic trends and level-of-serve improvements
- model implications:
  - if the trends can apparently be explained then we may reasonably expect our updated model to be able to reproduce them,
  - if not, then we need to consider what other explanation of the trends might be feasible;
  - if the unexplained growth is in the off peak then there may be explanations associated with income-related growth in leisure travel

B-3. Task 2.2 Initial tabulations, Model Structure and Segmentation Descriptions

B-3.1 Data Source

(a) Household Survey (expanded and raw sample)

B-3.2 Time Period

Additional data sources:
(b) Traffic counts by time of day
(c) Bus and rail counts by time of day (may just have to use our rail survey counts if there is nothing else conveniently available)

Expanded household survey graphs/tables (ignore CVs):
1) For defined trip purposes, tabulate/graph % of daily all-mode travel for each trip purpose (and all purposes together) by time of day in 15 minute time periods, for 3 different time definitions: trip start time, midpoint time and arrival time;
2) Repeat 1) for car (driver+passenger) and public transport separately, with purposes aggregated to HBW, HBEd and all other, plus all purposes combined ('super-purposes');
3) Repeat 1) for origin TLAs (3/4 groups appropriately by distance form CBD) using super-purposes as 2).

Plot road and public transport count data by 15min time periods at different parts of the networks (specifically: near CBD then moving away from CBD). Then compare peak period traffic volumes for different definitions of the peak period at each location.

Review what is done in other models.

Some arguments:
- superficially, the midpoint time would tend to even out the errors in time period allocation across the network;
- if we assume that it is the arrival time that has the lowest variance (ie people are all trying to get to work at similar times), then the endpoint time is likely to represent the peak flow anywhere on the network, BUT it means that the flows across the network are not for exactly the same times of day, as the peak will occur earlier outside Wellington; this will pose some difficulties for validation?

Then decide on modelled time periods, between:
- start time
- midpoint time
- end time
- am start time, pm end time, interpeak the rest

Decision will rest on:
- what is traditionally done and the arguments for it,
- how closely the household survey distributions match the count distributions (terms of the times of the peaks and the proportion of daily travel in the peaks),

- the extent to which different time period definitions accord with the time profiles of each trip purpose;
- which time period definition is least erroneous (and it seems likely that midpoint might be best.

B-3.3 Purpose

Expanded (unless otherwise stated) household survey tabulations/graphs:

- % of trips by each proposed purpose (include CVs as a separate purpose) – checking for very large or very small categories
- average trip length and trip length distribution (using crow fly distance) by purpose – checking for systematic distribution differences
- % of trips by mode for each purpose – checking for systematic mode share differences
- (previous work will give us % by time period)
- number of sample trips by purpose/mode – checking adequacy for calibration
- roughly compute zonal trip productions and attractions by purpose, then compute correlations between individual purposes; where high correlation are apparent, graph them – checking for merits of separating purposes for trip end models.

We are not at this stage ready to determine the treatment of escorts – so all we should do is choose some convenient classification.

Depending on the results of these initial tabulations we may want to explore further: either by combining purposes of we have some small segments or splitting purposes further (seems unlikely however!).

B-3.4 Person/Family Structure

For expanded distributions:

- By age (no aggregations), % persons by education status, % persons by employment status, % by driving licence status, % by any other activities; repeat for males and females separately;
- % households by car ownership level: 0, 1, 2 , 3 or more.

B-3.5 Car Availability

For expanded distributions as follows:

- for each purpose, the trips and mode shares (car driver+pax, public transport, slow modes) cross-classified by household car ownership (0,1 ,2 3+) and number of adults in household (1,2,3+);
- repeat the above replacing number of adults by number of persons with a driving licence (precise definition of which is to be agreed);
- for each purpose, the trips and mode shares (car driver+pax, public transport, slow modes) by the adult-based car availability categories in the table below;
- repeat the above replacing number of adults by number of persons with a driving licence (precise definition of which is to be agreed);
- for each purpose, the trips and mode shares (car driver+pax, public transport, slow modes) cross-classified by the number of cars/adult in the household (suggested categories of c/a: 0, 0<c/a<0.5, 0.5, 0.5<c/a<1, 1, 1<c/a).

Captive	trips by residents of non car owning households
Competition	trips by residents of households where no. of cars < no. of adults
Choice	trips by residents of households where no. of cars in household ≥ no. of adults

B-4. Task 2.3 Analysis of Parking Data

B-4.1 Scope

There are three parts to the analysis:

- determination from the household surveys of the parking behaviour of trip-makers;
- analysis of supply characteristics using independent WRC data;
- combining the two data sets in a spreadsheet to attribute average parking costs to different trip types.

The data are designed to enable the spreadsheet illustrated below (for the CBD only, but may be required for other parts of the study area) to be filled in ('parking.xls' in the .200 directory). The table enables the average price of parking to be calculated by purpose. The number of spaces is not used in the base year, but we could make use of the data in forecasting or policy testing (for example, if we reached the capacity of free spaces, we could allocate all additional traffic to paid spaces).

WTSM Parking Spreadsheet

Wellington CBD	% trips			Average parking duration			Average parking cost			Parking Capacity (Spaces)	
Parking Type	*HBW*	*BU*	*All Other*	*HBW (Days)*	*BU (hrs)*	*Other (hrs)*	*HBW (per day)*	*BU (per hr)*	*Other (per hr)*	*Long Term*	*Short term*
residential	0%	0%	0%				$0.0	$0.0	$0.0	n/a	n/a
public unmetered on street	10%	5%	40%				$0.0	$0.0	$0.0	0	1,000
public unmetered off street	10%	5%	10%				$0.0	$0.0	$0.0	500	2,000
public metered on street	15%	50%	10%	1	3	1.5	$12.0	$0.5	$0.5	0	5,000
paid	15%	25%	0%				$8.0	$1.0	$1.0	5,000	5,000
employer	50%	15%	0%				$0.0	$0.0	$0.0	50,000	5,000
customer	0%	0%	40%				$0.0	$0.0	$0.0	n/a	10,000
Total	*100%*	*100%*	*100%*							*55,500*	*28,000*
Average parking cost per trip							***$3.0***	***$1.5***	***$0.1***		

B-4.2 Household Survey Analysis

This is an analysis of car driver mode linked trip data by purpose and destination. It concerns the parking place data (Question E).

Table 1: for each purpose and for each TLA, tabulate the proportions in each category of:

- parking place,
- parking fee, and
- who paid

Notes: for home-based trips, only tabulate the parking characteristics at the destination end of the trip (the non-home end). For non-home based trips, tabulate the destination end of the trip.

Table 2: this depends on the results of Table 1. It seems possible that we may find the following:

- few pay fees for parking outside the Wellington TLA;
- if so, we will need to focus on Wellington's CBD and repeat Table 1 for this area; it is remotely possible that we might want to look at regional CBDs – Upper Hutt, Lower Hutt wherever.

Table 3: if we find that parking fees are significant for purposes other than commuting, we will need to compute the average length of time spent parking (from the trip times). We will need to check that these average times are the same for: people who pay for parking, people who park but don't pay and, in principle, people who use public transport.

From an analysis of these data we should be able to complete the first 2 blocks of columns in the spreadsheet.

B-4.3 WRC Parking Data Analysis

We would like two types of data: the volume of parking spaces by type and the unit parking price (per day, per hour etc) – see spreadsheet. The data is for defined areas: Wellington CBD and any other areas which would be helpful to us.

I think that data on the prices will be easiest.

The number of spaces is not so important – it is ONLY important for Wellington CBD and is only needed for future policy runs with the model.

B-4.4 Parking Spreadsheet

Finally, the draft spreadsheet can be developed into a final structure and infilled with data.

B-4.5 Further Possible Refinements

Andrew has raised the issue of considering parking spaces in the CBD more explicitly if we have a fine zone system. Issues to consider are:

- with a typical coarse zone system, the parking place is likely to be in the same zone as the activity and there is therefore no reasons to distinguish them;
- in a fine zone system, parking may be in another zone and assigning car traffic to the ultimate destination may, at least in theory, lead to inaccurate paths to the wrong place on the road network.

The minimum requirements to cause us to consider refinements appear to be:

- evidence that a significant proportion of car users attracted to Wellington CBD do not park in the destination zone and/or park at a significant time/distance from their destination; this is readily tested with household survey tabulations (3.5.1) which should distinguish, HBW, BU and other trip purposes;
- evidence that the distribution of parking spaces is not uniform across the CBD; this is likely to mean that a significant proportion of spaces is provided by a limited number of off-street public car parking buildings; some refinement of the analysis of the parking supply data (if it is available in the requisite detail) should cover this (3.5.2) – thus we need parking supply in some locational detail, which may or may not be available (3.5.3, chase up).

Supposing that these analyses indicated that it might be worth changing the model specification, there are a number of possibilities.

Option 1 would be to connect zones to the network via the car parks. The process might involve:

- putting capacities on existing centroid connectors relating to the present zonal parking capacity (excepting parking buildings);
- representing all parking buildings as network nodes, linking them to zones within their catchment with additional centroid connectors, and linking them to the network with connectors with appropriate capacities (an issue which may not be

simple if the building can be accessed from more than one link); in all cases some steeply sloping speed/flow curve would be associated with the connectors;

- in principle, this approach would allow a change in the existing distribution of existing parking spaces or the introduction of new parking buildings;
- a difficulty would be that we would expect parking locations to vary by purpose, at least between long (HBW) and short term (other purposes) parking; we do not assign traffic by purpose (unless we wished to expand the multi-user assignment concept), but we will assign peak and interpeak travel separately, which goes part way to achieving the required discrimination (3.5.4: to check this we should probably look at the purposes of car trips to the CBD in the peak period); a complication is allocating capacities to short term spaces.

Option 2 would be on a zonal basis:

- using the household survey we would prepare a table allocating travel to each CBD zone to the zones where the car was parked: we might imagine that this would not allocate all trips to the destination zone only where that zones had a limited parking supply;
- conceivably there could be separate zones for parking buildings, which might be attractive for network loading precision, but is unattractive for modelling new parking buildings, potentially requiring a zone system extension;
- we would then need procedures for amending this allocation in future (presumably a simple logit function allocating the surplus demand to zones with excess parking supply on basis of access time might do it.

In both options there would need to be means of predicting future changes in parking supply.

Before we give these options serious consideration we need to understand the extent to which it is an issue (tasks 3.5.1-3).

[Note that people may trade-off parking cost against walk access time such that the generalised costs of parking cost + a short walk may be similar to free parking + a longer walk.]

B-5. Task 2.4 Generalised Cost

B-5.1 Attributes of GC

Car and CV driver:
- Time
- Direct operating cost
- Parking charges
- Tolls

Car and CV passenger:
- Time
- ?

Public transport passenger:
- in-vehicle time
- other time (access/egress time)
- interchange
- waiting time at boarding and interchange
- fare

B-5.2 Issues

Values of time:
- use latest Transfund values plus tax
- query whether we can have difference between car and PT?

Direct vehicle operating costs:
- definition/source of values?

Interchange and waiting time:
- use/adapt Transfund/APT values to fit in with Emme/2 constraints (probably little change from present mode;
- interchange penalty can vary with type/quality of interchange if they can be identified?

PT access/egress time:
- usual weighting is 2, but slight concern in using a high weight where this time is measured inaccurately (on centroid connectors)

Parking charges: these are halved (the charge being shared between the out and return trips).

Car passenger/driver:
- which money costs are assumed to be shared between driver and passenger?
- an issue is the policy responsiveness of the model: if driver bears all of the costs then his decisions will be reasonably sensitive to cost changes (if half the costs, less so); if passenger bears none of the costs, then policies which increase cost of travel will not affect car passenger mode; impacts on forecasts depends on how car passengers are modelled, but it could be potentially counter-intuitive with a

large transfer to car passenger mode at the same time as there are fewer car drivers, implying a large increase in occupancies.

Time for slow modes:

- weighted by 1 or 2?

Note key differences from BAH in respect of parking charges, sharing of car money costs.

B-6. Task 2.5 Retail Destination Analysis

Follow up the reference to Malcolm Douglas.

Not sure how far to go with this and when to start. Ideally we need planning data identifying zones with different types of shopping activity (*?action on this?*).

We can do some limited initial analysis of the expanded trips in the household survey. We can do the following by mapping the trip ends on a GIS base or doing it by zone or CCD (or whatever):

- count the number of trip origins whose stop was 'shop/mall/retail' (by zone or plot on GIS); repeat for destinations (should be identical);
- for these particular trips, tabulate the distribution according to the answer to the 'why did you go?' question for that stop (to see whether they are doing other than shopping);
- again on a geographical basis, and for these particular trips, compute the % mode shares and the average journey length for vehicular trips (exclude walks, as some may be within the shopping area).

The outcome of this should be some ability to identify the main shopping attractors and to distinguish them according to their success in attracting public transport access and the extent to which they attract other than local shoppers.

To go further with this we should need data on the activity in the key areas.

B-7. Tasks 2.6 & 2.13 Commercial Travel and Vehicle Types

B-7.1 Commercial Travel

Not a lot to do here, just to find out a bit about the data.

Expanded household survey data:

- tabulate BU purpose trips by mode (distinguish truck/car);
- tabulate the trip origins by 'why did you go to stop?' by truck/car and identify the relative importance of employers' business and pick up/deliver goods by mode;
- tabulate BU trips by zone and identify group of zones which accounts for most business trips;
- tabulate the number of van/utes and trucks in the household
- *need to do some more detailed classification by type of CV using the household motor vehicle question if there are enough trucks to justify it – which would need a cross-classification between the household and trip questionnaires.*

I am not expecting too much from this!

B-7.2 Vehicle Types

The table below indicates the data collected and how it will be treated in modelling.

Vehicle Types	Household Survey	Manual Counts	Automatic Counts	Roadside Survey	Modelling Categories
Motorcycles	Y	Y	Y	Y	In Car (0.2% trips)
Car	Y			Y	Car
Taxi (driver)	Y				Light CV (0.5% trips)
4 wheel drive	Y				Car
Van, ute	Y***	Y*		Y*	Car/Light CV*
Other CV	Y	Y	Y**	Y	CV
Taxi passenger	Y	N	N	N	Light CV passenger (0.6% trips)
Truck passenger	Y	N	N	N	Truck passenger (0.2% trips)

* only company labelled vehicles: rest in cars
** only available if specialist equipment is used
*** to be classified as light CVs if used on business; otherwise as private cars

B-8. Task 2.7 & 2.8 Education Modelling & School Buses, Car Passenger Modelling and Escorts

B-8.1 Introduction

I have put these together because of the researchy, investigative nature of these tasks and the degree of overlap. Data sources: household and/or school surveys. Tasks are sub-numbered in the text.

B-8.2 Preliminary Data Appreciation

We need a good understanding of what is going on, the nature of behaviour in order to think out alternative modelling approaches.

For school trips, the focus is on the idea that trip distribution is every constrained (local schools) and the choice of mode with the emphasis on escorted car trips. For car passenger and escort modelling, the issues are how to model car passenger choices and how car driver trips are related to the escort purpose; our focus is on commuting and education escorts.

B-8.3 School Survey

Tables

Suggested tabulations/graphs of the school survey (2.7.1) to illustrate what is going on are *(most of this has already been done by Mandy and this is in italics)*:

- *% mode shares by age of school child and /or school grade*
- for car driver, tabulate the answers to Q9 (who else travelled in the car)
- for car passenger, cross tabulate the answers to Q8 & 9 (who drove and who was in the car)
- *trip length by age of school child and /or school grade*
- *mode use by distance from school*
- *(it may be worth checking out the return trip home too)*
- the graphs and tables need to be redone aggregating grades to primary secondary and, alternatively, to grades 1-8 and 9-14 (see below).

B-8.4 Household Survey

Tables

Analysis of the household survey for school trips really should focus on interaction with other household members and is therefore about escorts/car passenger trips. So this is combined with commuting escorts below. Because I have not thought out exactly how to do the analysis with the data, I do not always specify simple tables, but instead describe what we are interested in.

Expanded household survey (2.7.3):

- the first thing is simply to tabulate the no. & % of trips in the data by the common purpose categories by main mode; in principle, our primary interest is in escorting car drivers with purpose 11 & 12 and car passengers with purposes 1 & 2; we want to know how big a part of the data they form;

- next we have to understand how the car drivers and passenger relate to each other and how their trips relate to each other; the figure below and the associated tables attempt to identify what might be the principal trip types (5 in all) and the tables identify the purpose combinations (at this stage the common codes do not seem helpful); we need to find a way of establishing the volumes of tours/trips in each of these categories (and any other important ones which I have not thought of);
- from this analysis we can hope to be able to identify:
  - the extent to which escorting is confined to the family;
  - the extent to which drivers are en-route to their own destination of making a special trip
  - generally the trip volumes/proportions involved.

Figure Relevant Types of Tour

1. Home → 1 → Work Pick-Up → 2 passenger(s) → Work

2. Home → 1 passenger(s) → Work Drop-off → 2 → Work/other destination/home

3. Home → 1 passenger(s) → Work

4. Home → 1 passenger(s) → School Drop-off → 2 → Work/other destination/home

5. Home → 1 passenger(s)? → Pick-up → 2 passenger(s) → School drop-off → 3 → work/other destination/home

The stages are numbered (1-3) and whether or not there are passengers is identified. The reverse direction trips would need to be covered too.

An attempt to work out how the common purpose codes allocated to these trips is given in the table.

Trip	Stage	Purpose	
		Driver	Passenger(s)
1	1	11	-
	2	16	1
2	1	11	1
	2	16	-
3	1	1	1
4	1	12	2
	2	16	-
5	1	12	?
	2	16	?
	3	16	-

This table uses the detailed origin and destination purpose codes

Trip	Stage	Driver		Passenger(s)	
		O Purpose	D Purpose	O Purpose	D Purpose
1	1	12	11	-	-
	2	11	2	12?	2
2	1	12	11	12	2
	2	11	2/?/12	-	-
3	1	12	2	12	2
4	1	12	11	12	5
	2	11	2/?/12	-	-
5	1	12	11	12	5/11?
	2	11	11	11?	5
	3	11	2/?/12	-	-

B-9. Task 2.9 Weekend Travel

B-9.1 Aims

The purpose of the pre-analysis is to (i) develop our understanding of weekend travel patterns and (ii) verify some of the hypotheses underlying our proposed methodology.

B-9.2 Data Source

Household survey.
WRC counts.

B-9.3 Tabulations

(8.3.1) Travel characteristics by day of week. Tabulate trips by mode and purpose for weekdays, Saturday and Sunday separately:

- establish how the % of trips by purpose varies between days of the week,
- establish how mode shares for each purpose vary by days of the week

We expect to find mainly non-work trips at the weekend (HBSh, HBSo & NHBO) and a high car use. Presumably there may be some differences in trip purposes between Saturday and Sunday.

Henceforth, focus on car driver and passenger trips and the main trip purposes.

(8.3.2) We need to get a clear idea of the weekend travel peaks, so need profile data from weekend day automatic counts from WRC taken on different routes in different parts of the study area.
(8.3.3) We can get a sense of this from the household survey by tabulating car driver trips by time of day by purpose for Saturday and Sunday separately (in this case alone use expanded data).
(8.3.4) The above analysis will also tell us something about the time period factoring process (ie whether some purposes are concentrated in the peaks). But we need to probe this further distinguishing 'from home' from 'to home' trips (the 'direction'). So, using the peak periods already identified (Sat 12-14.00, Sun 12-14.00, modified if necessary by tasks 8.3.2 & 8.3.3), tabulate the proportion of the trips for each purpose/direction on Saturday and Sunday which occur in their respective peaks.

(8.3.5) We need to understand whether the trip end model relationships should be broadly similar between the weekday and weekend. Roughly compute zonal trip productions and attractions by purpose for the 3 day groups. Plot the day groups against each other to establish correlations (ie Saturday vs Sunday and vs weekday, Sunday vs weekday, combined Sat+Sun vs weekday).
(8.3.6) Extend this analysis at a person level by tabulating the total trips for each person type and the numbers of persons of each type on weekdays, Saturday and Sunday (for person types see p5, technical specification, ignoring employee sub-categories).

(8.3.7) We need to understand whether the trip distribution is markedly different at the weekend. Tabulate average trip length and trip length distribution by purpose for weekday, Saturday, Sunday and Saturday + Sunday.

(8.3.8) We have no plans to do anything special with commercial vehicles, but need WRC classified counts to confirm that CVs are a minor part of the weekend flows and therefore can be ignored or treated as a small factor on car flows.

B-9.4 Questions

The questions which we seek to answer are as follows.

- Can we focus on on-work trips?
- Can we focus on car trips?
- Can we combine Saturday and Sunday?
- For a given trip purpose, are the trip end and trip distribution characteristics of the weekend similar to the weekdays?
- Is there any evidence of travel in the weekend peaks having specific characteristics compared with the rest of the weekend?

The biggest issue may be the adequacy of the weekend survey sample for synthesising reliable matrices. For this the analyses which look at the relationships with the weekday data are the most important as they will indicate whether we can do any sort of joint estimation to improving the weekend model with weekday information.

B-10. Task 2.10 Road Pricing/Tolling

B-10.1 Issues

With these policies arise a number of new issues:

- peak pricing, which causes peak-spreading,
- general sensitivity to tolls and charges (VoT),
- segmenting the travelling population throughout the model for (i) the differences in charges experienced (eg tolls vary by vehicle type) and (ii) the differences in response to charges (essentially variations in values of time).

A distinction will be drawn between the needs of strategic and project assessments.

B-10.2 Discussion

A peak-spreading module will be included in the model. There will be constraints on the performance of this model:

- the strategic model operates for 3 aggregate time periods (detailed peak-spreading models divide the peak period into more time slices),
- international research on peak-spreading is still in its infancy,
- there are difficulties with the theoretical treatment of peak-spreading which cannot easily be addressed in a strategic model,
- there is little/no NZ research on the topic.

The average value of time for car users obtained by Transfund seems appropriate for use with road user charges as, although it does not specifically relate to tolls, it was focussed on increased trip-specific out-of-pocket costs (for fuel and parking). *Query: what further discussion do we need? Look at any local SP work?*

The values of time for CVs and cars on employer's business are based on the marginal productivity of labour (MPL). It is not clear whether this is the appropriate value of time for routeing decisions and the effects of tolls on them.

Segments that need to be considered are:

- vehicle type: cars and CVs (distinguishing lights?),
- private car trip purpose: EB and other (distinguishing commuting?), there are studies where income has been a segmentation variable
- other: I am aware of studies where the tolls are geographically specific (eg immediately local residents having the toll waived); in London, there are various types of traffic which do not have to pay the CBD cordon toll.

Responses to tolls; these are:

- for projects/individual road tolls, the major response will be re-routeing; WTSM is not designed for this purpose, but its set-up is required to facilitate the development of project-specific models;
- for congestion charging policies, peak-spreading is likely to be the first response;
- more broadly charging may impact on car demand (distribution and mode shares); we do not model the sensitivity of CV demands.

The presently designed model structure will allow strategic estimates to be made of responses to the broader pricing measures. We could consider multi-user assignment

enabling different routeings to be attributed to CVs and EB cars. This would certainly have application to tolling projects (providing particularly that CV routeing criteria could be confidently determined) but does not seem essential for the broader pricing strategies to which WTSM would be applied. It seems therefore that we should look at facilitating this option for project studies but not include it in the standard WTSM run.

We do however need to consider how to facilitate the WTSM interface with tolling project models:

- the model will explicitly segment in the matrices: car trips by purpose by time period and CVs by type, such that a project model could use multi-user assignments to reflect the different route choices of these categories;
- a further project model refinement would be to use a logit choice model to allocate traffic between the alternative routes; it seems possible that, within this model, allowance could be made for the income distributions of car users for the relevant segments; the parameterisation of this model would be an issue as would the assignment and iteration procedures;
- where the tolling process might be concerned with revenue maximisation, it seems plausible to want to consider prices varying by time of day and this in turn would place greater emphasis on peak spreading and the more detailed modelling of the times of travel.

In principle, all of these developments are feasible, and information from WTSM could be used to facilitate their development but, ultimately, the more the project model moves away from the WTSm specification the less feasible are detailed interfaces. But this does not seem to be a great issue.

Finally, what would seem to be needed to give confidence in applying WTSM to road user charging measures, is

- a review (9.2.1) of the performance of the present model (given that some criticisms have been raised);
- a review (9.2.2) of what is to be expected from international experience of such schemes or of modelling such schemes, that can be used to verify the reasonableness of the WTSM forecasts.

B-11. Task 2.11 Commercial Vehicle Modelling

B-11.1 Base model

CVs (excluding vans and utes)

- take current WTSM matrix as 'prior'; add external survey CV trips, overriding synthesised cells;
- assemble screenline classified count data and counts for specific generators,
- use matrix estimation to improve fit.

Vans and utes

(10.1.1)?Query what data we will have.

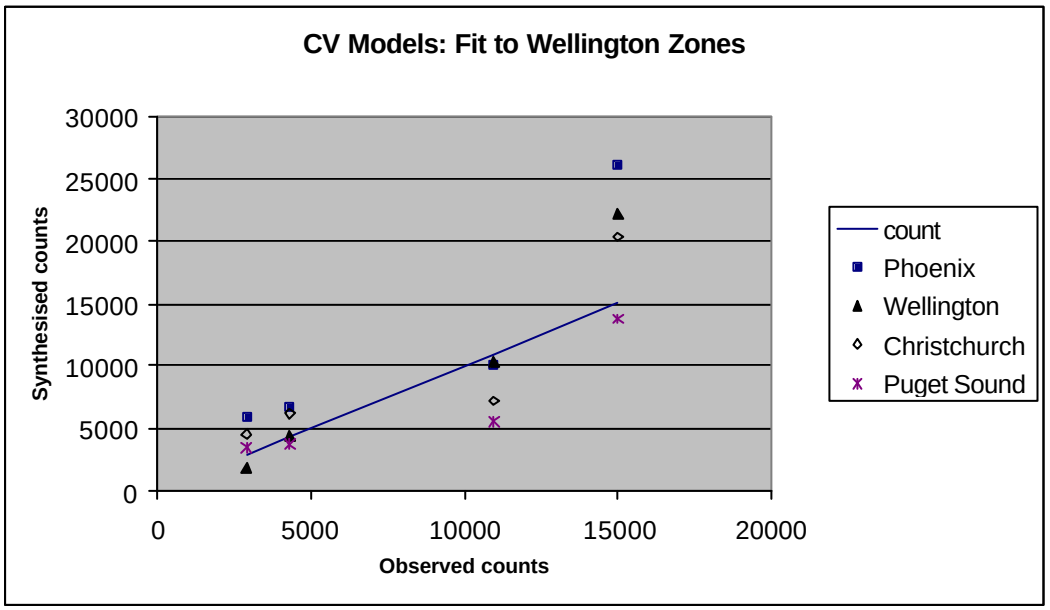
B-11.2 Forecasts

CVs (excluding vans and utes)

There is trip end model currently used. But its structure is quite odd. Formula is:

> CV trips = 0.48* transport & communications employment + 0.46 * retail employment + 1.80 * community services

Thus, no CV traffic is generated by residential areas, nor by manufacturing and other types of employment not covered by the formula. The figure is a re-analysis of information presented in the Transfund research report on Commercial Vehicle Usage and Forecasting by Opus. It shows 4 models, including the present Wellington model which appear to fit equally well four Wellington zones for which trip generation data was collected/available.



The table compares the 3 models, which are mutually consistent and intuitive, with high trip rates for those types of employment likely to be major CV generators, lower trip rates for other employment categories and low trip rates for residential areas. The present Wellington model does not reflect these features and seems unconvincing (but I note that there is some ambiguity about the meaning and scope of each employment category in each model).

Parameter	Values			Implied Relative Trip Rate
	Phoenix	Christchurch	Puget Sound	
Retail employment	1.21	1.45-1.56	0.76	High
Manufacturing employment	1.28	0.38-0.68	0.79	Medium/High
Transport & communications	1.28		0.79	High
Community & services employment	0.51	0.14-0.34	0.33	Low
Agriculture, mining & construction	1.57	-	-	Insufficient evidence
Households	0.39	0.11-0.2	0.19-0.32	Very Low

Given the reported unreliability of the Wellington data and models, I would feel more comfortable in adopting for the computation of growth factors, an inferred set of trip rates drawn from other studies, as they seem to be reasonably compatible regarding the relative influence of the different parameters.

It would also be very helpful to find historic evidence of the growth in commercial vehicle travel in Wellington (query?). Perhaps also vehicle fleet data? (10.2.1, WRC)

Vans and utes

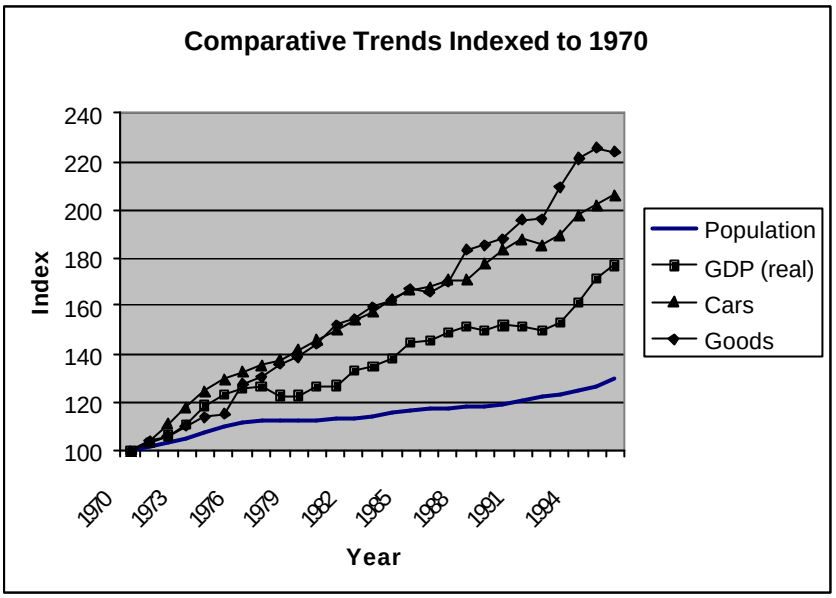
Forecasting options appear to be:

- using some variant of the CV formula (some of the international papers give comparative formulae for different vehicle categories),
- and perhaps also including an economic growth term (cf the UK approach).

It would again be helpful to obtain data on growth – conceivably base this on the vehicle fleet? (10.2.2, WRC)

General Growth Trends

As the following graph of NZ trends shows, the commercial vehicle fleet has grown as rapidly as the car fleet, much more rapidly than either GDP or populations (and therefore, we may presume, employment). The suggestion is therefore that simply forecasting growth on the basis of employment may underestimate the growth in truck travel.


Comparative Trends Indexed to 1970
240
220
200
180
160
140
120
100
Index
1970
1973
1976
1979
1982
1985
1988
1991
1994
Year
Population
GDP (real)
Cars
Goods

B-12. Task 2.12 Use of Intercept Matrix Data & Task 1.9 Combined Data Processing

B-12.1 Introduction

There are four activities to be specified:

- providing trip data for model estimation, which requires a decision on what data to use for this purpose;
- providing a base road matrix for assigning to obtain costs for model calibration (Task 8.3), and in the process checking for bias in the observed trip data; this task could include averaging with the WTSM I matrix;
- providing best estimate matrices for model application;
- *processing census j-t-w data in a way which enables project models to access geographically detailed data (this is cancelled).*

All of this assumes that the data are coded to the new zone system or, alternatively, that TLAs can be identified.

B-12.2 Data Sources

Purpose/Mode	Car	Public Transport	Other Modes
HBW	Household *Census*	Household *Census* Public Transport	N/a
HBEd	Household School	Household School Public Transport	N/a
Other purposes	Household	Household Public Transport	N/a
Resident external	Household External roadside	N/a	N/a
All purposes	Household WTSM I	N/a	WTSM I for CVs

N/a: not applicable

Bus ETM data: presently assume that this will not be useful for matrix development, unless WRC comes up with something new.

B-12.3 Establish General Data Consistency

All of the comparisons of data sources which follow are envisaged to be based on:

- an aggregated TLA to TLA expanded matrix; for this we need some concept of the sampling errors associated with each survey (for this I suggest we use my sampling error spreadsheet, assuming uniform sampling for each survey, and assume that the variance of the difference between 2 samples = sum of the variances of the individual samples and use a simple t-test of 95% significance);
- a frequency distribution of matrix cells by number of sampled (unexpanded) trips (to compare survey coverages).

Comparisons:

- (11.4.1) public transport trips: compare volumes in a TLA-TLA matrix and trip frequency distributions, for each purpose:
  - comparison of rail trips in household and rail surveys by purpose;
  - HBEd: comparison of education school and public bus trips by school age children between the household and school surveys;

- (11.4.2) car trips:
  - HBEd: *while we could compare education trips by school age children between the household and school surveys, this would require some thought, as it encompasses car passenger and escort trips; as we have no intention of using the car trip data from the school survey in the matrices, we shall omit this comparison*,
  - External: see (11.6)
  - all purposes, peak and off-peak periods separately: compare volumes in a TLA-TLA matrix for the household survey versus WTSM I (2001[1]); note that we need to obtain the relevant matrix; note that we need to agree on the time definitions for peak and interpeak.

Conclusions from this analysis will establish/confirm:

- that the intercept data provide much better matrix coverage, and will quantify this;
- whether the surveys are consistent, at the TLA level, ie the numbers of trips are not statistically different.

B-12.4 Model Estimation – Distribution and Mode Choice

It remains my view that we shall only use the household survey for model estimation because:

- there is a common sampling rate (I am not clear how easy it is to estimate models on raw data where the sampling rates vary markedly);
- there are common segment definitions (there are differences with the other surveys, most notably the census);
- it is standard practice.

(11.3.1) Nonetheless this should be reviewed.

B-12.5 Best Estimate Public Transport Matrices for Model Application

Our sole interest is in public transport trips, as these have low samples in the household survey. Unless the census is to be used, our other sources of public transport trip data are the school and rail surveys (which I will refer to as 'intercept' data). We need a means of improving the synthetic matrices on the basis of the higher sample intercept data.

[1] We would wish to use a WTSM 1 forecast matrix for 2001. If this is not available, then we shall have to use the 1996 matrix and apply a uniform factor to bring it up to the total traffic levels in the 2001 survey data, but this will give us somewhat less confidence in using the WTSM 1 matrices.

- **Sampled PT trips in three surveys are shown in the table.**

Survey	Mode		
	Rail	Public Bus	School Bus
Household	724	827	338
Rail	5500	-	-
School	161	259	445

Best estimate observed matrix

What follows is on a 'main mode' basis, so avoiding double-counting.

Because the synthetic matrices are for all public transport modes combined, it seems simplest if we create a best estimate observed public transport matrix by combining best estimate rail and bus matrices.

The best estimate rail matrix is simply that from the rail survey – there is nothing to be gained from combining this with the household or school surveys whose samples are so much smaller.

For public bus (and school bus if needed - 11.5.1) the household and school data can be combined for school age education trips[2] using an inverse variance approach (if there is a fully consistent HBEd definition for the 2 surveys) then added to the other public transport trips from the household survey.

The bus and rail matrices can then be summed.

For the above we need the expanded matrix and the sample matrix for later processing.

Combining with the synthetic matrix

The process of using these other matrices will be as follows:

- we shall produce a synthesised set of matrices for 2001 solely from models developed on the household survey;
- using some sort of Bayesian averaging (to be specified – 11.5.2) we will combine this with the observed public transport matrix to get a best estimate base matrix[3];
- from the ratio of the best estimate matrix to the synthetic matrix, we obtain a series of matrix factors which can also be applied to the forecast matrices; our confidence in these factors at a zonal level will be small, so we shall need some sort of geographic aggregation (matrix 'sectors') and this will help ensure that the factors are not too diverse and do not generate sillies in the forecasts.

[2] We can only combine the school and household survey bus matrices if we can isolate school trips from tertiary education trips (on which we have no supplementary data) in the household survey.

[3] My preference would only be to combine cells where the sample of observations in the cell is much higher than that obtained from the household survey (ie we do not want to combine synthetic and household data).

B-12.6 Best Estimate Car Trip matrices for Base Assignment and Model Application

This concerns use of the external roadside surveys. School survey car trips will not be used.

B-12.6.1 External CV trips

In the base year, external CV trips will simply be added to the prior CV matrices by time period, entirely replacing unreliable synthetic estimates. (Forecast year matrices will be derived using growth factors.)

B-12.6.2 External car trips

Non-residents' home-based car trips are not duplicated with any other data source and will be processed to give trip matrices by time period:

- these will be added to the residents' household survey trip matrices to give fully observed base matrices of all car travel;
- the matrices will be also be added to the synthetic modelled matrices in base and future years (in the latter, after growth procedures have been applied[4] – note required 11.6.1);

Residents' home based trips duplicate the household survey, but it is likely that their sampling rate is much higher than the household survey:

- for the observed base matrix, they will replace the household survey data in the trip matrices (as CVs);
- for the synthesised matrix, we shall need to ensure that it reproduces these observed external trip patterns; task: compare expanded residents' home based trips in the household and roadside surveys (11.6.3); in application, a similar approach to that for the public transport matrices may be appropriate;

- non home based trips: these partially duplicate the household survey combining residents' and non-residents' trips:
  - for the observed base matrix, these trips will simply replace external household survey trips;
  - for the synthesised matrices, we shall need to examine the consistency with the household data before reaching a decision (11.6.4); there are a few options:
    - attribute a proportion of these trips to non-residents and apply the same methods as for home-based trips;
    - treat them all as residents' trips;
    - remove all external trips from the synthetic matrices and replace by the external matrices (growthed up as appropriate).

B-12.6.3 Trip Attractions

During this process, the opportunity should be taken to extract the study area trip attractions by purpose for non-residents for the attraction model calibration.

[4] A simple treatment of external traffic is justified primarily if this traffic is expected to have a small impact on most policy issues.

B-13. Task 2.14 Model Structure Simplifications

B-13.1 Introduction

The final attempt to specify this is described in section 13.3 – it has been rejected because there are uncertainties over its forecasting performance and acceptability which cannot be resolved without considerable further work and because its non-standard form may not win the support of external reviewers. The modelling approach will be as described in the Technical Design, with the modifications discussed below in section 13.2.

B-13.2 Modifications/Refinements to Methodology

Car Ownership

This will accord with the technical design, but we will review whether some of the 'bells and whistles' can be foregone (eg accessibility effects), our general perspective being that there are good reasons to adopt a simple cost-effective method here:

- population, family structures and cars are not expected to change markedly over the forecasting period;
- the forecasts of household formation and household structures are expected to be subject to significant uncertainties for Wellington.

Family Structure

We propose to adopt a variant of the simplification proposed in the technical design appendix, as illustrated in the figure below.

The objective is to produce for each transport zone in the forecast years the distribution of persons by person type and by household category. As illustrated in the figure there are 7 person types and 14 household categories.

The base year distribution for the study area is available from the household survey, and it would be worth checking the TLA distributions (for stability and variation).

MERA will provide zonal forecasts for the 7 person types in future years. They will also be asked to provide household forecasts for 5 categories:

- 1 adult, retired
- 1 adult, not retired,
- 2 adults, retired,
- 2 adults, not retired,
- 3 or more adults.

The forecasts of the car ownership model will enable these 5 categories to be expanded to the required 15 categories for each zone.

The model then uses the specifically zonal distributions of persons and households to factor the study area base year combined distribution of population by person and household types to a combined distribution for the zone.

The combined zonal distribution can then be used to forecast the trip productions by zone based on trip rates varying by these person types and to disaggregate the trip ends according to some measure of modal captivity (based on the number of adults and cars in the household).

- **Figure The Family Structure Model**

			Person Type							
Household Type					young adult		adult			
Adults	Status	Cars	infant	chld	unemployed	employed	unemployed	employed	retired	%households
1 adult	retired	0	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	1.6%	2.5%
"	"	1	0.1%	0.7%	0.0%	0.0%	0.0%	0.0%	5.1%	10.0%
"	working	0	0.0%	0.1%	0.1%	0.1%	0.1%	0.2%	0.0%	1.3%
"	"	1	0.2%	0.7%	0.6%	0.8%	0.8%	1.7%	0.0%	11.3%
2 adults	retired	0	0.1%	0.4%	0.2%	0.2%	0.0%	0.0%	1.8%	1.8%
"	"	1	0.1%	0.3%	0.6%	0.9%	0.0%	0.0%	12.2%	9.0%
"	"	2	0.4%	1.9%	0.4%	0.6%	0.0%	0.0%	3.2%	7.2%
"	working	0	0.3%	1.4%	0.9%	0.4%	1.4%	0.9%	0.0%	4.2%
"	"	1	0.7%	3.7%	1.1%	2.1%	3.7%	4.6%	0.4%	16.8%
"	"	2	0.5%	2.5%	1.7%	2.5%	5.8%	6.4%	0.0%	21.0%
3 adults	-	0	0.0%	0.4%	0.1%	0.3%	0.2%	0.6%	0.4%	1.5%
"	-	1	0.1%	0.4%	0.3%	0.3%	0.4%	1.8%	0.7%	3.0%
"	-	2	0.2%	1.1%	0.5%	1.1%	1.0%	2.2%	1.8%	6.0%
"	-	3	0.3%	1.3%	0.6%	0.8%	1.5%	1.7%	2.7%	4.5%
		%persons	3.0%	15.0%	7.0%	10.0%	15.0%	20.0%	30.0%	100.0%

Formula

$$P'_{ij} = P'_i * P_{ij} * (H'_j/H_j) / S_k P_{ik} * (H'_k/H_k)$$

where
P_{ij} is the proportion of persons of person type i in household type j
H_j is the number of households of type j
Supercript ' refers to future

B-13.3 Final Rejected Attempt at Simplified Model

B-13.3.1 Rationale

It seems sensible to consider simplifying the modelling approach, because:

- In the present model form, there is a requirement to develop forecasts of the number of households and a family structure model, neither of which appears satisfactorily managed in the present model;

- households are presented in models because of the contribution of household car ownership to explaining trip generation and mode choice; in NZ, it is expected that the future rate of increase in car ownership will be relatively small, as will be its effect on future travel patterns.

The proposed simplification involves dropping any consideration of households in the model, and consequently modifying and simplifying the car ownership and trip end model specifications.

■ **Standard Model Specification**

Model	Household Component of Specification
Trip production	Those for non-work trips (HBSh, HBS0, NHBO) were potentially expected to have household terms in the person trip rates. Also expected to have car ownership (mobility) terms.
Car ownership	Forecasts households with 0, 1, 2, 3+ cars based on household income.
Family structure & car availability	In order to segment trip productions into car availability categories, the family structure model is required to disaggregate the demographic data to estimate the number of persons of each type (in each zone) in each car availability category.

The proposed simplifications to this structure are as follows.

■ **Simplified Model Specification**

Model	Household Component of Specification
Trip production models	❑ household terms in the person trip rates are dropped on the reasonable presumption that they are second-order; ❑ car ownership (mobility) terms re-specified as 'cars/adult'
Car ownership and family structure	❑ these are collapsed into a modelling process in which car ownership and availability are measured in relation to 'cars/adult'.

In the following sections we develop the specification of the simplified model, and identify data analyses ("tasks") which will either (i) assist in its justification or (ii) enable its specification to be confirmed.

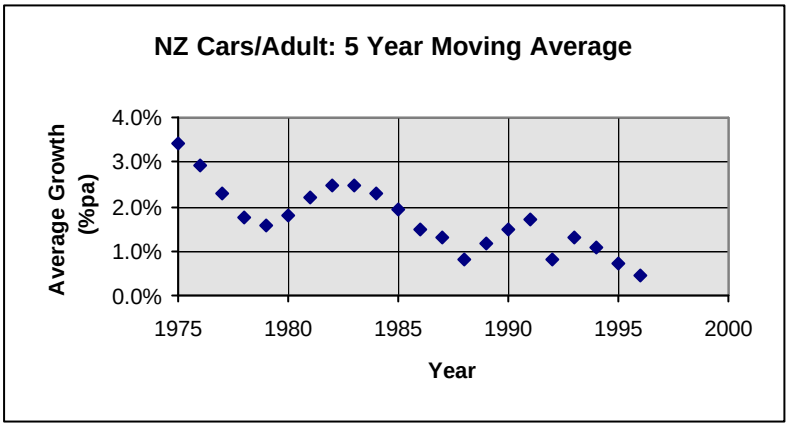
B-13.3.2 Evidence on Car Ownership Growth

BAH data on historic NZ car ownership trends show a rapid fall of in smoothed (5 year rolling average) annual growth rates, dropping to below 0.5%pa in the period 1991-1996. BAH median forecasts for the period 2001 to 2021 are for a 13% increase in NZ car ownership.

The cross-sectional car ownership forecasts of the present Wellington Transport Strategy Model are for an 8% increase over 20 years.

NZ average cars/head in 1996 was 0.52, with Wellington being similar to this national average.

Task 1: Data on the trends in car ownership between 1996 and 2001 are required to confirm that a continuing low growth rate is plausible. *Checks show that cars/person increased by 2.3%pa over the period. However, in May 1998 car import duties ceased, with a consequent large car price reduction. Car ownership rose by 3.8% and 5.3% to June 1998 and 1999 respectively, seemingly as a result. If these years can be discounted, the growth rate in the other 3 years averaged less than 1%pa.*



B-13.3.3 Specifying the Simplified Model

Step 1. For 2001, we can estimate cars/adult for every transport model zone (from census car ownership and population data, the latter through MERA).

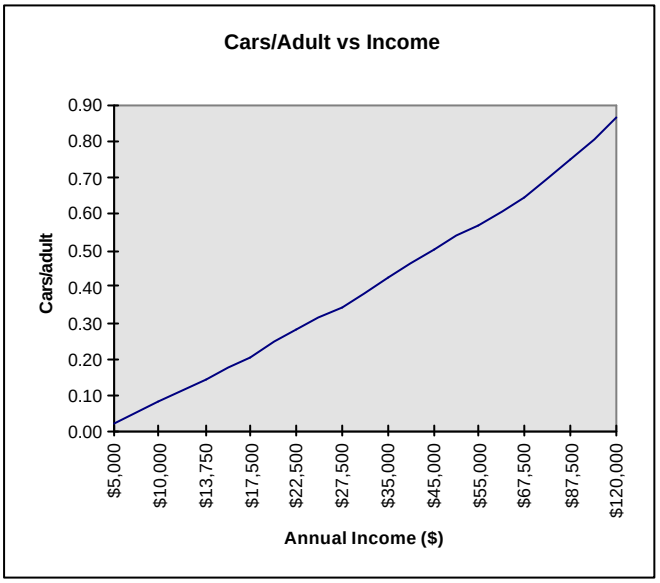
Step 2. Forecasts of NZ cars/person can be obtained from an updated version of the BAH trend car ownership forecasting model. Wellington car ownership levels conveniently correspond to the national average enabling the national trend in cars/person to be used with reasonable confidence (**Task 2:** check that this comparability continues to apply for 2001.*)*

Step 3. This forecast can be converted to cars/adult in Wellington region using MERA population segment forecasts.

Step 4. To convert the regional estimate of cars/adult to the required zonal values, we could simply assume that the zonal trends are the same as the regional value. But it seems preferable to allow for higher growth in areas where the cars/adult values are presently lower than average (a feature of most car ownership models).

This is possible using a relationship (shown below) of cars/adult with household income easily determined from the household survey data, for which the income elasticity reduces as income and cars/adult increase. The process would be:

- for a given regional growth in cars/adult, estimate from the curve the equivalent (implied) % change in income;
- then when applying this to individual zones, use the zonal cars/adult to determine the equivalent zonal income, increase this by the regional % and then read off the new cars/adult from the curve;
- this process will lead to higher increases in cars/adult for zones with low current car ownership levels.



Task 3: Roughly prepare this curve from the household survey data and check that the elasticities are as expected.

Step 5. The trip production model will be on the basis of person types, with trip rates for a particular purpose given by:

$T_{ph} = \alpha_p + \beta_p.CA_h$

where:
T_p is trip rate for person type p in household h
α_p is fixed trip rate for each person type p
β_p is coefficient of cars per adult CA_h

This specification differs from the household-based model in that the 'mobility' effect would be based on the number of household cars. We considered whether to use cars, cars/person or cars/adult as a mobility parameter and concluded that cars/adult seemed likely to be at least as good a measure of mobility effects on trip rates as the others. It combines availability (the number of cars) with competition for their use (the number of adults) and these two factors a together are likely to contribute to increased mobility. Given this choice, the simplification is to express the mobility term as a linear function. (**Task 4**: do a preliminary calibration for 1 or 2 person types on 1 trip purpose, say HBSh + HBSo + HBO, to check these statements.)

Step 6. To accumulate the trip rates to zonal trip totals for each person type, we have to accumulate the cars/adult applicable to each person type (the second term in the trip rate formula).

In earlier steps we have computed the zonal cars/adult values. We It seems likely that because person types are not uniformly distributed across households, the cars/adult for the set of households applicable to a particular person type will differ from the overall average. We propose to assume that these differences do not vary by zone or between base and forecast years. Therefore, we will compute cars/adult values in

2001 at a regional level for each person type and assume that the % differences from the overall average apply to transport zones in the base and forecast years[5].

Mathematically:

$$CA^{y}_{pz} = CA^{y}_{z} * F_{p}$$

where:
CA^{y}_{pz} is the cars/adult for person type p in zone z in year y
CA^{y}_{z} is the cars/adult for zone z (step 3) in year y
F_p is a regional average factor for person type p held constant in forecasting

Task 5: Check by computing values for cars/adult for each person type and overall, for each TLA in the region; repeat calculation for 4 different income categories (using income as an indicator of change in forecast years).

Step 7: The final step is to disaggregate trip productions into car availability categories. In both the standard and simplified approaches, common plan is to define car availability (ca) by the household characteristic:

Captive	cars/adult = 0
Competition	0 < cars/adult<1
Choice	1 ≤ cars/adult

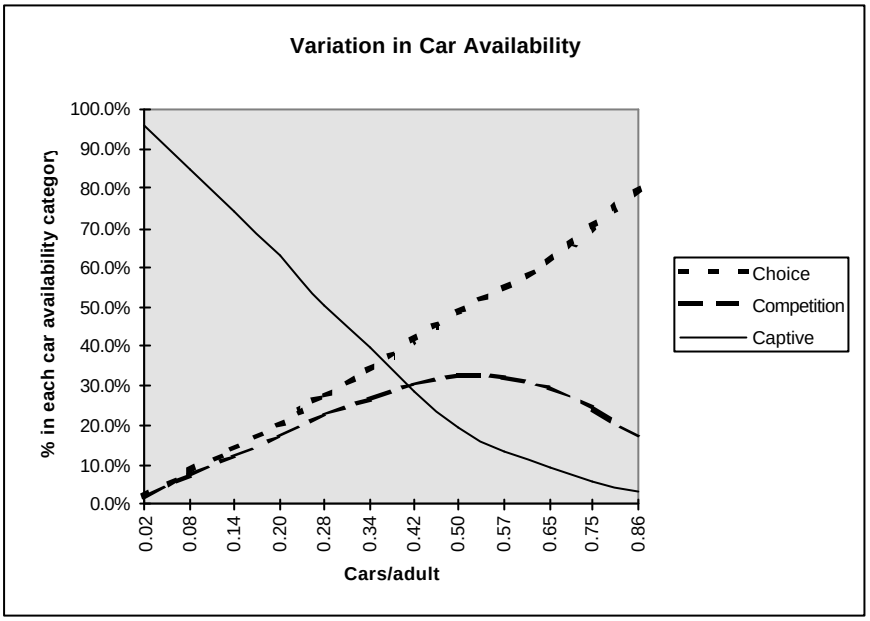
We propose to do this at an aggregate zonal level by establishing a relationship between trip car availability and cars/adult. This is achieved by household survey tabulations:

- for each purpose and person type, tabulate person trips by household car ownership, number of adults and income group;
- then, for each income group, aggregate the person trips into car availability categories using the no. of adults and car ownership; also for each income group compute the average cars/adult from the same information;
- the car availability-cars/adult graphs can then be produced.

Task 6: test this out for one trip purpose and two person types.

In forecasting, given the zonal cars/adult for persons of a particular type for a particular trip purpose, the allocation of trip productions to car availability categories can be made.

[5] All this is hypothesising is that, for example, unemployed adults are somewhat more likely to be in low car owning households than adults, and that this can reasonably be assumed to apply in all situations.



B-13.3.4 Discussion

The following issues were recorded at the recent client/consultant meeting:

The Advantage, Disadvantages and Issues associated with this simplified approach are outlined as follows:

Advantages

- *Simpler in concept*
- *Consistent person trip approach throughout the model structure*
- *Saving in cost of car ownership and family structure models*
- *MERA (Land Use Forecast) savings*

Disadvantages

- *Policy impact on car ownership*
- *Effect of changing family size*
- *Household structure effects on trip generation*
- *New approval risks associated with the peer review*
- *Impact of accessibility on car ownership*

Issues

- *Importance of future car ownership growth.*
  - *Check 2001 census and historic trends*
  - *Check BAH projections*
- *Review household effects on person trip generation in initial tabulations or earlier.*
- *Check out list of WTSM applications and policies.*

The project team confirmed that sufficient confidence was required to confirm that this was the right approach. As part of the preliminary studies Task 2.14 - Model Structure Simplifications the technical specification need to be developed further to cover the issues above and confirm if this approach is appropriate for the New WTSM

The above points will need to be responded to, with the attached table giving some initial reactions.

Issue	Response
Advantages	
Simpler in concept	Very much simpler.
Consistent person trip approach throughout the model structure	Person-based throughout.
Saving in cost of car ownership and family structure models	Substantial savings.
MERA (Land Use Forecast) savings	No requirement to forecast households or household structures.
Disadvantages	
Policy impact on car ownership	There are no policy parameters in the present model, except insofar as accessibility is material. However: ❑ the validity of the parameter values are anyway open to question, and the model is almost certainly insensitive to it; given the expect low potential growth in car ownership, the accessibility effect might be expected to be small; ❑ the additional iterations required to balance the model would be expensive; ❑ has it ever been run in the way? The revised approach includes car price effects in the forecasts.
Effect of changing family size	Household trip rate models include family size in order to allow for the number of persons in the family. Our proposal models the number of persons directly and thus obviates this requirement. A theoretical but rather improbable issue is whether person trip rates are lower for large families if some activities (like shopping) are pooled. As this is likely to be a small effect, we are confident that it can be ignored.
Household structure effects on trip generation	As for family size, most of the household structure effects are covered in the person segmentation.
New approval risks associated with the peer review	Yes.
Impact of accessibility on car ownership	See above.
Issues	
Importance of future car ownership growth	Task 1.
Review household effects on person trip generation in initial tabulations or earlier.	Task 4, for mobility effects only.
Check out list of WTSM applications and policies	?

B-14. Task 2.15 Park-&-Ride

B-14.1 Data Analysis

WRC has done a survey specifically aimed at park-&-ride, which we need to obtain and analyse before reaching any final conclusions (14.1.1).

We should also analyse the rail survey for information on parking at stations (where, from how far away?) (14.1.2).

(14.1.3) We also need from WRC a classification of stations based on their parking facilities and price, if appropriate (this may be available from timetables or other public information).

B-14.2 Methodology

There are essentially two different issues to consider:

- ensuring that our public transport network is capable of realistically representing the relationship between rail users and the rail network, which means representing station catchments areas and access times realistically;
- developing methods able to forecast the impacts of park-&-ride initiatives.

We must achieve the first of these, whereas the second is not a priority.

B-14.3 Network Representation

This all comes down to how we link zones to the public transport network and, in particular, the rail network.

Most access will be by walk links.

For large zones or zones away from the station, this may not be feasible and, typically, the zone would be connected to the nearest bus service or, alternatively, some long centroid connector would be coded to which an access time (and perhaps cost) is attached. But connecting to the nearest bus service will not be sensible if most long distance access is by car – it will over-estimate the deterrence of the access link – and this is of special concern if the access time is further weighted by 2!

So we need to review how zones are connected to the stations in the present network (14.3.1) to identify where there are direct (mainly walk) connections and where there are indirect bus connections.

I do not believe that the assignment will be able to share station access traffic between bus, walk and car sensibly, so it seems likely that our best bet would be to determine an access time function of access distance to code onto direct centroid connectors. The access time would be calculated assuming shares by the different access modes available (bus and car) from the rail survey.

In this approach, stations which are classifiable as ‘park-&-ride’, as identified from the rail survey, might have a bigger catchment area of zones.

B-14.4 Park-&-Ride Policy

It seems to me that this is about catchment areas, improved rail level-of-service and perhaps cheaper fares[6] at these stations. The approach described above might provide the basis for looking into different catchment areas especially if the rail survey analysis indicated that stations with particular facilities/services win a larger catchment.

[6] Where people drive nearer to the CBD to catch the train.

B-15. Task 2.16 Ports and Airports

B-15.1 Scope

The principal reasons for wanting to give these areas special treatment are:

- their traffic generation is unique;
- much of the traffic may not be included in the household survey (eg air and ferry passengers arriving from elsewhere);
- they are a major source of CV trips.

B-15.2 Air Passengers

We can construct a supplementary model for travel demands from the airport if we have annual air passenger numbers and forecasts, current information on access mode shares (distinguishing car driver and passenger and taxi particularly) and preferably information on where air passengers live (ie residents or non-residents of Wellington region). We would also like the time profiles of passenger arrivals and departures (or alternatively flight arrival and departures so we can map time profiles onto the data. Model 'calibration' would be assisted by obtaining traffic counts (by time of day) on the airport approach road(s). So the first thing is to find out what data are available (15.2.1) – the ideal would be to be able to commission some simple tables from an air passenger survey.

In application, there are the following types of personal traffic accessing the airport:

- air passengers non-residents,
- air passengers, residents,
- meters and greeters,
- airport worker commutes,
- other business sightseer trips.

In principal only the first of these is missing from our data base. However, the trip attraction rates from a conventional trip end model would not reflect the particular characteristics of the airport, and the extra information would enable these to be improved.

B-15.3 Ferry passengers

The issues are similar to airports, but the traffic generation is usually much smaller. Our concern is only with those ferries which serve non-residents, not local ferries.

B-15.4 Commercial vehicles

If we could get information from a count 'cordon' on the CV trip generation, this could be used to improve the trip matrices.

B-16. Task 2.17 Role of WTSM and Project Models

A discussion of WTSM's role in project applications is required, recognising the potential range of applications. A provisional list follows:

- roading infrastructure projects, with or without tolls;
- public transport infrastructure projects (here I assume that the focus is rail, because of the difficulties in modelling local bus services);
- policy projects (ie the detailed assessment of implementation of policy measures).

The purpose is to assure that the proposed specification of the new model will provide the foundation for later project work.

B-17. Inputs to Model Calibration

This short paper notes the data that we will need prior to starting model calibration.

All sub-models:
- matrix sectorisations for diagnostic analyses, including CBD definition;
- time period, purpose and segment (person type, household type, vehicle type, car availability) definitions.

Trip productions:
- household survey: processed, unexpanded.

Trip attractions:
- household survey: processed, expanded and bias corrected;
- external survey and rail survey, processed and expanded: to extract the internal attractions of non-residents (see Task 13);
- planning data: zonal population and employment by category, land area and other zonal activity indicators (shopping centres by type, key recreational attractors etc);
- *ports and airports analysis.*

Car ownership:
- household survey: processed, unexpanded;
- census car ownership by zone (for each of the 5 household types: no. of 0 car, 1 car, 2 car, 3+ car households and total cars – ***definition of 'cars'***);
- processed networks: if we are to examine accessibility; (further we need to generate some aggregate time period accessibility values;)
- expanded household data for sample enumeration?

Car ownership trend model:
- update the data bases on which this was based
- ***specify required data***

Distribution/Mode Choice:
- household survey: processed, unexpanded;
- household survey: processed, expanded and bias corrected;
- *non-residents trip matrix from external rail and road surveys?;*
- processed networks.

Family structure:
- household survey: processed, expanded and bias corrected.

Time period factors:
- household survey: processed, expanded and bias corrected.

Processed networks:
- completed networks;
- base road network calibration to get journey times; requiring validation counts and speeds;
- specification of generalised costs, in turn covering such issues as parking, fares etc.

This is summarised in the table, with the nomenclature I hope being obvious.

Data Source	Sub-Model					
	P	**A**	**CO**	**DMS**	**FS**	**TPF**
Household survey, unexpanded	X		X	X		
Household survey expanded		X	X?	X	X	X
External surveys		X		X		
Planning data		X				
Processed networks			X?	X		
Census data			X			