Before the Queenstown Lakes District Council Hearing Panel

Under	the Resource Management Act 1991
In the matter of	the renotification of two submissions on Stage 1 of the Queenstown Lakes Proposed District Plan concerning the zoning of land at Arthur's Point by Gertrude's Saddlery Limited and Larchmont Enterprises Limited

Statement of Evidence of Dr Reece Hill on behalf of Gertrude's Saddlery Limited and Larchmont Enterprises Limited

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Introduction

1 My full name is Dr Reece Blackburn Hill.

2 I hold a Doctor of Philosophy in Soil Science from Lincoln University (2000), a Master of Applied Science in Soil Science from Lincoln University (1994), and a Bachelor of Science with a double major in Biological Sciences and Earth Sciences from University of Waikato (1988).

3 I am a past President of the New Zealand Society of Soil Science (2014-2016), and a current member of the New Zealand Society of Soil Science, New Zealand Association of Resource Management, and the New Zealand Institute of Agricultural & Horticultural Science.

4 I have 19 years' experience as a Soil Scientist at Waikato Regional Council, six years' experience as a Soil Consultant at Landsystems, of which I have been full time for the past three years, and three years' experience mapping forest soils in Tasmania.

5 I specialise in soil characterisation, soil mapping, land use capability assessment, regional soil policy, soil quality and catchment and land management. I have applied these skills in numerous projects within Waikato Regional Council and Landsystems, working with individual landowners including farmers and growers, regional and district council staff, Crown Research Organisations, Universities, and Ministry staff (MPI and MfE).

6 I was lead reviewer for the Ministry for the Environment review of national soil quality monitoring and indicators and established the soil quality monitoring programmes for Waikato Regional Council and Nelson City Council. I was lead author of the soil quality monitoring chapter of "Land and Soil Monitoring: A guide for SOE and regional council reporting".

7 I have advised central government and district and regional councils throughout New Zealand in relation to soil management, land use capability, high class soils and the use of soil map information. This included regional council representation on the Land Use Capability Classification System (LUCCS) Governance Group.

8 I have undertaken property scale soil and Land Use Capability (LUC) assessments to identify high class soils for subdivision applications in the Waikato, Auckland, Bay of Plenty, Marlborough and Otago regions.

9 As part of my role at Waikato Regional Council, I was Lead Technical Writer for the Soils chapter (Chapter 14) of the Waikato Regional Policy Statement

which became operative in 2016. Chapter 14 included a policy on High Class Soils (Policy 14.2).

10 In 2020, I provided technical soil expertise to support The Waikato District Plan (Stage 1) review, with my main input focussing on Subdivision Rules and high class soils.

11 In 2021, I provided a review of the Productive Land Classification for Tasman District Council.

12 I have undertaken soil and Land Use Capability (LUC) assessments for subdivision that have required assessment against the NPS-HPL.

Scope of evidence

13 In preparing this evidence, I have reviewed the following reports and statements:

(a) Available regional scale (NZLRI) LUC map information.

(b) Available aerial photography of the subject site.

(c) A detailed slope class map of the subject site.

14 I have prepared this evidence in relation to:

(a) Applicability of the NPS-HPL to the subject site,

(b) Land Use Capability Classification system definitions,

(c) the Land Use Capability classification of the subject site, and

(d) assessment against the National Policy Statement for Highly Productive Land.

15 I have not undertaken a field assessment of the subject site. My evidence is based on a desktop analysis of available LUC map information and interpretation of aerial photography and detailed contour map information.

Executive summary

16 My evidence is based on a desktop analysis of available LUC map information and interpretation of aerial photography and detailed contour map information.

17 The available NZLRI LUC map information indicates that the LUC map unit for the site is 3s6+6e19, where LUC unit 3s6 is the dominant unit and 6e19 is the sub-dominant unit.

18 By definition LUC class 1, 2 and 3 land cannot occur on slopes greater than 15 degree slopes.

19 My interpretation of available aerial photography indicates that LUC unit 3s6 is the dominant unit in the LUC map unit, with the balance of the map unit area being LUC class 4 or greater.

20 My interpretation of a detailed (property scale) slope class map indicates that the slopes on the subject site are predominantly greater than 15 degrees and that the land is more correctly LUC class 4 or greater.

21 Council have classed the subject site land as NPS highly productive land based on the dominant LUC unit of the NZLRI map unit (3s6+6e19).

22 In my opinion, the use of the NZLRI dominant LUC unit (3s6) fails to acknowledge the presence of other LUC class land in the map unit and on the subject site.

23 As my evidence shows, the property scale assessment using aerial photography and detailed slope class map information, indicates that the subject site land would more accurately be class as LUC class 4 or greater, based on slope alone, and as such would not be classed as NPS highly productive land.

National Policy Statement for Highly Productive Land (NPS-HPL)

24 Aspects of the NPS-HPL that relate to LUC classification are within my expertise.

25 "Highly productive land" is defined in the NPS-HPL as:

> means land that has been mapped in accordance with clause 3.4 and is included in an operative regional policy statement as required by clause 3.5 (but see clause 3.5(7) for what is treated as highly productive land before the maps are included in an operative regional policy statement and clause 3.5(6) for when land is rezoned and therefore ceases to be highly productive land)

26 My understanding is that clause 3.5(7) applies because maps produced in accordance with clause 3.4 have not yet been included in an operative regional policy statement as required by clause 3.5. Clause 3.5(7) states:

(7) Until a regional policy statement containing maps of highly productive land in the region is operative, each relevant territorial authority and consent authority must apply this National Policy Statement as if references to highly productive land were references to land that, at the commencement date:

(a) is

(i) zoned general rural or rural production; and

(ii) LUC 1, 2, or 3 land; but

(b) is not:

(i) identified for future urban development; or

(ii) subject to a Council initiated, or an adopted, notified plan change to rezone it from general rural or rural production to urban or rural lifestyle.

"LUC 1, 2 and 3" is defined as:

LUC 1, 2, or 3 land means land identified as Land Use Capability Class 1, 2, or 3, as mapped by the New Zealand Land Resource Inventory or by any more detailed mapping that uses the Land Use Capability classification.

LUC classification system

27 Land use capability is defined as *the land's properties that determine its capacity for long term sustained production*. The productive capacity of the land is determined by the physical qualities of the land, soil and environment and its limitations. Limitations include susceptibility to erosion, steepness of slope, susceptibility to flooding, liability to wetness or drought, salinity, depth of soil, soil texture, structure and nutrient supply and climate[1]. Increasing limitations reduce the land's versatility for use. These concepts are encapsulated in New Zealand's Land Use Capability Classification system.

28 The LUC Classification criteria and their use are defined according to the Land Use Capability Survey Handbook 3rd Edition[2] (Land Use Capability Handbook).

[1] Lynn, IH, Manderson, AK, Harmsworth, GR, Eyles, GO, Douglas, GB, Mackay, AD, Newsome PJF. 2009. Land Use Capability Handbook - a New Zealand handbook for the classification of land 3rd Ed. Hamilton, AgResearch; Lincoln, Landcare Research; Lower Hutt, GNS Science 163pp.

[2] Lynn, IH, Manderson, AK, Harmsworth, GR, Eyles, GO, Douglas, GB, Mackay, AD, Newsome PJF. 2009. Land Use Capability Handbook - a New Zealand handbook for the classification of land 3rd Ed. Hamilton, AgResearch; Lincoln, Landcare Research; Lower Hutt, GNS Science 163pp.

29 The Land Use Capability Handbook provides the most common limitations that define LUC class 3 (p56):

(a) Moderate susceptibility to erosion under cultivation.

(b) Rolling slopes (8-15°).

(c) Shallow (20-45 cm) or stony soils.

(d) Wetness or waterlogging after drainage.

(e) Occasional damaging overflow.

(f) Low moisture holding capacity.

(g) Moderate structural impediments to cultivation.

(h) Low natural fertility.

(i) Weak salinity.

(j) Moderate climatic limitations.

30 The Land Use Capability Handbook provides the most common limitations that define LUC class 6 (p66):

(a) Moderate erosion hazard under perennial vegetation.

(b) Steep and very steep slopes (>26°).

(c) Very stony (35-70%) or very shallow (<20 cm) soils.

(d) Excessive wetness. Frequent flooding.

(e) Low moisture holding capacity.

(f) Moderate to strong salinity.

(g) Moderate climatic limitations.

31 Focussing on the slope limitation, for land to be LUC class 1, 2 or 3, the land must have a slope of 15 degrees or less (irrespective of any other LUC limitation). Land with slopes greater than 15 degrees would be LUC class 4 or greater, depending on the slope class.

32 The LUC Classification can be applied (mapped) at any scale and regional scale LUC map units can differ from those identified at property scale[3].

33 At any scale but more so for regional scale map information, LUC map units may include more than one LUC unit, in association (where they can individually be distinguished in a repeating pattern but are too small to map separately, or in a complex where they cannot be distinguished in an obvious pattern).

34 Where two or more LUC units are present within a LUC map unit, The dominant LUC unit is listed first, and the subdominant listed second.

Regional scale LUC map information limitations

35 The LUC classification can be applied at any scale. Property scale mapping is typically mapped at a scale between 1:5,000 and 1:15,000, while catchment and regional maps are mapped at 1:15,000 to 1:50,000 scale. The Land Use Capability Handbook sets out recommended mapping scales for inventory surveys and LUC mapping (p100).

36 Mapping LUC at a property scale can identify different LUC units (and map units) than depicted by regional scale LUC mapping. This is because property scale mapping includes more observations compared with regional scale mapping.

37 Soil and LUC maps are usually drawn at a specific scale depending on the smallest area of interest for a particular use and the density of field observations. For example, a 1:5,000 scale map requires on average four observation/ha while a 1:50,000 scale map requires 0.04 observation/ha (four observations per 100 ha). With GIS tools and geospatial databases, it has become easy to manipulate maps, creating the temptation to rescale a map beyond its original scale of collection.

38 For the regional scale LUC map information, map unit boundaries may not align with the topography (slope) and other geographic features (such as rivers). In the case of the regional scale (1:50,000 scale) NZLRI LUC map information this primarily because the mapping used hard copy 20 m contour topography maps as a base for drafting the original maps.

39 Technology such as high resolution aerial photography (and its interpretation), and detailed contour mapping enable a closer examination

[3] Lynn, IH, Manderson, AK, Harmsworth, GR, Eyles, GO, Douglas, GB, Mackay, AD, Newsome PJF. 2009. Land Use Capability Handbook - a New Zealand handbook for the classification of land 3rd Ed. Hamilton, AgResearch; Lincoln, Landcare Research; Lower Hutt, GNS Science 163pp.

of the accuracy of the regional scale LUC map information to identify areas that may not agree with the mapped LUC unit(s).

40 In the following part of my evidence I provide an assessment of LUC class for the subject site using interpretation of available aerial photography and a detailed contour derived slope class map provided by Boffa Miskell (provided in **Appendix 1**).

LUC units on the subject site

41 The regional scale Land Use Capability (LUC) map information available (and relied on) for the subject site is provided by the 1:50,000 scale New Land Resource Inventory which can be accessed via the Manaaki Whenua Landcare Research LRIS portal[4].

42 The NZLRI LUC map information indicates that the LUC map unit for the site is 3s6+6e19, where LUC unit 3s6 is the dominant unit and 6e19 is the sub-dominant unit.

43 Generally, a subdominant unit is only presented if it occupies greater than 30% of the map unit area.

44 Of the common limitations listed for LUC class 3 land (para. 29), limitations (b) rolling slopes (8-15°), (c) shallow (20-45 cm) or stony soils, (f) low moisture holding capacity, and (g) moderate structural impediments to cultivation are likely to apply to the LUC 3s6 unit.

45 Of the common limitations listed for LUC class 6 land (para. 30), limitations (a) moderate erosion hazard under perennial vegetation, (b) steep and very steep slopes (>26°), (c) very stony (35-70%) or very shallow (<20 cm) soils, and (e) low moisture holding capacity are likely to apply to the LUC 6e19 unit.

46 Irrespective of the soil ('s') limitation defining the LUC 3s6 unit, the land in question would still require a slope of 15 degrees or less to be classified as LUC class 3 land (refer to limitation (b) in para 28 in my evidence).

47 Based on my visual assessment of the available aerial photography (available on Google Earth) the distribution of the individual LUC units (3s6 and 6e19) within the NZLRI LUC map unit encompassing the subject site are spread across the map unit.

[4] https://lris.scinfo.org.nz/layer/48076-nzlri-land-use-capability-2021/

48 I have provided an image showing the general locations of the LUC 3s6 and LUC 6e19 units within the NZLRI 3s6+6e19 map unit in which the subject area is included as **Appendix 2**.

49 Based on my visual interpretation, the subject site would be one of the areas classed as LUC 6e19 within the NLZRI LUC map unit, rather than one of the areas classed as LUC 3s6.

50 Based on the slope class map, I have delineated the areas with slopes of 15 degrees or less (yellow and green) aeras on the slope class map). The delineated areas are shown in **Appendix 3**.

51 Based on the slope class map, the slope classes (0-3°, 4-7°, and 8-15°) that would allow for the land to be classed as LUC class 3 or less, discounting any other limitations, occupy only a small proportion of the subject site.

52 I note that existing dwellings, driveways, and curtilage areas are located in some of these areas, and some of the flatter topography is the result of recontouring (flattening) to provide the building platforms and curtilage. These areas are indicated on the image in **Appendix 4** (red circled areas).

53 The slope class map indicates that the dominant slopes on the subject site are greater than 15 degrees (orange and red areas).

54 In my opinion, if classified at property scale the subject site would be LUC class 6 or 4 land.

Non-productive land on the subject site

55 As noted in paragraph 52, the subject site contains existing dwellings, driveways, and curtilage areas, as well as connecting access tracks.

56 It is very likely that earthworks in these areas have resulted in the removal or substantial modification of the soil profile. As such, these areas would be considered non-productive land, reducing the area of potentially productive land in the subject area.

57 It is my understanding that the site was recently cleared of wilding pines that have self-seeded over the site since approximately the 1970s. Large stumps remain over the site. In order for these areas to be converted to more intensive productive uses such as pasture, cropping or horticulture, the stumps would need to be removed. In my experience, even with careful management, such removal of the stumps is very likely to result in extensive disruption of the soil profile, with mixing of the subsoil and topsoil, or the

loss of the topsoil. In turn, the productive capacity of the land in these areas will be even further reduced.

NPS highly productive land on the subject site

58 NPS-HPL clause 3.5(7)(a) allows for detailed mapping that uses the Land Use Capability classification.

59 I have used the Land Use Capability classification criteria provided by the Land Use Capability Handbook in combination with detailed slope class map information to interpretation the likely LUC class(s) for the subject site at property scale.

60 In my opinion, this assessment provides a more spatially accurate property scale estimate of the LUC classes present on the subject site than the regional scale NZLRI LUC map information.

61 Based on my assessment, the subject site has slopes predominantly greater than 15 degrees and at property scale, would most likely be classified as LUC class 4 land or greater.

62 As such, I conclude that the subject site is not predominantly LUC class 1, 2 or 3 and is not NPS highly productive land.

Conclusion

63 The regional scale Land Use Capability (LUC) map information available for the subject site is provided by the 1:50,000 scale New Land Resource Inventory.

64 The NZLRI LUC map information indicates that the LUC map unit for the site is 3s6+6e19, where LUC unit 3s6 is the dominant unit and 6e19 is the sub-dominant unit.

65 My assessment based on the interpretation of aerial photographs and detailed contour derived slope class maps indicates that the subject site is not LUC class 3 land.

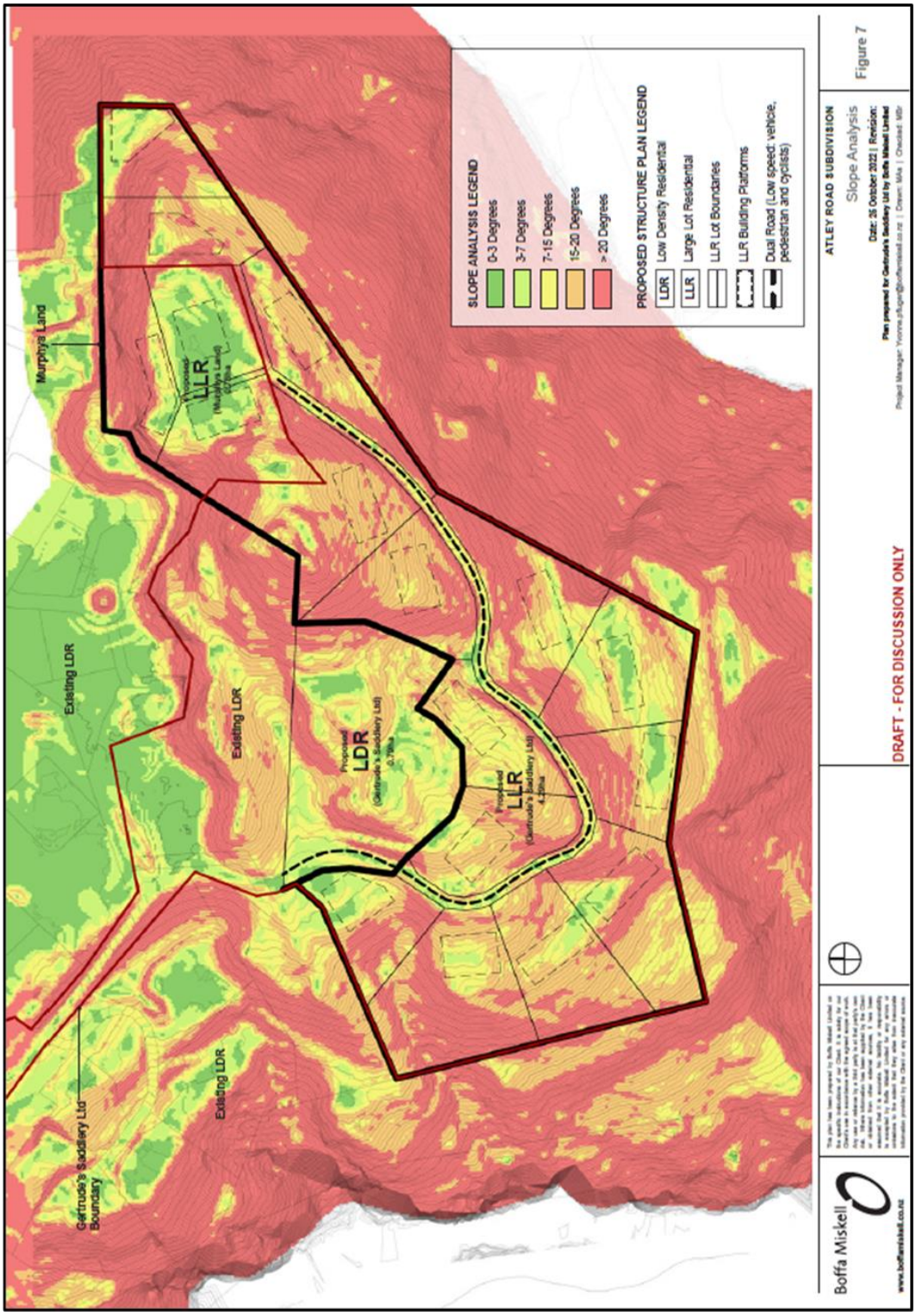
66 In my opinion, the determination of NPS highly productive land on the site should not solely be based on the dominant LUC unit (3s6) depicted by the NZLRI LUC map information as this ignores available information provided in the NZLRI map information (i.e. that LUC unit 6e19 is present in the greater LUC map unit encompassing the subject site).

67 Additionally, available aerial photography and detailed slope class mapping of the site indicate that the land is not class 3, and therefore, is not NPS highly productive land.

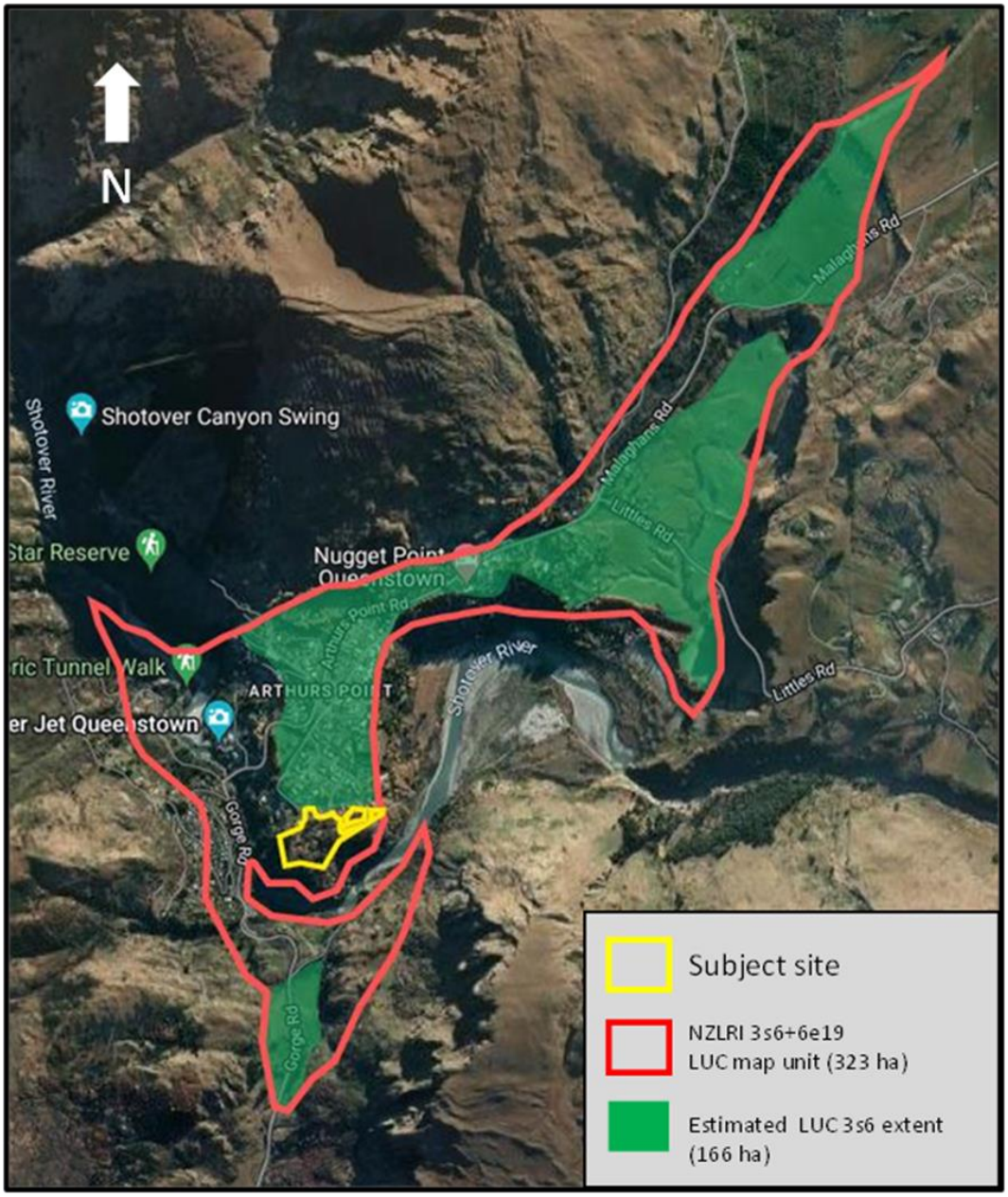
Reece Blackburn Hill

15 November 2022

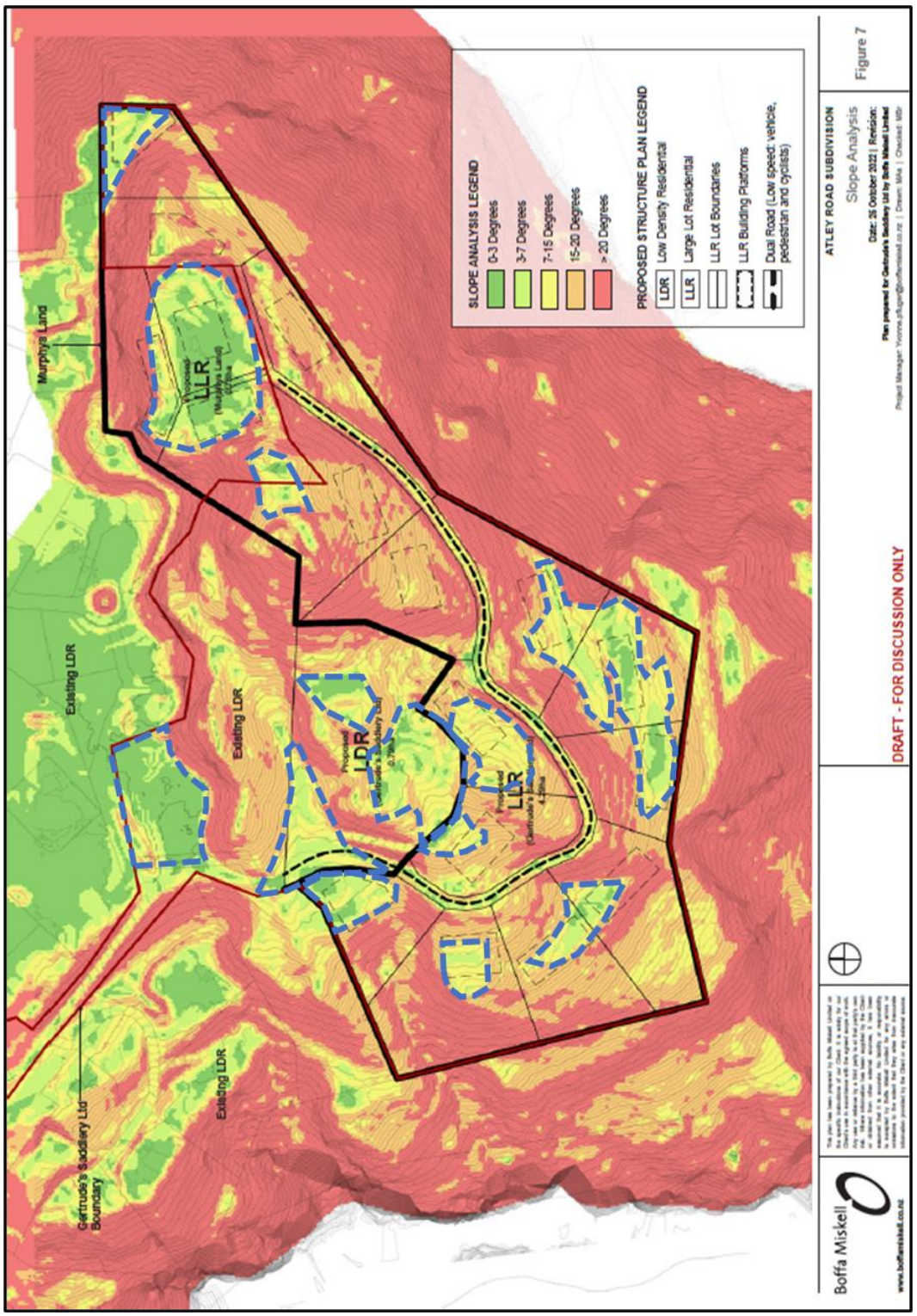
Appendix 1: Detailed contour derived slope class map of the subject site prepared by Boffa Miskell



Appendix 2: NZLRI 3s6+6e19 LUC map unit showing estimated extent of LUC 3s6 (green area) within the greater LUC map unit.



Appendix 3: Slope class map of the subject area with delineated areas of ≤15°slopes (areas indicated by blue dashed lines)



Appendix 4: Slope class map of the subject area with delineated areas of ≤15°slopes (areas indicated by blue dashed lines) and location of existing dwellings and curtilage (areas indicated by red circles)