Report

Otamatea West Structure Plan - Integrated Transport Assessment

Prepared for NZ Transport Agency

By Beca Ltd

18 October 2017

Revision History

Revision N°	Prepared By	Description	Date
A	Caron Greenough	Internal Review	28/09/2017
B	Caron Greenough	Incorporating Client comments	18/10/2017

Document Acceptance

Action	Name	Signed	Date
Prepared by	Caron Greenough		28th September 2017
Reviewed by	Kara Hartshorne		27th September 2017
Approved by			
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Appendix A – Otamatea West Structure Plan

– Technical Report – Opus International Consultations Ltd

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1 Introduction

1.1 Introduction

This report is a short Integrated Transport Assessment (ITA) intended to inform the NZ Transport Agency (the Transport Agency) on strategic land use and transport matters arising from the proposed Structure Plan for Otamatea West, within the Whanganui District Council area.

This report comments on the location and operation of the site accesses off SH3 Great North Road, the internal movement network design and the compliance with the relevant objectives, rules and policies of the Whanganui District Plan. In relation to mode share and trip generation, the ITA would consider the relevant transport environment including safety.

This report has been prepared with reference to the structure planning requirements set out in the Transport Agency's ITA Guidelines. This ITA has been progressed in liaison with the Transport Agency.

The ITA refers to from the Otamatea West Structure Plan (August 2017) *Technical Report* by Opus International Consultants Limited (Opus) in relation to the preparation of the Structure Plan by Whanganui District Council, the Whanganui District Plan, the Whanganui District Council Plan Change 46 - Scoping Report (August 2016) and information provided on the Council website. A copy of the Opus Technical Report is contained in Appendix A.

1.2 Background

In 2015 Whanganui Council completed a review of residential demand in Whanganui. This assessment identified Otamatea, Springvale and Whanganui Central as potential areas to accommodate future residential development. The study identified demand for approximately 630 new dwellings at Otamatea by 2065. These dwellings would mostly be accommodated within existing areas already zoned for Residential activities. The structure planning exercise that has been carried out identified an area, at Otamatea, where greenfield residential development could also be accommodated.

The Scoping Report identified three options for evaluation for greenfield development. While Option 2 was evaluated as being the preferred option, allowing the site to achieve higher amenity and less cost per site for infrastructure, Option 1 was developed further within the Technical Report.

Option 1 would zone the entire Otamatea West area to the west of Great North Road, between Sandcroft Drive northwards to Pickwick Road (including 209 Great North Road), as a residential zone.

Option 2 focused on the re-zoning of only land that was feasible for residential development and leave the remaining land as rural lifestyle zone. This would result in mixed density urban area. This area would run from 209 Great North Road and end adjacent to 17A Turere Place. This option provided for residential development as well as increased access to landlocked parcels of rural lifestyle land that could be developed to capacity.

Options 3 was status quo and would leave the existing District Plan provisions as they currently are, meaning that the majority of area remained zoned Rural Lifestyle with a minimum lot size of 5000m^2.

The report did not provide an assessment of the impact of the proposed road layout, and the site of any of the options, on the existing road network.

1.3 The Proposal

The site area that was reviewed within the Opus Technical Report, as per Option 1 mentioned above, is located adjacent to the northern edge of the Whanganui urban area on State Highway 3, Great North Road. Residential development in the vicinity is typically on larger sections, ranging in size from 800m^2 to 7700m^2, with a predominance of cul-de-sac street layouts or long multiple accesses or rights of way extending off Great North Road. The location is shown in Figures 1 and 2 below.

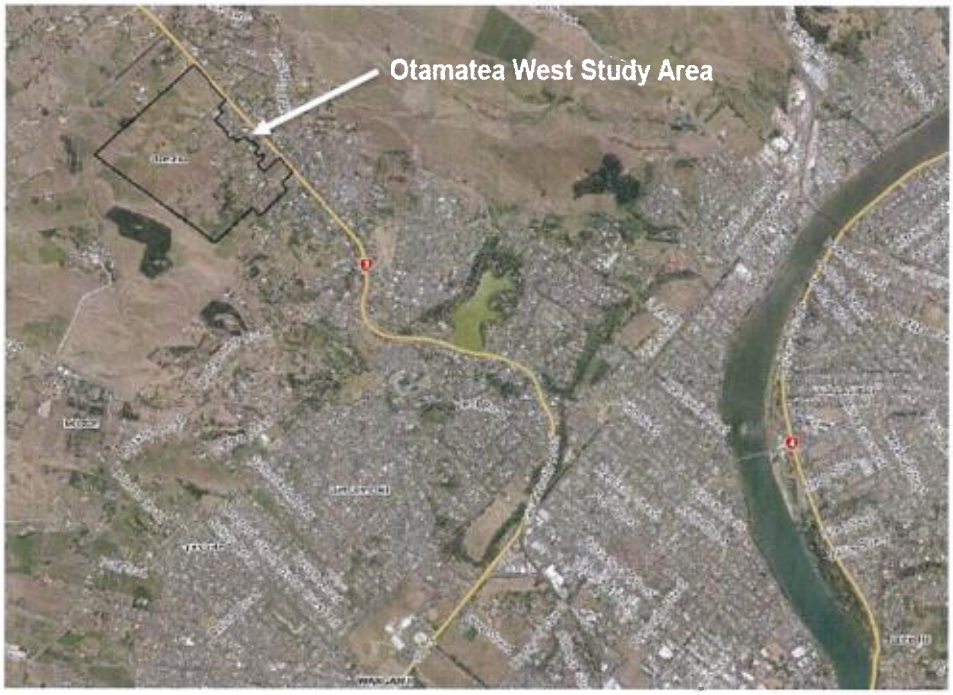


Figure 1 Location Plan

The area is approximately 58 hectares in area and 4.5km northwest of the town centre.

The landscape is gently rolling to flat in the northeast and slopes away to the southwest becoming increasingly steeper to form a number of gullies incising the southern boundary.

Figure 2 – Proposed Site Area

1.4 District Plan Principles

The District Plan principles that are contained within the Whanganui District Plan that are relevant to this transport assessment are contained within Chapter 4 Residential and Chapter 12 Subdivision and Infrastructure. Of particular relevance are:

Policy 4.3.2 states that it will:

Ensure a high standard of property access and avoid street congestion and excessive traffic on roads;

Chapter 13 signs up to the Urban Design Protocol which will ensure subdivisions and developments:

Enhance connectivity within multimodal transportation networks and the links between different transport modes (pedestrian/cycle/street), to ensure safe and easy movement for people and the integration of subdivision with existing and future surrounding neighbourhoods through these networks.

1.5 Structure Plan Principles

The key design principles that were applied within the Technical Report for developing the Structure Plan were:

- Create purposeful linkages for vehicles and for active modes of transport which are safe, pleasant and work with the natural landform.
- Establish linkages to existing residential development adjacent to the study area and to other community facilities.
- Identify suitable residential areas and design infrastructure which work with the natural landscape as far as possible.

- Avoid perpetuating the prevalence of private rights of ways, as access to back sections, in the vicinity and where possible mitigate existing situations.
- Manage storm water to ensure neutral environmental effects within and beyond the study area.

1.6 New Zealand Transport Agency – Planning Policy Manual

The Planning Policy Manual was developed in 2007 to assist with Transit, now the NZ Transport Agency, to meet its objective of having regard to the effects of individual developments on the state highway network, as these can positively or negatively affect the safety and sustainability of state highways.

Development brings benefits to New Zealand by creating wealth, jobs and improved economic performance. However, new development usually generates additional traffic and this can potentially create adverse effects by:

- reducing average vehicle speeds, increasing journey times and delays and trip variability;
- increasing the number and/or severity of road accidents;
- accelerating the need to upgrade the state highway network;
- complicating future plans to upgrade a road, for example by adding new lanes or a central median barrier; and/or
- creating environmental and social effects, such as increased pollution from vehicle emissions.

The cumulative effects of small-scale development are particularly difficult to manage within the provisions of the RMA. This is a concern for transport systems where each development may adversely impact levels of service, congestion and safety by only a small amount, but where the combination of a number of developments can result in significant adverse effects.

There are a number of tools that can be used to manage the effects. One of these is Limited Access Roads.

The Government Roading Powers Act 1989 (TNZA) gives the Transport Agency powers to declare state highways to be Limited Access Roads (LAR). No person can lawfully drive or move a vehicle onto or from a LAR except at a road intersection that existed prior to the state highway being declared a LAR, a road intersection with a LAR that has been authorised by the Agency, or an identified crossing place that has been authorised by the Agency.

The Agency is required to authorise such a crossing place to and from a parcel of land that does not have reasonably practicable alternative legal access to some other road. However, even in those circumstances the Agency is only required to grant one crossing place, will specify the location of that accessway and can impose appropriate conditions on that accessway.

The Agency may use the LAR powers to prevent access to and/or from a LAR, including where the accessway is sought for a new development, where this may have an unacceptable adverse effect on the safety or functioning of the state highway. However, where the Agency considers a new accessway onto a LAR should not be authorised, it may still be possible for the development to proceed if alternative access arrangements via the local road network can be found.

2 Description of Land Use and Transport Environment

2.1 Site Location and Land Use

2.1.1 Existing Road Environment

The study area is located adjacent to the northern edge of the Whanganui urban and is adjacent to State Highway 3 Great North Road. State Highway 3 in this location is gently rolling as shown in the photograph below (Figure 3) looking north from Tirimoana Place.

Figure 3 – Photograph of SH3 from Tirimoana Place looking north

There are a number of side roads, rights of ways and accesses to mainly residential properties along Great North Road, between Turere Place and Tirimoana Place, but the environment is largely rural north of Tirimoana Place.

Travelling north the posted speed limit is 50kph until just south of Turere Place then changes to 70kph, then north of Tirimoana Place the limit changes to 100kph.

State Highway 3 is a regional strategic highway but also has limited-access road status (LAR) from the 100kph speed limit change northwards.

The road width of the state highway adjacent to the proposed site is generally 3.3m wide traffic lanes with wide 2.5 – 3.0m shoulders in places.

There is a narrow 1.5m wide footpath running on the western side of the state highway up until Tirimoana Place.

Traffic volumes are on average around 7,000 vehicles per day and there has been little growth in this volume over the past 5 years.

There are no local bus routes that travel as far north, along SH3, as the proposed site area, although the InterCity Coach does travel out of Whanganui towards Kai Iwi and New Plymouth along SH3 and there is a bus shelter located just south of Tirimoana Road, which is likely to be for school bus services.

2.2 Road Safety

As most of the study area is situated in a 50 to 70kph area there has been no risk assessment undertaken of this length of state highway by the Transport Agency, however the section directly north of the 100kph posted speed limit has a 'medium high' Collective risk rating and a 'high' Personal Risk rating as provided by the Transport Agency's SafetyNET tool and the High Risk Rural Roads Guide.

The intersections on this section of state highway are all classified as 'low' risk.

With no formal risk assessment, crash records for SH3 in the 50 to 70kph zone have been obtained from the Transport Agency's Crash Analysis System (CAS) for the past 5 years. They show that there have been 3 reported crashes recorded. Two of the crashes resulted in no injuries, with the third, minor injuries only. The minor injury crash was a loss of control type crash whereas the other two crashes were as a result of hitting another vehicle either parked or stationary/slow.

With so few crashes it is difficult to determine any significant patterns, and with no fatal and serious injuries this section would be considered low risk.

2.3 Existing Land Use

The study area is zoned a mixture of Rural Lifestyle and Residential zones. It is surrounded by Residential zoned land to the east and northeast. The Rural Lifestyle zone continues to the southeast of the study area. To the south and west of the study area the land is zoned Rural.

On the southern side of Great North Road, the Residential zone extends to sites fronting Great North Road and includes sites accessed via Tirimoana Place and Turere Place, as well as back sections, with direct access onto Great North Road. These sites are generally developed for residential lifestyle rural living purposes.

3 Development Proposal

3.1 Overview

The land use plan, has been prepared by Whanganui District Council, with the Technical Report undertaken by Opus. The relevant information from the report is outlined below with comment on the details provided within the Transport Assessment in Section 4 below.

The proposed road network was reported to have been designed to take account of the natural contours of the land and thus reducing the need for cut and fill earthworks. The road widths leading from Great North Road were also reported to be constrained by existing development but these may be in line with facilitating a 'living streets' people focused environment, with slower traffic speeds.

The roading infrastructure design for the Structure Plan have been based on *NZS 4404:2010 Land Development and Subdivision Infrastructure*, the *Engineering Document 2016* and *Austroads: Guide to Road Design Part 3 – Geometric Design*.

Due to the proposed layout, development is concluded, in the report, to be able to proceed in stages, which are not all dependent on each other. The 'Bristol' property (as shown on Figure 2 and as Area 1 on Figure 4 below) is though stated to be reliant on a connection via Tirimoana Place or via a new connection to Great North Road, although both are shown on the plans. The connection to Great North Road is shown on the proposed plans to be within the existing 100kph zone and thus the LAR classification.

The Structure Plan also mentions a number of additional linkages between the properties which are considered, in their opinion, to create a connected network and avoiding rights of way access from Great North Road. However the staging and location of all the linkages is not entirely clear from the plans, nor any comment on their benefits to the proposal.

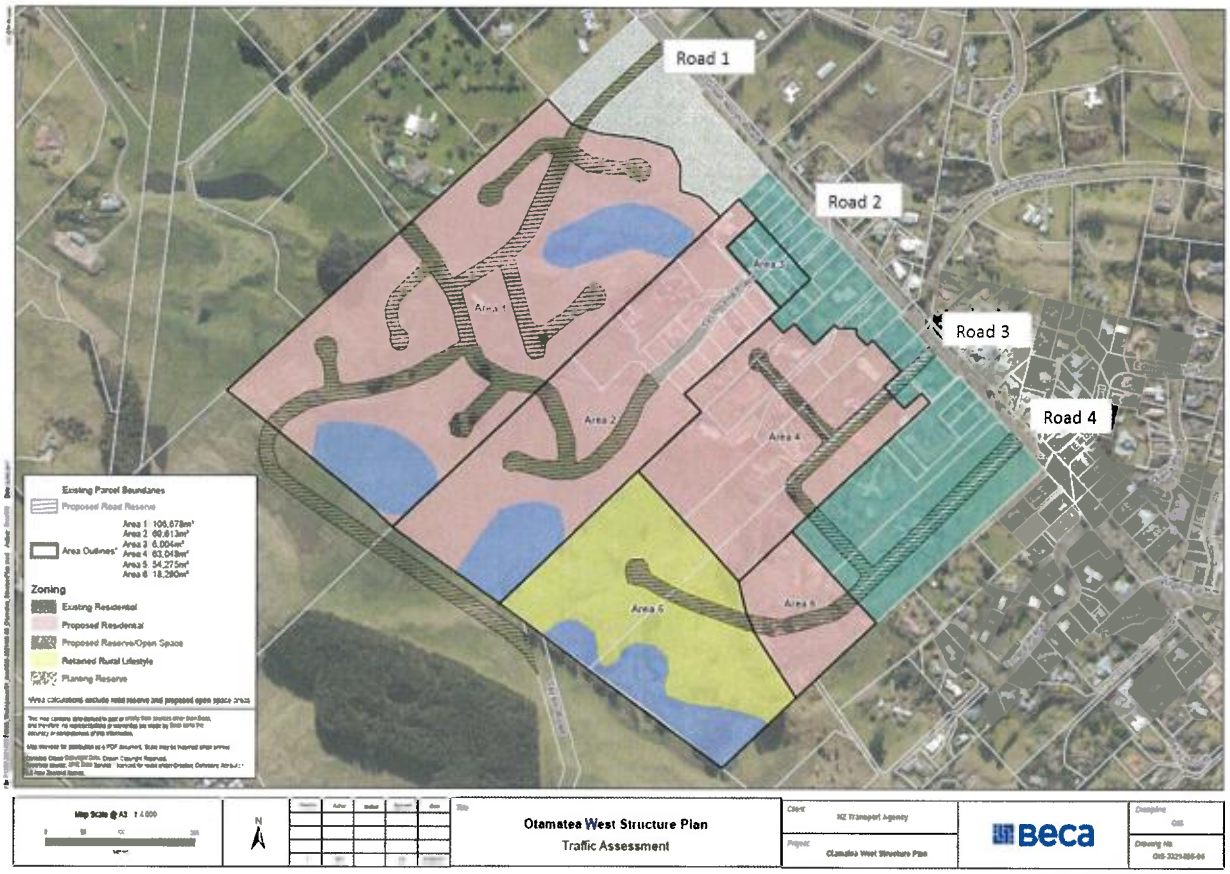


Figure 4 – Proposed Development Area with road layout and land use zones

According to the report, the Transport Agency, in signing off Stage 1 of the extension to Tirimoana Place, advised that any further development of sections or extension of the road would require an upgrade to the intersection with SH3, including a right hand turn lane. With this being Stage 2 of the Tirimoana Place subdivision, it is concluded in the report that this would see the intersection upgraded – although no assessment was undertaken.

The report also suggests that an upgrade of the Tirimoana Place/SH3 intersection will potentially benefit the Bristol property, as well as facilitate the proposed second stage residential development of Tirimoana Place. Together with the new link road to the Bristol land this intersection upgrade will potentially facilitate development of the mid- and rear portions of the Bristol property for residential activities.

The proposed new roads, it is reported, could largely be provided by developers over time, within the Structure Plan area, however two sections of new road adjacent to SH3 at the existing Bristol and Underwood blocks will likely require development contribution funding as the beneficiaries are numerous and likely to involve staged development. It is also stated that the SH3 intersections will require development contributions as they will benefit a range of development areas which are likely to occur in a series of planned stages. It is therefore unclear as to the timing of these improvements.

New walkways are also proposed that align to and along proposed detention ponds and linking to the footpath network on proposed roads.

With expansion of residential development it is suggested in the report that an opportunity could be created to extend the existing bus service to travel a loop via Tirimoana Place through the Structure Plan area and out via the proposed road through the Bristol property. No timing or recommendation though was made in the report and it does not include any suggestion of how Areas 4, 5 and 6 might be serviced by public transport.

The report also suggests that opportunities exist to extend the cycle lanes along Great North Road to Tirimoana Place, in line with a suggestion that the speed limit is reduced in this area as development progresses. There may also be options to provide for cyclists to utilise the proposed walkway linkages within the Structure Plan area.

The impact of a reduction in speed limit is not assessed in the Opus report.

3.2 Proposed Land Use

The proposed land use is intended to be residential which requires the majority of the land within the study area to be re-zoned via a plan change to Residential. The exception being the south western sections of land on the Quigley property, on which stormwater ponds are to be located. These are proposed to be retained as Rural Lifestyle zone, to encourage lifestyle block sized lots to be developed.

A range of lots sizes is anticipated throughout the Structure Plan area. The Structure Plan assumes a minimum lot size of 800m^2 to facilitate a total number of lots consistent with projected demand.

Lots on the south western side of the Quigley properties would be restricted to larger lifestyle blocks given the topography of the land in this portion of the study area. As such, it has been recommended that these areas retain their Rural Lifestyle zoning, which has a minimum lot size of 5,000m^2.

Figure 4 shows the proposed land use and square meterage of each and estimates the number of lots per zone.

In summary:

Table 1 – Number of Lots

Area	Zone	m^2	Lot Size	Number of Lots
Area 1:	Residential	106,678	800	133
Area 2:	Residential	69,613	800	87
Area 3:	Existing Residential	6,004	800	8
Area 4:	Residential	63,048	800	79
Area 5:	Rural Residential	54,275	5000	11
Area 6:	Residential	18,280	800	23
				341

4 Transport Assessment

4.1 Approach

The purpose of this section is to set out the trip generation and distribution that will inform the assessment.

It should be noted that the total number of lots that the site area could support, nor the trips that these lots might generate, were determined in the Opus Structure Plan Technical Report.

The number of lots has been calculated simply by dividing the area available in each zone by the minimum lot size. As this is based on a minimum lot size the number of lots may be overestimated.

The number of trips that might be generated by the development has been determined from a number of source documents. These include predominantly the *New Zealand Transport Agency Research Report 453 - Trips and parking related to land use November 2011.*

This research report showed that for residential developments there was some variation in trip making by sub-groups of houses, divided between household size or car ownership, within each of the subdivisions surveyed, but it was not determine why this variation occurred. The 85th percentile figure of 10.4 vpd (in + out) per household was recommended as an appropriate figure for design and assessment purposes when considering the full range of households within a city. However, there are many suburbs where a lower figure is appropriate and suitable rates per household may need to be selected in different urban areas.

It was noteworthy that car ownership did not appear to be the sole dictator of household trip making: for households with 1.8 cars, the trip rate varied widely, from about four to 13 trips per household per day.

The surveys showed that lower trip generation rates were typically found in more rural subdivisions. Surveys near Queenstown and Christchurch indicated daily rates of between 6 and 8vpd (in + out) per household which could reflect an increase in trip linking which might occur when the primary employment trip is longer, eg greater than 20 minutes, as with rural lifestyle properties located in the outskirts of an urban area.

The research also looked at Census data from various centres (2006 data). The Census data for Whanganui showed that house hold car ownership was lower than for other centres.

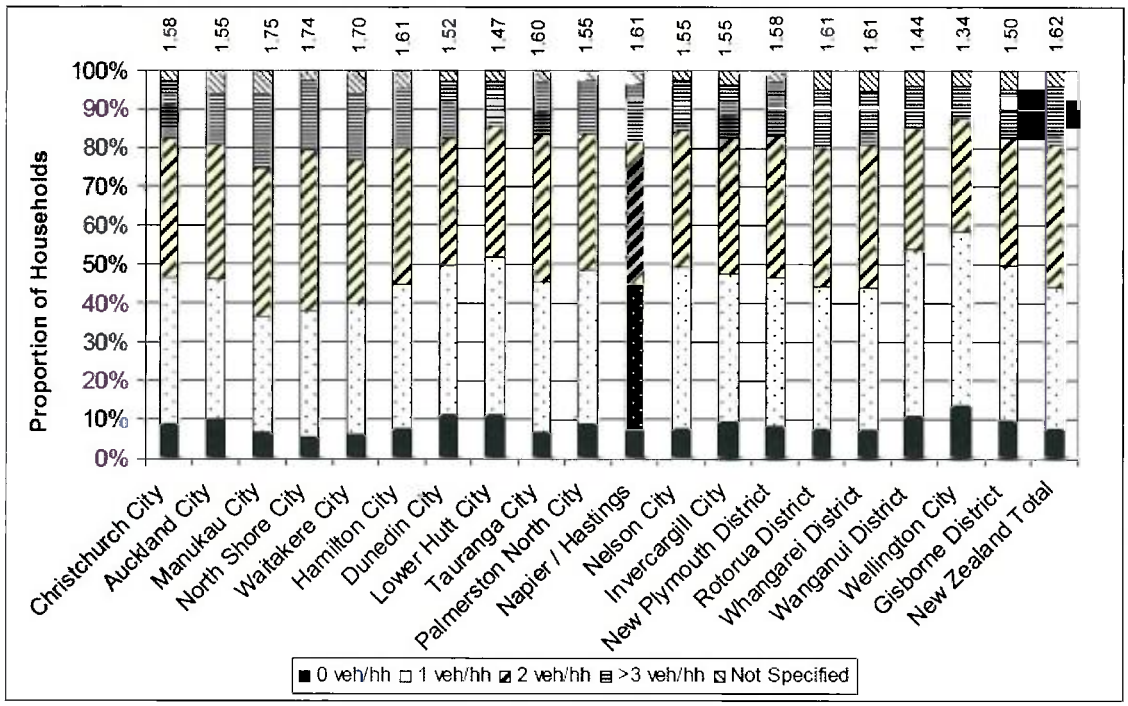


Figure 5 – Car Ownership (Census Data 2006)

Given this research and the lower car ownership a trip generation rate of **8 vehicles per day per household** has been applied to the Otamatea site.

4.2 Trip Generation Rates for Otamatea

Based on the trip generation rates the following trip rates per day have been calculated for each lot.

Area	Zone	m²	Lot Size	Number of Lots	Trip Generation (v/day)	Trips per day
Area 1:	Residential	106,678	800	133	8	1067
Area 2:	Residential	69,613	800	87	8	696
Area 3:	Existing Residential	6,004	800	8	8	60
Area 4:	Residential	63,048	800	79	8	630
Area 5:	Rural Residential	54,275	5000	11	6	65
Area 6:	Residential	18,280	800	23	8	183
				340		**2701**

It is estimated that the site will generate approximately **2700 trips per day**.

4.3 Trip Distribution

Four intersections are proposed from SH3 to access the site (shown as Roads 1- 4 on Figure 4), with a possible fifth should a connection be made to Taylor Road in the future. One of these roads utilises the existing side road of Tirimoana Place. The other intersections are new.

Using Figure 4 as a guide, the trips generated per area have been distributed across each of the proposed roads connections exiting onto the state highway.

With no other data available, it is estimated that 10% of the total trips per day will be in both of the peak hours. It has also been assumed that in the AM peak 70% of the trips are exiting the area and 30% entering and the reverse in the evening peak.

The distribution for each road is shown in Table 3 below:

	Peak Hour (10%)	AM Peak (in)	AM Peak (out)	PM Peak (in)	PM Peak (out)
Area 1 - **Road 1**	107	32	75	75	32
Area 2 - **Road 2** (Tirimoana Place)	70	21	49	49	21
Area 3 - **Road 2** (Tirimoana Place)	6	2	4	4	2
Area 4 - **Road 3**	63	19	44	44	19
Area 5 - **Road 4**	7	2	5	5	2
Area 6 - **Road 4**	18	5	13	13	5
TOTAL (vph)	**270**	**81**	**189**	**189**	**81**

The distribution shows that Road 1 (Bristol land) has the most traffic entering and exiting it.

From the Transport Agency's traffic counter on SH3, the average daily flow from the past 5 years is **7502**. Again using 10% as an approximation for peak hour flows, approximately 750 vehicles would be travelling past the site.

As growth on the state highway has been minimal it is assumed that these flows will remain relevant as the development is progressed and no growth factors have been applied.

Given the lack of bus services and walking/cycling facilities, for the purposes of the assessment, it is assumed that all trips are made by motor vehicle and no allowance has been made for alternative modes. Should public transport or walking and cycling be facilitated with the development then the number of trips by private vehicles would be reduced.

4.4 Traffic Model

No information or assessment of the design of the proposed intersections was made within the Technical Report however it is noted that the Transport Agency in 2011 required the Tirimoana Place intersection to be upgraded to include a right-turn lane should the road be extended, however it has been assumed for the purposes of the modelling that the layout is as existing.

Using the data above for Road 1, the intersection data was entered into aaSIDRA to understand the level of service for State Highway 3 and the proposed access road. The outputs from the aaSIDRA model are shown in Appendix A.

From the model the level of service in both the AM and PM peak with Road 1 is a **LOS A,** with a maximum delay of **8 seconds** for the right-turn into Road 1 and the right-turn out of Road 1.

As a sensitivity test the model was also run assuming all of the proposed site traffic exited and entered via a single access road called Road Q within the SIDRA model. The location of which has not been determined.

From the model, the level of service in both the AM and PM peak with Road Q was generally a **LOS A** with the exception of the right-turn into the site from the state highway which dropped to a **LOS B.**

This equates to a maximum delay for this right-turn movement of **11 seconds.**

4.5 Intersection Layout

The Austroad Guide to Road Design advises that intersection design is generally based on traffic operation, road safety and other physical conditions at a particular site.

Roads 2, 3 and 4 are all proposed to be within a posted 70km/hr speed limit area and Road 1 is within a posted 100km/hr speed limit area.

4.5.1 Sight Distance

On assessing the Stopping Sight Distance and the Safe Intersection Sight Distances along this section of corridor, there is generally good visibility from the existing side roads. Minimum sight distances are shown in the table below taken from the NZTA Planning Policy Manual.

Posted speed limit (km/h)	85th percentile operating speed, measured at the site (or if above not known, posted speed plus 10 km/h)	Minimum sight distance standard (m)
Not applicable	50	89
50	60	113
60	70	140
70	80	170
80	90	203
90	100	240
100	110	282

For the proposed roads, Road 1 would require further assessment, once the location is confirmed, to ensure it complies with the sight distance requirements of a 100kph speed limit.

4.5.2 Intersection Design

The side roads have also been assessed against Austroads criteria for turn treatments – Austroads Part 4A: Unsignalised and Signalised Intersections.

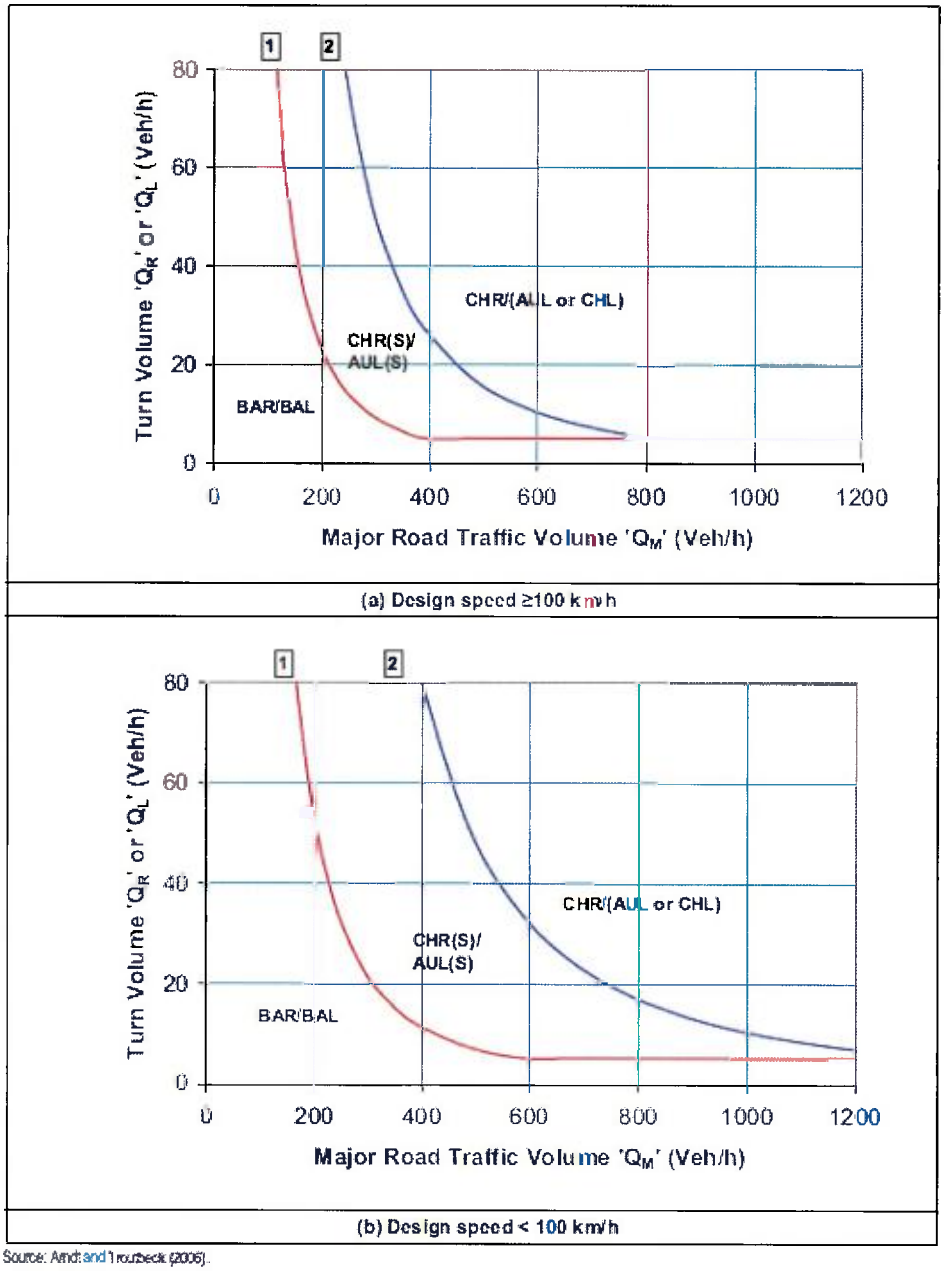
The warrants in the guide apply to major road turn treatments for basic, auxiliary lane and channelised layouts. The warrants are shown in the Austroads Figure 4.9 below and provide guidance on where a full-length deceleration lane must be used and where a shorter lane, designated Rural Auxiliary Left-turn Treatment – Short Turn Lane (AUL(S)) and Urban Channelised T-junction – Short Lane Type (CHR(S)), may be acceptable based on traffic volumes. Figure 4.9 contains two graphs for the selection of turn treatments on roads with a design speed:

- greater than or equal to 100 km/h. Figure 4.9(a) is appropriate for high speed rural roads.
- less than 100 km/h. Figure 4.9(b) is appropriate for urban roads, including those on the urban fringe and lower speed rural roads.

If a particular turn from a major road is associated with some geometric minima (for example, limited sight distance, steep grade), consideration should be given to the adoption of a turn treatment of a higher order than that indicated by the warrants.

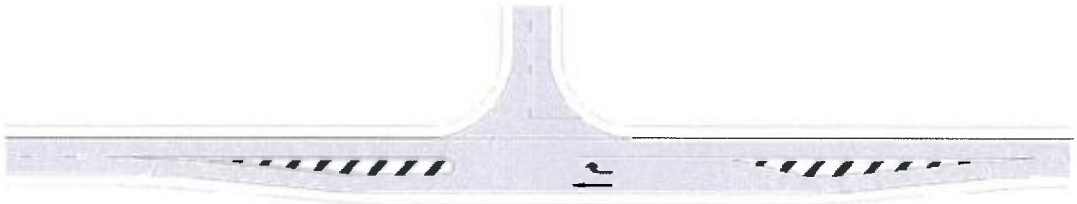
For example, if the warrants indicate that anUrban Basic Right-turn Treatment (BAR) turn treatment is acceptable for the relevant traffic volumes, but limited visibility to the right-turning vehicle is available, consideration should be given to the adoption of a CHR(S) or Channelised Right-turn CHR turn treatment instead. Another example is a major road on a short steep downgrade where numerous heavy vehicles travel quickly down the grade, in which case it would not be appropriate

to adopt a BAL turn treatment. Instead, an AUL(S) or a Rural Auxiliary Left-turn Lane Treatment AUL would be a preferred treatment.



Source: Arndt and Troutbeck (2006).

Figure 4.9: Warrants for turn treatments on the major road at unsignalised intersections



Channelised Right Turn (CHR)
on the Major Road

Based on the Austroads criteria: the volume of the major road; the delay for the right-turn into the side roads; the gradients of SH3; and a possible crash issue with right-turning traffic, it is recommended that for Roads 1, 2 and 3 that a channelised right turn layout be adopted as a minimum. For Road 1 a channelised left-turn layout is also recommended however in New Zealand left-turn layouts require careful design as through traffic can become shadowed by turning traffic and crashes eventuate.

For Road 4, given the lower volume of turning traffic and the lower speed environment the warrant suggests that this could remain a priority T-intersection, although short channelisation would be beneficial.

4.5.3 Access Strategy

The impact of the intersections for the proposed site are also influenced by the location of other roads. As a result, when determining the spacing and design of intersections, there is a need to balance local connectivity, safety, network efficiency and social and environmental objectives.

Decisions on the design and spacing of intersections are strongly influenced by the state highway categorisation. On national state highways the priority will generally be to maintain the through flow of long distance traffic and will discourage short local trips. This is likely to lead to fewer intersections, particularly in urban and peri-urban areas. Conversely it will be appropriate to accommodate more intersections on regional and sub-regional state highways, which have a greater local access role.

The new connections, as they would generate more than 20 movements in the peak hour, are considered as intersections rather than accessways and have therefore been assessed using Austroads Guide to Road Design Part 4: Intersections and Crossings. This guide determines that the spacing of unsignalised access (streets and driveways) can be assessed by considering:

- safety
- stopping sight distance
- intersection sight distance
- functional area
- left-turn conflict overlap
- influence distance
- egress capacity.

Safety and stopping sight distances have been discussed above. The other elements, that can be determined, are the left-turn overlap conflict and the egress capacity.

A left-turn overlap conflict occurs when the through driver must monitor more than one access at a time. Providing at least the stopping sight distance between access points will allow a through vehicle to avoid a collision with an entering vehicle. However, this is considered too conservative as the entering vehicle will be accelerating away. Table A3 from the Austroads document provides the minimum distance to avoid the overlap according to the method used by TRB (2003). The acceleration and deceleration rates used in this method are conservative.

The minimum distance to reduce collision potential for overlapping left turns would be **105 metres**.

Table A 3: Minimum distance to reduce collision potential due to overlapping left turns

Speed (km/h)	Minimum spacing (m)
50	60
60	80
70	105

Egress capacity refers to the ability of vehicles to exit from an access into the traffic stream. TRB (2003) quotes research from Australia (Major and Buckley 1962) to derive a spacing based on the capacity to exit from an access. This research showed that the capacity increases with increasing spacing of the access points until the spacing is 1.5 times the distance to accelerate from a stop to the average speed of the through traffic. This criterion results in the values in Table A 6.

Table A 6: Distances to maximise the ability of cars to re-enter the through traffic stream from an unsignalised driveway

Speed (km/h)	Minimum access spacing (m)
20	30
30	45
40	75
50	115
60	170
70	240

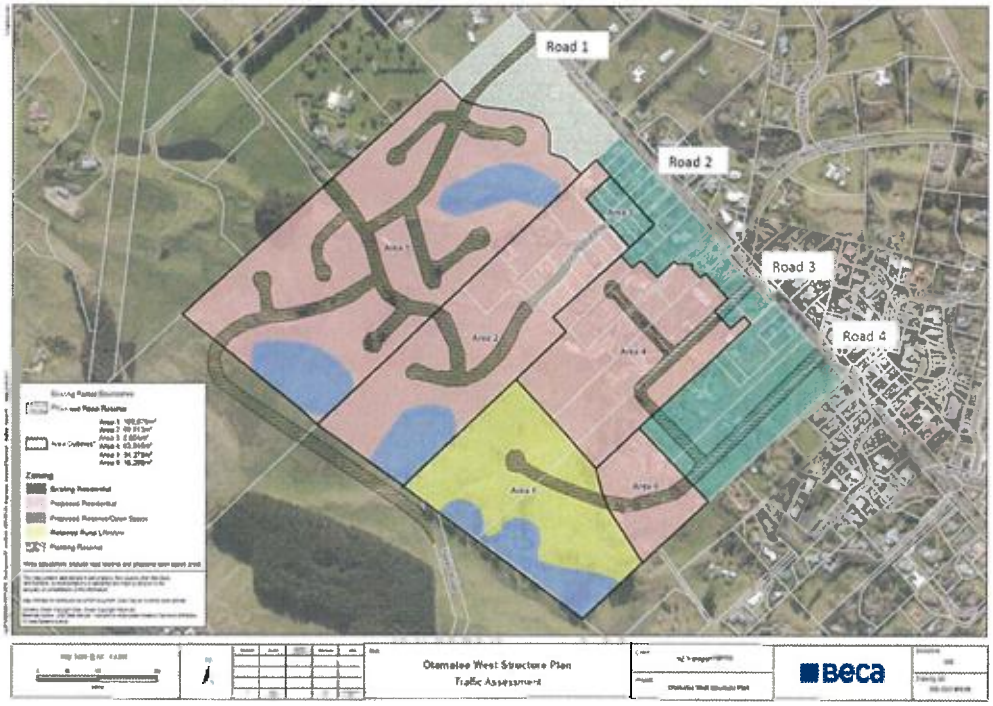
The minimum distance to maximise the ability of cars to re-enter the through traffic stream within a 70kph speed zone is **240 metres**.

Of particular concern with the proposal is the close proximity of Mannington Road and Eaton Crescent to the development. Eaton Crescent is approximately 85m from Turere Place to the south, but will also be approximately that distance from the proposed Road 4 to the north. Mannington Road will be almost opposite the proposed Road 3.

While sight distances do not appear to be an issue, although this would need to be determined at detail design, the left-turn conflict and egress capacity are below standard, neither of these criteria are met by the proposal.

4.6 Internal Road Layout

Under NZS 4404:2010 Land Development and Subdivision Infrastructure, the proposed roading layout for the subdivision can be categorised as 'Live and Play – Urban' which identifies minimum road reserve widths, minimum movement land widths, maximum vertical profile grades and target operating speeds for vehicles with land developments catering for up to 200 dwellings, although the number of dwellings has not been stated.



For Road 1, the horizontal alignment consists of a main alignment intersecting at Great North Road, through the Bristol property, and having a possible future connection to what is known as the Taylor Road easement.

From this main alignment, cul-de-sac roads and one loop road make up the remaining roading network.

Proposed connecting roads have also been designed from the Bristol property to access the Tirimoana Development Ltd property to the south east, and also to connect to the adjacent Harding property to the North West.

Areas 4, 5 and 6 are connect via new roads also connecting directly to Great North Road and each other.

The following internal roading design parameters have been adopted from NZS 4404:2010 for this proposed subdivision:

- 15.0m road reserve width
- 7.0m new seal width
- New kerb and channel both sides of carriageway
- 1.5m wide footpaths both sides of carriageway
- Potential on street parking
- Roading vertical profiles have a maximum grade of 5.5%

- All cul de sac heads have 9.5m radii
- Lighting design as per AS/NZS 1158

No assessment has been undertaken of the validity of the location of the internal road layout or how well it integrates with the topography.

The subdivision standards, as per NZS 4404:2010, would be appropriate and allow for walking and cycling to be integrated within the street. However the design principles of interconnectivity, a high standard of property access and avoiding street congestion and excessive traffic on roads, do not seem to have been met in full.

The Urban Design Protocols within the District Plan seek to enhance connectivity within multimodal transportation networks and links between different transport modes (pedestrian/cycle/street), to ensure safe and easy movement for people. They also allow for the integration of subdivisions with existing and future surrounding neighbourhoods through these networks, and the subdivision principals, of establishing linkages to existing residential developments adjacent to the study area and to other community facilities. An example of where this is not met is where the location of the nearest play ground on the opposite side of the state highway. Access to schools and other facilities are also only realistically accessible by car.

The lack of internal connection between the two main residential areas proposed means that extra connections are required to Great North Road, which as demonstrated above, are not required for capacity reasons.

In addition the ability to provide a good public transport loop is limited by this layout.

5 Conclusions and Recommendations

5.1 Conclusion

The Opus Technical Report did not assess the impact of the traffic generated by the proposed development, nor the impact of the proposed road layout on the wider transport network, in particular, the state highway.

The proposed site is expected to accommodate a maximum of 340 lots which would generate up to 270 trips in the peak hours, in and out of the site.

An assessment of the operation of the 'worst' intersection, in terms of traffic volumes only, was undertaken using the modelling tool aaSIDRA and this concluded that in isolation the intersection would perform at a LOS A overall. The assessment was also undertaken with traffic entering and exiting via a single intersection. The modelling showed the intersection would perform generally at a LOS A but a LOS B for the right-turn into the site in the PM peak.

Based on engineering criteria the sight distances to and from the proposed intersections appear appropriate but more detailed design would be required to confirm this, however the location of existing side roads are in conflict with the safety and operation of the proposed roads. While the safety record is currently good within the urban zone, the increase in turning movements, lack of turning facilities and close proximity of existing intersections is likely to reduce the level of safety.

The internal road layout is in accordance with the subdivision design guidelines, however, the lack of internal connectivity, leads to additional and potentially superfluous connections to Great North Road, and appear to be contrary to the Urban Design Principals.

With two new connections within the 70kph zone and one within the 100kph zone, this could lead to the state highway function becoming compromised in the future.

The site is on the urban fringes of Whanganui. There is a lack of public transport facilities and as the internal road network has limited connectivity the ability to provide a good service is restricted.

The current footpath connectivity is poor with the provision of a 1.5m wide footpath only provided on the existing state highway and the internal road layout, while appropriately designed to integrate walking and cycling, does not facilitate good linkages.

5.2 Recommendations

To ensure a good safety outcome for this site it is recommended that, as a minimum, the road network access is rationalised and that connections are restricted to the 70kph zone. This would mean that Road 1 would not be acceptable in its proposed location. A single connection has been modelled and considered to operate acceptably although the design and location of any connection would need to be considered further. Careful consideration would be required to ensure that any connections does not interfere with existing side roads and that channalised right-turn bays are incorporated into the design to avoid delays in turning and associated rear-end type crashes.

It is also recommended that the internal road network be better connected to ensure it meets the Urban Design Protocols and Structure Plan principals. This would also facilitate better public transport and walking/cycling routes.