Proposed Development
Lynmore Junction, Rotorua

Integrated Transport Assessment

Prepared by

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PORTER

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1. INTRODUCTION

1.1 Overview

WD Holmes 2000 Trust proposes to construct and operate a supermarket based neighbourhood centre development on the property located at 346-352 Te Ngae Rd Rotorua, legally described as Lot 1 DPS 75440 and Lot 2 DPS 70760.

Because of the scale of the development and being a non-complying one under the Rotorua District Plan, an Integrated Traffic Assessment is required for the activity. This report provides that assessment, and forms part of the Resource Consent Application.

The assessment has been prepared in accordance with NZ Transport Agency research report 422 guidelines. It draws on discussions with the applicant (Mr Ryan Holmes) and other members of the project team, Rotorua District Council, the NZ Transport Agency, and site observations.

1.2 Background

During the planning stages of the project a briefing meeting was arranged by the Applicant and Planner, which was attended by NZ Transport Agency (NZTA), Rotorua District Council (RDC), and Gabites Porter representatives. The meeting took place on 15th August 2012, and the key focus areas noted by NZTA and RDC were:

- Effect of the development on Te Ngae Rd as a regional strategic route
- Transport effects on local roads in the area
- Pedestrian accessibility both internally and to the site

It was accepted that an efficient approach to the transport assessment would be to agree on the trip generation rates and modelling approach prior to undertaking the detailed assessment. The subsequent agreed approach to these aspects is detailed in Section 5 of this report.

Approval was received from NZTA for use of the Rotorua Transportation Model with the development and Rotorua Eastern Arterial (REA) options for assessing the network effect of this development.
2. EXISTING ENVIRONMENT

2.1 The Site and Surrounding Area

2.1.1 The Site

The proposed development site is located on the northwest side of Te Ngae Rd at the Te Ngae Rd / Iles Rd intersection, and covers an area of approximately 2.7ha. Within the Rotorua District Plan part of the site is zoned Industrial B and part of the site Residential B.

The site has two formed accesses to Te Ngae Rd; an entry-only near the southern boundary and a main entry/exit located approximately 50m north of the Iles Rd intersection.

Immediately adjacent the site, commercial and Industrial developments occupy the land to the south and west, and a large vacant area of land exists to the north.

North of Basley Rd, Te Ngae Rd passes through a residential area. A shopping centre is located 1.5km north of the site on the west side of the Te Ngae Rd / Owhata Rd intersection. To the south of the site, various commercial and industrial developments front onto Te Ngae Rd such as petrol stations and car yards.

An aerial plan of the area showing the development site is shown below. The subject site is indicated with an orange border.
2.1.2 Existing Use

The property is currently occupied by Sealed Air, a goods manufacturer, who employ around 130 staff. Employment is on a shift rotation basis, with operation seven days per week.

There are nine different shifts. Only one of these coincides with the morning and evening traffic peak on Te Ngae Rd, with this shift incorporating eleven staff.

In its current operation, the site attracts some 330 vehicle movements over a 24 hour period, of which around 24 movements are trucks.

2.2 Roading Network

2.2.1 Te Ngae Rd

Te Ngae Rd forms part of State Highway 30 (SH30) between Rotorua and Whakatane. It passes the site on a northeast-southwest alignment, hereafter referred to as north-south (out of town and in to town respectively) for the purposes of this report.

Te Ngae Rd is classified as a Major Arterial within the District Plan. It is the primary access to Rotorua east, and also links the central city with Rotorua Airport. Adjacent the site, Te Ngae Rd has a posted speed limit of 60km/h. It has one northbound lane and one southbound lane widening into two southbound lanes at the Iles Rd intersection. Footpaths are provided on both sides of the road, and kerbside cycle lanes are also marked on both sides. The road contains a flush median approximately 3m wide.

2.2.2 Iles Rd

Iles Rd is classified as a Collector within the District Plan, and provides access to the Lynmore residential area local roads. It has a carriageway width of approximately 13m, which includes one lane each way and on-street parking on the southern side of the road. Parking is restricted on the northern side of the road all day with no stopping lines.

Iles Rd intersects Te Ngae Rd as a priority ‘T’ intersection, with Iles Rd as a “Give Way”. A continuous slip lane is provided for the left turn out movement, which forms the start of the second southbound lane on Te Ngae Rd.

Lynmore Primary School is located on the southern side of the intersection, with access via Iles Rd. On-street bus parking is marked outside the school on the southern side of Iles Rd.

Visibility at the Iles Rd / Te Ngae Rd intersection is excellent in all directions, as there are wide berms on both sides of Te Ngae Rd.

2.2.3 Walking Network

Te Ngae Rd has footpaths on both sides the road. The nearest formal crossing facility is a signalised pedestrian crossing located 600m to the north of Iles Rd. South of Iles Rd, the nearest crossing facility is at the Tarawera Rd roundabout.
Iles Rd has footpaths on both sides. Pedestrian cutdowns to cross Iles Rd are provided at the Te Ngae Rd intersection, and a pedestrian “zebra” crossing is located outside the school approximately 160m from Te Ngae Rd.

Pedestrian activity in the area is minimal, despite the presence of Lynmore Primary School. The only noticeable crossing desire line at the intersection is north-south across Iles Rd. Peak pedestrian activity occurred at school close. During an hour observation on a Wednesday at the intersection of Te Ngae Rd / Iles Rd, the following pedestrian crossing movements were observed:

- North-south across Iles Rd: 3 pedestrians, average stopped delay of 2 seconds
- East-west across Te Ngae Rd: 1 pedestrian, with a stopped delay of 12 seconds

### 2.2.4 Cycling Network

Marked cycle lanes are provided on both sides of Te Ngae Rd, adjacent the kerb. These lanes form part of a strategic cycle route along Te Ngae Rd which include off-road shared cycle facilities at the Tarawera Rd roundabout. Cycle lanes are not provided on Iles Rd.

Peak cyclist activity observed at the Te Ngae Rd / Iles Rd intersection occurred during the evening peak hour of 4:30 – 5:30pm on a Wednesday, during which time the following numbers of cyclists were observed:

- Te Ngae Rd northbound: 9 cyclists
- Te Ngae Rd southbound: 2 cyclists

No other cyclist movements were observed during this hour. However during the morning and after school peak periods one cyclist was observed in each period turning left out of Iles Rd.

Te Ngae Rd is identified as a strategic cycle route in the Rotorua Transport Strategy and Proposed Structure Plan

### 2.2.5 Public Transport

Two bus routes travel past the site on Te Ngae Rd. These are Route 10 – Rotorua Airport, and the Twin City Express. Route 3 – Owhata passes through the Lynmore residential area to the east of Te Ngae Rd.

Routes 10 and 3 operate every half hour, and the Airport route operates twice per day. The nearest bus stops are the Te Ngae junction and Tennyson Dr stops.

During the 2:30 – 3:30 pm after school peak, there were two school buses observed at the Te Ngae Rd / Iles Rd intersection. One turned left out of Iles Rd and one turned right into Iles Rd.
2.3 Traffic Volumes and Level of Service

2.3.1 Te Ngae Rd

The NZTA collects traffic count data at various locations on SH30. The Annual Average Daily Traffic (AADT) for the count location closest to the site is shown in Table 1 with an estimation of the AADT adjacent the site.

<table>
<thead>
<tr>
<th>Site reference(s)</th>
<th>Location</th>
<th>2011 Volume (AADT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03010149</td>
<td>Te Ngae Rd - East End of Puarenga Brg</td>
<td>33,577</td>
</tr>
<tr>
<td>03020149</td>
<td>-</td>
<td>20,200</td>
</tr>
</tbody>
</table>

The traffic volume adjacent the site was estimated by factoring the peak hour volume determined during an intersection survey by the peak hour to all day traffic factor from the NZTA count on Te Ngae Rd.

Recent data published by the NZTA indicate traffic volumes in the Rotorua area have not experienced any real change over the last few years.

Because the location of this NZTA count station is closer to the central city than the site, particularly since it is south of the Tarawera Rd intersection and is 4 lanes wide, this volume is significantly higher than the AADT adjacent the site.

The heavy vehicle composition on Te Ngae Rd was shown in the NZTA traffic count data as constituting 5.9% of the AADT. This value may be slightly lower than the HCV proportion adjacent the site as there is likely to be a higher level of commuter traffic at the NZTA count location. However, a sensitivity test showed that a higher value of 8% HCV had no real effect on the intersection performance and therefore 5.9% is considered an appropriate value for modelling purposes.

2.3.2 Traffic Survey

Traffic surveys were carried out at the Te Ngae Rd / Iles Rd intersection during the morning, evening, and after school peak periods on Wednesday 15\textsuperscript{th} and Thursday 16\textsuperscript{th} August 2012. The survey included the recording of all traffic volumes, queue lengths, and delays. Pedestrian, cyclist, and bus volumes were also identified.

The surveys were carried out at the following times:
- Morning: 7:30 – 9:00am
- After school: 2:30 – 3:30pm
- Evening: 4:30 – 6:00pm

The peak hour volume periods from the morning and evening surveys were identified as:
- Morning peak hour: 7:45 – 8:45am
- Evening peak hour: 4:30 – 5:30pm
The diagrams below show these peak hour volumes for the Te Ngae Rd / Iles Rd intersection.

The after school peak had a lower traffic volume of 2008 vehicles per hour and is therefore not considered critical.

Queue lengths and average delay for the right turn movements are shown in Table 2.

<table>
<thead>
<tr>
<th>Movement</th>
<th>Average Stopped Delay (seconds)</th>
<th>95%ile Queue Length (vehicles)</th>
<th>LOS*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Te Ngae Rd right turn in</td>
<td>Morning peak: 31.2</td>
<td>Morning peak: 4</td>
<td>Morning: D</td>
</tr>
<tr>
<td></td>
<td>Evening peak: 12.0</td>
<td>Evening peak: 4</td>
<td>Evening: C</td>
</tr>
<tr>
<td>Iles Rd right turn out</td>
<td>Morning peak: 27.6</td>
<td>Morning peak: 1</td>
<td>Morning: D</td>
</tr>
<tr>
<td></td>
<td>Evening peak: 53.8</td>
<td>Evening peak: 2</td>
<td>Evening: F</td>
</tr>
</tbody>
</table>

* Note: Movement Level Of Service (LOS) was determined using SIDRA 5 models calibrated with site survey data.

The following observations were noted:

- Counts between the morning and evening volumes indicate a heavy directional split on Te Ngae Rd
- There is a substantial right turn movement from Te Ngae Rd south into Iles Rd during the evening peak
- There is some difficulty turning right out of Iles Rd. Two drivers in each observation period gave up after a prolonged delay and turned left instead. Some vehicles pulled into the median and completed the turn as a two-stage movement.
- During the after school period, three northbound vehicles on Te Ngae Rd did U-Turns at the intersection to park on the berm adjacent the school on Te Ngae Rd to pick up children.
2.4 Accidents

The NZ Transport Agency records indicate there have been six accidents reported over the last five years at the intersection of Te Ngae Rd and outside the site, as outlined in Table 3.

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Injury</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 2007</td>
<td>At the intersection</td>
<td>Non-injury</td>
<td>A car northbound on SH30 hit a vehicle turning out of Iles Rd</td>
</tr>
<tr>
<td>Mar 2007</td>
<td>Approaching the intersection</td>
<td>Non-injury</td>
<td>A car northbound on SH30 lost control and went off the road</td>
</tr>
<tr>
<td>Jun 2007</td>
<td>Approaching the intersection</td>
<td>Minor</td>
<td>A car southbound on SH30 lost control and went off the road</td>
</tr>
<tr>
<td>Sep 2007</td>
<td>At the intersection</td>
<td>Non-injury</td>
<td>A car westbound on Iles Rd went through the intersection and off road</td>
</tr>
<tr>
<td>Oct 2008</td>
<td>South of the intersection</td>
<td>Non-injury</td>
<td>A car southbound on Iles Rd hit a vehicle while changing lanes</td>
</tr>
<tr>
<td>Sep 2010</td>
<td>At the intersection</td>
<td>Non-injury</td>
<td>A car southbound on Iles Rd hit a truck while changing lanes</td>
</tr>
<tr>
<td>Dec 2010</td>
<td>South of the intersection</td>
<td>Non-injury</td>
<td>A van northbound on SH30 hit the rear of a vehicle in front</td>
</tr>
<tr>
<td>Feb 2011</td>
<td>At the intersection</td>
<td>Non-injury</td>
<td>A car westbound on Iles Rd hit the rear of car in front</td>
</tr>
</tbody>
</table>

From the accident data it is noted that:

- There were no real accident trends apparent at the intersection
- No accidents were reported to have occurred at the existing accesses to the property
- The site specific accident rate for this intersection based on procedures in the NZTA Economic Evaluation Manual equates to 0.19, while the weighted typical accident rate is 0.73. This indicates that the number of injury accidents occurring at the intersection is around a quarter of that which would typically be expected at an intersection of this nature and with this level of traffic

The data does not indicate any real safety concern with the Te Ngae Rd / Iles Rd intersection.
3. ROADING PROPOSALS

3.1 Rotorua Eastern Arterial

The Rotorua Eastern Arterial (REA) project aims to increase efficiency, reduce travel times, and improve safety for all road users travelling around and through the eastern suburbs of Rotorua. NZTA are presently considering options for this corridor.

Currently, the designated alignment involves a new highway in predominantly green-field areas, basically parallel to Te Ngae Rd between it and Lake Rotorua. It would connect to Sala St and a new intersection with the proposed Victoria St Arterial. At the north-eastern end of the proposed highway, the intersection with Te Ngae Rd is located just south of the Rotorua Airport.

Implementation of the proposed REA as currently designated would significantly reduce the traffic volume on Te Ngae Rd adjacent the site. Te Ngae Rd would operate as a local road, and able to better cater for vehicle access, pedestrians, and cyclists.

In addition to this alignment, NZTA is currently considering two alternative REA options. These are:

- Vaughan Rd link
  In this option, the proposed REA links into Vaughan Rd. Te Ngae Rd (west of Vaughan Rd) and Vaughan Rd would be widened. This option would also have a significant improvement in traffic conditions adjacent the site

- Upgrade Te Ngae Rd
  This option would involve widening Te Ngae Rd, which would remain as SH30. Traffic volumes on Te Ngae Rd would increase, and direct access onto the highway would likely be restricted.

This assessment of the future traffic conditions on Te Ngae Rd is based on the current designated alignment. However, the effects of the two alternative REA options in relation to the proposed development are discussed in Section 6.2.

3.2 Rotorua Basin Structure Plan

There is considerable development planned for the northeast of the city. This includes the recent approval of the Ngati Whakaue Plan Change 34, while further development is covered in the Rotorua Basin Structure Plan. This plan integrates the Eastern and Western structure plans developed in 2008. Its purpose is to establish a future vision for the Rotorua Basin, and will inform the District Plan and strategic policies.

Te Ngae Rd is identified as a key transport corridor, on which intersection upgrades are identified as being necessary to compliment the REA, to facilitate the Structure Plan development. The plan anticipates that demand management measures, such as increased passenger transport services and walking and cycling opportunities to be undertaken on Te Ngae Rd in conjunction with the opportunities that arise through traffic relief offered from the REA.

Key development areas are Wharenu Rd residential and Gee Rd rural-residential.
Part 2 of the Structure Plan comprises an integrated transport assessment of the effects of the plan. Key outcomes of this assessment that relate to the site include:

- The current capacity of SH30 Te Ngae Rd will not be able to cater for planned growth in the Structure Plan

- Short term available capacity on Te Ngae Road will be taken up by development traffic associated with the Ngati Whakaue Plan Change 34. Any further development as a result of Plan Change 34 or the Structure Plan will require the REA.

- The REA will support the growth by accommodating strategic trips, with Te Ngae Rd retained for local transport functions

- Intersection upgrades will be required on Te Ngae Rd in the short term to support Plan Change 34 and Structure Plan development, including:
  - Traffic signals at Te Ngae Rd / Iles Rd intersection
  - Upgrades to other intersections on Te Ngae Rd

The mitigation statement for the Te Ngae Rd / Iles Rd intersection as noted in the Structure Plan Report is:

“Future Condition: Queuing will occur on the Iles Road approach left turn and right turn movements during the AM peak period plus queuing on the Iles Road approach right turn movement during the PM peak period. Infrastructure improvement options were not considered necessary at this intersection due to the heavy, but not excessive delay (average of about 45 seconds during AM and PM peak periods). Signals were assessed as an ideal short to medium term solution together with provision for passenger transport, and walking and cycling.

Recommendation: Signalise and demand management”

The Structure Plan Report indicates that the timing for the proposed upgrade of this intersection should be in conjunction with the REA development.
4. THE PROPOSAL

4.1 Concept

The proposal is to construct a supermarket based neighbourhood centre of comprehensive commercial nature on the site with a total gross floor area (gfa) of 8,490 m². The proposed component activities for the complex are:

- Retail: 7090 m²
- Fast food: 600 m²
- Medical: 540 m²
- Service station: 260 m²

It is anticipated that a supermarket of 3325 m² will constitute a large portion of the retail area as an anchor tenant.

A site plan of the proposal is shown below. This plan is also attached in the Appendix to this report with drawing number RC10-02 Revision A, prepared by Brown Day Group.

Two intersection treatment options are also shown in the Appendix to this report, with drawing numbers 10-03 and 10-04, prepared by Brown Day Group.
Access to the site will be via three accesses as follows:

- The main access intersects Te Ngae Rd opposite Iles Rd, to form a four leg intersection
- A left turn in entry is provided south of the main access for northbound vehicles on Te Ngae Rd to enter the site
- A left turn out exit is provided north of the main access for vehicles exiting to the north on Te Ngae Rd from the supermarket area

The anticipated hours of operation are:

- Supermarket: 7am – 10pm, 7 days per week
- Service station & Fast food: 24hrs per day, 7 days per week
- Medical and convenience retail: 7am – 6pm, 7 days per week

4.2 Transport Provisions

On site car parking is provided for 376 vehicles. Included in this are:

- 27 staff only parking spaces (located in the one-way area along the south and west boundaries)
- 8 disabled parking spaces

The service delivery routes are shown on the site plan, with tracking alignments for an 18m semi-trailer. Access to the supermarket delivery area involves entering via the main access and exiting via the left turn out onto Te Ngae Rd. Service delivery vehicles then heading south would U-turn at the Te Ngae Rd / Owhata Rd roundabout north of the site. Service delivery vehicles accessing the other tenants would exit via the main access.

Cycle parking is provided adjacent the convenience retail buildings, and there is potential for additional cycle racks to be provided near the entrance to the supermarket.

The internal layout has been developed to ensure easy manoeuvring and reduce the occurrence of potential congestion, particularly near the accesses to Te Ngae Rd.

Pedestrian connectivity has been provided with marked crossing locations and footpaths on key desire lines.

There is potential for an internal bus stop to be provided near the main entrance, should there be a demand for a bus stop within the site at some point in the future.

All the above on-site transport provisions are further discussed in Section 7 of this report.
5. TRANSPORTATION MODELLING

5.1 Traffic Generation

5.1.1 Overview

Assessed trip generation for the proposal was developed in discussion with NZTA, and was subsequently approved for use in traffic modelling. NZTA research report 453 “Trips and parking related to land use” (November 2011) was used to determine appropriate trip generation rates, and compared against trip surveys of similar developments from the NZ Trips Database Bureau.

Overall, the trip generation for the proposed development is assessed as 1148 vehicle movements during the peak hour. This traffic has conservatively been assessed against the critical evening peak traffic period.

5.1.2 Existing Site Traffic

As noted in Section 2.1.2, the existing development operates on a shift rotation basis seven days per week. Only one of the nine shifts coincides with the morning and evening traffic peak on Te Ngae Rd, with this shift incorporating eleven staff.

In its current operation, the site attracts some 330 vehicle movements over a 24 hour period, of which around 24 are trucks.

During each of the morning and evening peak periods, around 15 vehicle movements were observed.

The peak periods of existing site activity do not coincide with the proposed development traffic peaks. Therefore, existing trips have not been included when assessing the network effects from additional traffic. This is considered a conservative approach.

5.1.3 Trip Generation Methodology

As a starting point to estimate the anticipated trip generation, a typical “base” rate for a retail shopping centre (ignoring the fast food and service station activities at this stage) was determined as follows:

- The 50thile rates in Table C1 of Research Report 453 are 12.2 and 7.1 vehicle movements per 100m² gfa for medium and large shopping centres respectively. The proposed development is toward the large end of a medium sized shopping centre

- Figure 5.4 of Report 453 provides a graph of shopping centre trip rates vs size. This shows a rate of 10 for a proposed shopping centre of this size
To account for the service station on the site, Table 5.3 of Report 453 provides average trip rates for shopping centres with on-site petrol fill stations. For a shopping centre size between 6,001 – 10,000 the rate for NZ is 13.19 vehicle movements per 100m² gfa. Given that:

- The proposed area is near the middle of this range (slightly on the conservative side)
- There are many service stations that already exist on Te Ngae Rd near the site, including one immediately adjacent the site
- It seems an appropriate increase over the rate of 10 for shopping centres

It is therefore considered an appropriate rate for the entire shopping centre (including the medical and convenience retail) to account for the service station, but excluding the fast food.

To account for the fast food outlet, Table C1 of Report 453 contains a 50%ile rate for stand alone fast food activities of 36 vehicle movements per 100m² gfa. Given that:

- A higher proportion of trips will be from pedestrians than a typical fast food activity given that it is within the shopping centre complex
- Many of the trips will be cross-linkage between food and non food retail outlets and will therefore not be “new” trips as discussed in section 5.6.2 of Report 453
- Fast food retail would typically have a peak period that is offset to a shopping centre retail peak period

It is considered appropriate that half of the trips to the fast food outlet would be “new” dedicated trips, and therefore the fast food retail is assessed separately with a trip rate of 18 per 100m² gfa.

The assessed trip generation for the proposal is given in Table 4.

<table>
<thead>
<tr>
<th>Activity</th>
<th>GFA (m²)</th>
<th>Trip rate (trips per 100 m² gfa)</th>
<th>Vehicle movements (peak hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shopping centre &amp; service station</td>
<td>7,890</td>
<td>13.19</td>
<td>1,040</td>
</tr>
<tr>
<td>Fast food</td>
<td>600</td>
<td>18</td>
<td>108</td>
</tr>
<tr>
<td>Total:</td>
<td>8,490</td>
<td>n/a</td>
<td>1,148</td>
</tr>
</tbody>
</table>

This traffic has conservatively been assessed against the critical evening peak traffic period. For the morning peak period a trip generation of 60% of the peak rate has been assumed which gives a volume of some 700 vehicles per hour.
5.2 Network Modelling

5.2.1 Approach

The approach to modelling the network was developed in discussion with NZTA prior to analysis, and was agreed that:

TRACKS modelling software will be used to evaluate network effects resulting from the proposed development on the Rotorua Transportation Model. The year 2021 will be used for analysis of future volumes as this year coincides with post-construction modelling year for the REA. The process involved:

- Adding a new zone into the Rotorua Transportation Model to represent the proposed development, linking in to the existing intersection at Te Ngae Rd / Iles Rd. This zone was loaded with the proposed land uses for the site such as employment and retail area, to provide the assessed level of trip generation as discussed in Section 5.1.

- Developing models for various scenarios such as intersection treatment, base year and future year, morning and evening peak, and REA options

- Output from the model included local road volume changes, the effect on level of service, and was also used to determine the traffic distribution, pass-by and diverted trips to and from the proposed development

For transportation modelling of the 2012 base year, the 2006 network model is considered appropriate for use as this base year model on the basis that:

- Very little development has occurred since 2006
- There has been no real change in volume on the Rotorua State Highway network over the last few years.
- The 2006 Rotorua Transportation Model represents the existing traffic at the intersection very well. For example in the critical evening peak period the model shows a total of 2262 movements while there were 2263 movements recorded on site during the intersection survey.

On this basis, the 2006 model has been adopted for the 2012 base year as it is unnecessary to create a new base year model.

5.2.2 Future Land Use

The future year TRACKS models for 2021 used in assessing this proposal use the latest approved land use forecast scenario “GA11”, which includes the Eastern Basin growth and the Ngati Whakaue development.

With NZTA approval, testing of the network without the REA bypass in place used the same transportation models that the NZTA are currently using for testing of REA options.

5.2.3 Trip Assignment

The assessed trip generation levels were applied to the Rotorua Transportation Model during the morning and evening peak periods for the base year and future year (2021).
Volume change diagrams showing the effect on the wider network are shown in the Appendix to this report for various network and development options. Volume increases of 50 vehicles/hr or more are shown in red, while decreases in volume of 50 vehicles/hr or more are shown in green.

As evident from these diagrams, the additional delay associated with the four-leg intersection on Te Ngae Rd causes some shift in traffic onto the REA and Vaughan Rd, depending on the intersection treatment. There is also some redistribution of local traffic in the Lynmore area east of Te Ngae Rd, although this is relatively small.

The diagram below shows the resulting distribution of site traffic onto the network during the critical evening peak period determined by the Tracks network model:

The pass-by rate for a proposal is defined as the proportion of traffic generated by the development estimated to be existing traffic on the network passing by. For this proposal, the pass-by rate is around 30% - 35%.

5.3 Intersection Modelling

5.3.1 Approach

SIDRA INTERSECTION 5 was used to assess the performance of a new intersection layout at the Te Ngae Rd / Iles Rd junction. Two intersection control treatments were considered, a roundabout and traffic signals.

Unless land was taken near the intersection, a roundabout at this site would be limited in size, and for modelling purposes it was assumed to have a 20m diameter central island. This is larger than the roundabout at the Te Ngae Rd / Owhata Rd intersection of 15m, and smaller than the roundabout at the Te Ngae Rd / Tarawera Rd intersection of 28m.
For modelling of the intersection, the following design assumptions are made:

- The roundabout layout has two lanes in each direction, except for the Iles Rd exit which only has one lane. The roundabout has an internal island diameter of 20m.
- The traffic signal layout has three lanes on each approach except for Iles Rd which has two approach lanes. The Te Ngae Rd approaches have a right turn lane, a through lane, and a shared through and left lane. The Iles Rd approach has a shared through and right turn lane, and a left turn lane. The site access approach has two right turn lanes, and a shared through and left lane.
- Traffic signal phasing comprises a diamond lead for Te Ngae Rd and split phasing for the side roads. Pedestrian crossings are provided across Iles Rd, the site access, and Te Ngae Rd north approach.

Concept plans showing the two intersection treatment option are included in the Appendix to this report.

Intersection traffic volumes were calculated as follows:

- Tracks network modelling identified the percent change in volume between the roundabout option and the base model, for each existing movement.
- This percent change was then applied to the existing traffic volumes determined at the intersection during the survey.
- Traffic volumes for new movements to and from the development were taken directly from the Tracks network model. The total trip rate is based on the assessed trip generation in Section 5.1.

It should be noted that traffic volumes are not the same for the two intersection treatments due to the effect they have on the wider network.

Heavy vehicle composition was assessed as follows:

- NZTA data showed a heavy vehicle proportion of 5.9% on Te Ngae Rd.
- A 3% heavy vehicle proportion was assumed for Iles Rd.
- A 2% heavy vehicle proportion was assumed for site traffic.

As discussed in Section 4.1, there are three accesses to the proposed development, including a left turn in and a left turn out. It is assumed that at 50:50 split in traffic using these left turn only accesses relative to their respective intersection movements will occur.

Intersection traffic volumes are higher in the evening peak than the morning, after school, and Saturday midday periods. The evening peak is therefore considered the critical period for intersection operation, particularly given that development traffic from shopping centres is generally low during the morning peak period.

While the evening peak traffic is critical, the morning peak was tested during intersection modelling to assess operation given the change in traffic conditions and distribution.
5.3.2 Traffic Volumes

The assessed evening peak hour traffic volumes at the Te Ngae Rd / Iles Rd intersection are shown below, for a Roundabout and Traffic signal treatments in the base year and following implementation of the REA in 2021.

![Traffic Volumes Diagrams]

As evident in the volume diagrams, through traffic on Te Ngae Rd drops away significantly with completion of the REA. Therefore, the base year is critical for intersection performance.

5.3.3 Intersection Performance

A comparison between the performance of the intersection with traffic signals and a roundabout is given in Table 5 during the evening peak, for the base year and following implementation of the REA in the year 2021.

<table>
<thead>
<tr>
<th></th>
<th>Te Ngae Rd north</th>
<th>Te Ngae Rd south</th>
<th>Total 2784 veh/hr</th>
<th>Site access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roundabout - Base year</td>
<td>180</td>
<td>933</td>
<td>222</td>
<td>Iles Rd</td>
</tr>
<tr>
<td></td>
<td>317</td>
<td>78</td>
<td>91</td>
<td>Site access</td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
<td>58</td>
<td>6</td>
<td>Iles Rd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Te Ngae Rd north</th>
<th>Te Ngae Rd south</th>
<th>Total 1707 veh/hr</th>
<th>Site access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roundabout - 2021</td>
<td>180</td>
<td>130</td>
<td>400</td>
<td>Iles Rd</td>
</tr>
<tr>
<td></td>
<td>153</td>
<td>615</td>
<td>60</td>
<td>Site access</td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
<td>58</td>
<td>6</td>
<td>Iles Rd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Te Ngae Rd north</th>
<th>Te Ngae Rd south</th>
<th>Total 2561 veh/hr</th>
<th>Site access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic signals - Base year</td>
<td>180</td>
<td>758</td>
<td>212</td>
<td>Iles Rd</td>
</tr>
<tr>
<td></td>
<td>317</td>
<td>77</td>
<td>152</td>
<td>Site access</td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
<td>58</td>
<td>6</td>
<td>Iles Rd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Te Ngae Rd north</th>
<th>Te Ngae Rd south</th>
<th>Total 1584 veh/hr</th>
<th>Site access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic signals - 2021</td>
<td>180</td>
<td>163</td>
<td>259</td>
<td>Iles Rd</td>
</tr>
<tr>
<td></td>
<td>159</td>
<td>94</td>
<td>4</td>
<td>Site access</td>
</tr>
<tr>
<td>Total</td>
<td>97</td>
<td>88</td>
<td>11</td>
<td>Iles Rd</td>
</tr>
</tbody>
</table>
As evident from Table 5, both the roundabout and traffic signal treatments can cater for the assessed traffic volumes at the Te Ngae Rd / Iles Rd intersection following development and in 2021, with an intersection level of service of LOS D or better.

Although the northbound right turn is a heavy movement during the evening peak, its opposing traffic flows are not sufficiently heavy to prevent the intersection from performing adequately.

Table 5 indicates that:

- A roundabout is expected to operate more efficiently in 2021 than the base year
- Traffic signals are expected to operate slightly more efficiently than they would in the base year
- A roundabout treatment is more efficient than traffic signals both in the base year and in 2021 following completion of the REA

<table>
<thead>
<tr>
<th>Approach</th>
<th>Base Year</th>
<th>2021 with REA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Degree of</td>
<td>Level of</td>
</tr>
<tr>
<td></td>
<td>saturation</td>
<td>Service</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do Minimum *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Te Ngae Rd south</td>
<td>0.624</td>
<td>C</td>
</tr>
<tr>
<td>Iles Rd</td>
<td>0.091</td>
<td>F</td>
</tr>
<tr>
<td>Te Ngae Rd north</td>
<td>0.402</td>
<td>A</td>
</tr>
<tr>
<td><strong>All vehicles</strong></td>
<td><strong>N/A</strong></td>
<td><strong>N/A</strong></td>
</tr>
<tr>
<td>Roundabout</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Te Ngae Rd south</td>
<td>0.851</td>
<td>B</td>
</tr>
<tr>
<td>Iles Rd</td>
<td>0.130</td>
<td>B</td>
</tr>
<tr>
<td>Te Ngae Rd north</td>
<td>0.550</td>
<td>B</td>
</tr>
<tr>
<td>Site access</td>
<td>0.748</td>
<td>C</td>
</tr>
<tr>
<td><strong>All vehicles</strong></td>
<td><strong>N/A</strong></td>
<td><strong>B</strong></td>
</tr>
<tr>
<td>Traffic Signals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Te Ngae Rd south</td>
<td>0.846</td>
<td>C</td>
</tr>
<tr>
<td>Iles Rd</td>
<td>0.568</td>
<td>D</td>
</tr>
<tr>
<td>Te Ngae Rd north</td>
<td>0.778</td>
<td>D</td>
</tr>
<tr>
<td>Site access</td>
<td>0.425</td>
<td>D</td>
</tr>
<tr>
<td><strong>All vehicles</strong></td>
<td><strong>N/A</strong></td>
<td><strong>D</strong></td>
</tr>
</tbody>
</table>

*Note: The do minimum is a no development option with the existing priority intersection in the base year and a three leg signalised intersection in 2021*
Queue lengths for each approach lane under both the roundabout and traffic signal options are provided in Table 6. These values are the 95th percentile queues during the critical evening peak as reported by SIDRA

<table>
<thead>
<tr>
<th>Approach Lane</th>
<th>Roundabout 95th%ile queue (m)</th>
<th>Traffic Signals 95th%ile queue (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Te Ngae Rd south</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lane 1</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>Lane 2</td>
<td>140</td>
<td>245</td>
</tr>
<tr>
<td>Lane 3 (signals only)</td>
<td>-</td>
<td>80</td>
</tr>
<tr>
<td><strong>Iles Rd</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lane 1</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Lane 2</td>
<td>10</td>
<td>35</td>
</tr>
<tr>
<td><strong>Te Ngae Rd north</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lane 1</td>
<td>40</td>
<td>100</td>
</tr>
<tr>
<td>Lane 2</td>
<td>40</td>
<td>120</td>
</tr>
<tr>
<td>Lane 3 (signals only)</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td><strong>Site access</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lane 1</td>
<td>35</td>
<td>65</td>
</tr>
<tr>
<td>Lane 2</td>
<td>70</td>
<td>65</td>
</tr>
<tr>
<td>Lane 3 (signals only)</td>
<td>-</td>
<td>65</td>
</tr>
</tbody>
</table>

All the peak queue lengths shown in Table 6 are below the lengths of their respective lanes shown on the intersection layout plans in the Appendix to this report.

Of note is the 245m queue for the northbound through movement in Lane 2 of the Te Ngae Rd south approach. Although this queue length is high, the movement operates at LOS C with a degree of saturation of 0.85, indicating acceptable operation. In practise, this queue is likely to operate below this level for the following reasons:

- The SIDRA allocated lane utilisation for the adjacent kerbside lane is 57%, resulting in a relatively short queue of 60m for this lane as shown in Table 6. This utilisation is considered conservative, and it is likely to be higher in practise resulting in an improved balance in queue lengths between these lanes

- Traffic signal optimisation should favour Te Ngae Rd, being the strategic route, and it is likely that a higher proportion of green time would be allocated Te Ngae Rd. The northbound through movement would benefit from such optimisation
6. APPRAISAL OF TRANSPORTATION EFFECTS

6.1 Network Effects

As discussed in Section 5.2.2 the implementation of a four-leg intersection at the Te Ngae Rd / Iles Rd intersection introduces additional delay to traffic at the intersection which causes some shift in traffic off Te Ngae Rd, along with some redistribution of local traffic near Iles Rd. The site attraction also increases some movements to and from the site.

Volume change diagrams showing the effect on the wider network are shown in the Appendix to this report for various network and development options. Volume increases of 50 vehicles/hr or more are shown in red, while decreases in volume of 50 vehicles/hr or more are shown in green.

During the base year, the following effects are apparent:

- As shown in Figure 5 and Figure 7 of the Appendix, there is little effect on the network during the morning peak. Noticeable volume change is limited to Te Ngae Rd south of the site resulting from development traffic
- During the evening peak, traffic increases are apparent to and from the site to the south as shown in Figure 6. Traffic signals at the intersection also cause some redistribution of traffic as shown in Figure 8, with a shift in through traffic from Te Ngae Rd to Vaughan Rd of around 200 vehicles

In 2021, the following effects are apparent as shown in Figures 9 – 16 of the Appendix:

- During the morning peak there are increases in traffic on Te Ngae Rd to and from the site, and a small shift in through traffic from Te Ngae Rd to the REA. Traffic signals at the intersection further cause some redistribution of local traffic, predominantly between Basley Rd and Iles Rd
- During the evening peak there are increases in traffic on Te Ngae Rd to and from the development, particularly south of the site. There is also a small shift in traffic from Tarawera Rd to Iles Rd. Traffic signals at the intersection cause some redistribution of local traffic between Basley Rd and Iles Rd, and shift some through traffic from Te Ngae Rd to the REA due to the increased delay to through traffic associated with the traffic signals.
- Without the REA, traffic signals result in a shift of approximately 200 vehicles from Te Ngae Rd to Vaughan Rd.

Overall, the redistribution in traffic near the site is small in comparison to the existing volumes, and the effect of the proposed development on local roads in the Lynmore area is considered to be minimal. However, traffic signals at the intersection result in a shift in traffic onto Vaughan Rd of approximately 200 vehicles in the evening peak without the REA.

The introduction of a four leg signalised intersection on Te Ngae Rd is likely to result in a shift in through traffic onto the REA, particularly during the evening peak, which is considered desirable.
6.2 Eastern Arterial Options

6.2.1 Background

As discussed in Section 3.2, the NZTA is currently considering two alternative REA options in addition to the designated alignment. These are:

- Vaughan Rd link
  
  In this option, the proposed REA links into Vaughan Rd. Te Ngae Rd (west of Vaughan Rd) and Vaughan Rd would be widened. This option would also have a significant improvement in traffic conditions adjacent the site.

- Upgrade Te Ngae Rd
  
  This option would involve widening Te Ngae Rd, which would remain as SH30. Traffic volumes on Te Ngae Rd would increase, and direct access onto the highway would likely be restricted.

With regard to the traffic environment of Te Ngae Rd adjacent the site, the Vaughan Rd option is a combination of the other two options with traffic conditions similar to the designated alignment. Therefore it is not critical for assessment purposes.

However the Te Ngae Rd option will result in significant change in the nature of Te Ngae Rd, which will carry a much higher volume of through traffic. Subsequently, network and intersection models have been developed for this option to assess the effects of the proposal.

6.2.2 Assessment

Network modelling indicates the effect of the proposed development on the network in 2021 without the REA to be as follows:

- A roundabout at the intersection of Te Ngae Rd / Iles Rd causes very little shift in traffic volume, limited to a small redistribution in traffic between Iles Rd, Tarawera Rd and Basley Rd in the morning peak period as shown in Figure 13 in the Appendix to this report.

- Upgrading the traffic signals to a four-leg intersection results in a through traffic shift of around 200 vehicles/hr from Te Ngae Rd to Vaughan Rd in the evening peak, as shown in Figure 16 in the Appendix to this report. There is also some local traffic redistribution between Tarawera Rd and Basley Rd.

Vaughan Rd is expected to have a peak hour volume of around 850 vehicles in 2021 without the development. The additional delay introduced on Te Ngae Rd from the four-leg intersection is likely to increase this volume during the evening peak period by about 20%.

Performance of the intersection as a roundabout and traffic signals in 2021 without the REA is given in Table 7 for the critical evening peak period.
As evident from Table 7, a roundabout option is unable to sufficiently cater for the traffic volumes in 2021 if the REA is not implemented. This is primarily because the heavy right turn movement into Iles Rd causes significant delay to the southbound through movement on Te Ngae Rd. Therefore without the REA, traffic signals would likely be required at the intersection.

It should be noted that while traffic signals operate to LOS D without the REA in 2021, the critical through queue length on Te Ngae Rd is around 400m which is very long. However, it is likely that the intersection would be improved in conjunction with the Te Ngae Rd upgrade and therefore operation would be better than that modelled for this assessment.

The advantages gained by implementation of the REA include:

- Improved performance of the Te Ngae Rd / Iles Rd intersection, particularly with roundabout control
- Diversion of through traffic onto Vaughan Rd is significantly reduced

### 6.3 Intersection Operation

Intersection performance of the Te Ngae Rd / Iles Rd intersection with roundabout and traffic signal treatments is provided in Table 5 of Section 5.3.3. As evident from this table, both intersection treatments are able to cater for the traffic volumes, with a roundabout providing a better Level Of Service (LOS) for vehicular traffic than traffic signals.

A roundabout is expected to operate more efficiently in 2021 than the base year, with an overall level of service improvement to LOS A and a reduction in average delay from 14.1 to 9.9 seconds. On site parking loss to accommodate the roundabout footprint would be minimal.

Traffic signals are also expected to operate slightly more efficiently in 2021 than they would in the base year. The level of service for traffic signals improves to LOS C and the average delay reduces from 35.5 to 31.2 seconds.
It should be noted that there is some shift in through traffic off Te Ngae Rd as a result of the traffic signals as discussed in Section 6.1. It is anticipated that signal optimisation could be used to manage the level of traffic redistributed to the REA or Vaughan Rd.

Although traffic signals have a higher delay to vehicular traffic, they also provide the following benefits:

- Improved facilities and access for cyclists. Cycle lanes could be provided on all approaches, in particular Te Ngae Rd which is identified as a strategic cycle route in the Rotorua Transport Strategy and Proposed Structure Plan.

- Better provision for pedestrians. Pedestrian crossing facilities would improve the pedestrian connectivity between the shopping complex and the Lynmore residential area. Traffic signals would also benefit school patrons in crossing Te Ngae Rd.

The preferred intersection treatment is likely to depend on a number of factors such as the long term function of Te Ngae Rd, provision for active modes, and detailed design.

Upgrade of the Te Ngae Rd / Iles Rd intersection could be expected to change the accident types in this location given the change of site activity and intersection control. This has the potential to increase the accident risk, especially to new users such as pedestrians.

6.4 Parking Provision

The District Plan parking requirement for a comprehensive retail development is:

“1 space for every 18 m² gross floor area”

For a proposed total area of 8490 m², this equates to a requirement of 472 spaces.

On site car parking is provided for 376 vehicles as mentioned in Section 4.2. While not meeting the District Plan requirement, this is considered an appropriate number of spaces to meet the assessed demand.

A parking demand assessment has been carried out for the proposal based on the 50th percentile parking rates provided in Table C1 in Appendix C in the NZTA research report 453 “Trips and parking related to land use” (November 2011).

The assessed parking demand for the proposed development is provided in Table 8.

<table>
<thead>
<tr>
<th>Activity</th>
<th>GFA (m²)</th>
<th>Parking rate (spaces per 100 m² gfa)</th>
<th>Spaces (peak hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail</td>
<td>7,090</td>
<td>3.3</td>
<td>234</td>
</tr>
<tr>
<td>Fast food</td>
<td>600</td>
<td>8</td>
<td>48</td>
</tr>
<tr>
<td>Service station</td>
<td>260</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>Medical</td>
<td>540</td>
<td>1.5</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>8,490</strong></td>
<td><strong>n/a</strong></td>
<td><strong>311</strong></td>
</tr>
</tbody>
</table>
As shown in Table 8, the assessed peak parking demand is 311 vehicles. This is considered conservative as it does not take into account multi-purpose trips or the offset of peaks for the various activities.

The parking area adjacent the northern boundary behind the supermarket may be underutilised, as it is further from the central shopping area. However, this area could be used for additional staff parking, and given that the parking demand has been exceeded this is not of concern.

For comparison, Rotorua Central has been considered. Eight surveys were carried out during the two weeks leading up to Christmas 2011 and the critical survey, found to be the 23rd December at 1pm, revealed a peak rate of 3.2 spaces per 100m² gfa which equates to the 70th percentile rate for a large shopping centre. The 85th percentile demand for this proposal is 444 spaces, and therefore the provided parking area should similarly cater for the 70th percentile demand. Furthermore, this demand is considered conservative as it does not take into account multi-purpose trips or the offset of peaks for the various activities.

While not meeting the District Plan requirement, the proposed parking provision is considered more than sufficient to cater for the assessed parking demand of the development. The 376 proposed spaces provides a good buffer over the assessed demand of 311 spaces.

The District Plan requirement for disabled person parking spaces is two spaces up to 99 car parks and one for every additional 50 car parks required by the activity. This results in a required minimum number of disabled spaces of eight, for the proposed development parking requirement of 311 spaces. On site there are eight disabled spaces provided, meeting the District Plan requirement.

6.5 Access and Servicing

Queueing within the site from the intersection on Te Ngae Rd should not restrict circulation. A roundabout at the intersection would result in a peak hour 95th percentile queue for the critical right turn out movement of 70m, while the queue resulting from traffic signals is around 60m.

The available dedicated queuing space would be in the order of 65m between the intersection and the access through to the supermarket. A further 30m of queuing past this point would be required before circulation in front of the convenience retail is affected.

Therefore there are no concerns regarding the effect of queuing from the main exit on vehicle circulation within the site.

In addition to the main access to the Te Ngae Rd / Iles Rd intersection, the proposed development includes a left turn in entry south of main intersection and a left turn out exit north of the main intersection.

The left in and left out accesses are able to accommodate fuel tankers and service delivery vehicles respectively. There are no queuing or capacity concerns relating to these accesses.
Service delivery vehicles to the supermarket must exit through the left turn out onto Te Ngae Rd meaning that trucks that have a destination south of the site will have to travel north to the Te Ngae Rd / Owhata Rd roundabout before heading south. While it would be preferable for these vehicles to use the Iles Rd intersection with the other service vehicles accessing the site, the effect it will have on the network is minimal.

In order to avoid the Te Ngae Rd / Iles Rd intersection, there will be some desire to use the left turn accesses to turn right in and out of the site which in turn is likely to compromise the safety and efficient operation of these accesses. Therefore appropriate measures should be instigated to restrict the occurrence of right turn movements, such as signage, access shape, and a solid median on Te Ngae Rd.

### 6.6 District Plan Compliance

Relevant transportation rules from the Operative District Plan are provided in Table 9 with comment as to compliance of the proposed development with these rules.

<table>
<thead>
<tr>
<th>Rule</th>
<th>Subject</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>R9.2.5</td>
<td>Parking and Turning</td>
<td>While not meeting the District Plan requirement, the proposed parking provision is considered more than sufficient to cater for the assessed parking demand. The proposed parking areas have been designed in accordance with Appendix F of the District Plan. The internal circulation layout minimises the likelihood of congestion, particularly near access points.</td>
</tr>
<tr>
<td>R7.2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R9.4.2.3</td>
<td>Traffic generation</td>
<td>Effects of trip generation from the proposed development on road and intersection capacity are able to be mitigated as discussed in Section 6.1 and 6.2</td>
</tr>
<tr>
<td>R7.4.2.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R9.4.2.5</td>
<td>Access</td>
<td>The location and arrangement of site accesses will minimise volumes on the Te Ngae Rd / Iles Rd intersection, while maximising safety and efficiency of turning movements</td>
</tr>
<tr>
<td>R7.4.2.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R9.4.2.8</td>
<td>Servicing</td>
<td>There are appropriate internal service delivery vehicle routes through the site. These are shown on the layout plan in the Appendix to this report.</td>
</tr>
<tr>
<td>R7.4.2.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. MITIGATION MEASURES

7.1 Te Ngae Rd / Iles Rd intersection

The Te Ngae Rd / Iles Rd intersection should be upgraded in conjunction with the development to cater for the traffic generated by the complex and minimise the impact of that traffic on existing operation.

The Rotorua Basin Structure Plan identifies the Te Ngae Rd / Iles Rd intersection to be upgraded to traffic signals in conjunction with the REA. While a roundabout would not be considered appropriate at this location at present given the traffic volumes and nature of the three-leg intersection, the proposed development results in a four-leg intersection. Subsequently, a roundabout should also be considered as a potential treatment for the intersection in granting consent for the development.

Intersection modelling carried out as part of this assessment indicates that the expected development traffic on the Te Ngae Rd / Iles Rd intersection can be accommodated by bringing forward the proposed upgrade of the junction to coincide with the development. Although the northbound right turn is a heavy movement during the evening peak, its opposing traffic flows are not sufficiently heavy to prevent the intersection from performing adequately.

The preferred intersection treatment will depend on a number of factors such as the long term function of Te Ngae Rd, provision for active modes of transport, and detailed design.

Regardless of the preferred intersection treatment for upgrade of the Te Ngae Rd / Iles Rd junction, the following aspects should be carefully considered during design:

- Cycle facilities should be provided at the intersection, particularly on Te Ngae Rd which is identified as a strategic cycle route in the Rotorua Transport Strategy and Proposed Structure Plan. For a roundabout, the cycle lane form is likely to be similar to the Te Ngae Rd / Tarawera roundabout which provides shared off-road cycle and pedestrian facilities through the intersection.

- Pedestrian crossing facilities to improve connectivity between the shopping complex and the Lynmore residential area and primary school.

- Appropriate measures should be instigated to restrict the occurrence of right turn movements to and from the left turn site accesses, such as signage, access shape, and a solid median on Te Ngae Rd. This median could be planted to improve the aesthetic nature of the road.

An upgrade to the Te Ngae Rd / Iles Rd intersection that incorporates these aspects is considered an appropriate mitigation measure to accommodate the traffic generation from the proposed development.

Intersection concept plans for both intersection treatment options are shown in the Appendix to this report.
7.2 On-site Measures

The proposed site plan includes the following aspects to ensure a safe and efficient site operation:

- Wide vehicle access routes between car park areas, to reduce the likelihood of congestion
- The parking area adjacent the northern boundary behind the supermarket is identified as an unreserved overflow staff parking location, as it may be underutilised given that it is further from the central shopping area
- Appropriate lighting is to be provided to maximise security and safety. This lighting should be directed downward as this helps to reduce glare and intrusion especially for the properties opposite the site
- Footpaths and pedestrian crossing areas are located on key desire lines to improve pedestrian connectivity and prominence
- The main access to the supermarket is located away from the busy vehicle route near the main internal access to minimise congestion near the building entry and exit
- Side access onto the site exit has been located sufficiently far from the intersection to minimise the potential for queuing to affect internal circulation

The site plan shown on page 10 and in the Appendix to this report incorporate the above mitigation measures, which are considered sufficient to ensure safe and efficient operation of the site.
8. OVERVIEW

8.1 Discussion

WD Holmes 2000 Trust proposes to construct and operate a supermarket based neighbourhood centre of comprehensive commercial nature on the property located at 346-352 Te Ngae Rd Rotorua, with total gross floor area of 8,490 m². This report provides the results of an integrated transport assessment of the proposed development, and forms part of the Resource Consent Application.

Network modelling has been carried out for the proposal based on a trip generation previously agreed with the NZTA. Overall, the redistribution in traffic near the site is small in comparison to existing volumes, and effects of the proposed development on local roads in the Lynmore area is considered minimal in both the base year and the post-REA scenarios of 2021. However, traffic signals at the intersection result in a shift in traffic onto Vaughan Rd of approximately 200 vehicles in the evening peak without the REA.

The introduction of a four leg signalised intersection on Te Ngae Rd is likely to result in some shift in through traffic onto the REA, particularly during the evening peak, which is considered desirable.

Upgrading the Te Ngae Rd / Iles Rd intersection should coincide with the development to cater for traffic generated by the complex. This intersection has been identified in the Rotorua Basin Structure Plan for upgrade to traffic signals in conjunction with the REA. However given that the intersection would have four legs with the proposed development, a roundabout should also be considered as a potential treatment for the intersection in granting consent. The assessment found that upgrading this intersection will effectively accommodate the expected development traffic. Such an intersection should provide appropriate cycle and pedestrian facilities.

The preferred intersection treatment will be determined during the detailed design stage, should consent be granted for the proposal. The appropriate control method will depend on a number of factors such as the long term function of Te Ngae Rd in relation to the REA, provision for active modes, and site constraints.

Internal mitigation measures have been taken into account during design of the site plan to mitigate adverse effects within the shopping complex and provide a safe and accessible environment for all users.

While not meeting the District Plan requirement, the proposed parking provision is considered more than sufficient to cater for the assessed parking demand. Service delivery routes have been identified through the site and are shown on the site plan.

NZTA is currently considering two alternative REA options in addition to the designated alignment. Should the Te Ngae Rd option be selected, this will significantly increase the volume of through traffic adjacent the site. This assessment has found that in this scenario, traffic signals would be required at the Te Ngae Rd / Iles Rd intersection. However these traffic signals will divert some through traffic from Te Ngae Rd to Vaughan Rd in addition to traffic diversion as a result of the Te Ngae Rd REA option. Therefore if NZTA proceed with the Te Ngae Rd option and traffic signals are implemented in conjunction with the proposed development, consideration should be given to mitigating the combined effects of these proposals on Vaughan Rd.
8.2 Conclusions

The overall conclusion of this assessment is that, from a transportation viewpoint, resource consent is appropriate for the proposal provided the Te Ngae Rd / Iles Rd intersection is upgraded in conjunction with the development.

In particular it is concluded that:

1) The decision on whether a roundabout or traffic signals is the preferred option for the intersection upgrade is to be determined in conjunction with the NZ Transport Agency and Rotorua District Council.

2) Regardless of the proposed intersection treatment for the upgrade of the Te Ngae Rd / Iles Rd intersection, the following aspects should be included in the design:
   a. Cycle facilities should be provided through the intersection, particularly on Te Ngae Rd which is identified as a strategic cycle route in the Rotorua Transport Strategy and Proposed Structure Plan
   b. Pedestrian crossing facilities to improve connectivity between the shopping complex and the Lynmore residential area and primary school
   c. Appropriate measures are instigated to restrict the occurrence of right turn movements to and from the left turn only site accesses, such as signage, access shape, and a solid median on Te Ngae Rd

3) Traffic effects on local roads in the Lynmore area east of Te Ngae Rd because of the proposed development are minimal

4) Without the Rotorua Eastern Arterial, traffic signals at the Te Ngae Rd / Iles Rd intersection cause some shift in through traffic from Te Ngae Rd to Vaughan Rd during the evening peak.

5) The on site parking provision is appropriate to meet the anticipated demand

6) The proposed design is in accordance with the transportation provisions of the District Plan, other than with regard to parking provision
## APPENDIX

### Network Volume Change Diagram Index

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Holmes Trust Te Ngae
Road Rotorua

Gabites Porter

2006 Volume Change Plot
AMP
With Development RAB vs Existing Situation

Figure 5
Holmes Trust Te Ngae
Road Rotorua
Gabites Porter

2006 Volume Change Plot
AMP
With Development Signals vs Existing Situation

Figure 7
Figure 12

KEY
- Red: Increase
- Green: Decrease

2021 Volume Plot – With REA
PMP
Development Signals vs No Development Signals
Figure 14

Holmes Trust Te Ngae
Road Rotorua
Gabites Porter

2021 Volume Plot – Without REA
PMP
Development RAB vs No Development RAB

KEY
Increase
Decrease

500m
Figure 15

Holmes Trust Te Ngae
Road Rotorua
Gabites Porter

2021 Volume Plot – Without REA
AMP
Development Signals vs No Development Signals

KEY
Increase
Decrease
2006 Volume Plot – Select Link Analysis
PMP – Entering The Site
Development with Signals

Figure 17
Holmes Trust Te Ngae Road Rotorua
Gabites Porter

2006 Volume Plot – Select Link Analysis
PMP – Exiting The Site
Development with Signals

Figure 18