

TRANSPORTATION REVIEW



EXPRESSION OF INTEREST

JULY 2016

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Queenstown 9304

TDG Ref: 13958
4 July 2016

Issued via email: kristan@shotovercountry.com

Dear Kristan

**Glenpanel SHA
Howards Drive Access**

We understand that following your preliminary discussions of the Glenpanel SHA proposal with Queenstown Lakes District Council (QLDC), concerns were raised about the proposed new intersection on State Highway 6 (SH6) between the Stalker Road roundabout and Howards Drive. We understand that the development has now been revised to include the construction of a new connection to SH6 at Howards Drive. This report provides an assessment of the proposed new connection.

1. Initial Proposal

The initial concept plan for the Glenpanel SHA development included the construction of a new priority intersection on SH6 approximately mid-way between the Stalker Road roundabout and Howards Drive. The investigation of the future operating performance of the intersection is summarised in the following tables and shows the expected delays and corresponding levels of service for all vehicle movement.

Approach	Movement	Base	5% SH6 Growth	10% SH6 Growth	15% SH6 Growth	20% SH6 Growth
SH6 (West)	Through	0 (A)	0 (A)	0 (A)	0 (A)	0 (A)
	Left In	8 (A)	8 (A)	8 (A)	8 (A)	8 (A)
Development	Left Out	6 (A)	6 (A)	6 (A)	6 (A)	7 (A)
	Right Out	22 (C)	24 (C)	25 (D)	27 (D)	29 (D)
SH6 (East)	Right In	9 (A)	9 (A)	9 (A)	9 (A)	9 (A)
	Through	0 (A)	0 (A)	0 (A)	0 (A)	0 (A)

Table 1: Expected Levels of Service - Glenpanel SHA / SH6 (AM Peak)



Approach	Movement	Base	5% SH6 Growth	10% SH6 Growth	15% SH6 Growth	20% SH6 Growth
SH6 (West)	Through	0 (A)	0 (A)	0 (A)	0 (A)	0 (A)
	Left In	8 (A)	8 (A)	8 (A)	8 (A)	8 (A)
Development	Left Out	12 (B)	13 (B)	14 (B)	15 (C)	16 (C)
	Right Out	34 (D)	37 (E)	41 (E)	45 (E)	51 (F)
SH6 (East)	Right In	14 (B)	14 (B)	15 (C)	16 (C)	17 (C)
	Through	0 (A)	0 (A)	0 (A)	0 (A)	0 (A)

Table 2: Expected Levels of Service - Glenpanel SHA / SH6 (PM Peak)

Table 1 shows that the right turn movement from the subdivision is expected to be in the range 25-30s during the morning peak period which represents Level of Service D. This reflects the high volumes of traffic using SH6.

In the evening peak period, the forecast delays for the right turn movement shown in **Table 2** from the subdivision are in the range 40-50s which represents Level of Service E. Again this reflects the high volumes of traffic using SH6 at that time and is comparable to the forecast delays for right turn movements at the SH6 / Howards Drive intersection with similar levels of growth on SH6.

It is understood that both QLDC and NZTA consider that the proposed intersection did not fit well with long term development plans for the wider area and have indicated that a connection to a new four arm intersection at Howards Drive was preferred.

2. Howards Drive Connection

There is an unformed legal road on the northern side of SH6 opposite Howards Drive which has potential to provide access to the Glenpanel development and also to land to the east. Given the generally rural nature of SH6 in this area, the existing high speed limit and forecast traffic volumes, it is considered that a priority controlled cross-roads intersection would not provide an acceptable level of safety or efficiency and a roundabout or signals would be required.

For the purposes of this assessment, an investigation of the operational performance of a roundabout similar in design to the Stalker Road roundabout has been undertaken based on the traffic generation rates outlined in our initial report. The analysis results shown in **Table 3** indicate that following full development of the Bridesdale Farm subdivision, the Queenstown Country Club proposal and Glenpanel, a 40m roundabout would operate with Level of Service A even with 20% additional growth in the SH6 traffic volumes.

A signal controlled intersection would be expected to provide a similar level of service and would also provide benefits by creating an opportunity for safe pedestrian and cycle crossing facilities.



Approach	Movement	AM Peak		PM Peak	
		15% SH6 Growth	20% SH6 Growth	15% SH6 Growth	20% SH6 Growth
Howards Drive	Left	5 (A)	6 (A)	4 (A)	4 (A)
	Through	5 (A)	5 (A)	5 (A)	5 (A)
	Right	12 (B)	12 (B)	11 (B)	12 (B)
SH6 East	Left	8 (A)	9 (A)	10 (A)	10 (A)
	Through	9 (A)	9 (A)	10 (B)	10 (B)
	Right	15 (B)	15 (B)	16 (B)	16 (B)
Glenpanel	Left	5 (A)	5 (A)	7 (A)	7 (A)
	Through	5 (A)	5 (A)	7 (A)	7 (A)
	Right	11 (B)	11 (B)	12 (B)	12 (B)
SH6 West	Left	7 (A)	7 (A)	7 (A)	7 (A)
	Through	8 (A)	8 (A)	8 (A)	8 (A)
	Right	15 (B)	15 (B)	15 (B)	15 (B)
Overall		8 (A)	8 (B)	10 (A)	10 (A)

Table 3: Expected Levels of Service - Glenpanel SHA / SH6 / Howards Drive – 40m Roundabout

3. Conclusions

The investigation of the performance of the proposed new intersection on SH6 between Stalker Road and Howards Drive indicates that some movements would be subject to delays of more than 30 seconds during the morning and evening peak periods. While this level of delay is comparable to the forecast delays at the existing Howards Drive intersection following full development of Bridesdale Farm and the Queenstown Country Club proposal, QLDC and NZTA have indicated a preference for access to be provided at a new four arm intersection at Howards Drive.

Although the surrounding environment is currently rural in nature and SH6 has a speed limit of 100km/h, it is considered that the road environment will change with the various development proposals and a lower speed limit would be more appropriate. However, even with a lower speed limit, it is considered that a priority controlled cross-roads intersection would not provide an acceptable level of safety or efficiency and that a roundabout or signals will be required. If a roundabout design similar to the Stalker Road intersection was adopted, then a very high level of service would be provided completion of all proposed development in the surrounding area and with a further 20% growth in the SH6 traffic volumes. A signal controlled intersection would provide a similar level of service.

Overall, it has been concluded that the development can be supported from a transport perspective if safe and efficient access is provided via a new four arm intersection at Howards Drive.



We trust that this report is clear but would be happy to discuss any matter raised as necessary.

Yours sincerely
Traffic Design Group Ltd

A handwritten signature in purple ink that reads "C. Rossiter".

Chris Rossiter
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Glenpanel

Special Housing Area

Transportation Assessment

July 2016

Glenpanel

Special Housing Area

Transportation Assessment

Quality Assurance Statement

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Status: Final report

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1. Introduction

A Special Housing Area (SHA) to be called Glenpanel is proposed on a green-field site generally opposite the Shotover Country residential subdivision which is about 12km north of Queenstown. This report provides an assessment of the expected traffic generation, proposed access arrangements and potential traffic effects.

2. Existing Transportation Infrastructure

Figure 1 shows Glenpanel is located approximately 12km northeast of Queenstown to the north of State Highway 6 (SH6) and generally opposite the Shotover Country residential subdivision.



Figure 1: Site Location

The existing development in the area accesses the State Highway at two intersections that are about 800m apart; Howards Drive and Stalker Road. The Howards Drive / SH6 intersection is a three-way priority T intersection. The Stalker Road / SH6 intersection has been recently upgraded to a high capacity roundabout, with Lower Shotover Road forming the fourth leg.

The largest subdivision on the south is the Shotover Country Subdivision. This is anticipated to have about 800 households and a primary school to service the local area. The primary access route for the subdivision is via Stalker Road. Secondary access is provided by Jones Avenue to Howards Drive.

Lake Hayes Estate is the next largest residential area with approximately 450 households and has its primary access via Howards Drive.

The Bridesdale Farm subdivision is south of Lake Hayes Estate and is also reliant on Howards Drive for access. The subdivision will include approximately 150 households.

The Queenstown Country Club proposal involving the development of two retirement villages along with associated facilities has also been recently approved by QLDC. Based on the location of the site, it is expected that the majority of vehicle movements will use Howards Drive to access SH6.

The transportation assessment for the Queenstown Country Club concluded that, improvements to the SH6 / Howards Drive intersection will be required in the five to ten

year time frame. The improvements to the intersection will involve an extension to the right turn bay.

Ritchies operates the Connectabus public transport service which connects Queenstown, Arrowtown, Arthurs Point, Kelvin Heights and other hubs in between. The number 10 Arrowtown route and the 12 Lake Hayes route both travel down SH6. Each day, 15 buses travel eastbound on the number 10 route, and four on the number 12. Seven travel westbound on the number 10, and six on the number 12.

3. Traffic Patterns

3.1 SH6 Daily Traffic Volumes

NZTA records traffic volumes in various locations on the state highway network. The recorded traffic volume on SH6 east of Lower Shotover Road during the first week in May 2016 indicates the following:

- An average daily weekday (Monday to Thursday) traffic volume of 13,000 vehicles per day (vpd);
- A higher traffic volume on Friday of 13,600vpd; and
- Lower average weekend traffic volumes of 11,000vpd.

Traffic volumes during the peak summer holiday period are higher. Over the December 2015 to January 2016 period, there was:

- An average daily weekday (Monday to Thursday) traffic volume of 14,700vpd;
- An average traffic volume on Fridays of 15,700vpd; and
- Average weekend traffic volumes of 13,400 vpd.

3.2 SH6 Hourly Movement Patterns

Figure 2 shows the hourly traffic volume counts on SH6 for January 2015 – May 2016 (excluding holiday periods).

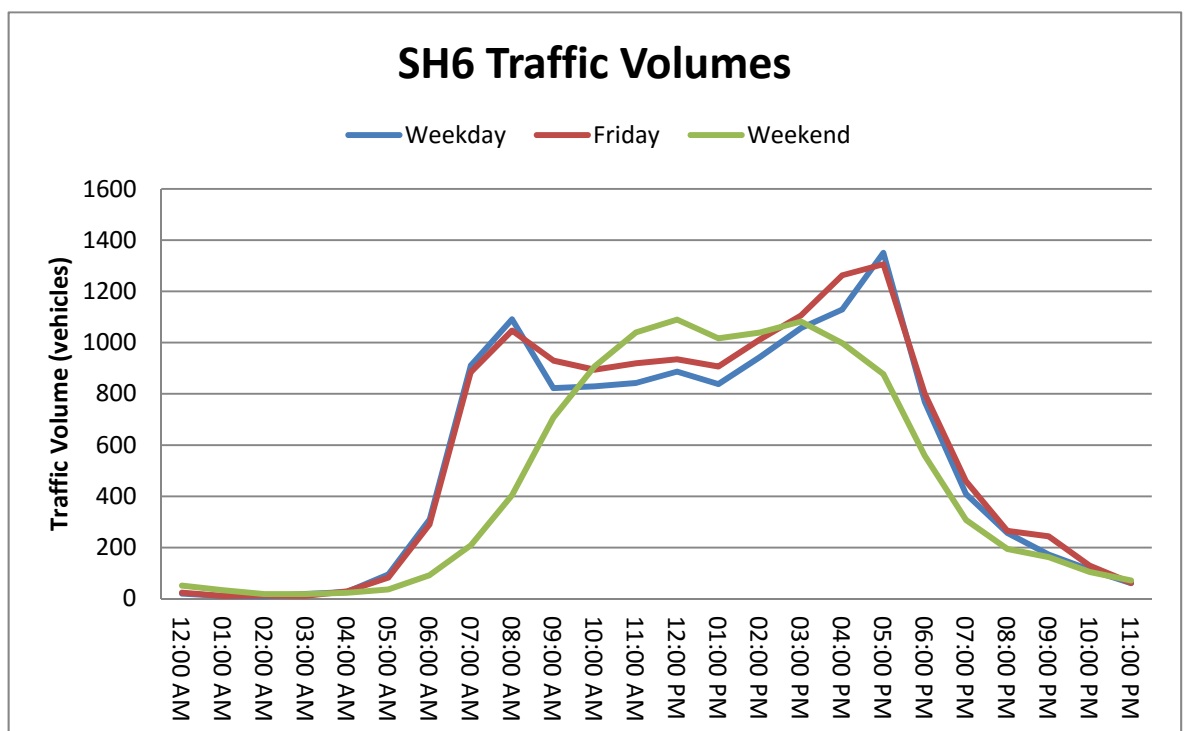


Figure 2: Hourly Traffic Volumes – SH6 east of Lower Shotover Road – January 2015 to May 2016

The main features of this traffic pattern include:

- The major daily peak for weekdays and Friday occurs between 4pm and 6pm with SH6 carrying approximately 1,350vph two-way;
- A peak hour factor for weekdays of 10% in the PM peak period;
- Smaller morning peaks between 8:00 am and 9:00am with SH6 carrying approximately 1,100vph; and
- A broad peak through the middle of the day at weekends with a two-way volume of about 1,050vph.

3.3 SH6 / Howards Drive Intersection Movement Patterns

Vehicle turning movements at the SH6 / Howards Drive intersection were observed during the evening peak hour (5:00 pm to 6:00 pm) on 24 September 2014 and the morning peak hour (8:00 am to 9:00 am) on 25 September 2014.

The observed traffic volumes at the intersection are summarised in **Table 1** below:

TRAFFIC VOLUME (vph)			
Approach	Movement	AM Peak	PM Peak
SH6 (West)	Through	236	454
	Right In	62	291
Howards Drive	Left Out	340	124
	Right Out	56	27
SH6 (East)	Left In	33	42
	Through	406	456
Total		1,133	1,394

Table 1: SH6 / Howards Drive Intersection Peak Hour Traffic Volumes (vph)

It can be seen from the table above, 80-85% of traffic exits Howards Drive by performing a left turn towards Queenstown. The table also shows that 80% of traffic is leaving the southern developments in the AM period, and 35% in the PM period.

3.4 State Highway Traffic Growth

Figure 3 shows average annual daily traffic volumes recorded by NZTA on SH6 east of Lower Shotover Road for the past 15 years. It broadly shows three periods with different growth patterns. From 2000 to 2007, average daily traffic volumes were growing at about 7% per annum. This was followed by a period of very low growth that ended about 2011. From 2012 to the present, traffic volumes have been rising again at a rate of about 3% per annum.

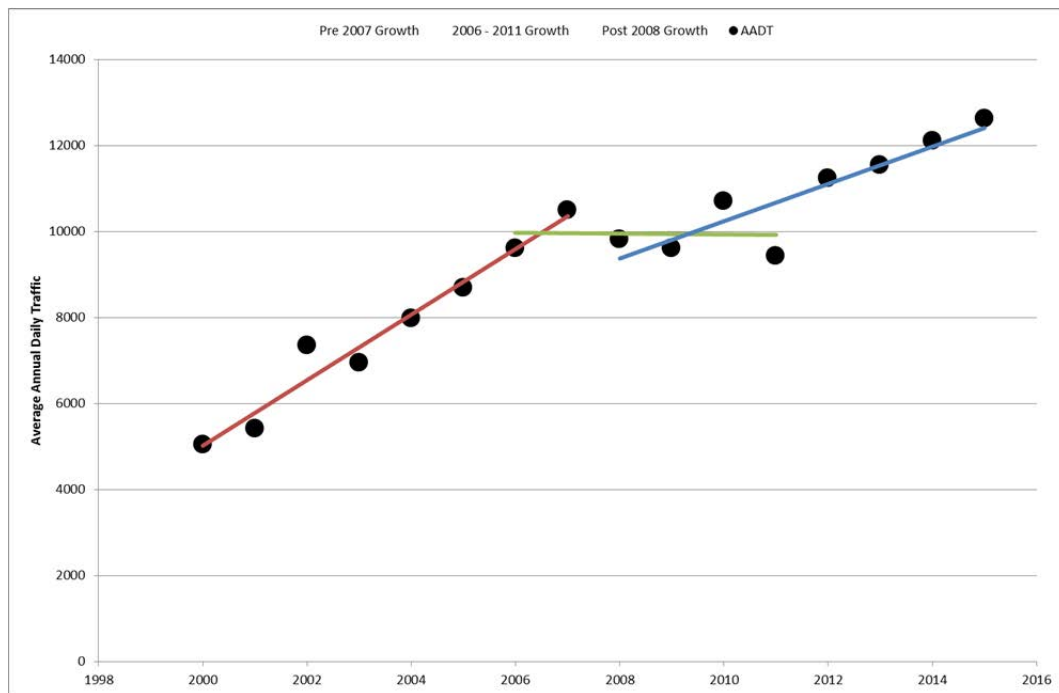


Figure 3: Average Annual Daily Traffic (AADT) on SH6

4. Proposed Development

The proposed development covers an area of about 20 hectares. For the initial stage of development, a single access is proposed approximately half way between Howards Drive and Stalker Road to minimise interaction between the three intersections on SH6. It is understood that the internal roads will be constructed to the QLDC Land Development and Subdivision Code of Practice.

Figure 4 illustrates the concept development plan and shows a mix of residential housing types. The concept plan includes 41 villas, 61 low density lots and 110 multi-unit, medium density lots earmarked for 'worker' accommodation.

The internal road network allows for future road connections to the east and west. A pedestrian connection to the Shotover Country subdivision is proposed via an underpass east of the Stalker Road roundabout.



GLENPANEL MASTERPLAN

REFERENCE 2652-SK03 - SCALE = 1500 AT A1 - 1:3000 AT A3 - 29 Jun 2016
j:\2652 - glenpanel sha\cad\ref - 2652 - masterplan 3.dwg - Glenpanel masterplan



CLARK FORTUNE McDONALD
& ASSOCIATES



5. Traffic Generation and Distribution

5.1 Expected Traffic Generation

The concept plan includes 210 residential lots that will provide for about 250 dwellings. The QLDC Engineering Code of Practice recommends that the assessment of traffic effects is based on a traffic generation rate of 8 vehicle movements per day per unit. The peak hour traffic generation rate of residential activity is typically about 10% of the daily traffic generation rate. On this basis, a peak hour traffic generation rate of 0.8 vehicle movements per hour (vph) per unit has been adopted.

Using these rates and dwelling numbers, at full development the proposal could generate about 200vph at peak times and about 2,000vpd.

5.2 Expected Distribution

The general pattern of vehicle movements at the SH6 intersection is expected to be similar to those observed at the SH6 / Howards Drive intersection because both developments are predominantly residential. On this basis, it is expected that about 85% of vehicle movements will be towards or from Queenstown.

The Howards Drive intersection survey indicates that about 80% of vehicle movements will be outbound during the morning peak hour. In the evening, the traffic movements are more balanced with 65% being inbound and 35% being outbound.

Table 2 shows the expected pattern of vehicle movements at the proposed intersection when the site is fully developed.

Approach	Movement	AM Peak	PM Peak
From Queenstown	Left into Development	34	111
From Development	Left to East	24	11
	Right to Queenstown	136	60
From SH6 East	Right into Development	6	20
Total		200	200

Table 2: Expected Peak Hour Vehicle Movements and Volumes

6. Expected Traffic Effects

6.1 State Highway

SIDRA has been used to investigate the performance of the new SH6 intersection. For the purposes of this assessment, four SH6 traffic growth scenarios have been investigated to provide some sensitivity testing of the expected growth over the next five to ten years. For each growth scenario, the full traffic generation of the development has been added on top of the state highway growth to provide a conservative basis for the assessment. This has then effect of increasing the growth rate in average daily traffic volumes east of Lower Shotover Road from 3% per annum to 4-5% per annum based on lots being developed at a rate of about 40 per year.

The traffic volumes on SH6 are already at a level where drivers typically adjust their behaviour and taking shorter gaps in the traffic flows. TDG has undertaken stop line delay surveys at many priority intersections on high volume, two lane roads to investigate this change in behaviour. Based on these surveys, it is anticipated that drivers turning right onto SH6 will adopt gaps of 4.4-4.9 seconds. For this assessment therefore, a gap acceptance of 4.9s has been adopted in the base scenario and has been gradually reduced in 4.4s in the highest growth scenario.

The expected delays and corresponding levels of service (LOS) for all vehicle movements at the new intersection are shown in **Table 3** and **Table 4** for the AM and PM periods respectively.

Approach	Movement	Base	5% SH6 Growth	10% SH6 Growth	15% SH6 Growth	20% SH6 Growth
SH6 (West)	Through	0 (A)	0 (A)	0 (A)	0 (A)	0 (A)
	Left In	8 (A)	8 (A)	8 (A)	8 (A)	8 (A)
Development	Left Out	6 (A)	6 (A)	6 (A)	6 (A)	7 (A)
	Right Out	22 (C)	24 (C)	25 (D)	27 (D)	29 (D)
SH6 (East)	Right In	9 (A)	9 (A)	9 (A)	9 (A)	9 (A)
	Through	0 (A)	0 (A)	0 (A)	0 (A)	0 (A)

Table 3: Expected Levels of Service - Glenpanel SHA / SH6 (AM Peak)

Approach	Movement	Base	5% SH6 Growth	10% SH6 Growth	15% SH6 Growth	20% SH6 Growth
SH6 (West)	Through	0 (A)	0 (A)	0 (A)	0 (A)	0 (A)
	Left In	8 (A)	8 (A)	8 (A)	8 (A)	8 (A)
Development	Left Out	12 (B)	13 (B)	14 (B)	15 (C)	16 (C)
	Right Out	34 (D)	37 (E)	41 (E)	45 (E)	51 (F)
SH6 (East)	Right In	14 (B)	14 (B)	15 (C)	16 (C)	17 (C)
	Through	0 (A)	0 (A)	0 (A)	0 (A)	0 (A)

Table 4: Expected Levels of Service - Glenpanel SHA / SH6 (PM Peak)

Table 3 shows that the right turn movement from the subdivision is expected to be in the range 25-30s during the morning peak period which represents level of service D. This reflects the high volumes of traffic using SH6. The 95 percentile queue length on the side road approach is about 15m in the highest growth scenario.

In the evening peak period, the forecast delays for the right turn movement from the subdivision are in the range 40-50s which represents level of service E. Again this reflects the high volumes of traffic using SH6 at that time and is comparable to the forecast delays for right turn movements at the SH6 / Howards Drive intersection.

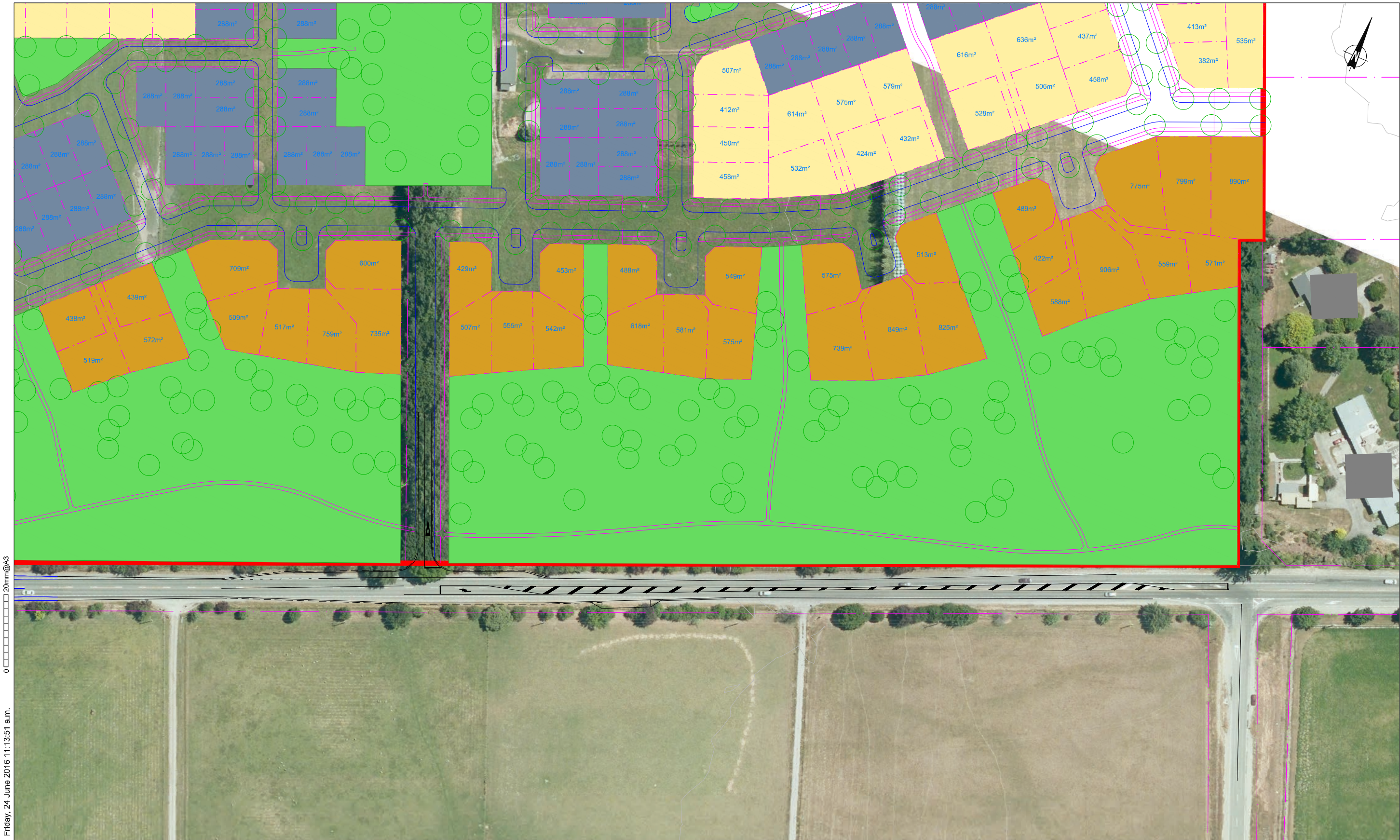
The magnitude of the forecast delays for the right turn movement will be reduced by the QLDC initiatives to increase public transport patronage because this will both reduce the growth in traffic volumes on SH6 and reduce the traffic generation rate of individual dwellings. The concept development plan also allows for future road connections to the west to Lower Shotover Road. This would result in traffic movements being distributed between the new intersection and Lower Shotover Road and will reduce the delays at the new intersection.

7. Access Design

The industry standard Austroads Guide to Road Design Part 4A provides warrants for turn treatments at unsignalised intersections. With the high volume of through traffic on SH6, the warrants for both the left and right turn treatments are met and channelized treatment is recommended for the right turn into the site along with an auxiliary treatment for the left turn in.

Figure 5 shows a concept intersection based on the following design parameters:

- 110km/h design speed on SH6;
- Deceleration distance of 185m;
- Right turn bay storage length of 20m;
- A right turn bay width of 3.5m;
- Taper lengths of 35m on SH6;
- A 10m long left turn lane exiting the site to allow left turning vehicles to avoid right turn queues up to 30m long; and
- Wide sealed shoulder areas to the east of the intersection with sufficient space for a bus to stop.



Friday, 24 June 2016 11:13:51 a.m.
0 20mm@A3

REV	DATE	DRN	CHK	DESCRIPTION
1	28/06/16	---	---	Initial Design
2	28/06/16	---	---	Revised Design
3	28/06/16	---	---	Final Design
4	28/06/16	---	---	As Built
5	28/06/16	---	---	As Built
6	28/06/16	---	---	As Built
7	28/06/16	---	---	As Built
8	28/06/16	---	---	As Built
9	28/06/16	---	---	As Built
10	28/06/16	---	---	As Built

GLENPANEL
CONCEPT DESIGN FOR SH6 INTERSECTION

DRAWN: VM	---	---
DATE: 28/06/16	STATUS: ---	
SCALE: 1:1500 @ A3		
DWG NO:13958_C1A		



8. Public Transport

Two public transport options have been investigated for the development:

- Bus stops close to the SH6 / Glenpanel intersection; and
- Bus stops close to the SH6 / Stalker Road roundabout near the underpass.

The first option provides the shortest walking distance to a bus stop for all areas of the development assuming that a bus does not travel into the development. The main concern with this option is that bus users will have to cross SH6 to board buses travelling towards Queenstown. This will be very difficult at peak times because of the high volumes of traffic.

The second option is preferred if buses do not travel into the development because the proposed underpass provides a safe route for pedestrians to cross SH6. Although this involves a longer walk from the development, all lots remain within ten minutes walking distance of the underpass. While it is desirable for all lots to be within five minutes walk, this can only be achieved by diverting an existing bus route and it is considered unlikely that this would be an option until the site is close to full development.

9. Summary and Conclusions

The Glenpanel development could generate about 2,000 vehicle movements per day at full development and about 200 vehicle movements per hour at peak times. In practice however, these are expected to represent upper limits because of the type of housing being proposed and because of the ongoing QLDC initiatives to encourage greater use of public transport.

The analysis of the new SH6 intersection taking into account the future growth in state highway volumes indicates that it will generally provide an acceptable level of service. At peak times however, there will be delays for the right turn movement from the development onto SH6 that exceed 25s and have a corresponding level of service of LOS D or LOS E.

The development proposal plans includes provision for future road connections to the east and west. When these connections are completed, the development traffic will be distributed across the wider road network which will contribute to reducing delays at the new intersection.

The pedestrian network includes a connection to a proposed underpass east of the Stalker Road roundabout. This represents the preferred location to create bus stop areas for public transport or school buses until such time that the public transport operators consider diverting a service into the site.

A concept intersection design has been developed for the subdivision that includes a right turn bay and an auxiliary left turn lane. These can be constructed by widening the existing carriageway within the road reserve and no additional land is required.

Overall, it is considered that the proposal can be supported from a transport perspective. There is some minor concern with the level of delay associated with the right turn movement from the site at the new intersection but it is considered that will be mitigated by the creation of new roads to the east and west of the site.

TDG