STAGE 3 - SECTION 32

CHAPTER 17

RURAL - CRANFORD BASIN

APPENDIX 4 - CRANFORD BASIN PROPOSED REZONING TRANSPORT ASSESSMENT

Christchurch City Council

QTP
Quality Transport Planning

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Memorandum

To:	Ivan Thomson
From:	Tim Wright
Subject:	Cranford Basin Proposed Rezoning Transport Assessment
Date:	Thursday 2nd April 2015
Copy:	Nilesh Redekar

Dear Ivan,

Thank you for asking QTP to assist with the transport assessment you require as an input to the Section 32 (of the RMA) Evaluation of the proposed rezoning of the Cranford Basin area for urban purposes as part of the proposed Replacement District Plan (pRDP).

As discussed at our meeting last week, the effects-based assessment has been informed by a significant amount of traffic modelling using Council's Christchurch Assignment and Simulation Traffic (CAST) model. Due to the short time-frame available for the analysis and reporting, at this stage, some aspects of the transport assessment are necessarily high-level and the reporting here-is highly summarised. This perhaps belies the degree of technical work that has been undertaken to develop a workable road network to service the area proposed for rezoning and to assess various iterations of this network for some 5 alternative urban development scenarios, for both AM and PM peak hours, both in the short-term (2021) and the medium-term (2031).

1 Scope of Assessment

1.1 Council have specified the Scope of the assessment as follows:

1) What are the effects on the local road network under the following rezoning scenarios ?:
   i. 200 households of similar density to the Residential Suburban Peat Constraint Zone (L1B in the Operative Plan;
   ii. 750 households of similar density to the Residential Suburban Zone (L1 in the Operative plan);
   iii. 1500 households of similar density to the Residential; Medium Density (L3 in the operative plan;
   iv. Assuming that the portion of the area identified for rezoning to the south-west of Cranford Street is zoned for general industrial purposes; and
   v. Assuming that part of the portion of the area identified for rezoning to the south-west of Cranford Street is zoned to accommodate a commercial area comprising 30,000m^2 GFA.
2) What upgrades would be needed, their timing and approximate cost ?

3) An assessment of the area in terms of public transport services, cycleways, and active transport
4) Where are the safest and most efficient access points into the site from the surrounding existing and potential network, and what is the most efficient internal layout ?

1.2 The extent of the area to accommodate the proposed urban zoning is illustrated within the following diagram (being the area indicated by white hatching).

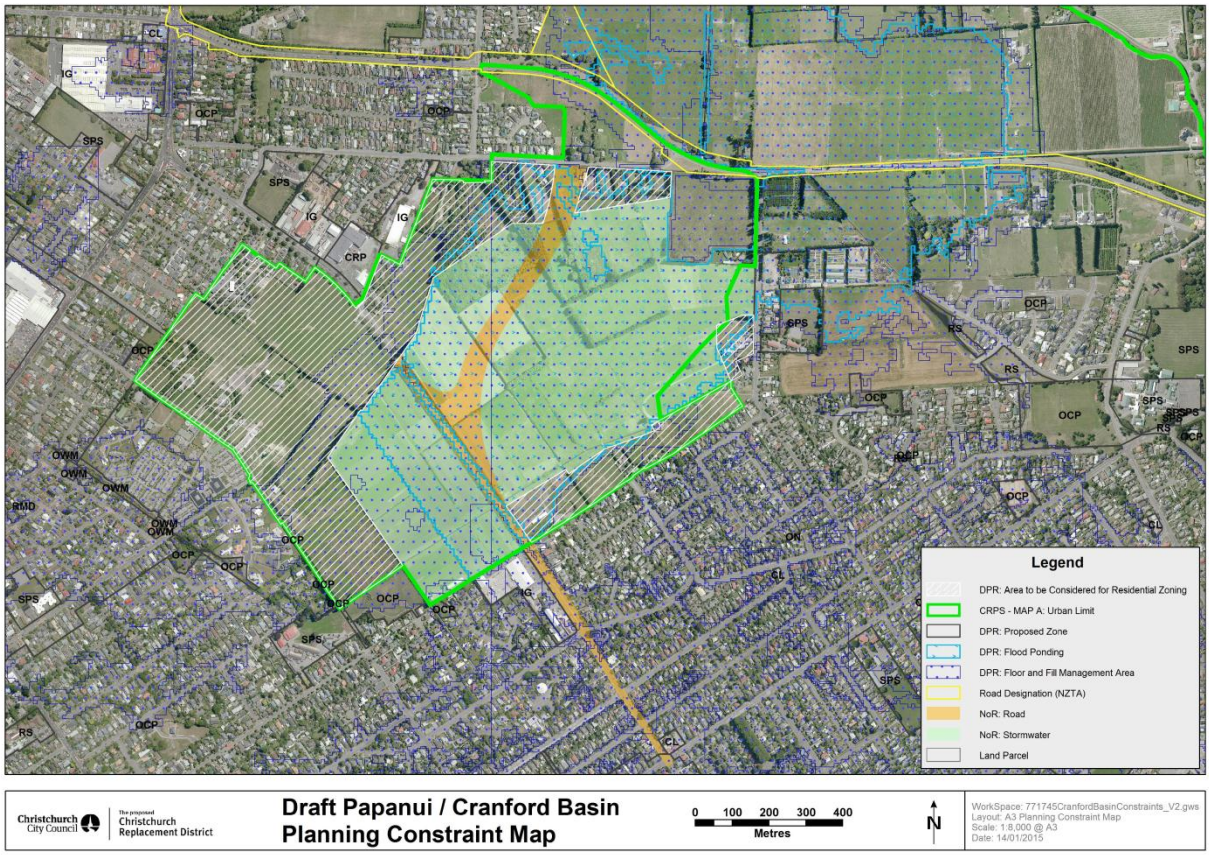

Figure 1.1: Draft Cranford Basin Planning Constraint Map

1.3 In relation to item 2) above, we have excluded from the scope any information regarding project costings given the time available for this assessment and that this is not QTP's area of expertise.

1.4 At this stage, neither a full Integrated Transport Assessment (ITA) is required, nor is the preparation of Expert Evidence on transport matters. The transport modelling methodology is also necessarily simplified to meet the required timescales as explained further next.

2 Methodology

2.1 As discussed at our meeting last week, given the time available to complete this analysis, modelling is to be undertaken using the CAST model only. This study involves the modelling of increased household numbers adjacent to existing residential areas. As such, the base model distribution of the trips of the residential areas subject to

potential residential zoning is considered a reasonable basis for the distribution of trips under increased traffic generation. It was therefore agreed, and considered appropriate, at the Scoping Stage, that the CAST model (alone) could be used at the basis of the assessment.

2.2 This study does, however, also consider alternative zoning of the site for industrial and commercial purposes. Ideally, the distribution of trips would be informed by first undertaking modelling using the regional CTM model. The CTM provides an estimate of trip distribution for different trip purposes by matching trip generation (typically the home-end of the trip) with attractions (the workplace, shops etc.). In this regard the CTM would provide a better estimate of potential trip distribution for the industrial and commercial land-uses than the more simplistic method adopted for this assessment, both for the site being considered and other areas of the city where trip patterns could be affected by the proposed rezoning.

2.3 However, in the time available to conduct this analysis it has not been possible to undertake CTM modelling of the various scenarios and then use the resulting demands as the basis of the more detailed assessment afforded by the CAST model. Given that the resolution of the CTM model is not sufficient to identify the effects of the proposed development on the road network (including 'Local' roads) in the vicinity of the site, it is preferable that modelling be undertaken with the CAST model. This has a much finer-grained representation of model demands and unlike the CTM includes all local roads with a significant through-traffic function. Unlike the CTM, the CAST model includes sophisticated simulation of intersections and their interactions and also simulates capacity constraints of the road network.

2.4 Whilst there are some limitations associated with the CAST modelling (only), it is considered a reasonable basis for informing the effects on the local (and wider) road network at this stage. The assignment and simulation model allows all trips to re-route to their optimal route under the modelled traffic conditions and in this regard is considerably more sophisticated than traditional techniques applied in undertaking Integrated Transport Assessments (ITAs) where trip distribution is estimated and new trips are simply superimposed on the base situation. Such analysis does not allow for the reassignment of traffic across the network and is often limited in scope (network coverage). Conversely, the CAST model represents the whole of Christchurch city in 'simulation' level of detail, allowing the wider effects of re-zoning to be identified.

3 Traffic Demands

3.1 The following table summarises the trip rates adopted for this assessment.

Landuse Scenario	No.	Unit	Type	AM		PM		AM	PM
				From	To	From	To	2-Way	2-Way
1	200	hh	L1B Low Density Res.	0.76	0.31	0.46	0.72	1.07	1.18
2	750	hh	L1 Low Density Res.	0.76	0.31	0.46	0.72	1.07	1.18
3	1,500	hh	L3 Med Density Res.	0.44	0.18	0.31	0.49	0.62	0.80
4	3,340	$100m^2$ site area	General Industrial	0.09	0.21	0.20	0.10	0.30	0.30
5	30,000	$100m^2$ GFA	Commercial (LFR)	0.59	0.76	2.02	0.98	1.35	3.00

Table 3.1: Adopted Trip Rates for Traffic Generation

3.2 The above trip rates translate to the following traffic generation:

Landuse Scenario	No.	Unit	Type	AM		PM		AM	PM
				From	To	From	To	2-Way	2-Way
1	200	hh	L1B Low Density Res.	152	62	92	144	214	236
2	750	hh	L1 Low Density Res.	570	233	345	540	803	885
3	1,500	hh	L3 Med Density Res.	660	270	465	735	930	1,200
4	33	$100m^2$ site area	Industrial + Res.	521	785	791	546	1,306	1,337
5	8	$100m^2$ GFA	Commercial + Res.	634	415	883	728	1,049	1,610

Table 3.2: Traffic Generation

3.3 In relation to traffic generation, the following points are noted:

- Rates are generally reflective of 'design' 85th %ile rates and draw on a number of sources including the New Zealand Trips Database, NZTA Research Report RR453, the RTA Guide to Traffic Generating Developments, rates adopted in Transport Assessments conducted by Council, QTP and third parties.
- For scenarios 4 (general industrial) and 5 (commercial) the rates apply to only part of the site south of Cranford Street. The remainder of the sites are assumed to be developed for low density residential under these scenarios.
- All traffic generation is assumed to be additional to the base case generic CAST models. No adjustment has been made to traffic generation in other locations in the future year models that might be anticipated under an assumed fixed population. In this regard, the assessment is considered robust in terms of assessed network operation. In practice, the effects of applying such adjustments on a model-wide basis are likely to be insignificant given the total traffic generation above equates to around 1% of total model demands.
- For the commercial development scenario, assuming Large Format Retail type development (LFR), no specific representation of pass-by or diverted trips has been made. However, the adopted trip rates are 20-40% lower than some trip rate sources for some LFR types and therefore constitutes a simplified approach to accounting for the fact that not all trips to/from the commercial element are likely to be entirely 'new' to the road network.

3.4 For the residential development, the distribution of trips is based on the aggregate distribution of trips to from the surrounding residential areas (or model zones). For the industrial development, the nearest model zone which contains predominantly industrial development is at Sheffield Crescent, Burnside. For the commercial development, the distribution of trips is based on the model zones comprising Northlands Mall.

3.5 The development area has been represented by four new zones coded into the model to the south of Cranford Street and a total of five zones to the north of Cranford Street (three new zones and two existing residential zones encompassing adjacent residential areas on the south-eastern extent of the proposed urban rezoning).

4 Initial Road Network

4.1 In consultation with Council, an initial road network was developed as the basis of the traffic modelling conducted to inform the assessment of effects. This is illustrated in the following diagram, overlaid on the planning constraints map, and including the road classification of the existing roads as per the pRDP.

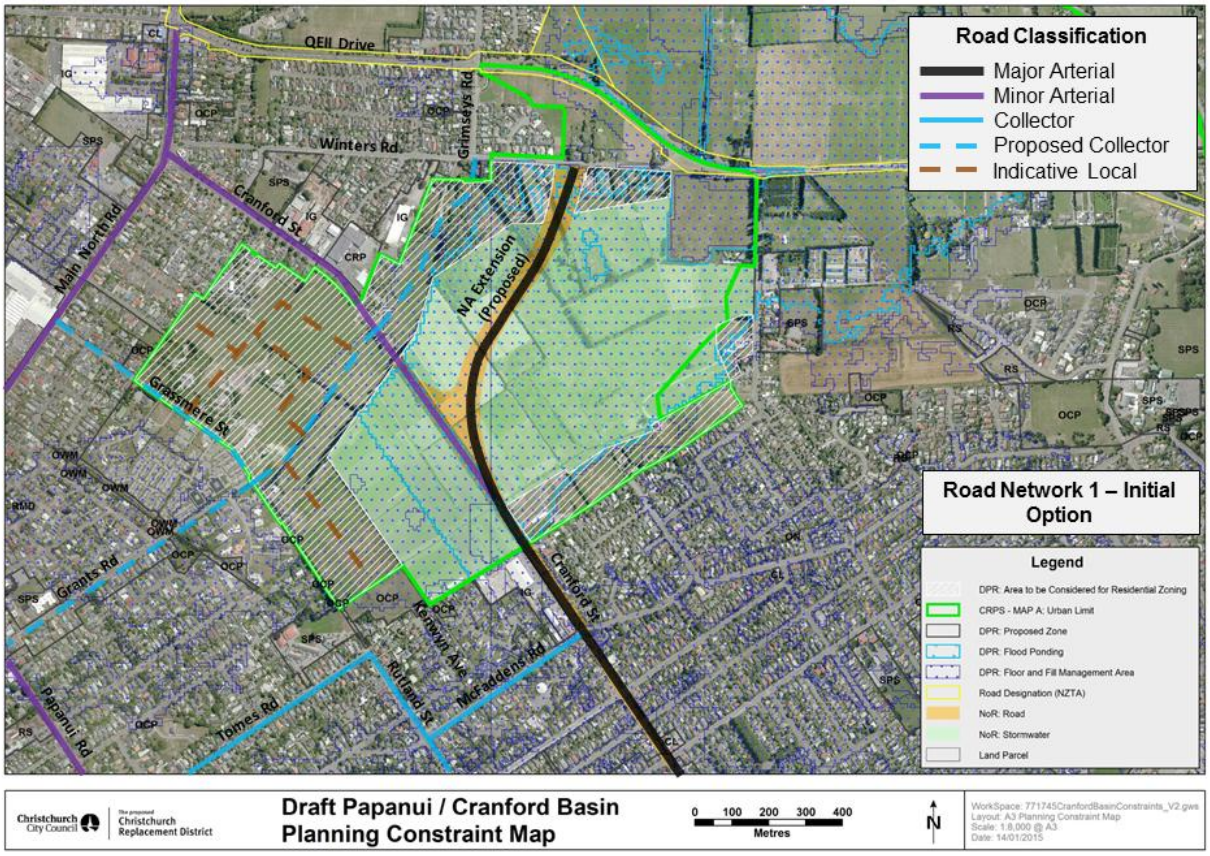

Figure 4.1: Initial Road Network

4.2 Key features of the above network are:

- Three access routes provided via Collector Roads serving the proposed urban zoning south of Cranford Street (and the surrounding residential area)
- A spine road serving the smaller proposed urban zoning north of Cranford Street, with connections to Cranford Street to the south and Winters Rd to the north
- Good access between the two urban areas afforded via the four-way intersection of the two Collector Rds and Cranford Street

4.3 Ideally, from a transport perspective, accessibility and overall network efficiency (through reduced vehicle.kilometres) would be improved with the provision of a fourth access route to the south-east, for example connecting with Rutland Street or Kenwyn Avenue. However, there are considerable constraints to such an option, including the zoning of Open Space (Rutland Reserve), the Paparoa Street School and the proposed 'Papanui Parallel' Major Cycleway that would connect Grassmere Street and Rutland

Street. Accordingly, in order to provide a pragmatic basis of assessment, a fourth corridor to the south-east of the proposed urban zoning (south of Cranford St) has not been assumed for general traffic, but is considered a vital component of a walking and cycling network.

5 Base Traffic Models (the Receiving Environment)

5.1 This Memo is focused on summarising the potential effects of the proposed rezoning. However, given the requirement to undertake traffic modelling at 2021 (with No Northern Arterial or Extension) and 2031 (with Northern Arterial and Extension), it is useful to first understand how traffic patterns may change in the future, irrespective of the proposed Cranford Basin rezoning.

5.2 The following diagrams provide an indication of modelled daily traffic volumes[1] in 2021 and 2031, with the third diagram illustrating the changes between the two scenarios (green bands indicating reductions and red bands increases, with the **width** of the bands (not the length) proportional to the traffic volumes illustrated in each diagram).

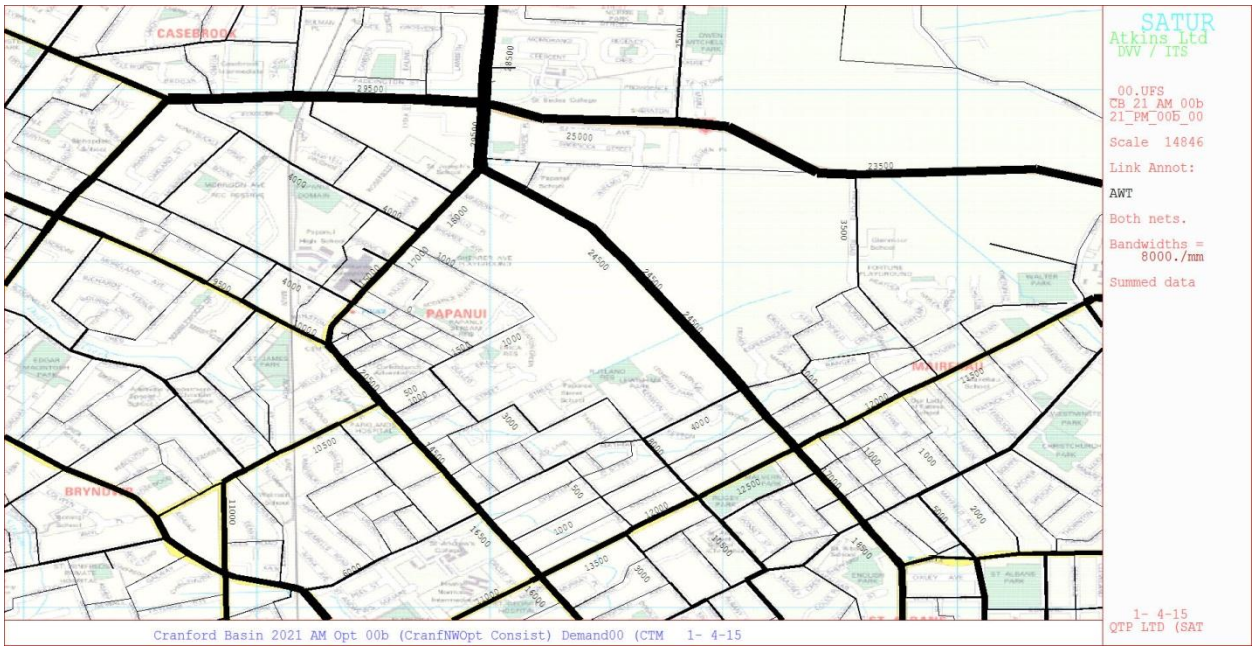

Figure 5.1: Modelled Daily Traffic Volumes 2021 (no Northern Arterial and Extension)

[1] Estimated from CAST AM and PM peak hour modelling

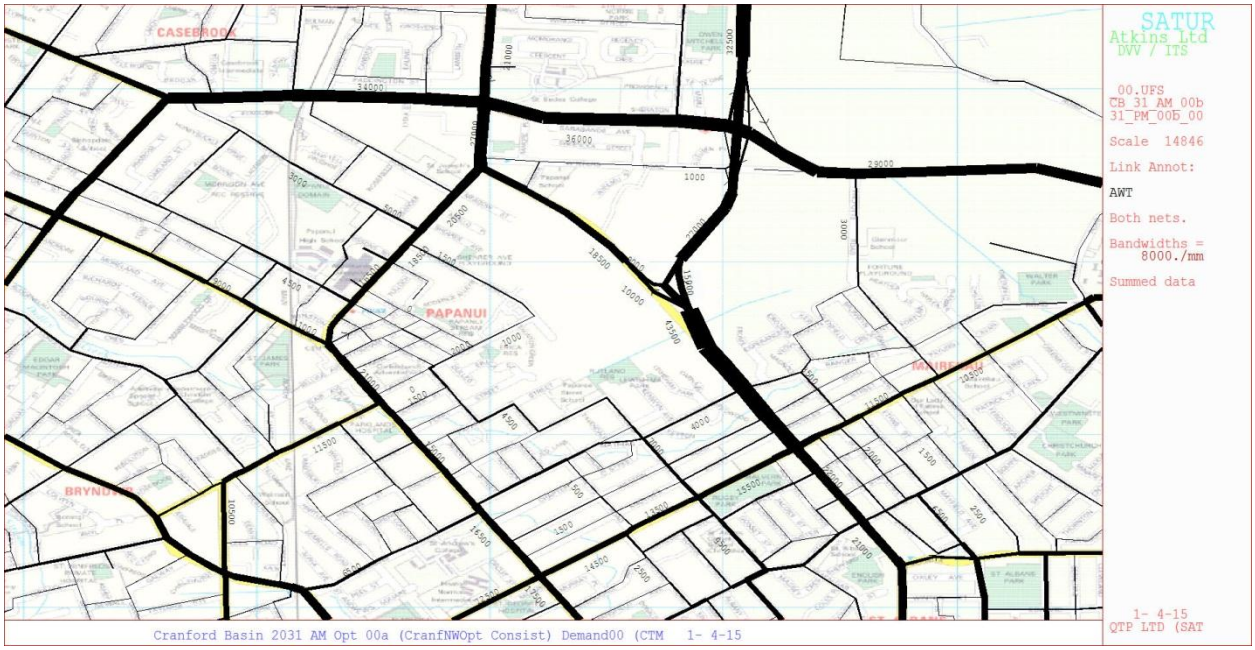

Figure 5.2: Modelled Daily Traffic Volumes 2031 (with Northern Arterial and Extension)

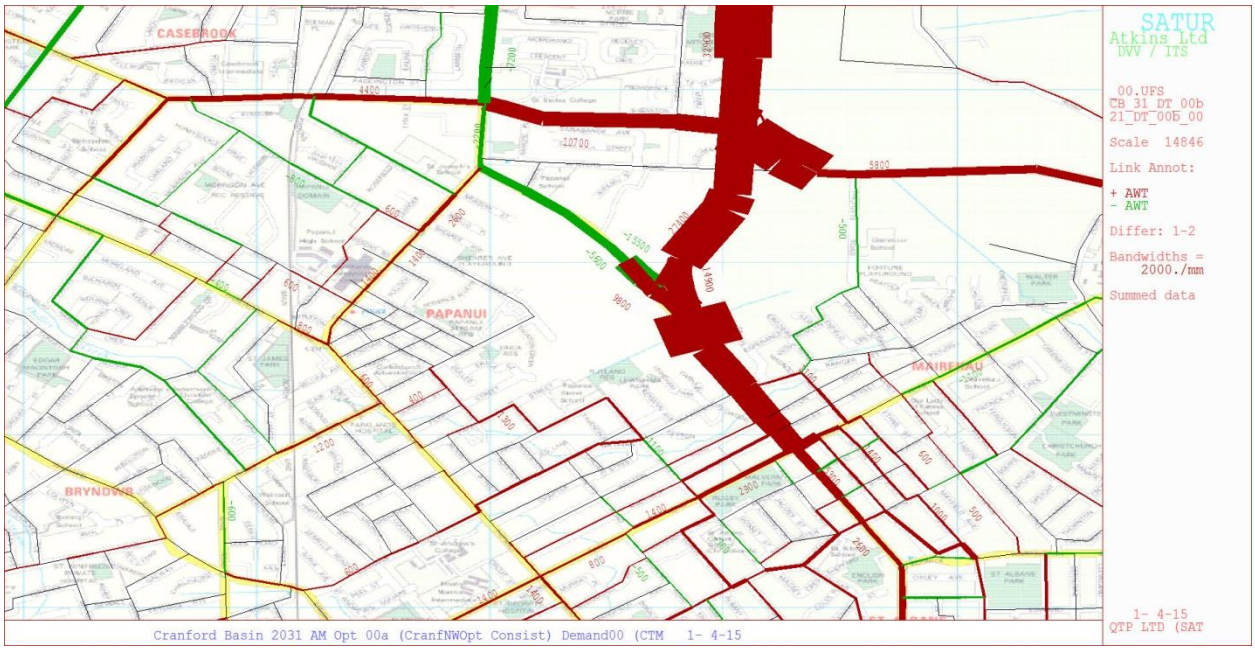

Figure 5.3: Modelled Change in Daily Traffic Volumes 2031 vs. 2021

5.3 The above diagrams illustrate:

- Significant increases in traffic volumes on Cranford Street to the south of the proposed roundabout at the intersection of the Northern Arterial Extension (NAX) and Cranford Street (an increase of 19,000 vpd and reducing as progressing southbound along Cranford Street);
- Reductions in traffic volumes on Cranford Street to the north of the NAX roundabout of around 6,000 vpd;
- Small increases on Main North Rd south of Cranford Street (around 2,000 vpd); and
- No significant change in traffic volumes on Papanui Rd.

6 Initial Traffic Modelling and Results

6.1 Initially, traffic modelling has assumed a single-lane four-arm roundabout at the intersection of the proposed Collector Rd serving the proposed rezoning and Cranford Street. This was to gauge the level of development that might be adequately served by the proposed intersection both in the short-term (2021) and in the medium-term (2031). In 2031, traffic volumes on the section of Cranford Street through the proposed rezoning are anticipated to reduce with the Northern Arterial (NA) and Northern Arterial Extension (NAX) assumed to be in place.

6.2 The modelling indicates that the roundabout would be over capacity on several approaches in all scenarios modelled in 2021. For 2031, with reduced traffic volumes on this section of Cranford Street, such a roundabout generally operates with modest delays for all scenarios in the AM peak hour. However, in the PM peak hour, large delays (>70 seconds, LoS F) are indicated for all scenarios modelled.

6.3 The following diagram illustrates the potential location of the proposed 4-way intersection in relation to the scheme plans developed for the NAX.

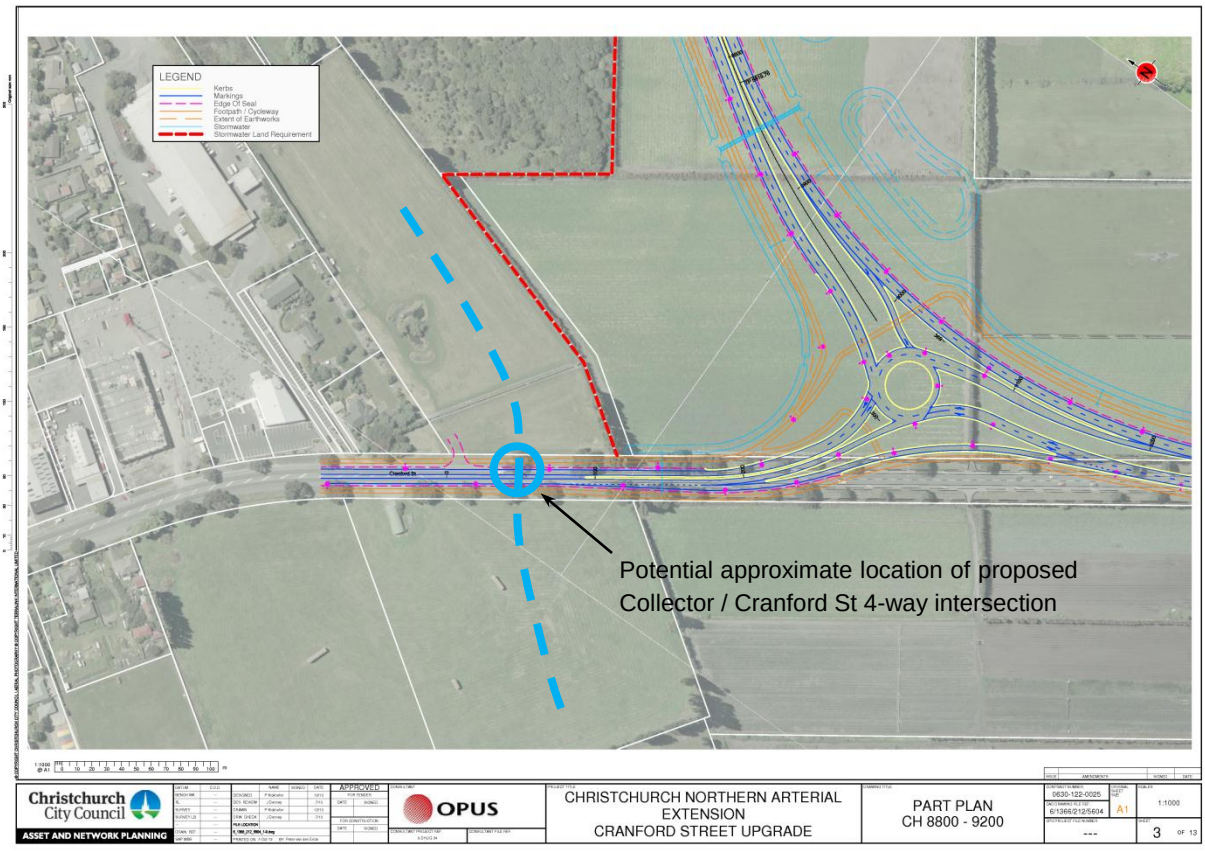

Figure 6.1: Location of Potential Cranford St Intersection Relative to NAX

6.4 Whilst it is around 250m between the intersections, the design incorporates a slip-lane for northbound traffic on Cranford Street. This requires a merge length from two lanes to a single lane, which terminates just on approach to the approximate roundabout location. It may be possible to modify the NAX roundabout design and the location of

the proposed roundabout to some degree, thus enabling an intersection with single approach lanes to be provided. However, assuming the NAX intersection design retains a slip-lane and merge length, it is considered most unlikely that a multi-lane intersection (roundabout or signals) could be safely accommodated at the proposed location. This is because this would create a 'weave' of vehicles between the NAX intersection exit lanes and the proposed intersection approach lanes over a very short length of road. Accordingly, this initial road network configuration has been modified.

7 Modified Road Network

7.1 The road network has been modified to provide two T-intersections on Cranford Street serving the proposed rezoning area as illustrated within the following diagram.

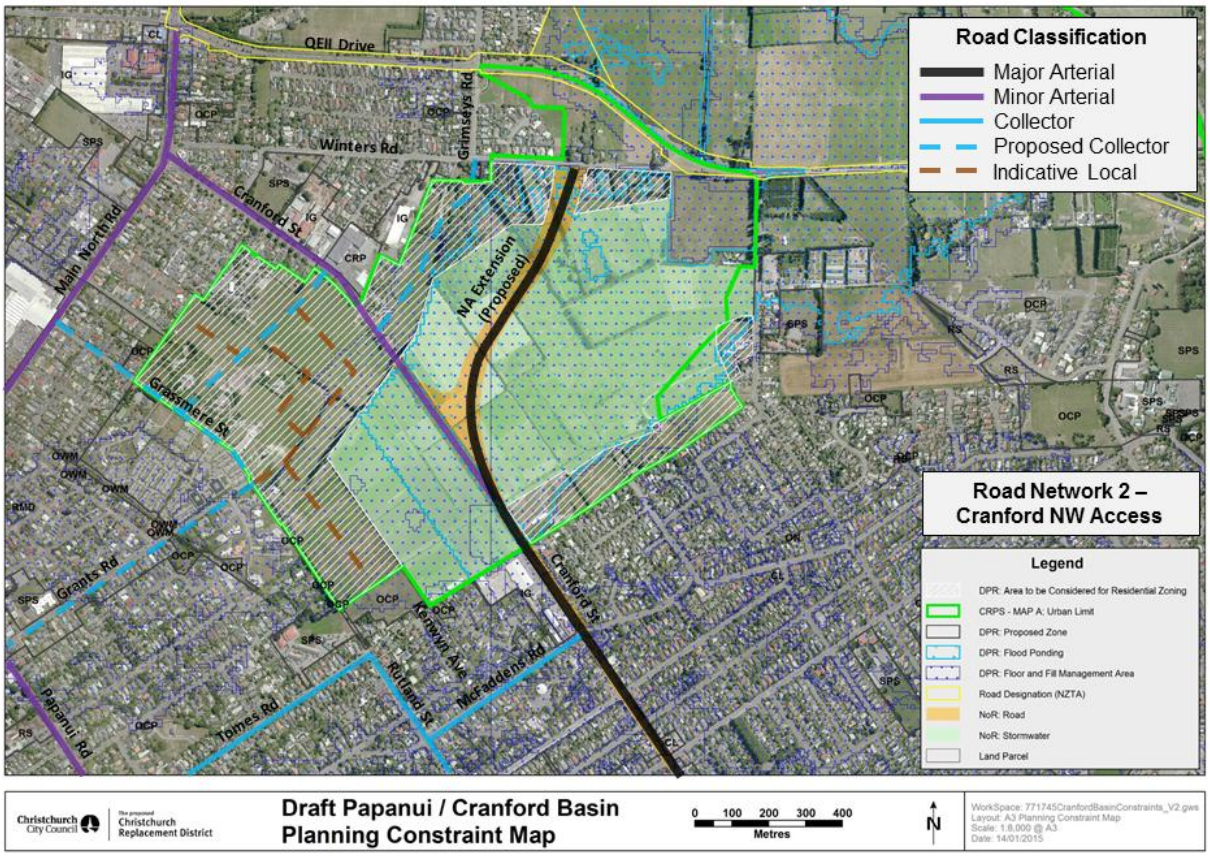

Figure 7.1: Modified Road Network

7.2 The road network does not provide the same level of accessibility between the proposed urban zoning north and south of Cranford Street. However, good accessibility for pedestrian and cyclists can be maintained through the provision of a suitably designed walking / cycling link in the southern section, connecting to the proposed Collector Road serving the northern section. The modelling has assumed the following:

- The proposed Cranford Street intersection serving the smaller (northern) portion of the proposed rezoning is assumed to be a Left-In, Left-Out (LILO) priority T-intersection. This design acknowledges the close proximity of the adjacent NAX

intersection and the resulting issues discussed above. Whilst this design represents a compromise in terms of accessibility to the northern area, the strongest vehicular demand between Cranford Street (to/from the central city) and the northern area is accommodated by means of the left-turn out movement and the proximity of the proposed roundabout to the north-west, that would accommodate a u-turning movement from the central city direction.

- The proposed Cranford Street intersection serving the larger (southern) portion of the proposed rezoning is assumed to be a two-lane roundabout. This has the potential to accommodate U-turns in accessing the northern section of the proposed rezoning. Testing of a single-lane roundabout indicated insufficient capacity for the lowest traffic generation scenario.

8 Modelled Effects of Rezoning

8.1 Modelling has been conducted for 5 demand scenarios, for 2 transport networks, for both the AM and PM peak hours, both at 2021 and 2031. This is some 40 model runs. Various graphical outputs have been extracted from the model for each model run both for the purpose of checking the sensibility of outputs and to inform the assessment of effects. Some 400 model plots have thus been generated.

8.2 It is not within the scope of this assessment to provide a full explanation of the assessed traffic volumes, delays and changes in volumes and delays for each model run. Thus selected model outputs have been chosen to illustrate the results of the assessment and a summary chapter provided at the end of this Memo.

8.3 Base Models

8.3.1 In order to provide some context to the assessment of effects, the following diagrams illustrate the modelled delays and CAST Level of Service (LoS) on the road network for the generic 2021 and 2031 CAST models for the AM and PM peak hours (without the effects of the proposed rezoning). The delays are at the intersection approach level and are colour-coded as follows:

- LOS A to C (green bands) = 0 to 30 seconds delay
- LOS D (orange bands) = 30-50 seconds delay
- LOS E (red bands) = 50-70 seconds
- LOS F (black bands) > 70 seconds

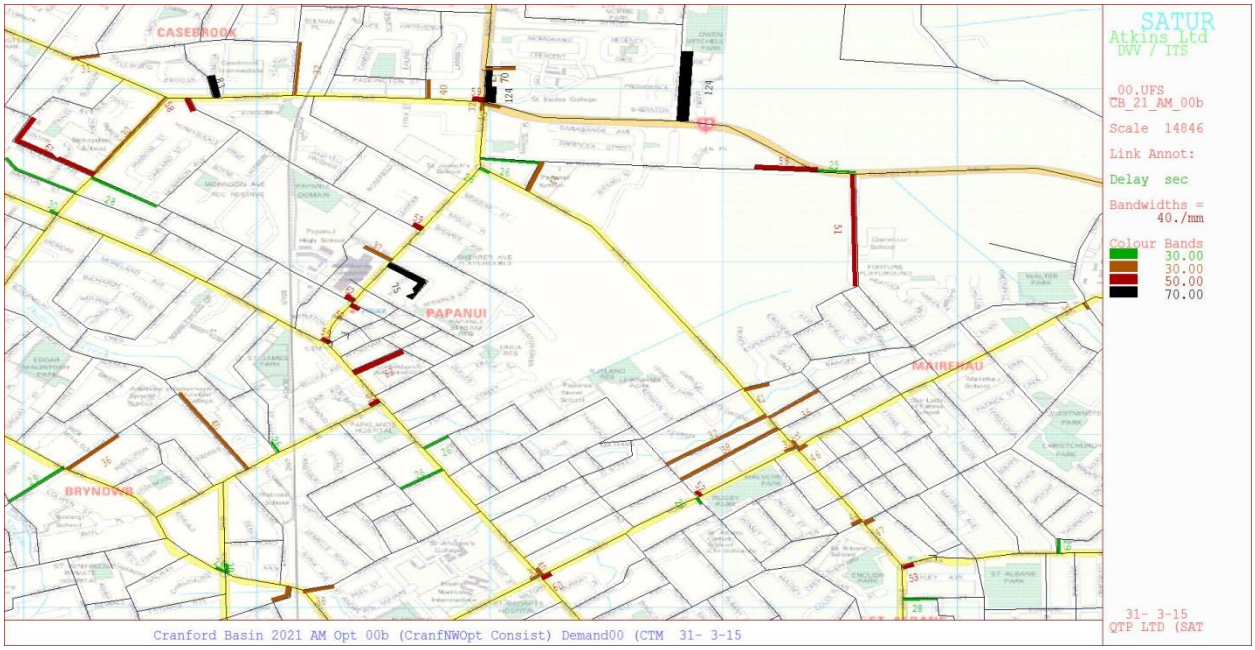

Figure 8.1: Link Delays and LoS, Base Model, 2021 AM Peak Hour

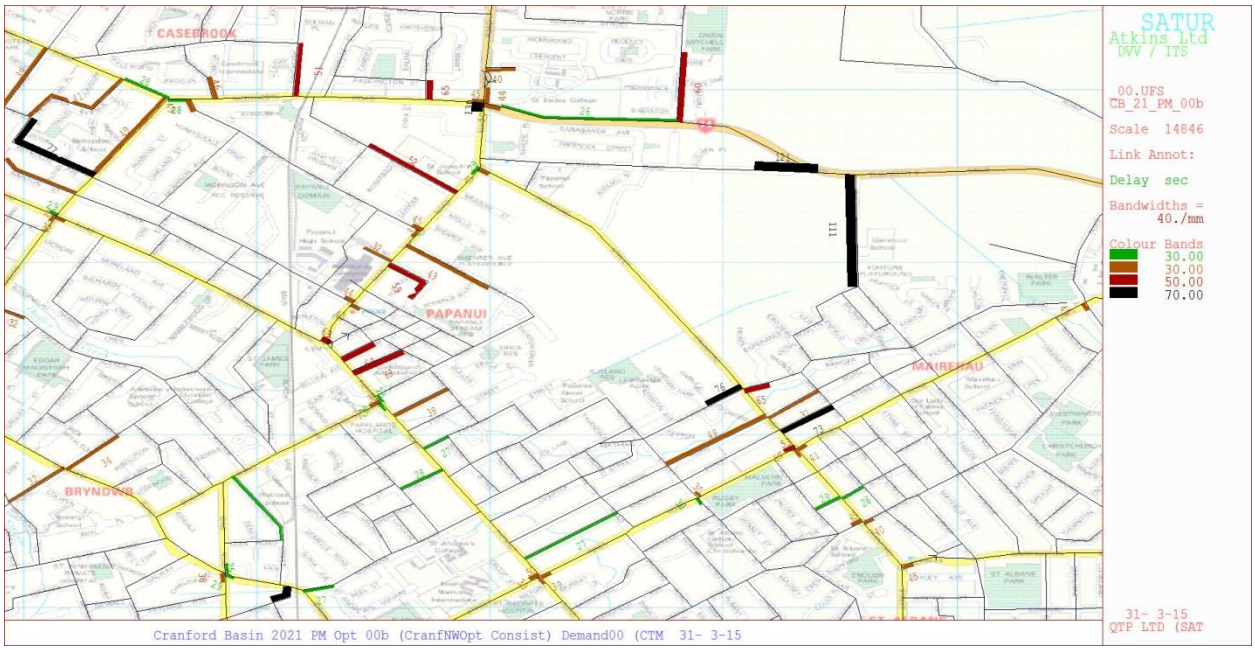

Figure 8.2: Link Delays and LoS, Base Model, 2021 PM Peak Hour

Figure 8.3: Link Delays and LoS, Base Model, 2031 AM Peak Hour

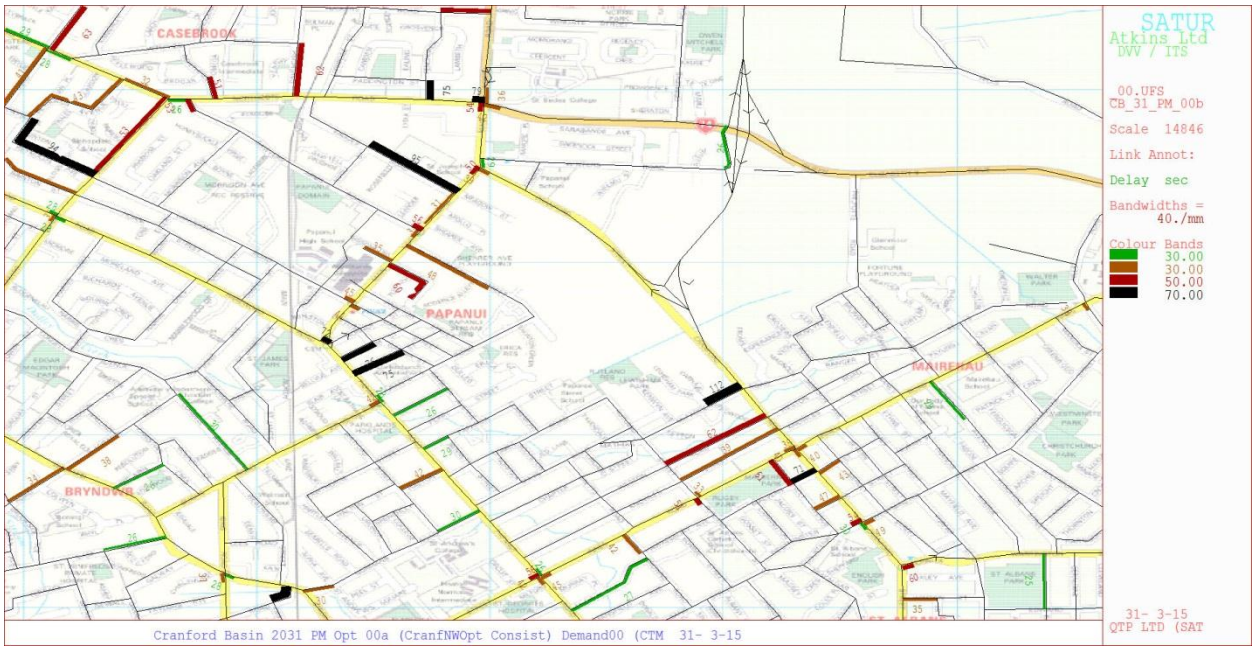

Figure 8.4: Link Delays and LoS, Base Model, 2031 PM Peak Hour

8.3.2 The following points are noted:

- A number of minor road approaches to Main North Rd and Papanui Rd have high delays with LoS E or F illustrated in both 2021 and 2031
- At 2031, with the NAX assumed to be in place, delays on the McFaddens Rd and Weston Rd approaches increase and are at LoS F and E respectively.

8.3.3 For modelled base year daily traffic volumes, refer Figure 5.1 and Figure 5.2 above.

8.4 Scenario 1: 200 Low Density Households

8.4.1 The following diagram illustrates the modest changes in daily traffic volumes resulting from this scenario (2021 illustrated).

Figure 8.5: Changes in Daily Traffic Volumes, Scenario 1: 200 Low Density Households, 2021

8.4.2 The following diagrams illustrate the resulting changes in delays as a consequence of the additional development traffic in the AM and PM peak hours at 2021.

Figure 8.6: Changes in Delays due to Scenario 1: 200 Low Density Households, AM Peak, 2021

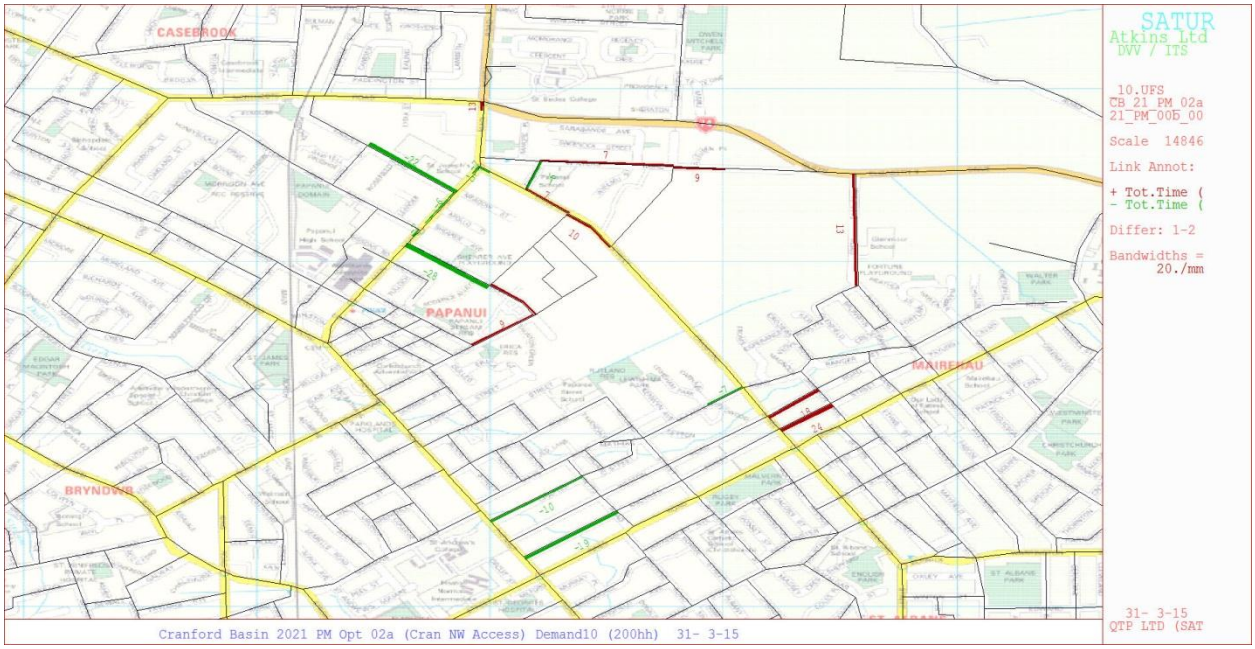

Figure 8.7: Changes in Delays due to Scenario 1: 200 Low Density Households, PM Peak 2021

8.4.3 At 2021, the impacts are generally modest. Note that there are modest reductions in delays relative to the base model on some minor-arm approaches to Papanui, Main North Rd and Cranford Street. This is because the assumed intersection on Cranford Street provides some relief to delays faced by traffic from the surrounding residential area in accessing these arterial roads.

8.4.4 There are however some locations of notable increases in delays:

- Grimseys Rd southbound (approximately 20 seconds), AM Peak Hour
- Philpotts Rd northbound to QEII Drv (approximately 10 seconds), PM Peak Hour
- Knowles St southwestbound to Cranford St (approximately 20 seconds), PM Peak Hour

8.4.5 Because these locations are already operating at LoS E or F in the base model, these impacts are considered potentially significant, particularly as there are safety consequences of large delays on give-way approaches to intersections.

8.4.6 It is somewhat subjective as to whether such a scale of impacts are considered minor, or more than minor. At this stage, our recommendation would be not to allow for zoning that could exacerbate existing efficiency and associated safety issues on the road network at 2021 without either mitigating these effects or undertaking more detailed analysis to confirm these initial findings.

8.4.7 The following plots illustrate the modelled delay increases at 2031.

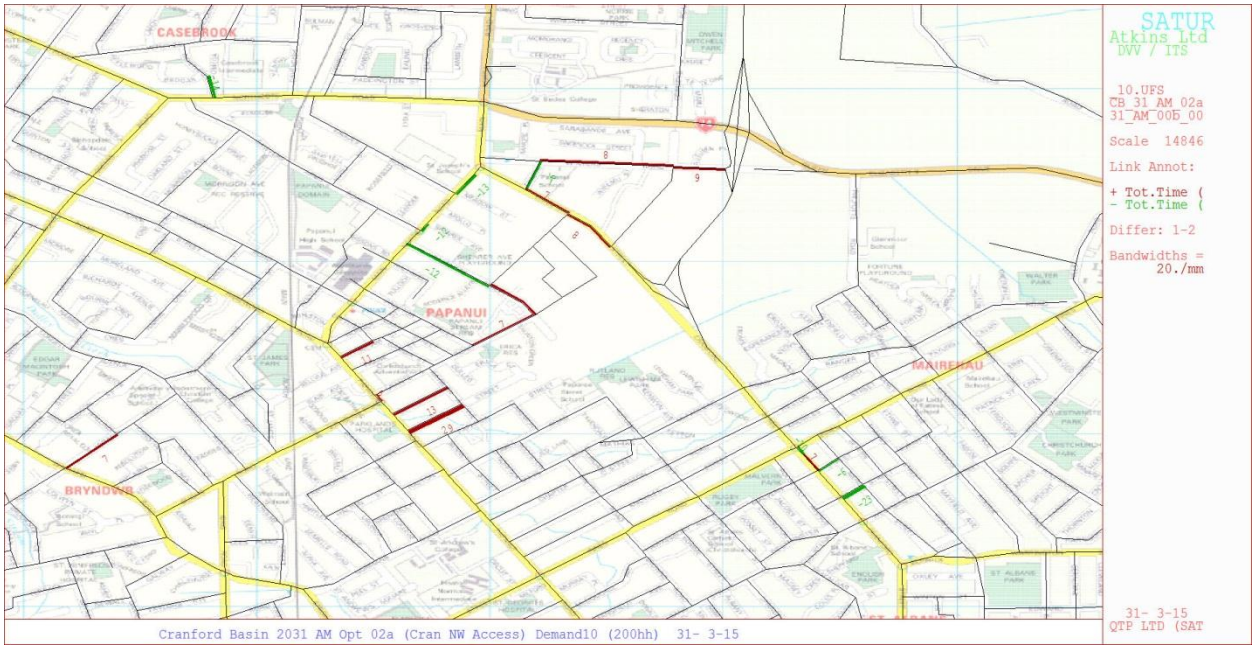

Figure 8.8: Changes in Delays due to Scenario 1: 200 Low Density Households, AM Peak, 2031

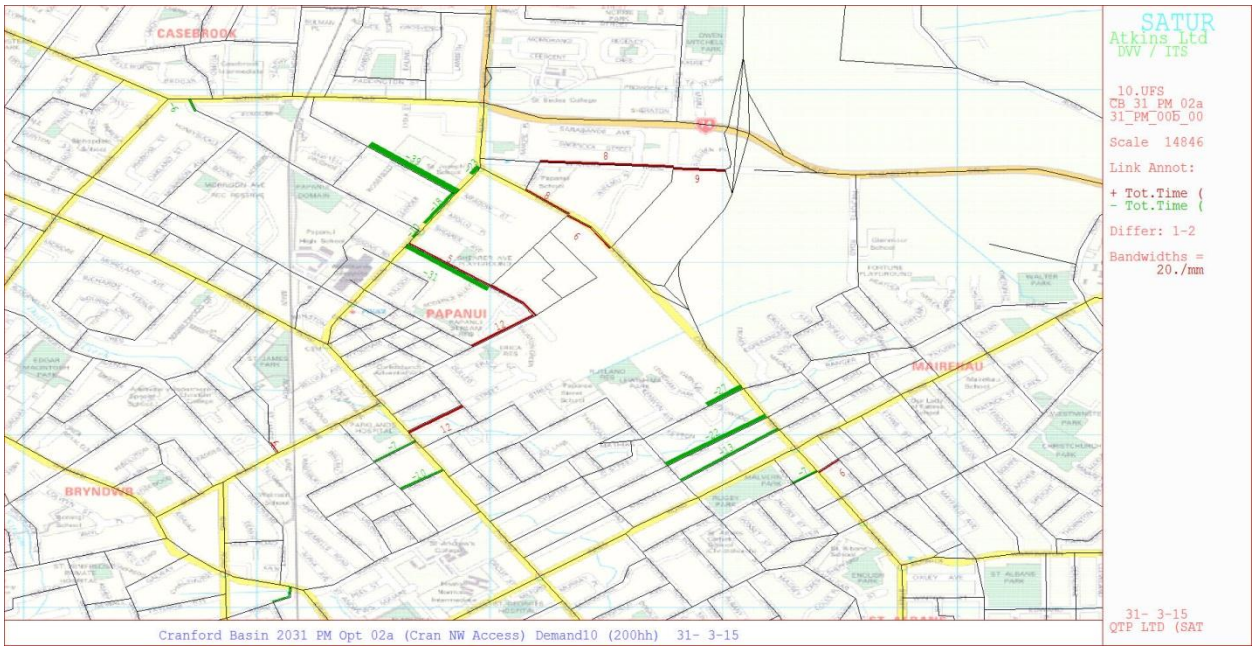

Figure 8.9: Changes in Delays due to Scenario 1: 200 Low Density Households, PM Peak 2031

8.4.8 At 2031, these locations of potentially significant delay **increase** as summarised above in 8.4.4 do not occur due to the relief to these bottlenecks brought by the NA & NAX.

8.4.9 Generally the effects on the road network are modest, and on balance slightly adverse in the morning peak hour (with more traffic from residential side-roads) but with generally positive benefits in the PM peak hour due to the relief provided to other routes as a consequence of the proposed Cranford Street intersection.

8.4.10 Whilst there are some locations of increased delay in the AM peak hour for traffic

approaching Papanui Rd, these are at locations where delays are modest, such that the resulting LoS is D or better.

8.5 Scenario 2: 750 Low Density Households

8.5.1 The following diagram illustrates the changes in daily traffic volumes resulting from this scenario (2021 illustrated).

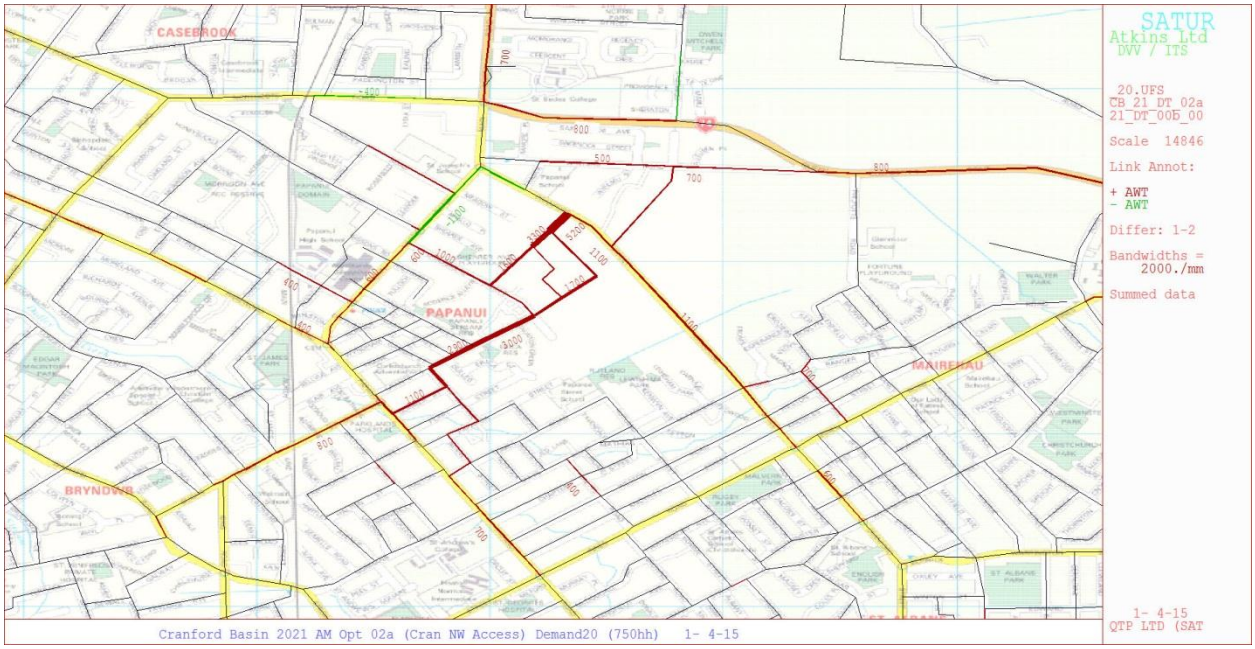

Figure 8.10: Changes in Daily Traffic Volumes, Scenario 2: 750 Low Density Households, 2021

8.5.2 The increases in traffic volumes are noticeably higher than for Scenario 1. The following diagrams illustrate the resulting changes in delays as a consequence of the additional development traffic in the AM and PM peak hours at 2021.

Figure 8.11: Changes in Delays due to Scenario 2: 750 Low Density Households, AM Peak, 2021

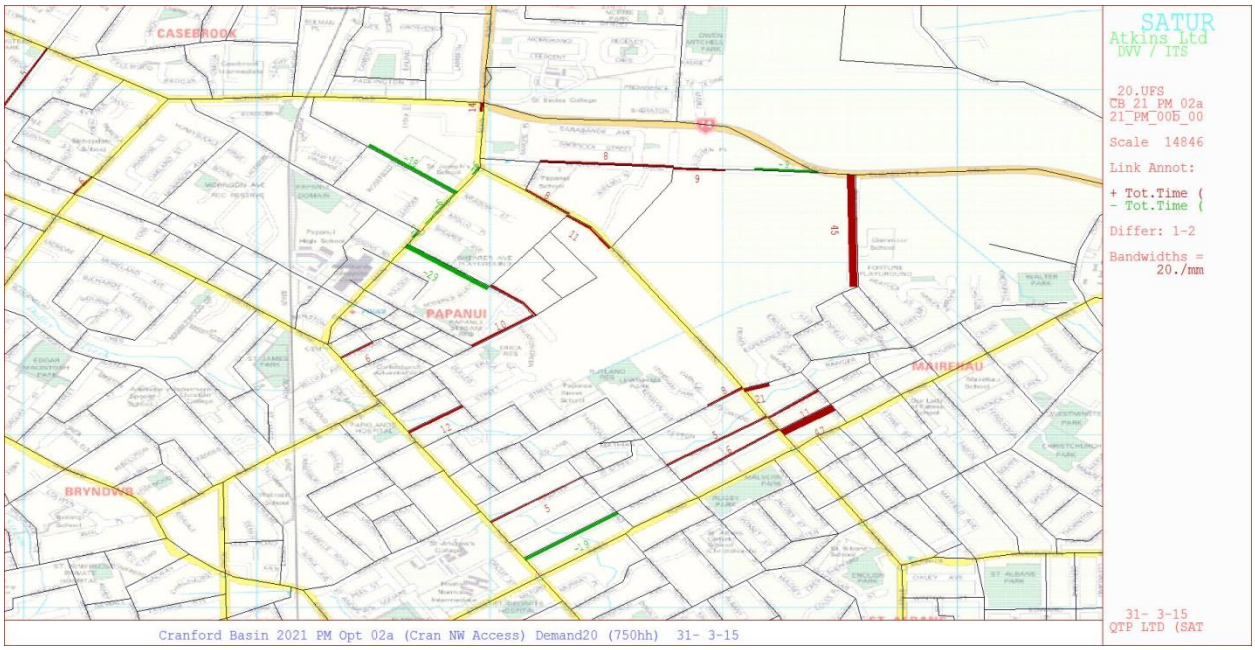

Figure 8.12: Changes in Delays due to Scenario 2: 750 Low Density Households, PM Peak 2021

8.5.3 At 2021, the impacts of landuse Scenario 2 are generally modest. However, there are some locations of notable increases in delays, being somewhat higher than for landuse Scenario 1:

- Grimseys Rd southbound (approximately 60 seconds), AM Peak Hour
- Philpotts Rd northbound to QEII Drv (approximately 45 seconds), PM Peak Hour
- Knowles St southwestbound to Cranford St (approximately 45 seconds), PM Peak Hour

8.5.4 Because these locations are already operating at LoS E or F in the base model, these impacts are considered significant, particularly as there are safety consequences of large delays on give-way approaches to intersections.

8.5.5 We further note that the proposed Collector serving the northern portion of the area proposed for rezoning operates at LoS F (with a delay of 2 minutes) at 2021 on approach to Cranford Street, prior to the NA / NAX being completed. By contrast, this approach is modelled at operating at LoS E (with a delay of just under one minute), at the limit of acceptable performance under Scenario 1. The following diagrams highlight these locations of poor performance and significant impact at 2021.

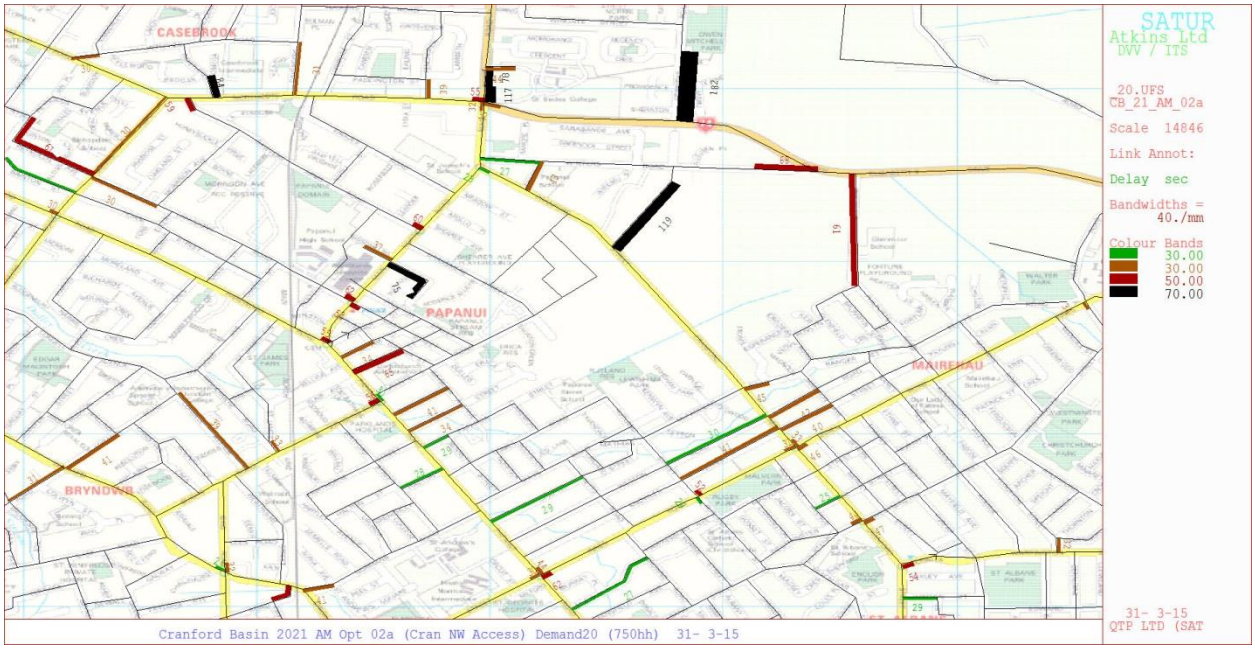

Figure 8.13: Link Delays and LoS, Scenario 2, 2021 AM Peak Hour

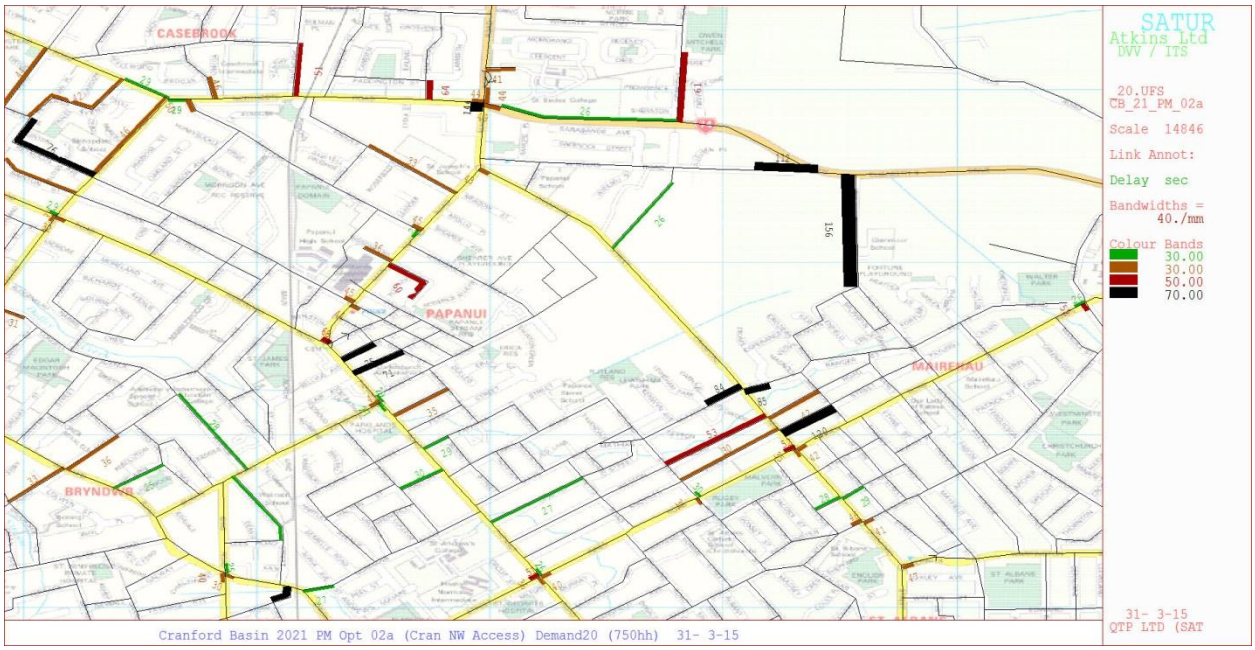

Figure 8.14: Link Delays and LoS, Scenario 2, 2021 PM Peak Hour

8.5.6 At 2031, these locations of significant delay **increase** as summarised above in 8.5.3 do not occur due to the relief to these bottlenecks brought by the NA & NAX, as illustrated in the following plots.

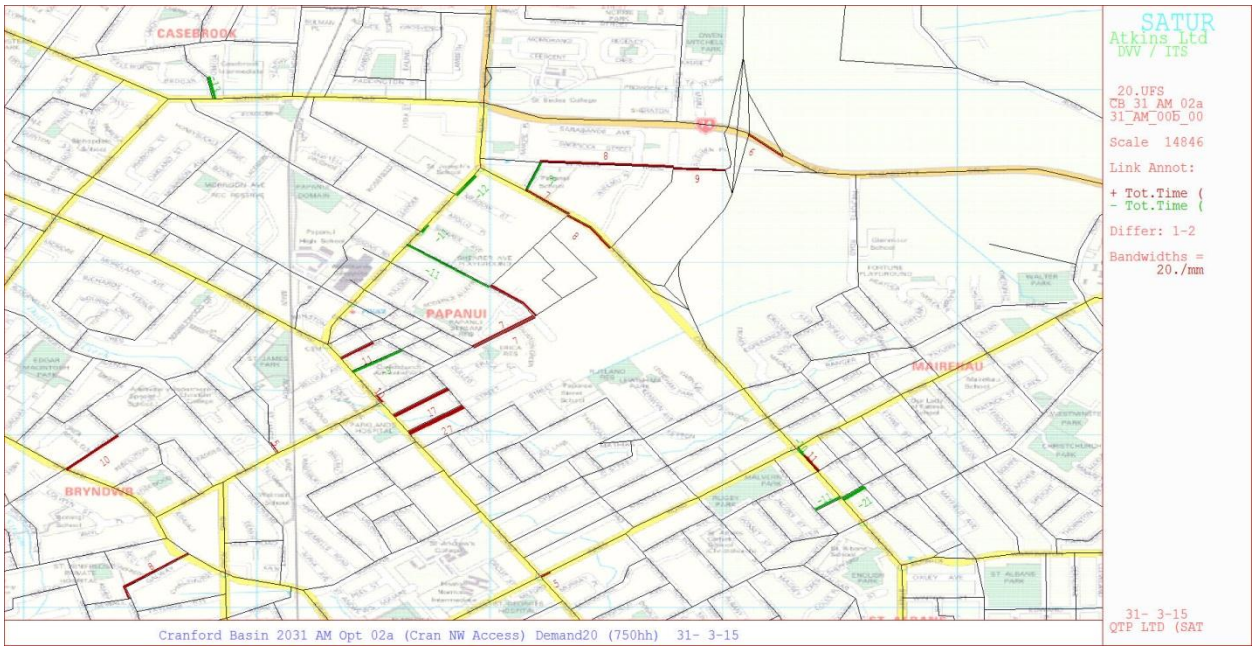

Figure 8.15: Changes in Delays due to Scenario 2: 750 Low Density Households, AM Peak, 2031

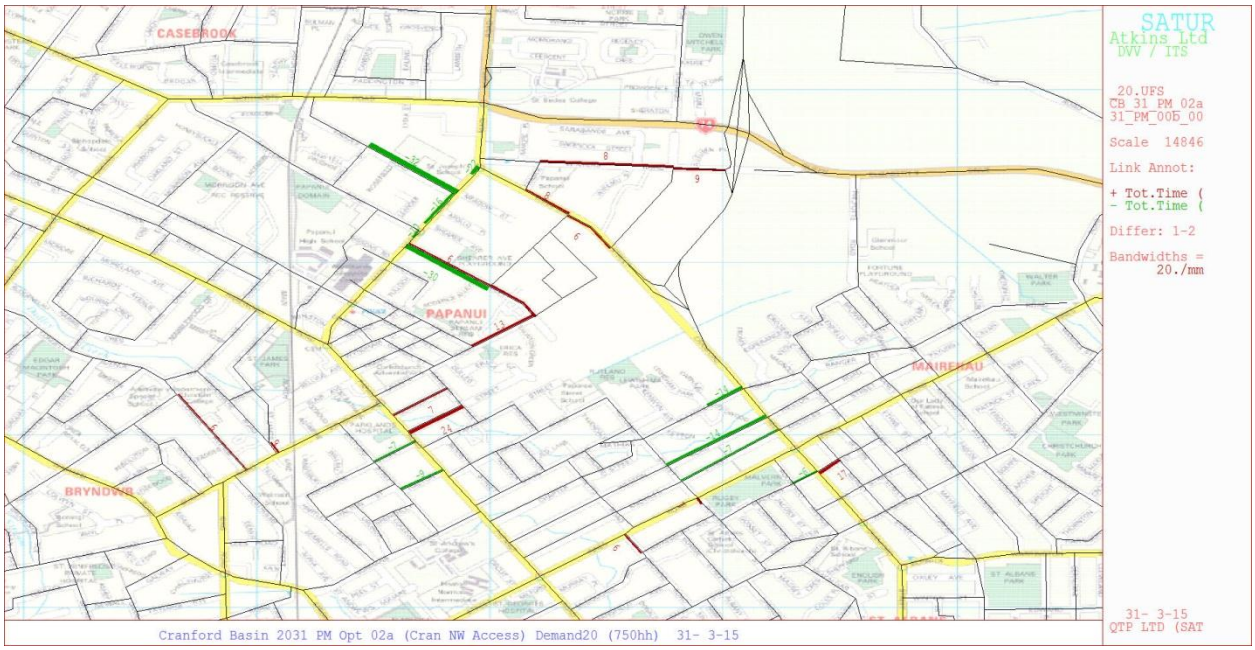

Figure 8.16: Changes in Delays due to Scenario 2: 750 Low Density Households, PM Peak 2031

8.5.7 Generally the effects on the road network are modest, and on balance slightly adverse in the morning peak hour (with more traffic from residential side-roads) but with generally positive benefits in the PM peak hour due to the relief provided to other routes as a consequence of the proposed Cranford Street intersection.

8.5.8 Whilst there are some locations of increased delay in the AM peak hour for traffic

approaching Papanui Rd, these are at locations where delays are modest, such that the resulting LoS is D or better.

8.6 Scenario 3: 1,500 Medium Density Households

8.6.1 The following diagram illustrates changes in daily traffic volumes resulting from this scenario (2031 illustrated).

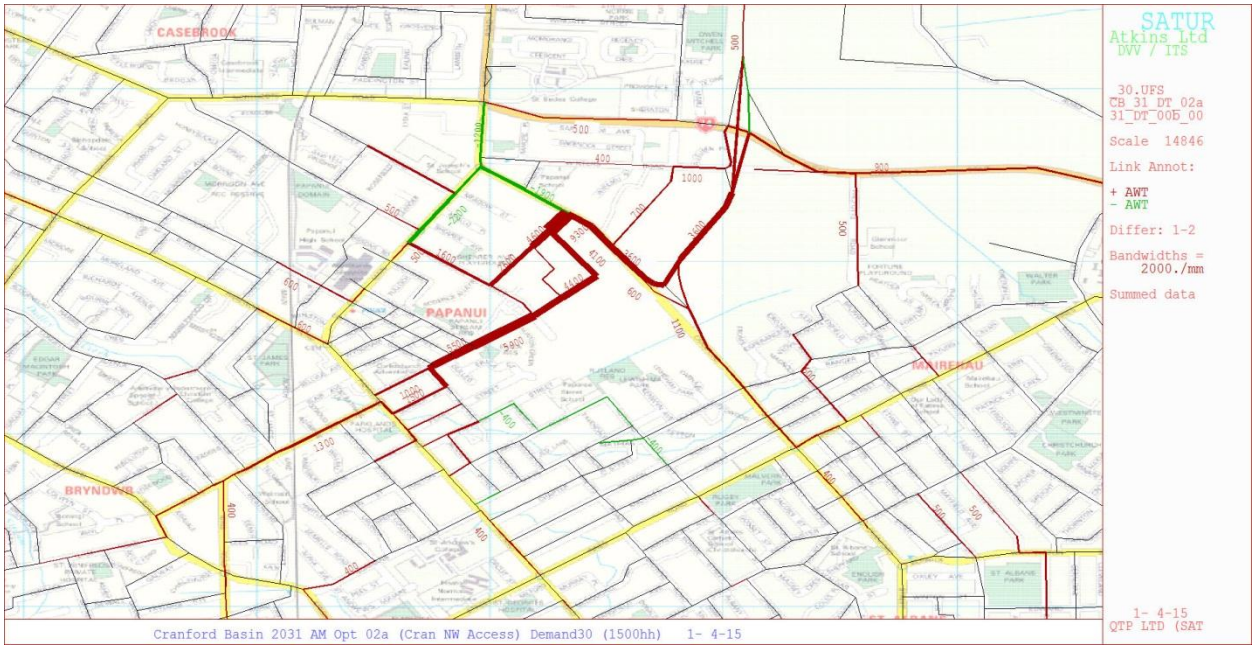

Figure 8.17: Changes in Daily Traffic Volumes, Scenario 3: 1500 Med Density Households, 2031

8.6.2 Note that significant changes (over around 1,000 vpd two-way) are limited to the localised area bound by QEII Drive to the north, Main North Rd / Papanui Rd to west and Innes Rd to the south. Given the reporting for Scenario 2, with an overall smaller traffic generation, analysis at 2021 is not presented here as the effects were considered to be significant.

8.6.3 The following diagrams illustrate the impacts on delays on the surrounding network at 2031.

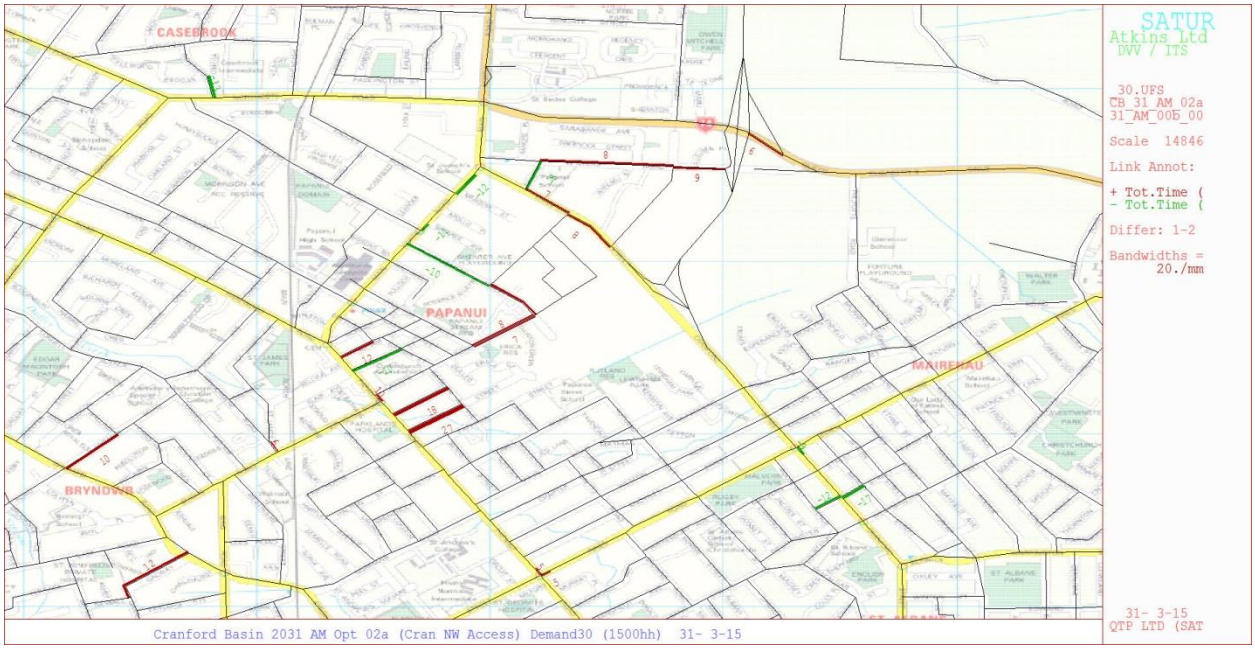

Figure 8.18: Changes in Delays due to Scenario 3: 1500 Medium Density Households, AM Peak, 2031

Figure 8.19: Changes in Delays due to Scenario 3: 1500 Medium Density Households, PM Peak 2031

8.6.4 As with Scenarios 1 and 2 at 2031, generally the effects on the road network are considered modest. The following diagrams illustrate the modelled delays / LoS for Scenario 3 in 2031.

Figure 8.20: Link Delays and LoS, Scenario 3, 2031 AM Peak Hour

Figure 8.21: Link Delays and LoS, Scenario 3, 2031 PM Peak Hour

8.6.5 Cross-checking the locations of significant increases in delays (say, greater than 10 seconds) of the previous diagrams with the locations of poor performance (red and black bands indicating LoS E/F) suggests that Scenario 3 does not contribute significantly to poor network performance for the modelled road network (including access to/from Cranford Street).

8.6.6 However small increases in traffic volumes on Papanui Rd and on the give-way minor road approaches does lead to an increase in delays on the Wyndham St, Dormer St and Perry St approaches in the AM peak hour, all of which have 'borderline' LoS D performance. Discussion on possible mitigation measures is provided in the subsequent section on Scenario 4 traffic effects.

8.7 Scenario 4: General Industrial + Residential

8.7.1 This scenario assumes all the proposed area for urban rezoning to the south of Cranford Street is for industrial purposes. This constitutes some 33.4 ha. The area to the north of Cranford Street (around 20ha in total) is assumed to be low density residential as per Scenario 2, yielding some 284 hh. The total trip generation assessed is higher than for Scenario 3 (or 5), as shown in Table 3.2 above. Note, however that the predominant direction of travel is reversed from the residential scenarios with employment areas attracting more inbound trips than outbound in the morning peak hour and more outbound trips in the PM peak hour.

8.7.2 The following diagram illustrates changes in daily traffic volumes resulting from this scenario (2031 illustrated).

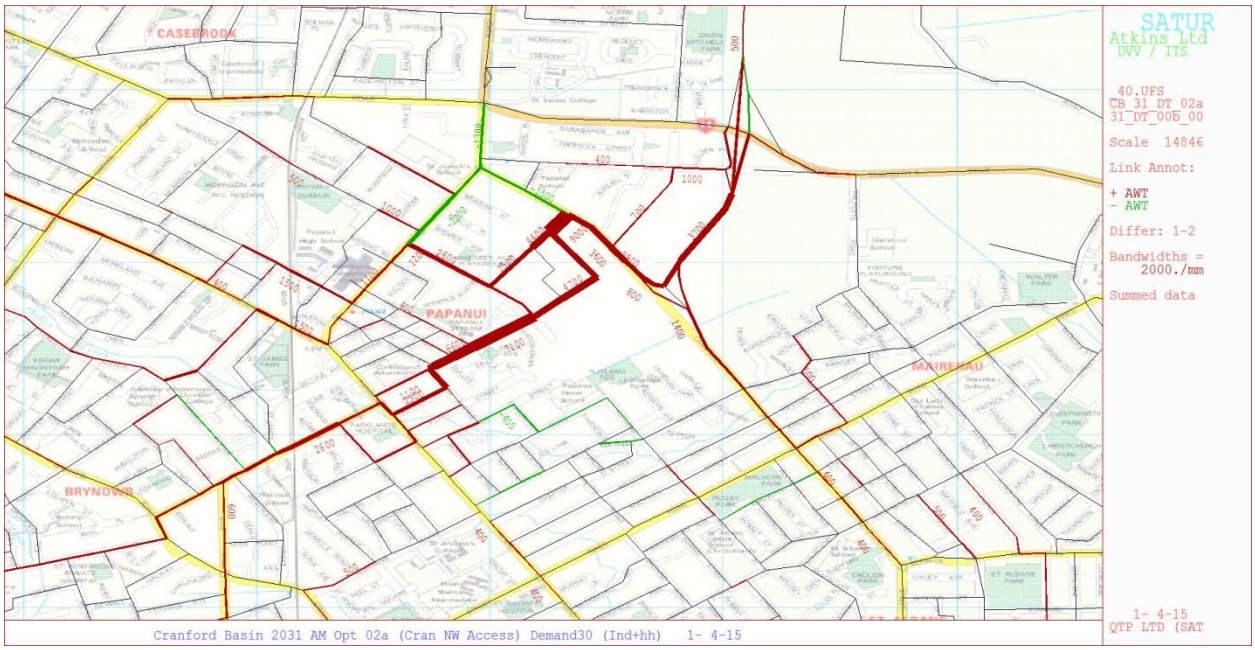

Figure 8.22: Changes in Daily Traffic Volumes, Scenario 4: General Industrial + Residential, 2031

8.7.3 Note that significant changes (over around 1,000 vpd two-way) extend beyond the area identified for Scenario 3, with some 2,500 trips to/from Blighs Rd and around 1,500 to/from Harewood Rd. Note the significant volume increases modelled on Grants Rd of up to 7,000 vpd.

8.7.4 The following diagrams illustrate the impacts on delays on the surrounding network at 2031.

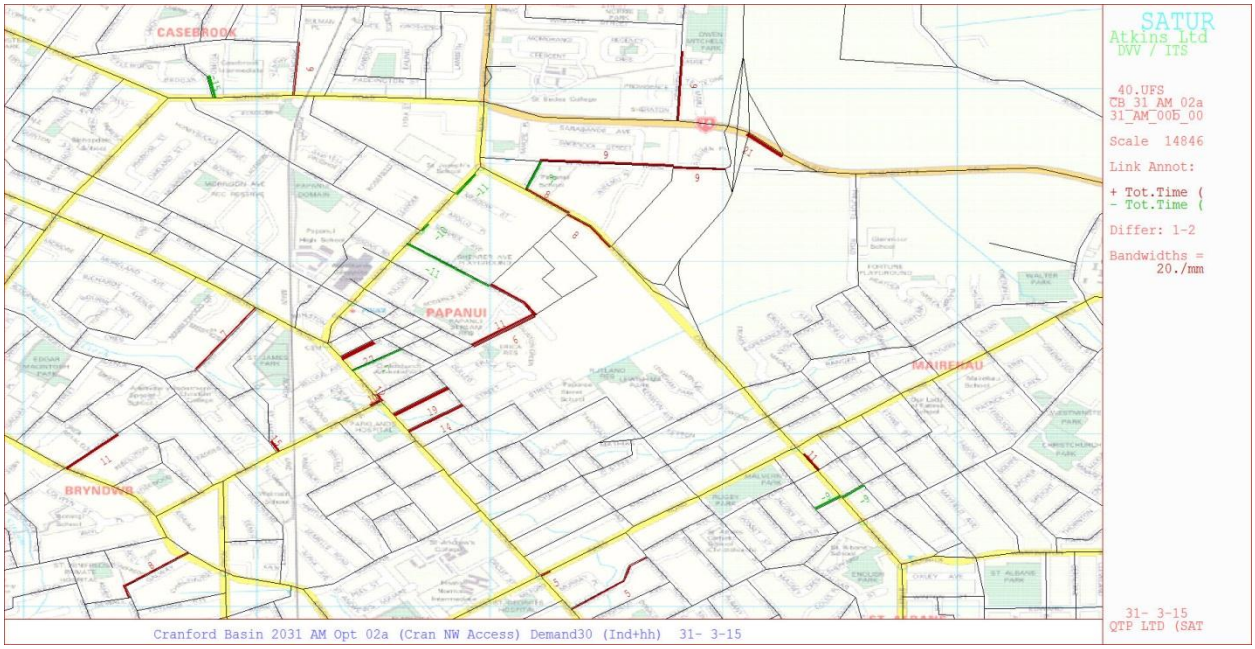

Figure 8.23: Changes in Delays due to Scenario 4: Industrial + Residential, AM Peak, 2031

Figure 8.24: Changes in Delays due to Scenario 4: Industrial + Residential, PM Peak 2031

8.7.5 As with Scenarios 1 to 3, generally the effects on the road network are considered modest at 2031. The following diagrams illustrate the modelled delays / LoS for Scenario 4 in 2031.

Figure 8.25: Link Delays and LoS, Scenario 3, 2031 AM Peak Hour

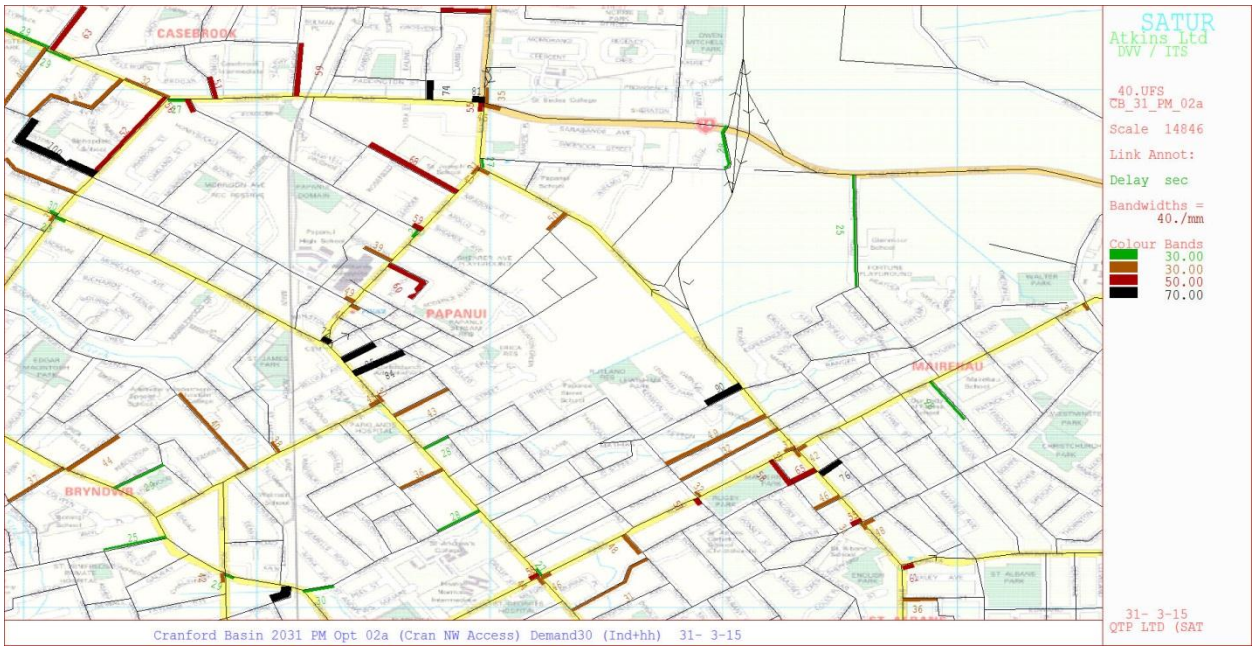

Figure 8.26: Link Delays and LoS, Base Scenario 3, 2031 PM Peak Hour

8.7.6 Cross-checking the locations of significant increases in delays (say, greater than 10 seconds) of the previous diagrams with the locations of poor performance (red and black bands indicating LoS E/F) suggests that Scenario 4 does contribute to increased delays in the AM peak hour on some approaches to Papanui Rd that have a poor LoS (notably the Wyndham Street approach). It is suggested that some form of mitigation by way of intersection upgrade(s) would be appropriate to mitigate these effects. For example, consideration could be given to signalisation of the intersection of Grants Rd with Papanui Rd or Grassmere St with Main North Rd. As illustrated within Figure 7.1, Grassmere Street and Grants Rd are considered to act as Collector Rds in serving the proposed urban area and existing hinterland. On this basis, it would be logical that delays and impacts on local streets be mitigated though promotion of the street

hierarchy with appropriate intersection upgrades. It is not, however, within Scope of this assessment to test the effectiveness of such solutions, at this stage.

8.8 Scenario 5: Commercial + Residential

8.8.1 This scenario assumes that part of the proposed area for urban rezoning to the south of Cranford Street is for commercial purposes. Trip generation has been based on Large Format Retail assuming that part of the site (30,000m^2 GFA) fronting Cranford Street (on its southern side) is zoned for commercial purposes. The total trip generation assessed is similar to Scenario 3 in the AM peak hour and considerably higher than any other scenario in the PM peak hour.

8.8.2 The following diagram illustrates changes in daily traffic volumes resulting from this scenario (2031 illustrated).

Figure 8.27: Changes in Daily Traffic Volumes, Scenario 3: Commercial + Residential, 2031

8.8.3 The following diagrams illustrate the impacts on delays on the surrounding network at 2031.

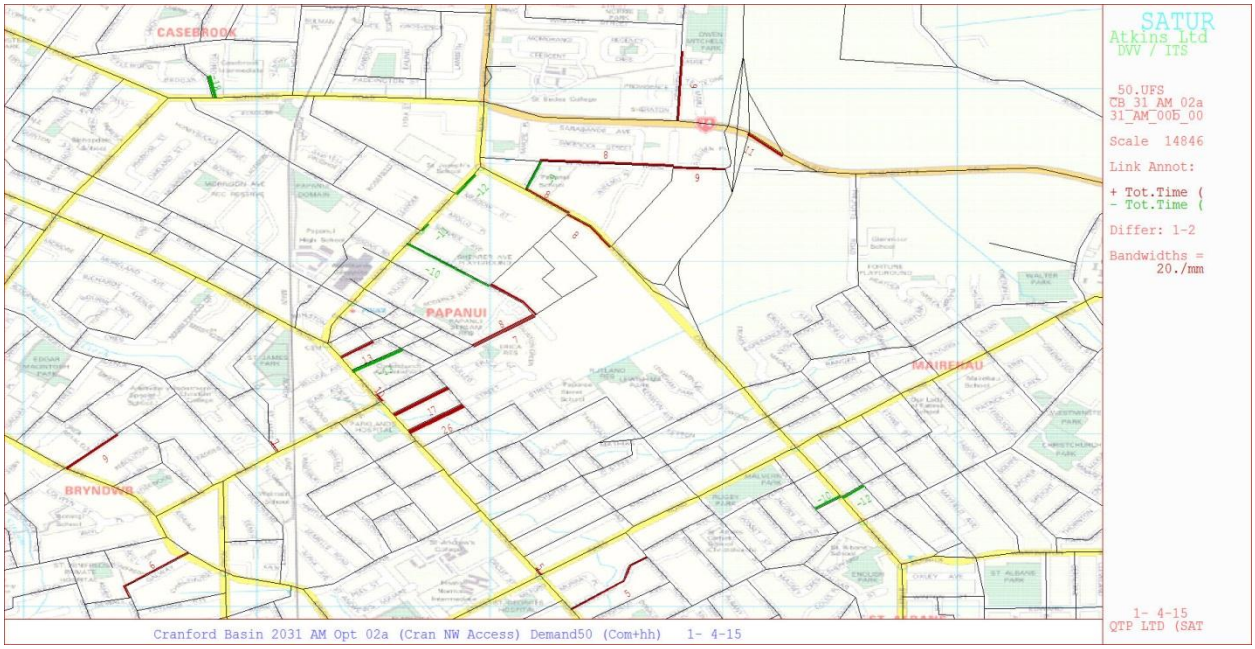

Figure 8.28: Changes in Delays due to Scenario 5: Commercial + Residential, AM Peak, 2031

Figure 8.29: Changes in Delays due to Scenario 5: Commercial + Residential, PM Peak 2031

8.8.4 As with Scenarios 1 to 4, generally the effects on the road network are considered modest at 2031. This is true of the PM peak hour, despite this scenario having the highest two-way traffic generation in this period. The following diagrams illustrate the modelled delays / LoS for Scenario 5 in 2031.

Figure 8.30: Link Delays and LoS, Scenario 5, 2031 AM Peak Hour

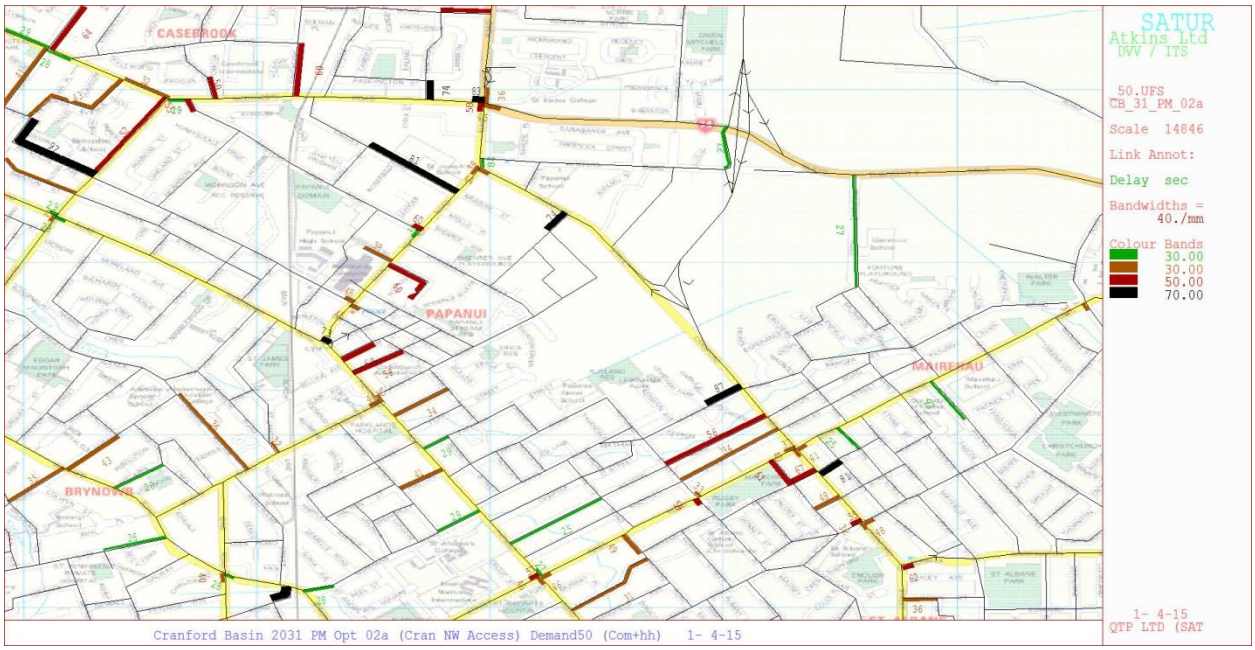

Figure 8.31: Link Delays and LoS, Scenario 5, 2031 PM Peak Hour

8.8.5 As with scenario 3, cross-checking the locations of significant increases in delays (say, greater than 10 seconds) of the previous diagrams with the locations of poor performance (red and black bands indicating LoS E/F) suggests that Scenario 5 does not contribute significantly to poor network performance for the modelled road network (including access to/from Cranford Street).

8.8.6 However, as also noted under Scenario 3, small increases in traffic volumes on Papanui Rd and on the give-way minor road approaches does lead to an increase in delays on the Wyndham St, Dormer St and Perry St approaches in the AM peak hour, all of which have 'borderline' LoS D performance.

8.8.7 Note also that the assumed roundabout providing access to the site from Cranford Street is at LoS F on the Collector Rd approach (with a delay of approximately 70 seconds). Modelling of a signalised intersection (with two-through lanes on Cranford Street) indicates better performance on the Collector Rd can be achieved, but with higher delays on the Cranford Street approaches (albeit still operating at LoS C in 2031).

9 Public Transport, Cycleways and Pedestrian Accessibility

9.1 Public Transport

9.1.1 The following diagram illustrates the relationship between the Cranford Basin proposed urban zoning area and the existing public transport routes. Walking distances to the Blue Line and No 28 bus services are illustrated at 500m (approximately a 6 minute walk) and 800m (approximately a 10 minute walk).

Figure 9.1: Bus Routes Serving Proposed Urban Zoning

9.1.2 The site is generally very well served by public transport. The Blue Line, a direct service to/from the Central City, routing via Main North Rd and Papanui Rd has a frequency of 10 minutes in the peak hours and typically 15 minutes at other times during the day.

9.1.3 The Orbiter (illustrated above in green) has a frequency of 10 minutes during the day.

9.1.4 Route 28 (Papanui to Lyttelton and Rapaki) via the City, routing via Cranford Street, operates with a frequency of around 30 minutes for most of the day.

9.1.5 The above diagram illustrates that nearly all of the proposed urban zoning is within around a 6-minute walk (500m) from Route 28. The majority of the site is also within a 10-minute walk (800m) from the high-frequency Blue Line service (and the Orbiter).

9.1.6 Ideally, all dwellings would be within a 5 to 10 minute walk of a direct, high-frequency bus service such as the Blue Line. However, in practice, there is a trade-off between walking distance to a route and the frequency and directness of services that can be provided (afforded) in serving the whole city. There is little value in providing infrequent, meandering bus routes in order to meet targets of proportions of dwellings within close proximity to bus routes. We consider a better outcome is achieved by focusing public transport services on arterial routes, of a high frequency, and generally directly to/from the Central City. In this regard, the relatively small area of the site not within a 5 to 10 minute walk of a high-frequency service is considered an acceptable trade-off, particularly as this portion of the site is within 500m of a 30-minute frequency route on Cranford Street.

9.1.7 In order to take full advantage of the adjacent bus routes, it is essential that an Outline Development Plan (ODP) is prepared that includes excellent pedestrian connections between the proposed urban zoning and Main North Rd and Cranford Street. Whilst pedestrian linkages would undoubtedly be available via Grassmere Street, it appears that accessibility to Main North Rd via Meadow Street and Apollo Place (refer above diagram) may not be possible due to the nature of the development that has occurred at the south-eastern end of these cul-de-sacs. At very least, pedestrian linkages should be pursued between the proposed urban zoning and Shearer Avenue. Under any redevelopment of the holiday park at the end of Meadow Street that occurs under the proposed zoning, Council should also seek to provide pedestrian (and cycle) linkage between the proposed urban area and Meadow Street to maximise accessibility to the high-frequency public transport service on Main North Rd.

9.1.8 The smaller proposed urban area to the north of Cranford Street also has excellent opportunities for good access to high quality public transport, being within a 600m walk of the Route 28 service on Cranford Street and around 800m from the high-frequency Orbiter service.

9.1.9 Finally, we note that the Draft Regional Passenger Transport Plan (dRPTP) anticipates that some new routes may be introduced in the future to service new residential subdivisions. Given the proximity of the proposed urban rezoning area to routes 28, The Blue Line and the Orbiter, we would not anticipate any new routes specifically serving the area. It is quite possible that Ecan may look in future to increase the frequency of Service 28 on Cranford Street in response to greater demand from the proposed rezoned area. Whilst this is highly desirable, this is not considered essential given the proximity to existing high-frequency services for the majority of the area.

9.2 Cycling

9.2.1 The site is presently rural and as such no cycle facilities exist within the proposed urban zoning area. The following diagram, illustrates CCC's cycle routes as at 2012, in the vicinity of the site.

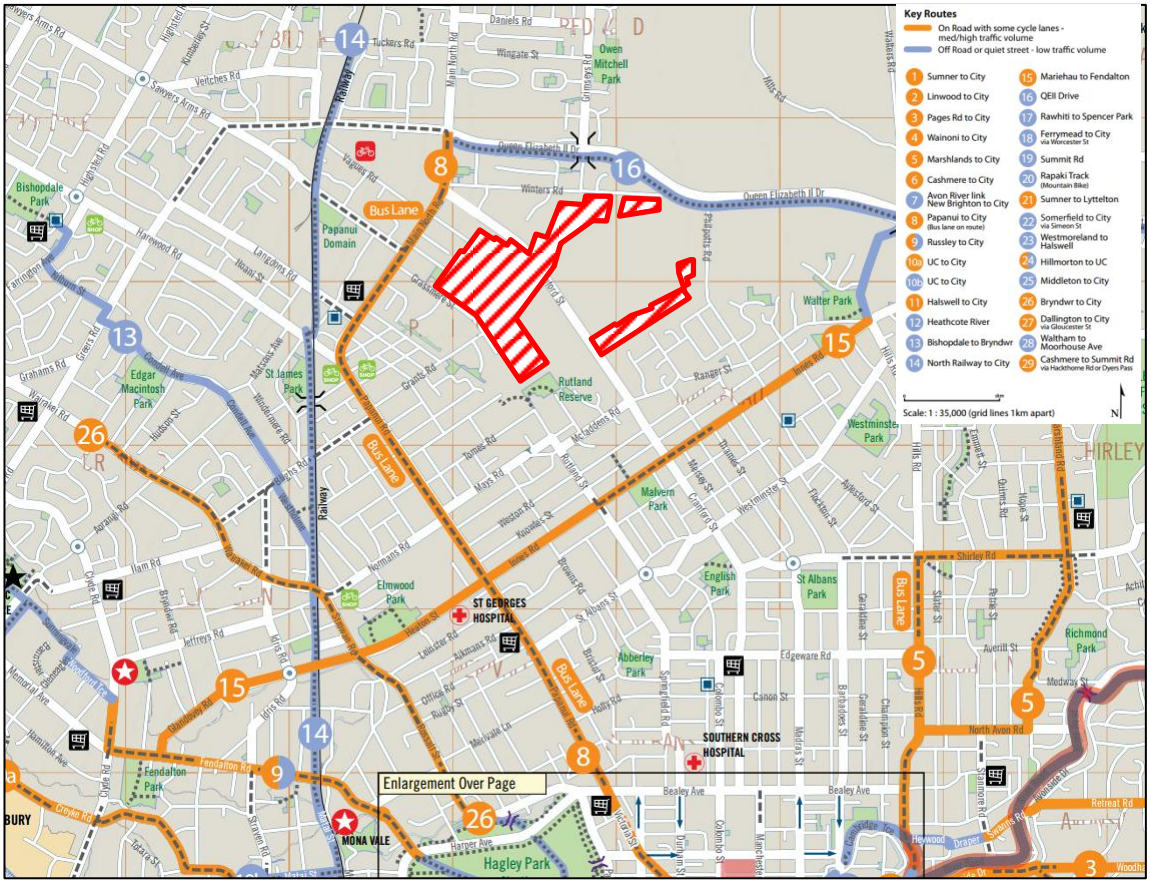

Figure 9.2: Existing (2012) Cycle Routes Network in Relation to Proposed Urban Zoning

9.2.2 The key existing facilities that would serve the site are:

- Papanui Rd / Main North Rd cycle lane shared with the bus lane;
- The North Railway to City off-road cycle path;
- The QEII Drive off-road cycle path; and
- The Innes Rd cycle lanes.

9.2.3 Council are currently planning, designing and implementing a network comprising 13 Major Cycle Routes (MCR). These are illustrated in the following diagram.

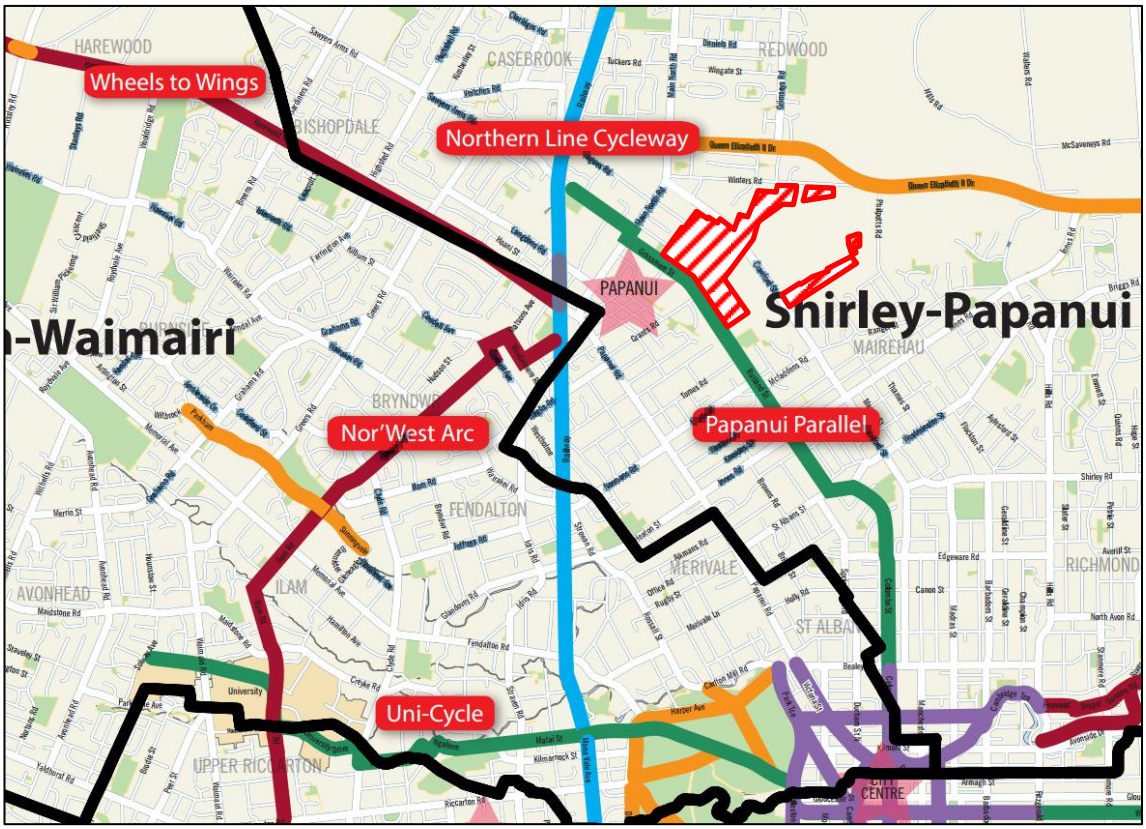

Figure 9.3: Major Cycle Routes Network in Relation to Proposed Urban Zoning

9.2.4 The Papanui Parallel route would provide highly convenient, direct access to the proposed urban zoning, connecting the site to the Central City. The Papanui Parallel is one of the first four routes to be built and Council's current programme is for this to be completed by 2017.

9.2.5 The Northern Line route would see an extension of the current north Railway route, north of Tuckers Rd and south to Blenheim Rd. Council have applied for funding for this project to be completed in the 2018/19 financial year.

9.2.6 We note that no cycle facilities exist or are planned on Cranford Street. It is therefore considered essential that a highly convenient crossing facility is provided of Cranford Street, connecting the northern and southern portions of the proposed urban zoning. Given the forecast traffic volumes on Cranford Street and the close proximity of such a crossing facility (connecting the northern and southern portions of the zoning) and the proximity to the proposed Cranford St / NAX intersection, our assessment at this high-level stage is that this should be grade-separated (an overpass or underpass).

9.2.7 The proposed Papanui Parallel MCR provides an excellent opportunity to provide good accessibility of the site to/from the surrounding residential areas to the south-east (and beyond) in the absence of a road connection. Naturally, the transport network for the site should be designed with frequent pedestrian and cycle access to this route and conversely minimise the number of vehicle conflicts with the route.

9.2.8 As noted above in relation to public transport accessibility, it is highly desirable that

improved cycle / pedestrian links are provided to the northwest of the site (e.g. Shearer Avenue and Meadow Street) in order to provide convenient access to Main North Rd with the employment, shopping and recreational trip opportunities that exist, particularly associated with Northlands Mall.

9.3 Walking

9.3.1 As illustrated within Figure 9.1 above, the site is well located for pedestrian access to Main North Rd to provide convenient access to a high-quality public transport corridor, but also for employment, shopping and other recreational purposes associated with Northlands Mall and the surrounding area.

9.3.2 As noted above under ‘Cycling’ the internal network should be designed to provide high-quality pedestrian linkages to the residential areas to the north-west and south-east of the site, the proposed Papanui Parallel to the south-west and the recommended pedestrian crossing of Cranford Street for access to/from the portion of the proposed urban zoning to the north of Cranford Street.

10 Wider Consideration of Transport Issue Affecting Landuse Choice

10.1 Chapter 8 has considered the effects of alternative land-uses on the operation of the surrounding road network, with Chapter 9 providing an assessment of the accessibility of the area in terms of public transport, cycling and walking. This Chapter briefly considers some of the wider transport-related issues and implications of the alternative land-uses assessed. For the sake of brevity, the issues and implications are bulleted for each land-use scenario.

10.2 Scenario 1: Low Density Residential 200 households

- Residential zoning is highly compatible with the existing surrounding residential land-uses in terms of traffic effects (minimal heavy vehicles and noise)
- Residential zoning is well located for local public transport, employment, shopping and recreational activities
- A relatively small number of households does not realise the full potential of the site for being serviced by, or having access to, high quality public transport or the MCRs
- In the longer-term, adverse traffic effects (congestion, emissions) for this location which is encompassed by existing urban areas are likely to be less than for residential development more remote from the Central City. More remote Greenfield Sites or locations within Selwyn or Waimakariri District will generally be less accessible to public transport and employment centres, resulting in a greater number of vehicle.kilometres travelled by private vehicles, with an associated economic, environmental and social cost.

10.3 Scenario 2: Low Density Residential 750 households

- Residential zoning is highly compatible with the existing surrounding residential land-uses in terms of traffic effects (minimal heavy vehicles and noise)
- Residential zoning is well located for local public transport, employment, shopping and recreational activities
- In the longer-term, adverse traffic effects (congestion, emissions) for this location which is encompassed by existing urban areas are likely to be less than for residential development more remote from the Central City. More remote Greenfield Sites or locations within Selwyn or Waimakariri District will generally be less accessible to public transport and employment centres, resulting in a greater number of vehicle.kilometres travelled by private vehicles, with an associated economic, environmental and social cost.

10.4 Scenario 3: Medium Density Residential 1500 households

- Residential zoning is highly compatible with the existing surrounding residential land-uses in terms of traffic effects (minimal heavy vehicles and noise)
- Residential zoning is well located for local public transport, employment, shopping and recreational activities
- A relatively large number of households realises the full potential of the site for being serviced by, or having access to, high quality public transport or the MCRs,

thereby gaining full advantage of investment in cycle and public transport services.

- In the longer-term, adverse traffic effects (congestion, emissions) for this location which is encompassed by existing urban areas are likely to be less than for residential development more remote from the Central City. More remote Greenfield Sites or locations within Selwyn or Waimakariri District will generally be less accessible to public transport and employment centres, resulting in a greater number of vehicle.kilometres travelled by private vehicles, with an associated economic, environmental and social cost.

10.5 Scenario 4: General Industrial + Low Density Residential

- Industrial zoning is not compatible with the existing surrounding residential land-uses in terms of traffic effects (Heavy vehicles and noise)
- Industrial zoning does provide further employment opportunities within close proximity to residential areas, maximising opportunities for walking and cycling
- However, analysis of employment capacity for land already zone for employment purposes in the Greater Christchurch area suggests that ample Greenfield Land has already been zoned, such that by 2041, Greenfield employment areas would only be at around 30% of their employment capacity.[2] An over-supply of land zoned for employment makes it difficult to effectively plan and manage the transport network due to the uncertainty regarding where development will actually occur. At the Greater Christchurch level, it does not provide a cost-effective basis for providing transport infrastructure (road upgrades, cycling, walking and public transport provision) with a dispersed pattern of trip making.
- Industrial zoning is well located for access by public transport services and proposed / existing cycling infrastructure
- In the longer-term, adverse traffic effects (congestion, emissions) for this location which is encompassed by existing urban areas are likely to be less than for industrial development more remote from the Central City. More remote Greenfield Sites or locations within Selwyn or Waimakariri District will generally be less accessible to public transport, cycling infrastructure and walking opportunities from surrounding residential areas, resulting in a greater number of vehicle.kilometres travelled by private vehicles, with an associated economic, environmental and social cost.

10.6 Scenario 5: Commercial + Low Density Residential

- The transport network associated with partial commercial zoning would need to be carefully managed to avoid adverse traffic effects on the remainder of the proposed residential zoning and surrounding existing residential community.
- Commercial zoning does provide further employment and shopping opportunities within close proximity to residential areas, maximising opportunities for walking and cycling

[2] Source: CAST Integration with CTM: Derivation of Landuse Inputs, May 2012. Table 8-6 and Figure 8-12.

- Commercial zoning is well located for access by public transport services and proposed / existing cycling infrastructure
- Similar to the concerns provided above regarding the over-supply of land for employment purposes, we are concerned that this argument could also apply to commercial premises. We have not, however, been involved in the assessment of the capacity of land supply specifically for commercial purposes. Due to the potential agglomeration benefits of the location of appropriate business types together in a central location, such as the Central City, from a sustainable transport perspective, it is recommended that consideration be given to adopting Plan Change rules to limit the degree of office-related development at this urban fringe location, which is considered to be better suited to residential activities.

11 Summary and Conclusions

11.1 This Memo sets out the rationale in developing a draft transport network for the proposed Cranford Basin urban zoning, the likely effects on the traffic network of five alternative land-use assumptions and a high-level assessment of the area in terms of public transport, cycling and walking. Due to the time constraints for this assessment, it does not constitute a full Integrated Transport Assessment and there are some limitations in the modelling methodologies applied.

11.2 An initial road network was identified that provided direct linkage via a Collector Rd between the portions of the proposed urban zoning either side of Cranford Street. Initial modelling and further consideration of the implications of the new intersection proposed at the Cranford Street / Northern Arterial Extension would suggest that this direct general-traffic linkage, via a four-way intersection, is not workable on safety and efficiency grounds.

11.3 Accordingly, a second road network has been developed, effectively with staggered T-intersections on Cranford Street serving the northern and southern portions of the proposed urban rezoning. This has formed the basis of the main 'effects'-based assessment of the five alternative land-use scenarios modelled and reported here.

11.4 The five alternative land-use scenarios assessed are summarised as follows:

1) 200 low-density households
2) 750 low-density households
3) 1500 medium-density households
4) The southern portion as Industrial (the smaller northern portion as low density residential)
5) Part of the southern portion as 30,000m^2 GFA Commercial (Large Format Retail assumed), the remainder of the southern portion and the northern portion as low density residential)

11.5 Traffic modelling has been conducted using Council's CAST traffic model for the horizon years of 2021 (pre-Northern Arterial and Extension) and 2031 (with Northern Arterial and Extension) for the AM and PM peak hours.

11.5.1 At 2021, for Scenario 1 (200 hh), there are measurable impacts at a number of locations on the surrounding road network for which no simple mitigation measures have been identified. Because these locations are already operating at LoS E or F in the base model, these impacts are considered potentially significant, particularly as there are safety consequences of large delays on give-way approaches to intersections. It is somewhat subjective as to whether the scale of impacts is considered minor, or more than minor. At this stage, our recommendation would be not to allow for zoning that could exacerbate existing efficiency and associated safety issues on the road network at 2021 without either mitigating these effects or undertaking more detailed analysis to confirm these initial findings.

11.5.2 At 2021, for Scenario 2 (750hh), the scale of the impacts at a number of locations on the local road network is considered significant (more than minor). Scenarios 2 to 5 all have a large traffic generation potential and it is recommended that in the absence of more detailed analysis that zoning rules are implemented that constrain the amount of development that could occur prior to the Northern Arterial (NA) and Extension (NAX) being implemented.

11.5.3 At 2031, the locations of significant delay increases for Scenarios 1 and 2 do not occur due to the relief to these bottlenecks brought by the NA & NAX. The modelling would suggest that the effects of Scenarios 1 and 2 on the surrounding road network are minor.

11.6 At 2031, the traffic effects for Scenario 3 (1500 hh) are also generally minor. The modelling does however indicate some potentially significant increases in delays and border-line performance of some minor road approached to Papanui Rd.

11.7 For Scenario 4 (with industrial zoning south of Cranford Street) projected traffic volume increases on Grants Rd are large at up to 7,000 vpd. Whilst modelled network impacts are generally minor, the modelling does suggest that some form of local area traffic management and intersection upgrades would be required to mitigate potential impacts on the minor road approaches to Papanui Rd (e.g. Wyndham St, Dormer St and Perry St).

11.8 Scenario 5 (some commercial zoning south of Cranford Street) has projected traffic volume increases on Grants Rd of up to 6,000 vpd at 2031. As with Scenario 4, the modelling does suggest that some form of local area traffic management and intersection upgrades would be required to mitigate potential impacts on the minor road approaches to Papanui Rd (Wyndham St, Dormer St and Perry St). The main access to the commercial / residential development on the south side of Cranford Street was assumed to be a roundabout in all options. This roundabout works in tandem with the assumed Left-In, Left-Out intersection serving the northern portion of the proposed urban zoning by accommodating U-turning movements. Under Scenario 5, the assumed two-circulating roundabout is at LoS F on the Collector Rd approach in the PM peak hour. An alternative configuration assuming a large signalised intersection indicates satisfactory performance but may not accommodate U-turners satisfactorily.

11.9 Assessment of the site in terms of public transport, cycling and walking accessibility indicates that it is well located to take advantage of existing and proposed investment in high quality Public Transport (PT) services and cycling infrastructure. Further development of an ODP should include extensive cycling and walking linkages to capitalise on the high quality PT and cycling routes and to provide good accessibility to the neighbouring residential areas to the north-west and south-east of the site where accessibility by road corridors is otherwise poor.

11.9.1 We note that no cycle facilities exist or are planned on Cranford Street. It is therefore considered essential that a highly convenient crossing facility is provided of Cranford Street, connecting the northern and southern portions of the proposed urban zoning.

Given the forecast traffic volumes on Cranford Street and the close proximity of such a crossing facility (connecting the northern and southern portions of the zoning) and the proximity to the proposed Cranford St / NAX intersection, our assessment at this high-level stage is that this should be grade-separated (an overpass or underpass).

11.9.2 Our overall assessment of the transport implications of alternative land-use scenarios is that a high number of residential households (Scenario 3) would be the preferable use of the proposed urban zoning. Residential zoning is highly compatible with the existing surrounding residential land-uses in terms of traffic effects (minimal heavy vehicles and noise compared to industrial and commercial uses).

11.9.3 Residential zoning is well located for local public transport, employment, shopping and recreational activities. A relatively large number of households realises the full potential of the site for being serviced by, or having access to, high quality public transport or the Major Cycle Routes, thereby gaining full advantage of investment in cycle infrastructure and public transport services.

11.9.4 In the longer-term, adverse traffic effects (congestion, emissions) for this location which is encompassed by existing urban areas are likely to be less than for residential development more remote from the Central City. More remote Greenfield Sites or locations within Selwyn or Waimakariri District will generally be less accessible to public transport and employment centres, resulting in a greater number of vehicle.kilometres travelled by private vehicles, with an associated economic, environmental and social cost.

11.9.5 An over-supply of land zoned for employment (as implied by analysis previously conducted by QTP in the preparation of landuse inputs for the regional CTM transport model) makes it difficult to effectively plan and manage the transport network due to the uncertainty regarding where development will actually occur. At the Greater Christchurch level, it does not provide a cost-effective basis for providing transport infrastructure (road upgrades, cycling, walking and public transport provision) with a dispersed pattern of trip making.