
Memorandum

To: Mike Calvert

From: Paul Roberts

Subject: North-East Papanui Outline Development Plan Transport Assessment

Date: Friday 8th December 2016

Copy: Sarah Oliver

Dear Mike,

Thank you for asking QTP to assist with the transport assessment you require as an input to the Outline Development Plan (**ODP**) for North-East Papanui, currently being developed by Christchurch City Council (**CCC**). The ODP seeks to integrate the various facets of a proposed residential development, in accordance with the proposed Replacement District Plan (**pRDP**) and the Regional Policy Statement.

This assessment provides a technical basis for input into the ODP development. In particular it seeks to ensure a comprehensive, fully connected road network that can serve the North-East Papanui area is ultimately enabled and whose design has been supported through testing and consideration of various road network options.

This assessment is also required to demonstrate whether any adverse traffic effects on the local (and wider) network of the draft ODP and proposed residential densities are no more than minor. Should modelling demonstrate otherwise, then mitigation measures should be suggested. These might include (but are not limited to): maximum household numbers; less residentially zoned land; lower densities; or limits on development before the Northern Arterial (or other network improvements) is completed. A short discussion on the positive effects of the location of the proposed residential zoning relative to the Key Activity Centre (**KAC**), high frequency bus routes and major cycleway is also to be provided.

Investigations into potential road network options for the Residential area have previously been considered in reports provided to CCC by QTP. These being:

- Cranford Basin Proposed Rezoning Transport Assessment – 2 April 2015
- Cranford Basin Submissions Transport Modelling and Access Review Memorandum – 1 December 2015
- Statement of evidence of Tim Wright before the Replacement Christchurch District Plan Hearings Panel – 10 December 2015

Whilst these previous (transport) investigations do provide a good starting point from which to demonstrate a high-level consideration of the transport effects of the zoning now proposed, it is noted that Council have since further developed their thoughts on what may be the most-appropriate road network and land use (type and density) for the area, based not only on the previous transport advice but a wider range of relevant urban planning considerations.

This investigation therefore uses the latest design changes as the starting point for its updated assessment. Specifically, it should be noted that the issues previously raised around the Case and Croziers land and other land to the north of Cranford Street do not need to be addressed in this commission.

1 Scope of Assessment

1.1 The draft ODP landuse and network provided as the basis for this updated assessment is shown in Figure 1-1.

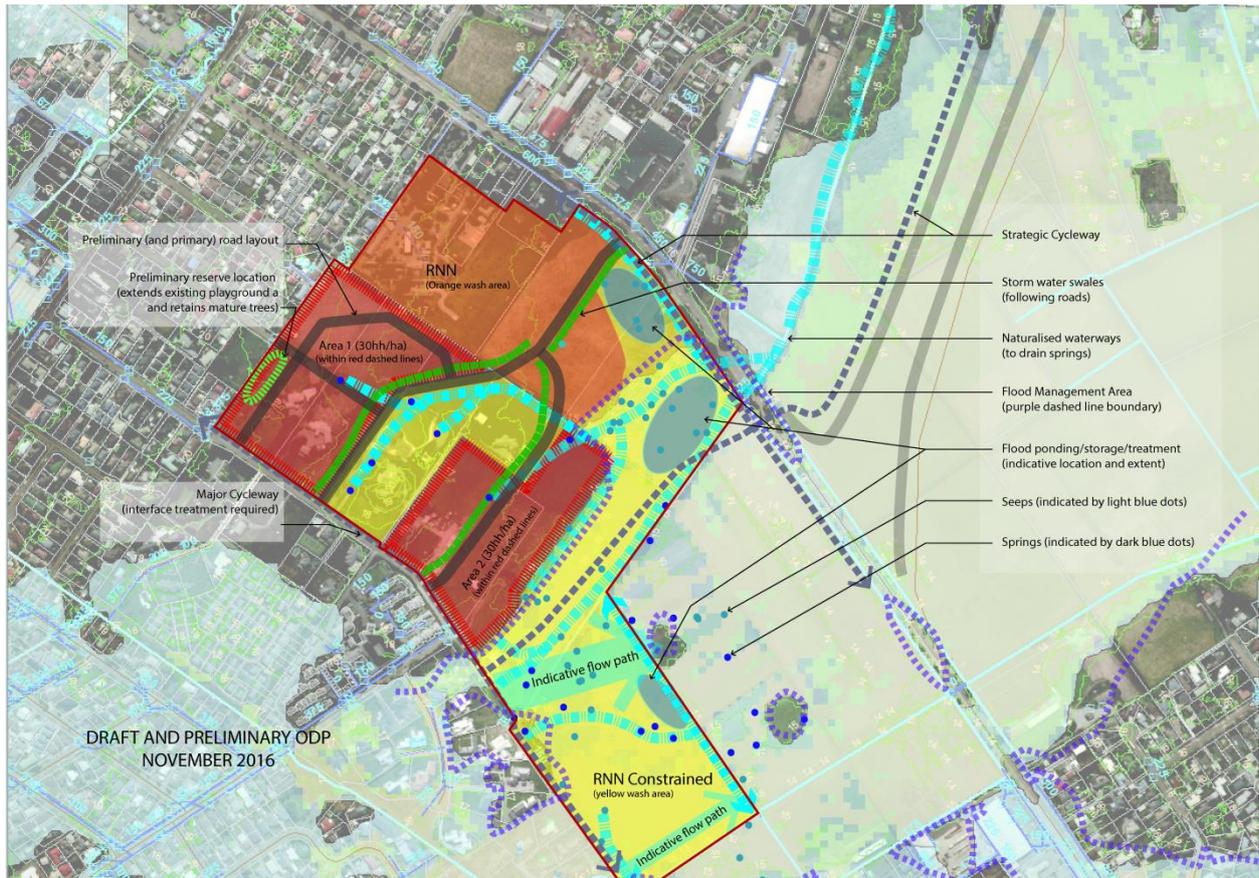


Figure 1-1: Draft North-East Papanui Outline Development Plan landuse.

1.2 The specific requirements of this assessment are to:

- Refine base and do something networks for the draft ODP (using 2016 network with 2021 demands to indicate potential effects prior to the Northern Arterial (**NA**) / Northern Arterial Extension (**NAE**) and the 2031 model to assess longer-term effects (with NA/NAE);
- Estimate the traffic demands for the proposed development;
- Analyse the effects and identify mitigation measures (if necessary);
- Include high level accessibility, multi-modal and integrated transport considerations (as canvassed in the April 2015 assessment); and
- Provide a short Technical Report (this memo) summarising the assumptions, methodology and findings.

1.3 As with the previously-reported assessments, the traffic modelling conducted to inform this assessment has used Council's Christchurch Assignment and Simulation Traffic (**CAST**) model. Since the previous assessments however, this model has undergone a comprehensive update, in terms of both networks and future land use assumptions. This study therefore both makes use of the latest version of the model (**v16a**) as the basis for assessment, as well as reflecting the land use and transport network design changes within the draft ODP illustrated above.

2 Methodology

2.1 As for the previous assessments, this study has involved modelling the transport (traffic) impacts of increased household numbers adjacent to existing residential areas.

2.2 The CAST model is considered a reasonable basis for identifying the (principal) potential effects on the local (and wider) road network. This assignment and simulation traffic 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.

2.3 Our assessment has been conducted for the weekday morning and evening peak hours, these being 07:30-08:30 and 16:30-17:30 respectively. Assessments have been conducted for these periods at both a potential 'short-term' (2021) and the 'medium-term' (2031) horizons.

2.4 The basis for the potential 'short-term' (2021) horizon is however the existing (2016) v16a CAST network model, to which forecast (v16a) 2021 traffic demands have been applied.

2.5 The rationale behind this is the use of the 2016 road network provides a suitable base by which to assess the potential impact of the proposed ODP area *prior* to completion of the Northern Arterial, Northern Arterial Extension (**NAE**) and Cranford Street Upgrade (**CSU**), which together are hereafter referred to collectively as the Christchurch Northern Connections (**CNC**).

2.6 This network thus provides the basis to consider the potential land use scenarios (with and without the ODP) either:

- should the implementation of the CNC schemes be deferred beyond the currently-anticipated timeframes; and/or
- whether and of what scale any limitations might be appropriate on ODP development, prior to their completion: The existing (v16a) 2021 network model assumes that all of these major infrastructure schemes *will* be completed by 2021 and removal of the schemes from this network (to reflect a potential 'pre-Northern

Connections' network') would have been much less-expedient than adoption of the existing 2016 network as a base for an appropriate network.

2.7 Consistent with our previous assessments, the base model distribution of the trips of residential areas surrounding the ODP area is considered a reasonable basis for the distribution of ODP residential trips under increased traffic generation.

3 Traffic Demands

3.1 The draft ODP now contemplates development that differs from the six potential land use scenarios assessed through previously-reported transport investigations. Thus the current draft ODP landuse is reported upon here as a single additional (landuse) scenario ('Scenario 7').

3.2 The trip rates adopted to determine traffic demands for this scenario are however consistent with those applied for previous assessments. These are shown, along with the revised assumed potential residential household (hh) yields, in Table 3.1.

ODP Area	Gross Area (ha)	Net Area (ha)	Density (hh/ha)	HH Yield	Rate	Trip Rates (VPH/hh)					
						AM		PM		AM	PM
						From	To	From	To	2-Way	2-Way
Area 1 (RMD)	5.1	3.6	30	107	Med	0.44	0.18	0.31	0.49	0.62	0.80
Area 2 (RMD)	4.8	3.3	30	100	Med	0.44	0.18	0.31	0.49	0.62	0.80
Area 3 (RNN)	7.1	5.0	15	74	Low	0.76	0.31	0.46	0.72	1.07	1.18
Area 4 (RNN Constrained)	16.0	11.2	8	89	Low	0.76	0.31	0.46	0.72	1.07	1.18
Total ODP Area	32.9	23.0	16.1	370		0.62	0.25	0.39	0.62	0.87	1.01

Table 3.1: Adopted Yields and Trip Rates for Traffic Generation

3.3 The above yields and trip rates translate to the anticipated traffic generation shown in Table 3.2.

ODP Area	HH Yield	Vehicle Trips (VPH)					
		AM		PM		AM	PM
		From	To	From	To	2-Way	2-Way
Area 1 (RMD)	107	81	33	49	77	114	126
Area 2 (RMD)	100	76	31	46	72	107	118
Area 3 (RNN)	74	33	13	23	36	46	59
Area 4 (RNN Constrained)	89	39	16	28	44	55	71
Total ODP Area	370	229	94	146	229	323	375

Table 3.2: ODP Traffic Generation

3.4 We note that the total generation now anticipated thus falls towards the lower-end of the spectrum of the 6 scenarios previously assessed. These ranged from a total yield of 200hh (exclusively residential), with estimated PM peak hour traffic generation of 236vph, up to a potential commercial and residential scenario (over a wider area), which was anticipated to potentially generate up to 1,610vph.

3.5 As with the previous assessments:

- Adopted 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.

- All traffic generation is assumed to be additional to the adjusted base-case¹ 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.
- 3.6 The development area has been represented by four new zones coded into the model to the south of Cranford Street, representing each of the areas identified in Figure 1-1 and the tables above. The distribution of trips to these areas is based on the aggregate distribution of trips to and from surrounding residential areas (or model zones).
- 3.7 In addition to the potential traffic generated by development within the ODP area, a further zone (#3068) has also been added, to more precisely reflect the *existing* development (within zone #3061) serviced *only* by Shearer Avenue: Given that the outline ODP draft primary road network now proposes a connection to this street, this model modification thus allows any potential increase in demand, given the ODP, to be identified and reported upon.
- 3.8 Finally, the base (v16a) demands have been slightly modified in selected areas² surrounding the ODP, to reflect the potential for development up to the densities now anticipated in the pRDP and in particular the 'RMD' areas to the south-west. These modifications have been applied to provide an updated base for assessment of the incremental effect of the potential residential development within the ODP alone.

¹ The generic CAST models have been adjusted (in terms of both network and demand) to form an appropriate evaluation base ('without-ODP') for this ODP assessment, as explained below.

² CAST zones #3051, 3052, 3063, 3074, 3075 & 4411.

4 Road Networks Assessed

4.1 As shown in Figure 1-1, the Council have provided an initial conceptual primary road network which has been used as the basis of the traffic modelling conducted to inform the assessment of effects reported here. The model networks adopted, given implementation of the ODP are illustrated in the following diagrams.



Figure 4-1: Initial Road Network ('2021' with ODP – No CNC)

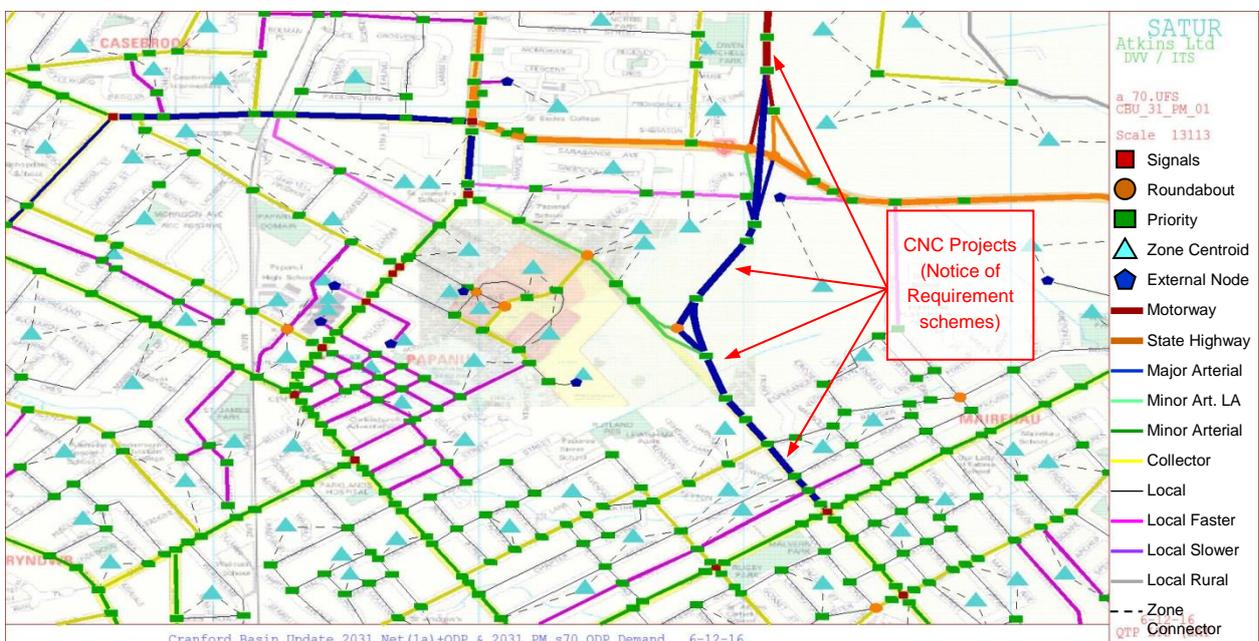


Figure 4-2: Initial Road Network (2031 with ODP – CNC in place)

4.2 It might be noted from both the above two diagrams (which illustrate the initial 'with-ODP' networks used for this assessment), that:

- The starting point is the 'generic' (official v16a release) CAST networks, being the 2016 (used for assessment under 2021 demands) and 2031 networks.

- To form a modified base for this assessment (the ‘without-ODP’ scenarios), the v16a-version generic networks have been modified with respect to:
 - Disaggregation (splitting) of zones within and adjacent to the ODP area, as noted in paragraph 3.7.
 - Addition of Shearer Avenue (given the potential with-ODP connection);
 - Addition of the westbound-eastbound U-turn proposed on QEII Drive east of Main North Road (given CNC proposed Outline Plan changes described further below);
 - Addition of a signal crossing between Grassmere Street and Sawyers Arms Road planned as part of the Papanui Parallel Major Cycle route (**MCR**), (given this scheme is presently under construction); and
 - Addition of the nodes where the ‘with-ODP’ network would intersect with the base network, in order to allow consistent illustration of differences between ‘with-ODP’ and ‘without-ODP’ scenarios.
 - For the ‘with-ODP’ networks, priority intersections have (initially) been assumed at the interface between all connections between the primary ODP network and Grassmere Street, whilst a roundabout intersection has been assumed with the single connection assumed with Cranford Street. These initial assumptions reflect potentially-appropriate forms, given the anticipated demands on the respective roads.
 - The layout on the wider road network shown in Figure 4-2 reflects the CNC schemes which were considered when the Notice of Requirements (**NoR**) for both the Northern Arterial and NAE were considered and approved following hearings in 2015. It is the NoR proposals which are reflected within the current v16a CAST generic future models (v16a) and which form the starting point for this updated assessment.
- 4.3 More recently however, the NZ Transport Agency and CCC have submitted Outline Plans for the CNC works which reflect modified arrangements (compared with those presented within the respective NoRs). These are currently being processed under s176A of the Resource Management Act and no decisions have yet been made to the Requiring Authorities, as to whether and what modifications to their Outline Plans may be recommended.
- 4.4 The principal CNC Outline Plan changes within the vicinity of the ODP now proposed by the Requiring Authorities are illustrated within Figure 4-3. Those with the greatest potential to affect traffic flows around (and through) the ODP area are:
- The proposed removal of a southbound right-turn option from the NAE to Cranford Street (north) at the proposed roundabout;
 - Removal of the northbound slip lane bypassing the Cranford/NAE roundabout; and
 - The proposed removal of a southbound traffic lane from the western NA/QEII Drive Roundabout to Winters Road; this being substituted by the proposed opening of a Left In/Left Out (LILLO) intersection at the intersection of QEII Drive and Grimseys Road (south).

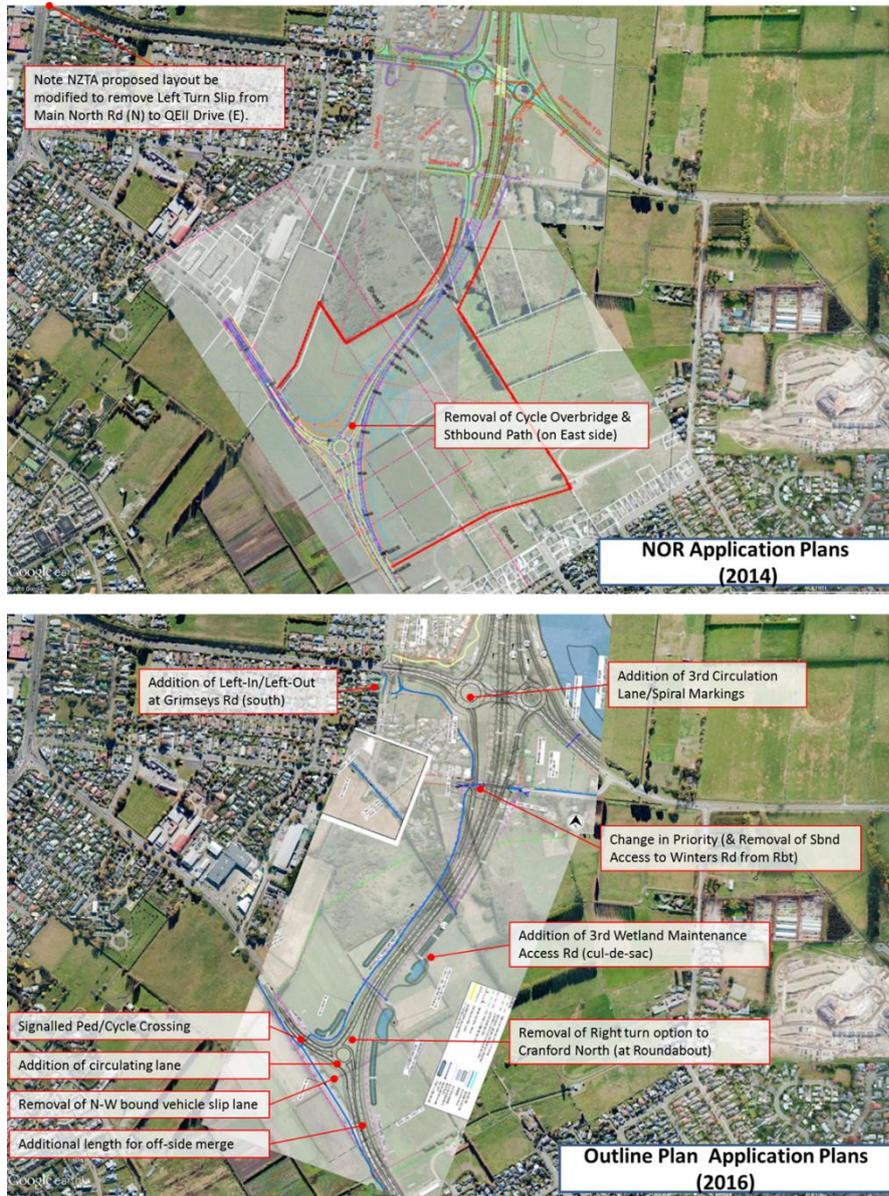


Figure 4-3: Local Changes Proposed within CNC Project Outline Plans (cf NoR)

4.5 These changes have therefore been examined through further network model runs, to illustrate the potential impact of these changes with and without the ODP (in 2031 only) – and indicate any changes which may be of significance for the ODP assessment, which is the focus of this investigation.

4.6 Finally, the ‘with-ODP’ networks have been (briefly) examined to illustrate whether and to what extent additional traffic-calming measures might limit any ‘extraneous’ (non-ODP) traffic that could be attracted to travel through the ODP area (with the potential to affect the amenity of both the ODP and surrounding residential areas). These measures have been reflected (notionally³), through the addition of further roundabout intersections, at the ODP interface with Grassmere Street, illustrated by the model

³ Potential traffic-calming measures could be more extensive, if required but examination of multiple options is beyond the scope of the current study.

network diagram shown in Figure 4-4.

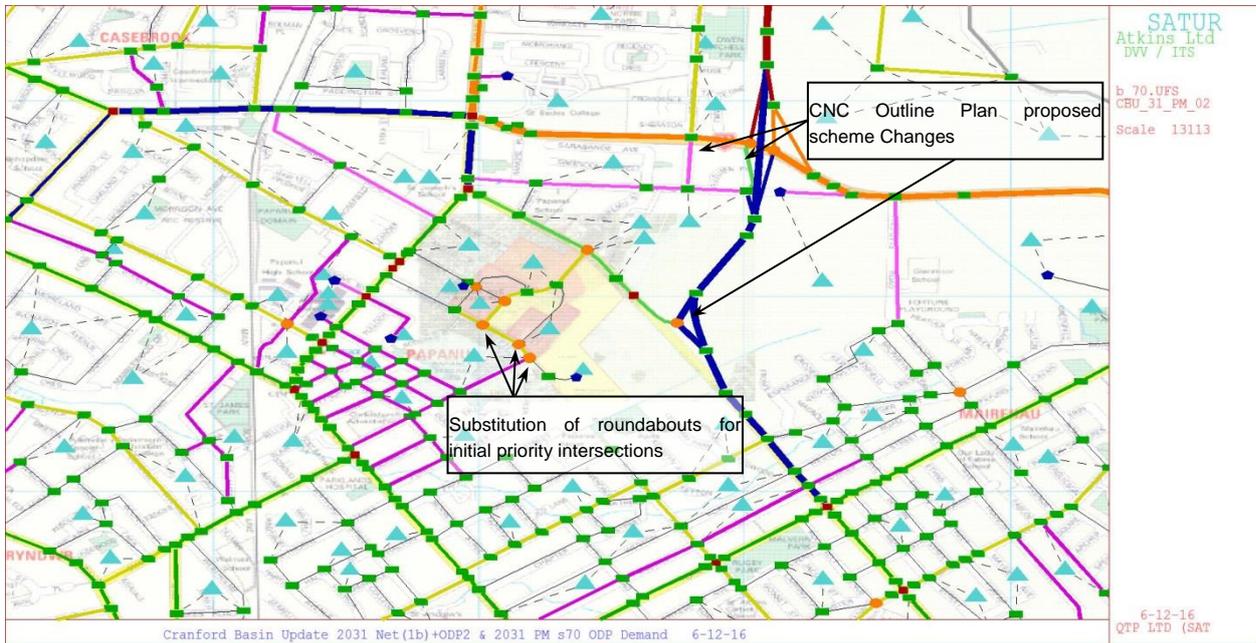


Figure 4-4: Modelled Network showing CNC Outline Plan Changes and modified ODP Intersections

4.7 A summary of all demand/network scenarios assessed (each being modelled for both AM and PM peak hours in the relevant years) is presented, together with the relevant network file references in Table 4.1.

Demand Scenario	Without ODP	With ODP
2021	No CNC <i>CBU_16_**_00a_00</i>	No CNC <i>CBU_16_**_01a_70</i>
		No CNC, Grassmere Rbts <i>CBU_16_**_02a_70</i>
2031	With CNC (NoR Schemes) <i>CBU_31_**_00a_00</i>	With CNC (NoR Schemes) <i>CBU_31_**_01a_70</i>
	With CNC (OP Schemes) <i>CBU_31_**_00b_00</i>	With CNC (OP Schemes) <i>CBU_31_**_01b_70</i>
		With CNC (OP Schemes) + Grassmere Rbts <i>CBU_31_**_02b_70</i>

** refers to the time period modelled ('AM' or 'PM' Peak hour)

Table 4.1: Summary of Modelled Assessment Scenarios (Network references in italics)

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 ODP rezoning.

5.2 The following diagrams provide an indication of modelled daily traffic volumes⁴ 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).

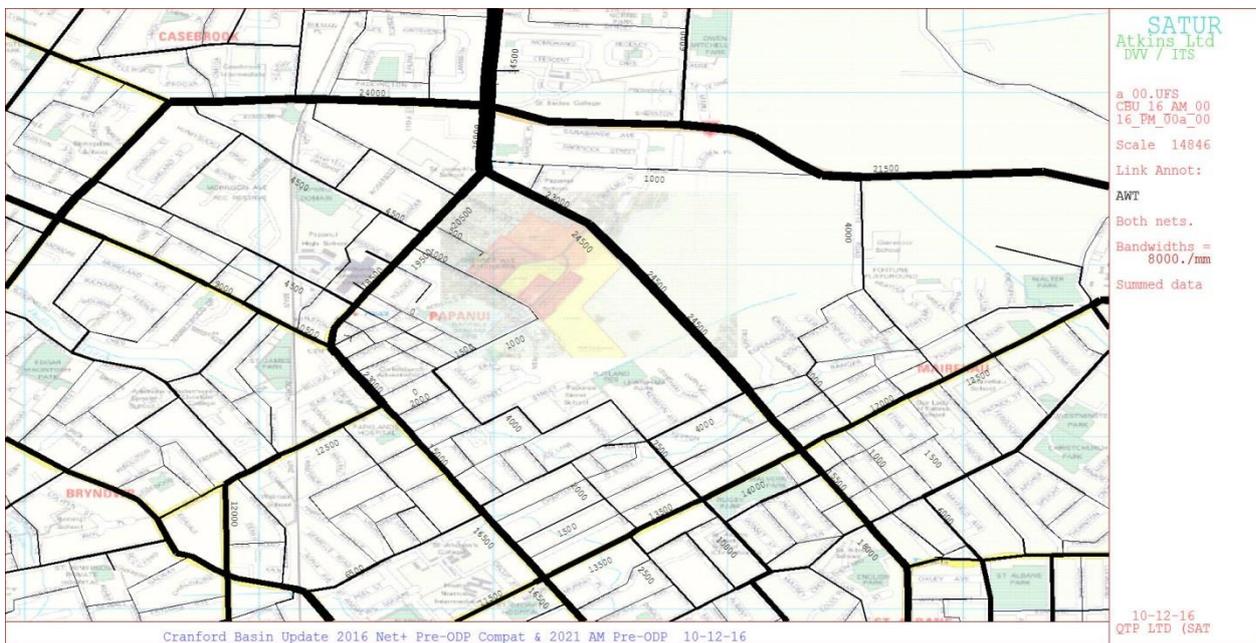


Figure 5-1: Modelled Daily Traffic Volumes 2021 (no Northern Arterial and Extension)

⁴ Estimated from CAST AM and PM peak hour modelling



Figure 5-2: Modelled Daily Traffic Volumes 2031 (with CNC - NoR Schemes)

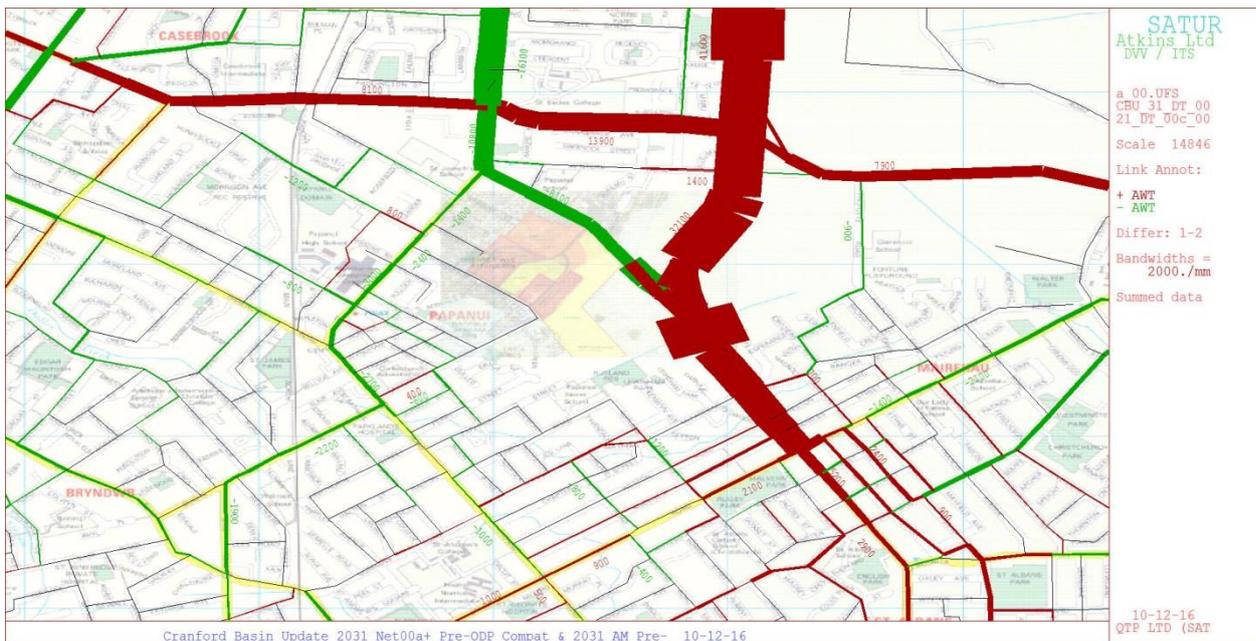


Figure 5-3: Modelled Change in Daily Traffic Volumes 2031 vs. 2021

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 NAE and Cranford Street (an increase of 21,500 vpd and reducing as progressing southbound along Cranford Street);
- Reductions in traffic volumes on Cranford Street to the north of the NAE roundabout of around 8,000 vpd;
- Decreases on Main North Rd south of Cranford Street (around 1.5-3,000 vpd); and
- No significant change in traffic volumes on Papanui Rd, south of Blighs Road.

6 Principal Connection to Cranford Street

- 6.1 This traffic modelling has assumed a single-lane (3-arm) roundabout would provide the intersection of the proposed Collector Rd serving the proposed ODP and Cranford St.
- 6.2 The modelling indicates that the roundabout would be approaching practical capacity⁵ on several approaches for the updated ODP scenario modelled in 2021 - should the CNC projects not be implemented by this time, but the ODP were to be fully-developed ahead of this, to now-proposed densities. However, on completion of the CNC projects, with reduced traffic volumes on this section of Cranford Street, such a roundabout is forecast to operate (in 2031) with modest delays, in both (AM and PM) peak hours.

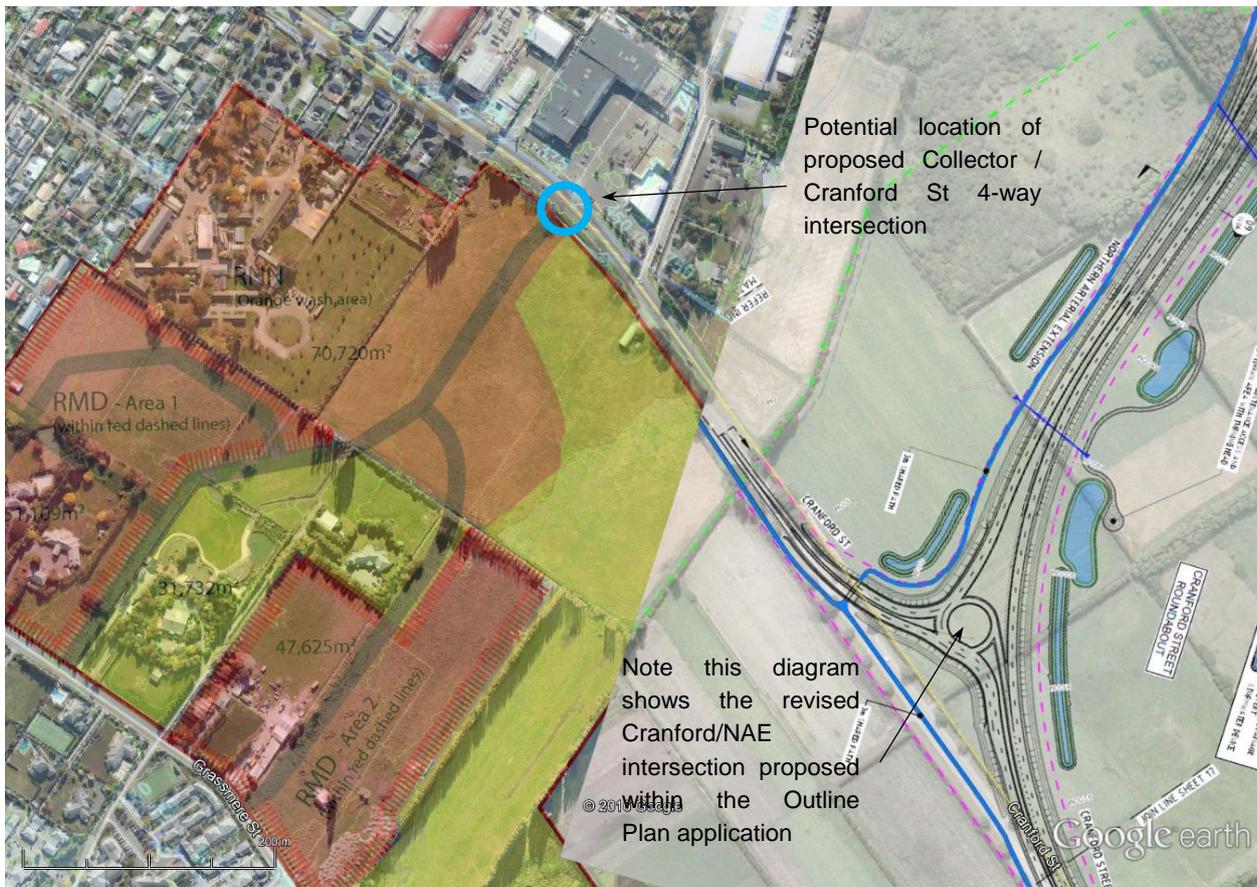


Figure 6-1: Location of Potential Cranford St/ODP Intersection Relative to the NAE

- 6.3 We note that the roundabout location has been shifted north under the updated draft ODP, such that it is now located around 400m north of a proposed (signalled) cycle/pedestrian crossing, to be located west of the Cranford/NAE roundabout⁶.

⁵ With peak ratio of flow to capacity of around 90%, resulting in average approach delays of around 32 seconds/veh.

⁶ Note that the previous potential roundabout location afforded the opportunity for a four-way intersection with a connecting link north to serve potential future development between the CRP zone and NAE. This created issues given the proximity to the potential merge from the northbound slip lane within the NoR NAE scheme, which has since been removed from the recently-submitted Outline Plan scheme.

- 6.4 This location (along with the revisions proposed to the NAE Outline Plan configuration) will remove the issues raised within our 2015 assessment regarding the potential weave between the NAE/Cranford roundabout and this principal ODP access, in the network adopted for the initial network assessed previously.
- 6.5 However, it should also be noted that within this round of modelling, we have not attempted to identify and specifically locate the demands from the Commercial Centre as the potential fourth arm of the Cranford/ODP roundabout - such demand being loaded to adjacent sections of Cranford St, as in the v16a base models. Therefore, for explicit recognition of the potential impacts of the ODP on access to and from this site (and confirmation of this preliminary modelling which indicates that a roundabout could form a suitable intersection form), we suggest that further detailed investigation is likely to be warranted at some point in the future, to confirm any detailed intersection design.
- 6.6 A further difference to the networks considered in previous modelling (which considered an ODP over a wider area than that which is now being contemplated), is that the potential link between Grimseys Road and Cranford Street assumed for that assessment now no longer forms part of the ODP area, nor thus the networks modelled to indicate the impact of the revised ODP. However, omission of this link does provide a suitable base, by which to assess the (reduced) accessibility that a more limited external connection network for the ODP may have.
- 6.7 The previous ODP assessments suggested that such a direct local network link between Cranford Street and QEII Drive may also have provided a conduit through which 'external' traffic (i.e. that not generated by the ODP land itself) may travel between QEII Drive and areas to the south and west of the ODP area - making use of the ODP road network. The revised CNC proposals (whereby a LILO intersection is now proposed to directly access QEII Drive to and from Grimseys Road south) may also have been expected to increase the potential for such 'rat-running' traffic further. Thus the omission of this link (from the network assumed), whilst it can be expected to reduce the accessibility to the ODP, is also likely to reduce the potential for additional traffic to be attracted to the network to the south and west of the ODP site.

7 Modelled Effects of Rezoning

- 7.1 As noted above, modelling for this updated assessment has been conducted for a single revised 'with-ODP' demand scenario. However, together with the 'without-ODP' demand scenarios, the modelling for 2021 and 2031 and various network configurations has resulted in a requirement for some 16 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 80 model plots have thus been generated.
- 7.2 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 only selected model outputs have been chosen to illustrate the results of the assessment and a summary chapter provided at the end of this Memo.

7.3 Base ('Without-ODP') Models

7.3.1 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 2021 and 2031 base models for the AM and PM peak hours (I.e. without the effects of the proposed rezoning). The approach-level delays 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 7-1: Link Delays and LoS, Base Model, 2021 AM Peak Hour

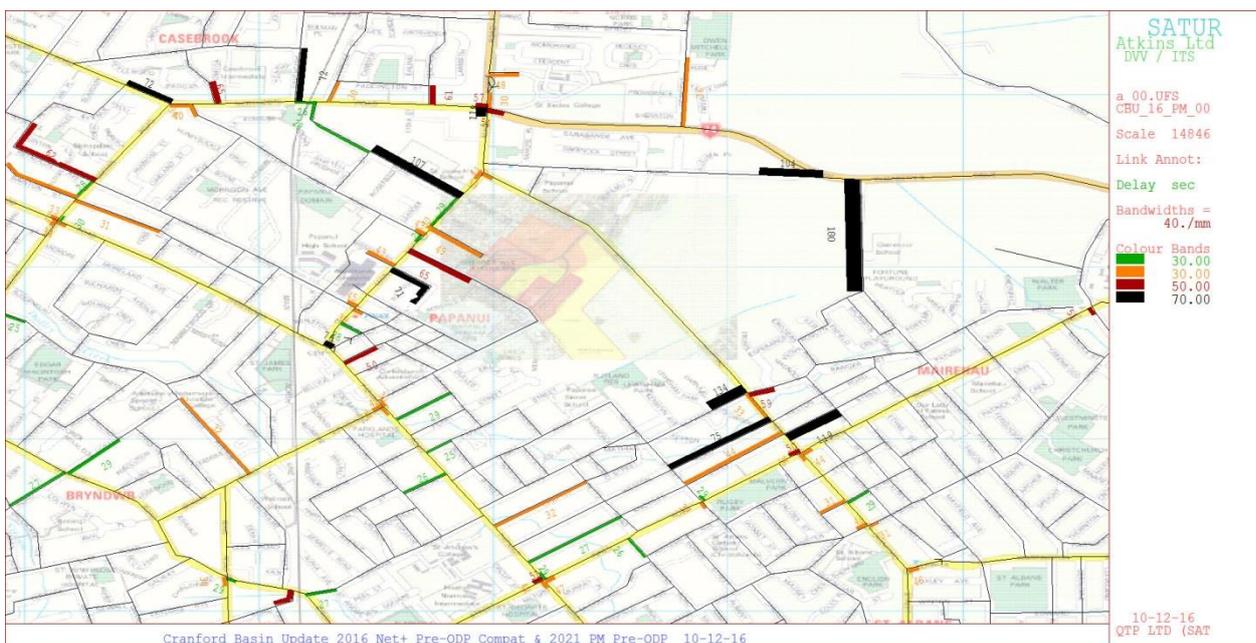


Figure 7-2: Link Delays and LoS, Base Model, 2021 PM Peak Hour

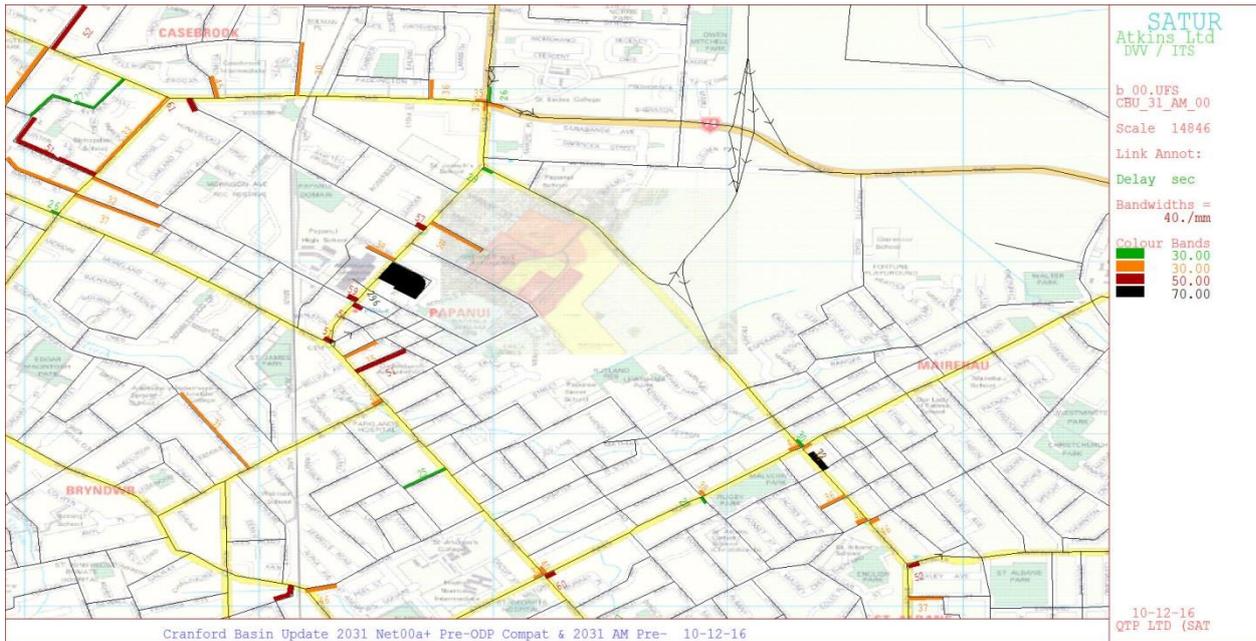


Figure 7-3: Link Delays and LoS, Base Model, 2031 AM Peak Hour

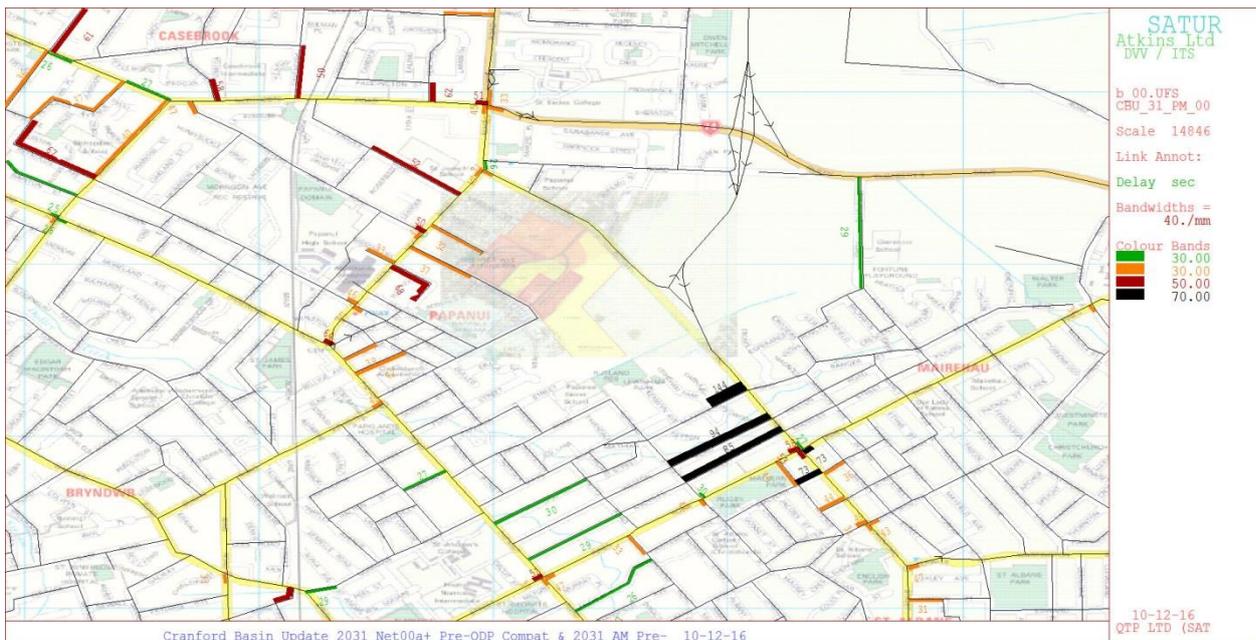


Figure 7-4: Link Delays and LoS, Base Model, 2031 PM Peak Hour

7.3.2 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;
- The modelled delays at Halliwell Avenue/Main North Road are forecast to be particularly severe, in the morning peak - even following the completion of the CNC projects. This arises due to a) higher demands within the v16a forecast matrices (compared to the previous ODP assessment base) of the area (model zone) served by Halliwell Avenue and Tulloch Place and b) The potential increase then applied to these, to allow for potential development of this area up to anticipated (RMD)

densities (30hh/ha, potentially yielding 190hh, compared with the v16 future model assumptions of around 130hh and a 2013 Census total of 115hh. Whether the assumed density and thus demand would ever eventuate is of course unknown, but such delays could be relatively easily addressed through signal phasing changes - albeit at some cost to delays from wither the Main North Road approaches (or the Northlands Mall access).

- Compared to previously-reported assessments there are also higher delays (at LoS F) forecast on the local road connections to Cranford Street between McFaddens Road and Innes Road, with the CNC in place.

7.3.3 For modelled base year daily traffic volumes, refer Figure 5-1 and Figure 5-2 above.

7.4 Scenario 7 (Draft ODP at 370 Households) – Prior to Completion of CNC Projects

7.4.1 The following diagram illustrates the potential changes in daily traffic volumes resulting from this scenario (2021, *without* completion of the CNC projects).



Figure 7-5: Changes in Daily Traffic Volumes, Draft ODP Scenario, 2021 (No CNC)

7.4.2 It may be seen that the forecast impacts, in terms of volume changes, are generally modest in extent. The additional traffic forecast on the local road network is greatest on Grants Road, east of Rayburn Ave. Existing volumes on this road rise up to around 1,600vpd (towards the eastern end) and these are in line with its current Local Road status. Given the full development of the draft ODP (by 2021, but without the CNC projects), this volume could rise up to around 4,400vpd. This is above a desirable volume for a Local Road – albeit being not untypical of many existing local roads in Christchurch, particularly those that serve a Collector Road function, even if they are not currently designated as such. Whilst such a volume is well within the carrying capacity of the road, the degree of increase is considered likely to be perceived by some residents as representing a significant impact. More detailed investigation would be required however, to determine whether such a volume would result in a more-than minor impact, in

practice, in terms of traffic safety and amenity, given the particular nature and crash record for this street.

- 7.4.3 It is also notable that the existing form of the intersection between Grants Road and Papanui Road as a LILO intersection (which serves to limit the traffic volumes carried, particularly at the western end of Grants Rd) does not currently reflect the full connectivity that might be expected at the intersection of a Minor Arterial (Papanui Road) and what might be anticipated as the potential status of Grants Rd (as a Collector rather than a Local Road), given development of the ODP. Modelling of the impacts of further network improvement scenarios, such as might be considered at the intersection, is beyond the limitations of the current study. We do note however that such improvements may have the potential to reduce the ODP impacts forecast in this study through the residential areas north and south of Grants Road as these result, in part, through this lack of direct (full) connectivity at Grants/Papanui.
- 7.4.4 Grassmere Street currently (2016) carries volumes of around 1,200vpd and this volume might be expected to rise to approaching 2,400vpd, given full development of the ODP (by 2021). Whilst a substantial *relative* impact, the resulting volume would still be (just) within the volumes expected to be carried by a typical Local Road⁷.
- 7.4.5 Further afield the most significant traffic volume increase is forecast to be on Blighs Road. This Collector Road currently carries around 12,600vpd and this is expected to rise to around 13,600vpd (about 8%), given development of the draft ODP area.
- 7.4.6 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.

⁷ Note that these are likely to be 'worst-case' estimates: Whilst the signal crossing of Main North Road east of Grassmere Street proposed as part of the Papanui Parallel MCR has been incorporated within all modelling, a potential associated change of the Grassmere St/Main North Rd intersection to allow only LILO movements has not: It is understood that this is still being considered and no decisions have yet been made. Retention of the existing 'full' movements at this intersection therefore provides maximum accessibility to the ODP and wider area and thus results in higher traffic volumes (on Grassmere Street) than would be expected with a LILO configuration. Conversely however, a LILO configuration, without the ODP, can be expected to increase impacts at the intersection of Main North Rd/Mary St to the south-west. Despite the added traffic generation, the ODP network with its connection to Cranford St has the potential to *reduce* the resulting adverse effects that might otherwise occur to the south-west, should Grassmere/Main North be made LILO.



Figure 7-6: Changes in Delays due to Draft ODP Scenario, AM Peak, 2021 (No CNC)

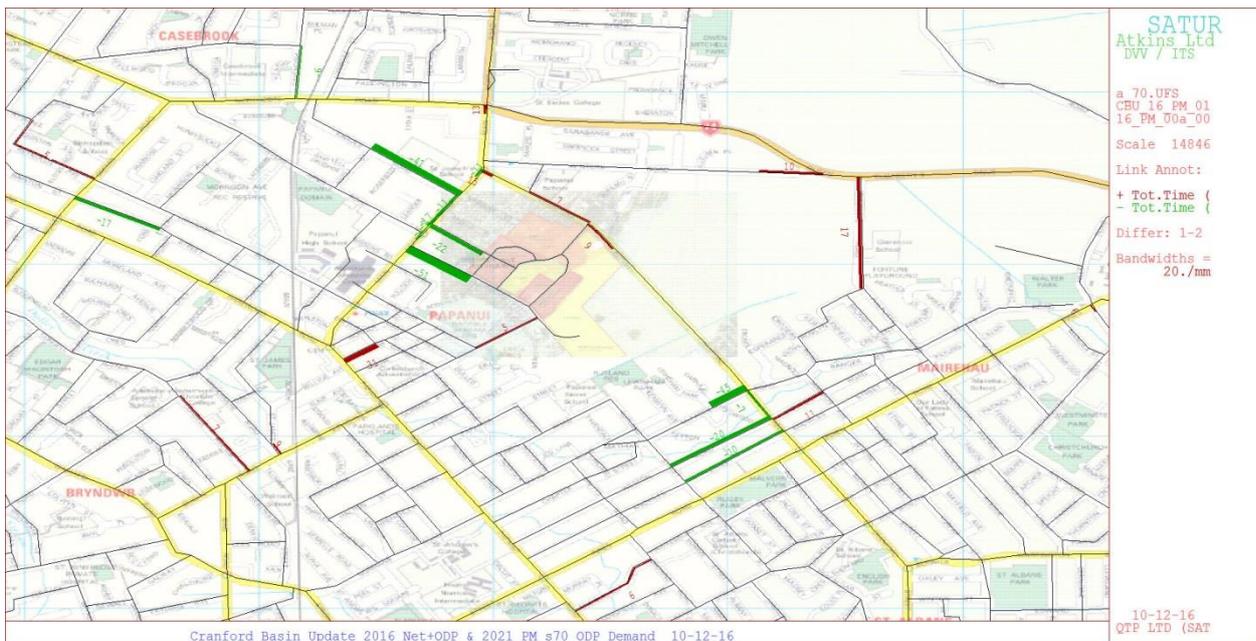


Figure 7-7: Changes in Delays due to Draft ODP Scenario, PM Peak, 2021 (No CNC)

7.4.7 It may be seen that there are forecast to be substantial reductions in delays relative to the base model on some minor-arm approaches to Main North Rd and Cranford Street. This is primarily because the alternative route enabled through the ODP area would provide some relief to delays faced by traffic from the surrounding residential areas in accessing these arterial roads.

7.4.8 There are however some locations of notable increases in delays forecast:

- westbound to Papanui Rd at Frank St through to Perry St (up to 30 seconds), AM Peak Hour; and
- westbound to Papanui Rd at Frank St (around 30 seconds), PM Peak Hour

7.4.9 Because these locations are already operating at a reasonable level of service (LoS C or D) in the base model, these impacts may be considered potentially significant, particularly as there are safety consequences of large delays on give-way approaches to intersections. The delays are exacerbated because of the lack of (full) connectivity between Grants Road and Papanui Road, noted above.

7.4.10 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.

7.4.11 Whilst it might be considered that an appropriate way to mitigate the potential (adverse) traffic effects (whilst still providing for the ODP) would be to defer the ODP zoning until implementation of the CNC projects has been achieved, it is noted that the impacts (in terms of additional traffic forecast on Grants Rd, Grassmere St and Blighs Rd only) are very similar, whether or not the CNC projects are in place, as demonstrated below.

7.5 Scenario 7 (Draft ODP at 370 Households) – 2031 (with CNC Projects)

7.5.1 The following plot illustrates the modelled volume increases at 2031, given the additional traffic generated by the ODP. (Note that the network shown for this example assumes that the Outline Plan changes submitted for the CNC projects would proceed, as submitted by the respective Requiring Authorities).

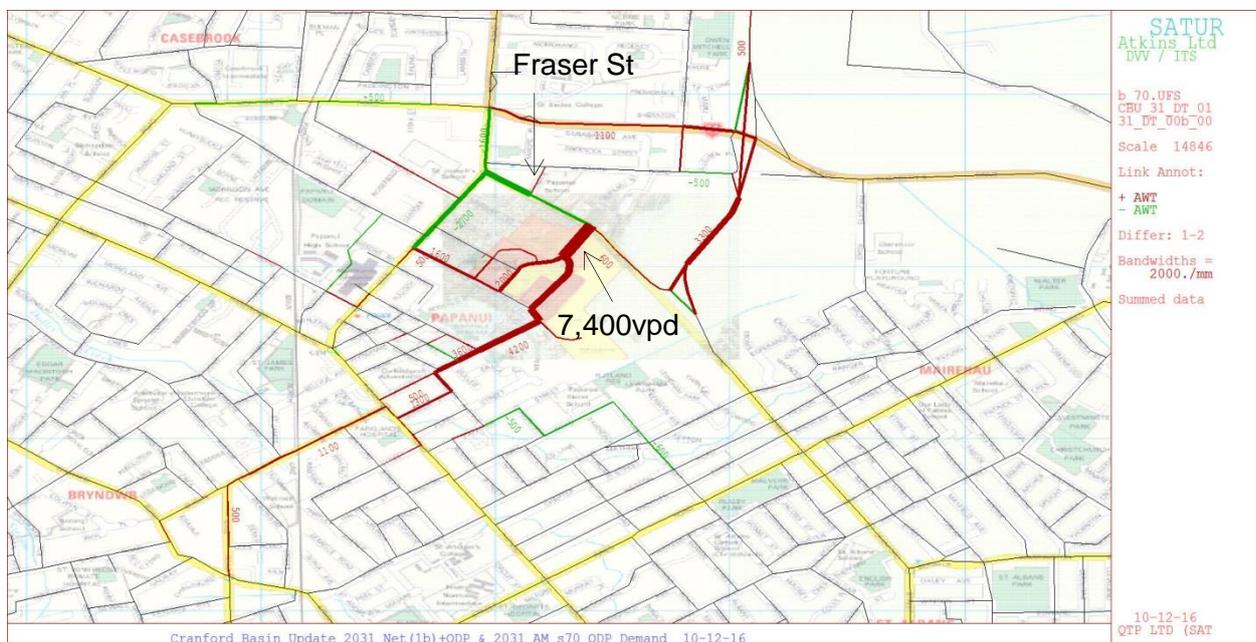


Figure 7-8: Changes in Daily Traffic Volumes, Draft ODP Scenario, 2031 (With CNC)

7.5.2 As may be seen through comparison with Figure 7-5, the forecast traffic volume increases on Grants Rd, Grassmere St and Blighs Rd are of a similar magnitude to those forecast for 2021 (without the CNC projects in place).

7.5.3 It may be noted that the increases shown for Grimseys Rd (south), Winters Rd and

Fraser St, as a result of development of the ODP, are not anticipated to be particularly ‘significant’ (although in proportional terms they are, at between +17-23%). As illustrated by the following results for Fraser Street, the changes resulting from the CNC Outline Plan changes (e.g. opening of a LILLO intersection at Grimseys/QEII Drive are forecast to be more significant than the forecast to occur as a result of draft ODP.

CNC Scheme	Land Use	ADT
As NoR	Without ODP	1360
	With ODP	1590
	<i>Increase</i>	<i>230</i>
As Outline Plan	Without ODP	2170
	With ODP	2670
	<i>Increase</i>	<i>500</i>

Table 7.1: Weekday Daily Traffic Volumes, 2031, on Fraser Street (N Cranford)

7.5.4 Clearly the CNC Outline Plan proposals to open Grimseys south to QE2 and remove the (direct) right turn from the NAE into Cranford St (north) is somewhat less-desirable in ‘strategic’ terms, compared to the CNC NoR proposals, in terms of accommodating ODP and other traffic on the arterial rather than the local road network⁸. It might also be argued that, if the CNC projects are implemented according to the CNC Outline Plan schemes (rather than the CNC NoR proposals), then the draft ODP anticipated development would take this connection (just) above a threshold that might be considered reasonable for a Local Road. However, although the recommendations on the proposed CNC Outline Plan have yet to be made and considered, we are relatively comfortable in suggesting that the impacts (of the ODP) on the roads north of QEII Drive may be judged to be ‘minor’, whether the CNC projects are ultimately implemented according to either of the scheme layouts assessed.

7.5.5 There are however more substantial volume reductions forecast, on Main North Rd (N Grassmere St) and Cranford St (N of the proposed ODP principal access), by virtue of the enhanced connectivity and use made of the ODP principal road network, to access the CNC projects.

7.5.6 The following plots illustrate the modelled delay increases at 2031 given the additional traffic generated by the ODP (Note that these diagrams area for the same network as above i.e. with the CNC Outline Plan configuration).

⁸ There may also be some potential issues with respect to a potential for increased crash risk at the NAE roundabout - but this is a matter of detail beyond the direct potential implications for the ODP.



Figure 7-9: Changes in Delays due to Draft ODP Scenario, AM Peak, 2031 (With CNC)

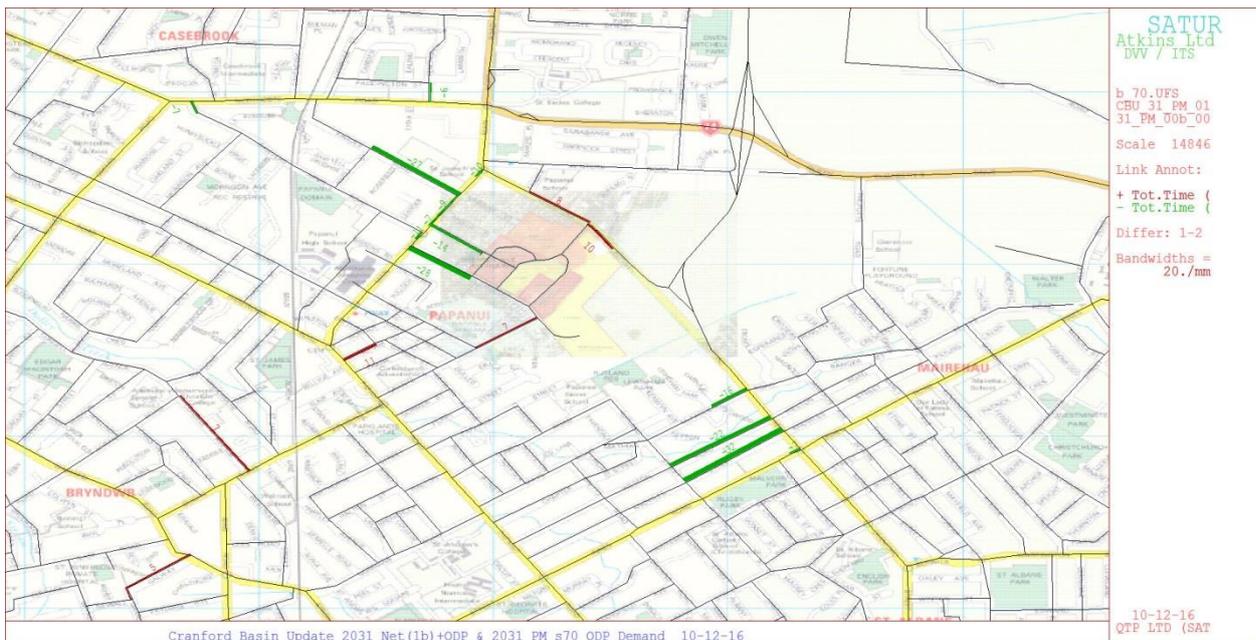


Figure 7-10: Changes in Delays due to Draft ODP Scenario, PM Peak, 2031 (With CNC)

7.5.7 At 2031, the locations of potentially significant delay **increase** summarised above in 7.4.8 do not occur, due to the relief to these bottlenecks that is forecast to be brought about by the CNC projects. This is despite that demand from 10 years more of general traffic growth, as well as that generated by the draft ODP, is being accommodated.

7.5.8 Generally, notwithstanding the increased traffic volumes forecast on Grants Rd, Grassmere St and Blighs Rd, the potential effects on the immediately surrounding are modest. Indeed, on balance there are generally positive benefits, due to the relief provided to other routes as a consequence of the proposed route created through the ODP area and the access this affords to Cranford St.

7.5.9 The above conclusions hold for the 'base' (ODP) networks assessed for this study, which assume priority intersections at the interface with Grassmere St. However, we have also briefly examined whether and to what extent additional traffic-calming measures might limit any 'extraneous' (non-ODP) traffic that could be attracted to travel through the ODP area (with the potential to affect the amenity of both the ODP and surrounding residential areas), these measures being reflected through the addition of further roundabout intersections, at the ODP interface with Grassmere Street (refer Figure 4-4). The diagram below indicates the difference in daily traffic volumes that is predicted to occur as a result of these additions:



Figure 7-11: Changes in Daily Traffic due to additional traffic-calming only (Draft ODP Scenario, 2031 (With CNC))

7.5.10 It may be seen that the measures assumed have a relatively modest, but positive effect in terms of reducing traffic volumes on Grants Rd: As detailed in Table 7.2 below, given full-development of the ODP and adoption of the Outline Plan changes proposed for the CNC projects, with the additional traffic-calming volumes on Grants Rd could be reduced to total around 4,700vpd, compared to around 5,400vpd without the measures (assumed).

CNC Scheme	Land Use	ADT
As NoR	Without ODP	1630
	With ODP	4360
	<i>Increase</i>	<i>2730</i>
As Outline Plan	Without ODP	1700
	With ODP	5280
	<i>Increase</i>	<i>3570</i>
	With ODP (Rbts)	4670
	<i>Increase</i>	<i>2960</i>

Table 7.2: Weekday Daily Traffic Volumes, 2031, on Grants Road (E Proctor)

7.5.11 While the predicted benefits of relief from additional traffic appear to be negligible for Grassmere Street, it is however also worth noting the reassignment predicted on the internal ODP network, through the addition of the roundabout at the intersection of the main road through the ODP site (anticipated to fulfil a Collector function) and Grassmere St. The modelling suggests that this may induce some drivers to use the alternative internal route to the north, which is unlikely to be desired. This could be potentially reduced by further amending intersections along this route – but modelling of the detailed potential effects of such further options is beyond the scope of the present study.

7.5.12 Furthermore, as noted in section 3.5, all traffic generation is assumed to be *additional* to the adjusted base-case⁹ generic CAST models for the purposes of this study, with no adjustment being 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. It will however not fully reflect the ‘true’ overall benefits that will accrue from development in this location, compared to others in more remote and less-accessible sites through the greater Christchurch area.

⁹ The generic CAST models have been adjusted (in terms of both network and demand) to form an appropriate evaluation base (‘without-ODP’) for this ODP assessment, as explained below.

8 Public Transport, Cycleways and Pedestrian Accessibility

8.1 Public Transport

8.1.1 The following diagram illustrates the relationship between the draft ODP 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 8-1: Bus Routes Serving Proposed Urban Zoning

8.1.2 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.

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

8.1.4 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.

8.1.5 The above diagram illustrates that nearly all of the draft ODP area 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).

8.1.6 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.

- 8.1.7 In order to take full advantage of the adjacent bus routes, it is essential that the ODP is prepared that includes excellent pedestrian connections between the proposed urban zoning and Main North Rd and Cranford Street. Under the draft ODP layout, pedestrian linkages to Main North Rd would be available via Grassmere Street and Shearer Avenue.
- 8.1.8 It appears that accessibility via Apollo Place (which lies between Shearer Avenue and Meadow Place on above diagram) may not be possible due to the nature of the development that has occurred at the south-eastern end of this cul-de-sac. However, the Top 10 holiday park (which covers some 3.8ha or 50% of the area signalled as RNN - Area 3) currently enjoys access from both Meadow Place and Cranford Street and Council should therefore seek to provide pedestrian (and cycle) linkage between the proposed ODP area and Meadow Street to maximise accessibility to the high-frequency public transport service on Main North Rd¹⁰.
- 8.1.9 We note that the routing of the Orbiter service shown on the above diagram will likely be amended on completion of the CNC projects: Given the proposals for the Northern Arterial and associated four-laning of QEII Drive, with the latter including the conversion of the Philpotts Rd intersection at QEII Drive to a LILLO configuration, this would prevent the existing 'clockwise' service from using the existing route. It is therefore possible that the Orbiter may be rerouted (in both directions) to travel via Cranford St rather than QEII Drive, bringing this high-frequency service still closer to the proposed ODP area.
- 8.1.10 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 however 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.

¹⁰ Note that the traffic modelling reported above reflects the provided primary road network plan and therefore has not considered a (secondary) potential vehicle linkage to Meadow Street that may be possible to the RNN area, given the current holiday park access at this point.

8.2 Cycling

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

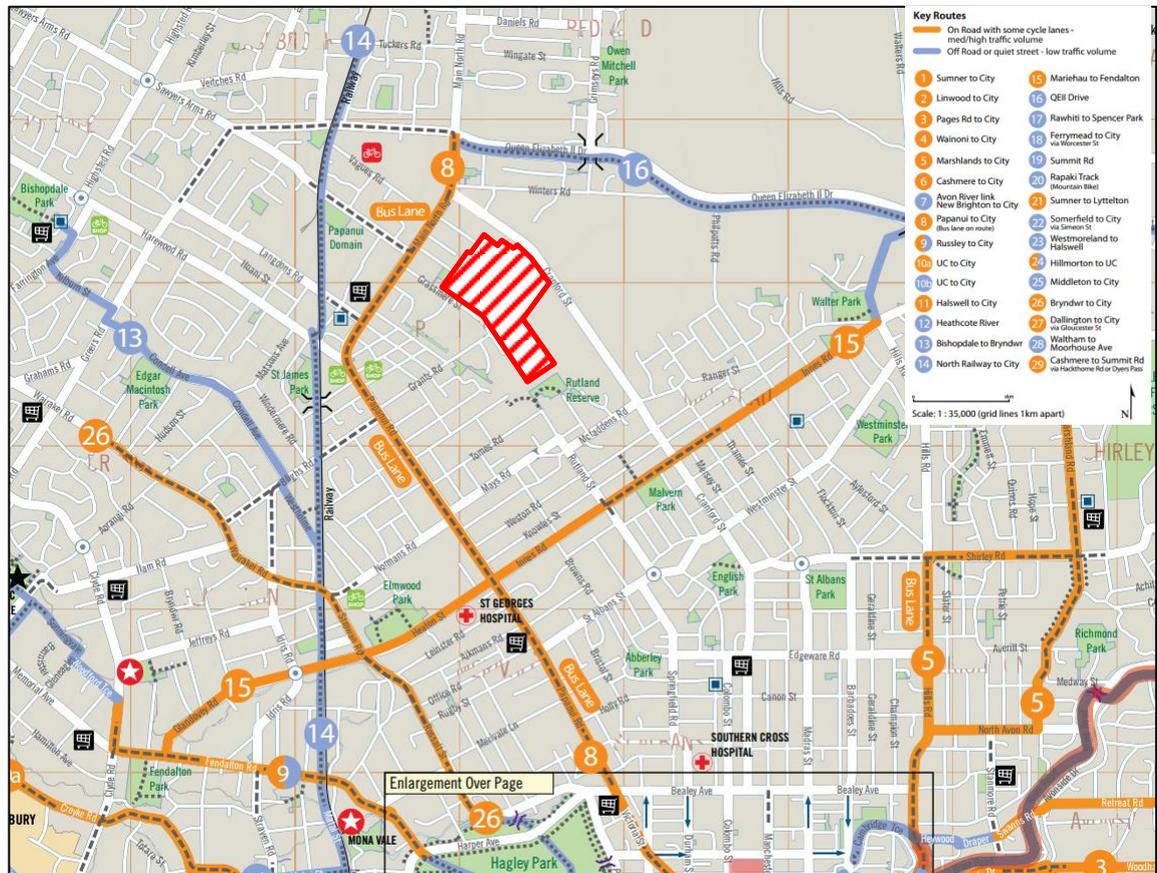


Figure 8-2: Existing (2012) Cycle Routes Network in Relation to draft ODP area.

8.2.2 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.

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



Figure 8-3: Major Cycle Routes Network in Relation to draft ODP area.

8.2.4 The Papanui Parallel route, which is currently under construction and scheduled for completion in 2017, will provide highly convenient, direct access to the proposed ODP area, connecting the site to the Central City. The Northern Line route would see an extension of the current north Railway route, north of Tuckers Rd and south to Blenheim Rd. This route is currently programmed for completion in 2019.

8.2.5 On a more local basis, the diagram below shows the current Council and NZTA proposals for cycleway improvements in the immediate area of the ODP, together with a potential strategic cycle route connection through the ODP area that would connect with the shared path proposed on the west side of the NAE and Cranford St as part of the CNC works (submitted Outline Plan schemes).

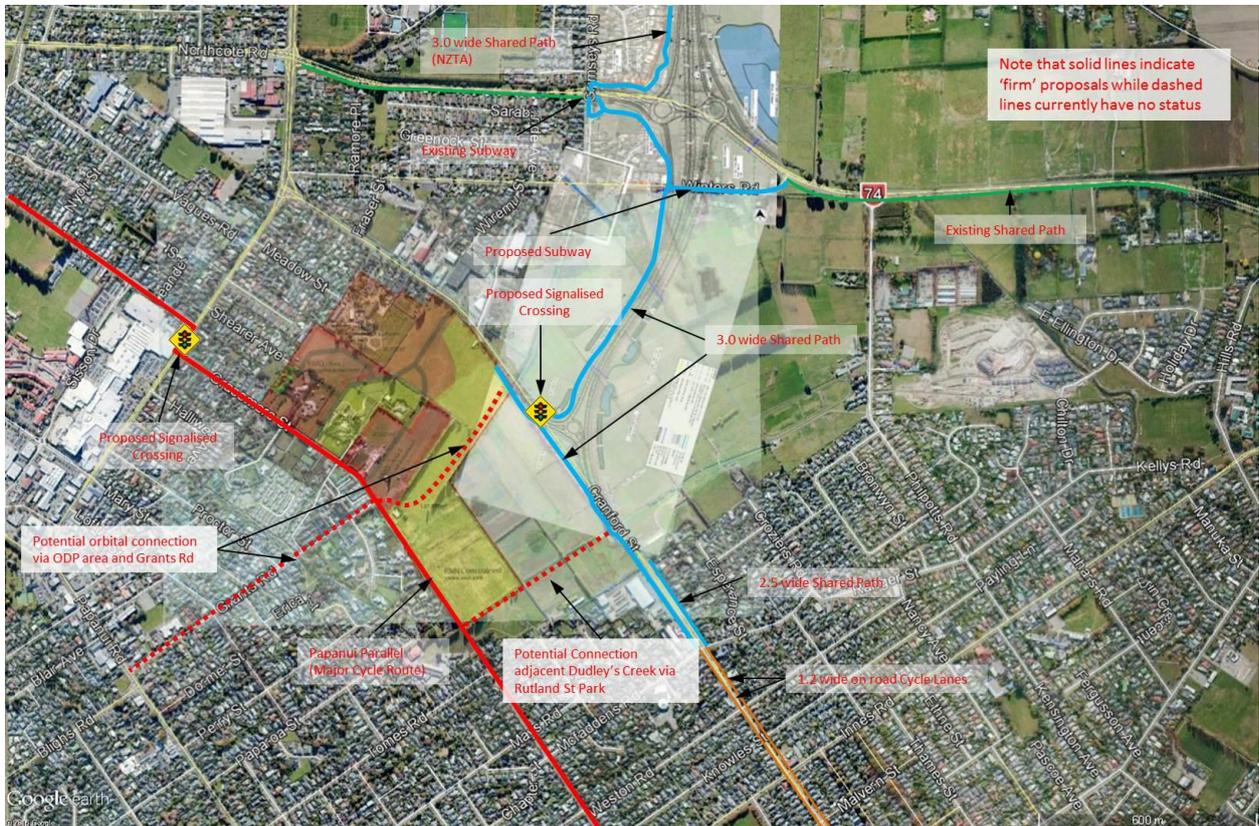


Figure 8-4: Current/Potential Cycle Infrastructure Proposals in vicinity of ODP area

8.2.6 It may be noted that such a connection formed part of the future network assumed for the MCR 'package' assessment and its function to facilitate 'orbital' connectivity between the proposed NZTA Northern Arterial cycleway and the Papanui Parallel MCR may be seen of the modelled cycle demand diagram below, where the width of the bands indicates the modelled cycle demand in 2031 (given completion of the full MCR programme and associated routes assumed).

8.2.7 It may be noted however that the direct connection assumed for this network (between the existing Grimseys Rd/QEII Drive underpass does **not** form a part of any current programmed works – but may be facilitated through incorporation within the Cranford Stormwater basin works. Without this more-direct link to the assumed potential route through the draft ODP area, the demand through the ODP area is likely to be less than shown, as the route between the planned Northern Arterial and Papanui Parallel cycleways will be less-attractive if it is *only* facilitated by less-direct route afforded via the shared path proposed to the immediate west of the NAE.

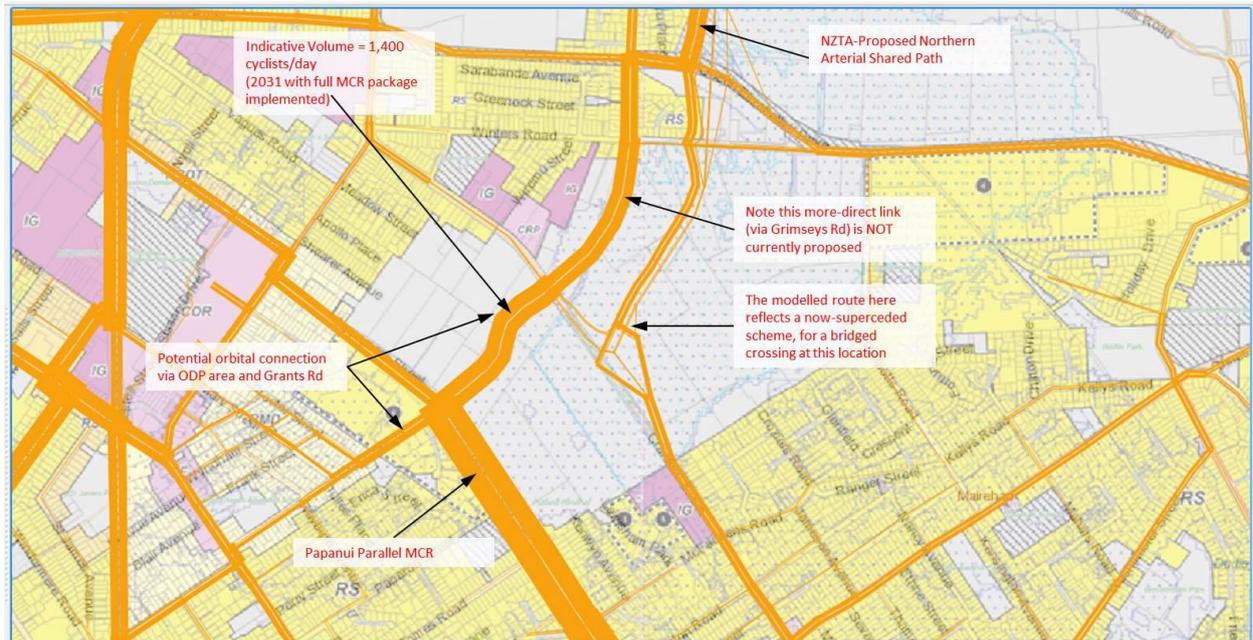


Figure 8-5: Potential Cycle Demand Around and Through the Draft ODP Area

8.2.8 Notwithstanding that it lies outside the draft ODP area, we therefore strongly recommend that Council should seek to achieve (or at least safeguard) a more direct route between the ODP area and Grimseys Rd, through the Cranford Basin.

8.2.9 Irrespective of linkages to the north, the proposed Papanui Parallel MCR will provide 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.

8.2.10 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 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.

8.3 Walking

8.3.1 As illustrated within Figure 8-1 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.

8.3.2 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.

9 Wider Consideration of Transport Issues

9.1 Section 7 has considered the effects of the draft ODP on the operation of the surrounding road network, with Section 8 providing an assessment of the accessibility of the area in terms of public transport, cycling and walking. In line with our brief, the bullet points below provide only brief commentary on some of the wider transport-related issues and implications of the draft ODP

- The proposed residential zoning is highly compatible with the existing surrounding residential land-uses in terms of traffic effects (minimal heavy vehicles and noise);
- The proposed residential zoning is well-located for local public transport, employment, shopping and recreational activities;
- Arguably, the relatively small number of households (370) does not realise the full potential of the site for being serviced by, or having access to, high quality public transport or the MCRs, but there are naturally other considerations for the site that in practical terms will limit this, not least being constraints (and opportunities) presented by stormwater management; and
- 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 Summary and Conclusions

- 10.1 This Memo has considered the potential transport effects of the draft ODP, which provides for development of around 370 households within the Cranford Basin area.
- 10.2 Traffic modelling has been conducted using Council's CAST traffic model for the horizon years of 2021 (but reflecting a scenario if the ODP were to be developed ahead of completion of the Christchurch Northern Connections (**CNC**) projects¹¹) and 2031 (reflecting implementation of these projects). Modelling has considered both the CNC schemes identified within the Notice of Requirements for these projects, as well as updated Outline Plans which include changes that will affect access around the ODP..
- 10.3 All ODP traffic generation is assumed to be additional to the 'no-ODP' models for the purposes of this study, with no adjustment being made to traffic generation in other locations that might be anticipated under an assumed fixed population. In this regard, the assessment is considered robust in terms of assessed network operation.
- 10.4 An initial primary road network to serve the ODP has been identified by Council. It includes a direct linkage between Cranford and Grassmere Sts. Initial modelling of the new intersection formed between this road and Cranford St would suggest that if formed as a roundabout, this is likely to operate without undue delay.
- 10.5 Prior to completion of the CNC projects, the forecast impacts in terms of volume changes, are forecast (at 2021) to generally be modest in extent. The additional traffic forecast on the local road network is greatest on Grants Road, east of Rayburn Ave.
- 10.6 At 2031, assuming completion of the CNC projects, the level of impact, in terms of additional traffic forecast on Grants Rd and Grassmere St are very similar to those identified for 2021 (without the CNC projects in place). The volumes of Grassmere St are forecast to remain within those typically expected of Local Roads. On Grants Rd however, volumes are expected to rise by a significant degree (compared to the existing 1,000-1,600vpd), but at up to around 5,300vpd (with the CNC proposed outline Plan scheme changes), this would be within the levels expected of a Collector Road.
- 10.7 Generally, notwithstanding the increased traffic volumes forecast on Grants Rd, Grassmere St (and Blighs Rd), the potential effects on the immediately surrounding are modest. Indeed, on balance there are generally positive benefits, due to the relief provided to other routes as a consequence of the proposed route created through the ODP area and the access this affords to Cranford St..
- 10.8 We suggest that the impacts (of the ODP) on the roads north of QEII Drive may be judged to be 'minor', whether the CNC projects are ultimately implemented according to either of the scheme layouts (NoR or Outline Plan) assessed.
- 10.9 Additional traffic-calming of the ODP road network has the potential to reduce use of

¹¹ Northern Arterial, Northern Arterial Extension and Cranford Street Upgrade.

local roads by extraneous traffic, to a modest degree – albeit reducing the potential for wider relief (of delays) identified above.

- 10.10 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.
- 10.11 The ODP should seek to achieve a high-quality cycle connection between Cranford Street and the Papanui Parallel MCR, as well as facilities to provide permeability for cyclists and pedestrians through, to and from the wider ODP area). Notwithstanding that it lies outside the draft ODP area, we also strongly recommend that Council should investigate a direct cycle/pedestrian route between the ODP area and Grimseys Rd, (that is in addition to the current Outline Plan NAE proposal).
- 10.12 Our overall assessment is that the:
- Notwithstanding some potential for imposing increased traffic on surrounding roads (most notably Grants Rd), the proposed residential zoning is generally highly-compatible with the surrounding residential land-uses in terms of traffic effects and indeed is much more so than potential (e.g. industrial and commercial) alternatives.
 - The ODP is well located for local public transport, employment, shopping and recreational activities.
 - In the longer-term, any 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.
 - Although the judgement is ‘marginal’, and it would defer the potential to achieve transport benefits on the surrounding network should the ODP be implemented, on balance we consider that the most efficient way to mitigate potential adverse effects, prior to completion of the CNC projects is to recommend that (development of) the ODP land be deferred until the CNC projects have been implemented. This will reduce the potential for adverse traffic effects (increased delay and reduced safety) that are otherwise predicted to occur at the intersections of local roads north and south of Grants Rd with Papanui Rd.
 - Once the CNC projects are implemented, we consider that the transport effects of the ODP proposed are on balance likely to be positive overall. Where the potential for adverse effects does exist, it is likely that these will be generally of a minor or less-than-minor scale.
 - That being said, there is the opportunity to mitigate the potential for adverse effects on Grants Rd through careful design in detail of the ODP network and its interface with existing roads. Further more-detailed investigation would be required to confirm the efficacy of such measures – and indeed whether and what further measures may be warranted on Grants Rd and/or intersecting streets.