Leeston Industrial Transport Assessment

Selwyn District Council

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Leeston Industrial Transport Assessment

Selwyn District Council

Quality Assurance Information

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1. Introduction

The Selwyn District Council is proposing to extend the Business 2 (Industrial) Zone in the south-east of Leeston Township to include additional industrial zoned land within the Proposed District Plan. The area being considered for the Business 2 (Industrial) Zone is up to 100,000m^2. This Transport Assessment explores the transport implications of the proposed zoning change on the receiving environment. The transport provisions within the Selwyn District Plan are currently under review and this Transport Assessment has been prepared based on the operative Selwyn District Plan.

This report was originally collated in early 2019. There may be some updated background information available, but this is not expected to affect the assessment and conclusions in this report.

2. Site Location and Context

2.1 Background

Leeston is a rural-residential area with a population of approximately 1,500 people. It is located approximately 25km southwest of Rolleston.

2.2 Locality

The plan change area is located at the eastern edge of the Leeston urban area. The area is approximately 2km southwest of Doyleston and 7km northeast of Southbridge. Leeston Road, an Arterial Road, provides the major east-west roading connection from Leeston to Springston, approximately 17km to the northeast. The location of Leeston in the context of the wider Selwyn District area is shown in **Figure 2.1**. The locality plan is shown in more detail in **Figure 2.2**.

Figure 2.1 Locality plan - wider Christchurch area[1]

[1] Data obtained from Google Maps on January 24, 2019

Figure 2.2 Locality Plan[2]

2.3 Surrounds

The area is predominantly surrounded by farming land. There are existing industrial and low density uses to the west. The A and P showgrounds are located just north of the proposed zone change area.

2.4 Zoning

The site is currently zoned as Outer Plains in the Selwyn District Plan as shown in **Figure 2.3**. The other adjacent zones include Living 1, Living 2, and Business 2.

The relevant zone definitions from the Plan are described below;

- Living 1: Areas that are managed to maintain environments that are most pleasant for residing in. Activities in Living zones have effects which are compatible with residential activities and amenity values.
- Living 2: As for Living 1 Zone, but with lower building density and development reflective of the rural character expected of low density living environments. While generally adjoining existing living zones, in some circumstances, low density Living 2 Zones can be located on the edge of townships. Larger sections, more space between dwellings, panoramic views and rural outlook are characteristic of this zone.
- Business 2: Business 2 Zones are areas where activities likely to be considered less pleasant by people are located. Aesthetic and amenity standards are less than those in Living or Business 1 Zones. Activities are still managed to protect natural resources and people's health or well-being. Activities likely to cause 'reverse sensitivity' issues are discouraged in Business 2 Zones e.g. residential activities.

[2] Imagery obtained from Canterbury Maps on January 24, 2019

- Outer Plains: The Outer Plains zone is reserved rural uses. The Outer Plains zone has a maximum residential density of 1:20 dwellings per ha and a minimum allotment size of 20ha. The Outer Plains zone is differentiated from the Inner Plains zone because of its greater distance from the Christchurch urban area and reduced residential density.

The relevant activity definitions from the Plan are defined below;

- Residential activity means the use of land and buildings for the purpose of living accommodation and ancillary activities. For the purpose of this definition, residential activity shall include:
  a) Accommodation offered to not more than five guests for reward or payment where the registered proprietor resides on-site;
  b) Emergency and/or refuge accommodation; and
  c) Supervised living accommodation and any associated caregivers where the residents are not detained on the site.

  Residential Activity does not include:

  a) Travelling accommodation activities (other than those specified above); and
  b) Custodial and/or supervised living accommodation where the residents are detained on the site.

- Rural Activity means the use of land or building(s) for the purpose of growing or rearing of crops or livestock, including forestry, viticulture and horticulture and intensive livestock production and may include a dwelling.
- Industrial Activity means any activity involving the manufacturing, production, processing, assembly, disassembly, packaging, servicing, testing, repair and/or warehousing of any materials, goods, products, machinery or vehicles, but excludes mining, mineral exploration and quarrying.

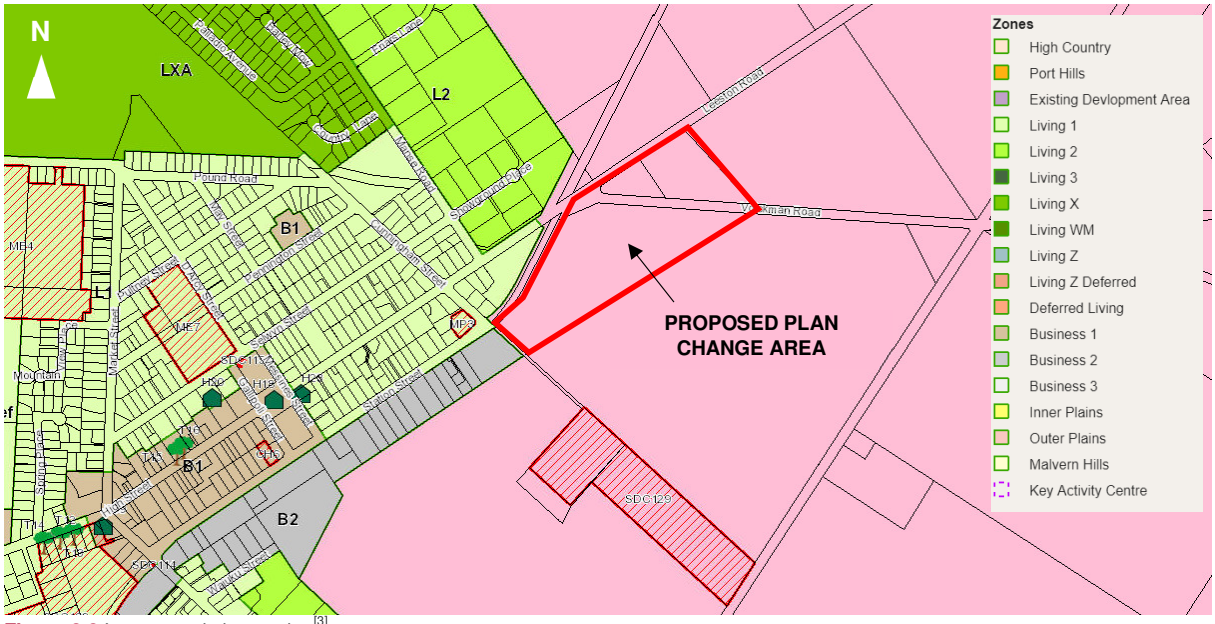

Figure 2.3 Leeston existing zoning[3]

Plan Change plan

The Plan Change site is up to 100,000m^2 split between Area 1 and Area 2 as shown in **Figure 2.4**.

[3] Obtained from Selwyn District Plan on January 24, 2019

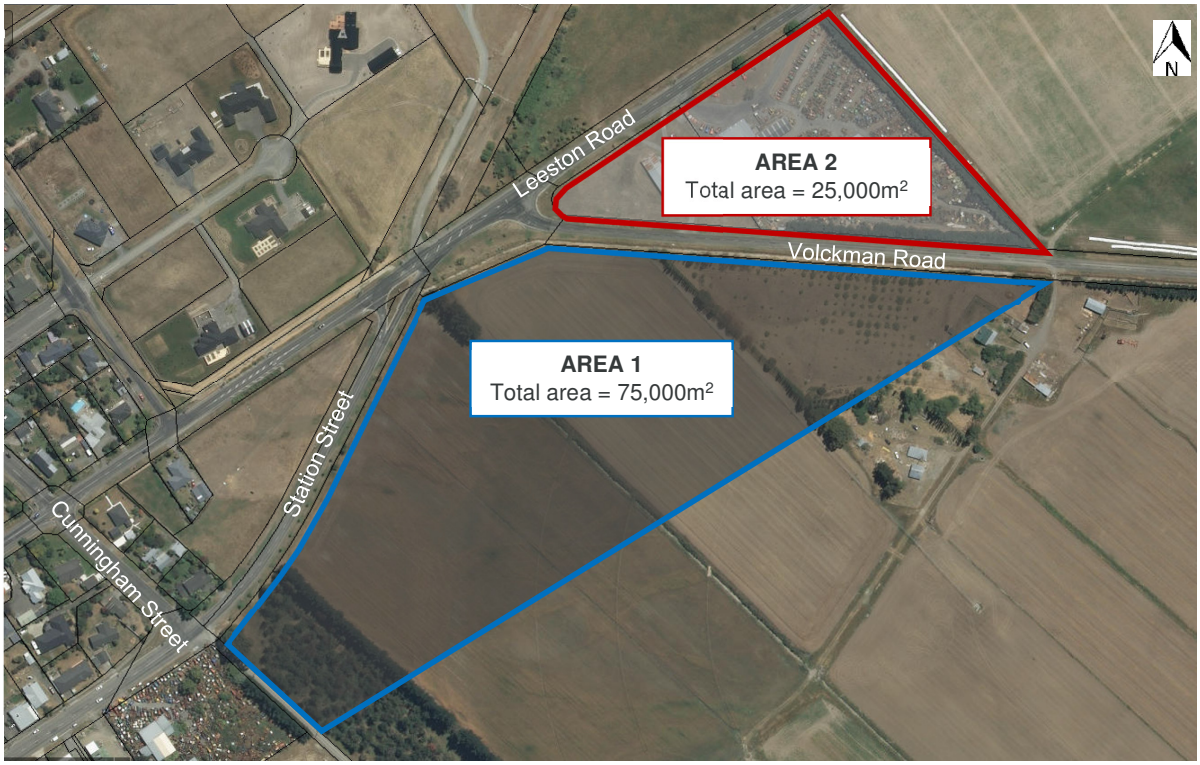

Figure 2.4 Plan Change area

Figure 2.4 shows that the site is bounded by Leeston Road and Station Street to the north and west. The existing Volckman Road runs through the Plan Change area dividing the area into two. Area 1 is part of an existing rural property while Area 2 is currently occupied by existing industrial businesses (Millars tractor spares, Bridgestone tyre centre and Legg and McMahon automotive repairs and servicing).

3. Existing Transport Environment

3.1 Leeston Road

For ease of understanding, it is assumed that Leeston Road is aligned in the east-west direction. Leeston Road forms the northern boundary of the eastern section of the proposed zoning change area (Area 2). Leeston Road is the primary road through Leeston and is classified as an Arterial Road under the District Plan roading hierarchy. The District Plan uses the following definition for Arterial Roads: "*They connect areas of district importance not already provided by State Highways. Arterial roads connect the districts townships and other important places and activities together, including across district boundaries*." At the site location, Leeston Road has a straight and level alignment with a carriageway sealed width of 7m. The road reserve width is 20m. The speed limit on Leeston Road is 50km/h within Leeston, 60km/hr from the intersection of Leeston Road and Station Street to 500m east of that intersection, and 100km/hr past that point in the eastern direction. Cross-sections of Leeston Road are shown in **Figure 3.1** and **Figure 3.2**.

Figure 3.1 Leeston Road at Volckman Road - looking east (proposed zoning change area to the right)

Figure 3.2 Leeston Road at Station Street - looking west

In the vicinity of the plan change area, Leeston Road forms two give-way controlled intersections with Station Street and Volckman Road. The priority is assigned to Leeston Road at both intersections. The separation distance between the two intersections is approximately 90m. At the intersection with Station Street, eastbound vehicles on Leeston Road are not permitted to turn right onto Station Street. At the intersection with Volckman Road, the width of Leeston Road increases to 10m to include a 3m right turn bay for eastbound vehicles turning onto Volckman Road. Access to the A

and P Showgrounds is also provided adjacent to the intersection of Leeston Road and Station Street. See **Figure 3.3** for an aerial view of both intersections.

Figure 3.3 Aerial view of the Leeston / Station and Leeston / Volckman intersections[4]

3.2 Station Street

Station Street forms the northern boundary of the western section of the proposed plan change area (Area 1). Station Street is the heavy vehicle bypass route for Leeston and is classified as an Arterial Road under the District Plan roading hierarchy. The District Plan uses the following definition for Arterial Roads: "*They connect areas of district importance not already provided by State Highways. Arterial roads connect the districts townships and other important places and activities together, including across district boundaries.*" At the site location, Station Street has a straight and level alignment with a carriageway sealed width of 7m. The road reserve width is 20m. At the channelised intersection with Leeston Road, the northbound lane has a width of 5.2m, and the southbound lane has a width of 4.2m. The speed limit on Station Street (west of Cunningham Street) is 50km/h and 60km/hr from Cunningham Street to Leeston Road. Sight distances from Station Street are excellent for turning onto Leeston Road in both directions at the Leeston/Station intersection. Station Street is shown in **Figure 3.4**.

[4] Data obtained from Canterbury Maps on January 24, 2019

Figure 3.4 Station Street at Leeston Road - looking south (proposed zoning change area to the left)

3.3 Volckman Road

Volckman Road passes through the proposed plan change area and is classified as a Local Road. The District Plan uses the following definition for Local Roads: "*A road that is not intended to act as main through routes for traffic as their primary function is to provide property access, and they generally have lower traffic volumes*." Within the site frontage, Volckman Road has a straight and level alignment with a carriageway sealed width of 5.5m. The road reserve width is 20m. The speed limit on Volckman Road is 100km/h. Sight distances are excellent for turning onto Leeston Road in both directions. There are private access driveways located at 1631 Leeston Road and 483 Volckman Road. Volckman Road is shown in **Figure 3.5**.

Figure 3.5 Volckman Road at Leeston Road - looking east

3.4 Traffic Flows

Council undertakes regular traffic counts at several locations throughout the District. Recent traffic volume count data is not available for Volckman Road but is available for Leeston Road and Station Street. The most recent link count flow for Leeston Road was undertaken between Drain Road and Station Street in July 2018. The pattern of hourly volumes is shown in **Figure 3.6**.

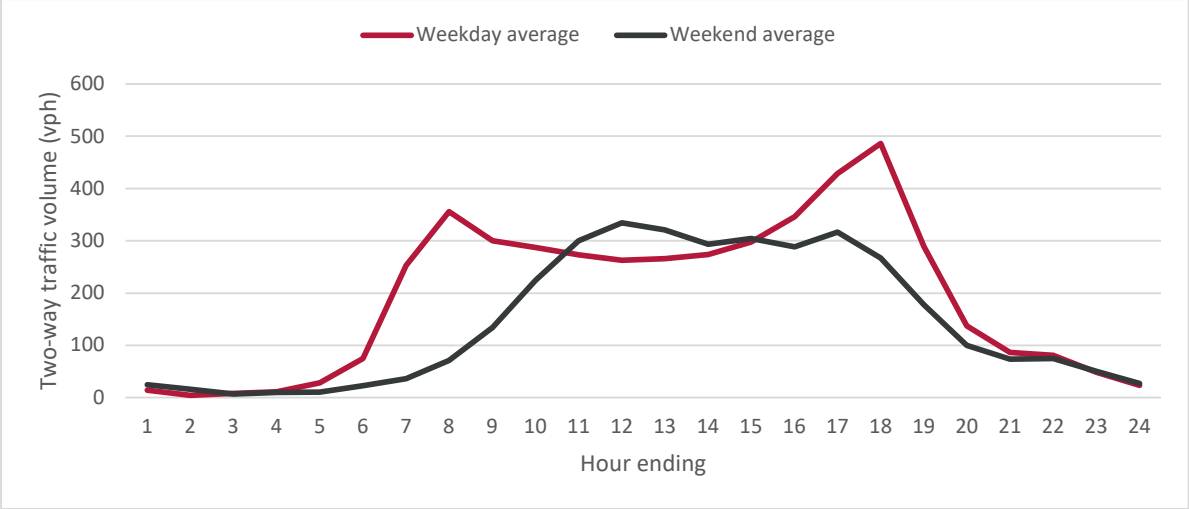

Figure 3.6 Leeston Road hourly traffic patterns

The main features of this pattern include:

- An average daily weekday (Monday to Friday) traffic volume of 4635 vehicles per day (vpd) and an average daily weekend (Saturday and Sunday) traffic volume of 3483vpd;
- Two peak periods on Monday to Friday; a morning peak volume of 356vph occurred between 7am and 8am and an evening peak volume of 486vph occurred between 5pm and 6pm; and
- The weekend has a midday peak volume of 334vph between 11am and 12pm.

The nearest available traffic count data for Station Street was undertaken in June/July 2018 between Leeston Road and Cunningham Street. The hourly traffic volumes on Station Street are shown in **Figure 3.7**

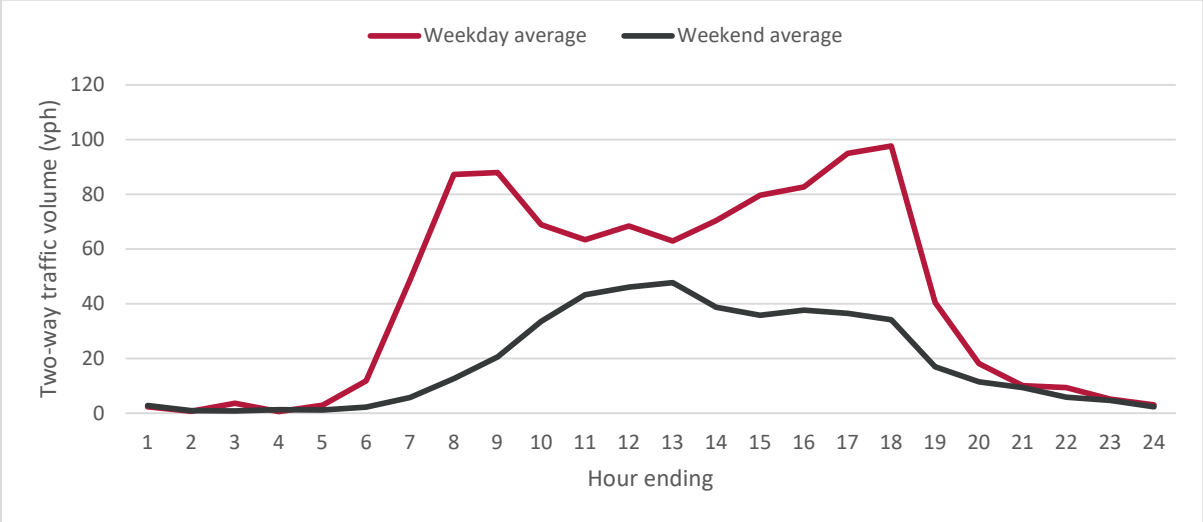

Figure 3.7 Station Street hourly traffic patterns

The main features of this traffic pattern include:

- An average weekday (Monday to Friday) traffic volume of 1021vpd and an average daily weekend (Saturday and Sunday) traffic volume of 452vpd;
- There were two typical morning and evening peak periods from Monday to Friday. The morning peak hour occurred between 8am and 9am with 88vph and an evening peak volume of 98vph occurred between 5pm and 6pm;
- The weekend has a midday peak hour volume of 48vph occurred between 12pm and 1pm.

Peak hour intersection turning movements

Abley undertook traffic turning movement surveys at the Leeston Road/ Volckman Road intersection and at the Leeston Road/ Station Street intersection on Thursday, 17 January 2019. Due to the timeframes of this project the survey was undertaken during the summer school holiday period. The survey covered a half hour period from 5:00pm to 5:30pm. The surveyed turning movements were doubled to obtain the evening peak hour (5pm to 6pm) turning movements at both intersections. The evening peak hour turning movements at both intersections are shown in **Figure 3.8**.

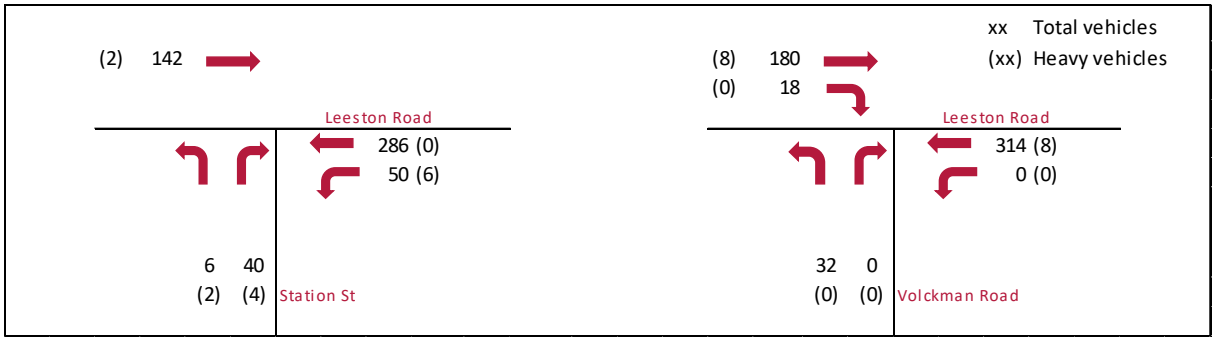

Figure 3.8 Existing evening peak hour traffic volumes

3.5 Existing intersection performance

The existing performance of the Leeston / Station and Leeston / Volckman intersections have been modelled using SIDRA Intersection Version 8 software for the existing evening peak hour. SIDRA Intersection offers a range of outputs for any given model. The outputs selected for this analysis are:

- Degree of saturation (DOS)
  - The DOS is a ratio of the demand placed on the intersection against the capacity of the intersection. A DOS equal to 1.0 indicates that the intersection is operating at its maximum theoretical capacity
- Average delay (seconds)
  - Average delay is the average delay experienced by vehicles travelling through an intersection and includes deceleration, queuing, stopping and acceleration.
- Level of Service (LOS)
  - The LOS generally describes the traffic conditions in terms of travel time, volume, capacity, freedom to manoeuvre and convenience. The LOS ranges from A to F where A represents the least impediment to vehicle movement and F represents heavy congested conditions
- 95th percentile back of queue and queue distance (metres)
  - The 95th percentile back of queue and queue distance is the value below which 95% of all observed queue lengths fall (i.e. 5% of all observed queue lengths exceed this value).

The gap acceptance criteria for the intersection has been adjusted based on the recommended values in Table 5.10.6 in the SIDRA user guide (Aug 2018) and the Two-Way Sign Control (TWSC) adjustment has been disabled. The critical minor road right turn out movement has a critical gap of 5.5 seconds and follow-up headway of 3.5 seconds. The minor road left turn out movement has a critical gap of 4.5 seconds and follow-up headway of 2.5 seconds. The right turn movement into the minor road has a critical gap of 4.0 seconds and follow-up headway of 2.0 seconds.

A summary of SIDRA outputs for the existing traffic flows at Leeston/Volckman intersection and Leeston/Station intersection during the evening peak hour are provided in **Table 3.1** and **Table 3.2** respectively.

Table 3.1 Existing Leeston/Volckman intersection performance - evening peak hour

Movement	Degree of saturation (DOS)	Average delay (s)	Level of service	95% back of queue (veh)	95 % back of queue (m)
South approach: Volckman Road					
Left	0.035	9.3	A	0.1	0.9
Right	0.035	11.6	B	0.1	0.9
East approach: Leeston Road					
Left	0.173	5.6	A	0.0	0.0
Through	0.173	0.0	A	0.0	0.0
West approach: Leeston Road					
Through	0.101	0.0	A	0.0	0.0
Right	0.014	6.5	A	0.1	0.4
Intersection	**0.173**	**0.8**	**NA**	**0.1**	**0.04**

Table 3.2 Existing Leeston/Station intersection performance - evening peak hour

Movement	Degree of saturation (DOS)	Average delay (s)	Level of service	95% back of queue (veh)	95 % back of queue (m)
South approach: Station Street					
Left	0.087	7.8	A	0.3	2.3
Right	0.087	9.7	A	0.3	2.3
East approach: Leeston Road					
Left	0.185	5.7	A	0.0	0.0
Through	0.185	0.0	A	0.0	0.0
West approach: Leeston Road					
Through	0.077	0.0	A	0.0	0.0
Intersection	**0.185**	**1.4**	**NA**	**0.3**	**2.3**

Table 3.1 and **Table 3.2** show that both Leeston/Volckman and Leeston/Station intersections currently operate at good LOS A/B and that there are currently no capacity constraints at these intersections.

3.6 Public Transport

Leeston does not lie on any permanent public transport route. The nearest services are the Christchurch Metro 820 bus line that services Lincoln and Rolleston and the Christchurch Metro 80 bus line that services Lincoln and Christchurch Central.

Starting in late January 2019, Christchurch Metro began operating a trial commuter bus service (route 87) between Leeston and Christchurch Central. See **Figure 3.9** for a map of the route and pick-up locations within Leeston.

Figure 3.9 Metro 87 bus route, pick-up locations[5]

3.7 Cycle and Pedestrian Environment

There is currently no dedicated provision for cyclists or pedestrians in the vicinity of the zone change area.

3.8 Road Safety

The road safety of the surrounding network was evaluated using the metrics from the NZTA's Safer Journeys Risk Assessment Tool. The Safer Journeys Risk Assessment Tool provides the 2013-2017 crash history data, road safety metrics, safe and appropriate speed limits, infrastructure risk ratings, and other metrics that support and guide a strategic road safety approach. The Collective and Personal Risk metrics are a function of historic crash performance translated to estimated death and serious injury (DSi) casualty equivalents using calculations from the High-Risk Intersections Guide and Urban KiwiRAP analysis.

Collective Risk is a measure of the total estimated DSi casualty equivalents per km for a road segment. It is effectively a measure of the number of deaths and serious injuries per km that can be expected on a road segment over the next five years. The Collective Risk thresholds for corridors are shown in **Figure 3.10**. The Collective Risk values for the surrounding area are shown in **Figure 3.12.**

[5] Obtained from Christchurch Metro on January 20, 2020

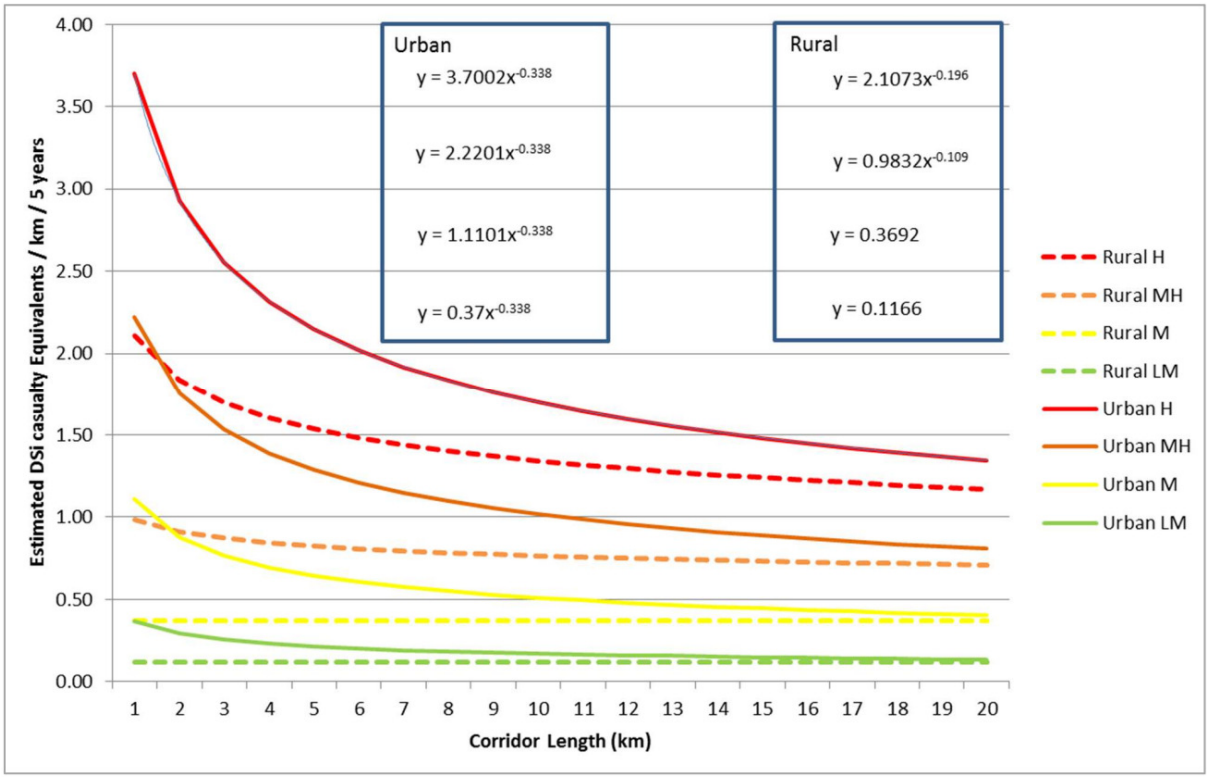

Figure 3.10 Collective Risk Thresholds[6]

Personal Risk is a measure of the risk of an individual dying or being seriously injured on a road corridor. It is calculated by dividing Collective Risk by traffic volume exposure. The Personal Risk thresholds for corridors are shown in **Figure 3.11**. The Personal Risk values for the surrounding area are shown in **Figure 3.13**.

Risk Category	Corridor Personal Risk Value
Low	< 2
Low Medium	2 - <5
Medium	5 - <12
Medium High	12 - <20 * Where Corridor Personal Risk is 12 - <20, and has only 1 injury crash, Personal Risk is categorised as "Medium".
High	≥ 20 Where Corridor Personal Risk is >=20, and has only 1 injury crash, Personal Risk is categorised as "Medium". Where Corridor Personal Risk is >=20, and has only 2 injury crashes, Personal Risk is categorised as "Medium High".

Figure 3.11 Personal Risk Thresholds[6]

[6] Obtained from the NZTA Safer Journeys Risk Assessment Tool (Mega Maps) Edition II on January 25, 2019

Figure 3.12 Road Safety - Collective Risk[6]

Figure 3.13 Road Safety -Personal Risk[6]

Figure 3.12 and **Figure 3.13** show that the existing adjacent road network has a low risk value for both Collective Risk and Personal Risk.

4. Anticipated trip generation and distribution

4.1 Development scenario

A concept of the Plan Change area is not available at this stage and therefore the following development scenario assumptions have been adopted for the trip generation assessment:

- The predominant land use at the site will be industrial. The permitted industrial activities will be consistent with the definition in the Selwyn District Plan:

  "Industrial Activity means any activity involving the manufacturing, production, processing, assembly, disassembly, packaging, servicing, testing, repair and/or warehousing of any materials, goods, products, machinery or vehicles, but excludes mining, mineral exploration and quarrying."
- A small portion of the site (6400m^2) will be used for retail activities and these will be included within Area 1 shown in **Figure 2.4**. These include:
  - A service station;
    i) The site area for the service station is assumed to be 1400m^2. This is similar to the existing Z service station in Geraldine with four fuel pumps and a retail shop of 70m^2.
  - A food and beverage site;
    i) The food and beverage site area is assumed to be a café or lunch bar of 500m^2 with a building coverage of 375m^2. This is similar to the existing café at 140 Colombo Street, Christchurch.
  - A bulk goods retail/ trade retail site;
    i) The bulk goods retail site area is assumed to be 4500m^2 with a Gross Floor Area (GFA) of 2700m^2. This is similar to the existing Mitre 10 Beckenham store at 260 Colombo Street, Christchurch.
- The food and beverage site services primarily the Plan Change area and is expected to be closed before the evening peak hour. Therefore, the food and beverage site is not expected to generate traffic during the evening peak hour.
- Although the rezoning of Area 2 in **Figure 2.4** reflects the existing activities in the area, it is assumed that Area 2 will intensify following the plan change as a conservative assessment.

The Trips Database Bureau (TDB) is New Zealand's pre-eminent source of trips and parking information for land use activities. TDB data has been used to estimate the anticipated trip generation for the proposed plan change from Outer Plains to Business 2. The selected industrial activities within the TDB database include industrial-commercial, industrial-contractors, industrial-manufacturing and industrial-storage. A description of these is included in **Table 4.1**.

The remaining area of Area 1, after subtracting the retail activities, is then split between the four different types of industrial activities. The same proportion split between the four different industrial activities is adopted for Area 2. A summary of the adopted development scenario for trip generation assessment is shown in **Table 4.1**.

Table 4.1 Adopted development scenario for trip generation assessment

Activity	Activity description	Site Area (%)	Site area (m^2)	
			Area 1	Area 2
Industry - commercial	light industrial activities generally associated with industrial parks. May include industrial offices, and research laboratories.	30%	20,580	7,500
Industry - contractor	where a range of construction and manual services are undertaken off site.	15%	10,290	3,750
Industry - manufacturing	production sites where raw materials, goods and services are further processed and then distributed.	15%	10,290	3,750
Industry - storage	including warehousing, container storage, repacking and storage facilities for consolidation for forward transport (e.g. containers, couriers, mail centres, storage units).	40%	27,440	10,000

Activity	Activity description	Site Area (%)	Site area (m^2)	
			Area 1	Area 2
Service station	a site providing primarily for the sale of petrol and other fuels. On-site food and other retail facilities are also expected from most modern service stations.	-	1,400	-
Food and beverage	activities involving the preparation and sale of food. Assumed to be a coffee shop servicing primarily the industrial area.	-	500	-
Bulk goods retail	Large format centre providing a range of large warehouse and retail areas for the sale of bulky goods and home supplies.	-	4,500	-
Total			75,000	25,000

4.2 Trip generation

The peak hour trip generation for the development scenario in **Table 4.1** has been calculated using the average peak hour trip generation rates from the Trips Database Bureau (TDB) and the NZ Transport Agency Research Report 453. TDB data before 2005 has been excluded in the assessment. The adopted peak hour trip rates and the calculated peak hour trip generation are shown in **Table 4.2**. The site coverage or Gross Floor Area (GFA) for all four industrial activities were averaged from survey sites in the NZ TDB database. The GFA for the service station is based on the existing Z service station in Geraldine while the food and beverage and bulk goods retail activities are based on existing sites in Christchurch. Only the evening peak hour trip generation assessment is included given that the prevailing traffic flows are higher in this period than during the morning peak hour (as noted in Section 3.4).

Table 4.2 Estimated evening peak hour trip generation

Activity	Trip generation rate	GFA (% of site area)	Area 1		Area 2	
			GFA (m^2)	Trip Generation (vph)	GFA (m^2)	Trip Generation (vph)
Industry - commercial	0.28/100m^2 GFA	56%	11,525	32	4,200	12
Industry - contractor	2.9/100m^2 GFA	42%	4,322	125	1,575	46
Industry - manufacturing	1.12/100m^2 GFA	40%	4,116	46	2,100	24
Industry - storage	0.58/100m^2GFA	49%	13,446	78	4,900	28
service station	20.4/bay	5%	70	82	-	-
Food and beverage	No trips during PM peak hour (primarily servicing the industrial area)	75%	375	-	-	-
Bulk goods retail	3.94/100m^2 GFA	60%	2,700	106	-	-
Total				470		110

Table 4.2 shows that the site is estimated to generate a total of 580vph during the evening peak hour once fully developed. Area 1 is expected to generate approximately 470vph and Area 2 approximately 110vph.

4.3 Trip distribution

The following assumptions have been adopted in the evening peak hour traffic distribution analysis:

- About 80% of the traffic generation will leave the site coinciding with the end of hours of operation with the remaining 20% of traffic entering the site.
- Area 1 will have direct access to both Station Street and Volckman Road and all traffic generated by Area 1 is evenly distributed between the Leeston/Station and Leeston/Volckman intersections.
- Area 2 will only have access to Volckman Road and all traffic generated by Area 2 will access the site via the Leeston/Volckman intersection. This is a conservative assumption as it is likely that Area 2 will have direct access onto Leeston Road as per the existing businesses in Area 2.
- About 40% of inbound trips will undertake a right turn in manoeuvre from Leeston Road with the remaining 60% undertaking a left turn in manoeuvre from Leeston Road at either the Leeston/Station intersection or the Leeston/Volckman intersection.
- About 40% of outbound trips will undertake a right turn out manoeuvre onto Leeston Road from Station Street or Volckman Road at either the Leeston/Station intersection or the Leeston/Volckman intersection. The remaining 60% of outbound trips will undertake a right turn out manoeuvre onto Leeston Road.
- All traffic generated are new trips. This is a conservative approach as a proportion of the trips generated would be trips that are already on the road network.
- No changes to the existing intersection layout at both Leeston/Station and Leeston/Volckman intersections. Right turn in from Leeston Road is not permitted at the Leeston/Station intersection.

The anticipated evening peak hour trip distribution of the development through the Leeston/Station intersection and the Leeston /Volckman intersection is shown in **Figure 4.1**.

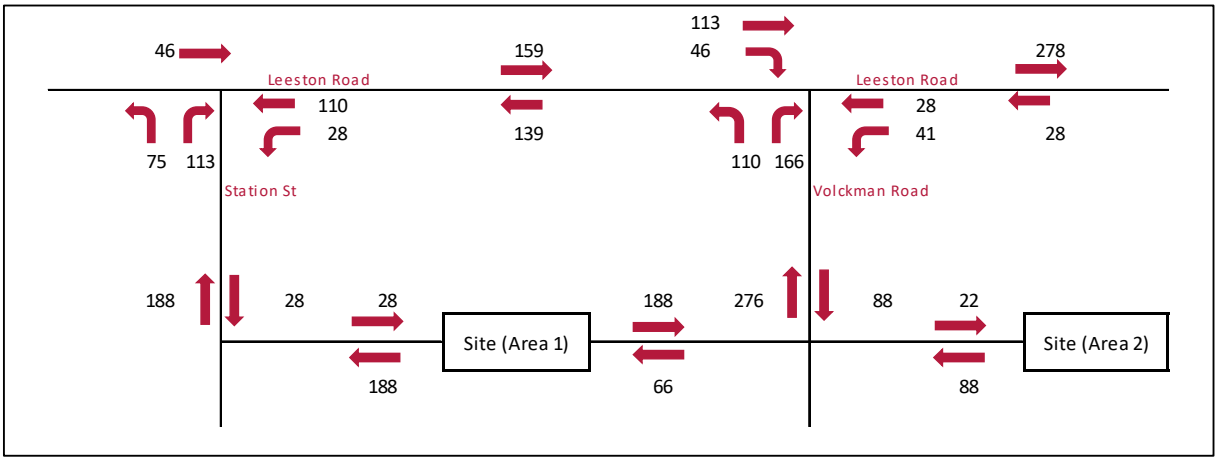

Figure 4.1 Estimated evening peak hour trip distribution

The overall evening peak hour turning movements at both Leeston/Station and Leeston /Volckman intersections are expected to be in addition to the existing turning movements shown in **Figure 3.8** and the anticipated evening peak hour trip generation in **Figure 4.1.** The total evening peak hour turning movements with the site fully developed are shown in **Figure 4.2**.

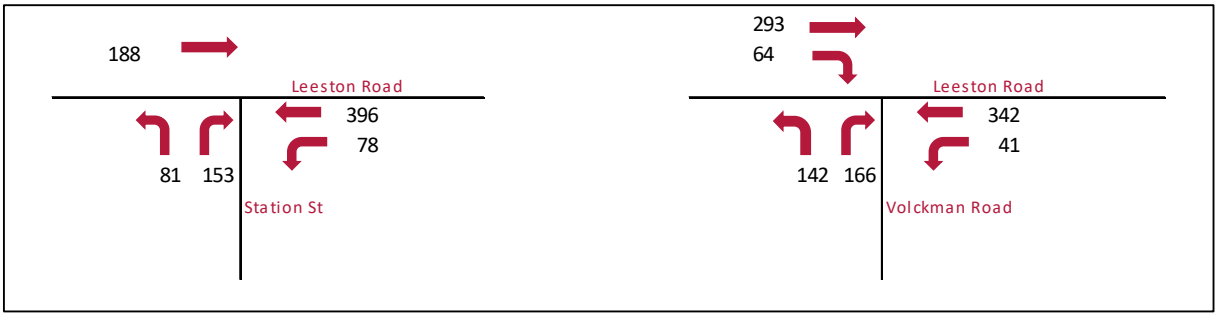

Figure 4.2 Evening peak hour intersection turning movements with development

5. Appraisal of transportation effects

5.1 Intersection performance

The results of the SIDRA analysis for both Leeston/Volckman and Leeston/Station intersections with the additional 580vph development traffic are shown in **Table 5.1** and **Table 5.2** respectively. A total of 10% of traffic turning into and out of Station Street and Volckman Road has been assumed to be heavy vehicles with the remaining 90% being light vehicles.

Table 5.1 Leeston/Volckman intersection performance post-development - evening peak hour

Movement	Degree of saturation (DOS)	Average delay (s)	Level of service	95% back of queue (veh)	95 % back of queue (m)
South approach: Volckman Road					
Left	0.669	15.5	C	4.9	37.3
Right	0.669	24.4	C	4.9	37.3
East approach: Leeston Road					
Left	0.213	5.7	A	0.0	0.0
Through	0.213	0.0	A	0.0	0.0
West approach: Leeston Road					
Through	0.164	0.0	A	0.0	0.0
Right	0.060	7.2	A	0.3	1.9
Intersection	**0.669**	**6.6**	**NA**	**4.9**	**37.3**

Table 5.2 Leeston/Station intersection performance post-development - evening peak hour

Movement	Degree of saturation (DOS)	Average delay (s)	Level of service	95% back of queue (veh)	95 % back of queue (m)
South approach: Station Street					
Left	0.511	10.8	B	2.8	21.4
Right	0.511	16.8	C	2.8	21.4
East approach: Leeston Road					
Left	0.261	5.7	A	0.0	0.0
Through	0.261	0.0	A	0.0	0.0
West approach: Leeston Road					
Through	0.102	0.0	A	0.0	0.0
Intersection	**0.511**	**4.4**	**NA**	**2.8**	**21.4**

Table 5.1 and **Table 5.2** show that all movements at both Leeston/Volckman and Leeston/Station intersection operate at LOS C or better during the evening peak hour. This indicates that both intersections would operate with sufficient capacity.

Sensitivity test

It is possible that a greater amount of activity could occur on-site than that estimated in **Table 4.2**. As a sensitivity test, the total evening peak hour traffic generated by the site has been increased from 580vph to 700vph with the additional 120vph assumed to be generated by Area 1. An increase of 120vph is more than double the adopted peak hour traffic generation for the bulk goods activity in **Table 4.2** and bulk goods retail activity has a higher trip generation than most of the industrial activities. Therefore, it is considered that the sensitivity test covers the scenario where a greater amount of activity occurs than originally anticipated. Applying the same trip distribution assumptions in Section 4.3, the evening peak hour trip distribution of the development through the Leeston/Station intersection and the Leeston /Volckman intersection is shown in **Figure 5.1**.

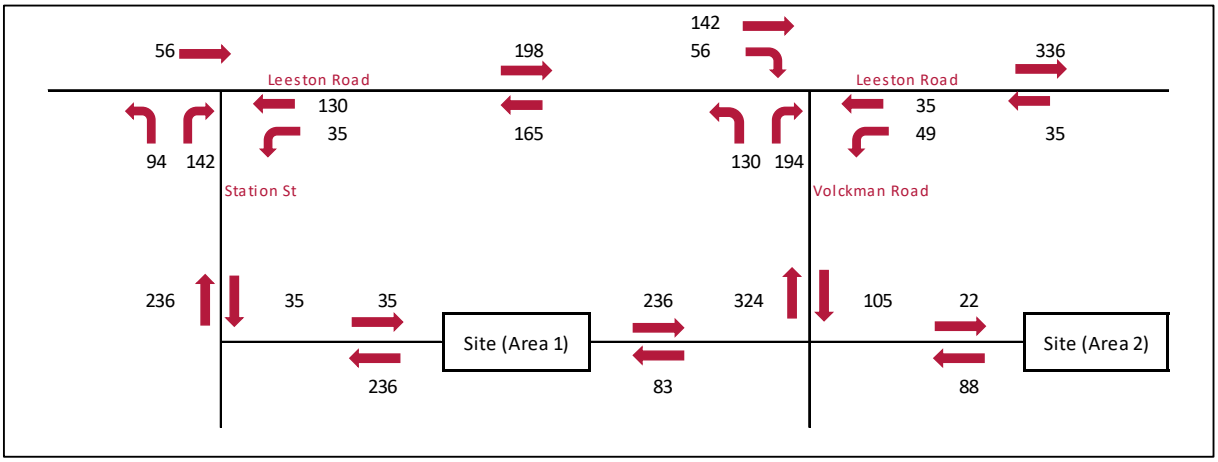

Figure 5.1 Estimated evening peak hour trip distribution - sensitivity test

The overall evening peak hour turning movements at both Leeston/Station and Leeston /Volckman intersections are expected to be addition of the existing turning movements shown in **Figure 3.8** and the anticipated evening peak hour trip generation **Figure 5.1** as shown in **Figure 5.2**.

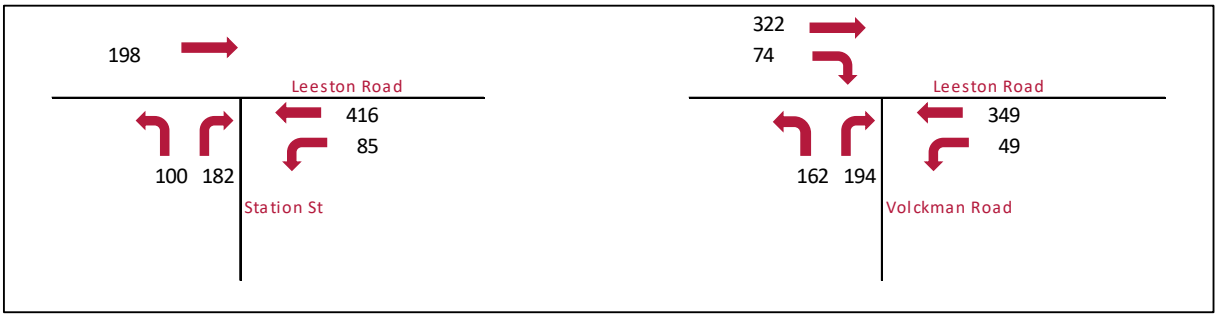

Figure 5.2 Evening peak hour intersection turning movements with development - sensitivity test

The results of the SIDRA analysis for both Leeston/Volckman and Leeston/Station intersections with the 700vph development traffic are shown **Table 5.3** and **Table 5.4**.

Table 5.3 Leeston/Volckman intersection performance post-development - evening peak hour - sensitivity test

Movement	Degree of saturation (DOS)	Average delay (s)	Level of service	95% back of queue (veh)	95 % back of queue (m)
South approach: Volckman Road					
Left	0.831	22.9	C	8.8	66.8
Right	0.831	34.1	D	8.8	66.8
East approach: Leeston Road					
Left	0.221	5.7	A	0.0	0.0
Through	0.221	0.0	A	0.0	0.0
West approach: Leeston Road					
Through	0.180	0.0	A	0.0	0.0
Right	0.071	7.3	A	0.3	2.3
Intersection	**0.831**	**9.7**	**NA**	**8.8**	**66.8**

Table 5.4 Leeston/Station intersection performance post-development - evening peak hour - sensitivity test

Movement	Degree of saturation (DOS)	Average delay (s)	Level of service	95% back of queue (veh)	95 % back of queue (m)
South approach: Station Street					
Left	0.647	13.2	B	4.3	32.7
Right	0.647	20.4	C	4.3	32.7
East approach: Leeston Road					
Left	0.276	5.7	A	0.0	0.0
Through	0.276	0.0	A	0.0	0.0
West approach: Leeston Road					
Through	0.108	0.0	A	0.0	0.0
Intersection	**0.647**	**5.6**	**NA**	**4.3**	**32.7**

Table 5.3 and **Table 5.4** show that all movements at the Leeston/Volckman intersection operate at LOS D or better while the all movements at the Leeston/Station intersection operate at LOS C or better. These indicate that both intersections are still expected to operate satisfactorily with the higher traffic generated by the site although the Volckman Road approach is nearing saturation.

5.2 Intersection safety

The proposed Plan Change will increase the number of vehicles at both Leeston/Station and Leeston/Volckman intersections. The existing Leeston/Station intersection was designed to accommodate heavy vehicles as the intersection is part of the heavy vehicle bypass route for Leeston. As shown in Section 3.8, the existing Leeston/Station intersection has a low risk value for both Collective Risk and Personal Risk. Therefore, it is expected that the existing Leeston/Station intersection can safely accommodate the increase in vehicles at the intersection.

Due to the proximity of both Leeston/Station and Leeston/Volckman intersections, a southbound driver on Leeston Road heading to Station Street is likely to start indicating left at or before the Leeston/Volckman intersection. A driver waiting to exit Volckman Road at the Leeston/Volckman intersection may misinterpret the intention of the driver on Leeston Road indicating to turn left as an indication to turn left into Volckman Road and pull out onto Leeston Road. Therefore, it is

proposed that a left turn lane is included on Leeston Road at the Leeston/Volckman intersection for traffic turning from Leeston Road onto Volckman Road. With the expected increase in heavy vehicles accessing the site via Leeston/Volckman intersection, it is recommended that the intersection is modified to ensure the swept path of the largest expected vehicle can be accommodated at the intersection. Widening of the intersection may be required to accommodate the largest expected heavy vehicle turning left in from Leeston Road to prevent the vehicle from crossing the opposing traffic lane. The indicative proposed changes at the Leeston/Volckman intersection are shown in **Figure 5.3**.

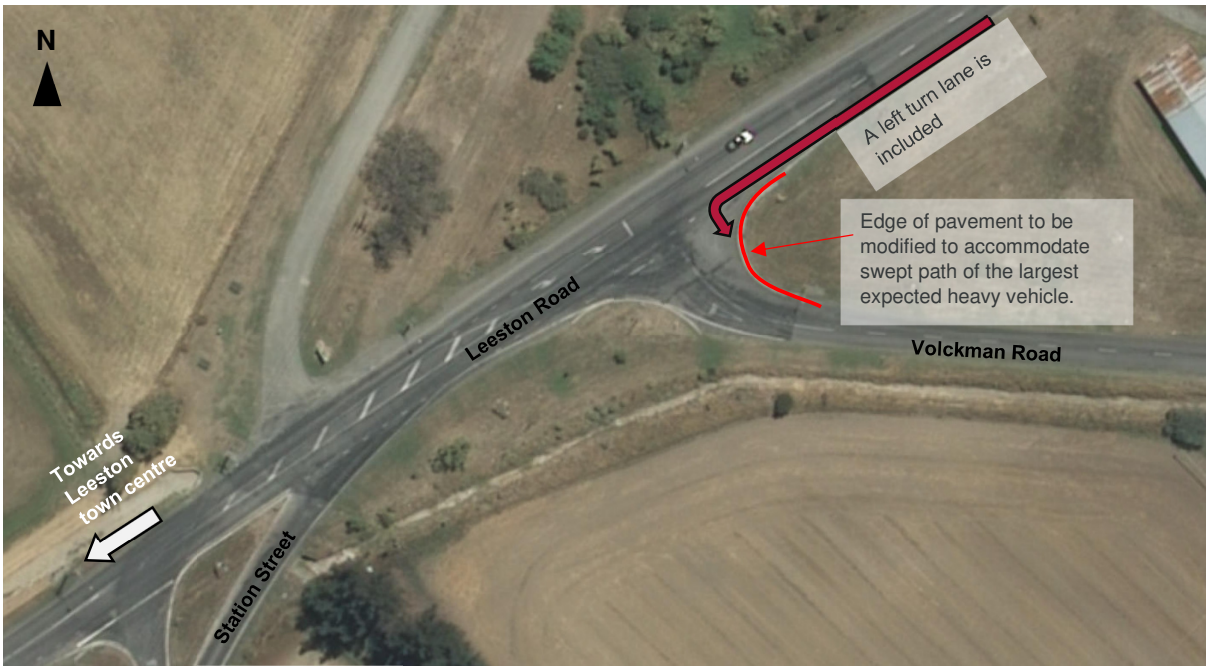

Figure 5.3 Indicative proposed changes at the Leeston/Volckman intersections

It is recommended that the speed environment at both Leeston/Station and Leeston/Volckman intersections are revised based on the NZ Transport Agency Speed Management Guide to ensure that safe and appropriate speeds are applied for the anticipated road function and use.

5.3 Parking

Adopting the same development scenario in Section 4.1, the various industrial activities would all be classified as 'Industrial Activity' for the purpose of calculating the Selwyn District Plan parking requirements. As a guide, each parking space requires approximately 25m^2 of land to physically accommodate the parking space and the manoeuvring areas. The statutory parking requirement is shown in **Table 5.5**.

Table 5.5 Statutory parking requirement

Activity	Minimum parking requirement	Site area (m^2)	GFA (m^2)	Minimum parking spaces	Parking area (m^2)
Industrial	1.5 spaces per 100m^2 GFA	93,600	46,183	693	17,325
Service stations	1 space beside each booth or facility except car wash facilities which shall be provided with 5 stacked parking spaces per facility.	1,400	70	4 (assuming 4 fuel pumps)	100
Slow trade and bulk goods retail	2.5 spaces per 100m^2 GFA and/or outdoor display area	4,500	2700	68	1,700
Food and beverage	4.5 spaces per 100m^2 PFA for the first 150m^2 then 19 spaces per 100m^2 PFA thereafter.	500	375	6 (assuming 1/3 of GFA is PFA)	150
		100,000	49,328	771	19,275

Table 5.5 shows that if developed under the assumed development scenario the whole plan change area would be required to provide a total of 771 parking space requiring approximately 19% of the overall plan change area. The industrial activities are required to provide approximately 693 parking spaces equating to 18.5% of the industrial site area. The parking requirement for bulk goods retail and food and beverage activity is higher requiring between 30% to 38% of these retail site areas.

It is important that permitted building coverage within the plan change area will not restrict on-site parking provision from achieving compliance with the District Plan requirements in order to reduce potential adverse effects on traffic flow and to avoid reliance on on-street parking.

Loading space requirements will be an addition to the parking requirement in **Table 5.5** and should be provided on-site in accordance with the District Plan requirements.

6. Recommendations and considerations

6.1 Site access

It is recommended that a spine road is provided in Area 1 of the site in **Figure 2.4,** connecting Station Street to Volckman Road, as right turn in from Leeston Road at the Leeston/Station intersection is not permitted. Vehicles approaching the site (Station Street side) from Leeston Township will be required to make a right turn in advance at the High St/Cunningham intersection. The inclusion of the spine road will provide an alternative option for vehicles to access the site (Station Street side) via the Leeston/Volckman intersection as it would be undesirable for traffic to U-turn on Leeston Road if the High St/Cunningham intersection was missed.

Direct access to Leeston Road between the Leeston/Station intersection and Leeston/Volckman intersection should be avoided due to the proximity of the two intersections.

Any new roads, vehicle accessways and vehicle crossings need to be designed and formed in accordance with the Business Zone Rules in the District Plan. These include

- Road standards; and
- Vehicle accessway and crossing standards.

The spacing between road intersections should comply with the District Plan requirement shown in **Figure 6.1**

Posted (Legal) Speed Limit (km/hr)	Road types	Distance (m)
100	All	800
90	All	248
80	All	214
70	All	181
60	All	151
50	State Highways, Arterials, Collector and Local Business Roads	123
50 (or less)	Local roads only	75

Figure 6.1 Minimum distance between intersections (extracted from Table E13.9 of Selwyn District Plan)

The existing 60km/hr speed limit on Station Street (within the site frontage) requires any new roads provided to the site to be at least 151m from both Leeston/Station and Station/Cunningham intersections. The site frontage of approximately 280m means that the proposed spine road on Station Street will only be able to comply with the required minimum distance from either the Leeston/Station intersection or the Station/Cunningham intersection. Therefore, it is recommended that the speed limit on Volckman Road is reduced to 50km/hr, if a spine road is to be provided, to comply with the District Plan minimum spacing of 123m between road intersections.

The existing open speed limit on Volckman Road requires any new roads provided to be at least 800m from the Leeston/Volckman intersection. This is beyond the approximately 355m site frontage on Volckman Road. Therefore, it is recommended that the speed limit on Volckman Road is reduced to 60km/hr or 50km/hr if a spine road is to be provided connecting Station Street and Volckman Road.

An indicative location of the spine road connecting Station Street and Volckman Road is shown in **Figure 6.2** assuming the speed limit on both Station Street and Volckman Road is reduced to 50km/h.

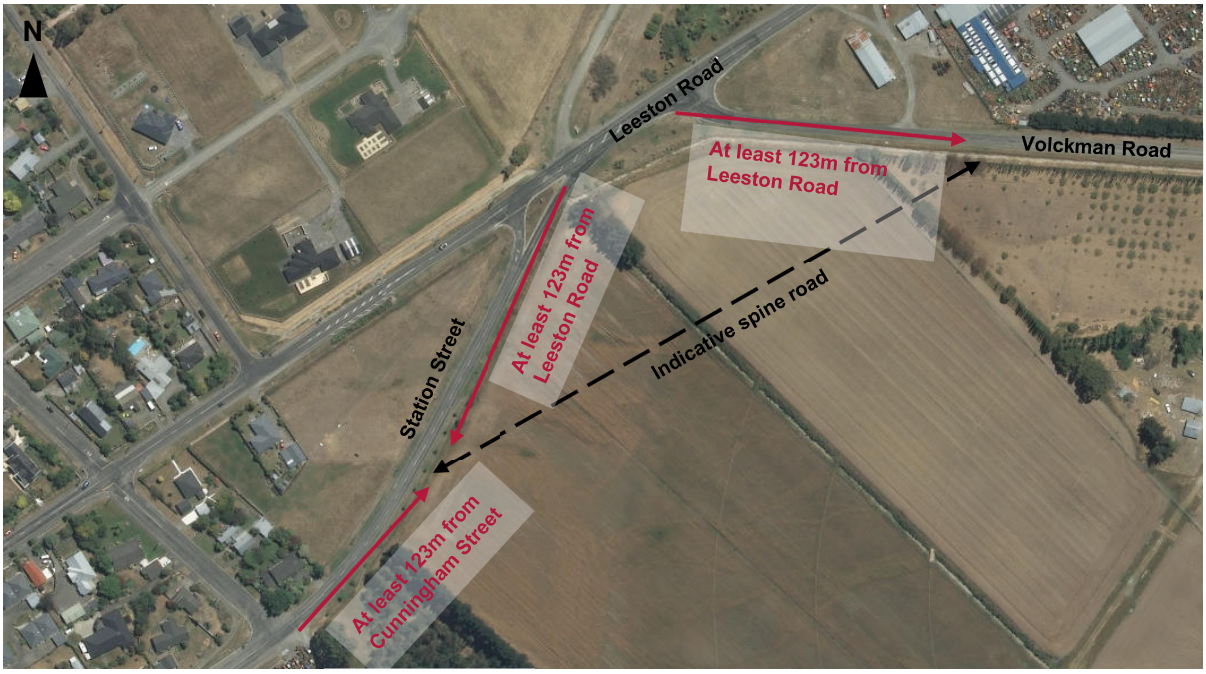

Figure 6.2 Indicative spine road location (assuming a 50km/h speed environment)

The spacing of any new vehicle crossings should comply with the District Plan requirement shown in **Figure 6.3**.

Intersection Road Type Distances in Metres					
Vehicle Crossing Joins to	**Posted speed Km/hr**	**State Highway**	**Arterial**	**Collector**	**Local**
~~**Strategic**~~ **State Highway**	**> 50**	100	100	100	100
	≤ 50	30	30	30	30
Arterial	**> 50**	100	100	100	100
	≤ 50	30	30	30	30
Collector	**> 50**	75	75	60	60
	≤ 50	30	30	30	25
Local	**> 50**	75	75	60	60
	≤ 50	25	25	25	10

Figure 6.3 Minimum distances of any vehicle crossing from intersections (extracted from Table E13.5 of Selwyn District Plan)

Assuming the speed environment remains the same, **Figure 6.3** indicates that the nearest vehicle crossing on Station Street (an arterial road) is required to be at least 100m from the Leeston/Station intersection. Similarly, any new vehicle crossings on Leeston Road (east of Volckman Road) are required to be at least 100m from the Leeston/Volckman intersection. Vehicle crossings on Volckman Road are required to be at least 75m from the Leeston/Volckman intersection. **Figure 6.3** shows that the minimum distance of any vehicle crossing from intersections reduces if the operating speed limit is 50km/hr or under.

6.2 Walking and cycling

Although the site is located at the edge of the Leeston Township, it is recommended that the site provides for walking and cycling connection to the existing residential area to the northwest of the site and to the town centre to encourage and support people to walk and cycle to the site.

There is currently no dedicated walking and cycling facilities within the site frontage on Leeston Road, Station Street and Volckman Road. Cyclists are required to share the traffic lanes with vehicles and pedestrians are required to walk on the grass berm on the sides of the carriageways.

The nearest footpaths are on Cunningham Street and Station Street west of Cunningham Street. Walking facilities should be provided to connect to these existing footpaths to facilitate walking to and from the town centre and the residential areas to the northwest of the site. Pedestrian crossing facilities should be provided at pedestrian crossing desire lines.

The Selwyn District Council 2018 Walking and Cycling Strategy Action Plan includes a Leeston to Doyleston cycleway as one of the inter-township cycleway projects. This is likely to be within the vicinity of the site. Therefore, it is recommended that on-site cycle parking is provided in accordance with the relevant District Plan requirements.

The design of walking and cycling facilities should be in accordance to the District Plan requirements.

6.3 Speed environment

The existing speed environment within the vicinity of the site is shown in **Figure 6.4**.

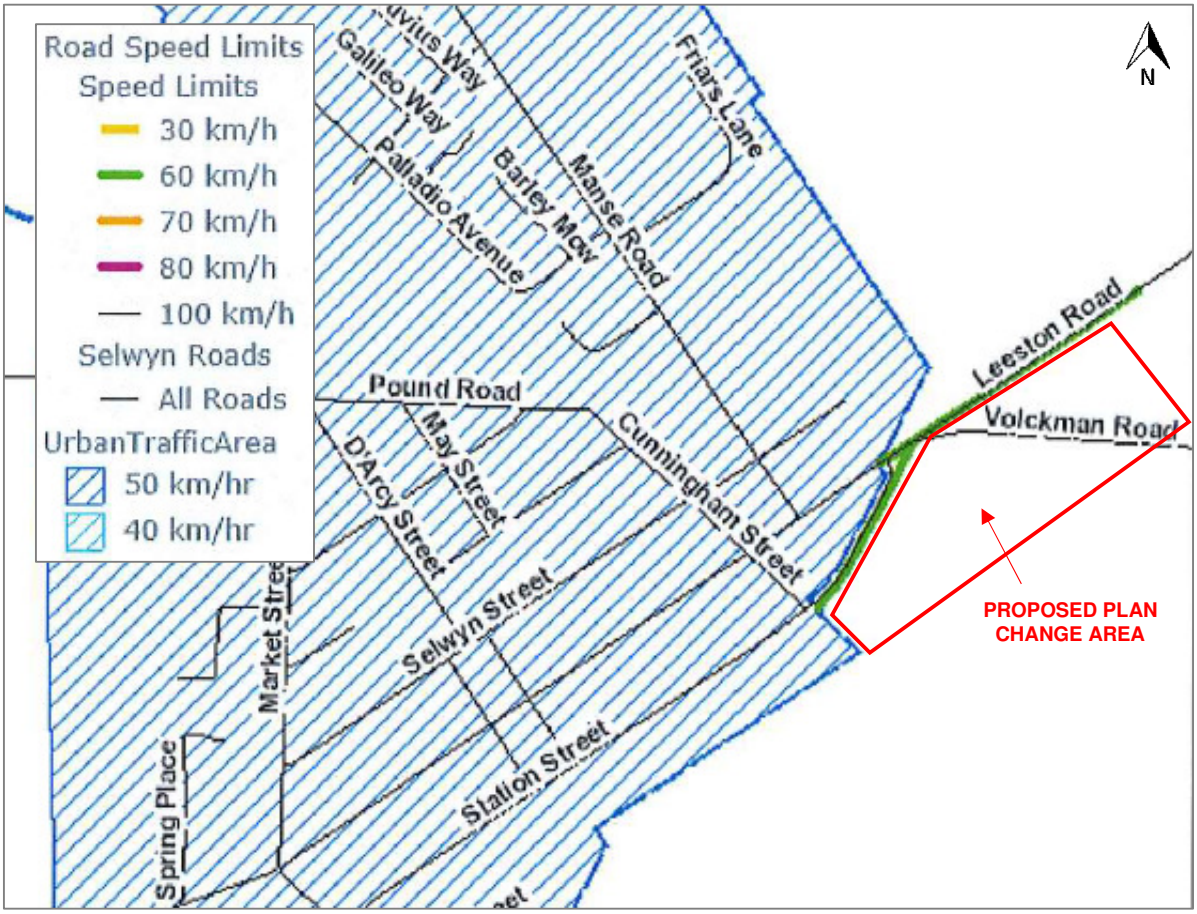

Figure 6.4 Selwyn District Council speed limit register (July 2018)

Figure 6.4 shows that the existing 60km/h speed limit areas on Leeston Road and Station Street function as transition areas between the 100km/h speed limit outside of the township and the 50km/h operating speed within the township urban traffic area.

The existing 100km/h speed limit on Volckman Road is an impediment to safe cycling and walking to the site as well as having implications for the spacing of road intersections. It is recommended that the current 100km/h speed limit on Volckman Road is revised based on the NZ Transport Agency Speed Management Guide. It is also recommended that the Leeston Township boundary is extended to include the Plan Change area which aligns with the lowering of the speed limit on Volckman Road. This may include changing the speed limit along the site frontages to 50km/h urban traffic area and shifting the 60km/h transition speed limit on Leeston Road further northeast of the site. Physical interventions may be required to reinforce the speed limit changes to drivers (for example threshold treatments or other measures).

7. Conclusions

Selwyn District Council is proposing a plan change to extend the Business 2 (Industrial) Zone to the east of Leeston Township. The area being considered for the Business 2 (Industrial) Zone is up to 100,000m^2. A concept of the plan change site is not available at this stage and therefore a development scenario in **Table 4.1** has been adopted for this transport assessment. A number of key transportation outcomes and recommendations include:

- The adopted development scenario is likely to generate a statutory parking requirement in the order of 771 spaces requiring approximately 19% of the plan change area. It is important that permitted building coverage within the plan change area will not restrict on-site parking provision from achieving compliance with the District Plan requirements in order to reduce potential adverse effects on traffic flow and to avoid reliance on on-street parking.
- Both Leeston/Station and Leeston/Volckman intersections have sufficient capacity to accommodate the forecast trip generation of the Plan Change area. However, it is recommended that a left turn lane is included at the Leeston/Volckman intersection and the intersection layout is reviewed to ensure the swept path of the largest expected heavy vehicle can be accommodated at the intersection.
- Direct access to Leeston Road between the Leeston/Station intersection and Leeston/Volckman intersection should be avoided due to the proximity of the two intersections
- Any new roads, vehicle accessways and vehicle crossings need to be designed and formed in accordance with the Business Zone Rules in the District Plan.
- A spine road connecting Station Street and Volckman Road is recommended. However, compliance with the District Plan minimum separation distance between intersections is not achievable unless the speed limits on Station Street and Volckman Road are reduced to 50km/h. The spine road is required to be at least 123m from Leeston Road (assuming a 50km/h speed environment).
- Car parking, loading areas and cycle parking should be provided on-site in accordance to the District Plan requirements.
- Walking connections should be provided between the plan change area and the existing footpath on Cunningham Street and Station Street (west of Cunningham Street) to encourage walking to and from the site. A footpath should be provided on any new roads within the site so people walking to the site do not need to mix with vehicles entering and exiting the site.
- Cycle parking is provided within the site to facilitate cycling to and from the site.
- Speed limits on the site frontages is revised or lowered based on the NZ Transport Agency Speed Management Guide. In particular, the 100km/h speed limit on Volckman Road is an impediment to safe cycling and walking to the site and should be reduced to 50 or 60km/hr.
- The Leeston Township boundary is extended to include the Plan Change area which aligns with the lowering of speed limit on the site frontages.

Overall, the proposed plan change area is not expected to generate adverse effects on the receiving transport environment that would be considered unacceptable provided the proposal incorporates the recommendations described above.

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