

UNDER THE RESOURCE MANAGEMENT ACT 1991

BEFORE THE Hearings Panel for the Queenstown Lakes District
Plan

IN THE MATTER OF Stage 3 Proposed District Plan – General Industrial
Zone

BETWEEN Cardrona Cattle Company Limited (Submitter
#3349)

AND Queenstown Lakes District Council (Planning
Authority)

SITE Victoria Flats Road

**TRANSPORTATION EVIDENCE OF RAYMOND JOHN EDWARDS IN SUPPORT OF
THE SUBMISSION OF CARDRONA CATTLE COMPANY LIMITED (Submitter #3349)**

DATE 19 June 2020

Introduction

Name, Qualifications and Experience

1. My name is Ray Edwards. I am a traffic engineering consultant practicing from Christchurch. I have been asked by the submitter, the Cardrona Cattle Company Limited (CCCL), to prepare transportation related evidence in support of their proposal to rezone land accessed from Victoria Flats Road from its current rural zoning to an industrial zoning.
2. I hold the qualifications of a New Zealand Certificate in Civil Engineering, and a Certificate of Transport Planning, Management and Control from the University of New South Wales. I am also an accredited RMA Commissioner.
3. I have over 31 years employment in the field of civil engineering, 28 of which has involved resource management related traffic engineering for both for the Christchurch City Council and also as a consultant to government agencies, other local authorities, and private developers. I therefore have extensive experience acting as an expert witness on traffic related issues associated with land use development, as well as the preparation and implementation of District Plans. My experience also includes many appearances before the Environment Court.
4. For the last 15 years I have been the Director of Urbis TPD Limited (Urbis) which is a Christchurch based consultancy that provides resource management, transportation planning and traffic engineering related advice. Urbis has been involved with over 4,000 projects nationwide including a significant amount of work relating to District Plan preparation and review processes.
5. Although this is a Council hearing, I confirm that I have read the Code of Conduct for Expert Witness contained in the Environment Court Practice Note and that I agree to comply with it. I confirm that I have considered all the material facts that I am aware of that might alter or detract from the opinions that I express, and that this evidence is within my area of expertise, except where I state that I am relying on the evidence of another person.

Background

6. I was commissioned by CCCL to provide traffic engineering and transportation planning advice in relation to the proposal to rezone its land, accessed from Victoria Flats Road, in March 2019. This work culminated in a desktop transportation assessment of the proposed rezoning that was prepared in August 2019. A copy of that assessment is provided as **Appendix A** to this evidence. For now, it needs to be noted that:
- a) The key transportation issue with the proposal is safely catering for site generated traffic turning into and out of Victoria Flats Road.
 - b) The preliminary assessment confirmed that the current Victoria Flats Road intersection design is inadequate to safely cater for predicted future traffic flows;
 - c) Noting that any proposed development of the site will be staged over many years, the assessment considered summer traffic volumes on State Highway 6 for a design year of 2028;
 - d) An upgraded intersection with a right turn bay for Victoria Flats Road traffic would cater for a certain level of development of the CCCL site (refer **Appendix B**). The installation of such an intersection design would require shortening of the current passing lanes to the east of Victoria Flats Road however a compliant passing lane length would be able to be maintained;
 - e) Full development of the CCCL site would require a more comprehensive intersection upgrade with the logical intersection design option being a roundabout in order to be consistent with similar situations elsewhere along State Highway 6 (for example Glenda Drive and Lower Shotover Road).
 - f) The trigger point for changing the intersection layout from priority control to roundabout control should be based on the performance of the critical right turn movement into Victoria Flats Road in the weekday AM peak period; such that a suitable level of turn movement performance is maintained above level of service F. It is currently estimated that this trigger point will occur at around 40% of site development.
 - g) Actual traffic generation from site development should be monitored as the site develops and it may eventuate that further site development could occur without the need for upgrading the intersection to the roundabout design.
7. Overall, it was considered that any traffic related effects of the proposal on the intersection of Victoria Flats Road with State Highway 6 are able to be suitably mitigated through the adoption of

standard intersection upgrade designs such that road capacity and road safety at this location is able to be maintained.

Consultation

8. From a transportation planning perspective, the key affected party with the rezoning proposal is the NZTA as road controlling authority for State Highway 6. Preliminary consultation began with the NZTA in June 2019, and formal meetings regarding progressing the proposal, and in particular any required intersection upgrades, began with the NZTA in December 2019 and have been continuing since.
9. As part of that consultation process, the issue of wider site access for the various developments accessing State Highway 6 in the vicinity of Victoria Flats Road has arisen. The NZTA has now requested that site access for any industrial rezoning of the CCCL land should also consider site access for neighbouring developments such as Oxbow, the landfill and the like. This resulted, in March 2020, of my preparation of a conceptual roundabout design that would incorporate access for neighbouring land development on the same side of State Highway 6 as the CCCL site, and also for sites on the other side of State Highway 6 from the CCCL site. I provide a copy of the preliminary roundabout design as **Appendix C** to this evidence.
10. In April 2020 the NZTA responded to the work I had presented to them by that time. A copy of this response is provided as **Appendix D** to this evidence. In summary, the NZTA has agreed that an engineering design solution is available for the necessary intersection upgrade to accommodate predicted increases in Victoria Flats Road traffic, but that further assessment was required in terms of determining the quantum of any road network effects further afield along State Highway 6. Subsequent consultation with the NZTA has identified that the key area of concern is State Highway 6 at the Shotover Bridge owing to existing network capacity issues in this location.

Resolution of Road Network Effects Issues

11. Since April 2020 I have been undertaking further detailed analysis of traffic volumes along State Highway 6 between Frankton and Victoria Flats Road in order to provide the further assessment requested by the NZTA. This work, which is still ongoing, has had two four components to it being:
- a) Providing a more accurate methodology for estimating the likely amount of traffic to be generated by the proposal;
 - b) Identifying a suitable design month upon which to consider the potential effects of site generated traffic on the operation of State Highway 6 (and State Highway 6A),
 - c) Identifying spare capacity on this section of the State Highway network, and;
 - d) Providing an evaluation of likely increases in traffic flows along State Highway 6 such that issues such as future network levels of service can be evaluated.

Site Generated Traffic Volumes

12. In terms of site generated traffic estimates, the Council has been very helpful with providing detailed traffic count data for what I consider to be a similar type of industrial development in Glenda Drive, Frankton. The dataset provided volumes for the 2004 to 2018 period, and of note is that the August 2018 counts were simultaneously undertaken in two locations on Glenda Drive to effectively provide a 'screen line survey' of the traffic generation of the industrial land development between the two count locations. Digital aerial imagery and cadastral survey data was then analysed to determine the amount of developed land area between the two count locations in August 2018, and the developed land was classified into land uses¹ to provide an understanding of land development mix. The outcome of this work was that Glenda Drive is considered to currently generate around 82.5 vehicles per hour per hectare, and around 481 vehicles per day per hectare. If applied to a 50.4 hectare developable area within the CCCL site², this calculates to a traffic generation of around 24,200 vehicles per day.

¹ Office, manufacturing, industrial, warehousing, and retail/ commercial tourism related

² Adopted from Geddes paragraph 25 and Bartlett paragraph 11. "The gross total developable land is estimated to be 72ha. A 30% loss of land through roading and servicing has been used to estimate 50.4ha of net developable land within the CCCL submission "

Road Network Volumes

13. In terms of road network traffic volumes, the NZTA has also been very helpful with providing detailed traffic count data for State Highway 6 in eight locations between the airport and Victoria Flats Road. This data is hourly for each location, for the most recent complete year and provides over 210,000 hourly count volume entries. To date the analysis have concentrated on State Highway 6A immediately east of the Frankton roundabout and also State Highway 6 either side of the Shotover bridge (identified by the NZTA as being the critical location). From the annual data for each count location the 85th percentile 24-hour volume³ has been calculated, and this was determined to typically occur in the shoulder periods of November or March each year (absolute peak volumes occur around Christmas time).

Road Network Capacity

14. In terms of road network capacity, there are numerous publications, such as Austroads, that suggest a mid-block peak hour capacity of around 900 vehicles per hour per lane. For a two-lane road this nominally equates to around 18,000 vehicles per day. It is important to recognise that this approach is very approximate and there are a number of factors that could increase or decrease this theoretical lane capacity. Of note is that there are a number of urban two-lane roads in larger centres around the country carrying in excess of 25,000 vehicles per day. However, in this instance estimation is not required because it is well documented that there are times of the year where State Highway 6 and State Highway 6A become gridlocked. It follows that the annual peak hourly flows recorded by the NZTA count stations will provide the actual peak hour lane capacity of the road.
15. Figures 1 and 2 below provide a comparison of the 85th percentile design day volumes and the annual peak hour volume for the three analysed count locations along State Highway 6. When viewing these graphs, one compares the actual count data for a given location being presented as a wiggly line in a certain colour with the maximum recorded hourly volume being a horizontal straight line presented in the same colour. The area between the two lines of the same colour is the theoretical spare capacity at that count location at hourly intervals across the design 85th percentile day.

³ The traffic volume that is exceeded only 15% of the year. Standard [practice for traffic analysis purposes.

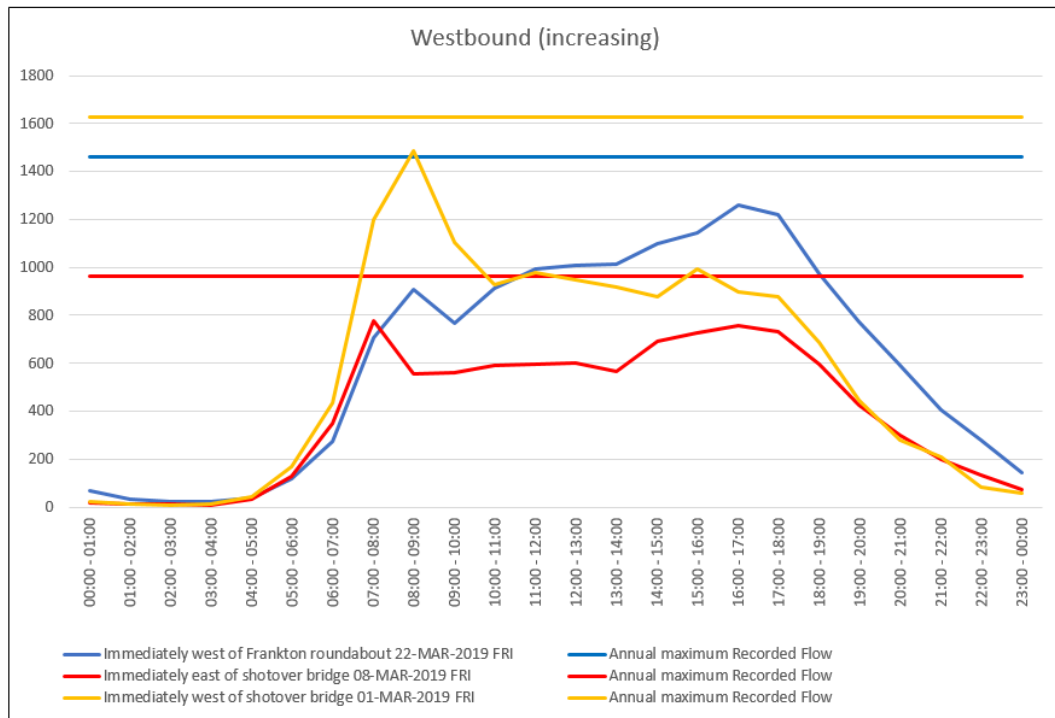


Figure 1: Comparison of counted traffic flows versus theoretical lane capacity for State Highway 6 and State Highway 6a in the westbound direction

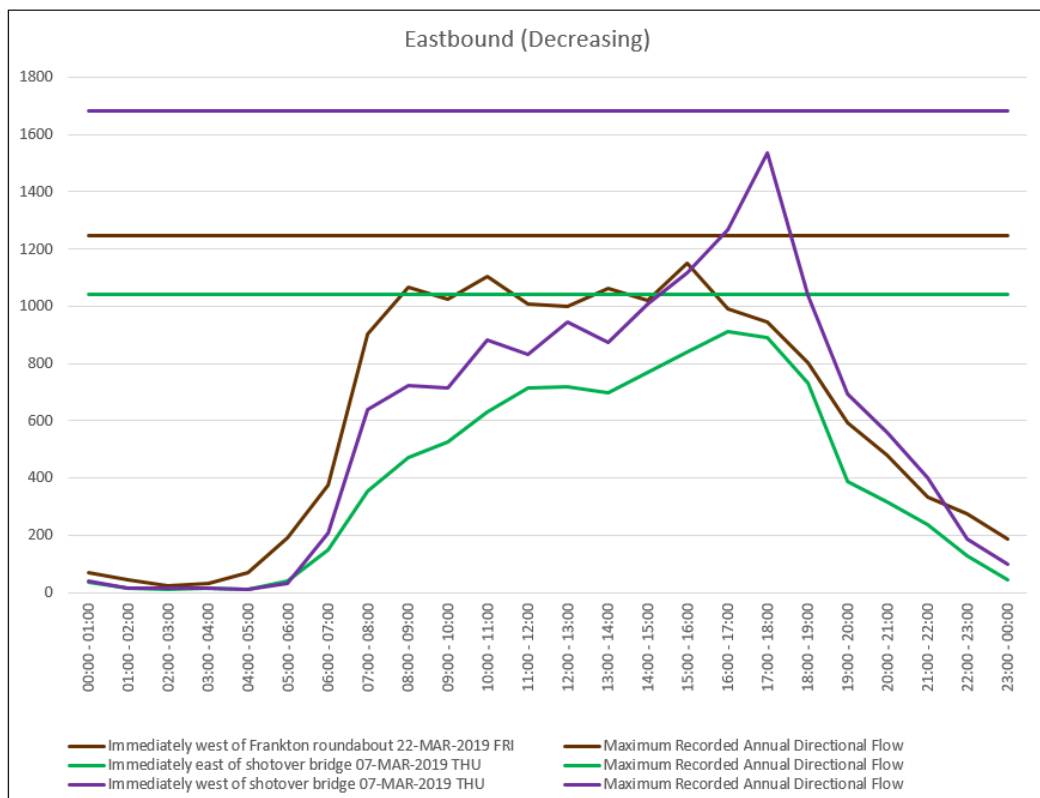


Figure 2: Comparison of counted traffic flows versus theoretical lane capacity for State Highway 6 and State Highway 6a in the eastbound direction

16. Of note from Figure 1 is that the 'Frankton roundabout' (blue) and the 'east of Shotover Bridge' (red) count stations provide a broadly similar westbound traffic flow profile, whereas the 'east of Shotover Bridge' (orange) flow profile has an unexplained and noticeable spike in flows around 9am on the surveyed day. The possible cause of this spike is still being investigated. Regardless, Figure 1 shows spare traffic capacity in the westbound direction across the day.

17. Of note from Figure 2 is that the 'Frankton roundabout' (brown) and the 'east of Shotover Bridge' (green) count stations also provide a broadly similar eastbound traffic flow profile, whereas the 'east of Shotover Bridge' (purple) flow profile has an unexplained and noticeable spike in flows around 5pm on the surveyed day. Despite this, Figure 2 also shows spare traffic capacity in the eastbound direction across the day.

Evaluation of Future Traffic Flows

18. At the time of preparing this evidence, the estimation of future predicted traffic flows is still being prepared. While the Glenda Drive survey analysis provides a suitable indication of estimated future traffic flows from the CCCL site, there are several areas where more work is required. These areas include:
 - a) Prediction of ambient traffic growth on State Highway 6 as a result of other land development in the wider basin area;
 - b) The estimated distribution of site generated traffic east and west of the Victoria Flats Road intersection,
 - c) Determining how much site generated traffic is already passing the site and as such will not be a new trip along State Highway 6 as a result of the proposal;
 - d) The influences of other transport provision such as 'park and ride' facilities being provided on the site to complement those understood to be proposed by the Council near the Lake Hayes Estate junction;

19. While it would be desirable to have these answers now, it is not critical to the current District Plan review process. As noted earlier, the NZTA is the road controlling authority for the most affected section of road, being State Highway 6 and State Highway 6A, and CCCL is in active consultation with the NZTA and the project has progressed considerably with them since August last year. Given that:

- a) there is spare network capacity on State Highway network to enable some development of the site;
- b) The level of independent control over resolving any potential effects of the proposal on the road network through needing specific approval from the NZTA in any case, and;
- c) That an interim junction control such as the right turn bay upgrade discussed in my August 2019 assessment is easily able to be achieved on site.....

Then there seems no reason that at least some of the CCCL could be rezoned for industrial purposes now, with the balance of the site having a deferred zoning pending the outcome of the further analysis work discussed above (and it is anticipated that this work would be completed prior to the hearing such that a definitive area of 'zone-now' and 'deferred zoning'; can be identified through agreement with the NZTA.

The Evidence of Mr Bartlett

20. I have read the evidence of Mr Bartlett, dated 5 June 2020, and I offer the following comments:

- a) The general approach of Mr Bartlett 's evidence suggests that he has not seen the August 2019 assessment that I prepared. This is unfortunate as many of the issues he has raised have been addressed by my earlier work in association with this proposal.
- b) Paragraph 13. My own analysis of the landfill activity, discussed in Section 3.3 of the August 2019 assessment, is that it generates around 50 (mostly heavy) vehicle movements per day. Mr Bartlett presents a near identical figure of around 45 vehicles movements per day. The difference is inconsequential. It is a very low landfill generated traffic volume regardless.
- c) Paragraph 13. My own analysis of the current traffic volume on Victoria Flats Road, also discussed in Section 3.3 of the August 2019 assessment, is that it generates around 126 vehicle movements per day. Mr Bartlett presents a similar figure of around 150 vehicles movements per day. The difference is also inconsequential
- d) Paragraph 16. The State Highway 6 traffic volumes presented in Mr Bartlett's Table 1 are accepted. Note that the volumes are significantly below the circa 18,000 vehicles per day that publications such as Austroads suggest as a theoretical maximum, capacity. Therefore, it comes as no surprise that a suitable intersection upgrade design for Victoria Flats Road with State Highway 6 would offer a high level of service for the majority of the day.

- e) Paragraph 18. The proposed intersection designs are based on an operating speed of 110km/h. The roundabout option would notably reduce this operating speed owing to the reduced speed required to negotiate the roundabout.
- f) Paragraph 19. It is agreed that intersection upgrades are required to accommodate the CCCL proposal. Mr Bartlett has suggested a right turn bay design option. My August 2019 analysis shows that this works for up to an estimated 40% of developable site area, and that a roundabout would be required in the longer term. Both intersection designs are readily achievable on site.
- g) Paragraphs 22-24. Mr Bartlett has relied upon three data sources to determine a potential range in traffic to be generated from the CCCL site should it be developed for industrial purposes. His range is 14,400 to 38,700 vehicles per day. The average of his estimates is 23,738 vehicles per day. My own analysis, undertaken using entirely different methodology estimates 24,200 vehicles per day. The similarity between the generation estimates is notable.
- h) Paragraphs 25, 26 and 36. Mr Bartlett calculates an average exiting delay of 15 seconds per landfill vehicle when exiting the landfill site onto Victoria Flats Road should the rezoning proceed. He notes this is level of Service C. What is missing from his assessment is the quantum of effect Level of Service C would have on landfill vehicles. Yet in his conclusion he considers that a 15 second delay is “*significant*”. His own analysis does not support this position given his calculated level of service, and the low volume of vehicles affected. Instead, level of Service C is an entirely appropriate operational delay at the landfill access given the very small landfill volumes involved. Any effects would clearly be inconsequential.
- i) Paragraphs 27-28. Mr Bartlett discusses how, with increases traffic volumes at the T-junction of the Howards Drive intersection with State Highway 6, the level of service at that junction has dropped and road safety issues are starting to arise. He states that a roundabout is being proposed by the NZTA. While I haven’t investigated road safety at that intersection or the NZTA proposal, this claimed experience with its operation is typical as intersection volumes increase anywhere, and entirely accords with the findings of my August 2019 assessment where I concluded that after a certain level of development of the CCCL site, that a roundabout intersection upgrade would be required either at (or better near to) the Victoria Flats Road intersection.

- j) Paragraph 29. Mr Bartlett comments that the CCCL submission provides no detail on any intersection upgrade proposals for Victoria Flats Road. It is not clear to me why Mr Bartlett has not seen my August 2019 assessment. Had he done so, then I submit that his evidence would be largely redundant.
- k) Paragraph 32. Mr Bartlett provides no evidence to substantiate his position that the CCCL proposal would have “*significant effects on the operation of the landfill*”. He has provided no data analysis of State Highway 6 traffic flows, no data analysis of estimated future intersection performance, and no analysis of quantum of effects for the landfill access (the level of Service C issue discussed earlier). Given this lack of analysis on Mr Bartlett’s part. I am surprised that Mr Bartlett’s unsubstantiated conclusion is the first conclusion of Mr Geddes in his paragraph 45⁴.
- l) Paragraph 37. It is agreed that the CCCL proposal will require upgrades to the Victoria Flats Road intersection with State Highway 6. This evidence discusses the work completed to date on this issue, and the consultation with the NZTA that has been undertaken. It is accepted that more work is still to be done, but this is not a reason to prevent a rezoning being considered now, with the potential for a deferred zoning for some of the site pending approval from the NZTA following resolution of the road network effects issue.

The Evidence of Mr Smith

- 21. Mr Smith’s evidence, dated 18 March 2020, also provides commentary on the potential transport effects of the CCL proposal. In reading his evidence it appears that Mr Smith is also not aware of my August 2019 assessment of this proposal. He has concentrated on the Victoria Flats Road intersection as it exists rather than properly evaluating upgrade options as mitigation measures.
- 22. Paragraphs 4.2, 5.7, 5.8 and 5.11 c). I agree that the introduction of a new intersection, or increased usage of an existing intersection, located at the end of high-speed passing lanes is undesirable from the road safety perspective. This is why my right turn bay upgrade option shortens the passing lanes back from the intersection, yet retains a compliant passing lane length. This in turn makes Mr

4 “Based upon the expert evidence of Mr Bartlett, I believe the volume of traffic associated with CCCL’s re-zoning submission and the resulting loss of service and safety will have a direct and adverse effect upon the existing road network which SRL relies upon for the efficient and continued operation of the landfill”

Smith's commentary in his paragraphs 5.9 and 5.10 redundant. Further, the roundabout option provides the opportunity to holistically consider site access for the various non-rural activities located along this section of State Highway 6, and provides the best practice design solution given the expected site road approach volumes.

23. Paragraph 4.4. Mr Smith's comment that the horizontal alignment of State Highway 6 in the general vicinity of Victoria Flats Road "*limits forward visibility*"; is misleading. The fact is that the Victoria Flats Road intersection is located on a long straight section of State Highway 6, and visibility on both directions from the intersection meets relevant sight line requirements.

The Evidence of Mr Giddens

24. I have read the evidence of Mr Giddens. In light of the concerns raised by Scope Resources Ltd, I suggest that the CCCL land around the landfill buffer should be deferred until such time that the intersection is upgraded. I understand that Mr Giddens will respond with a suggested provision that could be incorporated into the zone provisions.

Conclusion

25. It is agreed with Mr Bartlett and Mr Smith that the CCCL proposal has the potential to generate a significant amount of traffic onto State Highway 6 in the vicinity of the Victoria Flats Road intersection. This is the primary traffic issue with the proposal.
26. I agree with Mr Smith that the intersection in its current form does not have the capacity to safely accommodate this additional traffic. I agree with Mr Bartlett that an intersection upgrade is required and that a right turn bay upgrade or a roundabout upgrade are the most likely design solutions. I have been engaged by CCCL to assist with designing a solution and I am currently in discussions with the NZTA regarding this.
27. When preparing their evidence, neither Mr Bartlett nor Mr Smith seem to be aware of my August 2019 analysis of the potential effects of the proposal on the operation of the Victoria Flats Road intersection with State Highway 6, or the subsequent work undertaken in consultation with the NZTA to date. Had they been aware of this, then much, if not all, of their evidence would be redundant.

Table 8 below shows how the Developable Zone Area has been converted to a maximum building footprint area (assuming single storey development for non-residential uses and two storey development for residential uses) through consideration of the minimum required parking to be provided for a given land use classification. The residential unit numbers have been derived from the masterplan for the high-density units, with an assumed lower density for the balance of Zone A. The number and total GFA for the storage units has been derived from the transport assessment prepared for the resource consent application for that development.

Zone	Anticipated use	Developable Zone Area (m ²)	Parking Requirement per 100m ² GFA	Area per parking space (m ²)	Land required per 100m ² GFA	Maximum single level GFA (m ²)
A	High Density Workers Accommodation	11840	98 units			
	Low Density Workers Accommodation	130560	270 units			
B	Industrial Manufacturing	110400	2	40	180	61333
	Industrial Storage/warehousing	110400	1	40	140	78857
C	Amenity and Service Industries	7040	4	40	260	2708
	Office activity	6400	1	40	140	4571
D	Light Industrial	86784	1	40	140	61989
	Storage units	18816	784 units			24717
Total Zones B-D						234176m²

Table 8: Calculated Maximum Building Areas

In relation to the non-residential activities located in Zones B-D the total developable zone area of 424800m² has 234176m² or a total allotment site coverage of 55%. This level of site coverage is considered realistic for a development of this nature.

4.2 Estimated Traffic Generation

Noting the above anticipated land uses, the estimated weekday peak hour traffic generation (assuming AM and PM peak hour generation is the same) of the overall proposal has been estimated through reference to the following published traffic generation rates:

- RR453 rates for the residential units (outer suburban unit rate of 0.9 peak hour trips per unit);
- RTA Guide rate of 1.0 trips per 100m² for industrial factories and light industrial activities;

28. In my opinion, the most appropriate traffic response to the CCCL proposal is to upgrade the intersection. My preliminary analysis indicates that up to 40% of the site could be developed now, on the basis of a right turn bay upgrade being undertaken at the intersection. Beyond this level of site development, a further capacity upgrade would be required with a roundabout being the favoured design option. Both intersection upgrade designs following accepted best practice for traffic engineering, and both are feasible given the flat and straight alignment of State Highway 6 in the immediate vicinity of the Victoria Flats Road intersection.
29. More analysis is required on the issue of wider road network effects, and the NZTA has identified that State Highway 6 at the Shotover Bridge is their key concern. Additional work on this issue is being undertaken at present in consultation with the NZTA, and it is possible that this is resolved to an agreed solution prior to the Council's hearing on this matter. If this does not occur, then the NZTA is the only affected party as a result of the potential road network effects of the proposal, and the proposed zoning could be partially deferred until such time as the NZTA's concerns are resolved. With this deferment, I consider that the traffic effects can be appropriately managed.
30. I am happy to answer any questions.



Ray Edwards

19 June 2020

Transport Assessment

Proposed Rezoning

(Zones A-D)

**Victoria Bridge Terrace Site,
Gibbston Valley**

13th August 2019

Reference: 203014

Version: Preliminary Council Consultation

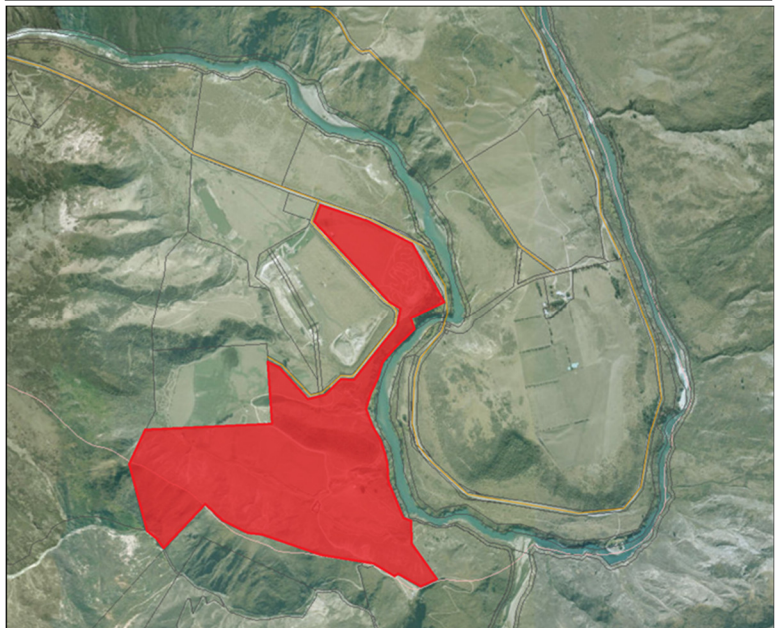


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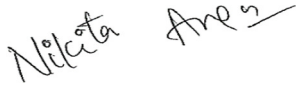

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Appendix A: Indicative Schematic Master Plan

Appendix B: Recommended Priority Control Intersection Layout

Appendix C: Recommended Roundabout Control Intersection Layout

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1.0 EXECUTIVE SUMMARY

1.1 Report Purpose

The purpose of this report is to provide a preliminary desktop transportation assessment for the rezoning of land currently zoned Rural and Gibbston Character on part of the Cardrona Cattle Company site that is located along the southern side of State Highway 6 and accessed from Victoria Flats Road. Consideration has been given to a predominately industrial land use.

The key transportation issue with this proposal is catering for site generated traffic turning into and out of Victoria Flats Road. Noting that the proposed development will be staged over many years, this report will provide an assessment of the performance of the critical intersection of State Highway 6 and Victoria Flats Road. This has been considered in terms of summer traffic volumes on State Highway 6 for a design year of 2028.

1.2 Report Scope

This report will include:

- A brief description of the site location and surrounding traffic environment;
- Detail the methodology used for estimating existing traffic flows at the intersection of Victoria Flats Road with State Highway 6;
- Summarise the traffic related elements of the proposal,
- Provide an estimated of weekday AM and PM peak hour traffic generation and distribution for the proposal;
- Provide an assessment of traffic related effects of the proposal on the operation of the intersection of Victoria Flats Road with State Highway 6;

This report does not consider wider road network effects such as that of any additional site generated traffic along the sections of State Highway 6 and State Highway 6A closer to Queenstown.

This preliminary assessment has been based on plans and information provided by the client. We understand that the site boundaries may not in all cases be accurate and that the development plans are conceptual only.

1.3 Report Conclusion

Overall, it is considered that any traffic related effects of the proposal are able to be suitably mitigated through the adoption of standard intersection upgrade designs such that road capacity and road safety is able to be maintained.

2.0 THE APPLICATION SITE

2.1 Summary of Property Details

Site Address:	Gibbston Valley, Queenstown
Legal Description:	Lot 8 DP 402448, Cert. of Title 477524
Total Site Area:	Total site: 113.4 hectares Application site: 75.35 hectares
Registered Owner:	The Cardrona Cattle Company Limited
Operative District Plan Zoning:	Rural General Zone
Overlays/Precincts/Other Limitations:	Designation 76 – Landfill Buffer (Victoria Bridge Terrace site)

2.2 Site Information

The subject site is accessed from Victoria Flats Road. The location of the site is identified in Figure 1a below

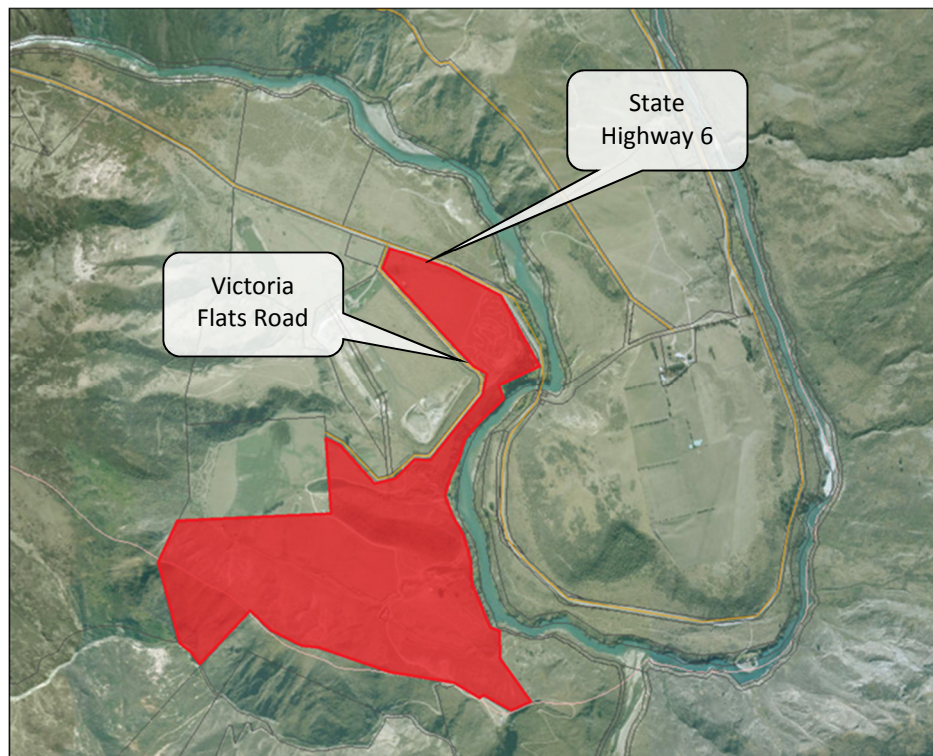


Figure 1: Location of the subject site

2.3 Neighbouring Land Uses

Victoria Flats Road is a cul-de-sac accessed from State Highway 6. The two main road users of Victoria Flats Road currently are AJ Hacket Bungy, and the Council owned Victoria Flats Landfill.

AJ Hackett has been operating the Nevis Bungy site for a number of years and currently operates nine busses per day along the road. The company offers these as a means to access the site as they note road access is not suitable for the general public.

The Victoria Flats Landfill (Designation 76 under the Queenstown Lakes District Plan) is located south west of the application site, as indicated in Figure 1. This landfill was established in 1999, under a Notice of Requirement (RM970116) and currently accepts commercial waste and is not accessible for general public waste.

The balance of the land area surrounding the subject site is in rural use.

3.0 THE ROAD NETWORK

3.1 Planned Function

Victoria Flats Road is not named as an Arterial or a Collector Road under the Operative District Plan Roading Hierarchy, or within the Proposed District Plan and therefore, by default, is classified as a local road. This classification is defined in the Operative District Plan as having the following function:

“Local roads make up the balance of the District’s roads. These function almost entirely as accessways to properties and are not intended to act as through routes for vehicles. These also serve other functions in terms of pedestrian access, cycle ways and may function as pedestrian malls or parking precincts”.

Victoria Flats Road connects to the Gibbston Highway (State Highway 6), which is classified as an Arterial Road and as a State Highway under both the Operative and Proposed District Plans respectively. Arterial Roads are described as having the following function:

All State Highways are (major) arterial roads. Other (minor) arterial roads have similar characteristics, being dominant elements of the network connecting the major settlements in the District with the District. Arterial roads will be managed to minimise their local access function.

From the above descriptions and planned functions, Victoria Flats Road acts to serve access to properties as opposed to carrying traffic between urban destinations. The Gibbston Highway, being an Arterial Road, provides limited access to some properties, but rather carries traffic between Cromwell and Queenstown. Because of the nature of the road environment, priority is given to State Highway 6 traffic as it travels east and west within the District.

3.2 Victoria Flats Road - Road Description

Victoria Flats Road is a no-exit road, accessible from an intersection on the south-western side of State Highway 6. The proposal’s only vehicle access is to Victoria Flats Road, and a description of this road is provided in Table 1 below:

Road Name	Victoria Flats Road
Road Classification	Local Road
Speed Limit	100 km/hour
Traffic Volume	Estimate of 125 vehicles per day according to Mobileroad.org (11/09/2017)
Carriageway Description	Unsealed, 5.5m wide carriage way accommodating two-way traffic flow.
Road Connections	Victoria Flats Road stems from Gibbston Highway; intersection is controlled by a give way sign against Gibbston Highway.
Cycling Infrastructure	No cycle infrastructure in the vicinity of the site
Pedestrian Infrastructure	No pedestrian infrastructure in the vicinity of the site
On Street Parking	Unrestricted parking, though no specific provision

Table 1: Victoria Flats Road Description

3.3 Victoria Flats Road - Current Traffic Volume

There is no formal traffic count data available for Victoria Flats Road. According to MobileRoad.org, the average daily traffic carried by Victoria Flats Road is estimated as being 125 vehicles per day. To check this estimate, traffic count data has been obtained for the two key activities on the road being the Nevis Bungy and the landfill activities.

Traffic volumes have been obtained from the Victoria Flats landfill activity. As noted earlier, this facility only caters for official refuse vehicles and is not open to the public. Vehicle arrival data for the last

two years has been obtained from the landfill operator and is displayed in Table 2 on the next page and analysed in Table 3 below:

Month	Vehicle Entries per Year		
	2016	2017	2018
January		462	543
February		447	509
March		488	557
April		478	602
May		459	584
June		537	514
July	405	437	
August	435	468	
September	405	472	
October	472	530	
November	582	536	
December	498	532	

Table 2: Vehicle Entries 2016-2018 (truck and trailer are counted as 2 vehicles)

	Entries	Trips per month	Trips per working day (ADT)
Average	472	-	-
Maximum	582	-	-
85%ile	512	1023	47

Table 3: Victoria Flats Landfill Traffic Generation

From this data, an approximate average ADT of approximately 50 trips per day has been calculated for the Victoria Flats Landfill activity.

AJ Hackett Bungy New Zealand operates an attraction further south of the application site and its only access is via Victoria Flats Road. This company notes that users cannot drive to the location, and offers 4WD bus service to the site. These buses arrive between 10:00am and 3:00pm at 40-minute intervals, equating to nine arrival trips daily. This analysis has also assumed an additional 20 movements for 10 staff that will occur along Victoria Flats Road. Therefore, the bungy activity is estimated to contribute around 38 trips per day.

To continue the conservative approach to traffic volumes, an additional 40 trips per day has been included to accommodate for farm use, or other land use within the area that may require access from Victoria Flats Road.

Based on the above analysis, a conservative total of 126 average daily traffic movements have been assumed on Victoria Flats Road. This aligns with the estimated 125 ADT volume obtained from MobileRoad.org.

In relation to peak hour traffic volumes, it is assumed that the peak hour volumes is 10% of the daily traffic volume – or around 13 vehicles per hour.

3.4 Victoria Flats Road - Formation Standard

Figure 2 below shows Victoria Flats Road as it is currently formed outside the proposed access of the application site. Victoria Flats Road has a legal width of 20m and has an unsealed formed width of approximately 7m, accommodating two-way traffic flow. There are broad grass verges on either side of road, with a large mature line of trees planted along the south western side.



Figure 2: Formation of Victoria Flats Road in the vicinity of proposed Zoned D (northern side of the road) and the landfill site (southern side of the road).

3.5 Gibbston Highway (State Highway 6) – Road Description

Victoria Flats Road’s only direct connection is from the Gibbston Highway. A description of the Gibbston Highway is detailed Table 4 below:

Road Name	Gibbston Highway (State Highway 6)
Road Classification	State Highway
Speed Limit	100 km/hour
Traffic Volume	5373 vehicles per day according to NZTA (2018)
Carriageway Description	15m wide carriage way accommodating two-way traffic flow with a 3.5m wide traffic lane in each direction. A westbound passing lane is provided to between the river bridge and the Victoria Flats Road intersection. The merge pint of the passing lane is to the immediate west of the Victoria Flats Road intersection.
Cycling Infrastructure	No cycle infrastructure in the vicinity of the site
Pedestrian Infrastructure	No pedestrian infrastructure in the vicinity of the site
On Street Parking	No specific provision

Table 4: Gibbston Highway Description

3.6 Gibbston Highway (State Highway 6) - Current Traffic Volumes

Table 4 above notes and AADT of 5373 vehicles per day on State Highway 6. This value was taken for NZTA count site 970, before Gibbston Back Rd, which is located approximately 3km west of the Victoria Flats Road intersection. There is no significant land use activity between the Victoria Flats Road intersection and the Site 970 count location and a such this count station is considered to provide an accurate portrayal of traffic volumes on State Highway 6 at the Victoria Flats Road intersection.

For further reference, the next closest count station on State Highway 6 is Site 947 with an AADT of 5342 vehicles per day. This count station location is just west of the SH6 intersection with Ripponvale Rd and Pearson Road (west of Cromwell). There is limited land use activity between the Victoria Flats Road intersection and the Site 947 count location and a such this count station is also considered to provide a strong indication of traffic volumes on State Highway 6 and the Victoria Flats Road intersection.

It is not clear from the NZTA count data what time of year the specified AADT count values were taken from. This is an issue with State Highway 6 given the significant seasonal fluctuations unique to this wider locality. To determine the effect of seasonal traffic flow variations, the NZTA has provided the hourly traffic count data for the two count sites for the July 2018 to June 2019 period. This has been analysed to determine a suitable design volume for the State Highway. The Site 947 data (Cromwell) has been provided for the entire 12-month period, however the Site 970 data (Gibbston) is only for a part year. However, Figure 3 above shows near identical AADT values such that the Site 947 data (Cromwell) should provide an accurate representation of a full year for Site 970 (Gibbston). The annual traffic flow profile based on available data for both count sites is presented in Figure 3 below:

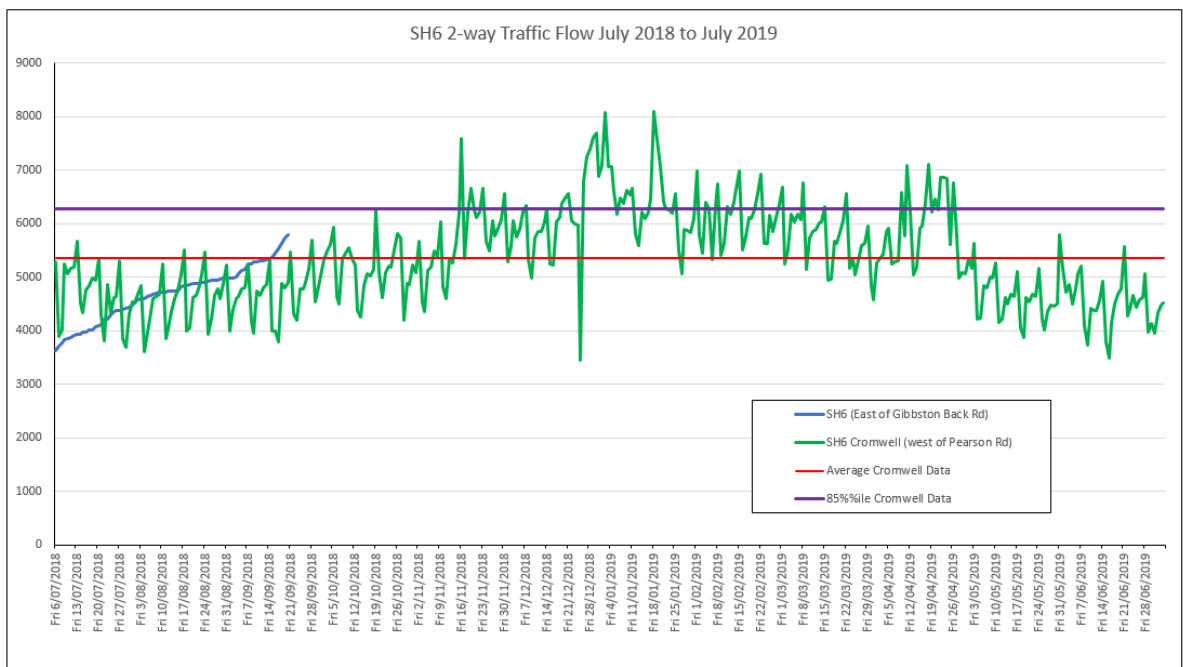


Figure 3: Annual traffic flow pattern on State Highway 6 between Cromwell and Gibbston – 2018 - 2019.

The part year data for Site 970 data (Gibbston) is shown as the blue line on the left-hand side of the graph. The full year data for Site 947 (Cromwell) is the green line. The calculated AADT is shown as the red line and this calculated value matches the NZTA specified AADT value of 5373vpd.

A comparison of the red and green lines shows that the actual traffic volume on State Highway 6 in the vicinity of the Victoria Flats Road intersection is well above the AADT for a significant portion of the year. For the purpose of this assessment the calculated 85%ile AADT of 6,300vpd (the purple line in Figure 3) for Site 947 (Cromwell) is also assumed to occur at Site 970 (Gibbston). This equates to the quoted AADT plus 17.5% and this level of traffic occurs during summer either side of Christmas.

In relation to data available from both count stations, both the blue line and the green line in Figure 3 cross the red line in early September 2018. Therefore, this week has been selected to estimate typical State Highway 6 traffic flows at the Victoria Flats Road intersection through analysis of hourly traffic flows. The hourly directional traffic flows for both count locations were able to be provided by the NZTA and this data has been summarised into the traffic flow profiles presented in Figure 4 below:

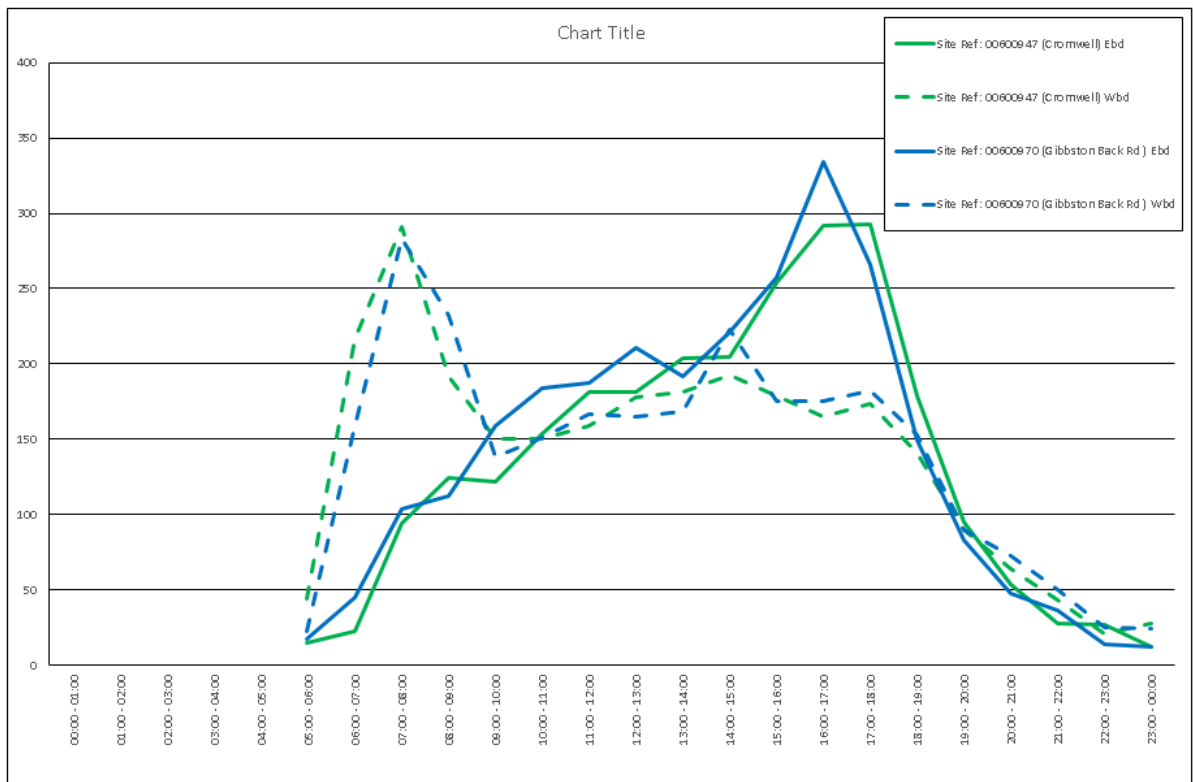


Figure 4: Annual traffic flow pattern on State Highway 6 between Cromwell and Gibbston – 2018 - 2019.

The data for Site 970 data (Gibbston) is shown as the blue lines. The data for Site 947 (Cromwell) is the green lines. Again, there is a very strong correlation between the traffic volumes counted at the two sites. The counted volumes for the AM peak hour period hour were 104vph eastbound and 283vph westbound. The counted volumes for the PM peak hour period hour were 266vph eastbound and 182vph westbound.

To reflect a suitable 2018 design flow, the recorded ‘average’ traffic volumes for Site 970 (Gibbston) from early September 2018 have been increased by 17.5% to provide an approximation of hourly volumes for the 85%ile design month. The estimated ‘summer’ volumes for the AM peak hour period hour are 122vph eastbound and 333vph westbound. The estimated ‘summer’ volumes for the PM peak hour period hour are 313vph eastbound and 214vph westbound.

3.7 Gibbston Highway (State Highway 6) - Traffic Growth

Further research of the traffic count data for both count stations confirms that there is been strong traffic growth on State Highway 6 in this location since 2009, and particularly so since 2014. This is shown in Figure 5 below. The near identical traffic flow profiles for both count locations further confirms the relative lack of significant land use activity along State Highway 6 between the two count sites.

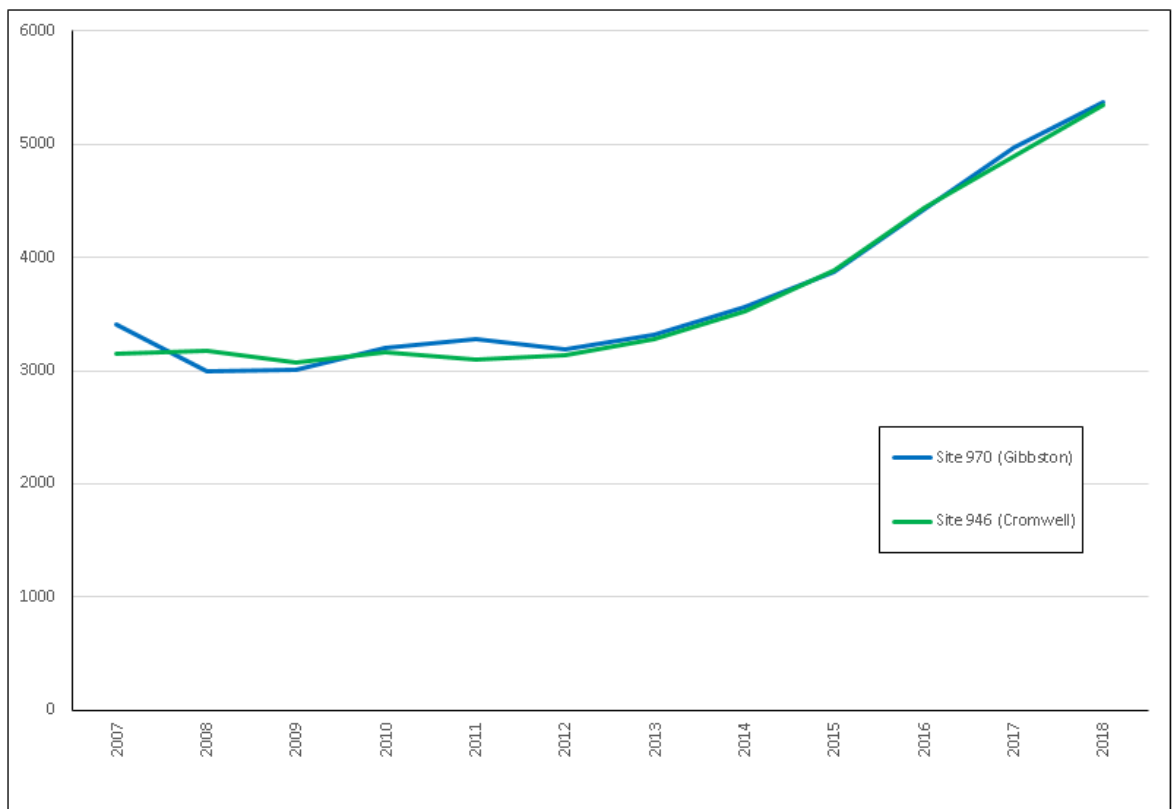


Figure 5: Measured traffic growth on State Highway 6 between Cromwell and Gibbston – 2009 - 2018.

Figure 5 shows a sharp increase in the traffic growth rate between 2012 and 2018. As noted earlier, this analysis will be based on a summer month and for a design year of 2028. It is not considered realistic that the more recent growth rate will continue for the next ten years. Instead consideration has been given to projections of recorded traffic growth on an annual compounding rate of +4.23% and extrapolation of a linear trend line as shown in Figure 6 below:

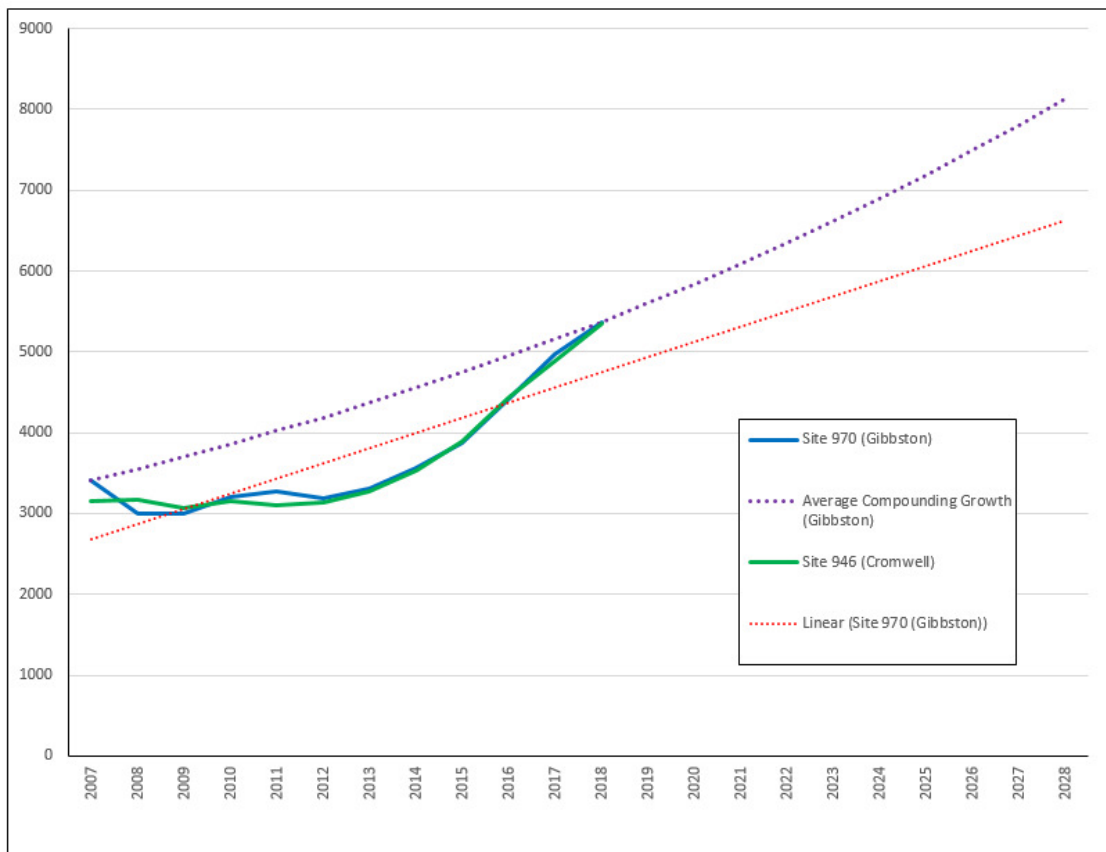


Figure 6: Extrapolation of measured traffic growth on State Highway 6 between Cromwell and Gibbston – 2009 - 2028.

Using these two projection methodologies provides an estimated 2028 AADT volume of 6700vpd to 8100vpd. Adopting the average of 7400vpd provides a predicted growth of +37.7% between 2018 and 2028. Applying this increase to the estimated ‘summer 2018’ volumes from earlier provides estimated ‘summer 2028’ volumes for the AM peak hour period hour of 168vph eastbound and 459vph westbound. The estimated ‘summer 2028’ volumes for the PM peak hour period hour are 431vph eastbound and 295vph westbound.

The preceding traffic volume projection methodology is summarised in Table 5 on the next page. When viewing the data in Table 5 it is interesting to note the tidal flow bias being predominantly westbound in the AM peak period and being predominantly eastbound in the AM peak period. This is considered to reflect commuter traffic travelling between Cromwell and Queenstown. Any proposed residential accommodation on the subject site could attract some of this traffic to instead having origins and destinations within the site although no allowance for this is made in this analysis.

	AM Peak Period		AM Peak Period	
	Eastbound	Westbound	Eastbound	Westbound
September 2018 Volume (=AADT)	104vph	283vph	266vph	182vph
Adjust to 2018 Summer Volume (+17.5% =85%ile design volume)	122vph	338vph	313vph	214vph
Adjust to 2028 Summer Volume (+37.7%)	168vph	459vph	431vph	295vph

Table 5: Estimated 2028 design month peak hour traffic volumes.

3.8 Estimated Summer 2028 Volumes for the Victoria Flats Road / Gibbston Highway Intersection

It was noted earlier that Victoria Flats Road is estimated to carry around 13vph in the peak hour periods (being 10% of the estimated AADT). If it is assumed that this traffic volume is split directional based on an 80%/20% flow bias in the peak hour periods, and with an assumed 75% Queenstown origin/destination and 25% Cromwell origin/destination¹, then the following estimated intersection peak hour volumes can be calculated:

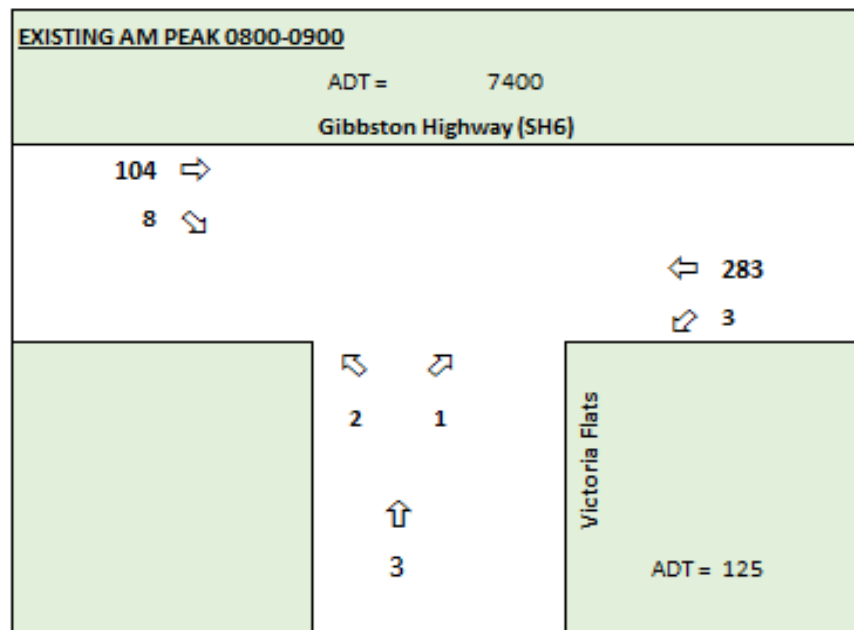


Figure 6: Estimated year 2028 summer design month weekday peak hour traffic volumes at the Victoria Flats Road intersection with State Highway 6.

¹This split is based on the relative populations of Cromwell and Queenstown being 5180 and 15850 persons respectively

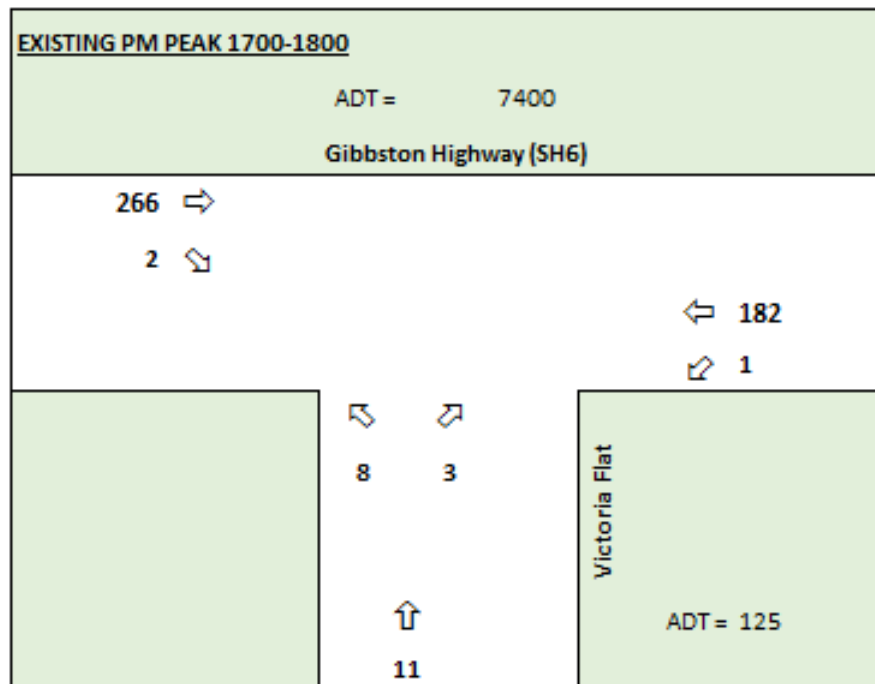


Figure 7: Estimated year 2028 summer design month weekday peak hour traffic volumes at the Victoria Flats Road intersection with State Highway 6.

3.9 Victoria Flats Road / Gibbston Highway Intersection Sight Distances

The sight distances at the intersection of Victoria Flats Road and Gibbston Valley Highway are in excess of 300m in either direction given the straight alignment of Gibbston Valley Highway. This is shown in Figures 8 and 9 on the next page.

Figure 9 also shows that there are two westbound traffic lanes on the State Highway 6 approach to the Victoria Flats Road intersection. This is the end of the uphill passing lane that commences after the Victoria bridge to the east of the site. The westbound merge point commences at the intersection and, although not shown in Figure 8, the NZTA has recently installed the usual wide shoulder markings to allow for late overtaking manoeuvres along the westbound road shoulder to the west of the intersection.



Figure 8: Sight Distance looking west along State Highway 6 from the Victoria Flats Road intersection.



Figure 9: Sight Distance looking east along State Highway 6 from the Victoria Flats Road intersection.

3.10 Road Safety

A search of the NZTA CAS database was conducted for the length of Victoria Flats Road fronting the application site and the intersection with Gibbston Highway for the most recent 5-year period (2014-2018) and all data currently available for 2019. On Victoria Flats Road no crashes were recorded, and at the Gibbston Highway intersection, two crashes were reported. These are detailed in Table 6 below:

Gibbston Highway				
Crash ID	Crash Description	Crash Factors	Conditions	Injuries
201742116 Sunday 18/06/2017 at 8:20pm	Car/Wagon1 EDB on Gibbston Highway lost control turning left, Car/Wagon1 hit fences, traffic sign, trees, ditches	CAR/WAGON1, lost control - road conditions, new driver/under instruction, ENV: road slippery due to frost or ice	Ice or Snow, Dark, Fine	Nil
201639919 Friday 3/06/2016 at 1:16pm	Van1 EDB on SH 6 hit rear end of SUV2 stopped/moving slowly	VAN1, failed to notice car slowing, stopping/stationary	Dry, Bright Sun, Fine	Nil

Table 6: CAS data base crashes recorded in the vicinity of Victoria Flats Road and the Gibbston Highway

The collision diagram in Figure 10 below illustrates the crashes described above:



Figure 10: Collision Diagram for Identified Crashes

It is noted that driver inattention or failure to control the vehicle appears to be the main cause of the most recent crashes in the area, as opposed to roading design. Overall, it is considered there are no inherent design deficiencies or existing safety issues with the roading network in the vicinity of the application site, or the operation of the intersection. However, it is noted that the location of the westbound passing lane merge point at the intersection itself is less than ideal if significant additional turn movements are anticipated at the intersection in the future.

4.0 THE PROPOSAL

4.1 General Description

The proposal includes establishing an industrial park consisting of four identified areas for industrial activities, amenity and service activities and workers accommodation as shown on the Indicative Schematic Master Plan (refer **Appendix A**). The total land area involved for these activities is 75.35 hectares and this will be developed in stages over 10+ years. The relative area of each zone and, for the purpose of this assessment, the anticipated use is summarised in Table 6 below. The table also shows how an allowance has been made for areas that will be allocated to roads, reserves, individual allotment landscaping and the like.

Zone	Anticipated use	Gross Zone Area (ha)	Allowance for roads and reserves	Developable Zone Area (m ²)	Allotment Landscape Requirement	Net Developable Zone Area (m ²)
A	High Density Workers Accommodation	1.85	20%	14800	20%	11840
	Low Density Workers Accommodation	20.4		163200		130560
B	Industrial Manufacturing	17.25		138000		110400
	Industrial Storage/warehousing	17.25		138000		110400
C	Amenity and Service Industries	1.1		8800		7040
	Office activity	1		8000		6400
D	Light Industrial	13.56		108480		86784
	Storage units	2.94		23520		18816
Total Zones B-D				424800m²		

Table 7: Proposed Rezoning Development Areas

Table 8 below shows how the Developable Zone Area has been converted to a maximum building footprint area (assuming single storey development for non-residential uses and two storey development for residential uses) through consideration of the minimum required parking to be provided for a given land use classification. The residential unit numbers have been derived from the masterplan for the high-density units, with an assumed lower density for the balance of Zone A. The number and total GFA for the storage units has been derived from the transport assessment prepared for the resource consent application for that development.

Zone	Anticipated use	Developable Zone Area (m ²)	Parking Requirement per 100m ² GFA	Area per parking space (m ²)	Land required per 100m ² GFA	Maximum single level GFA (m ²)
A	High Density Workers Accommodation	11840	98 units			
	Low Density Workers Accommodation	130560	270 units			
B	Industrial Manufacturing	110400	2	40	180	61333
	Industrial Storage/warehousing	110400	1	40	140	78857
C	Amenity and Service Industries	7040	4	40	260	2708
	Office activity	6400	1	40	140	4571
D	Light Industrial	86784	1	40	140	61989
	Storage units	18816	784 units			24717
Total Zones B-D						234176m²

Table 8: Calculated Maximum Building Areas

In relation to the non-residential activities located in Zones B-D the total developable zone area of 424800m² has 234176m² or a total allotment site coverage of 55%. This level of site coverage is considered realistic for a development of this nature.

4.2 Estimated Traffic Generation

Noting the above anticipated land uses, the estimated weekday peak hour traffic generation (assuming AM and PM peak hour generation is the same) of the overall proposal has been estimated through reference to the following published traffic generation rates:

- RR453 rates for the residential units (outer suburban unit rate of 0.9 peak hour trips per unit);
- RTA Guide rate of 1.0 trips per 100m² for industrial factories and light industrial activities;

- RTA Guide rate of 0.5 trips per 100m² for industrial warehousing;
- An arbitrary rate of 10 trips per 100m² for the amenity and service industries (noting that the small land area involved means that this rate is not sensitive to the overall analysis)
- A storage unit generation rate of 8.33 trips per 100 units per day adopted from data in the Australasian Self Storage Almanac 2001

Noting the range of activities proposed within the four zones, and in particular the provision of amenity and service industries and workers accommodation, it is considered that there is potential for trip internalisation within the site. For the purpose of this assessment an 20% trip internalisation rate has been assumed for the weekday peak hour periods. On this basis the weekday peak hour external trip generation based on maximum development of the four zone areas, can be estimated as follows:

Zone	Anticipated use	Maximum single level GFA (m ²)	Peak hour Generation rate per unit or per 100m ²	Estimated peak Hour Generation	Trips Internalised	External Trips (vph)	
A	High Density Workers Accommodation	98 units	0.9	88	20%	70	
	Low Density Workers Accommodation	270 units	0.9	243		194	
B	Industrial Manufacturing	61333	1	613		490	
	Industrial Storage/warehousing	78857	0.5	394		315	
C	Amenity and Service Industries	2708	10	271		217	
	Office activity	4571	2.5	114		91	
D	Light Industrial	61989	1	620		496	
	Storage units	24717	0.0833	65		52	
Total Zones B-D							1926

Table 9: Estimated Weekday Peak Hour Trips generation from Zones A-D

4.3 Estimated Traffic Distribution

For the purpose of this assessment it is assumed that the site generated traffic volume is split directionally based on an 75%/25% flow bias in the peak hour periods, and with an assumed 75% Queenstown origin/destination and 25% Cromwell origin/destination (again based on comparative population sizes), then the following estimated intersection peak hour volumes can be calculated:

Zone	Anticipated use	External Trips (vph)	AM Peak Period			
			Right Turn Entry	Left Turn Entry	Right Turn Exit	Left Turn Exit
A	High Density Workers Accom	70	40	13	4	13
	Low Density Workers Accom	194	110	36	12	37
B	Industrial Manufacturing	490	277	91	30	92
	Industrial Storage and warehousing	315	178	58	19	59
C	Amenity and Service Industries	217	123	40	13	41
	Office activity	91	52	17	6	17
D	Light Industrial	496	280	92	31	93
	Storage units	52	29	10	3	10
Total Zones B-D		1926	1089	357	118	362

Table 10: Estimated Weekday AM Peak Hour Trips generation from Zones A-D

Zone	Anticipated use	External Trips (vph)	PM Peak Period			
			Right Turn Entry	Left Turn Entry	Right Turn Exit	Left Turn Exit
A	High Density Workers Accom	70	13	4	13	40
	Low Density Workers Accom	194	37	12	36	110
B	Industrial Manufacturing	490	92	30	91	277
	Industrial Storage/warehousing	315	59	19	58	178
C	Amenity and Service Industries	217	41	13	40	123
	Office activity	91	17	6	17	52
D	Light Industrial	496	93	31	92	280
	Storage units	52	10	3	10	29
Total Zones B-D		1926	362	118	357	1089

Table 11: Estimated Weekday PM Peak Hour Trips generation from Zones A-D

5.0 ASSESSMENT OF TRANSPORT EFFECTS

The key transportation issue with this proposal is catering for site generated traffic turning into and out of Victoria Flats Road. Noting that the proposed development will be staged over many years, and noting that the critical issue will be safely catering for right turn movements into Victoria Flats Road from State Highway 6 it is considered that there are two intersection upgrade options for consideration:

- Preliminary intersection upgrade to include the provision of a dedicated right turn and left turn lanes for entering Victoria Flats Road, and separate right and left turn lanes for exiting Victoria Flats Road (refer **Appendix B**). This initial upgrade design option has been selected to provide no impediment to through traffic flow on State Highway 6. The performance of this intersection design option will be tested at varying right turn entry traffic volumes until such time as level of service F is about to be reached for any given turn movement at which point;
- Final intersection upgrade option that provides at least a target level of service E for the worst turn movement. Noting the intersection treatments provided elsewhere along State Highway 6 for a similar situation as this proposal (i.e. a high side road volume relative to the State Highway 6 through traffic volume), it is considered that a roundabout akin to that installed at the intersection of State Highway 6 and Hawthorne Drive in Frankton is the likely most viable final upgrade option as it will provide a consistent major intersection control treatment along the State Highway 6 route in the wider vicinity of Queenstown (refer **Appendix C**). It will also have the benefit of slowing State Highway 6 through traffic speeds through what will ultimately become a significant traffic junction.

5.1 Priority Control Intersection Performance

The key design features of this intersection upgrade option include:

- Shortening the existing westbound passing lane to a minimum desirable length of 550 metres to provide the westbound merge point to the east of the Victoria Flats Road intersection rather than the existing location to the west of it. This will result in one westbound through traffic lane past the intersection which will assist with the right turn decision making process for traffic heading into Victoria Flats Road;
- Providing a 90m long westbound left turn deceleration lane between the relocated westbound merge point and Victoria Flats Road so that westbound traffic intending to turn into Victoria

Flats Road can pull to the left clear of the westbound through traffic flow along State Highway 6;

- Providing a 60m long eastbound right turn lane with a 120m long diverge taper (to provide additional storage capacity if required and to the reduce the lateral offset rate for eastbound through traffic flow) that will cater for traffic intending to turn right into Victoria Flats Road;
- Providing separate left turn and right turn exit lanes from Victoria Flats Road.

This intersection design follows standard design practice for moderate intersection turning volumes relative to major road through traffic flow volumes. The design provided in **Appendix B** confirms that this intersection layout can be accommodated entirely within the current State Highway 6 road reserve area, with only minor seal widening on the southern side of the State Highway and more notable seal widening (to cater for the right turn bay) on the northern side of the State Highway.

The performance of this intersection design has been tested using SIDRA and using the traffic volumes detailed in Tables 10 and 11 earlier for the design summer month in the design year of 2028. It is important to note that using these volumes assumes that current State Highway 6 traffic is diverted into the site. Initial analysis confirmed that the right turn into Victoria Flats Road in the AM peak period is the critical movement under a priority control layout. Sensitivity testing was then undertaken based on increasing the site generated traffic volume at 10% increments and then 5% increments using the volumes shown in Table 12 below until such time as Level of Service F was about to be reached:

Sensitivity test Scenario – Percentage of Total estimated traffic volumes	AM Peak Period External Trips				Level of Service for Right Turn into VFR
	Right Turn Entry	Left Turn Entry	Right Turn Exit	Left Turn Exit	
100% (from Table 10)	1089	357	118	362	LOS = F
20%	218	71	24	72	15.6 secs = LOS =B
30%	327	107	35	109	17.5 secs = LOS =C
40%	436	143	47	145	34.2 secs = LOS =D
45%	490	125	4	127	102.6 secs = LOS =F
50%	545	179	59	181	234.3 secs = LOS = F

Table 12: Sensitivity Testing of the Estimated Weekday AM Peak Hour Trips generation from Zones A-D

Table 12 shows that at around 40% of site development is where the right turn movement into Victoria Flats Road in the weekday AM peak period experiences a critical drop in performance where the level of service reduces from D to F. The delay and queue outputs from SIDRA are presented in Figures 11-14 below at 40% site development for both weekday peak periods:

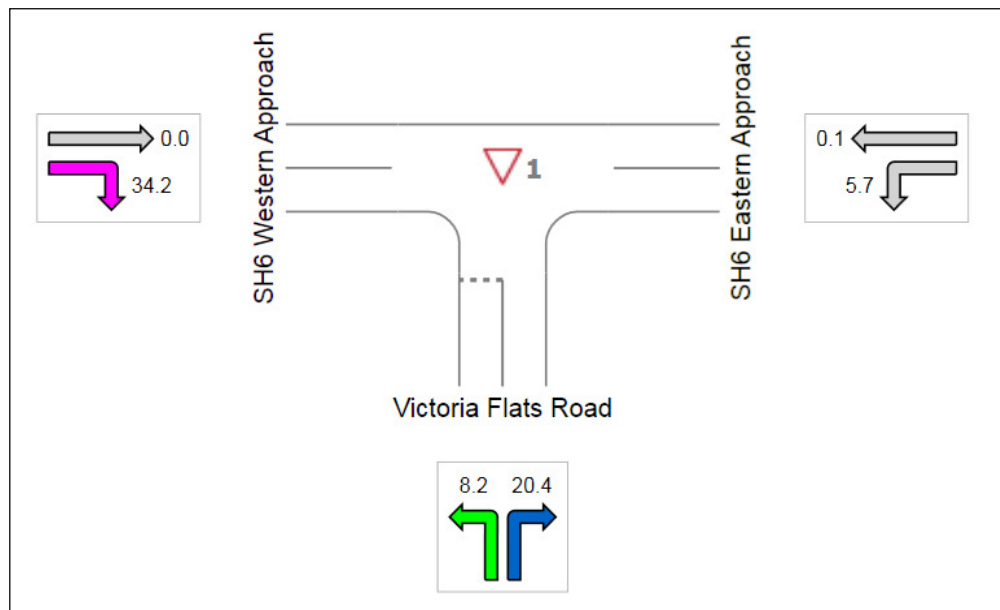


Figure 11: Calculated weekday AM peak average delays based on traffic volumes estimated to be generated by 40% of site development for the year 2028 design summer month

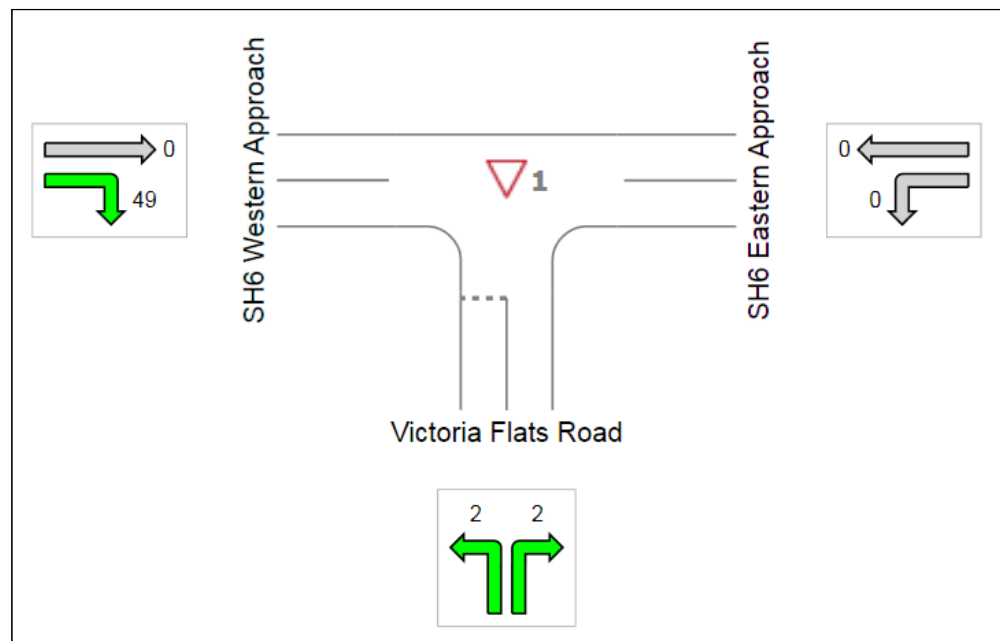


Figure 12: Calculated weekday AM peak average queue lengths based on traffic volumes estimated to be generated by 40% of site development for the year 2028 design summer month

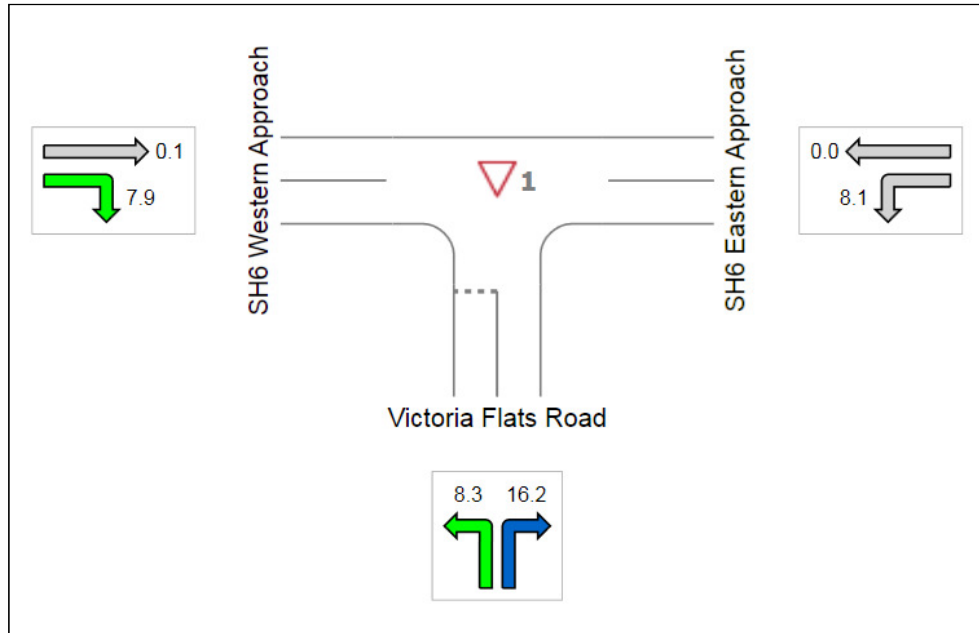


Figure 13: Calculated weekday PM peak average delays based on traffic volumes estimated to be generated by 40% of site development for the year 2028 design summer month

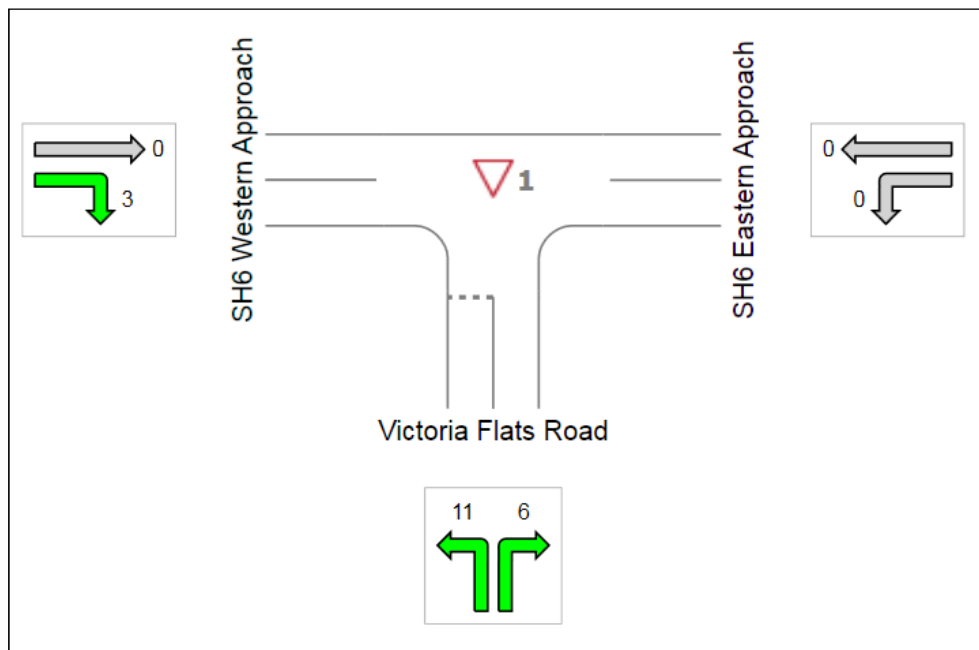


Figure 12: Calculated weekday PM peak average queue lengths based on traffic volumes estimated to be generated by 40% of site development for the year 2028 design summer month

It is therefore considered that the priority control intersection design would cater for around 40% of site development before a further intersection upgrade would need to be considered. In saying this it is critical to note that the actual generation of the site will depend upon which parts of the site are developed first and with what type of activity. Further, generic traffic generation rates have been used for this desktop analysis and instead site-specific generation rates should instead be used through monitoring of site generated traffic volumes as the initial stages of the site are developed. It may well eventuate that much more of the site can be developed before a further intersection upgrade is required.

5.2 Roundabout Control Intersection Performance

As noted earlier, it is considered that a roundabout akin to that installed at the intersection of State Highway 6 and Hawthorne Drive in Frankton is the likely most viable final upgrade option. Therefore, any roundabout design needs to be able to cater for 100% of site development traffic flows.

The traffic volumes presented for 100% site development in Tables 10 and 11 earlier have also been analysed in SIDRA using a roundabout layout based on a 30m central island diameter². Initial testing based on a single right turn lane into Victoria Flats Road showed that the expected right turn volumes in the weekday AM peak period resulted in excessive (LOS=F) delays for the westbound through traffic flow on State Highway 6 as the westbound through traffic has to give way to the traffic turning into Victoria Flats Road. This was resolved by altering the design to having two right turn lanes into Victoria Flats Road as per the Hawthorne Drive roundabout.

The indicative layout is present in **Appendix C**. The roundabouts layouts as shown are located central to the State Highway 6 road reserve however, for Victoria Flats Road, there is no reason why the roundabout cannot be offset into the subject site such that land along the northern side of State Highway 6 is unaffected.

Figures 13 – 16 on the next pages provide the key output parameters for the roundabout design as analysed in SIDRA.

² Noting that the Hawthorne Drive roundabout in Frankton has a approximately 40m central island diameter. Further, Austroads Guide to Road Design – Part 4B: Roundabouts (2011) provides details for the design of a roundabout intersection. The outline design suggests that the roundabout will need to accommodate two circulating lanes within the rural, 100km/hr operating speed. This suggests that the central island will have a minimum desirable radius of 24m with a minimum circulating carriageway width of 9m.

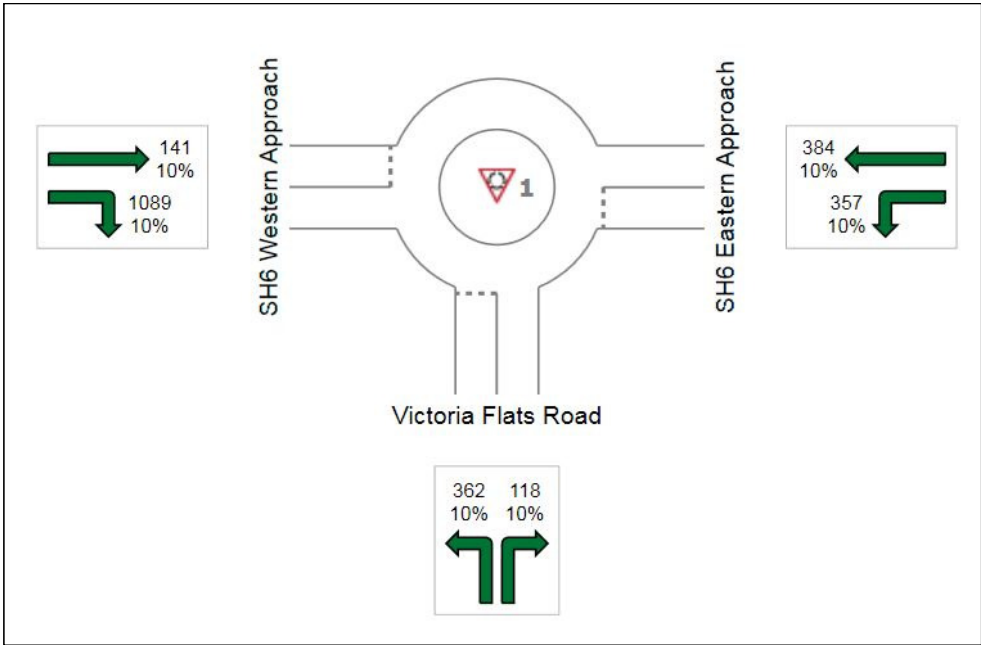


Figure 13: Calculated weekday AM peak traffic volumes estimated to be generated by 100% of site development for the year 2028 design summer month

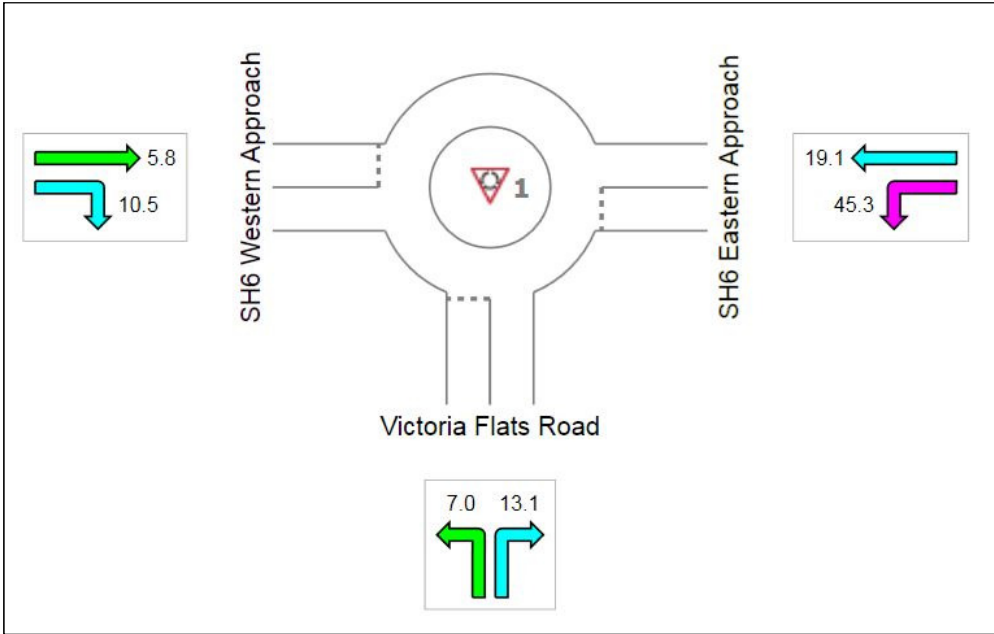


Figure 14: Calculated weekday AM peak average delays based on traffic volumes estimated to be generated by 100% of site development for the year 2028 design summer month

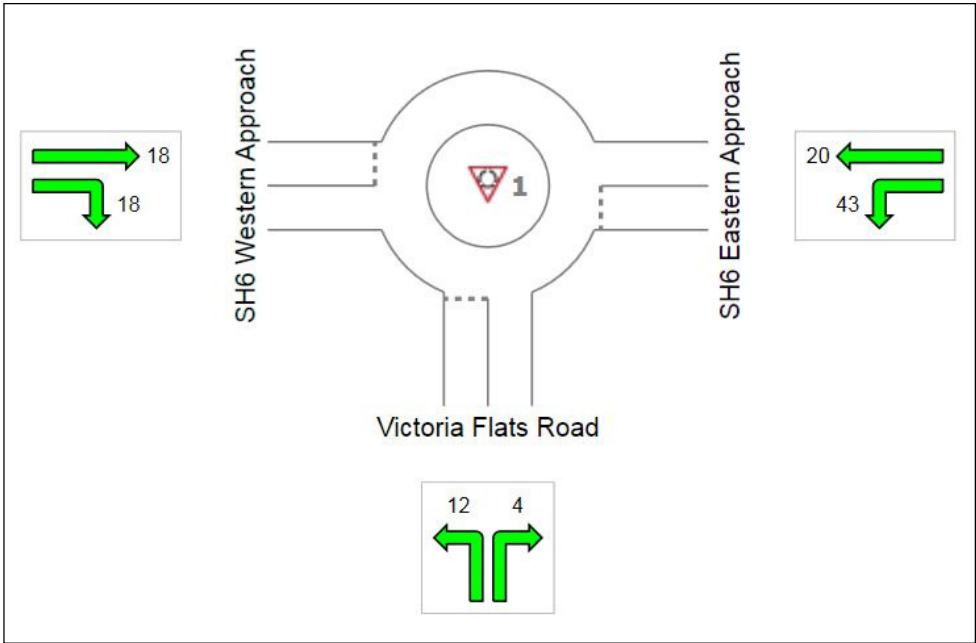


Figure 15: Calculated weekday AM peak average queue lengths based on traffic volumes estimated to be generated by 40% of site development for the year 2028 design summer month

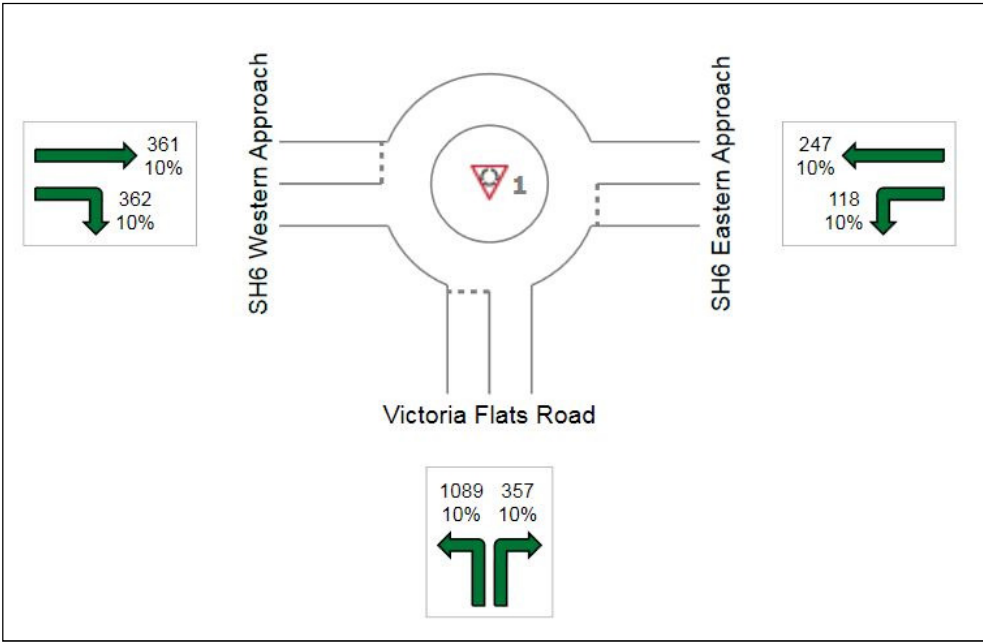


Figure 16: Calculated weekday PM peak traffic volumes estimated to be generated by 100% of site development for the year 2028 design summer month

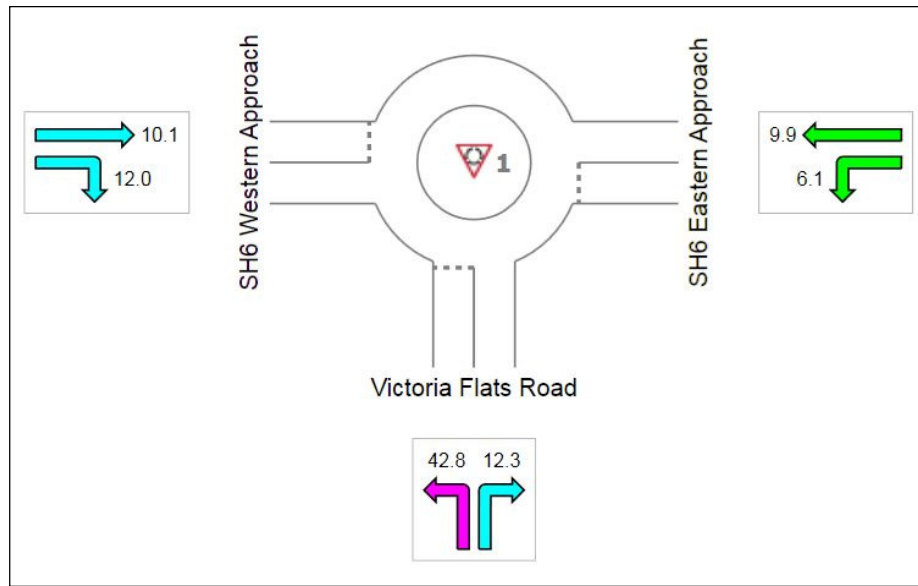


Figure 17: Calculated weekday PM peak average delays based on traffic volumes estimated to be generated by 100% of site development for the year 2028 design summer month

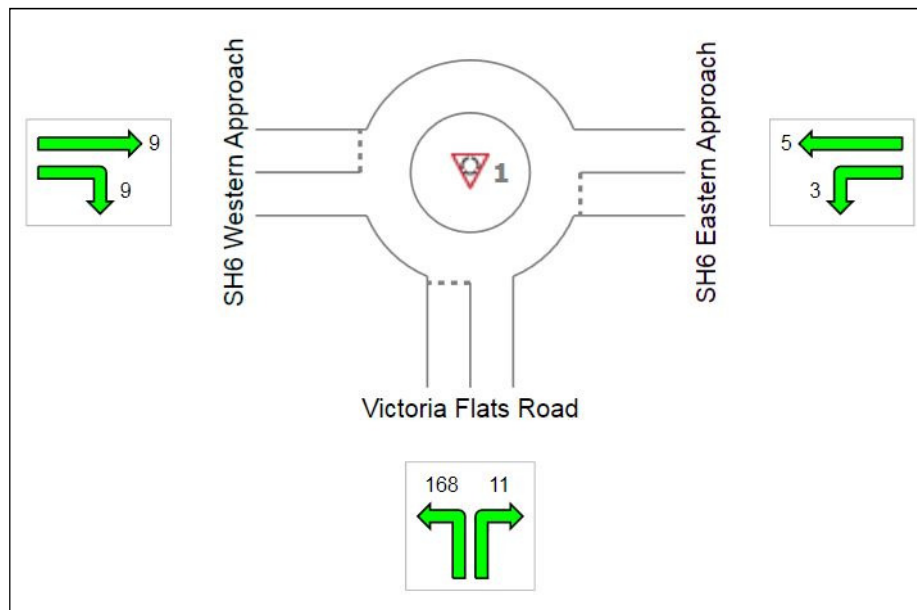


Figure 18: Calculated weekday PM peak average queue lengths based on traffic volumes estimated to be generated by 40% of site development for the year 2028 design summer month

Regarding the predicted future performance of the roundabout, there are only two turn movements where the level of service drops to D being the left turn into Victoria Flats Road in the AM peak period and the left turn out of Victoria Flats Road in the PM peak period. Overall, the analysis shows that a roundabout will provide a suitable level of service for both State Highway 6 and Victoria Flats Road traffic.

6.0 CONCLUSION

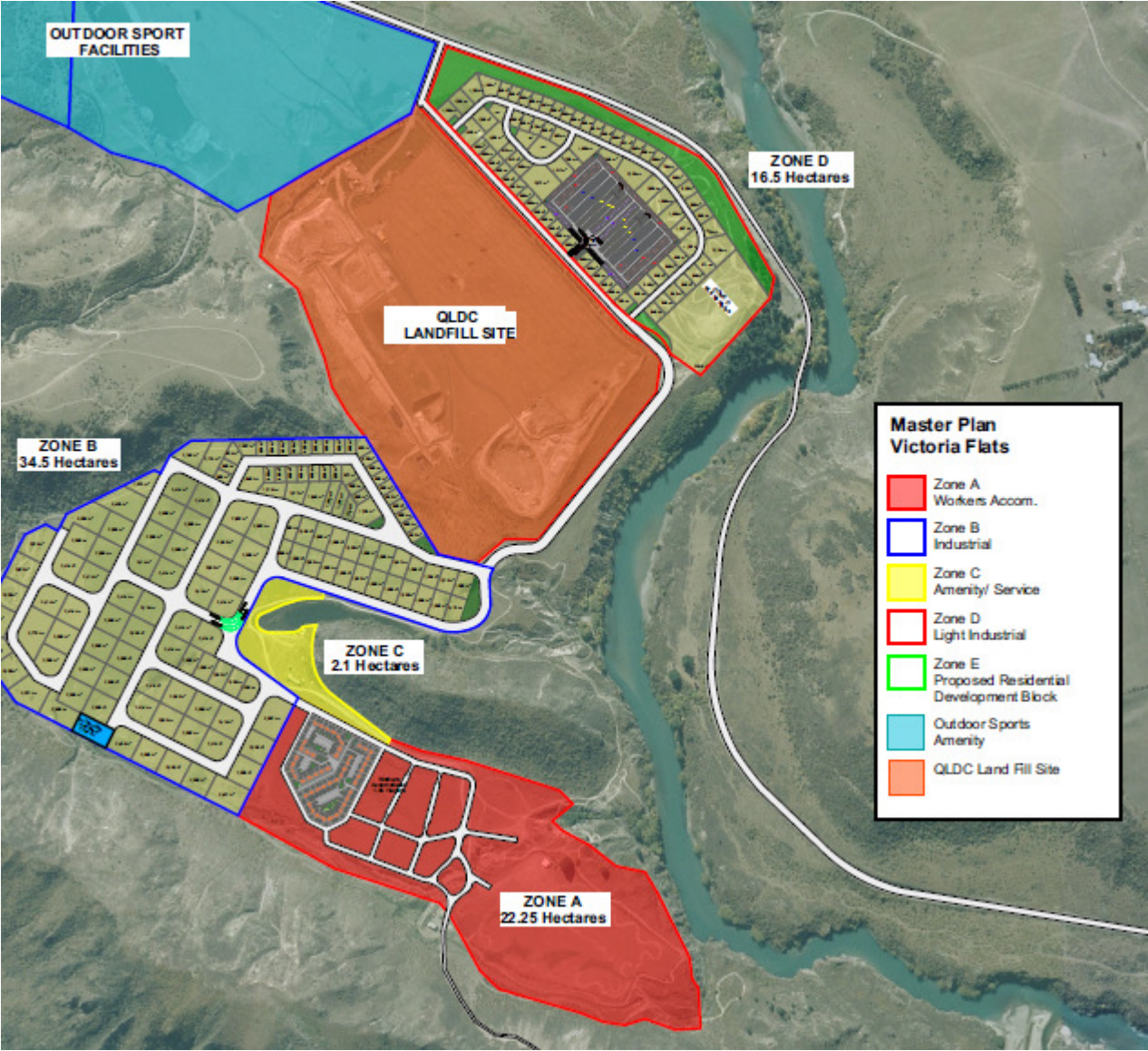
This report concludes that the Victoria Flats Road intersection with State Highway 6 will not safely cater for predicted future traffic flows in its current format. A suitable upgrade of the Victoria Flats Road intersection with State Highway 6 will be required and can be accommodated utilising standard intersection designs. It is recommended that this is initially via priority control with right turn and left turn lanes and then ultimately roundabout control.

The trigger point for changing the intersection layout from priority control to roundabout control should be based on the performance of the critical right turn movement into Victoria Flats Road in the weekday AM peak period; such that a suitable level of turn movement performance is maintained above level of service F. It is estimated that this trigger point will occur at around 40% of site development. It is also recommended that actual traffic generation from site development should be monitored as the site develops and it may eventuate that further site development could occur without the need for upgrading the intersection to the roundabout design.

These intersection designs will readily cater for anticipated future intersection approach volumes and turn movements whilst retaining a suitable level of service for through traffic flow along State Highway 6.

Overall, it is considered that any traffic related effects of the proposal are able to be suitably mitigated through the adoption of standard intersection upgrade designs such that road capacity and road safety is able to be maintained.

Appendix A: Indicative Schematic Master Plan



It should be noted that the outdoor sports facility shown in light blue on the above plan is not part of the industrial rezoning proposal.

Appendix B: Recommended Priority Control Intersection Layout

Provided as a series of separate pdf files.

Appendix C: Recommended Roundabout Control Intersection Layout

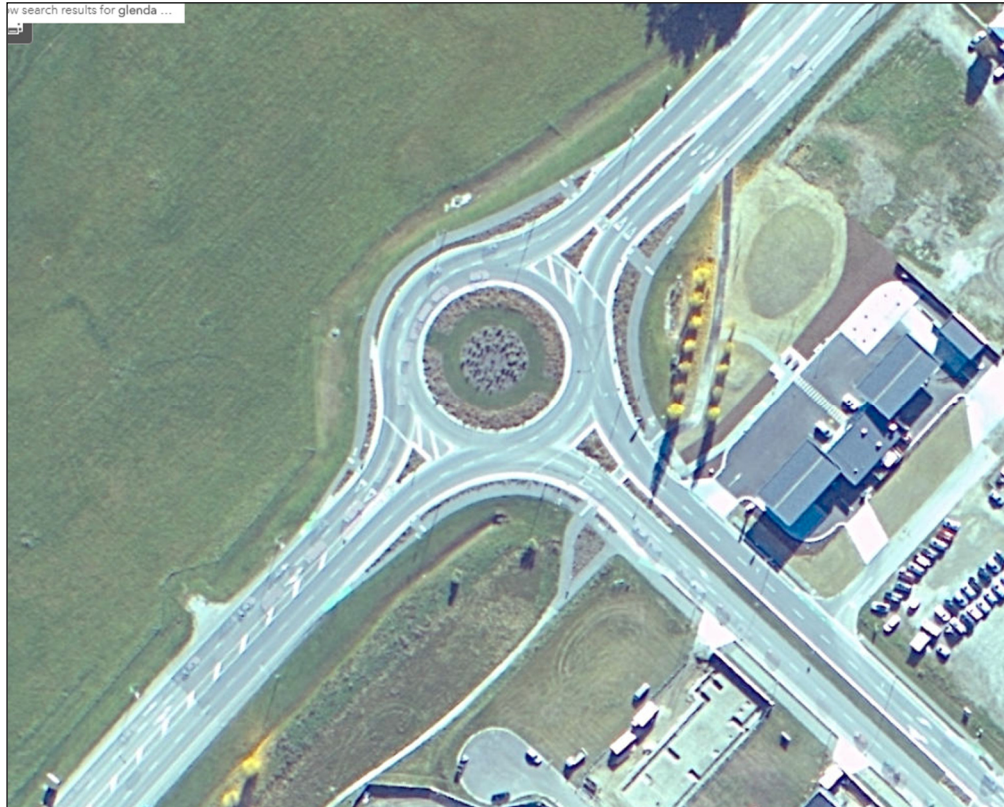


Figure C1: The existing roundabout layout at the intersection of Hawthorne Drive with State Highway 6.

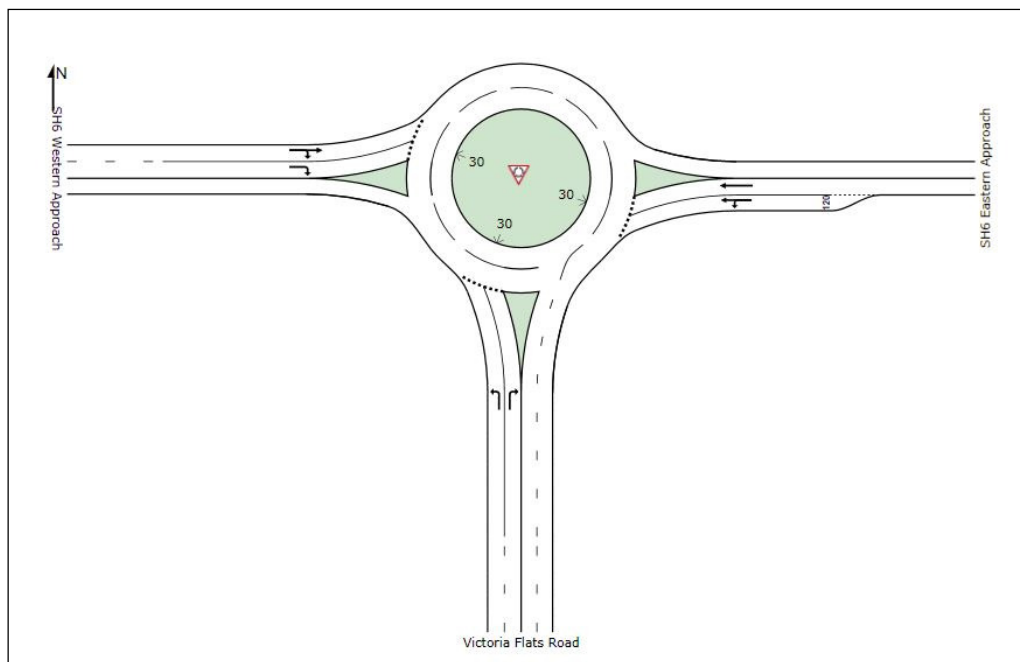
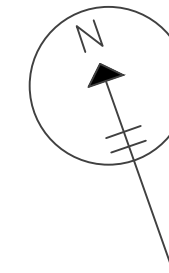


Figure C2: Indicative roundabout layout as tested in SIDRA



Rev	Date	Description
V1	07/08/2019	Gibbston Highway - Victoria Flats Road Intersection

General Notes

- Changes in the road markings are shown in red.
- All dimensions should be checked on - site.

Taper Length, $L_m = VY / 2.16$ (as per MOTSAM Part 2 Figure 3.2)

Taper length = 120.0m

RD 965

1.0m

3.5m

3.5m

Gibbston Highway - Victoria Flats Road Intersection - Priority Control Concept

Date: 07/08/2019

Drawn by: Nikita Arya

Checked by: Ray Edwards

Scale: 1:300

Sheet: 2 of 6

Job No.: 203014

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 Level 1, 30 Southwark Street,
 Christchurch 8145

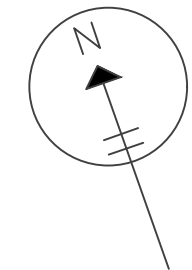


Rev	Date	Description
V1	07/08/2019	Gibbston Highway - Victoria Flats Road Intersection

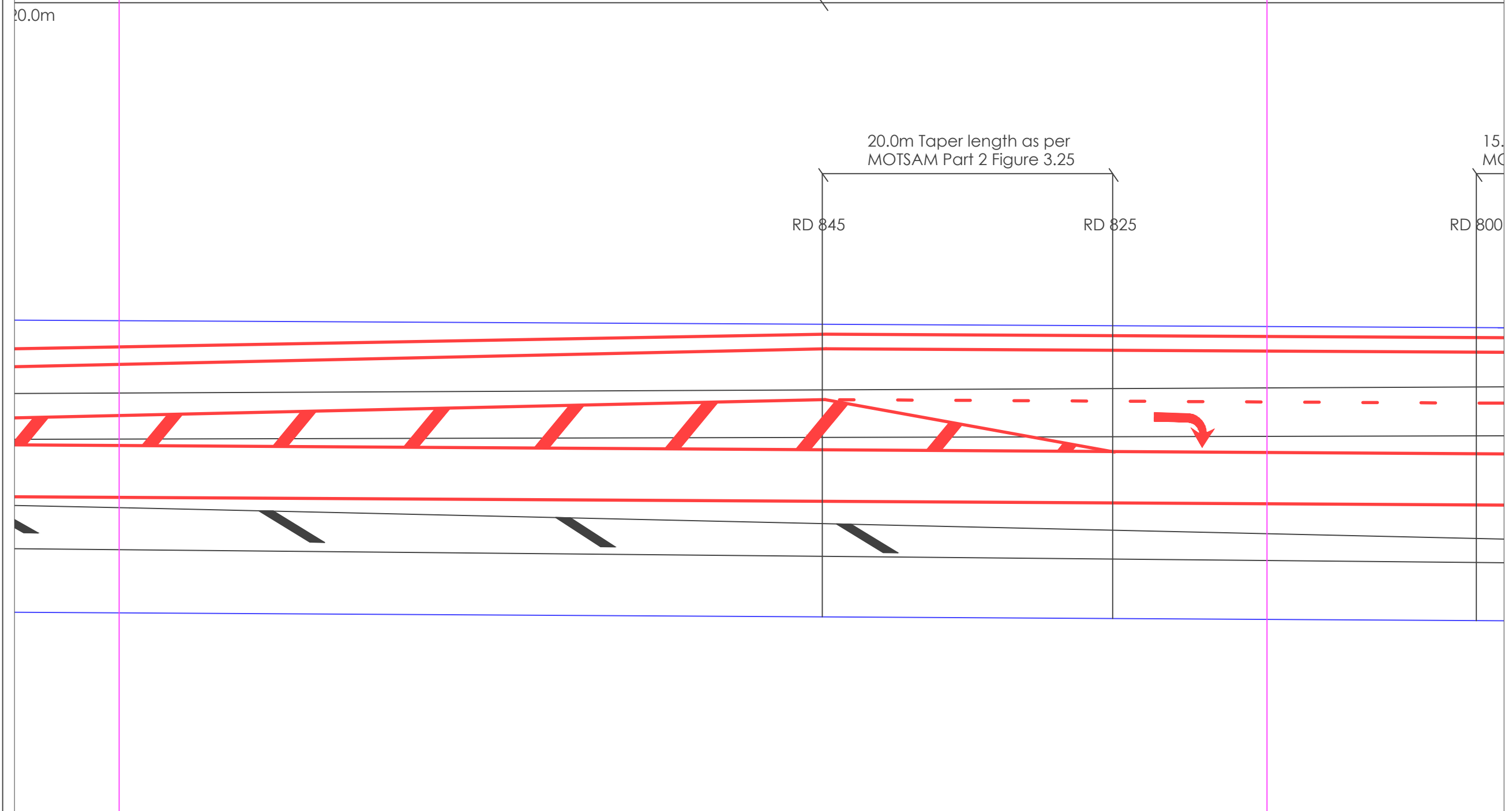
General Notes

- Changes in the road markings are shown in red.
- All dimensions should be checked on - site.

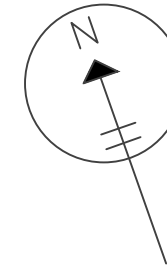
Date:	07/08/2019
Drawn by:	Nikita Arya
Checked by:	Ray Edwards
Scale:	1:300
Sheet:	3 of 6
Job No.:	203014



per MOTSAM Part 2 Figure 3.2



Gibbston Highway - Victoria Flats Road Intersection - Priority Control Concept



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Christchurch 8145

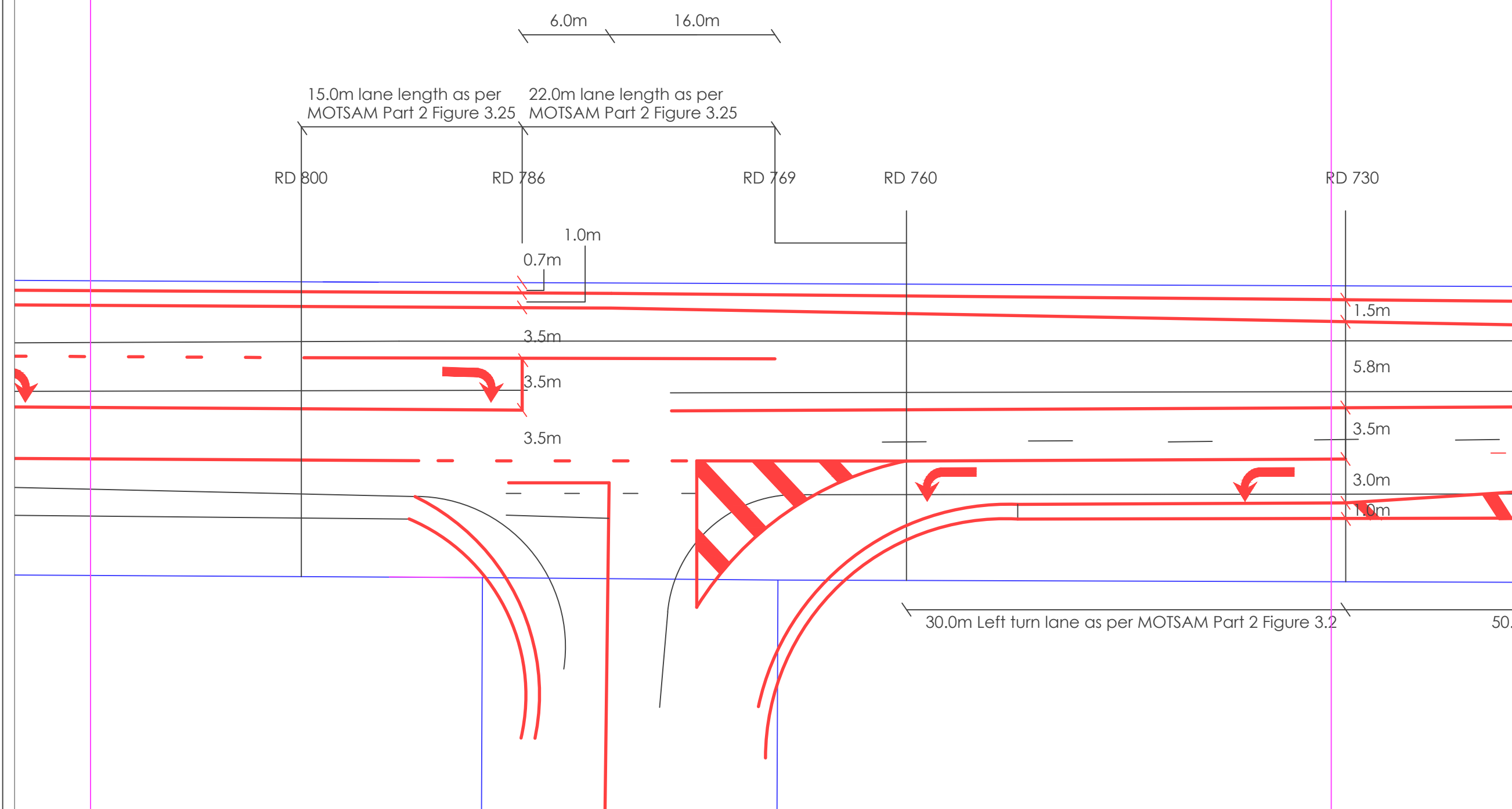


Rev	Date	Description
V1	07/08/2019	Gibbston Highway - Victoria Flats Road Intersection

General Notes

- Changes in the road markings are shown in red.
- All dimensions should be checked on - site.

Merge Length, $L_m = VY / 2.16$ (as per MOTSAM Part 2 Figure 3.25)
Merge Length = 90.0m



Gibbston Highway - Victoria Flats Road Intersection - Priority Control Concept

Date:	07/08/2019
Drawn by:	Nikita Arya
Checked by:	Ray Edwards
Scale:	1:300
Sheet:	4 of 6
Job No.:	203014

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 Christchurch 8145

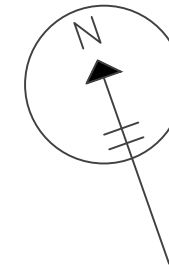


Rev	Date	Description
V1	07/08/2019	Gibbston Highway - Victoria Flats Road Intersection

General Notes

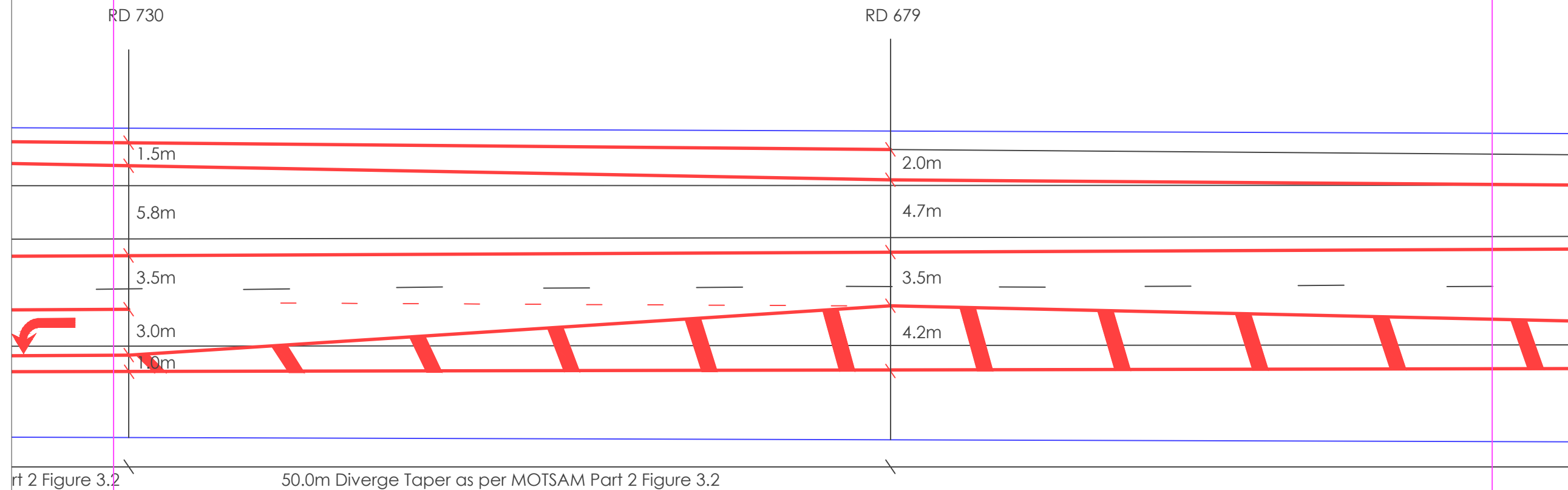
- Changes in the road markings are shown in red.
- All dimensions should be checked on - site.

Date:	07/08/2019
Drawn by:	Nikita Arya
Checked by:	Ray Edwards
Scale:	1:300
Sheet:	5 of 6
Job No.:	203014

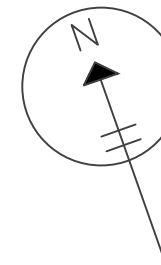


$L_m = VY / 2.16$ (as per MOTSAM Part 2 Figure 3.25)

Merge Length = 90.0m



Gibbston Highway - Victoria Flats Road Intersection - Priority Control Concept



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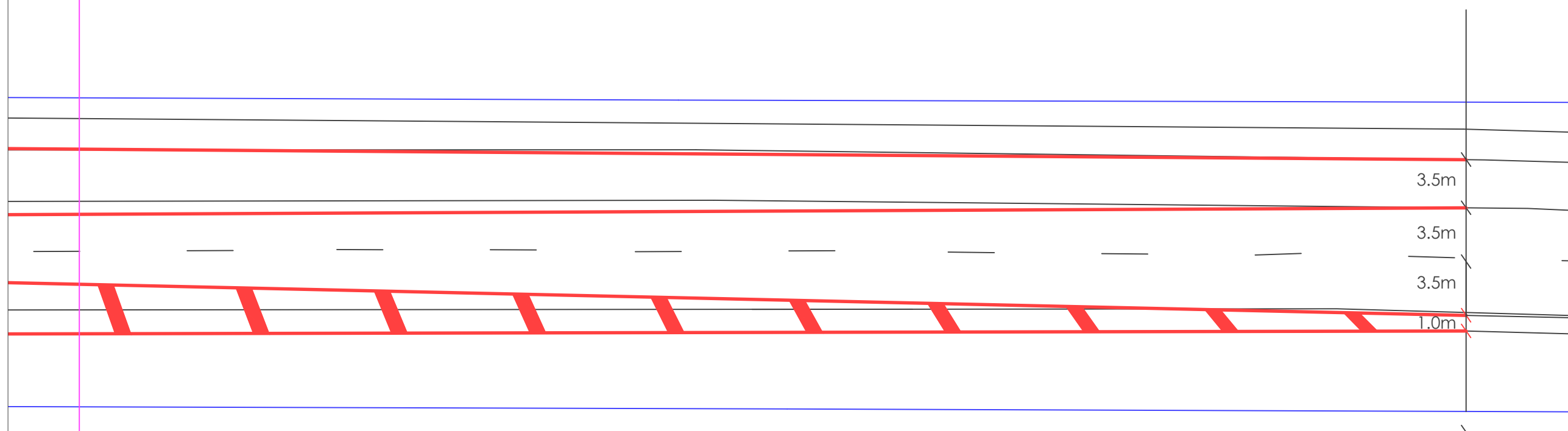


Rev	Date	Description
V1	07/08/2019	Gibbston Highway - Victoria Flats Road Intersection

General Notes

- Changes in the road markings are shown in red.
- All dimensions should be checked on - site.

RD 550m from the start of the passing



130.0m Passing Lane Merge as per MOTSAM Section 2 Figure 2.6

Gibbston Highway - Victoria Flats Road Intersection - Priority Control Concept

Date:	07/08/2019
Drawn by:	Nikita Arya
Checked by:	Ray Edwards
Scale:	1:300
Sheet:	6 of 6
Job No.:	203014

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Christchurch 8145

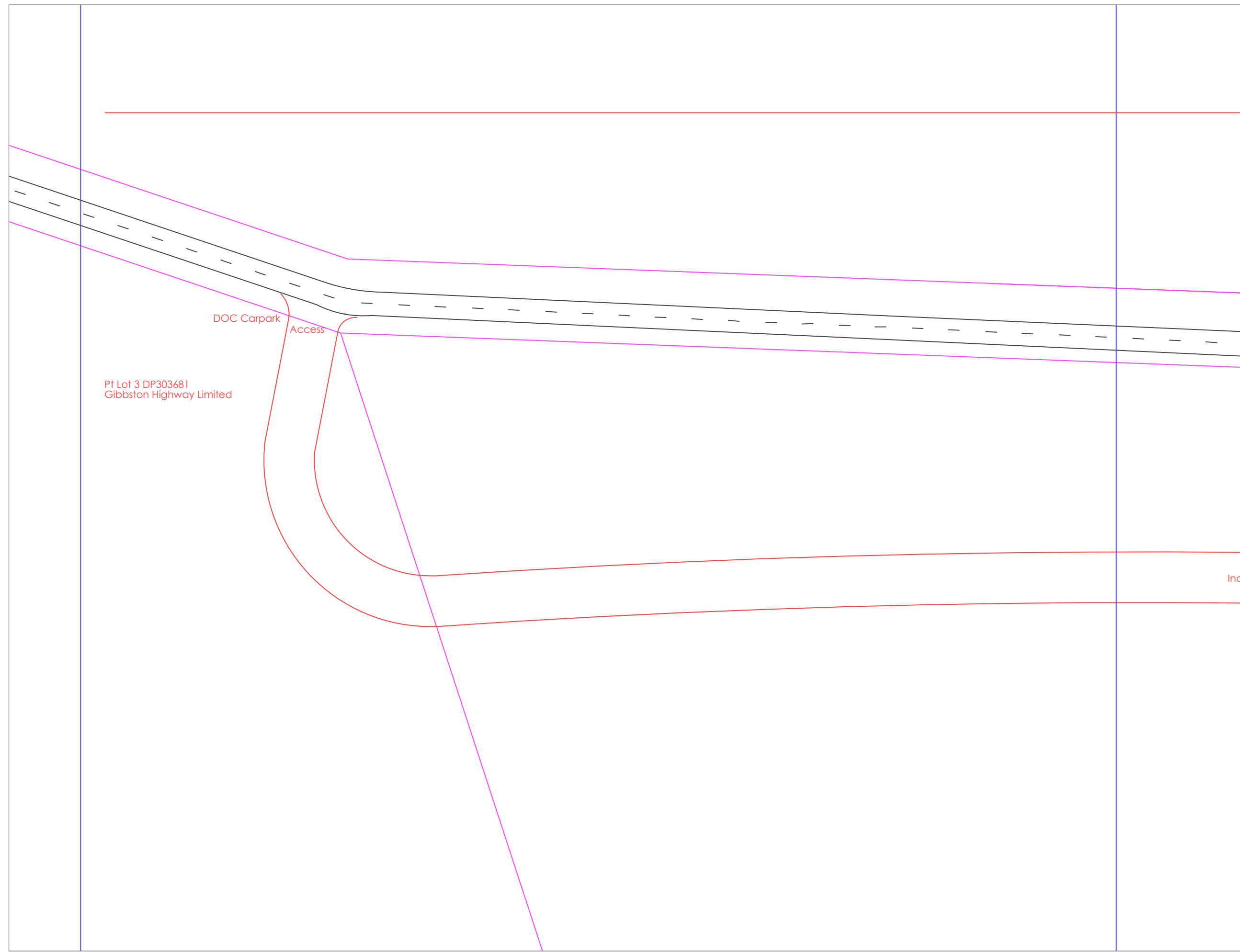


Rev	Date	Description
V1	24/03/2020	Proposed Roundabout and updated road layout

General Notes

- Sourced from:
QLDC Aerial Imagery
- All the dimensions need to be checked on site.
 - Changes in the road markings are shown in red.

Date:	24/03/2020
Drawn by:	Nikita Arya
Checked by:	Ray Edwards
Scale:	1:1000@A3
Sheet:	1 of 3
Job No.:	203015



Gibbston Highway- Proposed Roundabout and updated road layout

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 Christchurch 8145

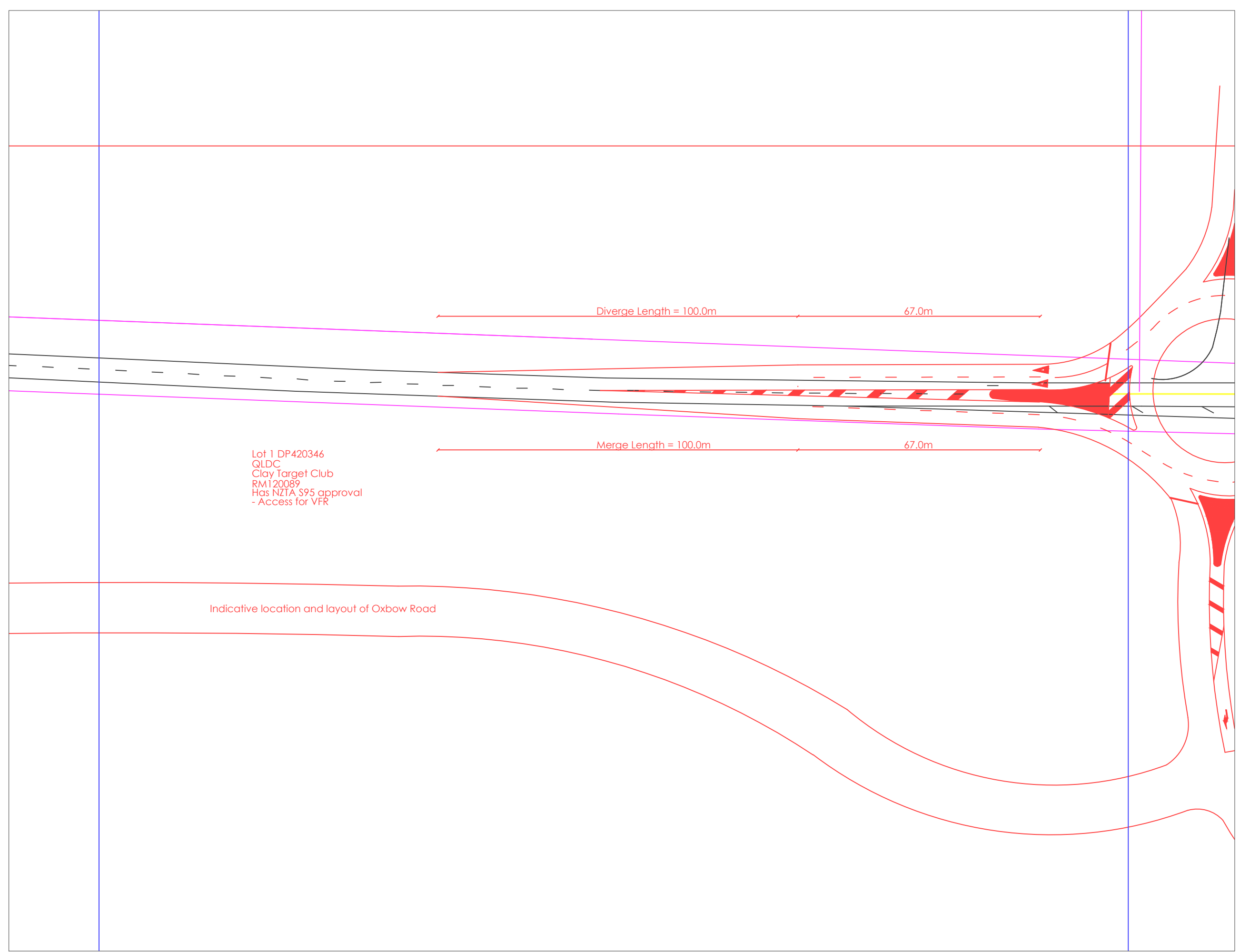


Rev	Date	Description
V1	24/03/2020	Proposed Roundabout and updated road layout

General Notes

- Sourced from:
 QLDC Aerial Imagery
- All the dimensions need to be checked on site.
 - Changes in the road markings are shown in red.

Date:	24/03/2020
Drawn by:	Nikita Arya
Checked by:	Ray Edwards
Scale:	1:1000@A3
Sheet:	2 of 3
Job No.:	203015



Gibbston Highway- Proposed Roundabout and updated road layout

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 Christchurch 8145

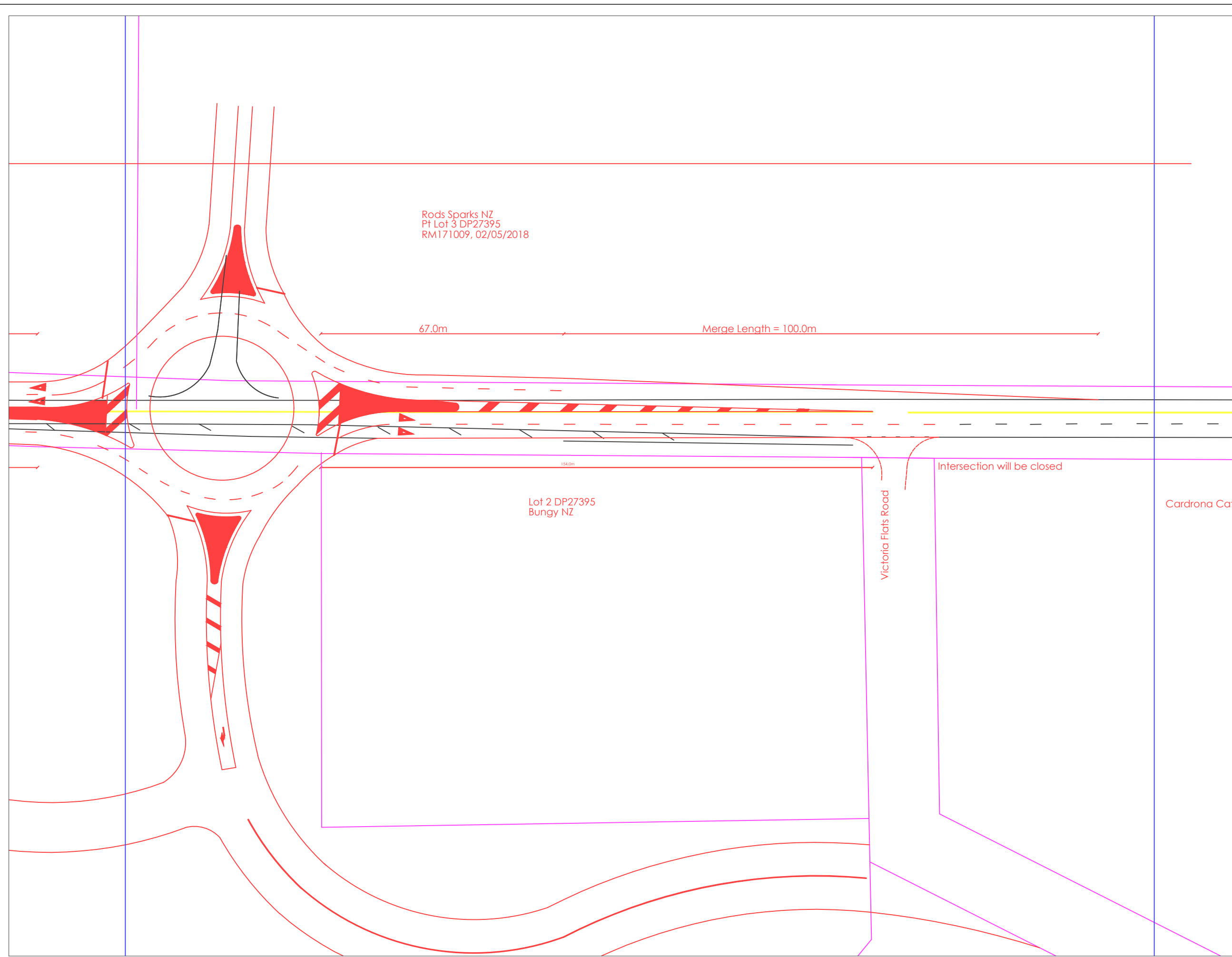


Rev	Date	Description
V1	24/03/2020	Proposed Roundabout and updated road layout

General Notes

- Sourced from:
 QLDC Aerial Imagery
- All the dimensions need to be checked on site.
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Date:	24/03/2020
Drawn by:	Nikita Arya
Checked by:	Ray Edwards
Scale:	1:1000@A3
Sheet:	3 of 3
Job No.:	203015



Gibbston Highway- Proposed Roundabout and updated road layout



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23 April 2020

Cadrona Cattle Co Ltd
c/- Ray Edwards
Urbis Traffic Planning and Development
PO Box 10318
CHRISTCHURCH 8145

Dear Ray

REQUEST FOR WAKA KOTAHI NZ TRANSPORT AGENCY COMMENT ON VICTORIA FLATS MASTER PLAN AND POTENTIAL ROADING IMPROVEMENTS

Thank you for providing the information on your client's wider proposal for Victoria Flats. The information provided included the traffic assessment conclusions for the wider development for Victoria Flats (Stage 2) and plans for an interim priority control intersection at Victoria Flats Road and SH6 as well as the potential for a roundabout should significant development occurs in the future. Information and links were also provided for the applicant's submission to the Queenstown Lakes District Proposed District Plan (Proposed Plan) for this area.

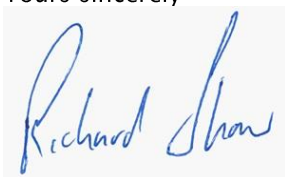
The Waka Kotahi NZ Transport Agency (the Agency) has assessed the information provided and notes there are some uncertainties and concerns around the proposal including:

- The potential scale and intensity of the proposed landuse. We note the Council Officers report for the Proposed Plan recommendation is to reject your client's and Waitiri Ltd submissions to rezone the land in this area to Gibbston Industrial. As a result, we consider the outcome of the Proposed Plan process is likely to affect the scale of the Masterplan.
- The Agency also has concerns around the scale of industrial and residential landuse presented in the Masterplan and the appropriateness of the location for these activities. Also, following on from this – concerns around what the nature of the landuses that may be attracted to this location if the Masterplan went ahead, and;
- The information provided to date does not include an assessment of how the activities represented by the Masterplan will affect the overall capacity of highway network and in particular the capacity of the Shotover Bridge.

Therefore, assessing plans for road improvements with a view to providing the Agency written approval to the Masterplan is considered premature at this point. However, we do note if the proposal goes forward and a resource consent application is prepared (or a application for a private plan change) that, subject to an assessment of effects of the proposal on the highway network capacity, an engineered solution for road improvements to mitigate the effects on the highway could be identified.

Once your client is at the point where the Masterplan can be refined further, and a resource consent application is being prepared we would be happy to revisit this proposal.

Yours sincerely

A handwritten signature in blue ink that reads "Richard Shaw". The signature is written in a cursive style with a large initial 'R'.

Richard Shaw

Team Leader - Consents and Approvals

Pursuant to authority delegated by NZ Transport Agency

CC Queenstown Lakes District Council