

Before the Fast-track Panel

Under: The Fast-track Approvals Act 2024
In the matter of: FTAA-2507-1089 – Bendigo-Ophir Gold Project

Statement of advice Max Crowe
Vegetation and Flora
Independent consultant
10 March 2026



Department of
Conservation
Te Papa Atawhai

**Te Kāwanatanga
o Aotearoa**
New Zealand Government

Executive Summary

1. The proposed Bendigo-Ophir Gold Mine site (the site) lies within the Shepherds Creek and Rise and Shine Creek catchments on the western side of the Dunstan Mountains, spanning an altitudinal gradient between 320 and 860 m asl. The site spans the Bendigo and Ardgour Stations, is adjacent to the Ardgour Conservation Area, the Bendigo Historic Reserve, and partially within the Bendigo Conservation Covenant.
2. Vegetation communities at the site are typical of the remaining montane vegetation of the Dunstan Ecological District, but notable in supporting at least forty-eight Nationally or Regionally Threatened, At Risk or Data Deficient plant species, representing exceptionally high levels of diversity for Threatened and At Risk plant species. Species of particular note include large populations of Threatened – Nationally Vulnerable *Myosotis brevis*, and a nationally important population of the Threatened – Nationally Critical¹ *Ceratocephala pungens* (the largest known population). The majority of the site is ecologically significant, as assessed against the Otago Regional Policy Statement (2019) significance criteria, and therefore qualifies as a Significant Natural Area for the purposes of Section 6(c) of the RMA (1991).
3. Construction of the gold mine, including open cast pits, processing plant, haul roads, waste rock stacks and the tailings dam will clear all vegetation and disturb soils over up to 610 ha of the site. Disturbance of Nationally Threatened species associated with the open-cast components of the mine makes a no-net-loss outcome for biodiversity unachievable.
4. Indirect effects including the deposition of dust and alteration of hydrology will impact vegetation and habitats over a larger, but unquantified, area. The values and effects associated with parts of the application, such as the Ardgour Road Concession, have not been described in a way that allows the impacts to be fully assessed.

¹ de Lange, P.J.; Gosden, J.; Courtney, S.P.; Fergus, A.J.; Barkla, J.W.; Beadel, S.M.; Champion, P.D.; Hindmarsh-Walls, R.; Makan, T.; Michel, P. 2024: Conservation status of vascular plants in Aotearoa New Zealand, 2023. New Zealand Threat Classification Series 43. Department of Conservation, Wellington. 105 p

5. Approximately 264 ha of the 610 ha Direct Disturbance Footprint lies within the Bendigo Conservation Covenant. Revocation of ~864 ha of the Covenant has been proposed, representing approximately 14% of the total Bendigo Conservation Covenant area. Importantly, the proposed revocation area supports high concentrations of Nationally At Risk and Threatened species, including the only known populations of *Ceratocephala pungens* within the Bendigo Conservation Covenant, and the largest and best known populations of this species nationally. Based on the best available information, the revocation of the covenant will result in a significant loss of the representation and diversity of the values that the covenant protects.
6. The biodiversity offsetting package relies on poorly evidenced, incorrect assumptions about underlying trajectories of biodiversity decline; untested enhancement techniques; and very long timeframes to achieve calculations of biodiversity uplift which are very likely to seriously overestimate gains for many of the affected habitats and species. Assessing the relationship between effects and mitigations is made difficult due to the content and structure of the application documents which obfuscates clear accounting.
7. Despite understating the values and extent of impacts and overestimating the benefits provided by the offsetting package, the applicant acknowledges that the project still results in a high or very high level of residual (unmitigated) effects. The outcome for the majority of the Threatened, At Risk and Data Deficient plant species following offset/compensation actions is net loss, some of which are large scale with an overall high or very high level of residual effect. For at least one plant species, *Ceratocephala pungens*, this represents the loss the largest known stronghold for a species on the brink of extinction.
8. The re-creation (if possible) over several decades of habitats dominated by common indigenous species does not mitigate for the loss of Threatened and At Risk species and wetlands. The proposed creation of a new covenant protecting fewer values does not mitigate for the loss of a high value covenant, and the implementation of temporary land management does not provide mitigation for permanent loss.
9. The scale of gap between losses/effects and effects management outcomes is neither trivial nor reconcilable. Large scale residual effects involving Threatened and At Risk species and vulnerable ecosystems mean the project

in its current proposed form cannot be considered in any way to be able to maintain indigenous plant biodiversity (i.e. achieve a no-net-loss scenario), and is therefore inconsistent with the mitigation hierarchy and policy direction under the National Policy Statement for Indigenous Biodiversity and the Otago Regional Policy statement.

10. As currently described, it not realistically possible for this project to achieve a no-net-loss outcome for indigenous biodiversity. It may be possible to achieve a no-net-loss scenario were the applicant to avoid the irreplaceable values currently threatened by the open cast components of the proposal and pursue only the underground components of the application.

Introduction

1. My full name is Max Maurice Leigh Crowe.
2. I have been instructed to provide expert advice on behalf of the Department of Conservation (DOC) on the Bendigo-Ophir Gold Project Fast-track application.

Qualification and Experience

3. I am an independent Environmental Consultant working from offices in Dunedin and Timaru. I have a Bachelor of Science in Botany and Ecology from the University of Otago (2010) and a Master of Science with Distinction in Ecology from University of Otago (2012). I have eight years' experience as a biodiversity ranger for the Department of Conservation, seven years' experience as a biodiversity advisor for the Waitaki District Council, and six years' experience as an independent ecologist. My role in this project to date has included review of both draft and substantive application documents, and attendance at a four-day workshop on the 17th-20th February 2026.
4. I have a good understanding of the vegetation, flora and ecosystem processes of Central Otago. Work that is especially relevant to this consent application includes:
 - i. Compliance monitoring of OceanaGold (New Zealand Limited) gold mining operations at Macraes Flat on behalf of the Waitaki District Council (2023-2025) and Dunedin City Council (2025).
 - ii. Field assistant for the Eastern South Island drylands botanical survey (Manaaki Whenua Landcare Research 2009/2010).
 - iii. Field botanist for the Department of Conservation Land Use and Carbon Analysis System (LUCAS) and Tier 1 Monitoring Programme (2012-2019)
 - iv. Review of consent applications for vegetation clearance in the Waitaki District, assessment of those applications against the Waitaki District Plan (WDP) vegetation clearance rules (2016-2025).
 - v. Assessments of ecological significance against Waitaki District Plan, Otago Regional Policy Statement, Canterbury Regional Policy Statement and National Policy Statement for Indigenous Biodiversity criteria, including dryland habitats (2016-2025).

Code of conduct

5. Whilst it is acknowledged this is not an Environment Court Proceeding, I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023. I have complied with the Code of Conduct in the preparation of this advice. Unless I state otherwise, this advice is 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 I express.

Material Considered

6. In preparing this advice I have reviewed the following documents as part of the substantive application:
 - i. **A.01-A.16:** Matakanui Gold Limited (2025) Bendigo-Ophir Gold Project Substantive Application Document under the Fast-track Approvals Act.
 - ii. **B.08:** Baber, M. (2025) Assessment of Ecological Effects: Terrestrial Ecology – Bendigo-Ophir Gold Project. Client report prepared for Matakanui Gold Limited. Alliance Ecology 2025.
 - iii. **B.08 – Appendix 3:** Usher, G. (2025) Memo: Bendigo-Ophir Mine: biodiversity offset modelling for terrestrial ecology values. Client report 2352. RMA Ecology 2025.
 - iv. **B.12:** Luring, J.; Nicol, D. (2025) Bendigo-Ophir Project Wetland Values Assessment. Report prepared for Matakanui Gold Ltd. RMA Ecology 2025
 - v. **B.13:** Milner, Z.; Nicol, D.; Kroos, H (2025) Bendigo-Ophir Project Vegetation Values Assessment. Report prepared for Matakanui Gold Ltd. RMA Ecology 2025.
 - vi. **B.16:** Simcock, R.; Brownstein, G. (2025) Applied Research Plan for conservation management, rehabilitation and expansion of cushionfield. Contract report LC4626. Prepared for Matakanui Gold Limited. Manaaki Whenua Landcare Research 2025.
 - vii. **B.18:** McDermott, K. (2025) Bendigo Ophir Gold Project Assessment of Freshwater Ecological Effects. Prepared for Matakanui Gold Limited. Boffa Miskell Limited 2025.

- viii. **B.33:** Bluett, J. (2025) Bendigo-Ophir Gold Project: Assessment of Environment Effects from the Discharge of Contaminants into Air. Job Reference C051440001. Client report for Matakanui Gold Limited. Pattle Delmore Partners 2025.
- ix. **B.40:** Bryce, L.; Hillman, C.; Dodge, C.; Wilson, J. (2025) Bendigo-Ophir Gold Project Mine Closure Plan. Document Number J-NZ0454-002-R-Rev2. Prepared for Matakanui Gold Limited by Mine Closure Management Pty Ltd 2025.
- x. **B.42:** Burgess, R. (2025) Memo: BOGP Wetland Drawdown Assessment. Document Number J-H-NZ0235-001-M-Rev0. Prepared for Matakanui Gold Limited by Hydro GeoChem Group Limited (2025).
- xi. **B.43:** Burgess, R. (2025) Memo: BOGP Flow Augmentation Strategy. Document Number J-H-NZ0235-002-M-Rev0. Prepared for Matakanui Gold Limited by Hydro GeoChem Group Limited (2025).
- xii. **D.01:** Bendigo-Ophir Gold Project Proposed Land use consent and conditions for activities within the jurisdiction of Central Otago District Council.
- xiii. **D.03:** Schedule Two: Bendigo-Ophir Gold Project – General Conditions which apply to all of the Resource Consents within the Jurisdiction of the Otago Regional Council.
- xiv. **D.06:** Bendigo-Ophir Gold Project – Department of Conservation concession and conditions for Ardgour Rise.
- xv. **D.07:** Bendigo-Ophir Gold Project – Department of Conservation concession and conditions for SH8 and Ardgour Road Intersection.
- xvi. **D.08:** Bendigo-Ophir Gold Project – Department of Conservation concession and conditions for Access Route to CIT Battery.
- xvii. **D.09:** Bendigo-Ophir Gold Project – Department of Conservation concession and conditions for Willow Management.
- xviii. **D.10:** Bendigo-Ophir Gold Project – Department of Conservation concession and conditions for Monitoring and Access.

- xix. **G.01:** Reid, S.; Weber, P. (2025) Water Management Plan. Report prepared for Matakanui Gold Limited by Mine Waste Management Limited.
- xx. **G.02:** Baber, M. (2025) Bendigo-Ophir Project: Ecological Management Plan Framework. Report prepared for Matakanui Gold Limited by Alliance Ecology 2025.
- xxi. **G.03:** Baber, M. (2025) Bendigo-Ophir Project: Habitat Impact Management Plan. Report prepared for Matakanui Gold Limited by Alliance Ecology 2025.
- xxii. **G.07a:** Simcock, R.; Barber, K.; Girvan, R. (2025) Bendigo-Ophir Gold Project: Landscape and Ecological Rehabilitation Plan – Part A. Report prepared for Matakanui Gold Limited by Boffa Miskell, Manaaki Whenua Landcare Research and Habitat NZ (2025).
- xxiii. **G.07b:** Simcock, R.; Barber, K.; Girvan, R. (2025) Bendigo-Ophir Gold Project: Landscape and Ecological Rehabilitation Plan – Part B (Appendices). Report prepared for Matakanui Gold Limited by Boffa Miskell, Manaaki Whenua Landcare Research and Habitat NZ 2025.
- xxiv. **G.08:** Norton, D. (2025) Bendigo-Ophir Gold Project: Ardgour Restoration Area Management Plan. Report prepared for Matakanui Gold Limited by Biodiversity Solutions Limited 2025.
- xxv. **G.09:** Barber, K.; Walsh, A.; Singh, Y.; Zwaagman, M (2025). Bendigo-Ophir Gold Project: Matakānui Sanctuary Management Plan. Report prepared for Matakānui Gold Limited by Habitat NZ Limited 2025.
- xxvi. **G.10:** Barber, K.; Walsh, A.; Barber, T.; Singh, Y.; Firoozkoobi S (2025) Bendigo-Ophir Gold Project: Mammalian Pest Management Plan. Report prepared for Matakānui Gold Limited by Habitat NZ Limited 2025.
- xxvii. **G.11:** Barber, K.; Walsh, A.; Singh, Y.; Barber, T.; Zwaagman, M (2025) Bendigo-Ophir Gold Project: Biosecurity and Plant Pest Management Plan. Report prepared for Matakānui Gold Limited by Habitat NZ Limited 2025.
- xxviii. **G.12:** Baber, M.; Barber, K. (2025) Bendigo-Ophir Gold Project: Biodiversity Outcome Monitoring Plan. Report prepared for Matakānui Gold Limited by Alliance Ecology Limited and Habitat NZ Limited 2025.

- xxix. **2025 Spring annual survey data** (.xls spreadsheet) provided 11 March 2025
7. I have undertaken site visits on 19 December 2025, and 17,18 and 20 February 2026.

Scope of advice and expert opinion

8. My expert advice will address the following matters:
- i. Adequacy of the applicant's assessment of values, noting any values not identified, underestimated or under valued
 - ii. Adequacy of the applicant's assessment of effects, noting any effects not adequately addressed
 - iii. Adequacy of applicant's proposed mitigation measures, noting the scale of effects compared to mitigations
 - iv. Any alternative mitigation measures, and/or the expert's preference for mitigation measures
 - v. Comments on conditions.

Ecological Context – Threatened drylands of Central Otago

9. The Dunstan Mountains are within the Dunstan Ecological District, which, along with the Pisa and Lindis Ecological Districts, make up the Central Otago Ecological Region. The semi-arid climate of Central Otago more closely approximates a "continental" climate than any other part of New Zealand, with the country's coldest winters and hottest summers². Being the most central of the alpine Central Otago mountain ranges, the Dunstan Mountains are also the driest, with annual rainfall of less than 400 mm in the valley floors and about 1,200 mm at the alpine zone summits. The valley floors of the Dunstan Ecological District are characterised by glacial moraines, and more recent alluvial deposition. The mountains are typical fault-block ranges, with steep slumped slopes on the south east faces, and long north-west slopes.
10. The vegetation of the ecological district is highly reflective of both rainfall and altitudinal sequences, overlain with impacts of human activities, such as fires, grazing, plant and animal pests, goldmining, and more recently top-dressing

and oversowing. The impacts of the hot summer fires of early pastoralism are particularly evident; slim snow tussock (*Chionochloa macra*) grasslands have been largely lost, or occur in only depleted forms on the northern faces and have been replaced in areas by fire and grazing-resistant taramea (*Aciphylla glauca*) dominated herbfields and depleted short-tussock grasslands.

11. The alluvial and moraine terraces are mainly cultivated and irrigated i.e. intensively developed. The lower altitude slopes of the northern faces of the Dunstan Mountains are extremely dry and are largely not intensively developed. Here a patchwork of dryland communities including scabweed cushionfield, fescue and silver tussocklands and low-producing exotic grasslands are interspersed with indigenous *Coprosma* and matagouri-dominated shrubland areas adjacent to streams.
12. Extensive kānuka (*Kunzea serotina*) shrublands are present below about 800 m on both sides of the range, but only south of Bendigo, which marks the point of transition into more diverse shrublands dominated by *Coprosma propinqua*. Indigenous forest cover is reduced to tiny fragments of thin-barked totara (*Podocarpus hallii*), kowhai (*Sophora microphylla*) and celery pine (*Phyllocladus alpinus*) restricted to rare fire refugia among schist outcrops, mostly on the southern faces of the Dunstan Mountains.
13. Despite the degraded status of the vegetation communities of the Dunstan Ecological District the habitats are known to support high numbers (>85) of Nationally Threatened, At Risk and Data Deficient plant species, and many more plant species with regional threat rankings. Plant species of particular conservation note include:
 - a. *Ceratocephala pungens* (Threatened – Nationally Critical)
 - b. *Lepidium sisymbrioides* (Threatened – Nationally Critical)
 - c. *Pachycladon cheesemanii* (Threatened – Nationally Endangered)
 - d. *Senecio dunedinensis* (Threatened – Nationally Endangered)
 - e. *Carex inopinata* (Threatened – Nationally Vulnerable)
 - f. *Carmichaelia kirkii* (Threatened -Nationally Vulnerable)
 - g. *Carmichaelia crassicaulis* subsp. *crassicaulis* (Threatened – Nationally Vulnerable)

h. *Craspedia incana* (Threatened – Nationally Vulnerable)

i. *Myosotis brevis* (Threatened – Nationally Vulnerable)

14. All of these Threatened species are dryland specialists, and most are small and cryptic in nature. Some are found in uncultivated depositional landforms such as alluvial and moraine surfaces, others are associated with uncommon ecosystems of dryland environments such as inland salt pans, and others are restricted to rock outcrops that provide refugia from grazing pressure.
15. Of particular note for flora are the many occurrences of ‘spring annuals’², Annual species are rare in the New Zealand flora, and undeveloped low altitude areas of Central Otago are a stronghold for a group of four species: *Ceratocephala pungens* (Threatened- Nationally Critical), *Myosotis brevis* (Threatened – Nationally Vulnerable), *Myosotis antarctica* subsp. *antarctica* (At Risk – Naturally Uncommon), and New Zealand mousetail (*Myosurus minimus* subsp. *novae-zelandiae*; At Risk – Declining). These species are becoming increasingly rare due to habitat loss and weed invasion. Based on analysis of historic survey data¹ the general undeveloped area of Bendigo is the most important remaining area nationally for the conservation of the spring annual species.
16. Remaining undeveloped lowland areas in Central Otago are nationally important for indigenous biodiversity because of the remaining drylands botanical values. Habitat clearance and modification is a principal, ongoing cause of indigenous biodiversity decline in New Zealand³. There has been extensive loss of dryland ecosystems which are New Zealand’s least protected and most threatened ecosystems, yet support about half of New Zealand’s most threatened plant species⁴. The remaining ecosystems of the inland South Island drylands are nationally significant⁵. They are critical reservoirs of what

² Rogers G, Walker S, Tubbs M, Henderson J. 2002. Ecology and conservation status of three “spring annual” herbs in dryland ecosystems of New Zealand. *New Zealand Journal of Botany* 40: 649-669.

³ Walker S, Bellingham PJ, Kaine G, Richardson S, Greenhalgh S, Simcock R, Brown MA, Stephens T, Lee WG. 2021. What effects must be avoided, remediated or mitigated to maintain indigenous biodiversity. *New Zealand Journal of Ecology* 45(2): 3445.

⁴ [Drylands: Habitats. www.doc.govt.nz](https://www.doc.govt.nz) Accessed 6 November 2024.

⁵ Walker S. 2019. Threats to New Zealand’s dryland ecosystems. [Threats to New Zealand’s dryland ecosystems | NZES](https://www.nzes.govt.nz). Accessed 6 November 2024.

little lowland Central Otago indigenous biodiversity remains, which has otherwise been extensively destroyed, heavily modified and continues to be threatened by development.

17. An illustration/example of the point made in paragraph 15 is that only a tiny fraction of indigenous vegetation remains on the extensive post-glacial Upper Clutha inland outwash gravels and moraines (flats) between Cromwell and Wanaka. The inland saline (salt pan) ecosystem which is almost only found in Otago, primarily in the upper Clutha, Manuhereki Valley and Maniototo, has been reduced to less than 1% of its extent since the 1960s/1970s⁶. Approximately 40,000 ha of land cover classes comprising indigenous vegetation was lost between 1996 and 2018 in Otago Region⁷. Areas identified as having high biodiversity values through the Protected Natural Area Programme (PNAP) in Otago i.e. Recommended Areas for Protection (RAP) continue to be lost. In Central Otago Ecological Districts (ED), such as Maniototo, Lindis, Pisa, Manorburn and Dunstan, 514 hectares of indigenous vegetation from 13 RAP was lost between 1989 and 2015⁸.

Vegetation and Flora at the Gold Mine Site – Exceptional diversity of Threatened and At Risk plants

18. Field surveys to inform the applicant's Vegetation Values Report (B.13), are reported to have been undertaken over 145 person days between October 2023 and January 2025. The report identifies 48 Nationally or Regionally At Risk or Threatened plant species within the Direct Disturbance Footprint. At least six Nationally At Risk species were found only in the Direct Disturbance Footprint, and an additional six Nationally threatened or At Risk species were found in higher abundance in the 610 ha Direct Disturbance Footprint than in the 4,760 ha Surrounding Landscape, indicating overall higher habitat quality.
19. A notable omission is the lack of a detailed consideration of the non-vascular flora (i.e. mosses and lichens), which can make up an important part of dryland

⁶ Allen RB, McIntosh PD. 1997. Guidelines for the conservation of salt pans in Central Otago. Science for Conservation 49. Department of Conservation, Wellington.

⁷ Harding, M. 2022. Otago Region Analysis of Recent Changes to Terrestrial Indigenous Ecosystems. A report to Otago Regional Council, June 2022.

⁸ Ibid.

ecosystems. Survey and description of the non-vascular flora would provide additional context regarding the impact of the proposal on indigenous biodiversity values.

20. The highest botanical values were generally found within vegetation communities characterised as “Mixed depleted herbfield (cushionfield) and grassland” and which supports at least thirty-two Nationally or Regionally At Risk or Threatened plant species, including national strongholds for Threatened species. An additional six vegetation types and three wetland types are also described as being affected by the proposal.
21. The overall conclusions around the types of botanical values present, and the relative significance of the habitats within the vegetation and wetland values report (B.12,B.13) appear sound and are generally well evidenced. Updated data has been provided to address some of the areas of low confidence, however this has not yet been integrated into the report (see paragraphs 23-24,28-29,37-39). Additionally, there are several analyses that could be performed that would help to reduce uncertainty in report findings, and potentially highlight areas where further work is required (see paragraphs 32-36).
22. Conversely, the AEE (B.08) generally assigns lower ecological values to the same species and habitats than those identified in the Vegetation Value Report. The methodological limitations in the AEE that give rise to these conflicting conclusions are outlined in paragraphs 41–44.

Spring Annuals – A national stronghold

23. Among the highest and most sensitive values identified are communities of spring annual plants associated with “depleted herbfield (cushionfield)” vegetation. This habitat type is well represented within the proposed mine site making up ~17% (104 ha) of the Direct Disturbance Footprint. However, the most recent survey data also shows that large concentrations of these Nationally Threatened species also occur within vegetation types where they were not previously detected.
24. Threatened plant species found within these herbfields include populations of *Myosotis brevis* (Threatened – Nationally Vulnerable) and *Ceratocephala pungens* (Threatened – Nationally Critical) which represent some the largest

known remaining strongholds of the species. The spring annual plants in the *Myosotis pygmaea* complex (*M. brevis* and *M. antarctica* subsp. *antarctica*) can be difficult to distinguish for inexperienced observers and were not differentiated in the Vegetation Values Report (B.13). The most recent survey data (11 March 2026) has differentiated these species.

25. Of all the spring annual flora *Ceratocephala pungens* is the least tolerant of competition from other plants, and in the absence of disturbance it can persist only on soils with extreme geochemistry that limits the invasion of taller potentially smothering plants (Rogers, 2024). In the absence of disturbance, competitive exclusion by taller vegetation smothers habitat for *C. pungens*. It has been theorised that grazing by sheep and lagomorphs (rabbits and hares) may provide a surrogate for historical megafauna disturbance.⁹
26. Population monitoring of *C. pungens* over the last several years shows a species trending towards extinction, largely associated with land-use change¹⁰. A recent inventory of national distribution and abundance data for *C. pungens* indicates that only nine of the seventeen known sites in Central Otago still support a population¹¹, and the Shepard's Creek population (discovered after the inventory was compiled) appears to be one of only three sites that reliably supports a population that numbers in the hundreds of individuals. The status of the populations of the species outside Central Otago in the Mackenzie Basin are described as "precarious" (Rogers, 2024). No management interventions have yet proven reliable in slowing or halting this decline, making any known stable populations extremely important from a conservation perspective.
27. The definition of Nationally Critical is "most severely threatened, facing an immediate high risk of extinction", and is the highest possible threat category¹⁴. The New Zealand Threat Classification System gives *C. pungens* a "data poor" qualifier for both the size and trend of the species, reflecting the extreme

⁹ Rogers, G., & Overton, J. McC. (2007). Land use effects on "spring annual" herbs in rare non-forest ecosystems of New Zealand. *New Zealand Journal of Botany*, 45(2), 317–327.

<https://doi.org/10.1080/00288250709509720>

¹⁰ Rogers, G. (2024) *Ceratocephala pungens* – a conservation management report for the plant Species on the Brink programme for the 2023-2024 growing season. Client report for the Department of Conservation.

¹¹ Ewans, R. 2025. Appendix A - Summary: *Ceratocephala pungens*. Memo prepared by Richard Ewans – Technical Advisor, Ecology, Flora & Ecosystems Teams, Department of Conservation

difficulty in assessing population sizes¹⁵. A key factor contributing to the lack of certainty regarding the status of these species relates to the difficulties in detecting such a small and transient species, which can sprout, flower, set seed and disappear within a matter of weeks, and which has high interannual variability (i.e. the same site might have 5 individuals one year and 100 the next, presumably depending on suitable conditions).

28. The applicant's most recent spring-annual survey data (submitted 11 March 2026) indicates that although only around 72 of the 212 known *C. pungens* locations fall within the Direct Disturbance Footprint, these sites support the highest recorded densities of the species. Based on the information provided, estimating the total population across Ardgour and Bendigo Stations remains difficult, but it is clearly in the thousands and likely exceeds 10,000 individuals, which is at least one order of magnitude greater than the population estimates provided in the Vegetation Values Report from 2025 (B.13). No populations of *C. pungens* were found in the Bendigo Conservation Covenant outside of the proposed revocation area.
29. Large gaps remain in the spring annual survey data, and uncertainty about where search effort has been prioritised complicates interpretation because detection probability is highly dependent on search effort. Priority areas for additional search are the upper slopes of Ardgour Station, further areas of the Direct Disturbance Footprint and adjacent habitat likely to experience indirect effects, and the remainder of the Conservation Covenant outside the proposed revocation area

Appropriate baselines – pre-exploration or pre-mining

30. Analysis of satellite imagery collected on behalf of Otago Regional Council between January and April 2025¹² shows that around 9 ha of land had been disturbed as a result of exploration activities, including within the cushionfield communities known to support large populations of Nationally Threatened species. It is likely that additional disturbance has occurred in the last ~14 months as exploration works have progressed. The question of baseline conditions was raised during workshops, and the stated position of the

¹² <https://data.linz.govt.nz/layer/122156-otago-02m-rural-aerial-photos-2025/>

applicant is that all disturbance associated with exploration is provided for under consent conditions, and therefore the appropriate baseline for considering the impacts of mining is the post-exploration environment.

31. It is outside the scope of this evidence to assess compliance with conditions associated with those consents, however this approach would seem to incentivise exploration disturbance as a method to minimise the values impacted by the mining activity. If the exploration conditions require that the land be returned to its original state, then it would be more appropriate for the pre-exploration environment to be considered as the baseline state, and to consolidate the remediation requirements of the existing permissions into the consent conditions crafted through the Fast Track process.

Delineation and classification of vegetation communities – diversity obscured

32. Delineation of vegetation communities in complex dryland environments is very difficult – frequently patches of vegetation may be smaller than the resolution of the mapping or may be impossible to differentiate based on aerial imagery alone. When assessing the adequacy of the methodology there are two key questions – are the defined vegetation communities reflective of the natural diversity on the ground, and if so, has there been sufficient sampling within each community to have high certainty that the full species diversity of that community has been captured in the data.
33. There are several analytical methods that could be employed, such as ordination (i.e. non-metric multidimensional scaling) or clustering that can test whether the seven hypothetical vegetation communities that were defined *a priori* reflect natural groupings that emerge in the data. Species accumulation curves or non-parametric richness estimators can be used to show what proportion of the total estimated diversity within each vegetation type has been sampled. This analysis can be undertaken based on existing data without any additional fieldwork and would provide greater certainty that the overall species diversity at the project site has been characterised, or whether further sampling is required. Determining adequacy of the overall values assessment in the absence of these analyses relies on speculation based on raw data provided by the applicant, previous experience working in these types of environments and observation in the field. The latter has been constrained by DOC having limited time and access to much of the site.

34. Based on the data provided it is considered highly likely that the use of only seven vegetation types over a 5,300 ha Ecological Study Area is unreasonably coarse. The “Native dominant scrubland” described in the RMA Ecology report is more appropriately split into at least two vegetation types named something like “*Coprosma*-Matagouri-scented tree daisy scrub” and differentiated from “kānuka scrub”, as these communities are floristically distinct. Another example is the “exotic pasture or herbfield” vegetation community, which does not differentiate between land at ~300 m elevation that is more likely to be modified, and south-facing, low-production grassland above 800 m, which is likely to hold higher botanical values.
35. Scrutiny of the methods used to delineate vegetation communities is important, because the extents of each community, and the estimated species diversity that they support is the primary method whereby the extent and type of values within the project site have been quantified. It is not possible to determine whether the way the vegetation communities has been defined has resulted in a systematic underestimate of biodiversity at the site without also considering whether each community was sampled sufficiently to capture all species that are present.
36. Vegetation community delineation is also relevant in the context of the proposal to revoke part of the Bendigo Conservation Covenant. For example, the lumping together of “native dominant scrubland” communities obscures the fact that the northern part of the covenant that is proposed for revocation supports a more diverse shrubland community compared with the kānuka shrubland that makes up the bulk of the woody vegetation on the remainder of the covenant.

Evidence from the field – unsampled diversity

37. A six-hour site visit in December 2025 constrained entirely to areas with public access (not facilitated by the applicant) found that approximately 40 hectares of land along the Mt Moka access track, which lies outside the Direct Disturbance Footprint but within the Bendigo Conservation Covenant uplift area, has an incorrect vegetation classification. This was raised and acknowledged during workshops as an error arising from use of desktop imagery rather than ground truthing to differentiate vegetation communities in parts of the site. Further ground truthing of the vegetation mapping may highlight similar discrepancies elsewhere, potentially with bearing on effects assessments.

38. The December site visit recorded six additional plant species, five of which are Nationally Threatened or At Risk, that had not previously been identified within the Ecological Study Area. This demonstrates that further ecological values remain undocumented at the site. When considered alongside the most recent spring annual survey results, which detected Nationally Threatened species within vegetation communities where they were previously unrecorded, the evidence indicates that the current vegetation delineation and sampling methods have not fully captured the biodiversity present. As a result, the assessment is likely to underestimate the overall ecological values of the site.
39. Until vegetation communities are more accurately defined, along with evidence that they have been comprehensively sampled, any assessment of ecological effects remains subject to uncertainty arising from a potential systematic underestimation of the values present.

Aggregation of biodiversity data prevents assessment of Concession and covenant revocation activities

40. Approximately 100 of the 148 sampling locations appear to be outside the Direct Disturbance Footprint, termed the Surrounding Landscape. Interpretation of many important parameters, including species diversity, population sizes, and survey adequacy is limited by the data having been aggregated together across several sites. Because of this aggregation approach it is not possible to determine the extent and type of values present within discrete areas of the surrounding landscape, including the proposed Bendigo Covenant Uplift Area, the Mine Regeneration Zones, the Ardgour Restoration Area and the Matakanui Sanctuary Areas, or any of the areas where concession activities are proposed. This limitation was discussed during workshops, and disaggregation of survey data to allow consideration of impacts and values within discrete areas of the Surrounding Landscape has been agreed to in principle by the applicant but was not provided in time for this review. Providing this data is important to assist with transparently reconciling effects against proposed effects management.

EIANZ guidelines - Underestimation of biodiversity values

41. The ecological values assessments provided for habitats and species affected by the proposal were generated using the Ecological Impact Assessment

Guidelines (2018)¹³ prepared by the Environmental Institute of Australia and New Zealand (EIANZ). This organisation is a professional body for environmental practitioners, especially in Australia. Inconsistencies between the guidance provided by EIANZ and New Zealand statutory requirements produces assessments of ecological value that are inadequate in nuanced but meaningful ways. Because of these inconsistencies, I'm not aware of any DOC or statutory processes that support the use of the EIANZ guidelines. The Ministry for the Environment does not endorse their use.

42. An example of how the EIANZ guidelines produce ecological values assessments inconsistent with established methods that reflect international best practice adopted in established policy (such as the NPS-IB and the Otago Regional Policy Statement) is through the consideration of the matter of "Representativeness" in the context of pre-European vegetation, as opposed to the present-day vegetation type and extent. This is also inconsistent with the approach under the RMA (s 31(b)), which requires maintenance of the indigenous biological diversity that is present today. This assessment method results in habitats being assessed providing only "low" or "moderate" ecological value despite containing high diversity of indigenous species including populations of Nationally or Regionally Threatened or At Risk species, which substantially understates their ecological value.
43. This matter was addressed by M Baber during workshops, however assertions in that forum that representativeness has not been assessed against pre-European vegetation does not appear consistent with the assessments provided in the AEE.
44. It is also noteworthy that the EIANZ method ascribes significance at the level of species and vegetation communities, rather than areas or ecosystems, which undervalues ecological integrity of a site, and does not capture wider ecological processes and context.

¹³ Roper-Lindsay, J., Fuller, S. A., Hooson, S., Sanders, M. D., & Ussher, G. T. (2018). *Ecological impact assessment: EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems* (2nd ed.). Environment Institute of Australia and New Zealand (EIANZ), Melbourne. ISBN 978-0-9805878-3-8.

Assessment of effects – missing or underestimated

45. The applicant has calculated that construction of the gold mine will clear vegetation and disturb soils over approximately 610 hectares. Significant uncertainty remains about the magnitude and extent of indirect effects arising from the mine.
46. Examples of potential indirect effects are listed on page 100 of the Vegetation Values Assessment (B.13), and include:
 - i. Fragmentation of species populations and vegetation communities
 - ii. Edge effects
 - iii. Spread of environmental weeds
 - iv. Dust deposition on vegetation
 - v. Alteration to farming or other land management practices that may result in a change of vegetation communities
 - vi. Alterations in surface and groundwater hydrology.
47. The applicant has included a 148 ha “contingency zone” within the 610 hectare Direct Disturbance Footprint. These areas have been included within the project footprint to allow for operational expansion where necessary. Contingency zones should not be considered analogous to buffers, because the application indicates that these areas may be disturbed if required.
48. This point is confused by the terms “contingency zone” and “buffer” being used interchangeably throughout the application. A buffer is more appropriately considered as an identified area outside but adjacent to the Direct Disturbance Footprint, where no direct disturbance is planned but that can be used to account for indirect effects of the activity on the environment.
49. The Assessment of Environmental Effects from the Discharge of Contaminants to Air (B.33) provides clear guidance that dust deposition is expected to extend at least 100 m from a high impact activity such as open cast pits, waste rock stacks or haul roads, even under the recommended dust suppression protocols. For sensitive ecological receptors such as the habitats of spring annual herbs, the report predicts that impacts will be “high” on plants located

within 100 m of the key dust sources and “moderate” on plants located between 100-200 m of the dust sources.

50. Indirect effects are likely to interact in compounding and possibly unanticipated ways, for example disturbed and fragmented vegetation communities are likely to be more susceptible to weed invasion, and the effectiveness of weed control in habitats and disturbed land around mine structures may be reduced by deposited dust on leaf surfaces reducing herbicide uptake.
51. The matter of indirect effects was raised in discussions with M Baber during workshops in February 2026. His response was that the indirect effects have been “included in the offset models”, however it is not immediately obvious how this was achieved based on the reports that have been provided.
52. The most transparent method for incorporating the significant indirect effects into the impact assessment is to establish strict “no-development” buffers in addition to the existing contingency areas around key dust-generating activities. Given the level of impact anticipated, habitats within these buffers should reasonably be considered lost when determining the spatial extent of effects
53. The substantive application acknowledges indirect effects on wetland values on seepage and swamp wetlands in the Rise And Shine catchment. A 146 ha Dewatering Drawdown Zone has been calculated to account for surface and groundwater loss to pit voids and underground workings, however the ~ 2 ha extent of affected swamp wetlands has not been included in offset models on the basis that it is “assumed that flow augmentation will be successful where applied” (para 1 page 2, B0.8 Appendix 3 – biodiversity offset modelling, Alliance ecology 2025).
54. The BOGP Wetland Drawdown Assessment (B.42) and the BOGP Flow Augmentation memo (B.43) articulate several uncertainties that could change the flow augmentation rates required, and places heavy emphasis on adaptive management. In addition to the uncertainty about how augmentation flows will be achieved, it appears that no wetland condition monitoring has been included in the monitoring regime, instead relying on water monitoring stations to ensure levels remain within appropriate parameters. Maintaining wetland quality and extent should be the key outcome of an augmentation regime. It is unclear, for example, how the chemical characteristics of the bore water may differ from

surface water quality, and how the role of fluctuating water levels may influence wetland function and vegetation composition.

55. This risk is further illustrated by the fact that no detailed water budget or adaptive management processes for augmented wetland high- or low-flow scenarios have been set out within the water management plan (S10.6 G0.1 Water Management Plan). It is also unclear how impacts on the Dewatering Drawdown Zone are anticipated to be managed after mine closure, at which point augmentation flows are assumed to cease.
56. For transparency and ease of compliance monitoring it would seem more appropriate for the Direct Disturbance Footprint to be extended to include the Dewatering Drawdown Zone, so that appropriate conditions can be placed on the augmentation and monitoring regime to ensure that wetland quality and extent is maintained.
57. One of the most significant indirect effects of the project is the proposed revocation of ~864 ha of the Bendigo Conservation Covenant, for which no mitigation or offsetting conditions have been provided. Removal of the covenant, including ~567 ha beyond the extent of the Direct Disturbance Footprint, would weaken protection for biodiversity values within the uplift area, making them more vulnerable to earthworks and vegetation clearance associated with exploration and future mining activities. As previously stated, it is not possible to determine the character and values contained within the proposed uplift area due to the aggregation of biodiversity data across both the Ardgour and Bendigo Stations. The extent of the proposed revocation area and overlap with the Direct Disturbance Foot has been estimated from mapping as the applicant has not provided these figures.
58. Because of the spatial constraints of the project survey area, it is also not possible to assess to what extent values that will be impacted by the proposed covenant revocation area are found elsewhere in any part of the area that will remain subject to covenant protection. No assessment has been provided as part of the substantive application, and as evidenced in earlier sections, there appears to be a high risk that both the diversity and extent of botanical values currently protected by the covenant will be substantially reduced because of the proposed revocation.

Biodiversity Offset Calculations lack credibility

59. Assessment of the biodiversity offsetting calculations is constrained because the model itself has not been made available, and only summaries of some of the model outputs have been provided. The outcomes that have been provided are clumped into “woody”, “tussock”, “taramea” and “wetland”. No justification has been provided as to why these groupings were considered more appropriate model components than the seven identified vegetation classifications used elsewhere.
60. One of the consequences of this approach is that it appears to overestimate the magnitude of the positive impacts on habitats arising from the proposed management package. It does not clearly allow for decreases in some habitat types to account for the corresponding projected increases in other habitat types, for example reductions in the extent of “Mixed scrubland” coinciding with projected increases in “native dominant scrubland” associated with proposed weed control activities, leading to an overestimate of the total extent of project indigenous vegetation in the offset areas.
61. The biodiversity outcome model also appears to include rehabilitation of the mine surfaces as part of the offsetting calculations. According to the User Manual for the Biodiversity Offsets Accounting Model, “Biodiversity offsetting is a last-resort option to address residual adverse biodiversity impacts due to economic development after all feasible avoidance, minimisation and remediation actions have been taken”¹⁴. Rehabilitation is analogous to “remedy” under the RMA mitigation hierarchy. In this context, rehabilitation of disturbed land can be considered as a mechanism to reduce overall effects, but it is not appropriate to account for residual effects, which is the purpose of offsetting calculations.
62. From a practical perspective, it is not appropriate for rehabilitated habitats to be considered like-for-like replacement for lost ecosystems; rehabilitation cannot

¹⁴ Maseyk, F.; Maron, M.; Dutson, G.; Possingham, H.; Seaton, r.; Carlyon, G.; Beveridge, A. 2015. A biodiversity offsets accounting model for New Zealand. Contract report: 2014-008. Client report for the Department of Conservation. The Catalyst Group, University of Queensland and The Biodiversity Conservancy.

recreate the ecological character, structure, soil profiles or species assemblages within the life of the consent.

63. Furthermore, the rehabilitation of the Direct Disturbance Footprint appears to be over-represented within the calculated habitat gains with the Mine Regeneration Zones. The total area of land within the Mine Regeneration Zone increases in extent by 164.5 hectares over the 35 year period, apparently to account for expansion of the Mine Regeneration Zones into the Contingency Zones of the Direct Disturbance Footprint. This assumes that these Contingency Zones won't be developed, which is not guaranteed. Furthermore, the total area of the Direct Disturbance Footprint is not reduced by the same amount over the same period, which appears to lead to double counting of these areas.

Predicted biodiversity declines – assertions without evidence

64. An assertion that is made throughout the application is that the indigenous biodiversity is declining in the Dunstan Ecological District. This context of declining biodiversity appears to be a key assumption that underpins many of the projected species' and habitat benefits, however, no evidence is provided to demonstrate this trend, what the drivers are, and what habitats and species are most at risk.
65. High elevation areas within the Dunstan Ecological District are well represented within Public Conservation Land, and the sub-alpine and high alpine vegetation within these areas are considered relatively secure from most threats, other than those posed by animal and plant pests, fire, and interaction of these threats with a changing climate.
66. Conversely, it is likely that low elevation parts of the landscape do face pressures especially from land-use change, such as conversion to irrigated pasture, vineyards and subdivision. A more nuanced assessment of biodiversity trends would also consider that even within lowland environments the pressures of land-use change are highly constrained by topology and water availability, and in principle many of these developments are also restricted by planning mechanisms such as vegetation clearance rules under the Central Otago District Plan, and legal protections under Conservation Covenants and Public Conservation Land.

67. Evidence that species and habitats are expanding under current land management practices is provided within the Assessment of Ecological Effects (B0.8 Appendix 3), which indicates that mixed shrubland cover in the Dry Creek Catchment has increased 20-50% over the last 20 years, and that this expansion of cover has occurred irrespective of whether grazing has been removed. In my opinion, it is likely that similar trends in increasing woody vegetation have occurred over the Dunstan Mountains over the last 20+ years due to natural regeneration, facilitated in part by top dressing, and is strongly correlated with the time that has elapsed since the most recent vegetation fires.
68. This finding of high levels of natural recruitment suggests that at least some component of the 50% increase in extent of woody vegetation that has been projected to occur within parts of the Ardgour Restoration Area and Mine Regeneration Zone over the proposed 35-year consent period as part of the offsetting and compensation package could be expected to occur without intervention, and therefore the magnitude of the benefits provided by the proposed management regimes has been overstated in the application.

Efficacy of proposed Effects Management is highly uncertain

69. It is implied that this project will deliver ecological benefits that exceed the negative impacts. For example, the applicant's Legal Overview frames the mine as a "unique opportunity to restore the landscape at scale in the long term and deliver additional benefits beyond directly addressing the residual effects of the BOGP" (para 183, page 54, A0.2A Legal Overview). The Assessment of Environment Effects (B0.8) states: "The project will generate demonstrable ecological benefits to terrestrial and wetland biodiversity within the Dunstan Ecological District as a result of extensive weed and pest control, pest exclusion, habitat enhancement and plantings and browsing pressure management. These measures will ensure a net gain in ecological values is achieved for many species".
70. This statement is not supported by evidence. In contrast, the Assessment of Ecological Effects shows that very high levels of effects (the highest possible in the risk matrix used) are predicted for the most ecologically valuable habitat at the site, with "net loss" or "uncertain" outcomes for at least 52% of the 48 Nationally or Regionally Threatened and At Risk plant species impacted by the proposal. The "Net positive" outcomes predicted for the remaining Nationally or

Regionally Threatened and At Risk plant species are assumed primarily on the basis of an erroneous assumption that all these species would decline in the absence of proposed management activities. The presence and natural recruitment of these species within the existing environment appears to be evidence to the contrary.

71. Invoking the potential for ecological restoration as a justification for destroying or damaging existing native ecosystems or for unsustainable use overstates the confidence that can be reasonably placed on ecological restoration as an effective method for achieving the levels of biodiversity, ecosystem function and delivery of services of intact ecosystems. “Enrichment planting” into dryland ecosystems to improve their condition is very difficult, and there are very few examples of ecosystems have been successfully reestablished after having been degraded or destroyed by mining operations, even where the technological and operational potential exists¹⁵.
72. The impacts of climate change on the vegetation communities of Central Otago have been mentioned only briefly within the Assessment of Environmental Effects; however this appears to be highly relevant given the high reliance on the offsetting and compensation over long time frames. Long term trends appear to show increasing temperatures and decreasing rainfall¹⁶, which could be expected to influence both rates of vegetation expansion and likelihood of wildfire. The risk of fire within the restoration areas would appear to be one of the more significant risks to achieving the proposed biodiversity outcomes, however there does not appear to be any strategies or contingencies that could be implemented should fire destroy or significantly set back the planned restoration work.

¹⁵ Lamb, D., Erskine, P.D. and Fletcher, A. (2015), Widening gap between expectations and practice in Australian minesite rehabilitation. *Ecol Manag Restor*, 16: 186-195.
<https://doi.org/10.1111/emr.12179>

¹⁶ Macara, G.; Woolley, J.; Zammit, C.; Pearce, P.; Stuart, S.; Wadwha, S.; Sood, A.; Collins, D. (2019) Climate change projections for the Otago Region. Client report prepared for the Otago Regional Council. National Institute of Water & Atmospheric Research Ltd. Auckland, New Zealand

Minimal plant salvage – heavy reliance on plant propagation

73. Salvage and relocation of “notable” plants has been listed as an approach to avoid or minimise impacts associated with the proposed mine. In this context, “notable” includes the salvage of > 100 *Carex kaloides* (At Risk – Declining), 10 *Anthosachne aprica* (At Risk – Naturally Uncommon) and 12,500 live hard tussock (Not Threatened). No other targeted salvage of live plants is proposed, which places considerable emphasis on nursery grown plants to achieve uplift for the At Risk species for which a “Net Positive” outcome is projected. No translocation of Nationally Threatened plant species has been proposed, which is not necessarily inappropriate as there is little evidence to suggest that it will be successful.
74. Several thousand nursery-grown plants to support “net positive” outcomes for some plant species are listed within Table 7.1 of Part B of the Landscape and Ecological Rehabilitation Management Plan (page 117, G.07B). There is considerable uncertainty regarding the number of individuals of each species impacted by the proposal, and by extension the appropriate number required to be planted to achieve a “net positive” outcome. There are also several assumptions regarding the likely trajectory of plant species within the Mine Regeneration Zone, however these are not quantified, and will not be able to be monitored without baseline data and targeted survey.
75. The majority of this planting is proposed to occur within rehabilitated areas of the Direct Disturbance Footprint. The feasibility of “net positive” outcomes for these species is undermined by introducing dependencies on mine development, and by requiring planting into a highly modified soil environment. There is no plausible scenario where planting into the rehabilitated landforms can achieve vegetation communities that are equivalent to those that will be lost within the 35-year life of the consent, especially given that work on several components of this planting plan (e.g. the wetland restoration on the capped tailings dam) can not commence until mine closure.
76. Rehabilitation of the mine landform sits higher in the mitigation hierarchy than offsetting, and should be considered an additional, rather than an equivalent action. The principles of biodiversity offsetting require time lags between impacts and offsetting to be reduced as much as possible. Under this principle, any planting required to achieve ‘net positive’ outcomes for species would be

undertaken immediately on the adjacent unmodified restoration areas. This would bring forward all planting obligations, and allow any implementation issues to be more quickly identified and resolved, which would reduce risks associated with mine closure. Experience from other mine projects suggests that highly prescriptive consent conditions relating to quantities, timeframes and acceptable mortality rates for planting are required to ensure compliance is achieved. It is therefore recommended that all planting requirements are listed as consent conditions with explicit species, numbers, timeframes, and acceptable levels of mortality (e.g. 20% within 3 years). Timeframes for planting should commence as early as practicable, (e.g. completed within 10 years of consent being granted).

Lack of consistency with National Policy Statement for Indigenous Biodiversity offsetting and compensation Principles

77. Maintaining indigenous biodiversity in the standard New Zealand policy context requires the avoidance of effects, including effects on populations of threatened species, indigenous wetlands, drylands, derived ecosystems below regional treelines, riparian vegetation, areas with formal protection under the Reserves Act or Conservation Act, or that have been identified as ecologically significant for the purpose of Section 6(c) of the RMA¹⁷.
78. The principles for Biodiversity Offsetting and Compensation set out in Appendices 3 and 4 of the National Policy Statement for Indigenous Biodiversity (2023) prioritises adherence to the mitigation hierarchy, reflecting the advantages of avoiding impacts compared with offsetting and compensation, which are inherently less certain mechanisms for ensuring the maintenance of biodiversity. It is acknowledged that the NPS-IB has a novel interpretation in a Fast-track context, however, it is informed by international best practice principles and is a relevant consideration.
79. The Direct Disturbance Footprint contains irreplaceable features where like-for-like replacement is not possible. Rather than avoiding these features, as required by the principles of compensation and offsetting under the NPS-IB and

¹⁷ Table 1 in Walker S, Bellingham PJ, Kaine G, Richardson S, Greenhalgh S, Simcock R, Brown MA, Stephens T, Lee WG. 2021. What effects must be avoided, remedied or mitigated to maintain indigenous biodiversity? *New Zealand Journal of Ecology* 45(2): 1-12.

the Otago Regional Policy Statement (2019), the applicant has recognised a net-loss outcome and provided a combination of unlike-for-like biodiversity compensation, and a “biodiversity and heritage fund”.

80. As outlined in previous sections, low altitude dryland ecosystems within the Dunstan Ecological District and the Central Otago Ecological Region are under pressure resulting from land-use change. Although not consistent with the principles of biodiversity offsetting, an arguably more appropriate approach to compensation for the destruction of these irreplaceable values would be to secure legal protection and provide for ongoing management of areas of ecologically significant dryland ecosystems on private or leasehold land that are at risk from development.
81. The provision of a ‘biodiversity fund’ with no direct link between the values that will be lost and potential fund outcomes, risks a significant underestimate of the financial costs associated with the protection and maintenance of equivalent values.

Come-In-Time pit delays – larger populations render condition unworkable

82. A key minimisation measure that has been proposed is the delay of open-cast mining of the Come-in-Time pit until such time that high levels of certainty about the relative security of *C. pungens* in the wider landscape can be assured. In the context of the most recent spring annual survey data provided by the applicant, the Come-in-Time population appears to represent fifty locations where at least one individual was found, including two locations where up to 1,000 individuals may be present.
83. The current drafting (updated 10th March 2026) of condition 111 of the D.01 CODC Land Use Consent and Conditions relating to this proposed delay on Come-In-Time requires that evidence be presented which demonstrates that the impacted populations at the Come-In-Time pit is equal to or less than 1% of the total population within the Dunstan Mountains, as evidenced by survey of new habitat, or by creation of new populations via the Applied Research Programme.
84. The mid-point range of the population estimate for the Come-In-Time pit based on the most recent spring annual data is 2,580 individuals. If this were used as a baseline, and was assumed to represent 1% of the population in the ED, the

applicant would be required to demonstrate the total population of *C. pungens* in the Dunstan ED exceeds 258,000 individuals. In reality, the inter-annual variability in the detectability of spring annuals makes a fixed percentage-of-ED threshold impractical to implement, as any survey of this size would necessarily take several years.

85. Due to the very specific and largely unknown conditions the species requires, it is highly unlikely that new self-sustaining populations of conservation merit can be created artificially through a rehabilitation programme.
86. DOC supports a condition which would avoid the effects of the mine on this Critically Threatened species, until such time that there is certainty around minimising potential impacts on the species and thus potential extinction risk. However, given that there is low probability that this condition can be achieved, consideration should again be given to avoidance of the Come in Time pit.
87. The high density and strong reoccurrence of spring annuals within and adjacent to this site indicates that the permanent protection of this site should be a priority. Given the national importance of the populations at this and adjacent sites, it is my view that permanent protection as a Scientific Reserve is warranted.

The Rise-and-Shine Pit – no avoidance of irreplaceable values

88. No equivalent minimisation pathway has been offered by the applicant to delay the development of the Rise-and-Shine pit until further research and survey can be undertaken, despite it supporting sixteen locations of *C. pungens*, including two locations with up to 1,000 individuals. This finding is especially notable in the context of the large extent of exploration earthworks that has occurred in these locations, which is likely to have already destroyed areas of spring annual habitat. DOC assumes that all appropriate CODC land use consents were sought in relation to earthworks and vegetation clearance within an Outstanding Natural Landscape, and within an area that meets the criteria to be considered a Significant Natural Area under the ORPS.
89. The populations within the Rise-and-Shine Pit appear to be smaller than those found within the Come-in-Time pit footprint, however it is not clear whether this reflects the actual populations present, the amount of habitat that has already

been cleared and/or the amount of time that has been spent searching the Direct Disturbance Footprint and surrounding area.

90. The impacts of the Rise-and-Shine pit on irreplaceable values may be smaller in magnitude than the impacts of the Come-In-Time pit, however it still represents impacts that cannot be offset or compensated under the NPS-IB and ORPS biodiversity offsetting framework. Avoidance of the impacts is therefore the only pathway to a no-net-loss scenario for the mine.

Bendigo Conservation Covenant revocation – unaddressed impacts

91. As outlined above, the proposal would revoke far more of the Bendigo Conservation Covenant than is required for the primary mining activities proposed as part of this Fast-track application, with no effort to avoid higher value areas and no equivalent protected land offered in exchange. The applicant has also counted part of the revocation area within its 2,219 ha offsetting and compensation package. This land is already partially subject to a conservation covenant, so it is nonsensical to remove its protections, expose it to mining related disturbance, and then claim additional biodiversity benefit. Compounding this, the draft conditions do not require reinstatement of a covenant until the end of the 35-year consent period, leaving the area unprotected for the duration of the activity. Limiting revocation to what is strictly necessary to enable the mine development would reduce the claimed compensation and offsetting package by a substantial area.

Management Plans - complexity obscuring deficiencies

92. A large number of management plans have been developed by the applicant for certification by the Panel through the Fast-track process. These management plans relate to directly managing effects on indigenous vegetation and flora, and are key mechanisms whereby the proposed consent conditions are achieved.
93. Management plans are a well-established mechanism for detailing the processes that will be implemented to achieve consent conditions; however their utility is highly contingent on the clarity of the consent conditions to which they relate.
94. As currently drafted, the management plans can be broadly categorised into three types:

- i. Area-specific management plans (i.e. Ardour Restoration Management Plan, Matakanui Sanctuary Management Plan, Landscape and Environmental Management Plan)
 - ii. Subject-specific management plans (e.g. Mine Closure Plan, Mammalian Pest Management Plan, Biosecurity and Plant Pest Management Plan)
 - iii. Process-specific management plans (i.e. Habitat Impact Management Plan, Ecological Management Plan Framework, Biodiversity Outcome Monitoring Plan, Applied Research Plan)
95. Very few of the management plans act as standalone documents, and many defer key biodiversity outcomes relevant for compliance monitoring to other sources, creating a labyrinthine network of interrelationships that are highly complicated to follow, and which obfuscates biodiversity outcomes and timeframes creating significant compliance risk.
96. As currently set out, all of these plans reference details set out in at least one other plan, and several reference the entire suite of management plans. Several area-specific plans are more comprehensive in scope than others and contain subject- or process-specific information that other area-specific plans lack. Where specified, very few of the biodiversity outcomes have clear success criteria or strict timeframes for when the outcomes must be achieved. Collectively, these management plans give the impression of having been developed independently by different experts based on high-level aspirations, with little consideration of how they might be practically implemented, or how compliance will be monitored.
97. An example of unnecessary complexity is contained within the Landscape and Ecological Rehabilitation Plan, where it describes both the rehabilitation of the impacted mine site, as well as the offsetting approaches and outcomes proposed through the management of the Mine Regeneration Zones. Thematically these offsetting-related management actions and biodiversity outcomes would more logically sit alongside the details set out in the Ardour Restoration Area Management Plan.
98. Another example is the Biodiversity Outcome Monitoring Plan, which duplicates the biodiversity outcomes (where specified) from the various management plans, but does not contain sufficiently detailed baseline states or sufficiently

comprehensive monitoring protocols so that the reporting outputs could be relied upon for compliance monitoring purposes. It is not clear, for example, how baseline extents of “cushionfield”, “tussock” and “woody vegetation” are proposed to be quantified, and what criteria or methods will be employed to demonstrate changes over time. It is also not clear what quantum of gain is considered necessary to achieve “net positive” or “net gain” for Nationally and Regionally Threatened and At Risk species, or how this will be demonstrated.

99. Yet another example is the Matakanui Sanctuary Management Plan, which contains highly detailed prescriptions for animal pest management, which for all other areas are in the Mammalian Pest Management Plan, and contains no detail on the proposed biodiversity outcomes, despite “achieving measurable conservation results” being stated within the purpose of the document.
100. The concept of adaptive management is heavily relied upon for many of the management interventions, suggesting that management plans will need to be updated in response to challenges in achieving compliance as they arise. The need to revise and update these plans places a significant future consultation burden on administering and regulatory agencies.
101. The complex interdependencies of these plans were raised as a point of concern during the workshop, namely:
 - i. The lack of clear distinction in function and interrelation between plans risks consultation and certification processes being undermined by changes being made to key documents that sit outside the consultation/certification process.
 - ii. The difficulties, from both an implementation and compliance perspective, in determining outcomes and success criteria for a given action where a consent condition only requires implementation of a specific management plan, and not the other subject-specific plans on which it depends.
 - iii. The likelihood of divergence in management plans over time due the provisions allowing the consent holder to vary management plans, leading to ambiguity in what compliance entails.
102. It was acknowledged by M Baber that changes to management plans would likely result in a “domino effect” of changes needing to be mapped and updated across multiple plans. It is accepted that there is a level of administrative

complexity associated with a project of this size that cannot be avoided, however it would appear preferable to integrate the plans where possible to reduce cross-referencing and clarify the objectives and outcomes of each plan accordingly.

Mine Closure Planning – a potential mechanism for closure risk management

103. A draft mine closure plan was provided as part the substantive application, however it has not been proposed to be certified by the panel through the Fast-track process.
104. The International Council on Mining and Metals has developed the “Integrated Mine Closure: Good Practice Guide”¹⁸ to support the needs of responsible mining companies as they plan for closure. Good practice, according to a statement on page 13 of this document, is that “*closure planning should be incorporated into the earliest stages of mine planning, including exploration, so closure risks and opportunities are captured from the start and proactively managed in order that closure is fully considered in the mine design and business plan*”. Neither Matakanui Gold Ltd nor Santana Minerals Ltd are a member of the International Council on Mining and Metals and have made no commitment to meeting the Good Practice Guidelines as far as I am aware.
105. Several authors reviewing the effectiveness of mine rehabilitation projects consider Mine Closure Plans to be a potentially useful approach for identifying the desired end state of a mine, and using that as a basis for tracking progress, along with an assessment of the closure risk associated with each component, while acknowledging the importance of motivated facilitators to drive the process^{19,20,21}.

¹⁸ ICCM (2025). Integrated Mine Closure Good Practice Guide, 3rd Edition. London, United Kingdom. lccm.com

¹⁹ Rebecca Getty, Angus Morrison-Saunders, 2020. Evaluating the effectiveness of integrating the environmental impact assessment and mine closure planning processes, Environmental Impact Assessment Review, Volume 82, ISSN 0195-9255, <https://doi.org/10.1016/j.eiar.2020.106366>.

²⁰ Morrison-Saunders, A., McHenry, M. P., Rita Sequeira, A., Gorey, P., Mtegha, H., & Doepel, D. (2016). Integrating mine closure planning with environmental impact assessment: challenges and opportunities drawn from African and Australian practice. *Impact Assessment and Project Appraisal*, 34(2), 117–128. <https://doi.org/10.1080/14615517.2016.1176407>

106. Several jurisdictions, including Western Australia, have developed specific legal requirements for Mine Closure Plans. To my knowledge there are no equivalent legal requirements for a Mining Closure Plan in a New Zealand context outside of what is specified in consent conditions. The draft conditions provided by the applicant delay development of this plan until 12 months prior to mine closure (Otago Regional Council and Central Otago Proposed Common Conditions C47-C50), and delays implementation until it has been certified by the relevant regulatory authorities. This seems inadequate to ensure that the risks associated with mine closure have been fully evaluated and addressed.
107. Many of the outcomes relating to biodiversity offsetting and compensation are proposed to be deferred until very late in mine life or post mine-closure. There is a risk of these actions being not completed either because of early closure or being postponed due to mining operations continuing beyond the current proposed mine-life. Early development of the Mine Closure Plan would provide a mechanism to assess and quantify risk associated with these scenarios ahead of time and provide contingency pathways to minimise risk to biodiversity outcomes.

Resource Consent Conditions

108. It is difficult to provide specific direction on consent conditions given the current uncertainty regarding ecological values, the extent of potential impacts, and the appropriateness and feasibility of the proposed effects-management package. Pending further discussion to resolve these matters, the following section summarises the key recommendations in this report that should be considered when drafting consent conditions.

Mine Closure Planning

- i. The Mine Closure Plan shall be created using the ICMM guidelines and implemented much sooner after the consent has been granted (e.g. 6 months) and reviewed triennially, rather than deferred to 12 months prior to mine closure.

Avoidance of Irreplaceable Values

- ii. The Come-in-Time pit shall be removed from the project footprint, rather than being contingent on additional survey or research outcomes.

- iii. No disturbance shall occur within areas supporting irreplaceable spring-annual plant populations within the Rise-and-Shine pit footprint and associated soil stockpiles.

Direct Disturbance Footprint (DDF) and Indirect Effects

- iv. The Direct Disturbance Footprint must be expanded to include all areas subject to hydrological drawdown.
- v. Minimum 100–200 m no-disturbance ecological exclusion zones shall be established around all dust-generating activities, consistent with dust deposition modelling.

Biodiversity Offsetting, Compensation and Management

- vi. All references to a “Biodiversity and Heritage Enhancement Fund” shall be removed and replaced with time-bound, enforceable, and fully funded biodiversity outcomes (e.g., protection of threatened dryland ecosystems commensurate with effects).
- vii. Any planting required to achieve net-positive outcomes for plant species must:
 - a. be supported by strong evidence and proportional to effects,
 - b. occur as soon as practicable after impacts,
 - c. be implemented on land unaffected by mining activity, and
 - d. be independent of rehabilitation activities within mine-affected land.
- viii. Consent conditions must explicitly state that wildfire-related loss or damage to offset, compensation, or rehabilitation areas does not relieve the consent holder of obligations to achieve required biodiversity outcomes. Contingency provisions must be specified.

Monitoring, Baselines and Survey Requirements

- ix. All ecosystem- and species-level biodiversity outcomes must be:
 - a. based on well-evidenced assessment of effects, including indirect effects,
 - b. quantifiable, and
 - c. time-bound.
- x. Monitoring must be sufficiently targeted and detailed to provide results directly relevant to the required biodiversity outcomes.

- xi. The ecological baseline for assessing effects must be defined as the pre-exploration state, unless evidence demonstrates that post-exploration remediation has returned the site to its original condition.
- xii. High-intensity surveys for spring-annual species must be completed across all unsurveyed areas prior to authorisation of any vegetation clearance.

Governance, Funding and Legal Protection Mechanisms

- xiii. Any revocation of the existing conservation covenant must be counterbalanced by securing alternative protection of equivalent ecological value.
- xiv. New protective covenants must be established promptly following grant of consent, rather than deferred until 12 months prior to mine closure.
- xv. A non-wasting endowment fund must be established to provide perpetual funding for monitoring and management of all covenanted areas.
- xvi. The applicant must fund and maintain a paid, expert reference group to review annual biodiversity reporting and function as an independent advisory body to regulators throughout the duration of the consent.
- xvii. Full disaggregated biodiversity survey baseline datasets must be provided for all management plans
- xviii. Revised vegetation mapping and species inventories, based on field verification, must be certified before any works commence.
- xix. Bryophyte surveys must be conducted and incorporated into the effects assessment and all relevant management plans.

Conclusions

- 109. The project as currently defined would result in severe, permanent and irreversible net loss of ecologically significant dryland ecosystems, primarily through the loss of large numbers of Nationally and Regionally Threatened and At Risk plant species, including the largest known population of Nationally Critical *C. pungens*. Open-cast mining is the key driver of irreplaceable loss.

110. The application fails to meet core principles of biodiversity offsetting under the NPS-IB and ORPS, such as irreplaceability, additionality, feasibility and time-lag and predicts a net loss for biodiversity, however methodological limitations indicate that the magnitude of this loss may be systematically underestimated by the applicant.
111. The application relies on the revocation of a large and ecologically significant part of a Conservation Covenant, for which no offsetting or compensation is provided. This revocation will result both in a reduction in the representativeness and overall diversity of values that the remainder of the covenant supports, as well as removing legal protection from future disturbance for the revocation area.
112. Because of impacts on irreplaceable values, a no-net-loss outcome is not achievable under any scenario involving open cast mining. Removal of the above ground open cast components is the only pathway consistent with the NPS-IB, the ORPS, and the maintenance of indigenous biodiversity.

ⁱ Ewans, R. 2025. Appendix A - Summary: *Ceratocephala pungens*. Memo prepared by Richard Ewans – Technical Advisor, Ecology, Flora & Ecosystems Teams, Department of Conservation