▪ report

Smart Growth - Refined Transport Modelling

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Prepared for
Smart Growth

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November 2002

Revision History

Revision Nº	Prepared By	Description	Date
A	Alex Gu		

Document Acceptance

Action	Name	Signed	Date
Prepared by	Alex Gu		
Reviewed by	Andrew Murray		
Approved by	Robert Jamieson		

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1 Introduction

1.1 Report Purpose

This report summarises the second phase of transport modelling for Smart Growth, which includes model refinement and analysis of the refined 2051 scenarios. It describes the refinement of the transport model, the scenarios tested and the results obtained.

1.2 Model Scope and Purpose

The purpose of the transport model was as follows:

- Predict Vehicle Demands in key corridors to assist in scaling the strategic road network capacity;
- Respond to alternative growth scenarios;
- Include the potential effects of significantly enhanced Public Transport infrastructure and services.

The refined model was developed from the preliminary model for the subsequent detailed analysis (please refer to ***Smart Growth – Preliminary Transport Modelling***).

2 Model Development

2.1 Approach

The general approach taken was to develop the strategic model using as much data from the existing Tauranga Transportation Model (TTM) as possible. In fact, the refined model was a 'stripped down' version of the current TTM model, where data (land use) input was simplified, the network detail was simplified and run times were significantly reduced. However, it has more network details than the preliminary model does. In the same way as the existing TTM model, the trip generation model was implemented in a spreadsheet, with distribution and assignment being developed via the TRIPS modelling software.

2.2 Tauranga Transport Model

The existing TTM can be summarised as follows:

- 3-Stage vehicle model (generation, distribution, assignment);
- Base year 1996, forecasts 2001, 2006, 2011 and 2016;
- Peak period models (am peak, inter peak and pm peak), with detailed networks and intersection modelling;
- 222 traffic activity zones.

2.3 Smart Growth Refined Model Structure

The structure of the Smart Growth model can be summarised as follows:

- Large growth sectors (40 zones);
- Strategic Network only;
- Trip Generation using TTM trip rates;
- Trip Distribution as per TTM;
- Trip Diversion to Public Transport;
- Assignment to network for three peak periods, but with daily flow estimates created from weighted sums of the peak flows.

2.4 Zone System

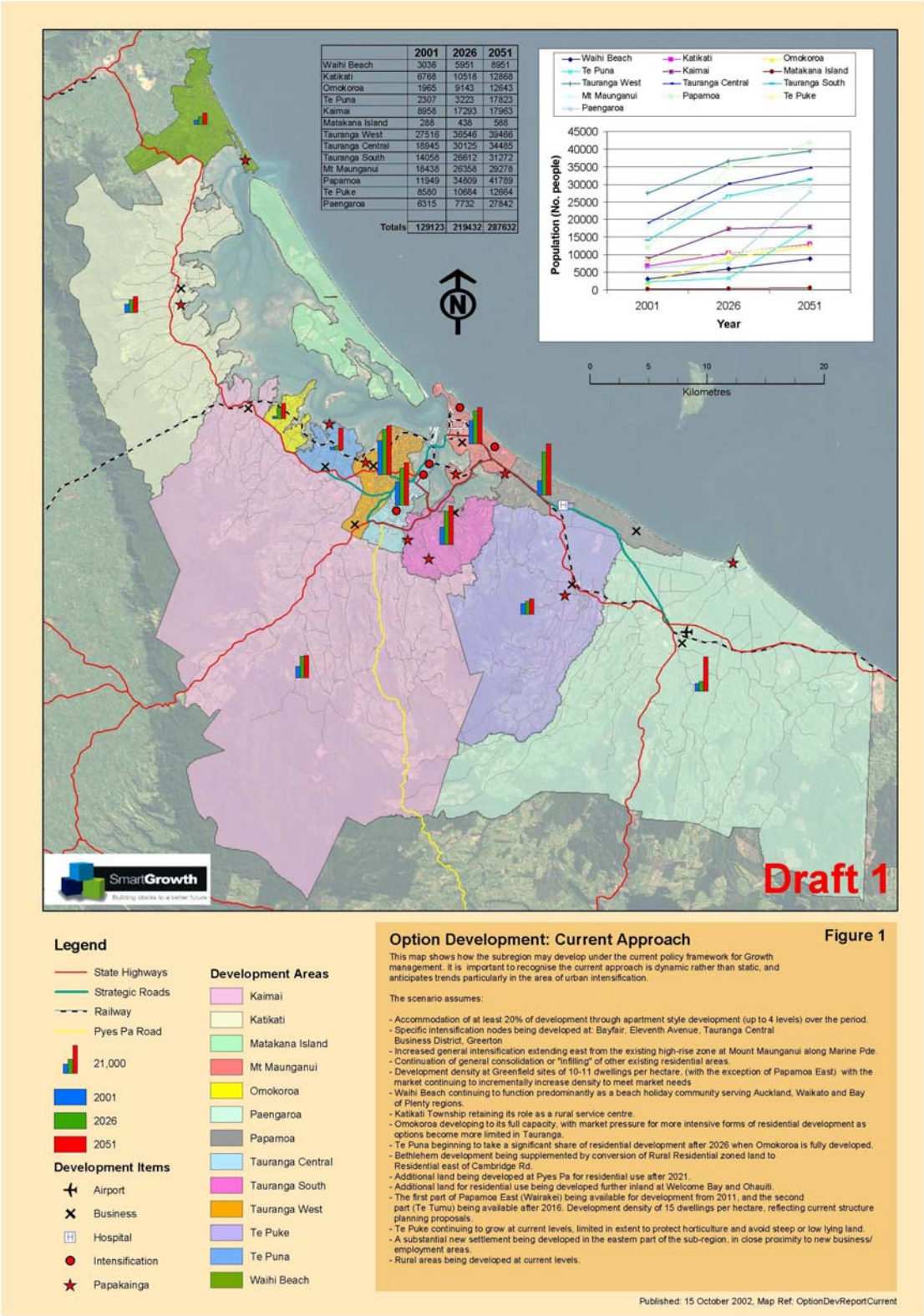
The model was developed around the 13 growth sectors identified by Smart Growth (see **Figure 2.1**). It was found that these growth sectors were too large to provide sensible traffic loading points onto the road network if modelled as single zones. Subsequently some of the Smart Growth sectors were split into smaller zones to provide more realistic loading points. Future land use forecasts were to be provided by Smart Growth only for the 13 sectors and hence this data was split to the smaller zones based on the forecast 2001 proportions in the TTM. This resulted in 30 internal traffic zones in the refined model. Ten external zones were also added as shown in **Figure 2.2** and **Table 2.1**.

Table 2.1

Traffic Zones

Smart Growth Sectors	*Traffic Model Zones*
Waihi Beach	1, 30
Katikati	2
Matakana Island	29
Omokoroa	4
Te Puna	5
Kaimai	3, 6, 14,15
Tauranga West	7, 16, 21, 22
Tauranga Central	8, 17, 18, 23, 24, 25
Tauranga South	9, 26
Mt Maunganui	10, 19, 27
Papamoa	11, 20, 28
Te Puke	12
Paengaroa	13
External Zones	31 - 40

Figure 2.1


2001 2026 2051
Waihi Beach 3036 5951 8951
Katikati 6768 10518 12868
Omokoroa 1965 9143 12643
Te Puna 2307 3223 17823
Kaimai 8958 17293 17963
Matakana Island 288 438 588
Tauranga West 27516 36546 39466
Tauranga Central 18945 30125 34485
Tauranga South 14058 26812 31272
Mt Maunganui 18438 26358 29278
Papamoa 11949 34809 41789
Te Puke 8580 10684 12664
Paengaroa 6315 7732 27842
Totals 129123 219432 287632
Waihi Beach
Katikati
Omokoroa
Te Puna
Kaimai
Matakana Island
Tauranga West
Tauranga Central
Tauranga South
Mt Maunganui
Papamoa
Te Puke
Paengaroa
Population (No. people)
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
2001
2026
2051
Year
N
0 5 10 20
Kilometres
SmartGrowth
Draft 1
Legend
State Highways
Strategic Roads
Railway
Pyes Pa Road
21,000
2001
2026
2051
Development Items
Airport
Business
Hospital
Intensification
Papakainga
Development Areas
Kaimai
Katikati
Matakana Island
Mt Maunganui
Omokoroa
Paengaroa
Papamoa
Tauranga Central
Tauranga South
Tauranga West
Te Puke
Te Puna
Waihi Beach
Option Development: Current Approach
Figure 1
This map shows how the subregion may develop under the current policy framework for Growth management. It is important to recognise the current approach is dynamic rather than static, and anticipates trends particularly in the area of urban intensification.
The scenario assumes:
- Accommodation of at least 20% of development through apartment style development (up to 4 levels) over the period.
- Specific intensification nodes being developed at: Bayfair, Eleventh Avenue, Tauranga Central Business District, Greerton
- Increased general intensification extending east from the existing high-rise zone at Mount Maunganui along Marine Pde.
- Continuation of general consolidation or "infilling" of other existing residential areas.
- Development density at Greenfield sites of 10-11 dwellings per hectare, (with the exception of Papamoa East) with the market continuing to incrementally increase density to meet market needs
- Waihi Beach continuing to function predominantly as a beach holiday community serving Auckland, Waikato and Bay of Plenty regions.
- Katikati Township retaining its role as a rural service centre.
- Omokoroa developing to its full capacity, with market pressure for more intensive forms of residential development as options become more limited in Tauranga.
- Te Puna beginning to take a significant share of residential development after 2026 when Omokoroa is fully developed.
- Bethlehem development being supplemented by conversion of Rural Residential zoned land to Residential east of Cambridge Rd.
- Additional land being developed at Pyes Pa for residential use after 2021.
- Additional land for residential use being developed further inland at Welcome Bay and Ohauiti.
- The first part of Papamoa East (Wairakei) being available for development from 2011, and the second part (Te Tumu) being available after 2016. Development density of 15 dwellings per hectare, reflecting current structure planning proposals.
- Te Puke continuing to grow at current levels, limited in extent to protect horticulture and avoid steep or low lying land.
- A substantial new settlement being developed in the eastern part of the sub-region, in close proximity to new business/ employment areas.
- Rural areas being developed at current levels.
Published: 15 October 2002, Map Ref: OptionDevReportCurrent

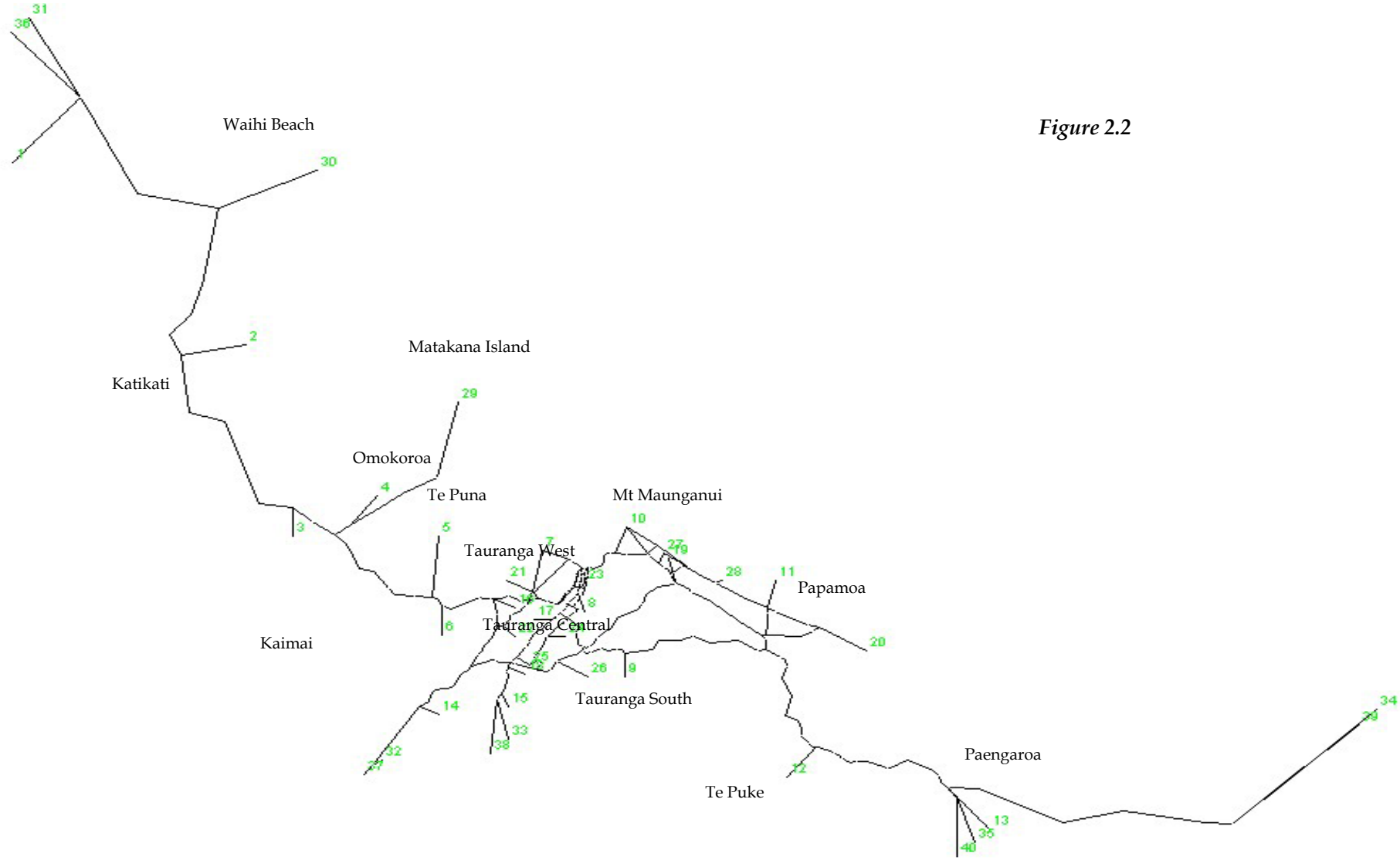

31
36
Waihi Beach
30
2
Matakana Island
Katikati
29
Omokoroa
4
Te Puna
Mt Maunganui
10
3
5
7
Tauranga West
27
19
28
11
Papamoa
21
23
8
17
Tauranga Central
6
20
Kaimai
25
22
26
9
Tauranga South
14
15
33
38
32
37
34
39
Paengaroa
12
Te Puke
13
35
40

Figure 2.2

2.5 Network Detail

The level of network detail included in the model was developed to match the zone size. Generally only the key State Highways and major arterials were included, although some principle-type roads were also included where required to provide more accurate traffic loadings. The level of network detail is indicated in **Figure 2.2**.

2.6 Trip Generation

The TTM household-category model was used to develop the trip ends for each sector. The land use forecasts for the 13 Smart Growth sectors were expanded to the 222 zones and the 16 household categories using the same proportions as found in the 1996 TTM census land use data. The use of the 1996 household proportions was the key assumption, as it assumed no change in household composition or car ownership. Without more formal prediction models it was believed to be adequate for this strategy analysis.

The existing model uses households rather than population. The Smart Growth population forecasts were converted to household forecasts, using the TTM 2001 land use data.

The model outputs are 24-hour trip ends (productions and attractions), by purpose for each sector. The purposes in the model are:

- Home-based work (commute);
- Home-based shopping;
- Home-based other;
- Non-home based;
- Commercial vehicle (includes light and heavy vehicles).

Trip rates for private travel varied between 1.8 and 11.2 per household per day across the 16 household categories. The weighted average value was found to be 5.5 trips per household, using the 1996 census distribution of household types. It is recognised that these trip rates from the TTM may not be applicable for the more rural areas to which they were applied in the extended coverage of the Smart Growth model.

2.7 Trip Distribution

Gravity models were used for each trip purpose, using the same form as in TTM. The models were re-calibrated to match the compressed 2001 trip matrices from the TTM. The re-calibrated models were then implemented to forecast the trip demands using the inter-zonal costs from the model network.

The size of the zones within the refined smart growth model is still relatively large comparing with the TTM. In this case the intra-zonal trips would be very important and these cannot be easily created or accurately predicted from the strategic Smart Growth

model. The very detailed TTM would provide better estimates of the intra-zonal costs. It is therefore decided to use the fixed intra-zonal costs compressed from the year 2001 and year 2016 TTM respectively.

The inter-zonal travel costs were skimmed from the model networks.

2.8 Time Period Model

Peak-hour matrices were created from the 24-hour matrices, based on the proportions used in the TTM model.

2.9 Assignment

This was undertaken in TRIPS, using speed-flow curves from the TTM. All future models used the year 2016 networks from the TTM (albeit in a simplified form). Estimates of daily flows were created from weighted combinations of the peak period flows.

The assignment process use Burrell multi-route path building and equilibrium capacity restraint.

No intersections were modelled explicitly however turn penalties output from the TTM were applied to most of them.

2.10 Public Transport

The TTM model predicts vehicle trips, as does the refined Smart Growth model. The potential diversion to public transport was estimated by applying fixed diversion rates between each sector, in line with the BAH predictions in their report:

Public Transport Viability – Western Bay of Plenty Sub-Region, Booz Allen Hamilton, August 2002.

The BAH report undertook two different methods of PT patronage forecasts for the Tauranga sub-region. One method involved applying observed modal-splits from Wellington to the Tauranga travel data and this method was adopted for use in the Smart Growth traffic model. The modal splits used were as follows:

Table 2.2

Adopted Modal Split Values

	AM Peak		***Interpeak***	
Trip Purpose	***To CBD***	***Non-CBD***	***To CBD***	***Non-CBD***
Home based work	37.5%	9.9%	22.6%	8.2%
Other	14.2%	13.3%	7.9%	5.9%
TOTAL	29.2%	12.2%	9.0%	6.0%

* It was assumed that the diverted car matrix in the PM peak was a simple transpose of the diverted car matrix in the AM peak.

The BAH report also assumed that 50% of the new PT users would be diverted car drivers (with the rest from car passengers, slow modes or new trips). In applying these values into the Smart Growth traffic model the following assumptions were made:

- The 'CBD' referred to the existing Tauranga CBD only (between 11th Avenue and Marsh Street);
- The existing modal share was assumed to be effectively 0% to PT, meaning that all future patronage would be new trips;
- The average car occupancy was 1.2;
- The above PT mode share values were assumed, with a 50% diversion rate from car drivers;
- The diversion rates for intra-zonal trips was taken as 25% of the inter-zonal values;
- The diverted car trips from the pm peak was assumed to be the transpose of the am peak diverted car matrix;
- The diverted car trips were subtracted from the vehicle matrix calculated from the trip generation and distribution models.

Typical outputs from this PT diversion model are shown in **Table 2.3.**

Table 2.3

Year 2051 Assumed PT Usage

Period	*Total Car Trips (pre PT diversion)*	*Diverted Car Trips (% of Total car trips)*	*PT Passengers*
AM peak hour	68,300	2,220 (3.3%)	4,440
Interpeak hour	64,270	760 (1.2%)	1,520
PM peak hour	71,890	2,220 (3.1%)	4,440

As suggested by BAH, the modal split values were actually adjusted downwards to allow the difference between Tauranga and Wellington. The sensitivity of the forecasted car trips to the adopted modal split values was then tested within the model. The results will be discussed in Section 5.

3 Model Validation

This model validation exercise is aimed at demonstrating the modelling ability to satisfactorily describe the existing situation. Comparisons of the modelled average daily traffic (ADT) against the observed ADT were undertaken on 32 individual links (16 count sites). The results are summarised in **Table 3.1** while the scatter plot of the comparisons is shown in **Figure 3.1**.

Table 3.1

Validation of Link Flows

Link Name	*Direction*	*Observed ADT*	*Modelled ADT*	*% Difference*
Papamoa Beach Rd	N/B	3,558	3,213	-10%
Papamoa Beach Rd	S/B	3,207	2,500	-22%
Te Maunga Rd	N/B	9,865	7,855	-20%
Te Maunga Rd	S/B	10,192	7,668	-25%
Welcome Bay Rd	E/B	1,180	1,286	9%
Welcome Bay Rd	W/B	1,184	1,125	-5%
Maungatapu Bridge	E/B	9,302	9,788	5%
Maungatapu Bridge	W/B	8,926	7,886	-12%
Tauranga Harbour Bridge	E/B	16,647	15,956	-4%
Tauranga Harbour Bridge	W/B	16,968	16,786	-1%
Chapel St	N/B	10,773	10,994	2%
Chapel St	S/B	11,279	9,040	-20%
Waikareao Expressway	S/B	12,525	11,940	-5%
Waikareao Expressway	N/B	9,493	11,076	17%
Waihi Rd	E/B	19,146	25,521	33%
Waihi Rd	W/B	18,745	23,252	24%
Cameron Rd	N/B	8,649	11,176	29%
Cameron Rd	S/B	8,615	9,602	11%
Fraser St	N/B	6,073	5,901	-3%
Fraser St	S/B	5,323	6,898	30%
Waihi Rd	E/B	11,743	11,517	-2%
Waihi Rd	W/B	11,829	11,412	-4%
Cambridge Rd	N/B	4,720	5,507	17%
Cambridge Rd	S/B	4,965	5,574	12%
SH29 west of Oropi Rd	E/B	6,588	5,667	-14%
SH29 west of Oropi Rd	W/B	6,205	5,656	-9%
SH29 west of Cambridge Rd	E/B	6,330	5,953	-6%
SH29 west of Cambridge Rd	W/B	6,276	5,930	-6%
SH2_Turret	N/B	11,075	8,366	-24%
SH2_Turret	S/B	11,868	10,158	-14%
SH2 west of Moffat Rd	E/B	9,756	10,431	7%
SH2 west of Moffat Rd	W/B	9,479	10,241	8%

Figure 3.1 Individual Link Comparisons

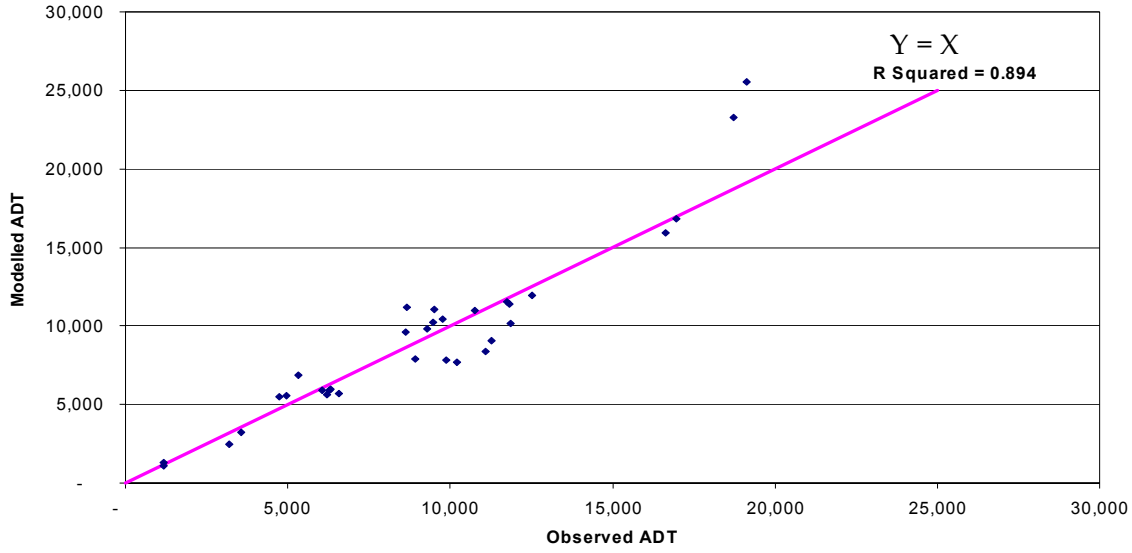


Table 3.1 shows that for 78% of the links the difference between the observed ADT and the modelled ADT is less than 20%. There is only one link where the difference is more than 30%. The scatter plot shows a good correlation between the observed ADT and the modelled ADT.

4 Land Use Scenarios

Three land use scenarios were obtained from Smart Growth, designated as High Density, Low Density and Current density. The distribution of employment was allocated at the same rate as household/population growth in each growth management area. **Table 3.1 – 3.4** provide the details of these land use scenarios.

Table 3.1

Smart Growth Land Use – 2001

Area	*Population*	*Retail Employment*	*Non-Retail Employment*
Waihi Beach	3,036	-	-
Katikati	6,768	561	1,353
Matakana	288	-	-
Omokoroa	1,965	115	309
Te Puna	2,307	81	325
Kaimai	8,958	148	1,305
Tauranga West	27,516	1,519	4,747
Tauranga Central	18,945	6,495	15,723
Tauranga South	14,058	327	1,579
Mount Maunganui	18,438	3,138	7,676
Papamoa	11,949	380	1,132
Te Puke	8,580	780	2,783
Paengaroa	6,315	173	1,216

Area	Population	Retail Employment	Non-Retail Employment
TOTAL	129,123	13,717	38,148

Table 3.2

Smart Growth Land Use – 2051 Current Density

Area	Population	Retail Employment	Non-Retail Employment
Waihi Beach	8,936	1,036	-
Katikati	12,877	1,247	2,507
Matakana	592	33	-
Omokoroa	12,863	1,350	1,348
Te Puna	17,607	1,646	1,018
Kaimai	13,308	551	1,305
Tauranga West	39,264	2,782	5,613
Tauranga Central	38,602	8,783	16,935
Tauranga South	30,679	2,236	1,868
Mount Maunganui	29,073	4,401	14,025
Papamoa	41,548	3,782	12,098
Te Puke	13,064	1,255	5,957
Paengaroa	27,757	2,402	13,625
TOTAL	286,169	31,505	76,297

Table 3.3

Smart Growth Land Use – 2051 Low Density

Area	Population	Retail Employment	Non-Retail Employment
Waihi Beach	8,936	1,037	-
Katikati	12,877	1,248	2,507
Matakana	592	33	-
Omokoroa	19,240	2,168	1,348
Te Puna	22,070	1,646	1,018
Kaimai	20,323	1,007	1,305
Tauranga West	36,129	2,473	5,613
Tauranga Central	32,055	8,019	16,935
Tauranga South	30,679	2,236	1,868
Mount Maunganui	24,427	3,799	14,025
Papamoa	38,043	3,371	12,098
Te Puke	13,141	1,266	5,957
Paengaroa	36,451	3,203	13,625
TOTAL	294,962	31,505	76,297

Table 3.4

Smart Growth Land Use – 2051 High Density

Area	Population	Retail Employment	Non-Retail Employment

Area	*Population*	*Retail Employment*	*Non-Retail Employment*
Waihi Beach	8,936	1,038	-
Katikati	13,360	1,302	2,507
Matakana	592	33	-
Omokoroa	12,863	1,905	1,348
Te Puna	3,098	165	1,018
Kaimai	13,308	552	1,305
Tauranga West	42,482	3,094	5,613
Tauranga Central	49,213	9,707	16,935
Tauranga South	34,487	2,597	1,868
Mount Maunganui	34,823	5,083	14,025
Papamoa	45,305	4,297	12,098
Te Puke	13,632	1,315	5,957
Paengaroa	10,842	417	13,625
TOTAL	282,940	31,505	76,297

5 Model Results

Five scenarios were tested within the model. They are listed as follows:

Code	Description
C	Current density forecast
C0P	Current density forecast, no public transport diversion
C0.5P	Current density forecast, only half of the predicted public transport diversion would happen
L	Low density forecast
H	High density forecast

The key model results are reported below.

5.1 Travel Statistics

The modelled travel statistics for each scenario are summarised in **Table 5.1** below. The key results are also shown graphically in **Figures 5.1 to 5.3**.

Table 5.1

Summary of Travel Statistics

Scenario	2001	C	C0.5P	C0P	L	H
Year	2001	2051	2051	2051	2051	2051
Daily Vehicle Trips	442,100	925,700	934,100	942,500	941,000	929,600
Daily Diverted PT trips	-	18,000	9,000	-	17,900	18,500
Daily Total PT trips	-	36,000	18,000	-	35,800	37,000
Daily Vehicle-hours	65,700	130,400	132,900	135,200	134,100	132,600
Daily Vehicle-kilometres	3,374,900	6,945,500	7,034,700	7,116,300	7,085,400	6,991,400

Figure 5.1 - Daily Vehicle-Kilometres

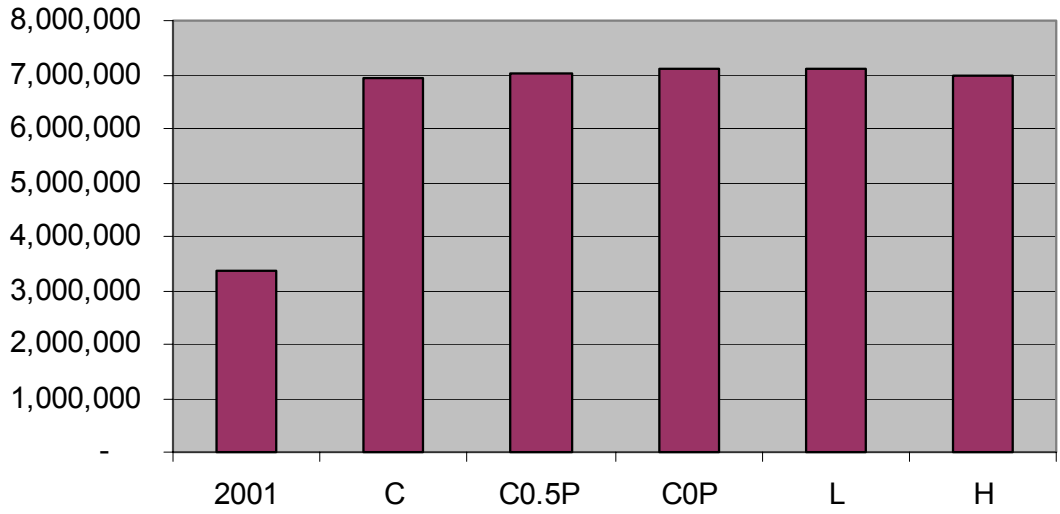


Figure 5.2 - Daily Vehicle-Hours

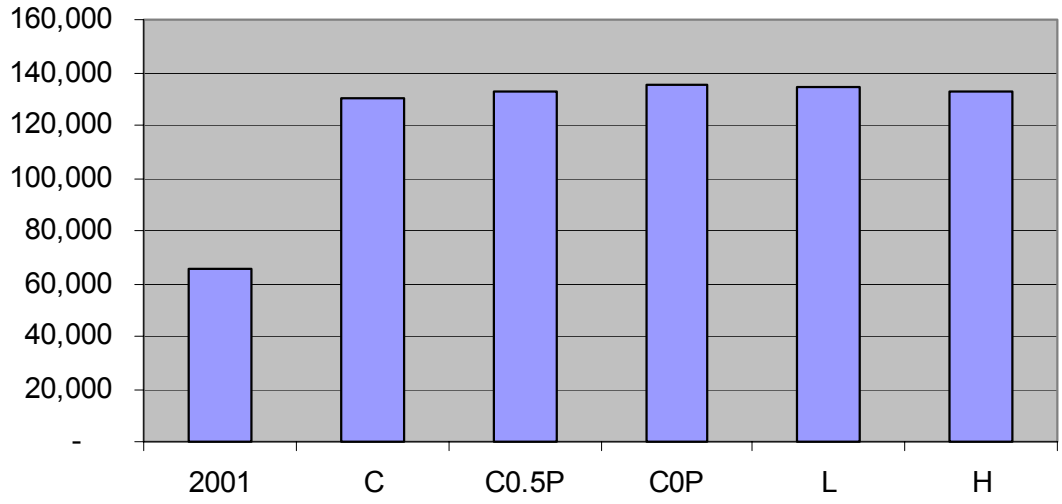
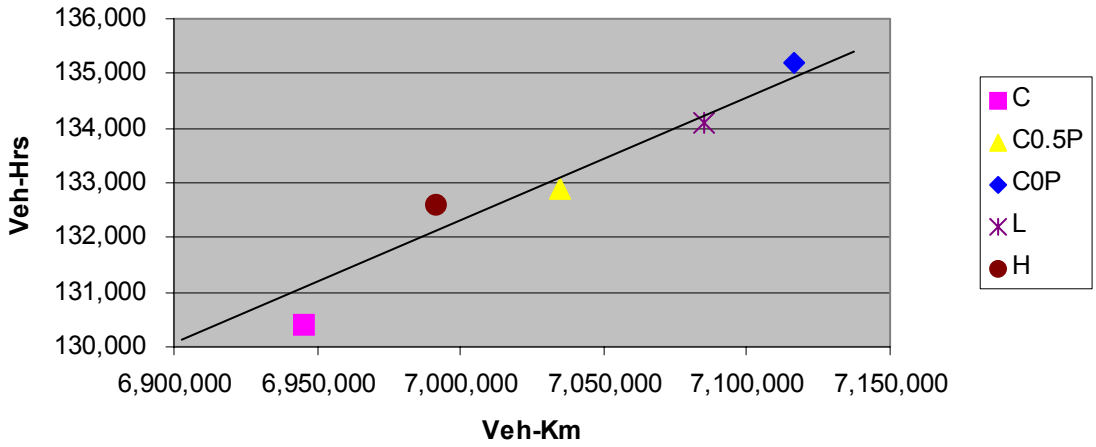


Figure 5.3 - Veh Hours versus Veh Km



5.2 Traffic Flows on Key Routes

Daily traffic flows and maximum, directional peak-hour flows are presented on the key routes for each scenario. In assessing these estimates the coarseness of the network and large traffic zones should be borne in mind.

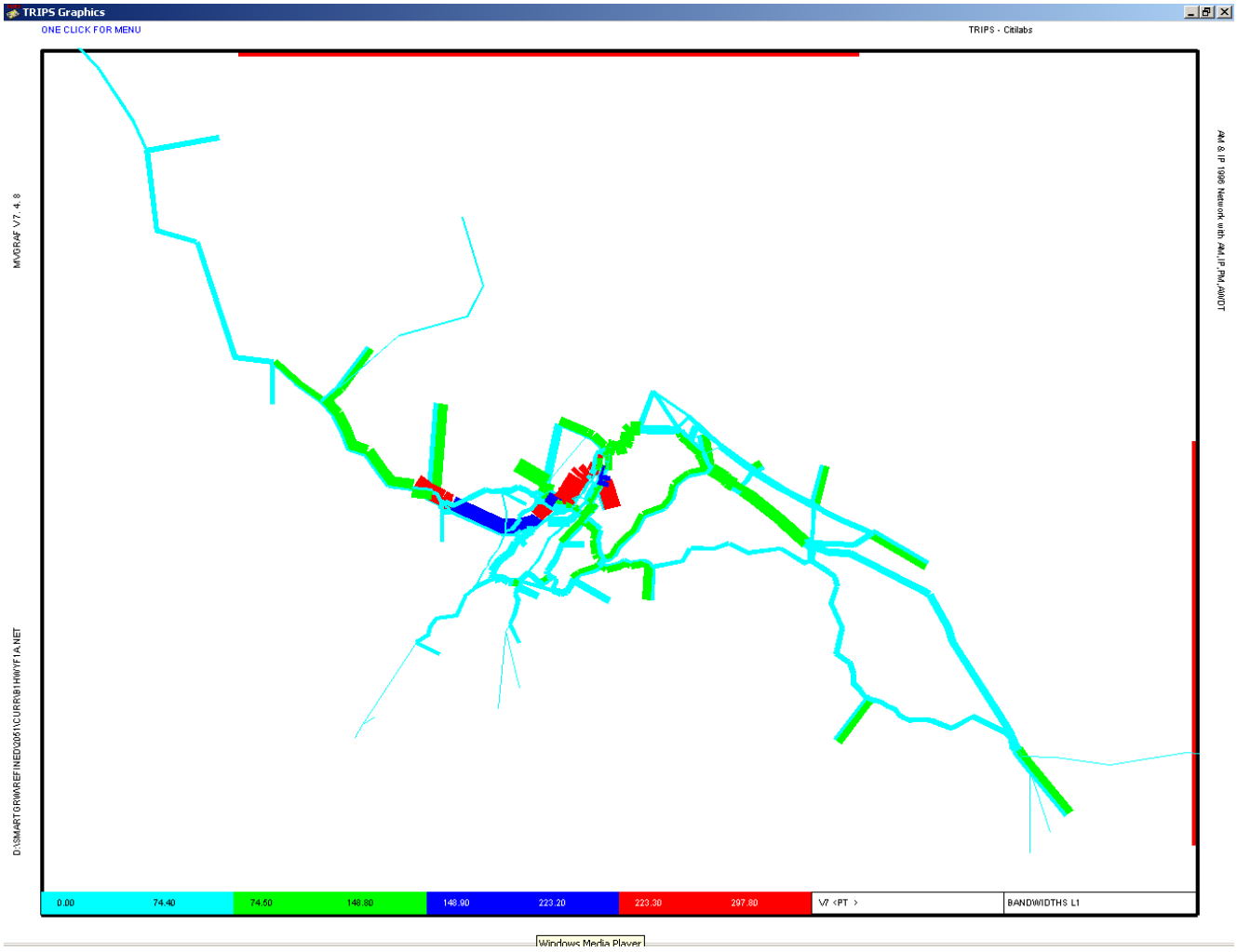
Smart Growth
Preliminary Transport Assessment

			2001		2051C		2051C0P		2051C0.5P		2051L		2051H	
Road	Between	and	ADT	Max vph	ADT	Max vph	ADT	Max vph	ADT	Max vph	ADT	Max vph	ADT	Max vph
SH2	Waihi	Anthenree	6700	433	12200	729	12400	747	12300	737	12200	713	12400	746
SH2	Anthenree	Katikati	6700	433	12200	729	12400	747	12300	737	12200	713	12400	746
SH2	Katikati	Omokoroa	10900	689	17700	1052	18200	1086	18000	1068	17900	1019	18400	1099
SH2	Omokoroa	Te Puna	16200	1057	38900	2249	40200	2338	39600	2293	45000	2621	33500	2003
SH2	Te Puna	Bethlehem	23600	1473	26500	1021	27600	1122	27300	1116	30700	1201	19600	984
SH2 - Waihi Road	Bethlehem	Otumotai	22900	1363	29500	1142	30800	1296	30400	1285	32600	1314	24900	1239
SH2 - Waihi Road	Otumotai	Birch Avenue	48800	2557	32400	1581	33100	1621	32700	1619	30100	1526	31800	1665
SH2 - Waihi Road	Birch Avenue	Cameron	27400	1422	23100	1424	23500	1421	23500	1470	21900	1454	19400	1503
SH2 Cameron Road	11th Avenue	15th Avenue	44800	2485	40600	2230	41900	2275	41500	2255	38400	2151	26300	2277
SH2 15th Avenue	Cameron	Fraser	18900	1524	36700	1673	37700	1700	37300	1690	35300	1607	30400	1575
SH2 Turret Road	Fraser	Hairini	18500	1108	34700	1516	35700	1612	35300	1567	34100	1536	34900	1552
SH2/SH29	Hairini	Te Maunga	17700	855	42300	2331	43100	2439	42900	2411	42100	2373	44000	2587
SH2	Te Maunga	Domain	15300	947	38200	2240	39400	2387	38800	2321	37500	2255	45200	2548
SH2	Domain	Te Puke	17000	844	18000	1073	18600	1128	18300	1104	17100	990	20300	1290
SH2	Te Puke	Paengaroa	17800	819	26100	1023	26500	1055	26300	1039	28600	1124	19700	883
SH2	Paengaroa	Matata	3400	166	7900	383	7900	383	7900	383	8300	399	7900	383
SH29	Kaimai	Tauriko	11900	553	22700	1023	23000	1047	22900	1035	27200	1222	22700	1024
SH29	Tauriko	Route K	15300	881	23000	1067	23400	1097	23200	1084	26700	1210	23600	1085
SH29	Route K	Barkes Cnr	15300	881	25100	1323	25600	1344	25300	1320	27800	1412	28500	1394
SH29	Barkes Cnr	Oropi	11300	612	20000	923	20200	939	20200	931	21600	1093	20900	938
SH29	Oropi	Welcome Bay	19400	870	36600	1535	37000	1592	37200	1600	36800	1549	39300	1801
SH29	Welcome Bay	Turret Road	26400	1445	30500	1163	30900	1222	30900	1194	29700	1144	29300	1281
SH29/SH2	Turret Road	Te Maunga	17700	855	42300	2331	43100	2439	42900	2411	42100	2373	44000	2587
SH29 Maunganui Road	Te Maunga	Girvan	33000	1583	48500	2501	50300	2641	49400	2546	44800	2304	57400	2747
SH29 Maunganui Road	Girvan	Hewletts	29600	1390	48200	2257	49600	2466	48900	2367	45000	2202	55600	2540
SH29 Hewletts Road	Maunganui	Totara	17300	900	28500	1590	29300	1605	28900	1588	27300	1577	31500	1617
Harbour Bridge	Dive Crescent	Tasman	32700	1437	52600	2811	53900	2870	53200	2831	50400	2799	57100	2875
Marsh Street	Dive Crescent	Chapel Street	27400	1437	4400	580	4600	634	4500	605	4300	577	4700	661
Dive Crescent	Marsh	Mclean	5300	360	12300	656	12600	680	12500	668	11100	557	11200	706
Chapel Street	Causeway		20000	1356	24300	1668	25300	1743	24800	1707	22300	1558	27000	1794
Chapel Street	Marsh	Cameron	25800	1679	15500	1065	16300	1189	15900	1105	14300	957	20100	1149
Willow Street	Brown	Mclean	11900	949	7800	506	8200	546	8000	520	7200	457	10800	517
Cameron Road	Brown	Hamilton	13900	731	8500	584	9000	668	8700	610	7900	524	9700	661
Cameron Road	Elizabeth	11th Avenue	39400	2047	48600	1889	50000	2030	49700	2020	47000	1908	42000	2128
Cameron Road	11th Avenue	15th Avenue	44800	2485	40600	2230	41900	2275	41500	2255	38400	2151	26300	2277
Cameron Road	15th Avenue	Gate Pa	38900	1670	48600	1815	50000	1861	49400	1842	47200	1795	46100	2194
Cameron Road	Gate Pa	Barkes Cnr	20800	1078	24400	1008	25200	1123	24900	1098	22900	943	19100	1353
Fraser Street	SH29	Gate Pa	7400	395	13400	996	13700	1031	13400	990	12300	1016	20200	975
Fraser Street	Gate Pa	15th Avenue	12800	575	23000	1467	23600	1530	23100	1476	21100	1433	31500	1542
Fraser Street	15th Avenue	11th Avenue	8700	834	12800	989	13300	1064	13000	1017	12300	964	26600	1091
Devonport Road	11th Avenue	Elizabeth ST	3200	399	5700	553	6300	662	5900	559	5600	540	11600	643
Devonport Road	Elizabeth ST	The Strand	400	27	500	107	500	109	500	107	600	130	800	123
Route P SBD	Chapel	Elizabeth ST	3700	356	9300	1209	9300	1196	9300	1193	9400	1259	9600	1133
Route B NBD	Elizabeth ST	Chapel	4900	424	17200	1492	17600	1555	17400	1528	16800	1591	19300	1397
Route P SBD	Elizabeth ST	Waihi Road	11900	1329	22800	3036	23100	3051	22800	2977	22800	2982	27100	2924
Route B NBD	Waihi Road	Elizabeth ST	11100	1163	22700	2593	23900	2842	23200	2674	23900	2816	24900	2298
Route B NBD	Elizabeth ST		2600	252	8600	1063	8900	1098	8800	1084	9100	1173	9800	937
Elizabeth Street	Route P	Cameron Road	18400	1161	33800	2370	35000	2366	34200	2313	33400	2145	39700	2385
Cambridge Road	SH29	Moffat	11100	610	5000	330	5200	337	5100	333	5400	329	5700	337
Cambridge Road	Moffat	Route J	11000	554	12300	635	12800	683	12600	674	11700	638	13700	699
Moffat Road	Cambridge Road	SH2	6100	383	3100	147	3200	157	3200	175	3300	168	2800	135
Welcome Bay Road	SH29	Welcome Bay	20600	1200	33400	1661	33700	1718	33900	1709	33200	1615	34700	1829
Welcome Bay Road	Welcome Bay	SH2	2400	127	6600	538	6800	564	6700	546	6500	520	7000	585
Girvan Road	Maunganui	Bay Fair	9400	437	12300	650	12300	621	12200	642	11400	623	9300	642
Girvan Road	Bay Fair	Papamoa Beach	9400	437	12300	650	12300	621	12200	642	11400	623	9300	642
Papamoa Beach	Girvan	Sandhurst	18900	1067	37200	1631	37100	1371	37100	1419	35100	1426	33300	1527
Papamoa Beach	Sandhurst	Domain	12500	790	35000	1464	35500	1424	35300	1452	33500	1383	32100	1448
Papamoa Beach	Domain	Marjorie	5700	380	19200	876	19600	867	19500	884	18000	854	19000	978
Domain Road	SH29	Papamoa Beach	4300	230	13200	724	13700	857	13500	811	12800	647	13400	818
Northern Arterial	Te Puna	Ramps	0	#N/A	21200	2306	21300	2200	20800	2069	24500	2677	15500	1113
Northern Arterial	Ramps	Route K	0	#N/A	34600	2663	35500	2677	34800	2601	40400	3176	23800	1519
Route K	SH29	Northern Arterial	0	#N/A	20000	1100	20500	1116	20100	1087	22600	1190	23000	1185
Route K NBD	Northern Arterial	Route J	0	#N/A	17100	2432	17700	2514	17300	2414	19800	2964	15900	1498
Route K SBD	Route J	Northern Arterial	0	#N/A	14500	2696	14700	2677	14400	2601	16500	2991	14600	1944
Route J EBD	Waihi Rd	Cambridge	0	#N/A	6400	584	6700	669	6600	632	6800	614	5800	634
Route J WBD	Cambridge	Waihi Rd	0	#N/A	7900	1047	8400	1187	8300	1191	8200	968	7000	1251

5.3 Public Transport

Figure 5.4 shows the morning peak-hour flows of assumed diverted car traffic (i.e. the car trips removed from the vehicle matrix assumed to divert to Public Transport). With the assumed 50% diversion rate to PT from car drivers, the actual PT patronage values would be double the values shown.

Figure 5.4 - AM Peak Car Trips Diverted to PT



The sensitivity to public transport diversion was tested for the scenario 2051C (refer to Table 5.1):

2051C0.5P - half of the predicted public transport diversion would happen.
This resulted in a 0.9% increase in daily vehicle trips, a 1.3% increase in daily vehicle-km and a 1.9% increase in daily vehicle-hours.

2051C0P – no public transport diversion.
This resulted in a 1.8% increase in daily vehicle trips, a 2.5% increase in daily vehicle-km and a 3.7% increase in daily vehicle-hour.

6 Discussion on Phase 3 Modelling

Car-ownership model, as developed by Ian Bone of Beca Carter, will be implemented to forecast future traffic demand. Additional modelling of intermediate years between 2001 and 2051 (e.g. 2026) will be undertaken for sequencing / staging and cash flow analysis. The detailed scope of phase 3 transport modelling will be set out shortly, in liaison with Smart Growth.