A photograph of a busy Wellington street. In the foreground, a white car is driving towards the camera. To its left, a grey car is also visible. In the background, a green bus is driving away, and a blue truck is parked. The street is lined with traffic lights and signs. In the distance, a hillside is covered with many houses, and a large green hill rises behind them.

TN3 - WELLINGTON TRANSPORT ANALYTICAL TOOLS 2019-21 UPDATE - ZONING

PREPARED FOR GREATER WELLINGTON REGIONAL COUNCIL

25 June 2020

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Greater Wellington Regional Council

TN3 – Wellington Transport Analytical Tools 2019-21 Update - Zoning

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1. Introduction

1.1 Project Overview

This technical note is part of a series documenting the 2019-2021 update of components of the Wellington Regional Transportation Planning Analytical Tools ("Analytical Tools", "Tools"). The higher-level Analytical Tools are maintained and operated by Greater Wellington Regional Council (GWRC), who are the client for this project. This project is being primarily delivered by Stantec and Jacobs, supported by GWRC transport planners.

The Analytical Tools referenced in this report are:

- Demand Model, the Wellington Transport Strategy Model (WTSM), which currently has 225 zones and will be rebuilt as part of this project; and
- Wellington Public Transport Model (WPTM) which has 780 zones (that aggregate to 225) and will be updated (i.e. not rebuilt).

1.2 Purpose of this Report

This report covers:

- Level of zoning for the updated Demand Model and the rationale;
- Zone boundaries associated with Census changes; and
- Changes to improve the zonal homogeneity required in particular for a Demand Model.

1.3 Technical Note Revisions

The first issue of this technical note ended with a recommendation for some further refinement of the zoning system. This was discussed and agreed with the client.

This updated technical note (issue 2) documents the initial findings, agreement reached, and further modifications to the zoning ("round 2").

2. Overall Level of Zoning

As part of rebuilding the Demand Model, the level of zoning needs to be decided. Options are:

- Retain the current 225 zones;
- Move to 780 zones to align with the WPTM; or
- Adopt a mid-way point.

A zone system finer than the WPTM has not been considered, as the lower-tiered models should have more detail than the Demand Model. And rebuilding the WPTM is not within the scope of this project.

The main benefit of the 225 zone system is optimal run times. This is offset by less accurate route choice in the traffic assignment, inability to reflect transit-orientated development impacts, and coarser mode choice.

With constantly improving computational power, run times should not be the sole determinant of zonal detail, as long as a couple of scenarios can be evaluated overnight.

It was therefore recommended and accepted in the Scoping Workshop that the number of zones is increased in the Demand Model. Aligning with the WPTM provides the additional benefit of moving to a single EMME bank¹, and (potentially) allowing feedback between the different models.

The new Demand Model will therefore build on the 780 zone system.

3. Zone Changes from Census

3.1 Introduction

Prior to 2018, meshblocks, the smallest geographical unit in the Census, were aggregated to Census Area Units (CAU) with some data available by meshblock and other data only by CAU due to privacy constraints. Meshblocks were the building blocks for model zone systems, with the 225 and 780 Wellington zone systems either single or aggregations of meshblocks.

The 2018 Census moved from Area Units to Statistical Areas (SAs). The model zone system therefore should be rebuilt on SAs to allow comparison (in particular) with Census Journey to Work and Journey to Education trips. While some data is still available by meshblock at request, SA1-based data is more accessible.

3.2 SA1-related Zone Changes

The 780 zone system was rebuilt based on SA1s.

A key principle was not to split any SA1s. This is to avoid adding complexity in producing the land use data over the life of the Demand Model, which will be 10-20 years. However, it was subsequently decided that a limited number of SA1s will be split to meshblock level, which is considered in Section 6 of this report.

Diagrams of the change to the zoning are provided below. The zones derived from meshblocks are shown in red, while the closest equivalent developed from SA1s is coloured turquoise. Map backgrounds are omitted for clarity of the change.

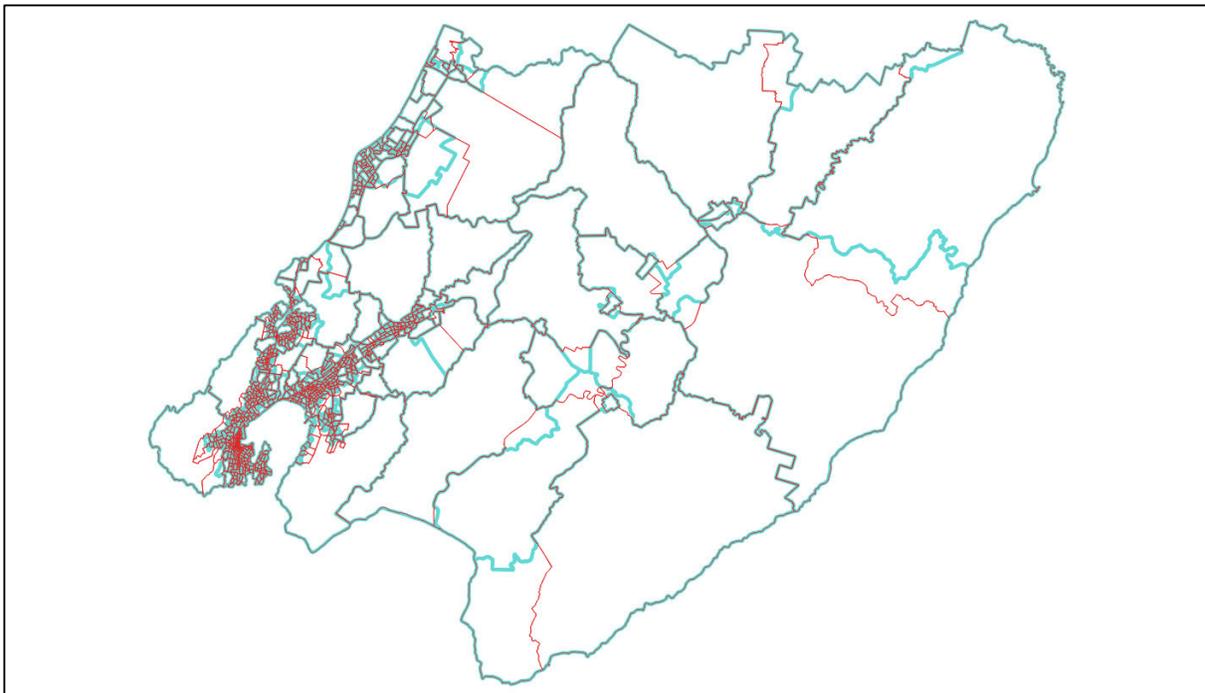


Figure 3-1: 780 Zones Based on SA1s – Region

¹ Each EMME bank can only accommodate one zone system. So currently, WTSM and WPTM must utilise separate EMME banks.



Figure 3-2: 780 Zones Based on SA1s – South

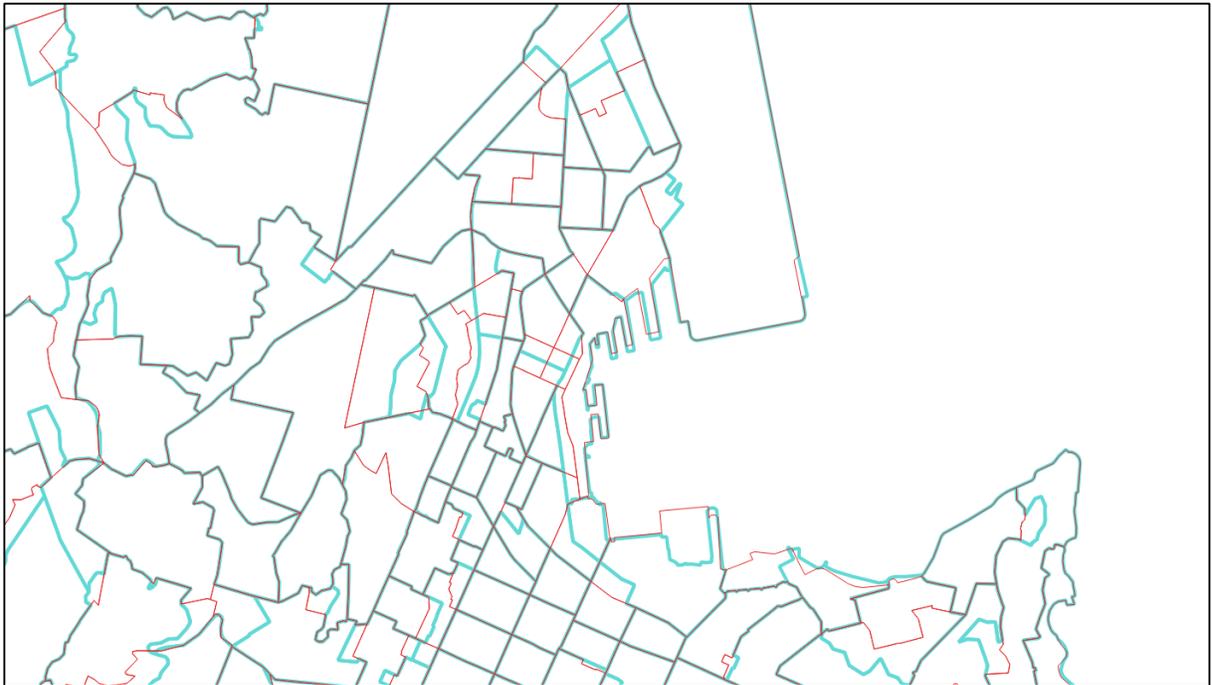


Figure 3-3: 780 Zones based on SA1s – CBD

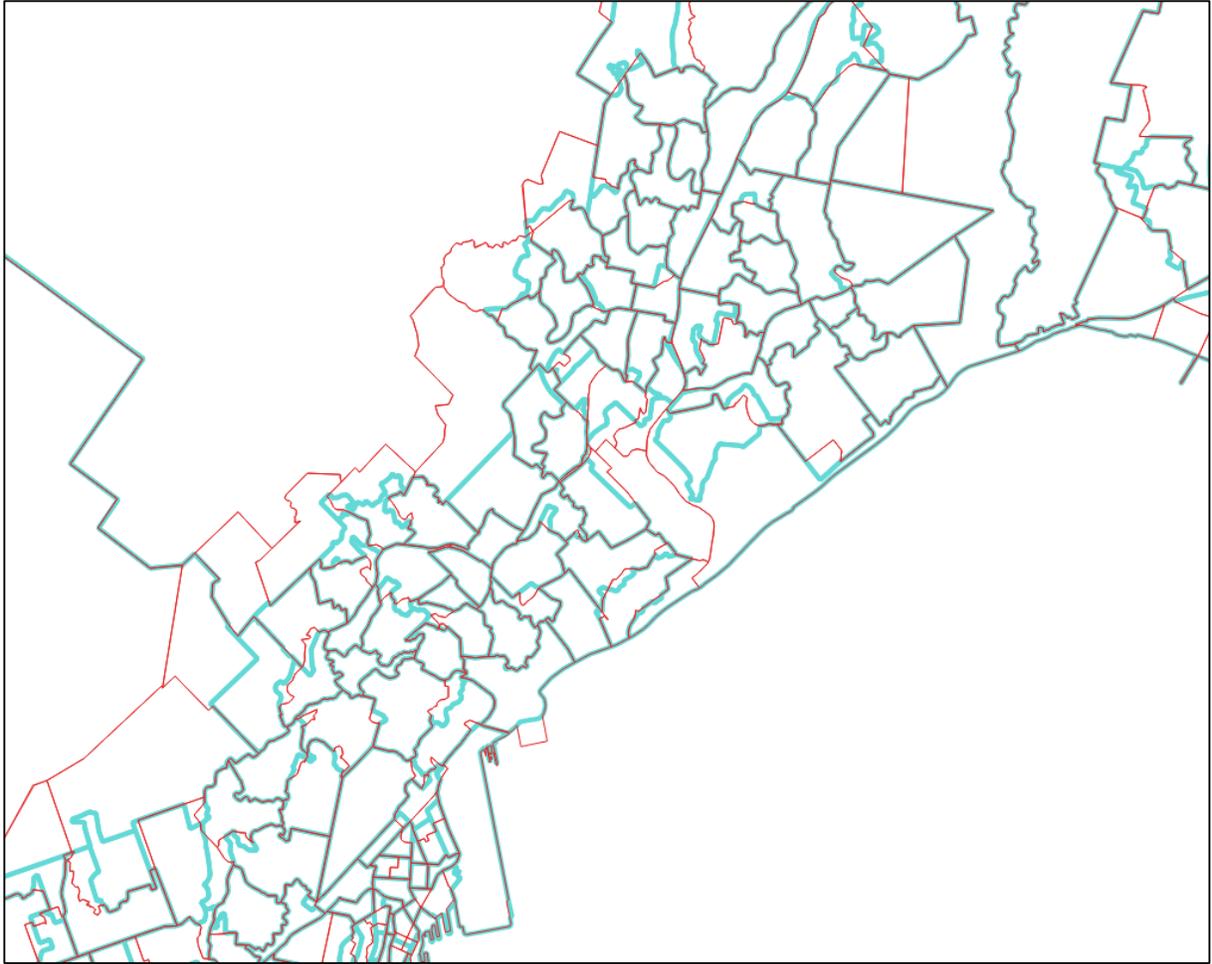


Figure 3-4: 780 Zones Based on SA1s – Mid

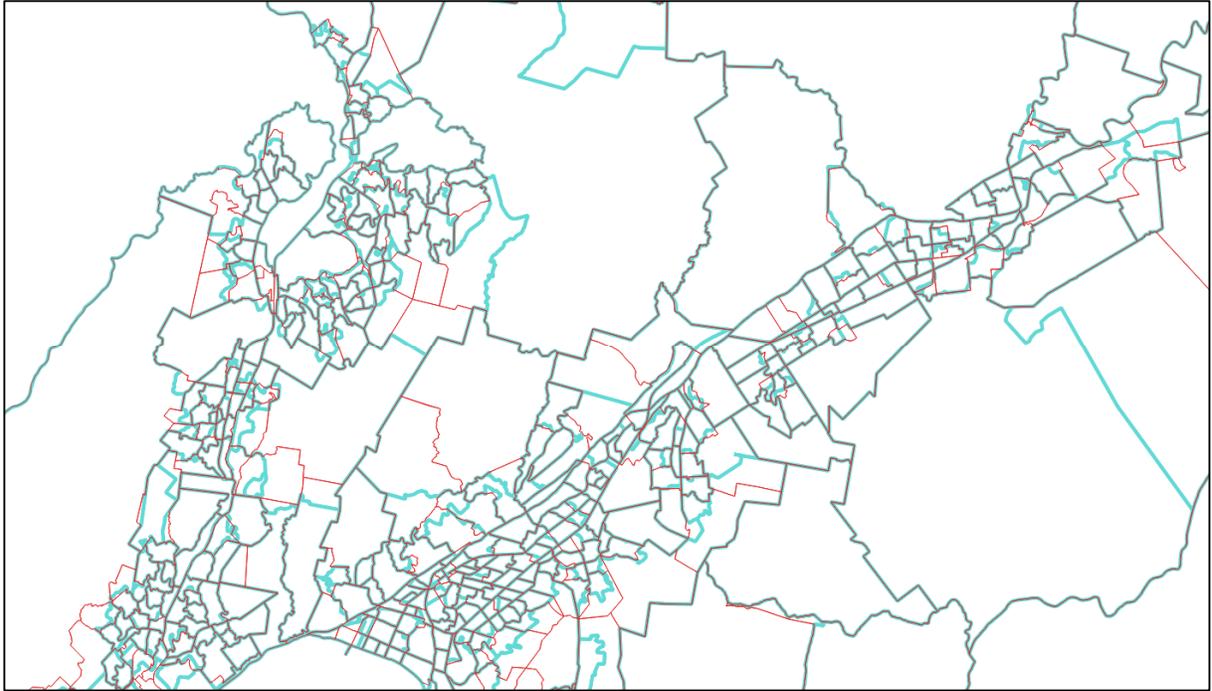


Figure 3-5: 780 Zones Based on SA1s – Northern Urban

The notable differences at the outskirts of the urban areas have no impact as these areas are generally uninhabited open spaces.

In reforming the zone system, two WTSM zones could not be formed. This is only a short term issue while WTSM is retained on a meshblock-based zoning system and new modules are developed and integrated in the new SA1-based zoning system. The issues are:

- Demands for zone 58 (CBD) will be combined with zones 59 and 63; and
- Demands for zone 180 (Lower Hutt) will be combined with zone 181.
- There are a small number of other locations where demand in a WTSM zone now straddles SA1 based zone boundaries. These may require some factoring to move from one zone system to the other in the short term.

A further issue was that 29 of the WPTM zones (based on meshblocks) could no longer be formed using SA1s. These are listed below for reference.

- Zone 134, Wellington CBD, now included in SA Zones 132, 133 and 135;
- Zone 182, almost all unoccupied land, only activity now included in SA Zone 181;
- Zone 373, Wellington CBD, now included in SA Zone 372;
- Zone 411, unoccupied land, now includes in SA Zones 402 and 423;
- Zone 551, Kelburn Park, now included in SA Zone 552;
- Zones 581, 582 and 632. Wellington CBD. Now included in SA Zones 631 and 591. Zone 632 was reinstated in the second round of zonal refinement at meshblock level;
- Zone 622, Wellington CBD, now included in SA Zone 651. Zone 622 was reinstated in the second round of zonal refinement at meshblock level;
- Zones 662 and 633, Wellington Railway Station, now included in SA Zone 661;
- Zone 734, Ngauranga (mostly roads), now included in SA Zone 742;

- Zone 843, unoccupied land, now included in SA Zone 841;
- Zones 971, 972, 934 and 935. Porirua, now included in SA Zone 973. These zones were reinstated in the second round of zonal refinement at meshblock level;
- Zone 1385 unoccupied land, now included in SA Zone 1353;
- Zone 1401, Upper Hutt central area, now includes in SA Zone 1403;
- Zone 1453, Trentham/Heretaunga, now included in SA Zone 1451;
- Zone 1501, St Patricks College SilverStream, now included in SA Zone 1502;
- Zone 1652, Naenae, now included in SA Zone 1651;
- Zone 1654, Naenae, now included in SA Zone 1653;
- Zone 1783, Lower Hutt, now included in SA Zone 1791;
- Zone 1801, Lower Hutt, now included in SA Zone 1811;
- Zone 1821, Lower Hutt, now included in SA Zone 1831;
- Zone 1951, Petone, now included in SA Zone 1952. Zone 1951 was reinstated in the second round of zonal refinement at meshblock level;
- Zone 1971, Seaview, now included in SA Zone 1972;

The result (excluding the second round adjustments covered in Section 6 of this report) was 751 internal zones developed from SA1s.

In addition to the zones that no longer exist, the boundaries of a significant number of zones changed – some slightly, but some significantly. Just under half (49%) of the zones had an area change of 10% or more. This will include rural areas where the boundary change will have no impact on the transport demands.

As a result of the scale of the zonal area change, every zone was manually reviewed. The outcome of the review is an approximate equivalence between the 780 meshblock-based and 751 SA1-based zoning, and notes for locations where network loading and the WPTM demand matrices will need further attention.

The following section reports the locations where the most significant changes in zoning occur. In this instance, “significant” refers to overlapping zones and impacts on the demands.

3.3 Areas with Greatest Change

There are three areas where the change in zoning is substantial and warrants further attention. These are illustrated in the figures below where:

- The thick blue line is the current WTSM 225 zone boundary;
- The thin red line is the current 780 meshblock (MB) based zone boundary;
- The thick turquoise line represents the 751 SA1-based zone boundary; and
- The red figures are the 780 MB zone number.

3.3.1 SA Issue in Porirua

The new zone selected below (thick red line, SA Zone 973) encompasses MB based zones 971, 972, 973, 934 and 935. It contains all of WTSM zone 97 plus almost half the activity in WTSM zone 93. This zone cannot be further refined without dividing SA1s. This large zone was retained in the first instance but it was subsequently agreed to move to meshblocks at this location. This is documented in Section 6 of this report.

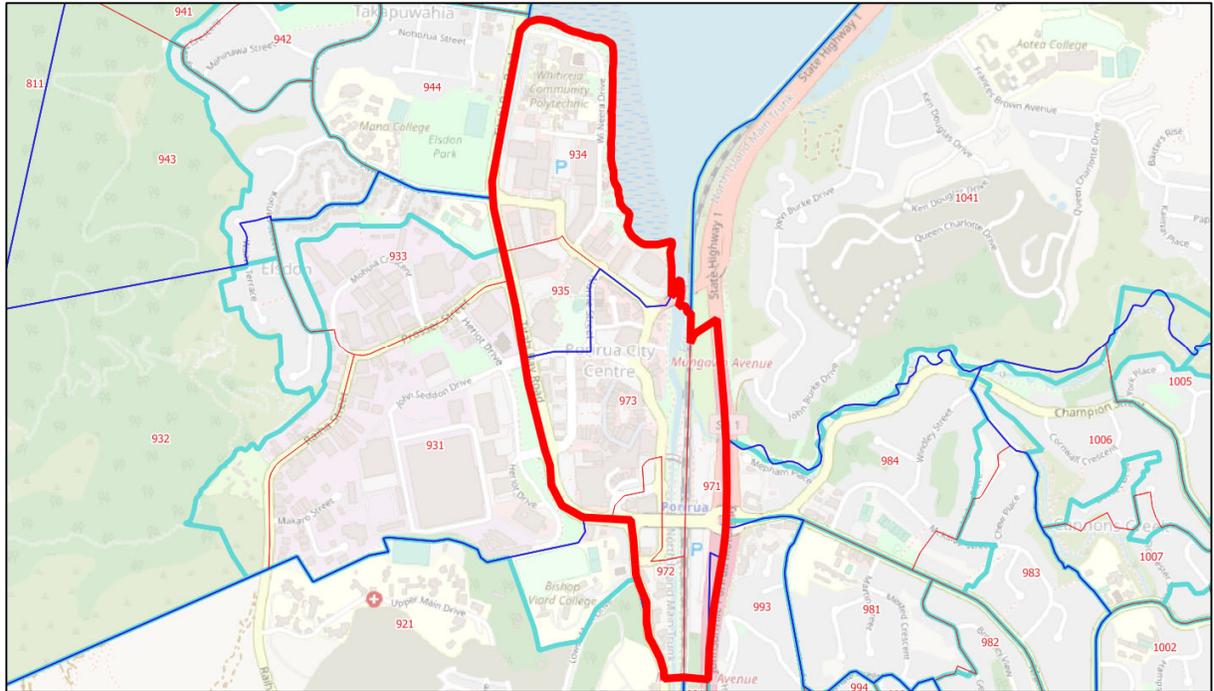


Figure 3-6: New Zoning Issue – Porirua

3.3.2 SA Issue in the CBD

Just south of the Wellington Railway station, MB Zones 581 and 582 will no longer exist and be included in larger zones 631 and 591. Furthermore, MB Zone 632 also cannot be formed and becomes part of SA Zone 631. This is illustrated in the following figure.

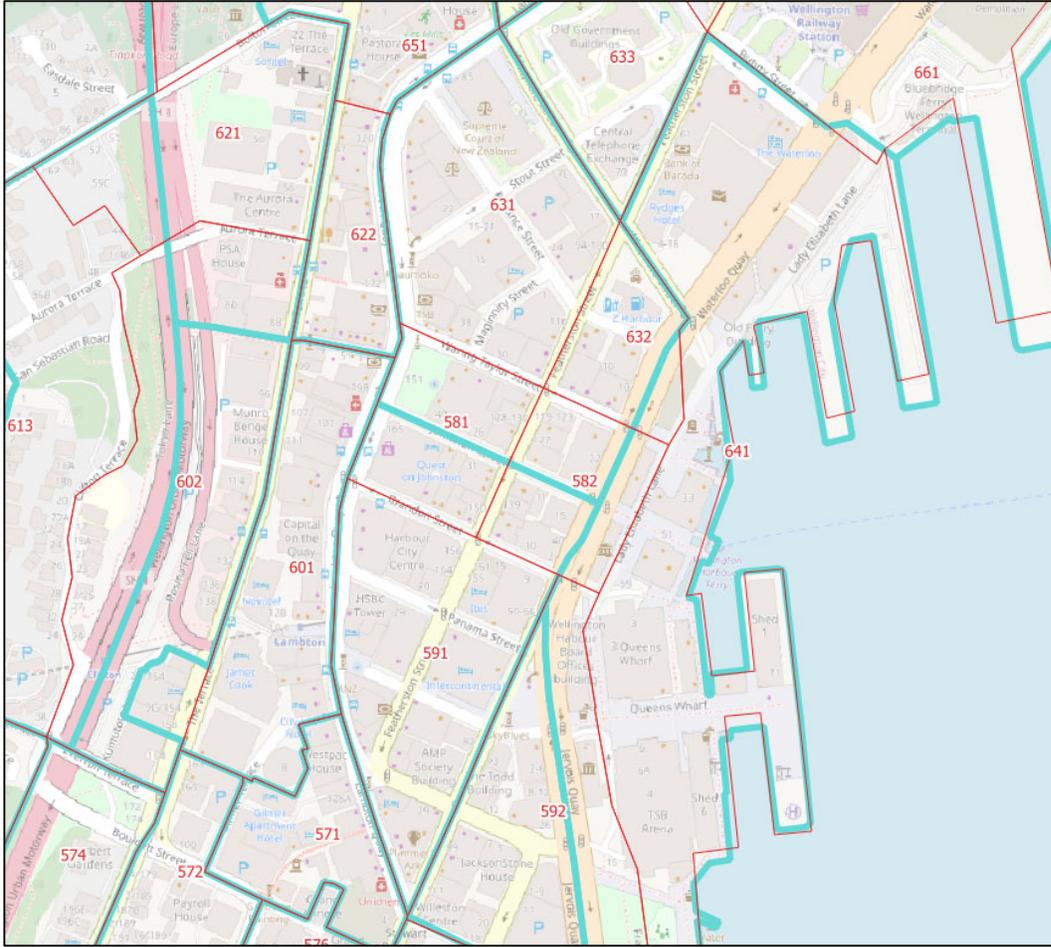


Figure 3-7: New Zoning Issue – CBD

It was subsequently agreed to move to meshblock level in this area to reduce the size of a few of these zones (see Section 6). However, zones 581 and 582 still do not exist as they straddle an SA1 boundary which is not ideal in a new system.

3.3.3 SA Issue in Lower Hutt

There are three adjacent issues in Lower Hutt.

- WTSM Zone 180 equates to the single WPTM MB Zone 1801. This cannot be formed and becomes part of SA Zone 1811. The alternative would be that WTSM/WPTM MB zones 181/1811 could not be formed;
- In order to retain WTSM Zone 179, which has the single equivalence of 1791 in the WPTM MB system, it had to be combined with MB zone 1783. The combination of MB zones 1791 and 1783 become SA zone 1791. This retains the WTSM zone;
- WTSM Zone 183 had the single equivalence of WPTM MB Zone 1831. To retain this zone, MZ zones 1831 and 1821 have been combined into SA Zone 1831. This retains the WTSM zone.

The key issue in central Lower Hutt is that the current WTSM to SA-based WPTM zoning is compromised. This is an interim problem while two models and two zoning systems are retained.

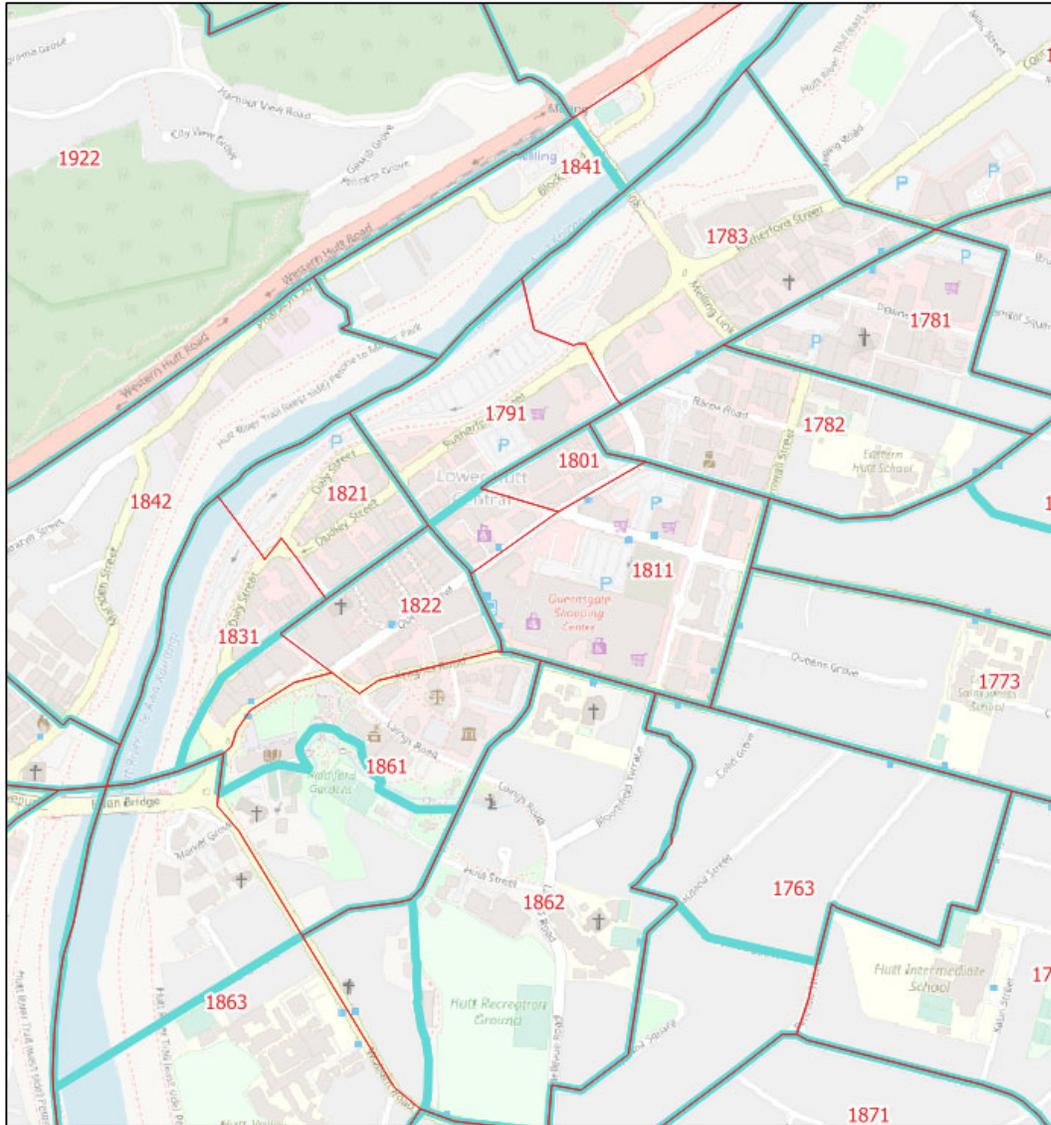


Figure 3-8: New Zoning Issue – Lower Hutt

3.4 Summary

The change from a meshblock based zoning system to statistical areas reduced the 780 internal zones to 751.

The move to SA1s results in issues in Porirua, Lower Hutt, and the CBD in particular where there is a significant coarsening of zones. The alternative is to divide the SA1s in certain key areas.

Two WTSM zones have no direct equivalence in the SA1-based zoning system, and will be aggregated. This is only a short term issue until the Demand Model is rebuilt.

4. Zone Changes for Demand Model (Round 1)

In this section, changes to the circa 780 zone system (which reduces to 751 zones using SA1s) required for the Demand Model are summarised.

This section represents "round 1" refinement where SA1s were not split. It was subsequently agreed to move to meshblocks in a few areas, which is documented in Section 6 of this report as "round 2" refinement. Round 2 occurred after discussion and agreement with the client.

Zones should be homogeneous in terms of the amount of activity generated/attracted. This is particularly important for Demand Models as the coefficients and explanatory variables can change with zone size.

4.1 Analysis of Zonal Activity

The 751 zones developed from SA1s were reviewed in terms of activity, with activity defined as population ("pop") plus twice the workplace employment ("emp"), both from the 2018 Census. The population definition used was Census Usually Resident, as this was released at the time of this analysis. Employment is doubled as it is (approximately) twice as likely to generate a trip compared with population. This will underestimate activity at shopping centres and schools, for example, where trips will be more than twice the number of jobs.

The frequency plot of the number of zones in each activity band is shown below.

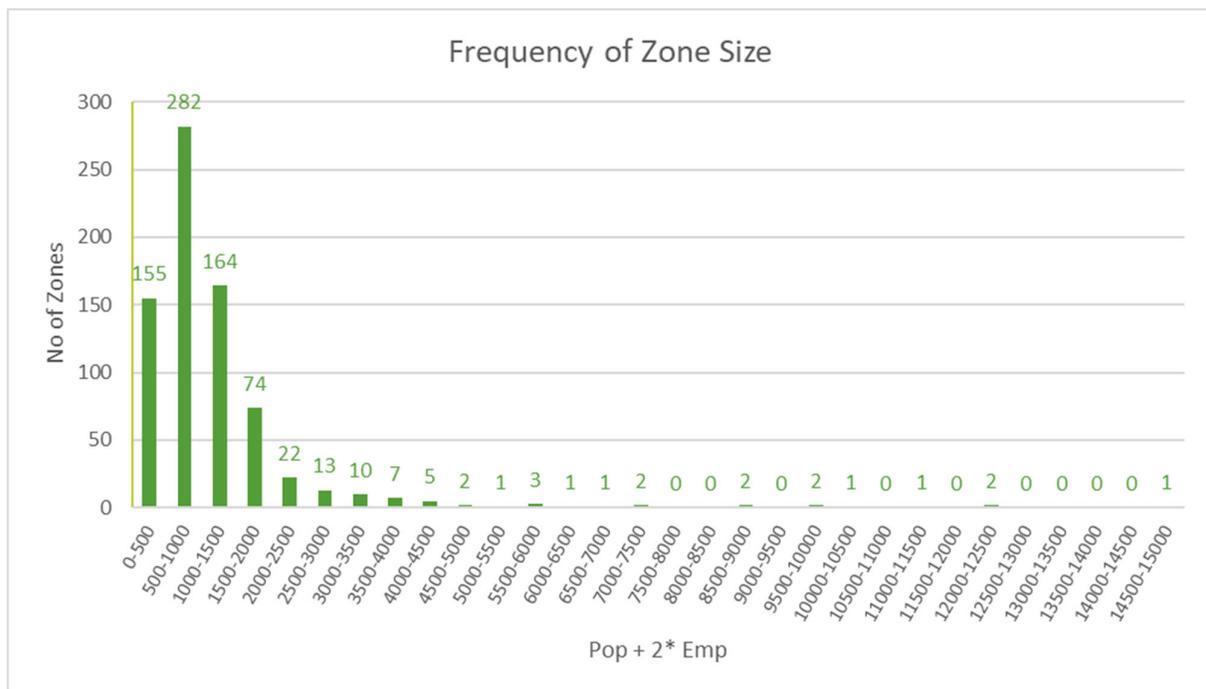


Figure 4-1: Frequency of Zone Size – Version 1 of SA-based Zoning

This figure shows a notable number of zones with non-homogeneous activity. Considering population plus twice employment of 3000 or greater, there are 41 zones that warrant further subdivision. Of these 41 zones, 19 are made up of a single SA1 and cannot be refined without subdividing SA1s. The remaining 22 zones were reviewed and subdivided to reduce the activity per zone. At this stage, SA1s were not split.

4.2 Further Zone Refinement to Balance Activity Levels

The zone refinement on the SA1 system to balance the activity levels so that each zone is more similarly sized is tabulated below. This is important for demand modelling.

In addition, figures are provided to illustrate each change. The turquoise line represents the new zone boundary built from SA1's. The purple line is the new zone boundary introduced to equalise activity – the purple line does not divide any SA1s. The purple numbers are the refined zone numbering on the SA-system (version 2).

Table 4-1: Changes to Zoning to Balance Activity Levels

Zones Before	Zones After	Area	Comment
31	31 & 34	Miramar	
92	92 & 96	Kilbirnie	
471	471 & 475	Cambridge Terrace, Courtenay Place and Tory Street	Zone 471 still larger than ideal
511	511 & 513	Victoria/Abel Smith	
576	576 & 577	Willis/Boulcott	
601	601 & 6013	Capital on the Quay/James Cook Hotel etc	Zone 601 still larger than ideal
663	663 & 665	National Library	
921	921 & 922	Kenepuru	
1041	1041, 1044 & 1045	Aotea	
1191	1191 & 1192	Kapiti	
1451	1451 & 1455	Trentham	
2060	2061 & 2062	Martinborough	
2070	2071 & 2072	Featherston	
2080	2081-2083	Greytown	
2090	2091-2094	Carterton	
2100	2101-2104	Masterton North	
2110	2111-2119	Masterton	
2120	2121-2128	Masterton	
2140	2141-2143	South-East of Masterton	
2160	2161-2163	North of Masterton	

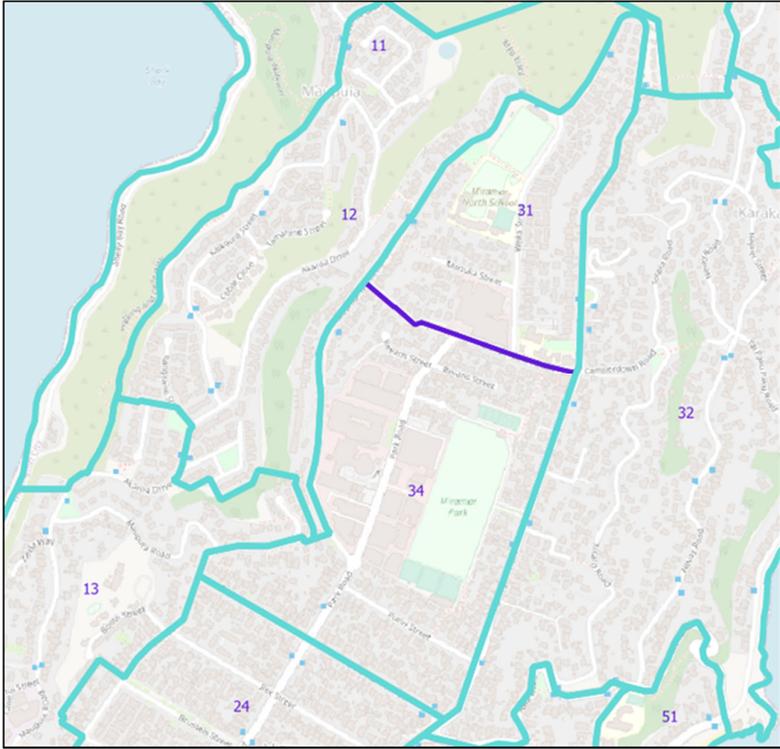


Figure 4-2: Zone Refinement for Activity – Miramar

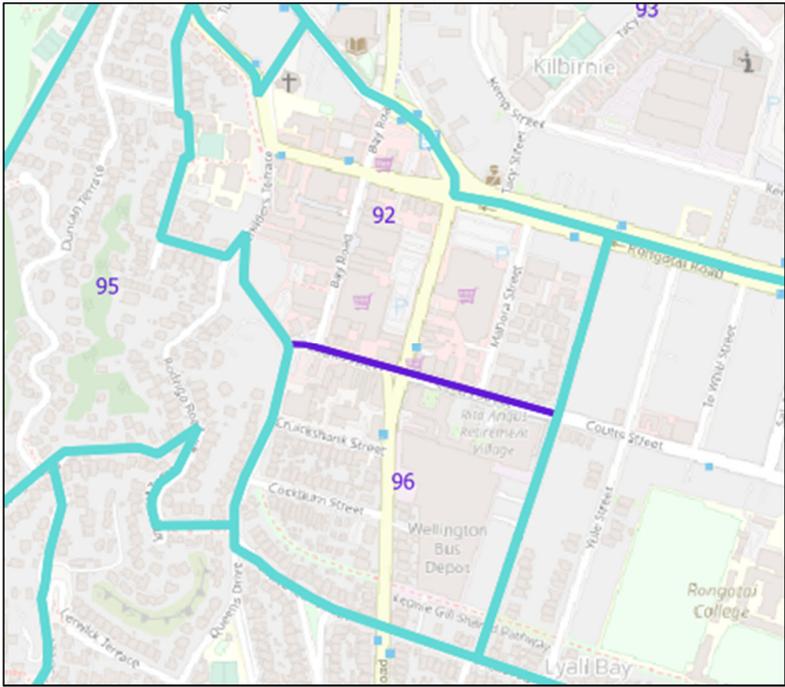


Figure 4-3: Zone Refinement for Activity – Kilbirnie

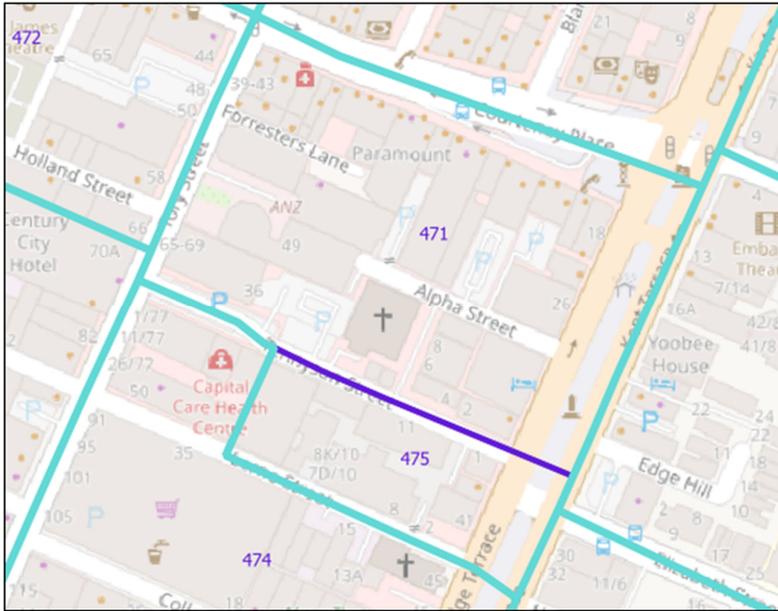


Figure 4-4: Zone Refinement for Activity – Courtenay/Cambridge

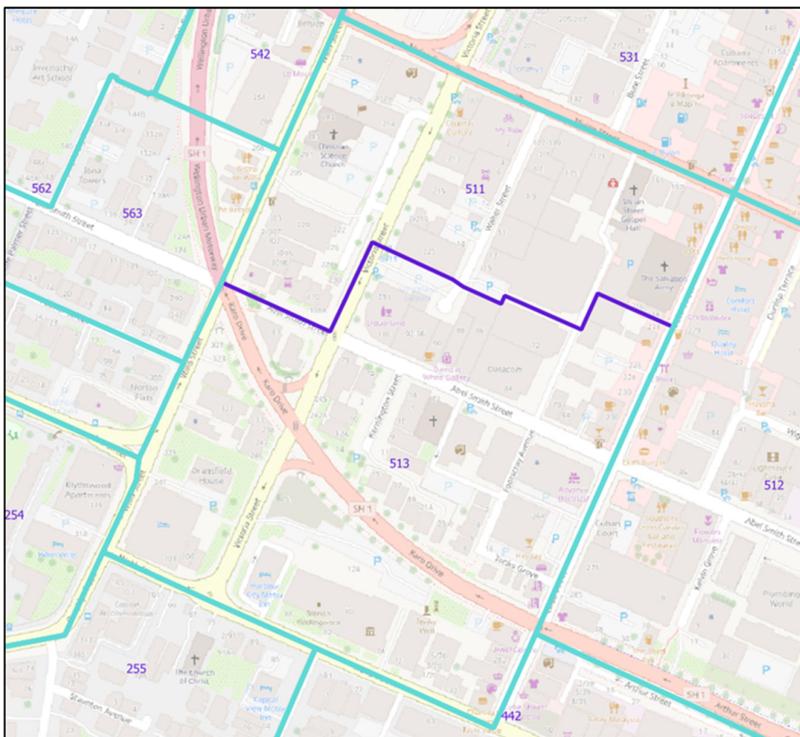


Figure 4-5: Zone Refinement for Activity – Victoria/Abel Smith

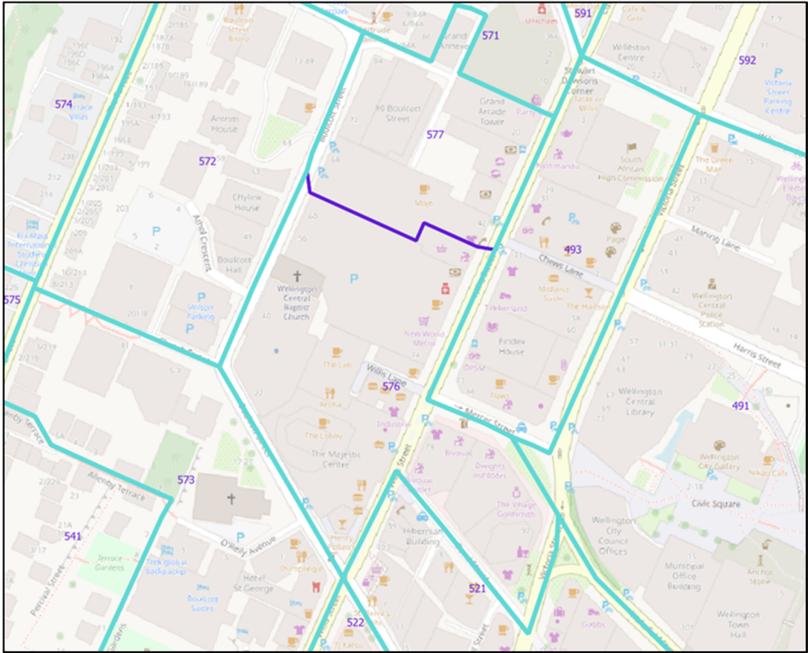


Figure 4-6: Zone Refinement for Activity – Willis/Boulcott

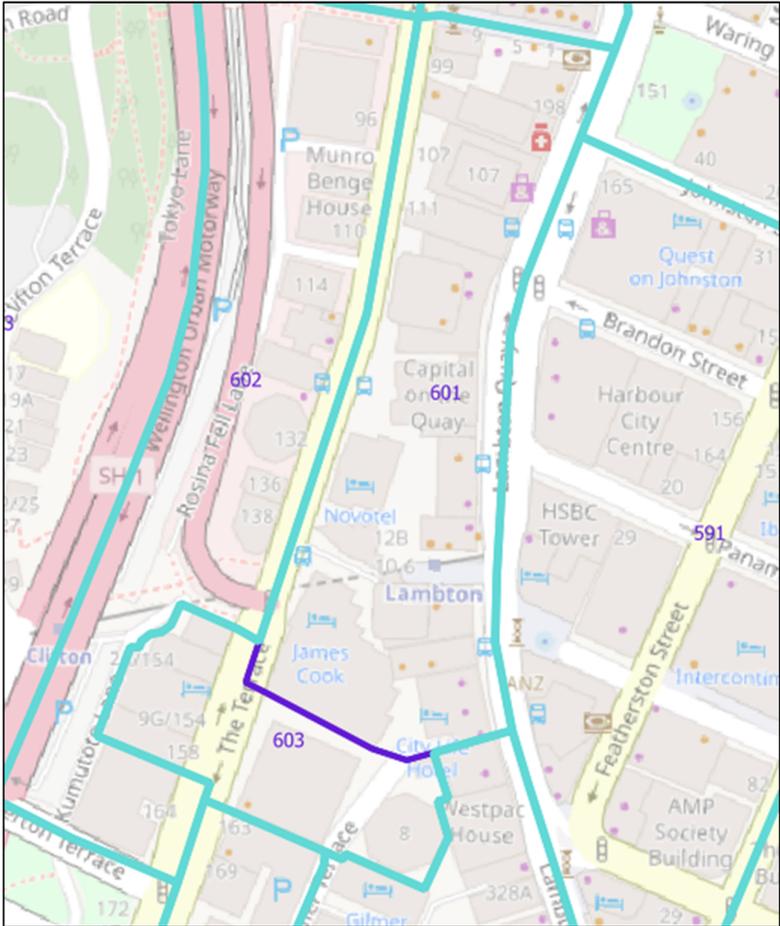


Figure 4-7: Zone Refinement for Activity – Lambton – Capital on the Quay etc

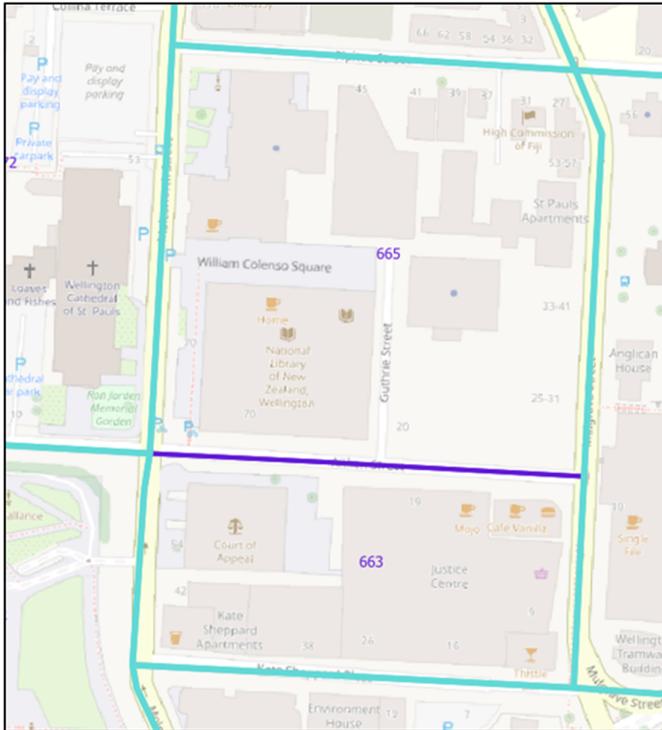


Figure 4-8: Zone Refinement for Activity – National Library

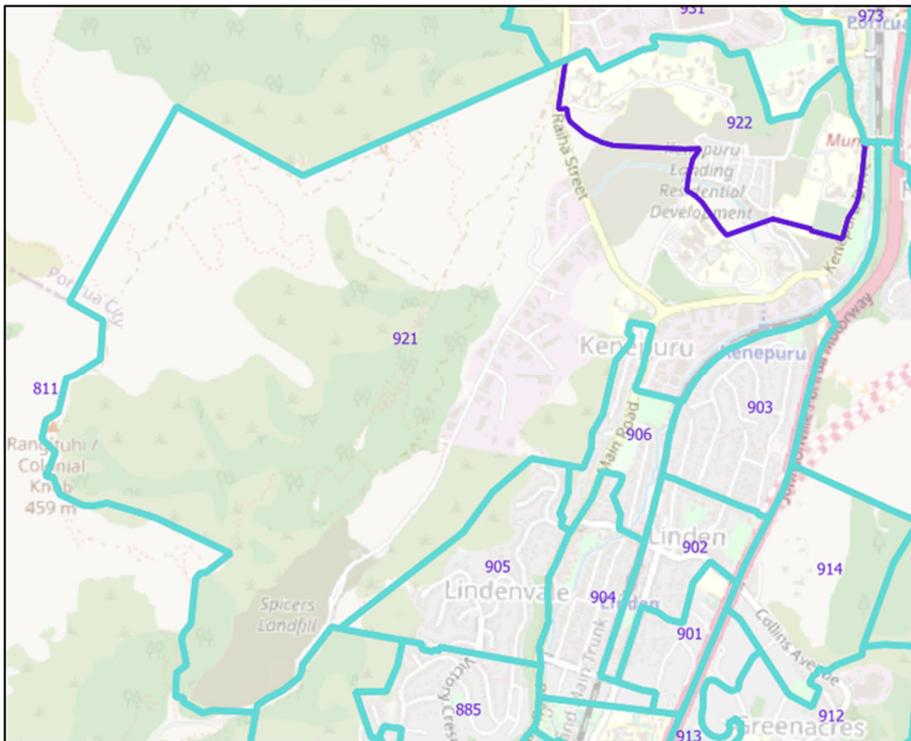


Figure 4-9: Zone Refinement for Activity – Kenepuru

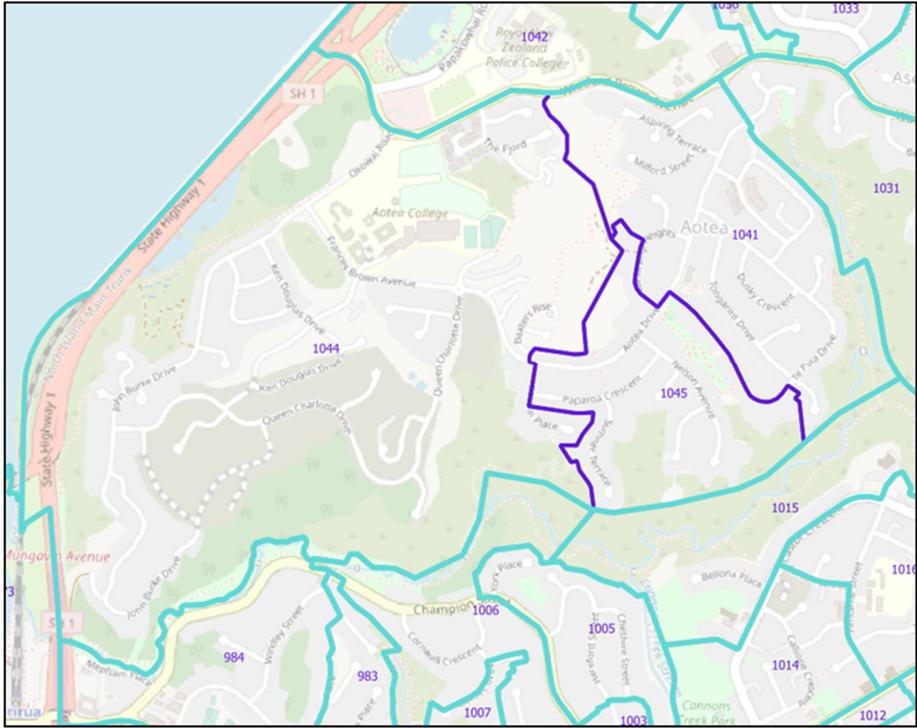


Figure 4-10: Zone Refinement for Activity – Aotea

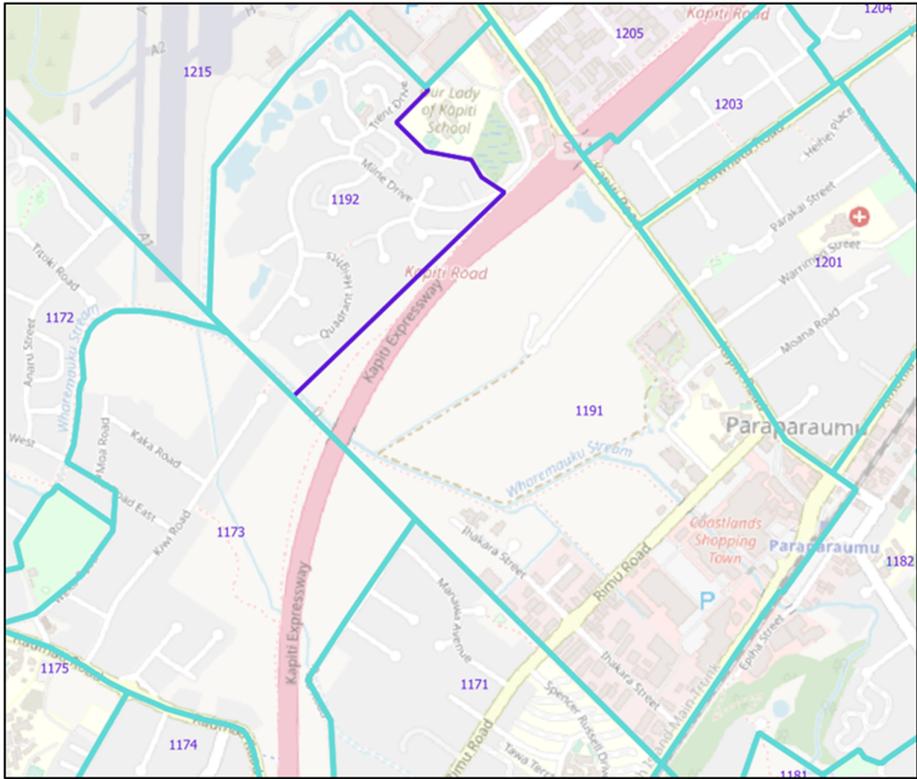


Figure 4-11: Zone Refinement for Activity – Kapiti

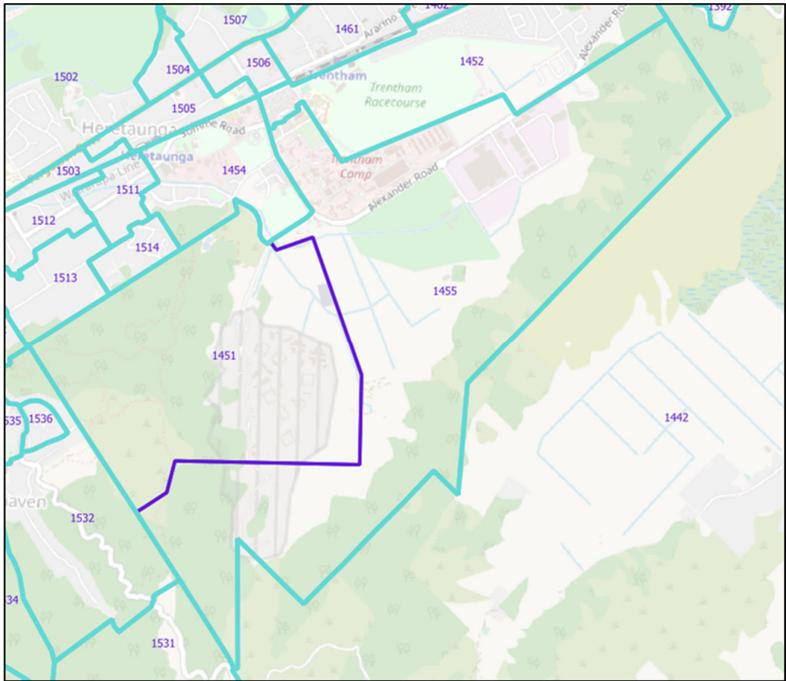


Figure 4-12: Zone Refinement for Activity – Trentham

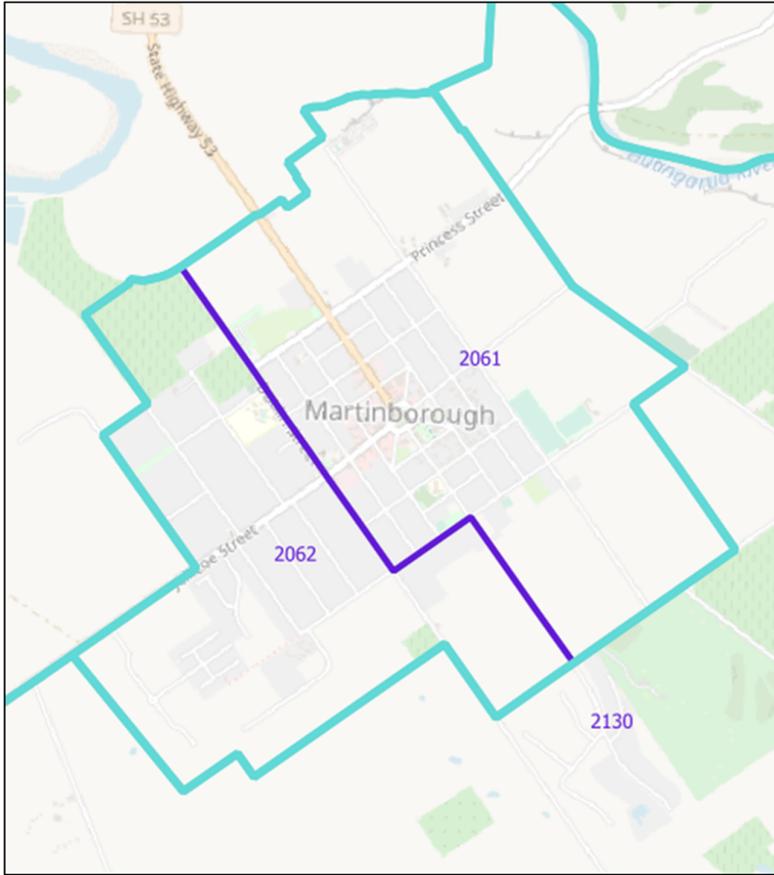


Figure 4-13: Zone Refinement for Activity – Martinborough

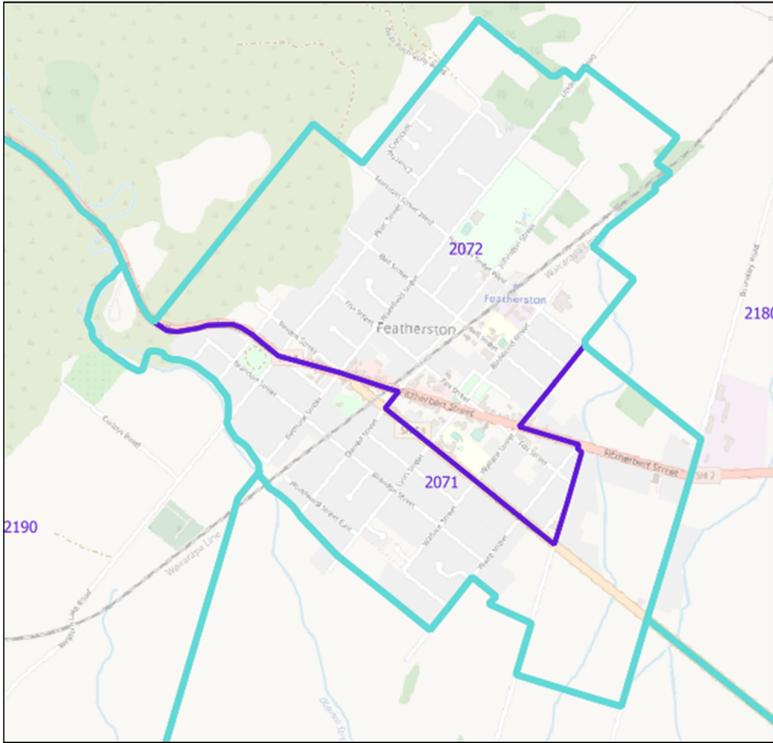


Figure 4-14: Zone Refinement for Activity – Featherston

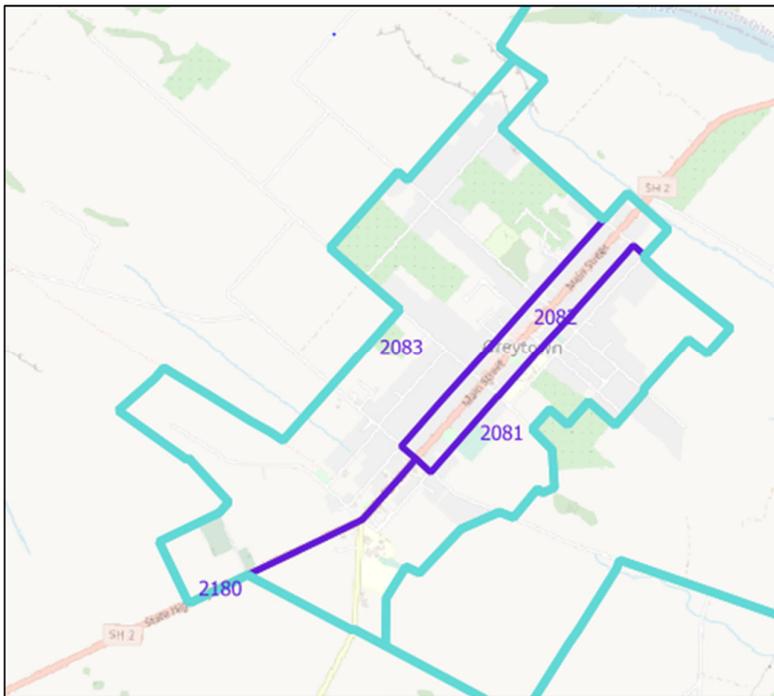


Figure 4-15: Zone Refinement for Activity – Greytown

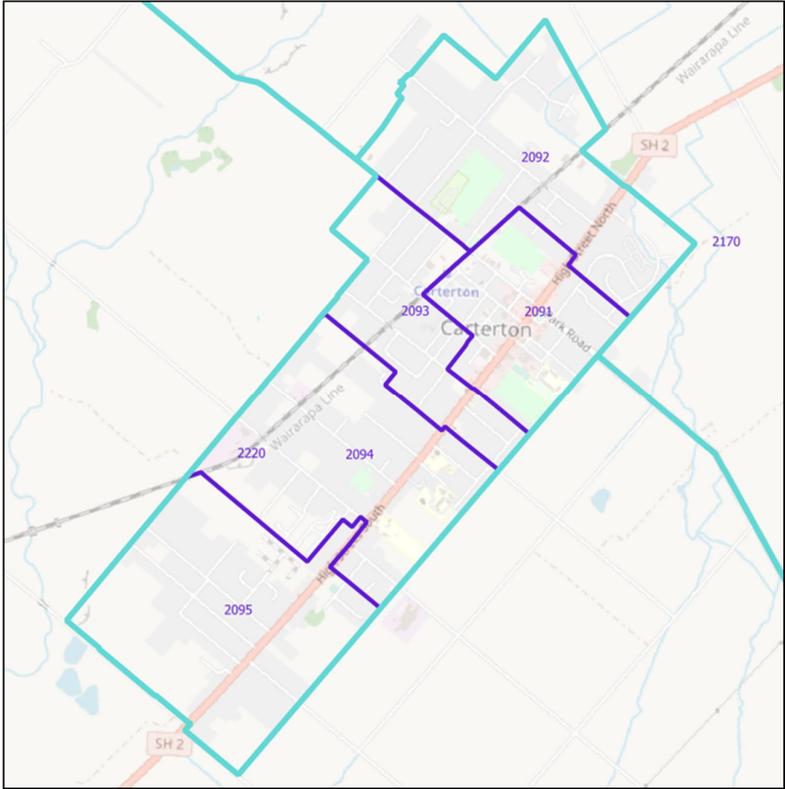


Figure 4-16: Zone Refinement for Activity – Carterton

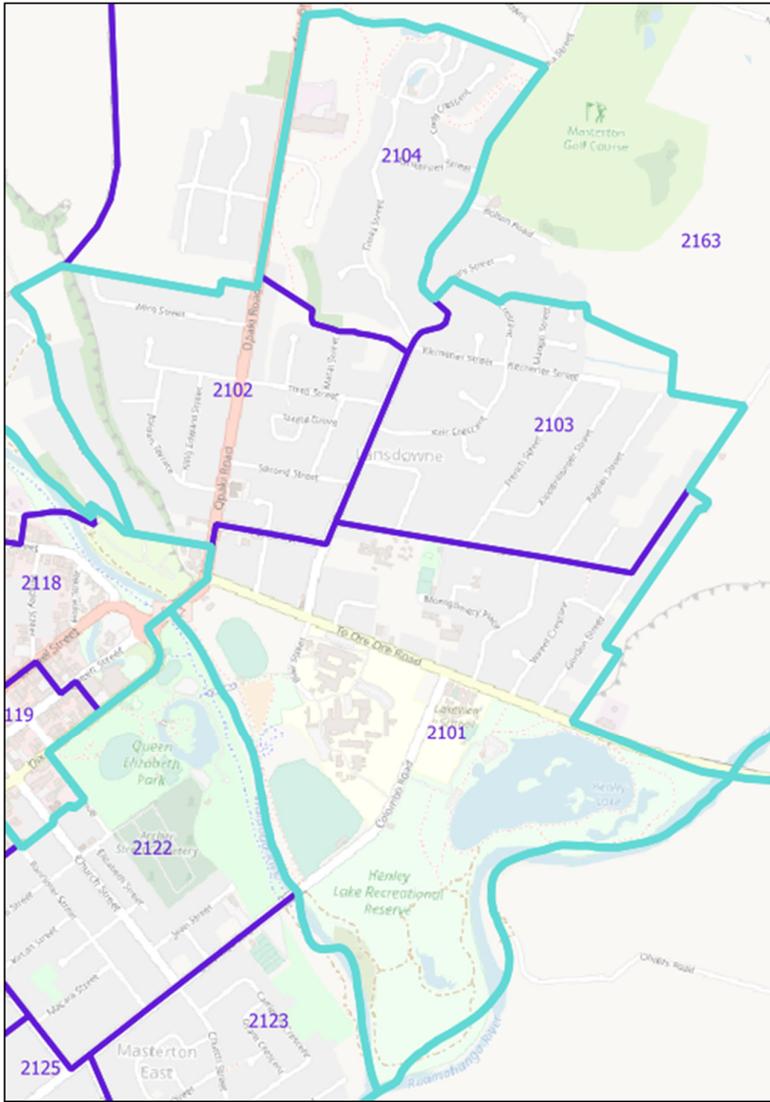


Figure 4-17: Zone Refinement for Activity – Masterton North

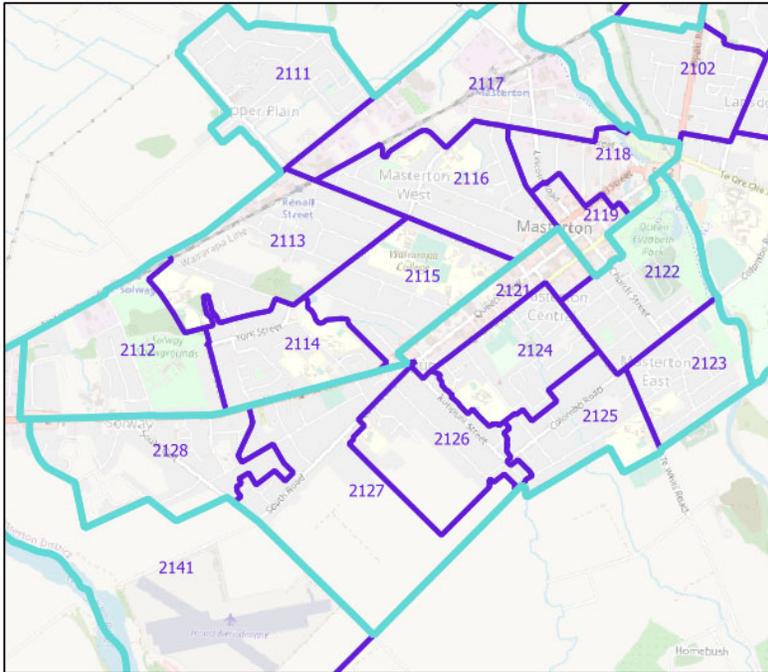


Figure 4-18: Zone Refinement for Activity – Masterton (WTSM Zone 211 and 212)

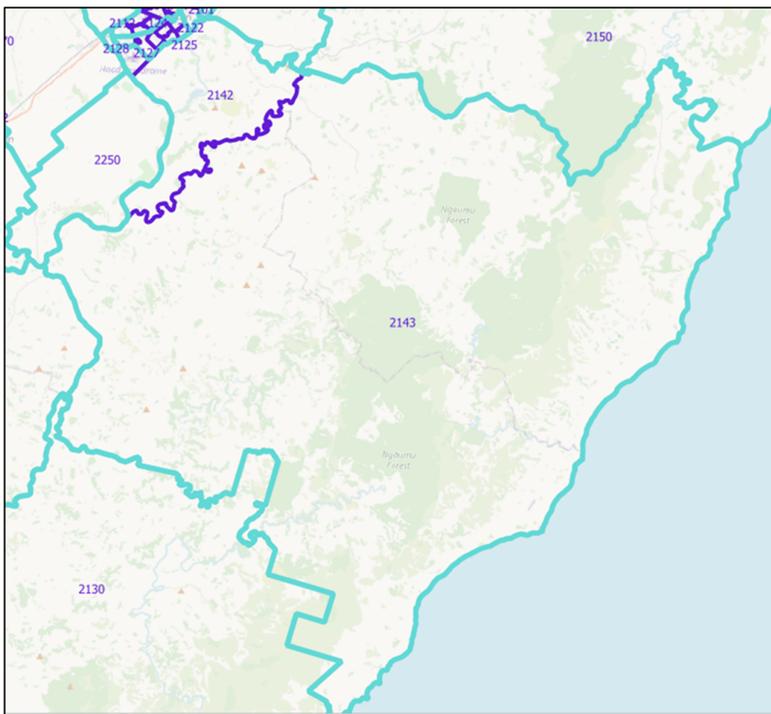


Figure 4-19: Zone Refinement for Activity – South-East of Masterton (WTSM Zone 214)

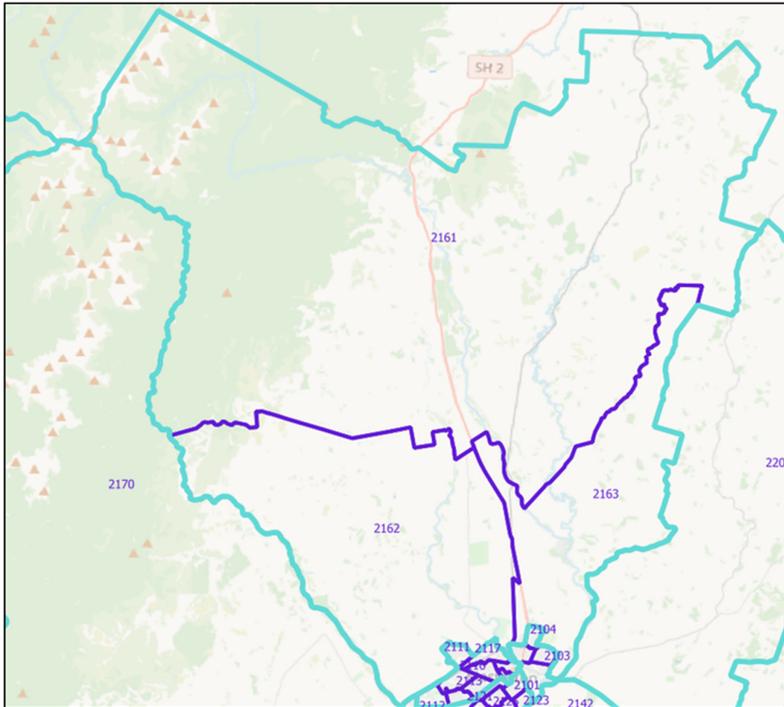


Figure 4-20: Zone Refinement for Activity – North of Masterton (WTSM Zone 216)

4.3 Outcome of Round 1 Zone Refinement

The number of zones in each band before and after round 1 zonal refinement to address homogeneity of activity is shown in the following table.

Table 4-2: Number of Zones Per Activity Band, Before and After Round 1 Refinement

Activity Band, Pop +2* Emp	SA1, Version 1 Zoning	Number of Zones – Modified SA1, Version 2	Difference
0-500	155	155	0
500-1000	282	289	7
1000-1500	164	189	25
1500-2000	74	88	14
2000-2500	22	27	5
2500-3000	13	15	2
3000-3500	10	9	-1
3500-4000	7	2	-5
4000-4500	5	7	2
4500-5000	2	1	-1
5000-5500	1	0	-1
5500-6000	3	3	0
6000-6500	1	2	1
6500-7000	1	1	0
7000-7500	2	1	-1

Activity Band, Pop +2* Emp	SA1, Version 1 Zoning	Number of Zones – Modified SA1, Version 2	Difference
7500-8000	0	0	0
8000-8500	0	0	0
8500-9000	2	0	-2
9000-9500	0	0	0
9500-10000	2	1	-1
10000-10500	1	1	0
10500-11000	0	0	0
11000-11500	1	0	-1
11500-12000	0	0	0
12000-12500	2	2	0
12500-13000	0	0	0
13000-13500	0	0	0
13500-14000	0	0	0
14000-14500	0	0	0
14500-15000	1	0	-1
Total	751	793	42

Rezoning the 22 zones with excessively large activity resulted in a further 41 zones. This revised zoning is referred to as "Version 2" zoning for referencing.

The frequency graph is provided below for completeness, however, the differences are so small that it is difficult to visualise the change.

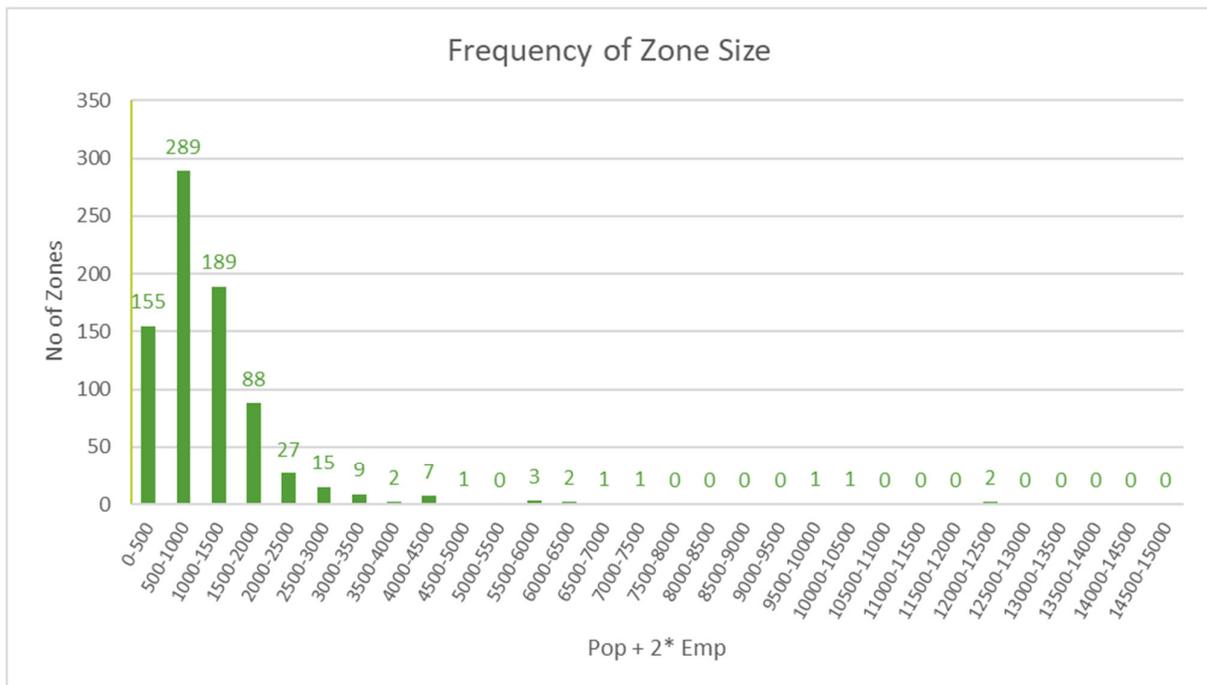


Figure 4-21: Frequency of Zone Size – Version 2 of SA-based Zoning

5. Recommendations and Decisions

This first issue of this technical note concluded with the following recommendations.

- Determine when to move to the SA-based zoning system in Stage 1. This affects the Freight Model, Airport Model, Port Model, WTAM, and WPTM. It is recommended that we move to the new system now, before the bulk of the Stage 1 analysis is undertaken. Moving zone system at a later date is likely to be more problematic and error prone.
- Decide if a small number of SA1s will be subdivided to meshblocks to reduce zone sizes.

Both of these recommendations were adopted.

The zoning system built entirely on SA1s underwent a second round of refinement to reduce zone size where there was significant activity. This round 2 refinement adopted meshblock boundaries in a small number of locations and is reported in the next section.

6. Zone Changes for Demand Model (Round 2)

In this round 2 refinement, zones built from SA1s with significant activity (defined as population plus twice employment) were subdivided using meshblocks. The new zones formed are either individual meshblocks or aggregates of meshblocks. They are smaller than SA1s but still ensure that zones do not straddle any SA1 boundaries.

New zones introduced or reinstated are:

- New zone 494 (Civic Square), subdivision of large zone 491 in the CBD (see Figure 6-1);
- New zones 578 and 579, subdivision of oddly shaped large zone 576 (Majestic Centre) in the CBD (see Figure 6-1);
- New zones 623 and 624, subdivision of zone 621 (Stafford House on The Terrace) in the CBD (see Figure 6-2);
- New zones 634-636 and reinstated zone 632, subdivision of large zone 631 (Customhouse Quay/Johnston Street/Lambton Quay/Whitmore Street) in the CBD (see Figure 6-2);
- New zones 593 and 594, subdivision of zone 591 (Customhouse Quay/Johnston Street/Lambton Quay) in the CBD (see Figure 6-2);
- Reinstated zone 622 (retail around Farmers Lane), subdivision of zone 651 (The Treasury/Pastoral House/Kelvin House) in the CBD (see Figure 6-2);
- Reinstated zones 971-972 and 934-935, subdivision of zone 973 in Porirua (see Figure 6-3);
- New zone 1944, subdivision of zone 1942 included since zone based on undivided SA1s straddled motorway in Petone (see Figure 6-4); and
- Reinstated zone 1951 and new zones 1956-1957, subdivisions of zone 1952 in Petone (see Figure 6-4).

The new or reintroduced zones are illustrated in the following figures. In terms of colours, the purple lines show the zone boundaries reported in the previous section which are based on SA1s (i.e. SA1s are not subdivided). The red lines are the round 2 subdivisions of SA1s based on meshblocks.

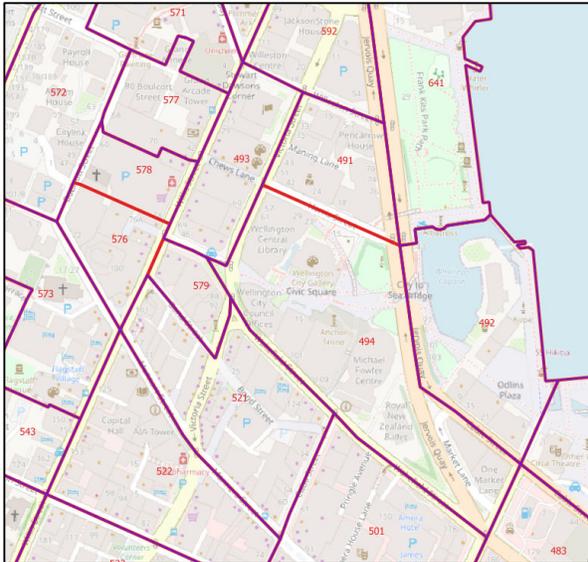


Figure 6-1: CBD Waterfront Zone Refinement

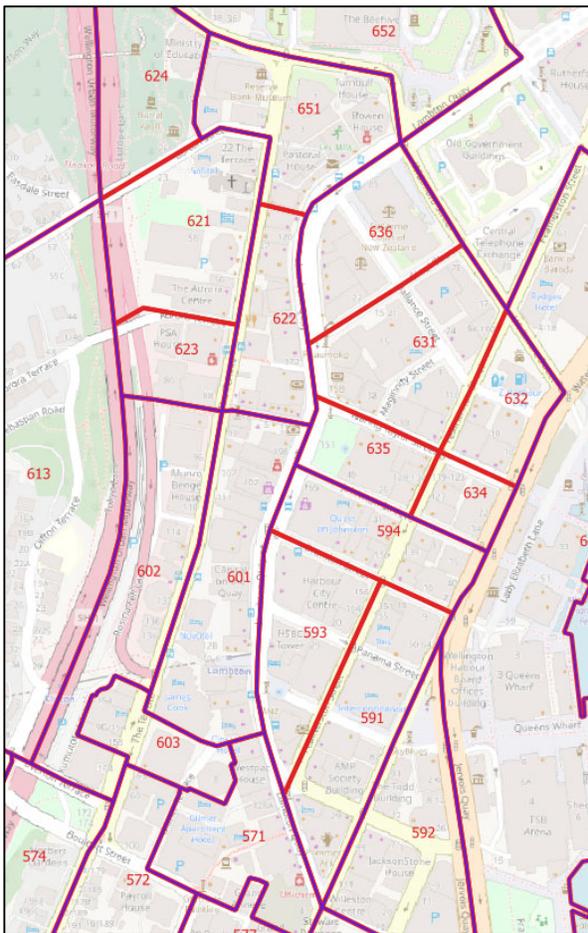


Figure 6-2: Core CBD Zone Refinement

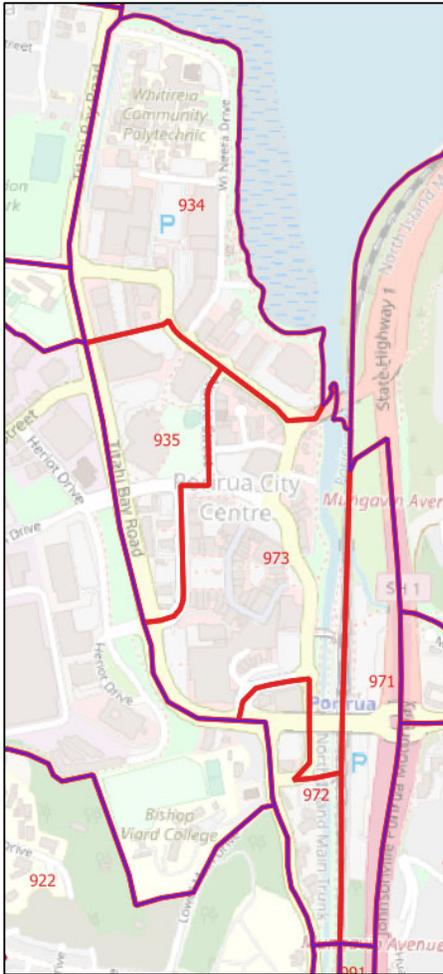


Figure 6-3: Porirua Zone Refinement

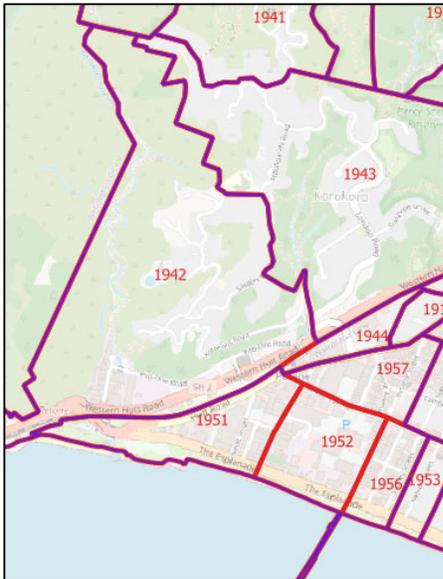


Figure 6-4: Petone Zone Refinement

The number of zones in each band at the various stages of refinement are shown in the following table by activity band. Version 1 zoning is where meshblock-based zone boundaries were reformed on SA1's; version 2 includes zonal disaggregation to balance activity levels while not splitting any SA1s; and version 3 introduces some meshblock-based zones to reduce zone sizes.

Nine zones were subdivided, resulting in 20 additional zones.

Table 6-1: Number of Zones Per Activity Band

Activity Band, Pop +2* Emp	SA1, Version 1 Zoning	Modified SA1, Version 2	SA1 & MB, Version 3
0-500	155	155	157
500-1000	282	289	292
1000-1500	164	189	196
1500-2000	74	88	90
2000-2500	22	27	29
2500-3000	13	15	16
3000-3500	10	9	11
3500-4000	7	2	5
4000-4500	5	7	9
4500-5000	2	1	3
5000-5500	1	0	0
5500-6000	3	3	2
6000-6500	1	2	2
6500-7000	1	1	1
7000-7500	2	1	0
7500-8000	0	0	0
8000-8500	0	0	0
8500-9000	2	0	0
9000-9500	0	0	0
9500-10000	2	1	0
10000-10500	1	1	0
10500-11000	0	0	0
11000-11500	1	0	0
11500-12000	0	0	0
12000-12500	2	2	0
12500-13000	0	0	0
13000-13500	0	0	0
13500-14000	0	0	0
14000-14500	0	0	0
14500-15000	1	0	0
Total	751	793	813

The updated frequency graph is provided below for completeness.

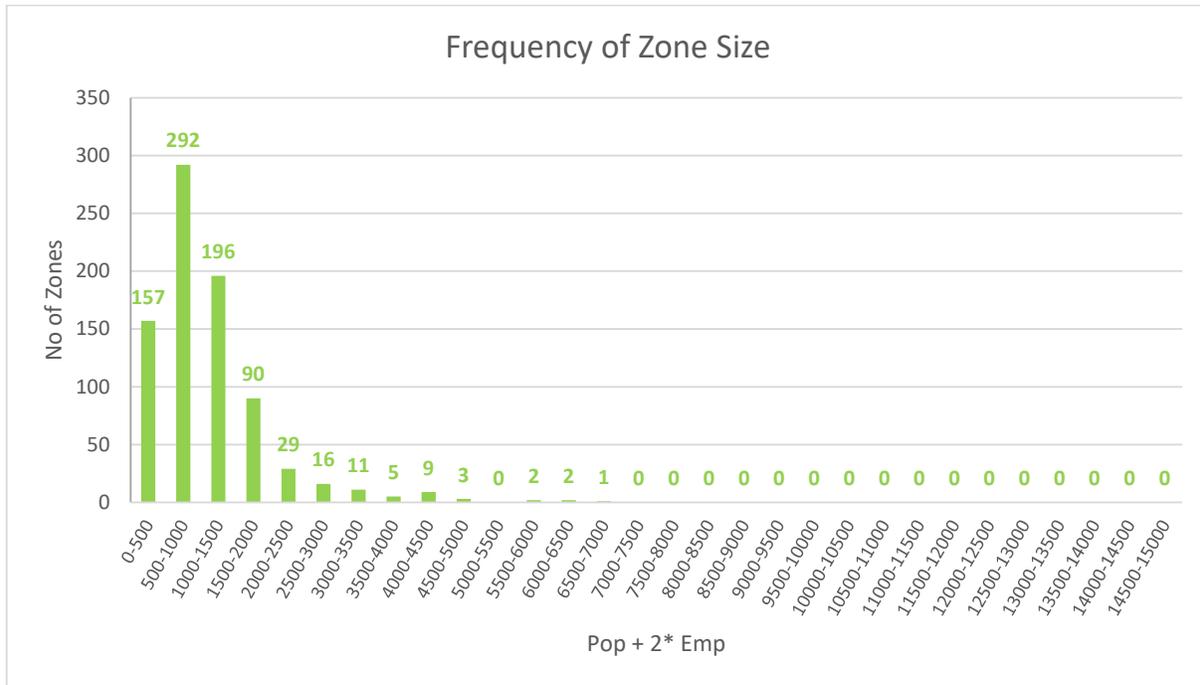


Figure 6-5: Frequency of Zone Size – Version 3 of SA1 and MB based Zoning

7. Other Zones

The 225 WTSM zone system refers to the number of internal zones. There are three additional external zones, which are:

- WTSM Zone 226, State Highway 1 northern external;
- WTSM Zone 227, State Highway 2 northern external; and
- WTSM Zone 228, Centreport Container Terminal.

These zones have no equivalence in the current 780 WPTM zone system as that was developed for public transport travel, and external PT trips are not modelled.

In the new system, the approach to number the other internal zones will be followed. So these external zones will be numbered such that the current WTSM zone is multiplied by 10 with 1 added.

Three "special generator" zones were added representing:

- Interislander Ferry Terminal;
- Bluebridge Ferry Terminal; and
- Airport, flight-related travel.

Table 7-1: External and Special Zone Numbering

Generator Name	WTSM Zone Number	WPTM Zone Number (780)	New System Zone Number
State Highway 1 Northern External	226	N/A	2261
State Highway 2 Northern External	227	N/A	2271
Centreport Container Terminal	228	N/A	2281

Generator Name	WTSM Zone Number	WPTM Zone Number (780)	New System Zone Number
Interisland Ferry Terminal	N/A	N/A	2291
Bluebridge Ferry Terminal	N/A	N/A	2301
Airport, flight-related travel	7, Including employment related travel	71, Including employment related travel	2311

8. Summary

This technical note has covered:

- Step 1 - Level of zoning for the updated Demand Model and the rationale;
- Step 2 - Zone boundaries associated with Census change from meshblocks to Statistical Areas;
- Step 3 - Changes (round 1) to improve the zonal homogeneity required for the Demand Model, without splitting any SA1s; and
- Step 4 -Subsequent changes (round 2) to improve the zonal homogeneity based on meshblocks with subdivided SA1s.

Step 1

The recommended and adopted level of zonal detail for the Demand Model is circa 780 zones, consistent with the WPTM. This will be introduced in Stage 2 of the project when the Demand Model is built. Until then, the current 225 zone system developed from meshblocks will be retained.

Step 2

- Moving the zoning system from meshblocks to statistical areas resulted in a significant change in the boundaries;
- 29 zones could no longer be formed, and a notable number of others now cover a very different area; and
- A handful of zones (in the order of 10) are unacceptably large but are made up of a single SA1. So refining these zones will require subdividing SA1s and using meshblocks.

The outcome of step 2 reduced the 780 meshblock-based zones to 751 SA1-based zones. In addition, two WTSM zones could not be formed.

Step 3

The third step was to evaluate the level of activity within each zone and confirm that each of the new 751 zones was similarly "sized".

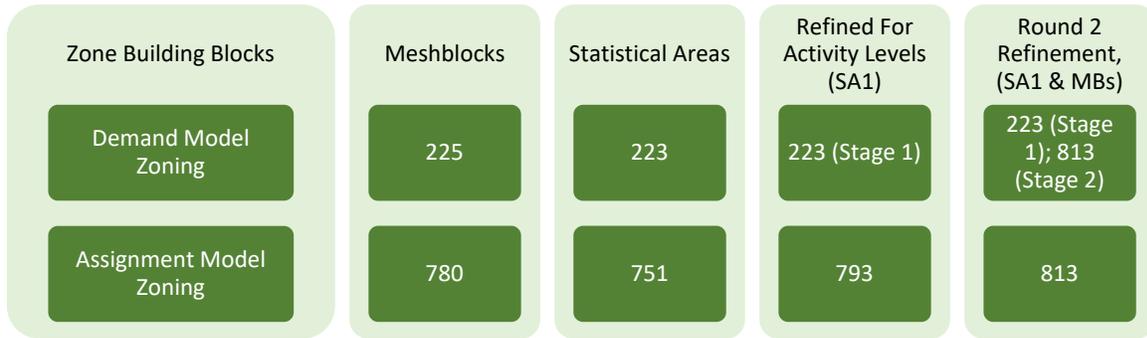
- The analysis indicated 41 zones that should be refined;
- 19 of these were a single SA1 and could not be changed without dividing the SA1s; and
- The other 22 zones with significant activity were refined, increasing the number of zones to 793.

Step 4

The fourth step followed issue 1 of this technical note and discussion with the client. It was agreed to subdivide zones with significant activity comprised of a single SA1. In this case, the zones will relate to meshblock boundaries.

- Of the 793 zones, eight large zones were subdivided using meshblocks or aggregations of meshblocks;
- In addition, one zone that straddled the motorway in Petone was subdivided;
- Dividing the nine zones added 20 zones resulting in 813 zones.

Steps 2 to 4 and the number of zones at each stage are illustrated in the following graphic.



Step 5

The three external zones plus three new special generator zones were included. This increments the 813 internal zones to 819 in total. Note that this does not directly compare with 225/780 zones, as those systems exclude the external zones.

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