BEFORE THE HEARINGS PANEL
FOR THE PROPOSED QUEENSTOWN LAKES DISTRICT PLAN

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of Hearing Stream 14: Wakatipu Basin hearing and transferred Stage 1 submssions relatying to Arrowtown and Lake Hayes

STATEMENT OF EVIDENCE OF ANDY CARR
ON BEHALF OF WATERFALL PARK DEVELOPMENTS LIMITED
S2388 – WATERFALL – T14 – CARR A - EVIDENCE

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1. Introduction

1.1 My full name is Andrew (Andy) David Carr.

1.2 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.

1.3 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.

1.4 I have more than 28 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.

1.5 I am presently a director of Carriageway Consulting Ltd, a specialist traffic engineering and transport planning consultancy which I founded in early 2014. 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.

1.6 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.

1.7 Although I am not a 'hands-on' modeller with regard to large transportation models, I have been involved in a number of commissions for changes in land use which have relied upon complex transportation models to demonstrate their effects on the roading network. These have included:

a. Christchurch City District Plan Change 30 (Prestons): the rezoning of 205ha facilitating the development of around 2,500 residences, a primary school and commercial development including a supermarket;

b. The rezoning of 24ha of land from rural to business/industrial use through the Christchurch District Plan review. This site is immediately adjacent to the key State Highway 1 / Memorial Avenue intersection, which not only provided an important north-south link for through traffic but is also the primary access to Christchurch Airport;

c. The rezoning of 17ha of land from rural to commercial and residential uses through the Christchurch District Plan review. The site is adjacent to, and gains access from, State Highway 75;

d. The development of a Countdown supermarket at Andersons Bay Road, Dunedin;

e. Tasman District Plan Change 62 (Progressive Enterprises Ltd): the rezoning of 1.3ha for commercial use (a supermarket) on the boundary between Nelson and Richmond;

f. A Notice of Requirement lodged by Ashburton District Plan to designate land to facilitate a second bridge within the urban area of Ashburton;

g. Christchurch City District Plan Change 22 (Styx Centre): the rezoning of rural land to facilitate 50,000sqm GFA of retail and commercial floorspace in Belfast. The site is adjacent to, and gains access from, State Highway 74

1.8 My experience also includes producing small transportation models as part of various land use consent applications and plan change requests for sites throughout the South Island including Nelson, Blenheim, Rangiora, Christchurch, Rolleston, Ashburton, Twizel, Dunedin, Queenstown, Wanaka and Invercargill, where new access intersections have been formed onto the frontage road and/or new private and public roads have been proposed.

1.9 I previously provided evidence for the proposed new access road into the Waterfall Park Zone for RM171280. The transport assessment, evidence and supplementary evidence provided as part of the notified hearing are appended to this evidence.

1.10 As a result of my experience, I consider that I am fully familiar with the particular issues associated with the use of transportation models to inform land-use planning decisions.

1.11 I have worked in the district for 14 years and have provided advice for around 75 different projects, ranging from large plan changes to the redevelopment of individual sites. As a result of this, I consider that I have a thorough understanding of the practical operation of the roading networks.

1.12 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.

2. Scope of Evidence

2.1 In this matter, I have been asked by the submitter, Waterfall Park Developments Limited (**WPDL**), to comment on the Statement of Evidence of Mr Dave Smith, a consultant transportation planner providing advice to Queenstown Lakes District Council. In providing these comments, I have drawn upon my own experience as well as reviewing Mr Smith's evidence.

3. Comments on Mr Smith's Statement of Evidence

3.1 At the outset I note that Mr Smith does not specifically comment on the WPDL submission and as such it is not possible to address any particular concerns which relate specifically to the site. However I assume that Mr Smith opposes the provisions sought through the submission, as he opposes all other submissions that seek intensification.

3.2 I have set out my concerns with the modelling work below.

An 'All or Nothing' Approach

3.3 Mr Smith succinctly summarises his approach as "*many of the submissions relate to relatively small increases in activity, which in isolation would have no noticeable effect on the performance of the transport network. However, there is a risk of cumulative effects if a number of these submissions are approved together*" (Smith paragraph 3.5). He then sets out that "*on this basis … I oppose (on the basis of transportation effects) all submissions that seek to increase residential density beyond that provided for in the notified Wakatipu Basin Chapter and plan maps*" (Smith paragraph 3.6).

3.4 In my view, these two comments represent the two extremes of the spectrum. In the first paragraph he sets out that if considered in isolation, the transportation effects would be benign. In the second paragraph, he concludes that if all submissions are considered together then the adverse effects would be significant. However his 'all or nothing' approach completely disregards the myriad of permutations that could occur between the two extremes. In other words, I expect that there are some combinations of submissions which if accepted would have negligible effects and conversely, other permutations may give rise to unacceptable transportation outcomes.

3.5 Mr Smith has not provided any information with regard to these intermediate permutations. In my experience this is not unreasonable or unexpected because even just taking into account the 11 submissions which he has addressed, there would be more than 2,000 individual model runs to be carried out, which would be both costly and time consuming. However his approach in my view means that in this case the modelling is not helpful to any decision-making because the only firm conclusion which can be drawn is that approving every submission would create unacceptable transportation effects, and that approving one submission would have benign effects. No information is available as to how many (and which combination of) submissions would have benign effects if approved.

Choice of Design Year

3.6 A second difficulty which is evident in the modelling is that of the 'design year' chosen. Mr Smith sets out that two years have been modelled, 2025 and 2045 (Smith paragraph 5.3) and that his views on the submissions are informed by the results from the 2045 model (Smith paragraph 5.5).

3.7 In my experience, it is common for rezoning analyses to look at a future year horizon, and so Mr Smith's general approach is appropriate. Indeed, such an approach is recommended through NZTA Research Report 422 ('Integrated Transport Assessment Guidelines') produced by Mr Smith's company in 2010. However, these guidelines also caution that as timeframes increase so does uncertainty and they therefore recommend that a ten-year horizon is typically used (section 5.5).

3.8 The importance of the design year is illustrated by Mr Smith and he acknowledges that there are various strategic documents that show how transportation infrastructure will change in the foreseeable future (Smith section 6). It is common in my experience for transportation models to include improvements to infrastructure that are either highly likely or that are confirmed, but in this case it

is not clear whether the model has been updated in this way (and this is a point which I consider could usefully be clarified). However, assuming that such infrastructure improvements have been included in the model I anticipate that these could include the indicated schemes within the (draft) Council Ten Year Plan 2018-2028. I am not aware of any documents which specify firm commitments to roading infrastructure beyond this timeframe, and irrespective of this, there is typically significant funding uncertainty for schemes beyond a ten-year timeframe. They are therefore not usually taken into account.

3.9 However Mr Smith's modelling reports levels of service in 2045. From the information available then, it appears he has implicitly assumed that between the current date and (likely) 2028, transportation schemes are put in place within the district to alleviate congestion. However between 2028 and 2045, no schemes are implemented and instead the 2045 traffic flows are accommodated on the road network existing in 2028. It is therefore unsurprising that the modelling shows that significant levels of congestion would arise. Put another way, it is akin to trying to accommodate current traffic flows in the district on the road network that existed in 2001. Congestion and poor levels of service are inevitable under such a scenario.

3.10 In my experience, it is unrealistic to have a complete 17-year hiatus for roading schemes but rather, schemes continue to be brought forwards for consideration and construction on an ongoing basis. With that in mind, I consider it is unreasonable for Mr Smith to find that *under the Council's proposed zonings* the State Highway 6 Shotover Bridge will be operating at capacity by 2035 (Smith paragraph 7.11) and a second bridge will be needed at the Edith Cavell Bridge "*well before 2045*" (Smith paragraph 7.17) and then no action will be taken for at least a decade. Indeed, Mr Smith highlights that a network operating with Levels of Service E or F (that is, approaching, or at, capacity) "*exhibits … significant network congestion and highlight the need to add roading capacity or remove demand in order to achieve satisfactory road network performance*" (Smith paragraph 7.7).

3.11 At a high level, the whole purpose of strategic transport planning is to identify future difficulties on a transportation network and to use this to make decisions accordingly. To my mind it is inconceivable that having invested in such a model, and having identified the need for improvement measures, the road controlling authorities would not take action for more than ten years. I consider that it is far more likely that by 2045, additional capacity will be available at least at the Edith Cavell Bridge and potentially also at the State Highway 6 Shotover Bridge. Such

increases in capacity do not appear to have been taken into account in the modelling.

Growth Assumptions

3.12 In addition to the roading network not reflecting likely changes to 2045, the model assumes a certain level of growth on the roads. The details of this have not been provided (Smith paragraph 5.5(a) and footnote).

3.13 Transportation modelling typically applies growth in a simplistic manner, via just adding extra traffic onto the network. However this application of the growth rate results in increasing numbers of vehicles attempting to use the road network in the peak hours despite existing high levels of congestion. This is not how people travel in the 'real world'. Rather, if there are significant queues and delays in the peak hours, drivers choose to travel at different times (known as 'peak spreading') meaning rates of growth in the peak hours diminish.

3.14 It is not clear how, or whether, this has been taken into account. However since Mr Smith reports that the capacity of the State Highway 6 Shotover Bridge is 1,590 vehicles per hour (Smith paragraph 7.10) but the model forecasts that by 2045, it will be used by 1,800 vehicles (Smith paragraph 7.11) it appears that no account has been taken of this.

Other Modelling Assumptions

3.15 Mr Smith sets out that within the modelling it has been assumed that the maximum level of development achievable is attained (Smith paragraph 5.5(a)) and that the extent of use of non-car modes of travel remains the same (Smith paragraph 5.7(c)).

3.16 In my experience, it is rare for multiple large sites to be built-out to their fullest extent. I am also aware that transportation planning options within the district are focussed on increasing the mode share for non-car modes of travel. Consequently I consider that these two assumptions mean that Mr Smith's baseline modelling, onto which the zonings sought by the submitters are added, are highly conservative. In this instance, the net outcome is that the model will show that there is less available capacity in the network than is likely to be the case in practice.

4. Implications for the WPDL Submission

4.1 In my view, the matters highlighted above have a significant influence on consideration of the WPDL submission for Ayrburn.

4.2 In particular, not only does Mr Smith highlight that the Edith Cavell Bridge is already approaching capacity, but also that it is possible that construction of a duplicated bridge near to the Edith Cavell Bridge could potentially start within the 2020-2031 window (Smith paragraph 7.14). Consequently I do not consider it realistic to assess the effects of the rezoning sought by the submitter in 2045 without additional capacity being provided at this location.

4.3 Based upon my measurements, the difference in the length between the submitter's site into Queenstown via the Edith Cavell Bridge and the route using the State Highway 6 Shotover Bridge is only around 10% (with the route via the Edith Cavell Bridge being the longer of the two). Consequently I consider that the Edith Cavell Bridge provides a viable alternative route for residents of Ayrburn in order to avoid a potentially congested State Highway 6 Shotover Bridge

4.4 As such, any concerns of Mr Smith with regard to the capacity constraints of the State Highway 6 Shotover Bridge are in my view less relevant to the assessment of this submission.

4.5 I accept (and have previously presented evidence to the Hearing Panel) that the current 'courtesy' give-way system at the Edith Cavell Bridge is presently nearing, or is at, capacity. Mr Smith agrees (Smith paragraph 7.16), and notes that signalisation of the bridge is a possible short-term option, and I concur. Such a scheme would then increase the capacity of the bridge.

4.6 I agree with Mr Smith that developments which increase the traffic flows at the Edith Cavell Bridge will bring forward the time at which a new bridge is required. However I consider that the location of the submitters site is such that not all generated traffic will cross the bridge, and those vehicles that do travel across the bridge will be dispersed over time due to the distance of the submitter's site from the bridge (rather than all arriving within a short timeframe). Both of these mitigate any adverse effects at the bridge arising from the rezoning sought.

Andy Carr

Carriageway Consulting Ltd

13 June 2018

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15 November 2017

CARRIAGEWAY CONSULTING
A. PO Box 29623, Christchurch, 8540
P. 03 377 7010
E. office@carriageway.co.nz

Lauren Christie
Waterfall Park Developments Limited

By e-mail only: lauren.christie@wintonpartners.co.nz

Dear Lauren

Waterfall Park: Layout and Design of Access Road

Further to e-mails and our discussions, we are pleased to provide our assessment of the proposed access road to Waterfall Park. The elements that underpin the road layout are discussed below.

At the outset we note that the existing Waterfall Park Road will not be closed or stopped as part of the provision of the access, and our analysis is carried out on that basis.

Background

Transportation Networks

Waterfall Park is located approximately 2.1km southeast of Arrowtown, on the western side of Arrowtown – Lake Hayes Road.

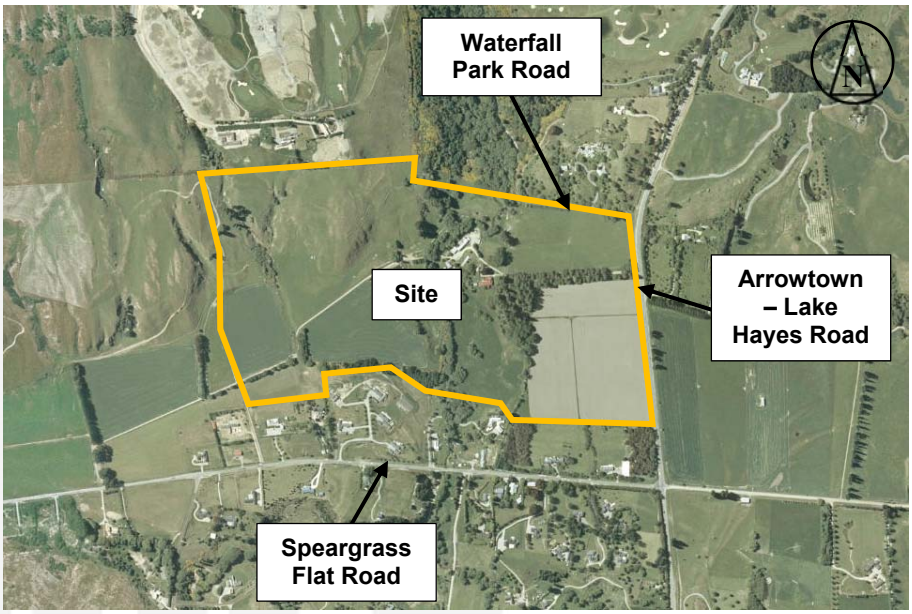

Figure 1: Site Location and Environs

Arrowtown – Lakes Hayes Road is an Arterial Road under the roading hierarchy set out in the Queenstown Lakes District Plan ("*District Plan*") indicating a role in primarily providing for through traffic and a limited property access function. In the vicinity of Waterfall Park, it has a rural road formation with a 7.2m carriageway with one traffic lane in each direction, and gravelled shoulders on each side. On the western side of the road is a 6m grassed verge with a swale, and there is a drainage ditch on the eastern side. The speed limit is 70km/h.

Photograph 1: Arrowtown – Lakes Hayes Road Looking North (Waterfall Park Resort Zone on Left)

The alignment of Arrowtown – Lakes Hayes Road over much of the frontage onto Waterfall Park is flat and straight, but towards the north the road starts to rise and it turns slightly towards the northeast.

There is an existing road which serves Waterfall Park and part of the current formation is aligned approximately with the northern site boundary, at the curve in Arrowtown – Lake Hayes Road. However also at this location, Arrowtown – Lake Hayes Road is climbing and so at the point where it is joined by Waterfall Park Road, there is a significant difference in levels, which we estimate to be around 6m.

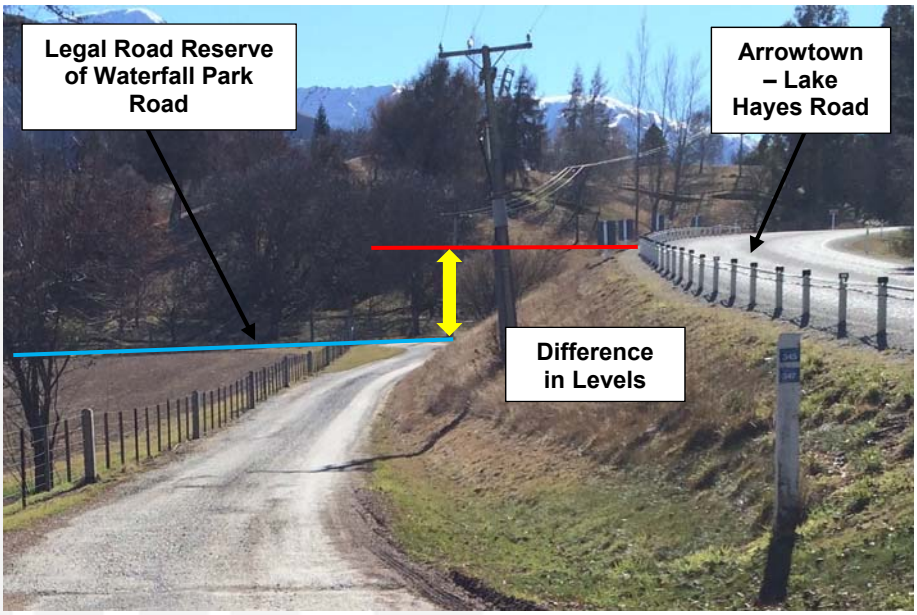

Figure 3: Level Difference

As a result of the difference in levels, the formation of Waterfall Park Road curves 90-degrees towards the south (partly within the legal road reserve of Arrowtown – Lake Hayes Road and partly within private property) and runs parallel to Arrowtown – Lake Hayes Road for approximately 120m before then turning through a further 90-degrees and joining it at a priority intersection.

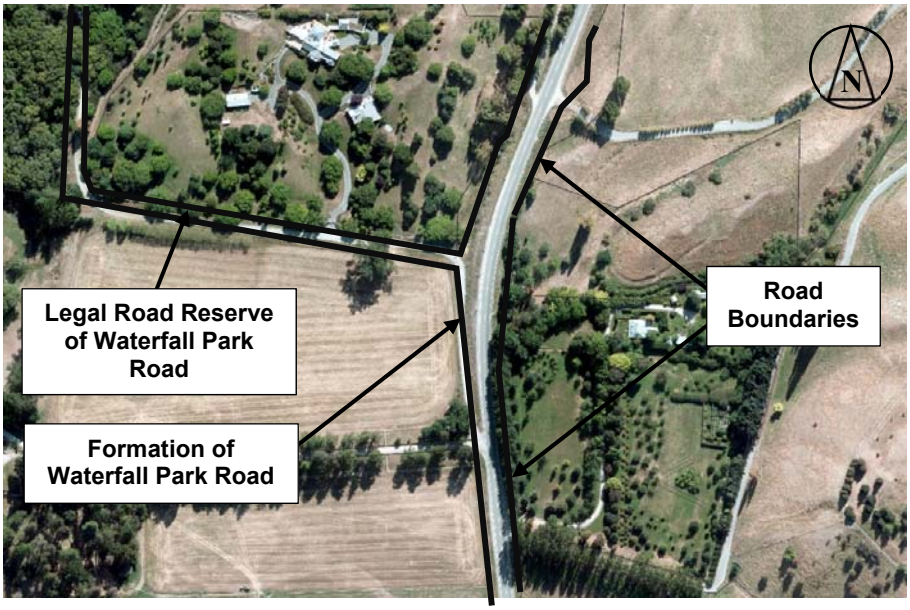

Figure 4: Formation of Waterfall Park Road with Reference to Legal Road Reserve

The legal (internal) part of Waterfall Park Road has a 10m wide road reserve and is presently formed with an unsealed carriageway of around 4m width with grassed verges on either side. The portion of the road formation which runs parallel to Arrowtown – Lake Hayes Road is constrained by the fill slope of that road on the eastern side and a property boundary on the west. Moreover, the land falls away sharply towards the west also, and part of the physical formation is on private land.

Photograph 2: Formed Section of Waterfall Park Road Adjacent to Arrowtown – Lakes Hayes Road Looking North (Waterfall Park Resort Zone on Left)

The speed limit on Waterfall Park Road is nominally 100km/h, but we consider that a speed of 50km/h is more likely in view of the current formation and alignment.

The Arrowtown – Lake Hayes Road / Waterfall Park Road intersection is formed as an uncontrolled priority intersection with no signage or carriageway markings.

Photograph 3: Arrowtown – Lakes Hayes Road / Waterfall Park Road Intersection Looking North

Approximately 500m south of the Arrowtown – Lake Hayes Road / Waterfall Park Road intersection, Speargrass Flat Road and Hogans Gully Road join Arrowtown – Lake Hayes Road at a priority ('give-way') controlled crossroads where traffic on Arrowtown – Lake Hayes Road retains priority. No auxiliary turning lanes are formed at the intersection.

Photograph 4: Arrowtown – Lakes Hayes Road / Speargrass Flat Road Intersection Looking North

Traffic Flows

Waterfall Park Road presently serves only a small amount of development and thus current traffic flows are negligible.

Arrowtown – Lake Hayes Road carries approximately 4,000 vehicles per day (two-way). Surveys were carried out in October 2017 which showed that the morning and evening peak hour traffic flows were 410 and 320 vehicles (two-way) respectively.

Speargrass Flat Road carries 750 vehicles per day (two-way), with surveyed morning and evening peak hour flows of 100 to 110 vehicles (two-way) respectively, with Hogans Gully Road carrying 150 vehicles per day (two-way), and morning and evening peak hour flows of 45 and 40 vehicles (two-way) respectively.

Road Safety

We have used the New Zealand Transport Agency Crash Analysis System to identify all reported crashes on Arrowtown – Lake Hayes Road (100m north of Waterfall Park Road to 100m south of Speargrass Flat Road), and the full length of Waterfall Park Road. Over the past five years (2012 to 2016 plus the partial record for 2017), four crashes were recorded. No crashes resulted in personal injuries.

- One crash occurred on Waterfall Park Road, which occurred when an intoxicated driver left the road at the sharp curve.
- One crash occurred at the Arrowtown – Lake Hayes Road / Speargrass Flat Road intersection, when an eastbound driver on Speargrass Flat Road failed to give way and struck a northbound driver on Arrowtown – Lake Hayes Road.
- One crash occurred 50m south of the Arrowtown – Lake Hayes Road / Speargrass Flat Road intersection, when a northbound vehicle was struck by debris falling off a vehicle in front.
- One crash occurred around 75m south of the Arrowtown – Lake Hayes Road / Speargrass Flat Road intersection, when a northbound driver fell asleep and left the road towards the east, hitting a fence.

No crashes have been reported at the Arrowtown – Lake Hayes Road / Waterfall Park Road intersection or on Arrowtown – Lake Hayes Road within the study area.

Type of Activity Proposed and Traffic Generation

We understand that the proposed access road is intended to serve several functions:

- to provide safe and efficient roading access to the existing Waterfall Park Resort Zone;
- to cater for potential future development of Ayrburn Farm which may result from the current District Plan Review; and
- to accommodate the traffic associated with a hotel at Waterfall Park which we understand is presently being designed and for which a resource consent application will be lodged in the near future.

The Waterfall Park Resort Zone is zoned for residential development plus visitor accommodation and development. We have been advised that the maximum extent of development enabled by the current zoning is 100 apartment units plus approximately 114 visitor accommodation rooms. That extent of development would generate a daily traffic flow in the order of 1,170 vehicle movements (two way) and a peak hour flow of 170 vehicle movements (two way).

We have been advised that the zoning outcome for Ayrburn Farm under the District Plan Review could be any of Rural, Rural Residential or Residential or a combination of those zonings. We understand that the maximum development capacity within that range could be in the order of 125 residential units each with its own associated secondary unit. That extent of development would generate a daily traffic flow in the order of 1,500 vehicle movements (two way) and a peak hour flow of 190 vehicle movements (two way).

The hotel which we understand is to be proposed will have 380 guest rooms, plus restaurants (450sqm), function room (700sqm) and wellness centre / spa (460sqm). Based on this configuration, and allowing for guests to make use of the ancillary facilities as well as the public, we consider that the hotel would generate between 1,960 and 2,300 vehicle movements per day with peak hour flows of 310 to 480 vehicles (two-way).

The range primarily depends on the operation of the function rooms. In our experience, events attended by the maximum number of people will occur rarely, and in such cases, a proportion of attendees will stay at the hotel and make use of the other facilities. Those attendees that stay off-site will not necessarily travel at peak times, and some of these will use minibuses or share taxis, or use coaches. This means that it is very difficult to be prescriptive as to the traffic that would be generated by this element of the development.

For the purposes of this assessment, we have combined the proposed hotel and potential zoning outcome for Ayrburn Farm, which results in a daily traffic flow in the order of 3,460 to 3,800 vehicle movements (two way) and a peak hour flow of 500 to 670 vehicle movements (two way). On a day-to-day basis, we consider that the traffic flows will be towards the lower end of the range.

Arrowtown – Lake Hayes Road / Site Access Intersection

Basic Design Criteria

Based on the traffic flows available, it is evident that the roading network in the vicinity of the site is not particularly heavily trafficked. In view of the low flows, and taking into account that existing intersections in the area are all priority controlled, we consider that the appropriate form for the intersection is priority control. This provides a consistent roading environment for drivers, which assists in supporting a safe roading environment.

From previous correspondence with the Council, we are aware that their preferred approach is to design intersection layouts using the Austroads Guide to Road Design Part 4A ('Signalised and Unsignalised Intersections'), supplemented where necessary with reference to the NZTA Manual of Traffic Signs and Markings. In respect of the design of the access road itself, the Council's 'Land Development and Subdivision Code of Practice' has been used.

Design Elements for the Intersection

The Austroads Guide to Road Design Part 4A ('Signalised and Unsignalised Intersections') sets out warrants for the provision of auxiliary turning lanes at intersections. Applying these to the proposed intersection shows that both right-turn and left-turn auxiliary lanes are justified. This will result in seal widening in order to accommodate the lanes.

Options for Site Access

Overview

The relative locations of the Waterfall Park Resort Zone and the roading network mean that there are several potential options for an access road. We have assessed the design opportunities and constraints for each below. These options assume that any land owned by Waterfall Park Developments Limited can, if required, be used to provide the necessary legal road width. Consequently design issues which involve such land are not discussed below.

Figure 5: Potential Access Options for Waterfall Park Resort Zone

Option Red: Upgrade Existing Waterfall Park Road

This option would upgrade the formed part of the formed legal road, plus also form the easternmost end of the legal road and a new intersection with Arrowtown – Lake Hayes Road.

Under this option, there is an issue of the manner in which Waterfall Park Road meets Arrowtown – Lake Hayes Road. The existing difference in levels means that it is not possible for the two roads to meet in a typical priority intersection by extending Waterfall Park Road within the existing road reserve. This is because Arrowtown – Lake Hayes Road cannot be lowered, and if Waterfall Park Road was to be elevated to meet it, then the road reserve would need to be increased to more than 40m width to accommodate the necessary embankment (assuming a batter slope of 1 in 2.5). In our view this would be impractical.

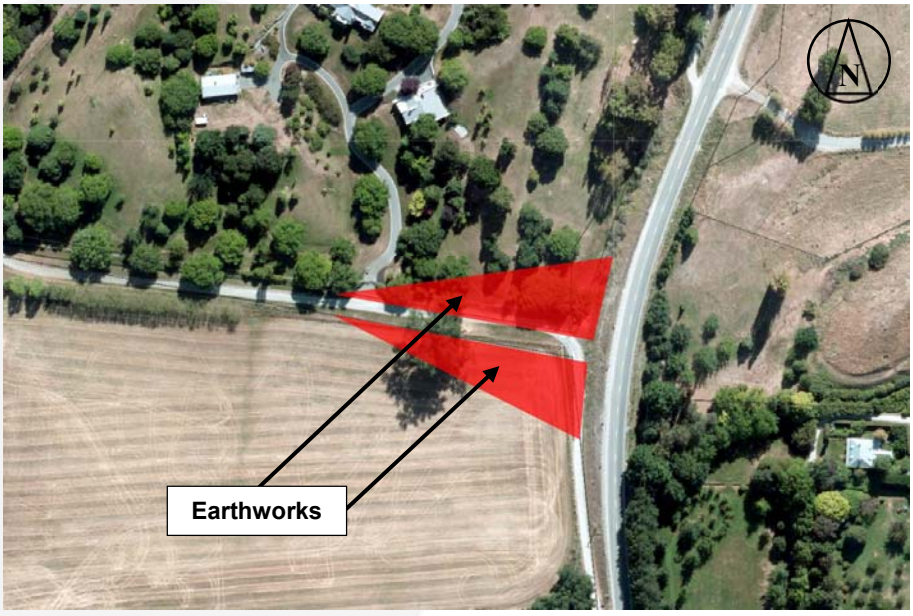

Figure 6: Potential Extent of Earthworks for Option Red

As set out above, auxiliary turning lanes are required at the intersection with Arrowtown – Lake Hayes Road and therefore the seal width of Arrowtown – Lake Hayes Road will need to increase by around 6m to accommodate these. However because of the levels, no extension can be provided toward the western side of the road and so widening must take place on the east. It is not possible to do this without realigning the through traffic lanes, and there is insufficient width available on the eastern side of the road for this. This will not only result in third party land being required on the eastern side, but moving the through traffic lanes will affect the curve radius of Arrowtown – Lake Hayes Road further north and will also require additional earthworks. Consequently providing an intersection and realignment of Arrowtown – Lake Hayes Road to meet appropriate guides and standards would be at best highly challenging, and potentially would require the Council to accept a non-standard intersection layout. This means that this option would potentially have adverse road safety outcomes.

Option Yellow: Upgrade Existing Road Formation

This option would upgrade the formed section of Waterfall Park Road, plus that part of the roadway which runs parallel to Arrowtown – Lake Hayes Road. It would also require an upgrade to the existing intersection.

The outcome of this alignment would be that the site access meets Arrowtown – Lake Hayes Road in the same location as the existing intersection. As with Option Red, auxiliary turning lanes are required with the seal width of Arrowtown – Lake Hayes Road being widened to accommodate these. Although the intersection is located further south than Option Red, the difference in levels still means that no extension can be provided toward the western side of the road and so widening must take place on the east. This cannot be accomplished without realigning the through traffic lanes, changing the curve radius of Arrowtown – Lake Hayes Road further north and using third party land on the eastern side of the road.

Consequently providing an intersection and realignment of Arrowtown – Lake Hayes Road to meet appropriate guides and standards would be at best highly challenging, and potentially would require the Council to accept a non-standard intersection layout. This means that this option would potentially have adverse road safety outcomes.

Option Green: New Road Alignment

This option provides a wholly new alignment for the access into the Waterfall Park Resort Zone, approximately 240m to the south of the existing Waterfall Park Road. This would not require any works to be carried out at the existing Waterfall Park Road alignment.

The new road would join Arrowtown – Lake Hayes Road in a different location to the existing intersection. The new location is sited on a section of Arrowtown – Lake Hayes Road with a flat and straight alignment, meaning that suitable sight distances can easily be achieved and appropriate widening of the carriageway to provide auxiliary turning lanes can be undertaken on both sides, reducing the need to realign the existing traffic lanes. Works would be required on the eastern side of the road to manage the existing drainage ditch (such as through realignment of culverting), but this is unlikely to be a complex exercise.

The proposed intersection is located around 250m to the north of the Arrowtown – Lake Hayes Road / Speargrass Flat Road intersection. At a speed of 80km/h, a vehicle would take 11 seconds to travel between the two intersections, and we consider that this is appropriate to ensure that drivers are aware of the presence of the intersection and do not become confused about where other vehicles may be turning.

There will be some earthworks required but the topography is generally favourable and so these would be minimal. We consider that this road alignment is practical and would be straightforward to achieve.

Option Pink: Use Existing Legal Road to Speargrass Flat Road

This option uses an existing legal road located towards the southwest to access the Waterfall Park Resort Zone.

The alignment makes use of an existing road reserve, meaning that the principle of a road in this location has already been established. However, the existing road reserve is just 10m wide, which under the Subdivision Code of Practice is only suitable for serving up to 20 houses. We therefore expect that the existing alignment could not be progressed without the Council requiring the legal road reserve to be widened. This would require land from the residential lots on either side of the road.

Further, part of the legal road is currently formed as a cycleway forming part of the 'Countryside Ride' trail between Arrowtown and Shotover Country. Any upgrading of the road would need to take into account that cyclist numbers will be greater than on a typical road, which in turn may require additional legal width to be able to accommodate these road users.

The intersection of this road with Speargrass Flat Road would not present any difficulties in terms of topography, since Speargrass Flat Road has a flat vertical alignment. We consider that appropriate sight distances can also be achieved due to the horizontal alignment. The road reserve width is also sufficiently wide for the required auxiliary turning lanes to be constructed. However there are private driveways on both sides of the road, which will make it difficult to provide the auxiliary turning lanes in a safe manner because the driveways will gain access through those lanes, which is not a desirable outcome.

Summary

We have compared the attributes of the various options, and this is summarised below

Option	Benefits	Disbenefits
Red	• Uses existing legal road	• Major earthworks required • Significant difficulties in creating new intersection onto Arrowtown – Lake Hayes Road, plus third party land likely to be required
Yellow	• Partly uses existing legal road • Minor earthworks only	• Significant difficulties in upgrading existing intersection onto Arrowtown – Lake Hayes Road, plus third party land likely to be required
Green	• Minor earthworks only • New intersection onto Arrowtown – Lake Hayes Road will meet guides/standards	• New road formed where none currently exists
Pink	• Minor earthworks only • New intersection onto Speargrass Flat Road will meet guides/standards	• Road reserve width insufficient so third party land likely to be required • Need to accommodate high cyclist numbers • Access to nearby properties will occur through the auxiliary turning lanes

Table 1: Benefits / Disbenefits for Site Access Options

We have ranked these options based on our assessment:

Order of Preference	Option	Reasons
4 (Least preferable)	Red	Requires major earthworks, plus difficulties with constructing a new intersection onto Arrowtown – Lake Hayes Road including use of third party land
3	Yellow	Difficulties with upgrading the existing intersection onto Arrowtown – Lake Hayes Road including use of third party land
2	Pink	Likely to require widening the legal width of the road reserve which would need third party land. Access to nearby properties will be gained through the auxiliary turning lanes
1 (most preferable)	Green	No significant traffic engineering issues identified

Table 2: Ranking of Site Access Options

Based on this we consider that the most preferable option (from a transportation perspective) is to form a new road part-way between Waterfall Park Road and Speargrass Flat Road.

Proposed Arrowtown – Lake Hayes Road / Waterfall Park Access Intersection

Based on the traffic flows set out above, both a left-turn and a right-turn auxiliary lane have been included within the intersection layout.

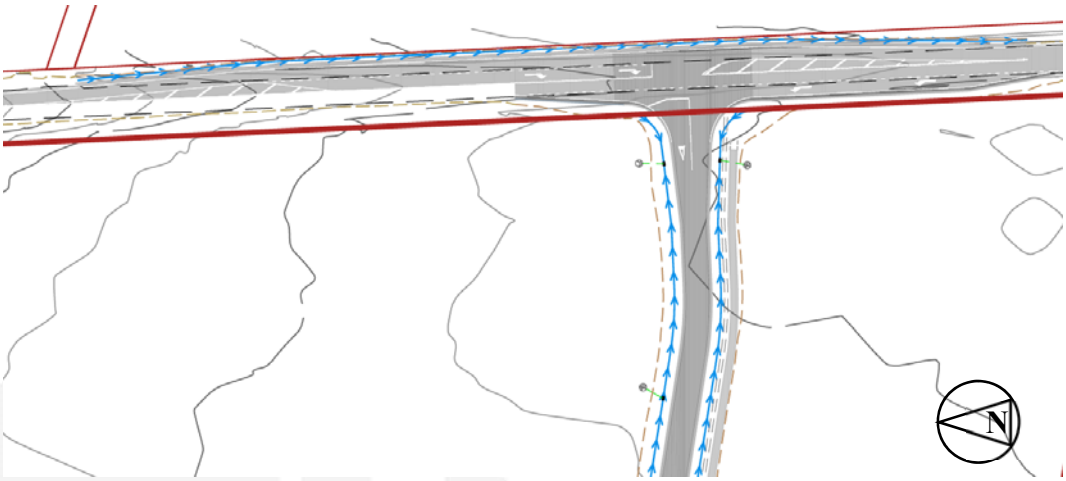

Figure 5: Overview of Proposed Arrowtown – Lake Hayes Road / New Waterfall Park Resort Zone Access Intersection (Extract from Paterson Pitts Drawing 'Proposed Access Road Intersection Detail', Q6388-15 Sheet 3 Rev B)

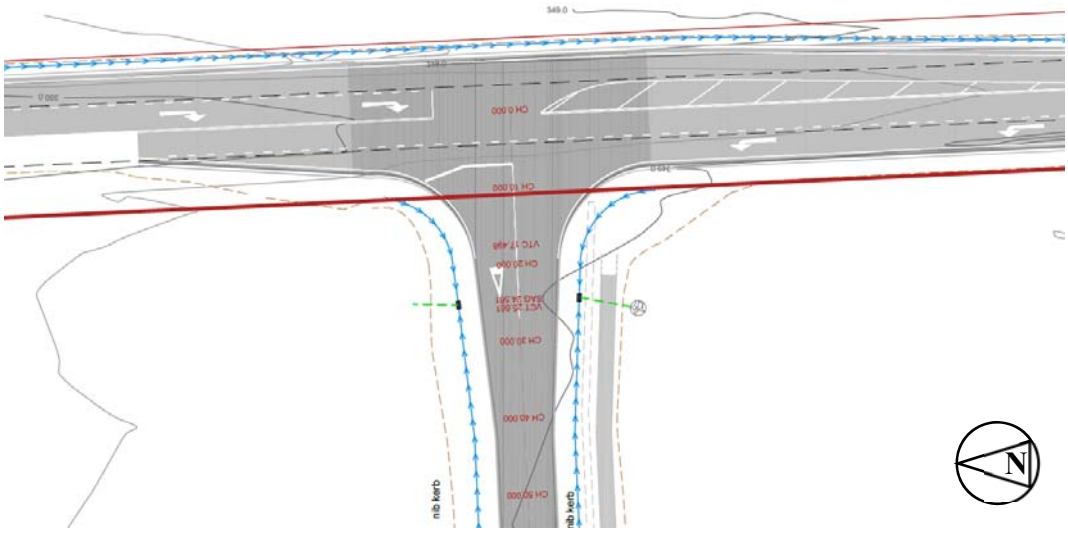

Figure 6: Detail of Proposed Arrowtown – Lake Hayes Road / New Waterfall Park Resort Zone Access Intersection (Extract from Paterson Pitts Drawing 'Proposed Access Road Intersection Detail', Q6388-15 Sheet 3 Rev B)

The design criteria for turning lanes are addressed in Sections 7 and 8 of the Austroads Guide to Road Design Part 4A. For a right-turn lane within an environment with a design speed of 80km/h:

- The length of taper (T) is 25m based on Table 5.1;
- Vehicles have to stop before turning right and so using the 'comfortable' parameter, the total length (D) is 100m based on Table 5.2;
- Hence length of parallel section (P) is 75m (100m minus the taper of 25m);
- Allow a further 12m length (S) to enable two vehicles to queue; and
- The holding line is set back 6-10m from the centreline of the access road.

For a left-turn lane within an environment with a design speed of 80km/h:

- The length of taper (T) is 25m based on Table 5.1;
- Vehicles do not have to stop before turning left and so assuming they can turn at 30km/h, then the total length (D) is 85m based on Table 5.2; and
- Hence length of parallel section (P) is 60m (85m minus the taper of 25m).

These parameters are reflected in the proposed layouts.

With regard to the control of the intersection, the plans show that 'give-way' control is proposed. Since the sight distances will meet appropriate standard, we consider that this is appropriate.

We have carried out a preliminary assessment of the functioning of this intersection layout. Based on the peak volumes of 670 vehicle movements, Levels of Service A or B are achieved on every approach, and the greatest delay (which occurs for drivers turning right from the proposed access) is less than 15 seconds. On this basis, we consider that the proposed intersection layout performs well under the traffic loadings for the extent of potential development.

Proposed New Access Road

The plans provided show that the proposed road will have a 7.2m wide carriageway, with a 2.0m footpath provided on one side only for the most part, within an 18m wide road reserve. Due to the topography, at some locations the road will be slightly elevated above the levels on each side and in other locations there will be a fill slope on one side.

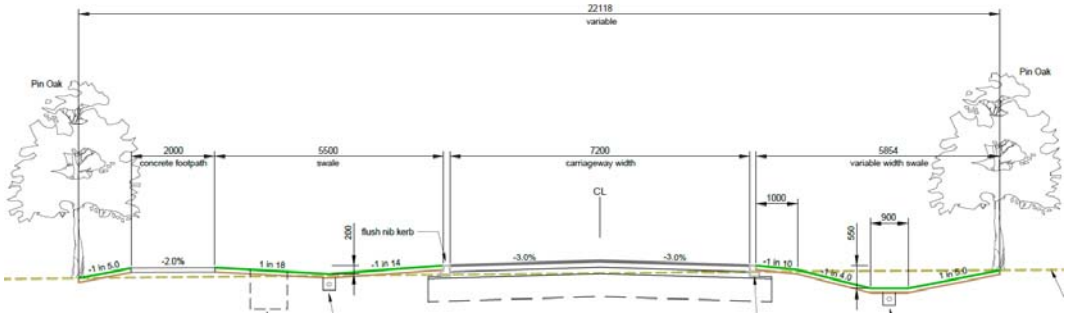

Figure 7: Example Cross-Section of Proposed Road (Extract from Paterson Pitts Drawing 'Proposed Access Road Typical Cross Sections', Q6388-15, Sheet 13 Rev B)

With regard to the Council's Subdivision Code of Practice, it would be appropriate for a rural road to have movement lanes of a total with of 5.5-5.7m, with 1.5m footpath on each side, and shoulders of 1.5m on either side (1.0m being sealed). The proposed layout therefore deviates from this slightly.

In terms of a design philosophy, we understand that the approach taken has been to signal to drivers that they are no longer on a through-route, but on a road where conditions are different. As a result, we consider that it is appropriate to have a different 'feel' to the road compared to Arrowtown – Lake Hayes Road and Speargrass Flat Road. Thus the 7.2m carriageway has been proposed in part to act as a 5.5m carriageway with sealed shoulders on each side, but also because it replicates the width required for a suburban road with a parking lane on one side. This will enable an appropriate speed limit to be set, and in our view this will potentially be 50km/h which will result in an operating speed for the road within a range of 50km/h to 60km/h.

We consider that there will be few walking movements on the road, other than for journeys wholly internal to the site, because of the lack of facilities within a viable walking distance. Moreover any journey would need to be made in part via Arrowtown – Lake Hayes Road, where there are presently no footpaths. Consequently we consider that one footpath within the site will be adequate, but this is slightly wider than the Subdivision Code stipulates in order to assist pedestrians to pass one another.

There may be a higher proportion of cyclists that use the road, as it may provide a useful east-west link between Arrowtown – Lake Hayes Road and the Countryside Ride. The volume of cyclists cannot be forecast with certainty however, but no additional provision is required for these road users under the Subdivision Code. It would be possible though to use the 2m wide footpath as a shared walking/cycling route.

In some cases, the road is abutted by swales, but in each case there is a flatter strip of berm (at 1 in 10 or less) which is 1m wide. In the event that a driver leaves the road, this provides an area for drivers to be able to stop or slow down, and return to the carriageway rather than crashing into the swale. The appropriate width for this zone depends on the speed limit of the road however, which is not yet determined. There is no requirement for a safety barrier to be provided under Section 3.3.4 of the Council's Subdivision Code of Practice.

The maximum gradient of the road is shown to be 1 in 16.67 (6%), although this only occurs for a short (100m) length and the balance of the road is no greater than 1 in 28 (3.5%). This is well within the maximum 10% permitted under the Subdivision Code.

Conclusions

Based on our analysis, we consider that the existing Waterfall Park Road is not able to serve a significantly greater amount of development than presently exists. The current zoning for the Waterfall Park Resort Zone means that traffic volumes can be generated which cannot be accommodated by the existing Waterfall Park Road, and the current alignment of the road, coupled with the difference in levels with Arrowtown – Lake Hayes Road and the need for improvements at the Arrowtown – Lake Hayes Road / Waterfall Park Road intersection, means that it will be difficult to achieve an improved roading layout which uses the existing road alignment.

We have reviewed a range of alternative locations for an access into the Waterfall Park Resort Zone and conclude that, of the options assessed, forming a new road around 240m south of the existing Waterfall Park Road onto Arrowtown – Lake Hayes Road is the optimum arrangement. We consider that this road, plus the intersection with Arrowtown – Lake Hayes Road, will be able to meet appropriate guides and will provide for increased traffic flows safely and efficiently.

Overall, having assessed the proposal, we are able to support the new road from a traffic and transportation perspective.

I trust that this is of assistance, but please do not hesitate to contact me if you require anything further or clarification of any issues.

Kind regards
Carriageway Consulting Limited

Andy Carr
Traffic Engineer | Director

Mobile 027 561 1967
Email andy.carr@carriageway.co.nz

BEFORE THE QUEENSTOWN LAKES DISTRICT COUNCIL

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER an application to construct and use a new road from Arrowtown – Lake Hayes Road to serve the Waterfall Park Resort Zone (RM171280)

STATEMENT OF EVIDENCE OF ANDY CARR
ON BEHALF OF WATERFALL PARK DEVELOPMENTS LIMITED

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1. Introduction

1.1 My full name is Andrew (Andy) David Carr.

1.2 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.

1.3 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.

1.4 I have more than 28 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.

1.5 I am presently a director of Carriageway Consulting Ltd, a specialist traffic engineering and transport planning consultancy which I founded in early 2014. 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.

1.6 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.

1.7 I have been involved in a number of proposals which have assessed the nature, location and need for proposed roads associated with new development, such as:

a. Queenstown Lakes District Plan Change 41 (Shotover Country): the rezoning of 120ha facilitating the development of around 800 residences, a school and a small amount of retail with an internal road network and new connection onto State Highway 6;

b. Queenstown Lakes District Plan Change 45 (Northlake): the rezoning of 219ha facilitating the development of around 1,600 residences and commercial development, plus the upgrading of existing roads and development of an internal road network;

c. Christchurch City District Plan Change 30 (Prestons): the rezoning of 205ha facilitating the development of around 2,500 residences, a primary school and commercial development including a supermarket, with new roading connections to the north, east, south and west of the site plus an internal road network;

d. The 'Silverstream' development in West Kaiapoi, which required the relocation of an existing road running through the site to the western site boundary.

e. Waimakariri District Plan Changes 14/15 (West Kaiapoi): the rezoning of 85ha facilitating the development of around 1,100 residences plus internal roading and connections to Beach Road to the south; and

f. Selwyn District Plan Change 24 (Darfield): the rezoning of 113ha facilitating the development of around 360 residences, with an internal roading network and connection onto State Highway 73.

1.8 My experience also includes providing advice for smaller subdivision and land use consents for sites throughout the South Island including Nelson, Blenheim, Rangiora, Christchurch, Rolleston, Ashburton, Twizel, Dunedin, Queenstown, Wanaka and Invercargill, where new access intersections have been formed onto the frontage road and/or new private and public roads have been proposed.

1.9 As a result of my experience, I consider that I am fully familiar with the particular traffic-related issues associated with the development of new and improved roading infrastructure.

1.10 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.

2. Scope of Evidence

2.1 In this matter, I have been asked by the applicant, Waterfall Park Developments Limited, to comment on the submissions received and the Council's s42a report, prepared by the Council's consultant planner, Mr Hamish Anderson and in particular the report of Ms Stella Torvelainen on which Mr Anderson relies.

2.2 My evidence is structured as follows:

a. Executive summary;

b. Refinement of the expected traffic flows on the proposed road;

c. Assessment of the reasons why using the existing point of access onto Arrowtown – Lake Hayes Road will not achieve appropriate standards;

d. Assessment of the development capacity of the Option Pink access referred to in my 15 November 2017 review;

e. Response to submissions; and

f. Response to the Council planner's report.

2.3 I have been involved with this proposal since mid-2017, and I produced a letter report (dated 15 November 2017) which addressed matters relating to the road design in some detail. I subsequently produced a supplementary letter report (dated 4 April 2018) which addressed additional matters. I adopt both of these reports as the primary part of my evidence. I have not replicated much of the detail of these letter reports within this evidence, other than what is relevant by way of background.

3. Executive Summary

3.1 In my letter report of 15 November 2017, I assessed the anticipated traffic flows that would be carried by the proposed road. I have updated these in view of refined development proposals, and remain of the view that the proposed road design is appropriate.

3.2 I have undertaken a further evaluation of the potential for using the existing intersection on Arrrowtown – Lake Hayes Road and the roadway which leads to Waterfall Park Road, but there are a number of constraints which mean that a suitable layout cannot be produced without substantial changes to the

existing geometries. In particular, to meet design guides the new road could not continue to be located at the foot of the embankment of McEntyre's Hill but would need to be situated approximately 80m towards the west.

3.3 It would be possible to use the 'Option Pink' access off Speargrass Flat Road to serve 20 to 40 rural lifestyle lots within the proposed Lifestyle Precinct area identified in the ongoing District Plan review.

3.4 I largely agree with the conclusions of the Council's consultant planner and land development engineer, other than in respect of their proposed Condition of Consent relating to vehicle speeds. I prefer a Condition of Consent that firstly identifies the nature and scale of any issue before a solution is devised and implemented, rather than the current wording which seeks to implement a solution when the need for mitigation is not established, and the extent of any issue is not defined.

3.5 Overall, from a transport engineering perspective, and subject to the preceding comments, I consider that there are no reasons why the proposed road could not be approved.

4. Refinement of the Traffic Flows on the Proposed Road

4.1 A fundamental element in the design of any new road is to understand the traffic flows which the road is expected to carry. In my letter report of 15 November 2017, I set these out (pages 5 and 6) and, based on the information available at the time, concluded that the road would carry a daily traffic flow of 3,460 to 3,800 vehicles (two-way), of which the peak hour flows would be 500 to 670 vehicle movements (two-way). This was based on:

a. 1,500 vehicle movements per day (two-way) and 190 vehicle movements in the peak hour (two-way) associated with the proposed rezoning of Ayrburn Farm through the ongoing District Plan Review; plus

b. 1,960 to 2,300 vehicle movements per day (two-way) and 310 to 480 vehicle movements in the peak hour (two-way) associated a proposed visitor accommodation complex, including a hotel, restaurants, function rooms and wellness centre/spa.

4.2 Since that time, the proposals for the visitor accommodation complex have been developed further and as a result, the associated traffic flows which it

can be expected to generate have increased. The revised traffic flows are a daily volume of 2,926 vehicles (two-way) and a peak hour traffic volume of 472 vehicles (two-way).

4.3 Overall then, the amount of traffic expected to be carried by the proposed road has changed:

a. Expected daily traffic flows have increased from 3,460 to 3,800 vehicles (two-way), to 4,426 vehicles (two-way); and

b. Expected peak hour traffic flows have been confirmed to be within the earlier range of 500 to 670 vehicles (two-way), with 662 vehicles expected.

4.4 From a practical perspective, although it is helpful to understand how much traffic a road carries over the course of a day, the 'worst-case' in respect of the road efficiency occurs at the time when the road carries its maximum traffic volume. To that end, the critical figure above is the peak hour volume, which has not changed compared to the earlier analysis. As a result, other than the daily traffic volume, I confirm my earlier review remains unchanged.

5. Use of the Existing Intersection on Arrowtown – Lake Hayes Road

5.1 There is an existing intersection to the immediate south of McEntyre's Hill, where Waterfall Park Road appears to link to Arrowtown – Lake Hayes Road. As I set out in my letter of 15 November 2017, in fact the formal connection lies toward the north of this but the difference in levels means that forming an intersection in that location is not practical. Rather, a roadway has been formed at the foot of the embankment of McEntyre's Hill, mostly (but not wholly) within the legal road reserve of Arrowtown – Lake Hayes Road. The roadway then turns sharply to the east to join Arrowtown – Lake Hayes Road. I have been asked to further assess this potential access option.

5.2 In the event that this location was to be used as a means of access to the Waterfall Park Resort Zone, it would need to be upgraded. This is because:

a. The existing zoning for the Waterfall Park Resort Zone is such that if developed, any priority intersection on Arrowtown – Lake Hayes Road would be required to have an auxiliary right-turn lane (and potentially a left-turn lane also) to meet current guides. No turning lane is presently provided;

b. The current formation of the section of roadway alongside Arrowtown – Lake Hayes Road is only sufficient for one traffic lane, whereas two traffic lanes would be required to accommodate the larger traffic flow;

c. The curve radius where the roadway meets Arrowtown – Lake Hayes Road is too small to meet current guides. It would also not be suitable for heavy vehicles to pass one another; and

d. Similarly, the curve radius where the roadway meets the legal and formed section of Waterfall Park Road is too small to meet current guides and would also not be suitable for heavy vehicles to pass one another.

5.3 With this in mind, I have arranged for a layout to be drawn up which shows how the current roadway and intersection could be amended to achieve the appropriate design criteria. The process followed for the intersection design is as follows:

a. In order to accommodate a right-turn lane, the seal width of Arrowtown– Lake Hayes Road needs to be widened by 3.5m;

b. This widening cannot take place on the western side without a realignment to a substantial part of Arrowtown – Lake Hayes Road, as part of which major earthworks will be required to the existing embankment.

c. As a consequence, widening on the eastern side of Arrowtown – Lake Hayes Road is the most viable option;

d. The dimensions of the right-turn lane need to comply with the Austroads Guide to Road Design Part 4A ('Unsignalised and Signalised Intersections');

e. At present, a driver travelling south on Arrowtown– Lake Hayes Road turns gently towards their left to negotiate the curve. If the right-turn lane was simply 'added in' to the existing road, then a driver would gently turn left (as the taper for the turning lane is developed), then they would straighten up slightly (as they passed the turning lane) and then they would again turn gently left. This is known as a 'broken back' curve and the Austroads Guide to Road Design Part 3 ('Geometric Design') notes that they are to be avoided;

f. Consequently, the traffic lane for southbound vehicles has been shown at a constant radius.

5.4 The resultant layout is shown on Annexure A to my evidence. While the layout appears to fit within the road reserve, in practice there are two locations where the edge of the traffic lane runs very close to the legal road boundary (around 2.5m away). At the northernmost of these locations, the forward sight distance available within the road reserve for a driver travelling south is 97m, compared to a requirement to provide 130m under the Austroads Guide to Road Design Part 4A (allowing for the downhill gradient). This is shown on Annexure A.

5.5 The provision of appropriate forward sight distances is an important aspect of ensuring that a road operates safely. In this case, unless third party land was acquired, the design could not meet appropriate safety-related criteria.

5.6 The process followed for the design of the proposed road is as follows:

a. The radius of the curve as the road approaches Arrowtown– Lake Hayes Road needs to be 50m to comply with the expected operating speed, under the Austroads Guide to Road Design Part 3;

b. Similarly the radius of the curve as the road approaches the formed section of Waterfall Park Road also needs to be 50m to comply with the expected operating speed; and

c. A driver approaching Arrowtown– Lake Hayes Road needs to have 73m of forward sight distance in order to see the intersection ahead of them.

d. To ensure that accesses meet the new road at 90 degrees, the accesses into the Ayrburn Homestead and into a private property at the northern curve both need to be realigned.

5.7 It can be seen that one outcome of the required curve radii is that the new road would need to be located further from Arrowtown – Lake Hayes Road than is presently the case, and it would be located approximately 80m towards the west and pass through the existing rural land.

5.8 Although not shown on Annexure A, from my site visits I have observed a slight difference in levels between the intersection with Arrowtown – Lake Hayes Road and the lot through which the new road would pass. As such, I expect that earthworks would be required to enable to new road to be elevated as it connects to the Arrowtown – Lake Hayes Road.

5.9 Overall then, based on my assessment, I am of the view that it would be extremely difficult to achieve an upgraded intersection layout which complies with relevant design guides, and third party land would be required to meet appropriate safety-related criteria .

6. Assessment of the Option Pink Development Capacity

6.1 I briefly noted previously the ability of the proposed road to serve development within the Ayrburn Farm and Waterfall Park Resort Zone. However I understand that the land through which the proposed road will pass is proposed to be rezoned as Lifestyle Precinct which I understand to be a rural lifestyle zoning. I have been asked to advise how many rural lifestyle lots could be served by the Option Pink access (described further in my letter report of 15 November 2017), off Speargrass Flat Road.

6.2 The Option Pink access has a legal width of 10m. It presently contains a public walkway/cycleway which forms part of the 'Countryside Ride' trail between Arrowtown and Shotover Country, and is part of the Queenstown Trails network. Consequently, any use of this option for motorised vehicles needs to take into account that cyclist numbers will be greater than on a typical road.

6.3 Under the Council's Subdivision Code, there are two relevant criteria for road design:

a. 1 to 20 dwellings: 9m wide legal road reserve, 5.5m to 5.7m carriageway; and

b. 1 to 150 dwellings: 15m wide legal road reserve, 5.5m to 5.7m carriageway.

6.4 It can be seen that in each case, the carriageway width is the same. However there is a degree of crossover between the two road layouts, and unfortunately the Subdivision Code does not give any guidance regarding how interim sizes of development could be served (for example, there is no information on the appropriate legal width for a road serving 30 dwellings).

6.5 From other commissions in the District, I am aware that the Council applies the thresholds rigidly, such that a road serving 21 dwellings should be designed at the higher level and have a 15m wide road reserve. I do not agree with this approach however, but rather, I consider that there is scope for an assessment of effects at these interim values.

6.6 However, based on the Council's approach, Option Pink would be able to provide access to 20 rural lifestyle lots. This size of development would generate 20 vehicle movements in the peak hours (one every three minutes, on average) and I therefore consider that the functioning of the cycleway would be largely unaffected.

6.7 In my view, it would be possible to serve around 40 rural lifestyle lots via Option Pink. This is based on the peak hour volumes being in the order of 40 vehicle movements, and the 10m-wide section being 130m in length, meaning that it could be traversed by a vehicle in about 40 seconds. I consider that this would result in the level of service provided to users of the walkway/cycleway remaining high, with appropriate levels of efficiency and road safety.

6.8 I note that as the Council applies the Subdivision Code in a particular manner, a resource consent application would need to be made if an applicant desired to use Option Pink to serve this greater number of lots.

7. Response to Submissions

7.1 I have read the submissions that address transportation-related matters, and comment on these below. For clarity, they are not set out in any particular order, and I have consolidated submissions where the same matter has been raised.

Submitter Concern: There is already an access road to the zone that is fit for purpose or could easily be widened

7.2 The existing legal corridor of Waterfall Park Road meets Arrowtown – Lake Hayes Road further to the north of the existing intersection, and due to the difference in levels, it would be extremely difficult to use this. However the current formation of the roadway parallel to Arrowtown – Lake Hayes Road is too narrow to accommodate the amount of traffic generated by the development which would be served.

7.3 I set out above that if the existing road was to be upgraded to meet current design guides, it would not be possible to achieve the appropriate forward sight distance for southbound traffic on Arrowtown – Lake Hayes Road, and the new road would need to be relocated 80m west of its current location (parallel to the foot of the embankment of Arrowtown – Lake Hayes Road) as shown on Annexure A.

7.4 On this basis, I do not consider that the existing road is fit for purpose, or could be widened such that current design guides are met without the realignment being implemented that is shown on Annexure A.

Submitter Concern: Traffic congestion on Arrowtown – Lake Hayes Road will be exacerbated

7.5 Development of the Waterfall Park Resort Zone will inevitably increase traffic volumes on Arrowtown – Lake Hayes Road. I have carried out analyses of the performance of the Arrowtown – Lake Hayes Road / Proposed Road and Arrowtown – Lake Hayes Road / Speargrass Flat Road intersections and these show that the effects on queues and delays are minimal, and that the intersections can accommodate the anticipated traffic flows safety and efficiently.

Submitter Concern: The road could be relocated further to the north

7.6 Relocating the road to the existing intersection with Arrowtown – Lake Hayes Road results in a non-compliance with sight distances, which is a safety-related matter. Even if the road was to be sited between this location and the currently-proposed location, it would still need to be designed with 50m radius curves and would traverse the rural area in order to meet the formed section of Waterfall Park Road.

Submitter Concern: The current roads are suitable for the existing zoning / the road is only needed for a future development

7.7 My earlier letter report of 15 November 2017 set out that "*the Waterfall Park Resort Zone is zoned for residential development plus visitor accommodation and development. We have been advised that the maximum extent of development enabled by the current zoning is 100 apartment units plus approximately 114 visitor accommodation rooms. That extent of development would generate a daily traffic flow in the order of 1,170 vehicle movements (two way) and a peak hour flow of 170 vehicle movements (two way*)."

7.8 Under the Council's Subdivision Code, a complying road serving a development of this scale would need to have a 15m wide legal width and a 5.5m to 5.7m wide carriageway. This is not achieved by the existing road formation. Thus the current access arrangements are not appropriate for the development that the land is already zoned for.

8. Response to Council Officers Report

8.1 I have read the report of Mr Hamish Anderson, Council's consultant planner, and reviewed it for those matters which relate to transportation issues. In this regard, I note that he relies on the report of Ms Stella Torvelainen, Council's Land Development Engineer. I largely agree with their conclusions, other than in respect of the matter of the speed environment.

8.2 With respect to vehicles speeds, both Mr Anderson and Ms Torvelainen agree that a 50km/h speed environment is appropriate. However they then go on to set out that in view of the road design, the detailing of traffic calming devices and speed treatments will need to be specified at the Engineering Approval stage (Anderson page 20 and Torvelainen page 68). This is then taken forwards into Condition of Consent 9(a), second bullet point.

8.3 I agree with the overarching philosophy of ensuring that the new road has an appropriate speed limit, and I also agree that this should be 50km/h. However in my view, there is no reason at this stage to anticipate that significantly higher speeds will be regularly achieved. This is because the road is effectively a cul-de-sac that only carries traffic that is moving to or from the activity zone, and the formed width remains limited.

8.4 With this in mind, I do not agree with Condition of Consent 9(a), second bullet point, because it assumes that a problem will arise and seeks that solutions will be implemented, at a time when there is no evidence that problems will occur. One potential outcome of this is that any measures will be well in excess of what is actually required, because they will be designed without an understanding of the nature and scale of the issue.

8.5 I agree though that if high speeds were to arise, then interventions to reduce those speeds should be implemented.

8.6 I therefore prefer a Condition of Consent that achieves the following:

a. As the road will be a private road, then the consent-holder (as the road controlling authority) will install 50km/h speed limit signs in accordance with the Manual of Traffic Signs and Markings Section 2;

b. Three months after the road opens, the consent-holder will arrange for a speed survey to be carried out to determine the operating speed of the road. This will be calculated as the 85th percentile observed speed, with at least 100 measurements being taken in each direction of travel. The results of this survey will be provided to the Council;

c. In the event that the operating speed exceeds 50km/h, then the consent holder shall design and implement measures to reduce the operating speed to 50km/h or less. Once the measures are constructed, the consent-holder will arrange for the speed survey to be repeated to demonstrate the effectives of these measures. The results of this survey will be provided to the Council.

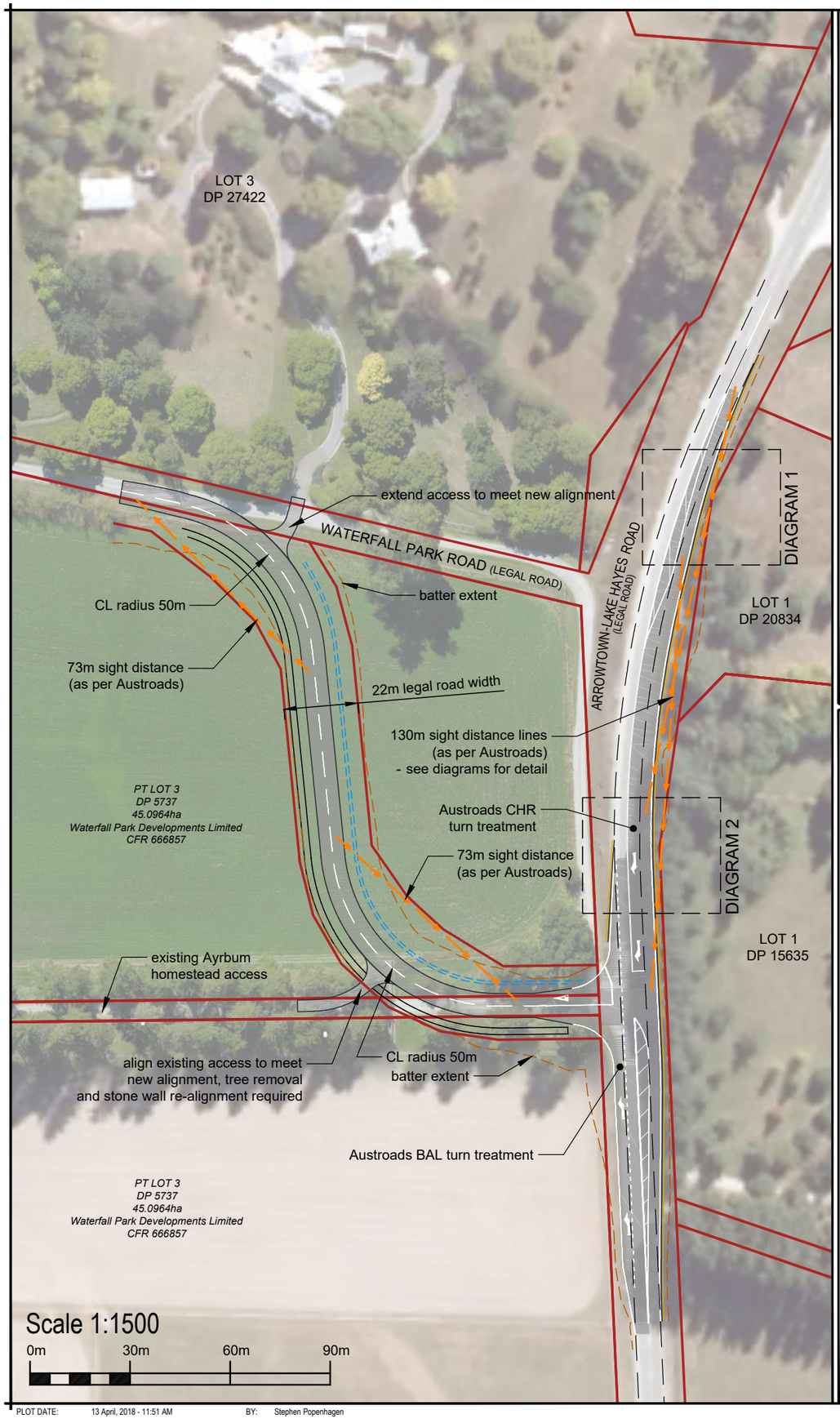
8.7 For clarity, if the road was to be vested in the future then the road controlling authority would be the Council, who would be similarly able to erect speed limit signs. However at that stage, it ceases to be a matter over which the consent-holder would have control.

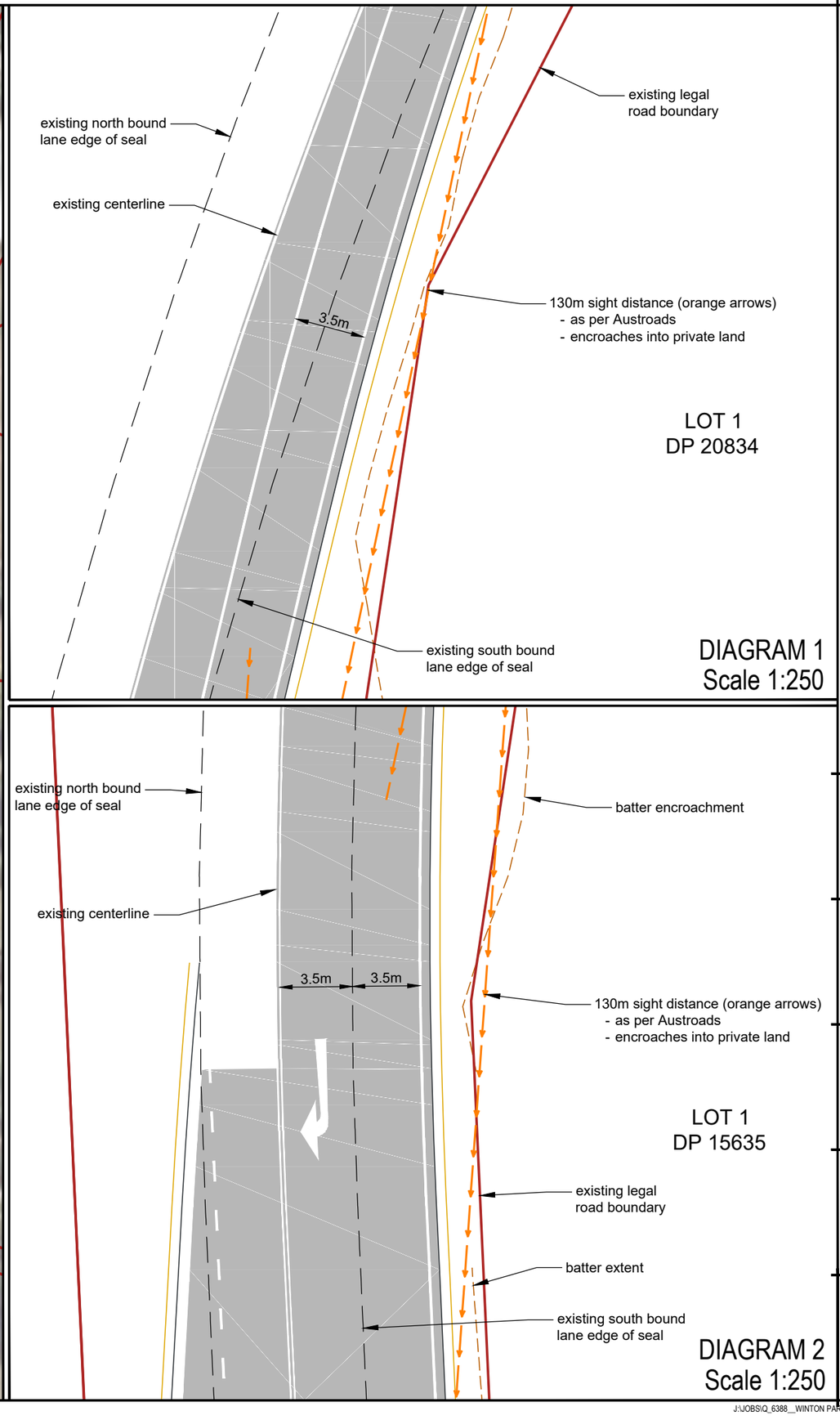
8.8 In my view, this Condition of Consent is superior to that which is presently proposed because it firstly only requires measures to be implemented when a speed issue is identified, and secondly, means that the measures can be made more specific to the particular concern.

Andy Carr

Carriageway Consulting Ltd

13 April 2018





A

NOTES:
1. This plan and its contents should not be used for any reason other than its intended purpose. This plan and surveyed information does not include assessment or representations concerning:
   - Hazard registers, ground conditions or suitability for development
   - 'Ground level' as defined by the QLDC District Plan
   - Service connections to utility services
2. This plan includes information from site surveys undertaken by Paterson Pitts Group (Sep 2017) and CFM (2016/2017)
3. Refer to the relevant CFRs and title plans for registered easements, covenants and interests
4. Existing Arrowtown - Lake Hayes Road alignment traced from QLDC GIS aerial image
5. Austroads sight distances (as shown) received from Carriageway Consulting Ltd

PATERSONPITTSGROUP
Surveying • Planning • Engineering
Your Land Professionals
www.ppgroup.co.nz
0800 PPGROUP

QUEENSTOWN:
Terrace Junction,
1092 Frankton Road.
PO Box 2645,
Queenstown 9349.
T 03 441 4715
E queenstown@ppgroup.co.nz

Client/Location:
Waterfall Park Developments Ltd
Sec 69 Blk VII Shotover SD, Lots 1 & 2
DP 23038, Lot 1 DP 27503, Lots 1 & 2
DP 507367, Pt Lot 3 DP 5737 and Lot 1 DP 18109

Purpose/Drawing Title:
Proposed Access Road Alternative Intersection

Surveyed by:	PPG	Original Size:	Scale:
Designed by:	SJP	A3	As shown
Drawn by:	SJP		
Checked by:	SJW		DO NOT SCALE
Approved by:			
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BEFORE THE QUEENSTOWN LAKES DISTRICT COUNCIL

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER an application to construct and use a new road from Arrowtown – Lake Hayes Road to serve the Waterfall Park Resort Zone (RM171280)

SUPPLEMENTARY STATEMENT OF EVIDENCE OF ANDY CARR ON BEHALF OF WATERFALL PARK DEVELOPMENTS LIMITED

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1. Introduction

1.1 My full name is Andrew (Andy) David Carr. My qualifications and experience remain as set out in my Evidence in Chief.

1.2 In this Supplementary Statement, I have been asked to consider a variation of Option Yellow, which has been suggested by a Submitter. Following receipt of the Commissioners' Minute, I have also been asked to comment on Matter 5.4, as to whether the width of the carriageway could be reduced.

1.3 I reconfirm that 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.

2. Description of Option Yellow and Submitter Option

2.1 Option Yellow was initially described within my letter report of 15 November 2017. In that letter report, I noted that it comprised of retaining the existing formation of the carriageway at the foot of the embankment of McEntyre's Hill but improving this to accommodate a higher traffic flow. This would also require the improvement of the intersection with Arrowtown – Lake Hayes Road, and also the improvement (widening) of the existing formation of Waterfall Park Road.

2.2 Subsequent to my letter report, Option Yellow was further refined and this culminated in the alignment shown in Annexure A of my Evidence in Chief. This alignment adopted minimum recommended curve radii for the new roadway (as set out in the Austroads Guide to Road Design Part 3, which the Council has adopted for new road designs) and in doing so showed that simply widening the existing road formation could not be accomplished while meeting that Guide. This meant that the roadway would have to be located approximately 80m west of its current alignment.

2.3 I understand that a Submitter has raised the possibility of extending the main roadway of Option Yellow to link to the new intersection proposed by the Applicant. I have therefore considered this option in more detail.

3. Submitter Option

3.1 In assessing this option, I have followed the same process as described in my Evidence in Chief. That is, I have used the desirable minimum radii and extended the roadway in the manner indicated by the Submitter. The resultant alignment is shown on Annexure A to my Evidence, with the new road running around 80m to the west of Arrowtown – Lake Hayes Road.

3.2 In my view, this alignment resolves the issue in respect of third party land (as I previously identified for Option Yellow). I also consider that an intersection layout with Arrowtown – Lake Hayes Road could be constructed to meet relevant guides and standards (since the location is the same as proposed within the Application).

3.3 My main concern with this alignment is that there would be two roads running parallel to one another in relatively close proximity. While there is no reason to expect that this will present difficulties during hours of daylight, at night-time northbound drivers on Arrowtown – Lake Hayes Road will see car headlights on their left-hand-side associated with southbound vehicles on the new road. This is not a scenario that drivers typically expect, since car headlights are invariably on a drivers' right. As such, there is the potential for both driver confusion about their position on the road, and also for drivers to be dazzled by the headlights[1].

3.4 Although I do not expect that this will be a common occurrence, I am mindful that Arrowtown – Lake Hayes Road has a speed limit of 70km/h and an operating speed of 80km/h. As such, if a northbound driver is confused or dazzled there is only a small amount of time available for them to react/recover before they encounter the intersection and the potential for turning vehicles, and then need to turn towards their right as they ascend McEntyre's Hill.

3.5 On this basis, I consider that this alignment would potentially have adverse road safety effects and that it would be appropriate to implement measures to eliminate the potential for glare/dazzle to arise. This is most commonly accomplished through the instruction of a physical barrier, such as a fence or dense vegetation. The selected option could be installed either along the

[1] Car headlights are adjusted so that they point slightly to the drivers' left, and hence away from any vehicles approaching on the opposite side of the road. However in this case, this angling of the headlights of cars travelling along either road means that they would be pointing *towards* vehicles on the other road.

westbound edge of Arrowtown – Lake Hayes Road, or on the eastern side of the new road.

4. Potential Variant to Submitter Option

4.1 Although not suggested by the Submitter, I have identified that it would also be possible to reduce the extent of the suggested southwards extension and move the new intersection to around 100m to the north of the location proposed in the application. This would continue to avoid the use of the third party land, and a suitable separation could be achieved from the Doyle's driveway. I have shown this in a dotted purple line on Annexure A.

4.2 Notwithstanding that this reduces the amount of additional roadway required, in my view it continues to have the same potential for adverse road safety effects as the new road remains parallel to Arrowtown- Lake Hayes Road. I remain of the view that measures should be implemented to reduce this potential, and these would be of the same type and location as for the Submitters option. However a lesser length would be required.

5. Response to Commissioners' Minute

5.1 Following receipt of a Minute from the Commissioners I have been asked to record in writing my verbal response to a query put to me about carriageway width (Matter 5.4 of the Minute).

5.2 If a new road is proposed within the District, and it is to be vested as a public road, then it has to comply with the Council's Subdivision Code of Practice (irrespective of whether subdivision is proposed or not). This Code is based on a national Standard (Standard NZS4404:2010 'Land Development and Subdivision Infrastructure') which sets out the dimensions for different types of road which are considered appropriate for particular circumstances.

5.3 New roads that are to remain in private ownership do not have to comply with the Code of Practice, but if a different type of cross-section is proposed, then the party proposing the road needs to demonstrate that it will operate safely and efficiently. In practice this is difficult to do, and typically leads to extensive discussion, and so the most pragmatic outcome is for private roads to be constructed to meet the Council's Subdivision Code of Practice also.

5.4 This approach also means that drivers experience a consistent road environment.

5.5 The Subdivision Code of Practice notes that for a road carrying the volume of traffic that is expected in this case, two traffic lanes are required with a total width of 5.5m to 5.7m.

5.6 The Code of Practice goes on to say that a further 1m of seal is required on each side of the traffic lanes. This is needed to prevent 'edge breakage'.

5.7 Edge breakage arises when there is little or no additional seal, because vehicle tyres pass over the edge of the seal and this in turn puts pressure onto the edge which can then crumble (as it has structural support on one side only). Over time this results in higher maintenance costs for repairs as the edge of the seal and eventually the edge of the traffic lane, fails.

5.8 Conversely, where there is additional seal width provided, vehicle tyres have a short separation from the edge of the seal. This means that the part of the seal over which the tyres pass has support on both sides and hence edge breakage does not occur.

5.9 Thus to comply with the Council's Subdivision Code, there needs to be a seal width of 7.5m.

5.10 The proposal provides a slightly smaller width, at 7.2m, which Council's engineering advisors have accepted as appropriate in this case.

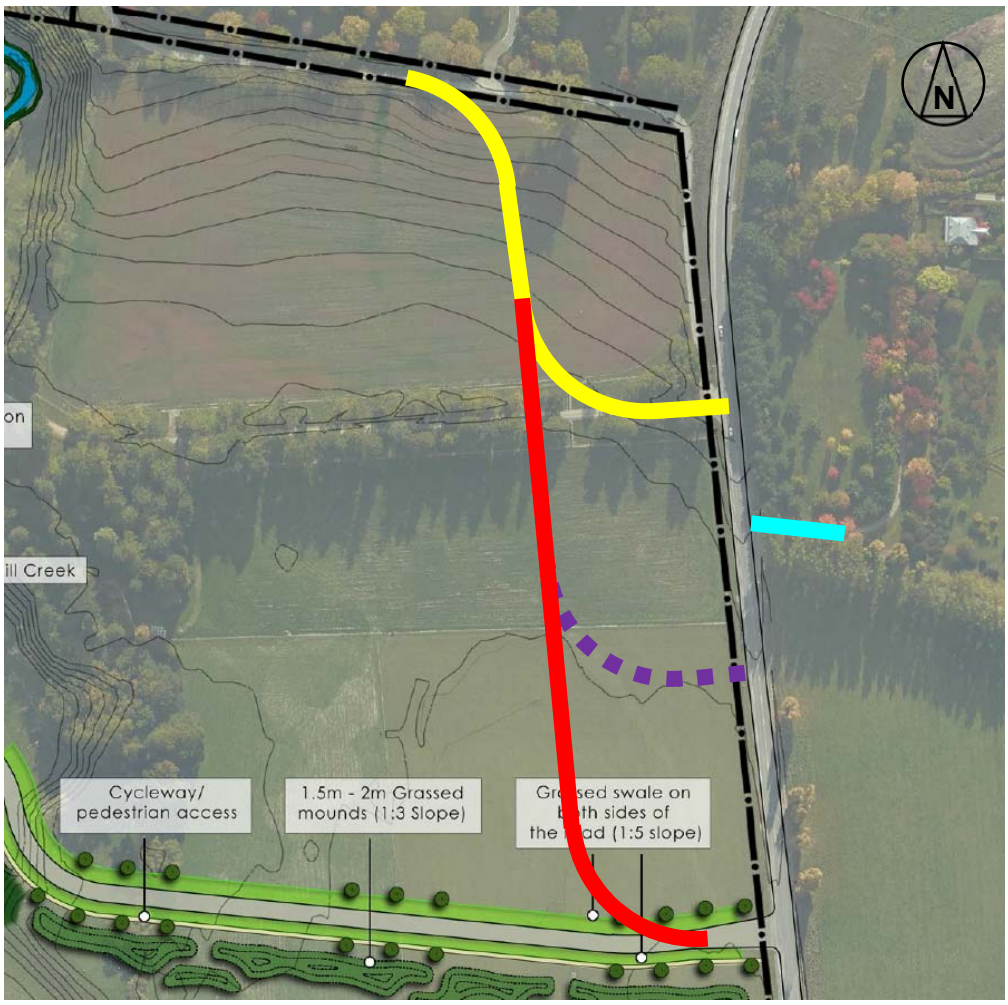
5.11 Consequently the width of the seal already falls slightly below what would normally be expected. In my view it should not be reduced any further as to do this would potentially incur additional maintenance costs due to a higher incidence of edge breakage and may mean that Council would not be prepared to accept the road as legal (vested) road in the future.

Andy Carr

Carriageway Consulting Ltd

4 May 2018

Annexure A: Potential Road Alignments



Option Yellow

Submitter Option

Variation to Submitter Option

Doyle's driveway