

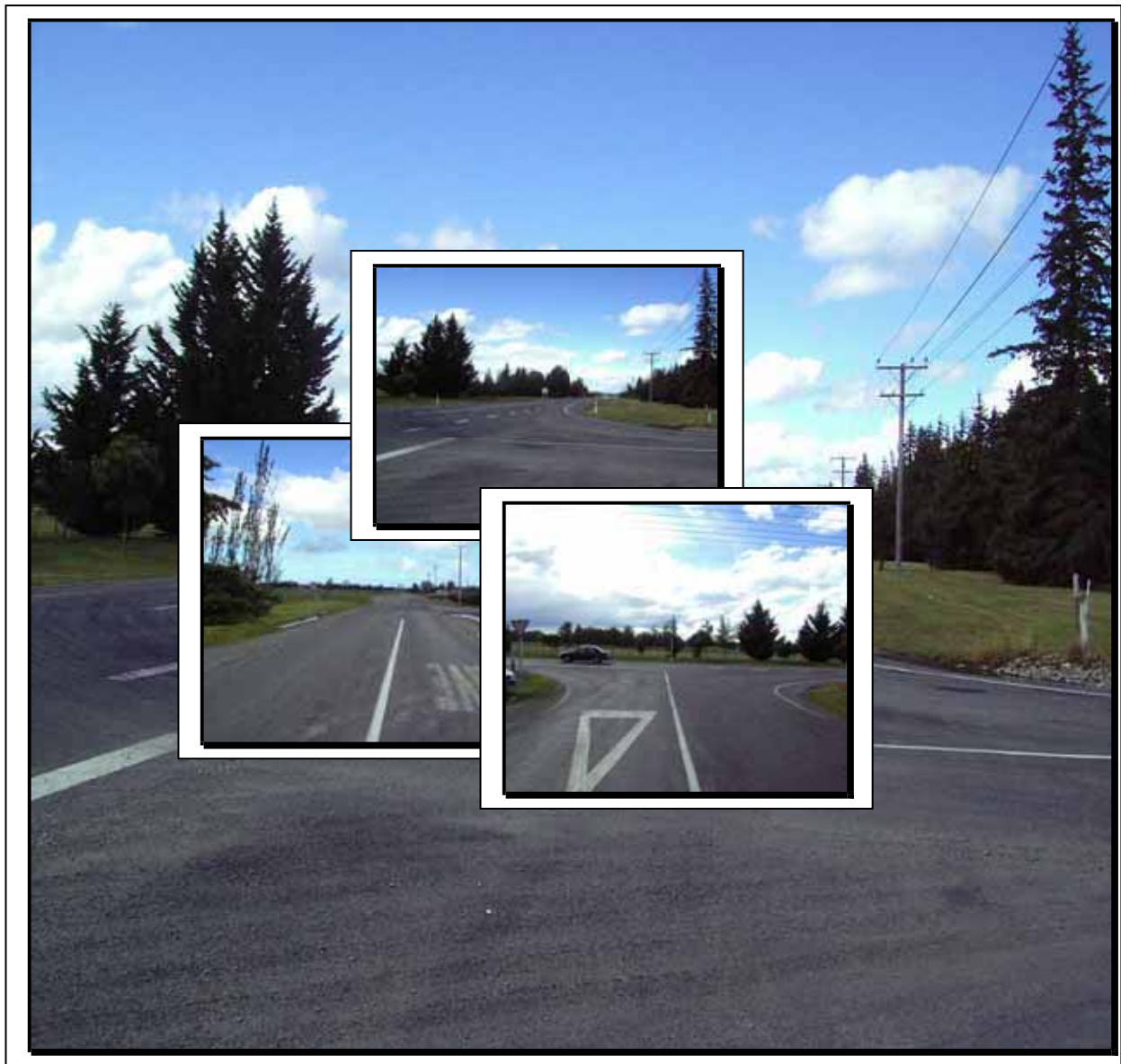


SH1/Northpark Road Designation

Intersection Performance Review

Prepared for: Ashburton District Council

Date: November 2006



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Statement of Details	
Prepared for: Ashburton District Council	Project: SH1 / Northpark Road Designation – Intersection Performance Review
Prepared by: Geoff McGregor Street in Sync Limited 	Reviewed by: Paul Burden Streets in Sync Limited
Date: November 2006	

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Appendix 1: Designation Diagram

Appendix 2: Initial Intersection Upgrade – Northpark Road

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1.0 INTRODUCTION

1. The following traffic impact assessment specifically relates to a proposed road designation on a section of land located adjacent to and on both sides of State Highway 1 (SH1) at the Northpark Road intersection which is situated approximately 3km north of Ashburton Town. The specific location of the designation is shown in **Appendix 1**.
2. The proposed designation is part of a wider development which includes a proposed District Plan change to re-zone (from rural to business/industrial) a one hundred and twenty hectare site located between Company Road and the Main South Railway Line bounded on the southwest by Northpark Road and the northeast by Works Road in the Ashburton District.
3. The purpose behind the overall development is to provide a large industrial subdivision in close proximity to Ashburton which will service the requirements of the entire Ashburton District into the future.
4. This assessment will consider the subdivision proposal with respect to the traffic related effects on the safety and efficiency of the SH1/Northpark Road intersection and approaches and in terms of the relevant rules, policies and objectives of the District Plan.
5. It is understood that Transit New Zealand, which is the road controlling authority for SH1, have some concerns in relation to the effects of this proposed development on the performance of the SH1/Northpark Road intersection and in particular on the operation of the State Highway. The view is that grade separation at the intersection will be an appropriate mitigating measure in this instance, should the Level of Service fall below what is considered to be an acceptable level.
6. This assessment investigates the likely performance of the intersection with regard to the anticipated traffic loadings generated as a result of the proposed industrial subdivision. An aaSIDRA analysis will be undertaken in order to determine the anticipated length of queue and time of delay at each approach to the intersection during the morning and evening peak periods assuming a fully developed site. This information will be used in order to



measure the anticipated intersection performance using the Level of Service (LOS) criteria given in the Highway Capacity Manual, with LOS A being a very high performance and LOS F being unacceptable.

7. The Canterbury Regional Land Transport Strategy identifies SH1 as a strategic road and recommends a minimum LOS for strategic roads of LOS C in peak times and LOS B at other times. Using this as a guideline for the following assessment, it will be recommended that grade separation at the SH1/Northpark Road intersection occur prior to LOS C being exceeded on the State Highway approaches to the intersection at peak times.

2.0 LOCATION OF DEVELOPMENT

8. The proposed development site is located between Company Road and the Main South Railway Line bounded on the southwest by Northpark road and the northeast by Works Road approximately 3 kilometres north of Ashburton.
9. The site will be accessed via one of 3 access points which will connect to an internal roading network within the site. The internal roading configuration has not yet been finalised but it is my understanding that it will comply with all statutory requirements. The access points will connect to Northpark Road to the southwest, Works Road to the northeast and Company Road to the southeast. Both Northpark Road and Works Road connect to SH1 which runs parallel with the site's northwestern boundary. Transit New Zealand is the Road Controlling Authority for all State Highway roads. Company Road provides access to Ashburton, located to the southwest.
10. **Figure 1.0** shows the location of the site within the context of the surrounding road network.

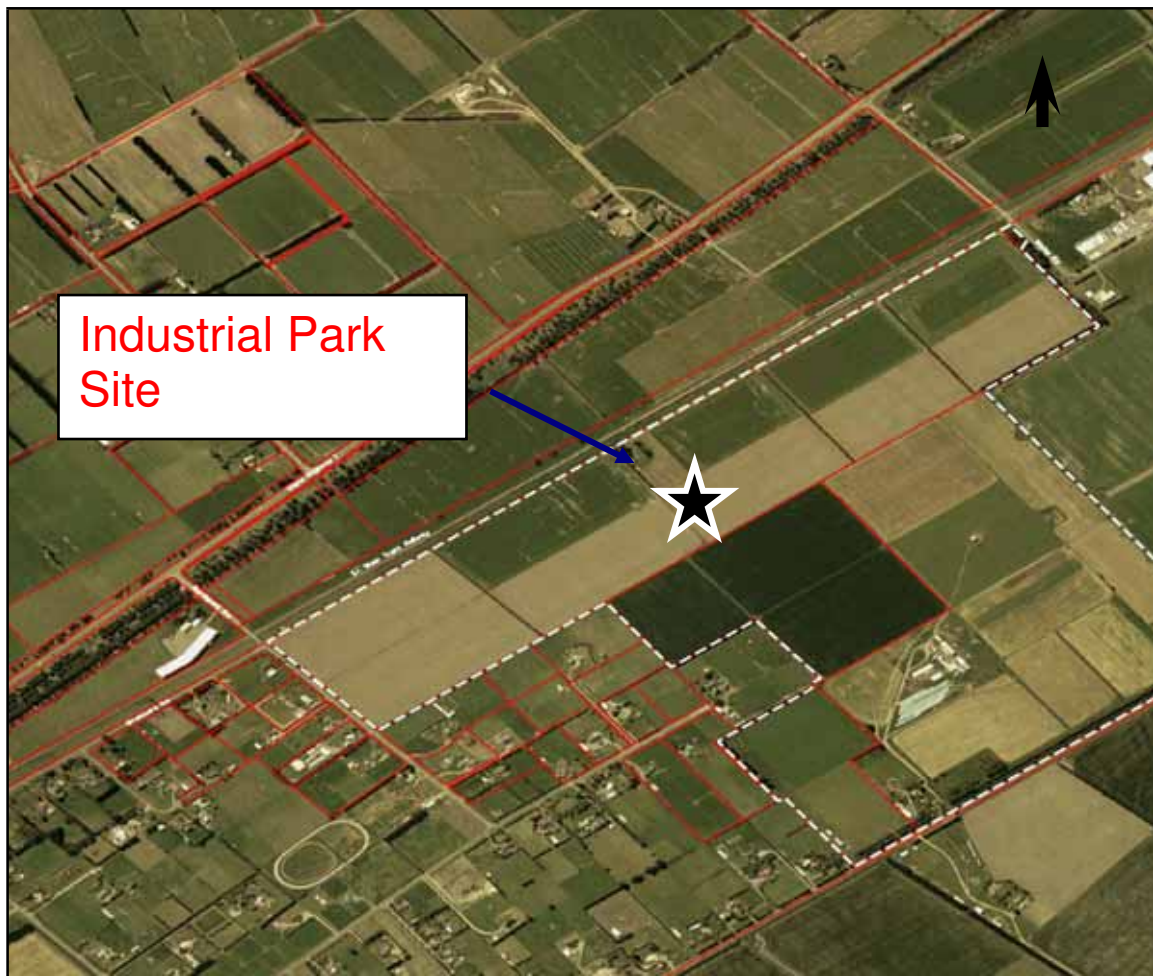


Figure 1.0 Site Location

3.0 PROPOSAL

11. The Ashburton District Council (the applicant) seeks to establish a road designation over a section of land adjacent to SH1 as shown in the plan contained in **Appendix 1 of this report**.
12. This proposal is part of a much wider proposal which seeks to rezone and subdivide the rural zoned site for the purposes of providing an industrial park which will serve the wider Ashburton District.
13. The designation is sought such that any future adverse traffic effects relating to the proposed industrial subdivision, which are deemed more than minor, will be able to be

mitigated by a grade separated interchange on the designated land and at the SH1/Northpark road intersection.

14. An initial upgrade of the SH1/Northpark Road intersection is proposed and is illustrated in **appendix 2 of this report**.
15. The actual industrial park incorporates a land area of approximately 120 ha of which 90 ha will be developed for a range of industrial uses. The remaining land will incorporate roading, railway and storm-water reticulation.

4.0 TRAFFIC ENVIRONMENT

16. The proposed development will have access to Company Road to the south, Works Road to the northeast and Northpark Road to the southwest. SH1 is classified as an “*Arterial Route*” in the Ashburton District Plan, forming the principal spine road for traffic moving into and out of the Ashburton. It has a 100kph speed limit in the vicinity of the application site. Company Road is classified a “*Collector Road*” in the context of the District Plan roading hierarchy and acts as a link between the rural/residential surrounds and the Ashburton Town. Company Road is restricted to 100kph within the vicinity of the site. Works Road and Northpark Road are both classified as “*Local Road*” in the District Plan and are also restricted to 100kph. The land use in the area is rural/rural-residential in nature with several other traffic generating activities located in the vicinity. Of note is the PPCS Freezing Works located to the northeast of the site and accessed via Works Road and the Canterbury Meat Packers plant located to the Northwest of the site. A cluster of rural/residential properties are located on the western side of Northpark Road between the proposed development site and Ashburton.
17. SH1 accommodates a single 3.7 metre wide traffic lane in each direction with 1 metre wide sealed shoulders. The shoulder on the western side of SH1 widens to a sealed width of 3.1 metres and extends approximately 50 metres either side of the intersection with Northpark Road. This provision allows for north flowing traffic to pass by traffic turning



into Northpark Road via a right turn. Northpark Road is controlled by a “Give Way” sign at the SH1 intersection. All road markings and signage is clear and in good condition.

18. Northpark Road accommodates a sealed roadway width of approximately 6 metres. The section of Northpark Road between SH1 and Bremners Road measures approximately 250 metres in length.
19. All roads are predominantly straight in horizontal and flat in vertical alignment in the vicinity of the site, raising no issues with forward visibility or safe stopping distances.
20. An aerial photograph of the site is shown in the plan contained in **Appendix 3 of this report**.

5.0 TRAFFIC VOLUMES

State Highway 1

21. The 2006 traffic volumes provided by Transit New Zealand show that SH1 carried approximately 9000 vehicles per day in the vicinity of the site with a weekday morning peak hour flow of approximately 600 vehicles per hour and a weekday evening peak traffic flow of approximately 1000 vehicles per hour. The hourly traffic flows are shown in **figure 2.0** below. The traffic volumes are within the anticipated volumes given the strategic nature and classification of SH1.



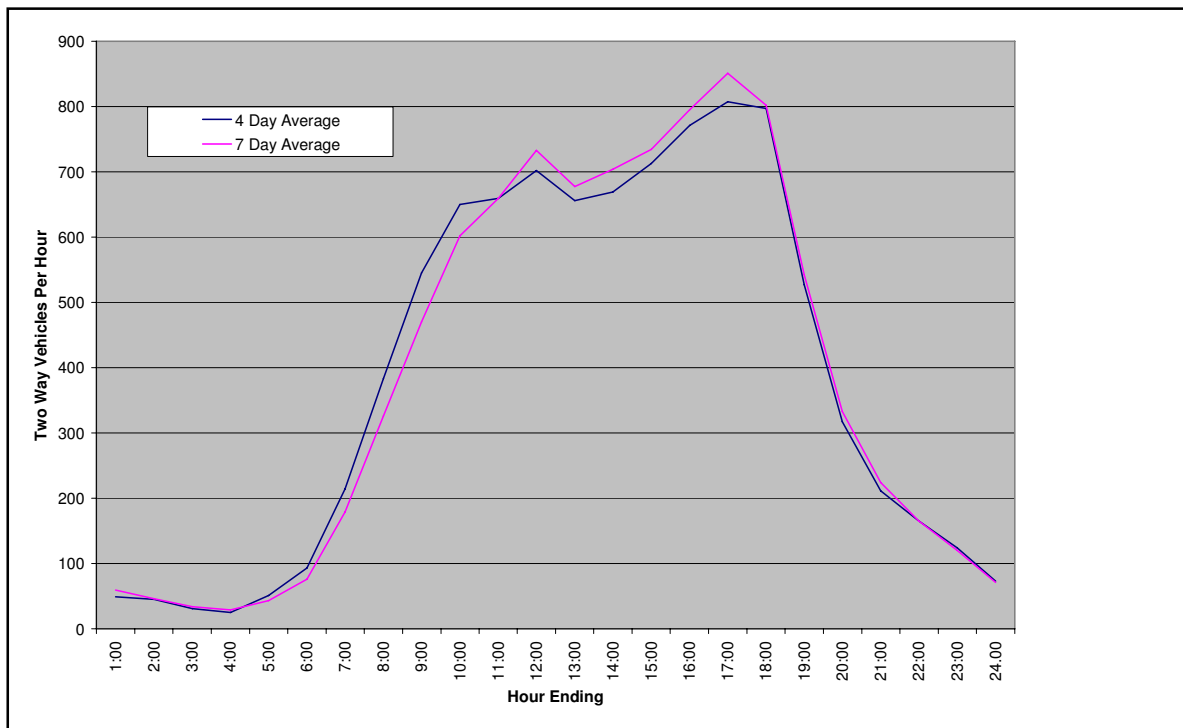


Figure 2.0 SH1 Traffic Volumes, North Ashburton, July 2006

22. Traffic volumes on arterial routes are typically increasing by approximately 3% per annum. Transit figures for SH1 for the period 2000 – 2005 suggest an average increase in traffic volumes of 3.5 % per annum. At current volumes this means that there will be an additional 1500 vehicles per day traveling that part of SH1 by 2010.

23. Figure 2 shows that SH1 experiences two distinct peaks in traffic flow corresponding to midday through traffic and evening travel patterns of the work force. The peak average hour flow rises to around 600 vehicles in the morning (peaking at 700 around midday) and 1000 in the evening peak. The off-peak curve is reasonably shallow indicating a comparatively high peak to off-peak ratio. This reflects the significant arterial or “strategic route” status of the road in that it is used frequently throughout the day.

6.0 ROAD SAFETY

24. A recent search of the Land Transport New Zealand Crash Analysis System (CAS) for the period 2001 to November 2006 revealed a total of 4 reported crashes within the vicinity of the site. **Table 1.0** shows the crash data in tabulated form.

Crash Location			Crash ID	Date	Day	Time	Description
1000	S	Works Road	2323305	20/12/2003	Sat	0945	Lost control when turning
100	N	Mitcham Road	2570248	24/01/2005	Mon	1500	Lost control, driver over-reaction
	A	Mitcham Road	2171803	09/06/2001	Sat	1730	Failure to give way
	A	Mitcham Road	2571405	20/05/2005	Fri	1800	Following too closely in misty dark conditions

Table 1.0 Crash Data

25. Two of the above crashes were a result of driver loss of control, and two resulted from poor driver behavior. There were a number of causes in relation to the 4 reported crashes however none were attributable to deficiencies in road construction or design.
26. The first crash in the table resulted in 1 serious and 1 minor injury. No injuries were recorded for the remaining crashes.

7.0 TRAFFIC GENERATION

27. The potential traffic generation of the proposed industrial subdivision has been considered using standard industrial rates based on the current published data and survey data specific to the Ashburton District. The published survey data has been converted from a rate per 100 m² GFA to a rate per developed hectare in order to provide for ease of comparison between the published data and the local survey data. This has been achieved by using estimated floor area data based on measured site coverage ratios over several industrial sites in Christchurch. Data from these measurements supplied by Urbis Traffic Planning indicates an average total floor area to site area ratio of 26.8%. This was measured for over 55ha of industrial site area.



28. **Table 2.0** below shows the published data, the local survey data and the traffic generation rates selected for this proposal.

Daily Trip Generation	Industrial / Warehouse		Industrial / Warehouse	Railway Yard
	Unit	Per 100 m ² GFA	Per Developed ha	Per Developed ha
RTA Guide	4-5	130		
BTS Library	5.2	135		
ITE Guide	3.8	99		
TRR209	30	780		
Austrroads Pt 5				
OnTrack				240
Opus Industrial Subdivision Smallbone St Ashburton			98	
Adopted Rate	5/100 m²	130	98	240/Site

Table 2.0 Traffic Generation Rates

29. In choosing a generation rate appropriate to the proposal it should be noted that the Transfund Research Report (TRR209) rate of 30 trips per 100 m² GFA daily or 780 trips per developed hectare is much higher than any other published rate. It has thus been assumed that the robustness of this data is questionable and it has subsequently been disregarded.



Peak Hr Trip Generation	Industrial / Warehouse		Industrial / Warehouse	Railway Yard
Unit	Per 100 m ² GFA	% Daily Total	Per Developed ha	% Daily Total
RTA Guide	0.5-1.0	13 – 16		
BTS Library				
ITE Guide	0.8	21		
Tr209	2.0	52		
Austrroads Pt 5		10 – 12		
OnTrack				13
Opus Industrial Subdivision Smallbone St Ashburton			12	
Adopted Rate	12% Daily Total			

Table 3.0 Peak Hour Traffic Generation Rates

30. Opus surveys conducted at the Smallbone St industrial subdivision in Ashburton in July 2005 revealed a total daily traffic volume of 3,340 vehicles. The peak hour flow was equal to 430 trips or approximately 12% of the daily volume. This aligns well with the published rate of 10 – 12% for peak hour traffic generation outlined in Austrroads Part 5.
31. The adopted rates given above have been applied to the estimated industrial floor areas on the site in order to establish an estimate daily and peak hour traffic generation for the proposed subdivision. The estimated floor area has been based on measured site coverage ratios over several industrial sites in Christchurch. As mentioned above, data from these measurements supplied by Urbis Traffic Planning indicates an average total floor area to site area ratio of 26.8%.



32. **Table 4.0** below shows the estimated daily and peak hour traffic generation for the proposed subdivision based on the survey data supplied by Opus for the existing subdivision located on Smallbone Street in Ashburton.

Daily Trip Generation	Industrial / Warehouse	Railway Yard
Unit	Per Developed ha	Per Site
Site Area (ha)	75.9	
Adopted Daily Generation Rate	98	
Daily Traffic Generation Estimate	7 438	240
	7 678	
Adopted Peak Hour Generation Rate	12% of AADT	12% of AADT
Peak Hour Traffic Generation	921	

Table 4.0 Daily and Peak Hour Estimated Future Traffic Generation for Local Survey Data

33. **Table 5.0** below shows the estimated daily and peak hour traffic generation for the proposed subdivision based on the adopted published rates (given above) and a floor area to site area ratio of 26.8%. Although the entire site area is 120ha, only 75.9ha has been applied to the following calculations leaving out storm-water retention areas of 14ha, railway of 8ha, roading of 7.6ha and the railway yard (separate category) of 14.5ha.

Daily Trip Generation	Industrial / Warehouse	Railway Yard
Unit	Per 100 m ²	Per Site
Site Area (m ²)	759 000	
Site Coverage	0.268	
GFA (m ²)	203 412	
Adopted Daily Generation Rate	5	240

Daily Traffic Generation Estimate	10 171	240
	10 411	
Adopted Peak Hour Generation Rate	12% of DT	12% of DT
Peak Hour Traffic Generation	1 249	

Table 5.0 Daily and Peak Hour Estimated Future Traffic Generation for Published Data

34. Tables 4 and 5 show that the proposal is likely to generate in the vicinity of 7,700 – 10,400 vehicles daily with a peak hour generation rate of between 920 – 1,250 vehicles. Table 4.0 rates are based on adopting high generation rates from the published literature, whilst table 5.0 rates are based on survey data for an existing industrial subdivision in the Ashburton District. Both totals do not account for internal trips which according to the published data in Austroads Part 5, are typically in the vicinity of 10% of all trips. In this instance however, given that a railway yard will be located on site and will act as a collection/distribution hub, internal trips are likely to form a higher percentage of total trips.
35. Information obtained in relation to the existing railway yard located in Ashburton indicates that internal trips are equal to approximately 50% of all trips generated by the site. A daily total of 120 trips with 15 trips in the peak hour are therefore estimated for the proposed new railway yard. In order to calculate the total number of daily and peak hour trips placed on the external road network, 10% of the total number of trips associated with the site plus 50% of the railway yard trips can be subtracted from the overall estimated daily traffic generation. This results in an estimated daily traffic generation of between 6,500 – 9,000 trips and between 780 – 1,080 trips in the peak hour.

8.0 TRIP DISTRIBUTION

36. Distribution of site generated traffic across the three access intersections is required. For the purpose of this assessment it is assumed that site generated traffic will be distributed as follows:



- 50% of trips will approach/exit the site via the SH1/Northpark Road intersection.
 - 15% of trips will approach/exit the site via the Northpark Road/Bremners Road intersection.
 - 7% of trips will approach/exit the site via the SH1/Works Road intersection.
 - 28% of trips will approach/exit the site via the Company Road intersection.
37. Given that this application relates solely to the proposed road designation, the following assessment will deal exclusively with the SH1/Northpark Road intersection
38. The distribution given above, results in an estimated 3,844 – 5,206 vehicles per day through the SH1/Northpark Road intersection with a peak hour volume of between 461 – 625 vehicles. The low end of the range will be referred to as **Scenario A** and the high end of the range will be referred to as **Scenario B**.
39. The traffic flow at the intersection is likely to be tidal in nature given that staff typically arrive in the morning and depart in the evening. In terms of this assessment, it has been assumed that the peak hour flow will be equal to 60% in-flows in the morning peak and 60% out-flows in the evening peak.
40. Assumptions in relation to the origin and destination of trips are also required. It is considered that the majority of site generated traffic will approach from and depart to the southeast, utilising that part of SH1 which connects the site with Ashburton. The intersection between SH1 and Works Road is likely to cater for the majority of the traffic approaching from and departing to the northwest and thus for the purposes of this assessment it is assumed that 90% of traffic utilising the SH1/Northpark Road intersection will approach from or depart to the southeast. The remaining 10% will approach from and depart to the northwest. These assumptions have been based on the situation prior to grade separation of the intersection. Grade separation is likely to have an impact on volumes at the SH1/Northpark Road intersection.
41. The morning and evening peak hour traffic volumes on SH1 (as outlined in paragraph 14) are equal to approximately 600 and 1000 vehicles respectively. The traffic count data for



SH1 indicates a directional bias of approximately 60% towards the south in the morning and 60% towards the north in the evening.

42. Given the above assumptions, **Table 6.0** outlines the estimated volumes by direction at the SH1/Northpark Road intersection for both the morning and evening peak periods given a fully developed industrial subdivision. The table provides a summary of the **existing** morning and evening peak hour traffic volumes at the SH1/Northpark Road intersection (counted October 26, 2006) and provides a **total** traffic volume which includes existing traffic volumes and estimated traffic volumes associated with the proposed industrial subdivision at completion.

	SH1 South Through	SH1 North Through	Right in	Right out	Left in	Left out
Existing (am)	240	360	4	6	8	6
Existing (pm)	600	400	12	7	8	6
Scenario A (am)	240	360	249	18	28	166
Scenario A (pm)	600	400	166	28	18	249
Scenario B (am)	240	360	337	25	38	225
Scenario B (pm)	600	400	225	38	25	337
Totals (Existing + Estimated)						
Scenario A (am)	240	360	253	24	36	172
Scenario A (pm)	600	400	178	35	26	255
Scenario B (am)	240	360	341	31	46	231
Scenario B (pm)	600	400	237	45	33	343

Table 6.0 Existing and Estimated Intersection Volumes

43. **Figures 3.0 and 4.0** illustrate the estimated future morning and evening peak turning volumes using the scenario A rates and **Figures 5.0 and 6.0** use the scenario B rates in order to provide an estimate at the high end of the range. All representations are inclusive of existing traffic volumes at the intersection.

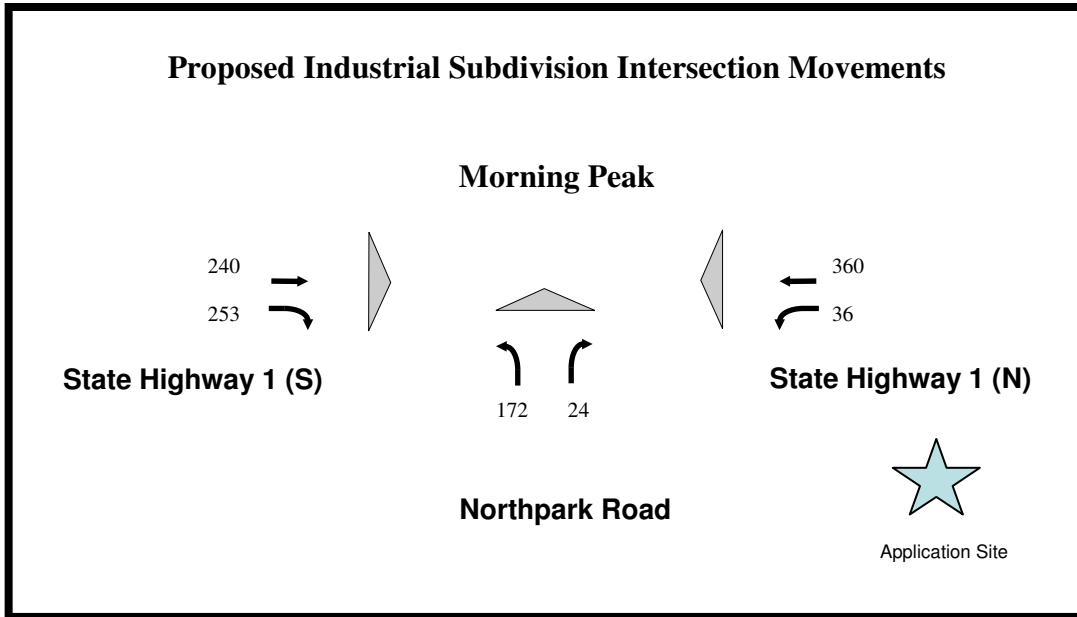


Figure 3.0 Morning Peak Hour Estimated Future Turning Volumes (Scenario A)

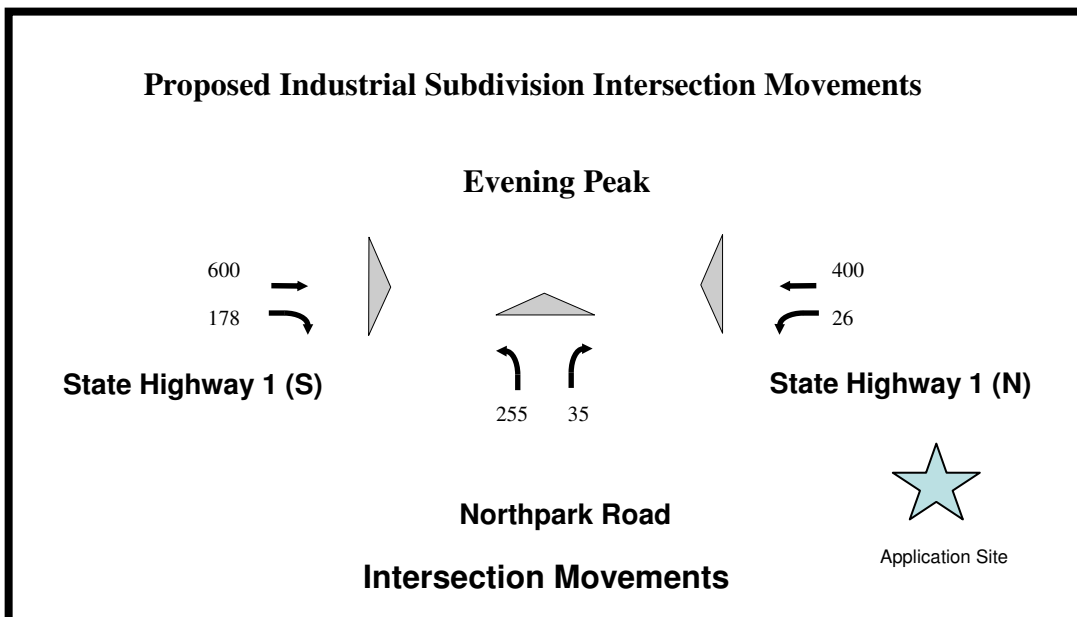


Figure 4.0 Evening Peak Hour Estimated Future Turning Volumes (Scenario A)

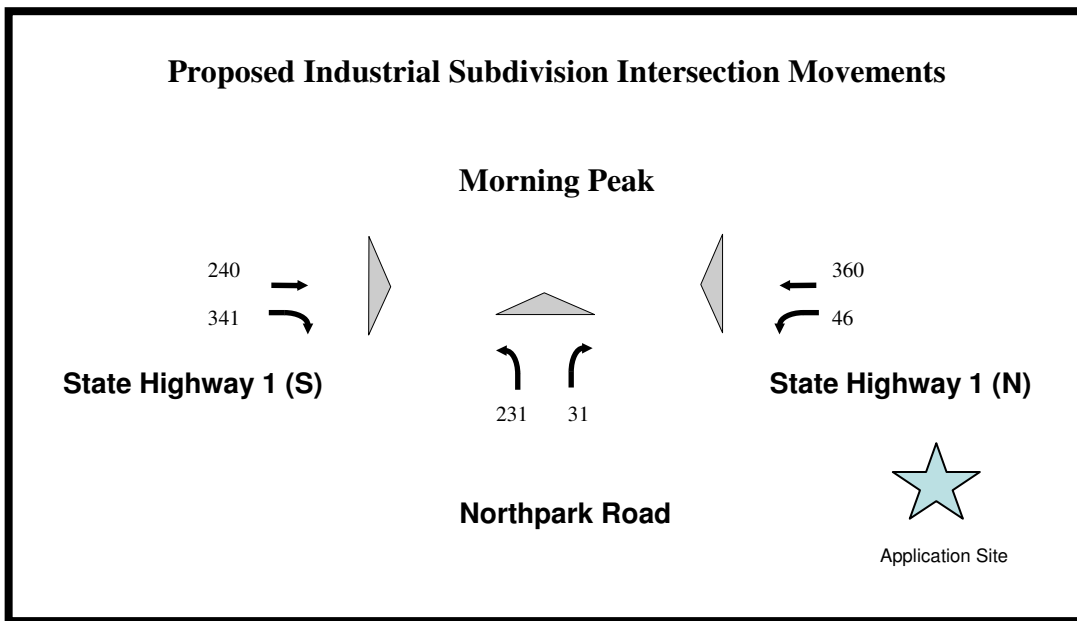


Figure 5.0 Morning Peak Hour Estimated Future Turning Volumes (Scenario B)

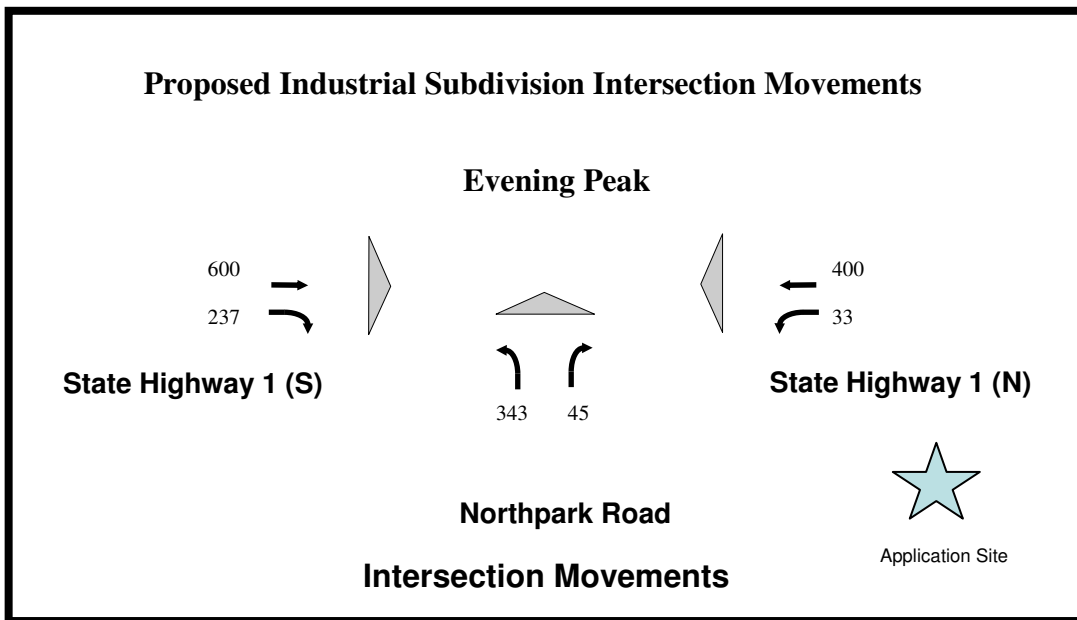


Figure 6.0 Evening Peak Hour Estimated Future Turning Volumes (Scenario B)

44. According to Austroads Part 5, heavy vehicle trips associated with industrial activities are typically in the vicinity of 15 – 25% of the total daily volume. Taking a conservative approach, a rate of 20% has been assumed for the purposes of this assessment given the uncertain nature and type of industrial activities which will establish within the proposed industrial park.

45. The effects of the above traffic volumes on the operation of SH1 and in particular the SH1/Northpark Road intersection will be outlined later in this report.

9.0 ASHBURTON DISTRICT PLAN ASSESSMENT

46. Section 3.7 of the Ashburton District Plan includes the objectives and policies relating to transport issues throughout the district.

Objectives

47. The District Plan contains the following Transport objectives relevant to land use activities:

“3.7.3.1 The efficient use of the District’s existing and future transport infrastructure....”

“3.7.3.5 The maintenance and improvement of the safety and ease of vehicle movement throughout the District.”

Policies

48. The District Plan contains the following transport policies relevant to this proposal:

“3.7.3.2(2) To protect the efficiency of through traffic on State Highway 1 and its primary role as a carrier of through traffic, by strictly limiting vehicle access and vehicle crossings for high traffic generating activities.”

“3.7.3.6(2). To ensure that the number, location and design of vehicle accesses and vehicle crossings and the intensity and nature of activities along roads is compatible with road capacity and function in order to ensure both vehicle and pedestrian safety. In particular to strictly limit the establishment of high traffic generating activities with vehicle access and vehicle crossings to State Highway 1.”

49. *“3.7.3.6(6). To preserve road safety and efficiency by ensuring that standards of road design, vehicle access, vehicle crossings, loading and parking are related to the intended use of each site and the relationship to the adjoining road classification.”*



50. *“3.7.3.6(7). To maintain and upgrade the existing roads in the District and provide for new roads and related facilities where these are important.”*
51. The following sections of this report will show that the initial proposed intersection upgrade (as shown in appendix 2) can suitably accommodate the anticipated site generated traffic with only minor effects on the intersection and the State Highway.

Rules

52. Section 6.5 of the Ashburton District Plan outlines the transport rules which are applicable to land use. The rules specifically relate to issues of parking provision and design and design and location of site access points. It is anticipated that as the proposed development proceeds and lot sizes and tenancies are allocated, that either compliance will be achieved in relation to these rules or resource consents will be sought on a case by case basis. For the purposes of this assessment, the anticipated traffic generation and the provision of site access and the subsequent effects on the function of SH1 is viewed as the primary traffic issue.
53. The site is zoned Rural B in the Ashburton District Plan. The proposal has been assessed with respect to the requirements of Section 6.5 – Transport of the Plan. The following requirements are noted:
54. *“6.5.2.2.8. Spacing between Intersections”*
“All intersections shall be designed and located such that the minimum spacing between successive intersections is not less than the minimum distance specified in Table 8.



Table 8 – Minimum Spacing between intersections

Legal Speed Limit for Road (km/hr)	Minimum Distance (m)
50	125
60	160
70	220
80	550
100	800

The distance shall be measured from the centre of one intersection to the centre of the succeeding intersection, parallel to the centre line of the road.

In Rural Zones where the legal speed limit for the road is 100km/hr, the above standard shall apply regardless of the side for the road on which the intersections are located.

On road in other zones, the above standard shall apply to intersection on the same side of the road only.”

55. A conservative approach has been taken in identifying this as a non-compliance as it has been assumed that the proposed internal road (shown in appendix 1) will eventually be established as legal roadway. It follows that the separation distances from the proposed internal road which will adjoin Northpark Road from the Northpark Road/SH1 intersection and from the Northpark Road/Bremners Road intersection will be approximately 320 metres and 100 metres respectively. Table 8 above shows a requirement of 800 metres for a frontage road with a speed limit of 100 km/hr.
56. Discussions with the Ashburton District Council have revealed that it is likely that the speed limit on that portion of Northpark Road between the SH1 intersection and the proposed intersection with the internal road will be reduced to 70 km/hr as a result of this proposal. In any event, this will be a short stretch of roadway dissected by the main south rail trunk line and it is unlikely that vehicles will broach a speed of 100 km/hr given the short distance and road environment.



57. The proposal demonstrates consistency with the relevant transport objectives and policies of the District Plan. The proposal achieves a high level of compliance with respect to the rules. No significant adverse effects are anticipated as a result of the single non-compliance.

10.0 NETWORK EFFECTS

58. The existing SH1/Northpark Road intersection is a simple T-intersection. An initial proposed upgrade to the intersection will include the following, and is outlined in Appendix 2:

- Right turn bay for vehicles entering Northpark Road from the south;
- Left turn deceleration lane for vehicles entering Northpark Road from the north; and
- Left turn acceleration lane for vehicles exiting Northpark Road to the south.

59. The Level of Service criteria from the Highway Capacity Manual (HCM) has been adopted for the purposes of assessing the traffic generation scenarios that could arise from the proposal. The levels range from A to F with A corresponding to an average delay of less than 10 seconds and F corresponding to an average delay of greater than 50 seconds as shown in **Figure 7.0**.

LOS	Av Delay (sec)
A	<10
B	10 to 15
C	15 to 25
D	25 to 35
E	35 to 50
F	>50

Figure 7.0 Level of Service Categories

60. Generally Level of Service A through C is acceptable. At D there will be a more than minor traffic effect and some intervention/mitigation could be contemplated such as grade separation. At E and F the delay is considered unacceptable with likely significant adverse traffic effects.
61. The performance of the intersection has been analysed using aaSIDRA for the traffic volumes associated with both scenario A and B and given in figures 3.0 – 6.0 above. **Tables 7.0 – 10.0** show the results of the aaSIDRA analysis for the critical movements. The current volumes on SH1 and Northpark Road were assumed as remaining static over the course of the development of the proposal.

Northpark Road Intersection	Right Turn In	Right Turn Out	Left Turn Out
Veh / hr	253	24	172
Av Delay (sec)	12.7	23.7	6.0
Queue (m) 95%	18	4	4
LOS	B	C	A

Table 7.0 Morning Peak Hour Intersection Performance (Scenario A)

Northpark Road Intersection	Right Turn In	Right Turn Out	Left Turn Out
Veh / hr	178	35	255
Av Delay (sec)	12.5	21.8	6.0
Queue (m) 95%	11	7	8
LOS	B	C	B

Table 8.0 Evening Peak Hour Intersection Performance (Scenario A)

Northpark Road Intersection	Right Turn In	Right Turn Out	Left Turn Out
Veh / hr	341	31	231
Av Delay (sec)	13.7	30.9	6.0
Queue (m) 95%	31	7	6
LOS	B	D	A

Table 9.0 Morning Peak Hour Intersection Performance (Scenario B)

Northpark Road Intersection	Right Turn In	Right Turn Out	Left Turn Out
Veh / hr	237	45	343
Av Delay (sec)	18.3	26.5	6.0
Queue (m) 95%	18	10	10
LOS	C	D	A

Table 10.0 Evening Peak Hour Intersection Performance (Scenario B)

62. The analysis shows that the T-junction intersection at Northpark Road will operate with an acceptable Level of Service (LOS) for a majority of the time.
63. The estimated average delay per vehicle for traffic turning right from SH1 into Northpark Road is calculated at between approximately 12.5 – 18.3 seconds. This equates to a LOS ranging between B and C. The average delay per vehicle for the left turn out manoeuvre is 6.0 seconds (LOS A) and the average delay per vehicle for the right turn out manoeuvre is between approximately 21.8 – 30.9 seconds ranging between LOS C – D.
64. The average delay for the more likely and more frequent right turn into and left turn out of the site is acceptable. The average delay for the less likely and less frequent right turn out of the site during the peak hour is high and likely to lead to frustration and possible poor gap selection. However, as shown, it is most unlikely that the proposal will generate any right turn exiting manoeuvres of any consequence, particularly during peak periods. In



addition, it is not expected that queues will form as a result of delays for the right turn out. Put simply, approximately 1 vehicle every two minutes will experience a delay of up to approximately 31 seconds during the peak hour when undertaking a right turn from Northpark Road on to SH1.

65. The analysis shows that the intersection will perform within capacity and motorists will experience low to moderate delays with the exception being the right turn exiting manoeuvre. It is emphasised that the analysis combines a number of “*worst case*” factors. In practice the performance is likely to be better due to platooning opposing flow volumes (for right turns in and out of the site) during the morning and evening peak period and the traffic generation rate for the proposal itself being conservatively high.
66. Giving consideration to the above information and accounting for the excellent visibility at the intersection and the proposed approach queue lengths, it is considered that the proposed development will have a no more than minor effect on the operation of the State Highway.
67. Although the analysis suggests that even when fully developed the traffic generated by the industrial subdivision is unlikely to warrant a grade separated interchange at the State Highway, it is acknowledged that a conservative approach should be taken. Actual activities and tenancies have not yet been finalised and for these reasons the designation provides an important safety net in the event that volumes are significantly higher than those anticipated.
68. It is worth noting that in addition to the analysis provided above, scenario B (which is the most conservative scenario) was subjected to an aaSIDRA analysis with a volume growth rate of 2% per annum (on the State Highway and through the intersection) for the next 20 years. As a result, it becomes immediately apparent that the State Highway does not suffer from a poor level of service LOS due to increased volumes at the intersection. In fact, all state Highway approaches are operating at or below LOS C. This provides some degree of confidence should traffic volumes at the intersection be substantially higher than those anticipated above.



69. It is recommended for the purposes of this report that grade separation should be implemented before any of the following occurs:

- LOS C is reached at the SH1 approach in peak times
- LOS E is reached at the Northpark Road approach in peak times
- Average peak hour delay on any approach to either intersection reaches 35 seconds
- Average off peak hour delay on any approach to either intersection reaches 25 seconds

11.0 CONCLUSION

70. The proposal is well located in terms of minimising the traffic impacts on the road network. Being on the southeastern side of the SH1/Northpark Road intersection will mean that access to the site will primarily involve right turns from Northpark Road. These manoeuvres are afforded the protection of a dedicated right turn bay. Departure manoeuvres from the site will primarily involve left turns onto SH1. Conservatively high estimates have been used in examining the effects of traffic entering and exiting the site on the performance of SH1. It is unlikely that the turning volumes in practice will amount to those used in the analysis. In any event, it is demonstrated that, with the exception of the right out turn movement out of Northpark Road during the peak hour, the proposal can be accommodated without compromising the level of safety and efficiency of SH1. The volume of traffic attempting to turn right out of the site is expected to be limited and as such should be of low frequency in the context of the anticipated daily site generated traffic volume.

71. The proposed initial upgrade of the SH1/Northpark Road intersection should adequately provide for the additional anticipated volumes through the intersection.

72. The proposed designation will ensure that should grade separation be required at the SH1/Northpark Road intersection, any adverse traffic effects resulting from the industrial subdivision will be suitably mitigated.

73. Visibility at the SH1/Northpark Road intersection is excellent.



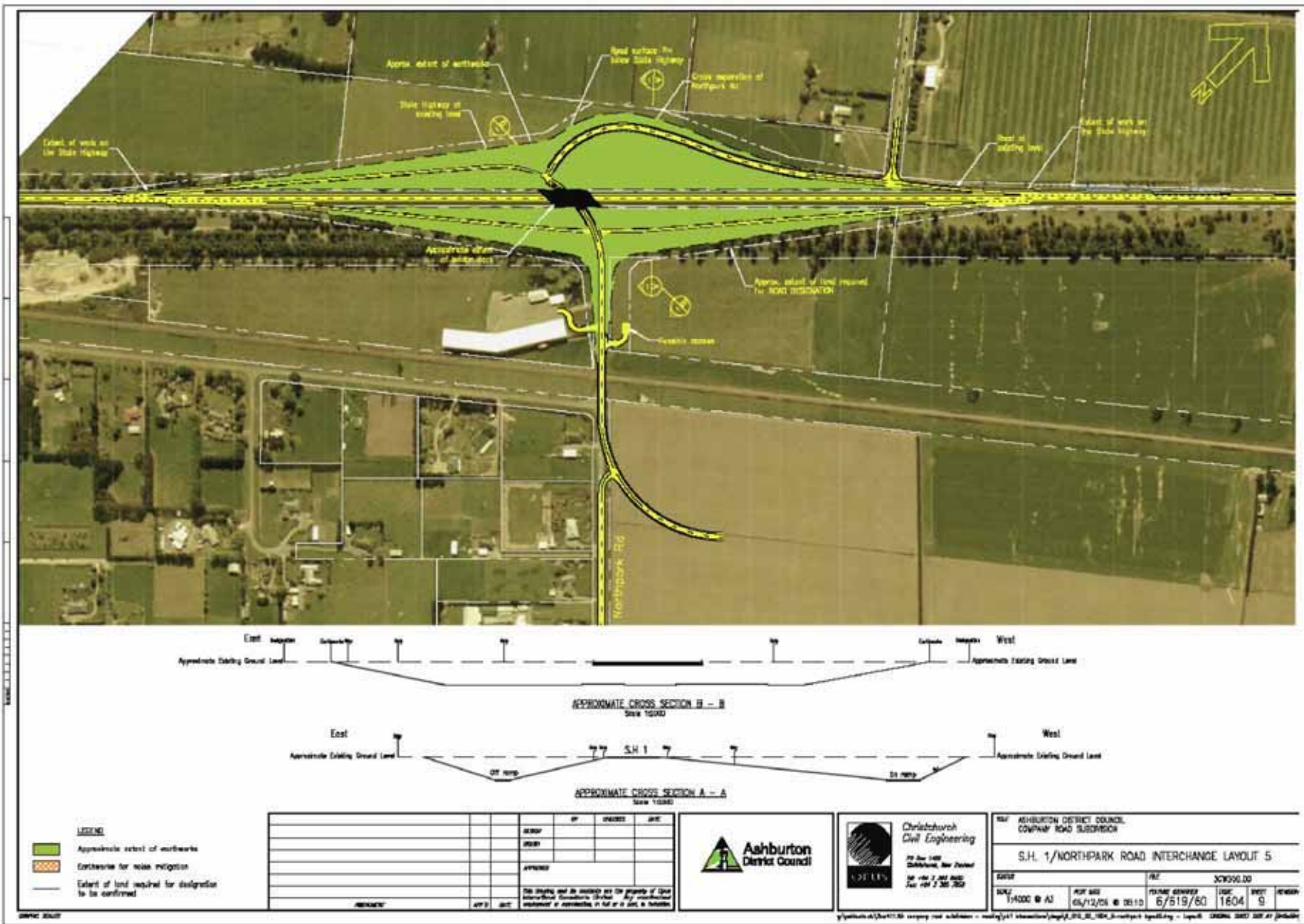
74. There are no aspects of the proposal that would suggest there will be any impact on road safety or any compromise to the levels of safety below that which is typically accepted.
75. The separation distance of the proposed intersection between the internal road and Northpark road from the SH1 intersection is less than permitted, however the effects of this are negligible.
76. The proposal will not compromise any of the relevant objectives and policies of the Proposed District Plan.
77. Overall the traffic related effects of the proposal are considered minor.

Geoffrey Gray McGregor BSC (Hons), MSC
STREETS IN SYNC

APPENDIX 1

Designation Diagram

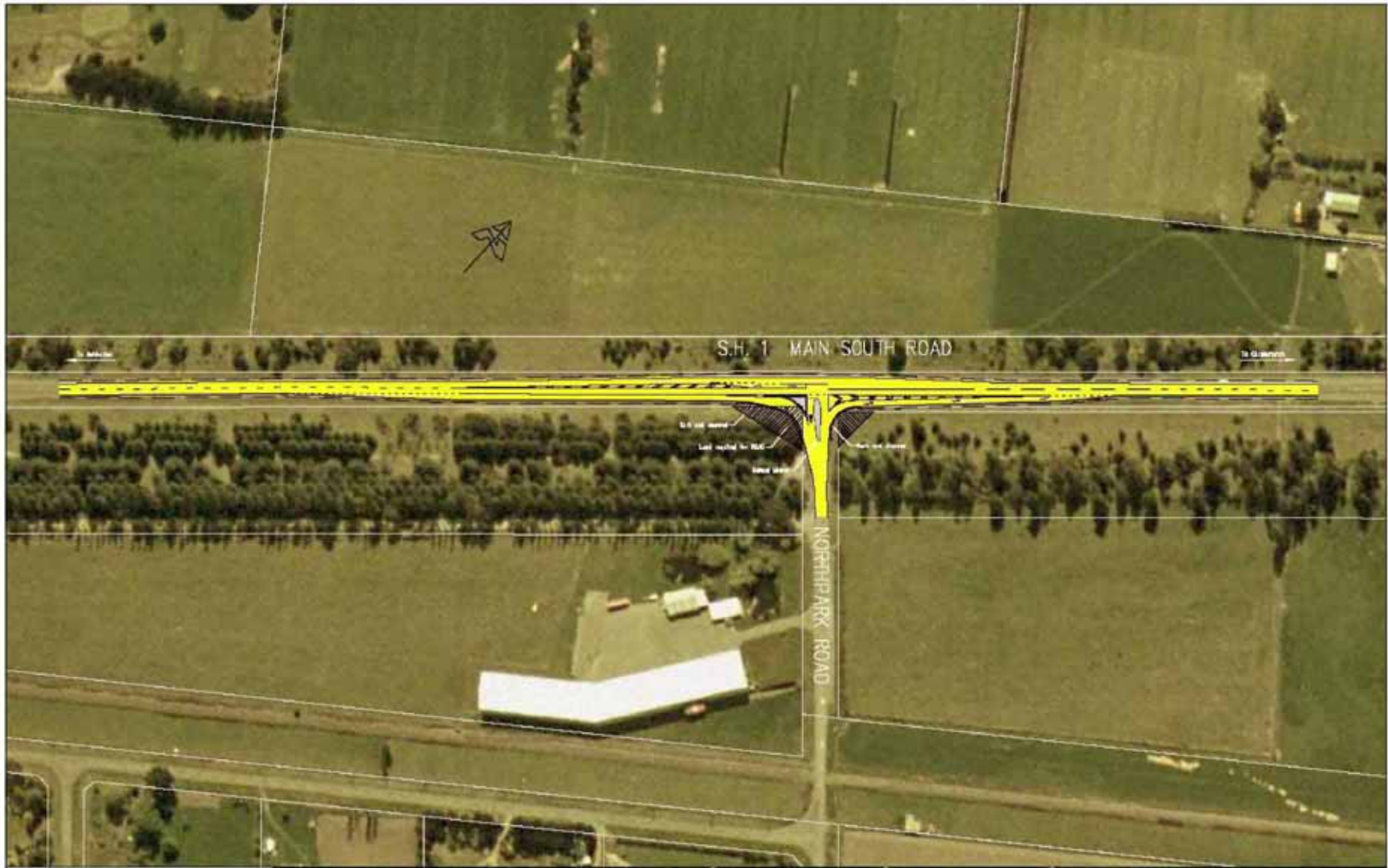




APPENDIX 2

Initial Intersection Upgrade – Northpark Road





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DATE	BY	DESIGNED	INSD																																						
				PRICE 309350.00																																					
				DATE 5/5/19/60		SHEET 1																																			
				SCALE 1:1000 @ A1 1:5000 @ A0		DATE 1604																																			

APPENDIX 3

Site Location – Aerial Photograph



