APPENDIX 2: Integrated Transport Assessment (Bloxam Burnett and Olliver)

Te Kowhai Airfield
Rezoning Plan

Integrated Transport Assessment

March 2018

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1.0 Executive Summary

The Te Kowhai Airfield Ltd (the Applicant) is seeking to rezone land around the existing Te Kowhai Airfield which is located at 98 Limmer Road, Te Kowhai. The proposal is for an airpark including:

- an airfield;
- 45 apartments with adjacent hangers and apron access;
- 87 residential lots ranging from 600 m^2 - 2,500 m^2 in size;
- a commercial precinct with up to 300 m^2 of retail and a café of up to 225 m^2;
- a 24-room motel; and
- a community facility of up to 300 m^2.

A Concept Masterplan is shown on Figure 2 which divides the site into four precincts:

- Precinct A: Runway and Operations;
- Precinct B: Commercial and hangers,
- Precinct C: Medium Density Residential, and
- Precinct D: General Residential.

Limmer Road is designated as State Highway 39 (SH39) and the subject site has an existing access off Limmer Road. Limmer Road became SH39 in 2013 after the opening of the Ngaruawahia section of the Waikato Expressway, and was upgraded at this time with shoulder widening and intersection improvements. Limmer Road intersects with Horotiu Road approximately 800 m to the west of the existing airfield access, and with Hawksgrip Road approximately 550 m to the east.

Based on the CAS crash record there does not appear to be any underlying safety concerns with Limmer Road.

The existing airfield has a trip generation of approximately 30 vehicle movements per day (vpd). It is assumed that the proposed apartments and residential lots will generate trips at a rate that is typical for this land use. However, due to the nature of the airfield activity, it is likely that the apartments will generally not be fully occupied during the week, except on occasions when major events are on in Hamilton such as the annual Fieldays or All Black test matches.

Two scenarios have been tested for occupancy rates of the apartments. It is predicted that a worst-case scenario would see 70% of apartments occupied during the week, with the expected (normal) scenario which would see 50% of apartments occupied. Based on the worst-case apartment scenario, the trip generation of the residential lots and airfield, the Te Kowhai Airpark could be expected to generate approximately 1,798 trips per weekday, and 291 trips per weekday AM and PM peak hour.

SIDRA modelling of the proposed new Access Road and Limmer Road intersection shows that it performs well up to year 2042, even using the 70% apartment occupancy rate and 2% growth rate based on actual surveyed Limmer Road traffic counts. The Level of Service (LoS) for the worst vehicle movement (right turn out of the airpark access) operates at LoS C. All movements on SH39 continue to operate at LoS A. Similarly, the Horotiu Road and Te Kowhai Road intersections continue to operate at a high LoS, with no movement operating at less than LoS C.

The proposed access off Limmer Road complies with sight distances in the NZ Transport Agency's Planning and Policy Manual (the Planning Manual), however it does not comply with the minimum separation distance to adjacent accesses.

The existing vehicle crossing has not been designed to accommodate large traffic volumes. The access will be upgraded to an intersection to accommodate traffic from the proposed airpark. An intersection concept design is included in Appendix B.

This report considers that the proposed airpark will have negligible safety and efficiency effects on the state highway provided the following traffic recommendations are adopted:

- The existing access is to be upgraded to an intersection with Limmer Road / SH39.
- The intersection should be designed in accordance with the preliminary concept drawing provided in Appendix B.
- The new access road typical cross section and the number of car parking spaces should be determined in the detailed design, and these should comply with Appendix A: Traffic, of the Waikato District Plan.

2.0 Introduction

2.1 Report Purpose

This report is an Integrated Transport Assessment in accordance with Appendix 5C of the NZ Transport Agency's Planning Policy Manual. This report will assess the traffic effects of the proposed Te Kowhai Airfield Rezoning Plan.

2.2 Proposal Overview

The Applicant is seeking to rezone land around the existing Te Kowhai Airfield which is located at 98 Limmer Road, Te Kowhai. The proposal is for an airpark which consists of four precincts:

- a runway and operations precinct (A)
- a commercial precinct (B)
- a medium density residential precinct €
- a general residential and motel precinct (D)

The proposal consists of:

- an airfield;
- 45 apartments with adjacent hangers and apron access;
- 87 residential lots ranging from 600 m^2 – 2,500 m^2 in size;
- a commercial precinct with up to 300 m^2 of retail and a café of up to 225 m^2;
- a community facility of up to 300 m^2; and
- a motel with 24 units.

The site location is shown in Figure 1, with an indicative site layout shown in Figure 2 (also included as Appendix A).

3.0 Strategies and Policy

3.1 TRANSPORT STRATEGIES

The New Zealand Transport Strategy 2008

The New Zealand Transport Strategy 2008 (NZTS) replaces the previous strategy published in 2002. It sets out the government's vision for transport and guides policy decision on transport matters. Whereas the 2002 Strategy covered the period until 2010, the current NZTS covers a longer period until 2040. This reflects the fact that many transport investments have long-term implications, and achieving change takes time.

The government's vision for transport is as follows:

"People and Freight in New Zealand have access to an affordable, integrated, safe, responsive and sustainable transport system"

The government's objectives to see the vision realised are:

- *Assisting economic development*
- *Assisting safety and personal security*
- *Improving access and mobility*
- *Protecting and promoting public health*
- *Ensuring environmental sustainability*

Access Hamilton

Access Hamilton guides Hamilton City's development, transport infrastructure, and planning over the next 30 years. It aims to support Hamilton's economic and social environment, support sustainable development and land use, manage incremental change in transport, and position infrastructure and land development to meet the City's long-term needs.

While the location of the proposed airpark is not well suited to multi-modal transport, the very nature of the activity itself will reduce vehicle trips on the network. The Te Kowhai Airpark will allow apartment owners to fly to and from the site without needing to make any vehicle trips. Prior to the construction of the apartments, anyone wanting to fly to or from the site would have to make a minimum of two vehicle trips.

Promoting the use of easy air travel with accommodation on site also has the potential to reduce the need for some long-distance vehicle trips as plane owners from further afield can elect to fly and stay on site when visiting Hamilton, rather than driving long distances.

Future Proof Hearing

The Applicant has recently provided a submission to the Future Proof Hearings recently held. This submission proposed that the airpark site be included within the Te Kowhai urban limit boundary. The submission was coordinated with, and supported by, the Waikato District Council (the Council).

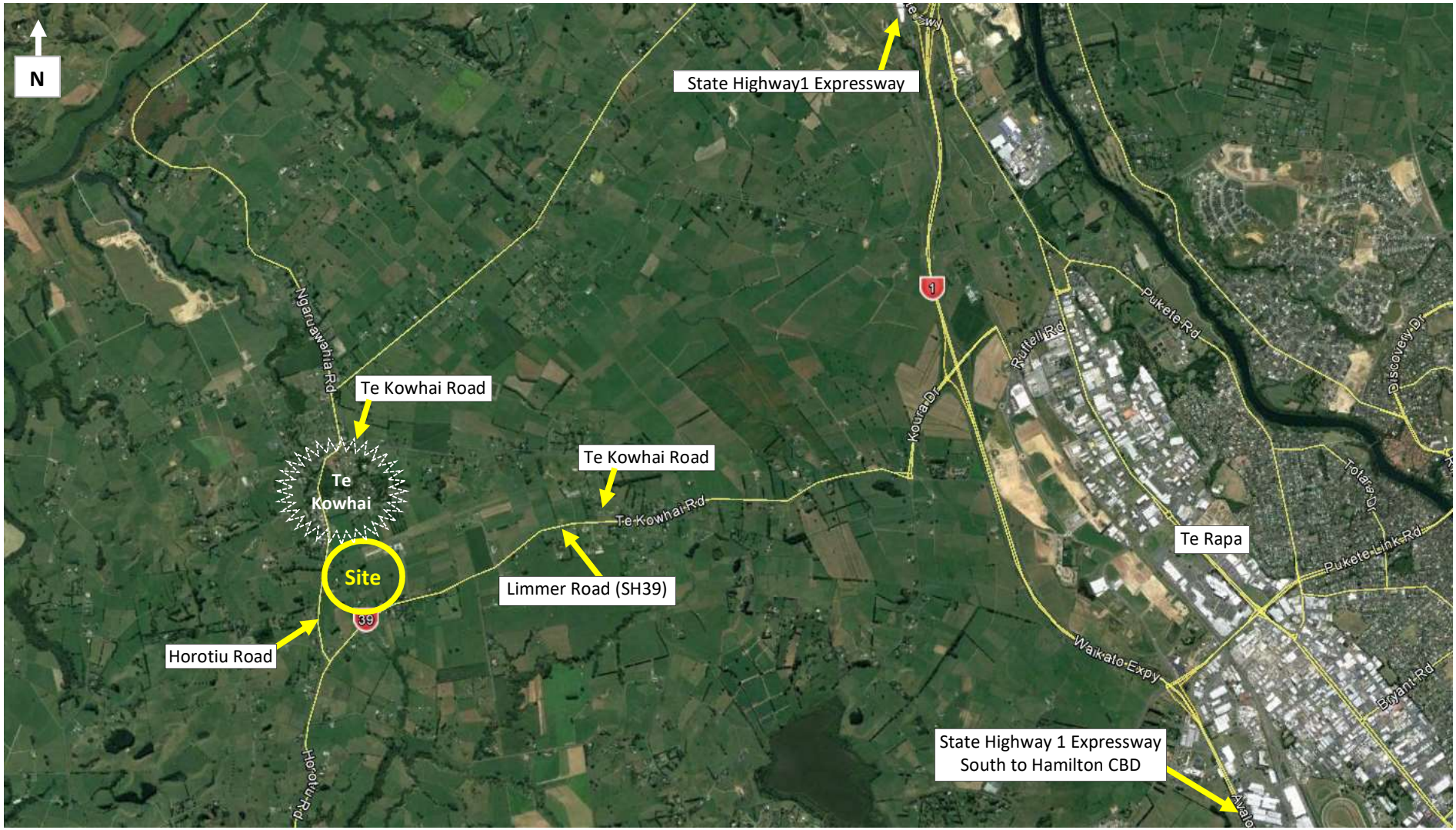


Figure 1: Site Location

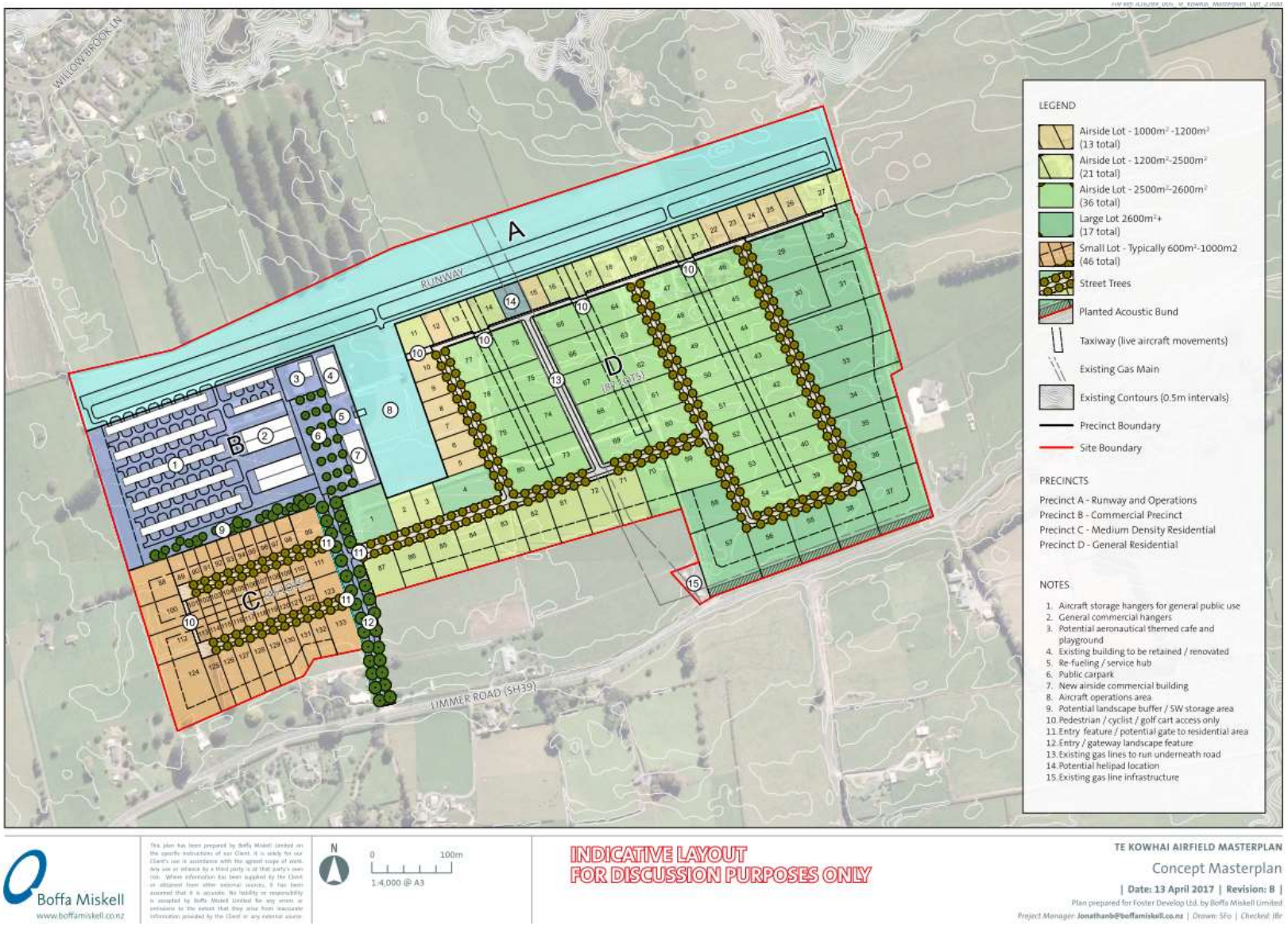


Figure 2: Indicative layout

4.0 Baseline Conditions

4.1 EXISTING LAND USE

The site is located between 98 and 202 Limmer Road in Te Kowhai north of Hamilton. The site has an existing use as an airfield surrounded by rural land use. The subject site is zoned rural.

4.2 EXISTING ROAD NETWORK

Limmer Road/SH39 is a two-way two-lane road with 3.5 m lane widths and 1.5 m sealed shoulders in the vicinity of the subject site. Limmer Road is classified as a Regional Arterial, and has an AADT of 4,350 vpd with 19% heavy commercial vehicles (HCV) according to the NZ Transport Agency's 2016 traffic counts. The NZ Transport Agency's traffic counts indicate that the peak hour for traffic on Limmer Road is between 7-8 am (326 vehicles per hour) and 5-6 pm (395 vehicles per hour).

Horotiu Road is a two-way two-lane road with 3.5 m lane widths and generally no shoulders in the area around the application site. Horotiu Road is classified as an Arterial Road and has an AADT of 1,170 vpd with 9% HCV according to the Council's traffic counts in 2017.

Hawksgrip Road is a two-way two-lane road with a sealed pavement width of 5 m. Hawksgrip Road is classified as a local road and has an AADT of 100 vpd according to the Council's traffic counts.

Prior to the opening of the Ngaruawahia Section of the Waikato Expressway, Limmer Road did not form part of SH39. SH39 began in Ngaruawahia and continued down Horotiu Road. However, with the extension of the Waikato Expressway, Horotiu Road was no longer needed as part of state highway network. As a result, the control at the intersection of Limmer Road and Horotiu Road was changed to give traffic on Limmer Road priority over traffic on Horotiu Road. Limmer Road was also upgraded to improve its safety and to reflect its classification as a state highway. This included an upgrade of the Horotiu Road/Limmer Road intersection, which is shown in Figure 3, and the Limmer Road/Hawksgrip Road intersection which is shown in Figure 4.

4.3 EXISTING SPEED ENVIRONMENT

Limmer Road had a posted speed limit of 80 km/h. The operating speed was measured on site to be 93 km/h for traffic from the west and 86 km/h for traffic from the east (site survey results are included in Appendix D).

4.4 EXISTING PEDESTRIAN AND CYCLIST FACILITIES

The subject site is located in a rural area with no existing pedestrian or cyclist facilities.

4.5 TRANSPORT MODES

There are no bus stops on Limmer Road near the subject site, and there are no regular bus services to or from the application site. This is due to the rural nature of this area and the close proximity of State Highway 1 and Great South Road which carry intercity buses.

Figure 3: Horotiu Road/Limmer Road Intersection

Figure 4: Hawksgrip Road/Limmer Road Intersection

It is desirable that connection be provided from the Airpark to the Te Kowhai township to allow pedestrian and cyclist access to the township. The Airpark concept plan includes a walkway from the northwest corner of the Airpark to Te Kowhai, and the Applicant is in discussion with the adjacent landowner to obtain support for this connection.

It is noted that the Applicant only has frontage onto Limmer Road and no frontage onto Horotiu Road, therefore this connection is dependent on outside parties. Regardless of the outcome of this consultation, the Applicant intends to provide a walking and cycling connection from the site to the boundary of 721 Horotiu Road (the southern end of Te Kowhai, where gated permanent advance warning sign for "50 km/h speed posted speed limit ahead" are located) to allow the possibility of a future connection in this area.

4.6 CRASH HISTORY

The New Zealand Transport Agency Crash Analysis System (CAS) has six reported crashes on Limmer Road around the subject site, including the Horotiu Road intersection, in the past five years between 2012 and 2017.

Four of these crashes occurred at the Limmer Road/Horotiu Road intersection. Three of these crashes occurring in the last year, and all crashes occurring since the intersection was reconstructed and reprioritised in 2013 when the Ngaruawahia Section of the Waikato Expressway opened. This intersection reconstruction included the provision of turn lanes and straightening to ease the tight curve. The crashes were all non-injury crashes, with three crashes involving turning movements, for which failure to give way was a cause in two crashes, and one crash was a loss of control. The recent crash record suggests that there may be a safety issue with this intersection with some Horotiu Road motorists not recognising that they must give way.

The remaining two crashes were loss of control crashes on Limmer Road, both of which were non-injury crashes that occurred in dark conditions, and one suspected of involving alcohol. In term of crash locations, one crash occurred approximately 172 m east of the subject site access, and the other occurred 248 m to the west of the subject site access. Based on the types and frequency of crashes, there does not appear to be any underlying safety issues with Limmer Road.

5.0 Existing Access

5.1 ACCESS LOCATION

Vehicle access to the site is currently provided via the one single entranceway off Limmer Road, located between Hawksgrip Road and Horotiu Road at the site's only road frontage as shown in Figure 5.

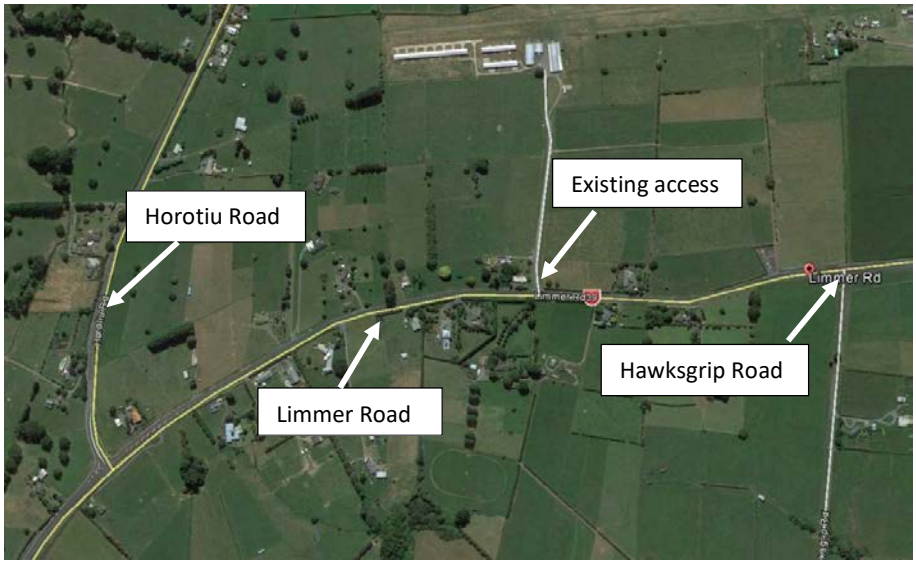


Figure 5: Existing Access Location

Figure 6: Existing Access

5.2 SIGHT DISTANCE

The sight distances from the access are given in Table 1 and are shown in Figures 7 and 8. The minimum sight distance at the existing access is 195 m to the west from the opposite side of the road. Slightly greater sight distances are achieved from a location 10 m to the east of the existing access (the proposed access location). The Planning Manual requires a sight distance of 214 m in a 93 km/h speed environment. The existing access location does not meet this requirement, however positioning the proposed new access approximately 10 m to the east of the existing access, will overcome this issue.

The achievable sight distances for both the existing access and the proposed new access are summarised in Table 1.

Table 1: Sight Distances

Location	Direction	Side of Road	Sight Distance	Operating Speed	Required Sight Distance
Existing Access	To the west	Access	220 m	93 km/h	214 m
		Opposite	**195 m**		
	To the East	Access	290 m	86 km/h	190 m
		Opposite	310 m		
Proposed New Access	To the west	Access	235 m	93 km/h	214 m
		Right turn bay	215 m		
	To the East	Access	270 m	86 km/h	190 m
		Right turn bay	300 m		

Figure 7: Sight Distance Looking West

Figure 8: Sight Distance Looking East

5.3 FORMATION AND SEPARATION

The existing access is sealed for the first 55 m only, and it has not been constructed to accommodate the volumes of traffic expected from the proposed airpark. The existing width

and wide shoulders on both sides of the road mean that this access currently exceeds the NZ Transport Agency's Planning Policy Manual Appendix 5B Diagram C dimensions required for sites with 1-30 vehicle movements a day, and less than one HCV per week.

The Planning Manual requirement for separation distances in a 90 km/h operating speed environment is 200 m between accesses and between an access and an intersection. The existing access does not meet the access separation distance requirement as there are seven accesses within 200 m of the site access. They are shown on Figure 9 as:

- access (a) for 171 Limmer Road, located almost directly opposite the Airpark access;
- to the west and on the same side of road, access (b) for 176 Limmer Road is approximately **30** m away;
- to the east on the opposite side of the road, three existing accesses €, (d) and € for 161 Limmer Road, are approximately **15** (farm access)**, 92** (dwelling access) and **130** m (garage) away respectively;
- to the east, access (f) for 158 Limmer Road, is approximately **120** m away; and
- to the west, the double access (g) for 185 and 187 Limmer Road is approximately **126** m away.

The closest intersection (Hawksgrip Road) is more than 500 m east to the existing access.

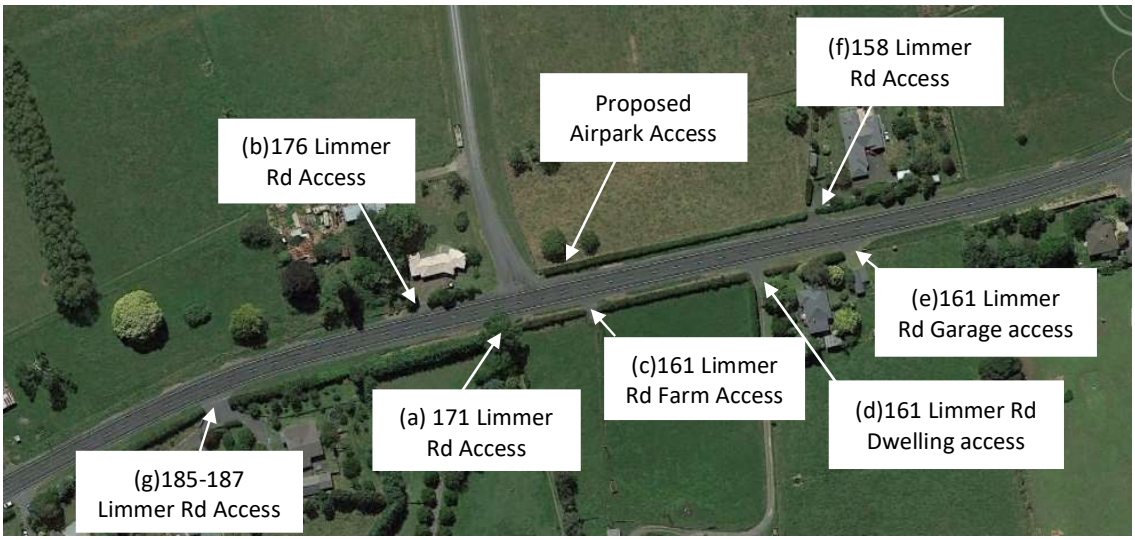


Figure 9: Adjacent Accesses

6.0 Trip Generation

6.1 PERMITTED BASELINE

The existing airfield is currently used for private air trips and flying lessons. Trip generation information provided by the Applicant indicates that the existing site generates, on average, approximately 30 vpd, with a summer average peak of 40 vpd.

6.2 TRIP GENERATION

The proposal for the site includes 45 apartments, a motel with 24 units and 87 residential lots of 2,500 m^2. There will also be a 225 m^2 GFA café, 300 m^2 GFA of retail, a 300 m^2 community facility, and an expansion of the existing airpark operations.

As there are no facilities quite like this in New Zealand, there is no readily available trip generation data from which to base trip generation calculations. However, the concept is similar to the Hampton Downs Racetrack apartments, although these apartments sill require people to drive to them. The Applicant has indicated that they see the 45 apartments and 24 motel units operating largely as weekend/holiday accommodation for flying enthusiasts who fly their planes either to or from the site. There may also be some local flying enthusiasts who choose to live on site, as a result the 87 residential lots would operate more like typical residential lots.

On this basis, the following assumptions have been made to calculate trip generation of the proposal:

- Approximately 50% (70% used for sensitivity testing) of the 45 apartments will be occupied during the week. Occupied apartments will have trip generation rates similar to those of a typical apartment;
- The motel will have a trip generation rate of similar motel unit and will be 100% occupied;
- The 87 country living lots will have trip generation of a typical residential unit and will be 100% occupied;
- The airfield zone will have similar trip generation to the existing airfield with additional trip generation commensurate with the increase in size of the airfield (to be doubled);
- The commercial zone will have a trip generation rate of typical similar activities;
- Approximately 20% of trips to the retail and café are expected to be internal Airpark trips;
- The community facility has been assessed as only generating internal trips as it is intended to service the community living at the airpark, rather than being a destination that could generate external trips; and

It is noted that the expected 50% occupancy rate of the apartments is based on the Applicant's industry experience. The 70% occupancy rate used in sensitivity test is based on typical hotel occupancy rates in Waikato and Hamilton area. This figure is considered conservative as holiday homes tend to have a lower occupancy rate compared to hotels.

Trip generation data has been sourced from the New Zealand Trips and Parking database and has been compared with other standard trip generation databases.

For a residential unit, the predicted trip generation rate is 10.7 vpd per unit, and 1.3 per unit during the peak hour. For an apartment, the predicted trip generation rate is 6.8 vpd per unit and 0.8 per peak hour. However, given the rural location of the site, a residential lot trip generation rate has also been adopted for the apartments.

The typical trip generation rate for a café is 73.3 vpd per 100 m^2 GFA and 18 trips per peak hour per 100 m^2 GFA. The typical trip generation for retail is approximately 100 vpd per 100 m^2 GFA and 15.3 trips per peak hour per 100 m^2 GFA.

The airpark currently generates a peak season average of 43 vpd. The proposed development is expected to double the trip numbers solely associated with the airpark, bring the peak season daily average up to 86 vpd. It is assumed that 40% of these trips (34 trips) will occur in each of the peak hours.

The fully established Airpark is predicted to generate between 279-291 trips in the peak hour, and between 1,629-1,726 vpd. All relevant trip generation data is summarised in Tables 2 and 3.

Table 2: Airpark Peak Hour Trip Generation

Land Use	**Peak Hour Trip Generation Rate**	**Number/ GFA**	**Typical Occupancy/Trips**	**Weekday peak hour trip generation (trips per hour)**
Residential / Country living lots	1.3 per dwelling	87	100%	113
Motel	1.4 per unit	24	100%	34
Residential Apartments	1.3 per dwelling	45	50%/70%	29/41
Café	to 18 per 100 m^2 GFA	225 m^2	80%	32
Retail	15.3 per 100 m^2 GFA	300 m^2	80%	37
Airpark	Twice of the existing	17.2	200%	34
Total				**279/291 vph**

Table 3: Airpark Daily Trip Generation

Land Use	**Peak Hour Trip Generation Rate**	**Number/ GFA**	**Typical Occupancy /Trips**	**Weekday peak hour trip generation** (trips per hour)
Residential / Country living lots	10.7 per dwelling	87	100%	931
Motel	3 per unit	24	100%	72
Residential Apartments	10.7 per dwelling	45	50%/70%	240/337
Café	to 73.3 per 100 m^2 GFA	225 m^2	80%	132
Retail	100 per 100 m^2 GFA	300 m^2	80%	240
Airpark	Twice of the existing	43	200%	86
Total				**1,701/1,798**

7.0 Airpark Access

The existing access is unsuitable for the predicted increase in traffic volume expected from the Airpark development. Instead, it is proposed that a new access road (the Access Road) is constructed to service the Airpark. The cross section of the Access Road should comply with Table 4: Access and Road Performance Standards of Appendix A: Traffic of the Waikato District Plan. Based on the predicted traffic volumes, this Access Road is required to meet the "Local Road" standard.

To achieve suitable sight distances, it is recommended that the proposed Access Road is located approximately 10 m east (centreline to centreline) of the existing access. This will provide the new access with sufficient sight distances and compliance with the NZ Transport Agency Planning Manual. The proposed location and layout is shown in Figure 10 and in Appendix B.

The proposed Access Road intersection will include a right turn pocket within a central flush median constructed in accordance with MOTSAM Part 2 *Figure 3.28: Marking for Flush Medians at 'T' Intersections*. This design has been chosen instead of *Figure 2.35: Right Turn Bays in Rural Areas*, as the flush median design provides increased sight distance and separate waiting area for vehicles turning right into accesses on the opposite side of the road while allowing through traffic to safely pass waiting vehicles.

The flush median layout is based on the Figure 2.35 requirement for a 90 km/h operating speed. It allows a 3.5 m wide right turn flush median and 146 m long tapers. Furthermore, adequate width (greater than 6 m between the edge of seal and far side of the flush median), is provided by shoulder widening at all adjacent accesses for vehicles turning right into these accesses. The main difference between designing this site as a flush median with a right turn pocket instead of a rural right turn bay, is the absence of double yellow lines on the proposed access side of the road. While it is illegal to overtake on a flush median, the presence of double yellow lines, and the advance warning yellow lines, reinforces this fact to motorists.

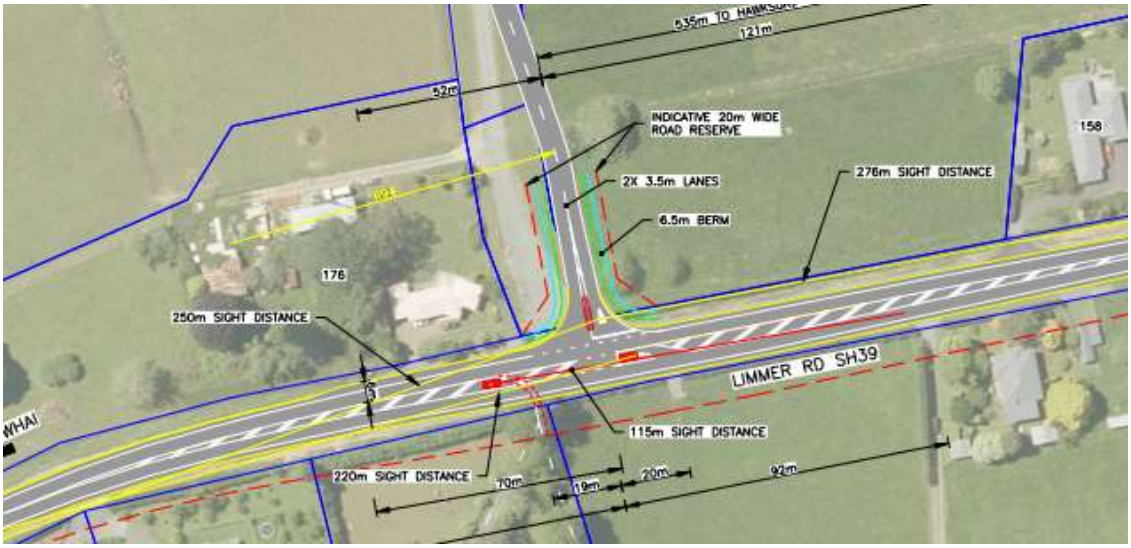


Figure 10: Proposed Access Design

It is considered that the proposed design for the Access Road intersection adequately mitigates the separation distance issues for the following reasons:

- The flush median and shoulder widening will allow through traffic to safely pass any slowing down left turning vehicles into accesses within 100 m of the proposed Access Road intersection. Therefore, the left turning vehicles and through traffic manoeuvre around each other safely.
- The flush median and shoulder widening will also provide improved sight lines and a safe waiting area for right turning vehicles in the vicinity of the Access Road intersection, allowing through traffic to safely pass waiting right turn vehicles.
- Waiting right turn vehicles at the Access Road intersection and the opposite access will restrict each other's sight distances. This issue is mitigated by the flush median, together with the curves in Limmer Road in either direction, which allows waiting traffic to see approaching traffic.
- While the increase in traffic from the Airpark will increase the potential for sight line restrictions from right turning vehicles, this issue is mitigated by the increased pavement width provided in this area, allowing for safer turning movements into all accesses.

For these reasons, the effects of this access are considered to be appropriately mitigated.

A left turn slip lane is not recommended for the Access Road intersection as the majority of traffic is likely to access the site from Hamilton, and traffic volumes approaching from the west are expected to be low. Furthermore, left turn slip lanes have the potential to cause safety issues by obscuring the visibility of through vehicles on the main road to a driver at the stop line of the minor road. The Planning Manual Diagram E left turn shoulder widening is incorporated in the intersection design.

It is recommended that the detailed design of the Airpark access and Access Road to include street lighting in accordance with *AS/NZS 1158 series – Lighting for Roads and Public Spaces.*

On the basis of the above discussion, it is considered that the proposed concept design for the Airpark access will adequately mitigate any adverse traffic or safety effects generated by the proposed development.

8.0 Airpark Access Performance

It is predicted that traffic using the proposed access will predominantly travel between Hamilton City and the Airpark either to and from work during the week; or to access facilities and service available in the City or at the Airpark. The fastest route into Hamilton is to turn left out of the site onto SH39. It is estimated that 20% of traffic may turn right onto SH39 to head to Te Kowhai or south to Whatawhata towards Raglan. This relatively low attraction rate is considered appropriate given that Te Kowhai does not have any significant retail or commercial facilities. It is predicted that 90% of traffic will be exiting the site in the AM peak and entering in the PM peak. These splits have been used to calculate turning volumes of the Airpark traffic.

A SIDRA model of the Airpark access has been created to assess the traffic effects of the proposed Airpark. The modelling considered future growth by applying a 2% annual increase rate of traffic on Limmer Road for up to year 2042. This growth rate was based on traffic volume changes on SH39 south of the Horotiu Road intersection over the last five years. The location south of Horotiu Road has been chosen as the area north of Horotiu Road has only

been a state highway since 2013 and therefore does not have adequate record of traffic volumes history.

The growth rate to be applied for the year 2042 traffic analysis has been further analysed to satisfy NZTA comments on the growth rate. The latest Waikato Regional Transport Model (WRTM) predicted volumes for in 20 years' time on Limmer Road give growth rates of 1.7% in the AM peak period 1.93% in the PM peak period. Therefore the 2% growth rate used in this report is considered to be conservative. It is also noted that while growth at Te Kowhai is expected to add to the traffic volumes on Limmer Road, through traffic volumes on SH39 are expected to decrease in the near future with the opening of the Hamilton section of the Waikato Expressway in 2020, which is expected to attract many of the vehicles that are currently bypassing Hamilton to the west. Considering the WRTM data and the likely effect of the Hamilton section of the Waikato Expressway, the growth figure of 2% is considered to be the appropriate figure to use at this site.

The results of SIDRA modelling are summarised in Table 4 with full results included in Appendix E. Assessments have also included a sensitivity test with a conservative 70% occupancy of the 45 apartments, and conservative 100 % occupancy for 24 units of the motel.

Overall the Airpark access performs well with no movement worse than LoS C, even in the 2042 peak periods with 70% occupancy of the apartments. The LoS on SH39 is not affected with through movements operating at LoS A and turning movements into the Airpark also operating at LoS A, even in the 2042 peak periods.

Table 4: SIDRA Summary Airpark Access Intersection

Peak Period		**LoS** for worst movement	**Average Delay** for the worst movement (seconds)	**Degree of Saturation** for the worst movement
AM	Existing + Airpark	A	9.0	0.280
	2042 + Airpark	B	13.8	0.357
PM	Existing + Airpark	B	12.2	0.301
	2042 + Airpark	C	17.6	0.387

8.1 WIDER NETWORK EFFECTS

To provide for traffic modelling for the wider road network effects, traffic surveys were undertaken at the Horotiu Road and Te Kowhai Road intersections. These intersections were surveyed on two days; Tuesday 11th April and Wednesday 12th April 2017 in both the morning and evening peak periods. The surveyed traffic flows were used to build a SIDRA models of the intersections. As with the SH39/Limmer Road traffic, an annual growth rate of 2% was used to create models for the 2042 peak periods.

The results of SIDRA analysis for Horotiu Road indicates that this intersection currently performs well with the worst movement at LoS B with Airpark traffic. Modelling for future years shows that Horotiu Road intersection operates at LoS C in the year 2042 for the right turn out of Horotiu Road, with a 23.7 second average delay in the PM peak period. This delay is considered acceptable.

Table 5: SIDRA Summary Horotiu Road Intersection

Peak Period		LoS for worst movement	Average Delay for the worst movement (seconds)	Degree of Saturation For the worst movement
AM	Existing + Airpark	A	8.9	0.199
	2042 + Airpark	C	19	0.527
PM	Existing + Airpark	B	10	0.290
	2042 + Airpark	C	23.7	0.715

The results of the SIDRA analysis for Te Kowhai Road intersection indicate that this intersection currently performs well with the worst movement at LoS B with Airpark traffic. Modelling for future years shows that Te Kowhai Road intersection operates at LoS C in the year 2042 for the right turn out of Te Kowhai Road, with a 19.8 second average delay in the PM peak period. This delay is considered acceptable.

Table 6: SIDRA Summary Te Kowhai Road Intersection

Peak Period		LoS For worst movement	Average Delay for the worst movement (seconds)	Degree of Saturation For the worst movement
AM	Existing	A	9.3	0.256
	2042	B	14	0.346
PM	Existing	B	11.1	0.279
	2042	C	19.8	0.406

As both intersections continue to operate at a high-level of service, even with the addition of traffic from the proposed Airpark and a 2% annual growth rate through to 2042, the impacts on the surrounding road network are considered to be no more than minor.

9.0 Parking

The Waikato District Plan Appendix A: *Traffic* has parking requirements in its Table 1. For a dwelling, the requirement is 1 car parking space per bedroom.

As the proposed Te Kowhai Airfield development is only in its concept stage, the number of units and design of individual units have not been finalised. Therefore, it is considered that parking requirements should be met in the detailed design phase and if requirements cannot be met, a separate Resource Consent should be sought.

It is noted that there are currently no parking requirements in the Waikato District Plan for an airfield related activity. Parking for the airfield should be determined in the detailed design phase using relevant industry knowledge and experience once the exact use and size of the proposed airfield is known.

10.0 Travel Demand Management

9.1 TRAVEL DEMAND MANAGEMENT (TDM) OPPORTUNITIES

The NZ Transport Agency recognises that travel demand cannot continue to be met with the unlimited supply of road infrastructure.

Travel Demand Management refers to methods to reduce the need to travel as well as reducing short private vehicle trips. TDM is about providing greater choice of sustainable transportation options to the public, thereby spreading all trips over more travel modes and over more times of the day, or removing the need to travel at all. TDM therefore also helps to reduce the impact on the environment by reducing the level of carbon produced by travel.

While the location of the proposed airpark is not well suited to multi-modal transport, the very nature of the activity itself will reduce vehicle trips on the network. The Te Kowhai Airpark will allow apartment owners to fly to and from the site without needing to make any vehicle trips. Prior to the construction of the apartments, anyone wanting to fly to or from the site would have to make a minimum of two vehicle trips, as well as having to find accommodation elsewhere in the Waikato region and / or Hamilton City. Under the proposal, majority of the needs will be provided for on site, reducing the required private vehicle trips on the road network.

Promoting the use of easy air travel with accommodation on site also has the potential to reduce the need for some long-distance vehicle trips, as plane owners visiting from other airfields can elect to fly and stay on site when visiting Hamilton and nearby areas, rather than driving long distances.

11.0 Signage

The Applicant intends for all signage to be provided on private property. The signage will either meet the Council's requirements or be approved by the Council via resource consent process. Details of the proposed signage will be provided at the detailed design stage of this development.

12.0 Consultation with the NZ Transport Agency

Feedback from the NZ Transport Agency, and comments on points raised are provided in Table 7.

Table 7: NZ Transport Agency Consultation

Date of NZTA reply	NZTA Comment	BBO Reply
8/6/2017	A better understanding of the size and scale of the proposal.	Details provided in Revision 2 of the ITA.
	Connectivity to Te Kowhai, specifically the potential future provision of a	The Airpark concept plan includes a walkway from the northwest corner of the

Date of NZTA reply	NZTA Comment	BBO Reply
	walking and cycling path through to Te Kowhai township.	Airpark to Te Kowhai, and the Applicant is in discussion with the adjacent landowner to obtain support for this connection.
	The addition of Diagram E left turn deceleration shoulder widening to any access concept design.	The proposed design exceeds a Diagram E.
	Confirmation of sight distance at the proposed access.	Sight distances all exceed 215 m at the proposed access, and therefore meet the required 203 m distance.
	Street lighting is to be provided in accordance with *AS/NZS 1158 Series – Lighting for Roads and Public Spaces.*	The street lighting design will be undertaken in the detailed design stage to meet this standard.
	Confirmation of signage at the proposed access.	This information will be provided at the detailed design stage.
	Closure of other site access.	The site has no other accesses to this site.
	NZTA require an independent safety audit to be undertaken at the design and post-construction stages for the intersection with any audit recommendations and design changes agreed with NZTA.	Agreed.
	An understanding of discussions held with the Council.	The Applicant has recently provided a submission to the Future Proof Hearings recently held. This submission proposed that the airpark site be included within the Te Kowhai urban limit boundary. The submission was coordinated with, and supported by, the Waikato District Council
25/1/18	The final design of the intersection is to be approved by the NZTA.	Agreed.
	The safety of all adjacent accesses is to be considered in the design.	All accessways have been considered.
	Recommendation to use a traffic growth figure between 3-10%.	The growth rate has been increased from 1% (used in Revision 1 of this report) to 2% (used in Revision 2 of this report). The selection of this figure is discussed in detail in Section 8 of this report.
	Maintenance of the site access to a minimum of 50 m back from the state highway.	Agreed.
	Closure of all other accesses onto the state highway.	The site has no other accesses onto any state highway.
	Confirmation of access sight distances.	The sight distances have been confirmed to be accurate.
	Details of street lighting provision.	The street lighting design will be undertaken in the detailed design stage in

Date of NZTA reply	NZTA Comment	BBO Reply
		accordance with *AS/NZS 1158 Series – Lighting for Roads and Public Spaces*.
	All signs are to comply with the District Plan.	Agreed.
	The requirement for an independent safety audit at design and post-construction stages.	Agreed.
	IG-6 "no overtaking on flush median" signs are not required to be installed by the developer.	This report has been updated to reflect this comment.

This second version of the draft report has been updated to reflect the NZ Transport Agency comments from their letter dated the 15 January 2018, and address points raised.

13.0 Conclusion

Based on this report Bloxam, Burnett and Olliver make the following conclusions:

- The existing access is to be relocated and upgraded to a "Local Road" standard with a T intersection onto State Highway 39 to accommodate traffic from the proposed development. An access concept design is included in Appendix B, which addresses the potential safety issues with non-complying separation distances to nearby property accesses.

- The existing airfield has a trip generation of approximately 30 vpd. Due to the unique nature of the proposal, there is no trip generation data available for similar development. Based on some assumptions, the Airpark is expected to generate approximately 291 trips per weekday AM and PM peak hour.

- SIDRA modelling of the proposed intersection shows that it performs well, up to year 2042 traffic flows on State Highway 39/Limmer Road using a 2% annual growth rate on actual surveyed traffic counts. The model indicates that the LoS for the worst movement (the right turn out of the airpark access) will operate at LoS C. All movements on SH39 continue to operate at LoS A under. Similarly, the Horotiu Road and Te Kowhai Road intersection continues to operate at a high LoS, with no movement operating at less than LoS C.

- Parking requirements will be confirmed in the detailed design phase, and if requirements cannot be met a separate Resource Consent should be sought.

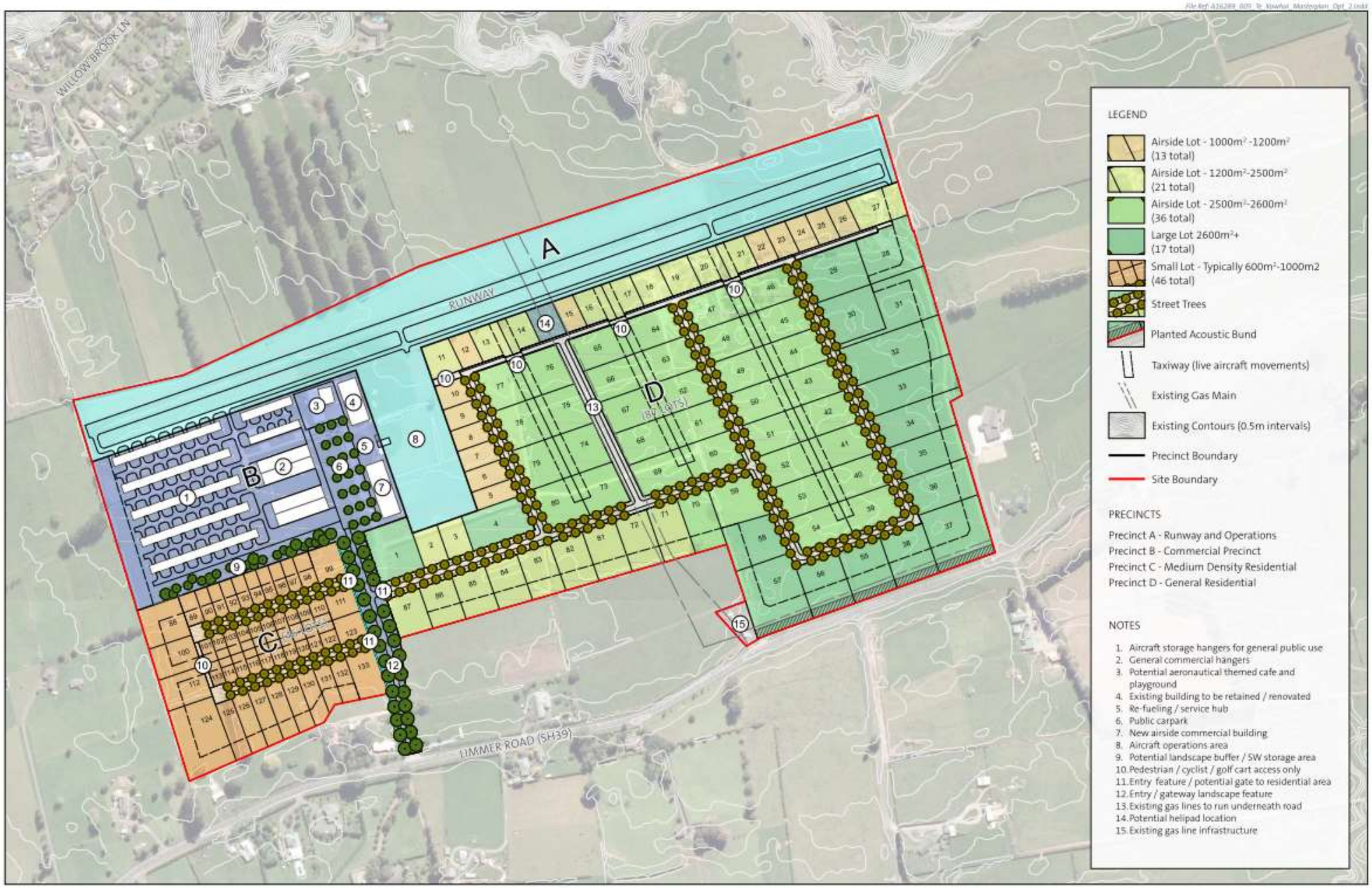
14.0 Recommendations

Based on this report, Bloxam, Burnett and Olliver make the following recommendations:

- The Applicant is to provide a walking and cycling connection from the site to the boundary of 721 Horotiu Road.
- The existing access is to be relocated and upgraded to a "Local Road" intersection standard with State Highway 39/Limmer Road. The intersection should be designed in accordance with the preliminary design drawing provided in Appendix B, and the design is to have New Zealand Transport Agency approval.
- The new access road typical cross section and the number of car parking spaces should be determined in the detailed design, but these should comply with Appendix A: Traffic in the Waikato District Plan.
- Until the access road is vested in Council the Appli9cant will maintain a minimum of 50 m back from the state highway to Council's standard maintenance criteria.
- The detailed design of the Airpark access and Access Road is to include street lighting in accordance with *AS/NZS 1158 series – Lighting for Roads and Public Spaces.*
- Airpark signage is to either meet the Waikato District Council requirements or be approved by the Council via resource consent process.
- An independent safety audit is to be undertaken at design and post-construction stages for the proposed intersection with any audit recommendations and design changes agreed with the NZ Transport Agency.

Appendix A

Airpark Indicative Layout



Boffa Miskell
www.boffamiskell.co.nz

N

0 100m

1:4,000 @ A3

INDICATIVE LAYOUT
FOR DISCUSSION PURPOSES ONLY

TE KOWHAI AIRFIELD MASTERPLAN

Concept Masterplan

| Date: 13 April 2017 | Revision: B |

Plan prepared for Foster Develop Ltd. by Boffa Miskell Limited

Project Manager: **jonathanb@boffamiskell.co.nz** | *Drawn:* SFo | *Checked:* JBr

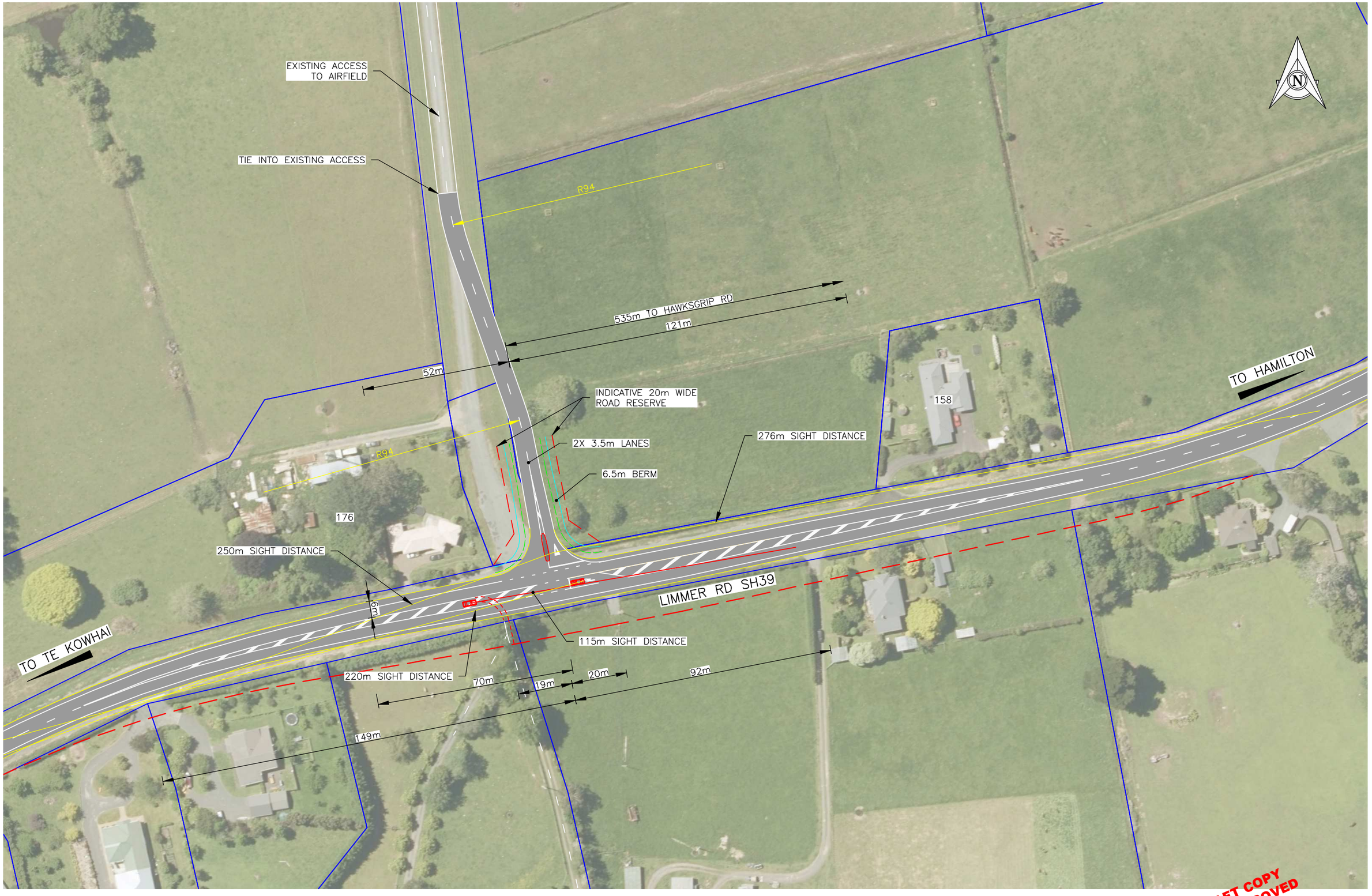
Appendix B

Intersection Concept Design

100mm

0

SCALE FOR VALIDATING SIZE OF A3 PLOT ONLY



						Designed: ML	Checked
						Drawn: ML	Approved
C	01.09.17	FLUSH MEDIAN UPDATED	ML			mx model version:	
B	13.07.17	REVISED FOR FLUSH MEDIAN	AB	RP			
A	07.07.17	RTB ISSUED FOR DISCUSSION	ML	RP			
	Date	Issue/revision detail	By	Chk	Appr		

Version 2.04 – October 2013

BLOXAM BURNETT OLLIVER
Phone 64-7-838 0144, Fax 64-7-839 0431

Client: FOSTER CONSTRUCTION GROUP

Project: TE KOWHAI AIRFIELD

Drawing: INTERSECTION LAYOUT OPTION 1

DRAFT COPY NOT APPROVED

Status: PRELIMINARY

Date: 03.04.2017

Scale (Original Size A3): 1:1250

Drawing Number: 144310/00 /P /010

Revision: C

K:\144310 Te Kowhai Airpark\Drawings\144310_00_010.dwg 4/9/2017 11:38 a.m. mlu

Appendix C

CAS Data

CRASH ROAD	CRASH DIS	CRASH DIR	SIDE ROAD	CRASH ID	CRASH DATE	CRASH DO	CRASH TIM	MVMT DESCR	CAUSES	ROAD WET	LIGHT	WTHRa	JUNC TYPE	TRAF CTRL	CRASH FAT	CRASH SEV	CRASH MIN
39/4/1.838	120	W	HAWKSGRIP ROAD	201231083	28/03/2012	Wed	820	CAR1 EBD on SH 39 lost control turning right, CAR1 hit Fence, Post Or Pole on right hand bend	CAR1 too far left/right, lost control when turning, driver over-reacted	Dry	Bright Sun	Fine	Unknown	N/A	0	0	0
LIMMER ROAD	1000	E	39/4/2.135	201338806	7/07/2013	Sun	20	VAN1 EBD on LIMMER ROAD missed inters or end of road, VAN1 hit Fence, Post Or Pole	VAN1 lost control when turning, failed to notice bend In road ENV: fog or mist	Dry	Dark	Mist	Unknown	N/A	0	0	0
39/4/2.555	580	N	HOROTIU ROAD	201743116	1/07/2017	Sat	2344	CAR1 EBD on SH 39 lost control; went off road to left, CAR1 hit Fence	CAR1 alcohol test above limit or test refused	Wet	Dark	Heavy Rain	Unknown	N/A	0	0	0
39/4/3.135		I	HOROTIU ROAD	201655899	24/12/2016	Sat	1940	CAR1 NBD on SH 39 lost control turning left, CAR1 hit Fence, Ditch	CAR1 Entering / On curve, too far left/right	Dry	Bright Sun	Fine	T Type Jun	Give Way S	0	0	0
39/11/0		I	LIMMER ROAD	201535823	27/04/2015	Mon	1115	VAN1 SBD on SH 39 hit CAR2 turning right onto SH 39 from the left	CAR2 Failed to give way At a priority traffic control, failed to notice control	Dry	Bright Sun	Fine	T Type Jun	Give Way S	0	0	0
39/11/0		I	LIMMER ROAD	201642090	20/05/2016	Fri	1657	SUV1 SBD on SH 39 hit CAR2 turning right onto SH 39 from the left	CAR2 Objects under drivers pedals, wrong pedal / foot slipped	Dry	Twilight	Fine	T Type Jun	Give Way S	0	0	0
39/11/0		I	SH 39	201632330	24/01/2016	Sun	910	CAR1 NBD on SH 39 hit turning TRUCK2	CAR1 alcohol suspected, Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Bright Sun	Fine	T Type Jun	Give Way S	0	0	0

Appendix D

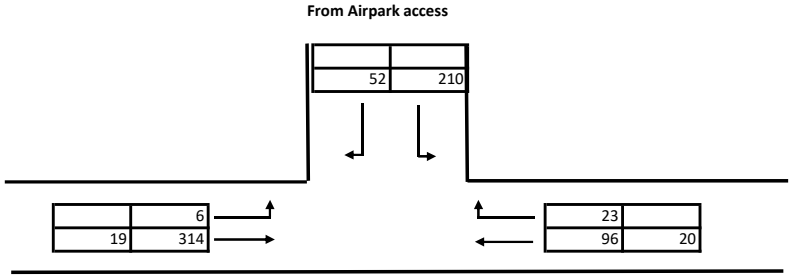
Indicative Operating Speed Measurements

Operating Speed Measurements		7/09/2017
	From West	From East
	88	72
	76	90
	84	81
	82	82
	78	85
	79	92
	78	76
	88	69
	81	76
	79	78
	95	86
	82	70
	71	95
	93	82
	65	69
	73	78
	90	85
	97	75
	65	84
	75	80
	86	79
	88	83
	93	76
	80	80
	96	86
85th percentile	**93**	**86**
Required sight line	**214**	**190**

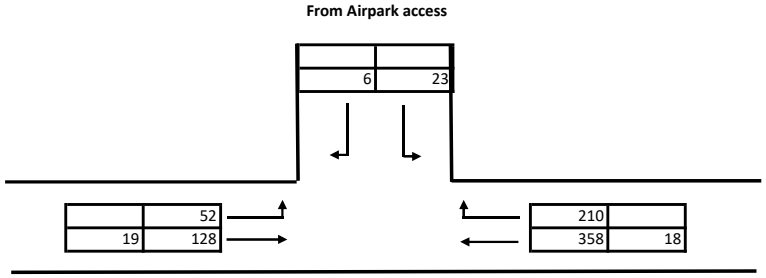
Appendix E

Flow Diagrams and SIDRA Results

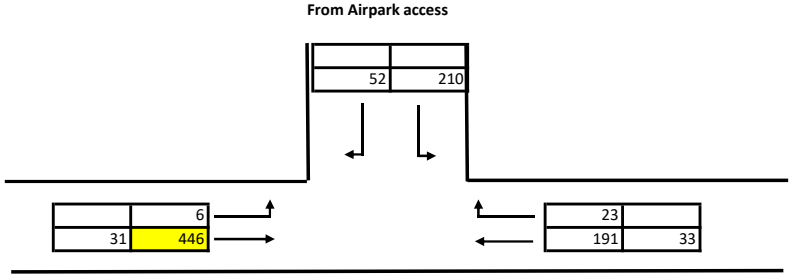
Access Intersection
2017 - 70% Occupancy
AM
7:30-8:30



PM
4:30-5:30



2042 - 70% Occupancy
AM
7:30-8:30



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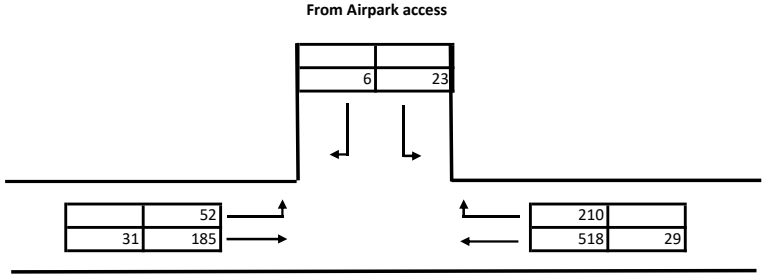
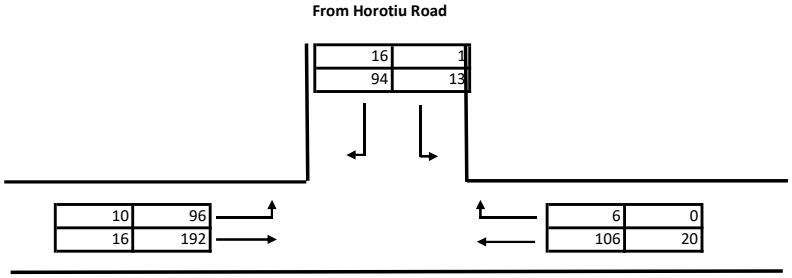
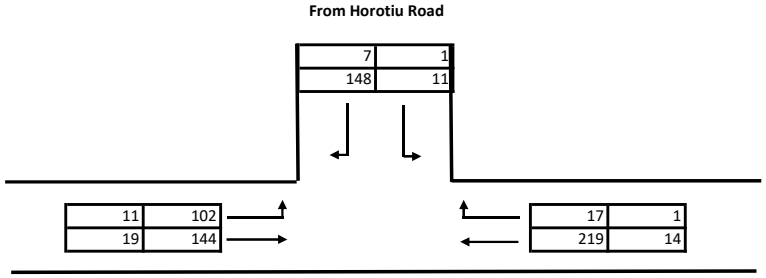
4:30-5:30



Horotiu Road
2017 - 70% Occupancy
AM
7:30-8:30

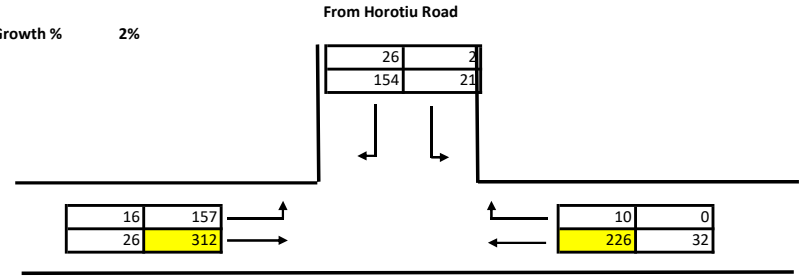


PM
4:30-5:30

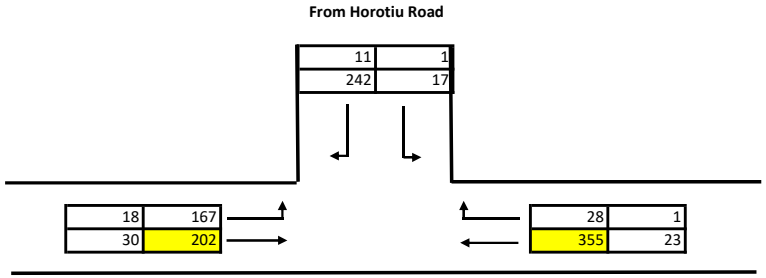


Horotiu Road+airpark
2042 - 70% Occupancy
AM
7:30-8:30

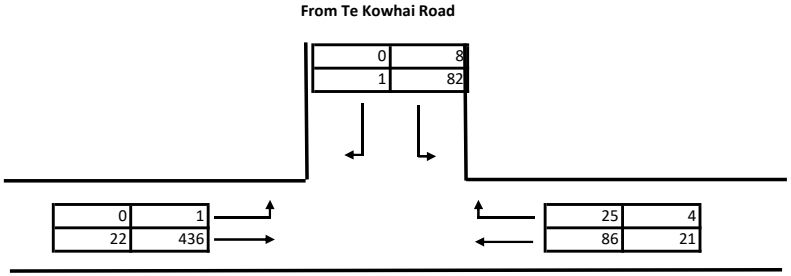
Growth % **2%**



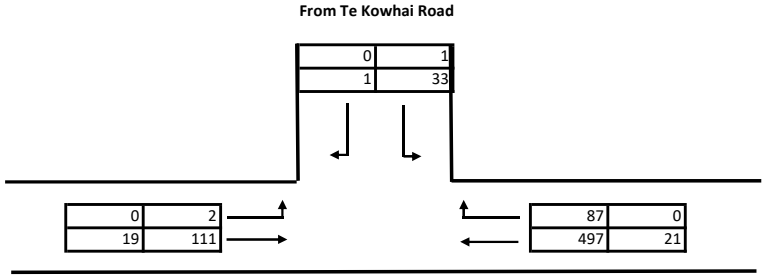
PM
4:30-5:30



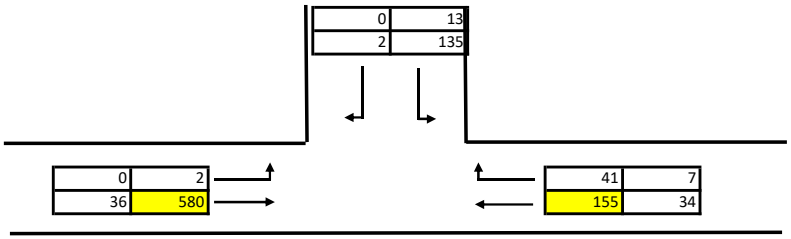
Te Kowhai Road
2017 - 70% Occupancy
AM
7:15-8:15



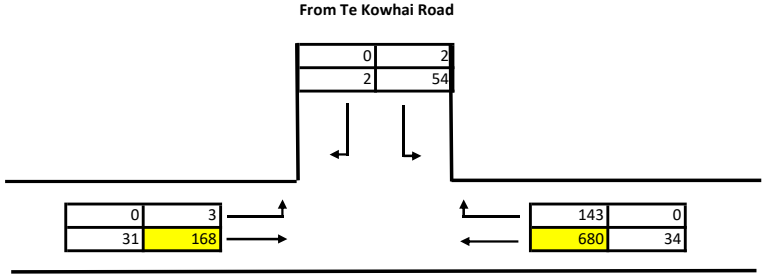
PM
4:15-5:15



2042 - 70% Occupancy
AM **Year** **2041**
7:15-8:15
Growth % **2%**



PM
4:15-5:15



MOVEMENT SUMMARY

Site: 101 [Airpark Access AM Base + Airpark]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: SH39 East											
5	T1	101	13.0	0.063	0.4	LOS A	0.2	1.5	0.18	0.12	76.5
6	R2	24	5.0	0.063	8.1	LOS A	0.2	1.5	0.23	0.16	57.5
Approach		125	11.5	0.063	1.9	NA	0.2	1.5	0.19	0.13	71.9
North: Airpark Access											
7	L2	221	5.0	0.280	6.2	LOS A	1.2	9.0	0.49	0.68	51.4
9	R2	55	5.0	0.280	9.0	LOS A	1.2	9.0	0.49	0.68	51.1
Approach		276	5.0	0.280	6.8	LOS A	1.2	9.0	0.49	0.68	51.4
West: SH39 West											
10	L2	6	5.0	0.187	7.1	LOS A	0.0	0.0	0.00	0.01	72.2
11	T1	331	13.0	0.187	0.0	LOS A	0.0	0.0	0.00	0.01	79.7
Approach		337	12.9	0.187	0.2	NA	0.0	0.0	0.00	0.01	79.5
All Vehicles		738	9.7	0.280	2.9	NA	1.2	9.0	0.22	0.28	65.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Airpark Access AM 2042 + Airpark]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: SH39 East											
5	T1	201	13.0	0.113	0.4	LOS A	0.3	2.0	0.14	0.07	77.6
6	R2	24	5.0	0.113	9.0	LOS A	0.3	2.0	0.18	0.09	58.3
Approach		225	12.1	0.113	1.3	NA	0.3	2.0	0.15	0.08	74.9
North: Airpark Access											
7	L2	221	5.0	0.357	7.8	LOS A	1.8	13.2	0.60	0.85	49.9
9	R2	55	5.0	0.357	13.8	LOS B	1.8	13.2	0.60	0.85	49.6
Approach		276	5.0	0.357	9.0	LOS A	1.8	13.2	0.60	0.85	49.8
West: SH39 West											
10	L2	6	5.0	0.265	7.1	LOS A	0.0	0.0	0.00	0.01	72.2
11	T1	469	13.0	0.265	0.0	LOS A	0.0	0.0	0.00	0.01	79.7
Approach		476	12.9	0.265	0.1	NA	0.0	0.0	0.00	0.01	79.6
All Vehicles		977	10.5	0.357	2.9	NA	1.8	13.2	0.20	0.26	67.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
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HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Airpark Access PM Base + Airpark]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: SH39 East											
5	T1	377	13.0	0.301	0.4	LOS A	1.6	11.8	0.23	0.21	74.8
6	R2	221	5.0	0.301	7.6	LOS A	1.6	11.8	0.32	0.30	55.9
Approach		598	10.0	0.301	3.1	NA	1.6	11.8	0.26	0.24	66.5
North: Airpark Access											
7	L2	24	5.0	0.033	5.0	LOS A	0.1	0.9	0.28	0.54	51.6
9	R2	6	5.0	0.033	12.2	LOS B	0.1	0.9	0.28	0.54	51.3
Approach		31	5.0	0.033	6.5	LOS A	0.1	0.9	0.28	0.54	51.6
West: SH39 West											
10	L2	55	5.0	0.105	7.0	LOS A	0.0	0.0	0.00	0.19	69.5
11	T1	135	13.0	0.105	0.0	LOS A	0.0	0.0	0.00	0.19	76.4
Approach		189	10.7	0.105	2.0	NA	0.0	0.0	0.00	0.19	74.3
All Vehicles		818	10.0	0.301	3.0	NA	1.6	11.8	0.20	0.24	67.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Airpark Access PM 2042 + Airpark]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: SH39 East											
5	T1	545	13.0	0.387	0.6	LOS A	2.0	15.0	0.26	0.18	75.1
6	R2	221	5.0	0.387	8.1	LOS A	2.0	15.0	0.35	0.24	56.4
Approach		766	10.7	0.387	2.8	NA	2.0	15.0	0.28	0.20	68.5
North: Airpark Access											
7	L2	24	5.0	0.043	5.3	LOS A	0.2	1.1	0.38	0.57	50.7
9	R2	6	5.0	0.043	17.6	LOS C	0.2	1.1	0.38	0.57	50.4
Approach		31	5.0	0.043	7.8	LOS A	0.2	1.1	0.38	0.57	50.6
West: SH39 West											
10	L2	55	5.0	0.139	7.0	LOS A	0.0	0.0	0.00	0.14	70.1
11	T1	195	13.0	0.139	0.0	LOS A	0.0	0.0	0.00	0.14	77.2
Approach		249	11.2	0.139	1.6	NA	0.0	0.0	0.00	0.14	75.5
All Vehicles		1046	10.7	0.387	2.6	NA	2.0	15.0	0.22	0.20	69.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Horotiu AM Base + Airpark]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: SH39 east											
25	T1	133	15.9	0.074	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
26	R2	6	0.0	0.004	5.2	LOS A	0.0	0.1	0.31	0.50	45.8
Approach		139	15.2	0.074	0.2	NA	0.0	0.1	0.01	0.02	49.8
NorthWest: Horotiu Road											
27	L2	15	7.1	0.014	5.5	LOS A	0.0	0.4	0.30	0.53	45.8
29	R2	116	14.5	0.199	8.9	LOS A	0.8	6.3	0.55	0.76	43.9
Approach		131	13.7	0.199	8.5	LOS A	0.8	6.3	0.52	0.73	44.1
SouthWest: SH39 west											
30	L2	112	9.4	0.072	4.6	LOS A	0.3	2.3	0.04	0.48	47.0
31	T1	219	7.7	0.117	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		331	8.3	0.117	1.6	LOS A	0.3	2.3	0.01	0.16	48.9
All Vehicles		600	11.1	0.199	2.8	NA	0.8	6.3	0.12	0.25	48.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Horotiu AM 2042 + Airpark]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: SH39 east											
25	T1	272	12.4	0.149	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
26	R2	11	0.0	0.008	5.7	LOS A	0.0	0.2	0.41	0.54	45.6
Approach		282	11.9	0.149	0.2	NA	0.0	0.2	0.02	0.02	49.8
NorthWest: Horotiu Road											
27	L2	24	8.7	0.027	6.3	LOS A	0.1	0.7	0.40	0.59	45.5
29	R2	189	14.4	0.527	19.0	LOS C	2.9	22.5	0.81	1.07	39.2
Approach		214	13.8	0.527	17.5	LOS C	2.9	22.5	0.76	1.02	39.8
SouthWest: SH39 west											
30	L2	182	9.2	0.117	4.6	LOS A	0.5	3.9	0.05	0.47	47.0
31	T1	356	7.7	0.190	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		538	8.2	0.190	1.6	LOS A	0.5	3.9	0.02	0.16	48.9
All Vehicles		1034	10.4	0.527	4.5	NA	2.9	22.5	0.17	0.30	46.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Horotiu PM Base + Airpark]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: SH39 east											
25	T1	245	6.0	0.129	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
26	R2	19	5.6	0.013	5.2	LOS A	0.1	0.4	0.28	0.51	45.8
Approach		264	6.0	0.129	0.4	NA	0.1	0.4	0.02	0.04	49.7
NorthWest: Horotiu Road											
27	L2	13	8.3	0.012	5.3	LOS A	0.0	0.3	0.27	0.51	45.9
29	R2	163	4.5	0.290	10.0	LOS B	1.3	9.5	0.60	0.85	43.4
Approach		176	4.8	0.290	9.7	LOS A	1.3	9.5	0.58	0.82	43.6
SouthWest: SH39 west											
30	L2	119	9.7	0.077	4.6	LOS A	0.3	2.5	0.08	0.47	46.9
31	T1	172	11.7	0.094	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		291	10.9	0.094	1.9	LOS A	0.3	2.5	0.03	0.19	48.7
All Vehicles		731	7.6	0.290	3.2	NA	1.3	9.5	0.16	0.29	47.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Horotiu PM 2042 + Airpark]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: SH39 east											
25	T1	398	6.1	0.210	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
26	R2	31	3.4	0.022	5.4	LOS A	0.1	0.7	0.35	0.53	45.6
Approach		428	5.9	0.210	0.4	NA	0.1	0.7	0.02	0.04	49.6
NorthWest: Horotiu Road											
27	L2	19	5.6	0.019	5.7	LOS A	0.1	0.5	0.33	0.54	45.8
29	R2	266	4.3	0.715	23.7	LOS C	5.1	36.9	0.88	1.27	37.4
Approach		285	4.4	0.715	22.5	LOS C	5.1	36.9	0.84	1.23	37.8
SouthWest: SH39 west											
30	L2	195	9.7	0.128	4.7	LOS A	0.6	4.3	0.11	0.47	46.8
31	T1	244	12.9	0.134	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		439	11.5	0.134	2.1	LOS A	0.6	4.3	0.05	0.21	48.5
All Vehicles		1153	7.7	0.715	6.5	NA	5.1	36.9	0.23	0.40	45.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Te Kowhai Road AM Base + Airpark]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: SH39 East											
5	T1	113	19.6	0.065	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R2	31	13.8	0.031	6.9	LOS A	0.1	1.0	0.51	0.64	45.0
Approach		143	18.4	0.065	1.5	NA	0.1	1.0	0.11	0.14	48.8
North: Te Kowhai Road											
7	L2	95	8.9	0.101	6.8	LOS A	0.4	2.9	0.49	0.68	45.2
9	R2	1	0.0	0.002	9.3	LOS A	0.0	0.0	0.57	0.62	43.6
Approach		96	8.8	0.101	6.9	LOS A	0.4	2.9	0.49	0.68	45.2
West: SH39 West											
10	L2	1	0.0	0.256	4.6	LOS A	0.0	0.0	0.00	0.00	49.5
11	T1	482	4.8	0.256	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		483	4.8	0.256	0.0	NA	0.0	0.0	0.00	0.00	50.0
All Vehicles		722	8.0	0.256	1.2	NA	0.4	2.9	0.09	0.12	49.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Te Kowhai Road 2042 AM + Airpark]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: SH39 East											
5	T1	199	18.0	0.114	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R2	51	14.6	0.067	8.4	LOS A	0.3	2.1	0.59	0.75	44.2
Approach		249	17.3	0.114	1.7	NA	0.3	2.1	0.12	0.15	48.7
North: Te Kowhai Road											
7	L2	156	8.8	0.211	8.4	LOS A	0.8	6.1	0.60	0.81	44.4
9	R2	2	0.0	0.007	14.0	LOS B	0.0	0.2	0.73	0.77	41.2
Approach		158	8.7	0.211	8.5	LOS A	0.8	6.1	0.60	0.81	44.3
West: SH39 West											
10	L2	2	0.0	0.346	4.6	LOS A	0.0	0.0	0.00	0.00	49.4
11	T1	648	5.8	0.346	0.0	LOS A	0.0	0.0	0.00	0.00	49.9
Approach		651	5.8	0.346	0.1	NA	0.0	0.0	0.00	0.00	49.9
All Vehicles		1058	9.0	0.346	1.7	NA	0.8	6.1	0.12	0.16	48.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Te Kowhai Road PM Base + Airpark]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: SH39 East											
5	T1	545	4.1	0.279	0.0	LOS A	0.3	2.2	0.01	0.01	49.9
6	R2	92	0.0	0.066	5.0	LOS A	0.3	2.2	0.26	0.45	46.2
Approach		637	3.5	0.279	0.8	NA	0.3	2.2	0.04	0.08	49.3
North: Te Kowhai Road											
7	L2	36	2.9	0.025	5.0	LOS A	0.1	0.7	0.24	0.51	46.0
9	R2	1	0.0	0.003	11.1	LOS B	0.0	0.1	0.65	0.67	42.6
Approach		37	2.9	0.025	5.2	LOS A	0.1	0.7	0.25	0.51	45.9
West: SH39 West											
10	L2	2	0.0	0.078	4.6	LOS A	0.0	0.0	0.00	0.01	49.4
11	T1	137	14.6	0.078	0.0	LOS A	0.0	0.0	0.00	0.01	49.9
Approach		139	14.4	0.078	0.1	NA	0.0	0.0	0.00	0.01	49.9
All Vehicles		813	5.3	0.279	0.8	NA	0.3	2.2	0.05	0.08	49.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Te Kowhai Road 2042 PM + Airpark]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: SH39 East											
5	T1	762	6.1	0.406	0.1	LOS A	0.0	0.0	0.00	0.00	49.9
6	R2	151	0.0	0.103	5.3	LOS A	0.5	3.3	0.34	0.56	45.7
Approach		913	5.1	0.406	0.9	NA	0.5	3.3	0.06	0.09	49.2
North: Te Kowhai Road											
7	L2	59	3.6	0.045	5.3	LOS A	0.2	1.3	0.31	0.54	45.8
9	R2	2	0.0	0.010	19.8	LOS C	0.0	0.2	0.82	0.87	38.7
Approach		61	3.4	0.045	5.8	LOS A	0.2	1.3	0.33	0.55	45.6
West: SH39 West											
10	L2	3	0.0	0.120	4.6	LOS A	0.0	0.0	0.00	0.01	49.4
11	T1	209	15.6	0.120	0.0	LOS A	0.0	0.0	0.00	0.01	49.9
Approach		213	15.3	0.120	0.1	NA	0.0	0.0	0.00	0.01	49.9
All Vehicles		1186	6.8	0.406	1.0	NA	0.5	3.3	0.06	0.10	49.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.