

BEFORE SELWYN DISTRICT COUNCIL

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of a Resource Consent Application by RC185627 and a change of Resource Consent RC192408-414 by Fulton Hogan Ltd

STATEMENT OF EVIDENCE OF ANDREW DAVID CARR

DATED 2 SEPTEMBER 2019

INTRODUCTION

Qualifications and experience

1. My full name is Andrew (Andy) David Carr.
2. I am a Chartered Professional Engineer and an International Professional Engineer (New Zealand section of the register). I hold a Masters degree in Transport Engineering and Operations and also a Masters degree in Business Administration.
3. I served on the national committee of the Resource Management Law Association between 2013-14 and 2015-17, and I am a past Chair of the Canterbury branch of the organisation. I am also a Chartered Member of Engineering New Zealand (formerly the Institution of Professional Engineers New Zealand), and an Associate Member of the New Zealand Planning Institute.
4. I have 30 years' experience in traffic engineering, over which time I have been responsible for investigating and evaluating the traffic and transportation impacts of a wide range of land use developments, both in New Zealand and the United Kingdom.
5. I am presently a director of Carriageway Consulting Ltd, a specialist traffic engineering and transport planning consultancy which I founded more than five years ago. My role primarily involves undertaking and reviewing traffic analyses for both resource consent applications and proposed plan changes for a variety of different development types, for both local authorities and private organisations. I am also a Hearings Commissioner and have acted in that role for Greater Wellington Regional Council, Ashburton District Council, Waimakariri District Council and Christchurch City Council.
6. Prior to forming Carriageway Consulting Ltd I was employed by traffic engineering consultancies where I had senior roles in developing the business, undertaking technical work and supervising project teams primarily within the South Island.

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7. I have been involved in a number of proposals which have involved assessing the transportation implications of quarries and similar activities. These have included
 - a. Assessing the transportation effects of quarries on Roberts Road (where for clarity the applicant was Fulton Hogan) and on Conservators Road, both of which are within Christchurch.
 - b. Providing advice for a gravel extraction and cleanfill activity in Wanaka
 - c. Undertaking a peer review on behalf of Selwyn District Council for the expansion of a quarry on Selwyn Road
 - d. Assessing a cleanfill facility at the Shotover Delta in Frankton
 - e. Sitting as a commissioner for a cleanfill site near Porirua
 - f. Assessing the effects of new or existing mines on the West Coast for Solid Energy and Bathurst Resources
8. As a result of my experience, I consider that I am familiar with the particular traffic-related issues associated with proposals of this nature.
9. I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014. This evidence has been prepared in accordance with it and I agree to comply with it. The matters addressed in this Statement of Evidence are within my area of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

BACKGROUND

10. In November 2018, I was engaged by Selwyn District Council (**SDC**) to provide traffic engineering advice relating to the application for Resource Consent for Fulton Hogan to establish and operate a gravel quarry and processing operation at

Roydon Quarry on Jones Road between Curraghs Road and Dawsons Road in Rolleston.

11. I have reviewed the Applicant's Consent Documents including the Integrated Transportation Assessment (ITA) prepared by Stantec and dated 15 November 2018.
12. Having assessed this report, I provided advice to the Requests for Further Information issued by the Selwyn District Council and dated 21 December 2018, 11 July 2019 and 25 July 2019. I reviewed the responses received from Stantec (dated 27 February and 16 August 2019)
13. For clarity, at the time of writing this evidence, I have not been involved with any expert witness conferencing. However I have spoken with Mr Andrew Metherell of Stantec on several occasions to clarify matters within the Integrated Transportation Assessment and the responses to the Requests for Further Information.
14. I have visited the site on a number of occasions during May and July 2019.
15. My evidence commences with a review of the information provided by Stantec through the ITA and subsequent responses. The rationale for providing this is because there are various matters which underpin the assessment which it is necessary to evaluate prior to then considering the expected effects. I then discuss the proposed Conditions of Consent before addressing the submissions received that relate to transportation matters.

REVIEW OF TRANSPORTATION INFORMATION

Background

16. At the outset I note that there has been a reduction in the expected extent of traffic generation of the development since the application was lodged, changing from a maximum of 1,500 truck movements per day (two-way, hence 750 trucks entering

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the site and 750 trucks exiting) to 1,200 truck movements per day (two-way, hence 600 trucks entering the site and 600 trucks exiting). The traffic analyses included within the ITA and described as being the 'maximum' therefore reflect a greater amount of traffic generation than is now expected to occur. Stantec identifies that the previously-calculated 85th percentile value now reflects the maximum amount of traffic generation that is expected. I have endeavoured to take this into account where possible within my evidence.

Stantec ITA Chapter 2: Existing Transport Networks

17. With regard to the proposed road hierarchies (section 2.2), the Stantec report is based on the operative District Plan. Selwyn District Council is presently reviewing the District Plan and as part of this, the roading hierarchy is also under review. From information provided by Council's Transportation Asset Manager, Mr Mazey, there are three proposed changes in the immediate vicinity of the development site:
 - a. Jones Road: presently a Local Road, proposed to become a Collector Road between Dawsons Road and Weedons Ross Road;
 - b. Maddisons Road: presently a Local Road, proposed to become a Collector Road between Dawsons Road and Hoskyns Road; and
 - c. Curraghs Road: presently a Local Road, proposed to become a Collector Road between Maddisons Road and Main South Road.
18. Each of these potential changes would result in the affected roads being reclassified as a higher-order road in the hierarchy. As such, I would expect that these roads would carry a greater proportion of through traffic and traffic flows would typically be higher. In those regards, the revisions would be supportive of the increased traffic associated with the quarry, if consent was to be granted. That said, the District Plan review is at an early stage and so these changes can only be considered as indicative of the Council's thinking rather than being given any significant weight.

Stantec ITA Chapter 3: Existing Transport Infrastructure

19. I confirm that the description of the existing roading networks is appropriate.

Stantec ITA Chapter 4: Existing Traffic Volumes

20. The traffic flows shown in the ITA range in age, from surveys carried out in 2014 to those undertaken in 2018. In my experience it is unusual that surveys that are five years old or greater are used within analyses because of likely changes to land uses and also ambient traffic growth which both tend to increase volumes. One example of this is the 2014 volume observed on Jones Road west of Curraghs Road, which the ITA reports to be 3,746 vehicles but is recorded as 4,133 vehicles in the MobileRoad website. In some instances then, I consider that the traffic flows are likely to be under-representative of the current volumes. I anticipate that the applicant will take the opportunity to review and update those that are the most critical at the hearing, and also assess whether the revised volumes affect any conclusions of the report.

21. With regard to the hourly traffic patterns (section 4.2 of the ITA) I agree that there is evidence of Jones Road and Maddisons Road being used by commuter traffic. The mix of vehicle types (section 4.4 of the ITA) is as I would expect, with a bias towards light vehicles, and the observed vehicles speeds are within typical ranges for the (then-prevailing) speed limits.

22. I have not independently verified the extent of train movements on the railway (section 4.6), but have no reason to doubt the data provided by Kiwirail, which equates to an average of one train movement every hour (although as Stantec rightly notes, there will be some hours of the day with more than one train movement, and conversely, some hours where there are no train movements).

23. I confirm the intersection priorities identified in section 2.3 of the ITA, the walking / cycling network described in section 2.4, and the public transport network described in section 2.5.

Stantec ITA Chapter 5: Road Safety

24. I have reviewed the road safety records reported in the ITA and confirm that the description provided is correct. I note though that the analysis only extends as far as 2017, and there is now a further 20 months of information available within the NZTA Crash Analysis System. The works underway for the construction of Christchurch Southern Motorway Stage 2 (**CSM2**) will to some extent influence the records because travel routes will have changed due to diversions in the wider area but nevertheless, I consider it would be helpful for the applicant to bring this assessment up-to-date¹. In this regard, I note that in respect of Figure 5-2 of the ITA, which shows the roading network in the immediate vicinity of the development site, a further nine injury crashes have been recorded during 2018 and 2019.

Stantec ITA Chapter 6: Proposed Transport Projects

25. I confirm the description of CSM2, and note that the latest information from NZTA is that the scheme is due to be open to traffic next year. I therefore consider that it is appropriate to take into account the changes in travel patterns that the scheme will cause, as Stantec has done.
26. Section 6.5 of the ITA discusses the roading upgraded proposed by the Council. However I have been advised by the Council's Transportation Asset Manager, Mr Mazey, that the reprioritisation of the NZTA funding streams means that the roading schemes that had been signalled in the Councils' Long Term Plan may not now progress. One example provided by Mr Mazey was that the Hamptons Road route is now unlikely to be progressed (the fourth, fifth and sixth bullet points listed in this part of the ITA) due to a lack of funding.

¹ In passing we note that it is common for crash analysis included in a consent application to be outdated by the time that the applicant is considered, because data is added to the NZTA systems on a daily basis.

27. Although it is not specifically stated in the ITA, it appears that Stantec has placed reliance on these schemes to address safety and capacity issues, to a greater or lesser extent, and has not specifically addressed a scenario where the schemes are not in place. While it is important to take into account committed changes to the road network within any transportation assessment, the changes to the strategic direction of transport in the country and resultant effects on scheme funding mean that I expect Stantec will review whether the applicant should introduce any improvement measures on the roading network as part of ensuring that the network operates safely and efficiently.
28. I note that in the second RFI response Stantec sets out that the trip distribution of vehicles will not change as a result of the changes to these schemes. However no assessment is made of the resultant effects on safety and efficiency.

Stantec ITA Chapter 7: Forecast Traffic Growth with CSM2

29. This section of the ITA replicates traffic volumes presented as part of the consenting process for CSM2 but then applies the expected changes to the observed traffic volumes. For instance, if CSM2 is expected to reduce the traffic flows on a particular road by 10%, then Stantec has reduced the observed traffic flows by 10%. This is an appropriate adjustment, to take into account changes due to CSM2 (which will occur irrespective of the presence of the quarry).

Stantec ITA Chapter 8: Proposed Quarry Site

30. This section sets out an overview of the quarry, and I have no comment to make on this.

Stantec ITA Chapter 9: Traffic Generation Patterns

31. One particular aspect about any quarry, and which is evident here, is that the movement of vehicles will not take place on a regular basis, but there are times when there will be more vehicles both in every hour and also in every day, in response to customer demands. The approach taken by Stantec is to assess the traffic generation patterns at another quarry operated by the applicant (at Pound Road, around 5km to the northeast of the proposed quarry) and then apply these to the traffic generation of the proposed quarry. I consider that this is an appropriate technical approach.
32. For light vehicles, Stantec has allowed for 75 vehicles to enter the site per day and the same number to exit, 15 of which would occur in each of the peak hours. Stantec highlights that this equates to an average of 1 vehicle movement every 4 minutes at the busiest times, and that the effects of this will be negligible. Although no analysis is presented in respect of quantifying the effects of these extra vehicle on the efficiency and safety of the road network, I agree that the small volume is extremely unlikely to result in any adverse effects arising.
33. For heavy vehicles, data is presented for the Pound Road quarry, from which the daily 50th, 85th, 90th and 95th percentile traffic flows are calculated, as well as the absolute maximum number of vehicle movements. These are then used to determine the expected traffic flows at the proposed site, using a simple pro-rata approach. I support the methodology used. Stantec goes on to say that for the remainder of their analysis, the 50th, 85th and maximum traffic volumes have been used. However later in the ITA, the median and 90th percentile values also have been used. As noted above though, the reduction in the number of heavy vehicles from 1,500 to 1,200 vehicles per day means that these values are too large – the 85th percentile represents the maximum volume, and the mean value also will be greater than will now occur.
34. Stantec then adopts a similar approach for calculating the expected heavy vehicle movements by hour of day. For this, they have calculated the average number of

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heavy vehicles generated at the Pound Road quarry, and applied this to the daily traffic flows (50th and 85th percentiles and then-maximum) of the proposed quarry.

35. In this regard, the approach differs slightly from that used to calculate the daily volumes. For the daily volumes, Stantec identifies the traffic volumes on an average day, a busy day (85th percentile) and the very busiest day. For the hourly patterns, Stantec simply uses the average number of trucks generated in each hour, rather than the average, 85th percentile and maximum number. While the difference is subtle, it is important because when the 85th percentile figure is referenced later in the ITA, it is referring to the typical 85th percentile day. Equally, for the maximum number of trucks per hour, it is not the absolute maximum but the typical maximum volume. By way of further example, the ITA sets out that “approximately 180-190 heavy vehicles per hour could be expected during the busiest hour of the busiest day”. This gives the impression that this is the absolute maximum number of vehicles which could be generated but in fact it is the busiest hour of a typical busy day. The approach taken by Stantec appears to be:

- a. Between 11am and 12pm, the average traffic generation across all days surveyed equated to 12% of the total traffic flow; and
- b. Applying this to the maximum value of 1,500 vehicles per day at the proposed quarry shows that the maximum traffic volume would be around 180 heavy vehicle movements per hour.

36. However the value of 12% is found by taking the mean value, and thus by definition, for 50% of the time, the percentage will be greater. Under my calculation:

- c. The absolute busiest hour recorded at Pound Road was on a Monday when around 180 vehicles were observed (Figure 9-3 of the ITA);
- d. I have estimated the total number of vehicle movement on this day, and in my view, the 180 vehicles in the peak hour represents around 13.5% of the daily traffic volumes;

- e. Applying this to the maximum value of 1,500 vehicles per day at the proposed quarry shows that the maximum traffic volume would be around 200 heavy vehicle movements per hour
37. My purpose in noting this difference is to highlight that some degree of interpretation is needed when the ITA refers to the 85th percentile and maximum traffic generation per hour. In practice, traffic flows could be slightly higher than this, possibly by around 10%, for the reasons set out above.
 38. That said, I agree that the bulk of heavy vehicles generated by the proposed quarry will take place outside of the 'commuter' peak hours on the network.
 39. Stantec also highlights that consent is being sought for activities up to 10pm, such as allowing for materials to be transported from the site to night-time roadworks. They consider that the nature of such works means that generated traffic flows will be low, plus they will also occur at times when there is ample available capacity on the roading network. I agree, and concur that the effects on the efficiency of the road network at such times will be negligible.
 40. The their first RFI response, Stantec noted that they had allowed for 70% of heavy vehicles to be trucks and 30% to be truck+trailer units, based on observations at the Pound Road quarry. In my view this is an appropriate assumption.

Stantec ITA Chapter 10: Traffic Distribution Patterns

41. The approach taken by Stantec has again been to reference the Pound Road quarry. Six weeks of data from the weighbridge was geocoded to identify the locations to which materials were transported and these were then assigned to the most likely routes used. While the destination of each load was found directly from the observations, the assignment onto the specific routes was based on engineering judgement coupled with some assessment of journey times, taking into account the type of road, travel distance and travel time. Stantec notes that the greater sensitivity to the length of the trip, which in their view leads to a preference for "*well-formed arterial roads*". Although I partially agree with this, I

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note that trucks will also use short-cuts where there is a benefit in them doing so (such as a reduced travel time).

42. Stantec works through, in some detail, the process followed to determine which routes are the most likely to be used by heavy vehicles. The description is sufficient that I have been able to trace the process followed, and I agree with the assessments presented in the ITA. However the approach is 'all or nothing', meaning that if a particular route is assessed as being the most suitable, then no allowance is made for drivers to select another route instead. I discuss this further below.
43. My primary concern with the approach used however is that it is based on a snapshot of vehicle distributions from June and July 2018. While this will be accurate in and of itself, it does not allow for any changes to the trip distribution over time, as the quarry responds to changes in customer locations. For example, 25-34% of deliveries were made to 'Chch Urban South'. This is assumed to stay fixed at all times in the future, which may not be the case.
44. In their first RFI, Stantec replied that they anticipated that due to the relative size and continued growth of Christchurch compared to other locations, they expected that under all future scenarios there would be a strong bias of traffic movements in this direction. I agree with this overarching assumption. They then carried out a sensitivity test to allow for a reduction in eastbound traffic in favour of more vehicles travelling north, south and west from the quarry. This showed that increases would be small, in the order of no more than 4 heavy vehicles per hour (which I expect will reduce further due to the lower overall traffic generation now expected). The site accesses would continue to operate satisfactorily under revised modelling presented in the first RFI response (although for clarity this is based on a layout with two accesses rather than one).
45. Overall, I consider that the sensitivity testing undertaken by Stantec shows that changes to the trip distribution can be accommodated on the roading network.

Stantec ITA Chapter 11: Heavy Traffic Volume Forecast

46. Based on the assignment process noted above, Stantec presents expected increases in the traffic flows on the various roads (Table 11-1 and Figure 11-1). In producing this however, the range of values used previously has not been carried forwards. For example:
- a. Table 10-2 shows that 60-135 vehicle movements could be expected to/from Rolleston. Table 11-1 shows that 70 vehicles would use Jones Road west of the site with 35 vehicles using Jones Road east of the site (a total of 105 vehicles).
 - b. Table 10-2 shows that 15-45 vehicle movements could be expected to/from 'Chch Rural Northwest'. Table 11-1 shows that 30 vehicles would use Jones Road east of the site.
 - c. Table 10-2 shows that 195-285 vehicle movements could be expected to/from 'Chch Hornby'. Table 11-1 shows that 240 vehicles would use Jones Road east of the site.
47. In each case, it appears that when determining the traffic flows on each of the roads, Stantec has adopted the mean value of the range identified in the trip distribution. In other words, where the earlier trip distribution has identified, say, a range of 435 to 555 vehicles travelling to/from Chch Urban North, Stantec has simplified this to a single value of 495 vehicles.
48. No comment is made in the ITA as to the reason for adopting this approach. However it is common-sense that the maximum percentage cannot be achieved in each and every case (an assessment of Table 10-2 shows that this would equate to a sum of 122%) and so in my view it is reasonable that if some locations are under the average value then others will be over the average value. However the process used means that if there was to be more use of some roads than others, then this is not taken into account. For example, the analysis assumes that 6.5% of

vehicles will travel to Rolleston. It would be possible that this could reduce to 4% (within the range shown on Table 10-2) and instead demand in (say) Hornby could increase from 16% to 18.5% (again, within the range shown). The outcome is an increase in traffic on Jones Road (east of the site), Dawsons Road and State Highway 1 (east) because the change from Rolleston to Hornby would result in different routes being used.

49. Consequently, care is required when interpreting the forecast traffic volumes. The title of Table 11-1 is “Heavy Vehicle Movements per day on Surrounding Roads – Destinations for Maximum Volume”. However it is not a maximum volume, but is instead based on a fixed trip distribution, which may change in future.
50. I also note that the process of an ‘all or nothing’ approach means that some roads which might intuitively have been used by traffic instead show no increase. One example of this is Maddisons Road – all traffic travelling northwards is assumed to stay on Dawsons Road, Curraghs Road and Weedons Ross Road. However Stantec identifies that increases in movements such as these will not be significant and will represent only small changes in the prevailing traffic flows. I agree.
51. Stantec then goes on to present the expected traffic increases on each road for the maximum, 90th percentile and median day (Table 11-2). Again, I highlight that these are based on a fixed trip distribution and that changes in the destination of vehicles will change these volumes. Using the example noted above, a reduction in materials being transported to Rolleston would mean that traffic volumes on Jones Road (east) and Dawsons Road would increase. The assessment also does not reflect the 85th percentile value, which is identified as being the maximum value due to the reduced amount of traffic to be permitted.
52. Overall, Table 11-1 shows that there is significant use of Jones Road (east), Dawsons Road and the state highway. I concur that this seems reasonable, and agree that an appropriate focus for the application relates to the provision of a safe and efficient route between the quarry access and the highway.

53. When converting the daily traffic flows to hourly volumes, Stantec has factored the data according to the patterns observed at the Pound Road quarry. However as discussed above, the latter data adopts an approach of taking an average percentage rather than a maximum percentage. Hence the values presented by Stantec are slightly lower than those which could arise.
54. I agree though that Figure 11-4 shows a large change in traffic volume on Jones Road (and by implication, Dawsons Road). I highlight that the blue part of Figure 11-4 generally comprises light vehicles, with the orange part representing heavy vehicles. At certain times of day, this therefore shows that heavy vehicles will comprise around 50% of the flows. It can also be seen that the forecast future volumes in the middle of the day are greater than the morning peak hour volumes without the quarry in place. I also note that the effect of the quarry is to change the timing of the evening peak hour. Figure 11-4 shows that the peak volume presently occurs at 5pm to 6pm but with the quarry, this shifts to 3pm to 4pm.
55. In Section 11.3 of the ITA, Stantec has presented the traffic generation of the quarry in the morning and evening peak hours and I confirm the calculations on Figures 11-5 and 11-6 are numerically correct.

Stantec ITA Chapter 12: Site Access

56. In the ITA it was set out that the intent was to separate the movements of light vehicles from heavy vehicles, and I support this arrangement.
57. In the second RFI response, Stantec notes that the applicant also seeks the ability to combine the accesses into one, with both types of vehicle sharing the same access. Under that scenario, Stantec sets out that it will be necessary to ensure that within the site, clear routes are provided for each vehicle type. The latter is likely to fall within the applicant's health and safety processes rather than consenting, but in respect of the effects on the roading network, it is likely to result in a greater volume of traffic using the access in the peak hours. No new analysis is presented in the second RFI and I therefore expect that this will be provided in

due course. Any such analysis should, in my view, also take into account the sensitivity testing around the trip distribution which was carried out in the first RFI.

58. With regard to the detailed design of the two accesses, the light vehicle access is to be upgraded to a Commercial Access as specified in the District Plan, which I consider to be appropriate. The heavy vehicle access is to be designed to a full intersection standard which includes right-turn and left-turn lanes, plus localised shoulder widening to provide additional road pavement support for heavy vehicles turning. Having also reviewed the first RFI response in respect of whether turning lanes are required, I concur with this level of provision.
59. In terms of the performance of these accesses, Stantec has undertaken modelling of the heavy vehicle access using the Sidra Intersection software package. The greatest delays arise for right-turning vehicles exiting the site in the evening peak hour, but the delay is only 27 seconds and the queue of vehicles is low (less than one vehicle). The more heavily used right-turn into the site and left-turn out of the site have low delays and queues. I therefore concur that the access will operate efficiently. In passing, the text of the ITA notes that delays of 30 to 40 seconds could be expected but no analysis is presented which supports this.
60. Although the modelling purports to show the “maximum day”, as noted above the figures are based on the mean values observed at the Pound Road quarry, and as such, I consider that they are likely to be somewhat lower than the absolute maximum, meaning that the intersection performance will be slightly better than will be the case on the very busiest days. However there is sufficient available capacity within the access intersection in my view that it will continue to operate with an appropriate level of service without the need for any updated analysis, and noting that the performance will improve further due to the lower flows now expected.
61. Stantec notes that the main driveway will be sealed “*well into the quarry*” to prevent debris from being spread onto Jones Road and also that the applicant has

processes in place to respond to any occasional debris on the road. I agree with this provision, and discuss conditions of consent subsequently.

Stantec ITA Chapter 13: Jones Road / Dawsons Road Intersection

62. As identified within the ITA, this is the intersection through which the bulk of traffic will pass, and therefore I consider it is critical that it functions with an appropriate level of service. Stantec notes that there is a poor crash record at the *intersection and that while there have been some minor measures to address this, “the changes are not transformational”* and they do not address the short queuing distance between the intersection and the railway level crossing. As such, Stantec considers that a more significant intersection upgrade is required in this location and follows a structured process to determine that the optimum solution is a roundabout. I support this proposal.
63. Two options are presented, one being an ‘online’ solution where the roundabout is constructed to the east and west of Dawsons Road (Figure 13-1 of the ITA) and one being an ‘offline’ solution where the roundabout is constructed wholly on the western side of Dawsons Road. The former is a four-arm roundabout and uses land presently owned by Christchurch City Council, but that Council has made a submission which makes it clear that they do not wish their land to be used in this manner. Conversely, the latter arrangement uses land owned by the applicant but has only three approaches as Jones Road (east) remains configured as a priority intersection.
64. I have reviewed the modelling of the roundabouts and consider that each option is able to accommodate the expected traffic flows. One assumption within the model will be that vehicles arrive randomly at the roundabout, and this will not always be the case as vehicles will arrive in a platoon if they are delayed by the railway level crossing. However the forecast levels of service and delays mean that even with platooning, and even if there were to be slightly higher traffic flows (due to the mean values being used to find the hourly traffic flows), both roundabouts would continue to operate satisfactorily.

Stantec ITA Chapter 14: Dawsons Road Railway Level Crossing

65. My focus in respect of the level crossing safety is in relation to the queues expected to occur when a train passes. Stantec notes that the queues will be affected by the extent to which traffic transfers onto Dawsons Road following CSM2, how busy the quarry is, the hour of the day (which determines background traffic flows on Dawsons Road), the length of the train (which determines how long the barriers are down) and the arrival profile of vehicles. I agree with this summary.
66. Stantec then goes on to set out that a typical intersection analysis will usually reference the 95th percentile queue length, but because a train passing across Dawsons Road is a comparatively rare event (an average of one train movement per hour), their assessment is based on an evaluation of the 50th percentile queue.
67. I do not agree with this approach. In the first instance, I note that while there may be an average of one train movement every hour, there are also hours where more than one train passes (as Stantec identifies in section 4.6 of the ITA). Further, a 50th percentile queue length by definition means that for 50% of the time, the queue will be longer than reported. In most cases, increased queue lengths can lead to delays for drivers or potentially some degree of driver frustration. In this case though, increased queuing will result in queues of vehicles extending to the State Highway 1 / Dawsons Road roundabout. Stationary vehicles on the roundabout circulating carriageway have the potential to result in significant adverse road safety effects. This would in my view be classified as an event of low probability but with high potential impact. As a consequence of this, my assessment below is based on the 95th percentile queue length, which I consider to be the more appropriate assessment.
68. The ITA notes that there is a distance of 52m provided between the railway level crossing and the State Highway 1 / Dawsons Road roundabout and I concur. Graph 14-1 shows that when the quarry is operating on a 'median day' (which will be exceeded for 146 days each year, from Table 9-2) and when a train of 500m

length of present, of the 10 data points plotted, the queue length exceeds 52m on 3 occasions. When the quarry is operating on an 85th percentile day (which is now considered by Stantec to be the maximum operating flows), 6 of the 12 data points plotted exceed a queue of 52m.

69. When trains are assumed to be 1km in length, all 12 of the plotted data points show that the queue length will extend into the roundabout (in fact, the forecast queue of 90m at 8am will completely block eastbound traffic on the highway) even when the quarry is operating as a 'median day'.
70. It follows that at times when the quarry is busier than the median day, which will be for half the year, queue lengths will be even longer.
71. I have set out previously that care is required when considering data presented at the 85th percentile level, because to derive this, Stantec has used the average observed hourly rates at the Pound Road quarry. This approach tends to diminish the traffic flows somewhat. For the most part, the analyses carried out by Stantec show that there is robustness in the roading network such that slight increases in generated traffic will not have a material effect. This is not the case in respect of the railway level crossing however, because even slight increases in forecast traffic flows will increase the potential that the queue extends back onto the highway.
72. This is compounded by the approach taken in the ITA of allowing for one fixed trip distribution over the life of the quarry. As noted above, changes to the destinations of vehicles which lie within the range expected, will increase traffic flows on Dawsons Road.
73. Overall then, in my view the analysis presented in the ITA favours shorter queues than might otherwise be expected under a different (but reasonable) set of assumptions.
74. Stantec identifies that there will be "some" occasions when the queue of traffic extends back into the State Highway 1 / Dawsons Road roundabout. Stantec

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considers that this would be mitigated by the short duration of the queuing, and the small impact on vehicle delays. They also highlight that there are two approach lanes on the highway, and that one traffic lane would continue to operate. My concern though is that the number of occasions will be greater than has been calculated, the queue length will be greater, and that drivers will simply not be expecting to encounter stationary vehicles on the circulating carriageway of the roundabout, with a consequential increased road safety risk. In addition to the potential for significant personal injury, the blockage of the main highway in the South Island (plus the inability for the quarry to operate) mean that in my view, this is a potential significant adverse effect.

75. Stantec suggests that mitigation could be provided by installing a vehicle-actuated warning signal on the approaches to advise drivers that there is a queue ahead. In my experience, this is an approach that is more commonly used as a 'retrofit' measure to address an existing road safety deficiency, rather than as an addition to a newly-designed intersection. However Stantec may be able to provide further details on the efficacy of such a measure and examples of its use elsewhere. That said, no condition of consent is proposed for the provision of such a signal.
76. I am aware that Stantec is updating the modelling of this location and that this is likely to take into account the reduced traffic flows expected, and that this in turn may affect the forecast queue lengths. However at the time of writing my evidence, this was not available. Consequently at this stage, based on the information presented, I consider that the operation of the quarry in conjunction with the railway level crossing, will have significant adverse effects on road safety on State Highway 1. For clarity, in forming this opinion, I have been cognisant of the additional information provided in the first RFI response.
77. With regard to the queue of vehicles on the southbound approach to the level crossing, the modelling undertaken by Stantec shows that queues can extend up to 70m or 80m at times with a 500m long train, and up to 100m with a 1km long train. Stantec again highlights that the effects of this are, in their view, negligible, but also suggests engineering measures that could be adopted such as auxiliary

turning lanes. They also highlight that it is possible to relocate the roundabouts in order to create additional queuing length. I agree with these suggestions, and expect that they will be considered in the updated modelling, where the forecast queue lengths are likely to be revised.

Stantec ITA Chapter 15: Effects on Jones Road

78. Stantec recommends that Jones Road east of the heavy vehicle access is improved to a higher standard, with 3.5m wide traffic lanes plus a 1.0m shoulder to reduce the potential for edge breakage and provide a suitable level of service for all road users. I support these provisions.
79. Towards the west of the heavy vehicle access, Stantec notes that the current seal width is less than desirable at present for the current classification of the road. Based on the expected traffic flows, I agree with this conclusion. However as noted above, the trip distribution is assumed to be fixed for the duration of the quarry. In the event that more material was to be transported towards the west, heavy vehicle volumes would increase from the numbers shown, which increases the technical case for the seal width to be widened.
80. I agree that no widening is required to the east of Dawsons Road.

Stantec ITA Chapter 16: Other Council Roads Near Templeton

81. I concur that in large part, traffic increases on other district roads will be low. In respect of Hamptons Road though, Stantec mentions the safety and efficiency benefits of the roading schemes within the Council's Long-Term Plan. As set out above, these schemes are not now funded and so I expect that Stantec will now consider the effects of additional traffic on this route without the improvement schemes.

Stantec ITA Chapter 17: Effects on Main South Road

82. Stantec's modelling of the State Highway 1 / Dawsons Road roundabout shows that on a 'maximum' day of operation, queues would remain low. While I again

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highlight that traffic flows associated with the quarry are likely to be slightly greater than have been modelled, in my view the roundabout has sufficient capacity to accommodate the expected traffic flows without queues extending back as far as the railway level crossing. The delays and queues will reduce further from those shown due to the reduction in the maximum numbers of vehicles.

Stantec ITA Chapter 18: Effect on Other Road Users

83. I agree that the cycleway being constructed as part of CSM2 would be unaffected by the proposal, and that the movement of (at least part of) the Jones Road / Dawsons Road intersection towards the north will make crossing Dawsons Road less complex for cyclists. In my view the off-road cycleway is likely to be the preferred route for cyclists and also for pedestrians.
84. Stantec notes that no horses were observed using the roading network. I anticipate that horse riding will be for recreational purposes and therefore will largely occur at weekends, and may therefore not have appeared within the surveys undertaken (which were carried out on weekdays). The quarry is proposed to operate on Saturdays but only infrequently on Sundays, meaning that any effects on equestrians will largely occur on Saturday
85. There are few road safety studies relating to horses mingling with heavy vehicles, but Stantec notes that the likely future environment would “*not differ markedly*” from the existing environment because there is already a high volume of traffic that uses Jones Road. I consider that traffic volumes will increase as a result of the quarry, but I anticipate that if a horse is accustomed to traffic, this will not change as a result such an increase.

Stantec ITA Chapter 20: District Plan Compliance

86. Stantec works through each of the District Plan requirements in turn and identifies that there are non-compliances with regard to the traffic generation, and proposed improvements to Jones Road including the access intersections. With regard to the

remaining provisions of the District Plan, compliance will be achieved. I have reviewed each of the relevant provisions and agree with Stantec's assessment.

PROPOSED CONDITIONS OF CONSENT

87. I have referenced the proposed conditions of consent to identify whether Stantec has relied on matters which are not controlled through conditions, and which could therefore undermine the conclusions drawn. The proposed conditions of consent particularly relating to transport matters are numbered 5, 6, 8 and 22 through to 27 (Applicant's version, August 2019).
88. Condition of Consent 5 addresses the provision of vehicle access, which are to be designed and constructed in accordance with the recommendations of the Stantec ITA. As set out previously in my evidence, it is unclear whether one access is to be provided or two, but both Stantec layouts are appropriate and I therefore support this condition.
89. Condition of Consent 6 relates to upgrades to the roading network as set out in the Stantec ITA. While this is appropriate in my view for Jones Road and the Dawsons Road roundabout, no mention is made of the warning signal on the highway to which Stantec refers in the ITA (and which it is not clear is being offered). I also question whether this condition of consent is sufficiently clear because there are two roundabout options in the Stantec ITA of which only one can be constructed. However one roundabout design uses third party land for which consents may be needed, meaning that this condition of consent potentially relies on other consents being granted.
90. I recommend that these conditions of consent are slightly modified to identify that the measures are to be in place prior to any transportation of materials to or from the quarry.

91. I also recommend that a condition of consent is put in place that the detailed designs of the roading improvement schemes is to be approved by the Council's Roading Manager, and that the proposed roundabout is to be subject to a road safety audit (at the applicant's expense). These conditions of consent are necessary in my view to ensure that the schemes will operate safely and are designed to appropriate standards.
92. Condition of Consent 8 requires that no transportation from the site shall take place until CSM2 is fully open (that is, there is no temporary traffic management in place on Dawsons Road or at the State Highway 1 / Dawsons Road roundabout). CSM2 has been relied upon in the Stantec ITA and I therefore support this condition.
93. Conditions of Consent 22 and 23 limit the maximum number of heavy vehicles to 1,200 movements per day, with an average of no more than 800 heavy vehicles per day over any consecutive 60 calendar day period. These are necessary to limit the extent of traffic generation, but it is not clear from the information provided to date how this is to be monitored or how (and how often) the information is to be provided to the relevant authorities. There is, for instance, no traffic management plan specified within Condition of Consent 63 relating to traffic. Without the specific means to record vehicle movements being defined, I consider that there is a risk that traffic volumes will increase above these levels. In practice, there is no way to monitor (or enforce) Condition of Consent 23 without daily collection of heavy vehicle numbers.
94. Condition of Consent 24 is intended to ensure that trucks drivers do not travel through Templeton unless a delivery is in the immediately vicinity of the settlement, with the applicant's drivers being required to do this and third party drivers being required to sign up to a code of conduct for the same. Signage is proposed at the quarry gate instructing drivers to avoid Templeton and site induction will also specifically address the issue.

95. In my experience, controlling the traffic routing of applicants' vehicles is a straightforward matter, not only because drivers are under their direct control but also because the vehicles are typically liveried and thus easily identified. Control on third parties are harder to achieve. In the last resort, there are mechanisms open to the Council to prohibit large vehicles from using various routes. That said, the assessment carried out by Stantec in the ITA shows that *at present*, there are only limited reasons why vehicles would travel through Templeton, based on the distribution of vehicles from the survey of the Pound Road quarry.
96. In the second RFI response, Stantec indicates that there are additional measures that could be used with regard to monitoring traffic distribution, and that this could be done relatively quickly after the quarry opens. Measures could include refining induction procedures, producing maps of preferred routes in the immediate vicinity of the site, reviewing signage at the exit gates, and audits to monitor responses. Stantec also highlights that *if* monitoring was to be carried out, then one option would be number plate matching surveys at adjacent intersections in the immediate vicinity of the site, such as at the site access and Dawsons Road / Jones Road intersection
97. Having reviewed the traffic assessments, it is evident that these are predicated on a very strong route bias of Jones Road (east), Dawsons Road and State Highway 1. Large differences to the routing are not contemplated for the reasons set out in the ITA. However if such large differences were to arise, then traffic would travel past locations where there has been no specific assessment of effects (such as through Templeton and past schools). Further, I am aware that concerns have been expressed by submitters regarding the potential for adverse road traffic noise at various locations due to truck movements. The assessment of noise is based on the trip distribution meaning that if the distribution changes, then so will the noise assessment.
98. With that in mind, I consider that there would be merit in undertaking surveys as identified by Stantec to confirm the distribution. In my view this would only be required at the site access (to confirm the proportions of eastbound and

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westbound vehicles) and at the Jones Road / Dawsons Road intersection to identify that the proportion turning towards (and from) the highway is as expected. This would be an additional condition of consent.

99. To ensure that changes to the distribution are identified as soon as practical, monitoring is required on a regular basis. However I accept the point made by Stantec that customer locations are unlikely to change very quickly. Consequently I consider that the surveys described above should be carried out once per year, with the first survey being undertaken six months after the quarry opens.
100. I also consider that there would be merit in specifying the key content of a transportation management plan / induction plan within Condition of Consent 63, due to the reliance on this as a means of ensuring that trucks do not use unsuitable routes.
101. In the ITA, Stantec identified that the access into the site should be sealed and that measures should be put in place that manage situations where loose materials are deposited onto the road network. These are addressed in conditions of consent 25, 26 and 27. I recommend that the distance over which the heavy vehicle access is to be sealed is specified to avoid any misunderstanding.
102. In discussions, Council's Transportation Asset Manager Mr Mazey has suggested that the applicant gives consideration to an emergency access to the site, in the event that the main heavy vehicle access was to be blocked by some unforeseen event. This would enable materials to be transported on a short-term, temporary basis while the blockage at the main access was resolved. There is such an arrangement in place at the Fonterra plant in Darfield, where if the main access is blocked, use of other roads is permitted subject to not exceeding a specified maximum number of days in the year and operating under temporary traffic management. I am advised that the Council would be amenable to such an arrangement if sought by the application (and subject to matters of detail).

SUBMISSIONS

103. A total of 430 submissions have been received. Some 65 of the submissions relate directly to the Samadhi Buddhist Temple located at 358 Maddisons Road which is currently unconsented and therefore I have been advised that these submissions cannot be considered insofar as they relate to the unconsented activity.

104. Of the remaining submissions, most mention some aspect of traffic matters although the level of detail provided varies. As is often the case with traffic matters, submitters highlight matters arising from traffic such as noise, air quality and amenity which are beyond traffic engineering per se. The remaining traffic-related concerns of submitters include:

- General safety concerns relating to the increase in truck volumes
- The ability of the roading network to accommodate increased traffic flows
- Delays to other traffic arising from the presence of trucks
- Increased costs arising from additional maintenance required to roads due to higher heavy vehicle numbers
- The potential that trucks will use roads that are unsuitable (such as residential roads or past schools) and the ability/inability to control or monitor this
- Safety concerns relating to other road users, such as pedestrians, equestrians and cyclists

105. I confirm that I have read and considered these submissions before forming my views on the application that I have set out in the sections above.

SUMMARY AND CONCLUSIONS

106. The traffic characteristics of the quarry have changed as a result of the second RFI response, where it was noted that the maximum number of heavy vehicle movements would be reduced from 1,500 to 1,200 vehicles. The outcome is that much of the assessment included within the ITA accompanying the application and the first RFI needs to be interpreted cautiously as in some cases it will show greater queues and delays than will now arise.
107. However, I am concerned that there is the potential for vehicle queues to extend from the railway level crossing, along Dawsons Road and as far as the highway. Queues of stationary vehicles in this location will not be expected by drivers travelling towards Christchurch, and I consider that there is the potential for adverse road safety effects to arise. Stantec is presently updating their modelling in this location but this is not available at the present time, and thus it cannot be determined whether the reduced traffic generated by the site will resolve this situation.
108. At the present time, I consider that the potential road safety effects in this location are such that the application should not be approved.
109. In the alternative, if the revised modelling shows that the queuing issue is resolved, I consider that the transportation assessment shows that the traffic generated by the proposal can be accommodated safely on the roading networks without adverse efficiency issues arising.
110. Since the transportation assessment is based on a particular distribution of heavy vehicles. I have suggested that this is monitored after the quarry opens to ensure that the anticipated distribution is in fact occurring.
111. I have also suggested other amendments and additional to the conditions of consent in the event that the commissioners are minded to approve the application, and/or the revised modelling shows that queues on Dawsons Road will

not reach the state highway roundabout. I have made amendments to Mr Henderson's consolidated set of Conditions of Consent.

Andy Carr

2 September 2019