BEFORE THE HEARINGS PANEL

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of submissions on the Proposed Otago Regional Policy Statement 2021 (non-freshwater provisions)

EVIDENCE OF MIKE THORSEN

FOR OCEANA GOLD NEW ZEALAND LIMITED

ECO CHAPTER AND APP 2

Dated 23 November 2022

Solicitor acting:

Jackie St John
In-house counsel
22 Maclaggan St
Dunedin 9016
Jackie.stjohn@oceanagold.com

Counsel acting:

Stephen Christensen
Project Barrister
421 Highgate, Dunedin 9010
P 027 448 2325
stephen@projectbarrister.nz

Table of Contents

INTRODUCTION AND BACKGROUND

1. My name is Michael James Thorsen.
2. I have been engaged by Oceana Gold (New Zealand) Limited (**OceanaGold**) to review and comment on the proposed biodiversity provisions of the proposed Otago Regional Policy Statement 2021 non-freshwater provisions (**pORPS**) as they relate to the identification and management of adverse ecological effects as a result of mining and on leasehold farms.
3. I have the following qualifications and experience:
    a. I am a Director and Principal Ecologist with Ahikā Consulting Ltd, a company that focusses on sustainability.
    b. I have been working professionally in the biodiversity management field since 1990 for a number of organisations including the Department of Conservation (17 years), Mauritian Wildlife Foundation, United States Fish and Wildlife Service, St Helena National Trust, Landcare Research, Birdlife International, and as a freelance ecologist on a wide variety of flora and fauna restoration and protection projects throughout New Zealand, in Hawaii, Mauritius, Seychelles, Marquesas, St Helena and Kiribati. I have a PhD in Ecology from the University of Otago.
    c. I have been providing support on biodiversity issues to OceanaGold at Macraes Mine since 2013. I am familiar with the biodiversity of the Otago Region and in the area of the Macraes Mine and the general surrounds, having worked on vegetation and reptile studies for the Department of Conservation and as a professional ecologist since 2005.

d. I am familiar with many of the Otago Region's and Macraes Ecological District's terrestrial ecological values, having undertaken various detailed surveys in parts of the district since 2004. While I am generally familiar with the Otago Region and Macraes Ecological District as a whole, given its substantial size I acknowledge that there are large parts of it that I have not surveyed in detail.

e. I was member of the Ecosystem Reference Group providing feedback on previous versions of the pORPS to ORC.

4. Even though this matter is not before the Environment Court, I confirm that I have read the code of conduct for expert witnesses contained in the Environment Court Consolidated Practice Note 2014. I have complied with it when preparing this written statement of evidence and I agree to comply with it when presenting evidence. This evidence is within my area of expertise, except where I state that I am relying upon material produced by another person. I have not omitted to consider material facts known to me that might alter or detract from my opinions.

5. In preparing this evidence I have read the following:

a. the pORPS, the s32 Evaluation Report[1] (including the relevant appendices, particularly Appendix 17 (Wildlands Report [2]).

[1] May 2021.

[2] Ecological Advice on Indigenous Biodiversity Provisions in the Proposed Otago Regional Policy Statement 2021.

b. The section 42A report and proposed amendments to the pORPS;

c. The evidence of Dr Kelvin Lloyd.

6. In Dr Lloyd's evidence dated 29 September 2022, he has commented on OceanaGold's 21 July 2022 letter to ORC. I do not wish to engage in a 'tit for tat' rebuttal of his evidence, however I have provided a response to some errors in an Appendix to my evidence. In summary, Dr Lloyd notes losses of some ecological features (as examples of Net Loss), but does not acknowledge the Net Gains achieved in the projects and covenants at Macraes. Dr Lloyd provided expert advice on the Deepdell North project for the Waitaki District Council, and as far as I was aware having participated in the consenting process and having attended the resource consent hearing in my capacity as a consultant ecologist for Oceana Gold, Dr Lloyd had approved of the proposed offsetting and compensation package as being appropriate and sufficient.

EXECUTIVE SUMMARY

7. I believe that Topic ECO of the pORPS is well intentioned, but that the policies do not align with the current causes of biodiversity loss in the region and do not adequately consider positive contributions that have been made in conserving biodiversity, and that can be made in the future if the policies allow this. I also consider that the effectiveness of the Significant Natural Areas (**SNA**) approach has not been evaluated and the impact of implementation of the policies relating to SNA has not been adequately evaluated in the s32 report.

8. The policies relating to the application mitigation hierarchy and the important role that offsetting and compensation play in addressing residual project effects and in delivering overall biodiversity benefits has not been properly considered and is at odds with the objectives and other policies of the pORPS and the draft National Policy Statement on Indigenous Biodiversity (**draft NPS-IB**) (especially Policies 6 and 8).
9. My September 2021 evidence[3] has been updated to include consideration of recent mapping of indigenous vegetation by the Otago Regional Council. Some grammatical and minor errors in the September 2021 evidence have been corrected. Using the ORC mapping information, SNAs could cover 232,515 ha (9.8%) of freehold land in Otago, compared with my September assessment using LCDB 5 vegetation mapping which came to 458,958 ha (19%). Although 9.8% is less than my earlier 19% figure, I am of the opinion that the 19% figure better reflects the current situation if the proposed SNA criteria are adopted. Nevertheless, even 9.8% in my opinion still constitutes a very large area of freehold land (remembering that this excludes land already protected under DOC or by a covenant) and will affect a number of landowners. I am unconvinced that adopting an extent of SNA such as what my figures indicate is warranted for achieving the objectives in the pORPS.

[3] This was appended to Oceana Gold's submission on the pORPS.

OUTLINE OF EVIDENCE

10. I have been requested by OceanaGold to provide expert evidence on the likely impact of proposed policies in Topic ECO of the pORPS on ecological considerations associated with consenting future mine developments and on freehold lands leased for farming. I have also considered the s32 report (v61) and supporting references.
11. I have been able to incorporate new mapping information from ORC into my evidence, and therefore this evidence supersedes the statement of evidence dated 3 September 2021 which was appended to OceanaGold's submission on the pORPS.
12. In this evidence I:
    a. Examine the ecological rationale and provide general comment of the proposed policies in Topic ECO;
    b. Provide an evaluation of the probable extent of land that could qualify as a Significant Natural Area (SNA) throughout Otago.
    c. Describe recent advances in biodiversity management being undertaken by OceanaGold and make a preliminary assessment of their adequacy in producing an increase in the biodiversity in the area surrounding Macraes mine;
    d. Describe the probable effects of the policies in Topic ECO on future mine developments at Macraes.
    e. I illustrate this evidence with examples drawn from past OceanaGold mine developments at Macraes with which I am familiar, particularly the recent Coronation North and Deepdell North developments, together with current ecological information from the Macraes Ecological District

(E.D.) including from a database of 21,697 plant records in this E.D. dating from 1889 – a database probably unique in NZ in its size.

ECOLOGICAL RATIONALE AND GENERAL COMMENTS ON THE DRAFT ORPS

13. I find that the structure of the pORPS is confusing, particularly the relationship between Part 2 and Part 3, ie it is unclear what the relationship is between a Topic and a Domain, and their Objectives and Policies, in Part 3 and the objectives and policies in Part 2 (such as IM). Therefore, I refrain from commenting on the implications of adopting the policies in Topic ECO in relation to attainment of other objectives and priorities in the pORPS. The pORPS and the s32 report also uses the term 'Chapters' which are not explained in or used in the pORPS.
14. I consider the objective of ECO-01: "Otago's indigenous biodiversity is healthy and thriving and any net decline in condition, quantity and diversity is halted", to be aspirational, and not sufficiently supported by the policies in Topic ECO.

15. In my opinion the ECO policies are not well aligned with the primary causes of biodiversity loss in Otago. I understand those primary causes to be: [4,5,6,7]

    a. habitat and ecosystem effects: the impacts of browsers, weeds, deliberate and accidental clearance of vegetation, diseases, and impacts from a changing climate (with increasing frequency of extreme events) on both the extent and quality of the remaining indigenous vegetation; and

    b. effects on species: the impacts of predators, weeds, browsers, declining habitat quality, diseases, and impacts from a changing climate (with increasing frequency of extreme events) on the numbers and distribution of indigenous species, to the point that well over 4,000 species (and possibly as many as 7,000 species) are of some conservation concern nationally, and a considerable number are in real and imminent threat of extinction.

16. These effects are complicated, often inter-related, and mostly poorly understood. The effects of a changing climate on indigenous biodiversity are especially poorly understood, but are likely to be of increasing influence as a driver of biodiversity change. While these

---

[4] DOC. 2020. Te Mana o te Taiao: Aotearoa NZ Biodiversity Strategy 2020.

[5] DOC. 2020. Biodiversity in Aotearoa: an overview of state, trends and pressures.

[6] Macinnis-Ng; et al. 2021. Climate-change impacts exacerbate conservation threats in island systems: New Zealand as a case study. Frontiers in Ecology and the Environment. https://doi.org/10.1002/fee.2285.

[7] Brown, M.A; et al. 2015. Vanishing Nature: facing New Zealand's biodiversity crisis. Environmental Defence Society, Auckland.

effects are generally described in SRMR-I3, there is no assessment of the relative importance of each on the natural environment, and there is a poor relationship between these effects and the ECO policies.

17. Habitat loss caused by deliberate vegetation clearance (such as that created during new mine development) is often demand driven and without policies to support sustainable use of resources, minimisation of waste and full costings of activities (including ecological costs)[8] through approaches such as life cycle analysis and environmental reporting, then this demand is unlikely to change. Such policies appear to be absent from the pORPS.
18. The s32 report, section 42 report and supporting references do not prioritise the importance of the factors affecting biodiversity loss and appears to mainly consider statutory alignment and therefore the Objectives and Policies in the pORPS are skewed from the primary causes of biodiversity loss.
19. While there is some limited consideration of the positive contribution that some activities provide to maintaining or enhancing biodiversity in section 4 of the Wildlands (2021b) report, this does not seem to have been carried through into the pORPS itself. Also, the Wildlands analysis is only partial and does not consider the effectiveness of the current protected area network throughout Otago in protecting indigenous biodiversity, or the many positive roles that community groups and industry have and can play.

[8] Stats NZ and MfE. 2021. *Our land 2021:* New Zealand's Environmental Reporting Series.

20. In particular there is no acknowledgement of the recent developments in New Zealand, such as those being employed at Macraes and the September 2018 guidance document to council's Biodiversity Working Group[9], and internationally[10] on the use of biodiversity offsets to produce net gains in biodiversity.
21. Because the pORPS policies are poorly aligned with the primary causes of biodiversity loss, and do not consider the positive gains that can be made through community conservation and commercial offsetting (for example), I have low confidence that adopting these policies will address the issue of biodiversity loss.
22. While I am generally supportive of the SNA approach, this support is tempered with caution centred around the adequacy of the approach employed in the pORPS to accurately identify sites that are significant (as defined in the RMA) and which would result in improved biodiversity condition in an area. I also have caution around the impact of this approach on people's land, particularly Mana Whenua lands, and understand the rural community has expressed concerns about this approach. I do believe this view held by the rural community also needs to be balanced with the need to effectively protect New Zealand's indigenous biodiversity.

---

[9] Maseyk, F; Ussher, G; Kessels, G; Christensen, M; Brown, M. 2018. Biodiversity Offsetting under the Resource Management Act: A guidance document. Report to Biodiversity Working Group.

[10] Devenish, K; Desbureaux, S; Willcock, S; Jones, P.G. 2022. On track to achieve no net loss at Madagascar's biggest mine. Nature Sustainability. https://www.nature.com/articles/s41893-022-00850-7

23. In my opinion the pORPS approach to SNAs has not been adequately evaluated for effectiveness in identifying significant areas in accordance with the RMA or in protecting Otago's biodiversity. To the best of my knowledge, there has been little such evaluation anywhere in NZ[11] , which is concerning given the widespread adoption of similar approaches.
24. I am concerned that the significance criteria in the pORPS are more stringent and restrictive than those in the draft NPSIB. The s32 report at p23 claims that the criteria are considered "largely the same", but I disagree.
25. I also note that an area has to only meet one of the criteria before being considered significant. This approach will result in many more areas being considered as significant in the absence of clearly defined thresholds.
26. I have concerns around the wording and content of the criteria in APP2. In particular:
    a. Representativeness criterion. My main concern with this criterion, specifically subcriterion (a), is that representativeness is defined in relation to "original" without any consideration of what original means. For example, does original mean pre-human? Whatever the representative state, what information will be used to make this assessment and what confidence can we have with this information?

[11] See Maseyk, J.F.F; Gerbeaux, P. 2014. Advances in the identification and assessment of ecologically significant habitats in two areas of contrasting biodiversity loss in New Zealand. New Zealand Journal of Ecology (2015) 39(1).

Because of this uncertainty an interpretation that could be made is that ANY natural vegetation is representative (and therefore qualifies as significant). Because there is no threshold state, and the definition specifically includes "degraded examples", then even very degraded examples of natural vegetation could be considered significant.

b. Rarity criterion. My concern is that employment of the criteria "Indigenous vegetation or habitat of indigenous fauna that has been reduced to less than 20% of its former extent nationally" is not specifically linked to the Land Environment NZ (LENZ)[12] database which does provide a similar type of information. However, if this criterion is specifically linked to this data source, then consideration needs to be made of the confidence in the LENZ data – particularly with regards to classification errors and spatial resolution[13]. Further, analysis of error in remote vegetation style of mapping has only been performed at a national scale, and the reported potential errors make reference to it at a regional or Ecological District scale problematic.

c. Diversity criterion: My concern is how diversity is assessed. When does something become 'diverse'? I also note that in some cases low diversity is actually the valued state, such as

[12] https://www.landcareresearch.co.nz/tools-and-resources/mapping/lenz/

[13] See Dymond, J.R. et al. 2017. Estimating change in areas of indigenous vegetation cover in New Zealand from the New Zealand Land Cover Database (LCDB). New Zealand Journal of Ecology 41(1): 56-6.

in saline sites that often only contain a few indigenous species.

d. Distinctiveness criterion: this is likely to be mostly an expert opinion unless specific mapping and analysis is undertaken.

e. Ecological context criterion. How is 'important' judged?

27. I have concerns also on the adequacy of some of the definitions:

a. *Indigenous Vegetation: means vascular and non-vascular plants that, in relation to a particular area, are native to the ecological district or freshwater or marine bioregion in which that area is located.*

Concern: This definition lacks the aspect that "Vegetation" should refer to group or community of plants. The definition above seems to apply more to defining an indigenous species rather than defining the "vegetation" component of the phrase.

b. *Significant natural area: means areas of significant indigenous vegetation and significant habitats of indigenous fauna.*

Concern: This definition lacks any consideration of what is meant by significant or whether the Criteria in APP2 are considered part of this definition. It is also erroneous to refer to the plural areas and habitats when referring to the singular term Significant natural area (which is usually also capitalised).

28. I note the insertion of an additional criteria in APP2: Vulnerable and sensitive species. I consider it to mostly be captured in the other

criteria and dependent on several qualifiers (‘sensitive’, ‘fragile’, ‘slow’) that are not defined and have no reasonably accepted information base for judging alignment with criteria. Under a broad interpretation all native species would fit this criterion as the range of nearly all native species has contracted since human colonisation of New Zealand and therefore could be considered fragile to anthropogenic effects. Therefore, I do not see sufficient merit in its inclusion.

THE LIKELY EXTENT OF SIGNIFICANT NATURAL AREAS WITHIN OTAGO

29. Policies ECO-P2 and P3 address the identification and protection of SNA within Otago and ECO-P3 is linked to a mitigation hierarchy in ECO-P6 to address project effects on biodiversity.
30. This effects management hierarchy in ECO-P6 is only available for activities that are able to meet the ‘avoid’ test in ECO-P3 (which also refers to ECO-P4 and P5). The ‘avoid’ test is very broad, as it does not allow reduction in area or values with a concomitant increase in the ecological value of the site as a result of mitigation activities. This effectively means that a large range of activities (including mining and farming, which are not listed in ECO-P4) will not be able to access the effects management hierarchy if the effect is on an area that qualifies as a SNA under the Criteria in APP2. It is not within my area of expertise to comment on the social and economic consequences of this approach, but in the context of the ecological component of the recent mining proposals at Macraes with which I have been involved I consider that outcome to be confusing. These

recent projects demonstrate that development of the mineral resource within SNA and the maintenance and enhancement of important biodiversity values can both be achieved. 'Avoidance' as the only outcome provided for seems to me to offer the worst of all worlds. Opportunities to secure investment in positive biodiversity outcomes are foregone, as are the non-ecological benefits associated with the mining activity.

31. The effects of these Policies is partly considered within the s32 report. While the potential effect of this policy structure was identified to ORC during Reference Group consultation, and the concerns appear to be accepted at paragraphs 436 and 439 of the s32 report, these concerns are not addressed in the preferred option of the s32 report or the pORPS.

32. I also consider the analysis at paragraph 445 of the s32 report on ECO-P5 to be naive, in that while the intention is to allow the continuation of existing activities (presumably such as farming) within a SNA where the activity "will not lead to the loss (including through cumulative loss) of extent or degradation of the ecological integrity" the reality is that some groups will consider current farming practices ARE affecting the ecological integrity of SNAs, with the result that they will use these provisions to exclude farming from these areas, and the apparent safeguard at (2) of ECO-P5 will be very difficult to prove for most farming operations.

33. Neither the pORPS nor the s32 report make any assessment of the likely extent of SNA within Otago if ECO-P2 and P3 and criteria in APP-2 are adopted. Therefore, the impact of these policies on economic and social issues has not been considered.

34. To address this, I attempted to map the potential extent of SNAs within the Otago Region. I emailed the ORC numerous times[14] requesting a copy of the base mapping information underpinning parts of the pORPS and the Appendices to the s32 report. Unfortunately, I did not receive the information 3 September 2021, which left me insufficient time to incorporate it into maps in my 3 September 2021 evidence.
35. I have now been able to incorporate the base mapping information and update my evidence. I note that not all criteria have geographic information available that would represent the extent of SNA under that criterion. This means that my maps may be conservative in identifying the potential extent of SNAs. I have not made any effort to validate the ORC vegetation mapping data, but I do note discrepancies (both in classification and of boundaries) in the mapping of vegetation that has been supplied to the Otago Regional Council and what is visible on inspection of aerial photographs, and this decreases my level of confidence in the information available.
36. For the purposes of my analysis, Otago Region's total land area is calculated as 3,110,780 ha if lakes > 4 ha and the sea are excluded. Removing urban and residential areas results in a land area of 3,099,547 ha.
37. Areas identified as freehold land in this exercise are those that do not include lands already protected under DOC or by a covenant. Removing these protected areas results in an area of 2,364,435 ha

[14] On 16 July, 20 July, and 20 August 2021.

of freehold land where new SNAs may be present. This figure is the basis for my analysis.

Spatial extent of Representativeness criteria

38. The Representativeness criteria is based around the current extent of natural vegetation, including degraded examples. Therefore, any area of natural vegetation potentially qualifies as a SNA under Representativeness criterion (a). Criterion (b) and (c) are not mapped as they are marine focussed.

39. The coverage of Otago Region's freehold area by native vegetation was estimated using mapping of indigenous vegetation types from the ORC's mapping of indigenous vegetation (my September 2021 mapping used the Landcover Database (LCDB 5)[15]). I do not know whether the ORC mapping includes depleted grasslands and low producing grasslands vegetation communities as, in my experience, these often harbour extensive natural biodiversity and can be viewed as a degraded short tussock grassland habitat[16,17] , which fits within the degraded context of Representativeness subcriterion (a). There is at least 890,913 ha (nearly 38%) of freehold area when using the ORC's map of current indigenous vegetation (Table 1) or 1,262,679 (53%) if using the LCDB 5 vegetation mapping. Depending on the

[15] https://lris.scinfo.org.nz/layer/104400-lcdb-v50-land-cover-database-version-50-mainland-new-zealand/

[16] See 3.1 in Peart, R; Woodhouse, C. 2020. Te Manahuna – Mackenzie Basin and Landscape Protection. Environmental Defence Society, 118 pp.

[17] Walker et al. 2021. What effects must be avoided, remediated or mitigated to maintain indigenous biodiversity? New Zealand Journal of Ecology, Vol. 45, No. 2, 2021.

interpretation made of the wording in the Criterion, it is possible that any (or all) of these areas could be assessed as SNA.

ORC Current Indigenous Vegetation map community	Area(ha)
AH1: Gravelfield, stonefield	12,053
AH2: Dracophyllum muscoides cushionfield	4,761
AH3: Gravelfield/stonefield mixed species cushionfield	8,220
AL1: Narrow-leaved and slim snow tussock tussockland/shrubland	325,876
AL6: Mid-ribbed and narrow-leaved snow tussock tussockland/shrubland	6,184
AL7.1: Pungent snow tussock tussockland/shrubland	1,143
Beach	210
BR1: Hard tussock, scabweed, gravelfield/stonefield	826
BR2: Scabweed gravelfield stonefield	401
CDF1: Pahautea, Hall's tōtara, mountain celery pine, broadleaf forest	10
CDF2: Dracophyllum, Phyllocladus, Olearia, Hebe scrub (subalpine scrub)	12,610
CDF3: Mountain beech forest	11,635
CL11: Mountain tutu, Hebe, whararikі, Chionochloa shrubland/tussockland/rockland	52
CL5: Harakeke, Hebe elliptica flaxland/rockland	235
CL8: Helichrysum, Melicytus, shrubland/tussockland/rockland	8
CLF1: Hall's tōtara, mountain celery pine, broadleaf forest	797
CLF10: Red beech, silver beech forest	2,098
CLF11.2: Silver beech forest	1,248
CLF11.3: Silver beech forest	3,860
CLF12: Silver beech, mountain beech forest	2,118
CLF13: Matai, broadleaf forest	135
CLF2: Hall's tōtara forest (dune forest)	21
CLF4.2: Kahikatea, tōtara, matai forest	1,933
CLF4.3: Kahikatea, tōtara, matai forest	1,471
CLF6.1: Kamahi, southern rātā, podocarp forest	6,089
CLF6.5: Kamahi, southern rātā podocarp forest	2,995
CLF9: Red beech, podocarp forest	162
DN3: Pingao sedgeland	118
DN5: Oioi, knobby clubrush sedgeland	20
EP1.1: Siliceous rockland	31
Estuary	59
Gravel or Rock	6,370
Indigenous Forest	146
Kanuka scrub/forest	22,453
Lake or Pond	2,487
Makahikatoa scrub and shrubland	8,809
Manuka scrub/forest	8,516
MF3: Matai, totara, kahikatea, broadleaved forest	389
MF4: Kahikatea Forest	132
Permanent Snow and Ice	199
River	10,510
SA11: Kirk's scurvy grass herbfield/loamfield	0
SA3: Glasswort herbfield	230
SA3: Glasswort, sea primrose herbfield (saltmarsh)	294
SA5: Herbfield (coastal turf)	15
Sand or Gravel	32
SC1: Gravelfield (screes and boulderfields)	4,075
Tall Tussock Grassland	325,037
TI1: Bog pine, mountain celery pine scrub/forest	84
TI2: Kānuka, Olearia scrub/treeland	29
TI4: Coprosma, Olearia, matagouri scrub (grey scrub)	14
TI6: Red tussock tussockland	17
VS10: Bracken fernland	23,739
VS11: Short tussock tussockland	0
VS5: Broadleaved species scrub/forest	16,928
VS6: Matagouri, Coprosma propinqua, kowhai scrub (grey scrub)	29,962

WL10: Oioi restiad rushland/reedland	155
WL11: Machaerina sedgeland	17
WL12: Mānuka, tangle frern scrub/fernland	44
WL13: Sphagnum mossfield	2
WL14: Herbfield (ephemeral wetland)	361
WL15: Herbfield (lakeshore turf)	2
WL16: Red tussock, Schoenus pauciflorus tussockland	10,352
WL17: Schoenus pauciflorus sedgeland (alpine seepages/flushes)	2,360
WL18: Flaxland	1,605
WL19: Raupō reedland	39
WL20: Coprosma, twiggy tree daisy scrub	3,647
WL22: Carex, Schoenus pauciflorus sedgeland	1,821
WL6: Lesser wire rush, tangle fern restiad rushland/fernland	623
WL8: Herbfield/mossfield/sedgeland	2,021
WL9: Cushionfield	20

Table 1. Areas of natural vegetation communities within the freehold land areas of Otago. Community names follow the ORC mapping of current indigenous vegetation.

Spatial extent of Rarity criteria

40. Within the freehold area are 22,800 records (Table 2) of nearly 600 species of conservation concern in a database developed by myself for the Endangered Species Foundation using species records in electronic biodiversity databases. This database does not include species that might be considered Regionally or locally rare as the criteria for identifying these species has not been provided in the pORPS. Because the criteria for rarity are so broad (threatened, at risk[18] or uncommon, nationally or within an ED), and includes the At Risk – Declining matagouri which is widespread in Otago, the sites

[18] While this subcriterion has been reworded to “an important population of species that is at risk”, this rewording has virtually no effect on the overall definition as it is not an important population of an at risk species, it is then likely to be uncommon.

for all of these records qualify as a SNA under criteria (d) (i), even if the site is not within an area with natural vegetation cover.

Threat Status	Records
Migrant	111
Relict	145
Vagrant	684
Extinct	11
Nationally Endangered	2262
Recovering	1805
Data Deficient	181
Nationally Critical	2448
Declining	10271
Nationally Vulnerable	2011
Naturally Uncommon	2859
Coloniser	12

Table 2. The threat status under the NZ Threat Classification System of species mapped as occurring within the freehold land areas of Otago.

41. To calculate the area associated with each record within Otago, a conservative assumption is made that each record requires a 500 m x 500 m area to inhabit. This results in a total of 191,215 ha required to provide habitat for these species. If a more realistic area of 1 km x 1 km area for each site where a species has been recorded is used then 586,357 ha is required. Records are scattered throughout Otago but are concentrated around the Otago Peninsula, the Catlins, Macraes, around Alexandra, and Cromwell through to Queenstown and Wanaka.

Threatened land environment Criteria (d) (ii)

42. ORC current indigenous vegetation communities that are mapped as a Land Environment NZ (LENZ) with less than 20% of vegetation remaining = 51,481 ha using ORC's information (777,136 ha if using the LCDB 5 vegetation mapping) in the freehold area. Note, this is a conservative estimate as "habitat of indigenous fauna" could include areas that are not natural vegetation.

Overall

43. Overall, this means that using data to map areas where there is a high probability of being assessed as a SNA (considered a 'high probability' because the criteria have little opportunity for interpretation: LENZ with less than 20% natural vegetation remaining and mapped by ORC with a cover of indigenous vegetation and 500m^2 area around species records), then SNAs could cover 232,515 ha (9.8%) (or 458,958 ha (19%) if using LCDB 5 vegetation mapping) of freehold land in Otago (Figure 1, Table 3).
44. Overall, this means that using data to map areas where there is a moderate probability of being assessed as a SNA (considered a moderate probability because the criteria are more broadly defined and therefore have more opportunity for interpretation: the representativeness and larger 1km^2 area around species records), which includes the area considered high probability (which is based on other, partly overlapping, criteria) then SNAs could cover 1,095,746 ha (46%) (or 1,540,198 ha (65%) if using LDCB 5 vegetation mapping) of freehold land (Figure 2, Table 3).

45. This approach means that within the portion of the Waitaki District Council's territorial area that is within the Otago Region, SNAs could cover between 28,703 ha and 145,551 ha (9.83% to 65.14%) of freehold land (Figures 3, 4, Table 3).

46. In my opinion, the likely extent of SNA-qualifying land, using the proposed criteria, would be at or above the higher figures I have calculated. This is because I believe both mapping schemes do not accurately reflect the current distribution of native vegetation in Otago and both (but particularly the ORC vegetation mapping) underestimate the true extent, especially so if degraded examples are also included as per the Representative Criteria. There are also additional areas, such as habitat for indigenous fauna – which can include exotic vegetation communities, for which there is inadequate information on their occurrence in Otago or no spatial information exists.

Council Name	Land Area in Otago Region	Area Freehold	High Probability of SNA (using ORC vegetation mapping)	High Probability of SNA (using LCDB 5 vegetation mapping)	% of Freehold Area	Moderate Probability of SNA (using ORC vegetation mapping)	Moderate Probability of SNA (using LCDB 5 vegetation mapping)	% of Freehold Area
Central Otago District	995,876	859,888	84,728	205,347	9.9- 23.9	416,168	658,858	48.4 - 76.6
Clutha District	636,089	558,334	44,147	46,445	7.9 - 8.3	148,688	170,654	26.6 - 30.6
Dunedin City	328,146	281,318	38,901	97,911	13.8 - 34.8	111,179	193,344	39.5 - 68.7
Queenstown-Lakes District	935,757	391,715	36,036	45,832	9.2 - 11.7	321,419	371,790	82.1 - 94.9
Waitaki District	291,140	273,180	28,703	63,424	10.5 - 23.2	84,536	145,552	31.0 - 53.3
Otago Region	3,187,007	2,364,435	232,515	458,958	9.8 - 19.4	1,081,989	1,540,198	45.8 - 65.1

Table 3. Areas of freehold land within council boundaries with high or moderate probabilities of being considered an SNA.

47. There are undoubtedly extra areas that would qualify as a SNA under one or more of the criteria, but there is insufficient information available to allow mapping of these features. The criteria that could not be mapped are Representativeness (b) & (c), Rarity (d) (iii) & (iv), Diversity, Distinctiveness, Ecological context, and Vulnerable and sensitive species. The inability to identify SNAs based on these criteria due to lack of information further highlights issues with the criteria in the pORPS.

48. Further, in my opinion, I do not believe that all of the potential SNA extent estimated here using the proposed criteria would be considered Significant, if using a definition meaning “important in the maintenance of current biodiversity within the region”, but instead has a standard of preservation of all remaining biodiversity, no matter its importance or value. My opinion is based on several factors:

    a. Biodiversity is not adequately defined for the purpose of this exercise, especially consideration of whether it includes all of the extent or distribution of all indigenous species, if it includes all species associations and dependences, and consideration of the importance (or not) of maintaining the full remaining spatial extent of all communities (both flora and fauna and ecological), and regionally or nationally rare species and communities.

    b. The adequacy of the existing protected area network in preservation of the biodiversity of the region has not been evaluated.

c. There has been little evaluation of what aspects of biodiversity are those that are significant and requiring additional protections as such. This is particularly true of the Representativeness Criteria, which seems to have an unstated ambition that all remaining plant communities, including those that are degraded or of recent origin, are significant.

d. There is little consideration of the positive impacts communities can make and the positive gains in biodiversity that are occurring. This is particularly true for the commercial sector, which has the resourcing to make considerable investment in the maintenance (or positive gains in some instances) of biodiversity affected by their activities, but there is limited opportunity within the proposed policy to allow this to be considered.

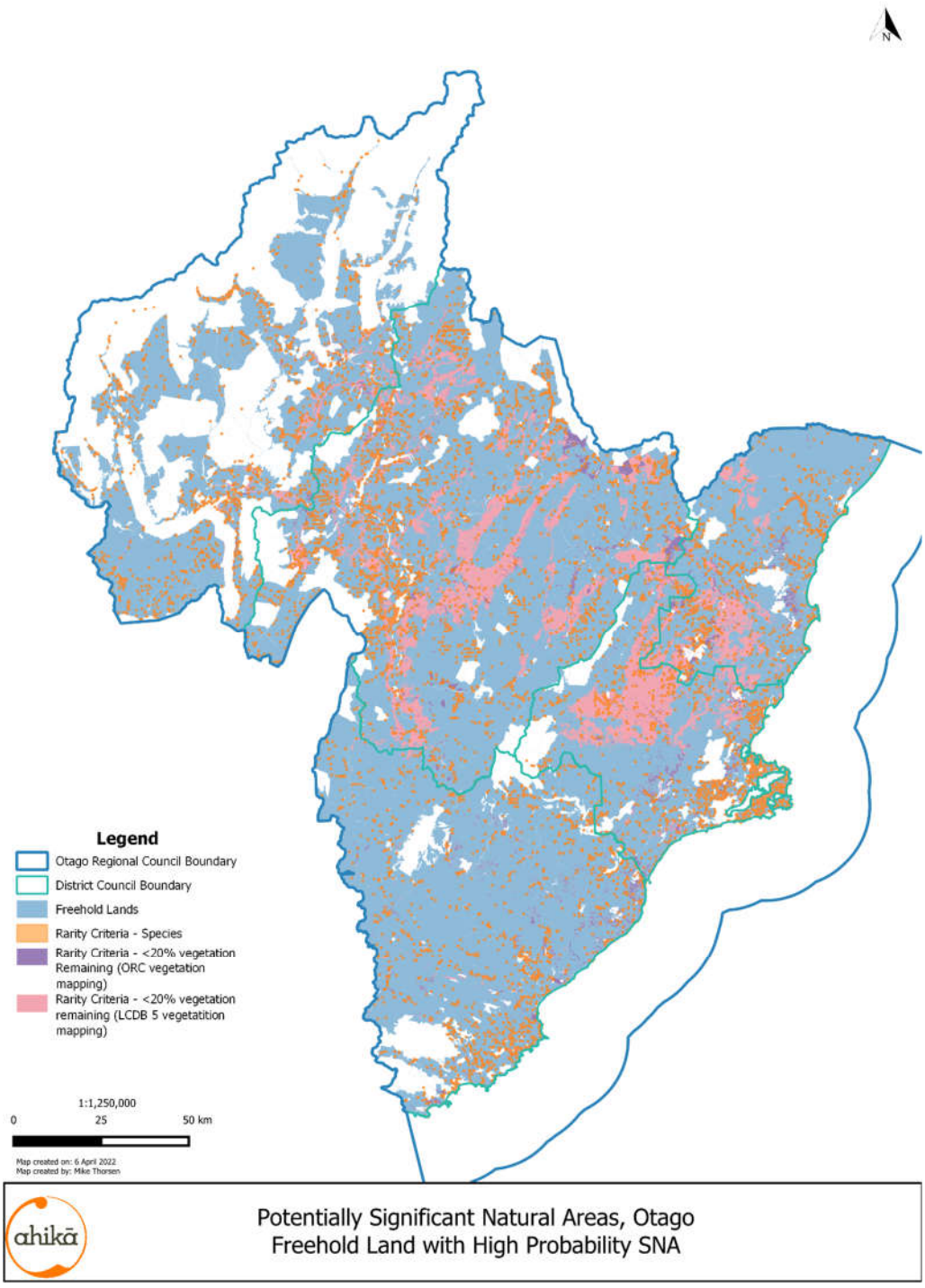

Figure 1. Area of freehold land within the Otago region with a high probability of being assessed as an SNA.

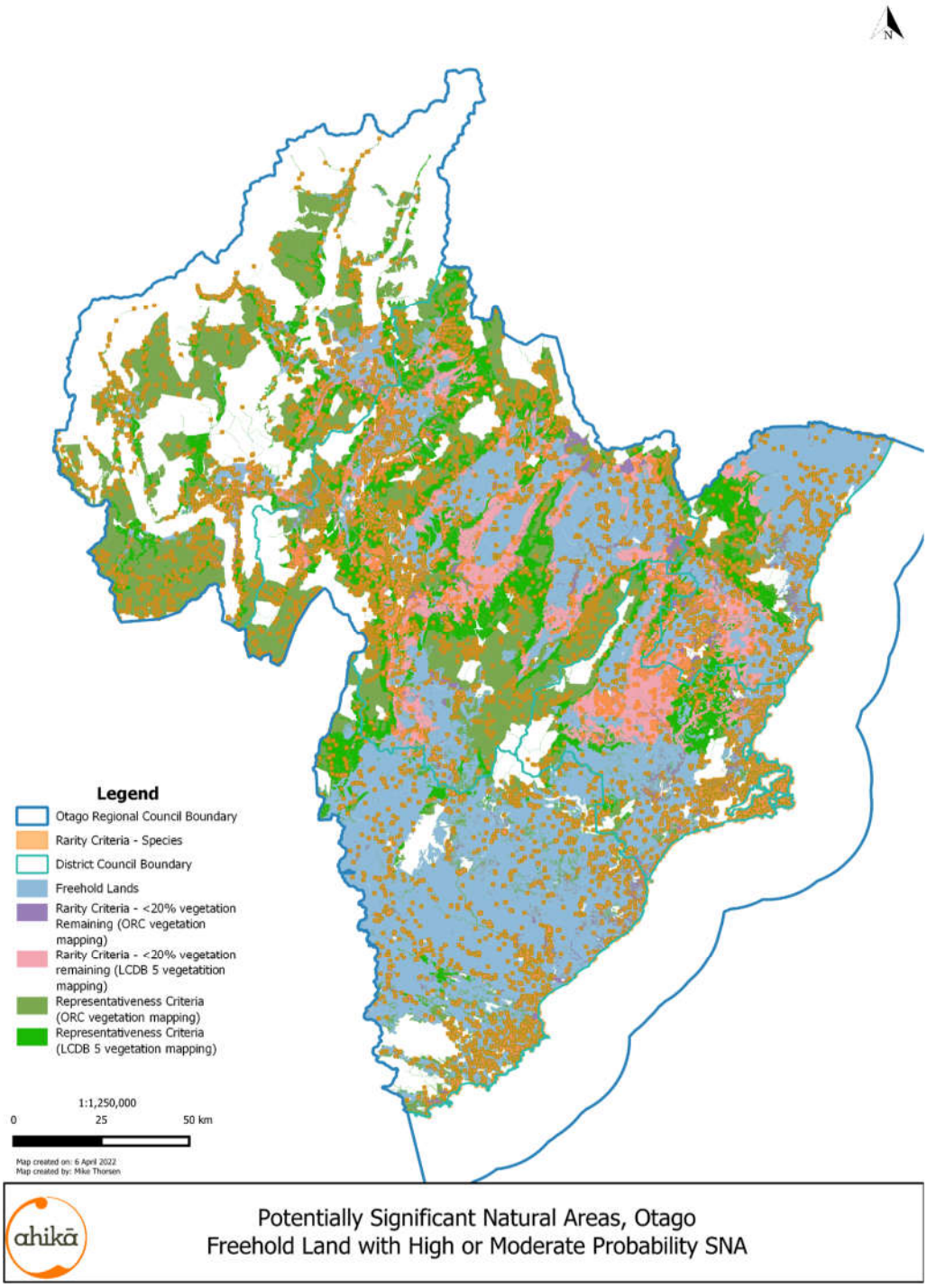

Figure 2. Area of freehold land within the Otago region with a high or moderate probability of being assessed as an SNA.

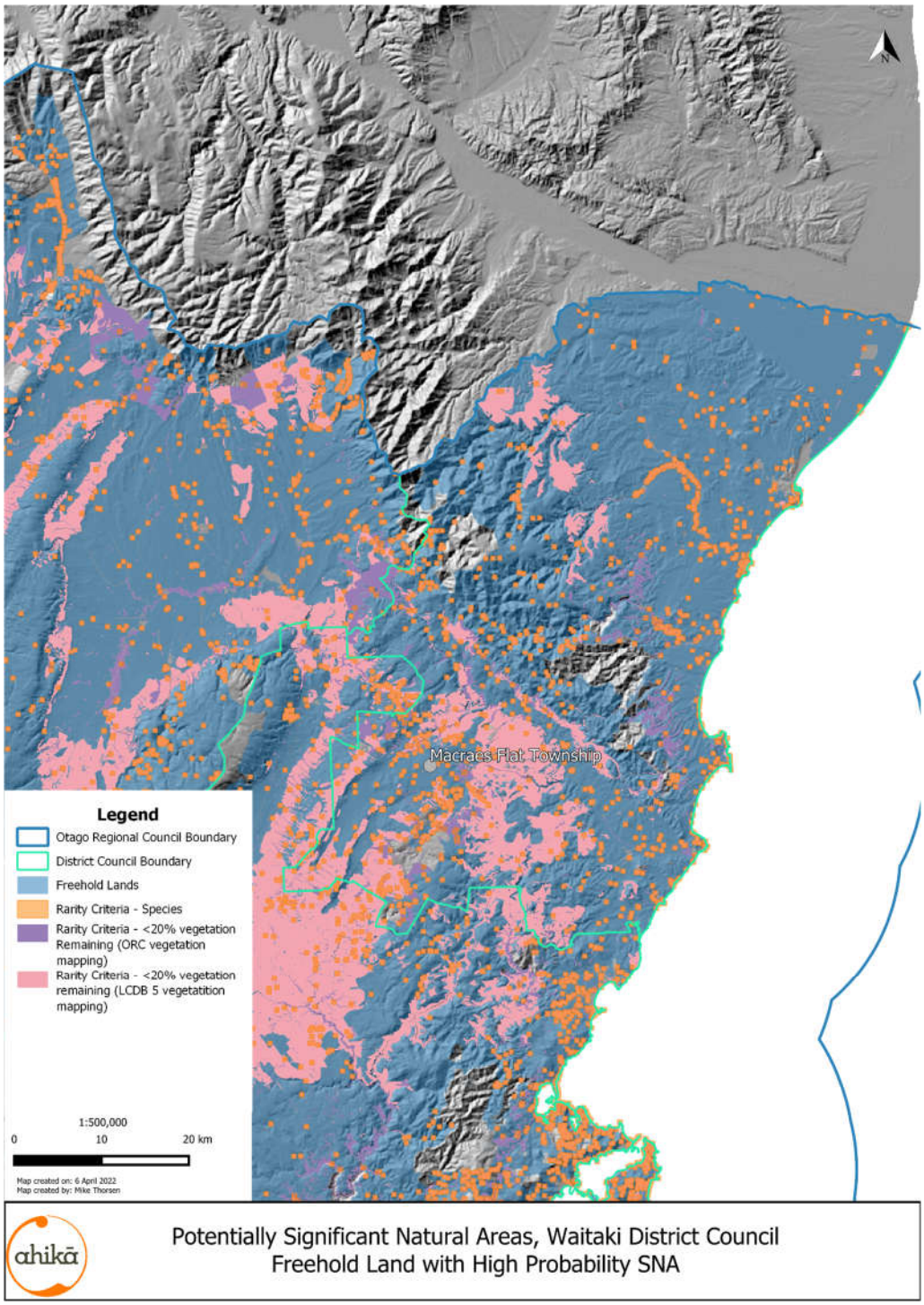

Figure 3. Area of freehold land within the Waitaki District of Otago region with a high probability of being assessed as an SNA.

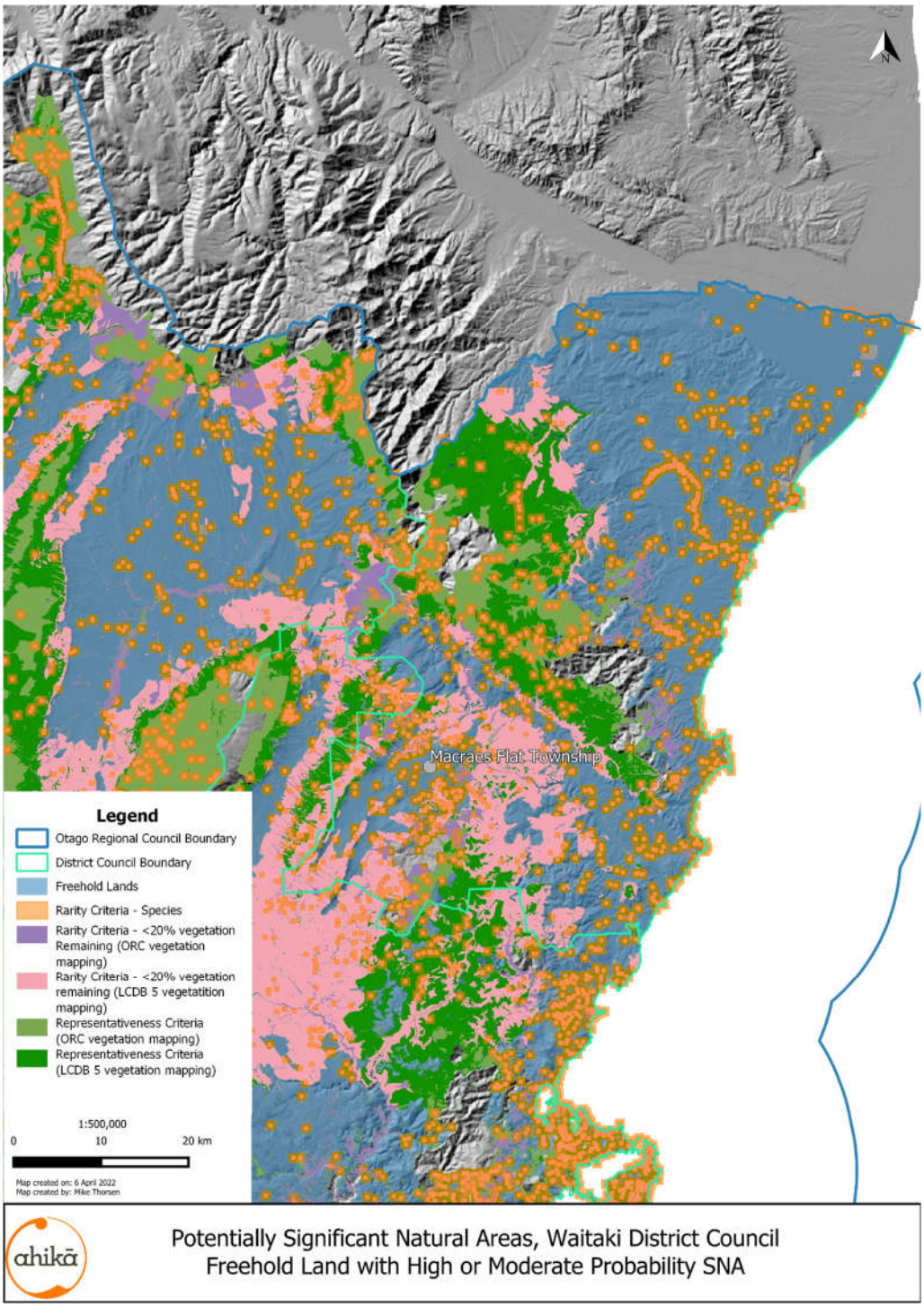

Figure 4. Area of freehold land within the Waitaki District of Otago region with a high or moderate probability of being assessed as an SNA.

CURRENT APPROACHES TO EFFECTS MANAGEMENT EMPLOYED BY OCEANAGOLD

49. I was involved in both the recent Coronation North and Deepdell North projects where effects on vegetation were assessed as significant, and would also have been assessed as significant under one or more of the proposed criteria in APP2.

50. The approach employed in the Coronation North and Deepdell North projects applied the effects management hierarchy of sequentially seeking to avoid effects, remedy effects, mitigate effects, offset effects and compensate for effects. This resulted in a mitigation package that was designed, with input from councils and the Department of Conservation, with the aim of having an overall benefit to the area's biodiversity.

51. In the Deepdell North project, where the partially Operative Regional Policy Statement applied, the mitigation package was a combination of all levels of the effects management hierarchy. I wish to focus on the offsetting component of this mitigation package.

52. Two offset projects are part of this mitigation package, one focussing on a wetland near Middlemarch (wetland offset) and one on an area on Redbank Station (Redbank offset). Both offsets are primarily focussed on addressing project effects on vegetation communities, but also include components of rare species management.

53. The Ecological Enhancement Area Management Plans (EEAMP) for both sites were produced (under the umbrella of a project-specific Ecological Management Plan) on the basis of offset calculations

using a disaggregated accounting model[19] to calculate the extent of works required within the EEA to achieve a state of at least No Net Loss of biodiversity (NNL). The offset calculations and EEAMPs were independently reviewed by an expert in offset design and calculation to confirm NNL. The Department of Conservation had a strong role in developing these EEAMP, and supported what was proposed prior to the consent being granted.

54. An important component of these offsets is that they incorporate a long-term funding model to support the planned actions for a greater than 50-year time frame (a greater time period than consent duration) using a sustainable fund captured in the mine bond. The quantum of this fund was calculated on the cost of undertaking the planned activities and includes depreciation and replacement of materials and inflationary pressure.
55. Where there is some uncertainty around the effectiveness of actions within the EEAMP, a research action has been instigated to address this uncertainty. In the case of the wetland offset, this is a 7-year research programme comparing the utility of herbicides, grazing, mowing and restoring lost ecological function using surrogate wetland bird species in producing and maintaining ephemeral wetland vegetation in a Critically Endangered and Naturally Uncommon ecosystem type (and the largest example of in Otago).
56. Both sites will be protected in perpetuity through covenanting.

---

[19] Maseyk, F.J.F; Barea, L.T; Stephens, R.T.T; Possingham, H.P; Dutson, G; Maron, M. 2016. A disaggregated biodiversity accounting model to improve estimation of ecological equivalency and no net loss. Biological Conservation 204: 322-332.

57. Both projects have been implemented and are in the baseline information gathering stage.
58. As I understand it, if the Deepdell North project was being consenting under the pORPS, the potential for offset or compensation could not be considered because there is no consenting pathway under ECO-P4.
59. In my opinion projects such as these address concerns about the validity of commercial activities being able to occur with no net impact on an area's biodiversity. My concern is the pORPS does not allow for mining to show, on a case-by-case basis, that it can provide a biodiversity offset and this means that the region will lose out on potential biodiversity offsets which would see NNL or biodiversity gains.

IMPACT OF TOPIC ECO ON FUTURE OCEANAGOLD MINE ACTIVITIES

60. I assessed the possibility of areas within two indicative areas of future mine interest (Roundhill Extension and Golden Bar) being assessed as Significant Natural Areas if using the proposed criteria in APP2. To do this I used expert interpretation of aerial photographs to outline natural areas that I consider have a possibility of being assessed as an SNA. Much of the area around and within the forecast area of mine interest is likely to be assessed as SNA (see Figures 5, 6, 7 below), as has been the case in the recent projects, and most of the identified areas have a High or Very High possibility of meeting one or more of the criteria in APP2.
61. ECO-P3 is structured so that access to the effects management hierarchy in P6 occurs subsequent to the requirement to avoid any

reduction of the area or values (even if those values are not themselves significant) identified under ECO–P2(1). As avoidance is not possible with commercial activities such as mining (which is locationally constrained) and as mining is not provided for in ECO-P4, it effectively means that any new mining, such as that indicated by the Areas of Interest (AOI) planned for the Roundhill Extension and Golden Bar, cannot occur. This is particularly concerning given the large areas of land affected by the broad criteria used to identify SNAs and in my opinion it is likely that there would be many more areas at Macraes where further development would coincide with a SNA and therefore could not occur.

62. If instead use of the effects management hierarchy is elevated higher in the policy structure, on the basis that well-planned and well-implemented activities can redress project effects on local biodiversity, then mine activities can progress if their effects can be adequately and appropriately managed.
63. In my opinion this approach is more consistent with objective ECO-01 as it provides another well-resourced avenue whereby Otago's indigenous biodiversity is healthy and thriving and any decline in quality, quantity and diversity is halted.

CONCLUSION

64. The Topic-ECO policies do not best align with the objective of ECO-01 as the magnitude of the effects on Otago's indigenous biodiversity arising from different factors, and the positive measures that have been or could be employed have not been adequately considered.

65. The impacts arising from policies associated with identification and protection of Significant Natural Areas have not been evaluated in the context of the suitability of the criteria within APP2 in identifying 'real' SNAs and the probably wide spatial extent of new SNA's within Otago if these criteria are adopted. Therefore, the impact on social, cultural and economic activities has been under appreciated.
66. The opportunity to implement the effects management hierarchy in ECO-P6 is practically non-existent if a project affects a SNA. This will have the effect of stymying many commercial developments, including those which would have an overall result of no net loss (or net gain) of biodiversity.
67. If instead the effects management hierarchy was allowed to be considered against an 'at least no net loss of indigenous biodiversity' standard when a project affects a SNA, then well-planned projects with good environmental outcomes could be considered. This approach helps meet objective ECO-01 by facilitating well-funded conservation works that otherwise would not occur.
68. I suggest a pathway forward to address my concerns around the identification of SNAs within Otago could be to use best available quantitative information to characterise current state and trend in Otago's biodiversity to guide appropriate criteria for the identification of SNAs and the most appropriate policies to reach the stated objective of the pORPS. A similar process to that being undertaken by regional councils (including the ORC) in identification of critical habitats of threatened freshwater biodiversity and developing regional conservation needs surfaces, together with a full evaluation of impact of SNA designation on both landowner livelihood and on

biodiversity outcomes, including perverse outcomes, and analysis of comprehensiveness, adequacy and shortfall of existing protected area network would put the pORPS on a much more justifiable footing.

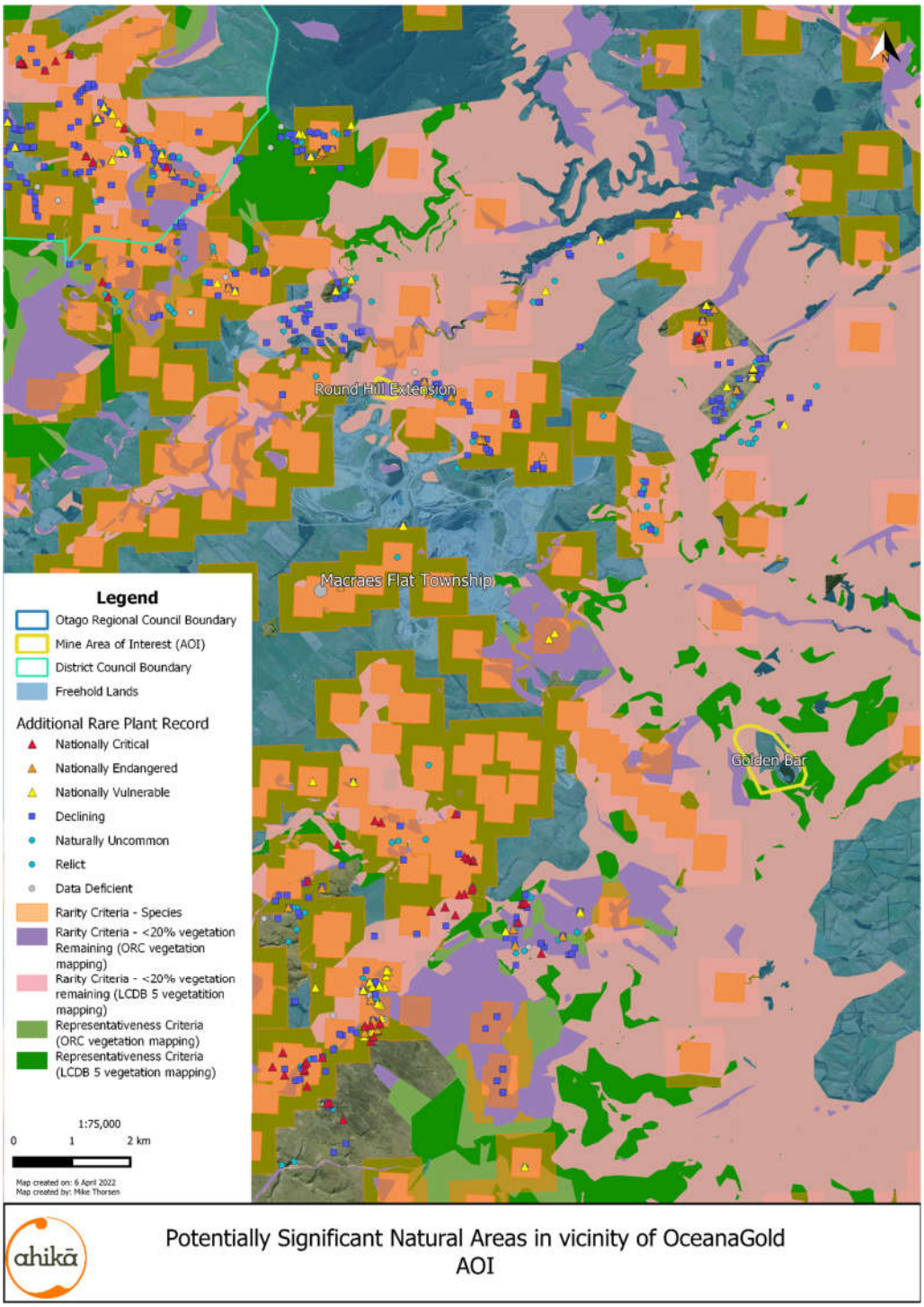

Figure 5. Possible extent of SNA in the vicinity of OceanaGold's future Areas of Interest (AOI). This map uses the same mapping as in previous figures, but with the addition of locations of rare species recorded during survey work by myself in the area.

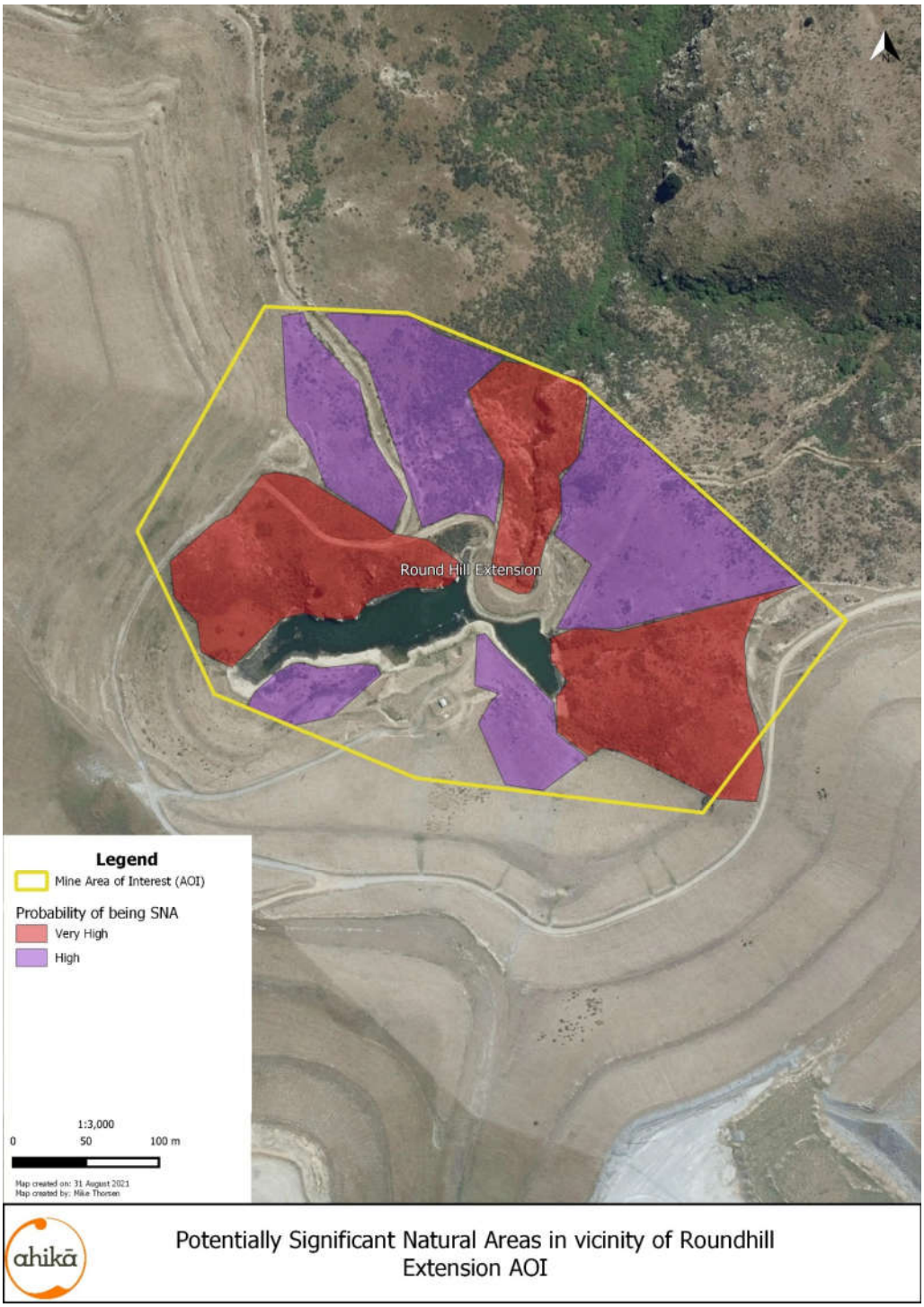

Figure 6. Finer-grained assessment using expert interpretation of aerial imagery of probability of the Roundhill Extension Area of Interest (AOI) being considered a SNA under the criteria in APP2 of the pORPS. Note: the entire extent of the AOI is mapped in LENZ as having less than 20% of vegetation cover remining but is not mapped as potentially significant as there is no natural vegetation cover.

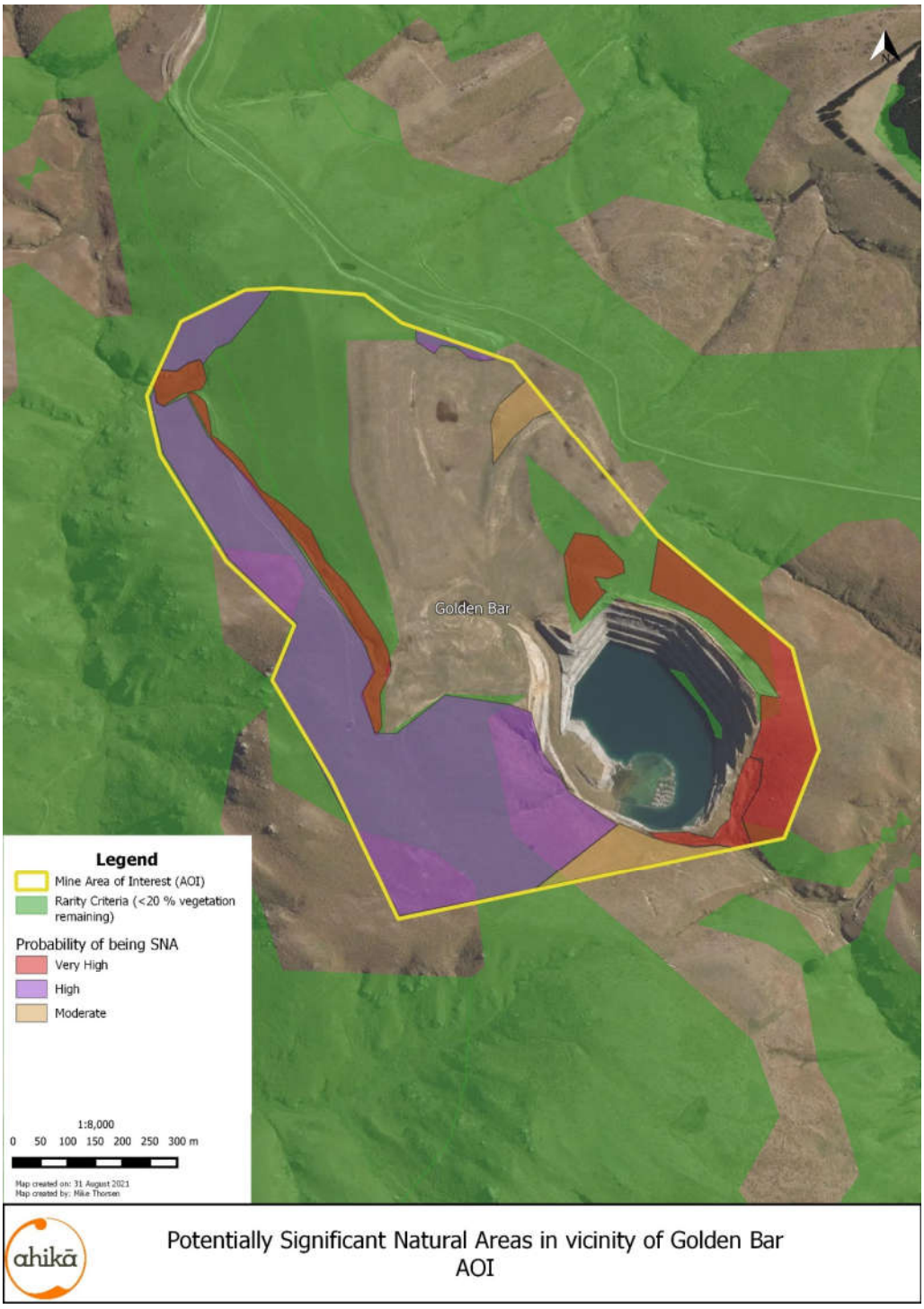

Figure 7. Finer-grained assessment using expert interpretation of aerial imagery of probability of the Golden Bar Area of Interest (AOI) being considered a SNA under the criteria in APP2 of the pORPS. Note: much of the extent of the AOI is mapped in LENZ as having less than 20% of vegetation cover remining but is not mapped as potentially significant as there is no natural vegetation cover.

APPENDIX

1. In paragraphs of 26 to 35 of his 29 September 2022 evidence, Dr Kelvin Lloyd has commented on Oceana Gold's letter of 21 July 2022. I wish to respond to some of his comments.
2. The offsets and compensation are newly implemented and have not had the time required to demonstrate the gains.
3. Prior to Deepdell North, the effectiveness of the mitigation package was assessed by consensus of ecological experts (including Dr Lloyd). There was little or no requirement to measure their success. These measures have mostly been achieved, but OceanaGold acknowledges there are some outstanding minor actions that are actively being pursued. Therefore the mitigation for these projects is thought to be at least NNL.
4. Dr Lloyd confuses NNL with effect on species or community. While there may have been some detrimental effect on some communities (and that is arguable), overall the result has been at least NNL.
5. At paragraph 30 of Dr Lloyd's evidence he discusses averted loss. Averted loss was only a minor component of one offset (loss of low-producing grassland), a habitat that Dr Lloyd has stated in other evidence as having no ecological value. I also dispute Dr Lloyd's suggestion that the offsets were 'simplistic'. The offsets were chosen to be meaningful and were validated by internal review by Graham Ussher and by DOC and were accepted as adequate by DOC and Councils.

6. Contrary to paragraph 30 of Dr Lloyd's evidence, no planting has yet occurred of *Deyeuxia quadriseta* or *Epilobium insulare*, so they cannot have 'died'.
7. In response to his paragraph 34, rare plant translocations are a higher order of the effect mitigation hierarchy, which is why they were not included in offsets.