Private Plan Change 79: Birchs Village Limited

Transportation Hearing Report

April 2023

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TRANSPORTATION SPECIALISTS

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Project:	**Private Plan Change 79: Birchs Village Limited**
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Reviewed by:	**Ian Clark**

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SUMMARY OF MY PEER REVIEW

Selwyn District Council (Council) has requested Flow Transportation Specialists (Flow) to review the transportation matters associated with Private Plan Change 79 (PPC79), which has been lodged by Birchs Village Limited (Applicant).

In terms of the immediate effects of PPC79, and the proposed ODP

- The Integrated Transport Assessment includes a sensitivity test for a higher density scenario of 1581 dwellings, in response to the MDRS. This test identified that the Birchs Road/Hamptons Road and Birchs/Leadleys Road intersections would need to be upgraded to roundabouts to address congestion effects.

  I note that there is a difference between development intensity enabled by the MDRS vs what might be reasonably feasible from a market economics perspective. I am not able to comment on whether market economics may drive a more intensive development outcome for PPC79. To address this, I recommend a planning mechanism is included which specifies a 600 dwelling threshold at which an updated Integrated Transport Assessment would be required, including an assessment of Birchs Road/Hamptons Road and Birchs Road/Springs Road intersections. However, in my experience this type of rule can have some complexities and potential unintended outcomes, which increase as the number of landowners that are subject to the threshold rule increase. Refer to my discussion in Section 5.1

- I consider that the proposed cross road intersection between Birchs Road/Leadleys Road/Primary Road will result in an increase in death and serious injury crashes at this intersection. I recommend that the ODP identify that this intersection must be formed as a roundabout, and include safe crossing facilities to the Little River cycle trail, as shown in Figure 7. Refer to my discussion in Section 5.2

- I recommend that the Springs Road/Hamptons Road intersection is upgraded to a roundabout prior to any development within PPC79. Refer to my discussion in Section 5.3

- Mitigation measures, such as a speed reduction or turning restrictions, will be required to ensure the Primary Road intersection with Hamptons Road can operate safely. I recommend that the ODP narrative identify that further assessment of the safe intersection sight distance is required. Refer to my discussion in Section 5.4

- I recommend that the ODP narrative is amended to include "*Road frontage upgrades: The Birchs Road and Hamptons Road frontages are to be upgraded to an urban standard in accordance with the Council's Engineering Code of Practice. All frontage upgrades are to be developed in consultation with Council*". Refer to my discussion in Section 5.5

- I recommend that the ODP plan and narrative should be amended to indicate an additional north/south road, and that road cross sections are removed from the ODP or otherwise amended to comply with Section 13 of Council's Engineering Code of Practice. Refer to my discussion in Section 5.6

- Outcome: I recommend that the ODP should be amended to require that walking and cycling facilities must be provided on Primary Roads, and be separated from general traffic. Refer to my discussion in Section 5.7.

While there are and will be capacity constraints on the Prebbleton transport network during peak periods, regional modelling indicates that Shands Road and Springs Road are expected to experience little change in forecast traffic growth, when comparing a 2038 scenario with 10,000 additional dwellings more than forecast. I therefore conclude that PPC79 is likely to have a negligible effect on the operation of Shands Road and Springs Road through Prebbleton, with it being more likely that peak hour traffic effects will be concentrated onto currently less utilised corridors between Prebbleton and Christchurch such as Whincops Road/Longstaffs Road and SH75/Halswell Road. Refer to my discussion in Section 4.

PPC79 is inconsistent with the Prebbleton Structure Plan, in that it is outside the anticipated urban area. Should PPC79 affect the quantum of residential growth within Selwyn, without a corresponding increase in local employment and access to services, additional impact on the Greater Christchurch transport network can be expected as additional residents in Selwyn travel to access services and employment. However, assessing the effects of such development on the long term planning and funding commitments associated with bulk transport infrastructure is complex and requires assessment of multiple land use scenarios at a District or Regional level.

The transport effects of PPC79 at a subregional level, as an urban area outside the anticipated urban boundary, are likely to be minor. However, the cumulative effect of large scale urban development outside the anticipated urban boundary (as proposed by multiple plan changes in the Selwyn District) could have a significant effect on the transport network. Refer to my discussion in Section 6.

CONTENTS

APPENDICES

1 INTRODUCTION

This report has been completed by Mat Collins (Associate) and review by Ian Clark (Director). Ian and I are experts in the field of transport planning and engineering, and frequently attend Council and Environment Court mediation and hearings as transport experts for local government, road controlling authorities and private concerns.

Birchs Village Limited (Applicant) has lodged a PPC to change the Selwyn District Plan to rezone approximately 37 hectares of Rural Inner Plains zoned land to General Rural Zone (PPC79). This report details my review of PPC79.

The scope of this specialist transport report is to assist Council in determining the transport outcomes of PPC79 and includes the following

- A summary of PPC79 focusing on transport matters
- An overview of transport projects contained within the Long Term Plan (LTP), which are relevant to PPC79
- A review of the material provided to support the application for PPC79, and discussion of the potential effects of PPC79
- Summary of submissions, relating to transport matters only
- My recommendations.

I have reviewed the following documents, as they relate to transport matters

- Application for Private Plan Change (as notified), prepared by Baseline Group, dated 13 April 2022, including
    - Appendix 2: Outline Development Plan
    - Appendix 3: Proposed Living Medium Density Zone
    - Appendix 6: Integrated Transport Assessment
    - Response to the request for further information.
- Submissions as outlined in Section 7.

2 A SUMMARY OF PPC79

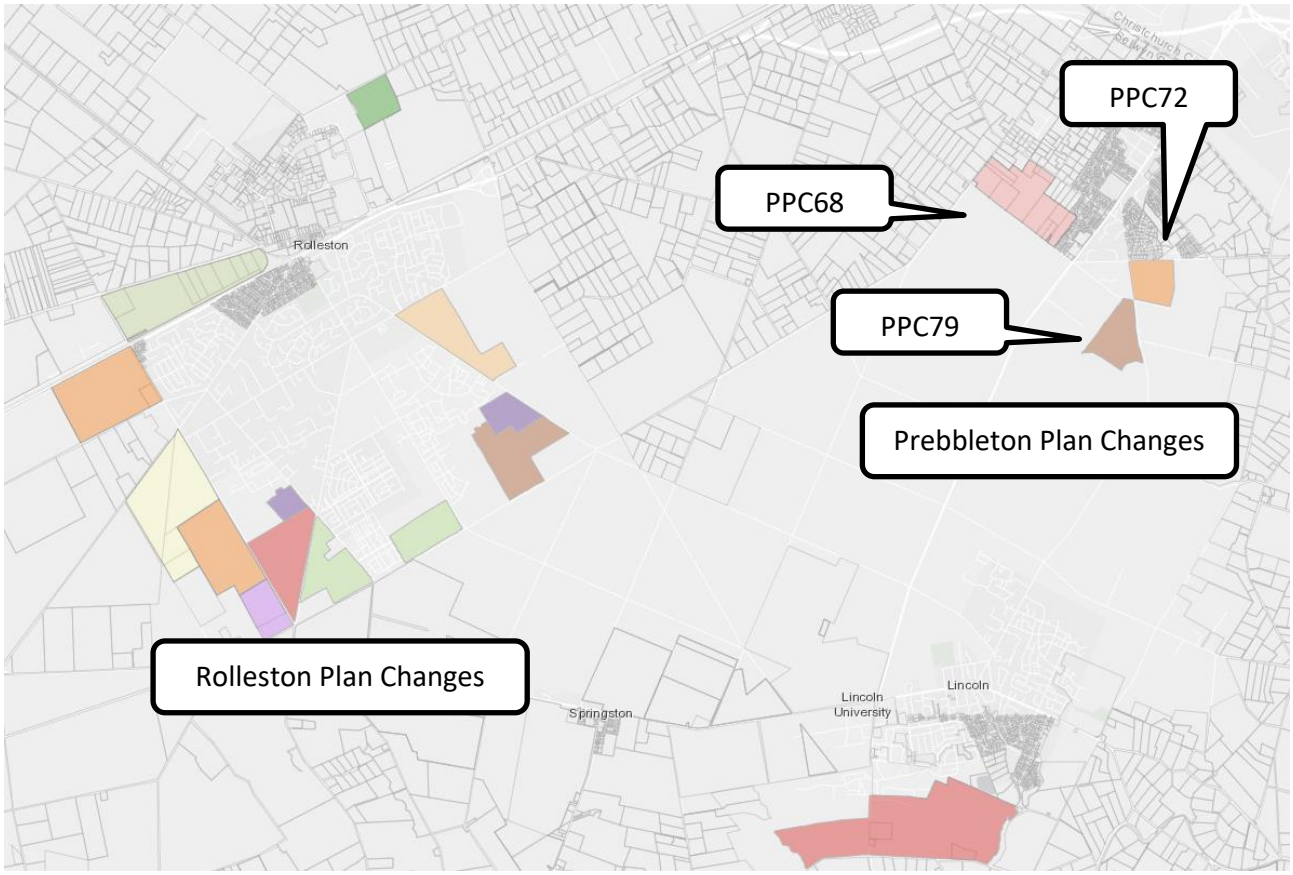
There are currently multiple private plan changes lodged within Rolleston, Lincoln and Prebbleton, as shown in Figure 1. PPC79 is to the south east of the existing urban area of Prebbleton, and is generally bounded by Birchs Road and Hamptons Road.

PPC79 proposes to rezone approximately 37 hectares of Rural Inner Plains zoned land to General Residential zone and Business 1 zone, which would enable approximately 530 - 850 residential sites. An Outline Development Plan (ODP) is proposed to guide the form and layout of future development.

The ODP is shown in Figure 2 and is intended to provide

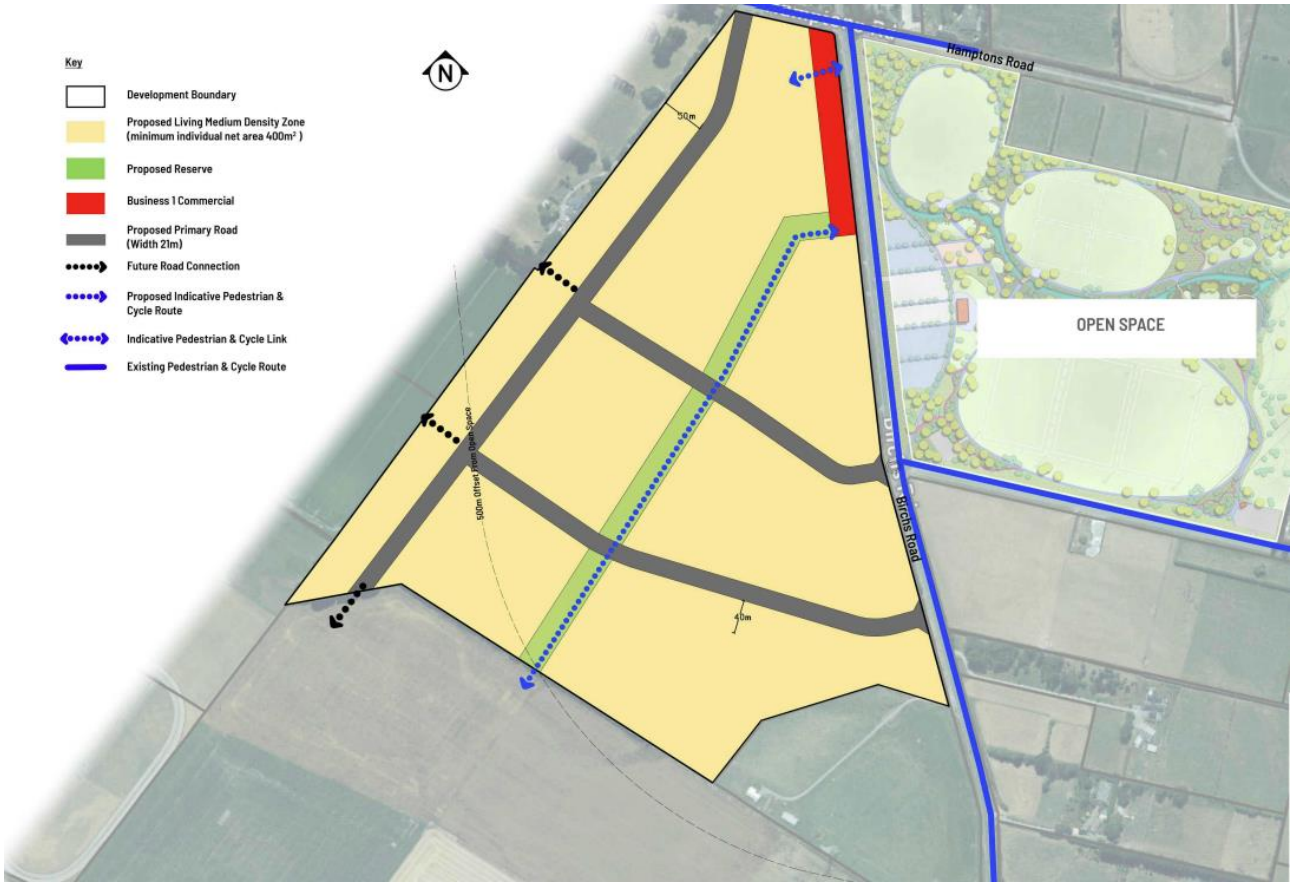
- Approximately 530 - 850 residential sites
- A north/south primary road, and two east/west primary roads
- One new intersection on Hamptons Road, and two new intersections on Birchs Road
- An area of Business 1 zone at the north eastern corner of the site
- A north/south pedestrian and cycle link.

Figure 1: Overview of PPC79 and other nearby PPCs[1]



[1] Adapted from Council's "Current plan change requests" website, available at https://www.selwyn.govt.nz/property-And-building/planning/strategies-and-plans/selwyn-district-plan/plan-changes

Figure 2: PPC79 Outline Development Plan



3 PREBBLETON TRANSPORT PROJECTS RELEVANT TO PPC79

This section discusses various funded and planned transport projects in Prebbleton that have relevance to PPC79.

3.1 Transport projects in the Long Term Plan

Council has provided a list of transport projects within the LTP that I consider to be relevant to PPC79. I have reproduced these in Table 1 below.

Table 1: LTP transport projects relevant to PPC79

Project	Scheduled year	Description
Shands Road / Blakes Road dual lane roundabout	Completed	Safety upgrade - Prebbleton arterial network. Includes the widening of Blakes Road to improve connectivity and safety
Trents Road seal widening	2023/24	Seal widening between Oakley Drive and Shands Road. Note that this upgrade is required prior to more than 120 residential allotments being created within PPC68, in accordance with Rule 12.1.3.48A.(b)
Shands Road / Trents Road single lane roundabout	2023/24	Safety upgrade - Prebbleton arterial network. Note that this intersection is currently in detailed design phase to a include a double lane approach and departure on Shands Road prior to any development within PPC68, in accordance with Rule 12.1.3.48A.(a)
Templeton to Prebbleton cycleway	2023/24	Off road cycleway alongside Trents Road - links between planned City and Rail Trail networks
Shands Road / Hamptons Road dual lane roundabout	2024/25	Safety upgrade - Prebbleton arterial network. Note that this intersection is required to be upgraded prior to more than 120 residential allotments being created within PPC68, in accordance with Rule 12.1.3.48A.(b)
Hamptons Road seal widening	2024/25	Seal widening between Springs Road and Shands Road. Note that this upgrade is required prior to more than 120 residential allotments being created within PPC68, in accordance with Rule 12.1.3.48A.(b)
Springs Road / Hamptons Road single lane roundabout	2024/25	Safety upgrade - Prebbleton arterial network
Springs Road /Tosswill Road traffic signals	2026/27	Safety upgrade - Prebbleton main street

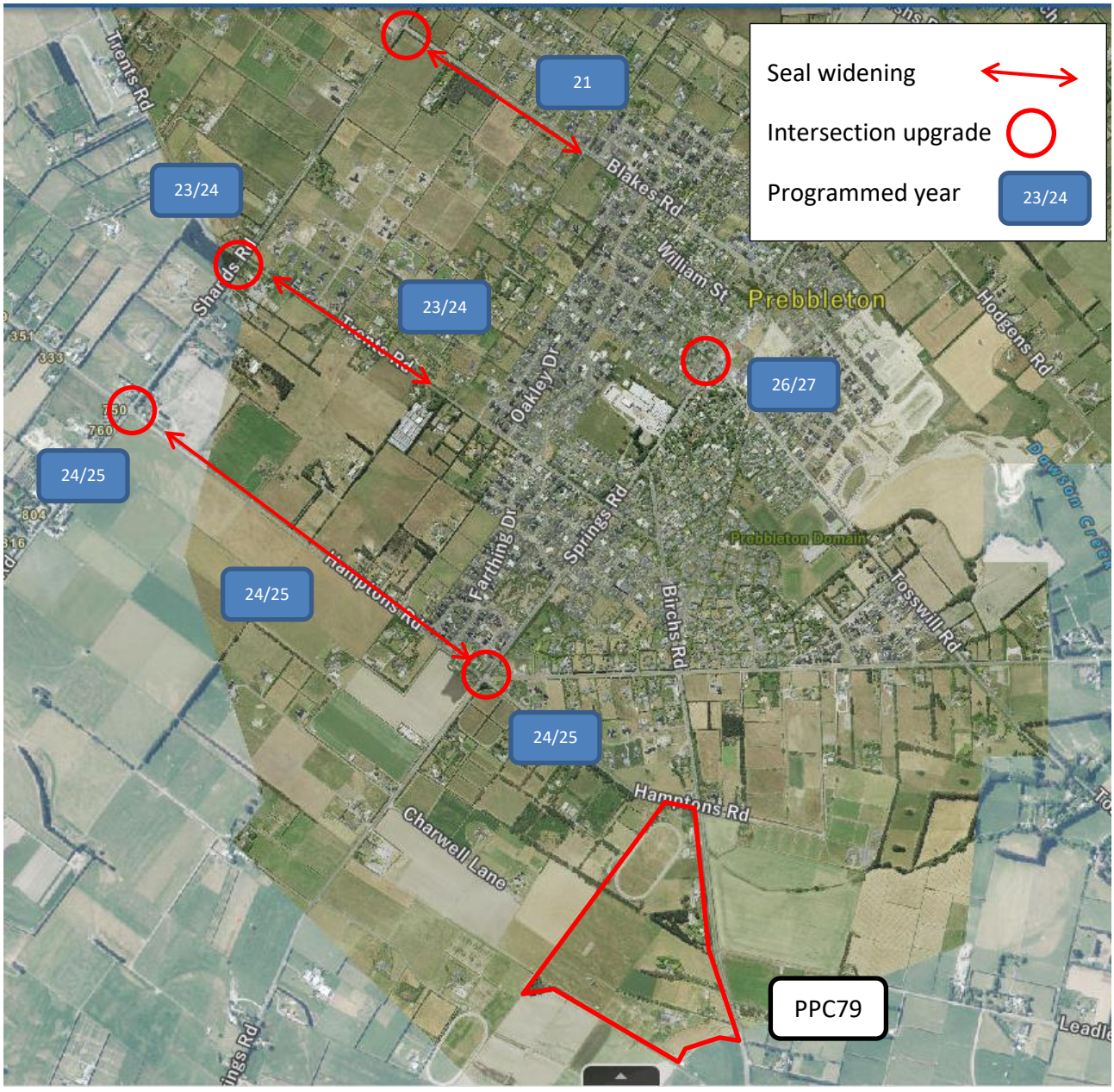
3.2 Prebbleton arterial safety works

Several projects identified in Table 1 form part of a programme aimed at

- improving safety along existing rural arterials
- improving safety and amenity within the Prebbleton town centre.

These projects, and the expected construction phasing, are shown in Figure 3.

Figure 3: Council transport improvements near PPC79



4 WIDER AREA EFFECTS OF CURRENT PLAN CHANGES

Currently there are multiple PPCs are being sought within Selwyn District. Of note to PPC79 are the following

- PPC64: Rolleston, 969 residential lots
- PPC66: Rolleston, industrial
- PPC68: Prebbleton, 820 residential lots
- PPC69: Lincoln, 2000 residential lots plus commercial
- PPC70: Rolleston, 800 residential lots plus commercial
- PPC71: Rolleston, 660 residential lots
- PPC72: Prebbleton, 295 residential lots
- PPC73: Rolleston, 2100 residential lots plus commercial
- PPC75: Rolleston, 280 residential lots
- PPC76: Rolleston, 150 residential lots
- PPC78: Rolleston, 750 residential lots
- PPC79: Prebbleton, 530 - 850 residential lots (subject of this report)
- PPC80: Rolleston, industrial
- PPC81: Rolleston, 350 residential lots
- PPC82: Rolleston, 1320 residential lots.

Council has commissioned Abley to prepare updates to the Rolleston and Lincoln Paramics models, which provide an indication of the potential future traffic demands within each settlement and the number of vehicles that are expected to enter and exit each settlement. However, no such traffic model exists for Prebbleton.

Council has recently engaged QTP[2] to test the effects of greater residential growth in Selwyn on the Greater Christchurch transport network, as part of Council's "Selwyn 2051" plan, which I have attached as Appendix A. The transport model outputs provided in the QTP report do not attempt to precisely predict future conditions, but rather provide a broad indication of likely outcomes if a certain set of assumptions come to pass, and further model limitations are also noted in Section 2.3 of the QTP report. I note that the QTP report is in draft format.

In absence of a Prebbleton transport model, I have relied on the QTP report to understand the potential future performance of the Prebbleton transport network.

The QTP report assesses the difference between two potential scenarios in 2038

[2] Future Year Transport Model Outputs - Selwyn 2031 Update (Selwyn 2051) report, prepared by QTP, dated October 2021

- Scenario 1 (2038): growth in Selwyn based on forecasts agreed by Greater Christchurch Partnership Committee for households, population, and employment
- Scenario 2 (2038): Scenario 1 plus an additional 10,000 dwellings (Selwyn District only), without any changes to employment, or any changes to households in Christchurch or Waimakariri. We note these are slightly lower than the sum of the current PPCs (10,900 dwellings) listed above.

Although the purpose of the QTP report is not to assess the cumulative transport effects of the multiple plan changes within Selwyn, it does provide insight into the potential quantum of effects, by comparing a standard population growth scenario (Scenario 1) with a high population growth scenario (Scenario 2). Of particular interest for my review are Shands Road and Springs Road, as these are near to PPC79 and known to be high demand corridors.

QTP found that

- Travel patterns in both Scenarios are indicated to remain similar to 2021, but with an increased magnitude proportional to population increase (increase of around 32% of peak hour trips)
- There is and will be high demand between Selwyn and Christchurch, with approximately 50% of Selwyn's peak hour trips starting or finishing in Christchurch, with trips distributing across available corridors between the two Districts
- For both Scenarios limited growth is indicated on some routes (such as Springs Road and Shands Road, due to downstream constraints in Christchurch) resulting in other routes seeing a higher increase in traffic (such as Ellesmere Road and Halswell Road)
- For both Scenarios, more than 90% of trips are indicated to be by private vehicle
- Scenario 2 is indicated to cause increasingly poor performance on several parts of the Prebbleton network, when compared with Scenario 1
    - Springs Road/Marshes Road intersection
    - Shands Road/Marshes Road intersection.

As can be seen in Figure 4, Scenario 2 is indicated to result in the following increases in morning peak hour flows, compared with Scenario 1, including at

- Approximately 100 veh/hr on Shands Road in each direction
- Approximately 100 veh/hr on Springs Road in each direction.

While these increases seem to be relatively small given that Scenario 2 has an additional 10,000 dwellings compared to Scenario 1, my interpretation of the modelling results is that traffic growth is instead focused on corridors that are currently less utilised (and therefore become more attractive compared to corridors with capacity constraints, such as Springs Road and Shands Road).

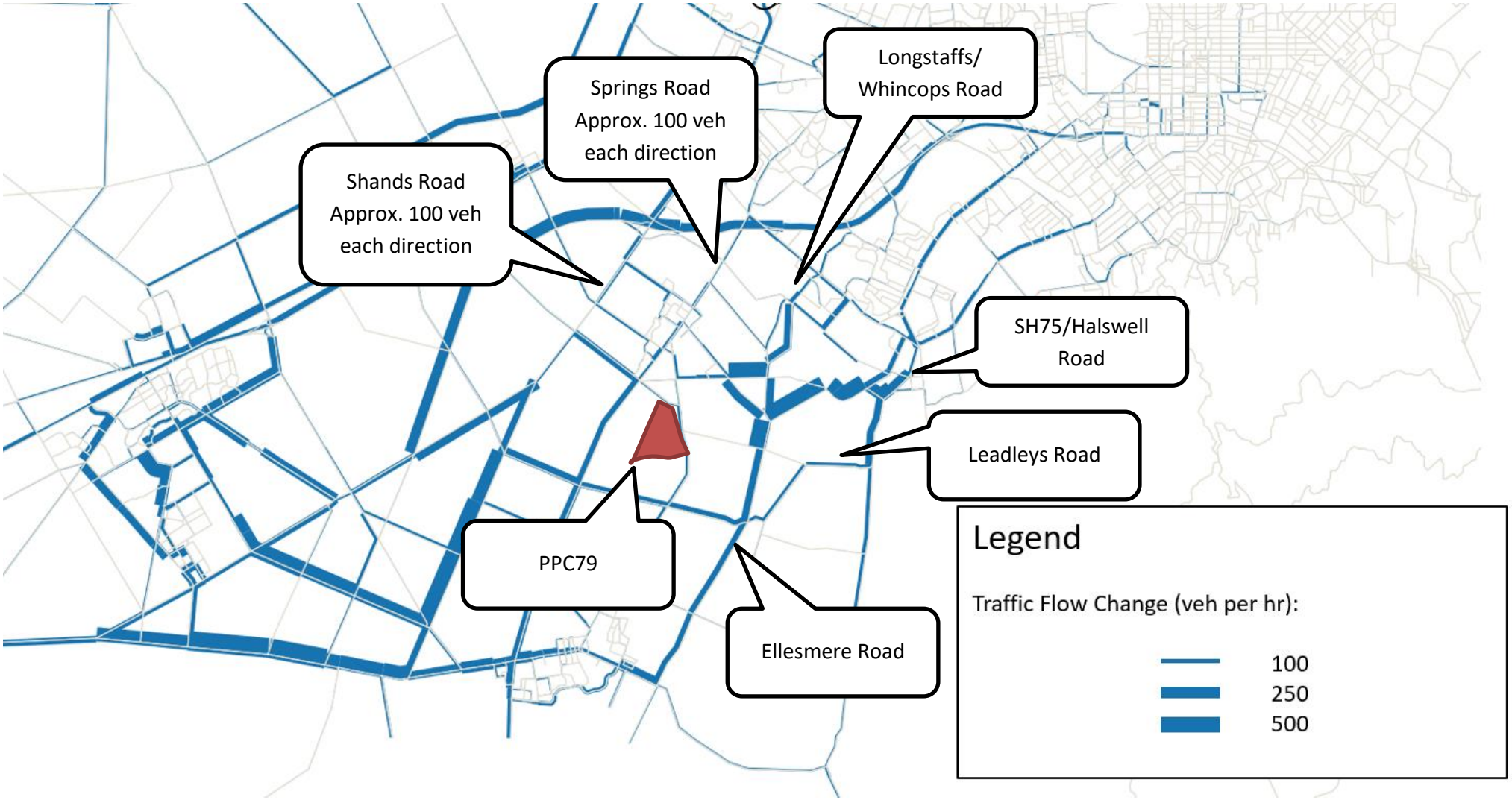
Shands Road and Springs Road through Prebbleton will be congested during peak periods. Should capacity improvements be required to address wider growth in Selwyn it is likely that this would occur on Shands Road (as a rural arterial) rather than Springs Road (as an urban arterial through a town centre). However, such investigations and potential works would be driven by wider regional growth rather than as a direct result of PPC79.

Corridors near Prebbleton that are indicated to have much greater growth in Scenario 2 include

- Waterholes Road, Christchurch Southern Motorway (SH76), Main South Road (SH1) in the north/west
- Ellesmere Road, Trices Road, Sabys Road, Leadleys Road and SH75 in the east.

Outcome: While there are and will be capacity constraints on the Prebbleton transport network during peak periods, regional modelling indicates that Shands Road and Springs Road are expected to experience adequate amount of change in forecast traffic growth, when comparing a 2038 scenario with 10,000 additional dwellings more than forecast. PPC79 is likely to have some effect on the operation of Springs Road through Prebbleton, along with generating effects on currently less utilised corridors between Prebbleton and Christchurch such as Whincops Road/Longstaffs Road and Leadleys Road/Ellesmere Road and SH75/Halswell Road.

Figure 4: Indicative changes in AM traffic flows, Scenario 2 vs Scenario 1



5 MY REVIEW OF THE TRANSPORT MATTERS

During my review, I considered the following aspects of PPC79

- Medium Density Residential Standards and traffic modelling
- Traffic modelling
- Birchs Road/Leadleys Road intersection
- Frontage upgrades
- Internal roading layout
- Provision for walking and cycling.

I discuss these matters in the following subsections.

5.1 Medium Density Residential Standards and traffic modelling

I note that the ITA was prepared before the Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021 (RMA-EHS), specifically the Medium Density Residential Standards (MDRS). The RMA-EHS requires tier 1 territorial authorities incorporate a prescribed approach to development within residential zones.

A territorial authority may make the MDRS less enabling of development in a relevant residential zone only to the extent necessary to accommodate one or more of the qualifying matters listed under section 77I of the Resource Management Act[3]. Transport constraints can be considered a qualifying matter. As I discuss in this report, I do not consider Transport constraints to be unresolvable, and therefore I do not consider them to be a qualifying matter.

5.1.1 Medium Density Residential Standards

The ITA has assumed a yield of approximately 600 dwellings within the site, which I understand is based on the predominant type of housing product being delivered in Selwyn. Novo Group undertook a sensitivity test for 1580 dwellings (paragraph 65 – 69 of the ITA) and issued a subsequent addendum to the ITA, dated 8 April 2022, which considered the effect of a total of 1581 dwellings in response to the MDRS.

When preparing an ITA, it is typical to assume a realistic yield for the site rather than the maximum potential yield as this is rarely realised. While the MDRS will enable higher yields to be delivered, I consider that there is likely to be a difference between development intensity enabled by the MDRS vs what might be reasonably feasible from a market economics perspective. I am not able to comment on whether market economics may drive a more intensive development outcome (e.g. a yield of 1581 dwellings or more).

[3] Medium Density Residential Standards, A guide for local authorities, Ministry for the Environment, available online https://environment.govt.nz/assets/publications/Files/Medium-Density-Residential-Standards-A-guide-for-territorial-authorities-July-2022.pdf

In order to address the potential for higher yield for the site, I recommend that a planning mechanism (such as a District Plan Rule) is included which requires an updated Integrated Transport Assessment should more than 600 dwellings be proposed within PPC79. I note that a similar approach was put forward by the Applicant for PPC81 and PPC82 in Rolleston.

However, I note that such a rule is not a perfect solution to the problem. In my experience this type of rule can have some complexities and potential unintended outcomes, which increase as the number of landowners that are subject to the threshold rule increase.

Should the Plan Change be approved and subdivided, the effectiveness of a threshold rule diminishes as the number of land owners increases. For example

- Subdivision consent can be sought for superlot subdivision, with the superlots then being onsold to a number of smaller developers
- Subsequent land use consents for those superlots could result in the dwellings threshold being exceeded
- This can create a "first mover advantage" situation. The developer that lodges the land use consent that triggers the dwelling rule can become responsible for wider transport improvements that exceed their proportional share of effects on the transport network – e.g. the ITA required by the threshold rule may identify that a major intersection upgrade is required.

5.1.2 Traffic modelling

The ITA provides traffic modelling for the following intersections

- Birchs Road/Leadleys Road/Primary Road
- Hamptons Road/Primary Road
- Birchs Road/Hamptons Road.

As discussed above, Novo Group undertook a sensitivity test for a higher yield scenario for the site. This identified that the following improvements would be required, should the yield of the site be 1581 dwellings

- Upgrade Birchs Road/Leadleys Road to a roundabout[4]
- Upgrade Birchs Road/Hamptons Road to a roundabout.

I consider that methodology of the ITA is reasonable, however I note the following

- I consider that the number of through movements between the Primary Road and Leadleys Road, at the Birchs Road/Leadleys Road intersection may be underpredicted (refer to my discussion in Section 4 and Section 5.2). However, for the purpose of the traffic modelling assessment I consider that this is unlikely to affect the conclusions of the ITA regarding modelled level of performance

[4] I consider that the Birchs Road/Leadleys Road intersection must be upgraded to a roundabout at the time of the formation of the Primary Road, refer to my discussion in Section 5.2

- The traffic modelling does not include the Birchs Road/Springs Road intersection in Prebbleton. During my review of PPC72 I requested that Ms Williams undertake an assessment of this intersection. Ms Williams provided an estimate of the existing and future performance in her Evidence for PPC72[5]. While her assessment did not include traffic from PPC79, it did include a growth factor of 20% for background traffic. I consider that it demonstrated that this intersection is expected to operate acceptably (albeit in a somewhat congested state during peak hours), with the development of PPC72 and PPC79 (600 dwelling scenario). However, should the 1500 – 1581 dwelling scenario eventuate for PPC79, I consider that further assessment of this intersection would be required. Refer to my discussion in Section 5.1 for a potential planning mechanism to ensure this outcome.

Outcome: The Integrated Transport Assessment includes a sensitivity test for a higher density scenario of 1581 dwellings, in response to the MDRS. This test identified that the Birchs Road/Hamptons Road and Birchs/Leadleys Road intersections would need to be upgraded to roundabouts to address congestion effects.

I note that there is a difference between development intensity enabled by the MDRS vs what might be reasonably feasible from a market economics perspective. I am not able to comment on whether market economics may drive a more intensive development outcome for PPC79. To address this, I recommend a planning mechanism is included which specifies a 600 dwelling threshold at which an updated Integrated Transport Assessment would be required, including an assessment of Birchs Road/Hamptons Road and Birchs Road/Springs Road intersections. However, in my experience this type of rule can have some complexities and potential unintended outcomes, which increase as the number of landowners that are subject to the threshold rule increase.

5.2 Birchs Road/Leadleys Road intersection

The ODP indicates that a new primary road will be formed on the western side of the existing Birchs Road/Leadleys Road intersection, forming a cross road. Paragraph 43 of the ITA notes that the angle of Leadleys Road relative to Birches Road means future consideration of through movements (between the Primary Road and Leadleys Road) will be required during future subdivision. In Figure 5 I have demonstrated how the Primary Road is expected to join the Birchs Road/Leadleys Road intersection, which demonstrates the misalignment between the Primary Road and Leadleys Road.

Intersections are places on the road network where road users' paths cross, increasing the risk of a crash. Despite the relatively short time spent travelling through intersections on most journeys, a high proportion of crashes occur at them. The number of potential conflict points increases as the number of arms on the intersection increases. As an intersection becomes busy, the complexity of decision making increases as several of these conflicts can happen at the same time.

Cross road (priority form) intersections are recognised as having a higher rate of death and serious injury crashes than other intersection types. In contrast, roundabouts are the safest form of intersection

[5] PPC72 Evidence of Lisa Williams dated 13 January 2022, paragraphs 22 – 32, available online https://www.selwyn.govt.nz/__data/assets/pdf_file/0008/667115/TRRG-evidence-traffic-Lisa-Williams-FINAL.PDF

control for drivers[6], and with careful design consideration they can also perform safely for pedestrians and cyclists provided speeds are well controlled by a mix of tight geometry and vertical deflection[7].

As shown in Figure 6, crashes at cross road (priority form) intersections are

- around 1.2 times more likely to involve a death or serious injury in urban environments compared to a roundabout
- around 2.4 times more likely to involve a death or serious injury in rural environments compared to a roundabout.

The presence of the Little River Trail cycleway along the eastern side of Birches Road adds additional complexity for drivers and vulnerable road users (pedestrians and cyclists). The survivable vehicle speed for vulnerable users is 30km/h, therefore the risk of a death or serious injury crash is higher at cross road intersections than at roundabouts, where entry speeds can be controlled.

As discussed in Section 4, I expect that a large proportion of commuter trips generated by PPC79 will use Leadleys Road to access Ellesmere Road and SH75 when travelling to and from Christchurch, resulting in a high proportion of PPC79 vehicle movements travelling in an east/west direction through the Birchs Road/Leadleys Road intersection. I therefore recommend carriageway widening for Leadleys Road to connect safely to Ellesmere Road. I also recommend that ODP identify that this intersection must be formed as a roundabout and that it includes safe crossing facilities to the Little River cycle trail, as shown in Figure 7.

Outcome: I consider that the proposed cross road intersection between Birchs Road/Leadleys Road/Primary Road will result in an increase in death and serious injury crashes at this intersection. I recommend carriageway widening for Leadleys Road and that the ODP identify that this intersection must be formed as a roundabout, and include safe crossing facilities to the Little River cycle trail, as shown in Figure 7.

[6] Roundabouts, Waka Kotahi NZTA, available online at https://www.nzta.govt.nz/walking-cycling-and-public-transport/cycling/cycling-standards-and-guidance/cycling-network-guidance/designing-a-cycle-facility/intersections-and-crossings/roundabouts/

[7] High risk intersections guide: Section 6.5.4, Waka Kotahi NZTA, July 2013, available online at https://www.nzta.govt.nz/assets/resources/high-risk-intersections-guide/docs/high-risk-intersections-guide.pdf

Figure 5: Existing Birchs Road/Leadleys Road intersection, demonstrating indicative Primary Road and non-right angle intersection form

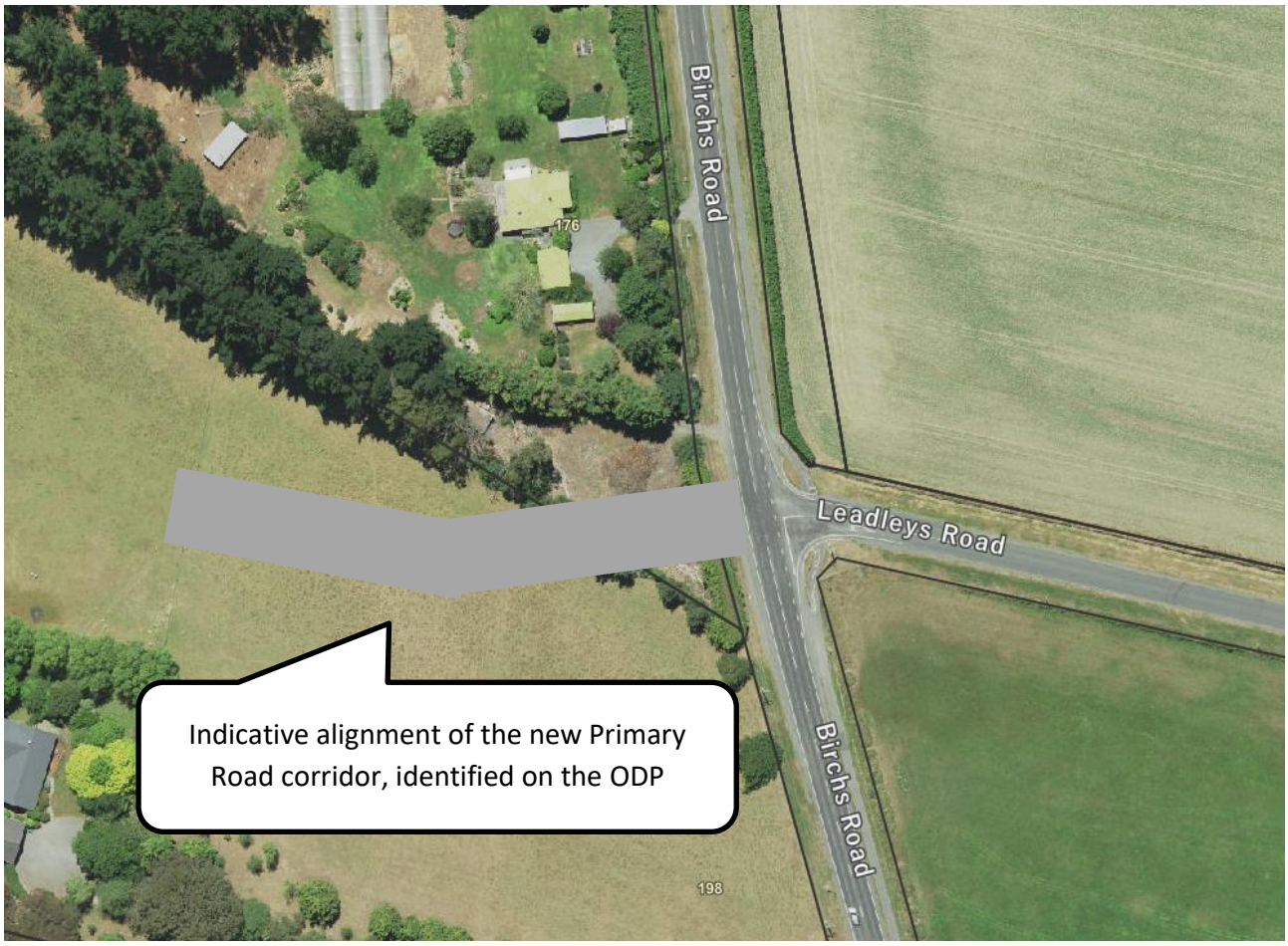
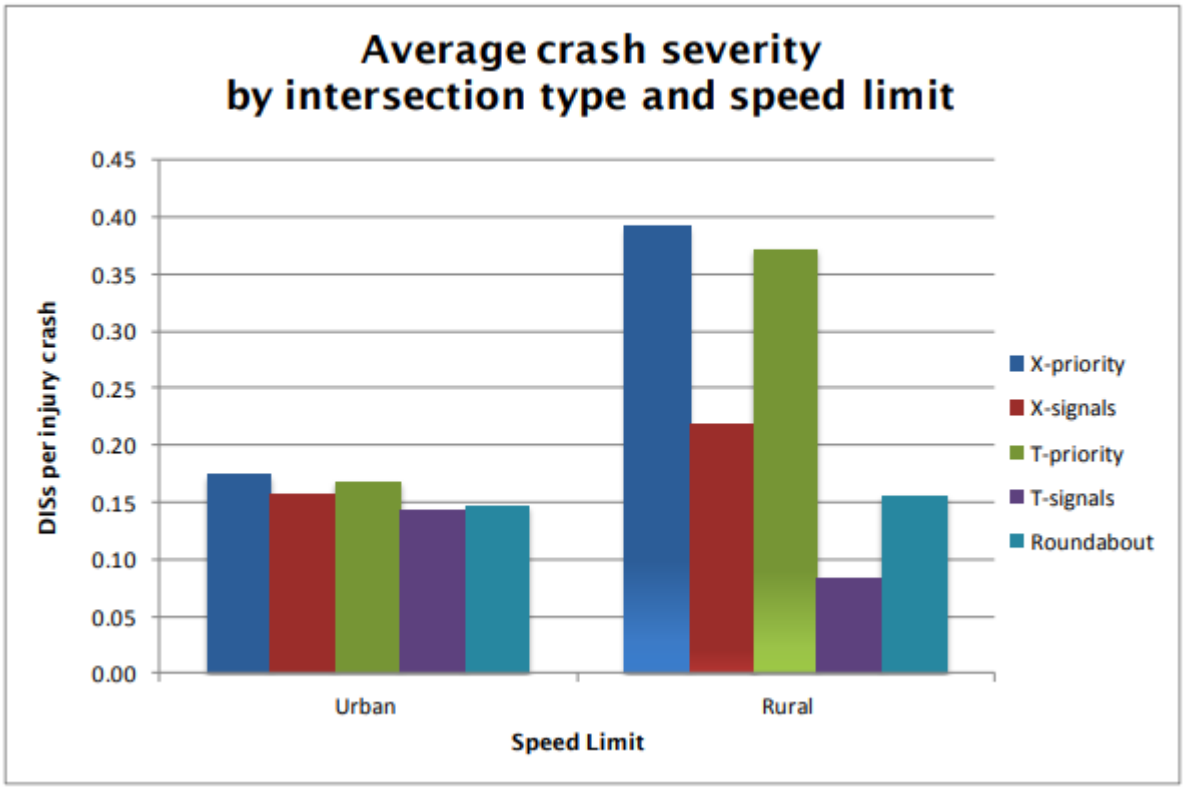


Figure 6: Death and serious injury crash ratios at intersections[8]



5.3 Springs Road/Hamptons Road intersection

Paragraph 52 of the ITA estimates that 600 dwellings within PPC79 will generate 98 vehicle movements through the Hamptons Road/Springs Road intersection during the AM peak hour, and 56 movements during the PM peak hour.

As identified in Section 3.2, Council intends to upgrade the Springs Road/Hamptons Road intersection to a roundabout in 2024/2025. To avoid potential safety and congestion effects at this intersection, I recommend that it is upgraded prior to any development within PPC79.

Outcome: I recommend that the Springs Road/Hamptons Road intersection is upgraded to a roundabout prior to any development within PPC79. An upgrade of Ellesmere Road is a prerequisite and Leadleys Road widening on formation of the roundabout with Birchs.

5.4 Hamptons Road/Primary Road intersection

Paragraph 41 of the ITA identifies that the proposed Primary Road intersection with Hamptons Road will achieve a Safe Intersection Sight Distance of 123m to the west, due to the proximity of a horizonal curve on Hamptons Road. This is adequate for a 60 km/hr design speed, which generally equates to a 50 km/hr speed limit. The ITA considers that this is acceptable, as the current 80 km/hr speed limit on Hamptons Road is likely to be reduced in the future.

[8] High risk intersections guide: Figure 3-2, Waka Kotahi NZTA, July 2013, available online at https://www.nzta.govt.nz/assets/resources/high-risk-intersections-guide/docs/high-risk-intersections-guide.pdf

However, I note that speed limit changes can only be implemented by the road controlling authority. Should the speed limit on Hamptons Road remain at 80 km/hr, the Primary Road intersection will have insufficient visibility for east bound traffic on Hamptons Road, unless the intersection is restricted to a left in/left out arrangement. I therefore recommend that the ODP narrative identify that the Primary Road intersection with Hamptons Road must be designed in consultation with Council, including consideration of sight lines on Hampton Road.

Outcome: Mitigation measures, such as a speed reduction or turning restrictions, will be required to ensure the Primary Road intersection with Hamptons Road can operate safely. I recommend that the ODP narrative identify that further assessment of the safe intersection sight distance is required.

5.5 Frontage upgrades

As is consistent with other greenfield developments within Selwyn I consider that the developer should upgrade all existing road frontages to urban standard. In my recommendations on behalf of Council for the nearby PPC72, I recommended that these frontages be identified on the ODP. In his Decision on PPC72, Commissioner Thomas considered that wording within the ODP narrative was sufficient to ensure this outcome[9]. I therefore recommend that the ODP narrative is amended to include reference to a requirement for developers to upgrade site frontages with Birchs Road and Hamptons Road to urban standard.

Outcome: I recommend that the ODP narrative is amended to include "Road frontage upgrades: The Birchs Road and Hamptons Road frontages are to be upgraded to an urban standard in accordance with the Council's Engineering Code of Practice. All frontage upgrades are to be developed in consultation with Council".

5.6 Internal roading layout

I consider that the OPD provides a logical roading layout within the site. However, I recommend that an additional north/south road be included, as shown in Figure 7. In my view it would be acceptable to show this as a "Proposed Secondary Road" rather than "Proposed Primary Road (Width 21m)".

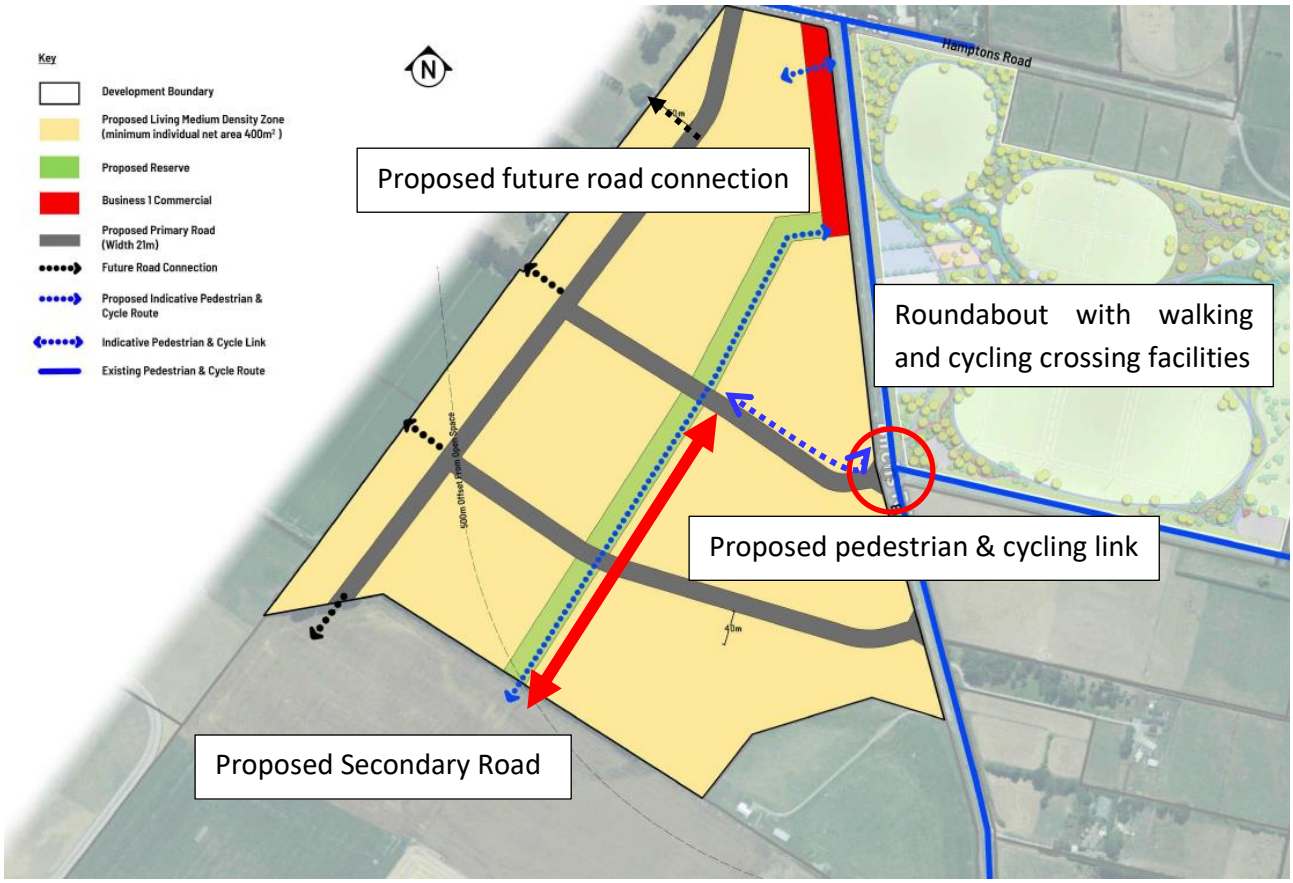
I consider that this road is of sufficient importance to the internal and potential future external connectivity of the site, and I note that this road is shown in the Landscape Concept – Overall Perspective image prepared by DCM Urban Design, included in Appendix 2 of the notified documents.

The indicative cross sections for roads, included in Appendix 2 – Outline Development Plan, do not fully comply with Council's Engineering Code of Practice. For example Section 13 Table 3 identifies that local roads must have a minimum legal width of 13m, whereas the ODP proposes a 12m wide shared street.

[9] Plan Change 72 Report and recommendations by Hearing Commissioner Paul Thomas: paragraph 66, dated 30 March 2022, available online at https://www.selwyn.govt.nz/__data/assets/pdf_file/0008/806930/Recommendation-Report-PC-72-Final.pdf

Outcome: I recommend that the ODP plan and narrative should be amended to indicate an additional north/south road, and that road cross sections are removed from the ODP or otherwise amended to comply with Section 13 of Council's Engineering Code of Practice.

Figure 7: Recommended amendments to the ODP to include a secondary north/south road and roundabout at the Birchs Road/Leadleys Road intersection



5.7 Provision for walking and cycling

The ODP identifies that Primary Roads are anticipated to include walking and cycling facilities, separated from general traffic. I agree with this approach, however I recommend minor amendments to require this outcome.

Outcome: I recommend that the ODP should be amended to require that walking and cycling facilities must be provided on Primary Roads and along Birchs Road frontage, and be separated from general traffic.

> *"A primary road legal width of 21 m is proposed, ~~**to allow inclusion of**~~ **which will include** a shared pedestrian/cycle path, separate from the main vehicle carriageway"*

6 PREBBLETON STRUCTURE PLAN AND INFRASTRUCTURE BOUNDARY

As part of my review, I have considered the Prebbleton Structure Plan (Structure Plan)[10], which was prepared in 2010.

PPC79 sits outside the anticipated urban area of the Structure Plan, as well as the proposed infrastructure boundary specified in the Canterbury Regional Policy Statement (CRPS) Map A[11].

I regard to the potential effects of PPC79 on the wider transport network

- The transport effects of PPC79 on the wider transport network, beyond Prebbleton, have not been assessed in the ITA
- If PPC79 does not affect the quantum of residential growth within Selwyn District over the life of the District Plan (i.e. residential growth in Selwyn District is a "zero sum game", with PPC79 drawing growth demand away from other parts of Selwyn), PPC79 is unlikely to result in significant wider transport network effects beyond what are already anticipated by strategic growth plans and policies (such as Our Space and the CRPS)
- If PPC79 (as a Plan Change outside the anticipated urban area) leads to greater residential growth in Selwyn beyond what has been anticipated strategic growth plans and policies, without a corresponding increase in local employment and access to services, additional impact on the Greater Christchurch transport network can be expected as additional residents in Selwyn travel to access services and employment
- The wider area effects of PPC79 may not be overly apparent in a macro scale regional transport model. Assessing the effects of PPC79, as a development outside of the identified infrastructure boundary, on the long term planning and funding commitments associated with bulk transport infrastructure is complex and requires assessment of multiple land use scenarios (e.g. expansion vs intensification scenarios). My discussion of the transport effects of two potential future growth scenarios is included in Section 4
- The transport effects of PPC79 at a subregional level, as an urban area outside the anticipated urban boundary, are likely to be minor. However, the cumulative effect of large scale urban development outside the anticipated urban boundary (as proposed by multiple plan changes in the Selwyn District) could have a significant effect on the transport network.

Outcome: PPC79 is inconsistent with the Prebbleton Structure Plan, in that it is outside the anticipated urban area. Should PPC79 affect the quantum of residential growth within Selwyn, without a corresponding increase in local employment and access to services, additional impact on the Greater Christchurch transport network can be expected as additional residents in Selwyn travel to access services and employment. However, assessing the effects of such development on the long term planning and funding commitments associated with bulk transport infrastructure is complex and requires assessment of multiple land use scenarios at a District or Regional level.

[10] Prebbleton Structure Plan, available online https://www.selwyn.govt.nz/property-And-building/planning/strategies-and-plans/prebbleton-structure-plan
[11] Canterbury Regional Policy Statement Map A, available online https://www.ecan.govt.nz/your-region/plans-strategies-and-bylaws/canterbury-regional-policy-statement/

The transport effects of PPC79 at a subregional level, as an urban area outside the anticipated urban boundary, are likely to be minor. However, the cumulative effect of large scale urban development outside the anticipated urban boundary (as proposed by multiple plan changes in the Selwyn District) could have a significant effect on the transport network.

7 MY REVIEW OF SUBMISSIONS

Multiple submissions were received relating to transport matters, which include the following broad topics

- Provision of transport infrastructure
- Walking and cycling
- Speed limits for existing roads.

I comment on these matters further in the following subsections.

Other matters related to traffic were identified in submissions, however I have not commented on these as I am not a subject matter expert for

- Traffic noise and pollution
- Greenhouse gas emissions from traffic.

7.1 Traffic congestion and safety effects

Aspects of submissions that discussed the adequacy of existing and/or planned transport infrastructure, and my responses, are provided in Table 2.

Table 2: Commentary on submissions related to traffic effects

Submission point	Flow comment
Number of additional houses having a strain on the current road infrastructure in the area.	Refer to my discussion in Sections 4, 5, and 6
Birch, Springs and Shands Road are corridors for a wider catchment area from Leeston, Springston and Lincoln. The need to assess combined traffic effects of all plan changes in Prebbleton and Lincoln.	
Concerns about additional traffic in the Prebbleton vicinity (roads are already at full capacity) – including traffic noise and pollution. This will add to the existing congestion problem.	
Concerns about Birch Road being congested during commuting times currently and safety effects of vehicle access onto Birchs Road.	I consider that this has been assessed by the ITA. The ODP narrative indicates that direct vehicle access to Birchs Road is not anticipated.
Concerns about the Birch's Road / Springs Road T-intersection.	Refer to my discussion of Birchs Road/Springs Road in Section 5.1.

The NOVO Group report states there will be approximately 600 residential dwellings and some local businesses built. However, the plan details up to four times that number. There is concern over inaccuracy of the report and plan details.	Refer to my discussion in Section 5.1.
Traffic count data in NOVO report is out of date and flawed. The November 2020 counts were taken during COVID, and there are 2018 counts used in the report which is 4 years ago. The significant development of Prebbleton and Lincoln has occurred after 2018, therefore it does not consider this growth.	I consider that this is unlikely to affect the conclusions of the ITA, or my review.
Concern that the traffic model uses one day of traffic data, which means all outputs from this model is reliant on one day's number.	
Poor visibility at Hamptons Road / Birch's Road intersection and for vehicles travelling east on Hamptons Road approaching the new development road.	Sight lines for the existing Hamptons Road / Birch's Road intersection are adequate. The Primary Road/Hamptons Road intersection will require further design consideration, refer to my discussion in Section 5.4
Intersection upgrades should be implemented at these intersections: - Hamptons Road / Birch's Road - Hamptons Road / Springs Road - Birch's Road / Leadleys Road.	Refer to my discussion in Sections 5.1, 5.2 and 5.3

7.2 Walking and cycling

Some submitters raised concerns about the effects of PPC79 on pedestrians and cyclists using Birchs Road. Refer to my discussion in Sections 5.2, 5.5, and 5.7.

7.3 Speed limits for existing roads

Some submitters identified concerns with existing speed limits on Birchs Road and Hamptons Road. Urbanisation will support the lowering of existing speed limits, and I note that only the Road Controlling Authority can alter speed limits. I expect the Council will reduce speed limits on surrounding roads where warranted. Also refer to my discussion of the speed limit on Hamptons Road in Section 5.4.

7.4 Public Transport

The Lincoln 80 Metro service runs along Birchs Road, which will be able to service this development. This includes plans in the future for more direct services between Lincoln and the central city. This may be higher frequency daily services running internally within the development or peak express stops on Birch Road.

APPENDIX A QTP Future Year Transport Model Outputs report

Quality Transport Planning

Future Year Transport Model Outputs

Selwyn 2031 Update (Selwyn 2051)

October 2021

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Document Issue Record

Version No	Prepared By	Description	Date
V1	John Falconer	Draft – 2021 AM Peak Outputs Only	21 October 2021

Document Verification

Role	Name	Signature	Date
Preparation	John Falconer		21 October 2021
Reviewer			
Approval	John Falconer		21 October 2021

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Contents

Appendices

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1 Introduction

1.1 This report sets out the results of future year scenario transport modelling used to inform the Selwyn 2031 Update (Selwyn 2051).

1.2 The modelling utilises regional transport models (both CTM and CAST) that are jointly owned and operated by the Greater Christchurch Partnership (GCP). The GCP have agreed future year (2028, 2038 and 2048) base input assumptions relating to landuse and network supply agreed at the regional level, to enable a consistent planning approach. From these base scenarios, additional scenarios can be developed (e.g. redistributing where growth occurs and/or the overall scale of growth).

1.3 The purpose of the transport modelling in this application is to help understand both the current and potential future:

- transport patterns of Selwyn District based traffic, including trip origins, destinations and usage by the most common modes (light vehicles, heavy vehicles, bus and cycle), and how this relates to accessibility.
- performance of the Selwyn District transport network in terms of utilisation of road links by mode and the overall Level of Service (LoS) of road links and intersections.
- impact of Selwyn housing and employment on the Greater Christchurch network, including the proportion of traffic using key arterial roads and intersections.

1.4 Collectively, this information will inform the likely transport impacts of future landuse demand (additional population and employment) associated with the scale and location of particular growth areas and how this may vary across alternative scenarios.

1.5 The specific tasks performed by QTP are summarised below:

- Provide analysis of the current state of the transport network, across a range of transport modes (walking, cycling, car, and bus), including:
  a. Accessibility to land-use activities (e.g. employment, KACs, and schools);
  b. Peak time flows (vehicle trips and bus passengers) on road links;
  c. Trip patterns between key locations; and
  d. Identification of intersections and links that are at or near capacity (resulting in poor level of service);
- Assess the impact of current Selwyn housing and employment on the Greater Christchurch transport network; in particular the impact of peak time flows into and out of Selwyn's townships.
- The testing of alternate land-use scenarios, developed in conjunction with SDC.

1.6 The model outputs and outcomes associated with the first two bullets above are documented in the report titled '*Transport Model Outputs for Selwyn 2031 Update (Selwyn 2051) V1.PDF'*. This report documents the last bullet point; the testing of alternate land-use scenarios.

2 Transport Model Application

2.1 Modelling Overview

2.1.1 Greater Christchurch extends over three Territorial Local Authorities (TLAs); Christchurch City, Waimakariri District to the north, and Selwyn District to the south. While each TLA is governed separately, many decisions made by one TLA have an impact on the other two (and other stakeholders), especially in relation to transport.

2.1.2 As part of this, a joint committee known as the Greater Christchurch Partnership Committee (**GCPC**) has formally been established, with representatives from each Partner's organisations to lead and coordinate projects.

2.1.3 The GCPC have collectively prepared forecasts of population, households and employment and at the Territorial Local Authority (TLA) level (within the Greater Christchurch area). These forecasts are reasonably consistent with Statistics NZ (sub-national) population forecasts released in 2017[1]; when applying the Medium Growth projection within Christchurch City and the Medium-High projection to Waimakariri and Selwyn Districts.

2.1.4 In addition to the above 'default' forecasts (hereafter called Scenario 1), this report includes testing of an alternate land-use scenario (hereafter called Scenario 2), which includes an additional 10,000 households located in Selwyn townships by 2038. Population and Household totals for Christchurch City and Waimakariri District remain unchanged (i.e. Scenario 2 has a net gain of 10,000 households relative to Scenario 1 at 2038, all allocated to Selwyn District).

2.1.5 Specific locations (Meshblocks) where residential capacity has been added to Scenario 2 , as supplied by SDC, are included in **Appendix A**.

2.2 Software Capability

2.2.1 The CTM is a traditional regional four stage[2] transport model, covering the Greater Christchurch area and implemented in CUBE Voyager software. It was commissioned in 2005 and completed in 2009. The cost of the model was significant (in the order of $2m), with approximately half of this cost allocated to data collection. The CTM provides a meaningful response to the most critical factors that affect the transport system; travel demand (based on spatial population and landuse activity) and the available transport linkages (network provision) that facilitate movement between locations.

2.2.2 The CAST model, implemented in the SATURN software, uses travel demand estimated by the CTM and provides a much more detailed simulation of intersection operation and interaction, whilst still modelling the operation of the entire Greater Christchurch road network[3]. In this regard the modelling is extremely powerful as it simulates localised impacts whilst also capturing the effects on the wider road network. The detailed simulation modelling is achieved through use of the Cyclical Flow Profile which tracks

[1] Note the CTM and CAST models are currently being updated to 2018 Census data and new forecasts are imminent, however the 2017 forecasts still reasonably represent anticipated spatial growth patterns in the short to medium term.
[2] The four stages being trip generation, trip distribution, mode choice and traffic assignment.
[3] Some local roads such as cul-de-sacs and others without a significant through-traffic potential are not included.

the arrival and departure profiles of vehicles through the network through every 'step' (typically 1 second) of the adopted cycle time.

2.3 Model Limitations

2.3.1 When interpreting transport model outputs, it is important to note that the model attempts to represent complex human behaviour in a pragmatic manner such that it is possible to make reasonable and useful predictions of potential outcomes in the future.

2.3.2 While all such transport models are simplifications of reality, they provide a foundation for quantitative estimates of likely effects and potential benefits that can be helpful for decision-makers. In reality, there are many individual motivators for choosing to travel (or not) in the first place, let alone which mode or routes or modes are taken.

2.3.3 Any tool or model framework which 'aggregates' such individual choices will, inevitably, use generalised assumptions (such as aggregation to zones, 'household types', etc.). In many cases these assumptions may have a degree of error or simply be 'wrong' at an individual level. However, 'on the whole' such models seek to provide a reasonable approximation to the observed or anticipated behaviour of the target population at a particular point in time – and most pertinently for planning purposes, need to respond (sensibly) to key variables, including demographic changes and potential policy interventions or levers.

2.3.4 The transport models have been calibrated to reflect 2006 travel behaviour, with an inherent assumption that this will continue. While over the last few decades this has been proven (empirically) to be a valid assumption, the recent (2021) government policy statements on land transport and housing and urban development suggest (correctly) that significant intervention is needed in the near future to force travel behaviour change in order to address climate change, sustainability issues, urban design and to provide better long-term social outcomes.

2.3.5 The transport models will therefore continue to evolve to reflect latest policy and wider societal changes, with regularly updated planning horizons and modelling techniques based on the best information available at the time.

2.3.6 Indeed, it was the insights provided by transport models that have helped (in part) build the case for change are now seeing.

3 Future Year (2038) Network Model Outputs

3.1 Model Outputs

3.1.1 The full range of model output plots for the modelled 2038 year are included in Appendix B.

3.1.2 A selection of these are duplicated in this section where further discussion and interpretation is warranted. Due to space constraints, these have been reduced in size, however the reader may therefore refer to the full-size versions in the appendix for more detailed information.

3.1.3 Only the morning peak period has been reported because this period has the greatest impact within Selwyn District. The evening peak period generally has similar traffic patterns but in the inverse direction. However, trips travelling from Christchurch to Selwyn during the evening peak (i.e. peak flow direction) are highly constrained by the Christchurch City network, which regulates the rate at which trips cross the border from Christchurch to Selwyn. This limits effects relative to the morning peak.

3.1.4 In line with the project scope, the outputs have been grouped into four themes:

- ***Trip Patterns*** – to understand broadly where people (and goods) are travelling within Greater Christchurch.
- ***Traffic Flows*** – to understand the how traffic flows might change between 2021 and 2038 (for both Scenario 1 and Scenario 2) and also understand the differences at 2038 between Scenario 1 and Scenario 2.
- ***Network Performance*** – to identify how the traffic flows above relate to the available network capacity and the resulting Level of Service (LoS).

3.2 Trip Patterns

3.2.1 A summary of vehicle trips to and from Selwyn is provided below.

Figure 3-1: Morning Peak 2021 Vehicle Trip Summary

AM Peak 2038 Base – 2hr (0700-0900) Vehicle Trip Summaries by mode

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Light Vehicle	From Selwyn GC to	9,180	2,620	9,700	70	1,330	50	22,950
	To Selwyn GC from	9,180	330	5,090	280	70	50	15,000
	From Selwyn Ext to	1,280	200	1,100	60	40	70	2,750
	To Selwyn Ext from	1,330	260	1,120	50	40	50	2,850
	TOTAL Trips	18,360	2,950	14,790	350	1,400	100	37,950

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Heavy Vehicle	From Selwyn GC to	120	10	360	30	30	30	580
	To Selwyn GC from	120	10	310	30	30	10	510
	From Selwyn Ext to	30	80	270	30	-	30	440
	To Selwyn Ext from	30	80	280	30	-	10	430
	TOTAL Trips	240	20	670	60	60	40	1,090

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
TOTAL	From Selwyn GC to	9,300	2,630	10,060	100	1,360	80	23,530
	To Selwyn GC from	9,300	340	5,400	310	100	60	15,510
	From Selwyn Ext to	1,310	280	1,370	90	40	100	3,190
	To Selwyn Ext from	1,360	340	1,400	80	40	60	3,280
	TOTAL Trips	18,600	2,970	15,460	410	1,460	140	39,040

3.2.2 This figure shows that during the morning peak period:

- Vehicle trip patterns are indicated to remain similar to 2021, but with increased magnitude (from 29,400 tips per day in 2021 to 39,000 in 2038, i.e. +32%).
- Heavy vehicle trips are a very small proportion (3%) of total Selwyn based traffic. This proportion remains similar to 2021.
- There is still high transport demand between Selwyn District and Christchurch in 2038 (with approximately 50% of Selwyn trips having an origin or destination in Christchurch, as was also the case in 2021), with more than 90% of trips indicated to be by private vehicle (despite assumed improved PT services in future years).

3.3 Traffic Flows

3.3.1 The following plots indicate the implication of the trip patterns in relation to the available roads that make up the transport network how these are used.

3.3.2 General traffic flow patterns for 2038 appear to be broadly similar to 2021, but are about 25% (on average) higher as indicated below shown below:

Figure 3-2: Morning Peak 2021 Traffic Flow

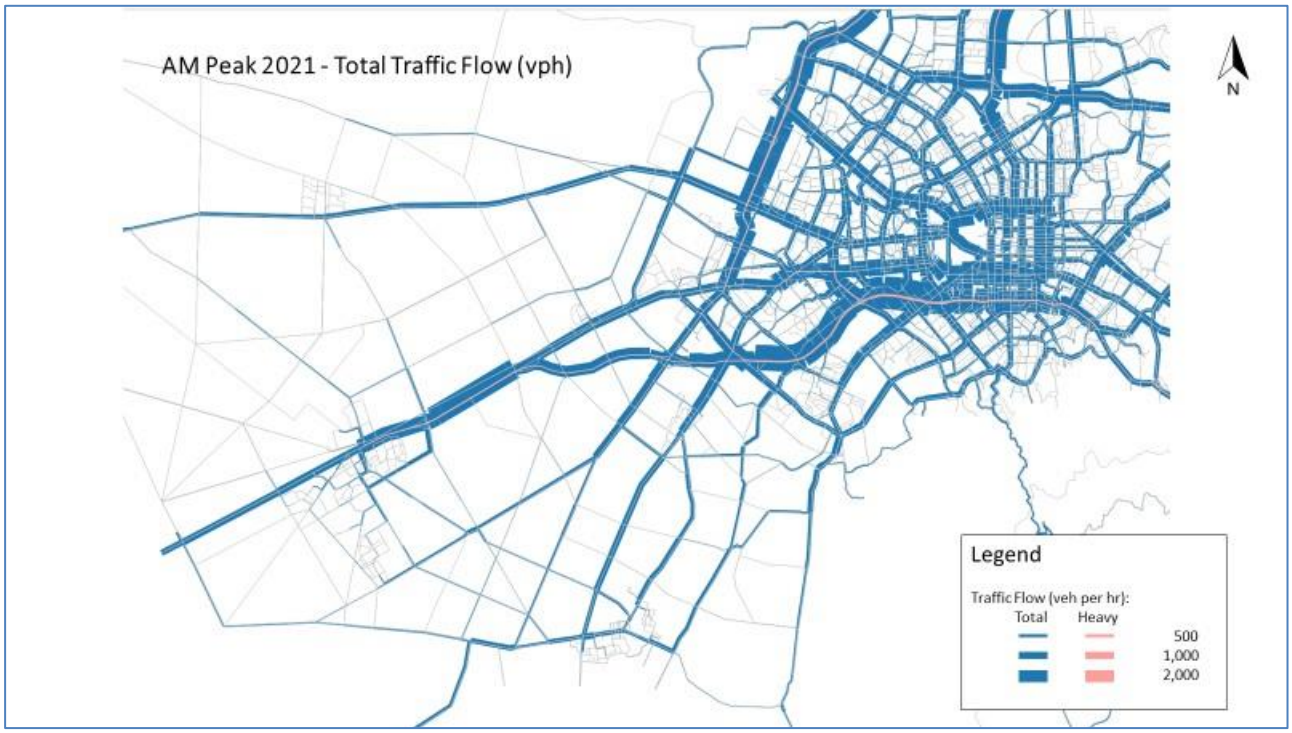
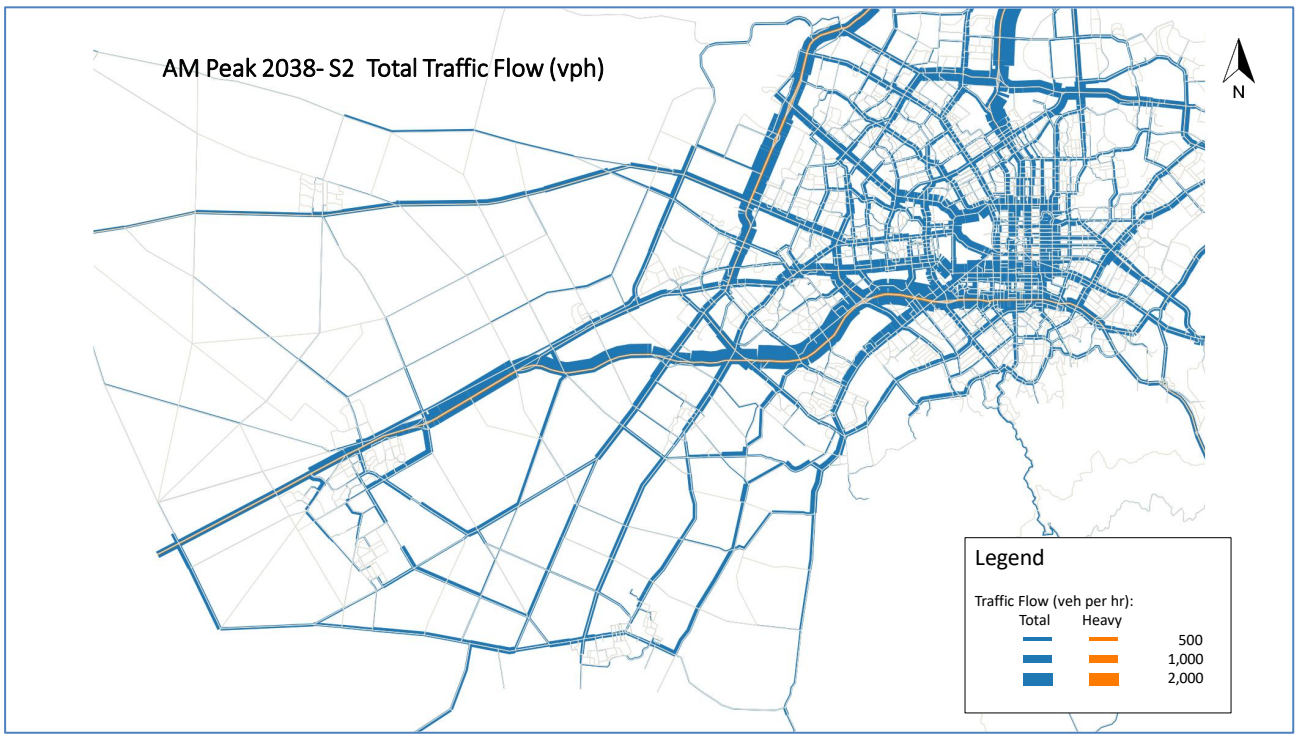


Figure 3-3: Morning Peak 2038 Traffic Flow



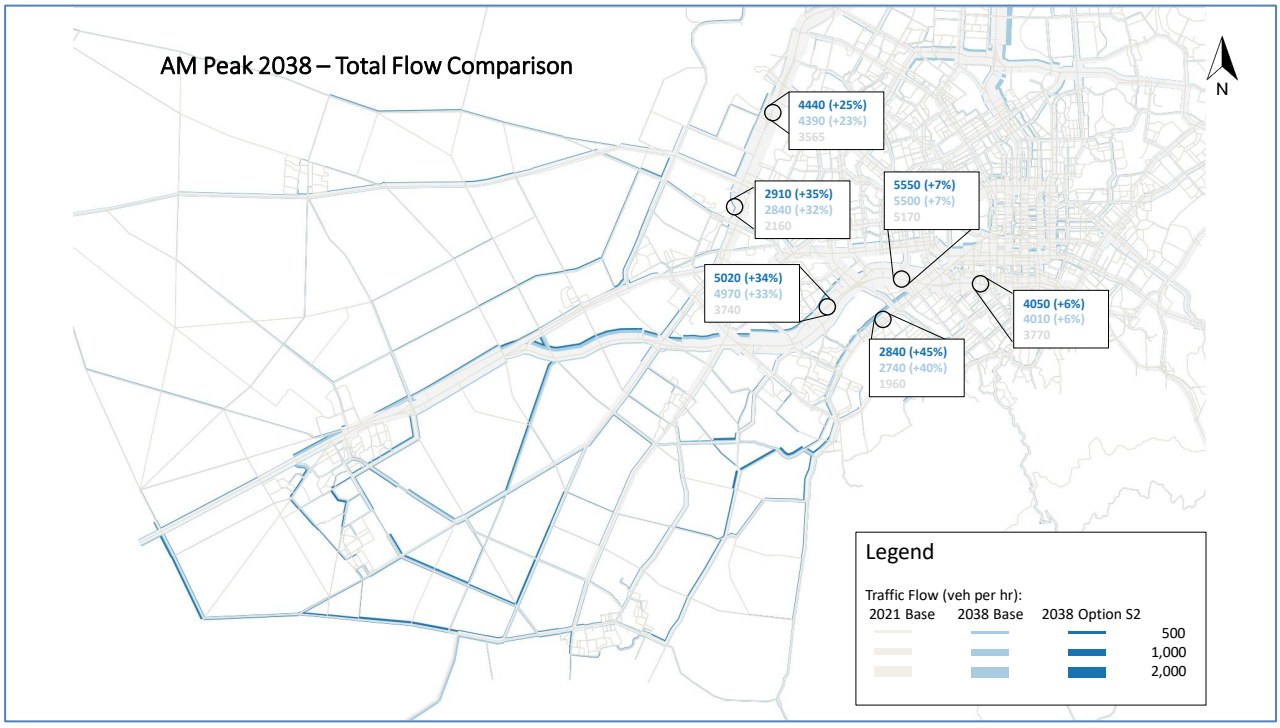
3.3.3 This increase in overall traffic flow is indicated to be almost directly proportional to the population increase as shown in Table 3-1 below.

Table 3-1: Estimated increase in population and vehicle trips 2021 to 2038 (Scenario 2)

Greater Christchurch	Forecast Year		Change	
	2021	2038	abs	%
Population	495,027	617,262	+122,235	25%
Vehicle Trips	172,626	218,127	+45,501	26%

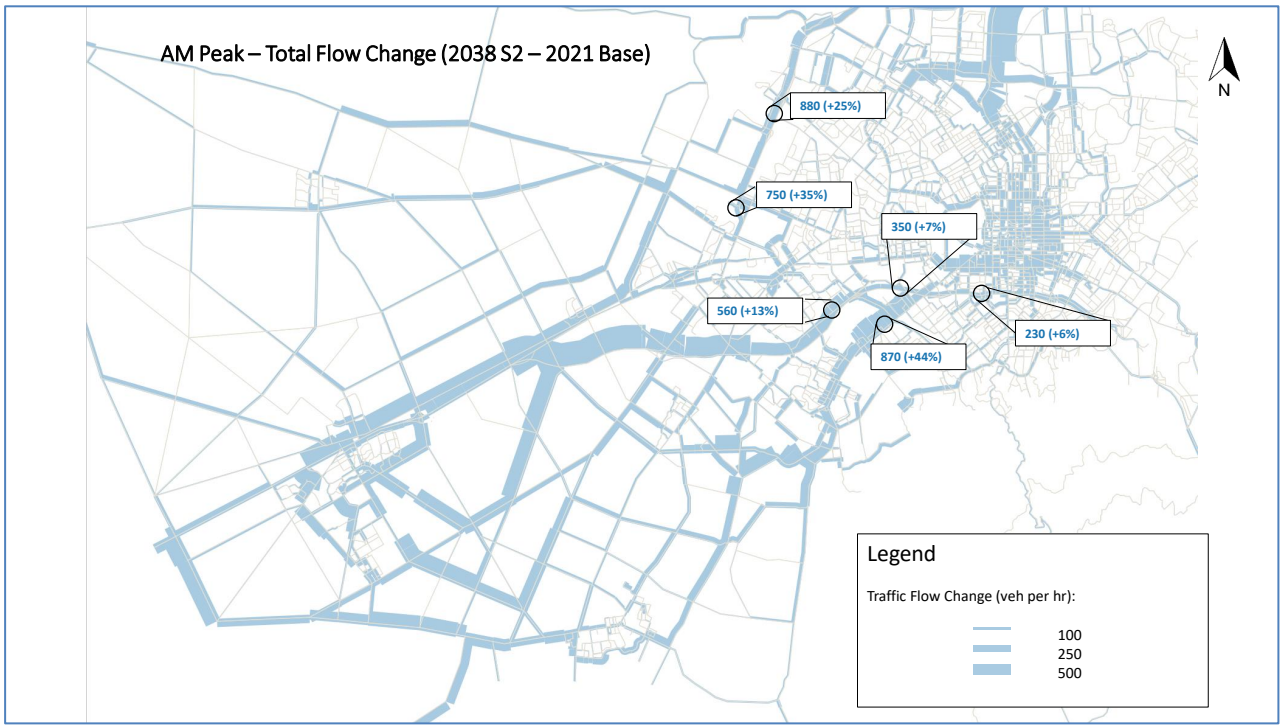
3.3.4 Figure 3-4 below shows just the Selwyn based component of traffic (with incremental changes for both Scenario 1 and 2 between 2021 and 2038).

Figure 3-4: Morning Peak 2038 Selwyn Based Traffic Flow – Incremental Changes



3.3.5 Figures on the following page show the change in 2038 (Scenario 2) relative to 2021 (Figure 3-5 and the change between Scenario 1 and 2 (Figure 3-7). This is the same information presented in Figure 3-4, but with an exaggerated bandwidth scale to better distinguish changes on individual roads.

Figure 3-5: Morning Peak Base Traffic Change (2021 to 2038 Scenario 2)



3.3.6 The above figures indicate that traffic travelling between Selwyn and Christchurch City will distribute itself over all available corridors across the boundary; SH74 West Coast Road, SH1Main South Road, CSM2, Shands Road, Springs Road, Whincops Road and SH75 Halswell Road.

3.3.7 It is apparent that traffic interactions and network constraints within Christchurch City, combined with ongoing development of south-west Christchurch, have a significant impact on how Selwyn traffic distributes to use the most viable routes.

3.3.8 For example, there is only very limited traffic growth on Springs and Sands Roads due to downstream constraints across the border in Christchurch reducing the attractiveness of these routes relative to alternatives. Such alternatives include Ellesmere Road connecting into Halswell Road. While Halswell Road is also indicated to be congested in the future, traffic growth distributes in varying extents to all available routes according to Waldrop's first and second principles[4].

3.3.9 These principles (which also underpin the traffic modelling) state that as networks become increasingly congested, trips spread themselves over multiple routes such that an equilibrium is reached where journey times by all available routes are similar. This also results in all routes being simultaneously degraded to some extent as a consequence of the increased traffic.

3.3.10 As a result of this equilibrium, some interesting route choices can materialise. A good

[4] https://en.wikipedia.org/wiki/John_Glen_Wardrop

example of that is the obvious increase in traffic on Waterholes Road. While overall total traffic flows on Waterholes Road remain relatively low compared to other roads, this route becomes increasingly attractive from south Rolleston to Christchurch, enabled by the roundabout at SH1/Dawsons, where eastbound (peak flow direction) traffic on SH1 have to give way to all traffic using the Waterholes Road route (where the latter turns right at the roundabout towards Christchurch but only having to give way to lesser westbound traffic flow).

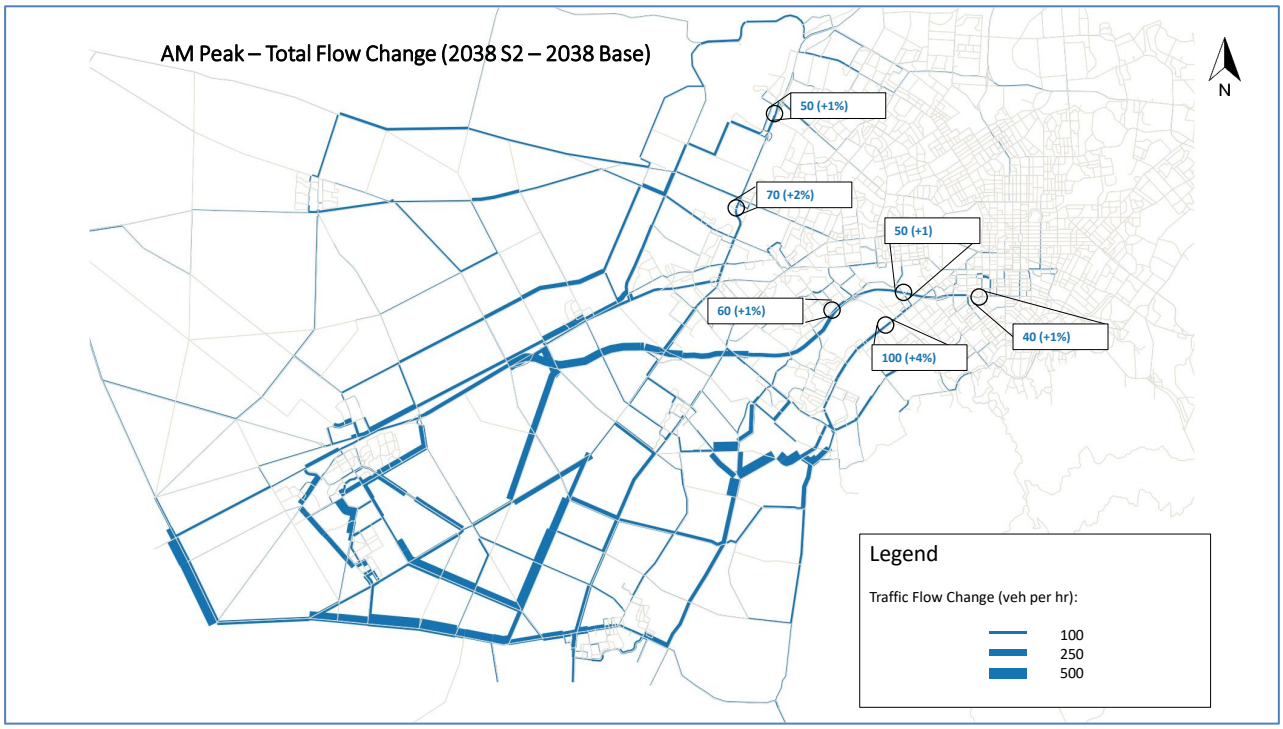
3.3.11 An additional factor (also included in the CAST model) is that trip demand is elastic. That is that demand for travel will change in response to cost[5]. Therefore, trip retiming (peak spreading), changing mode, or deciding not to make a trip, increasingly occur as congestion increases, which provides a dampening effect to increasing travel demand.

3.3.12 This effect, combined with the equilibrium theory described earlier, has resulted in a negligible increase in Brougham Street traffic in the future. This appears to be sensible, given that Brougham Street has already reached capacity during peak periods, resulting in long queues extending up the southern motorway during the morning peak, as recorded in the picture below (picture taken 2km west of Barrington Street during the morning peak in October 2021).

Figure 3-6 – Existing morning peak queuing on southern motorway 2km west of Barrington Street.

[5] This works both ways, where reducing travel delays and 'easing congestion' is likely to simply increase travel demand, and therefore congestion will still exist. This is known as 'induced traffic' and is why no city has ever been able to 'build its way out of congestion' (at least without resorting to some form of road pricing).

Figure 3-7: Morning Peak Base Traffic Change (2021 to 2038 Scenario 2)



3.3.13 The changes in traffic flows between Scenario 1 and Scenario 2 (at 2038) follow a similar pattern to the changes between 2021 and 2038. This is not surprising, given all the added capacity for Scenario 2 was added to the townships (primarily West Melton, Rolleston, Prebbleton and Lincoln), so it tends to simply reinforce existing growth areas which in turn reinforces existing travel patterns[6].

[6] Although theoretically an increasing level of self-sufficiency and opportunities for active modes should also result thereby offsetting some of the indicated traffic growth.

3.4 Network Performance

3.4.1 The following plots identify how traffic flows relate to the available network capacity and the resulting Level of Service (LoS).

3.4.2 Figure 3-8 provides a summary of average intersection delay, for each intersection as a whole, and for the worst movement (almost always a right turn). Link volume to capacity ratio (reflecting how much of the available capacity is being used) is also displayed.

3.4.3 Intersections normally have less overall capacity than adjacent road links. Therefore, intersections are often the limiting factor in terms of network capacity.

Figure 3-8: Morning Peak 2038 Network Performance (Scenario 1)

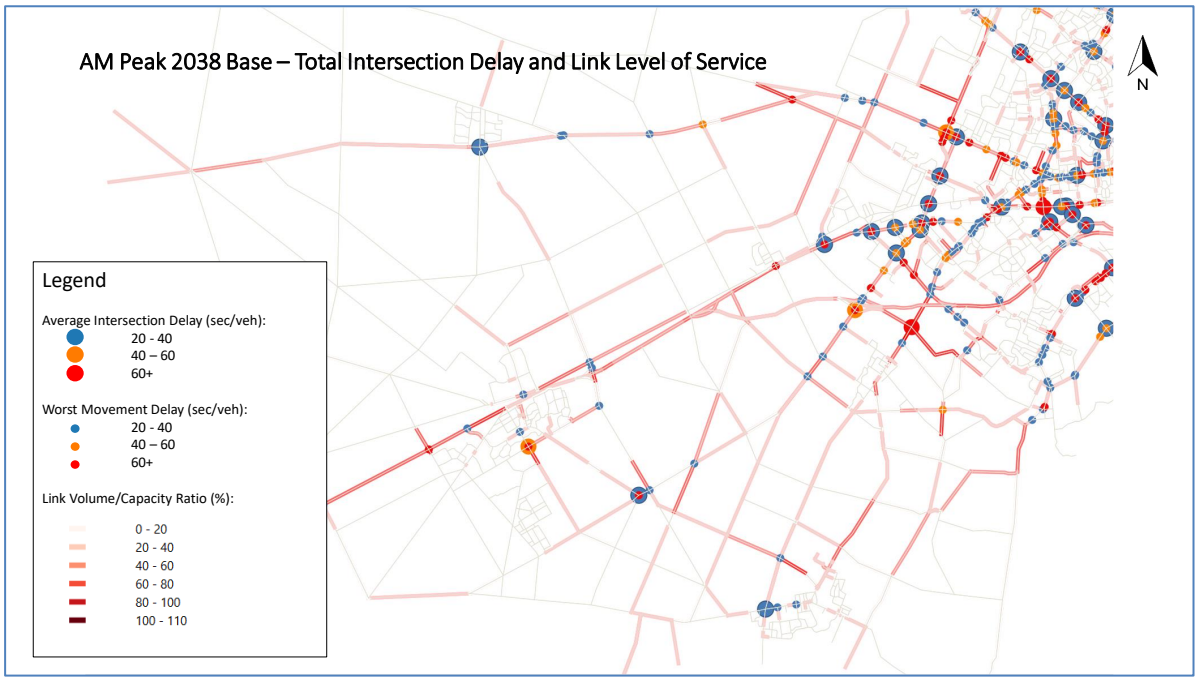
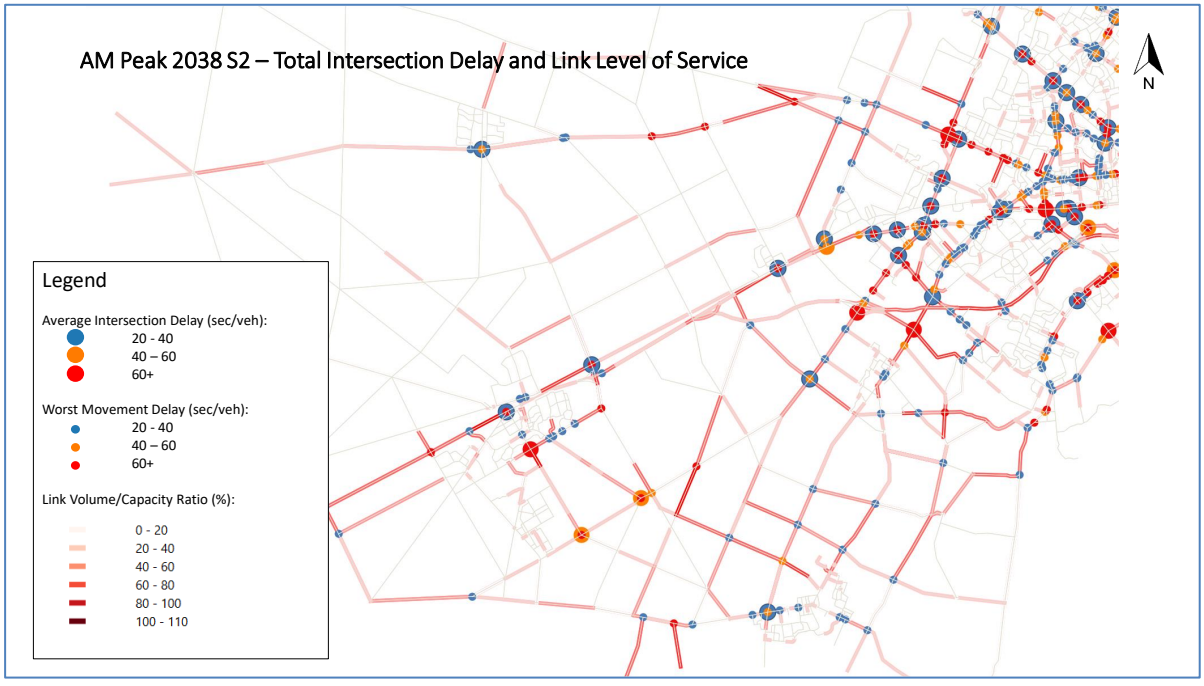


Figure 3-9: Morning Peak 2038 Network Performance (Scenario 2)



3.4.4 There appear to be a few deficiencies and bottlenecks within the Selwyn District portion of greater Christchurch in 2038 Scenario 1. A few potential issues (but note that these are not necessarily unacceptable and may in fact be required to achieve other desired outcomes) that stand out include:

- Tennyson/Lowes/Springston-Rolleston traffic signals.
- Springs Road/Marshs Road roundabout.
- Potential for congestion (due to high V/C) on some sections of SH1, Shands Rd and Springs Road.

3.4.5 It is noted that some deficiencies that occurred in 2021 no longer apply in 2038 due to various infrastructure improvements, especially those associated with the SH1 Rolleston improvements.

3.4.6 Relative to Scenario 1, additional deficiencies are apparent in Scenario 2. These are effectively all related to the increased population and include:

- Additional pressure on Tennyson/Lowes/Springston-Rolleston traffic signals.
- Additional pressure on Springs Road/Marshs Road roundabout.
- Lincoln Rolleston and Selwyn Road priority intersection.
- Springston Rolleston Road/Selwyn Road priority intersection.
- Ellesmere Jct/Gerald/Springs (Lincoln) traffic signals.
- Shands/Marshs traffic signals.
- Toswill/Trices priority intersection.

3.4.7 These ‘deficiencies’ do not necessarily need to be addressed or mitigated however, for the reasons stated in paragraphs 3.3.11 and 3.3.12 (the exception to this would be if there is an obvious safety risk or conflicts with other modes).

3.4.8 These types of deficiencies are also likely to occur at certain points in the network regardless of specific locations where residential growth is added.

3.4.9 From a transport planning point of view, the best strategy for accommodating growth (in the current environment) is therefore to consolidate as much as possible (with increased densities) to improve overall access to Public Transport and enable active modes (which require relatively short distances). This approach may make private vehicle travel less attractive than is currently is, although it will still be reasonably attractive relative to other modes, resulting in a better balance between modes, which in turn leads to more choice.

APPENDIX A – Scenario 2 Inputs

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Input Targets - Selwyn Scenario 1

TLA[1]	Input Total	2006	2013	2018	2028	2038	2048
Selwyn	ERPopulation	21,971	31,530	41,026	55,089	62,780	73,484
	Households	7,691	9,943	14,147	19,675	23,252	28,263
	Adults (15+)	16,963	24,536	32,795	43,777	50,950	60,495
	Workers	12,500	17,553	22,943	31,111	35,386	41,365
	Students	5,265	7,614	9,767	12,546	13,735	15,623
	Non-Students	15,124	21,299	28,855	38,895	45,265	53,743

[1]Note these refer to only the parts of the districts within the CTM/CAST model (UDS/LURP) area.

Input Targets - Selwyn Scenario 2

TLA[1]	Input Total	2006	2013	2018	2028	2038	2048
Selwyn	ERPopulation	21,971	31,530	41,026	71,981	89,912	99,612
	Households	7,691	9,943	14,147	25,708	33,301	38,312
	Adults (15+)	16,963	24,536	32,795	57,200	72,969	82,004
	Workers	12,500	17,553	22,943	40,650	50,680	56,073
	Students	5,265	7,614	9,767	16,392	19,671	21,178
	Non-Students	15,124	21,299	28,855	50,821	64,828	72,852

[1]Note these refer to only the parts of the districts within the CTM/CAST model (UDS/LURP) area.

Added Household Capacity for Scenaro 2

PC	Township	MB	2028	2038	Total
64	Rolleston F SE	4010047	353	236	589
		2719417	249	159	408
67	West Melton S	4011164	39	26	65
		4011163	40	26	66
68	Prebbleton W Hamptons	4011165	492	328	820
69	Lincoln	2720800	600	400	1000
		4010021	600	400	1000
70	Rolleston F FW	2719416	480	320	800
71	Rolleston Flight Contours	4008019	396	264	660
72	Prebbleton Trices	2500100	177	118	295
73	Rolleston L3	2719004	600	400	1000
		2719005	660	440	1100
74	West Melton E	4000454	78	52	130
75	Rolleston E	4008019	168	112	280
76	Rolleston E Maddisons	2719416	93	62	155
77	West Melton W	4000456	150	100	250
		4000452	165	110	275
78	Rolleston SE	4008019	453	303	756
79	Prebbleton	2500200	120	80	200
		2500400	120	80	200
			6033	4016	10049

APPENDIX B – 2038 AM Plots

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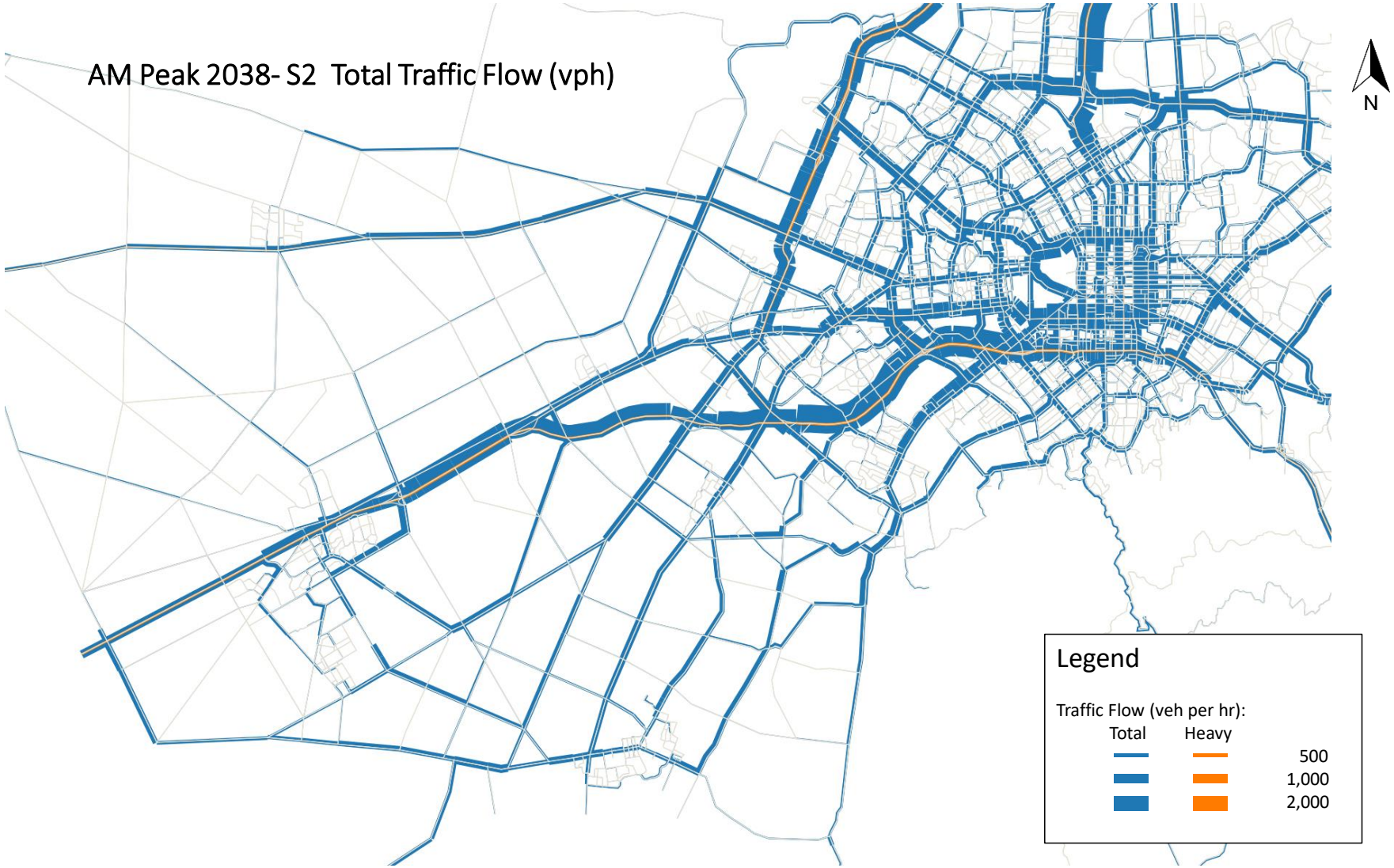
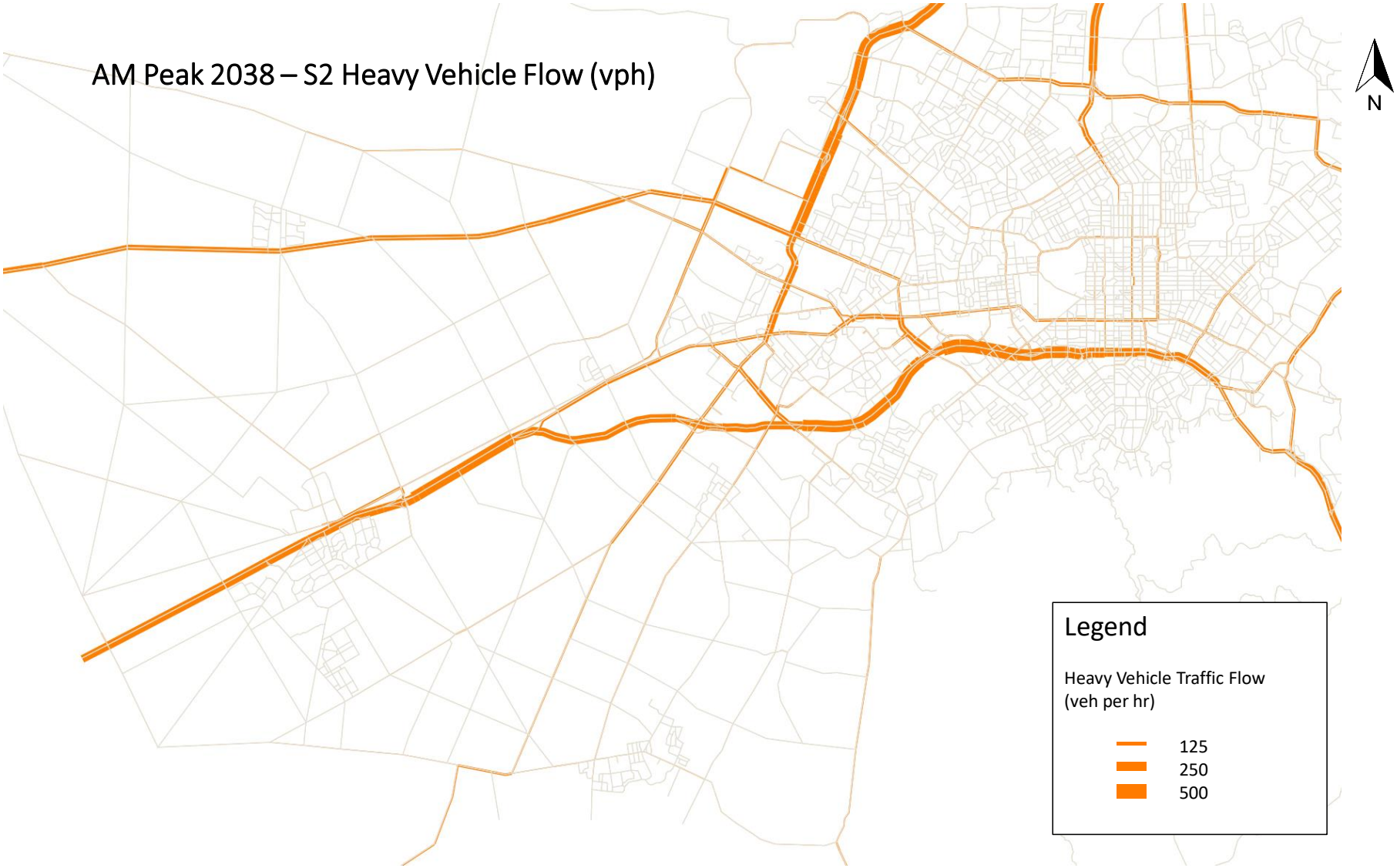
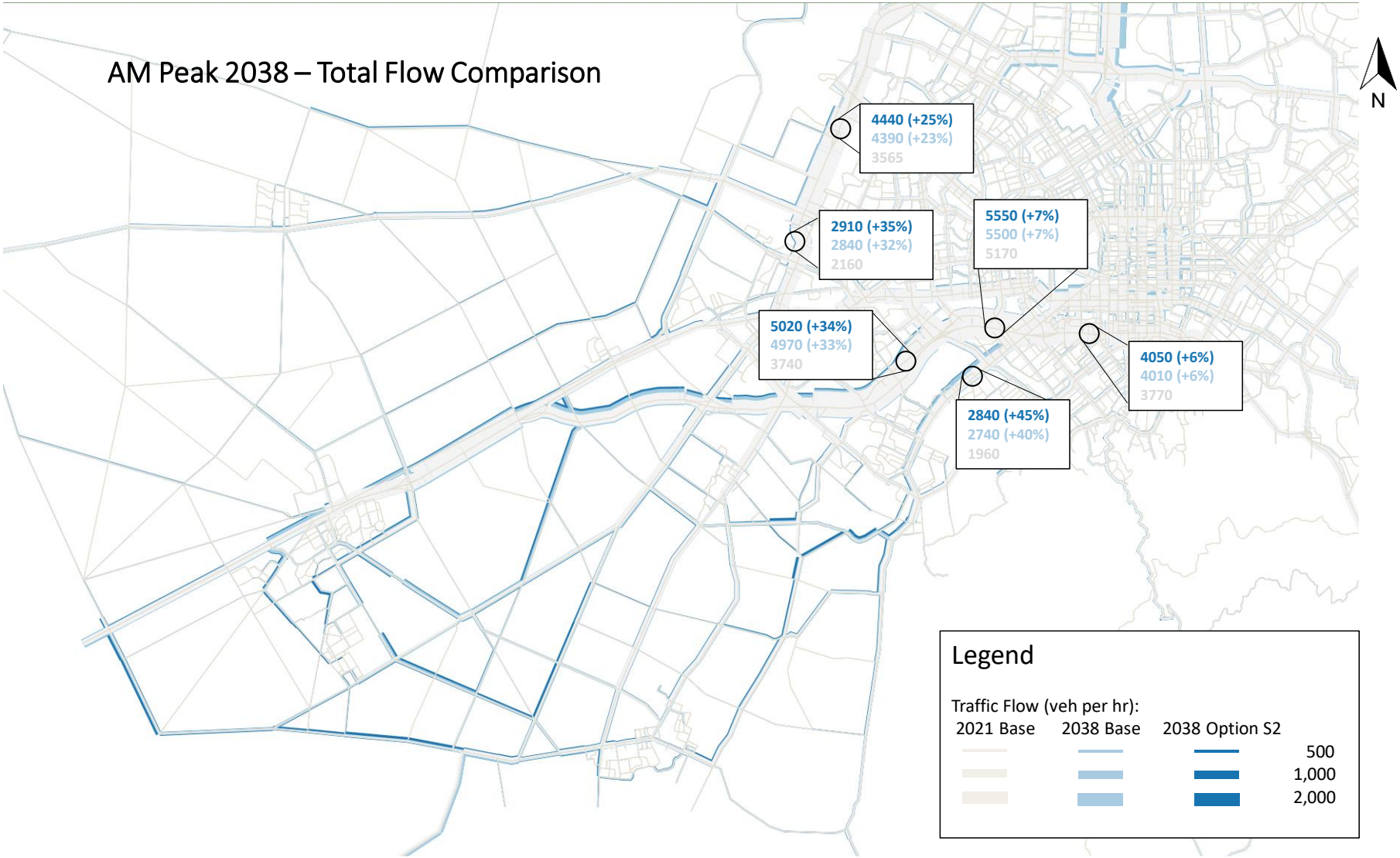
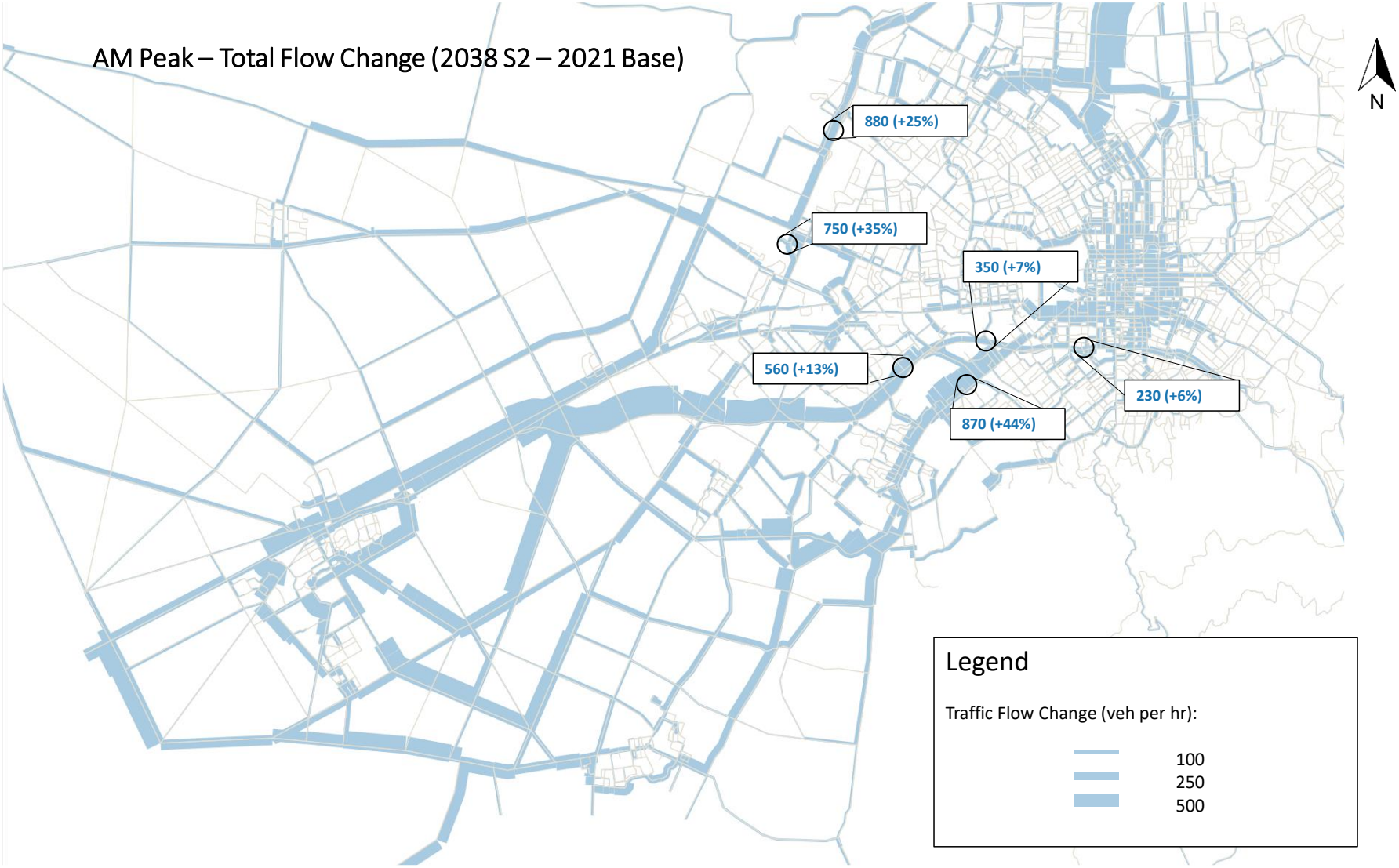
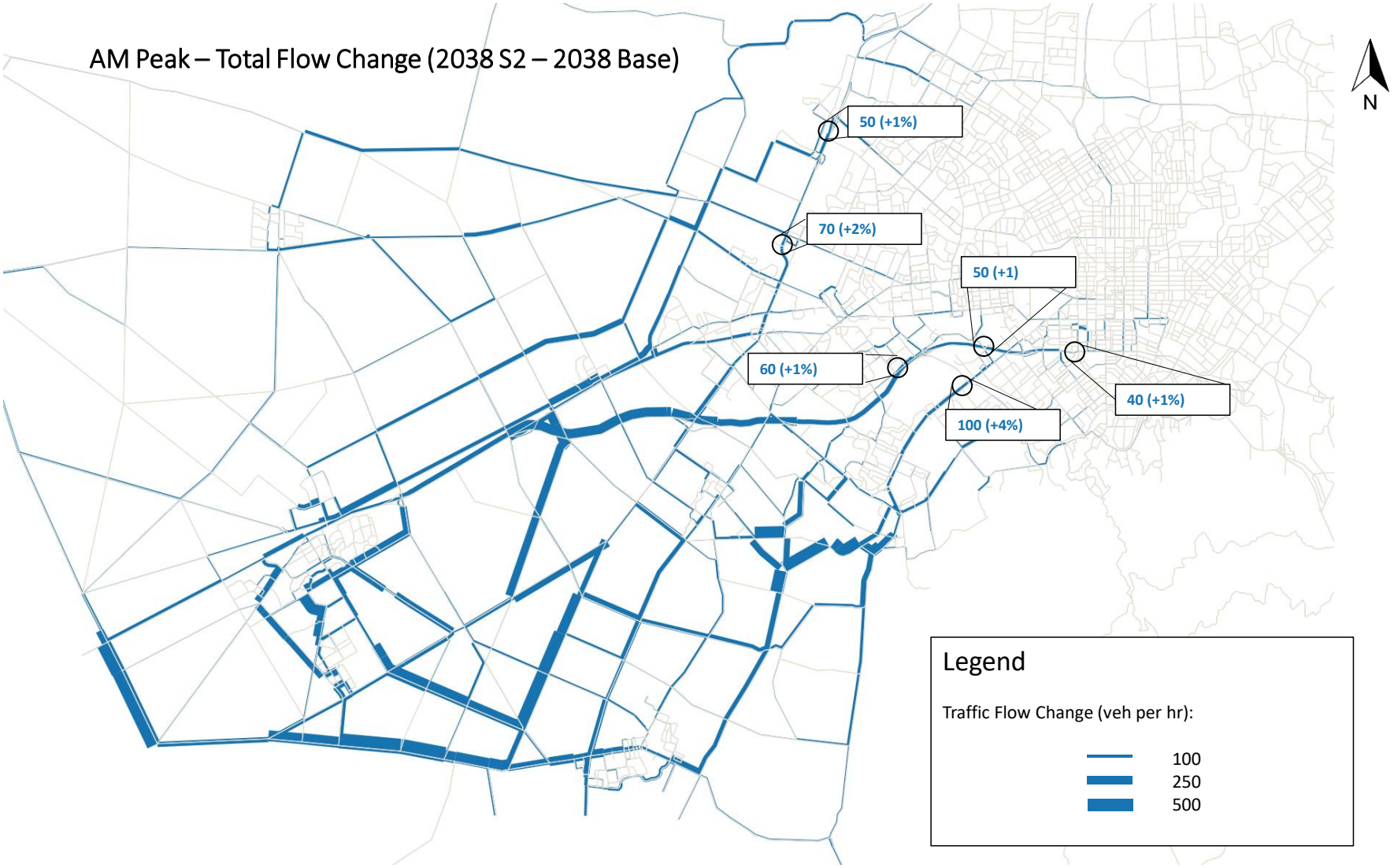

AM Peak 2038- S2 Total Traffic Flow (vph)
N
Legend
Traffic Flow (veh per hr):
Total
Heavy
500
1,000
2,000

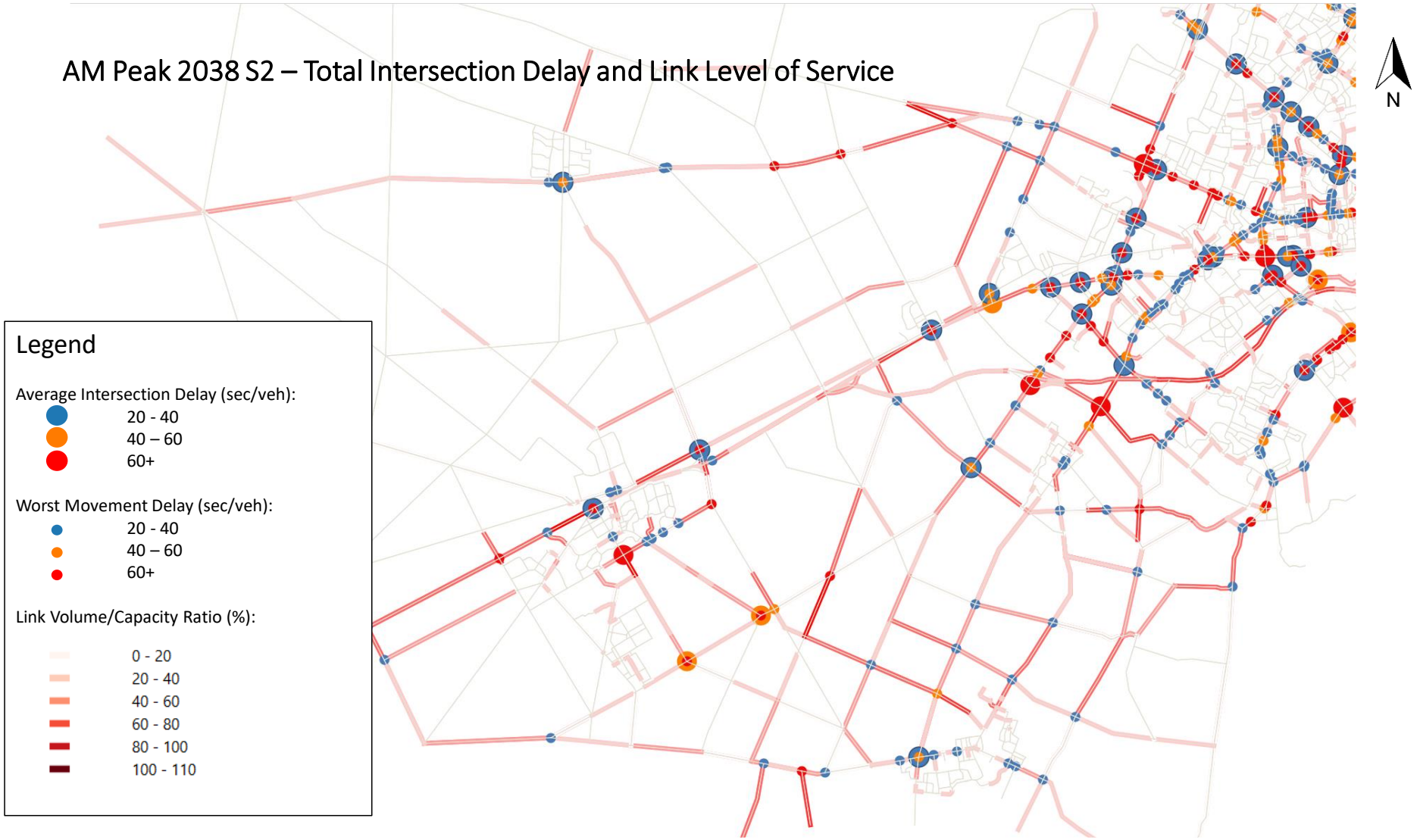

AM Peak 2038 – S2 Heavy Vehicle Flow (vph)
N
Legend
Heavy Vehicle Traffic Flow
(veh per hr)
125
250
500


AM Peak 2038 – Total Flow Comparison
N
4440 (+25%)
4390 (+23%)
3565
2910 (+35%)
2840 (+32%)
2160
5550 (+7%)
5500 (+7%)
5170
5020 (+34%)
4970 (+33%)
3740
4050 (+6%)
4010 (+6%)
3770
2840 (+45%)
2740 (+40%)
1960
Legend
Traffic Flow (veh per hr):
2021 Base
2038 Base
2038 Option S2
500
1,000
2,000

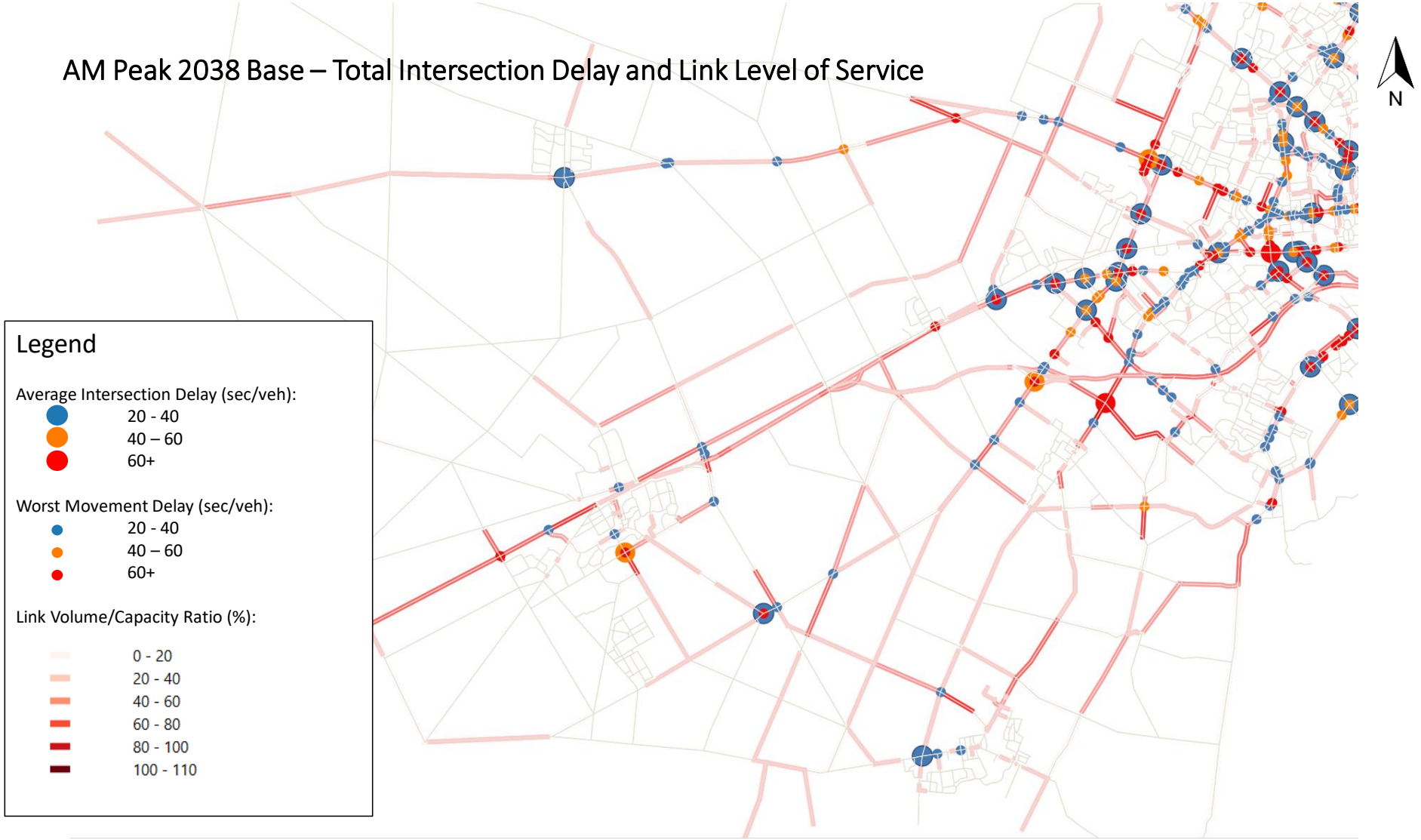




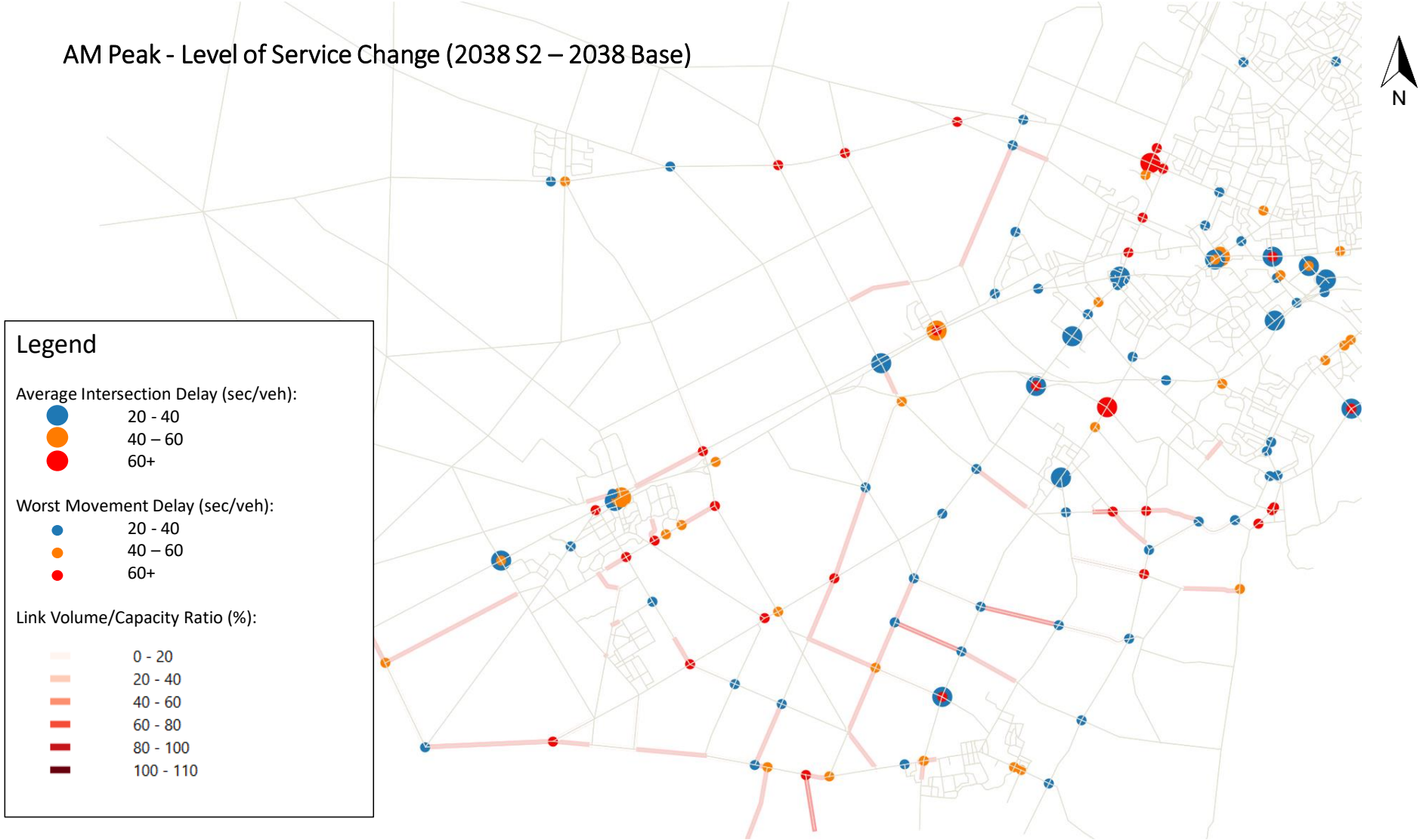
AM Peak 2038 S2 – Total Intersection Delay and Link Level of Service



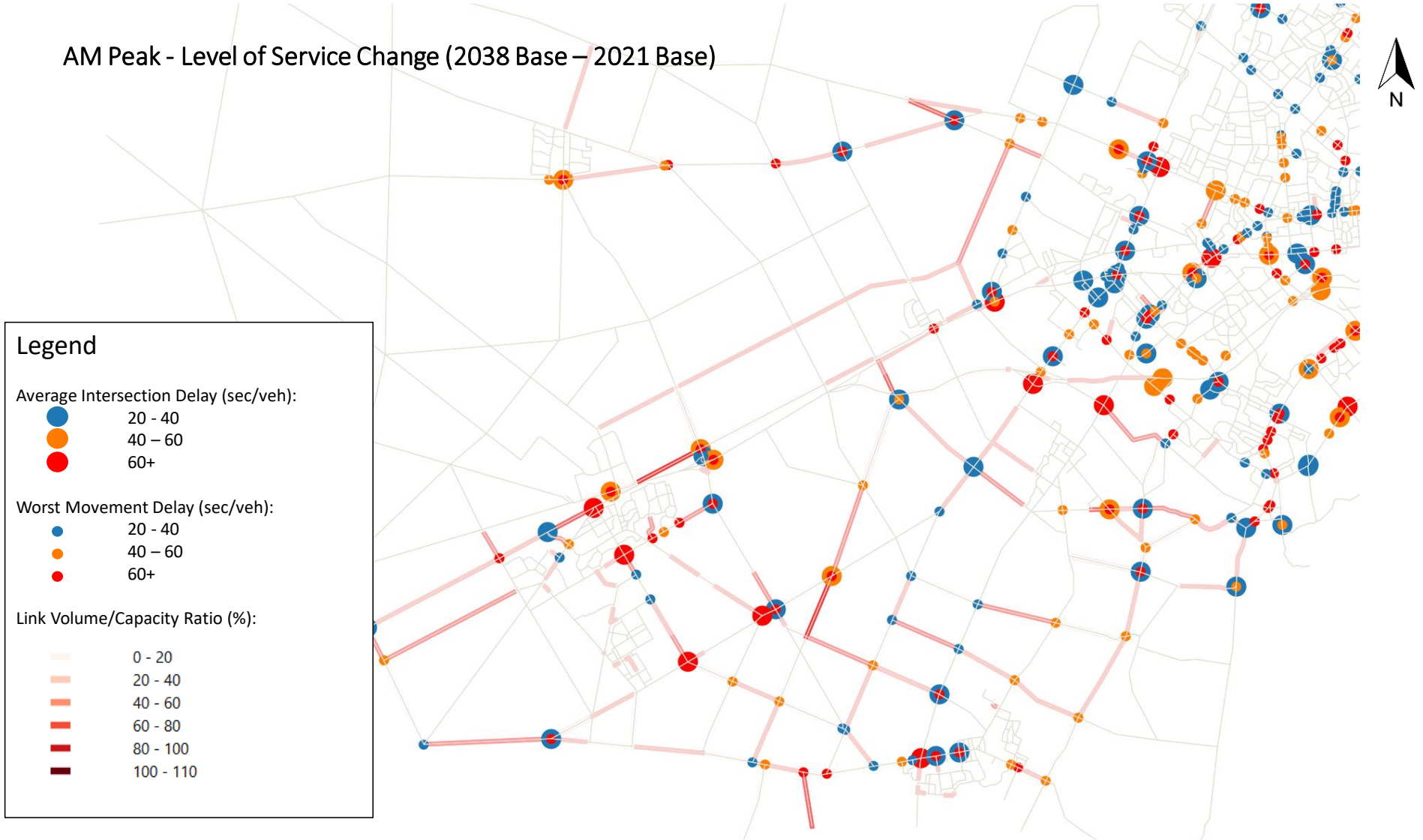
AM Peak 2038 Base – Total Intersection Delay and Link Level of Service



AM Peak - Level of Service Change (2038 S2 – 2038 Base)



AM Peak - Level of Service Change (2038 Base – 2021 Base)



AM Peak 2038 S2 – 2hr (0700-0900) Person Trip Summaries by mode

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Light Vehicle	From Selwyn GC to	22,240	4,650	18,580	100	2,340	120	48,030
	To Selwyn GC from	22,240	520	6,950	230	90	60	30,090
	From Selwyn Ext to	2,260	200	1,190	50	60	90	3,850
	To Selwyn Ext from	2,340	260	1,220	40	60	60	3,980
	TOTAL Trips	44,480	5,170	25,530	330	2,430	180	78,120

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
PublicTransport	From Selwyn GC to	30	450	270	10	-	-	760
	To Selwyn GC from	30	10	70	-	-	-	110
	From Selwyn Ext to	-	-	-	-	-	-	-
	To Selwyn Ext from	-	-	-	-	-	-	-
	TOTAL Trips	60	460	340	10	-	-	870

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Cycle	From Selwyn GC to	910	60	220	-	-	-	1,190
	To Selwyn GC from	910	-	40	-	-	-	950
	From Selwyn Ext to	-	-	-	-	-	-	-
	To Selwyn Ext from	-	-	-	-	-	-	-
	TOTAL Trips	1,820	60	260	-	-	-	2,140

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
TOTAL	From Selwyn GC to	23,180	5,160	19,070	110	2,340	120	49,980
	To Selwyn GC from	23,180	530	7,060	230	90	60	31,150
	From Selwyn Ext to	2,260	200	1,190	50	60	90	3,850
	To Selwyn Ext from	2,340	260	1,220	40	60	60	3,980
	TOTAL Trips	46,360	5,690	26,130	340	2,430	180	81,130

AM Peak 2038 S2 – 2hr (0700-0900) Person Trip Summaries by mode (%)

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Light Vehicle	From Selwyn GC to	46%	10%	39%	0%	5%	0%	100%
	To Selwyn GC from	74%	2%	23%	1%	0%	0%	100%
	From Selwyn Ext to	59%	5%	31%	1%	2%	2%	100%
	To Selwyn Ext from	59%	7%	31%	1%	2%	2%	100%
	TOTAL Trips	57%	7%	33%	0%	3%	0%	100%

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
PublicTransport	From Selwyn GC to	4%	59%	36%	1%	0%	0%	100%
	To Selwyn GC from	27%	9%	64%	0%	0%	0%	100%
	From Selwyn Ext to							
	To Selwyn Ext from							
	TOTAL Trips	7%	53%	39%	1%	0%	0%	100%

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Cycle	From Selwyn GC to	76%	5%	18%	0%	0%	0%	100%
	To Selwyn GC from	96%	0%	4%	0%	0%	0%	100%
	From Selwyn Ext to							
	To Selwyn Ext from							
	TOTAL Trips	85%	3%	12%	0%	0%	0%	100%

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
TOTAL	From Selwyn GC to	46%	10%	38%	0%	5%	0%	100%
	To Selwyn GC from	74%	2%	23%	1%	0%	0%	100%
	From Selwyn Ext to	59%	5%	31%	1%	2%	2%	100%
	To Selwyn Ext from	59%	7%	31%	1%	2%	2%	100%
	TOTAL Trips	57%	7%	32%	0%	3%	0%	100%

AM Peak 2038 S2 – 2hr (0700-0900) Vehicle Trip Summaries by mode

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Light Vehicle	From Selwyn GC to	12,770	3,840	13,440	80	1,670	80	31,880
	To Selwyn GC from	12,770	370	4,820	200	70	50	18,280
	From Selwyn Ext to	1,610	140	850	40	40	70	2,750
	To Selwyn Ext from	1,670	180	870	30	40	50	2,840
	TOTAL Trips	25,540	4,210	18,260	280	1,740	130	50,160

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Heavy Vehicle	From Selwyn GC to	140	20	380	30	30	30	630
	To Selwyn GC from	140	10	330	40	30	10	560
	From Selwyn Ext to	30	80	270	30	-	30	440
	To Selwyn Ext from	30	80	280	30	-	10	430
	TOTAL Trips	280	30	710	70	60	40	1,190

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
TOTAL	From Selwyn GC to	12,910	3,860	13,820	110	1,700	110	32,510
	To Selwyn GC from	12,910	380	5,150	240	100	60	18,840
	From Selwyn Ext to	1,640	220	1,120	70	40	100	3,190
	To Selwyn Ext from	1,700	260	1,150	60	40	60	3,270
	TOTAL Trips	25,820	4,240	18,970	350	1,800	170	51,350

AM Peak 2038 S2 – 2hr (0700-0900) Vehicle Trip Summaries by mode (%)

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Light Vehicle	From Selwyn GC to	40%	12%	42%	0%	5%	0%	100%
	To Selwyn GC from	70%	2%	26%	1%	0%	0%	100%
	From Selwyn Ext to	59%	5%	31%	1%	1%	3%	100%
	To Selwyn Ext from	59%	6%	31%	1%	1%	2%	100%
	TOTAL Trips	51%	8%	36%	1%	3%	0%	100%

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Heavy Vehicle	From Selwyn GC to	22%	3%	60%	5%	5%	5%	100%
	To Selwyn GC from	25%	2%	59%	7%	5%	2%	100%
	From Selwyn Ext to	7%	18%	61%	7%	0%	7%	100%
	To Selwyn Ext from	7%	19%	65%	7%	0%	2%	100%
	TOTAL Trips	24%	3%	60%	6%	5%	3%	100%

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
TOTAL	From Selwyn GC to	40%	12%	43%	0%	5%	0%	100%
	To Selwyn GC from	69%	2%	27%	1%	1%	0%	100%
	From Selwyn Ext to	51%	7%	35%	2%	1%	3%	100%
	To Selwyn Ext from	52%	8%	35%	2%	1%	2%	100%
	TOTAL Trips	50%	8%	37%	1%	4%	0%	100%

AM Peak 2038 Base – 2hr (0700-0900) Person Trip Summaries by mode

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Light Vehicle	From Selwyn GC to	16,740	3,150	13,020	80	1,860	70	34,920
	To Selwyn GC from	16,740	460	7,180	340	90	60	24,870
	From Selwyn Ext to	1,800	270	1,540	90	60	90	3,850
	To Selwyn Ext from	1,860	360	1,570	70	60	60	3,980
	TOTAL Trips	33,480	3,610	20,200	420	1,950	130	59,790

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
PublicTransport	From Selwyn GC to	30	300	190	-	-	-	520
	To Selwyn GC from	30	10	70	-	-	-	110
	From Selwyn Ext to	-	-	-	-	-	-	-
	To Selwyn Ext from	-	-	-	-	-	-	-
	TOTAL Trips	60	310	260	-	-	-	630

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Cycle	From Selwyn GC to	340	30	130	-	-	-	500
	To Selwyn GC from	340	-	40	-	-	-	380
	From Selwyn Ext to	-	-	-	-	-	-	-
	To Selwyn Ext from	-	-	-	-	-	-	-
	TOTAL Trips	680	30	170	-	-	-	880

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
TOTAL	From Selwyn GC to	17,110	3,480	13,340	80	1,860	70	35,940
	To Selwyn GC from	17,110	470	7,290	340	90	60	25,360
	From Selwyn Ext to	1,800	270	1,540	90	60	90	3,850
	To Selwyn Ext from	1,860	360	1,570	70	60	60	3,980
	TOTAL Trips	34,220	3,950	20,630	420	1,950	130	61,300

AM Peak 2038 Base – 2hr (0700-0900) Person Trip Summaries by mode (%)

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Light Vehicle	From Selwyn GC to	48%	9%	37%	0%	5%	0%	100%
	To Selwyn GC from	67%	2%	29%	1%	0%	0%	100%
	From Selwyn Ext to	47%	7%	40%	2%	2%	2%	100%
	To Selwyn Ext from	47%	9%	39%	2%	2%	2%	100%
	TOTAL Trips	56%	6%	34%	1%	3%	0%	100%

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
PublicTransport	From Selwyn GC to	6%	58%	37%	0%	0%	0%	100%
	To Selwyn GC from	27%	9%	64%	0%	0%	0%	100%
	From Selwyn Ext to							
	To Selwyn Ext from							
	TOTAL Trips	10%	49%	41%	0%	0%	0%	100%

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Cycle	From Selwyn GC to	68%	6%	26%	0%	0%	0%	100%
	To Selwyn GC from	89%	0%	11%	0%	0%	0%	100%
	From Selwyn Ext to							
	To Selwyn Ext from							
	TOTAL Trips	77%	3%	19%	0%	0%	0%	100%

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
TOTAL	From Selwyn GC to	48%	10%	37%	0%	5%	0%	100%
	To Selwyn GC from	67%	2%	29%	1%	0%	0%	100%
	From Selwyn Ext to	47%	7%	40%	2%	2%	2%	100%
	To Selwyn Ext from	47%	9%	39%	2%	2%	2%	100%
	TOTAL Trips	56%	6%	34%	1%	3%	0%	100%

AM Peak 2038 Base – 2hr (0700-0900) Vehicle Trip Summaries by mode

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Light Vehicle	From Selwyn GC to	9,180	2,620	9,700	70	1,330	50	22,950
	To Selwyn GC from	9,180	330	5,090	280	70	50	15,000
	From Selwyn Ext to	1,280	200	1,100	60	40	70	2,750
	To Selwyn Ext from	1,330	260	1,120	50	40	50	2,850
	TOTAL Trips	18,360	2,950	14,790	350	1,400	100	37,950

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Heavy Vehicle	From Selwyn GC to	120	10	360	30	30	30	580
	To Selwyn GC from	120	10	310	30	30	10	510
	From Selwyn Ext to	30	80	270	30	-	30	440
	To Selwyn Ext from	30	80	280	30	-	10	430
	TOTAL Trips	240	20	670	60	60	40	1,090

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
TOTAL	From Selwyn GC to	9,300	2,630	10,060	100	1,360	80	23,530
	To Selwyn GC from	9,300	340	5,400	310	100	60	15,510
	From Selwyn Ext to	1,310	280	1,370	90	40	100	3,190
	To Selwyn Ext from	1,360	340	1,400	80	40	60	3,280
	TOTAL Trips	18,600	2,970	15,460	410	1,460	140	39,040

AM Peak 2038 Base -2hr (0700-0900) Vehicle Trip Summaries by mode (%)

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Light Vehicle	From Selwyn GC to	40%	11%	42%	0%	6%	0%	100%
	To Selwyn GC from	61%	2%	34%	2%	0%	0%	100%
	From Selwyn Ext to	47%	7%	40%	2%	1%	3%	100%
	To Selwyn Ext from	47%	9%	39%	2%	1%	2%	100%
	TOTAL Trips	48%	8%	39%	1%	4%	0%	100%

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
Heavy Vehicle	From Selwyn GC to	21%	2%	62%	5%	5%	5%	100%
	To Selwyn GC from	24%	2%	61%	6%	6%	2%	100%
	From Selwyn Ext to	7%	18%	61%	7%	0%	7%	100%
	To Selwyn Ext from	7%	19%	65%	7%	0%	2%	100%
	TOTAL Trips	22%	2%	61%	6%	6%	4%	100%

	Location	Selwyn District	Christchuch Central City	Christchuch Other	Wiamakariri District	Selwyn External	Wimakariri External	TOTAL
TOTAL	From Selwyn GC to	40%	11%	43%	0%	6%	0%	100%
	To Selwyn GC from	60%	2%	35%	2%	1%	0%	100%
	From Selwyn Ext to	41%	9%	43%	3%	1%	3%	100%
	To Selwyn Ext from	41%	10%	43%	2%	1%	2%	100%
	TOTAL Trips	48%	8%	40%	1%	4%	0%	100%