TRANSPORTATION ASSESSMENT REPORT

BIRCHS ROAD MIXED USE DEVELOPMENT

PREPARED FOR LINCOLN DEVELOPMENTS LIMITED

30 July 2019

Stantec

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Lincoln Developments Limited

Birchs Road mixed use Development

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1. Introduction

Stantec has been engaged by Lincoln Developments Limited to assess a proposed mixed-use greenfield neighbourhood centre development in Lincoln, Christchurch. The development comprises various land use activities including a supermarket, café, childcare centre and some residential lots.

This Transportation Assessment Report ("TAR") forms part of the resource consent application for the development, and has been progressed with due regard to the policies and standards contained within the Selwyn District Council District Plan ("District Plan").

This TAR has been prepared to assess the transportation features and effects of the proposal, as follows:

- Chapter 2: Existing Transport Network - describes the site location in the context of the road and public transport networks, including traffic flows;
- Chapter 3: Future Transport Infrastructure - describes proposed network upgrades in nearby areas;
- Chapter 4: Development Proposal - details the proposal, discusses the new road cross-sections, site access, internal roading and parking;
- Chapter 5: Traffic Generation and Distribution - identifies the likely trip generation expected at the site and how it will be distributed on the network;
- Chapter 6: District Plan - summarises the relevant District Plan rules; and
- Chapter 7: Development Traffic Effects Assessment - examines the effects of the development on the local transport network.

In summary, this report concludes that development of this site to provide for a new supermarket, childcare and residential activity, with associated vehicular and pedestrian facilities and connections, can be supported from a transportation perspective.

2. Existing Transport Environment

2.1 Site Location

The proposed development is located on a section of land to the northeast of Lincoln town centre and is zoned as Residential / Living Z, within the Lincoln Outline Development Plan Area 3 ("ODP Area 3").

The ODP Area 3 provides an overarching urban design framework to guide future development of the land. In terms of transport, it provides guidance on the design rationale for the road, cycle and pedestrian networks.

Figure 2-1 shows the location of the site adjacent to Birchs Road. Land use in the vicinity of the site is generally zoned 'Living / Residential' to the south and 'Inner Plains' to the north.

Figure 2-1: Location of the Site relative to Lincoln Town Centre

2.2 Transport Infrastructure

The local road network in the immediate vicinity of the site includes Birchs Road (to the west) and O'Reilly Road (to the east) as shown in **Figure 2-2**. Birchs Road is classified as a Collector Road within the District Plan and provides a direct connection to Prebbleton, located about 6km to the north.

Figure 2-2: Road Network in the vicinity of the Site

Birchs Road has a posted speed limit of 50km/h which extends along the proposal site frontage and north, towards the Tancreds Road intersection.

In terms of pedestrian and cycle facilities, the Little River Rail Trail shared path starts at the Birchs Road-Trices Road intersection and is a 7 km off-road asphalt pathway on the eastern side of Birchs Road, extending along the proposal site frontage.

2.3 Site Visit

A site visit was completed on 18th July 2019 to gain an understanding of the general layout of existing roads in the area relative to the development site, and inform this assessment.

2.3.1 Birchs Road

Adjacent to the proposal site, the Birchs Road carriageway comprises (west to east) a 1m wide footpath; 2.3m wide parking lane; 3.25m wide northbound traffic lane; 3.25m wide southbound traffic lane; 1.5m wide berm; and a 1-1.5m shared path. **Photograph 1** shows the Birchs Road layout, illustrating the general rural characteristic of the surrounding area in its current undeveloped state.

Photograph 1: View north along Birchs Road adjacent to the site

Photograph 2 below shows Birchs Road at the location of the proposed new site access road (Makybe Terrace) intersection, showing the contrasting urban character of the surrounding land use, as compared with Photograph 1 (some 80m to the north). The cross-section in this location is slightly wider, providing for kerbside parking on both sides of the road and a slightly wider shared path (approximately 2.6m width).

Photograph 2: View south along Birchs Road at point of intersection with proposed new development access road (Makybe Terrace)

2.3.2 O'Reilly Road

The existing section of O'Reilly Road, which is classified as a Collector Road, has been formed with an 11.2m wide carriageway, with 1.6m wide footpaths and generous berms on either side. The road width provides sufficient space to accommodate a single traffic lane in each direction, with kerb side parking on either side, as indicated in **Photograph 3**.

Photograph 3: View north on O'Reilly Road at current extent of carriageway formation (north of Oaks Drive)

2.3.3 Shared Path (Birchs Road)

The shared path (Little River Rail Trail) on Birchs Road to the south of the site has recently been upgraded to provide a 2.6m sealed width, as shown in **Photograph 4**. It is understood that Council proposes to develop an equivalent shared path width, northwards across the development site frontage.

Photograph 4: Shared Path adjacent to the development site

Further to the north of the proposal site, the shared path includes paint markings and signage across driveways to establish priority, as shown in **Photograph 5**.

Photograph 5: Shared Path north of the site

Photograph 6 shows how the shared path has been treated at the Birchs Road / Tancreds Road intersection. Cyclists and pedestrians are required to give way to vehicular traffic on the road.

Photograph 6: Existing Shared Path treatment at Birch Road / Tancreds Road intersection

2.4 Current Traffic Patterns

2.4.1 Vehicular Traffic

The most recent available vehicle count[1] undertaken by Council indicates Birchs Road currently carries about 6,500 vehicles per day ("vpd"). The daily traffic profile for Birchs Road in the vicinity of the site is shown in **Figure 2-3** below.

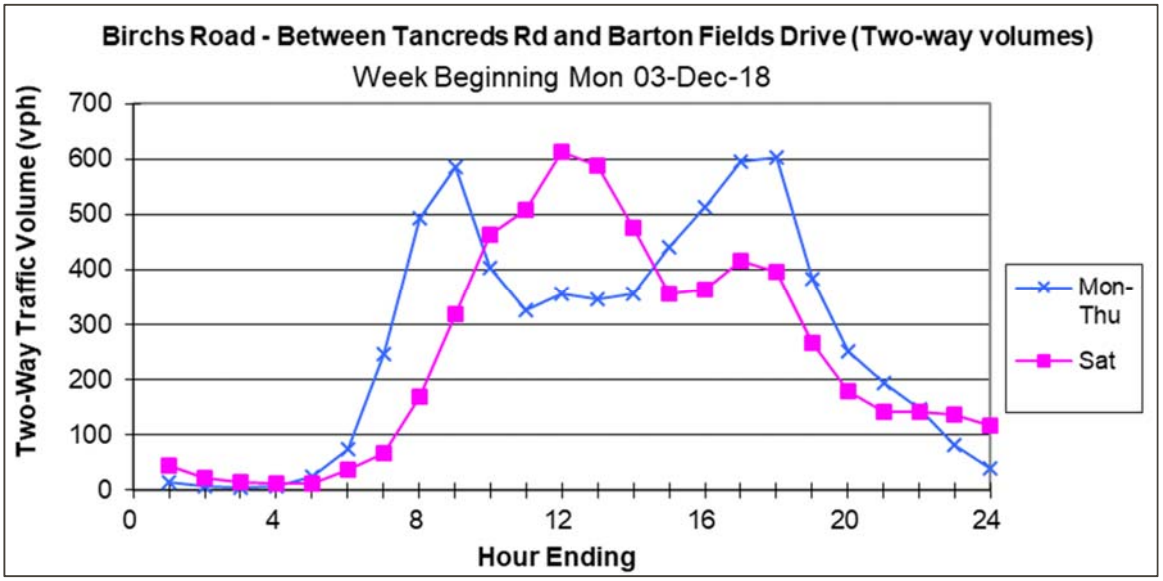

Figure 2-3: Two-way Traffic Profile on Birchs Road

The weekday profile shown by the blue line indicates there are notable traffic peaks of about 600 vehicles per hour ("vph") in the typical AM and PM commuter peaks. On weekends, the purple line shows traffic flows peak at around 600vph at midday.

2.4.2 Cycleway Count

Count data for the Birchs Road shared path provides an indication of how many cyclists use the facility. The information provided by Council has been summarised in **Table 1** below, and indicates this is a reasonably popular route for cyclists in the area, particularly during summertime.

[1] Week commencing 3 December 2018

Period	Daily Count (Cycles)
Summer Average	300
Summer Peak	375
Winter Average	125
Winter Peak	225

Table 1: Summary of Birchs Road shared path cycle volumes

It is understood that the Little River Rail Trail is to be diverted in the future on to O'Reilly Road, to the east. This can be expected to result in some decrease in cycle volumes currently using the shared path on Birchs Road.

2.5 Public Transport

There are two Metro bus services that travel through Lincoln. The first of these, Route 80 'Lincoln to Parklands' (as shown in **Figure 2-4)** provides a key connection between Lincoln and Christchurch city centre. During weekdays, this service operates at 10-minute intervals during peak periods and at 30-minute intervals during the off-peak. On weekends the service operates at about 30-minute intervals during peaks, and hourly during the off-peak. The nearest current bus stop is located just south of Oaks Road, a short 150m walk from the site.

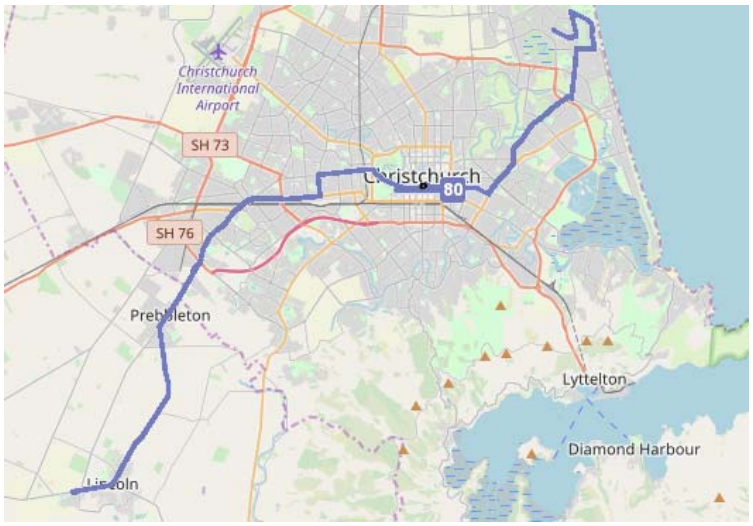

Figure 2-4: Route 80 - Lincoln to Parklands

Route 820 'Burnham to Lincoln via Rolleston' (as shown in **Figure 2-5)** provides a connection west of Lincoln. This service operates hourly throughout the week. The route starts / terminates near the James Street / Edward Street intersection in Lincoln.

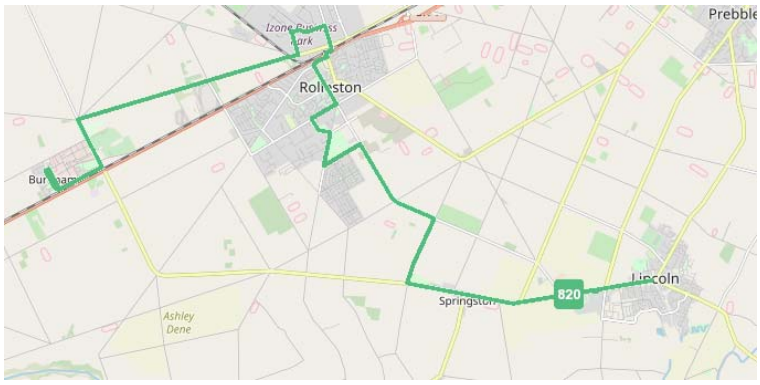

Figure 2-5: Bus Route 820 - Burnham to Lincoln via Rolleston

2.6 Road Safety

The accident record for the roads surrounding the site has been obtained from the industry-available Crash Analysis System ("CAS") for the latest complete five-year period from 2014 and 2018. The search area extends 150m north and south of the proposed development site as indicated by the area shaded blue in **Figure 2-6.** The search did not return any recorded crashes on this section of road.

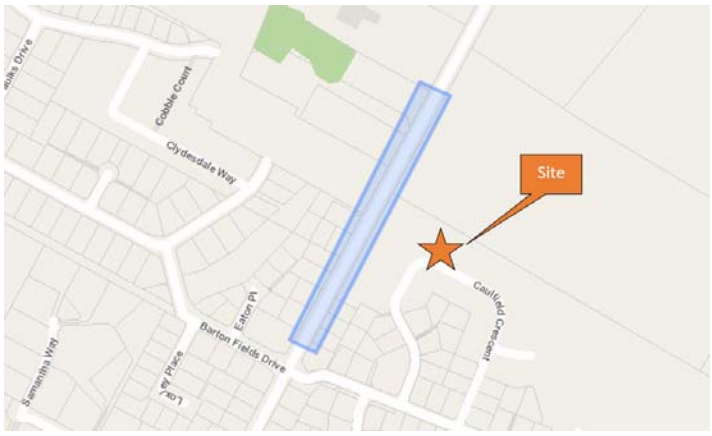

Figure 2-6: Road Safety History (2014-2018)

Since the search did not return any crashes, the search was extended to cover a longer 10-year period (2009 - 2018) which returned one non-injury crash at the location shown in **Figure 2-7**. This crash involved a vehicle colliding with a cow that had strayed onto the road and the driver was unable to stop in time due to lack of visibility at night. This isolated crash does not present any reoccurring safety trends along this section of road.

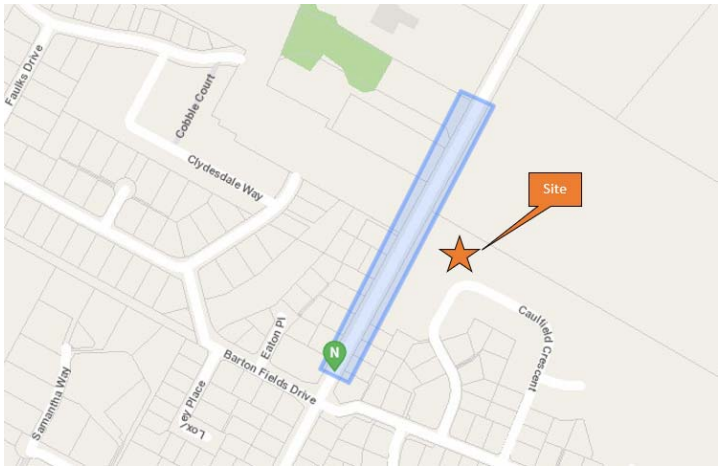

Figure 2-7: Crash Locations (2009 - 2018)

Overall, there is nothing to suggest from the accident record that there are existing safety issues that require attention in respect of this current proposal.

3. Lincoln Outline Development Plan

The Outline Development Plan Area 3 provides an overview of how the area is envisaged to be developed in terms of an urban design framework, and includes an indicative movement network of roads and cycle / pedestrian routes.

Figure 3-1 below shows the road network layout, as defined in ODP Area 3. As shown, there are two connections to Birchs Road, one primary connection and one secondary connection. The secondary connection has already been built in the form of Craig Thompson Drive, whereas the primary connection is a continuation of O'Reilly Road, which at present is only partially completed (and as yet does not connect with Birchs Road). The intended future intersection between O'Reilly Road and Birchs Road is expected to connect around 100m north of the proposal site.

In addition to those indicative connections shown in Figure 3-1, an established secondary route (Oaks Drive) connects between Birchs Road and O'Reilly Road, providing further network permeability and route choice.

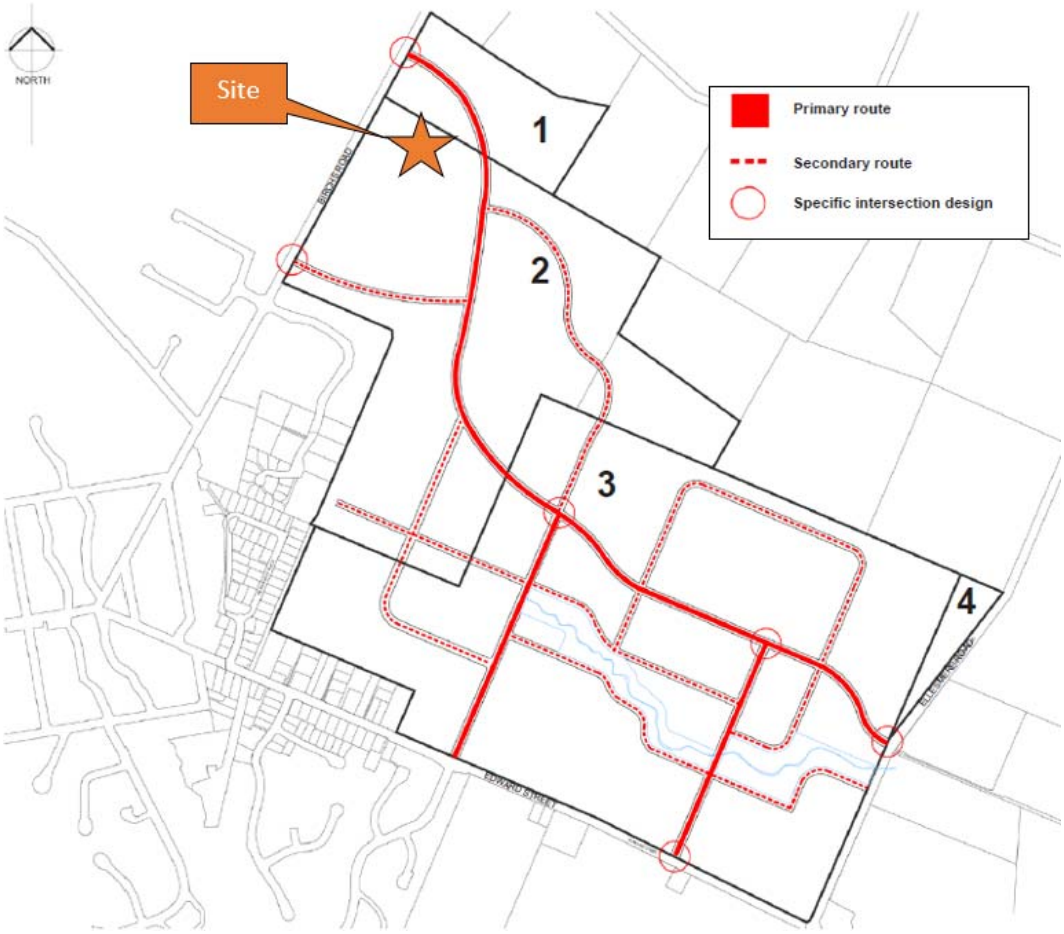

Figure 3-1: ODP Area 3 Road Network

The ODP Area 3 cycle and pedestrian network is shown in **Figure 3-2.** This diagram indicates the key cycle and pedestrian routes are typically located along the road network, with some supplementary off-street pedestrian and cycle paths provided in the southern section of the ODP Area 3. In the immediate vicinity of the site, a pedestrian/cycle connection is proposed to be developed between the already established Caulfield Crescent (west) and the new main site access road (Makybe Terrace).

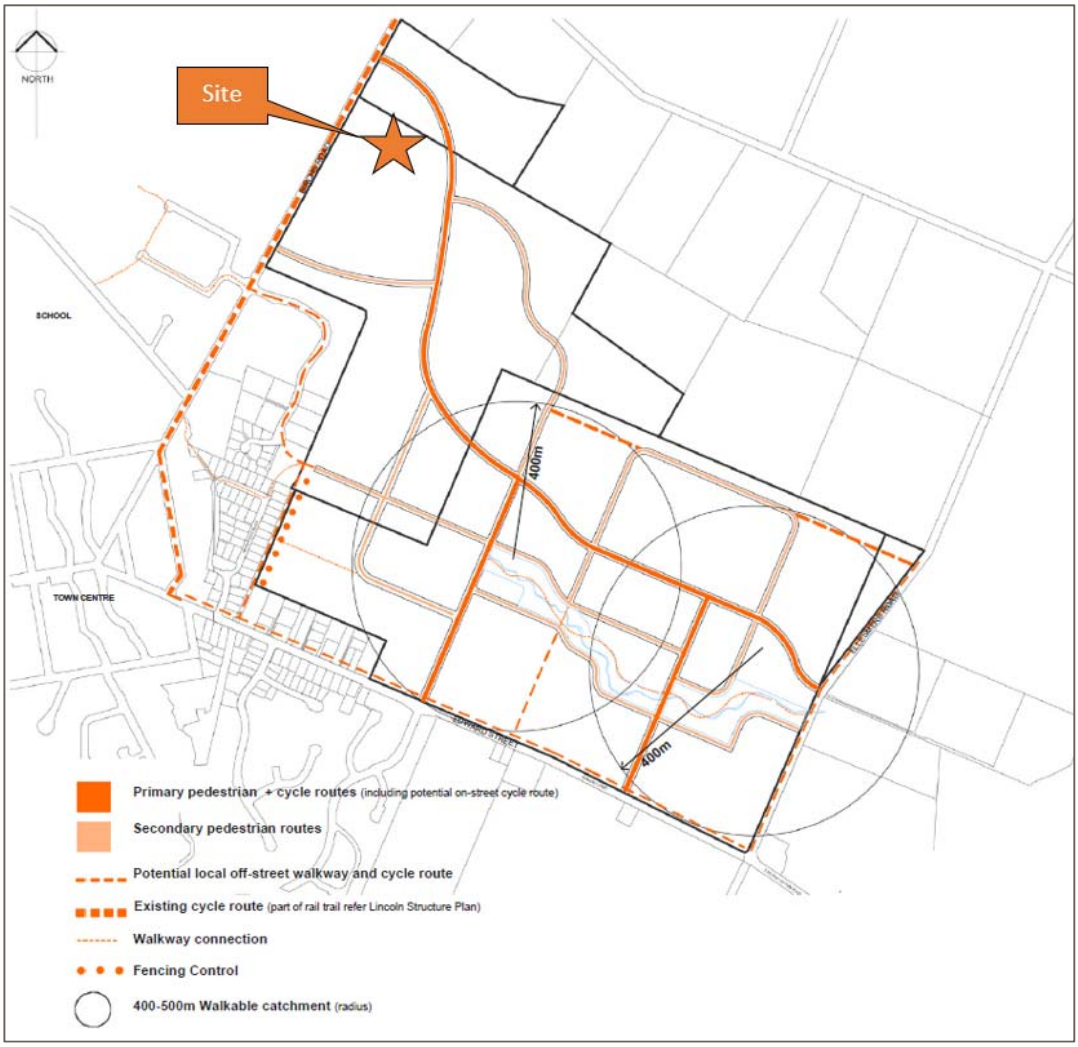

Figure 3-2: ODP Area 3 Cyclist and Pedestrian Network

4. Proposed Development

4.1 Roading Network

This proposal forms the northern portion of the 'Flemington Subdivision', the southern part of which is already well underway in terms of development. The current proposal provides for a number of activities at the site including a supermarket, café, childcare and residential dwellings.

Access to these activities will be achieved by way of extending the existing road network and in developing a new east-west connection through the site, as indicated in **Figure 4-1.** As shown, O'Reilly Road will be extended to the site's northern boundary and will connect with a new road (Makybe Terrace), which will extend through the development area to connect with Birchs Road to the west, via a new t-intersection.

The existing cross-section of Birchs Road is to be upgraded by Council in the vicinity of the proposal site to include a central flush median, to accommodate right turn movements at the new Makybe Terrace intersection and proposed supermarket driveway (to the north). In addition, a new pedestrian central refuge crossing point connecting the new neighbourhood centre with the residential areas to the west is proposed to be introduced, to the north of the Makybe Terrace intersection.

A pedestrian/cycle connection between the existing western section of Caufield Crescent (west) cul-de-sac and Makybe Terrace is also proposed, facilitating walking and cycling trips to and from the site and the south.

Figure 4-1: Proposed Site Layout

4.2 Proposed Land Uses

The proposed supermarket is located at the north west corner of the development site, and includes a 3,063m^2 Gross Floor Area ("GFA") store, inclusive of ancillary offices. The building also includes an ancillary 80m^2 GFA café. The supermarket and café will be supported by a total of 176 on-site parking spaces,

including provision for mobility, online order pick-up, parent, and electric vehicle charging spaces. Ten cycle parks are also proposed to be provided on the southern side of the supermarket.

Access to the supermarket is proposed via two new (two-way) customer driveways, one off each of Birchs Road and Makybe Terrace; a second exit only driveway to Makybe Terrace at the eastern end of the supermarket site will facilitate service vehicle egress from the on-site (un)loading area. With clear sightlines and pedestrian inter-visibility available at the supermarket driveways, along with the implementation of appropriate carriageway markings and delineation at these vehicle crossings, in particular at the Birchs Road shared path interface, the proposed access arrangements are able to operate safely. Detailed plans of the proposed supermarket carparking and access arrangements are provided within the fuller application documents.

A new 537m² GFA childcare centre with capacity for up to 100 children is proposed at the corner of Birchs Road and Makybe Terrace, with access to the site achieved off the latter. This proposed vehicle driveway is located directly opposite the supermarket access; a painted central median on Makybe Terrace will provide for right-turn-in movements at both the supermarket and childcare centre access driveways, enabling turning vehicles to wait clear of through traffic movements. The childcare centre includes an on-site carpark providing a total of 28 spaces (inclusive of three mobility parks). On-site cycle parks are also proposed.

The wider development proposal also provides for a total of 41 residential lots, of which 17 lots are shown on the current plan and included in this application; the balance of 24 lots form part of a future 'comprehensive residential development', for which resource consent will be addressed in a separate application. However, it is noted that for the purposes of this assessment all 41 dwellings are assumed to be in place.

4.3 New Roads

As per the ODP Area 3, and as discussed above, changes to existing roads and construction of new road connections are proposed as part of the site development. These are discussed in more detail, below.

4.3.1 Birchs Road

The current Birchs Road carriageway is proposed to be reconfigured to provide for a central flush median along the development site frontage, to accommodate a right turn bay at the new Makybe Terrace intersection and facilitate right turns into the new supermarket driveway. It is anticipated that the existing footpath on the western side would be retained and the shared path would be widened to 2.6m as part of the same upgrade works to be completed by Council.

4.3.2 O'Reilly Road

The existing section of O'Reilly Road has been formed as a collector road with a carriageway width of 11.2m and footpaths on either side of the road. It is anticipated that this established cross-section would be extended through the proposal site as far as its northern boundary.

4.3.3 Makybe Terrace

Makybe Terrace, which is identified as a secondary connection road, has been designed with a carriageway width of some 9m, with footpaths either side. Although it would not allow parking on the road adjacent to the supermarket / childcare, there is potential to accommodate kerbside parking further east on one side of the road in the area adjacent to the proposed residential lots. The proposed new Makybe Terrace t-intersection at Birchs Road includes separate left and right turn lanes for traffic exiting Makybe Terrace, and a dedicated right turn lane for vehicles turning off Birchs Road (as illustrated in Figure 4-1). An assessment of this intersection arrangements capacity to accommodate the forecast traffic associated with the development is provided later, in chapter 7.

4.3.4 Caufield Crescent (east)

The existing 'southern' section of Caufield Crescent (east), which connects off Oaks Drive, has an approximately 5m sealed width and provides access to a small number of residential lots. It is proposed to construct the corresponding northern section of this route connecting off Makybe Terrace at a slightly wider 7m sealed width (within a 10m legal width) to provide access to the three adjacent residential lots, and future comprehensive residential development to the east. It is noted that the cross-section does not include dedicated footpaths with pedestrians instead sharing the movement lane with vehicles, commensurate with the slow speed shared laneway environment that would be reinforced through the use of traffic calming measures.

4.4 Pedestrian and Cyclist Provision

As outlined in the previous section, all new roads aside from Caufield Crescent (east) provide for footpaths on both sides of the road. On O'Reilly Road and Makybe Terrace cyclists are required to share the road with other vehicular traffic, whereas on Birchs Road the separated shared path can accommodate cyclists, as required. As previously intimated, it is anticipated the current 2.6m wide section of shared path that terminates at the site's southern boundary, would be extended across the development area frontage. It is anticipated that the interface of the shared path with the proposed supermarket site driveway would include paint markings / symbols and coloured surfacing to increase driver awareness of the potential presence of pedestrians and cyclists.

4.5 Car Parking

The supermarket and café will be supported by a total of 176 parking spaces, which includes the following:

- standard parks: 162 spaces;
- mobility parks: 5 spaces;
- infant/parent parks: 2 spaces;
- online shopping pick-up parks: 4 spaces; and
- electric vehicle charging parks: 3 spaces.

These on-site parking arrangements have been designed to comply with the parking space dimension and manoeuvre aisle widths (i.e. 2.6m x 5m spaces, and 7.5m wide aisles), in accordance with the requirements of AS/NZS 2890.1:2004 'Off-street Car Parking' ("AS/NZS2890.1"). A provision of five mobility spaces, which will be provided immediately adjacent to the store entrance, will be marked out in accordance with the dimensions given in AS/NZS2890.6 'Design for Access and Mobility' ("AS/NZS 2890.6").

The plans for the childcare centre show 28 on-site parking spaces (including three mobility spaces). Whilst detailed plans of the parking layout are not included, the final design will be developed in accordance with AS/NZS2890.1 and AS/NZS2890.6.

Each of the 17 residential lots is able to provide on-site carparking.

4.6 Servicing

The supermarket includes a dedicated on-site (un)loading yard, located to the east of the new supermarket building, which has been designed at approximately 15m wide and more than 40m in length. In this manner, the servicing area has been designed to accommodate more than one service vehicle at a time, should an occasion arise where a second service vehicle arrives at the site whilst another is already (un)loading (noting that supermarket servicing activities are mostly scheduled to avoid servicing visits overlapping).

In terms of demand, supermarkets such as that proposed here typically generate around 20-25 servicing trips per day (with deliveries scheduled from early morning through to late afternoon), with up to three or four involving articulated trucks and the balance being standard rigid trucks, small trucks, and vans.

The proposed loading area is designed to operate as a one-way facility, with service vehicles entering via the driveway off Birchs Road, travelling clockwise through the site via the service lane along the northern edge of the supermarket building into the loading area, before egressing at the exit only driveway to Makybe Terrace.

Servicing demands associated with childcare centres are generally limited to refuse collection and food delivery. Accordingly, typical activity and delivery frequencies involve general rubbish collection (twice a week); recycling collection (twice a week); and catering supplies (3 times a week). These servicing trips would typically occur outside of the normal peak period child drop-off and pick-up demands and would generally be undertaken from within the on-site carpark for short duration visits at times outside the main drop-off and pick-up periods.

The residential development refuse collection activities will be suitably accommodated at the kerbside.

5. Traffic Generation and Distribution

5.1 Supermarket

Relevant data from surveys at approximately half a dozen Countdown supermarkets across New Zealand can be referred to in estimating the traffic generation of the proposed supermarket. From these completed surveys, the data suggests that the PM peak trip rates of around 10.6vph per 100m² GFA can be expected. It is noted that this trip rate is slightly higher than that adopted and approved for the planned new Fresh Choice supermarket at nearby Prebbleton, noting the smaller nature of that store as compared to the fuller supermarket offering proposed here.

Applying this rate of 10.6vph per 100m² GFA to the proposed 3,063m² GFA supermarket provides an expected PM peak hour trip generation of 325vph.

Whilst the supermarket activity is likely to generate some wholly 'new trips' on the network (i.e. primary trips), many of those visiting the store will be drawn from traffic already travelling on the adjacent road network, either those on Birchs Road ('pass-by' trips), or on other routes in the local area that choose to divert on to Birchs Road in order to access the site ('link diverted').

Allowance for such trips has therefore been made using pass-by rates for supermarket activities published by the industry-recognised research of Gravitas and Strategy Limited, as set out in **Table 2**.

	Primary	Secondary	
		Pass-by	Link Diverted
Weekday PM	36%	32%	32%

Table 2: Primary and Secondary Trips

As shown**,** around third of trips to the site are expected to be pass-by trips, with another third being link diverted. Given the location of the supermarket site on the northern route in/out of Lincoln, link diverted trips will effectively constitute 'new' movements on this section of Birchs Road. As such, and by way of providing a robust assessment, these trips are assumed to be new.

On this basis, it has been assessed that one third of traffic will already be passing the site on Birchs Road and will therefore not add to network volumes. The remaining two-thirds are expected to be new traffic on the network.

5.2 Café

Data informing the industry-familiar NZTA Research Report 453 'Trips and Parking Related to Land Use' ("Research Report 453") provides PM peak trip rates for cafes at around 18vph/100m² or 0.5vph per seat. In addition, Research Report 453 suggests that traditional café activities would have a component of non-vehicle-based trips (particularly those in suburban locations), such that mode share for customers arriving by private vehicles would be around 0.85, with an associated mean vehicle occupancy of 2.2 persons.

In assuming that 85% of the seats are occupied at any given peak time (i.e. 17 customers[2]), then applying the mode share and vehicle occupancy rates above gives a total of 7 vehicles potentially arriving / departing the site during the peak hour. Adding in an allowance for some staff movements during this PM peak hour gives an overall trip generation of 10vph, noting that many trips will be coincident with supermarket trips and that the café activity will not wholly be a standalone generator.

Whilst trip generation at the café may be slightly higher during the AM and weekday interpeak periods, corresponding trip rates at the supermarket will be much lower, meaning overall traffic generated to and from the site will be at its highest during the PM peak, which has therefore been assessed later in chapter 7.

5.3 Childcare Centre

Comprehensive full day trip generation surveys undertaken by Stantec at existing childcare centres around the country provide a useful indication of the trip patterns during the peak drop-off and pick-up activity periods, relative to the number of children that a childcare centre is licensed to accommodate. Using this

[2] Assuming seating for around 20 people in total

surveyed data, the proposed 100-child centre can be expected to generate around 50-60 vehicle movements at the site during the PM peak hour period.

5.4 Residential

Research Report 453 provides rates based on surveys of existing residential developments undertaken within New Zealand. This guideline provides a peak hour rate of 1.2 vph per household for an inner suburban residential dwelling, which when applied to full 41-lot residential component of the site, equates to a peak hour generation of 49vph.

5.5 Total Site Traffic Generation

Table 3 below provides a summary of all the development site component trip generation discussed above, for the critical PM peak hour, when all activities combined will have the greatest generation, coinciding also with the busy period on the adjacent road network.

Activity	Traffic Generation (vph)
Supermarket	325
Café	10
Childcare	60
Residential	49
Total	**444**

Table 3: Summary of Forecast PM Peak Hour Traffic Generation

Overall, the site is expected to generate a total of 444vph during the PM Peak.

Daily traffic generation profile data collected at a similar supermarket, childcare centre, and an established residential subdivision has been used to determine the expected 'cumulative' traffic profile for this proposed mixed-use development, as shown in **Figure 5-1**.

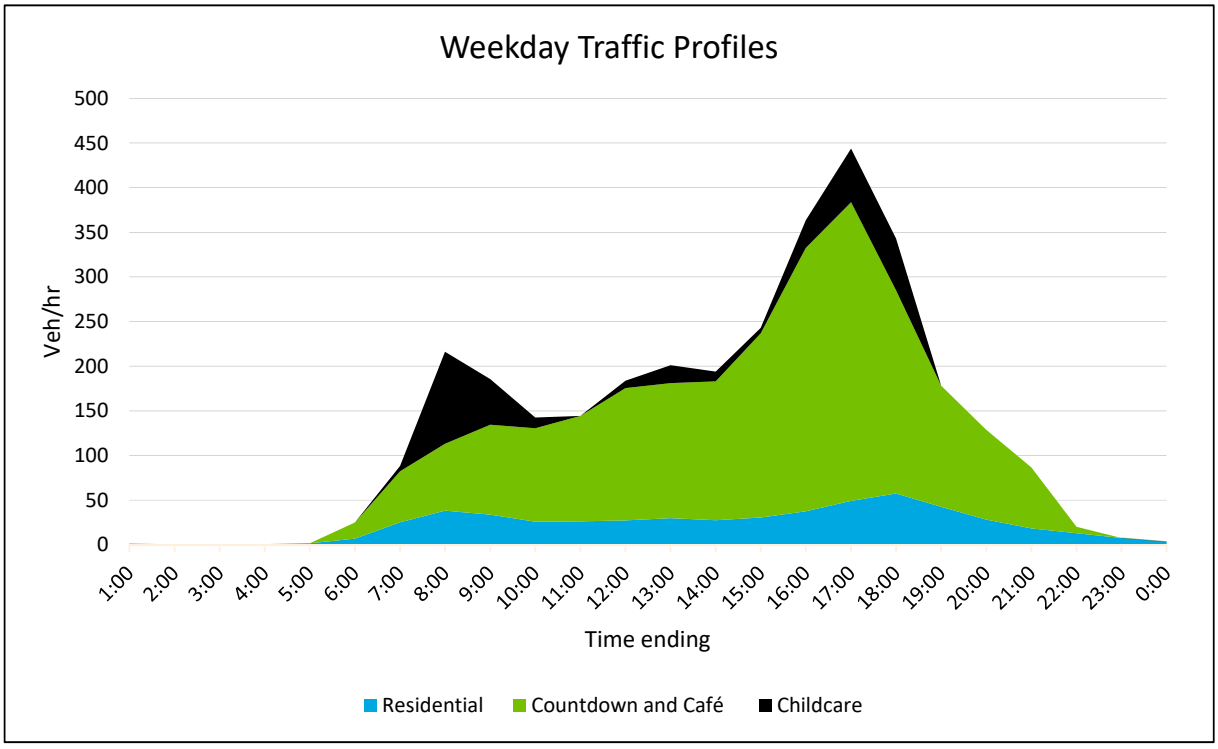

Figure 5-1: Cumulative Weekday Traffic Profiles of Proposed Mixed-use Development

As shown, the residential profile indicates morning and afternoon commuter peaks, whilst the supermarket shows modest volumes during the equivalent morning period, with a noticeable afternoon peak as people visit on their way home from work. In comparison, the childcare centre has notable morning and afternoon peaks, with little traffic generation in between.

The profile clearly shows the expected daily traffic peak will occur during the late afternoon, at around 5-6pm. On this basis, the PM peak has been confirmed as the worst-case scenario and the rest of the assessment has been completed in terms of the PM peak.

5.6 Traffic Distribution

Further interrogation of the traffic data summarised earlier in Chapter 2 shows an approximately 60/40 split of northbound/southbound traffic on Birchs Road, during the PM peak hour. For supermarket trips, all southbound vehicles on Birchs Road are assumed to use the site driveway on this frontage to access the site, whilst northbound vehicles on Birchs Road have been assumed to generally route 1/3 via the Makybe Terrace driveway and 2/3 via the Birchs Road driveway.

In this manner, the development traffic distribution has been determined using these wider network route choice assumptions along with the directional traffic count information for existing patterns on Birchs Road, to inform the detailed turning patterns at the intersection and driveways.

The overall site traffic distribution has been shown in **Figure 5-2** below.

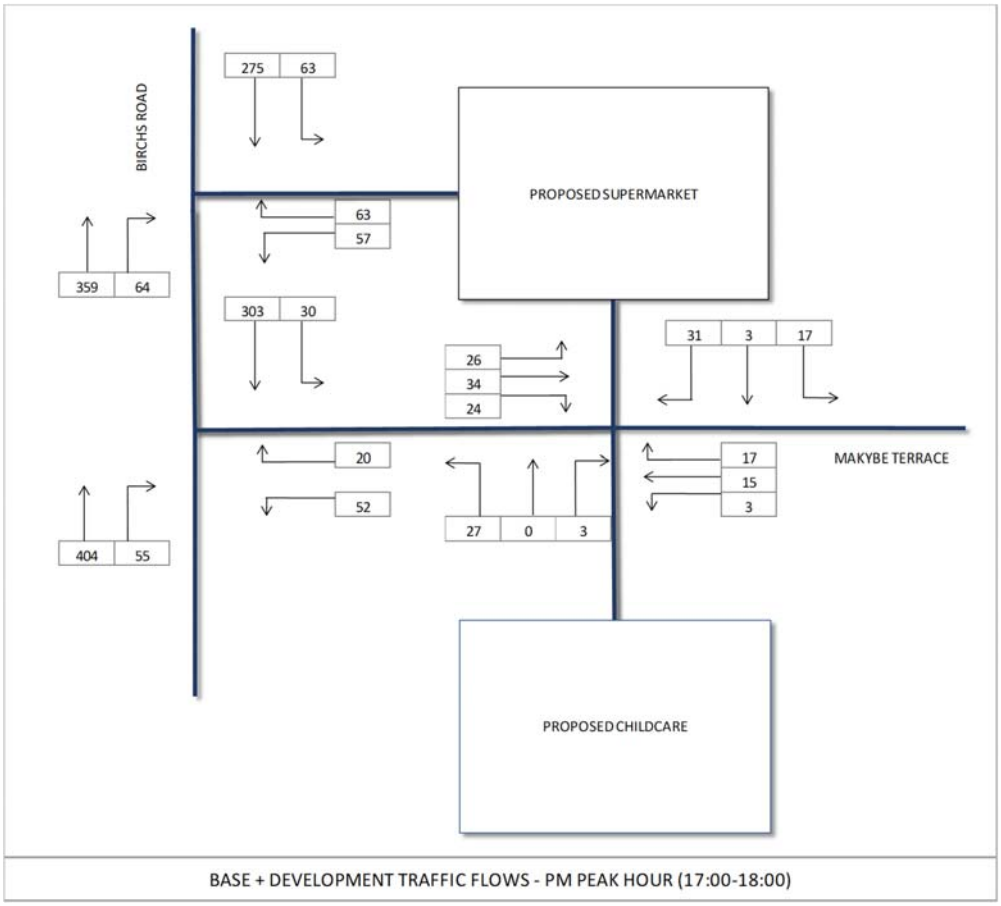

Figure 5-2: Existing Traffic with Forecast Development Traffic

The diagram also indicates that approximately 70% of supermarket traffic is expected to use the Birchs Road access and the remaining 30% would use the Makybe Terrace access.

6. District Plan Compliance

The site is zoned as 'Living Z / Residential' within the provisions of the operative District Plan[3]. Chapter 5 of the District Plan relates to the requirements for Permitted Activities in respect of roads, access, parking and loading. The proposed development is assessed against each of these rules and requirements in **Table 4** below, followed by assessment of the identified non-compliances.

Table 4: District Plan Compliance Table

Clause	Requirement	Provided	Compliance
C5.1 Road and Engineering Standards			
Rule 5.1.1	The forming of any road shall be a permitted activity if the following conditions are met:		
Rule 5.1.1.1	The road is formed on land which has an average slope of less than 20°; and	Land in the area is generally flat.	Can comply
Rule 5.1.1.2	The road does not have a gradient greater than: (a) 1:6 vertical; or (b) 1:20 horizontal; and	Will be addressed at detailed design.	Can comply
Rule 5.1.1.3	The road is not located closer than: (a) 20m to any waterbody listed in Appendix 12; or (b) 20m to a site listed in Appendices 3 or 4; and	The site is not located near these features.	Complies
Rule 5.1.1.4	The road is formed to the relevant standards in Appendix E13.3.1, except that E13.3.1 shall not apply to works to existing roads undertaken by Council pursuant to the Local Government Act; and	As outlined below	
E13.3.1.1	**New Roads** Any new road shall be laid out and vested in the Council in accordance with the standards contained in Table E13.8. Where stipulated that one parking lane is required the placement of this can alternate between respective sides of the road in the form of parking base.		
	Table E13.8 requires a Collector (except in Business 1 zone) to provide the following: - Legal width - 20-25m - Carriageway width - 11-12m - Traffic lanes - 2 - Parking lanes - 1 - Specific provision for cycles (on road or off road) - Yes - Pedestrian Provision - Both sides	The upgraded cross-section of Birchs Road proposed by Council meets this requirement. O'Reilly Road can be designed to meet these requirements.	Complies
	Table E13.8 requires a Local - Major road to provide the following: - Legal width - 16-20m - Carriageway width - 8.5-9m - Traffic lanes - 2 - Parking lanes - 1 - Specific provision for cycles (on road or off	Makybe Terrace is to be formed as a Major-Local road, but will not provide a parking lane along the full length.	Does not Comply See Section 6.1.1

[3] Operative: 03 May 2016, Revision: 20 May 2019

Clause	Requirement	Provided	Compliance
	road) - Optional - Pedestrian Provision - One side		
	Table E13.8 requires a Local - Minor road to provide the following: - Legal width - 10-12m - Carriageway width - 5-6m - Traffic lanes - 1 - Parking lanes - NA - Specific provision for cycles (on road or off road) - NA - Pedestrian Provision - NA	Caulfield Crescent is permitted a maximum formed width of 6m, but is proposed at 7m	Does not Comply See Section 6.1.2
Rule 5.1.1.5	The road complies with the relevant standards in Appendix E13.3.2; and	As outlined below	
E13.3.2.1	**Road Intersection Spacing (all roads)** The spacing between road intersections shall comply with Table E13.9. Posted (Legal) Speed Limit - 50km/h Arterial Road Minimum Distance Between Intersections - 123m required	All new roads meet this requirement	Complies
E13.3.2.2	In determining intersection spacing from Table E13.9 in accordance with E13.3.2.1, where new roads are proposed as part of any Outline Development Plan, the intersection spacing can be designed for the proposed (future) speed limit (typically 50km/hr) within the Outline Development Plan area and on immediately adjoining roads.	Assessed as per this rule.	Complies
E13.3.2.3	The distance between any two road intersections shall be measured along the centre line of the road which has both the intersections: (a) From the point where the centre lines of two of the roads intersect; (b) To the point where the centre lines of the other two roads intersect.	Assessed as per this rule.	Complies
C5.2 Vehicle Accessways			
Rule 5.2.1	The forming of any vehicle accessway shall be a permitted activity if the following conditions are met:	As outlined below	
Rule 5.2.1.1	The site has legal access to a formed, legal road; and	All new activities have direct access to a formed legal road.	Complies
Rule 5.2.1.2	Any site with more than one road frontage to a road that is formed and maintained by Council, shall have access to the formed and maintained (and legal) road with the lowest classification, except that where a site has frontage to a collector and a local road frontage may be	The supermarket proposed has access to Birchs Road (collector) and Makybe Terrace (local).	Complies

Clause	Requirement	Provided	Compliance
	obtained to either road. Note: For example, where a state highway and arterial road intersect the access shall be to the arterial road or in the case of an arterial road and collector road access shall be to the collector road.		
Rule 5.2.1.3	The vehicle accessway is formed on land which has an average slope of less than 20°; and	Land in the area is generally flat.	Can comply
Rule 5.2.1.4	The vehicle accessway does not have a gradient greater than: (a) 1:6 vertical; or (b) 1:20 horizontal; and	Will be addressed at detailed design.	Can comply
Rule 5.2.1.5	The vehicle accessway is not located closer than: (a) 20m to any waterbody listed in Appendix 12; or (b) 20m to a site listed in Appendices 3 or 4; and	The site is not located near these features.	Complies
Rule 5.2.1.7	Shared access to more than six dwellings or sites shall be by formed and vested legal road and not by a private accessway.	Will be addressed at detailed design.	Can comply
C5.3 Vehicle Crossings			
Rule 5.3.1.1	The vehicle crossing is formed to the relevant standards in Appendix E13.2.2, E13.2.4 and E13.2.5	As outlined below	
E13.2.2	**Distance of Vehicle Crossings from Intersections** No part of any vehicle crossing shall be located closer to the intersection of any roads than the minimum distances specified in Table E13.5 except that where the boundaries of a site do not allow the provision of any vehicle crossing whatsoever in conformity with Table E13.5, a single vehicle crossing may be constructed in the position which most nearly complies. (Note that the Road Hierarchy for the District is set out in Appendix 7). Collector intersecting Collector - 30m Collector intersecting Local – 25m Local intersecting Local - 10m	Supermarket and Childcare meet this requirement. The Lots on the eastern side of O'Reilly Road would not meet the 25m separation requirement.	Does not Comply. See Section 6.2.1
E13.2.4.1	**Vehicle Crossing Design** Vehicle access to any site from any road or service lane shall be by way of a vehicle crossing constructed at the owner's or developer's expense.	This requirement can be met.	Can Comply
E13.2.4.2	For all sites in a Living Zone there shall be a maximum of one vehicle crossing per site.	Three vehicle crossings proposed at the Supermarket	Does not comply See Section 6.2.2
E13.2.4.5	The maximum spacing and width of any vehicle crossing shall comply with Table E13.7. Distance Between Crossings (m) on Same Side of Road - Less than 1m or greater than 7m	None of the three Supermarket accesses comply. Childcare access	Does not Comply See Section 6.2.3

Clause	Requirement	Provided	Compliance
	Width - Residential activities — 3.5 to 6m, Non-residential activities – 4 to 7m	complies. Future residential accesses to be addressed at detailed design stage.	
E13.2.5.1	**Standard of Vehicle Crossings** Vehicle crossings shall be constructed to the following minimum standards: (a) Standard vehicle crossings shall be provided to sites capable of containing no more than 6 dwellings or which generate no more than 100 vehicle movements per day. (b) Heavy-duty vehicle crossings shall be provided for all other sites.	Can be addressed at detailed design.	Can comply
Rule 5.3.1.2	The vehicle crossing is to be sealed if the adjoining road is sealed; the crossing shall be sealed for the full length between the site boundary and the sealed carriageway;	All vehicle crossings shall be sealed	Can comply
Rule 5.3.1.3	The vehicle crossing complies with the relevant standards in Appendix E13.2.3	As outlined below	
E13.2.3	**Sight Distances from Vehicle Crossings** Any access on any road shall have minimum unobstructed sight distances that comply with Tables E13.6 below and measured in accordance with Diagram E13.2. 50km/h – Collector and local road, Living zone – 45m 50km/h Collector and local road, business zone – 113m	Sight distances are met. Sight distances of future residential units will be assessed at detailed design.	Can comply
Rule 5.3.1.4	The site does not have access directly on to a State Highway or arterial road unless the speed limit on that part of the road to which access is gained is 70km/h or less	The site does not have access to State Highway or an arterial road	Complies
C5.4 Traffic Sight Lines – Road / Rail Crossings			
	Not applicable as no rail crossings nearby		
C5.5 Vehicle Parking and Cycle Parking			
Rule 5.5.1.1	The number of car parks provided complies with the relevant requirements for the activity as listed in Appendix E13.1.1, E13.1.2, E13.1.3, E13.1.12.	As outlined below	
E13.1.1	**Parking Spaces to be Provided** The minimum number of car parking spaces shall comply with table E13.1. Table E13.1(a) requires 141 parking spaces for the supermarket and Café, 26 spaces for the childcare, and two spaces for the residential lots.	Parking Provisions: Supermarket and café - 176 spaces Childcare - 28 spaces Residential will comply	Complies
	Vehicle parking, for use by staff and visitors,	The supermarket	Complies

Clause	Requirement	Provided	Compliance
	shall be in compliance with the car park dimensions in Table E13.2 and Diagram E13.1. Table E13.2 requires a 90˚ parking layout at a supermarket or childcare to provide the following dimensions: - Stall width - 2.6m - Stall depth - 5.4m - Aisle - 5.5m - Total stall depth + aisle - 10.9m	provides stall widths of 2.6m and a minimum stall depth + aisle width of 12.5m or more.	
		The layout of the childcare parking area will be confirmed at detailed design.	Can Comply
E13.1.2	**Availability of Parking Spaces** Any area required for on-site parking or loading shall be available at all times for staff and visitors.	Designed as per this requirement.	Complies
E13.1.3.1	**Parking Area Location** All parking and loading areas shall be located on the same site as the activity for which the parking is required.	Designed as per this requirement.	Complies
E13.1.12.1	**Surface of Parking and Loading Areas** The surface of any parking, loading, and associated access areas shall be formed, sealed and drained with the parking spaces permanently marked.	Designed as per this requirement.	Complies
Rule 5.5.1.2	All car parking spaces and vehicle manoeuvring areas are designed to meet the criteria set out in Appendix E 13.1.5.2, E13.1.6, E13.1.7, E13.1.8, E13.1.9, E13.1.10 and E13.1.11.	As outlined below	
E13.1.5.2	**Loading and Manoeuvring** No loading zone shall obstruct any on-site car parking spaces or pedestrian access.	Designed as per this requirement.	Complies
E13.1.7	**Gradient for Parking Areas** The gradient for any on-site parking surface shall be no more than: - At 90 degree to the angle of parking (1:16) - Parallel to the angle of parking (1:20)	Can be designed as per this requirement.	Can comply
E13.1.8	**Maximum Gradients for Access** The maximum average gradient of any access shall be 1 in 6.	Can be addressed at detailed design.	Can comply
E13.1.9	**On-site Manoeuvring** Parking spaces shall be located to ensure that no vehicle is required to carry out any reverse manoeuvre when entering any required space Vehicles shall not be required to undertake more than one reverse manoeuvre when exiting a space	Designed as per this requirement.	Complies
E13.1.10	**Queuing Spaces** A queuing space shall be provided on-site for all vehicles entering or exiting a parking or loading area. The length of such queuing spaces shall be	The supermarket has provision for a total of 26.5m queuing between	Complies See Section 6.3

Clause	Requirement	Provided	Compliance
	in accordance with Table E13.3 10.5m where 21-50 spaces provided on site 25.5m where 151 or more spaces provided. At the supermarket, the parking spaces and associated required queuing space has been apportioned as follows between the two public accesses: Birchs Rd Access - 18m and Makybe Terrace Access – 7.5m.	the two accesses to the parking area. The parking design layout shown for the childcare can meet this requirement.	
E13.1.11	**Illumination** Any parking and loading areas which are required at night shall be illuminated to a minimum maintained level of 2 lux, with high uniformity, during the hours of operation.	Can be addressed at detailed design.	Can comply
Rule 5.5.1.3	**Loading** Each site that is used for an activity which is not a residential activity and which generates more than 4 heavy vehicle movements per day has one on-site loading space which complies with the requirements set out in Appendix E13.1.5. The loading space does not count as a car parking space for the purpose of complying with Rule 5.5.1.1	Designed as per this requirement.	Complies
Rule 5.5.1.5	Each non-residential site has one car parking space for mobility impaired persons for up to 10 car parking spaces provided, and one additional car park space for a mobility impaired person for every additional 50 car parking spaces provided or part there-of. A parking area (supermarket) with 176 spaces is required to provide 5 mobility spaces. A parking area (childcare) with 28 spaces is required to provide 2 mobility spaces.	Designed as per this requirement.	Complies
Rule 5.5.1.6	Car parking spaces for mobility impaired persons are: (a) Sited as close to the entrance to the building or to the site of the activity as practical, and (b) Sited on a level surface, and (c) Clearly marked for exclusive use by mobility impaired persons	The supermarket parking is designed as per this requirement. For the Childcare, this will be confirmed at detailed design stage.	Complies
Rule 5.5.1.7	Cycle parking spaces are provided in accordance with the standards in Appendix E13.1.4	See below	
E13.1.4.1	**Cycle Parking** Any activity is to provide cycle parking at a rate of minimum of 2 cycle space and then at a rate of 1 cycle space for every 5 car parking spaces required, to a maximum of 10 cycle spaces. The supermarket with 176 car parking spaces is required to provide 10 cycle parking spaces.	Supermarket has provision for 10 cycle parks.	Complies
E13.1.4.2	Any Place of assembly, recreation or education activity shall provide cycle parking at a minimum	Childcare centre can provide the 8	Can comply

Clause	Requirement	Provided	Compliance
	of 2 spaces and then at a rate of 1 cycle space for every 5 car parking spaces required. The childcare has 28 car parking spaces and is therefore required to provide 8 cycle parking spaces.	cycle parks required.	
Rule 10.8.3	Permitted Activity Standard Vehicle movements are limited to 40 per day and 4 HGV on Collector roads and 20 per day and 2 HGV on local roads.	The supermarket, and childcare traffic generation will exceed these limits.	Does not comply. Assessment of traffic effects is provided at Chapter 7

6.1 Rule 5.1.1.4 - Road Cross-sections

6.1.1 Makybe Terrace

The District Plan requires a major-local road to provide two traffic lanes and one parking lane within its carriageway. The proposed cross-section of Makybe Terrace has a width of 9m along its length, however, the western end of the road adjacent the proposed supermarket does not provide a parking lane as the carriageway accommodates a right turn bay leaving no space for kerbside parking. The eastern section of this road does however allow for one lane of informal / unmarked parking and two traffic movement lanes.

It is considered that the cross-section adjacent the supermarket in not providing kerbside parking, is in character with the surrounding activities and enables the safe and efficient movement of vehicles along the road, particularly with respect to maintaining unobstructed sightlines at the respective supermarket and childcare centre driveways. This arrangement is therefore supported from a traffic engineering perspective, noting particularly that the activities provide for all parking on-site such that they will not generate a demand for street parking.

6.1.2 Caufield Crescent

Caufield Crescent is a local minor road which is permitted to have a maximum carriageway width of 6m. The road is proposed with a 7m wide carriageway with associated traffic calming, which exceeds the permitted maximum. This width would allow for either two-way movement or parking on one side and one-way movement. Therefore, in terms of function, it would operate very similar to a 6m wide road. In terms of pedestrian movements being shared within the road carriageway, the short cul-de-sac formation and commensurate low traffic volumes, combined with the narrower width, will deliver a slow speed outcome ensuring pedestrians and cyclists can safely co-exist with vehicular traffic. The deviation from the standard is therefore not expected to give rise to adverse effects.

6.2 Rule 5.3.1.1 - Vehicle Crossing Standards

6.2.1 Distance of Vehicle Crossings from Intersections

The residential properties located on the corner of O'Reilly Road (collector road) and Makybe Terrace (local road), are required by the permitted activity standards of the District Plan to provide a 25m separation between any vehicle crossing and the adjacent intersection. The requirement also states that where a site does not allow provision for any vehicle crossing whatsoever in conformity with this separation, a single vehicle crossing may be constructed in order to achieve access to a lot, in the position which most nearly complies (i.e. at a point furthest from the intersection). Given the position and size of the lots proposed do not allow for this 25m separation to be fully met, the vehicle crossings will need to be constructed at a position farthest from the intersection, to satisfy the intent of this rule. Noting the low volume of vehicle movements typical of residential dwellings then such an outcome, as permitted by the rule, is not expected to give rise to adverse safety effects on the adjacent road frontage.

6.2.2 Number of Vehicle Crossings

The District Plan states that lots in the Living zone are permitted a maximum of one vehicle crossing per site. The supermarket, in being a commercial activity positioned on a corner site, includes three proposed vehicle crossings, which is considered to better facilitate site traffic distribution across the adjacent road frontages. In terms of the second access to Makybe Terrace, the provision of a dedicated servicing area

egress will beneficially serve to separate service truck exit manoeuvres from customer vehicle movements at the carpark driveway.

As such, the access design for the supermarket as proposed is considered appropriate, and the deviation from District Plan rule around the number of vehicle crossings will not lead to any adverse effects on the adjacent road network.

6.2.3 Vehicle Crossing Width

A vehicle crossing for a non-residential activity is allowed to have a maximum width of 7m. With respect to the supermarket, the vehicle crossings have been designed so as to enable either simultaneous entry/exit movements at the customer carpark driveway, or have been geometrically designed to enable larger servicing vehicles to be able to track to/from the site.

The Birchs Road vehicle crossing has a width of about 15m and this is necessary to accommodate semi-trailer service vehicles entering the site.

The Makybe Terrace customer vehicle crossing has a width of about 7.5m, to safely accommodate two-way vehicle flow.

The third vehicle crossing to Makybe Terrace that will accommodate service vehicles egress has a width of 11m, which is required to again accommodate the geometric demands of semi-trailers.

6.3 Rule 5.5.1.2 - Queuing Space

A parking area with a capacity of 151 spaces or more is required to provide 25.5m of queueing space. The rule also states that the queueing space may be apportioned between the driveways based on the number of parking spaces serviced by each driveway. As stated earlier in the report, the main Birchs Road driveway is expected to accommodate 70% of all traffic movements on site, with the balance routing via the Makybe Terrace driveway. This suggests that some 18m of queueing needs to be available at the Birchs Road driveway and the remaining 7.5m of queueing at the Makybe Terrace driveway. The available queuing space at the Birchs Road and Makybe Terrace driveways is interpreted as being approximately 20m and 8m, respectively, meaning the proposed design aligns with the intentions of the District Plan.

7. Traffic Effects

To assess the off-site transportation effects of the proposed development, it is appropriate to assess the relative performance at the new Birchs Road / Makybe Terrace intersection. In addition, with the introduction of a proposed new site driveway off Birchs Road to facilitate customer access and egress to the supermarket carpark, it is also appropriate to assess the performance of this new driveway.

For this purpose, the industry-recognised 'SIDRA' traffic model has been used to assess the post–development performance of the intersection, for the PM peak hour. The SIDRA software analyses intersection capacities, vehicle delay and vehicle queueing, giving an indication of expected intersection performance. It calculates a number of performance indicators including the following, which are reported on here:

- level of service ("LOS"), based on the delay to motorists, graded from A (excellent performance) to F (poor performance);
- average delay (seconds / vehicle), defining delay to the typical motorist; and
- maximum (95th percentile) queue length, defining 95% of the time queues will be less than this.

The traffic generation and distribution data described earlier has been used to simulate the expected performance of Birchs Road intersection and supermarket site driveway, as summarised in **Table 5** below.

	Approach	Movement	LOS	Delay (Seconds)	95% Back of Queue (Vehicles)
Birchs Road / Makybe Terrace Intersection	Birchs Road South	Through	A	0	0
		Right	A	6	1
	Makybe Terrace	Left	A	6	1
		Right	B	11	1
	Birchs Road North	Left	A	5	0
		Through	A	0	0
Proposed Birchs Road Supermarket Driveway	Birchs Road South	Through	A	0	0
		Right	A	8	1
	Supermarket Driveway	Left	A	1	1
		Right	A	7	1
	Birchs Road North	Left	A	8	0
		Through	A	0	0

Table 5: Summary of SIDRA Outputs

The analysis indicates there is sufficient capacity to accommodate the proposed level of traffic on Birchs Road and on the proposed new road, with little to no delay. Both the Makybe Terrace intersection and proposed new supermarket driveway access are expected to perform at a very good level of service for all movements, so that even if the assessed distributions are different from those forecast here, continued good performances can be expected.

8. Conclusions

This report details the assessment of traffic and transportation effects associated with a proposed mixed-use development in Lincoln.

The proposed development includes a new supermarket, café, childcare centre and residential lots. Access to the site is proposed from Birchs Road and other new/extended roads including O'Reilly Road, Makybe Terrace and Caufield Crescent (east).

The newly proposed Makybe Terrace will form a new intersection with Birchs Road and O'Reilly Road. The new road network has generally been designed in accordance with the ODP Area 3 for this area, and associated District Plan requirements. It is considered that the design and location of the new roads would provide safe and efficient access to the different activities.

The proposed development is expected to generate about 445vph during the PM peak period. A SIDRA assessment of both the Birchs Road/ Makybe Terrace intersection and the main supermarket access driveway on to Birchs Road, has shown that each is expected to operate with a good level of service, demonstrating that Birchs Road has sufficient capacity to accommodate the traffic associated with the new mixed-use development.

The amount of development site parking proposed, meets the requirements of the District Plan for each activity, and is assessed as being appropriate for the nature and scale of the planned activity. Loading for the supermarket is to be provided at the rear of the building (eastern end of the supermarket site) within a gated loading area accessed via the Birchs Road access; egress is proposed via dedicated service vehicle exit only driveway to Makybe Terrace. This loading area has been designed to accommodate the largest semi-trailer service vehicle expected at the site.

In summary, it is concluded that the mixed-use development, as proposed, can be properly and safely accommodated across the site, and that the associated effects can be appropriately managed and mitigated through the introduction of the new roading infrastructure, which forms part of the development plans.

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