



Waikato Regional Transport Model

900 zone vs 2500 zone Model
Comparison : Network and Land
Use Demand

Technical Note 38

September 2017

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Appendix A

Differences Between Old and New Network Models

Appendix B

Sector Vehicle Demands, 2021 and 2041, AM/Interpeak/PM Peak Two Hours, Old vs New Model

1. Introduction and Background

In 2013 the Waikato Regional Transport Model was updated and refined. The original 900 zone model was re-calibrated and re-validated and the zone system refined to create a 2500 zone model with model parameters and equations recalibrated from the 2008 Household Travel Survey data. The recalibrated model was then applied using 2013 census land use data.

For details of the model update scope and build process see the Waikato Regional Transport Model, 2013 Model Update Final Report.

The objective of this project was to compare land use, networks and demand between the 900 zone or “old” version of the model and the 2500 zone (“new”) version to provide insight into, and an opportunity to review, assumptions made as to levels of growth and network configurations and to quantify different demands/travel patterns at a broad level.

This report discusses the process and results of a comparison of the old 900 zone model network and the new 2500 zone model network. We have compared the 2500 zone 2041 base network (network B3) with an equivalent 900 zone 2041 network 2J (Opus network number 42). The 900 zone network used for the Waikato Expressway testing does not include the Southern Links, the Northern River Crossing, the Fifth Avenue or SH26 interchanges or the Ruakura Spine Road. It should be noted that there are a number of other 900 zone networks which do include various combinations of these network improvements.

We also document the process and results of undertaking a comparison of land use in the old and new models and a broad level comparison of travel patterns in the old and the new models.

2. Network Comparison

The two TRACKS networks identified above were exported to Map Interchange Format and imported into CUBE where a network comparison script was run to compare the two networks and identify differences. The increased number of zones in the new model meant that all of the nodes in the new model had been renumbered (for example, node 2400 in the old model cannot exist in the new model as this number is reserved for a zone). So a direct comparison failed (i.e. everything was different). To address this issue and enable comparison, all of the nodes were temporarily renumbered to a consistent basis. This was achieved by matching coordinates and allocating new node numbers on a geographic basis. The renumbered networks could then be visually and robustly compared.

Appendix A contains a full list of identified differences between the old and new networks used in this comparison. Many of the differences identified will have only a negligible effect on the results output by the model. Table 1 contains a list of the most significant differences between the old and new 2041 networks. Some of the identified changes included in the new network would warrant review and potentially revision as to their inclusion in the new model base networks.

In the tables, the abbreviation LILO is used for Left In, Left Out.

900 ZONE VS 2500 ZONE NETWORK COMPARISON		
Location	900z	2500z
Rural Waikato		
Hauraki Rd	80 kph	95 kph
Awaiti Rd	75 kph	95 kph
Front Miranda/Miranda/Mangatangi Rd	75 kph	85/100 kph
Huntly		Additional roading modelled – e.g. Rayner Rd to James Rd, Bailey St, Hakanoa St, Rosser St
Waikato expressway/Fisher Rd	1 approach lane on each approach	2 approach lanes on each approach
McVie Rd	Disconnected at expressway	Connected across expressway
SH1 - Tainui Bridge Rd to Bell Crossing St	50 kph	80 kph
Hakarimata Rd - Ngaruawahia to Tainui Bridge Rd	85 kph	70 kph
Tainui Bridge Rd/Rotowaro Rd/Riverview Rd	3 leg Minor intersection	Realigned to 4 leg intersection with Harris St and Roundabout modelled
Waikato Expressway intersection with Gordonton Rd	Diamond with Give Ways at on/off ramps	Diamond with Roundabouts at ramps
SH1 intersection with Horotiu Rd	LILO	Give Way with all turns available
SH1 intersection with Horotiu Bridge Rd	Roundabout	Signals
Onion Rd extension to Horotiu Rd	Extension modelled and Mathers Rd to Redoaks Close connected	Not modelled

900 ZONE VS 2500 ZONE NETWORK COMPARISON		
Location	900z	2500z
SH26 - S of Paeroa to N of Te Aroha	100 kph	70 kph
Ngutumanga	75 kph	90 kph
SH2 - Crean Rd to Gilmour St	70 kph	90 kph
Old Tauranga Rd/Pukekauri Rd	90 kph	70 kph
Katikati Bypass	modelled	Not Modelled
Roache Rd/SH26 (E of Studholme) to W of Stanley Rd South	70 kph	85 kph
SH26/SH27	3 leg intersection	Realigned to 4 leg intersection with Roundabout modelled
Puketaha Rd	80 kph	95 kph
Waharoa Rd west - N of Broadway	60 kph	85/90 kph
SH27 - Mowbray to Wardville	60 kph	90 kph
Te Kumi Rd - N of Carroll St	100 kph	80 kph
Waitete/Awakino Rd	Give Way	Roundabout
SH31 N from Te Kawa Rd	100 kph	90 kph
Taupiri		
Wright St/Greenlane Rd	Connected to SH1	Both connect to Gordonton Rd
Driver Rd	90 kph	70 kph
Howard Rd	90 kph	70 kph
Gordonton Rd - Puke Rd to Peach Rd	65/75 kph	95 kph
Tauranga		
Tauranga West Rd S of Katikati to N of Momokoroa	2 lanes each direction	1 lane each direction
Tauranga West/Omokoroa	Roundabout	Give Way
Tauranga West/Wairoa Rd	Roundabout	Give Way
Hairini St - connection to SH2	Connection modelled	Hairini Rd disconnected from SH2A
Ohaiti Rd/ Poike Rd	Roundabout	Stop
Welcome Bay Rd/SH29	Signals (1/2 diamond)	Roundabout
SH2/SH29	Signals (1/2 diamond)	Roundabout
Tauranga East Rd (SH2) - S of Hwy/Tara Rd to W of SH33 Te Puke East Rd	80 kph	95 kph
Tauranga East / SH2 (Tara/Domain)	Full diamond with Roundabouts	Intersection layout matches current layout
Maunganui Rd/SH2		Free L turns added to RA
Tauranga Harbour Bridge	55/60 kph	70 kph
Mirrilees Rd/Dive Cres	Roundabout S side of bridge, Give Way N side of bridge	Signals both sides of the bridge and signals at Chapel St

900 ZONE VS 2500 ZONE NETWORK COMPARISON		
Location	900z	2500z
Rotorua		
Ngongotaha Rd/SH5	Signals	Roundabout
Ngongotaha Rd/Old Quarry Rd		SB through movement banned
Tokoroa		
Old Taupo Rd/SH32 (Maraetai Rd)	Priority to Old Taupo Rd	Priority to SH32
Taupo		
Centennial Drive - Broadlands to SW of Taupo bypass	50/60 kph	90 kph
Broadlands Rd - View Rd to Miro St	75 kph	90 kph
Crown Rd	45 kph	40/70 kph
Anzac Memorial Rd	Not modelled	modelled
Napier Taupo Rd - E of Taupo bypass to Lake Terrace	70 kph	100/80 kph
SH1/Tirau Rd intersection with SH29	Banned turns not included at merges etc	Banned turns included
Te Awamutu		
Pirongia Rd	75 kph	90 kph
Frontier Rd	75 kph	90 kph
Cambridge Rd	40 kph	75 kph
Park Rd	40 kph	75 kph
Flat Rd	40 kph	75 kph
Cambridge /Ohaupo Rd	1 approach lane on each approach	2 approach lane on each approach
Cambridge		
Norfolk Dr extn to Victoria Rd	Not modelled	Modelled with signals at Victoria Rd
Bypass/Victoria Rd	Give Way at ramps	Signals at ramps
Tulip Drive and other minor roads	Not modelled	Modelled
Swayne Rd/Norfolk Dr	3 leg, Minor	4 leg, Roundabout
Madison/Watkins	3 leg, Minor	4 leg, Roundabout
Tirau/Shakespeare	LILO banned, stop	Roundabout
Tirau - E of intersection with Shakespeare	80 kph	50 kph
Cambridge Rd - W of Hall St	60/65/95 kph	50 kph
Oaklea Lane/Pickering Rd/Strawberry Field Rd	Give way	Roundabout
Tamahere Dr/Pickering Rd	Give way from Tamahere South	Give way from Pickering
Eastern Link - Cambridge Rd to SH1	Not modelled	Modelled

900 ZONE VS 2500 ZONE NETWORK COMPARISON		
Location	900z	2500z
"New Link"/Devine Lane		Slip lanes modelled
"New Link"/Airport Rd		Slip lanes modelled
Birchwood Lane extension to Devine Lane		Slip lanes modelled
Shakespeare St/Cook St	2 approach lanes from Cook St	1 approach lane from Cook St
Carlyle St/Lamb St	Stops	Minors
Peacocke		
Minor roads	Different road layouts	Different road layouts
Ohaupo Rd extension North to Southern Links	Not modelled	Modelled
Interchange on SH3 at Titanium Park	Not modelled	Modelled
Hamilton City		
Collins Rd - from Catalina Dr West	85 kph	100 kph
Ohaupo Rd - S of Collins	Different speeds	Different speeds
Temple Access	65 kph	40 kph
Tuhikaramea/Cowley Dr	Give way	Roundabout
Tuhikaramea/Foster Rd	Give way	Roundabout
Kahikatea/Quentin/Gallagher	Roundabout	Signals
Cobham Dr / City Link	Seagull	Signals with free L turns
Mormandy / Beatty	Stop	LILO
Mount View Rd / Vivian St	Give way	Roundabout
Mount View Rd / Prisk St	Give way	Roundabout
Rhonda Ave / Rosalind St	Give way	Roundabout
Deanwell Ave / Janna Pl	Give way	Roundabout
Deanwell Ave /Susan Pl	Give way	Roundabout
Irvine St	30 kph	50 kph
Blackburn St	30 kph	50 kph
Paterson St	30 kph	50 kph
Greenwood St -Killarney to Rifle Range Rd	80 kph	60 kph
Lincoln St	80 kph	60 kph
Rifle Range Rd -to Ellicott	70 kph	50 kph
Ellicott Rd	Different speeds	Different speeds
Killarney/Queens Ave	R turns into Queens Ave banned	No banned turns
Killarney/Greenwood		Free L from Killarney WB
Lachlan Dr	30 kph	50 kph
Maple Ave/Aberdeen Dr	Stop	Roundabout

900 ZONE VS 2500 ZONE NETWORK COMPARISON		
Location	900z	2500z
Ruakura/Morrinsville/Lissette	Give Ways	Roundabout
Ruakura/Davison/Vaile	Give Ways	Roundabout
Ruakura/Holland	Give way from Old Ruakura	Minor from Holland
Ruakura minor roads	Different road layout	Different road layout
Morrinsville/Cambridge		Seagull at intersection
Cambridge/Cobham	Roundabout	Signals
Cambridge/Masters Ave	Give way	Signals
Cambridge/Hillcrest Rd	Give way	Roundabout
Cambridge/Knighton Rd	Give way	Roundabout
Cambridge/Naylor/Wairere Dr Extn	Signals with full diamond	Free L turn from Cambridge WB
Brookfield St	Terminates at Fox St	Extends to just before Wairere Dr extn
Henry St	Terminates at Fox St	Connect to Dey St
Peacockes Rd/City Link/Ring Rd Link	Roundabout	Signals
Southern Links/Peacockes minor roads	Different minor road layout	Different minor road layout
Naylor St/Grey St	Give ways	Roundabout with free L turns
Wairere Dr extn	Not modelled	Modelled
Old Farm Rd ramp to Dey St	Not modelled	Modelled
Wairere Dr/Old Farm Rd (to N)	R turn out of Old Farm Rd banned	No banned turns
Cassidy St		Extended to Dey St
Cook St		Extended to Dey St
Wellington St		Extended to Dey St
Henry St		Extended to Dey St
Ruakura/Peachgrove/Te Aroha St	Signals with free L turn from Peachgrove SB	3/4 diamond
Wairere Dr/Ruakura	4-way intersection with signals	Full diamond
Bains Ave	20 kph	40 kph
Boundary Rd/Casey Ave	Give Way	Give Way with banned R turn out of Casey Ave
Boundary Rd/Heaphy Tc	Roundabout	Signals
Boundary Rd/Peachgrove Rd/Fifth Ave/Brooklyn Rd	Roundabout	Signals
Fifth Ave/John St	Give Way with 1 approach lane on each approach	Give Way with 2 approach lanes on each approach
Fifth Ave/Spenser Rd	Give Way with 1 approach lane on each approach	Give Way with 2 approach lanes on each approach

900 ZONE VS 2500 ZONE NETWORK COMPARISON		
Location	900z	2500z
Fifth Ave/Tramway Rd	Stops	Give Ways
Clarkin Rd/Heaphy Tce	Give Way	Roundabout
Clarkin Rd/Bankwood Rd	Give Way	Roundabout
Kensington Pl extension	Road with link-type 4	Private access - LT 99
Lake Rd/Queens Ave	Stop	Roundabout
Commerce St - Lake Rd to High St	2 lanes	1 lane
Ward St	Connection to Anglesea & Worley disconnected from Alexandra	Ward St ends at Anglesea, Worley Pl connected to Alexandra
Anglesea - London to Mill	1 lane each way	2 lanes NB, 1 lane SB
Awatere Ave	30 kph	50 kph
Garnett Ave	30 kph	50 kph
Forsyth St	35 kph	50 kph
Forsyth/Cotton	Give Way	Roundabout
Forsyth/Glasgow/Bowen	Minors	Realigned to 4-way intersection with Roundabout
Norton Rd - Tahi to Lincoln	35 kph	50 kph
Livingstone Ave	30 kph	50 kph
Avalon Dr/Livingstone Ave	Give Way	Roundabout
Avalon Dr/Grandview Rd	Give Way	Roundabout
Avalon Dr/Dominion Rd	Give Way	Roundabout
Nyanza St		Extended to Ellicott Rd
Roy St	35 kph	50 kph
Hyde Ave/Lindsay Cres	Give Way	Roundabout
Farnborough Dr/Arundel/Highbury	Give Way	Roundabout
Baverstock Rd - Rotokauri to Farnborough	45kph	50/65 kph
Rotokauri Minor roads	Different road layout	Different road layout
Rotokauri Rd - E of Exelby	65 kph	80 kph
Link Pine Ave to Rawlings St	40 kph	Link-type 99 (walk)
Pine Ave/Odette St/Dermont St	Give Ways	Roundabout
Howell Ave	35 kph	50 kph
Johnsonview Tce	50 kph	35 kph
Duck Rd	65 kph	100 kph
Fullerton Rd	65 kph	100 kph
Limmer Rd	65 kph	100 kph

900 ZONE VS 2500 ZONE NETWORK COMPARISON		
Location	900z	2500z
Laxon Rd	65 kph	80 kph
Great South Rd/The Base Parade	4-way intersection with signals	Full diamond with signals
Maahanga Dr/The Base Parade	signals	roundabout
Karewa Pl - Wairere Dr to Eagle Way	40 kph	55 kph
Wairere Dr/Pukete Rd	4-way intersection with signals	Full diamond with signals
Vickery St to Maxwell Pl	40 kph	55 kph
Maui St	40 kph	60 kph
Pukete Rd - N of Millthorpe	80 kph	60 kph
Te Rapa Rd - N of Te Rapa Access Rd	80 kph	100 kph
Rototuna Minor roads	Different minor road layout	Different minor road layout
Resolution Dr	65 kph	80 kph
Thomas Rd	70 kph	60/50 kph
Resolution Dr - Wairere to Rototuna	55 kph	80 kph
Wairere Dr/Huntington Dr N	Give Way all turns allowed	LIFO
Wairere Dr/Huntington Dr S	Give Way	Roundabout
Wairere/Stoneleigh Dr	Give Way all turns allowed	LIFO
Stoneleigh Dr/Ellsworth Pl/Milbrook Pl	Minors	Roundabout
Darjon Dr - Shirley Pl to Rhys Ave	LT 4	LT 99 (Walk)
Puketaha/St James/Gordonton	Stops	Roundabout
Thomas/Gordonton	Give Way	Roundabout
Barrington/Thomas	Give Way	Roundabout
Moonlight Dr/Mercury/Alconbury	Minors	Roundabout
Alconbury Dr/Westminster Pl	Minors	Roundabout
Cycle Path (Magellan Rise to Tuirangi St)	LT 4	LT 99 (Walk)

Table 1: Network Comparison

Figure 1 to Figure 4 provide snapshots of roading included in each of the developments in Rotokauri, Rototuna, Ruakura and Peacockes at 2041 in both the old model network and in the new model base network. Commentary is provided in the next section.



Figure 1: Rotokauri Development

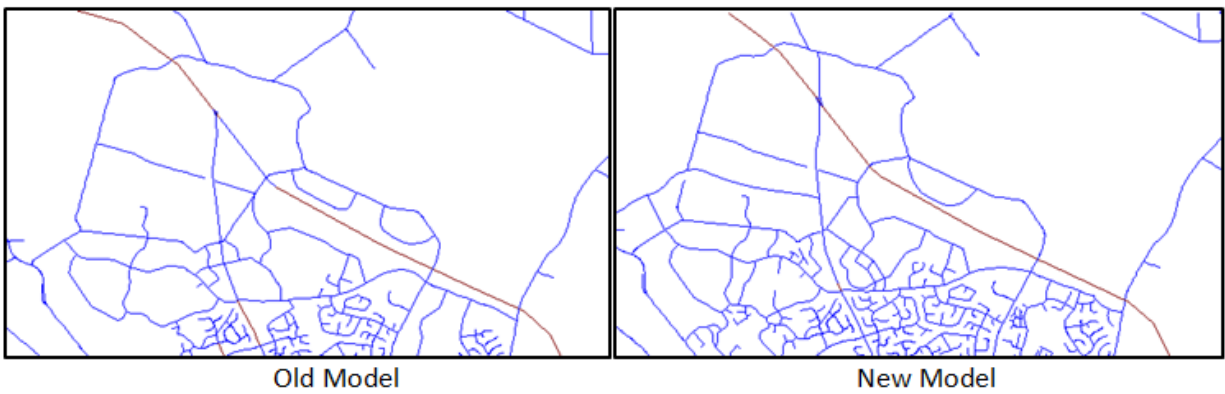


Figure 2: Rototuna Development

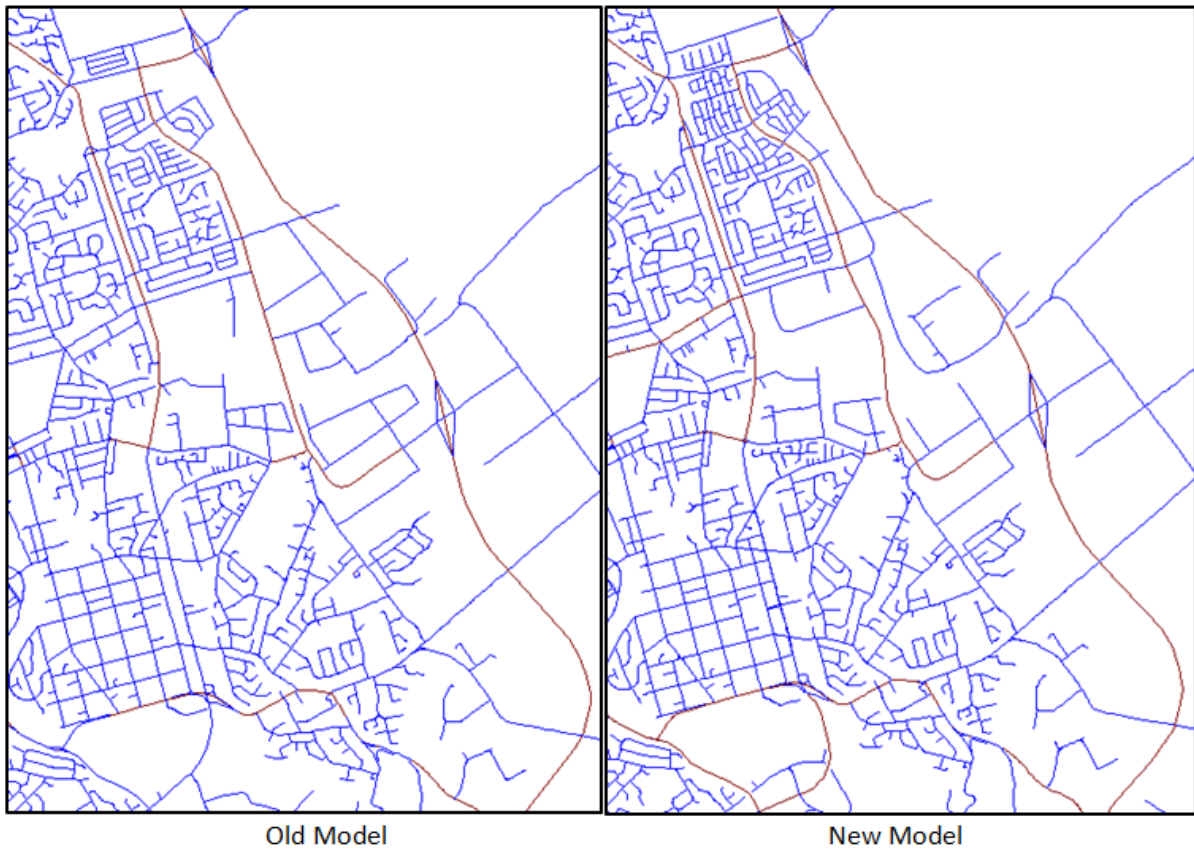


Figure 3: Ruakura Development

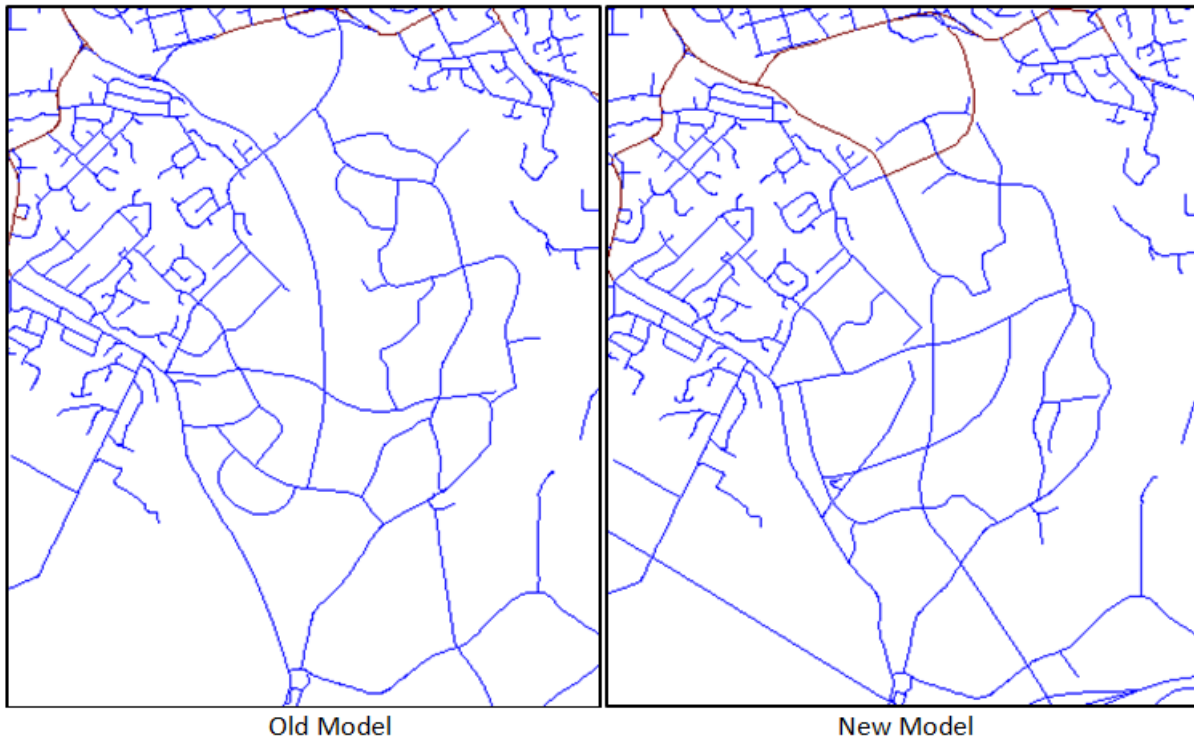


Figure 4: Peacockes Development

3. Key Points on Network Differences

A large number of the differences identified in Appendix A, including small changes (5-10 kph) in speed limits, will have no significant impact on the model outputs. Other changes such as changes to intersection controls on high volume roads and addition of network links will have much more impact.

Significant differences between the old and new model networks include the inclusion of the Onion road extension in the old model but not in the new model base network at 2041. Similarly, the Katikati bypass is modelled in the old model network but is not included in the new model 2041 base network. The Southern Links, Northern River Crossing and Resolution Drive extension to Horsham Downs Road are all included in the new model 2041 base network but were not included in the Waikato Expressway testing conducted using the old model.

The new model 2041 base network includes different minor road layouts in each of the major developments in Rotokauri, Rototuna, Ruakura and Peacockes. In the Peacockes development area the Ohaupo Road extension north to Southern Links and the interchange on SH3 at Titanium Park are included in the new model at 2041 but were not in the old model used for the Waikato Expressway. This may be due to assumptions changing over time.

In the Hamilton City area there are a number of speed limit changes and intersection control changes from give way to roundabout or roundabout to signals. In addition to changes to minor roads in each of the development areas in Rotokauri, Rototuna, Ruakura and Peacockes there are a number of other network link changes including:

- Decreasing Commerce Street between Lake Road and High Street from 4 lanes in the old model to 2 lanes in the new model 2041 base network;
- The Wairere Drive extension is modelled in the new model 2041 base network but was not in the old model applied for the Waikato Expressway;
- A ramp from Old Farm Road to Dey Street is modelled in the new model 2041 base network but not in the old model;
- The right turn out of Old Farm Road at Wairere Drive is banned in the old model but not in the new;
- Anglesea Street from London Street to Mill Street is modelled as a 2 lane road in the old model. In the new model an extra north bound lane is added.

In rural Waikato there are a number of changes to speed limits ranging from 5-30 kph. There are additional minor roads in Huntly and Rangiriri in the new model and various changes to intersection layout/controls including the Waikato Expressway intersection with Gordonton Road (diamond with give ways at on/off ramps in the old model to diamond with roundabouts at on/off ramps), SH1 intersection with Horotiu Bridge Road (roundabout to signals), and Waitete Rd intersection with Awakino Road (give way to signals).

Most of the differences in the Taupo area are speed limit changes of 10 kph or less. There are no major changes to road layouts or intersection controls.

In Cambridge the Eastern link from Cambridge Road to SH1 is not modelled in the old model 2041 network assessed but is included in the new model 2041 base network. The Victoria road ramps on/off the bypass are modelled with give ways in the old model but as signals in the new model 2041 network.

There are various speed limit changes in Cambridge. The difference in speed limits are largely 10 kph or less although Tirau Road East of Shakespeare Road is modelled at 80 kph in the old model but only 50 kph in the new model. There are also decreases in speed limits of up to 45 kph from old model to new on Cambridge Road west of Hall Street.

4. Sector System for Land Use and Demand Comparison

There is no one-to-one relationship between zones or small groups of zones in the old and new models. In order to make meaningful comparisons of land use in corresponding areas of each network, zones in each model have been grouped into sectors which can be compared one model with the other.

It is important to note that the Franklin area (Area 9) was not included in the old 900 zone model but was added to the new 2500 zone model.

Zones in each model were grouped into 13 areas as follows:

1. Hamilton City North
2. Hamilton City South
3. Tauranga
4. Cambridge
5. Te Awamutu
6. Rotorua
7. Ngaruawahia
8. Huntly
9. Franklin
10. Remaining Zones (excluding those in areas 1-9) in the North West quadrant
11. Remaining Zones in the North East quadrant
12. Remaining Zones in the South East quadrant
13. Remaining Zones in the South West quadrant

Figure 5 below identifies the 13 areas selected for comparison between the old and new models.

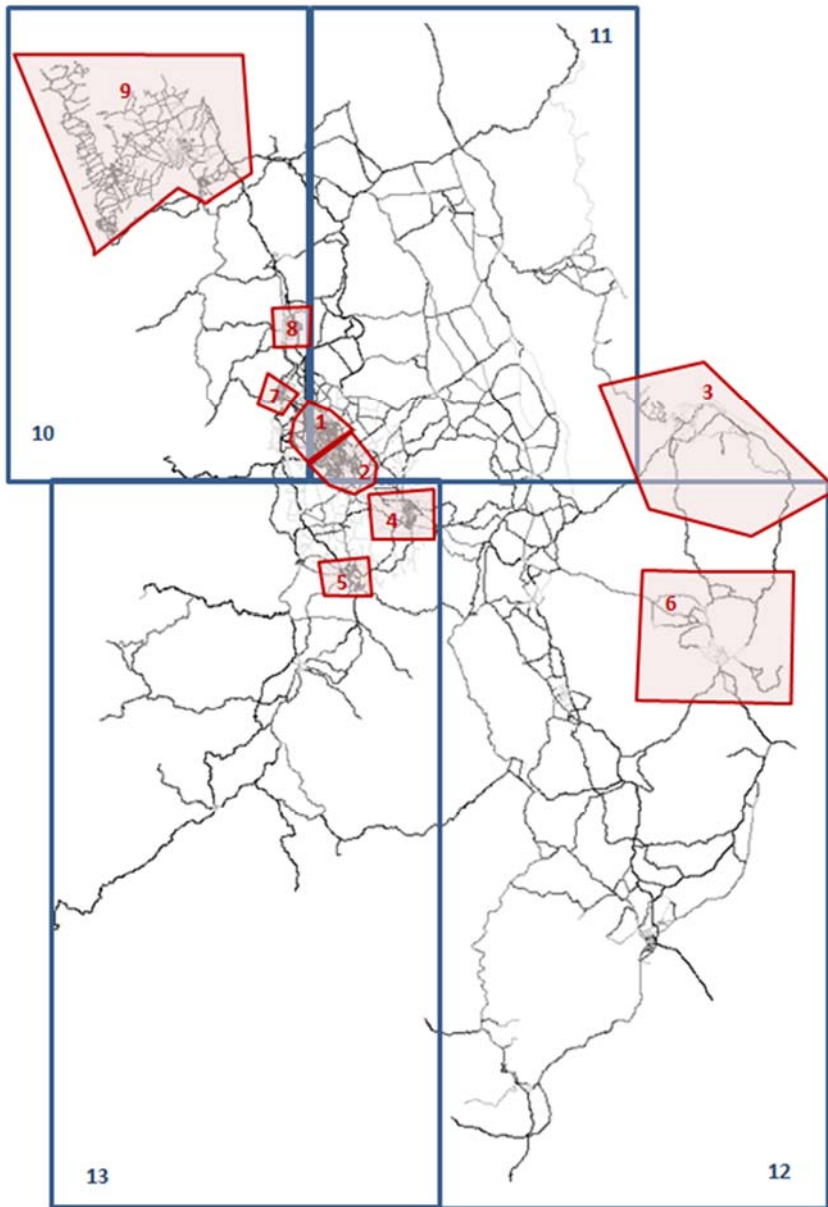


Figure 5: Areas for Comparison

5. Land Use Comparison

For each of the areas identified above, land use in the corresponding zones in each model was aggregated and the combined households and total jobs in the old model compared with the combined totals in the new model.

Please note that the base year for the old model was 2006 while the new model has also been validated to 2013. For comparison purposes, future years 2021 and 2041 have been selected as these are the two common forecast years between the models.

Table 2 includes a comparison of total households in each of the 13 identified areas.

For the same model area (i.e. excluding Franklin), there are 8,500 fewer households in the new model compared with the old model for the year 2021, and 6,000 fewer households in 2041. So recent assumptions input to the new model are that residential development will be slower than previously expected. This will mean fewer trips predicted by the new model (vs. the old model), with less pressure on existing and new infrastructure than previously forecast.

Of note, in 2041, the new model has 7,800 fewer households in Hamilton South compared with the old model, but 6,500 more in Tauranga. This will result in fewer trips generated in the Hamilton South area, and a likely reduction in flows forecast on the Southern Links. In contrast, more demand will be generated from Tauranga.

Growth in total households in Cambridge in the new model is lower with approximately 10% less households in the new old model by 2041 where there is slightly higher growth in the west but no longer any growth in the east as input to the old model.

There is 15% fewer total households assumed for Te Awamutu by 2041 and 13% in Rotorua where it appears less development is expected. Similarly, it seems development is no longer expected in Ngaruawahia or Huntly where total households are 50% and 12% lower respectively by 2041 in the new model.

Franklin was not included in the 900 zone version of the model. The new model suggests significant growth is expected in South Auckland including Tuakau, Pokeno and Pukekohe to Drury. This could well affect travel patterns, which are assessed later in this technical note.

It appears development in Te Kauwhata is no longer expected and this means fewer additional households are anticipated by 2041. In the wider area north east of Hamilton more households are expected (6%) while there are fewer households expected in the south east (1%). There is a more significant increase (17%) in total households in the areas south west of Hamilton city.

A development specific assessment is provided in the next section to add context to the change in the input assumptions between the model versions.

Table 3 compares total jobs in the old model and the new in each area.

For employment in the same area, in 2021 there are 28,000 fewer jobs in the new model compared with the old, and 11,000 less in 2041. Employment is used to allocate trips geographically, so the relativity between areas is important although the total itself is not

considered to estimate total person trip-making. This notable difference in jobs is still worth highlighting, however, as it could indicate a potential problem with the data and/or the processing.

Table 4 compares the percentage distribution of jobs by area excluding Franklin. This shows a similar distribution of employment in the old and new model for both 2021 and 2041.

		TOTAL HH									
		2006			2013	2021			2041		
		2500z	900z	Diff 2500 vs 900	2500z	2500z	900z	Diff 2500 vs 900	2500z	900z	Diff 2500 vs 900
Area 1	HCC North	19,259	18,528	731	22,882	26,691	27,904	-1,213	34,458	33,256	1,202
Area 2	HCC South	31,082	30,657	425	33,015	36,665	40,622	-3,957	52,436	60,326	-7,890
Area 3	Tauranga	48,922	48,909	13	54,720	64,642	64,824	-182	90,922	84,486	6,436
Area 4	Cambridge	6,051	6,012	39	6,977	6,855	8,808	-1,953	10,659	11,900	-1,241
Area 5	Te Awamutu	4,993	5,052	-59	5,426	5,830	6,746	-916	6,780	8,059	-1,279
Area 6	Rotorua	21,058	21,102	-44	21,985	22,085	24,306	-2,221	24,252	28,089	-3,837
Area 7	Ngaruawahia	1,761	1,827	-66	1,861	2,030	3,021	-991	2,274	4,561	-2,287
Area 8	Huntly	2,388	2,382	6	2,442	2,609	3,062	-453	2,945	3,341	-396
Area 9	Franklin	16,707	16,707	0	19,101	27,213	920	26,293	48,861	1,470	47,391
Area 10	Rest - NW	5,679	6,255	-576	6,242	8,097	8,064	33	9,858	10,785	-927
Area 11	Rest - NE	31,899	32,409	-510	34,460	39,066	38,454	612	42,767	40,233	2,534
Area 12	Rest - SE	25,515	25,551	-36	27,288	31,011	29,475	1,536	33,161	33,551	-390
Area 13	Rest - SW	10,014	9,927	87	10,652	12,719	11,541	1,178	13,916	11,847	2,069
Totals		225,328	225,318	10	247,051	285,513	267,747	17,766	373,289	331,904	41,385
Totals excluding Franklin		208,621	208,611	10	227,950	258,300	266,827	-8,527	324,428	330,434	-6,006

Table 2: Total Area Household Comparison

		TOTAL JOBS					
		2021			2041		
		2500z	900z	Diff 2500 vs 900	2500z	900z	Diff 2500 vs 900
Area 1	HCC North	29,829	33,778	-3,949	36,502	38,223	-1,721
Area 2	HCC South	52,451	62,717	-10,266	71,489	76,793	-5,304
Area 3	Tauranga	64,489	72,374	-7,885	74,511	83,115	-8,604
Area 4	Cambridge	6,681	7,310	-629	8,356	8,022	334
Area 5	Te Awamutu	5,956	6,170	-214	6,663	6,879	-216
Area 6	Rotorua	25,185	28,335	-3,150	23,234	29,701	-6,467
Area 7	Ngaruawahia	1,261	1,420	-159	1,598	1,654	-56
Area 8	Huntly	2,098	2,487	-389	2,792	3,029	-237
Area 9	Franklin	23,756	771	22,985	38,853	977	37,876
Area 10	Rest - NW	6,206	5,788	418	8,006	7,174	832
Area 11	Rest - NE	35,492	37,072	-1,580	39,785	34,867	4,918
Area 12	Rest - SE	31,730	32,611	-881	34,549	33,751	798
Area 13	Rest - SW	13,602	12,738	864	15,870	11,385	4,485
Totals		298,736	303,571	-4,835	362,208	335,570	26,638
Totals excluding Franklin		274,980	302,800	-27,820	323,355	334,593	-11,238

Table 3: Area Comparison of Total Jobs

		PROPORTION OF JOBS, EXCLUDING FRANKLIN					
		2021			2041		
		2500z	900z	Diff 2500 vs 900	2500z	900z	Diff 2500 vs 900
Area 1	HCC North	10.8%	11.2%	-0.3%	11.3%	11.4%	-0.1%
Area 2	HCC South	19.1%	20.7%	-1.6%	22.1%	23.0%	-0.8%
Area 3	Tauranga	23.5%	23.9%	-0.4%	23.0%	24.8%	-1.8%
Area 4	Cambridge	2.4%	2.4%	0.0%	2.6%	2.4%	0.2%
Area 5	Te Awamutu	2.2%	2.0%	0.1%	2.1%	2.1%	0.0%
Area 6	Rotorua	9.2%	9.4%	-0.2%	7.2%	8.9%	-1.7%
Area 7	Ngaruawahia	0.5%	0.5%	0.0%	0.5%	0.5%	0.0%
Area 8	Huntly	0.8%	0.8%	-0.1%	0.9%	0.9%	0.0%
Area 9	Franklin						
Area 10	Rest - NW	2.3%	1.9%	0.3%	2.5%	2.1%	0.3%
Area 11	Rest - NE	12.9%	12.2%	0.7%	12.3%	10.4%	1.9%
Area 12	Rest - SE	11.5%	10.8%	0.8%	10.7%	10.1%	0.6%
Area 13	Rest - SW	4.9%	4.2%	0.7%	4.9%	3.4%	1.5%
Totals excluding Franklin		100.0%	100.0%		100.0%	100.0%	

Table 4: Area Comparison of Proportion of Jobs, excluding Franklin

6. Review of Individual Developments

There are a number of significant developments planned/progressing within the model area including Rotokauri, Rototuna, Ruakura and Peacockes, which contribute to the overall growth in households. Table 4 below identifies growth in various areas and highlights differences in timing/extent of development in those areas. Households in Table 4 are rounded to the nearest hundred. Note that for the 900 zone (old) model, the increase in 2021 is compared to 2006, whereas for the 2500 zone (new) model, the increase in 2021 is calculated from the year 2013. Additional households in 2041 are relative to 2021 for both model versions.

Due to the completely different zoning between the models, the identification of growth cells was undertaken manually by examining individual zones with a significant change in households between the base and forecast years. There may therefore be one or two zones that have been erroneously omitted from this comparison – this is not expected to change the overall conclusions.

AREA	AREA13	NOTES	CHANGE	EXTRA HOUSEHOLDS					
				900z			2500z		
				By 2021	By 2041	Tot Inc	By 2021	By 2041	Tot Inc
Hamilton									
Rotokauri	HCC North	Total development higher, but occurs later	Similar	2,200	2,000	4,200	500	3,600	4,100
Rototuna	HCC North	Less growth with a higher proportion occurring later	Lower	4,300	900	5,200	3,400	1,400	4,800
Ruakura	HCC South		Lower	1,700	700	2,400	300	1,500	1,800
Peacockes	HCC South	Less development particularly in 2041, timing similar	Lower	300	7,500	7,800	500	5,200	5,700
Wider Area									
West Cambridge	Cambridge	Similar staging, slightly higher growth	Higher	500	1,500	2,000	300	2,400	2,700
East Cambridge	Cambridge	Development seems to no longer be expected	Lower	800	800	1,600	0	500	500
Ngaruawahia	Ngaruawahia	Development seems to no longer be expected	Lower	700	900	1,600	100	100	200
Huntly	Huntly	Development seems to no longer be expected	Lower	2,200	200	2,400	200	300	500
Tauranga	Tauranga	Similar, although note increase in 900z model is from 2006 and in 2500z model from 2013	Similar	15,900	19,700	35,600	10,000	26,300	36,300
South Auckland									
Te Kauwhata	Rest - NW	Development seems to no longer be expected	Lower	1,100	1,200	2,300	300	300	600
Tuakau	Franklin	Much higher growth for South Auckland expected	Higher	0	300	300	500	1,200	1,700
Pokeno	Franklin	Much higher growth for South Auckland expected	Higher	300	600	900	2,900	600	3,500
Pukekohe to Drury	Franklin	Significant growth expected in this area	n/a	n/a	n/a		2,700	15,600	18,300

Table 5: Additional Households by Development Area

In **Hamilton City North**, the Rotokauri development is expected to have the same number of additional households by 2041, although the staging assumptions are very different. By 2021, the new model has only 25% of the households input to the old model, with a much larger number of houses expected to be constructed between 2021 and 2041 in the new model to compensate.

The Rototuna development is now slightly smaller than before (4,800 in new model by 2041 vs 5,200). Again, the staging now expects fewer households to be constructed by 2021 and a greater number over the next twenty years.

By 2041, 1,200 more households in Hamilton North are included in the new model compared with the old, although the Rotokauri development is similarly sized and the Rototuna development is slightly smaller. This means growth in other residential areas of Hamilton City North is greater in the new model versus the old.

In **Hamilton City South**, Ruakura is expected to be slightly smaller in 2041 in the new model compared with the old, with more development again occurring between 2021 and 2041. The Peacockes development has reduced in size in 2041 (7,800 in old model vs 5,700 in new), although the staging is similar. By 2041, the new model has 7,900 fewer houses in Hamilton City South compared with the old, of which Peacockes accounts for just over a quarter (27%). So other residential areas in Hamilton City South are expected to grow less in the new model than the old.

In **Tauranga**, the household growth expected between 2006 and 2021 is identical between the two models (noting the growth to 2021 in Table 4 for the new model is from 2013). From 2021 to 2041, however, more than 6,000 additional houses are now expected in the new model compared with the old.

Elsewhere, and as noted in section 3, new developments no longer seem to be expected in East Cambridge, Huntly and Ngaruawahia.

Significant numbers of additional houses are expected between 2021 and 2041 for the **South Auckland** area covered by the WRTM. This is likely to influence travel patterns, which is discussed in the next section.

7. Travel Demand Comparison

7.1 Total Trips

Total light vehicle trips in each peak period (two hour generations) are tabulated below for 2021 and 2041 for the old and the new versions of the model, along with total households which controls trip-making. Franklin (area 9) has been omitted from all figures in the following table.

YEAR	MODEL	TOTAL HOUSEHOLDS	TOTAL LIGHT VEHICLE TRIPS (TWO HOURS)		
			AM	Interpeak	PM
2021	Old	266,800	269,900	260,300	310,200
	New	258,300	234,200	225,800	279,600
Difference (New - Old)		-8,500	-35,700	-34,500	-30,600
2041	Old	330,400	317,600	318,600	369,200
	New	324,400	261,200	264,000	321,100
Difference (New - Old)		-6,000	-56,300	-54,600	-48,100

Table 6: Households vs Total Trips, Old vs New

The fewer number of households means fewer trips in the new model for both 2021 and 2041.

7.2 Travel Patterns

Using the same sector system as outlined above, the light vehicle trip matrices between each of the 13 areas were compared for the old model versus the new. The sector matrices themselves and the differences are tabulated in Appendix B. Directionality has been removed so that trips to and from a sector are combined. Franklin has been removed from the tables but is included in the graphics below.

Figure 6 to Figure 17 below display graphically the trips between each area in the AM peak, interpeak and PM peak periods for the years 2021 and 2041 for both the old and new models. The blue bars show the aggregated number of vehicle trips for two hours within each period, the red dot illustrates the sector/area (approximate), and the red lines are the sector boundaries. Note that a single future year network has been used as the basis for all the graphics – it is the trip matrices that are the focus of the following analysis.

Trips within Hamilton City dominated the graphic and have therefore been removed from the graphics to improve visibility. Trips to/from area 9 (Franklin) have been retained but do not cover the same area so should be compared with caution. Intra-sector trips are not shown.

The diagrams in **Figure 6 to Figure 17** illustrate that, at a high level, travel patterns appear similar for both the old and new models.

The travel demand between Hamilton City and Cambridge and Hamilton and Te Awamutu is reduced by approximately 50% in the new model. There are 10-15% less households in these areas by 2041 in the new model which will contribute to the reduction in demand.

Trips to and from Ngaruawahia are approximately 40% lower in the new model at 2021 which is explained by the 50% reduction in households in Ngaruawahia in the new model.

Differences in travel demands are less pronounced in 2041 by which time various developments in the Waikato region are at similar stages in both the old and new models.

Further analysis is provided after the graphics below.

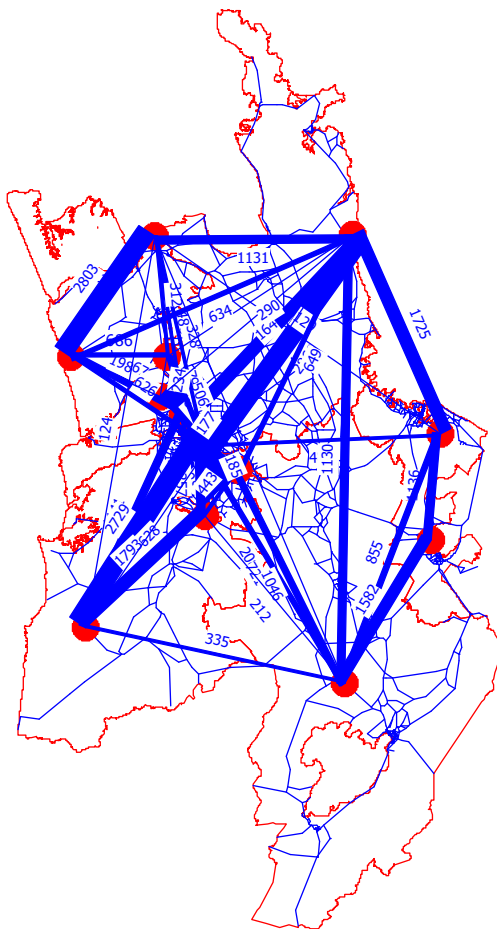


Figure 6: Old 2021 AM Peak

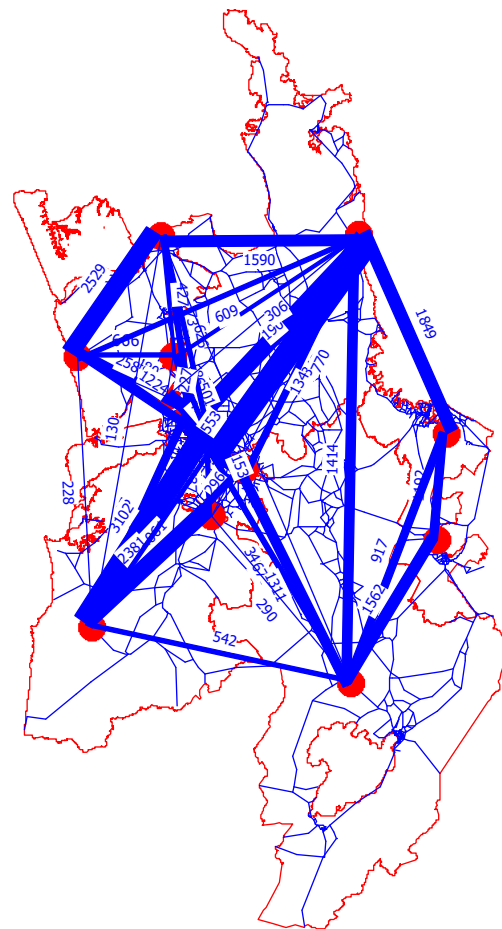


Figure 7: New 2021 AM Peak

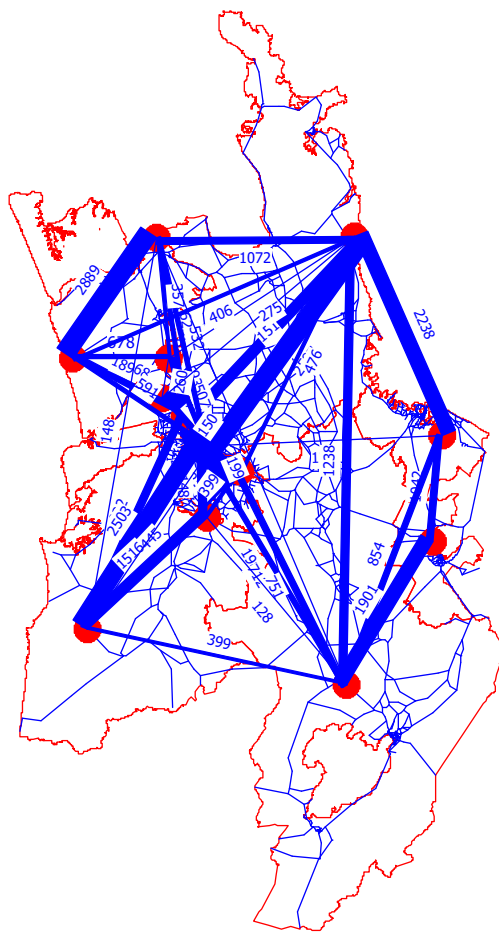


Figure 8: Old 2021 Interpeak

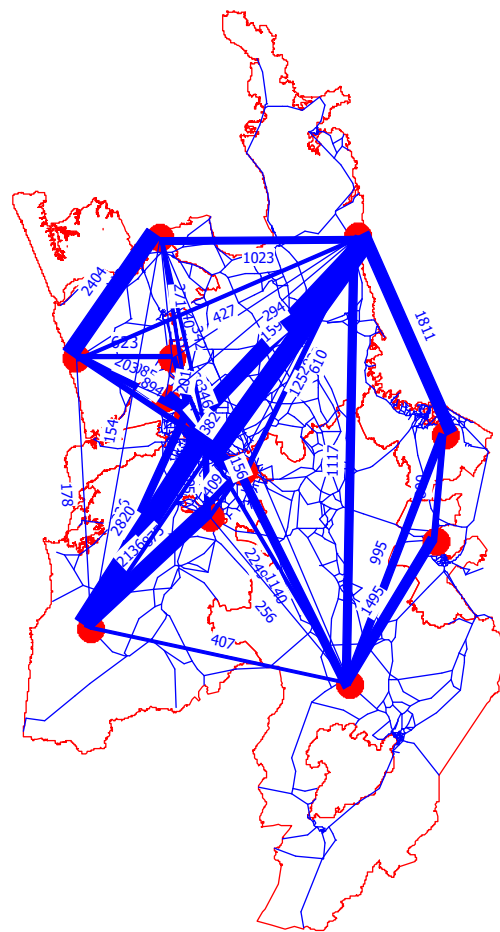


Figure 9: New 2021 Interpeak

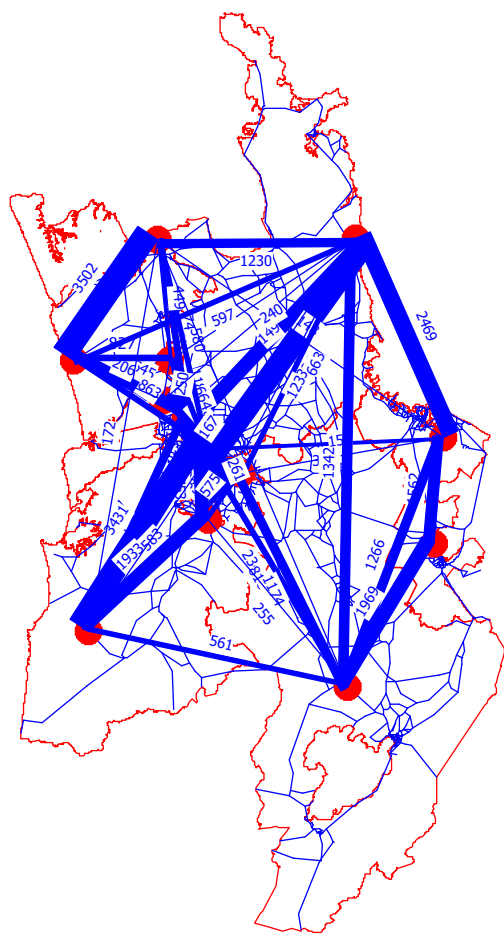


Figure 10: Old 2021 PM Peak

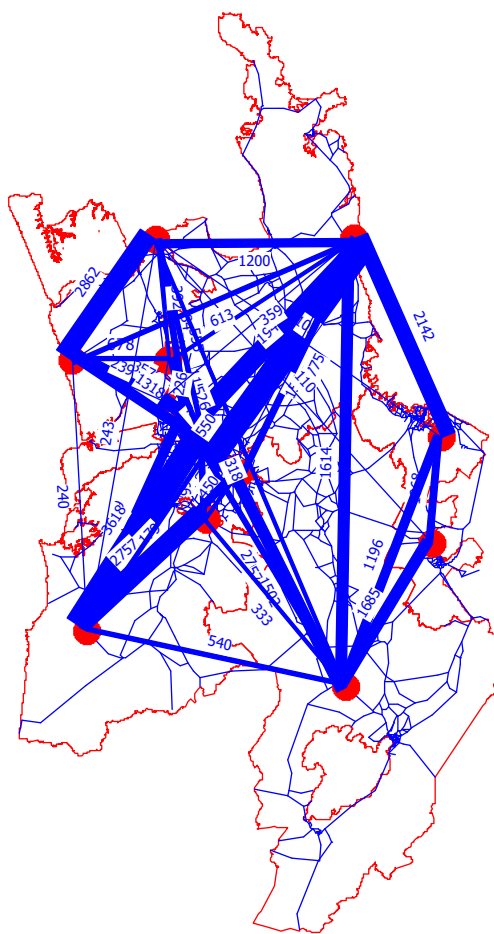


Figure 11: New 2021 PM Peak

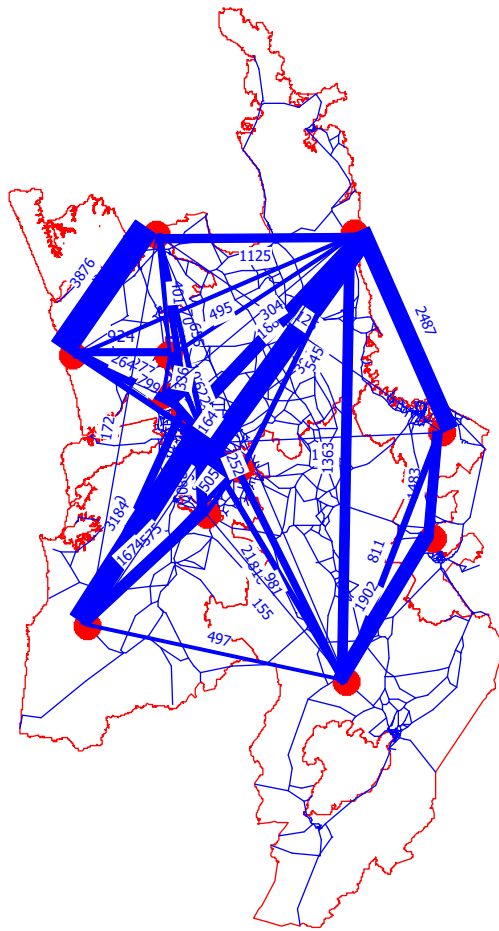


Figure 14: Old 2041 Interpeak

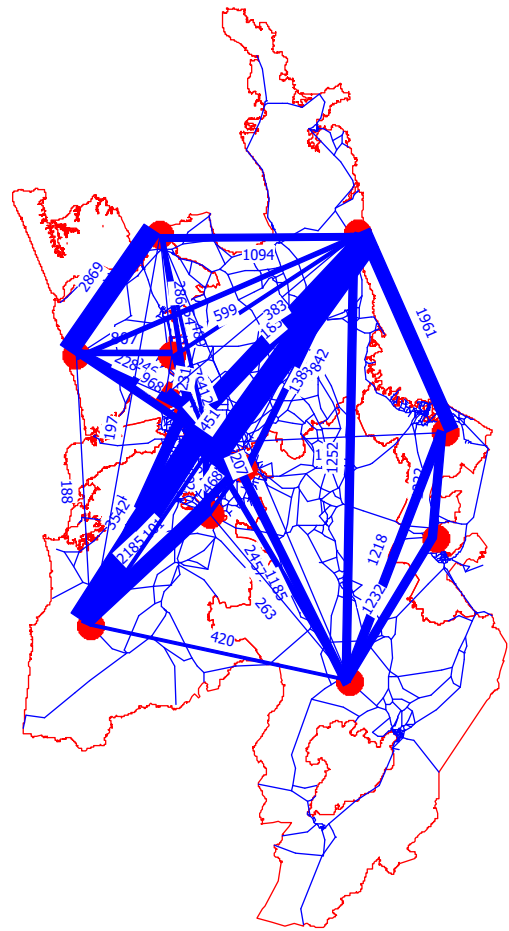


Figure 15: New 2041 Interpeak

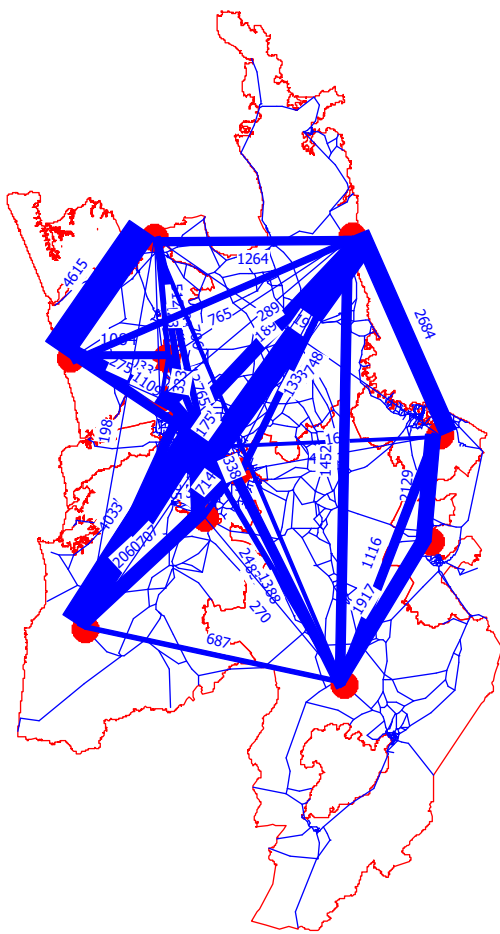


Figure 16: Old 2041 PM Peak

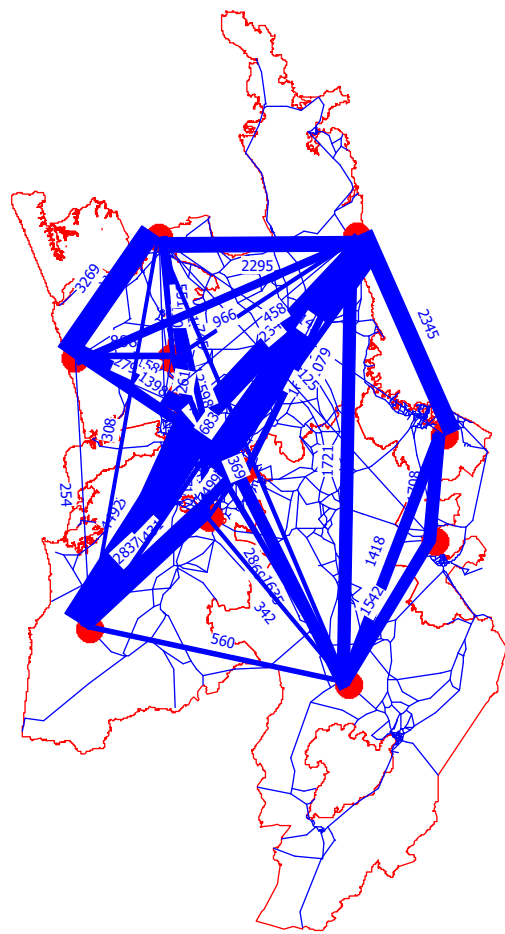


Figure 17: New 2041 PM Peak

The graphics above do not illustrate any change in intra-sector trips, or changes in trips within Hamilton City. Considering all travel, the significant differences in sector-to-sector trip making between the old and new models, which are consistent for all peak periods and both forecast years considered, are:

- Trips within Hamilton South, significantly less in the new model (10,000 – 20,000 fewer). This aligns with the smaller household growth and the smaller number of jobs input to the model;
- Reduced trips between Hamilton North and Hamilton South. This also aligns with the change in input land use, with significantly smaller estimates of residential growth and employment in Hamilton South and slightly fewer jobs in Hamilton North in the new model;
- Reduced trips within Tauranga. Fewer jobs are now projected in Tauranga, but more households are expected by 2041 (new model vs old). This will mean more travel as people leave Tauranga to seek employment opportunities elsewhere;
- Reduced trips within Rotorua. Both households and jobs are now lower in the new model than in the old;
- Reduced trips within the South East (sector 12). The drivers for this change are more difficult to ascertain, as land use inputs are similar between the models;

- For the AM peak only (both 2021 and 2041), there are fewer trips within the North East (sector 11). In other periods, a less notable difference is apparent.

The lower number of intra-sector trips in the new model (vs the old) is not compensated by a corresponding increase in inter-sector travel. So for Hamilton South, for example, the reduction in input households and jobs leads to fewer trips in total in and out of Hamilton South. This will clearly result in a change to forecasts for travel on the Southern Links in particular.

8. Key Points on Land Use Differences

- Overall, less residential development is now expected than in previous projections;
- In particular, households in Hamilton South are considerably lower in the latest land use projections (new vs old);
- In terms of specific developments, Rotokauri, Rototuna, and Ruakura have about the same number of households by 2041 but the staging is now deferred with more development occurring later. A smaller scale for the Peacockes development has also been assumed. Developments around Huntly, East Cambridge, and Ngaruawahia no longer appear to be planned (household growth in old land use that is not included in new);
- Employment figures are now also lower in aggregate. The employment inputs in particular warrant further investigation as they show a distinctly different pattern compared with households;
- The reduced input land use results in a lower estimate of vehicle trip-making in the new model compared with the old. This is associated with the model inputs and not the model itself.

9. Recommendations

9.1 Network Differences

The key differences reported in Table 1 should be reviewed by the WRTM User Group and a decision made regarding what is to be modelled.

Modified networks for the new model will then be produced, with additional network detail for the Rotokauri development, and taking on board input from the User Group regarding other network elements identified in this technical note.

9.2 Land Use Differences

It is recommended that the magnitude of the 'new' land use dataset is confirmed as appropriate, including absolute values as well as staging over time.

Appendix A

Differences Between Old and New Network Models

900 ZONE VS 2500 ZONE NETWORK COMPARISON			
Location	900z	2500z	Action Required
Rural Waikato			
Main Rd/Tairua Rd/Kopu-Hikuai Rd	60kph	70kph	
Hauraki Rd	80 kph	95 kph	
Awaiti Rd	75 kph	95 kph	
Front Miranda/Miranda/Mangatangi Rd	75 kph	95 kph	
Rangiriri		Roads W of Te Kauwhata added to model	
Tahuna Rd/Waiterimu Rd	1 approach lane from Tahuna Rd EB	2 approach lanes from Tahuna Rd EB	
Huntly		Additional roading modelled - eg Rayner Rd to James Rd, Bailey St, Hakanoa St, Rosser St	
Waikato expressway/Fisher Rd	1 approach lane on each approach	2 approach lanes on each approach	
McVie Rd	Disconnected at expressway	Connected across expressway	
SH1 - Bell Crossing St to East Mine Rd	70 kph	80 kph	
SH1 - Tainui Bridge Rd to Bell Crossing St	50 kph	80 kph	
SH1 - Great South Rd (Taupiri) to Tainui Bridge Rd	85 kph	80 kph NB, 90 kph SB	
Hakarimata Rd - Ngaruawahia to Tainui Bridge Rd	85 kph	70 kph	
Tainui Bridge Rd/Rotowaro Rd/Riverview Rd	3 leg Minor intersection	Realigned to 4 leg intersection with Harris St and Roundabout modelled	
Waikato Expressway intersection with Gordonton Rd	Diamond with Give Ways at on/off ramps	Diamond with Roundabouts at on/off ramps	
River Rd - South of Duke St	90 kph	80 kph	
SH1 - Croall Cres to Horotiu Rd	90 kph	100 kph	
SH1 intersection with Horotiu Rd	LILO	Give Way with all turns available	
SH1 intersection with Horotiu Bridge Rd	Roundabout	Signals	
Onion Rd extension to Horotiu Rd	Modelled and Mathers to Redoaks Close	Not modelled	

900 ZONE VS 2500 ZONE NETWORK COMPARISON			
Location	900z	2500z	Action Required
	connected		
Morrinsville- Tahuna Rd (Paeroa-Tahuna Rd to Pioneer Rd)	95 kph	85 kph	
Paeroa-Tahuna Rd	95 kph	85 kph	
SH26 (S of Paeroa to N of Te Aroha)	100 kph	70 kph	
Ngutumanga	75 kph	90 kph	
SH2 (Crean Rd to Gilmour St)	70 kph	90 kph	
Gilmour St	50 kph	60 kph	
Old Tauranga Rd/Pukekauri Rd	90 kph	70 kph	
Katikati Bypass	modelled	Not Modelled	
Roache Rd/SH26 (E of Studholme) to W of Stanley Rd South	70 kph	85 kph	
SH27 - Ngarua Rd to SH26	90 kph	95 kph	
SH26/SH27	3 leg intersection	Realigned to 4 leg intersection with Roundabout modelled	
Maungakawa Rd	75 kph	85 kph	
SH27 Wardville Rd to Waihekau Rd	90 kph	100 kph	
Kereone Rd	75 kph	85 kph	
Morrinsville- Walton Rd	85 kph	75 kph	
Chepmell Rd	85 kph	75 kph	
Walton Rd	85 kph	75 kph	
Bell Rd/Scotsman Valley Rd	85 kph	75 kph	
Tauwhare Road/SH26 to Piako Rd	90 kph	85 kph	
SH26 from Piako Rd	75 kph	85 kph	
Piako Rd/SH26	Give Way	Minor	
SH26 - Tauwhare to Platt	80 kph	95 kph	
Tauwhare Rd	90 kph	85 kph	
SH1B - Tauwhare to Victoria Rd	90 kph	85 kph	
Marychurch Rd	90 kph	85 kph	
SH1B - Gordonton to Puketaha	70 kph	75 kph	
Sainsbury Rd	85 kph	95 kph	
Puketaha Rd	80 kph	95 kph	

900 ZONE VS 2500 ZONE NETWORK COMPARISON			
Location	900z	2500z	Action Required
Waharoa Rd west - N of Broadway	60 kph	85/90 kph	
Mangawhero Rd - S of Tower Rd	65 kph	75 kph	
SH27 - Mowbray to Wardville	60 kph	90 kph	
Wardville Rd	65 kph	75 kph	
Main North Rd - Otorohanga Rd to E of Phillips Ave	70 kph	75 kph	
Te Kumi Rd - N of Carroll St	100 kph	80 kph	
Carroll St	100 kph	90 kph	
Waitete/Awakino Rd	Give Way	Roundabout	
SH31 N from Te Kawa Rd	100 kph	90 kph	
Pokuru Rd	100 kph	90 kph	
short link on SH3 N of Te Kawa Rd	80 kph	100 kph	
Taupiri			
Wright St/Greenlane Rd	Connected to SH1	Both connect to Gordonton Rd	
Onslow Av	Not modelled	Modelled	
Kerie Rd/Gordonton Rd	Minor	Give Way	
Dawson Rd	95 kph	90 kph	
Driver RD	90 kph	70 kph	
Howard Rd	90 kph	70 kph	
Bankier Rd	95 kph	90 kph	
Gordonton Rd - Peach to Ballard	85 kph	95 kph	
Gordonton Rd - Puke Rd to Peach Rd	65/75 kph	95 kph	
Tauranga			
Tauranga West Rd S of Katikati to N of Momokoroa	2 lanes each direction	1 lane each direction	Confirm correct number of lanes to model
Tauranga West/Omokoroa	Roundabout	Give Way	
Tauranga West/Plummers Point Rd	3 approach lanes on Tauranga West	2 approach lanes on Tauranga West	
Tauranga West/Snodgrass	3 approach lanes on Tauranga West	2 approach lanes on Tauranga West	
Tauranga West/Clarke	3 approach lanes on Tauranga West	2 approach lanes on Tauranga West	
Tauranga West/Te Puna	3 approach lanes on	2 approach lanes on	

900 ZONE VS 2500 ZONE NETWORK COMPARISON			
Location	900z	2500z	Action Required
	Tauranga West	Tauranga West	
Tauranga West/Te Puna Station Rd	3 approach lanes on Tauranga West	2 approach lanes on Tauranga West	
Tauranga West/Carmichael Rd	3 approach lanes on Tauranga West	2 approach lanes on Tauranga West	
Tauranga West/Wairoa Rd	Roundabout	Give Way	
SH29 from S of Moffat Rd to SH28	95 kph	80 kph	
short link in SH29at Hanga Rd intersection	70 kph	80 kph	
Hairini St - connection to SH2	Connection modelled	Hairini Rd disconnected from SH2A	
Ohauti Rd/ Poike Rd	Roundabout	Stop	
Welcome Bay Rd/SH29	Signals (1/2 diamond)	Roundabout	
SH2/SH29	Signals (1/2 diamond)	Roundabout	
Tauranga East Rd (SH2) - S of Hwy/Tara Rd to W of SH33 Te Puke East Rd	80 kph	95 kph	
Welcome Bay Rd/SH2	Banned R turns at free L turns	No banned turns	Add banned turns to new base model
Tauranga East / SH (Tara/Domain)	Full diamond with Roundabouts	Intersection layout matches current layout	
Tara/Parlton	2 approach lanes from Parlton NB	1 approach lanes from Parlton NB	
Papamoa Beach Rd/Parlton	2 approach lanes on each approach	1 approach lane on each approach	
SH2 intersection with SH33 (N of Paengaroa)		Different intersection alignment	
Maunganui Rd/SH2		Free L turns added to RA	
Maunganui Rd/Concord Ave	2 approach lanes from Maunganui Rd	3 approach lanes from Maunganui Rd	
Tauranga Harbour Bridge	55/60 kph	70 kph	
Mirrilees Rd/Dive Cres	Roundabout S side of bridge, Give Way N side of bridge	Signals both sides of the bridge and signals at Chapel St	
Rotorua			
Ngongotaha Rd/SH5	Signals	Roundabout	
Ngongotaha Rd/Old Quarry Rd		SB through movement banned	Confirm correct intersection movements and remove banned movement in new base model if appropriate

900 ZONE VS 2500 ZONE NETWORK COMPARISON			
Location	900z	2500z	Action Required
Fairy Springs Rd / SH5	55 kph	60 kph	
Tokoroa			
Old Taupo Rd/SH32 (Maraetai Rd)	Priority to Old Taupo Rd	Priority to SH32	Confirm correct priority and amend new base model if appropriate
SH5 (Settlers Rd to Tutukau Rd)	95 kph	100 kph	
Taupo			
Centennial Drive - Broadlands to SW of Taupo bypass	50/60 kph	90 kph	
Broadlands/Taupo bypass		Different intersection alignment	
Broadlands Rd - View Rd to Miro St	75 kph	90 kph	
Crown Rd	45 kph	40/70 kph	
SH1 - Richmond Ave to Rifle Range Rd	60/55 kph	70/50 kph	
Anzac Memorial Rd	Not modelled	modelled	
Arrowsmith Ave	40 kph	50 kph	
Mere Rd	50 kph	40 kph	
Heuheu Rd	60 kph	50 kph	
Tamamutu St	60 kph	50 kph	
Ruapehu St	60 kph	50 kph	
Spa Rd	60 kph	50 kph	
Napier Taupo Rd - E of Taupo bypass to Lake Terrace	70 kph	100/80 kph	
SH1/Tirau Rd intersection with SH29	banned turns not included at merges etc	Banned turns included	Omission of banned turns in old model was incorrect – no change to new model required
Te Awamutu			
Ngaroto Rd		Shape/alignment of road missing. Link is straight line connection between nodes.	Incorrect alignment has no significant effect on model operation but new base model will be edited to correct road alignment
Ohaupo Rd/SH3	100 kph	95 kph	
Pirongia Rd	75 kph	90 kph	
Frontier Rd	75 kph	90 kph	
Cambridge Rd	40 kph	75 kph	
Park Rd	40 kph	75 kph	

900 ZONE VS 2500 ZONE NETWORK COMPARISON			
Location	900z	2500z	Action Required
Flat Rd	40 kph	75 kph	
Golf Rd - SH3 to Park Rd	75 kph	65 kph	
Pokuru Rd - from Kawhia Rd N	85 kph	90 kph	
Cambridge /Ohaupo Rd	1 approach lane on each approach	2 approach lane on each approach	
Sloane St - Vaile to Brady	40 kph	50 kph	
Cambridge			
Norfolk Dr extn to Victoria Rd	Not modelled	Modelled with signals at Victoria Rd	
Bypass/Victoria Rd	Give Way at ramps	Signals at ramps	
Victoria Rd - Taylor to Hannon Rd	80 kph	70 kph	
Victoria Rd N of Hautapu	80 kph	70 kph	
Tulip Drive and other minor roads	Not modelled	Modelled	
Swayne Rd/Norfolk Dr	3 leg, Minor	4 leg, Roundabout	
ZigZag Rd E of Victoria	75 kph	65 kph	
Madison/Watkins	3 leg, Minor	4 leg, Roundabout	
Tirau/Shakespeare	LLO banned, stop	Roundabout	
Tirau - E of intersection with Shakespeare	80 kph	50 kph	
Tirau - W of intersection with Shakespeare	60 kph	50 kph	
Queen St	40 kph	45 kph	
Grey St	40 kph	45 kph	
Bryce St	40 kph	45 kph	
Cambridge Rd - W of Hall St	60/65/95 kph	50 kph	
Footpath/Cycle lane (Strawberry Field Rd)	modelled as road - Link-type 16	Link-type 99	Link type coded incorrectly in old model but correctly in new model. No action required.
Oaklea Lane/Pickering/Strawberry Field Rd	Give way	Roundabout	
Tamahere Dr/Pickering Rd	Give way from Tamahere South	Give way from Pickering	New model corrects intersection layout – No action required.
Marychurch Rd and SH1B - Victoria Rd to Tauwhare Rd	90 kph	85 kph	
Eastern Link - Cambridge Rd to	Not modelled	Modelled	

900 ZONE VS 2500 ZONE NETWORK COMPARISON			
Location	900z	2500z	Action Required
SH1			
"New Link"/Devine Lane		Slip lanes modelled	
"New Link"/Airport Rd		Slip lanes modelled	
Birchwood Lane extension to Devine Lane		Slip lanes modelled	
Newell Rd		Extended to wards Airport Rd	
Newell Rd	85 kph	75 kph	
Ihimaera Tce	Not modelled	Modelled	
Shakespeare St/Cook St	2 approach lanes from Cook St	1 approach lane from Cook St	
Carlyle St/Lamb St	Stops	Minors	
Peacocke			
Different road layout			
Ohaupo Rd extension North to Southern Links	Not modelled	Modelled	
Interchange on SH3 at Titanium Park	Not modelled	Modelled	
Rukuhia Rd	80 kph	90 kph	
Hamilton City			
Collins Rd - from Catalina Dr West	85 kph	100 kph	
Collins Rd East	50 kph	55 kph	
Ohaupo Rd - S of Collins	Different speeds	Different speeds	
Temple Access	65 kph	40 kph	
Private Rd (Off Collins Rd)	65 kph	55 kph	
Tuhikaramea Rd - Collins to temple access	65 kph	55 kph	
Tuhikaramea/Cowley Dr	Give way	Roundabout	
Tuhikaramea/Foster Rd	Give way	Roundabout	
Kahikatea/Quentin/Gallagher	Roundabout	Signals	
SH1 - Greenwood to Tawa	70 kph	60 kph	
SH1 - Ohaupo to Normandy Ave	60 kph	50 kph	
Normandy Ave from SH1	60 kph	50 kph	
Cobham Dr - Normandy to Tristram	60 kph	70 kph	
Cobham Dr / City Link	Seagull	Signals with free L turns	
Bader St	50 kph	40 kph	

900 ZONE VS 2500 ZONE NETWORK COMPARISON			
Location	900z	2500z	Action Required
Mormandy / Beatty	Stop	LIFO	
Mount View Rd / Vivian St	Give way	Roundabout	
Mount View Rd / Prisk St	Give way	Roundabout	
Prisk St	35 kph	40 kph	
Catalina Dr/Kittyhawk Pl	Minor	Give way	
Rhonda Ave / Rosalind St	Give way	Roundabout	
Deannell Ave / Janna Pl	Give way	Roundabout	
Deanwell Ave /Susan Pl	Give way	Roundabout	
Higgins Rd	60 kph	50 kph	
Irvine St	30 kph	50 kph	
Blackburn St	30 kph	50 kph	
Paterson St	30 kph	50 kph	
Poaka Ave	40 kph	50 kph	
Whatawhata Rd (SH23) to Wallace Rd	50/55 kph	60 kph	
Greenwood St - Killarney to Rifle Range Rd	80 kph	60 kph	
Lincoln St	80 kph	60 kph	
Rifle Range Rd - to Ellicott	70 kph	50 kph	
Ellicott Rd	Different speeds	Different speeds	
Ellis St	40 kph	50 kph	
Killarney Rd	45 kph	50 kph	
Killarney/Queens Ave	R turns into Queens Ave banned	No banned turns	
Killarney/Greenwood		Free L from Killarney WB	
Lachlan Dr	30 kph	50 kph	
Maple Ave/Aberdeen Dr	Stop	Roundabout	
Ruakura/Morrinsville/Lisette	Give Ways	Roundabout	
Ruakura/Davison/Vaile	Give Ways	Roundabout	
Ruakura/Holland	Give way from Old Ruakura	Minor from Holland	Confirm correct intersection layout and amend new base model if required
Ruakura minor roads	Different roading	Different roading	
Morrinsville Road	70 kph	80 kph	
Morrinsville/Cambridge		Seagull at intersection	
Cambridge/Cobham	Roundabout	Signals	

900 ZONE VS 2500 ZONE NETWORK COMPARISON			
Location	900z	2500z	Action Required
Cambridge/Masters Ave	Give way	Signals	
Cambridge/Hillcrest Rd	Give way	Roundabout	
Cambridge/Knighton Rd	Give way	Roundabout	
Cambridge/Naylor/Wairere Dr Extn	Signals with full diamond	Free L turn from Cambridge WB	
Brookfield St	Terminates at Fox St	Extends to just before Wairere Dr extn	
Henry St	Terminates at Fox St	Connect to Dey St	
Peacockes Rd/City Link/Ring Rd Link	Roundabout	Signals	
Southern Links/Peacockes minor roads	Different minor road layout	Different minor road layout	
Naylor St/Grey St	Give ways	Roundabout with free L turns	
Wairere Dr extn	Not modelled	Modelled	
Old Farm Rd ramp to Dey St	Not modelled	Modelled	
Wairere Dr/Old Farm Rd (to N)	R turn out of Old Farm Rd banned	No banned turns	
Cassidy St		Extended to Dey St	
Cook St		Extended to Dey St	
Wellington St		Extended to Dey St	
Henry St		Extended to Dey St	
Ruakura/Peachgrove/Te Aroha St	Signals with free L turn from Peachgrove SB	3/4 diamond	
Wairere Dr/Ruakura	4-way intersection with signals	Full diamond	
Bains Ave	20 kph	40 kph	
James St	30 kph	40 kph	
Frances St	30 kph	40 kph	
Bond St	30 kph	40 kph	
Argyle St	30 kph	40 kph	
Armagh St	30 kph	40 kph	
Te Aroha St/Ruakura Rd - Wairere Dr to River Rd	60 kph	50 kph	
River Rd - O'Neill St to Wairere Dr	60 kph	50 kph	
River Rd - Wairere Dr to Discovery Dr	55 kph	50 kph	
River Rd - Discovery Dr to	60 kph	50 kph	

900 ZONE VS 2500 ZONE NETWORK COMPARISON			
Location	900z	2500z	Action Required
Riverside Lane			
Boundary Rd/Casey Ave	Give Way	Give Way with banned R turn out of Casey Ave	
Boundary Rd/Heaphy Tc	Roundabout	Signals	
Boundary Rd/Peachgrove Rd/Fifth Ave/Brooklyn Rd	Roundabout	Signals	
Fifth Ave/John St	Give Way with 1 approach lane on each approach	Give Way with 2 approach lanes on each approach	
Fifth Ave/Spenser Rd	Give Way with 1 approach lane on each approach	Give Way with 2 approach lanes on each approach	
Fifth Ave/Tramway Rd	Stops	Give Ways	
Alfred St	30 kph	40 kph	
Claude St	30 kph	40 kph	
Clarkin Rd/Heaphy Tce	Give Way	Roundabout	
Clarkin Rd/Bankwood Rd	Give Way	Roundabout	
Bankwood Rd - Clarkin to Comries	40 kph	50 kph	
Kensington Pl extension	Road with link-type 4	Private access - LT 99	Link type coded incorrectly in old model but correctly in new model. No action required.
Snell Dr	60 kph	50 kph	
Thackery St - Ruakiwi to Tristram	35 kph	40 kph	
Tristram St - Cobham Dr to Thackery St	45 kph	55 kph	
Seddon Rd - S of King St	40 kph	50 kph	
Ward St	40 kph	50 kph	
Bryce St - Seddon to Anglesea	40 kph	50 kph	
Lake Rd/Queens Ave	Stop	Roundabout	
Commerce St - Lake Rd to High St	2 lanes	1 lane	
Ward St	Connection to Anglesea & Worley disconnected from Alexandra	Ward St ends at Anglesea, Worley Pl connected to Alexandra	
Tristram St - London to Rostrevor St	40 kph	50 kph	
Anglesea - London to Mill	1 lane each way	2 lanes NB, 1 lane SB	Confirm correct number of lanes and amend new base

900 ZONE VS 2500 ZONE NETWORK COMPARISON			
Location	900z	2500z	Action Required
			model if required
Abbotsford St	30 kph	40 kph	
Abbotsford/Ulster	2 app lanes on Ulster NB	3 app lanes on Ulster NB	
Ulster St - Abbotsford to Darley	55 kph	50 kph	
Victoria St - Mill St to Fairfield Bridge	60 kph	55 kph	
Rimu St	40/35 kph	50 kph	
Maeroa Rd	60 kph	50 kph	
Awatere Ave	30 kph	50 kph	
Forest Lake Rd	60 kph	55 kph	
Garnett Ave	30 kph	50 kph	
Forsyth St	35 kph	50 kph	
Forsyth/Cotton	Give Way	Roundabout	
Forsyth/Glasgow/Bowen	Minors	Realigned to 4-way intersection with Roundabout	
Norton Rd - Tahi to Lincoln	35 kph	50 kph	
Livingstone Ave	30 kph	50 kph	
Avalon Dr/Livingstone Ave	Give Way	Roundabout	
Avalon Dr/Grandview Rd	Give Way	Roundabout	
Avalon Dr/Dominion Rd	Give Way	Roundabout	
Nyanza St		Extended to Ellicott Rd	
Ellicott Rd - Avalon Dr to Aberfoyle St	50 kph	45 kph	
Waimarie St	40 kph	50 kph	
Roy St	35 kph	50 kph	
Hyde Ave/Lindsay Cres	Give Way	Roundabout	
Bartholomew Dr	40 kph	45 kph	
Farnborough Dr/Arundel/Highbury	Give Way	Roundabout	
Baverstock Rd - Rotokauri to Farnborough	45kph	50/65 kph	
Rotokauri/Avalon - Baverstock to Avalon Dr Bypass/SH1	45 kph	50 kph	
Rotokauri Minor roads	Different road layout	Different road layout	
Rotokauri Rd - E of Exelby	65 kph	80 kph	
Link Pine Ave to Rawlings St	40 kph	Link-type 99 (walk)	Link type coded incorrectly in old model but correctly in

900 ZONE VS 2500 ZONE NETWORK COMPARISON			
Location	900z	2500z	Action Required
			new model. No action required.
Pine Ave/Odette St/Dermont St	Give Ways	Roundabout	
Norrie St/Peacockes Rd to Waterford Rd	50 kph	40 kph	
Howell Ave	35 kph	50 kph	
Johnsonview Tce	50 kph	35 kph	
Duck Rd	65 kph	100 kph	
Fullerton Rd	65 kph	100 kph	
Limmer Rd	65 kph	100 kph	
Laxon Rd	65 kph	80 kph	
Great South Rd/The Base Parade	4-way intersection with signals	Full diamond with signals	
Maahanga Dr/The Base Parade	Signals	Roundabout	
Karewa Pl - Wairere Dr to Eagle Way	40 kph	55 kph	
Wairere Dr/Pukete Rd	4-way intersection with signals	Full diamond with signals	
Vickery St to Maxwell Pl	40 kph	55 kph	
Maui St	40 kph	60 kph	
Pukete Rd - N of Millthorpe	80 kph	60 kph	
Pukete Rd - S of Millthorpe	60 kph	50 kph	
Church Rd		Extended towards Pukete Rd	
Te Rapa Rd to Northern River Crossing	80 kph	90 kph	
Te Rapa Rd - N of Te Rapa Access Rd	80 kph	100 kph	
Hutchinson Rd	Straight line alignment	Alignment matches curvature of road on the ground (short dead-end road)	Error in road alignment in old model corrected in new model. No action required.
Rototuna Minor roads	Different minor road layout	Different minor road layout	
Discovery Dr	55 kph	50 kph	
Resolution Dr	65 kph	80 kph	
Thomas Rd	70 kph	60/50 kph	
Horsham Downs Rd - S of Thomas	60 kph	50 kph	

900 ZONE VS 2500 ZONE NETWORK COMPARISON			
Location	900z	2500z	Action Required
Resolution Dr - Wairere to Rototuna	55 kph	80 kph	
Wairere Dr/Huntington Dr N	Give Way all turns allowed	LILLO	
Wairere Dr/Huntington Dr S	Give Way	Roundabout	
Wairere/Stoneleigh Dr	Give Way all turns allowed	LILLO	
Stoneleigh Dr/Ellsworth Pl/Milbrook Pl	Minors	Roundabout	
Darjon Dr/Shirley Pl	Minor	Uncontrolled	
Darjon Dr - Shirley Pl to Rhys Ave	LT 4	LT 99 (Walk)	Link type coded incorrectly in old model but correctly in new model. No action required.
Puketaha/St James/Gordonton	Stops	Roundabout	
Thomas/Gordonton	Give Way	Roundabout	
Barrington/Thomas	Give Way	Roundabout	
Moonlight Dr/Mercury/Alconbury	Minors	Roundabout	
Alconbury Dr/Westminster Pl	Minors	Roundabout	
Cycle Path (Magellan Rise to Tuirangi St)	LT 4	LT 99 (Walk)	Link type coded incorrectly in old model but correctly in new model. No action required.
Crosby Rd	50 kph	55 kph	
Comries Rd	60 kph	50 kph	

Appendix B

Sector Vehicle Demands, 2021 and
2041, AM/Interpeak/PM Peak Two
Hours, Old vs New Model

2021 AM, Two Hours

Old Model

900Z2021AMP	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	15,424	20,809	46	705	316	11	1,792	793		967	1,768	208	1,141	43,982
2	0	33,064	486	2,883	1,257	22	856	506		626	2,866	721	2,729	46,017
3	0	0	64,325	49	7	1,136	2	2		4	1,725	855	24	68,129
4	0	0	0	4,871	443	24	34	33		34	649	1,046	628	7,763
5	0	0	0	0	4,216	2	17	10		19	84	212	1,793	6,354
6	0	0	0	0	0	24,445	0	1		1	39	1,582	10	26,079
7	0	0	0	0	0	0	700	234		198	164	10	61	1,366
8	0	0	0	0	0	0	0	1,304		686	290	16	36	2,333
9														0
10	0	0	0	0	0	0	0	0		3,578	634	18	78	4,308
11	0	0	0	0	0	0	0	0		0	27,755	1,130	177	29,062
12	0	0	0	0	0	0	0	0		0	0	26,441	335	26,775
13	0	0	0	0	0	0	0	0		0	0	0	7,760	7,760
Total	15,424	53,872	64,858	8,509	6,239	25,641	3,402	2,883	0	6,114	35,975	32,239	14,772	269,927

New Model

2500Z2021AMP	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	14,459	17,362	41	415	157	29	1,177	865		1,480	2,440	341	1,195	39,961
2	0	23,365	65	1,308	537	47	415	501		1,224	3,424	676	3,102	34,665
3	0	0	55,644	53	10	1,192	1	1		3	1,849	917	39	59,708
4	0	0	0	3,632	296	52	12	36		51	770	1,311	1,061	7,221
5	0	0	0	0	3,389	7	6	12		49	134	290	2,381	6,268
6	0	0	0	0	0	19,715	1	1		2	52	1,562	31	21,364
7	0	0	0	0	0	0	439	227		258	190	12	44	1,170
8	0	0	0	0	0	0	0	759		666	306	12	52	1,796
9														0
10	0	0	0	0	0	0	0	0		2,795	609	23	228	3,655
11	0	0	0	0	0	0	0	0		0	24,752	1,414	553	26,718
12	0	0	0	0	0	0	0	0		0	0	23,869	542	24,411
13	0	0	0	0	0	0	0	0		0	0	0	7,308	7,308
Total	14,459	40,727	55,749	5,408	4,389	21,043	2,052	2,403	0	6,528	34,525	30,425	16,535	234,243

Difference	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	-965	-3,446	-5	-290	-159	19	-615	72		513	672	132	53	-4,020
2	0	-9,699	-422	-1,575	-720	25	-441	-5		599	558	-45	373	-11,352
3	0	0	-8,682	4	3	56	-1	-1		-1	124	62	15	-8,422
4	0	0	0	-1,239	-147	28	-22	4		16	122	265	433	-542
5	0	0	0	0	-827	5	-10	2		30	50	78	588	-85
6	0	0	0	0	0	-4,730	1	0		1	13	-20	21	-4,715
7	0	0	0	0	0	0	-261	-7		60	25	2	-16	-196
8	0	0	0	0	0	0	0	-545		-20	16	-4	16	-538
9														0
10	0	0	0	0	0	0	0	0		-783	-25	6	149	-653
11	0	0	0	0	0	0	0	0		0	-3,003	284	376	-2,343
12	0	0	0	0	0	0	0	0		0	0	-2,571	207	-2,364
13	0	0	0	0	0	0	0	0		0	0	0	-453	-453
Total	-965	-13,145	-9,109	-3,101	-1,850	-4,598	-1,350	-480	0	414	-1,450	-1,814	1,762	-35,684

2021 Interpeak, Two Hours

Old Model

900Z2021INP	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	15,705	19,079	64	591	274	12	1,854	936		968	1,685	198	1,022	42,388
2	0	30,200	123	2,583	1,148	24	708	507		591	2,587	712	2,503	41,686
3	0	0	64,331	46	8	1,042	3	2		5	2,238	854	31	68,559
4	0	0	0	5,054	399	39	29	23		20	476	751	445	7,235
5	0	0	0	0	4,475	3	15	7		13	61	128	1,516	6,218
6	0	0	0	0	0	23,487	1	1		1	54	1,901	13	25,458
7	0	0	0	0	0	0	525	260		189	151	11	56	1,192
8	0	0	0	0	0	0	0	1,068		678	275	22	40	2,083
9														0
10	0	0	0	0	0	0	0	0		2,545	406	22	71	3,044
11	0	0	0	0	0	0	0	0		0	27,131	1,238	150	28,519
12	0	0	0	0	0	0	0	0		0	0	27,002	399	27,401
13	0	0	0	0	0	0	0	0		0	0	0	6,546	6,546
Total	15,705	49,279	64,518	8,274	6,303	24,606	3,136	2,804	0	5,011	35,064	32,839	12,789	260,329

New Model

2500Z2021INP	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	14,481	17,512	25	538	242	11	1,141	696		1,085	2,143	226	1,236	39,336
2	0	19,879	61	1,415	705	22	449	346		894	2,833	496	2,820	29,918
3	0	0	55,476	46	8	800	1	1		3	1,811	995	27	59,169
4	0	0	0	3,622	409	43	17	23		32	610	1,140	875	6,771
5	0	0	0	0	3,399	3	10	9		42	125	256	2,136	5,980
6	0	0	0	0	0	19,184	0	1		1	28	1,495	18	20,727
7	0	0	0	0	0	0	293	201		203	159	7	51	916
8	0	0	0	0	0	0	0	792		623	294	11	37	1,756
9														0
10	0	0	0	0	0	0	0	0		2,464	427	18	178	3,087
11	0	0	0	0	0	0	0	0		0	25,763	1,117	382	27,262
12	0	0	0	0	0	0	0	0		0	0	23,949	407	24,356
13	0	0	0	0	0	0	0	0		0	0	0	6,525	6,525
Total	14,481	37,391	55,563	5,621	4,762	20,064	1,911	2,069	0	5,346	34,192	29,710	14,691	225,802

Difference	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	-1,224	-1,567	-39	-53	-32	-1	-714	-239		117	458	28	214	-3,052
2	0	-10,321	-62	-1,168	-443	-2	-260	-161		302	245	-216	317	-11,768
3	0	0	-8,855	0	1	-241	-3	-1		-2	-427	141	-3	-9,390
4	0	0	0	-1,432	10	4	-13	0		11	135	390	430	-464
5	0	0	0	0	-1,076	1	-4	2		29	64	128	620	-237
6	0	0	0	0	0	-4,303	0	-1		0	-26	-406	5	-4,731
7	0	0	0	0	0	0	-232	-59		14	8	-3	-5	-277
8	0	0	0	0	0	0	0	-276		-55	18	-11	-3	-327
9														0
10	0	0	0	0	0	0	0	0		-81	21	-5	107	43
11	0	0	0	0	0	0	0	0		0	-1,368	-121	232	-1,257
12	0	0	0	0	0	0	0	0		0	0	-3,054	9	-3,045
13	0	0	0	0	0	0	0	0		0	0	0	-21	-21
Total	-1,224	-11,888	-8,955	-2,653	-1,541	-4,542	-1,225	-734	0	335	-872	-3,129	1,901	-34,527

2021 PM Peak, Two Hours

Old Model

900Z2021PMP	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	18,024	23,150	37	927	475	12	2,213	1,187		1,645	1,953	234	1,207	51,064
2	0	37,971	305	3,377	1,753	28	998	664		863	3,269	818	3,431	53,478
3	0	0	75,395	157	11	1,562	2	2		5	2,469	1,266	45	80,915
4	0	0	0	5,222	575	52	49	48		42	663	1,174	583	8,407
5	0	0	0	0	4,669	5	28	17		30	123	255	1,933	7,060
6	0	0	0	0	0	27,973	1	1		2	41	1,969	27	30,013
7	0	0	0	0	0	0	519	250		206	149	11	62	1,198
8	0	0	0	0	0	0	0	1,157		827	240	13	34	2,272
9														0
10	0	0	0	0	0	0	0	0		3,000	597	18	67	3,682
11	0	0	0	0	0	0	0	0		0	31,387	1,342	167	32,895
12	0	0	0	0	0	0	0	0		0	0	30,730	561	31,291
13	0	0	0	0	0	0	0	0		0	0	0	7,969	7,969
Total	18,024	61,121	75,738	9,683	7,484	29,632	3,810	3,326	0	6,620	40,891	37,830	16,085	310,244

New Model

2500Z2021PMP	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	19,087	20,511	18	562	256	13	1,365	1,153		1,857	2,727	270	1,399	49,217
2	0	26,911	28	1,499	766	20	439	526		1,318	3,553	574	3,618	39,253
3	0	0	68,204	43	6	1,068	1	1		2	2,142	1,196	29	72,692
4	0	0	0	4,354	450	37	15	34		43	775	1,502	1,179	8,389
5	0	0	0	0	4,145	5	9	14		55	155	333	2,757	7,472
6	0	0	0	0	0	23,956	0	1		2	40	1,685	27	25,710
7	0	0	0	0	0	0	381	226		239	194	10	47	1,097
8	0	0	0	0	0	0	0	716		678	359	13	56	1,822
9														0
10	0	0	0	0	0	0	0	0		2,638	613	22	240	3,514
11	0	0	0	0	0	0	0	0		0	30,448	1,614	550	32,612
12	0	0	0	0	0	0	0	0		0	0	28,940	540	29,480
13	0	0	0	0	0	0	0	0		0	0	0	8,387	8,387
Total	19,087	47,422	68,250	6,458	5,623	25,099	2,210	2,671	0	6,833	41,006	36,160	18,827	279,645

Difference	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	1,063	-2,639	-20	-364	-219	1	-848	-34		212	774	36	192	-1,847
2	0	-11,060	-277	-1,878	-986	-8	-560	-138		455	284	-244	187	-14,225
3	0	0	-7,191	-114	-5	-494	-1	-1		-3	-327	-70	-16	-8,223
4	0	0	0	-868	-125	-15	-34	-15		1	113	328	596	-18
5	0	0	0	0	-525	0	-19	-3		25	32	79	824	413
6	0	0	0	0	0	-4,017	0	0		0	-1	-284	0	-4,303
7	0	0	0	0	0	0	-138	-24		33	44	-1	-15	-101
8	0	0	0	0	0	0	0	-440		-149	119	0	21	-450
9														0
10	0	0	0	0	0	0	0	0		-362	16	5	172	-168
11	0	0	0	0	0	0	0	0		0	-938	272	383	-283
12	0	0	0	0	0	0	0	0		0	0	-1,790	-21	-1,811
13	0	0	0	0	0	0	0	0		0	0	0	418	418
Total	1,063	-13,699	-7,488	-3,224	-1,861	-4,534	-1,600	-656	0	213	116	-1,670	2,742	-30,598

2041 AM Peak, Two Hours

Old Model

900Z2041AMP	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	17,450	24,108	55	829	332	13	2,362	864		1,186	1,924	219	1,312	50,653
2	0	47,186	642	3,819	1,497	28	1,145	576		762	3,229	756	3,324	62,964
3	0	0	78,327	58	8	1,761	3	3		6	1,938	831	28	82,962
4	0	0	0	5,827	535	39	46	45		48	729	1,387	765	9,421
5	0	0	0	0	4,943	3	22	12		24	91	243	1,951	7,290
6	0	0	0	0	0	26,868	1	1		1	41	1,611	13	28,536
7	0	0	0	0	0	0	1,012	334		266	227	12	82	1,934
8	0	0	0	0	0	0	0	1,428		871	347	19	42	2,707
9														0
10	0	0	0	0	0	0	0	0		4,668	804	22	94	5,587
11	0	0	0	0	0	0	0	0		0	27,084	1,134	190	28,408
12	0	0	0	0	0	0	0	0		0	0	29,713	416	30,129
13	0	0	0	0	0	0	0	0		0	0	0	6,986	6,986
Total	17,450	71,295	79,023	10,533	7,315	28,712	4,590	3,262	0	7,833	36,414	35,948	15,202	317,578

New Model

250Z2041AMP	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	17,098	20,221	76	554	203	42	1,252	950		1,727	2,897	384	1,407	46,811
2	0	29,882	166	2,029	721	83	435	558		1,354	4,186	867	3,831	44,112
3	0	0	65,531	128	22	1,752	2	2		4	2,207	1,547	72	71,267
4	0	0	0	4,506	341	76	13	39		60	908	1,437	1,289	8,668
5	0	0	0	0	3,406	7	7	13		54	147	299	2,397	6,329
6	0	0	0	0	0	17,568	1	1		3	55	1,396	37	19,061
7	0	0	0	0	0	0	445	250		296	208	11	47	1,257
8	0	0	0	0	0	0	0	862		802	350	11	57	2,082
9														0
10	0	0	0	0	0	0	0	0		3,048	710	24	248	4,030
11	0	0	0	0	0	0	0	0		0	24,933	1,471	607	27,012
12	0	0	0	0	0	0	0	0		0	0	23,132	573	23,706
13	0	0	0	0	0	0	0	0		0	0	0	6,910	6,910
Total	17,098	50,102	65,774	7,217	4,693	19,528	2,156	2,674	0	7,348	36,602	30,579	17,474	261,245

Difference	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	-352	-3,888	22	-275	-129	30	-1,110	86		541	973	166	95	-3,841
2	0	-17,305	-476	-1,791	-776	55	-710	-18		593	957	111	507	-18,852
3	0	0	-12,795	71	14	-9	-1	-1		-2	268	716	44	-11,695
4	0	0	0	-1,322	-194	37	-33	-6		11	179	50	524	-753
5	0	0	0	0	-1,536	4	-15	1		30	56	55	446	-961
6	0	0	0	0	0	-9,300	1	0		1	14	-215	24	-9,475
7	0	0	0	0	0	0	-566	-85		30	-19	-1	-35	-677
8	0	0	0	0	0	0	0	-565		-69	3	-8	15	-625
9														0
10	0	0	0	0	0	0	0	0		-1,621	-93	3	154	-1,557
11	0	0	0	0	0	0	0	0		0	-2,151	337	417	-1,397
12	0	0	0	0	0	0	0	0		0	0	-6,581	157	-6,423
13	0	0	0	0	0	0	0	0		0	0	0	-76	-76
Total	-352	-21,193	-13,249	-3,317	-2,622	-9,183	-2,434	-588	0	-486	187	-5,368	2,272	-56,333

2041 Interpeak, Two Hours

Old Model

900Z2041INP	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	18,034	23,176	79	696	274	14	2,496	1,027		1,277	1,794	212	1,170	50,249
2	0	45,639	171	3,570	1,380	34	1,038	622		799	3,045	816	3,184	60,298
3	0	0	81,721	60	10	1,483	5	3		6	2,487	811	38	86,624
4	0	0	0	6,356	505	60	42	28		28	545	981	575	9,119
5	0	0	0	0	5,475	4	20	8		16	66	155	1,674	7,418
6	0	0	0	0	0	26,838	1	2		2	56	1,902	17	28,818
7	0	0	0	0	0	0	798	336		264	188	14	75	1,674
8	0	0	0	0	0	0	0	1,196		924	304	24	46	2,493
9														0
10	0	0	0	0	0	0	0	0		3,459	495	27	88	4,069
11	0	0	0	0	0	0	0	0		0	27,428	1,363	164	28,954
12	0	0	0	0	0	0	0	0		0	0	32,311	497	32,808
13	0	0	0	0	0	0	0	0		0	0	0	6,044	6,044
Total	18,034	68,815	81,970	10,682	7,644	28,433	4,400	3,221	0	6,775	36,408	38,616	13,572	318,569

New Model

250Z2041INP	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	17,299	21,040	58	735	299	18	1,230	793		1,246	2,566	243	1,504	47,030
2	0	26,237	175	2,229	892	43	483	412		968	3,522	577	3,542	39,079
3	0	0	69,916	97	20	1,222	2	2		5	1,961	1,218	55	74,497
4	0	0	0	4,656	468	30	21	31		43	842	1,185	1,101	8,378
5	0	0	0	0	3,602	5	11	10		42	138	263	2,185	6,256
6	0	0	0	0	0	18,797	0	1		2	30	1,232	20	20,083
7	0	0	0	0	0	0	329	231		228	185	7	54	1,035
8	0	0	0	0	0	0	0	1,085		807	383	11	43	2,330
9														0
10	0	0	0	0	0	0	0	0		2,798	599	20	188	3,604
11	0	0	0	0	0	0	0	0		0	28,311	1,252	451	30,015
12	0	0	0	0	0	0	0	0		0	0	24,764	420	25,184
13	0	0	0	0	0	0	0	0		0	0	0	6,525	6,525
Total	17,299	47,277	70,148	7,717	5,280	20,116	2,074	2,565	0	6,139	38,539	30,773	16,088	264,016

Difference	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	-735	-2,136	-21	39	25	3	-1,267	-234		-31	772	31	334	-3,220
2	0	-19,402	4	-1,342	-488	10	-555	-210		169	477	-239	357	-21,219
3	0	0	-11,805	38	10	-262	-3	-1		-1	-526	407	17	-12,126
4	0	0	0	-1,700	-37	-29	-21	3		15	298	205	526	-741
5	0	0	0	0	-1,873	2	-9	2		26	72	108	511	-1,162
6	0	0	0	0	0	-8,040	0	-1		0	-26	-670	3	-8,735
7	0	0	0	0	0	0	-469	-105		-36	-3	-6	-20	-639
8	0	0	0	0	0	0	0	-111		-116	80	-13	-3	-163
9														0
10	0	0	0	0	0	0	0	0		-662	103	-7	101	-465
11	0	0	0	0	0	0	0	0		0	884	-111	287	1,061
12	0	0	0	0	0	0	0	0		0	0	-7,547	-77	-7,624
13	0	0	0	0	0	0	0	0		0	0	0	481	481
Total	-735	-21,538	-11,822	-2,965	-2,364	-8,317	-2,325	-656	0	-636	2,131	-7,843	2,517	-54,553

2041 PM Peak, Two Hours

Old Model

900Z2041PMP	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	20,619	27,188	46	1,092	486	14	3,011	1,232		2,033	1,983	242	1,317	59,264
2	0	55,522	420	4,587	2,025	45	1,419	765		1,109	3,570	837	4,033	74,333
3	0	0	93,253	164	15	2,129	2	3		7	2,684	1,116	57	99,432
4	0	0	0	6,378	714	91	68	62		57	748	1,388	707	10,213
5	0	0	0	0	5,619	7	37	20		37	133	270	2,060	8,183
6	0	0	0	0	0	30,986	1	3		6	52	1,917	51	33,016
7	0	0	0	0	0	0	730	333		275	189	14	81	1,621
8	0	0	0	0	0	0	0	1,302		1,084	289	20	40	2,736
9														0
10	0	0	0	0	0	0	0	0		3,998	765	31	85	4,878
11	0	0	0	0	0	0	0	0		0	30,721	1,452	175	32,348
12	0	0	0	0	0	0	0	0		0	0	35,345	687	36,032
13	0	0	0	0	0	0	0	0		0	0	0	7,170	7,170
Total	20,619	82,710	93,719	12,220	8,860	33,272	5,268	3,722	0	8,605	41,135	42,634	16,462	369,226

New Model

2500Z2041PMP	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	23,274	24,256	22	734	316	13	1,455	1,271		2,158	3,272	286	1,686	58,743
2	0	35,061	38	2,238	971	22	458	598		1,398	4,396	691	4,492	50,363
3	0	0	83,178	47	7	1,708	1	1		3	2,345	1,418	28	88,737
4	0	0	0	5,525	499	51	17	42		57	1,079	1,635	1,431	10,337
5	0	0	0	0	4,300	4	10	15		57	169	342	2,837	7,733
6	0	0	0	0	0	22,354	0	1		2	36	1,542	24	23,958
7	0	0	0	0	0	0	407	261		279	234	9	50	1,240
8	0	0	0	0	0	0	0	973		888	458	13	63	2,395
9														0
10	0	0	0	0	0	0	0	0		2,937	966	25	254	4,182
11	0	0	0	0	0	0	0	0		0	32,561	1,721	683	34,966
12	0	0	0	0	0	0	0	0		0	0	29,456	560	30,016
13	0	0	0	0	0	0	0	0		0	0	0	8,419	8,419
Total	23,274	59,317	83,239	8,544	6,093	24,151	2,347	3,162	0	7,778	45,517	37,139	20,528	321,088

Difference	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
1	2,655	-2,932	-24	-358	-170	-1	-1,556	39		125	1,289	43	370	-521
2	0	-20,461	-382	-2,349	-1,055	-23	-961	-167		289	826	-146	459	-23,969
3	0	0	-10,075	-117	-8	-421	-2	-2		-4	-338	302	-29	-10,694
4	0	0	0	-853	-215	-40	-51	-20		0	331	247	724	124
5	0	0	0	0	-1,319	-3	-28	-5		19	36	72	777	-450
6	0	0	0	0	0	-8,632	0	-3		-4	-16	-375	-28	-9,058
7	0	0	0	0	0	0	-323	-72		4	45	-5	-31	-382
8	0	0	0	0	0	0	0	-330		-196	169	-7	23	-341
9														0
10	0	0	0	0	0	0	0	0		-1,060	201	-6	169	-696
11	0	0	0	0	0	0	0	0		0	1,840	269	509	2,617
12	0	0	0	0	0	0	0	0		0	0	-5,890	-127	-6,016
13	0	0	0	0	0	0	0	0		0	0	0	1,249	1,249
Total	2,655	-23,393	-10,481	-3,677	-2,766	-9,121	-2,921	-561	0	-827	4,383	-5,495	4,066	-48,138