

Before the Queenstown Lakes District
Council

In the matter of The Resource Management Act 1991 (RMA)

And The Queenstown Lakes Proposed District Plan Stage 3; Stream
18; Settlement Zone

Statement of evidence of Peter Forrest for Universal Developments (Hawea) Limited #3248

29 May 2020

Submitter's solicitors:

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Qualifications and experience

- 1 My full name is Peter David Forrest. I hold the qualification of first class honours degree in Geology and a PhD in Engineering Geology. I am a Chartered Geologist through the Geological Society of London (UK) and a member of the International Association of Engineering Geology. I am a member of the New Zealand Geotechnical Society (affiliated to Engineering New Zealand) and am currently applying for the chartered membership of Engineering New Zealand as Professional Engineering Geologist. I am employed as a Principal Engineering Geologist with Ground Consulting Limited (GCL). I have been working with GCL for the last 3.5 years.
- 2 I have over 25 years' experience as a consultant engineering geologist, having worked in the UK, Ireland and New Zealand. The last 13 years have been spent in New Zealand working for GHD, Aurecon and now GCL. My work in New Zealand has been varied including natural hazards (NZTA route security studies, Christchurch City Council Port Hills Geotech Group), resource and mining geology (Solid Energy), large scale Infrastructure (NZTA, Auckland Transport), and latterly commercial and residential development.
- 3 I currently manage the Queenstown office of GCL, where for the last three years I have serviced the residential and commercial development sector. The client base is wide ranging from the individual owner, regional and national housebuilders, planners and developers. The work has involved site investigation and geotechnical assessment of individual lots through to large residential and commercial subdivision, including stormwater and effluent disposal assessment. I have worked throughout the region including much work on various subdivisions in Wanaka and Lake Hawea.
- 4 I have also been involved with the all the site investigation and geotechnical reporting for the wider area associated with the Hawea SHA proposals, as reported in previous GCL reports R4372-2A, 3A and 4A and the more recent R6104-1A. I am therefore familiar with the wider scheme and ground conditions pertinent to the site under consideration.

Code of Conduct for Expert Witnesses

- 5 I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2014 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of evidence

- 6 In preparing this evidence I have reviewed the reports and statements of other experts giving evidence relevant to my area of expertise, including:
- (a) Geological and geotechnical ground conditions
 - (b) Natural hazards
 - (c) Stormwater management
- 7 I have prepared evidence in relation to:
- (a) Comprehensive zoning proposal of land located south of existing Hawea Township, as described in the evidence of Mr Williams at para 7.
- 8 My evidence is divided into the following sections:
- (a) Ground Conditions and geotechnical stability in context of future residential and commercial development;
 - (b) Natural hazards impacting on the property;
 - (c) Flooding hazard; and
 - (d) Suitability of ground conditions for stormwater disposal.

Executive Summary

- 9 This evidence provides a preliminary geotechnical investigation and assessment of the project site as defined in the evidence of Mr Williams at paras 7 – 10.
- 10 Based on the preliminary geotechnical investigations undertaken, there are no identified constraints related to ground conditions, natural hazards and flooding that would preclude the comprehensive zoning proposal for residential and commercial land use.

Evidence

Geological and Geotechnical Ground Conditions

- 11 GCL completed geotechnical site investigations of Lots 1 & 2 DP 343855 Cemetery Road in October 2018 and Lot 1 DP 541414 in March 2020. All investigations comprised a site walkover, a total of eighteen mechanically excavated test pits and associated Scala penetrometer testing in order to determine the nature, engineering properties and relative density of the soils. Soakage testing was also

completed in a number of the test pits in order to determine the ground's ability to accommodate soakage to ground stormwater disposal.

- 12 The nature of the investigations are considered 'preliminary' by means of the low number of investigation points across the total 130ha area under consideration. However, for this stage of the rezoning process the investigation distribution is considered commensurate and appropriate.
- 13 The ground conditions are very consistent across the site, comprising a thin mantle of top soil overlying recent overlying alluvial material, in turn overlying late Pleistocene river outwash deposits.
- 14 The alluvial material comprises loose to medium dense silty SAND. The outwash deposits are considerably more dense and consist of sandy GRAVEL with cobbles and boulders.
- 15 Groundwater was not encountered in the shallow investigations. Based on Otago Regional Council borehole data, it is anticipated to be approximately 12m below ground level across the site, meaning it will have little influence on the geotechnical properties of the site or be impacted by the development.
- 16 The ground conditions and the level nature of the topography pose no constraints from a geological and geotechnical perspective to future residential and commercial development. There are no slope stability issues. It is very unlikely that unstable ground conditions will be encountered during development.

Natural Hazards Assessment

- 17 The dense granular ground conditions and depressed groundwater regime renders the site at nil to low risk of liquefaction.
- 18 There are no alluvial landforms or active systems that pose a risk to the site.
- 19 The site is not influenced by any form of landslide or land instability.
- 20 The site is centred between two active faults comprising The Cardrona-Hawea Fault, 1km to the west and The Grandview Fault, 5km to the east. These two faults are inferred to run parallel to Hawea Flat / Upper Clutha basin before intersecting over Lake Hawea forming a single fault. It should be noted that placement of such fault boundaries is associated with a generous margin of error and no fault traces are visible in the immediate Lake Hawea area, including the subject site.
- 21 The Cardrona-Hawea Fault and Grandview Fault recurrence interval is estimated at 30,000 and 22,000 years respectively.

- 22 The Wanaka region is at reasonable seismic risk from potentially strong ground shaking, likely to be associated with a rupture of the Alpine Fault, located along the West Coast of the South Island. There is a moderate probability that an earthquake with an expected magnitude of over 8 will occur along the Alpine Fault within the next 50 years.
- 23 With reference to NZS1170.5, the seismic soil class for the subject site is Class D (deep soils).
- 24 Based on the investigations completed, there are no natural hazards that pose a risk with respect to the rezoning of the site. Whilst the district is at risk from ground shaking associated with seismic activity, the risk to the site is no greater than the surrounding areas and can be mitigated through appropriate geotechnical and structural engineering design.

Flooding Hazard

- 25 The eastern boundary of the project site coincides with the western margin of an inferred potential dam burst flood path of the Gladstone Control Gate; this is indicated in the evidence of Mr Williams at Appendix D.
- 26 A Works Consultancy Services report dated 1 September 1994 states that at the Probable Maximum Flood (PMF), Lake Hawea would rise to a level of approximately 350.8m and the Gladstone Gap embankment would overtop and wash out in this extreme event.
- 27 However, there are two mitigating circumstances that make the overtopping of the Gladstone Gap unlikely, namely
 - (a) The PMF level would be lower than the freeboard of the Lake Control Dam:
and
 - (b) The Gladstone Gap emergency spillway has been designed for floods greater than the 1 in 500 Annual Exceedance Probability Flood.
- 28 Therefore, the risk of flooding impacting the eastern margin of the site is very low within the life of any future building (100 years as per Building Code).

Stormwater Disposal

- 29 The ground conditions observed in the eight test pits completed are conducive for an engineered to-ground stormwater facility solution, based on the clean coarse granular make-up of the uniformly underlying river outwash gravels.

- 30 Based on the observations from this current site investigation and drawing on GCL's soakage testing completed in adjacent properties for separate resource consent application, an unfactored design soakage rate of 1000mm/hr is considered feasible in these ground conditions – subject to site specific infiltration testing.

Conclusion

- 31 A preliminary geotechnical investigation and assessment of the project site has been completed. This has allowed a geological ground model to be developed in terms of ground conditions, natural hazards, including flooding, and stormwater disposal.
- 32 The ground model suggests that there are no significant or specific geological or geotechnical constraints that would prohibit the project area from progressing with the proposed comprehensive zoning for residential and commercial land use.
- 33 Based on the geological, geotechnical and groundwater conditions that prevail across the site, the site would be able to support subdivision development subject to the adherence to QLDC's Code of Practice for Land Development and Subdivision and other appropriate engineering standards associated with earthworks and land development.

Peter Forest

Dated this 29th day of May 2020