



Vegetation and Wetland Values Assessment: Macraes Phase 4 Fast Track Project

OceanaGold (New Zealand) Limited

August 2026



Whirika Consulting
PO Box 1320
Dunedin 9054

Head Office: Level 1
77 Vogel Street
Dunedin 9016

(03) 742 1093
kiaora@whirika.co.nz
whirika.co.nz

Report prepared for client by Dr Mike Thorsen

Report identifier: C00389_01

© Whirika Consulting Limited
2 Dowling Street
Dunedin 9016
New Zealand

kiaora@whirika.co.nz
whirika.co.nz

Reliance and Disclaimer

The professional analysis and advice in this report has been prepared by Whirika Consulting Limited for the use of the party or parties to whom it is addressed (the addressee) and for the purposes specified in it. This report is supplied in good faith and reflects the knowledge, expertise and experience of the consultants involved. Whirika Consulting Limited accepts no responsibility whatsoever for any loss occasioned by any person acting or refraining from action as a result of reliance on the report, other than the addressee.

In preparing this report Whirika Consulting Limited has endeavoured to use what it considers the best information available at the date of publication, including information supplied by the addressee. Unless stated otherwise, Whirika Consulting Limited does not guarantee the accuracy of any forecast or prediction in this report.

Document Version History

Version	Date	Author	Reviewer	Change Status
A	May 2022	M. Thorsen (Ahikā)	Whirika Consulting	
B (Draft)	May 2026	Dr Mike Thorsen, Whirika Consulting Ltd	M. Baber (Alliance Ecology)	Restructured for MP4FT; addressed reviewer comments; aligned to EclAG (Roper-Lindsay et al., 2018) and NPSIB/ORC ecological significance criteria
B v9 (Draft)	June 2026	Dr Mike Thorsen, Whirika Consulting Ltd	OGL MP4FT team	Clarification and comments
C v1 (Draft)	July 2026	Dr Mike Thorsen, Whirika Consulting Ltd		
Rev 0	August 2026	Dr Mike Thorsen, Whirika Consulting Limited	Scott Mossman	Update of Project Description

This document has been produced for New Zealand consenting purposes only. Information contained herein must not be relied on for investment purposes.

Contents

Contents	1
1 Glossary of Terms and Abbreviations	5
1.1 Defined Technical Terms	5
Executive Summary	7
1.2 Overview and scope	7
1.3 The Ecological Study Area.....	7
1.4 Vegetation characteristics.....	8
1.5 Ecological significance.....	9
1.6 Ecological value	9
1.7 Limitations and confidence	11
2 Introduction	11
2.1 Site Location and Description	12
2.2 Project Overview	15
2.3 Impact Area Ecological Study Area.....	17
2.4 Purpose and Scope	18
3 Methods	20
3.1 Overview.....	20
3.2 Desktop investigations	20
3.2.1 Published and unpublished literature	20
3.2.2 Databases and online sources.....	21
3.3 Botanical field surveys	21
3.3.1 Survey effort and timing.....	21
3.3.2 Walk-through expert survey	22
3.3.3 Vegetation plots	22
3.3.4 Targeted threatened plant survey.....	23
3.3.5 Wetland delineation	23
3.3.6 Naturalness Index	23
3.3.7 Vegetation mapping	23
3.4 Assessment of ecological significance.....	24
3.5 Assessment of ecological value	24
3.5.1 Assigning value to habitats and vegetation communities	24

3.5.2	Assigning ecological value to species	25
3.5.3	Confidence in assessment	25
3.6	Survey limitations.....	25
4	Ecological Context	27
4.1	The Macraes Ecological District	27
4.2	Pre-human and historical vegetation.....	27
4.3	Existing pressures and threats	28
4.4	Changes in vegetation extent in the Macraes E.D.....	28
4.5	Climate Change	29
4.6	Identified protected areas and notable sites.....	30
4.7	Threatened Environment Classification.....	30
5	MP4FT Project Flora Ecological Values	36
5.1	Vegetation Communities	36
5.1.1	Overview.....	36
5.2	Description of Project vegetation communities	44
5.2.1	Coronation Mining Area Ecological Features	44
5.2.2	Central Mining Area Ecological Features	46
5.2.3	Golden Bar Mining Area Ecological Features	48
5.2.4	Golden Bar Haul Road	49
5.2.5	Camp Creek Reservoir wetlands	49
5.2.6	Coal Creek Reservoir wetlands	50
5.3	Descriptions of vegetation communities and notable habitat features	51
5.3.1	Ephemeral wetlands (WL14)	51
5.3.2	Seepage wetlands.....	53
5.3.3	Rock outcrops and tors CL8: Helichrysum, Melicytus shrubland/tussockland/rockland ..	53
5.3.4	Narrow-leaved tussock grassland	53
5.3.5	Shrublands	54
5.3.6	Riparian vegetation and wetland vegetation	55
5.3.7	Exotic vegetation, mine-modified ground and water bodies	55
5.3.8	Ecological integrity.....	56
5.3.9	Botanical diversity.....	57
5.4	Threatened, At Risk, or uncommon species.....	57

6	Assessment of Ecological Significance	0
6.1	Overview and approach.....	0
6.2	Summary of ecological significance.....	0
6.3	NPSIB Appendix 1 assessment	2
6.4	Otago Regional Policy Statement assessment.....	0
6.4.1	Operative ORPS Appendix 2 (operative 9 July 2026).....	0
6.5	District plan assessment.....	0
6.5.1	Dunedin City 2GP Policy 2.2.3.2 (Coronation Mining Area)	0
6.5.2	Waitaki District Plan Policy 16.9.3(3).....	1
6.6	Conclusion	1
7	Assessment of Ecological Value (EclAG)	3
7.1	Overview.....	3
7.2	Coronation Mining Area — sub-criterion assessment	3
7.3	Central Mining Area — sub-criterion assessment	6
7.4	Golden Bar Mining Area — sub-criterion assessment.....	8
7.5	Golden Bar Haul Road — sub-criterion assessment	11
7.6	Threatened plant species ecological values	13
	References	14
	Appendices	17
7.7	Appendix 1. Flora recorded in the ecological study area.....	18
7.8	Appendix 2. Site photographs	42
7.9	Appendix 3. Details of At Risk and Locally Uncommon Plant Species	0
	Threatened – Regionally Critical.....	0
	Threatened – Regionally Endangered.....	2
	Threatened – Regionally Vulnerable	9
	At Risk - Declining	16
	At Risk – Naturally Uncommon.....	24
	Data Deficient	31
	Uncommon Species	32
	Nearby rare plant species.....	33
	Appendix 4. Survey paths	34
	Appendix 5. Vegetation Plot Locations and Mapping	41

7.10 Appendix 5. Vegetation plot data for wetlands at Coronation 6..... 42

1 Glossary of Terms and Abbreviations

This glossary defines the technical and project-specific terms used throughout this report. Where terms are also defined in companion ecological reports for the MP4FT (avifauna, lizards, freshwater, terrestrial invertebrates, biodiversity offset/compensation), the definitions used here have been aligned with those companion reports to ensure consistent usage across the suite of reports supporting the OGNZL Fast-Track application.

1.1 Defined Technical Terms

Term	Meaning in this report
20 m buffer	A precautionary buffer applied around parts of the direct impact footprint to account for potential edge effects or uncertainty in the extent of disturbance. For Threatened plant assessment, plants within the footprint or 20 m buffer are treated as unable to be avoided unless otherwise confirmed.
80 m buffer	A wider ecological records buffer used in parts of the vegetation assessment to identify nearby Threatened, At Risk, Data Deficient or locally uncommon plant records that may be relevant to indirect effects or management planning.
Direct impact footprint/footprint	The mapped area of proposed works where earthworks, reclamation, landform modification or other direct physical disturbance will result in vegetation clearance.
Ecological District (E.D.)	The Macraes Ecological District is one of two E.D.'s comprising the Lammerlaw Ecological Region (Bibby 1997).
Ecological Study Area (ESA)	The combined Project footprint, 20 m buffer, 80 m buffer and surrounding landscape characterised through desktop investigations and on-ground surveys to provide ecological information to inform this report. Also includes results from work associated with previous mine projects at these sites.
Ecological value	The importance assigned to an ecological feature using the EIANZ framework and considering representativeness, rarity / distinctiveness, diversity and pattern, and ecological context. Assigned ratings of Negligible, Low, Moderate, High or Very High.
Ecological significance	Whether an area meets one or more of the criteria for significant indigenous vegetation or significant habitat of indigenous fauna under Appendix 1 of the NPSIB, Appendix 2 of the ORPS, or equivalent district plan criteria.
Environment Institute of Australia and New Zealand (EIANZ)	Professional body that developed the Ecological Impact Assessment Guidelines (EciAG) used in this report

Impact Area	The direct impact footprint plus a precautionary 20 m buffer applied for assessment purposes (unless otherwise stated) and excluding areas within existing consents (unless otherwise stated).
Land Cover Database (LCDB)	National land cover classification dataset (v6) maintained by Manaaki Whenua – Landcare Research.
Land Environments NZ (LENZ) and Threatened Environment Classification (TEC)	Environmental classification of New Zealand at multiple levels of detail, used to derive the Threatened Environment Classification (TEC): a six-category map combining LENZ, LCDB and the national protected areas network to indicate loss and protection of indigenous biodiversity (Walker et al. 2015).
Natural inland wetland	A natural inland wetland as defined under the NPS-FM and relevant wetland delineation protocols.
Project	The Macraes Phase Four Project, comprising the proposed mining, infrastructure, waste rock storage, tailings storage, road realignment, underground mining and associated ecological management works assessed in this EclA.
Project Footprint	The area within which MP4 works are proposed to occur, including pits, waste rock stacks, haul roads, road realignments, tailings storage, backfill areas and associated infrastructure.
Recommended Area for Protection (RAP)	Areas recommended for protection under the Department of Conservation's Protected Natural Areas Programme.
Significant Natural Area (SNA)	Area identified in district or regional planning instruments as significant indigenous vegetation or significant habitat of indigenous fauna under s6(c) of the Resource Management Act 1991.
Threatened and At Risk (TAR) plants	Plant species with a recognised national or regional conservation status, including Regionally Threatened, Regionally At Risk, Regionally Data Deficient and locally uncommon species. Conservation-status categories follow the New Zealand Threat Classification System (Rolfe et al., 2022; de Lange et al., 2024) and the Regional Threat Classification System (Crisp et al., 2026). For Otago vascular plants, the current regional assessment (Jarvie et al., 2026) provides the primary regional context, including for species classified as Not Threatened nationally.
Waste Rock Stack (WRS)	Engineered landform used to permanently store mine waste rock.
Zone of Influence	The broader area within which direct or indirect ecological effects could occur. This may include areas affected by dust, noise, vibration, lighting, hydrological change, sedimentation, edge effects or other disturbance pathways.

Executive Summary

1.2 Overview and scope

OceanaGold (New Zealand) Limited (“**OGNZL**”) currently undertakes open pit and underground gold mining operations at the Macraes Operation located at Golden Point Road, Macraes Flat, East Otago. As part of their ongoing operations, OGNZL continually review the remaining life of the Macraes Operation in light of updated knowledge of the gold resource and the economics of mining.

Reflecting recent exploration success and optimisation work, together with higher gold prices, the Macraes Phase Four Project (“MP4” or “the Project”) seeks to extend the life of mining at the Macraes Operation until at least 2039. The Project, which will enable ongoing gold production at a rate of approximately 130,000 ounces per annum, is identified as a Listed Project in Schedule 2 of the Fast-track Approvals Act 2024 (“FTAA”) as a project providing significant national or regional benefits.

To support the development of the substantive application for the Project, OGNZL has engaged Whirika Consultancy Limited to provide an assessment of the Project’s effects on Terrestrial vegetation and wetlands, and, to the extent required, identify any necessary management and operation measures to address any such effects.

This report is the vegetation and wetland values assessment for the Project. Its scope is to:

- (i) describe the vegetation communities and threatened plant values within the Project area and the wider Ecological Study Area (ESA);
- (ii) assess ecological significance against the National Policy Statement for Indigenous Biodiversity 2023, consolidated with the December 2025 amendments (Ministry for the Environment, 2025), the operative Otago Regional Policy Statement 2021 (Otago Regional Council, 2026), and applicable district-plan criteria; and
- (iii) assign ecological values to those communities and species using the EIANZ Ecological Impact Assessment Guidelines (Roper-Lindsay et al., 2018).

The assessment of potential effects, effects management, offsetting and compensation is undertaken in a separate Ecological Effects Assessment that draws on this report.

1.3 The Ecological Study Area

The assessed non-consented Impact Area, comprising the direct impact footprint and a precautionary 20 m buffer where applied, is approximately 319.76 ha. Vegetation survey and wetland mapping extended into a surrounding 100 m assessment area, while an 80 m flora-records buffer is retained for parts of the rare-plant assessment. The wider landscape is used to characterise ecological context and effect pathways beyond the direct works footprint.

The Ecological Study Area includes the 319.76 ha assessed Impact Area, a surrounding 100 m vegetation-survey and wetland-assessment area, the 80 m flora-records buffer used in parts of the rare-plant assessment, and relevant features in the wider landscape. Direct habitat loss is distinguished from the precautionary 20 m allowance and from indirect effects assessed farther

from the footprint. Areas already authorised under existing consents are identified separately where relevant.

The Project comprises five main mining components:

- the Coronation Mining Area (including Coronation North, Coronation Pit and the Trimbells WRS),
- the Central Mining Area (Frasers and Innes Mills (FrIM)),
- the Golden Bar Mining Area (Golden Bar Pit and Golden Bar WRS),
- the Golden Bar Haul Road, and
- the Camp Creek and the Coal Creek Reservoir wetlands.

1.4 Vegetation characteristics

The Impact Area lies within the Macraes Ecological District (ED), one of two E.D.s forming the Lammerlaw Ecological Region. The E.D. has been heavily modified by approximately 750 years of human settlement, repeated burning, gold mining, oversowing and topdressing with non-indigenous pasture species, grazing by livestock and introduced mammalian browsing, and weed invasion. Approximately 75% of the Macraes E.D. is now dominated by exotic vegetation, the remainder is mostly induced vegetation communities that have a high prevalence of indigenous plant species and is therefore categorised as indigenous (indigenous) vegetation, and areas (mostly small and fragmented) of remnants of the original indigenous vegetation cover. Despite this modification, the remaining indigenous vegetation communities are botanically diverse and support the highest diversity of Threatened or At Risk plant species of any area in New Zealand (Thorsen 2008).

Within the approximately 319.76 ha assessed Impact Area (unconsented), about 97.6 ha is mapped as indigenous or semi-natural vegetation, 138.8 ha is exotic-dominated vegetation, and 83.4 ha comprises existing or recent mine workings and roads. The principal indigenous habitats include approximately 90.01 ha of snow tussock grassland, 3.06 ha of dry shrubland and 0.26 ha of rock habitat when the 20 m precautionary allowance is included. Wetland and riparian communities are reported separately because their affected extents depend on the relevant hydrological effect pathway.

A total of 259 indigenous and 136 exotic vascular plant species were recorded across the surveyed area. Fifty Threatened, At Risk, Data Deficient or locally uncommon plant species are recorded within the MP4 zone of influence: 22 Regionally Threatened species, 9 Regionally Declining species, 13 Regionally Naturally Uncommon species, 4 Regionally Data Deficient species, and 2 locally uncommon species. These totals include records in the direct footprint and surrounding buffer and must not be interpreted as 50 species all subject to direct loss.

79 ha of indigenous vegetation within the Impact Area lies on Threatened Land Environments (TEC categories 1–3), with the majority (61.6 ha) on LENZ N3.1e (TEC 1, <10% of indigenous cover remaining nationally).

1.5 Ecological significance

Applying Appendix 1 of the National Policy Statement for Indigenous Biodiversity 2023, consolidated with the December 2025 amendments (Ministry for the Environment, 2025), Appendix 2 of the operative Otago Regional Policy Statement 2021 (Otago Regional Council, 2026), Policy 2.2.3.2 of the operative Dunedin City 2GP (Dunedin City Council, 2026), and Policy 16.9.3(3) of the operative Waitaki District Plan (Waitaki District Council, 2010), the indigenous vegetation communities assessed in this report meet at least one significance criterion under at least one applicable instrument. This is an ecological assessment of the criteria, not a legal or planning opinion. Exotic vegetation, mine-modified ground and water bodies were not identified as meeting those ecological significance criteria.

Significance is conferred primarily through:

- Rarity and distinctiveness — through the presence of nationally and regionally Threatened, Declining, At Risk, Data Deficient and locally Uncommon plant species across all indigenous vegetation types; through the presence of Naturally Uncommon ephemeral wetland (Critically Endangered) and seepage wetland (Endangered) ecosystems that are also a National Priority for Protection (MfE & DOC 2007; Williams et al. 2007; Holdaway et al. 2012); and through the presence of distinctive assemblages on rock outcrops at Coronation and within the Golden Bar Waste Rock Stack shrubland;
- Representativeness — through tussockland, riparian and rock outcrop communities that are typical of present-day vegetation communities in the Macraes E.D.;
- Ecological context — through linkages and buffering within the Trimbells Gully (RAP4) and Golden Bar (RAP7) mosaics and other areas of extensive indigenous vegetation. Ecological context is less strongly demonstrated in the more isolated and modified Central Mining Area and along the Golden Bar Haul Road.

All four mining areas (Coronation, Central, Golden Bar and Golden Bar Haul Road) contain significant indigenous vegetation under the operative ORPS. The Coronation Mining Area and the Golden Bar Mining Area additionally meet all four NPSIB criteria collectively.

1.6 Ecological value

Ecological values were assigned to each vegetation community and notable habitat feature using the EIANZ Ecological Impact Assessment Guidelines (EclAG, Roper-Lindsay et al., 2018). Sub-criterion scores for representativeness, rarity/distinctiveness, diversity and pattern, and ecological context were combined to give an overall ecological value rating from Negligible to Very High.

Across the Project, the highest vegetation and habitat values are associated with snow tussock grassland, rock outcrops and tors, ephemeral wetlands, wetland seepages, and freshwater herbaceous wetland and riparian communities. Values vary by location and condition. The integrated EclA assigns Very High Project-wide value to snow tussock grassland, rock habitat and ephemeral wetlands; High value to freshwater herbaceous and seepage communities; Moderate value to dry shrubland, sedgeland and wetland shrubland; and Low or Negligible value to most exotic and mine-modified land covers. Site-specific departures are retained where supported by the local condition and evidence.

Table 1. Summary of mapped vegetation and habitat extents and ecological values used in this report. Terrestrial extents include the 20 m precautionary allowance where stated. Wetland-community extents include mapping within the impact zone and surrounding 100 m wetland-assessment area and do not all represent direct loss. The rows are not additive.

Vegetation or habitat type	Assessed extent (ha)	Spatial basis	Overall ecological value
Dry shrubland	3.06	Includes the 20 m precautionary allowance	Moderate
Snow tussock grassland	90.01	Includes the 20 m precautionary allowance	Very High
Rock outcrops and tors	0.26	Includes the 20 m precautionary allowance	Very High
Ephemeral wetland	4.88	Mapped extent; not all direct loss	High to Very High
Sedgeland	2.80	Mapped extent; not all direct loss	Low to Moderate
Freshwater herbaceous vegetation	3.00	Mapped extent; not all direct loss	Low to High
Seepage wetland	0.02	Mapped extent; not all direct loss	High
Wetland shrubland	0.03	Mapped extent; not all direct loss	Moderate
Red tussock wetland	0.076	Mapped extent; not all direct loss	Moderate
Modified land cover (mapped as: exotic grassland, gorse, mine-disturbed, pine forest, pine felled, ponds, roads and woody exotic)	222.18	Broad land-cover total	Low to Negligible

Vegetation or habitat type	Assessed extent (ha)	Spatial basis	Overall ecological value
Total assessed non-consented Impact Area	319.76	Direct footprint plus 20 m precautionary allowance where applied	Not applicable

Note: Rows in Table 1 are not additive. Terrestrial habitat extents include the 20 m precautionary allowance where stated. Wetland-community extents are mapped within the impact zone and surrounding 100 m wetland-assessment area and do not all represent direct loss. The 80 m flora-records buffer and areas already authorised under existing consents are reported separately where relevant.

1.7 Limitations and confidence

The vegetation surveys reported here were undertaken on multiple occasions between 2016 and 2026, with subsequent revisits to inspect specific ecological features. In addition, there has been previous survey effort during previous mine projects such as Coronation, Coronation North, Coronation North extension, Innes Mills (various stages to Stage 10) and Back Road WRS outlined in Section 3.3.

Confidence in the assessments is generally Moderate, mostly because of a scarcity of ecological information in other areas of the E.D. Confidence is highest for ephemeral wetland identification. Confidence is lower for the wider surrounding landscape outside the mining footprints.

2 Introduction

OceanaGold (New Zealand) Limited (“**OGNZL**”) currently undertakes open pit and underground gold mining operations at the Macraes Operation located at Golden Point Road, Macraes Flat, East Otago. As part of their ongoing operations, OGNZL continually review the remaining life of the Macraes Operation in light of updated knowledge of the gold resource and the economics of mining.

Reflecting recent exploration success and optimisation work, together with higher gold prices, the Macraes Phase Four Project (MP4 or the Project) seeks to extend the life of mining at the Macraes Operation until at least 2039. The Project, which would enable ongoing gold production at a rate of approximately 130,000 ounces per annum, is a listed project in Schedule 2 of the Fast-track Approvals Act 2024 (New Zealand Government, 2024).

To support the development of the substantive application for the Project, OGNZL has engaged **Whirika Consulting Ltd** to provide an assessment of **botanical values** within and around the Project.

The scope of this report is to:

- Describe the botanical features (vegetation and plants of conservation interest (TAR species) in the project's Zone of Influence and surrounding area (the IMPACT AREA),
- Assess the ecological importance of these using the EclAG.
- Assess the ecological significance of the vegetation communities using the criteria in regional and district planning documents.

2.1 Site Location and Description

- OGNZL owns and operates the Macraes Operation at Macraes, approximately 30 km northwest of Palmerston in the Otago Region. The Macraes Operation is the largest gold mine in New Zealand and, since commissioning in 1990, has produced more than 6 million ounces of gold.
- Macraes Flat is situated on an elevated plateau at approximately 500 m above sea level. The plateau is flanked by the Taieri Ridge to the northwest, Shag Valley and Horse Range to the east, and the coastal hills and extinct volcanic cones of Palmerston and Waikouaiti to the southeast. Macraes Road provides access to Macraes Flat and the Macraes Operation, connecting to State Highway 85 to the east and State Highway 87 (SH87, the Middlemarch–Hyde Road) to the west.
- The environment within and surrounding the Macraes Operation has been shaped by historic and current mining activities. **Figure 1** shows the arrangement of the major mine

features at the Macraes Operation. In summary, the current components of the Macraes Operation include:

- Numerous open pits (both operational and non-operational);
- Two underground mines (Fraser's, now closed, and Golden Point, which is actively mined);
- Waste rock stacks at various stages of operation and rehabilitation;
- A network of haul roads and general mine service tracks;
- A Processing Plant;
- Five tailings storage facilities (three inactive, one active but nearing capacity, and one under construction and currently receiving tailings);
- An extensive network of water management infrastructure, including diversion drains, silt ponds, sumps, pit lakes, and freshwater storage reservoirs;
- Two consented but not yet constructed water storage reservoirs (Camp Creek Dam and Coal Creek Dam); and
- Associated infrastructure supporting ongoing operations, including district roads, powerlines, workshops, offices, and associated water and amenity facilities.

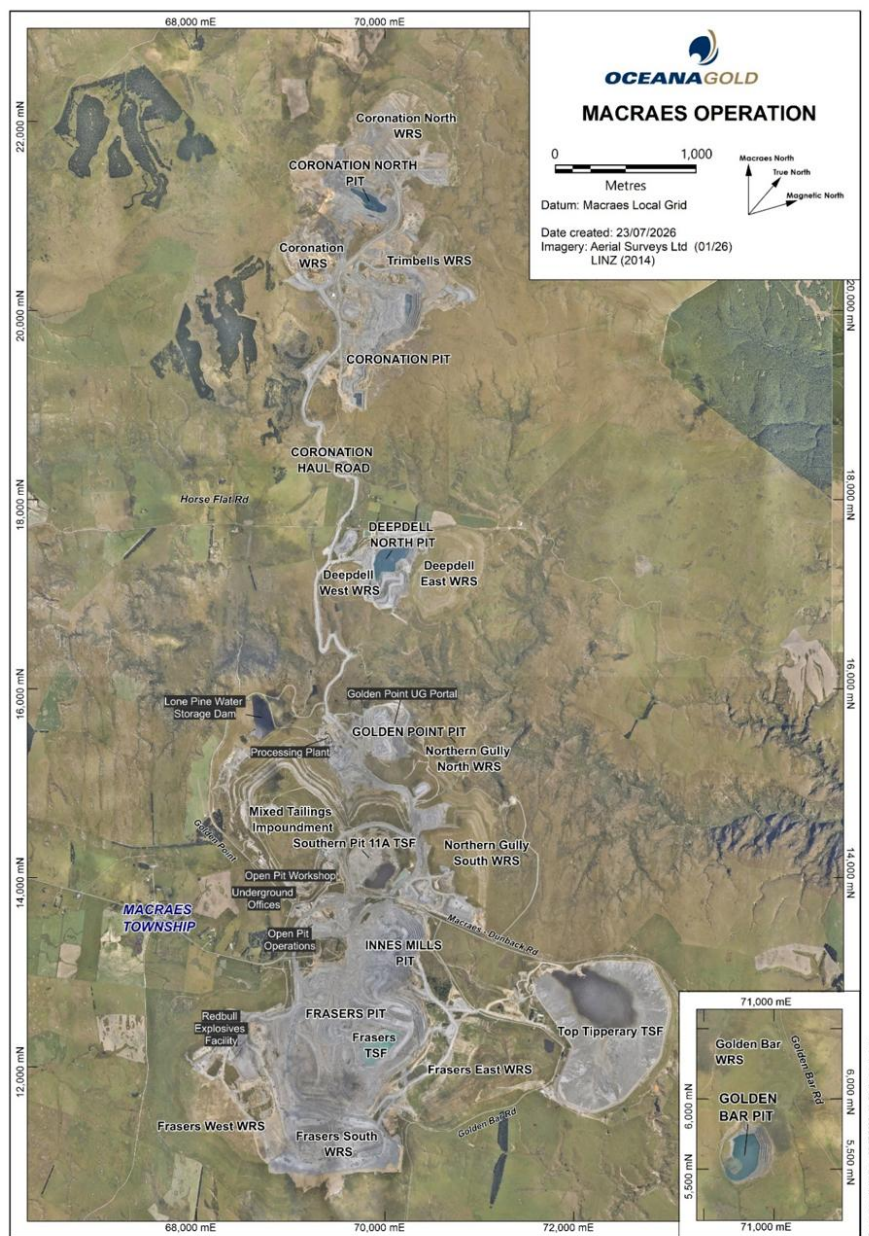


Figure 1: Existing site layout at the Macraes Operation (as of July 2026)

2.2 Project Overview

The Project is made up of the following proposed key activities:

- **Open pit extensions** at Coronation, Coronation North, Innes Mills, and Golden Bar.
- **Underground mine expansion** through further development of the Golden Point Underground mine (“**GPUG**”).
- **Tailings management**, including:
 - Construction of the Frasers Tailings Storage Facility (“**FTSF**”) Stage 3 to accommodate a total tailings storage of up to 153 Mt; and
 - Hydraulic mining and relocation of tailings from the Mixed Tailings Impoundment (“**MTI**”), Southern Pit Option 10 TSF (“**SP10**”), and Southern Pit Option 11A TSF (“**SP11**”) to FTSF.
- **Waste rock disposal**, including increased storage capacity within open pits and at existing waste rock stacks at Coronation, Coronation North, Innes Mills, Golden Bar, Golden Point, and Frasers.
- **Water management infrastructure and operations**, including:
 - Construction of Camp Creek and Coal Creek water storage dams for flow and water quality management;
 - Construction, operation and maintenance of a Water Treatment Plant; and
 - Ongoing operation and maintenance of the Mine Water Management System (“**MWMS**”).
- **Infrastructure and roading works**, including:
 - Realignment of Macraes Road in two stages; and
 - Relocation of the Open Pit Mining Workshop.
- **Ecological enhancements**, including establishment of:
 - Murphys Ecological Enhancement Area (“**MEEA**”) near Murphys Creek, including predator fencing, access tracks, and site facilities;
 - Mt Highlay restoration area;
 - Cranky Jims Link shrubland enhancement area;
 - Murphys Link tussock protection area; and
 - Additional compensation measures for residual ecological impacts.
- **Mine closure and rehabilitation activities**, including rehabilitation of mining landforms, creation of pit lakes, dry capping of tailings storage facilities, and revegetation in accordance with closure objectives.

An overview of the proposed activities which make up the Project is shown in Figure 2 below.

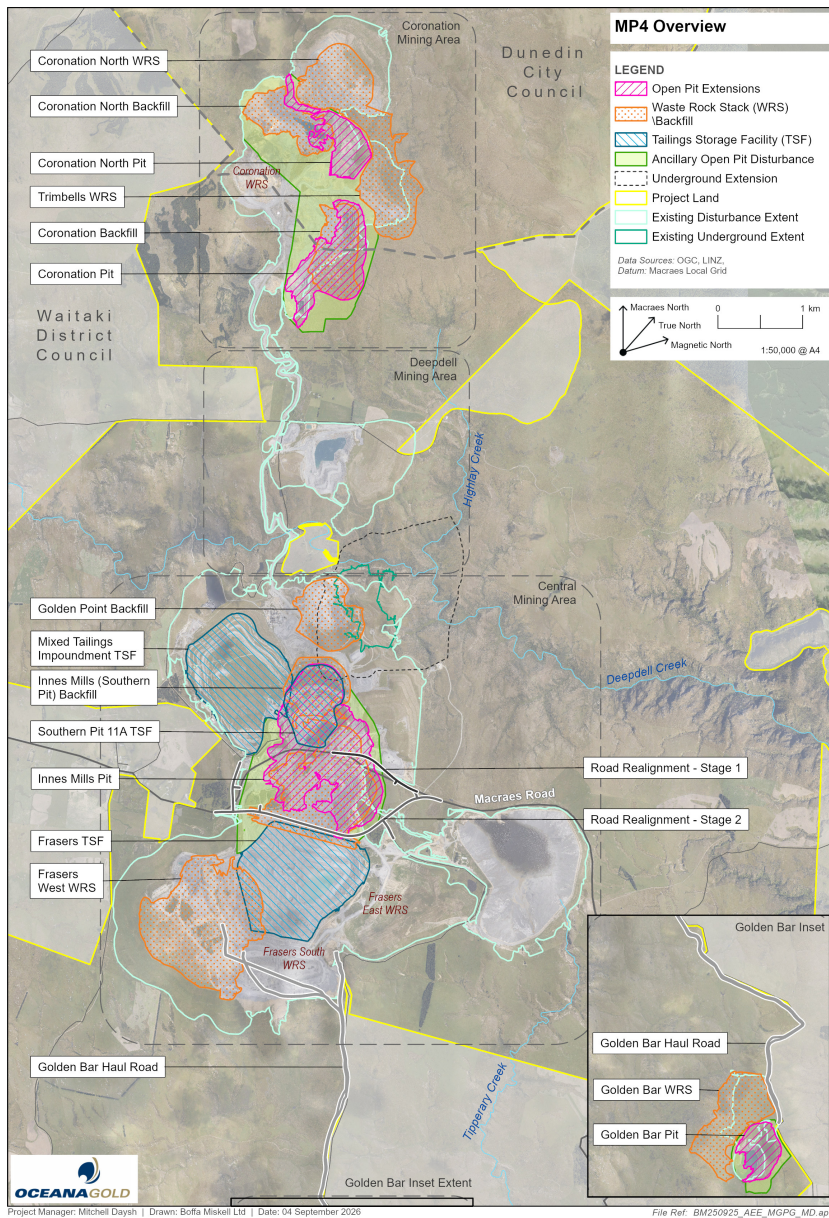


Figure 2: MP4 Overview Plan

2.3 Impact Area Ecological Study Area

The Ecological Study Area is the spatial scope of this values assessment. It comprises the approximately 319.76 ha non-consented Impact Area, including the direct impact footprint and a 20 m precautionary allowance where applied, together with a surrounding 100 m vegetation-survey and wetland-assessment area, the 80 m flora-records buffer used in parts of the rare-plant assessment, and relevant ecological features in the wider landscape. The current assessment-area summary is provided in Table 2.

Table 1. Areal breakdown of the Project components within the Ecological Study Area (hectares). 'New area' is the unconsented area assessed in this report; 'within existing consents' refers to the area already addressed by existing resource consents.

Assessment area	Assessed area (ha)	Status and scope
Coronation Mining Area	88.63	Core terrestrial assessment area
Central Mining Area	119.43	Core terrestrial assessment area
Golden Bar Mining Area	78.80	Core terrestrial assessment area
Golden Bar Haul Road	32.89	Core terrestrial assessment area
Golden Point Underground	52.58	Predominantly underground. No direct surface impact; but includes a 52.58 ha surface assessment area.
Back Road Waste Rock Stack	Avoided	Removed from the MP4 footprint; existing development rights proposed to be surrendered
Camp Creek reservoir	Assessed separately	Consented reservoir wetland scope
Coal Creek reservoir	Assessed separately	Consented reservoir wetland scope
Frasers West French Drain	5.50	Separate surface-work assessment; excluded from the 319.76 ha core total
Seepage capture drains	Assessed separately	Wetland effect-pathway assessment
Total core terrestrial assessment areas	319.76	Coronation, Central, Golden Bar and Golden Bar Haul Road

Note: The 319.76 ha core terrestrial Impact Area is the sum of the Coronation, Central, Golden Bar and Golden Bar Haul Road assessment areas after scope alignment. Golden Point Underground is excluded from this total pending confirmation of the conflicting surface-impact descriptions in E1 and E7. Back Road Waste Rock Stack is treated as avoided; the reservoirs, seepage capture drains and Frasers West French Drain are reported separately where relevant.

2.4 Purpose and Scope

The purpose of the assessment was to document and describe the vegetation and wetland habitat values present within the Project area and to guide an assessment of the project's effects on those values.

This document (E2) sits within a series of 18 ecology-focused documents relating to the Project (Table 2). The scope of this report is limited to assessing Vegetation and Wetland Values and does not include an assessment of the Project's effects on those values. The effects of the Project on vegetation and wetland communities and species are addressed separately in the EclA prepared by Bioresarches (E7).

Table 2: Ecology documents prepared for the proposed Macraes Phase 4 Project. Current document highlighted.

Document #	Document name	Aspects covered	Author
E1	Terrestrial and Wetland Ecology Summary	Summary of documents E2 – E16	Bioresearches (2026a)
Ecological Assessments			
E2	Assessment of Vegetation and Wetland Values	Terrestrial vegetation and wetlands	Whirika (2026)
E3	Assessment of Invertebrate Values		Bioresearches (2026b)
E4	Assessment of Lizard Values		Bioresearches (2026c)
E5	Assessment of Avifauna Values		Bioresearches (2026d)
E6	Assessment of Bat Values		Bioresearches (2026e)
E7	Ecological Impact Assessment	Terrestrial and wetland ecosystems and fauna	Bioresearches (2026f)
Ecological Management			
E8	Vegetation and TAR Flora Management Plan	Indigenous vegetation and threatened plants (wetland and terrestrial)	Bioresearches (2026g)
E9	Wetland Management Plan	Management and monitoring of Wetlands and TAR wetland plants	Bioresearches (2026h)
E10	Invertebrate Management & Monitoring Plan	Effects management and monitoring for invertebrates	Bioresearches (2026i)
E11	Lizard Management & Monitoring Plan	Effects management and monitoring for lizards	Bioresearches (2026j)
E12	Avifauna Management & Monitoring Plan	Effects management and monitoring for birds	Bioresearches (2026k)
Residual Effects Analysis and Management			
E13	Residual Effects Analysis: Terrestrial Ecology	Residual effects analyses for vegetation and fauna	Bioresearches (2026l)
E14	Residual Effects Analysis: Wetlands	Residual effects analyses for wetlands	Bioresearches (2026m)
E15	Residual Effects Terrestrial Restoration Plan	Compensation planting and vegetation restoration	Bioresearches (2026n)
E16	Residual Effects Wetland Management Plan	Planting and restoration for wetlands	Bioresearches (2026o)
E17	Ecological Impact Assessment: Pest-proof Fence Construction	Terrestrial and wetland ecosystems and fauna	Bioresearches (2026p)
E18	Pest Control and Elimination Plan	Animal pest management	Alliance Ecology (2026)

3 Methods

3.1 Overview

The vegetation and wetland values assessment was undertaken using four elements:

- Desktop investigations (Section 3.2);
- Vegetation mapping using aerial and drone imagery, with subsequent ground-truthing (Section 3.3.7);
- On-site botanical survey, comprising walk-through expert survey, quantitative vegetation plots, targeted threatened plant survey and wetland delineation (Section 3.3.2, 3.3.4); and
- Assessment of ecological significance (using NPSIB, ORPS, 2GP and WDP criteria) and ecological value (using the EclAG) (Sections 3.4, 3.5).

The methods draw on standard New Zealand ecological assessment practice.

3.2 Desktop investigations

Desktop investigations were undertaken to inform the field survey methodology, to characterise the ecological context of the Macraes E.D., and to identify previously recorded ecological features and threatened species in the Impact Area and wider Macraes area. The desktop investigations comprised the sources listed below.

3.2.1 Published and unpublished literature

- Bibby (1997). Protected Natural Areas Programme survey of the Macraes Ecological District.
- Whitaker (1986, 1996). Terrestrial fauna and grand skink studies for Macraes Flat.
- Singers and Rogers (2014). A Classification of New Zealand Terrestrial Ecosystems.
- Johnson and Rogers (2003). Ephemeral wetlands and their turfs in New Zealand.
- McGlone (1989); McGlone et al. (1995). Holocene vegetation history of Central Otago.
- Williams et al. (2007); Holdaway et al. (2012). Naturally Uncommon Ecosystem framework.
- MfE & DOC (2007). Protecting Our Places (national priorities for biodiversity protection).
- Walker et al. (2015). Threatened Environment Classification User Guide.
- de Lange et al. (2024); Jarvie et al. (2026). National and regional threat classification lists for vascular plants.
- Previous OGNZL ecological reports for the Macraes Operation, including the Coronation North 2016 and Deepdell North III consent applications and associated vegetation and wetland inventories.
- Author's unpublished plant location database for the Macraes area (M. Thorsen unpub.).

3.2.2 Databases and online sources

- New Zealand Plant Conservation Network (<https://www.nzpcn.org.nz>) — species information;
- Present-day aerial imagery from LINZ Data Service;
- Otago Regional Council GIS layers — Otago Wetland Mapping, Otago Ecosystems and Habitat Mapping, ORC Regionally Significant Wetlands Schedule 9;
- Manaaki Whenua – Landcare Research GIS layers — Land Cover Database (LCDB v5, v6), Land Environments New Zealand (LENZ Level IV), Threatened Environment Classification (TEC), Naturally Uncommon Ecosystems webpages;

3.3 Botanical field surveys

3.3.1 Survey effort and timing

The vegetation surveys reported here were undertaken on multiple occasions between 2019 and 2026, with subsequent revisits to inspect specific ecological features. In addition, there has been previous survey effort during other previous mine projects such as Coronation, Coronation North, Coronation North extension, Innes Mills (various stages to Stage 10) and Back Road WRS. Subsequent revisits to inspect specific ecological features were undertaken between 2024 and 2026. Persons involved in the survey include Dr Mike Thorsen, Craig Wilson, Caitlin Daley, Jacinta Steeds, Fergus Chinnery (all Whirika Consulting Ltd) Laura Drummond, and Bella Burgess (Bioresearches). Overall, 69 days of survey effort were involved (Table 3) and this effort has covered much of the Impact Area (Figure 54 to Figure 59).

Table 3. Survey effort (in days) of sites within the ESA. Excludes effort prior to 2022 associated with other mine projects.

		Corona tion	Golden Bar and GB Haul Road	Coal Creek	Camp Creek	Cent ral
2024- 2025	Capturing drone imagery		1			
2024- 2025	Mapping and analysis from drone and aerial imagery		1			
2024- 2025	Ground-truthing mapping, rare plant survey, wetland delineation	2	2			1
2024- 2025	Collecting shrubland and tussock plot data		1			
2025- 2026	Capturing drone imagery	*	1	1	1	*
2025- 2026	Mapping and analysis from drone and aerial imagery	3	2	1	1	2
2025- 2026	Ground-truthing mapping, rare plant survey, wetland delineation	14	7	2	2	4
2025- 2026	Collecting shrubland and tussock plot data	5	3			
2024	Botanical inventory and rare plant survey	2	1			
2023	Botanical inventory and rare plant survey	1	1			3

2022	Botanical inventory and rare plant survey	1	1			2
------	---	---	---	--	--	---

* = recent hi-resolution aerial imagery used

3.3.2 Walk-through expert survey

All plant species (indigenous and exotic) were recorded during a walk-through survey of the ESA. Survey paths traversed the most botanically interesting areas (gullies, rock outcrops, wetlands, ephemeral wetlands, intact patches of indigenous vegetation) and provided coverage across all vegetation communities (see Appendix 4 for maps of survey paths). The abundance of each plant species across the Impact Area was estimated using the following categories:

- Previously Present — recorded by previous visitors but not recorded during this survey;
- Rare — infrequently seen during survey and in very low numbers, covering <1% of area;
- Local — only seen at few areas during survey, but could be quite common within these areas and covering <5% of total area;
- Occasional — individuals scattered throughout site or in widely scattered clumps, covering 5–20% of area;
- Common — frequently encountered during survey, but not a dominant part of the flora, covering 20–60% of area;
- Abundant — a dominant part of the flora, covering >60% of area.

The locations of plant species or vegetation communities of interest were recorded using a handheld GPS (accuracy ~5 m). Descriptions of the vegetation and photographs of general vegetation patterns and sites of interest were taken; representative photographs are provided in Appendix 2.

3.3.3 Vegetation plots

Vegetation plots were used to quantify the species composition and percentage cover of representative vegetation patches. Different plot sizes were used for different vegetation communities to reflect the spatial scale of community variation and plots were randomly located within each vegetation community:

- Riparian and wetland vegetation: 2 m × 2 m quadrats were used to capture the predominantly herbaceous vegetation typical of these communities. For narrow riparian sites (<1 m wide) assessed in 2025, smaller 0.5 m × 0.5 m quadrats were used, consistent with Clarkson's (2013) wetland plot guidance for narrow vegetation strips.
- Tussock grassland and shrubland: vegetation plots were used to record dominant species, percentage cover, structure, and woody species composition.

Within each plot, percentage cover of each plant species was assessed visually. Where vegetation is intermingled, percentage cover was estimated using the outer boundary of patches of that species within the plot — for this reason percent covers sum to more than 100% in many cases. The percent cover values are not scaled to sum to 100. Vegetation plot locations are shown in Appendix 5.

3.3.4 Targeted threatened plant survey

In addition to the systematic walk-through and plot-based surveys, targeted searches were undertaken in areas known or likely to support nationally or regionally Threatened, At Risk or Data Deficient plant species. These targeted searches focused on rock outcrops, ephemeral wetlands, seepages, and gully heads.

3.3.5 Wetland delineation

Wetlands within the Ecological Study Area were delineated in accordance with the New Zealand wetland delineation protocols (Ministry for the Environment, 2022). The applicable vegetation, soil, hydrology and pasture-test tools were used where wetland indicators were present. Wetland vegetation classification followed Johnson and Gerbeaux (2004). Three broad wetland groups were identified:

- Ephemeral wetlands, comprising both long-inundation and short-inundation sub-types;
- Riparian wetlands (subdivided into freshwater herbaceous, *Carex secta* sedgeland, *Shawia bullata* shrubland types);
- Seepage wetlands.

3.3.6 Naturalness Index

To provide an overall indicator of vegetation naturalness¹ for the Impact Area and to enable comparison with other sites in the Macraes area, a Naturalness Index was calculated. The Naturalness Index is the sum of abundance values for indigenous species divided by the sum of abundance values for all species (indigenous plus exotic) within the Impact Area. Abundance values used are: Rare = 2, Local = 3, Occasional = 5, Common = 7, Abundant = 10. The Naturalness Index was applied only to the parts of the site that have not been transformed by past mining (e.g. waste rock stacks, pit walls, infrastructure pads are excluded). The resulting Naturalness Index was then compared with results from nearby comparison sites previously surveyed by the author using the same method (Table 4).

3.3.7 Vegetation mapping

The main vegetation types (and subtypes of riparian plant communities) of the Impact Area were manually mapped based on the results of vegetation plots, ground-survey, and examination of high-resolution drone images and aerial photographs.

¹ Naturalness should not be inferred to mean original vegetation as some natural vegetation communities at this site have developed as a result of clearance of the site. See Section 4.

3.4 Assessment of ecological significance

Ecological significance was assessed against the criteria in the following statutory and planning documents, applied individually, with significance conferred where at least one criterion is met:

- Appendix 1 of the National Policy Statement for Indigenous Biodiversity 2023, consolidated with the December 2025 amendments (NPSIB; Ministry for the Environment, 2025), using the criteria of representativeness, diversity and pattern, rarity and distinctiveness, and ecological context;
- Appendix 2 of the operative Otago Regional Policy Statement 2021 (Otago Regional Council, 2026), using the corresponding regional significance criteria;
- Policy 2.2.3.2 of the operative Dunedin City Second Generation District Plan (2GP; Dunedin City Council, 2026), applied to the Coronation Mining Area; and
- Policy 16.9.3(3) of the operative Waitaki District Plan (Waitaki District Council, 2010), applied to the Central and Golden Bar Mining Areas, including the Golden Bar Haul Road.

The assessment of ecological significance is undertaken for the areas that encompass the significant features, the linking habitats between them, and the buffer and supporting habitats around them. A summary table of significance for each vegetation type under each instrument is provided in Section 6.1.

3.5 Assessment of ecological value

Ecological value of vegetation communities and threatened plant species were assigned using the second edition of the EIANZ Ecological Impact Assessment Guidelines (EclAG) for terrestrial and freshwater ecosystems (Roper-Lindsay et al., 2018).

3.5.1 Assigning value to habitats and vegetation communities

For habitats and vegetation communities, ecological value was assessed against the four EclAG criteria in Table 5 of the EclAG:

- Representativeness — how well the community reflects what is currently characteristic of its type within the Ecological District (i.e. its current ecological character, not necessarily its pre-human state);
- Rarity / distinctiveness — the degree to which the community, or the species comprising it, are uncommon, geographically restricted, At Risk or Threatened, or distinctive in their composition or structure;
- Diversity and pattern — species richness, habitat heterogeneity, structural and successional pattern (gradients, ecotones, sequences); and
- Ecological context — the role of the feature in supporting broader landscape-scale ecological processes, including buffering, linkage and support for recruitment.

Each criterion was rated on a four-level scale (Very Low, Low, Moderate, High) using the descriptors in Table 4 and Table 5 of the EclAG. The four criteria scores were then combined to give an overall ecological value (Negligible, Low, Moderate, High, Very High) using Table 6 of the EclAG:

- Very High — High for 3 or all 4 sub-criteria;

- High — High for 2 sub-criteria, with Moderate or Low for the remainder; or High for 1 with Moderate for the remainder;
- Moderate — High for 1 sub-criterion with Moderate and Low for the remainder; or Moderate for 2 or more sub-criteria with Low or Very Low for the remainder;
- Low — Low or Very Low for the majority of sub-criteria and Moderate for one;
- Very Low / Negligible — Very Low for 3 sub-criteria with Moderate, Low or Very Low for the remainder.

Where vegetation communities support populations of nationally or regionally Threatened or At Risk - Declining species, this elevates the rarity/distinctiveness score and typically results in an overall ecological value of High or Very High consistent with the species' threat status.

3.5.2 Assigning ecological value to species

For individual flora species, ecological value relates directly to conservation status under the New Zealand Threat Classification System (Rolfe et al., 2022; de Lange et al., 2024) and the Regional Threat Classification System (Crisp et al., 2026; Jarvie et al., 2026). Consistent with Table 5 of the EclAG, the higher applicable national or regional threat category is used conservatively when assigning species value:

- Threatened (Regionally Critical, Regionally Endangered, Regionally Vulnerable) — Very High;
- Regionally At Risk – Declining — High;
- Regionally At Risk – Regionally Naturally Uncommon, Recovering, Relict, and Data Deficient — Moderate;
- Locally Uncommon — Low;
- Not Threatened — Very Low; Not Threatened species are not individually assigned an ecological value, unless an important for other ecological considerations (such as a canopy species).

3.5.3 Confidence in assessment

Each ecological value assignment is accompanied by a confidence rating (Low, Moderate, Moderate-High, High) reflecting the quality of underlying data, survey coverage, the level of variation observed across the community, and the degree to which the assignment relies on inference from comparable communities elsewhere in the Macraes E.D.

3.6 Survey limitations

No survey can guarantee to detect every species present in an area, and non-detection is most likely for cryptic or rare species, and plant species without flowering material at the time of survey. Specific limitations of this assessment are as follows:

- Approximately 20% of the New Zealand vascular flora lacks a formal name and there is limited information available on how to identify these entities and their distributions.
- The surveys did not cover the full seasonal range, and some spring-flowering species may have been overlooked.

- The wider surrounding landscape outside the mining footprints has not been systematically surveyed.
- Smaller occurrences (<0.1 ha) of some vegetation communities may not be represented at the mapping scale used in this report.
- Information drawn from previous reports by other organisations cannot be independently verified for quality, comprehensiveness or accuracy
- Inter-annual variation in abundance or site usage by some species (particularly annual species and ephemeral wetland species) is not captured by single-season survey data.

4 Ecological Context

4.1 The Macraes Ecological District

The Macraes E.D. is one of two Ecological Districts that make up the Lammerlaw Ecological Region of Otago (Bibby 1997). The climate is moderate, with periodic snow-lie during winter and occasional summer drought. The topography of the area consists of rolling hill country with flattened ridge crests and shallowly to deeply incised drainage associated with the flat-topped Waipounamu Erosion Surface on the Rakaia Terrane, which has probably been exposed since the late Miocene (Forsyth 2001). Rock outcropping is predominantly associated with drainage systems, with some tor formation on ridge crests. Underlying lithology is well foliated quartzo-feldspathic biotite greenschist and lesser chlorite schist, with occasional auriferous quartz reefs of Chlorite Subzone 3 and 4, Haast Schist Group, and areas of overlying Miocene to Quaternary sediments (Mutch 1963, McKellar 1966, Forsyth 2001). Soils are loess-derived hygrous Wehenga upland and high country yellow-brown earths.

4.2 Pre-human and historical vegetation

The pre-human vegetation cover of the Macraes E.D. is thought to have comprised mainly dryland forest and shrubland (Bibby 1997). Montane short tussockland grading into subalpine tall tussockland, with areas of mixed hardwood and podocarp forest, kanuka forest and *Coprosma*-flax scrub (Bibby 1997) developed after much of the original vegetation cover was dramatically altered over the past c. 750 years as a result of anthropogenic factors (particularly repeated burning) (McGlone et al. 1995, Whitaker 1996). Since European settlement in the 1850's (Thompson 1949), areas have been burnt (sometimes repeatedly) and exotic grasslands induced by ploughing, oversowing, and applying fertiliser (Whitaker 1996). The present vegetation of the Macraes E.D. is of a highly modified nature, with approximately 75% of the district dominated by exotic vegetation types (mainly improved pastureland), the remainder is mostly induced vegetation communities that have a high prevalence of indigenous plant species and is therefore categorised as indigenous (indigenous) vegetation, and areas (mostly small and fragmented) of remnants of the original indigenous vegetation cover. The remaining indigenous vegetation types are predominantly comprised of varying density narrow-leaved tussockland, copper tussock-based wetlands and grey shrubland interspersed with rare tiny remnants of original forest cover and scattered ephemeral ponds (Bibby 1997, Thorsen pers. obs.). The remaining indigenous vegetation communities currently present within the Macraes area are botanically diverse (Thorsen 2008) and are comprised of 621 indigenous plant species (including 17 Data Deficient, 82 At Risk and 30 Threatened species) and 236 exotic plant species, likely the highest per hectare diversity of rare plant species of any area in New Zealand².

² This is partly at least a result of the multitude of surveys that have occurred in this part of the Ecological District by staff of the Department of Conservation involved in the grand and Otago skink programme and ecologists working on mining projects. For example, Dr Thorsen has contributed over 13,600 plant observations for the area since 2004.

4.3 Existing pressures and threats

The vegetation communities present are likely to be derived from the original vegetation communities that existed prior to human colonisation of the region, but many are likely to be considerably reduced in extent and species diversity. Invasion by exotic shrub and tree species, particularly gorse and broom are a developing issue. Loss of natural vegetation cover continues, particularly through ploughing of tussock grassland and planting of winter feed crops and pine plantation, and sporadic fires (which can affect large areas due to the dry nature of the vegetation) (Thorsen pers. obs.).

4.4 Changes in vegetation extent in the Macraes E.D.

The extent of the vegetation communities in the Macraes E.D. is changing over time. Table 4 gives the estimated change in extent for the plant communities present in the Impact Area. The area within refined mapping of the Macraes E.D. of shrubland (includes both Manuka and/or Kanuka and Matagouri or Grey Scrub vegetation classes) has increased by 3.3% in recent times while tussock grassland has decreased by 1.9% and wetlands (as defined by LCDB) decreased by 7.4%. In the Otago region (the area for where analysis is available) the decrease in tussock grassland is through conversion to exotic forest but no information is available on what communities were replaced by the increase in shrubland or what wetlands were replaced with (a measure of the 'reason' for wetland loss). Information is not available to meaningfully assess changes in the other vegetation communities.

Table 4. Changes in extent in the Macraes E.D. between 2018 and 2023 of the indigenous vegetation communities present in the MP4FT ESF based on LCDB5 mapping. A “?” denotes a vegetation community present in MP4FT but which are not mapped in the Land Cover Database.

Vegetation Community	Area within Macraes E.D. in 2018	Area within Macraes E.D. in 2023 ³	% change in extent
Ephemeral Wetland	?	162.39 ⁴	?
Riparian vegetation	?	?	?
Shrubland	4,284	4,425	3.3
Tussockland	11,357	11,144	-1.9
Wetland	446	413	-7.4

³ The resolution of the imagery and methodology used in the mapping changed during this period (see Land Cover Database (LCDB) USER GUIDE 1). These changes may have influenced the designation and delineation of sites which could affect the percentage change calculations between the two measurement periods, particularly for vegetation represented typically by small polygons (such as wetlands).

⁴ Based on mapping conducted by Whirika Consulting Ltd during the 2019 Deepdell North III project

4.5 Climate Change

The climate at Macraes is likely already changing as a result of greenhouse gas accumulation in the atmosphere. The likely effects of this on the climate in Otago has been modelled by the Otago Regional Council⁵ which predicts an increase in sunshine hours and dry days with less wind for the area at Macraes vicinity⁶. Greater frequency and severity of storm effects is also expected.

Overseas, climate changes are resulting in widespread changes to ecosystem productivity, species interactions, vulnerability to biological invasions, and changes in morphology and behaviour, phenology, and range shifts of species^{7,8}. In New Zealand, information on observed effects of a changing climate on terrestrial biota is scarce but is likely to include habitat fragmentation, shifts in the altitudinal zone of alpine biodiversity, drought effects on indigenous fish and the effect of extreme weather events on species with very small populations^{9,10} and these effects could be exacerbated by changes in pest abundance and also resource use¹¹. The outcome of a changing climate on the biodiversity at Macraes is unknown but is likely to include similar effects to that observed elsewhere. There are likely to be effects at a variety of levels such as changes in community extent and structure as well as species-specific effects. An increase in aridity in the Macraes environment could lead to a reduction in distribution of narrow-leaved tussock grassland as this community requires a reasonable degree of soil moisture. This will also predispose it to easier clearance by fires and ploughing. Shrub communities will also be more vulnerable to fires, especially if the dry conditions lead to an increase in fire frequency and severity. Some of the long-inundation ephemeral wetland vegetation communities could shift from a sedge and copper tussock dominated vegetation to a low herb vegetation community more typical of short-inundation ephemeral wetlands. Riparian vegetation communities are likely to be reduced in extent as a result of less water within watercourses.

These ecosystem-level effects will have flow-on effects on the species which inhabit them, in addition to direct climate-related effects on individuals and populations. Of particular concern are species where the Macraes E.D. houses the bulk of the known population. This includes flora such as *Cardamine dilatata*, *Wurmbea novae-zelandiae*, *Crassula peduncularis*, *Lagenophora schmidiae*, *Simplica laxa*, *Euchiton ensifer*, *Celmisia hookeri*, and *Gingidia grisea*.

⁵ https://www.orc.govt.nz/media/7591/niwa_climatechangereport_2019_final.pdf

⁶ Though Macraes is on the boundary with a more coastal zone where rainfall is expected to increase and so dry days will be less. The prevalence of El Niño and La Niña conditions (and other long-term climate cycles such as the Interdecadal Pacific Oscillation and the ozone-influenced Southern Annular Mode) will also influence local weather.

⁷ <https://doi.org/10.1016/j.scitotenv.2020.137782>

⁸ <https://spj.science.org/doi/10.1080/20964129.2018.1530054>

⁹ <https://dx.doi.org/10.20417/nzjcol.46.10>

¹⁰ <https://researchspace.auckland.ac.nz/bitstream/handle/2292/54890/fee.2285.pdf?sequence=1&isAllowed=y>

¹¹ <https://www.doc.govt.nz/documents/science-and-technical/sap257.pdf>

4.6 Identified protected areas and notable sites

The Impact Area includes no Ramsar Sites, no Wetlands of National Importance, and no Wetland Management Areas or Regionally Significant Wetlands listed in Schedule 9 of the Regional Plan: Water for Otago. Two sites that overlap the Impact Area were identified by Bibby (1997) as Recommended Areas for Protection (RAPs):

- RAP4 — Trimbells Gully, which overlaps with the Coronation Mining Area project component;
- RAP7 — Golden Bar, part of which overlaps the 80 m buffer of the Golden Bar Haul Road.

The Coronation 6 Pit area lies within the Dunedin City Council 2GP, but contains no areas formally identified as Areas of Significant Biodiversity Value by the DCC. The Central and Golden Bar Mining Areas lie within the Waitaki District, but contain no areas formally identified as Significant Natural Areas under the Waitaki District Plan.

Four ephemeral wetland sites identified during the earlier Macraes Phase III consent process (locally referred to as 'Protected Wetland 3', 'Protected Wetland 4', 'Protected Wetland 5', and 'Protected Wetland 6', all of which have been fenced to exclude cattle) overlap the Innes Mills Pit Extension Stage 12 footprint or the Macraes Road Realignment 20 m buffer. Protected Wetland 6 is within 20 m of the indicative location of the Golden Bar Road realignment. Protected Wetlands 3 and 4 are known to have high indigenous floristic diversity.

4.7 Threatened Environment Classification

The Threatened Environment Classification (TEC) (Walker et al. 2015) combines data from the Land Environments of New Zealand (LENZ), the Land Cover Database (LCDBv5), and the national protected areas network into a six-category map of New Zealand. TEC categories 1–5 are 'Threatened land environments' (less than 30% of original indigenous cover remaining and/or less than 20% of land legally protected); category 6 includes environments where indigenous cover has been less reduced and protection levels are higher.

Five Level IV LENZ categories underlying areas with a cover of indigenous vegetation are present in the impact area of the ESF (Table 5), two of which are currently classified nationally as Threatened Land Environments: The Acutely Threatened TEC 1 (< 10% indigenous cover left) LENZ N3.1e and Chronically Threatened TEC 2 (10–20% indigenous cover left) LENZ Q4.3b, the At Risk TEC 3 (20–30% indigenous cover left) LENZ Q4.3a, the Critically Underprotected TEC 4 (>30% indigenous cover left and <10% protected) Q2.2a and the Less Reduced and Better Protected TEC 6 (>30% indigenous cover left and >20% protected) Q3.3c. Land environments N3.1e, Q4.3b and Q4.3a are widely distributed in the Macraes area with greater than 20,000 ha (though an unknown quantity is overlain by indigenous vegetation) and the MP4 project components are situated in extensive areas but the less threatened Q2.2a and Q3.3c are of limited extent in the Macraes E.D. (659 ha and 271 ha, respectively) (Figure 3).

Table 5. Threatened Environment Classifications in the impact area of the Impact Area where indigenous vegetation occurs. All areas are given in hectares.

Mining Area	Project Component	Land Environment NZ Level 4 identifier	Threatened Environment Class	Threatened Environment Class descriptor	Extent in Impact Area	Extent in Macrae's E.D.
Coronation North	80m Buffer	N3.1e	1	< 10% indigenous cover left	19.79	35,792.7
		Q2.2a	4	> 30 % left and < 10% protected	2.30	658.5
		Q3.3c	6	> 30 % left and > 20% protected	0.97	270.5
		Q4.3a	3	20-30% indigenous cover left	9.19	22,404.6
	Coronation North Pit (Stage 5)	N3.1e	1	< 10% indigenous cover left	0.10	35,792.7
	Coronation North Pit Disturbance	N3.1e	1	< 10% indigenous cover left	29.79	35,792.7
		Q2.2a	4	> 30 % left and < 10% protected	0.54	658.5
		Q3.3c	6	> 30 % left and > 20% protected	0.93	270.5
		Q4.3a	3	20-30% indigenous cover left	2.69	22,404.6
	Coronation North Pit Extension (Stage 6)	N3.1e	1	< 10% indigenous cover left	1.32	35,792.7
	Coronation North WD2	N3.1e	1	< 10% indigenous cover left	0.09	35,792.7
	Coronation Pit Backfill	N3.1e	1	< 10% indigenous cover left	7.01	35,792.7

Mining Area	Project Component	Land Environment NZ Level 4 identifier	Threatened Environment Class	Threatened Environment Class descriptor	Extent in Impact Area	Extent in Macraes E.D.
		Q4.3a	3	20-30% indigenous cover left	0.00	22,404.6
	Coronation Pit Extension (Stage 6)	N3.1e	1	< 10% indigenous cover left	1.90	35,792.7
	Coronation Pit Extension (Stage 7)	N3.1e	1	< 10% indigenous cover left	10.89	35,792.7
	Coronation Pit Extension (Stage 8)	N3.1e	1	< 10% indigenous cover left	2.44	35,792.7
	Trimbells Waste Rock Stack Height Raise and Extension	N3.1e	1	< 10% indigenous cover left	18.23	35,792.7
		Q4.3a	3	20-30% indigenous cover left	7.44	22,404.6
Golden Bar	20m Buffer	N3.1e	1	< 10% indigenous cover left	0.68	35,792.7
		Q4.3a	3	20-30% indigenous cover left	1.57	22,404.6
		Q4.3b	2	10-20% indigenous cover left	0.58	22,955.5
	80m Buffer	N3.1e	1	< 10% indigenous cover left	3.91	35,792.7
		Q4.3a	3	20-30% indigenous cover left	5.62	22,404.6
		Q4.3b	2	10-20% indigenous cover left	5.16	22,955.5
	Golden Bar Pit Disturbance	N3.1e	1	< 10% indigenous cover left	2.12	35,792.7

Mining Area	Project Component	Land Environment NZ Level 4 identifier	Threatened Environment Class	Threatened Environment Class descriptor	Extent in Impact Area	Extent in Macraes E.D.
		Q4.3a	3	20-30% indigenous cover left	2.31	22,404.6
		Q4.3b	2	10-20% indigenous cover left	0.25	22,955.5
	Golden Bar Pit Extension Stage 2	N3.1e	1	< 10% indigenous cover left	0.21	35,792.7
		Q4.3a	3	20-30% indigenous cover left	0.59	22,404.6
	Golden Bar Pit Extension Stage 3	N3.1e	1	< 10% indigenous cover left	1.39	35,792.7
		Q4.3a	3	20-30% indigenous cover left	0.09	22,404.6
	Golden Bar Waste Rock Stack Extension	N3.1e	1	< 10% indigenous cover left	9.44	35,792.7
		Q4.3a	3	20-30% indigenous cover left	4.97	22,404.6
		Q4.3b	2	10-20% indigenous cover left	0.62	22,955.5
Golden Bar Haul Road	20m Buffer	N3.1e	1	< 10% indigenous cover left	4.65	35,792.7
		Q4.3a	3	20-30% indigenous cover left	1.63	22,404.6
		Q4.3b	2	10-20% indigenous cover left	1.03	22,955.5
Golden Bar Haul Road	80m Buffer	N3.1e	1	< 10% indigenous cover left	21.21	35,792.7

Mining Area	Project Component	Land Environment NZ Level 4 identifier	Threatened Environment Class	Threatened Environment Class descriptor	Extent in Impact Area	Extent in Macraes E.D.
		Q4.3a	3	20-30% indigenous cover left	5.36	22,404.6
		Q4.3b	2	10-20% indigenous cover left	3.94	22,955.5
	Golden Bar Haul Road	N3.1e	1	< 10% indigenous cover left	0.02	35,792.7
		Q4.3a	3	20-30% indigenous cover left	0.00	22,404.6
		Q4.3b	2	10-20% indigenous cover left	0.04	22,955.5
Macraes Central	80m Buffer	N3.1e	1	< 10% indigenous cover left	4.64	35,792.7
	Innes Mills Backfill	N3.1e	1	< 10% indigenous cover left	0.18	35,792.7
	Innes Mills Pit (Stage 10)	N3.1e	1	< 10% indigenous cover left	0.31	35,792.7
	Innes Mills Pit Disturbance	N3.1e	1	< 10% indigenous cover left	2.08	35,792.7
	Innes Mills Pit Extension (Stage 11)	N3.1e	1	< 10% indigenous cover left	1.50	35,792.7
	Innes Mills Pit Extension (Stage 12)	N3.1e	1	< 10% indigenous cover left	0.97	35,792.7
	Macraes Road Realignment Stage 1	N3.1e	1	< 10% indigenous cover left	0.02	35,792.7
	Macraes Road Realignment Stage 2	N3.1e	1	< 10% indigenous cover left	0.11	35,792.7

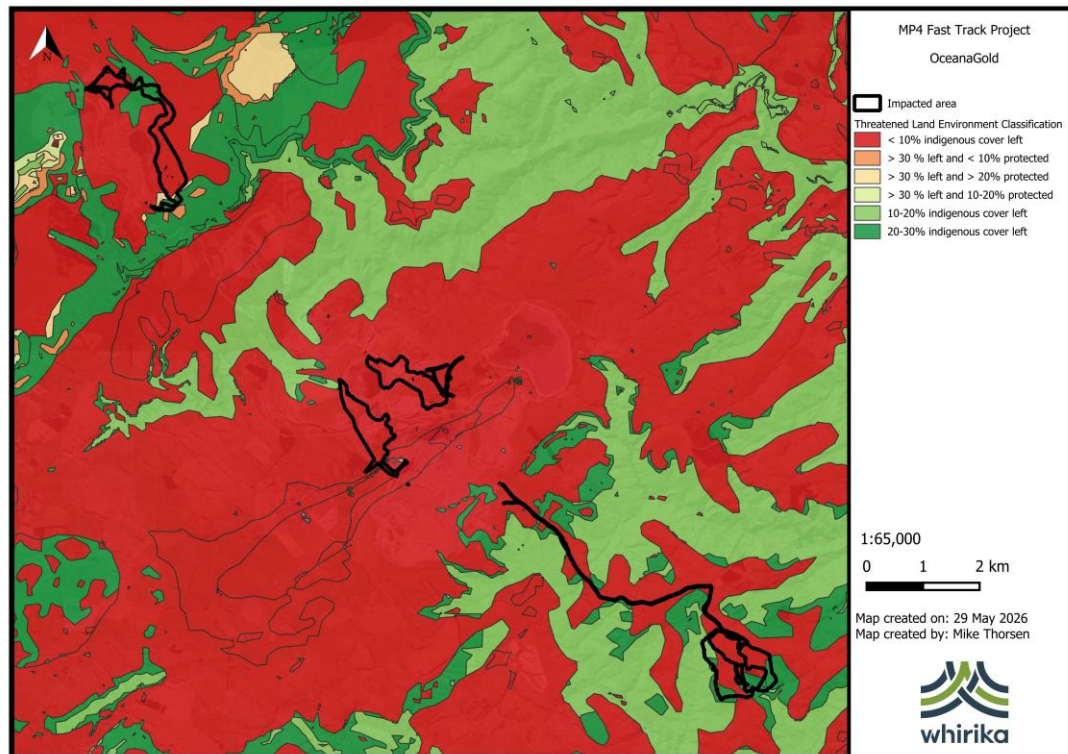


Figure 3. Threatened Environment Threat Classifications in the vicinity of the MP4FT project.

5 MP4FT Project Flora Ecological Values

5.1 Vegetation Communities

5.1.1 Overview

The extent of vegetation communities within the current non-consented Impact Area is summarised in Tables 6 and 7. Table 7 provides the detailed assessment-area and component breakdown, including the precautionary 20 m allowance and the surrounding survey or records buffer. Descriptions of vegetation types are provided in Section 5.3, representative photographs in Appendix 2, and mapping in Figures 4 to 7.

Within the approximately 319.76 ha non-consented Impact Area, mapped indigenous or semi-natural vegetation covers about 97.6 ha, exotic-dominated vegetation covers about 138.8 ha, and existing or recent mine workings and roads cover about 83.4 ha. These categories are approximate and reflect the current mapped assessment scope; wetland extents affected through hydrological pathways are addressed separately in the integrated EclA and Wetland Residual Effects Analysis.

Ecological significance is addressed in Section 6; the overall ecological value assigned under the EclAG is provided in Section 7. Representative photographs are referenced in Appendix 2.

Table 6. Areal extent (ha) of indigenous and exotic vegetation communities by mining area within the current non-consented Impact Area. Compiled from current OGNZL GIS data and field verification undertaken between 2016 and 2026. Detailed component-level data are provided in Table 7.

Mining Area and Project Component	Coronation North Impacted Area	Golden Bar Impacted Area	Golden Bar Haul Road Impacted Area	Macraes Central Impacted Area	Camp Creek Reservoir	Coal Creek Reservoir	Project Total Impacted Area (Impacted Footprint + 20m Buffer)
Exotic Grassland	9.83	52.04	22.51	45.76			130.1
Gorse	0.09	0.06		0.54			0.68
Mine - disturbed	4.47	2.72	0.74	64.72			72.7
Pine	0.02			1.17			1.19
Pine forest (felled)	5.8						5.8
Pond	0.02	0.19		0.13			0.35
Rehabilitated mine workings	0.08	0.14		0.01			0.24
Road	0.24	1.22	5.75	3.32			10.5
Woody Exotic				0.59			0.59
Exotic/Disturbed Total	20.56	56.37	29	116.24			222.2
Ephemeral Wetland	0.39	0.13	0.876	0.551			1.28
Riparian – Freshwater Herbaceous	0.8						0.8
Riparian - Copper Tussock	0.08						
Riparian - Sedgeland	0.11	0.37					0.48
Riparian - Shrubland	0	0.01					0.01
Rock	0.17	0.08	0.01				0.26
Shrubland	2.67	0.23	0.02	0.05			2.96
Tussock - Dense	59.75	14.87	2.5	1.67			78.8
Tussock - Moderately Dense	3.49	6.02	1.01	0.7			11.2
Wetland - Copper Tussock						0.215	0.215
Wetland - Freshwater Herbaceous	0.45	0.41	0.01	0.03	0.196	2.501	3.607
Wetland - Sedgeland	0.3	0.39	0.01	0.12	0.051	0.27	1.231
Wetland - Seepage	0.02						0.02
Wetland - Shrubland	0.01	0.01					0.02
Indigenous Total	68.15	22.52	3.71	3.2	0.247	2.986	97.6
Total	88.7	78.9	32.7	119.4	0.247	2.986	319.8

Table 7. Detailed vegetation and habitat extents within the current non-consented Impact Area (direct impact footprint plus the 20 m precautionary allowance where applied) and the surrounding 80 m flora-records buffer. Impact-area and buffer totals are presented separately and are not additive.

Mining Area and Project Component	Impacted area	Exotic Grassland	Gorse	Mine - disturbed	Pine	Pine forest (felled)	Pond	Rehabilitated mine workings	Road	Woody Exotic	Exotic/Disturbed Total	Ephemeral Wetland	Riparian – Freshwater Herbaceous	Riparian - Red Tussock	Riparian - Sedgeland	Riparian - Shrubland	Rock	Shrubland	Tussock - Dense	Tussock - Moderately Dense	Wetland - Freshwater Herbaceous	Wetland - Sedgeland	Wetland - Seepage	Wetland - Shrubland	Indigenous Total	Total
Coronation North Impacted Area		9.83	0.09	4.47	0.02	5.80	0.02	0.08	0.24		20.56	0.39	0.80		0.11	0.00	0.17	2.67	59.75	3.49	0.45	0.30	0.02	0.01	68.15	88.7
20m Buffer		0.85		0.08		0.002			0.01		0.94		0.05		0.001		0.04	0.58	7.53	0.30	0.12	0.02			8.64	9.6
80m Buffer		5.71	0.08	0.20		0.27			0.27		6.53		0.32	0.08			0.14	3.08	27.19	1.12	0.22	0.12			32.25	38.8
Coronation North Pit (Stage 5)		0.04		0.09							0.13								0.10						0.10	0.23
Coronation North Pit Disturbance		4.93	0.07	2.38	0.02	5.80	0.02	0.05	0.01		13.28	0.39	0.12				0.06	0.02	31.03	2.01	0.17	0.16			33.96	47.2
Coronation North Pit Extension (Stage 6)		0.41		0.39				0.04			0.85							0.01	1.14	0.17					1.32	2.16
Coronation North WD2		0.02		0.02							0.04							0.09	0.003						0.09	0.13
Coronation Pit Backfill		0.84	0.01	0.65	0.01	2.06					3.57	0.11					0.01		6.33	0.36	0.07	0.14			7.01	10.6
Coronation Pit Extension (Stage 6)		0.70	0.01	0.67	0.004	2.14					3.51	0.04							1.84	0.01	0.01				1.90	5.41
Coronation Pit Extension (Stage 7)		1.74	0.01	0.67	0.01	4.00					6.42	0.14					0.003		10.16	0.41	0.07	0.10			10.89	17.3
Coronation Pit Extension (Stage 8)		0.98		0.59	0.002	2.24	0.02				3.83								2.44						2.44	6.27
Trimbells Waste Rock Stack Height Raise and Extension		4.05	0.02	2.08				0.04	0.22		6.40		0.63		0.11		0.08	2.05	21.33	1.19	0.16	0.11	0.02	0.01	25.66	32.1
Golden Bar Impacted Area		52.04	0.06	2.72			0.19	0.14	1.22		56.37	0.13			0.37	0.01	0.08	0.23	14.87	6.02	0.41	0.39		0.01	22.52	78.9
20m Buffer		8.25					0.05	0.97			9.27	0.04			0.03		0.05	0.15	1.36	1.18	0.01	0.00			2.83	12.1
80m Buffer		17.79		0.003			0.002	0.41			18.20	0.001			0.37		0.91	1.61	6.58	5.18	0.02	0.04			14.70	32.9

Mining Area and Project Component	Impacted area	Exotic Grassland	Gorse	Mine - disturbed	Pine	Pine forest (felled)	Pond	Rehabilitated mine workings	Road	Woody Exotic	Exotic/Disturbed Total	Ephemeral Wetland	Riparian - Freshwater Herbaceous	Riparian - Red Tussock	Riparian - Sedge/land	Riparian - Shrubland	Rock	Shrubland	Tussock - Dense	Tussock - Moderately Dense	Wetland - Freshwater Herbaceous	Wetland - Sedge/land	Wetland - Seepage	Wetland - Shrubland	Indigenous Total	Total
Golden Bar Pit Disturbance		18.38	0.01	2.73			0.05	0.22			21.39	0.01			0.36	0.01	0.02	0.01	2.84	1.27	0.13	0.01		0.02	4.68	26.1
Golden Bar Pit Extension Stage 2		3.55		2.56				0.07			6.18				0.01		0.002		0.32	0.46	0.02				0.81	6.99
Golden Bar Pit Extension Stage 3		9.16		1.95			0.05	0.20			11.37					0.01	0.01		1.08	0.31	0.08	0.003			1.49	12.9
Golden Bar Stockpile		1.21						0.01			1.23															1.23
Golden Bar Waste Rock Stack Extension		23.86	0.05				0.14	0.10			24.14	0.08			0.32		0.01	0.06	10.67	3.57	0.28	0.05			15.03	39.2
Golden Bar Haul Road Impacted Area		22.51		0.74					5.75		29.00	0.876					0.01	0.02	2.50	1.01	0.01	0.01			3.71	32.7
20m Buffer		17.08		0.70					1.99		19.77	0.14					0.01	0.02	2.44	1.01	0.01	0.01			3.65	23.4
80m Buffer		57.05	0.21	0.88	0.01				2.09		60.23	0.97	0.15				0.29	0.24	18.58	9.30	0.41	0.65	0.01		30.59	90.8
Golden Bar Haul Road		5.96		0.04					4.02		10.02								0.05	0.01					0.06	10.1
Macraes Central Impacted Area		45.76	0.54	64.72	1.17		0.13	0.01	3.32	0.59	116.24	0.551						0.05	1.67	0.70	0.03	0.12			3.20	119.4
20m Buffer		8.9	0.1	4.9	0.0		0.0		0.5		14	1.346							0.4	0.2	0.0	0.0			1	15.0
80m Buffer		19.22	0.03	8.89	0.48		0.24	0.98	0.59	1.28	31.71						0.01		2.54	0.50	0.08	0.13			3.26	35.0
Frasers West Waste Rock Stack				0.04							0.04															0.04
Golden Bar Backfill				0.001							0.001															0.001
Innes Mills Backfill		3.11	0.09	5.88	0.22				0.11	0.10	9.52								0.06	0.12					0.18	9.70
Innes Mills Pit (Stage 10)		2.55		1.43					0.37		4.35								0.13	0.18					0.31	4.65
Innes Mills Pit (Stage 9)		0.38		2.34							2.72															2.72

Mining Area and Project Component	Impacted area	Exotic Grassland	Gorse	Mine - disturbed	Pine	Pine forest (felled)	Pond	Rehabilitated mine workings	Road	Woody Exotic	Exotic/Disturbed Total	Ephemeral Wetland	Riparian - Freshwater Herbaceous	Riparian - Red Tussock	Riparian - Sedge/land	Riparian - Shrubland	Rock	Shrubland	Tussock - Dense	Tussock - Moderately Dense	Wetland - Freshwater Herbaceous	Wetland - Sedge/land	Wetland - Seepage	Wetland - Shrubland	Indigenous Total	Total
Innes Mills Pit Disturbance		34.09	0.39	60.82	1.02		0.07		2.20	0.57	99.17	0.40						0.05	1.09	0.45	0.03	0.07			2.08	101.3
Innes Mills Pit Extension (Stage 11)		10.14	0.13	10.08	0.18		0.04		1.00		21.56							0.05	1.02	0.34	0.03	0.07			1.50	23.1
Innes Mills Pit Extension (Stage 12)		11.67	0.09	2.95					1.78		16.48	0.551							0.49	0.34	0.03	0.03			0.97	17.5
Innes Mills Pit Extension (Stage 13)		6.25		24.51					0.66		31.42															31.4
Macraes Road Realignment Stage 1		1.24		0.37					0.38		1.99								0.01	0.01					0.02	2.01
Macraes Road Realignment Stage 2		3.68	0.06	1.44	0.18		0.01		0.17		5.55								0.03	0.02	0.01	0.05			0.11	5.66
Mixed Tailings Impoundment		0.01		2.65							2.66															2.66
Southern Pit Backfill																										
Southern Pit Option 10 and 11 Tailings Storage Facilities		0.08		1.61							1.70															1.70
Project Total Impacted Area (Impacted Footprint + 20m Buffer)		130.1	0.68	72.7	1.19	5.80	0.35	0.24	10.5	0.59	222.2	1.28	0.80		0.48	0.01	0.26	2.96	78.8	11.2	0.91	0.83	0.02	0.02	97.6	319.8

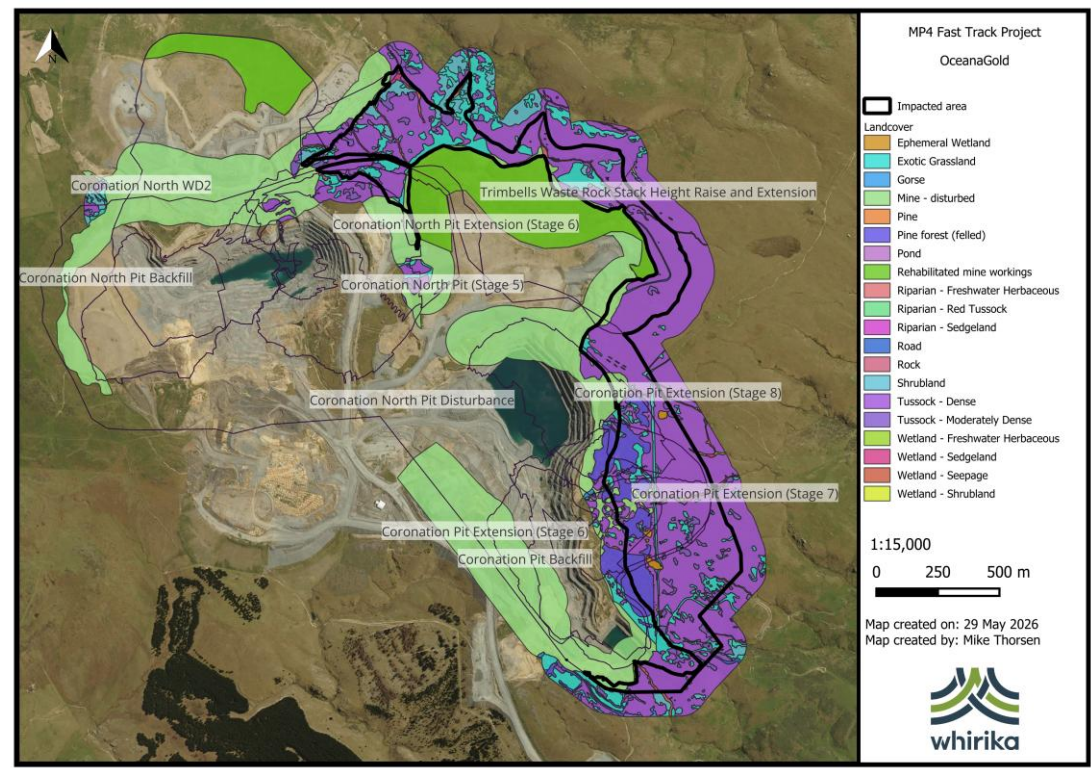


Figure 4. Landcover within the Coronation Mining Area Impact Area and a surrounding 80 m buffer area. Project Component boundaries marked with thin lines, new impacted area (impacted footprint + 20 m buffer) as thick black line

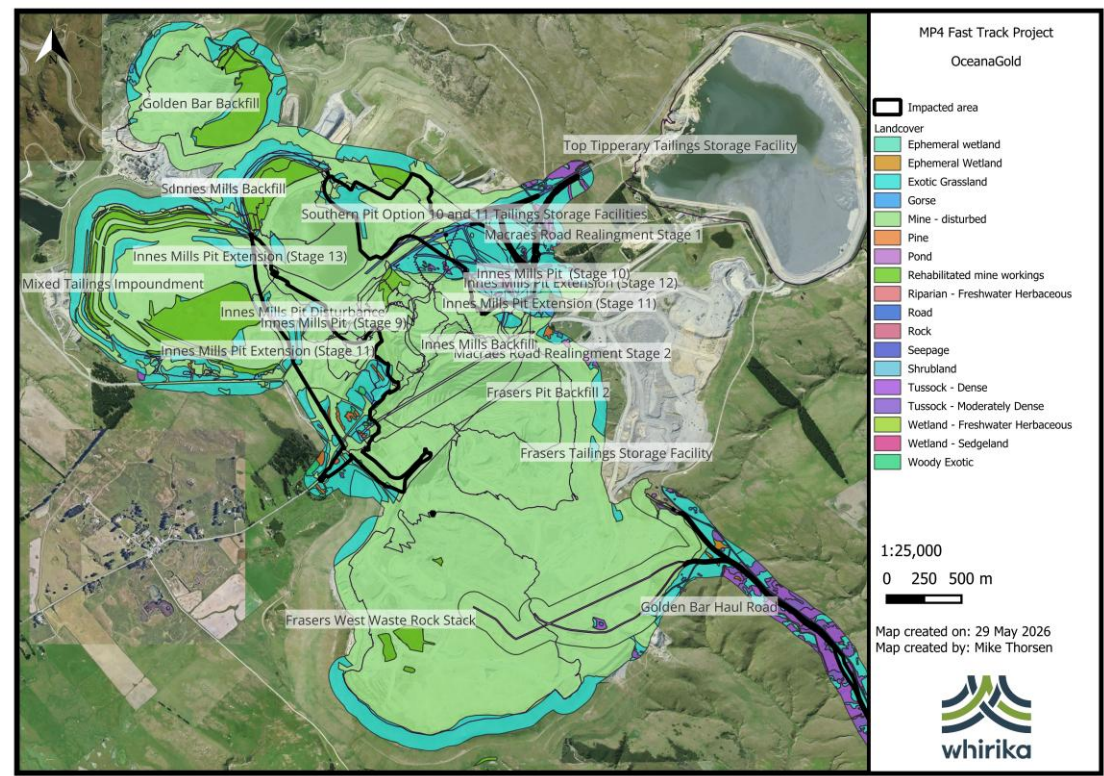


Figure 5. Landcover within the Central Mining Area Impact Area and a surrounding 80 m buffer area. Project Component boundaries marked with thin lines, assessed Impact Area (direct footprint plus the 20 m precautionary allowance) as thick black line

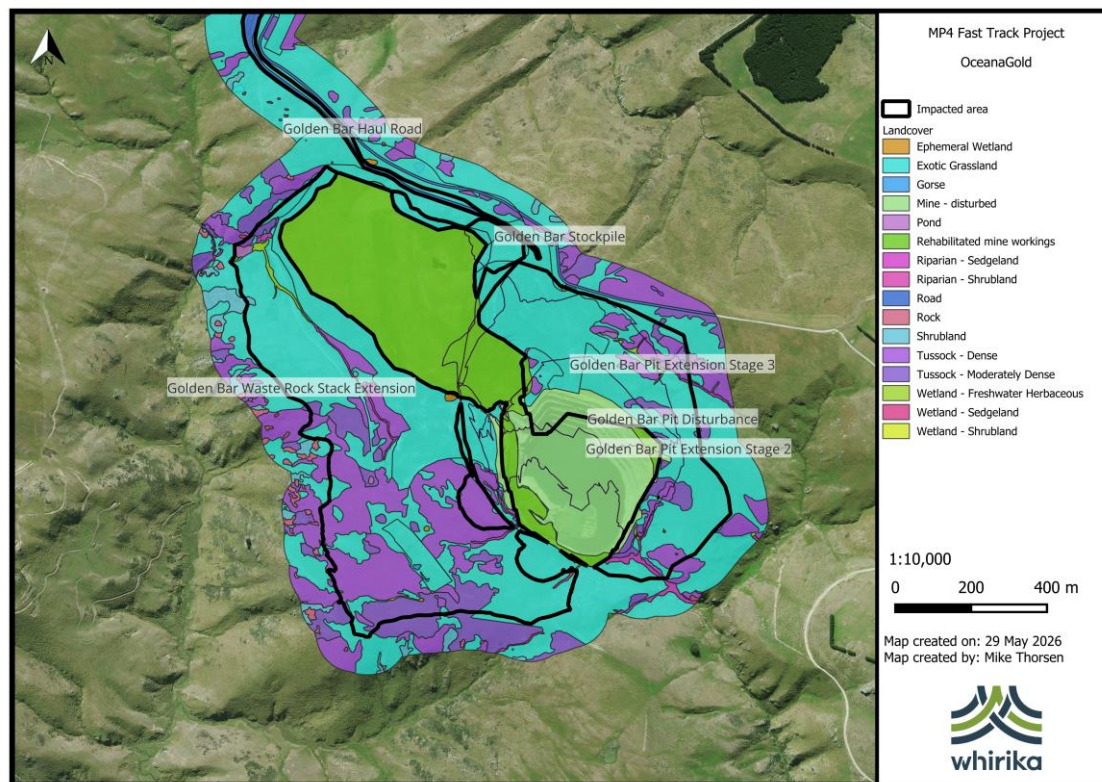


Figure 6. Landcover within the Golden Bar Mining Area Impact Area and a surrounding 80 m buffer area. Project Component boundaries marked with thin lines, assessed Impact Area (direct footprint plus the 20 m precautionary allowance) as thick black line

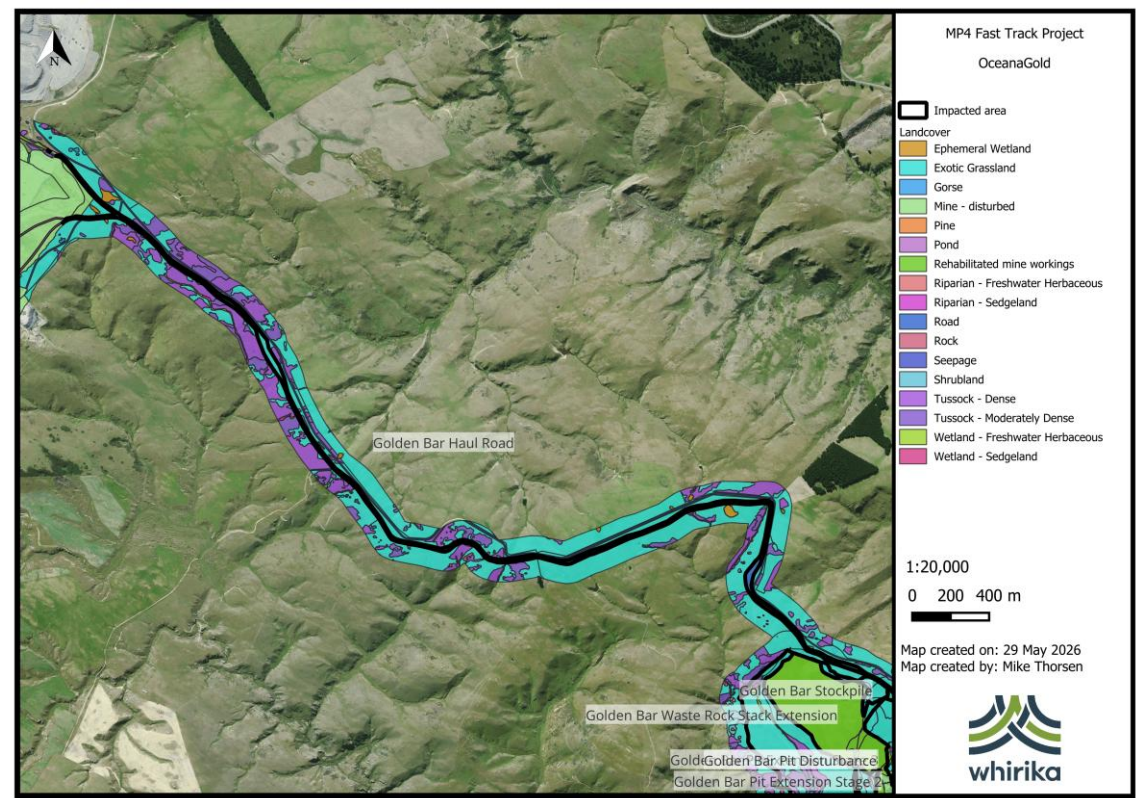


Figure 7. Landcover within the Golden Bar Haul Road Impact Area and a surrounding 80 m buffer area. Project Component boundaries marked with thin lines, assessed Impact Area (direct footprint plus the 20 m precautionary allowance) as thick black line

5.2 Description of Project vegetation communities

5.2.1 Coronation Mining Area Ecological Features

210 indigenous plant species were recorded in the Coronation Mining Area.

The impacted portion of the Coronation Mining Area is predominantly comprised of narrow-leaved tussock grassland with smaller areas of shrubland, riparian vegetation, wetlands, ephemeral wetlands and exotic grassland, pine, road and previous mine workings (Figure 4). Most of the indigenous vegetation communities are in the Coronation North pit Disturbance, Coronation Pit Extension (Stage 7) and Trimbells WRS Height Raise areas.

Narrow-leaved tussock grassland covers 63.24 ha of the Coronation Mining Area and 7.83 ha of the 20 m buffer. Mostly this is comprised of 50 cm to 1 m tall low stature tussock at up to 80% cover with areas of higher stature and cover on south-facing slopes in the Trimbells Gully vicinity. Inter-tussock species reflect the higher elevation of the site and are mostly exotic herbs and grasses. The area between the heritage fence (which runs roughly north-south and bisects the footprint area) and the Coronation Pit and the area adjacent to the Coronation North Pit has been degraded by past mine activities (parts are within the Zones of Influence of the 2016 Coronation North and Coronation Extension and the Coronation North Extension), and permitted exploratory pit drilling and pine felling and windrowing.

Shallow incised gullies contain drier riparian communities such as low herbaceous communities (0.8 ha), copper tussock (0.08 ha), and *Carex secta* sedgeland (0.11 ha). In seasonally wet or damp parts of these watercourses are riparian wetland vegetation communities comprising areas of low herbaceous vegetation (0.45 ha), *Carex secta*-dominated areas (0.3 ha) or seepage wetland (0.02 ha) a total of 0.78 ha of riparian wetland. These sites are often dominated by exotic grasses, rushes and sedges but some areas have higher preponderance of indigenous species. Some areas are bordered by *Polystichum vestitum* fernland.

Four ephemeral wetlands with a combined coverage of 0.0.39 ha are present in the Coronation Mining Area footprint, one in the Coronation North Pit Disturbance Area and three in the Coronation Pit Extensions area. One ephemeral wetland covering 0.04 ha that has been previously impacted by past and current mine activity occurs partly within the Coronation 6 Pit project and is now occupied by an increased density of pasture species as a result of past mine activities. A 0.02 ha site that has been previously impacted (through some dewatering, vehicle movements and dust) by past and current mine activity occurs in the buffer area and is now occupied by an increased density of pasture species as a result of past mine activities to the extent it no longer qualifies as a natural inland wetland. It is near a more natural 0.16 ha example which is more distant from the existing pit edge. Both the 0.04 ha and 0.16 sites at Coronation Pit Extension and the Coronation North Pit Disturbance sites are natural inland wetlands as defined in the NPS-FM. The ephemeral wetlands are mostly dominated by browntop *Agrostis capillaris*, *Carex leporina* and floating sweetgrass *Glyceria fluitans* with c. 23% cover by the At Risk – Naturally Uncommon *Agrostis*

pallescens, and have scattered representation by indigenous species including extensive patches of the At Risk – Naturally Uncommon grass *Agrostis pallescens* (especially in the 0.04 ha and 0.16 ha sites), the herbs *Myriophyllum propinquum*, *Gonocarpus micranthus* and buttercup *Ranunculus amphotrichus* and the sedges *Carex sinclairii*, *Carex gaudichaudiana* and *Eleocharis acuta*. The ephemeral wetlands within the Coronation 6 Pit are within the ESF of the 2016 Coronation North Project¹², which included the Stage 5 extension of Coronation Pit, and described impacts to all ephemeral wetlands within the ESF. The actual effects to date of the 2016 Coronation North Project on these ephemeral wetlands has been a degree of dewatering and consequent ecological change, especially of the two closest to the pit edge.

Shrubland is present at a few scattered localities, mainly in the Trimbells WRS Height Raise area. These shrublands are mostly composed of 0.5 – 1 m tall matagouri of various density intermixed with narrow-leaved tussock grasses and with rare plants of *Carmichaelia petriei* and cover 2.67 ha.

The vegetation in the general vicinity of the Coronation Mining Area is of higher ecological intactness than much of the Ecological District and is known to harbour a number of rare plant species and plant communities, including the only known site where one species (*Cardamine dilitata*) persists. This is predominantly due to the higher elevation of the site and past farm practices in the area. The area is predominantly covered in narrow-leaved tussock grassland, with some large pine plantations, and areas of cultivated pasture. The areas of cultivated pasture retain no indigenous plant value, but the cultivation does not usually extend down into the gullies and so these sites retain their vegetation values. The tussock grassland was subject to a heavy fire about 15 years ago and over large areas has not regained its stature or density since then. Areas of shrubland and herb communities exist mainly along the gullies or rocky areas, but extensive diffuse matagouri shrubland exists in many areas. The geology of the area includes extrusions of volcanic rock of the Dunedin Volcanic Group (for example at Highlay Hill, Sister Peaks and Station Hill) and the species composition of the natural vegetation communities are influenced by the type of basement rock. The plant communities occurring on these volcanic rocks are considered unusual in a regional context being known only at scattered sites from the Kakanui Mountains to southern Taieri Ridge. Seepage wetlands frequently occur on these volcanic outcrops in these areas, particularly at the contact zone with the schist basement rock. Some ephemeral wetlands (mostly of the long-inundation type) occur in the area and there are some examples of copper tussock grassland in wetter areas (such as on the slopes of Sifers Peaks). This plant community is rare in an Otago community. Rare plant species are mostly found in gullies or rock outcrops, with fewer in other natural plant communities. The natural plant communities are primarily under threat from agricultural practices and weed invasions and are reduced in extent from that present in the previous decade. Recent mining has contributed to the loss.

¹² Coronation North Project: Assessment of Environmental Effects, 24 May 2016.

5.2.2 Central Mining Area Ecological Features

146 indigenous plant species were recorded in the Central Mining Area.

Within the impacted portion of the Central Mining Area footprint and buffer are ephemeral wetlands, shrubland, narrow leaved tussock grassland and riparian wetlands as well as exotic gorse and woody weed patches, pine forest, and large areas of exotic grassland and improved pasture which are dominated by the exotic cocksfoot grass *Dactylis glomerata*, thistles (*Cirsium vulgare*, *Cirsium arvense*), Yorkshire fog grass *Holcus lanatus*, rye grass *Lolium perenne*, chickweed *Cerastium fontanum*, sweet vernal grass *Anthoxanthum odoratum* (Figure 5). Patches of recently disturbed ground are colonised by hedge parsley *Torilis japonica* and mayweed *Tripleurospermum inodorum*.

The 2.37 ha of narrow-leaved tussock grassland 50 cm to c. 1 m tall in height and with approximately 90% ground cover in association with scattered speargrass *Aciphylla aurea*, matagouri *Discaria toumatou*, creeping pohuehue vine *Muehlenbeckia complexa*, hard tussock *Festuca novae-zelandiae* and buttercup *Ranunculus multiscapus* with extensive exotic grasses and herbs providing much of the ground cover. The tussock grassland becomes sparser towards the east and patches of gorse *Ulex europaeus*, broom *Cytisus scoparius* and currant *Ribes sanguinolentum* are present in this area.

The 0.15 ha of riparian wetland vegetation is mostly dominated by exotic wetland grasses and herbs but there is 0.12 ha of *Carex secta* sedgeland and a few groups of toetoe *Cortaderia fulvida* and individuals of the shrub *Olearia bullata*. Some of this area would qualify as a natural inland wetland under the NPS-FM.

Within the Innes Mills area riparian wetlands totalling 0.15 ha in extent that are dominated by exotic wetland herbs and grasses and the sedge *Carex sinclairii* and scattered toetoe *Austroderia richardii* and one small grove of *Olearia bullata* shrubs and 0.12 ha of *Carex secta* sedgeland.

A 0.05 ha area of 1 m tall moderately dense matagouri shrubland with some *Olearia bullata* on the gully slopes is present in one area near the main Macraes Road.

0.551 ha of short-inundation type ephemeral wetland vegetation are within, overlap or are immediately adjacent to the Innes Mills Pit Extension (Stage 12) footprint. A further 1.346 ha overlaps the 20m buffer area or the Innes Mills Pit Disturbance area. These sites have a variable cover by indigenous ephemeral wetland species including *Carex gaudichaidiana*, *Lobelia ionantha*, *Lobelia perpusilla*, *Ranunculus amphitichus*.

The Central Mining Area has long been the focus on mining which has transformed the local plant communities. Outside of the mined areas and the extensive cultivated pasture, patches of indigenous vegetation persist as remnants which become elongated and extensive in gullies,

particularly those that are steep-sided. Some localised larger areas of narrow-leaved tussock remain, but these have frequently been historically impacted by burning and most are of low-stature. A number of ephemeral wetlands occur in the area, but most are highly degraded by weed invasion. Several long-inundation type (one adjacent to the Macraes Road and the others in the cranky Jims Wetland Covenant) and two short-inundation type ephemeral wetlands (both adjacent to the Macraes Road) retain significant indigenous vegetation communities. These wetlands are some of very few higher-naturalness examples known of schist-based ephemeral wetlands which only occur in the Otago Region. Rare plants are known to occur in scattered locations (particularly in gullies) and are probably much more widespread than mapped in this area. One of the largest known populations of the rare broom *Carmichaelia petriei* occurs in the Back Road area.

5.2.3 Golden Bar Mining Area Ecological Features

78 indigenous plant species were recorded in the Golden Bar and Golden Bar Haul Road project area.

Within the impacted portion of the Golden Bar Mining Area footprint and buffer are areas of narrow-leaved tussock grassland, riparian wetland, rock, shrubland, ephemeral wetlands, and riparian plant communities (Figure 6).

Narrow-leaved tussock grassland covers 20.89 ha of the impacted area. Mostly this is comprised of 50 cm to 1 m low stature tussock at up to 80% cover. Cover by tussock grasses is higher and with greater inter-tussock diversity on the shaded faces.

Two small areas of shrubland occur in the Golden Bar WRS. The 0.017 ha site includes diverse shrubland of *Coprosma crassifolia*, *Muehlenbeckia complexa* and *Rubus schmidelioides* var. *subpauperatus*, together with the Data Deficient shrub *Melicytus* 'Otago' and the locally uncommon vine *Fuchsia perscandens* (Table 9; Figure 13). A second 0.04 ha patch of low shrubs, including *Muehlenbeckia complexa*, *Melicytus alpinus* and matagouri, is present on the western edge of the WRS.

Shallow incised gullies containing seasonally wet or damp watercourses support water-dependent riparian wetland vegetation over approximately 0.81 ha. These sites are dominated by exotic grasses, rushes and sedges, with frequent *Carex secta pedestals* and occasional *Olearia bullata* shrubs (Table 9; Figure 13). Much of the wetland area in the Golden Bar WRS is induced and associated with deposition of the current WRS and the sediment-treatment pond. Drier parts of the gullies support mixed exotic and indigenous riparian sedges, herbs and ferns. Some small rock outcrops along tributaries are not mapped but provide habitat for *Celmisia hookeri*.

Three natural short-inundation type ephemeral wetlands covering 0.064 ha are present within the Golden Bar WRS Extension footprint. These are all occupied by exotic plant species, mostly the grass *Alopecurus geniculatus*. Another 0.015 ha man-made example is present on the current WRS and within the new Golden Bar WRS Extension footprint. This site is occupied by exotic herbs but the indigenous stonecrop *Crassula sinclairii* and the herb *Limosella lineata* are present. A further 0.014 ha natural example is present in the Golden Bar Pit Disturbance area

The Golden Bar Mining Area is located in an area of extensive, farmed, narrow-leaved tussock grassland that extends from the hill tops above the Shag River south to the Taieri Gorge on parts of the flat-topped Waipounamu Erosion Surface and the ruggedly steep deeply-incised tributaries of the Waikouaiti River. Within this area there are pockets of pasture grassland and infestations of gorse and broom are becoming more extensive and prolific. The tussock has been burnt repeatedly historically and recent wildfires have impacted some large area. On the darker southern face of gullies the tussocks are often tightly spaced and of tall stature. Shrubland and other indigenous vegetation communities are mostly restricted to rocky areas but some extensive matagouri shrubland are present in places. Regeneration of broadleaf *Griselinia littoralis* forest from isolated

remnants is occurring at some sites. Ephemeral Wetlands are scattered throughout the area, but most known examples are highly degraded by weed invasion.

5.2.4 Golden Bar Haul Road

Within the impacted portion of the Golden Bar Road Realignment footprint and 20 m buffer are mostly areas of narrow-leaved tussock grassland (3.51 ha) and exotic grassland (22.51 ha) with smaller areas in the 20 m buffer of riparian wetland, rock, shrubland, ephemeral wetlands, and riparian wetland plant communities (Figure 7). The ephemeral wetlands that are present or extend into the 20 m buffer includes seven sites totalling 0.876 ha. These ephemeral wetlands are dominated by exotic grasses and herbs with very low diversity and cover of indigenous species. Impact on all these sites can be avoided during project activities.

The shrubland patches are low-stature matagouri with some *Coprosma propinqua* and *Muehlenbeckia complexa*.

5.2.5 Camp Creek Reservoir wetlands

Wetlands in the Coal Creek Reservoir cover 0.247 ha and are mostly exotic-dominated rushes, herbs and grasses with some areas of swards of the indigenous sedge *Carex geminata* (Figure 8).

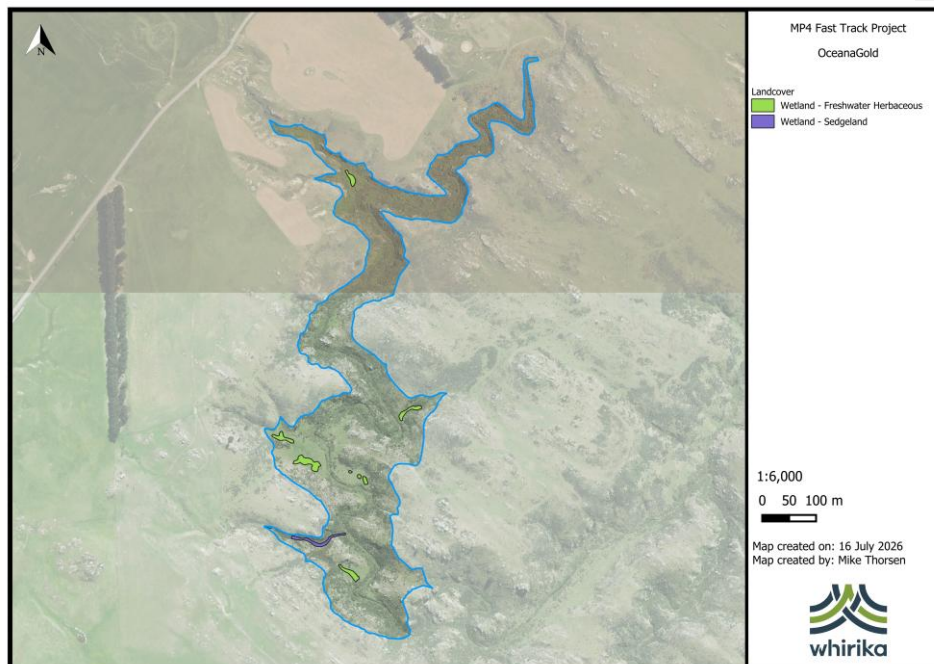


Figure 8. Wetland communities within the Camp Creek inundation area.

5.2.6 Coal Creek Reservoir wetlands

At the Coal Creek reservoir wetlands cover 2.986 ha and are comprised of a mosaic of freshwater herbaceous (including in places swards of *Carex geminata*), *Carex secta*-dominated sedgeland and *Chionochloa rubra* subsp. *Cuprea* copper tussock-dominated areas which in places are very inter-mixed (Figure 9). The freshwater herbaceous community includes areas of pasture grasses that, while individual plots in a few places met the pasture-exclusion criteria, are classified as part of the wetland mosaic as they are not forming patches of a size that they merited exclusion as pasture. This wetland is notable as containing one of the largest populations in Otago of the sedge *Carex kaloides* and areas of copper tussock – a vegetation community now very rare in the Ecological District and several other Threatened, At Risk or rare species occur within the wetland communities or in the non-affected parts of the wetland. The bluff community, though not part of a wetland, needs to be noted as providing habitat for a number of Threatened, At Risk or rare species, including two plants of the Regionally Critical cress *Cardamine dilitata* – which is part of the only known population in New Zealand which only occurs within a very small area including at this site..

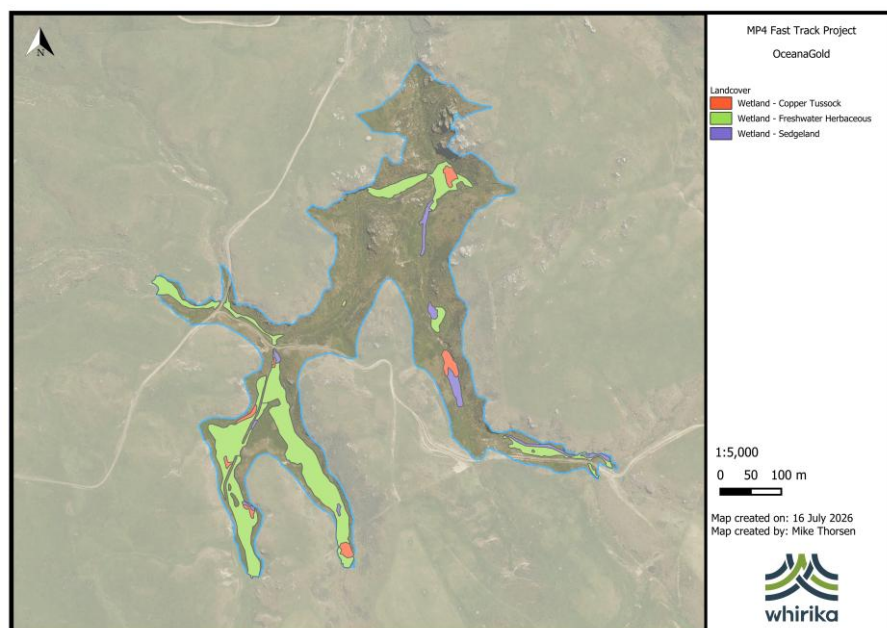


Figure 9. Wetland communities within the Coal Creek inundation area.

5.3 Descriptions of vegetation communities and notable habitat features

This section describes each vegetation community and notable habitat feature recorded in the Impact Areas, including the dominant species, structure, distribution within the Macraes E.D., and the values that distinguish it. Information on the rare plant species associated with each community is summarised in Section 4.4 and is detailed in Appendix 3.

5.3.1 Ephemeral wetlands (WL14)

Ephemeral wetlands are naturally occurring depressions that hold water for part of the year and support characteristic turf-forming or short herbaceous vegetation. They are classified by Singers and Rogers (2014) as WL14: Herbfeld [Ephemeral wetland] and are recognised as a Naturally Uncommon and Critically Endangered ecosystem (Williams et al. 2007, Holdaway et al. 2012). They are a National Priority for Protection under the Statement of National Priorities for Protecting Rare and Threatened Biodiversity on Private Land (MfE & DOC 2007). Ephemeral wetlands are known habitat for a number of rare plants^{13,14}, but at Macraes rare plants are present only in a few of the sites that have been inspected and seem to be lost from sites following invasion by sward forming grasses. They may be particularly at risk of this if grazing is removed (Author pers. obs.).

Various forms of ephemeral wetlands are found throughout New Zealand, but those formed in depressions on schist bedrock are restricted to Central Otago (Johnson and Rogers 2003). Schist-based ephemeral wetlands are most common in the Strath Taieri area and are particularly grouped in the Redbank Scenic Reserve, Paddy's Rock, Cranky Jims, Sutton and Styx areas. Within the Macraes E.D., mapping for the Deepdell North III Project (2019) identified 1,360 ephemeral wetlands covering 162.39 ha (with a further 218 possible examples), mostly in the southern and western parts of the E.D. The Project's Impact Area contains both ephemeral wetland sub-types:

- Long-inundation sub-type — retains water for longer periods (typically into early summer) and develops a deeper organic or peat soil base. Vegetation is typically taller, dominated by sedges (e.g. *Carex sinclairii*, *Carex gaudichaudiana*, *Eleocharis acuta*), grasses (*Glyceria fluitans*, the At Risk – Naturally Uncommon *Agrostis pallescens*), and herbs (*Myriophyllum propinquum*, *Gonocarpus micranthus*, *Ranunculus amphitrichus*). The four ephemeral wetlands in the Coronation Mining Area new footprint (0.39 ha total) are of this sub-type;
- Short-inundation sub-type — has a shallower profile and water is not retained during the driest part of the year. The vegetation is primarily turf-forming species and includes scattered occurrences of the indigenous herbs *Crassula sinclairii* and *Limosella lineata* and others. Examples occur within the Golden Bar Waste Rock Stack Extension footprint

¹³ Johnson, P. and Rogers, G. (2003) Ephemeral wetlands and their turfs in New Zealand. Science for Conservation, 230, Department of Conservation.

¹⁴ Gosden, J.L. et al. 2026. Ephemeral wetlands in Aotearoa | New Zealand kettle holes: geographic range, botanical biodiversity values and underlying land tenures. NZ J. Ecology 50: 1-14.

(0.008 ha across 3 sites), within the Innes Mills Stage 12 footprint (0.95 ha), and within the Golden Bar Haul Road impacted area and buffer (0.88 ha across 7 sites).

At Macraes, the two sub-types grade from short-inundation to long-inundation and ultimately into depression-based wetlands supporting copper tussock (*Chionochloa rubra* subsp. *cuprea*) and purei (*Carex secta*), reflecting a long-term geophysical succession

Ephemeral wetlands at Macraes are mainly under threat from invasion by exotic grasses (especially *Glyceria fluitans*, *Alopecurus geniculatus*), cultivation, and cattle pugging. Sheep grazing is thought to be possibly beneficial to short-inundation vegetation by reducing competition from taller exotic species. The ephemeral wetlands within the Coronation 6 Pit Impact Area lie within the previously-consented 2016 Coronation North Project, which addressed effects on these features. Existing effects on these wetlands include some dewatering and consequent ecological change, especially of the two ephemeral wetlands closest to the existing pit edge.

The impact of this project on ephemeral wetlands of this type will result in an approximately 0.8% reduction in extent of the vegetation community in the Macraes E.D. and about a c. <0.1% reduction in the number of sites within the Macraes E.D.

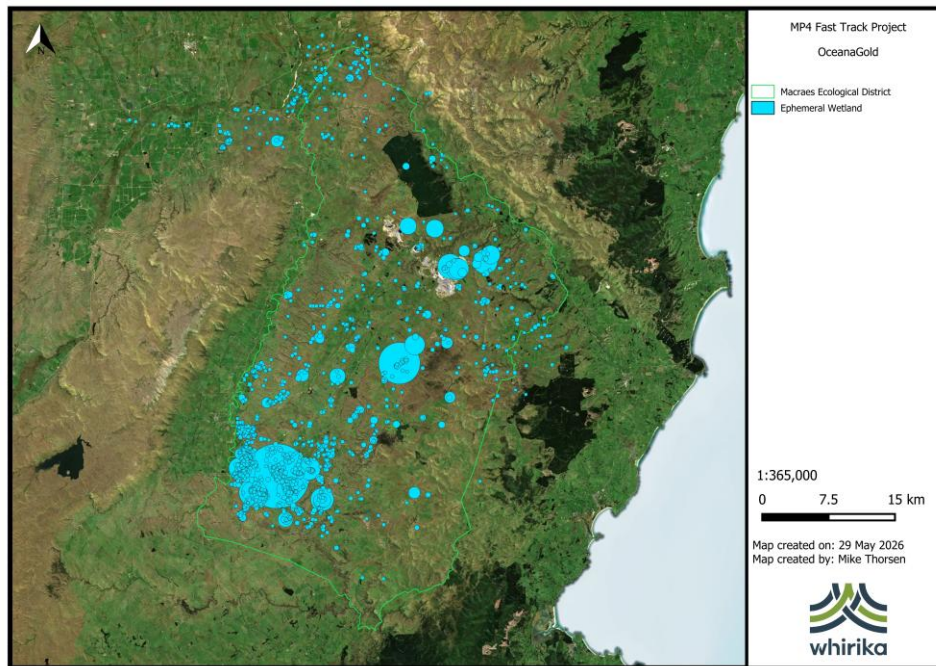


Figure 10. Mapped locations and size of ephemeral wetlands in the vicinity of Macraes E.D. Symbol size based on mapped area of the wetland and is centred on wetland location.

5.3.2 Seepage wetlands

Seepage wetlands occur within the Coronation Mining Area. They are characterised by permanent or near-permanent shallow groundwater discharge from below, supporting moss-dominated mats and herbaceous flora. They are a Naturally Uncommon and Endangered ecosystem under Williams et al. (2007) and Holdaway et al. (2012) and are a National Priority for Protection under MfE & DOC (2007). They have very restricted distribution at Macraes (and nationally). The 0.02 ha example in the Coronation 6 Pit Impact Area is therefore considered to be of High ecological value at the local scale.

5.3.3 Rock outcrops and tors CL8: *Helichrysum*, *Melicytus* shrubland/tussockland/rockland

Rock outcrops and tors occur on the schist basement. They support a distinctive vegetation community of ferns and small herbs adapted to thin soils and exposed conditions. They also support populations of nationally Threatened or At Risk species including *Celmisia hookeri*. Rock outcrops are classified by Singers and Rogers (2014) as CL8: *Helichrysum*, *Melicytus* shrubland/tussockland/rockland.

5.3.4 Narrow-leaved tussock grassland

Narrow-leaved tussock grassland in the Macraes E.D. is probably a human-induced analogue of AL1: Narrow-leaved and slim snow tussockland/shrubland (Singers and Rogers 2014). It has developed after early Māori burning of pre-existing dryland forest (McGlone 1989) followed by European-era burning, oversowing and fertiliser application.

This vegetation community is currently mapped from satellite photography as covering 11,144 ha in the Macraes E.D.¹⁵ and the area within the Impact Area represents 0.1% of this extent. Between 2018 and 2023, the Landcover Database (LCDB V6) mapped tussockland coverage had decreased by 1.9% (in the previous 5 years it had increased by 2.7%) in the Macraes E.D. Tussock grassland appears to be currently decreasing in extent with widespread clearance to create improved pasture or pine plantation.

In the Coronation Mining Area this vegetation community covers 63.69 ha of the Coronation Mining Area new footprint. Comprises 50 cm to 1 m tall low-stature tussock at up to 80% cover, with areas of higher stature and cover on south-facing slopes. Inter-tussock species reflect the higher elevation of the site and include both indigenous herbs (*Aciphylla aurea*, *Carmichaelia petriei*) and exotic herbs and grasses. The area between the heritage fence and the Coronation Pit has been

¹⁵ All extents of vegetation for the Macraes E.D. are calculated using updated mapping of the Macraes E.D. boundary to better reflect the boundary in the PNAP report.

previously degraded by past mine activities, permitted exploratory drilling, and pine felling/windrowing;

In the Golden Bar Mining Area and Haul Road this vegetation community covers 20.89 ha of the Golden Bar Mining Area new footprint, plus 3.51 ha within the Golden Bar Haul Road new footprint. Comprises 50 cm to 1 m low-stature tussock at up to 80% cover in association with scattered speargrass (*Aciphylla aurea*), matagouri (*Discaria toumatou*), creeping pohuehue vine (*Muehlenbeckia complexa*), hard tussock (*Festuca novae-zelandiae*) and buttercup (*Ranunculus multiscapus*), with extensive exotic grasses and herbs in the inter-tussock spaces. Tussock cover is higher and inter-tussock diversity is greater on shaded south-facing slopes. Tussock grassland becomes sparser towards the east and patches of gorse, broom and currant are present.

The Central Mining Area component contains a further 2.37 ha of narrow-leaved tussock grassland of a similar condition to that in the Golden Bar Haul Road and Golden Bar Mining Area.

5.3.5 Shrublands

Shrubland in the Impact Area is anthropogenic, originating following early Māori burning of dryland forest (McGlone 1989) followed by repeated burning and fertiliser application of narrow-leaved tussock grassland. It is well-represented on lower-elevation hillslopes of Central Otago, though its extent is being reduced in places by conversion to pasture, invasion by exotic woody species (particularly broom), and (in places) repeated burning. It is well-known in the Macraes area as being seral and quickly invading farmland unless prevented from doing so. Its extent is greatly affected by farming profitability — when profitability is high and woody-weed control is well-resourced, shrublands are constrained; when profitability is low, large areas of low-diversity, low-stature shrublands can develop.

Shrubland is currently mapped from satellite imagery as covering 4,425 ha in the Macraes E.D., and the area within the ESF represents <<0.001% of this extent. Between 2018 and 2023, shrubland coverage increased by 3.3% (in the previous 5 years it had decreased by 5.3%) in the Macraes E.D. Within the Impact Area, the shrubland is composed primarily of 0.5–1 m tall matagouri (*Discaria toumatou*) of various density intermixed with narrow-leaved tussock, with locally important populations of the At Risk – Declining *Carmichaelia petriei* (desert broom). A small 0.017 ha shrubland patch in the Golden Bar WRS includes the Data Deficient shrub *Melicytus* aff. *alpinus* (CHR 541568; 'Otago') and the Locally Uncommon vine *Fuchsia perscandens*. A 0.05 ha area of 1 m tall moderately dense matagouri shrubland with some *Shawia bullata* occurs on the gully slopes near the main Macraes Road in the Central Mining Area.

This type of shrubland is not separately classified by Singers and Rogers (2014) but is most likely analogous to CDF2 (Dracophyllum, mountain celery pine, Shawia, Hebe scrub) or T12 (Kānuka, Shawia scrub/treeland) in pre-disturbance terms.

5.3.6 Riparian vegetation and wetland vegetation

Gully side riparian vegetation and gully-based wetland vegetation occurs in the shallow incised gullies, watercourses and valley floors within the IMPACT AREA. It is not separately classified by Singers and Rogers (2014). Several sub-communities in both the riparian (gully-side) vegetation community and the wetter wetland vegetation community are distinguished here based on dominant structure and composition:

- Riparian – Herbaceous and Wetland - Freshwater Herbaceous — dominated by low herbs, sedges and exotic grasses; widely distributed in Otago and analogous with riparian communities in other regions; intactness influenced by grazing, particularly cattle, and degraded through weed invasion. Covers 0.8 ha of riparian vegetation and 0.91 ha of wetland habitat within the new Impact Area;
- *Carex secta* sedgeland — dense stands of pukio (*Carex secta*) pedestals (analogous to WL19 of Singers and Rogers 2014); some examples in the Innes Mills area within the Central Mining Area; covers 0.48 ha riparian vegetation and 0.83 ha wetland;
- *Shawia bullata* shrubland — small clumps of the regionally At Risk – Declining *Shawia bullata* (analogous to WL18); occurs as small patches associated with sedgeland in the Central Mining Area and Golden Bar; covers 0.01 ha riparian vegetation and 0.02 ha wetland;

These sites are often dominated by exotic grasses, rushes and sedges, but some areas have a higher preponderance of indigenous species. Some areas are bordered by *Polystichum vestitum* fernland. These areas are mostly considered natural inland wetlands under the NPSFM, on the basis of dominant wetland indicator species (OBL or FACW), limited pasture species presence, signs of high water tables (moist soils, high bryophyte cover), and occurrence in gully heads above the river classification threshold, but some areas, particularly at the head of gullies meet the pasture exclusion criteria and, in these cases, are assigned to the riparian – herbaceous community.

In the Camp Creek Reservoir, the wetlands are mostly exotic-dominated rushes, herbs and grasses with some areas of swards of the indigenous sedge *Carex geminata*.

In the Coal Creek Reservoir, the wetlands are a mosaic of the three wetland sub-communities which in places are very inter-mixed and include areas of pasture grasses that, while individual plots in a few places met the pasture-exclusion criteria, it was felt that they were part of the wetland mosaic and not forming patches of a size that they merited exclusion as pasture. This wetland is notable as containing one of the largest populations in Otago of the sedge *Carex kaloides* and areas of copper tussock – a vegetation community now very rare in the Ecological District.

5.3.7 Exotic vegetation, mine-modified ground and water bodies

Exotic-dominated plant communities, mine-modified ground and water bodies together cover approximately 69% of the current non-consented Impact Area. These include:

- Rough pasture (low-producing exotic grassland) — extensive areas dominated by cocksfoot (*Dactylis glomerata*), Yorkshire fog (*Holcus lanatus*), browntop (*Agrostis*

capillaris), ryegrass (*Lolium perenne*) and various exotic herbs (*Cerastium fontanum*, *Trifolium* spp.). Patches of recently disturbed ground are colonised by hedge parsley (*Torilis japonica*) and mayweed (*Tripleurospermum inodorum*);

- Cultivated pasture and winter feed crops — improved pasture and brassica winter crops, particularly in the Central Mining Area;
- Gorse (*Ulex europaeus*) and broom (*Cytisus scoparius*) infestations — present in scattered patches especially in the Central Mining Area;
- Pine plantation and felled pines — *Pinus radiata* with occasional *Pseudotsuga menziesii* in the Coronation 6 Pit area;
- Ponds, roads, mine workings (operational and recently rehabilitated) — including the Frasers West WRS, Mixed Tailings Impoundment, and the existing Coronation North Pit (Stage 5) which is already consented;
- Rehabilitated WRS — primarily browntop and cocksfoot, with some tussock on parts of the original Golden Bar and Tipperary WRS.

These exotic vegetation communities contain very few indigenous plant species and are not considered further as values in this report, except where a Threatened, At Risk or locally uncommon plant species has been recorded at the site (in which case the site is referenced in Appendix 3 species accounts).

5.3.8 Ecological integrity

The Impact Area is part of a mosaic of natural and exotic vegetation communities that are found throughout the wider Macraes area. Several of the natural vegetation communities in the Macraes E.D. are decreasing in extent due to conversion to pasture. They are also being degraded through weed invasion, which is being facilitated by repeated burning, changes in stocking, and fertiliser application. Exotic mammals and invertebrates are likely to be having both a negative (through browsing of plants and preventing regeneration) and positive effect (through maintaining some plant communities by suppressing competing weed species). In areas where sheep grazing and land management practices has been continued in a similar fashion for many years the vegetation appears to reach a semi-stable state with a high diversity of both indigenous and exotic species.

Overall, the vegetated area of the Impact Area has a Naturalness Index of 0.58 (i.e., approximately 58% of the area is covered by indigenous species) with the highest Naturalness Index at the Coronation Mining Area (0.65) and the lowest in the Central Mining Area (0.50). Few areas within the Central Mining Area are reasonably ecologically intact, but the areas of shrubland and tussockland at Golden Bar and especially at Coronation retain much more naturalness. There is some impact in most areas from ongoing grazing by sheep and cattle. The Impact Area is likely to be playing some role in supporting a metapopulation of some plant species, but the extent and type of this role is unknown and likely to vary between species. To some extent the outer margin of the Impact Area buffers the surrounding vegetation from mining effects.

5.3.9 Botanical diversity

Botanical diversity is moderate relative to comparable habitats in the Macraes Ecological District, with 259 indigenous and 136 exotic species recorded across the surveyed area. Because the survey and assessment boundaries have changed during Project development, species richness is not expressed here as a rate per hectare for the former 513 ha footprint. Comparisons with nearby covenants should be interpreted cautiously because survey extent, effort and habitat composition differ among sites.

Table 6. Comparison of botanical diversity and naturalness at sites within the Macraes area

Site	Area assessed (ha)	# indigenous species	# exotic species	Indigenous species / hectare ⁻¹	Naturalness Index
Coronation Mining Area	88.63	210	87	2.4	0.65
Central Mining Area	119.43	146	112	1.2	0.50
Golden Bar Mining Area	78.80	78	49	1.0	0.53
Deepdell North	109.4	71	78	0.6	0.40
Coronation North ESF	494	175	78	0.4	0.62
Cranky Jims Shrubland Covenant	47.1	98	39	2.1	0.65
Cranky Jims Wetland Covenant	97.3	92	40	0.9	0.61
Deepdell Tussock Covenant	109.8	108	37	1.0	0.72
Highlay Creek Covenant	16.9	52	47	3.1	0.55

5.4 Threatened, At Risk, or uncommon species

Fifty Threatened, At Risk, Data Deficient or locally uncommon plant species are recorded within the MP4 zone of influence. This comprises 22 Regionally Threatened species, 9 Regionally Declining species, 13 Regionally Naturally Uncommon species, 4 Regionally Data Deficient species and 2 locally uncommon species. Twenty-nine TAR species occur within the direct-loss footprint; other records occur within the 20 m allowance or the wider 80 m flora-records buffer. Table 9 summarises status and recorded locations. Appendix 3 contains legacy accounts for 33 of these species and is not a complete account of the current 50-species schedule.

Twenty-two Regionally Threatened species occur within the zone of influence, comprising 2 Regionally Critical, 10 Regionally Endangered and 10 Regionally Vulnerable species. Their

OceanaGold – MP4FT: vegetation values

relationship to the direct footprint, 20 m allowance and wider buffer must be retained because not all records represent direct loss.

Table 9. Threatened, At Risk, Data Deficient and locally uncommon plant species recorded within the MP4 zone of influence. National status follows de Lange et al. (2024), regional status follows Jarvie et al. (2026), and ecological value follows the EIANZ method. Record locations distinguish the direct footprint from surrounding buffers where the source data permit.

Regional Threat Ranking (2026)	National Threat Ranking (2023)	Current Name + Authority	Ecological Value	Coronation North	Golden Bar	Golden Bar Haul Road	Macraes Central	Coal Creek Reservoir
Regionally Critical	Nationally Vulnerable	Carmichaelia corrugata Colenso	Very High	4				
Regionally Critical	Nationally Endangered	Hypericum rubicundulum Heenan	Very High	3		1		
Regionally Endangered	Declining	Carex kaloides Petrie	Very High	2				8
Regionally Endangered	Declining	Carex tenuiculmis (Petrie) Heenan & de Lange	Very High	6		7	6	
Regionally Endangered	Declining	Euchiton ensifer (D.G.Drury) Holub	Very High				4	
Regionally Endangered	Declining	Gratiola aff. concinna (AK 251855; South Island)	Very High				1	
Regionally Endangered	Declining	Lagenophora barkeri Kirk	Very High	8	1		1	
Regionally Endangered	Declining	Leptinella pusilla Hook.f.	Very High	1				
Regionally Endangered	Declining	Lobelia ionantha Heenan	Very High				7	
Regionally Endangered	Declining	Rytidosperma thomsonii (Buchanan) Connor & Edgar	Very High	1	1			
Regionally Endangered	Nationally Vulnerable	Sonchus aff. novae-zelandiae (a) (CHR 517718; "grassland")	Very High	1				
Regionally Endangered	Nationally Endangered	Wurmbea novae-zelandiae (Hook.f. ex Kirk) Lekhak, Survesw. & S.R.Yadav	Very High				1	
Regionally Vulnerable	Declining	Acaena buchananii Hook.f.	Very High	1				
Regionally Vulnerable	Declining	Aciphylla subflabellata W.R.B.Oliv.	Very High	1	1	1	1	
Regionally Vulnerable	Declining	Deschampsia cespitosa (L.) P.Beauv.	Very High	10			6	
Regionally Vulnerable	Declining	Epilobium chionanthum Hausskn.	Very High			4		
Regionally Vulnerable	Declining	Epilobium insulare Hausskn.	Very High	1	1		3	2
Regionally Vulnerable	Declining	Euchiton polylepis (D.G.Drury) Breiwt. & J.M.Ward	Very High	1				
Regionally Vulnerable	Naturally Uncommon	Juncus pusillus Buchenau	Very High				5	
Regionally Vulnerable	Not Threatened	Lachnagrostis striata (Colenso) Zotov	Very High				6	

Regional Threat Ranking (2026)	National Threat Ranking (2023)	Current Name + Authority	Ecological Value	Coronation North	Golden Bar	Golden Bar Haul Road	Macraes Central	Coal Creek Reservoir
Regionally Vulnerable	Not Threatened	Lobelia perpusilla Hook.f.	Very High				6	
Regionally Vulnerable	Declining	Pterostylis tristis Colenso	Very High	1				
Regionally Declining	Declining	Anthosachne falcis (Connor) Barkworth & S.W.L.Jacobs	High	4			1	
Regionally Declining	Not Threatened	Carex dipsacea Berggr.	High				2	
Regionally Declining	Declining	Carmichaelia petriei Kirk	High	21	35	7		
Regionally Declining	Naturally Uncommon	Gingidia grisea Heenan	High		1			
Regionally Declining	Not Threatened	Juncus distegus Edgar	High	3	1		8	
Regionally Declining	Declining	Mentha cunninghamii Benth.	High	2			1	
Regionally Declining	Not Threatened	Microlaena stipoides (Labill.) R.Br.	High				1	
Regionally Declining	Declining	Shawia lineata	High	1				
Regionally Declining	Declining	Rytidosperma buchananii (Hook.f.) Connor & Edgar	High	1				
Regionally Naturally Uncommon	Naturally Uncommon	Agrostis pallescens Cheeseman	Moderate	31				
Regionally Naturally Uncommon	Not Threatened	Argyrotegium mackayi (Buchanan) J.M.Ward & Breitw.	Moderate				1	
Regionally Naturally Uncommon	Naturally Uncommon	Brachyscome longiscapa G.Simpson & J.S.Thomson	Moderate	5				
Regionally Naturally Uncommon	Naturally Uncommon	Carex purpurata (Petrie) K.A.Ford	Moderate			1		
Regionally Naturally Uncommon	Naturally Uncommon	Celmisia hookeri Cockayne	Moderate	18	20	4	1	1
Regionally Naturally Uncommon	Not Threatened	Epilobium komarovianum H.Lév.	Moderate				3	
Regionally Naturally Uncommon	Not Threatened	Euchiton traversii (Hook.f.) Holub	Moderate				4	
Regionally Naturally Uncommon	Not Threatened	Gentianella amabilis (Petrie) Glenn	Moderate				1	
Regionally Naturally Uncommon	Not Threatened	Lilaeopsis ruthiana Affolter	Moderate				2	

Regional Threat Ranking (2026)	National Threat Ranking (2023)	Current Name + Authority	Ecological Value	Coronation North	Golden Bar	Golden Bar Haul Road	Macraes Central	Coal Creek Reservoir
Regionally Naturally Uncommon	Not Threatened	Shawia bullata	Moderate	7			1	
Regionally Naturally Uncommon	Not Threatened	Poa pusilla Berggr.	Moderate	1				
Regionally Naturally Uncommon	Declining	Ranunculus aff. reflexus (CHR 394270; Mt Peel)	Moderate		1			
Regionally Data Deficient	Naturally Uncommon	Cardamine grandiscapa Heenan	Moderate		1			
Regionally Data Deficient	Not Threatened	Geranium homeanum Turcz.	Moderate				1	
Regionally Data Deficient	Not Threatened	Juncus australis Hook.f.	Moderate				1	
Regionally Data Deficient	Data Deficient	Melicytus aff. alpinus (c) (CHR 541568; Otago)	Moderate	1	2			
Regionally Data Deficient	Not Threatened	Oxalis rubens Haw.	Moderate	1				
Locally Uncommon	Not Threatened	Fuchsia perscandens	Low					
Locally Uncommon	Not Threatened	Sophora microphylla	Low		1			

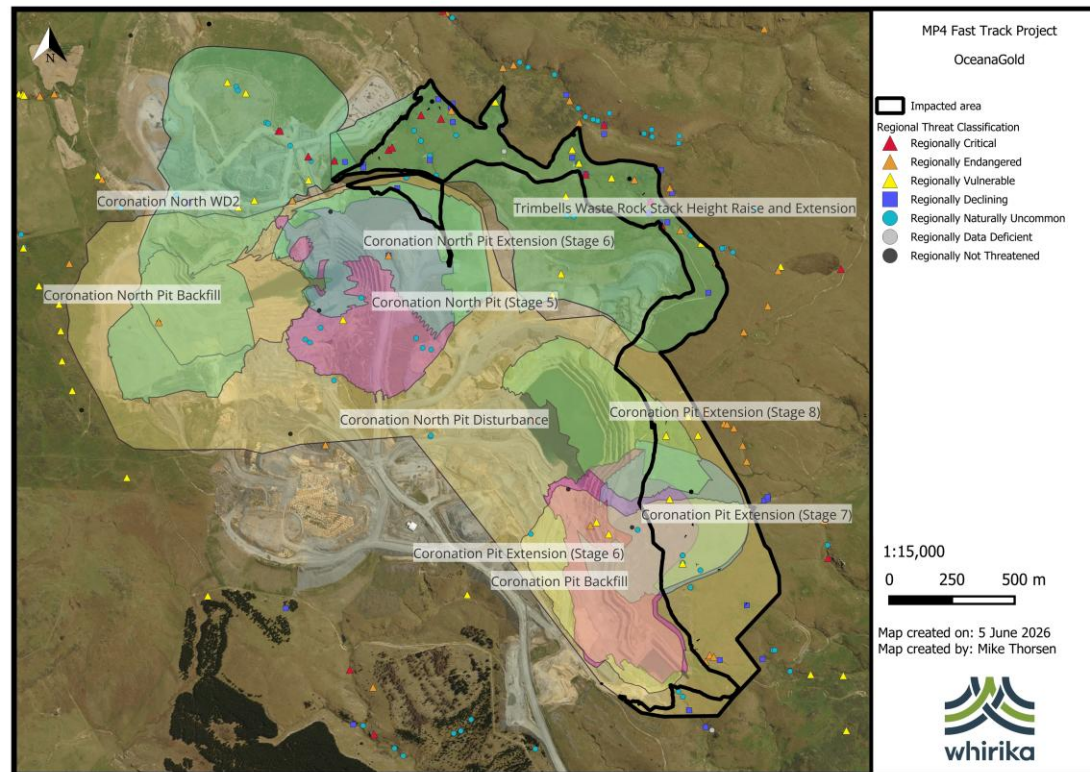


Figure 11. Locations of Regionally Threatened, At Risk, Data Deficient and locally uncommon plant species within the Coronation Area Mining Area. Note that the records in this map may include historic records and those erroneously mapped in the source dataset.

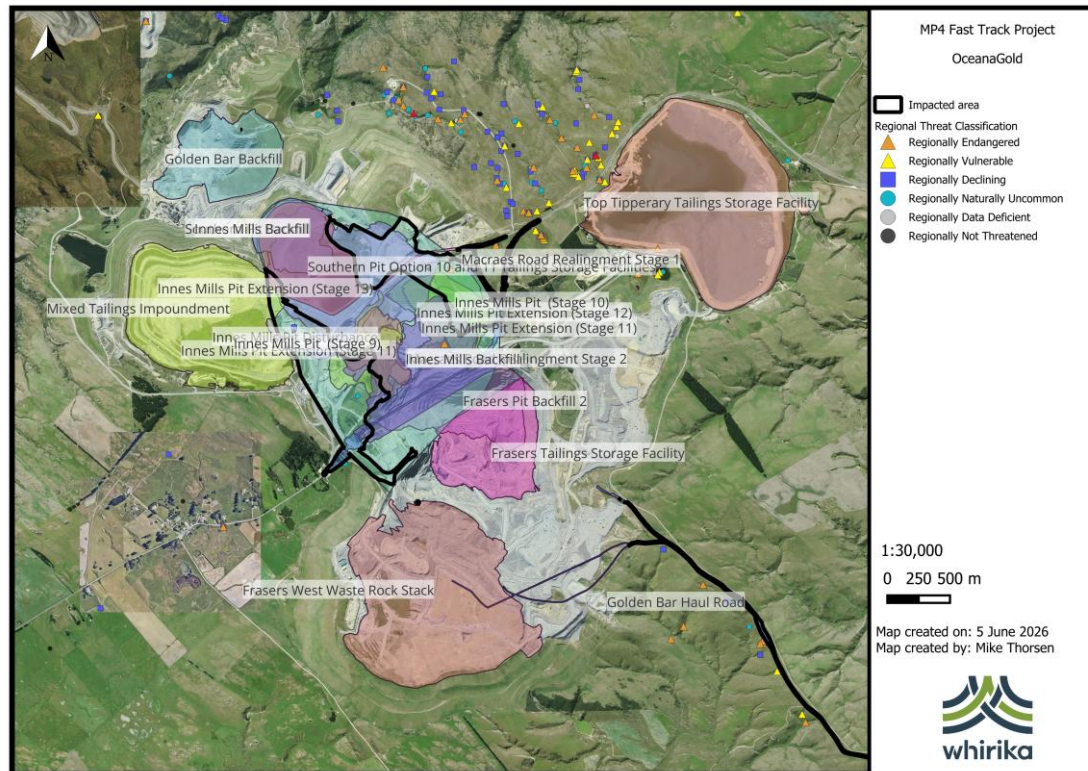


Figure 12. Locations of Regionally Threatened, At Risk, Data Deficient and locally uncommon plant species within the Coronation Area Mining Area Note that the records in this map may include historic records and those erroneously mapped in the source dataset.

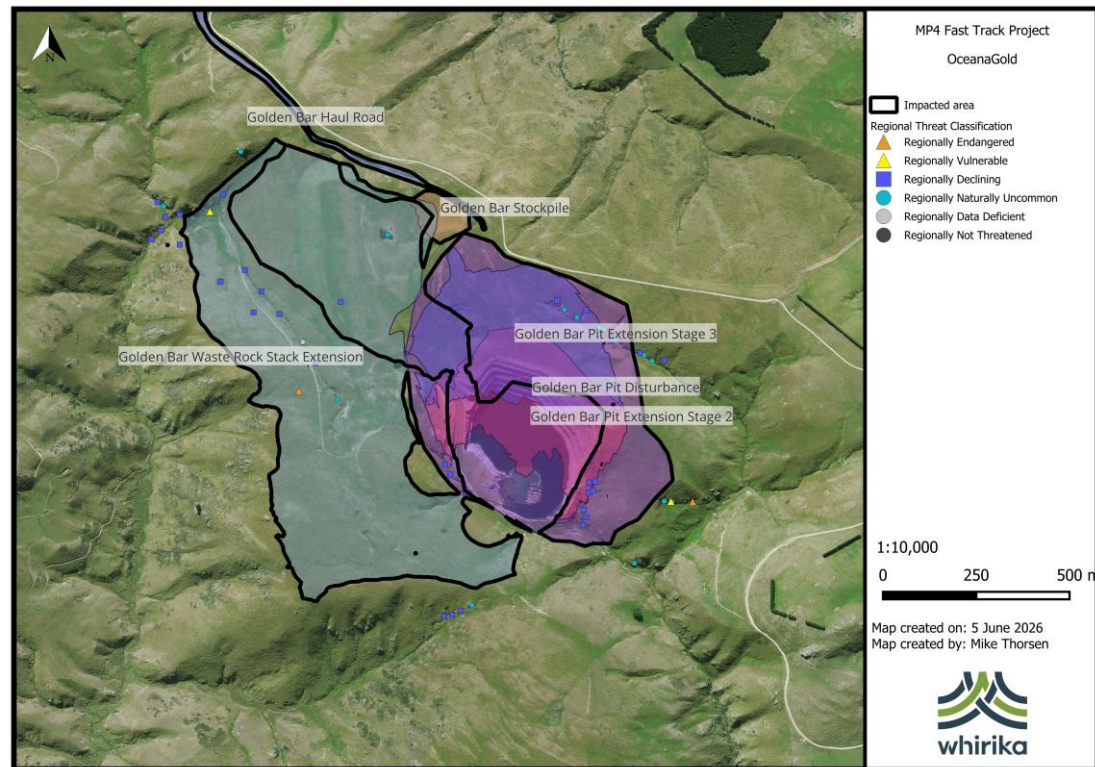


Figure 13. Locations of Regionally Threatened, At Risk, Data Deficient and locally uncommon plant species within the Golden Bar Area Mining Area. Note that the records in this map may include historic records and those erroneously mapped in the source dataset.

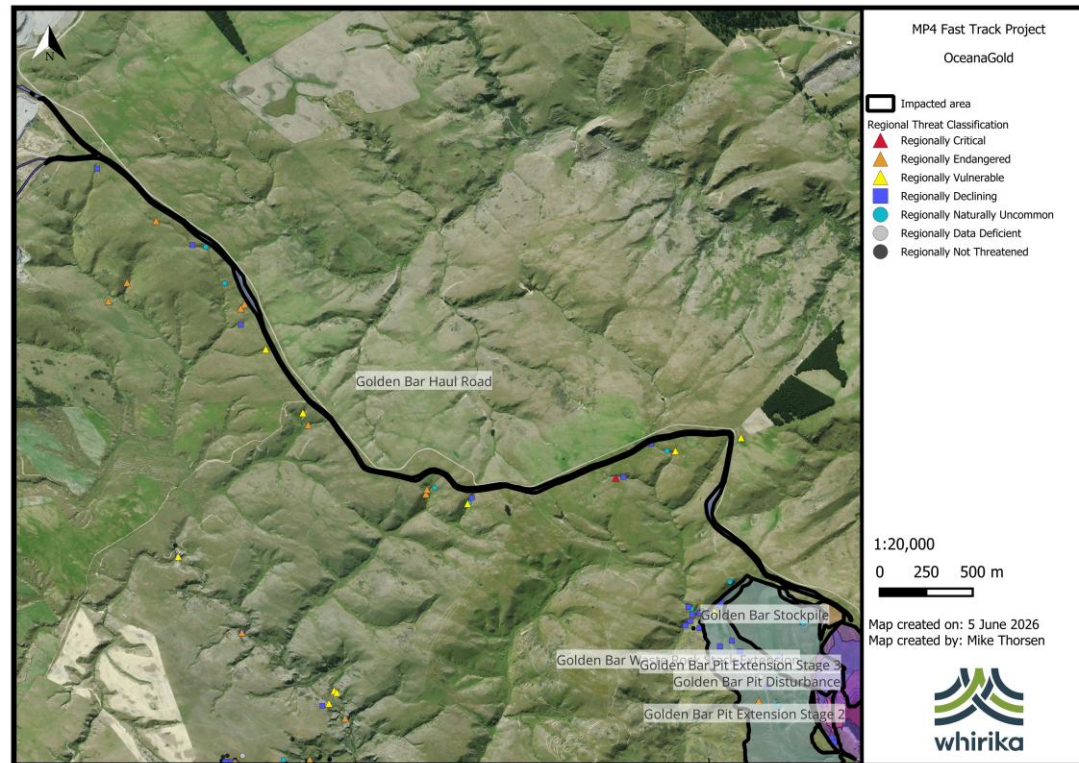


Figure 14. Locations of Regionally Threatened, At Risk, Data Deficient and locally uncommon plant species at the Golden Bar Haul Road. Note that the records in this map may include historic records and those erroneously mapped in the source dataset.

6 Assessment of Ecological Significance

6.1 Overview and approach

This section assesses the ecological significance of the indigenous vegetation communities within the current non-consented area of the Impact Area against the statutory and planning criteria identified in Section 3.4, namely:

- Appendix 1 of the NPSIB 2023;
- Appendix 2 of the Otago Regional Policy Statement 2021 (operative 9 July 2026) (ORPS);
- Policy 2.2.3.2 of the Dunedin City 2GP (applied to the Coronation Mining Area only);
- Policy 16.9.3(3) of the 2010 Waitaki District Plan (applied to the Central and Golden Bar Mining Areas, including the Golden Bar Haul Road).

Significance is conferred where at least one criterion under an applicable instrument is met. The significance assessment is undertaken across the relevant ecological feature and its supporting context, rather than treating each mapped vegetation community in isolation. Ecological connections, buffers and supporting habitats can contribute to the applicable statutory criteria (Ministry for the Environment, 2025; Otago Regional Council, 2026). A summary of significance assessment by vegetation type and instrument is provided in Section 6.2.

6.2 Summary of ecological significance

Table 7 summarises the outcome of the ecological significance assessment by mining area and vegetation type, against each applicable instrument. The detailed criterion-by-criterion assessments that support this summary are provided for each of the Mining Areas in the subsequent Sections 6.3 (NPSIB Appendix 1), 6.4 (operative ORPS), and 6.5 (Dunedin City 2GP and Waitaki District Plan).

Table 7. Summary of ecological significance of vegetation communities and habitat features within the Impact Area, by mining area and instrument. 'Y' = meets at least one criterion under the instrument; 'N' = does not meet any criterion; '(a)/(b)/etc.' indicates the specific Attribute met.

Mining area / vegetation type	NPSIB	ORPS 2021 (operative 9 July 2026)	DCC 2GP / WDP	Overall significant?
Coronation — ephemeral wetlands (long-inundation)	Y (A, B, C, D)	Y (A, B, C, D)	Y (2GP b, d, e, f)	YES
Coronation — seepage wetland	Y (C(e), C(g))	Y (C(e), C(g))	Y (2GP b, d)	YES
Coronation — rock outcrops / tors (Trimbells)	Y (A, B, C, D)	Y (A, B, C, D)	Y (2GP b, c, e, f)	YES

Mining area / vegetation type	NPSIB	ORPS 2021 (operative 9 July 2026)	DCC 2GP / WDP	Overall significant?
Coronation — narrow-leaved tussock grassland	Y (A, B, C, D)	Y (A, B, C, D)	Y (2GP c, e, f, g)	YES
Coronation — riparian (freshwater herbaceous, sedgeland, copper tussock)	Y (A, C, D)	Y (A, C, D)	Y (2GP c, e)	YES
Coronation — wetland (freshwater herbaceous, sedgeland, Shawia bullata)	Y (C)	Y (C)	Y (2GP b)	YES
Coronation — shrubland (Carmichaelia petriei habitat)	Y (C(a), C(d))	Y (C(a), C(d))	Y (2GP b)	YES
Central — ephemeral wetlands (Innes Mills Stage 12)	Y (C(a), C(b), C(d), C(e))	Y (C(a), C(b), C(d), C(e))	Y (WDP ii)	YES
Central — narrow-leaved tussock grassland	Y (A, C(b), C(d))	Y (A, C)	N (WDP)	YES (under NPSIB & ORPS)
Central — rock outcrops	Y (C(b), C(d))	Y (C)	Y (WDP ii)	YES
Central — riparian and wetland (sedgeland, Shawia bullata shrubland)	Y (C(a))	Y (C)	N (WDP)	YES (under NPSIB & ORPS)
Golden Bar — ephemeral wetlands	Y (C(a), C(d), C(e))	Y (C(a), C(d), C(e))	Y (WDP ii)	YES
Golden Bar — narrow-leaved tussock grassland	Y (A, C(b), C(d))	Y (A, C)	Y (WDP ii — Carmichaelia petriei habitat)	YES
Golden Bar — rock outcrops (Celmisia hookeri)	Y (A, B, C, D)	Y (A, B, C, D)	Y (WDP i, ii)	YES

Mining area / vegetation type	NPSIB	ORPS 2021 (operative 9 July 2026)	DCC 2GP / WDP	Overall significant?
Golden Bar — shrubland (Melicytus 'Otago' / Fuchsia)	Y (C(a), C(g))	Y (C(a), C(g))	Y (WDP ii)	YES
Golden Bar — riparian and wetland	Y (A, C)	Y (A, C)	N (WDP)	YES (under NPSIB & ORPS)
Golden Bar Haul Road — ephemeral wetlands (in 20 m buffer, avoidable)	Y (C(b), C(d), C(e))	Y (C)	Y (WDP ii)	YES
Golden Bar Haul Road — narrow-leaved tussock grassland	Y (A, C(b), C(d))	Y (A, C)	Y (WDP ii)	YES
All mining areas — exotic- dominated vegetation, mine- modified ground	N	N	N	NO
Camp Creek	Y (A, C)	Y (A, C)	N	YES
Coal Creek	Y (A, B, C, D)	Y (A, B, C, D)	Y (WDP i, ii)	YES

Key: NPSIB criteria: A = Representativeness; B = Diversity and Pattern; C = Rarity and Distinctiveness; D = Ecological Context. ORPS criteria: R = Representativeness; Ra = Rarity; Di = Distinctiveness; D = Diversity; C = Ecological Context. ORPS criteria mirror NPSIB. 2GP = Dunedin City Plan; WDP = Waitaki District Plan.

6.3 NPSIB Appendix 1 assessment

Table 8 sets out the assessment of the Impact Area against the four NPSIB Appendix 1 criteria of (A) Representativeness, (B) Diversity and Pattern, (C) Rarity and Distinctiveness, and (D) Ecological Context. The assessment is presented by mining area to enable mining-area-specific conclusions.

Table 8. Assessment of ecological significance against Appendix 1 of the National Policy Statement for Indigenous Biodiversity 2023, by mining area. Criteria are met where at least one Attribute (a–h, as applicable) is satisfied.

Criterion	Coronation Mining Area	Central Mining Area	Golden Bar Mining Area	Golden Bar Haul Road
A. Representativeness	MEETS — ephemeral wetlands, tussockland, rock outcrops and riparian vegetation have ecological integrity typical of the Macraes E.D. (Attribute (a)). Tussockland also provides habitat that supports a typical suite of indigenous flora characteristic of the E.D. (Attribute (b)).	MEETS for tussockland only — parts of the 2.37 ha of tussockland are typical of the Macraes E.D. (Attribute (a)). Other vegetation communities do not meet this criterion at a community scale because of small size and degradation.	MEETS — tussockland, rock outcrops and riparian vegetation, and one shrubland patch, meet Attribute (a) and (b).	MEETS for tussockland only — parts of the tussockland meet Attribute (a).
B. Diversity and Pattern	MEETS — ephemeral wetlands, tussockland, rock outcrops and riparian vegetation support at least moderate diversity in the E.D. context (Attribute (a)). Ecotones and gradients between tussock, rock outcrop and seepage communities at Trimbells Gully meet Attribute (b).	DOES NOT MEET — moderate diversity at small scales but no indigenous ecotones, gradients or sequences over significant areas.	MEETS — tussockland, rock outcrops, riparian vegetation and one shrubland meet Attribute (a).	DOES NOT MEET — tussockland is the only community of any extent and is of low diversity.

Criterion	Coronation Mining Area	Central Mining Area	Golden Bar Mining Area	Golden Bar Haul Road
C. Rarity and Distinctiveness	MEETS — ephemeral wetlands, seepage, shrubland, tussockland, rock outcrops and riparian vegetation provide habitat for Threatened or At Risk species (Attribute (a)); contain indigenous vegetation types uncommon within the E.D. (Attribute (b)); occur on land environments with <20% indigenous cover (Attribute (d)); and occur on Naturally Uncommon ecosystems (Attribute (e)). Distinctive assemblages at Coronation meet Attribute (g).	MEETS — ephemeral wetlands, rock outcrops, and parts of tussockland meet Attributes (b) (uncommon), (d) (<20% remaining LENZ N3.1e), and (e) (Naturally Uncommon ephemeral wetlands).	MEETS — ephemeral wetlands, shrublands, tussockland, rock outcrops and riparian vegetation meet Attributes (a) (Threatened/At Risk species habitat), (b), and (d).	MEETS — ephemeral wetlands and tussockland meet Attribute (b) (uncommon), (d) (<20% remaining LENZ N3.1e), (e) (Naturally Uncommon ephemeral wetlands).
D. Ecological Context	MEETS — ephemeral wetlands, tussockland, rock outcrop and riparian vegetation are part of a network of such habitats in a reasonably intact landscape connected to the Trimbells	DOES NOT MEET — communities are small, bordered by mine workings and farmland, and degraded by weeds and past disturbance.	MEETS — tussockland and rock outcrop are of reasonable extent and part of a mosaic of tussock habitats in the wider Golden Bar landscape including RAP7.	DOES NOT MEET — communities are small, fragmented and bordered by road and farmland.

Criterion	Coronation Mining Area	Central Mining Area	Golden Bar Mining Area	Golden Bar Haul Road
	Gully RAP4 and adjacent farmland-tussock mosaic.			
Overall conclusion	SIGNIFICANT — meets all four NPSIB criteria. The Impact Area in the Coronation Mining Area, including connecting habitats, is significant indigenous vegetation and significant habitat of indigenous fauna.	SIGNIFICANT — meets the Representativeness and Rarity criteria. The ephemeral wetlands, tussockland and rock outcrops in the Central Mining Area are significant.	SIGNIFICANT — meets all four NPSIB criteria. The Impact Area in the Golden Bar Mining Area, including the rock-outcrop / tussockland mosaic and the shrubland with rare species, is significant.	SIGNIFICANT — meets the Representativeness and Rarity criteria for tussockland and ephemeral wetlands.

6.4 Otago Regional Policy Statement assessment

6.4.1 Operative ORPS Appendix 2 (operative 9 July 2026)

The ORPS criteria largely mirror the NPSIB criteria but include an expanded definition of ecological context (with new sub-criterion (e) for areas important for indigenous fauna during a critical part of their lifecycle). Table 9 summarises the assessment.

Table 9. Assessment of ecological significance against Appendix 2 of the Otago Regional Policy Statement 2021 (operative 9 July 2026), by mining area.

Criterion	Coronation Mining Area	Central Mining Area	Golden Bar Mining Area	Golden Bar Haul Road
A. Representativeness	MEETS — Attribute (a) (typical of E.D.).	MEETS for tussockland Attribute (a).	MEETS — Attribute (a).	MEETS for tussockland Attribute (a).
B. Diversity and Pattern	MEETS — Attributes (a) and (b).	DOES NOT MEET.	MEETS — Attribute (a).	DOES NOT MEET.
C. Rarity and Distinctiveness	MEETS — Attributes (a), (b), (c), (d), (e), (g), (h).	MEETS — Attributes (b), (d), (e), (g), (h).	MEETS — Attributes (a), (b), (c), (d), (e), (g).	MEETS — Attributes (b), (d), (e), (g), (h).
D. Ecological Context	MEETS — Attributes (a), (b), (d).	DOES NOT MEET.	MEETS — Attributes (a), (b), (d).	DOES NOT MEET.
Overall conclusion	SIGNIFICANT under ORPS — meets all four criteria.	SIGNIFICANT under ORPS — meets Representativeness and Rarity and Distinctiveness.	SIGNIFICANT under ORPS — meets all four criteria.	SIGNIFICANT under ORPS — meets Representativeness and Rarity and Distinctiveness.

6.5 District plan assessment

6.5.1 Dunedin City 2GP Policy 2.2.3.2 (Coronation Mining Area)

The Coronation Mining Area lies within the Dunedin City Council jurisdiction and is assessed against the criteria in Policy 2.2.3.2 of the 2GP. Findings:

- Criterion (a) Protected areas — No protected areas are present within the Coronation Mining Area new footprint.

- Criterion (b) Rarity — MEETS. Shrubland, tussockland, ephemeral wetlands, rock outcrops and riparian vegetation provide habitat for indigenous species that are Threatened, At Risk or uncommon nationally or within the E.D. The indigenous vegetation on mapped TEC 1 (LENZ N3.1e <10% remaining) within the Coronation Mining Area is significant under this criterion. The ephemeral wetlands and seepage are also significant as they contain indigenous vegetation and habitat within originally rare ecosystems.
- Criterion (c) Representativeness — MEETS. The tussockland, ephemeral wetlands, rock outcrops and riparian vegetation are examples of indigenous vegetation/habitat that is typical or characteristic of the natural diversity of the Macraes E.D.
- Criterion (d) Distinctiveness — MEETS for ephemeral wetlands and seepage (developed in periodically wetted areas / spring water inflow; meets the 'unusual environmental factor' attribute). None of the flora species at the site are at their distributional limit within Dunedin or nationally; none are endemic to the Otago region.
- Criterion (e) Ecological Context — MEETS. Tussockland, ephemeral wetlands, rock outcrops and riparian vegetation provide important connectivity for indigenous biodiversity and perform an important buffering function for adjacent ecologically important features (Trimbells Gully RAP4).
- Criterion (f) Diversity — MEETS. Tussockland, ephemeral wetlands, rock outcrops and riparian vegetation support a high diversity of indigenous taxa, with changes in species composition reflecting natural features and gradients (geology, aspect, elevation, moisture).
- Criterion (g) Size — MEETS for tussockland. The 63.24 ha of tussockland is of sufficient size to be significant in the context of the Macraes E.D.

The Coronation Mining Area indigenous vegetation meets at least one criterion in Policy 2.2.3.2 of the Dunedin City 2GP and is therefore significant indigenous vegetation under the 2GP.

6.5.2 Waitaki District Plan Policy 16.9.3(3)

The Central Mining Area, Golden Bar Mining Area and Golden Bar Haul Road lie within the Waitaki District Council jurisdiction and are assessed against the criteria in Policy 16.9.3(3) of the 2010 Waitaki District Plan. Findings:

- Central Mining Area — DOES NOT MEET Criterion (i) Representativeness (vegetation communities are small and fragmented). MEETS Criterion (ii) Rarity and Distinctiveness — ephemeral wetlands and rock outcrops provide habitat for rare species that are vulnerable within the E.D. or threatened nationally.
- Golden Bar Mining Area — MEETS Criterion (i) Representativeness for rock outcrop, riparian vegetation and one shrubland. MEETS Criterion (ii) Rarity and Distinctiveness for tussockland, ephemeral wetlands, shrubland, rock outcrop and riparian vegetation.
- Golden Bar Haul Road — DOES NOT MEET Criterion (i) Representativeness. MEETS Criterion (ii) Rarity and Distinctiveness for tussockland (provides habitat for *Carmichaelia petriei*).

All three Project components within the Waitaki District meet at least one criterion under Policy 16.9.3(3) and are therefore significant under the Waitaki District Plan.

6.6 Conclusion

All indigenous vegetation communities and notable habitat features within the Impact Area meet at least one criterion for ecological significance under at least one applicable planning instrument. Across the four mining areas, significance is conferred primarily through the criteria of:

- Rarity and distinctiveness — through the presence of nationally and regionally Threatened, At Risk, Data Deficient and locally uncommon plant species across all vegetation types; the presence of Naturally Uncommon ephemeral wetland and seepage ecosystems (also National Priorities for Protection); and the Golden Bar WRS shrubland (*Melicytus* aff. *alpinus* 'Otago', *Fuchsia perscandens*);
- Representativeness — for typical E.D. tussockland, riparian vegetation and rock outcrop communities;
- Ecological context — through linkages and buffering within the Trimbells Gully RAP4 (Coronation) and RAP7 (Golden Bar) mosaics; less so in the more isolated and modified Central Mining Area and Golden Bar Haul Road areas.

Exotic-dominated vegetation, mine-modified ground and water bodies do not meet any significance criteria under any applicable instrument.

The implications of these significance findings for the assessment of effects, effects management, and offsetting/compensation are addressed in the separate Ecological Effects Assessment.

7 Assessment of Ecological Value (EclAG)

7.1 Overview

This section presents the assessment of ecological value for vegetation communities and notable habitat features within the current non-consented Impact Area. The assessment applies the EIANZ Ecological Impact Assessment Guidelines for terrestrial and freshwater ecosystems (Roper-Lindsay et al., 2018), using the method in Section 3.5. Ecological values for flora species are summarised in Table 9 and Section 5.4. The rarity and distinctiveness criterion is incorporated into the habitat ratings below.

Detailed sub-criterion assessments for each vegetation community by mining area are provided in Table 10 (Coronation Mining Area), Table 11 (Central Mining Area), Table 12 (Golden Bar Mining Area) and Table 13 (Golden Bar Haul Road).

7.2 Coronation Mining Area — sub-criterion assessment

Table 10 sets out the sub-criterion ecological value assessment for the vegetation communities and notable habitat features in the Coronation Mining Area, applying the EclAG criteria of representativeness, rarity/distinctiveness, diversity and pattern, and ecological context. The Coronation Mining Area is of higher ecological intactness than much of the surrounding Impact Area, supports the largest area of intact narrow-leaved tussock grassland in the Project (63.24 ha), and contains the only Naturally Uncommon seepage and long-inundation ephemeral wetlands in the Project.

Table 10. Ecological value of vegetation communities in the Coronation Mining Area (Coronation North, Coronation Pit Extensions, Trimbells WRS), assessed using the EciAG sub-criteria. Overall rating combines the four sub-criteria per Section 2.6.1. Confidence reflects the quality of underlying data and survey coverage.

Vegetation Community	Area impacted (ha)	Representativeness	Rarity/distinctiveness (community)	Rarity/distinctiveness (habitat of rare flora)	Diversity and Pattern	Ecological Context	Confidence in assessment	Rationale	Ecological Value
Ephemeral Wetland	0.39	Moderate	High	High	High	High	Moderate	A locally uncommon long-inundation subtype of a Naturally Uncommon Critically Endangered ecosystem that is a priority for protection and is habitat for Regionally Threatened and At Risk species and which retains a moderate diversity and cover of indigenous plant species. This sub-type is restricted to Otago and only occurs in either large examples or in areas of higher rainfall. Only a few sites have been inventoried locally and distribution of sub-type in wider Otago context unknown.	Very High
Riparian - Freshwater Herbaceous	0.8	Moderate	Moderate	High	Moderate	Moderate	Moderate-High	A widespread plant community in Otago and analogous with similar plant communities in other regions. Intactness influenced locally by grazing, particularly by cattle and mostly degraded through weed proliferation and grazing. Moderate diversity of indigenous species, some of which are Regionally Threatened or At Risk.	High
Riparian - Sedgeland	0.11	Moderate	Moderate	Low	Moderate	Moderate	Moderate-High	A widespread plant community in Otago and analogous with similar plant communities in other regions. Intactness influenced locally by grazing, particularly by cattle and mostly degraded through grazing and weed proliferation as ground cover. Diversity of indigenous plant species is naturally low but likely depleted from what was originally present.	Moderate
Rock	0.17	High	High	High	High	High	Moderate	Ecological importance varies with rock type with the rock outcrops along Trimbells Gully being of high intactness and providing habitat for Regionally Threatened and At Risk species tors being of moderate importance. Both rock type communities are widespread in Otago but not present elsewhere in NZ and usually only retain a moderate diversity	Very High

Vegetation Community	Area impacted (ha)	Representativeness	Rarity/distinctiveness (community)	Rarity/distinctiveness (habitat of rare flora)	Diversity and Pattern	Ecological Context	Confidence in assessment	Rationale	Ecological Value
								of indigenous plant species and higher importance botanical features tend to be very localised.	
Shrubland	2.67	Low	Low	Moderate	Low	Low	Moderate-high	Low diversity shrubland of low stature and impacted by historic burning and sheep and cattle grazing which limits recruitment. Provides habitat for a Regionally At Risk species which has no recruitment.	Low
Narrow-leaved Tussock Grassland	63.24	High	Low	High	High	High	Moderate-high	While this type of tussock grassland is widespread locally and in Otago this area has higher intactness, plant diversity and provides habitat or buffers habitat for Regionally Threatened and At Risk species. Has been degraded by fires and grazing.	High
Wetland - Freshwater Herbaceous	0.45	Moderate	Moderate	High	Moderate	Moderate	Moderate-High	A widespread but localised plant community in Otago and analogous with similar plant communities in other regions. Intactness influenced locally by grazing, particularly by cattle and mostly degraded through weed proliferation and grazing and pugging. Moderate diversity of indigenous species, some of which are Regionally Threatened or At Risk.	High
Wetland - Sedgeland	0.3	Moderate	Moderate	Low	Moderate	Moderate	Moderate-High	A widespread but localised plant community in Otago and analogous with similar plant communities in other regions. Intactness influenced locally by grazing, particularly by cattle and mostly degraded through grazing and weed proliferation as ground cover. Diversity of indigenous plant species is naturally low but likely depleted from what was originally present.	Moderate
Wetland - Seepage	0.02	Moderate	High	Low	High	Moderate	Moderate	A Naturally Uncommon Endangered ecosystem and priority for protection of limited distribution locally (though concentrations occur on basalt peaks in this area) and nationally. Degraded to some extent by exotic plants, grazing and pugging. This site not known to provide habitat for rare flora.	High
Wetland - Shrubland	0.01	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate-High	A widespread but localised plant community in Otago and analogous with similar plant communities in other regions.	Moderate

Vegetation Community	Area impacted (ha)	Representativeness	Rarity/distinctiveness (community)	Rarity/distinctiveness (habitat of rare flora)	Diversity and Pattern	Ecological Context	Confidence in assessment	Rationale	Ecological Value
								Intactness influenced locally by grazing, particularly by cattle and mostly degraded through weed proliferation as ground cover and grazing. Moderate diversity of indigenous species, one of which is Regionally At Risk due to a lack of recruitment.	

7.3 Central Mining Area — sub-criterion assessment

Table 11 sets out the sub-criterion ecological value assessment for the vegetation communities and habitat features in the Central Mining Area. The Central Mining Area has been substantially modified by historic and current mining, with most of the new area comprising exotic-dominated vegetation and mine-modified ground. Indigenous values persist primarily as ephemeral wetlands adjacent to Innes Mills Stage 12 and as small riparian and shrubland remnants.

Table 11. Ecological value of vegetation communities in the Central Mining Area, assessed using the EclAG sub-criteria.

Vegetation Community	Area impacted (ha)	Representativeness	Rarity/distinctiveness (community)	Rarity/distinctiveness (habitat of rare flora)	Diversity and Pattern	Ecological Context	Confidence in assessment	Rationale	Ecological Value
Ephemeral Wetland	0.13	Low	High	High	High	High	Moderate	A locally uncommon short-inundation subtype of a Naturally Uncommon Critically Endangered ecosystem that is a priority for protection with low diversity of indigenous species and is habitat for a Regionally Declining species. This sub-type is restricted to Otago and there are numerous examples known of similar intactness.	High

Vegetation Community	Area impacted (ha)	Representativeness	Rarity/distinctiveness (community)	Rarity/distinctiveness (habitat of rare flora)	Diversity and Pattern	Ecological Context	Confidence in assessment	Rationale	Ecological Value
Riparian - Sedgeland	0.37	Moderate	Moderate	Low	Moderate	Moderate	Moderate-High	A widespread plant community in Otago and analogous with similar plant communities in other regions. Intactness influenced locally by grazing, particularly by cattle and mostly degraded through grazing and weed proliferation as ground cover. Diversity of indigenous plant species is naturally low but likely depleted from what was originally present.	Moderate
Riparian - Shrubland	0.01	Moderate	Moderate	Low	Moderate	Moderate	Moderate-High	A widespread but localised plant community in Otago and analogous with similar plant communities in other regions. Intactness influenced locally by grazing, particularly by cattle and mostly degraded through weed proliferation as ground cover and grazing. Moderate diversity of indigenous species.	Moderate
Rock	0.08	Low	Low	Moderate	Low	Low	Moderate	A small example of type with very limited indigenous plant diversity, but habitat for a Regionally Naturally Uncommon plant.	Low
Shrubland	0.23	Low	Low	Low	Low	Low	Moderate-high	Low diversity shrubland of low stature and impacted by historic burning and sheep and cattle grazing which limits recruitment.	Low
Narrow-leaved Tussock Grassland	20.89	Moderate	Low	Low	Low	Low	Moderate-high	A widespread ecosystem locally and in Otago. This area has low intactness (though some patches are more intact than others), and low indigenous plant diversity. Has been degraded by grazing.	Low
Wetland - Freshwater Herbaceous	0.41	Low	Moderate	Low	Low	Low	Moderate-High	A widespread but localised plant community in Otago and analogous with similar plant communities in other regions. Intactness influenced locally by grazing, particularly by cattle and this site degraded through weed proliferation and grazing and pugging. Low diversity of indigenous species.	Low
Wetland - Sedgeland	0.39	Moderate	Moderate	Low	Low	Low	Moderate-High	A widespread but localised plant community in Otago and analogous with similar plant communities in other regions. Intactness influenced locally by grazing, particularly by cattle and this site mostly degraded through grazing and weed proliferation as ground cover. Diversity of indigenous plant	Low

Vegetation Community	Area impacted (ha)	Representativeness	Rarity/distinctiveness (community)	Rarity/distinctiveness (habitat of rare flora)	Diversity and Pattern	Ecological Context	Confidence in assessment	Rationale	Ecological Value
								species is naturally low but at this site depleted from what was originally present.	

7.4 Golden Bar Mining Area — sub-criterion assessment

Table 12 sets out the sub-criterion ecological value assessment for the Golden Bar Mining Area. The Golden Bar Mining Area is dominated by an extensive but heavily grazed and locally weed-affected narrow-leaved tussock grassland, with smaller areas of shrubland, riparian and ephemeral wetland features. The Golden Bar Waste Rock Stack contains the only known occurrence of *Melicytus* aff. *alpinus* (CHR 541568; 'Otago') and *Fuchsia perscandens* within the Project. Schist rock outcrops support *Celmisia hookeri*.

Table 12. Ecological value of vegetation communities in the Golden Bar Mining Area (Golden Bar Pit, Golden Bar WRS, Golden Bar Pit Extensions), assessed using the EciAG sub-criteria.

Vegetation Community	Area impacted	Representativeness	Rarity/distinctiveness (community)	Rarity/distinctiveness (habitat of rare flora)	Diversity and Pattern	Ecological Context	Confidence in assessment	Rationale	Ecological Value
Ephemeral Wetland	0.13	Low	High	Low	High	Moderate	Moderate	A locally uncommon short-inundation subtype of a Naturally Uncommon Critically Endangered ecosystem that is a priority for protection with low diversity of indigenous species. This sub-type is	Moderate

Commented [SM1]: SERIOUS ISSUE: Note that the Golden Bar table is incorrect. It is an exact copy of the GBHR table, so the values/areas/rationale all need to be changed.

								restricted to Otago and there are numerous examples known of similar intactness. One example at site induced on previous mine surface, the remainder are natural examples	
Riparian - Sedgeland	0.37	Moderate	Moderate	Low	Moderate	Moderate	Moderate-High	A widespread plant community in Otago and analogous with similar plant communities in other regions. Intactness influenced locally by grazing, particularly by cattle and mostly degraded through grazing and weed proliferation as ground cover. Diversity of indigenous plant species is naturally low but likely depleted from what was originally present.	Moderate
Riparian - Shrubland	0.01	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate-High	A widespread but localised plant community in Otago and analogous with similar plant communities in other regions. Intactness influenced locally by grazing, particularly by cattle and mostly degraded through weed proliferation as ground cover and grazing. Moderate diversity of indigenous species.	Moderate

Rock	0.08	High	High	High	Moderate	Moderate	Moderate	Small rock outcropping with a moderate diversity of indigenous plants, some of which are Regionally Declining or locally uncommon.	High
Shrubland	0.23	Low	Low	Moderate	Low	Low	Moderate-high	Mostly low diversity shrubland of low stature and impacted by historic burning and sheep and cattle grazing which limits recruitment. Provides habitat for a Data Deficient species and one site also has two locally uncommon species.	Low
Narrow-leaved Tussock Grassland	20.89	High	Low	Very High	Moderate	Moderate	Moderate-high	While this type of tussock grassland is widespread locally and in Otago this area has moderate to high (in places) intactness, plant diversity and provides habitat for a Regionally Threatened and an At Risk species. Has been degraded by fires and grazing.	High
Wetland - Freshwater Herbaceous	0.41	Moderate	Moderate	Very High	Moderate	Moderate	Moderate-High	A widespread but localised plant community in Otago and analogous with similar plant communities in other regions. Intactness influenced locally by grazing, particularly by cattle and mostly degraded through weed proliferation and grazing and pugging. Moderate diversity of indigenous species,	High

								two of which are Regionally Threatened or At Risk.	
Wetland - Sedgeland	0.39	Moderate	Moderate	Low	Moderate	Moderate	Moderate-High	A widespread but localised plant community in Otago and analogous with similar plant communities in other regions. Intactness influenced locally by grazing, particularly by cattle and mostly degraded through grazing and weed proliferation as ground cover. Diversity of indigenous plant species is naturally low but likely depleted from what was originally present.	Moderate
Wetland - Shrubland	0.01	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate-High	A widespread but localised plant community in Otago and analogous with similar plant communities in other regions. Intactness influenced locally by grazing, particularly by cattle and mostly degraded through weed proliferation as ground cover and grazing. Moderate diversity of indigenous species, one of which is Regionally At Risk due to a lack of recruitment.	Moderate

7.5 Golden Bar Haul Road — sub-criterion assessment

Table 13 sets out the sub-criterion ecological value assessment for the Golden Bar Haul Road. The Haul Road realignment area is predominantly exotic grassland and pasture, with patches of low-stature narrow-leaved tussock grassland (3.51 ha) and small areas of riparian wetland, rock, shrubland and ephemeral wetlands in the 20 m buffer (all considered avoidable through route refinement).

Table 13. Ecological value of vegetation communities at the Golden Bar Haul Road realignment, assessed using the EciAG sub-criteria.

Vegetation Community	Area impacted (ha)	Representativeness	Rarity/distinctiveness (community)	Rarity/distinctiveness (habitat of rare flora)	Diversity and Pattern	Ecological Context	Confidence in assessment	Rationale	Ecological Value
Ephemeral Wetland	0.14	Low	High	Low	High	Moderate	Moderate	A locally uncommon short-inundation subtype of a Naturally Uncommon Critically Endangered ecosystem that is a priority for protection with low diversity of indigenous species. This sub-type is restricted to Otago and there are numerous examples known of similar intactness.	High
Rock	0.01	Low	Low	Moderate	Low	Low	Moderate	A small example of type with very limited indigenous plant diversity.	Low
Shrubland	0.02	Low	Low	Low	Low	Low	Moderate-high	Low diversity shrubland of low stature and impacted by historic burning and sheep and cattle grazing which limits recruitment.	Low
Narrow-leaved Tussock Grassland	3.51	Moderate	Low	High	Low	Low	Moderate-high	A widespread ecosystem locally and in Otago. This area is mostly the upslope margin of more extensive areas that extend much further. Has low intactness (though some patches are more intact than others) and impacted by previous haul road, and low indigenous plant diversity. Has been degraded by grazing. Provides habitat for a Regionally Declining species that has no recruitment.	Low
Wetland - Freshwater Herbaceous	0.01	Low	Moderate	Low	Low	Low	Moderate-High	A widespread but localised plant community in Otago and analogous with similar plant communities in other regions. Intactness influenced locally by grazing, particularly by cattle and this site degraded through weed proliferation and grazing and pugging. Low diversity of indigenous species.	Low

Vegetation Community	Area impacted (ha)	Representativeness	Rarity/distinctiveness (community)	Rarity/distinctiveness (habitat of rare flora)	Diversity and Pattern	Ecological Context	Confidence in assessment	Rationale	Ecological Value
Wetland - Sedgeland	0.01	Moderate	Moderate	Low	Low	Low	Moderate-High	A widespread but localised plant community in Otago and analogous with similar plant communities in other regions. Intactness influenced locally by grazing, particularly by cattle and this site mostly degraded through grazing and weed proliferation as ground cover. Diversity of indigenous plant species is naturally low but at this site depleted from what was originally present.	Low

7.6 Threatened plant species ecological values

Ecological values assigned to individual Threatened, At Risk, Data Deficient and locally uncommon plant species are summarised in Table 9. Appendix 3 contains legacy detail for a 33-species subset and is not a complete account of the current 50-species schedule. Under the EIANZ method, the higher applicable national or regional threat category is used conservatively: Threatened species are assigned Very High value, At Risk–Declining species High value, other At Risk and Data Deficient species Moderate value, and locally uncommon species Low value.

Several species have populations within the Impact Area that may be locally, regionally or nationally significant:

- *Carmichaelia corrugata* (Nationally Vulnerable; Regionally Critical) — 4 records in the Trimbells WRS Height Raise and Extension footprint. Known from only 7 sites in the Macraes area, with Macraes near the southern limit of its national distribution. The Trimbells population is regionally and nationally significant.
- *Hypericum rubicundulum* (Nationally Endangered; Regionally Critical) — 3 records in the Trimbells WRS area and 1 record in the Golden Bar Haul Road 80 m buffer. Macraes is one of relatively few national locations.
- *Lagenophora barkeri* (Nationally Vulnerable; Regionally Endangered) — 9 records across the Coronation Mining Area and Golden Bar Haul Road 80 m buffer.
- *Carmichaelia petriei* (At Risk – Declining; Regionally At Risk – Declining) — 61 records across the IMPACT AREA, including a substantial population in the Golden Bar WRS Extension footprint. The Macraes area, including the 'Back Road' area within the Central Mining Area surrounds, is known to support one of the largest populations of this species nationally.
- *Agrostis pallescens* (At Risk – Naturally Uncommon) — 31 records, primarily in the Coronation North ephemeral wetlands. Provides up to 23% cover in some long-inundation ephemeral wetlands.
- *Carex kaloides* (Regionally Endangered) – the population at Coal Creek is one of the largest known in Otago.

Existing pressures, declining vegetation extent in the Macraes E.D., and weed/pest impacts mean that for most of these species the values within the Impact Area are considered to be in slow decline. Other species of high conservation value are known from the surrounding area, but there are no impacts on these species.

References

- Bibby, C.J. 1997. Macraes Ecological District, summary report for the Protected Natural Areas Programme. Department of Conservation, Dunedin.
- Clarkson, B.R. 2013. A vegetation tool for wetland delineation in New Zealand. Manaaki Whenua – Landcare Research Contract Report LC1793.
- Crisp P, Jarvie S, Melzer S, Michel P, Uys R. 2026. Regional Threat Classification System of Aotearoa New Zealand manual 2026. Wellington: Department of Conservation
- 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.
- Dunedin City Council. (2026). Dunedin City Second Generation District Plan (2GP) (operative 17 June 2026). <https://www.dunedin.govt.nz/council/district-plan/2nd-generation-district-plan/read-the-plan>
- Forsyth, P. J. (Comp.). (2001). Geology of the Waitaki area (Institute of Geological and Nuclear Sciences 1:250,000 Geological Map 19). Institute of Geological and Nuclear Sciences.
- Holdaway, R.J.; Wiser, S.K.; Williams, P.A. 2012. Status assessment of New Zealand's naturally uncommon ecosystems. *Conservation Biology* 26: 619–629.
- Hurst, J.M.; Allen, R.B. 2007. The Recce Method for describing New Zealand vegetation: field protocols. Manaaki Whenua – Landcare Research, Lincoln.
- Jarvie, S., Barkla, J., Rance, B., Rogers, G., Ewans, R., & Thorsen, M. (2026). Conservation status of indigenous vascular plants in Otago, 2026. Otago Regional Council, Otago Threat Classification Series 14.
- Johnson, P.; Gerbeaux, P. 2004. Wetland types in New Zealand. Department of Conservation, Wellington.
- Johnson, P.; Rogers, G. 2003. Ephemeral wetlands and their turfs in New Zealand. *Science for Conservation* 230. Department of Conservation, Wellington.
- McGlone, M.S. 1989. The Polynesian settlement of New Zealand in relation to environmental and biotic changes. *New Zealand Journal of Ecology* 12: 115–129.
- McGlone, M.S.; Mark, A.F.; Bell, D. 1995. Late Pleistocene and Holocene vegetation history, Central Otago, South Island, New Zealand. *Journal of the Royal Society of New Zealand* 25: 1–22.
- McKellar, I.C. 1966. Geological Map of New Zealand 1:250000, Sheet 25. Department of Scientific and Industrial Research, Wellington.

- Ministry for the Environment. 2022. Wetland delineation protocols. Ministry for the Environment, Wellington.
- Ministry for the Environment. (2025). National Policy Statement for Indigenous Biodiversity 2023 (consolidated with December 2025 amendments). <https://environment.govt.nz/acts-and-regulations/national-policy-statements/national-policy-statement-for-indigenous-biodiversity/>
- Ministry for the Environment & Department of Conservation. 2007. Protecting our places — Information about the Statement of National Priorities for Protecting Rare and Threatened Biodiversity on Private Land. Publication ME 799. Ministry for the Environment, Wellington.
- Mutch, A.R. 1963. Geological Map of New Zealand 1:250000, Sheet 23. Department of Scientific and Industrial Research, Wellington.
- New Zealand Government. (2024). Fast-track Approvals Act 2024, Schedule 2. <https://www.legislation.govt.nz/act/public/2024/56/en/latest/>
- Otago Regional Council. (2026). Otago Regional Policy Statement 2021 (operative 9 July 2026). <https://www.orc.govt.nz/your-council/plans-and-strategies/otago-regional-policy-statements>
- Rolfe, J.; Hitchmough, R.; Michel, P.; Makan, T.; Cooper, J.A.; de Lange, P.J.; Townsend, C.A.J.; Miskelly, C.M.; Molloy, J. 2022: New Zealand Threat Classification System manual 2022. Part 1: Assessments. Department of Conservation, Wellington. 45 p.
- Roper-Lindsay, J.; Fuller, S.A.; Hooson, S.; Sanders, M.D.; Ussher, G.T. 2018. Ecological Impact Assessment (EcIA): EIANZ Guidelines for use in New Zealand: Terrestrial and Freshwater Ecosystems. 2nd Edition. Environment Institute of Australia and New Zealand.
- Singers, N.J.D.; Rogers, G.M. 2014. A classification of New Zealand's terrestrial ecosystems. Science for Conservation 325. Department of Conservation, Wellington.
- Thompson, H.M. 1949. East of the Rock and Pillar: a history of the Strath Taieri and Macraes Districts. Otago Centennial Historical Publications, Christchurch.
- Thorsen, M. 2008. Where in New Zealand is the highest diversity of threatened plants? Trilepidea Newsletter 58: 4–8.
- Waitaki District Council. (2010). Waitaki District Plan: Chapter 16, Rural. https://www.waitaki.govt.nz/files/assets/public/v/1/files/our-services/planning-and-resource-consents/district-plan/current-district-plan/ii_16-ruralop.pdf
- Walker, S.; Cieraad, E.; Barringer, J. 2015. The Threatened Environment Classification for New Zealand 2012: a guide for users. Landcare Research, Dunedin.
- Whitaker, A.H. 1996. Impact of agricultural development on grand skink (*Oligosoma grande*) populations at Macraes Flat, Otago, New Zealand. Science for Conservation 33. Department of Conservation, Wellington.

Williams, P.A.; Wiser, S.; Clarkson, B.; Stanley, M.C. 2007. New Zealand's historically rare terrestrial ecosystems set in a physical and physiognomic framework. *New Zealand Journal of Ecology* 31: 119–128.

OceanaGold – MP4FT: vegetation values

Appendices

7.7 Appendix 1. Flora recorded in the ecological study area

Abundance score for mining area is r = rare, l = local, o = occasional, c = common, a = abundant.

OceanaGold – MP4FT: vegetation values

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Acaena anserinifolia (J.R.Forst. & G.Forst.) J.B.Armstr.	Native	Rosaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r		
Acaena buchananii Hook.f.	Native	Rosaceae	DICOTYLEDONOUS HERBS	Regionally Vulnerable	r		
Acaena caesiiglauc (Bitter) Bergmans	Native	Rosaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r		
Acaena dumicola B.H.Macmill.	Native	Rosaceae	DICOTYLEDONOUS HERBS	Regionally Naturally Uncommon	r	r	
Acaena inermis Hook.f.	Native	Rosaceae	DICOTYLEDONOUS HERBS	Regionally Declining	r		
Acaena novae-zelandiae Kirk	Native	Rosaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened		o	
Acaena tesca B.H.Macmill.	Native	Rosaceae	DICOTYLEDONOUS HERBS	Regionally Naturally Uncommon	r		
Aciphylla aurea W.R.B.Oliv.	Native	Apiaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	c	l	c
Aciphylla glaucescens W.R.B.Oliv.	Native	Apiaceae	DICOTYLEDONOUS HERBS	Regionally Declining	r		
Aciphylla subflabellata W.R.B.Oliv.	Native	Apiaceae	DICOTYLEDONOUS HERBS	Regionally Vulnerable	r	l	r
Agrostis pallescens Cheeseman	Native	Poaceae	MONOCOTYLEDONOUS HERBS		l		
Anaphalioides bellidioides (G.Forst.) Glenny	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l		l
Anisotome aromatica Hook.f.	Native	Apiaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l		l
Anisotome brevistylis (Hook.f.) Poppelw.	Native	Apiaceae	DICOTYLEDONOUS HERBS	Regionally Declining	r		
Anthosachne falcis (Connor) Barkworth & S.W.L.Jacobs	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Declining	o	o	
Anthosachne solandri (Steud.) Barkworth & S.W.L.Jacobs	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	r	r	
Argyrotegium mackayi (Buchanan) J.M.Ward & Breiwt.	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Naturally Uncommon		r	
Aristotelia fruticosa Hook.f.	Native	Elaeocarpaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened		r	
Arthropodium candidum Raoul	Native	Asparagaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	r		

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
<i>Asplenium appendiculatum</i> (Labill.) C.Presl subsp. <i>appendiculatum</i>	Native	Aspleniaceae	FERNS	Regionally Not Threatened	r	r	l
<i>Asplenium flabellifolium</i> Cav.	Native	Aspleniaceae	FERNS	Regionally Not Threatened	l	l	l
<i>Asplenium richardii</i> (Hook.f.) Hook.f.	Native	Aspleniaceae	FERNS	Regionally Not Threatened	l	l	l
<i>Astelia nervosa</i> Hook.f.	Native	Asteliaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	r		l
<i>Austroblechnum lanceolatum</i> (R.Br.) Gasper & V.A.O.Dittrich	Native	Blechnaceae	FERNS			l	
<i>Austroblechnum penna-marina</i> subsp. <i>alpina</i> (R.Br.) A.R.Field	Native	Blechnaceae	FERNS	Regionally Not Threatened	o	o	o
<i>Austroderia richardii</i> (Endl.) N.P.Barker & H.P.Linder	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	l		l
<i>Azorella haastii</i> subsp. <i>cyanopetala</i> (Domin) G.M.Plunkett & A.N.Nicolas	Native	Apiaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l		
<i>Azorella hookeri</i> Drude	Native	Apiaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r	r	
<i>Brachyglottis lagopus</i> (Raoul) B.Nord.	Native	Asteraceae	DICOTYLEDONOUS HERBS		l	r	l
<i>Brachyscome longiscapa</i> G.Simpson & J.S.Thomson	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Naturally Uncommon	o		
<i>Bulbinella angustifolia</i> (Cockayne & Laing) L.B.Moore	Native	Asphodelaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	o	l	o
<i>Callitriche petriei</i> R.Mason	Native	Plantaginaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l	l	l
<i>Cardamine corymbosa</i> Hook.f.	Native	Brassicaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r	r	
<i>Cardamine dilatata</i> Heenan	Native	Brassicaceae	DICOTYLEDONOUS HERBS	Regionally Critical	r		
<i>Cardamine forsteri</i> (hairy silique form)	Native		DICOTYLEDONOUS HERBS		r		
<i>Cardamine forsteri</i> Govaerts	Native	Brassicaceae	DICOTYLEDONOUS HERBS		r		r

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Cardamine grandiscapa Heenan	Native	Brassicaceae	DICOTYLEDONOUS HERBS	Regionally Data Deficient			r
Carex (CHR 58613; aff. C. punicea; Lammerlaw)	Native		MONOCOTYLEDONOUS HERBS		r	r	
Carex breviculmis R.Br.	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS		l		
Carex coriacea Hamlin	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	l	l	
Carex dipsacea Berggr.	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Declining		l	
Carex flagellifera Colenso	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	r	r	
Carex gaudichaudiana Kunth	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS		l	l	
Carex geminata Schkuhr	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened		l	
Carex inversa R.Br.	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Naturally Uncommon	r		
Carex kaloides Petrie	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Endangered	l		
Carex punicea K.A.Ford	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened		r	
Carex purpurata (Petrie) K.A.Ford	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Naturally Uncommon			r
Carex resectans Cheeseman	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Declining			r
Carex secta Boott	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS		l	l	l
Carex sinclairii Boott	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS		l	l	l
Carex subtilis K.A.Ford	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Endangered	r		
Carex tenuiculmis (Petrie) Heenan & de Lange	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Endangered	r	l	r
Carex testacea Sol. ex Boott	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	r		

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Carex testacea Sol. ex Boott (form with narrow leaves, filiform culms and congested inflorescence discussed by Moore on p. 263 of Flora II)	Native		MONOCOTYLEDONOUS HERBS		r		
Carex virgata Sol. ex Boott	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS				r
Carex wakatipu Petrie	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	r		
Carmichaelia corrugata Colenso	Native	Fabaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Critical	r		
Carmichaelia crassicaulis Hook.f. subsp. crassicaulis	Native	Fabaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Vulnerable	r		
Carmichaelia kirkii Hook.f.	Native	Fabaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Endangered		r	r
Carmichaelia petriei Kirk	Native	Fabaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Declining	o	c	o
Celmisia (g) (CHR 274779; "rhizomatous")	Native		DICOTYLEDONOUS HERBS		l	l	l
Celmisia densiflora Hook.f.	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r		
Celmisia gracilentia Hook.f.	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	o	o	
Celmisia hookeri Cockayne	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Naturally Uncommon	l	l	l
Celmisia lyallii Hook.f.	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r		
Chaerophyllum ramosum (Hook.f.) K.F.Chung	Native	Apiaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l	l	l
Chionochloa rigida (Raoul) Zotov subsp. rigida	Native	Poaceae	MONOCOTYLEDONOUS HERBS		a	c	a
Chionochloa rubra subsp. cuprea Connor	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	l	r	
Clematis marata J.B.Armstr.	Native	Ranunculaceae	DICOTYLEDONOUS LIANES & RELATED TRAILING PLANTS	Regionally Not Threatened	r	r	o

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Colobanthus apetalus (Labill.) Druce	Native	Caryophyllaceae	DICOTYLEDONOUS HERBS	Regionally Naturally Uncommon	r		
Colobanthus strictus Cheeseman	Native	Caryophyllaceae	DICOTYLEDONOUS HERBS	Regionally Declining	r		
Connorochloa tenuis (Buchanan) Barkworth, S.W.L.Jacobs & H.Q.Zhang	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Endangered	r	r	
Coprosma crassifolia Colenso	Native	Rubiaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened	l	l	r
Coprosma dumosa (Cheeseman) G.T.Jane	Native	Rubiaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened	r		
Coprosma intertexta G.Simpson	Native	Rubiaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Vulnerable	r		
Coprosma petriei Cheeseman	Native	Rubiaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened	r		
Coprosma propinqua A.Cunn. var. propinqua	Native	Rubiaceae	DICOTYLEDONOUS TREES AND SHRUBS		o	o	o
Coprosma rugosa Cheeseman	Native	Rubiaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened	l	r	
Cordyline australis (G.Forst.) Endl.	Native	Asparagaceae	MONOCOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened		r	
Coriaria sarmentosa G.Forst.	Native	Coriariaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened	l		
Corokia cotoneaster Raoul	Native	Argophyllaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened		l	
Corybas hatchii Lehnbach	Native	Orchidaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	l		
Cranfillia deltoides (Colenso) de Lange & Parris	Native	Blechnaceae	FERNS		l		
Cranfillia fluviatilis (R.Br.) Gasper & V.A.O.Dittrich	Native	Blechnaceae	FERNS		l		

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Crassula colligata Toelken subsp. colligata	Native	Crassulaceae	DICOTYLEDONOUS HERBS		l	l	
Crassula sieberiana (Schult. & Schult.f.) Druce	Native	Crassulaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l	l	
Crassula sinclairii (Hook.f.) A.P.Druce & Given	Native	Crassulaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened			l
Cystopteris tasmanica Hook.	Native	Cystopteridaceae	FERNS	Regionally Naturally Uncommon	r		
Deschampsia cespitosa (L.) P.Beauv.	Native	Poaceae	MONOCOTYLEDONOUS HERBS		r	l	
Dichondra repens J.R.Forst. & G.Forst.	Native	Convolvulaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r		r
Discaria toumatou Raoul	Native	Rhamnaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened	c	c	c
Dracophyllum frondosum (G.Simpson) S.Venter	Native	Ericaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Vulnerable	r		
Echinopogon ovatus (G.Forst.) P.Beauv.	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	r		
Eleocharis acuta R.Br.	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS		l	l	l
Epilobium alsinoides A.Cunn.	Native	Onagraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r		
Epilobium atriplicifolium A.Cunn.	Native	Onagraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r	r	
Epilobium brunnescens (Cockayne) P.H.Raven & Engelhorn subsp. brunnescens	Native	Onagraceae	DICOTYLEDONOUS HERBS		r		
Epilobium brunnescens subsp. minutiflorum (Cockayne) P.H.Raven & Engelhorn	Native	Onagraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened		r	
Epilobium chionanthum Hausskn.	Native	Onagraceae	DICOTYLEDONOUS HERBS	Regionally Vulnerable			r
Epilobium insulare Hausskn.	Native	Onagraceae	DICOTYLEDONOUS HERBS		r	r	r
Epilobium komarovianum H.Lév.	Native	Onagraceae	DICOTYLEDONOUS HERBS	Regionally Naturally Uncommon	r	r	

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Epilobium nerteroides A.Cunn.	Native	Onagraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened		r	
Epilobium pubens A.Rich.	Native	Onagraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r	r	r
Euchiton audax (D.G.Drury) Holub	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r		
Euchiton ensifer (D.G.Drury) Holub	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Endangered		r	
Euchiton lateralis (C.J.Webb) Breitw. & J.M.Ward	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r	r	
Euchiton limosus (D.G.Drury) Holub	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r		
Euchiton polylepis (D.G.Drury) Breitw. & J.M.Ward	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Vulnerable	r		
Euchiton traversii (Hook.f.) Holub	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Naturally Uncommon		r	
Festuca novae-zelandiae (Hack.) Cockayne	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	c	o	c
Fuchsia perscandens Cockayne & Allan	Native	Onagraceae	DICOTYLEDONOUS LIANES & RELATED TRAILING PLANTS	Regionally Not Threatened	r		r
Galium (b) (CHR 469914; aff. G. perpusillum; "lacustrine")	Native		DICOTYLEDONOUS HERBS		l	l	
Galium perpusillum (Hook.f.) Allan	Native	Rubiaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l		r
Galium propinquum A.Cunn.	Native	Rubiaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l	r	
Gaultheria antipoda G.Forst.	Native	Ericaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened	r	r	
Gaultheria crassa Allan	Native	Ericaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened		r	
Gaultheria depressa Hook.f. var. depressa	Native	Ericaceae	DICOTYLEDONOUS TREES AND SHRUBS		o		
Gaultheria macrostigma (Colenso) D.J.Middleton	Native	Ericaceae	DICOTYLEDONOUS TREES AND SHRUBS		o	o	

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Gentianella amabilis (Petrie) Glenny	Native	Gentianaceae	DICOTYLEDONOUS HERBS	Regionally Naturally Uncommon	l	r	
Gentianella grisebachii (Hook.f.) T.N.Ho	Native	Gentianaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened		r	
Geranium (d) (; aff. G. microphyllum; "mainland")	Native		DICOTYLEDONOUS HERBS		o	r	
Geranium brevicaule Hook.f.	Native	Geraniaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l		
Geranium homeanum Turcz.	Native	Geraniaceae	DICOTYLEDONOUS HERBS	Regionally Data Deficient	r	r	
Geum leiospermum Petrie	Native	Rosaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r		
Gingidia grisea Heenan	Native	Apiaceae	DICOTYLEDONOUS HERBS	Regionally Declining			r
Gonocarpus aggregatus (Buchanan) Orchard	Native	Haloragaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r	r	r
Gonocarpus micranthus Thunb. subsp. micranthus	Native	Haloragaceae	DICOTYLEDONOUS HERBS		l	l	
Gratiola aff. concinna (AK 251855; South Island)	Native	Plantaginaceae	DICOTYLEDONOUS HERBS	Regionally Endangered		l	
Griselinia littoralis (Raoul) Raoul	Native	Griselinaceae	DICOTYLEDONOUS TREES AND SHRUBS			r	
Helichrysum filicaule Hook.f.	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	o	o	o
Herpolirion novae-zelandiae Hook.f.	Native	Asparagaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	l	l	
Histiopteris incisa (Thunb.) J.Sm.	Native	Dennstaedtiaceae	FERNS	Regionally Not Threatened	r		r
Hydrocotyle heteromeria A.Rich.	Native	Araliaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened		r	
Hydrocotyle hydrophila Petrie	Native	Araliaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l	r	
Hydrocotyle microphylla A.Cunn.	Native	Araliaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l		
Hydrocotyle moschata G.Forst. var. moschata	Native	Araliaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l	r	
Hydrocotyle sulcata C.J.Webb & P.N.Johnson	Native	Araliaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened		r	

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
<i>Hypericum rubicundulum</i> Heenan	Native	Hypericaceae	DICOTYLEDONOUS HERBS	Regionally Critical	r		r
<i>Hypolepis millefolium</i> Hook.	Native	Dennstaedtiaceae	FERNS	Regionally Not Threatened		r	
<i>Isolepis basilaris</i> Hook.f.	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Endangered		l	
<i>Isolepis pottsii</i> (V.J.Cook) Soják	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS		l		
<i>Isolepis reticularis</i> Colenso	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Naturally Uncommon	r		
<i>Juncus distegus</i> Edgar	Native	Juncaceae	MONOCOTYLEDONOUS HERBS	Regionally Declining	l	l	l
<i>Juncus edgariae</i> L.A.S.Johnson & K.L.Wilson	Native	Juncaceae	MONOCOTYLEDONOUS HERBS		l	l	l
<i>Juncus pallidus</i> R.Br.	Native	Juncaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened		l	
<i>Juncus pusillus</i> Buchenau	Native	Juncaceae	MONOCOTYLEDONOUS HERBS	Regionally Vulnerable	l	l	
<i>Lachnagrostis striata</i> (Colenso) Zotov	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Vulnerable		l	
<i>Lagenophora barkeri</i> Kirk	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Endangered	l	l	l
<i>Lagenophora cuneata</i> Petrie	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l		
<i>Lagenophora petiolata</i> Hook.f.	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l		
<i>Lagenophora schmidiae</i> de Lange & Jian Wang ter	Native	Asteraceae	DICOTYLEDONOUS HERBS		r		
<i>Lecanopteris pustulata</i> (G.Forst.) Perrie & Brownsey subsp. <i>pustulata</i>	Native	Polypodiaceae	FERNS	Regionally Not Threatened	l		
<i>Lemna disperma</i> Hegelm.	Native	Araceae	MONOCOTYLEDONOUS HERBS	Regionally Data Deficient	l		
<i>Leptinella pusilla</i> Hook.f.	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Endangered	r		
<i>Leptinella serrulata</i> (D.G.Lloyd) D.G.Lloyd & C.J.Webb	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Declining	r		

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Leptinella squalida subsp. mediana (D.G.Lloyd) D.G.Lloyd & C.J.Webb	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r		
Leptospermum scoparium J.R.Forst. & G.Forst.	Native	Myrtaceae	DICOTYLEDONOUS TREES AND SHRUBS			l	
Leptostigma setulosum (Hook.f.) Fosberg	Native	Rubiaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened		r	
Leucopogon fraseri A.Cunn. (mountain ecotype)	Native	Ericaceae	DICOTYLEDONOUS TREES AND SHRUBS		c	c	c
Libertia ixioides (G.Forst.) Spreng.	Native	Iridaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened		r	
Lilaeopsis novae-zelandiae (Gand.) A.W.Hill	Native	Apiaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened		l	
Lilaeopsis ruthiana Affolter	Native	Apiaceae	DICOTYLEDONOUS HERBS	Regionally Naturally Uncommon		l	r
Limosella australis R.Br.	Native	Plantaginaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened		l	l
Lobelia angulata G.Forst.	Native	Campanulaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r	r	
Lobelia ionantha Heenan	Native	Campanulaceae	DICOTYLEDONOUS HERBS	Regionally Endangered	l	l	
Lobelia perpusilla Hook.f.	Native	Campanulaceae	DICOTYLEDONOUS HERBS	Regionally Vulnerable		l	
Luzula banksiana var. rhadina (Buchenau) Edgar	Native	Juncaceae	MONOCOTYLEDONOUS HERBS	Regionally Naturally Uncommon	l		
Luzula picta var. limosa Edgar	Native	Juncaceae	MONOCOTYLEDONOUS HERBS	Regionally Data Deficient	o		o
Luzula rufa Edgar var. rufa	Native	Juncaceae	MONOCOTYLEDONOUS HERBS		o		
Melicope simplex A.Cunn.	Native	Rutaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened		r	
Melicytus aff. alpinus (c) (CHR 541568; Otago)	Native	Violaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Data Deficient	l	r	o
Melicytus alpinus (Kirk) Garn.-Jones	Native	Violaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened	c	c	c

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
<i>Mentha cunninghamii</i> Benth.	Native	Lamiaceae	DICOTYLEDONOUS HERBS	Regionally Declining	r	r	r
<i>Microtis unifolia</i> (G.Forst.) Rchb.f.	Native	Orchidaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	o	o	
<i>Montia fontana</i> L. subsp. <i>fontana</i>	Native	Montiaceae	DICOTYLEDONOUS HERBS		r	l	
<i>Montia sessiliflora</i> (G.Simpson) Heenan	Native	Montiaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r		
<i>Muehlenbeckia australis</i> (G.Forst.) Meisn.	Native	Polygonaceae	DICOTYLEDONOUS LIANES & RELATED TRAILING PLANTS	Regionally Not Threatened		r	r
<i>Muehlenbeckia axillaris</i> (Hook.f.) Endl.	Native	Polygonaceae	DICOTYLEDONOUS LIANES & RELATED TRAILING PLANTS	Regionally Not Threatened	r		
<i>Muehlenbeckia complexa</i> (A.Cunn.) Meisn. var. <i>complexa</i>	Native	Polygonaceae	DICOTYLEDONOUS LIANES & RELATED TRAILING PLANTS		c	c	c
<i>Myosotis australis</i> subsp. <i>australis</i>	Native	Boraginaceae	DICOTYLEDONOUS HERBS		r		
<i>Myriophyllum propinquum</i> A.Cunn.	Native	Haloragaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l	l	
<i>Myriophyllum triphyllum</i> Orchard	Native	Haloragaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l		
<i>Olearia bullata</i> H.D.Wilson & Garn.-Jones	Native	Asteraceae	DICOTYLEDONOUS TREES AND SHRUBS		l	l	l
<i>Olearia lineata</i> (Kirk) Cockayne	Native	Asteraceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Declining	r		
<i>Olearia odorata</i> Petrie	Native	Asteraceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Declining	r		
<i>Oreobolus impar</i> Edgar	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	r		
<i>Oxalis exilis</i> A.Cunn.	Native	Oxalidaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l		
<i>Oxalis magellanica</i> "f. <i>glaucous</i> "	Native		DICOTYLEDONOUS HERBS		l		
<i>Oxalis rubens</i> Haw.	Native	Oxalidaceae	DICOTYLEDONOUS HERBS	Regionally Data Deficient	r	r	r

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Pachycladon cheesemanii Heenan & A.D.Mitch.	Native	Brassicaceae	DICOTYLEDONOUS HERBS	Regionally Endangered	r		
Paesia scaberula (A.Rich.) Kuhn	Native	Dennstaedtiaceae	FERNS	Regionally Not Threatened			r
Parablechnum montanum (T.C. Chambers & P.A.Farrant) Gasper & Salino	Native	Blechnaceae	FERNS		l	r	l
Pellaea caldirupium Brownsey & Lovis	Native	Pteridaceae	FERNS	Regionally Naturally Uncommon		r	
Pentachondra pumila (J.R.Forst. & G.Forst.) R.Br.	Native	Ericaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened	l		
Pentapogon avenoides (Hook.f.) P.M.Peterson, Romasch. & Soreng	Native	Poaceae	MONOCOTYLEDONOUS HERBS		o		o
Pentapogon crinitus (L.f.) P.M.Peterson, Romasch. & Soreng	Native	Poaceae	MONOCOTYLEDONOUS HERBS		o	r	o
Pentapogon quadrisetus (Labill.) P.M.Peterson, Romasch. & Soreng	Native	Poaceae	MONOCOTYLEDONOUS HERBS		r		
Phormium cookianum Le Jol. subsp. cookianum	Native	Asphodelaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	l	r	l
Pimelea oreophila subsp. lepta C.J.Burrows	Native	Thymelaeaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened	o	r	
Plantago raoulii Decne.	Native	Plantaginaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l		
Plantago triandra Berggr.	Native	Plantaginaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	l	l	
Poa breviglumis Hook.f.	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	l		
Poa cita Edgar	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	l	l	l
Poa colensoi Hook.f.	Native	Poaceae	MONOCOTYLEDONOUS HERBS		o		
Poa colensoi Hook.f. (small glaucous form with short ligule & scabrid lemma)	Native		MONOCOTYLEDONOUS HERBS		l	l	l

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
<i>Poa imbecilla</i> Spreng.	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	l		
<i>Poa kirkii</i> Buchanan	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	r		
<i>Poa pusilla</i> Berggr.	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Naturally Uncommon	r		
<i>Polystichum neozelandicum</i> subsp. <i>zerophyllum</i> (Colenso) Perrie	Native	Dryopteridaceae	FERNS		r	r	
<i>Polystichum vestitum</i> (G.Forst.) C.Presl	Native	Dryopteridaceae	FERNS		l	l	l
<i>Potamogeton cheesemanii</i> A.Benn.	Native	Potamogetonaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	l	l	
<i>Potentilla anserinoides</i> Raoul	Native	Rosaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r		
<i>Prasophyllum colensoi</i> Hook.f.	Native		MONOCOTYLEDONOUS HERBS		o		
<i>Pteridium esculentum</i> (G.Forst.) Cockayne	Native	Dennstaedtiaceae	FERNS	Regionally Not Threatened	l	l	l
<i>Pterostylis tristis</i> Colenso	Native	Orchidaceae	MONOCOTYLEDONOUS HERBS	Regionally Vulnerable	r	r	
<i>Ranunculus</i> aff. <i>reflexus</i> (CHR 39427; Mt Peel)	Native	Ranunculaceae	DICOTYLEDONOUS HERBS	Regionally Naturally Uncommon			r
<i>Ranunculus amphitrichus</i> Colenso	Native	Ranunculaceae	DICOTYLEDONOUS HERBS		l	l	l
<i>Ranunculus foliosus</i> Kirk	Native	Ranunculaceae	DICOTYLEDONOUS HERBS		l	l	l
<i>Ranunculus glabrifolius</i> Hook.	Native	Ranunculaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened		l	
<i>Ranunculus multiscapus</i> Hook.f.	Native	Ranunculaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	o	o	
<i>Ranunculus reflexus</i> Garn.-Jones	Native	Ranunculaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened		o	
<i>Ranunculus royi</i> G.Simpson	Native	Ranunculaceae	DICOTYLEDONOUS HERBS	Regionally Vulnerable	l		
<i>Ranunculus ternatifolius</i> Kirk	Native	Ranunculaceae	DICOTYLEDONOUS HERBS	Regionally Endangered	r		
<i>Raoulia australis</i> Hook.f. ex Raoul	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Declining	r		

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Raoulia subsericea Hook.f.	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	o	o	
Rubus cissoides A.Cunn.	Native	Rosaceae	DICOTYLEDONOUS LIANES & RELATED TRAILING PLANTS	Regionally Not Threatened		r	
Rubus schmidelioides var. subpauperatus (Cockayne) Allan	Native	Rosaceae	DICOTYLEDONOUS LIANES & RELATED TRAILING PLANTS	Regionally Not Threatened	o	o	
Rumex flexuosus Sol. ex G.Forst.	Native	Polygonaceae	DICOTYLEDONOUS HERBS	Regionally Naturally Uncommon	r	r	
Rytidosperma buchananii (Hook.f.) Connor & Edgar	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Declining	r		
Rytidosperma corinum Connor & Edgar	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	l		
Rytidosperma gracile (Hook.f.) Connor & Edgar	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	l	l	
Rytidosperma nigricans (Petrie) Connor & Edgar	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	l	r	
Rytidosperma pumilum (Kirk) Connor & Edgar	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Declining	l		
Rytidosperma thomsonii (Buchanan) Connor & Edgar	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Endangered	r		r
Rytidosperma unarede (Raoul) Connor & Edgar	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	l	r	r
Scandia geniculata (G.Forst.) J.W.Dawson	Native	Apiaceae	DICOTYLEDONOUS HERBS	Regionally Naturally Uncommon	r	r	r
Schoenus pauciflorus (Hook.f.) Hook.f.	Native	Cyperaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	l	l	l
Scleranthus brockiei P.A.Will.	Native	Caryophyllaceae	DICOTYLEDONOUS HERBS	Regionally Naturally Uncommon	r		
Scleranthus uniflorus P.A.Will.	Native	Caryophyllaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	o	o	
Senecio dunedinensis Belcher	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Endangered	r	r	
Senecio glomeratus Poir. subsp. glomeratus	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r	r	r
Senecio quadridentatus Labill.	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r	l	

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Senecio wairauensis Belcher	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened		r	
Simplicia laxa Kirk	Native	Poaceae	MONOCOTYLEDONOUS HERBS	Regionally Critical	r		
Sonchus aff. novae-zelandiae (a) (CHR 517718; "grassland")	Native	Asteraceae	DICOTYLEDONOUS HERBS	Regionally Endangered	r		
Sophora microphylla Aiton	Native	Fabaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened	r	r	
Stellaria gracilentia Hook.f.	Native	Caryophyllaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r		
Stellaria parviflora Hook.f.	Native	Caryophyllaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r	l	r
Tetrachondra hamiltonii Petrie ex Oliv.	Native	Tetrachondraceae	DICOTYLEDONOUS HERBS	Regionally Endangered	r		
Thelymitra longifolia J.R.Forst. & G.Forst.	Native	Orchidaceae	MONOCOTYLEDONOUS HERBS	Regionally Not Threatened	o	o	o
Veronica rakaiensis J.B.Armstr.	Native	Plantaginaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Naturally Uncommon	l		
Veronica salicifolia G.Forst.	Native	Plantaginaceae	DICOTYLEDONOUS TREES AND SHRUBS	Regionally Not Threatened		r	
Viola cunninghamii Hook.f.	Native	Violaceae	DICOTYLEDONOUS HERBS		o	o	
Viola filicaulis Hook.f.	Native	Violaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	r		
Wahlenbergia albomarginata Hook. subsp. albomarginata	Native	Campanulaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	c	c	
Wahlenbergia rupestris G.Simpson	Native	Campanulaceae	DICOTYLEDONOUS HERBS	Regionally Not Threatened	o	r	
Wahlenbergia violacea J.A.Pettersen	Native	Campanulaceae	DICOTYLEDONOUS HERBS	Regionally Vulnerable	r		
Wurmbea novae-zelandiae (Hook.f. ex Kirk) Lekhak, Survesw. & S.R.Yadav	Native	Colchiaceae	MONOCOTYLEDONOUS HERBS	Regionally Endangered		r	
Acaena novae-zelandiae Kirk x Acaena inermis Hook.f.	Hybrid		DICOTYLEDONOUS HERBS	r			r

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Anaphalioides bellidioides (G.Forst.) Glenny x Helichrysum filicaule Hook.f.	Hybrid		DICOTYLEDONOUS HERBS	r			
Chionochloa rubra subsp. cuprea X C. rigida subsp. rigida	Hybrid		MONOCOTYLEDONOUS HERBS	l		l	
Coprosma crassifolia x Coprosma virescens	Hybrid		DICOTYLEDONOUS TREES AND SHRUBS	r			
Coprosma propinqua var. propinqua x Coprosma crassifolia	Hybrid		DICOTYLEDONOUS TREES AND SHRUBS			r	
Gaultheria macrostigma (Colenso) D.J.Middleton x Gaultheria antipoda G.Forst.	Hybrid		DICOTYLEDONOUS TREES AND SHRUBS	r			
Rubus cissooides A.Cunn. x Rubus schmidelioides var. subpauperatus (Cockayne) Allan	Hybrid		DICOTYLEDONOUS LIANES & RELATED TRAILING PLANTS			r	r
Achillea millefolium L.	Exotic	Asteraceae	DICOTYLEDONOUS HERBS			l	l
Agrostis capillaris L.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	a		a	a
Agrostis stolonifera L.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	l		l	l
Aira caryophyllea L. subsp. caryophyllea	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	l		l	
Alopecurus geniculatus L.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	l		l	l
Anthosachne "green" (plants erect, with long drooping to erect culms, spikelets small and florets easily dropped. Exotic?)	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS				l
Anthoxanthum odoratum L.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	c		c	c
Anthriscus caucalis	Exotic	Apiaceae	DICOTYLEDONOUS HERBS	l			
Aphanes inexpectata	Exotic	Rosaceae	DICOTYLEDONOUS HERBS	l		l	
Arenaria serpyllifolia L.	Exotic	Caryophyllaceae	DICOTYLEDONOUS HERBS	l			

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Arrhenatherum elatius subsp. elatius (L.) J.Presl & C.Presl.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	r			
Bellardia viscosa (L.) Fisch. & C.A.Mey.	Exotic	Orobanchaceae	DICOTYLEDONOUS HERBS				l
Betula pendula	Exotic	Betulaceae	DICOTYLEDONOUS TREES AND SHRUBS	r			r
Brassica napus L. var. napus	Exotic	Brassicaceae	DICOTYLEDONOUS HERBS				l
Brassica rapa L. var. rapa	Exotic	Brassicaceae	DICOTYLEDONOUS HERBS	r			
Bromus hordeaceus L.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	c			c
Buddleja madagascariensis	Exotic	Buddlejaceae	DICOTYLEDONOUS TREES AND SHRUBS				r
Callitriche stagnalis Scop.	Exotic	Plantaginaceae	DICOTYLEDONOUS HERBS	l			l
Capsella bursa-pastoris	Exotic	Brassicaceae	DICOTYLEDONOUS HERBS	o			o
Carduus nutans	Exotic	Asteraceae	DICOTYLEDONOUS HERBS	o			o
Carex leporina L.	Exotic	Cyperaceae	MONOCOTYLEDONOUS HERBS	l			l
Cerastium fontanum subsp. vulgare (Hartm.) Greuter & Burdet	Exotic	Caryophyllaceae	DICOTYLEDONOUS HERBS	o			o
Cerastium glomeratum Thuill.	Exotic	Caryophyllaceae	DICOTYLEDONOUS HERBS	r			l
Cerastium semidecandrum L.	Exotic	Caryophyllaceae	DICOTYLEDONOUS HERBS	o			
Cirsium arvense	Exotic	Asteraceae	DICOTYLEDONOUS HERBS	l			l
Cirsium vulgare	Exotic	Asteraceae	DICOTYLEDONOUS HERBS	o			o
Conium maculatum	Exotic	Apiaceae	DICOTYLEDONOUS HERBS				l
Cotoneaster coriaceus Franchet	Exotic	Rosaceae	DICOTYLEDONOUS TREES AND SHRUBS				r
Crepis capillaris	Exotic	Asteraceae	DICOTYLEDONOUS HERBS	c			c

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Critesion murinum subsp. murinum	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	l			
Cupressus macrocarpa Hartw. ex Gordon	Exotic	Cupressaceae	GYMNOSPERM TREES AND SHRUBS	r			r
Cynosurus cristatus L.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	o			c
Cytisus scoparius	Exotic	Fabaceae	DICOTYLEDONOUS TREES AND SHRUBS	l			l
Dactylis glomerata L.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	l			c
Digitalis purpurea L.	Exotic	Plantaginaceae	DICOTYLEDONOUS HERBS	l			l
Echium vulgare	Exotic	Boraginaceae	DICOTYLEDONOUS HERBS				l
Elytrigia repens (L.) Nevski	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS				r
Epilobium ciliatum Raf.	Exotic	Onagraceae	DICOTYLEDONOUS HERBS				r
Erodium cicutarium (L.) L'Hér.	Exotic	Geraniaceae	DICOTYLEDONOUS HERBS	o			c
Festuca filiformis Pourr.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	c			c
Festuca rubra L. subsp. rubra	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS				o
Festuca rubra subsp. commutata	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	l			c
Foeniculum vulgare	Exotic	Apiaceae	DICOTYLEDONOUS HERBS				l
Galium aparine	Exotic	Rubiaceae	DICOTYLEDONOUS HERBS	l			l
Glyceria declinata Bréb.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	l			l
Hieracium lepidulum	Exotic	Asteraceae	DICOTYLEDONOUS HERBS	l			l
Holcus lanatus L.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	c			c
Hypochaeris glabra	Exotic	Asteraceae	DICOTYLEDONOUS HERBS				r

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Hypochaeris radicata	Exotic	Asteraceae	DICOTYLEDONOUS HERBS	c			c
Isolepis setacea	Exotic	Cyperaceae	MONOCOTYLEDONOUS HERBS				r
Jacobaea vulgaris Gaertn.	Exotic	Asteraceae	DICOTYLEDONOUS HERBS				l
Juncus acuminatus Michaux	Exotic	Juncaceae	MONOCOTYLEDONOUS HERBS				r
Juncus amabilis	Exotic	Juncaceae	MONOCOTYLEDONOUS HERBS	r			
Juncus articulatus L.	Exotic	Juncaceae	MONOCOTYLEDONOUS HERBS	l			l
Juncus bufonius var. bufonius	Exotic	Juncaceae	MONOCOTYLEDONOUS HERBS	l			l
Juncus effusus L. var. effusus	Exotic	Juncaceae	MONOCOTYLEDONOUS HERBS	l			l
Juncus effusus var. compactus	Exotic	Juncaceae	MONOCOTYLEDONOUS HERBS	l			l
Juncus filicaulis	Exotic	Juncaceae	MONOCOTYLEDONOUS HERBS				r
Lapsana communis	Exotic	Asteraceae	DICOTYLEDONOUS HERBS				r
Linum catharticum L.	Exotic	Linaceae	DICOTYLEDONOUS HERBS	l			l
Lolium arundinaceum (Schreb.) Darbysh. subsp. arundinaceum	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS				r
Lolium multiflorum Lam.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS				r
Lolium perenne L.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	c			c
Lotus pedunculatus Cav.	Exotic	Fabaceae	DICOTYLEDONOUS HERBS				o
Malus x domestica	Exotic	Rosaceae	DICOTYLEDONOUS TREES AND SHRUBS				r
Malva neglecta Wallr.	Exotic	Malvaceae	DICOTYLEDONOUS HERBS	r			
Marrubium vulgare	Exotic	Lamiaceae	DICOTYLEDONOUS HERBS	l			

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area
Mentha spicata L. subsp. spicata	Exotic	Lamiaceae	DICOTYLEDONOUS HERBS	l			
Mycelis muralis	Exotic	Asteraceae	DICOTYLEDONOUS HERBS			r	
Myosotis discolor Pers.	Exotic	Boraginaceae	DICOTYLEDONOUS HERBS	o			
Myosotis laxa Lehm. subsp. caespitosa (CF Schultz)	Exotic	Boraginaceae	DICOTYLEDONOUS HERBS	l		l	
Nasturtium microphyllum Boenn. ex Rchb.	Exotic	Brassicaceae	DICOTYLEDONOUS HERBS	l			
Phalaris aquatica L.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS			l	
Phleum pratense L.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	r		l	l
Pilosella officinarum F.Schultz & Sch.Bip.	Exotic	Asteraceae	DICOTYLEDONOUS HERBS	a		a	a
Pinus radiata D.Don	Exotic	Pinaceae	GYMNOSPERM TREES AND SHRUBS	r			
Plantago lanceolata	Exotic	Plantaginaceae	DICOTYLEDONOUS HERBS	r		r	
Plantago major	Exotic	Plantaginaceae	DICOTYLEDONOUS HERBS	r			
Poa annua L.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	l		l	l
Poa colensoi Hook.f. (tall green form with long ligule & smooth lemma)	Exotic		MONOCOTYLEDONOUS HERBS			c	o
Poa palustris L.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	r			
Poa pratensis L.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	l		l	l
Poa trivialis L.	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	l		r	
Prunella vulgaris	Exotic	Lamiaceae	DICOTYLEDONOUS HERBS	l		l	l
Pseudotsuga menziesii (Mirb.) Franco	Exotic	Pinaceae	GYMNOSPERM TREES AND SHRUBS			r	
Quercus robur	Exotic	Fagaceae	DICOTYLEDONOUS TREES AND SHRUBS			r	

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area	
Ranunculus flammula L.	Exotic	Ranunculaceae	DICOTYLEDONOUS HERBS				l	
Ranunculus repens L.	Exotic	Ranunculaceae	DICOTYLEDONOUS HERBS	l			l	
Ranunculus sceleratus L.	Exotic	Ranunculaceae	DICOTYLEDONOUS HERBS	r			r	r
Ranunculus trichophyllus Chaix	Exotic	Ranunculaceae	DICOTYLEDONOUS HERBS	l				
Reseda luteola	Exotic	Resedaceae	DICOTYLEDONOUS HERBS				r	
Rhamnus alaternus	Exotic	Rhamnaceae	DICOTYLEDONOUS TREES AND SHRUBS				r	
Ribes nigrum	Exotic	Grossulariaceae	DICOTYLEDONOUS TREES AND SHRUBS				r	
Ribes uva-crispa	Exotic	Grossulariaceae	DICOTYLEDONOUS TREES AND SHRUBS	r			r	
Rosa rubiginosa	Exotic	Rosaceae	DICOTYLEDONOUS TREES AND SHRUBS	l			o	
Rumex acetosella	Exotic	Polygonaceae	DICOTYLEDONOUS HERBS	c			a	c
Rumex conglomeratus	Exotic	Polygonaceae	DICOTYLEDONOUS HERBS					r
Rumex crispus	Exotic	Polygonaceae	DICOTYLEDONOUS HERBS	r			r	
Rumex obtusifolius	Exotic	Polygonaceae	DICOTYLEDONOUS HERBS				r	
Rytidosperma penicillatum (Labill.) Connor & Edgar	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	c			o	o
Sagina apetala Ard.	Exotic	Caryophyllaceae	DICOTYLEDONOUS HERBS				r	
Sagina procumbens L.	Exotic	Caryophyllaceae	DICOTYLEDONOUS HERBS	l			l	o
Salix fragilis L.	Exotic	Salicaceae	DICOTYLEDONOUS TREES AND SHRUBS				l	
Sambucus nigra	Exotic	Adoxaceae	DICOTYLEDONOUS TREES AND SHRUBS	r			r	
Scorzoneroide autumnalis (L.) Moench	Exotic	Asteraceae	DICOTYLEDONOUS HERBS	l			l	l

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area	
Senecio sylvaticus L.	Exotic	Asteraceae	DICOTYLEDONOUS HERBS				r	
Senecio vulgaris L.	Exotic	Asteraceae	DICOTYLEDONOUS HERBS				r	
Sherardia arvensis	Exotic	Rubiaceae	DICOTYLEDONOUS HERBS	l				
Solanum dulcamara L.	Exotic	Solanaceae	DICOTYLEDONOUS HERBS	r			r	
Sonchus asper	Exotic	Asteraceae	DICOTYLEDONOUS HERBS				l	
Sonchus oleraceus	Exotic	Asteraceae	DICOTYLEDONOUS HERBS				o	
Sorbus aucuparia subsp. aucuparia	Exotic	Rosaceae	DICOTYLEDONOUS TREES AND SHRUBS	r			r	
Spergula arvensis L.	Exotic	Caryophyllaceae	DICOTYLEDONOUS HERBS	r			r	
Spergularia rubra (L.) J.Presl & C.Presl	Exotic	Caryophyllaceae	DICOTYLEDONOUS HERBS					l
Stellaria alsine Grimm	Exotic	Caryophyllaceae	DICOTYLEDONOUS HERBS	l			l	l
Stellaria graminea	Exotic	Caryophyllaceae	DICOTYLEDONOUS HERBS				l	
Stellaria media (L.) Vill. subsp. media	Exotic	Caryophyllaceae	DICOTYLEDONOUS HERBS	l			l	l
Tanacetum parthenium (L.) Sch.Bip.	Exotic	Asteraceae	DICOTYLEDONOUS HERBS				l	
Taraxacum officinale agg.	Exotic	Asteraceae	DICOTYLEDONOUS HERBS	o			c	c
Trifolium arvense	Exotic	Fabaceae	DICOTYLEDONOUS HERBS	c			c	c
Trifolium dubium	Exotic	Fabaceae	DICOTYLEDONOUS HERBS	c			c	c
Trifolium glomeratum	Exotic	Fabaceae	DICOTYLEDONOUS HERBS				l	c
Trifolium micranthum	Exotic	Fabaceae	DICOTYLEDONOUS HERBS				c	
Trifolium pratense	Exotic	Fabaceae	DICOTYLEDONOUS HERBS	o			c	o

Name	Biostatus	Family (Tribe)	Taxonomic Group	Regional Threat ranking (2026)	Coronation Mining Area	Central Mining Area	Golden Bar Mining area	
Trifolium repens	Exotic	Fabaceae	DICOTYLEDONOUS HERBS	c			a	c
Tripleurospermum inodorum	Exotic	Asteraceae	DICOTYLEDONOUS HERBS				l	
Ugni molinae	Exotic	Myrtaceae	DICOTYLEDONOUS TREES AND SHRUBS				r	
Ulex europaeus	Exotic	Fabaceae	DICOTYLEDONOUS TREES AND SHRUBS				l	l
Verbascum thapsus L.	Exotic	Scrophulariaceae	DICOTYLEDONOUS HERBS	o			o	
Veronica arvensis	Exotic	Plantaginaceae	DICOTYLEDONOUS HERBS				o	o
Veronica serpyllifolia	Exotic	Plantaginaceae	DICOTYLEDONOUS HERBS	l			l	
Veronica verna	Exotic	Plantaginaceae	DICOTYLEDONOUS HERBS	o				
Vicia sativa	Exotic	Fabaceae	DICOTYLEDONOUS HERBS	r				
Vinca major	Exotic	Apocynaceae	DICOTYLEDONOUS HERBS				r	
Viola arvensis	Exotic	Violaceae	DICOTYLEDONOUS HERBS	r				
Vulpia bromoides (L.) Gray	Exotic	Poaceae	MONOCOTYLEDONOUS HERBS	c			c	c

7.8 Appendix 2. Site photographs



Figure 15. View of tussockland of Golden Point WRS (to left) and pit (to right) looking north from 1406480 4968011. Headwall of old Golden Bar pit in right midground. Photo taken 28 April 2022.



Figure 16. View of Golden Bar WRS looking south-east from 1405877 4968789 showing exotic grassland with scattered tussock and *Carmichaelia petriei* shrubs (left mid slope line). Existing Golden Bar WRS rear left. Photo taken 28 April 2022.



Figure 17. Shrubland remnant in Golden Bar WRS at 1406153 4968526. Photo taken 28 April 2022.



Figure 18. Carmichaelia petriei shrubs in Golden Bar WRS at 1405984 4968682. Photo taken 28 April 2022.



Figure 19. View of tussockland and felled pine plantation in Coronation 6 pit area looking south from 1396116 4977347. Photo taken 2 May 2022.



Figure 20. Partially dewatered ephemeral wetland in Coronation 6 Pit area at 1396310 4977134. Photo taken 2 May 2022.



Figure 21. Exotic grassland at Innes Mills area of Central Mining Area looking north-west from 1400732 4973280. Photo taken 28 April 2022.



Figure 22. Wetland vegetation in buffer area of Innes Mills Stage 10 showing indigenous toetoe (left) and pukio pedestals in exotic grasses and herbs including Californian thistle (grey).



Figure 23. View of rehabilitated rank exotic grassland on Northern Gully WRS showing primarily cocksfoot and browntop grasses.

7.9 Appendix 3. Details of At Risk and Locally Uncommon Plant Species

Thirty-three plant species that occur within the ESF are either currently classified regionally as Threatened, At Risk or Data Deficient (Rolfe et al., 2022; de Lange et al., 2024), or are thought to be uncommon in the Macraes E.D. based on the author’s observations. This section evaluates the impact of the project components on these species.

Threatened – Regionally Critical

Carmichaelia corrugata Colenso (dwarf broom, Fabaceae).

Distribution within project

Four sites containing 10 plants of this small creeping broom are recorded at Trimbells WRS Height Raise footprint.

Summary of existing information

Carmichaelia corrugata is an eastern South Island dwarf broom of dryland short grassland¹⁶. Macraes is near the southern limit of its distribution (it is also known from Mt Royal near Waikouaiti. It is known from seven sites in the Macraes area in the Trimbells and Coal Creek area and also in the Island Block Covenant.

It is classified in the Otago Region as Regionally Critical on the basis of the total area of occupancy being less than 1 ha there being Data Poor on Population Size, Population Trend and the populations likely to be fragmented, small and widely scattered. It is classified as Nationally Vulnerable on the basis of a total area of occupancy across all populations of <1000 ha and a predicted decline of 30-70% over the next three generations with these populations being scattered and fragmented (Qualifiers ‘Sp’, ‘PF’). This classification is qualified by Data Poor on the basis of Recognition, Population Size and Population Trend and it is thought to be failing to regenerate. The main threat to this species appears to be being lost though ploughing or loss of its short grassland habitat to taller plants. While it occurs in some protected areas its persistence is not guaranteed.

¹⁶ 10.1080/0028825X.1995.10410618
0

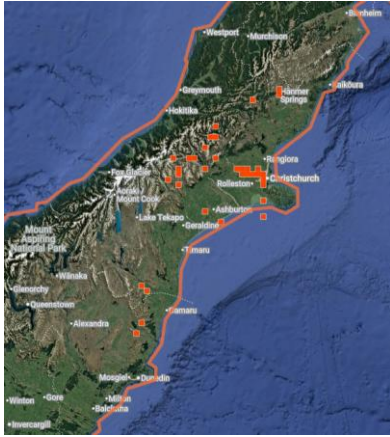


Figure 24. Distribution of *Carmichaelia corrugata* in New Zealand from the iNaturalist database No guarantee is given as to the accuracy of the map or the identification of the species.

The ecological importance of the population of this species within the ESF is categorised as **high**.

The confidence of this assessment is **low** as it was only recently recognised that this taxon inhabited the Macraes E.D., it is very poorly known and its distinguishing features are not well known, much of the Macraes area has not been closely explored, and all available records from the area are the result of opportunistic (rather than structured) surveys.

Hypericum rubicundulum Heenan (a indigenous St Johns wort, *Hypericaceae*).

Distribution within project

Three plants at three sites of this small creeping herb are recorded at Trimbells WRS Height Raise footprint (two of 10 cm x 10 cm patches in overhangs in schist outcrops recorded in 2018, one site of several plants on a clay bank) and one site of 25+ plants on a clay bank in the 80 m buffer of the Golden Bar Haul Road.

Summary of existing information

Hypericum rubicundulum is a recently (2008) described species known mainly from wetlands and lake margins in the eastern South Island and Nelson Lakes¹⁷. It is known from 18 sites in the Macraes area

¹⁷ 10.1080/00288250809509784

which is an outlying area from its more normal distribution. At Macraes it also occurs on clay banks and under schist rock overhangs which are anomalous habitats for this species.

It is classified in the Otago Region (which is likely to be at the natural range limit and a stronghold for this species) as Regionally Critical on the basis of the total area of occupancy being less than 1 ha there being Data Poor on Recognition, Population Size, Population Trend and the populations likely to be restricted to a particular habitat, populations are likely to be fragmented, small and widely scattered. It is classified as Nationally Endangered on the basis of a total area of occupancy across all populations of <10 ha with these populations occurring over a restricted range (Qualifier 'RR'). This classification is qualified by Data Poor on the basis of Recognition, Population Size and Population Trend. Little is known about threats, but it is likely to be vulnerable to displacement by taller weedy vegetation at some sites. While it occurs in some protected areas its persistence is not guaranteed.

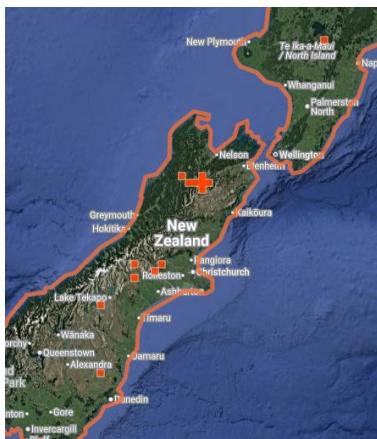


Figure 25. Distribution of *Hypericum rubicundulum* in New Zealand from the iNaturalist database No guarantee is given as to the accuracy of the map or the identification of the species.

Threatened – Regionally Endangered

Carex kaloides Petrie (a sedge, *Cyperaceae*).

Distribution within project

This sedge was observed as one plant forming a small patch at one site in the 20 m buffer and as a large population in the 80 m buffer of the Trimbells WRS Height Raise footprint. It is known at 38 sites in the Macraes area, all in gully bottoms.

Summary of existing information

Carex kaloides is an inland Eastern South Island inhabitant. Its presence in the Macraes area was not known until 2020 and is eastern outlier of the population range. Since recognition of the species in the Macraes area it is known to occur at 38 sites in the Macraes E.D. (and at Sutton Salt Lake), usually on flat gully bottoms.

It is classified in the Otago Region (which contains the Type Locality and likely to be at the natural range limit and a stronghold for this species) as Regionally Endangered on the basis of the total area of occupancy being 1-10 ha and there being a predicted decline of 10-30% over the next three generations of the species and being Data Poor on Population Trend and the populations likely to be small and widely scattered but with some populations being secure. It is classified Nationally as Declining on the basis of a total area of occupancy across all populations of <10,000 ha and a predicted decline of 10-50% over the next three generations with populations typically widely scattered and small (Qualifier 'Sp.'). This classification is qualified by Data Poor on the basis of Population Size and Population Trend. There appear to be little threats to this species in the Macraes area and it is only grazed during dry times, but this grazing does not appear to result in ill-thrift of the plants.



Figure 26. Distribution of *Carex kaloides* in New Zealand from the iNaturalist database No guarantee is given as to the accuracy of the map or the identification of the species.

Carex tenuiculmis (Petrie) Heenan & de Lange (slender wine sedge, Cyperaceae).

Distribution within project

This wetland sedge was recorded at 11 sites in the Golden Bar Haul Road and Coronation Mining Areas. Within the footprint and 20 m buffer of the MP4FT Project it is present at one site in the Trimbells WRS Raise footprint where 1 plant is present.

Summary of existing information

Carex tenuiculmis is distributed throughout the eastern South Island and on Stewart Island and the Chatham Islands¹⁸. In the wider Macraes area it is known from 35 sites and occurs in damp gully bottoms and wetlands.

It is classified in the Otago Region (which contains the Type Locality and a stronghold for this species) as Regionally Endangered on the basis of the total area of occupancy being less than 10 ha and being Data Poor on Population Trend and the populations being restricted to a specific habitat and likely to be stable, small and widely scattered. It is classified Nationally as Declining on the basis of the total population size is 5,000–20,000 mature individuals and a predicted decline of 10–30% over the next three generations with populations typically widely scattered and small (Qualifier 'Sp.'). This classification is qualified by Data Poor on the basis of Population Size and Population Trend. The main threat to this species is grazing by cattle that can cause the loss of the species from an area.



Figure 27. Distribution of *Carex tenuiculmis* in New Zealand from the iNaturalist database. No guarantee is given as to the accuracy of the map or the identification of the species.

Lagenophora barkeri Kirk (a wetland daisy, Asteraceae).

Distribution within project

¹⁸ P. B. Heenan, P. J. de Lange & B. G. Murray (1997) *Carex tenuiculmis* comb. Et stat. nov. (Cyperaceae), a threatened red-leaved sedge from New Zealand, New Zealand Journal of Botany, 35:2, 159–165, DOI: 10.1080/0028825X.1997.10414152

This wetland daisy was recorded at 1 site in the Golden Bar Mining Area and 8 in the Coronation Mining Area. Within the footprint and 20 m buffer of the MP4FT Project three plants are present at three sites with a total area 5.5 m x 2 m in the Trimbells WRS Raise footprint and Coronation North Pit Disturbance area.

Summary of existing information

Lagenophora barkeri is distributed throughout the South Island¹⁹. In the wider Macraes area it is known from at least 26 sites²⁰ and occurs in damp gully bottoms, wetlands and seeps and is very common in the nearby Highlay Hill Covenant.

It is classified in the Otago Region (which is a stronghold for this species) as Regionally Endangered on the basis of the total area of occupancy being 1 to 10 ha with a predicted population decline of 10-30% over three generations of the species and being Data Poor on Recognition, Population Size, Population Trend and the populations being restricted to a specific habitat and likely to be fragmented, small and widely scattered. It is classified nationally as Declining on the basis of the total population size is 5,000–20,000 mature individuals and a predicted decline of 10-30% over the next three generations with populations typically widely scattered and small and some populations being secure (Qualifiers ‘Sp’, ‘PD’). This classification is qualified by Data Poor on the basis of Recognition, Population Size and Population Trend. The main threat to this species is grazing invasion of wetlands by tall exotic weeds.

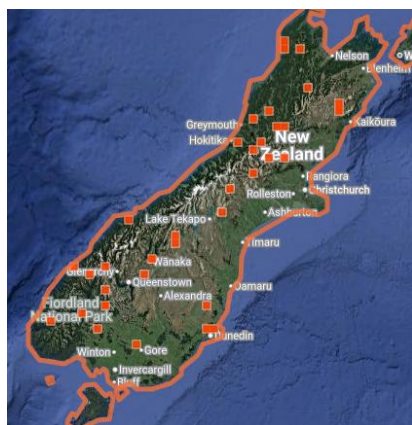


Figure 28. Distribution of *Lagenophora barkeri* in New Zealand from the iNaturalist database No guarantee is given as to the accuracy of the map or the identification of the species.

¹⁹ D. G. Drury (1974): A broadly based taxonomy of Lagenifera section Lagenifera and Solenogyne (Compositae-Astereae), with an account of their species in New Zealand, New Zealand Journal of Botany, 12:3, 365-395

²⁰ As this species is frequently encountered at Macraes locations are often not recorded.

Leptinella pusilla Hook.f. (ex. *Cotula perpusilla*) (a creeping buttondaisy, Asteraceae).

Distribution within project

One plant of this button daisy of shaded places was recorded in 2018 as a 2 m x 50 cm patch at one site in the Trimbells WRS Height Raise footprint.

Summary of existing information

Leptinella pusilla occurs on the Wellington south coast and in the South Island²¹. In the wider Macraes area it is known at an additional 12 sites as usually a single patch in shaded areas (mostly at the base of rock outcrops).

It is classified in the Otago Region (which is a stronghold for this species) as Regionally Endangered on the basis of the total area of occupancy being 1 to 10 ha with a predicted population decline of 10-30% over three generations of the species and being Data Poor on Recognition, Population Size, Population Trend and the populations likely to be fragmented, small and widely scattered. It is currently classified nationally as Declining on the basis of a total area of occupancy across all populations of >10,000 ha and a predicted decline of 10-70% over the next three generations. This classification is qualified by Data Poor on the basis of Population Trend. This species is considered to be at risk because of weed invasion, but there is considerable lack of knowledge of its distribution and threats.



Figure 29. Distribution of *Leptinella pusilla* in New Zealand from the iNaturalist databases No guarantee is given as to the accuracy of the maps or the identification of the species.

²¹ David G. Lloyd (1972) A revision of the New Zealand, Subantarctic, and South American species of *Cotula*, Section *Leptinella*, New Zealand Journal of Botany, 10:2, 277-372

Lobelia ionantha Heenan (a creeping wetland herb, *Campanulaceae*).

Distribution within project

This creeping wetland herb is present in Protected Wetlands 3 & 4 and was previously present at another site in the Innes Mills footprint.

Summary of existing information

Lobelia ionantha occurs in wetlands mostly in the east of the South Island²². At Macraes it has been recorded at 31 locations which are part of an eastern Otago population.

It is classified in the Otago Region (which is a stronghold for this species) as Regionally Endangered on the basis of the total area of occupancy being 1 to 10 ha with a predicted population decline of 10-50% over three generations of the species and being Data Poor on Recognition, Population Size, Population Trend and the populations likely to be fragmented, small and widely scattered and restricted to specific habitats. It is currently classified nationally as Declining on the basis of a total area of occupancy across all populations of >10,000 ha and a predicted decline of 10-70% over the next three generations. This species is considered to be at risk from habitat loss and because of weed invasion, but there is considerable lack of knowledge of its distribution and threats.

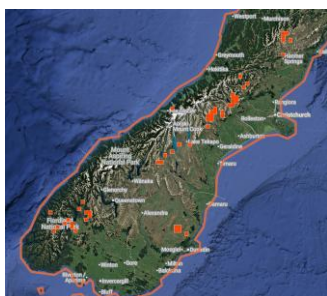


Figure 30. Distribution of *Lobelia ionantha* in New Zealand from the iNaturalist databases No guarantee is given as to the accuracy of the maps or the identification of the species.

Rytidosperma thomsonii (Buchanan) Connor & Edgar (a bristle grass, *Poaceae*).

Distribution within project

Four plants of this small grass were recorded in tussock grassland in the Coronation North Pit Disturbance footprint.

²² Heenan, P.N., et al. 2008. Generic placement in *Lobelia* and revised taxonomy for New Zealand species previously in *Hypsela* and *Isotoma* (Lobeliaceae). NZ Journal of Botany 46:87-100.

Summary of existing information

Rytidosperma thomsonii occurs in the eastern South island, particularly in inter-montane basins of Canterbury and Otago²³ It is a species of dry low short tussock vegetation. In the wider Macraes area it is known at one additional site on the nearby Highlay Hill.

It is classified in the Otago Region (which contains the Type Locality, range limit and a stronghold for this species) as Regionally Endangered on the basis of the total area of occupancy being 1 to 10 ha with a predicted population decline of 10-30% over three generations of the species and being Data Poor on Recognition, Population Size, Population Trend and the populations likely to be fragmented, small and widely scattered. It is currently classified nationally as Declining on the basis of a total area of occupancy across all populations of <10,000 ha and a predicted decline of 10-50% over the next three generations. This classification is qualified by Data Poor on the basis of Population Size. This species is considered to be at risk because of weed invasion and ploughing of dryland habitats, but there is considerable lack of knowledge of its distribution and threats.



Figure 31. Distribution of *Rytidosperma thomsonii* in New Zealand from the iNaturalist databases No guarantee is given as to the accuracy of the maps or the identification of the species.

Sonchus novae-zelandiae (a daisy, Asteraceae).

Distribution within project

One site containing two plants on a schist outcrop at Trimbells WRS Height Raise.

Summary of existing information

Sonchus novae-zelandiae (previously known as *Kirkianella novae-zelandiae*) has a complicated taxonomic history and several infraspecific variants are known²⁴. The identity of the plants at this site at Macraes is not known as they differ from the usual 'grassland' race found in Otago in their pale glaucous

²³ H. E. Connor & E. Edgar (1979): *Rytidosperma* Steudel (Notodanthonia Zotov) in New Zealand, *New Zealand Journal of Botany*, 17:3, 311-337

²⁴ <https://www.nzpcn.org.nz/flora/species/sonchus-novae-zelandiae/>. See also P. 10 of 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.

colour, rounded apical pinna and cliff habitat. The ‘grassland’ entity is an eastern South Island inhabitant dryland short grassland²⁵. It is known from 15 sites in the Macraes area.

The ‘grassland’ entity (which the individuals at this site are presumed to belong) is classified in the Otago Region (which is likely to be a stronghold for this species) as Regionally Endangered on the basis of the total area of occupancy being less than 10 ha there being Data Poor on Population Size, Population Trend and the populations likely to be small and widely scattered. It is classified as Nationally Endangered on the basis of a total population of 1,000 to 5,000 mature individuals with these populations being scattered (Qualifiers ‘Sp’) and populations numbers fluctuate widely from year to year. This classification is qualified by Data Poor on the basis of Population Size and Population Trend. Little is known about threats. The main threat to this species appears to be being lost though ploughing or loss of its short grassland habitat to taller plants though climate change may be affecting some cliff dwelling populations. It is also likely palatable to browsers. While it occurs in some protected areas its persistence is not guaranteed.

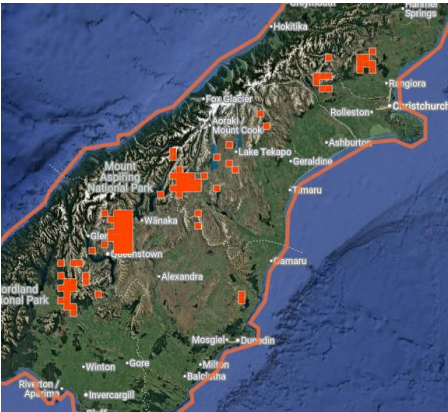


Figure 32. Distribution of *Sonchus novae-zelandiae* in New Zealand from the iNaturalist database No guarantee is given as to the accuracy of the map or the identification of the species.

Threatened – Regionally Vulnerable

Acaena buchanani Hook.f. (*bidibid*, *Rosaceae*).

Distribution within project

²⁵ 10.1080/0028825X.1995.10410618

One plant forming a patch 1 m x 1 m of this creeping glaucous bidibid was recorded at one site Trimbell's WRS Height Raise footprint in 2018.

Summary of existing information

Acaena buechanani is an eastern South Island creeping herb of dryland short grassland. It is known from seven sites in the Macraes area, mainly in the Taieri Ridge area and including in the Highlay Hill Covenant.

It is classified in the Otago Region (which contains the Type Locality and likely to be at the range limit and a stronghold for this species) as Regionally Vulnerable on the basis of the total area of occupancy being less than 100 ha with a decline of 10-50% over the next three generations of the species and being Data Poor on Population Size, Population Trend and the populations likely to be restricted to a particular habitat, populations are likely to be fragmented, small and widely scattered. It is classified Nationally as Declining on the basis of a total area of occupancy across all populations of <10,000 ha and a predicted decline of 10-50% over the next three generations. This classification is qualified by Data Poor on the basis of Population Size and Population Trend. The main threat to this species appears to be being lost through ploughing or loss of its short grassland habitat to taller plants. While it occurs in some protected areas its persistence is not guaranteed.

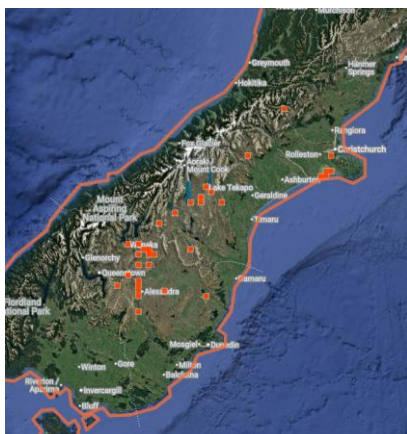


Figure 33. Distribution of *Acaena buechanani* in New Zealand from the iNaturalist database. No guarantee is given as to the accuracy of the map or the identification of the species.

Aciphylla subflabellata W.R.B. Oliv. (*Narrow-leaved speargrass*, *Apiaceae*).

Distribution within project

One plant at 1 site of this small speargrass was recorded at Trimbell's WRS Height Raise footprint in 2016, 6 plants in the 80 m buffer of the Golden Bar Haul Road and an unrecorded number of plants in the 80 m buffer of the Golden Bar Pit.

Summary of existing information

Aciphylla subflabellata is an eastern and southern South Island herb of dryland short grassland, particularly at sites with a damp deep loess mantle. It is known from 58 sites through the Macraes area.

It is classified in the Otago Region (which is likely to be a stronghold for this species) as Regionally Vulnerable on the basis of the total population size of 1,000 to 5,000 individuals and a predicted decline of 10-50% over the next three generations of the species and being Data Poor on Population Size, Population Trend and the populations likely to be fragmented, small and widely scattered. It is classified Nationally as Declining on the basis of a total population size of 20,000 to 100,000 mature individuals and a predicted decline of 10-50% over the next three generations. This classification is qualified by Data Poor on the basis of Population Trend. The main threat to this species appears to be being lost through ploughing or loss of its short grassland habitat to taller plants and at some sites and is known to have been lost as a result of cattle grazing. While it occurs in some protected areas its persistence is not guaranteed.

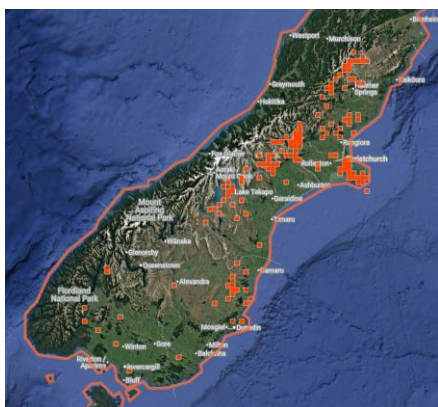


Figure 34. Distribution of *Aciphylla subflabellata* in New Zealand from the iNaturalist database. No guarantee is given as to the accuracy of the map or the identification of the species.

Deschampsia cespitosa (L.) P.Beauv. (a wetland grass, Gramineae).

Distribution within project

This wetland grass was recorded in 2016 and 2022 at 5 sites in the Coronation Pit vicinity where the number of plants vary from 3 to many (a site in the Coronation Pit footprint).

Summary of existing information

Deschampsia cespitosa has a Circumpolar²⁶ distribution. In New Zealand, this species is sparsely distributed from central North Island to Stewart Island also on the Chatham Islands and Antipodes. In the wider Macraes area it is widely by patchily distributed and has been recorded from 25 sites. It usually occurs in permanently damp environments.

It is classified in the Otago Region (which is likely to be a stronghold for this species) as Regionally Vulnerable on the basis of the total area of occupancy of <100 ha and a predicted decline of 10-30% over the next three generation of the species and being Data Poor on Population Size, Population Trend and the populations likely to be restricted to a particular habitat and be small and widely scattered. It is classified Nationally as Declining, with the qualifiers Data Poor on the basis of Population Size and Population Trend, Partial Decline and Secure Overseas (but note footnote), on the basis that the species is estimated to occupy less than 1,000 ha and is predicted to decline at 10-30%. This species is considered to be in decline primarily through loss of its wetland habitat and possibly by the actions of browsers (particularly cattle and deer). No conservation programmes are known for this species, but it occurs in several protected areas at Macraes (including in two of the OGL Covenants).



Figure 35. Distribution of *Deschampsia cespitosa* in New Zealand from the iNaturalist database No guarantee is given as to the accuracy of the maps or the identification of the species.

Epilobium chionanthum Hausskn. (marsh willowherb, *Onagraceae*).

Distribution within project

²⁶ Though there is doubt around the taxonomic status of New Zealand plants (<https://www.nzpcn.org.nz/flora/species/deschampsia-cespitosa/>)

This wetland willowherb was recorded in gully heads at 4 sites all in the 80 m buffer of the Golden Bar Haul Road.

Summary of existing information

Epilobium chionanthum is sparsely distributed throughout New Zealand and on Stewart Island and the Chatham Islands. In the wider Macraes area it is known from 4 other sites and occurs in damp gully bottoms and wetlands.

It is classified in the Otago Region (which is a stronghold for this species) as Regionally Vulnerable on the basis of the total area of occupancy being less than 100 ha and a predicted decline of 10-30% over the next three generations of the species and being Data Poor on Recognition, Population Size, Population Trend and the populations being restricted to a specific habitat and likely to be small and widely scattered. It is classified Nationally as Declining on the basis of a total area of occupancy across all populations of <10,000 ha and a predicted decline of 10-50% over the next three generations with populations restricted to a specific habitat and gene flow is restricted due to population fragmentation (Qualifiers 'RR', 'PF'). This classification is qualified by Data Poor on the basis of Recognition, Population Size and Population Trend. The main threat to this species is grazing by both sheep and cattle.



Figure 36. Distribution of *Epilobium chionanthum* in New Zealand from the iNaturalist database. No guarantee is given as to the accuracy of the map or the identification of the species.

Epilobium insulare Hausskn. (a wetland willowherb, Onagraceae).

Distribution within project

This wetland willowherb was recorded as 6 plants at two closely located sites in the footprint of the Golden Bar WRS area and as several plants in 2016 in the Trimbells WRS Height Raise footprint.

Summary of existing information

Epilobium insulare occurs nearly throughout New Zealand from the Waikato south, and on the Chatham Islands. In the wider Macraes area it is widespread and has been recorded at 52 sites as scattered groups of plants between Red Bank and Ramrock Roads and occurs in the Deepdell and Cranky Jims Wetland Covenants.

It is classified in the Otago Region (which is a stronghold for this species) as Regionally Vulnerable on the basis of the total area of occupancy being less than 100 ha and a predicted decline of 10-30% over the next three generations of the species and being Data Poor on Recognition, Population Size, Population Trend and the populations being restricted to a specific habitat and likely to be small and widely scattered. It is currently classified Nationally as Declining on the basis of a total area of occupancy across all populations of <1,000 ha and a predicted decline of 10-30% over the next three generations with populations that are typically small and widely scattered and restricted to a specific habitat and (Qualifiers 'RR', 'Sp'). This classification is qualified by Data Poor on the basis of Recognition, Population Size and Population Trend. This species is considered to be at risk because of loss of wetland habitat, but there is considerable lack of knowledge of its distribution and threats. Recent survey work has shown it to be widespread at Macraes, with numerous populations in areas where it is present, and therefore of little concern, although at most sites only a few plants are present. No conservation programmes are known for this species, but it occurs in covenanted areas at Macraes where there appear to be few threats.



Figure 37. Distribution of *Epilobium insulare* in New Zealand from the iNaturalist databases No guarantee is given as to the accuracy of the maps or the identification of the species.

Euchiton polylepis (D.G.Drury) Breitw. & J.M.Ward. (a creeping cudweed, Asteraceae).

Distribution within project

This cudweed of damp places was recorded as 1 plant at one site in 2018 in the Trimbells WRS Height Raise footprint.

Summary of existing information

Euchiton polylepis occurs from the Central North Island south to Stewart Island. In the wider Macraes area it is known at an additional 5 sites as usually a single patch on damp banks.

It is classified in the Otago Region (which is a stronghold for this species) as Regionally Vulnerable on the basis of the total area of occupancy being less than 100 ha and a predicted decline of 10-30% over the next three generations of the species and being Data Poor on Recognition, Population Size, Population Trend and the populations being fragmented, small and widely scattered. It is currently classified nationally as Declining on the basis of a total area of occupancy across all populations of <1,000 ha and a predicted decline of 10-30% over the next three generations with populations that are typically small and widely scattered (Qualifier 'Sp'). This species is considered to be at risk because of weed invasion, but there is considerable lack of knowledge of its distribution and threats.



Figure 38. Distribution of *Euchiton polylepis* in New Zealand from the iNaturalist databases No guarantee is given as to the accuracy of the maps or the identification of the species.

Pterostylis tristis Colenso (a dwarf greenhood orchid, *Orchidaceae*).

Distribution within project

Six plants of this small dryland greenhood orchid were recorded in 2018 at one site in the Trimbell's WRS Height Raise footprint.

Summary of existing information

Pterostylis tristis is an Eastern South Island species that also occurs on the Central Plateau of the North Island. It is known from 5 sites in the Macraes area, usually as small groups of plants. However, as it is only distinguishable from the very similar *Pterostylis tanypoda*, which also occurs in the area, the leaf rosettes that are frequently seen in open dry areas at Macraes cannot be assigned to species.

It is classified in the Otago Region (which is a stronghold for this species) as Regionally Vulnerable on the basis of the total area of occupancy being less than 100 ha and a predicted decline of 10-30% over the

next three generations of the species and being Data Poor on Recognition, Population Size, Population Trend and the populations being small and widely scattered. It is classified nationally as Declining on the basis of a total population size of 20,000 to 100,000 mature individuals and a predicted decline of 10-50% over the next three generations and where the populations are often small and widely scattered (Qualifier 'Sp'). The main threat to this species appears to be cultivation of its open low vegetation habitat.



Figure 39. Distribution of *Pterostylis tristis* in New Zealand from the iNaturalist database No guarantee is given as to the accuracy of the map or the identification of the species.

At Risk - Declining

Anthosachne falcis (Connor) Barkworth & S.W.L.Jacobs (prev. *Elymus falcis*) (Delicate bluegrass, Poaceae).

Distribution within project

This grass was observed at several sites in the Trimbells WRS Height Raise footprint. However, as it is an inconspicuous species that is known to frequently inhabit a number of sites in the Macraes area and it is likely to be present at a multitude of sites in the Coronation Mining Area.

Summary of existing information

Anthosachne falcis is a dryland Eastern South Island inhabitant. Its presence in the Macraes area was not known until 2020 (previously plants had been referred as an unnamed *Elymus* sp.). Since recognition of the species in the Macraes area it is known to be a frequent component of narrow-leaved tussock grassland and low rough grassland, often growing from the base of shrubs or clumps of rough grasses.

It is classified in the Otago Region (which is at the range limit and a stronghold for this species) as Declining on the basis of the total area of occupancy being less than 1,000 ha with a decline of 10-30% over the next three generations of the species and being Data Poor on Recognition, Population Size, Population Trend and the populations likely to be small and widely scattered. It is classified Nationally as Declining on the basis of a total area of occupancy across all populations of <10,000 ha and a predicted decline of 10-50% over the next three generations with populations typically widely scattered and small (Qualifier 'Sp.'). This classification is qualified by Data Poor on the basis of Population Trend. The main threat to this species appears to be being lost through ploughing.



Figure 40. Distribution of *Anthosachne falcis* in New Zealand from the iNaturalist database No guarantee is given as to the accuracy of the map or the identification of the species.

Colobanthus strictus Cheeseman (a herb, Caryophyllaceae).

Distribution within project

This small, tufted herb was recorded as 'Occasional' in the Coronation Mining Areas.

Summary of existing information

Colobanthus strictus is distributed in the central North Island and throughout much of the South Island. In the wider Macraes area it has been recorded as scattered plants on open areas at around 5 sites.

It is classified in the Otago Region (which is a stronghold for this species) as Declining on the basis of the total area of occupancy of less than 10,000 ha with a decline of 10-30% over the next three generations of the species and being Data Poor on Recognition, Population Size, Population Trend and the populations likely to be small and widely scattered. It is classified nationally as Not Threatened. The main threat to this species is loss of open habitats through ploughing and weed invasion.

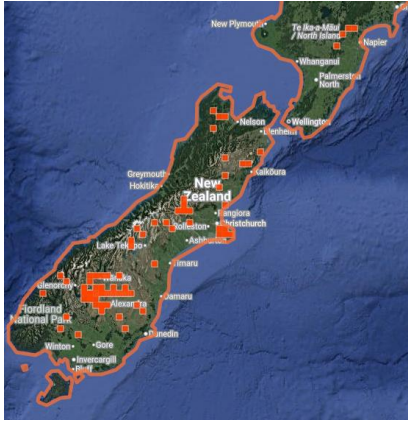


Figure 41. Distribution of *Colobanthus strictus* in New Zealand from the iNaturalist database No guarantee is given as to the accuracy of the map or the identification of the species.

Carmichaelia petriei Petrie (desert broom, Fabaceae).

Distribution within project

This leafless broom was recorded at 54 sites in the Golden Bar, Golden Bar Haul Road and Coronation Mining Areas. Within the footprint and 20 m buffer of the MP4FT Project it is estimated that c. 150 plants are present.

Summary of existing information

Carmichaelia petriei is distributed throughout the eastern South Island from the Mackenzie Basin to Southland and on Stewart Island, with the majority of the populations in Otago²⁷. In the wider Macraes area it occurs as mostly mature plants (recruitment appears to be very limited) in most areas of indigenous shrubland and grasslands, including those that are highly degraded, though numbers vary between sites. Plants are often heavily grazed when smaller, but this does not seem to cause mortality of the plants except during unnaturally dry periods.

It is classified in the Otago Region (which contains the Type Locality and a stronghold for this species) as Declining on the basis of the total population size of 20,000 to 100,000 mature individuals with a decline

²⁷ Heenan, P.B. 1996. A taxonomic revision of *Carmichaelia* (Fabaceae-Galegeae) in New Zealand (part II). *New Zealand Journal of Botany* 34: 157-177.

of 10-30% over the next three generations of the species and the populations likely to be fragmented. It is classified Nationally as Declining on the basis of the total population is estimated to number 20,000–100,000 mature individuals with a predicted decline of 10–50%, and there is little evidence of young plants in the populations. This classification is qualified by Data Poor on the basis of Population Size and Population Trend. This species is considered to be in decline primarily through loss of its dryland habitat and lack of recruitment of young individuals into populations. No conservation programmes are known for this species, but it occurs in several protected areas at Macraes (including the Deepdell Tussock and Cranky Jims Shrubland covenants) where there appear to be few threats (but even at these sites recruitment appears to be rare).

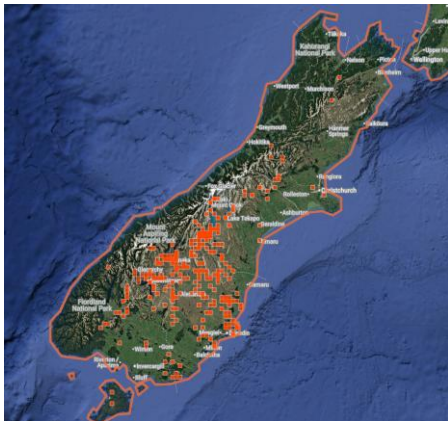


Figure 42. Distribution of *Carmichaelia petriei* in New Zealand from the iNaturalist database. No guarantee is given as to the accuracy of the map or the identification of the species.

Gingidia grisea Heenan (a mountain carrot, *Apiaceae*).

Distribution within project

This herb was recorded as c. 6 plants on a rock outcrop in the 20 m buffer of Golden Bar WRS.

Summary of existing information

Gingidea grisea inhabits schist rock bluffs, outcrops and rocky areas in north-eastern Otago²⁸. In the wider Macraes area it occurs at 9 sites, including in the Island Block and Cranky Jims Shrubland

²⁸ P. B. Heenan (2004) *Gingidiagrisea* (*Apiaceae*), a new species from north-east Otago, South Island, New Zealand, New Zealand Journal of Botany, 42:2, 175-180

Covenants. Population sizes in these areas are up to 100 plants at some sites, though 5-10 plants at a site is more usual.

It is endemic to the Otago region (which contains the Type Locality and is the stronghold for this species) and classified as Declining on the basis of the total area of occupancy being less than 10,000 ha with a decline of 10-30% over the next three generations of the species and being Data Poor on Population Size, Population Trend and the populations fragmented, restricted to a specific habitat likely to be small and widely scattered. It is currently classified nationally as Naturally Uncommon, with the qualifiers Data Poor for Population Size and Population Trend and Range Restricted (on the basis of its only occurring in north-eastern Otago). This species is possibly at risk because of its limited range and susceptibility to browsers.



Figure 43. Distribution of *Gingidea grisea* in New Zealand from the iNaturalist databases No guarantee is given as to the accuracy of the maps or the identification of the species.

Juncus distegus Edgar (an indigenous rush, *Junaceae*).

Distribution within project

This rush was recorded at three sites at Coronation North as 7 plants, and scattered plants over 20 m x 10 m and over 20 m x 5 m and 6 plants at one site in the Golden Bar Mining Area.

Summary of existing information

Juncus distegus is sparsely distributed through the North Island, South Island and Chatham Islands. In the wider Macraes area it is patchily distributed and has been recorded from 76 sites, usually in low numbers. It is most often found in open damp areas or the periodically-inundated margins of ephemeral wetlands.

It is classified in the Otago Region (which is a stronghold for this species) as Declining on the basis of the total population of 5,000 – 20,000 mature individuals with a predicted decline of 10-30% over the next three generations of the species and being Data Poor on Recognition, Population Size and Population

Trend and the populations likely to be restricted to a certain habitat, fragmented, and small and widely separated. It is classified nationally as Not Threatened. It is not known why this species is considered to be in decline as it does not appear to be grazed by stock unless at high stock densities and it occupies a number of damp open habitats. It is likely vulnerable to invasion from tall stature weeds. It is a poorly known species and frequently confused with other *Juncus* species so the actual situation for this species is uncertain.



Figure 44. Distribution of *Juncus distegus* in New Zealand from the iNaturalist databases No guarantee is given as to the accuracy of the maps or the identification of the species.

Mentha cunninghamii Benth. (indigenous mint, Lamiaceae).

Distribution within project

This herb was recorded at one site in the 20 m buffer of the Golden Bar WRS buffer where one plant forming a 50 cm² patch is present at the base of a rock outcrop and at two sites in the Trimbells WRS Height Raise footprint with a combined coverage of 2 m x 1.2 m at the base of rocks.

Summary of existing information

Mentha cunninghamii is sparsely distributed through the North Island, South Island, Stewart Island and Chatham Islands. In the wider Macraes area it is patchily distributed and has been recorded from 8 sites, usually in low numbers. It is most often found at the base of rock outcrops but is also occasionally present in depleted grassland at sites with higher moisture content.

It is classified in the Otago Region (which contains the Type Locality and a stronghold for this species) as Declining on the basis of the total area occupied of less than 1,000 ha with a predicted decline of 10-30% over the next three generations of the species and being Data Poor on Population Size and Population Trend and the populations likely to be fragmented, small and widely separated but some of which are

secure. It is classified nationally as Declining on the basis that the total area of occupancy is estimated to exceed > 10,000 ha with a predicted decline of 10–70, but some populations are secure. It is not known why this species is considered to be in decline. Its habitats appear reasonably secure, and it does not appear to be browsed. Competition from taller weeds is the most likely agent of decline as this species inhabits low turfs.



Figure 45. Distribution of *Mentha cunninghamii* in New Zealand from the iNaturalist databases No guarantee is given as to the accuracy of the maps or the identification of the species.

Rytidosperma buchananii (Hook.f.) Connor & Edgar (a bristle grass, Poaceae).

Distribution within project

Three plants of this small grass were recorded on a schist tor in the Coronation North Pit Disturbance area.

Summary of existing information

Rytidosperma buchananii occurs in the North Island axial ranges and other promontories and throughout the South Island (except Buller and northern Westland)²⁹ It is a species of rock outcrops and dry low short tussock vegetation. In the wider Macraes area it is known at an additional 2 sites.

It is classified in the Otago Region (which contains the Type Locality and a stronghold for this species) as Declining on the basis of the total area occupied of less than 1,000 ha with a predicted decline of 10-30% over the next three generations of the species and being Data Poor on Recognition, Population Size and Population Trend and the populations likely to be fragmented, small and widely separated. It is currently

²⁹ H. E. Connor & E. Edgar (1979): *Rytidosperma* Steudel (Notodanthonia Zotov) in New Zealand, New Zealand Journal of Botany, 17:3, 311-337

classified nationally as Declining on the basis of a total area of occupancy across all populations of >10,000 ha and a predicted decline of 10-70% over the next three generations. This classification is qualified by Data Poor on the basis of Recognition, Population Trend. This species is considered to be at risk because of weed invasion, but there is considerable lack of knowledge of its distribution and threats.



Figure 46. Distribution of *Rytidosperma buehnananii* in New Zealand from the iNaturalist databases No guarantee is given as to the accuracy of the maps or the identification of the species.

Shawia lineata (Cockayne) Saldivia & Nicol (ex. *Olearia lineata*) (a tree daisy, Asteraceae).

Distribution within project

One tree of this needle-leaved tree daisy was recorded in the 80 m buffer of the Coronation North Pit Disturbance Area.

Summary of existing information

Shawia lineata is a South Island species (south of Marlborough and Hokitika) of grey scrubland, particularly on damper gully slopes³⁰. It is known from 11 sites in the Macraes area, usually as isolated trees.

It is classified in the Otago Region (which is a stronghold for this species) as Declining on the basis of the total population of 5,000 to 20,000 mature individuals with a predicted decline of 10-30% over the next three generations of the species and the populations likely to be fragmented, small and widely separated but some are secure. It is classified nationally as Declining on the basis of a total population size of 20,000 to 100,000 mature individuals and a predicted decline of 10-50% over the next three generations

³⁰ Heads, M. 1998. Biodiversity in the New Zealand divaricating tree daisies: *Olearia* sect. nov. (Compositae). *Botanical Journal of the Linnean Society* 127: 239–285

and where recruitment is limited (Qualifier 'RF'). The main threat to this species appears to be lack of recruitment due to the close exotic grass sward at most sites it is found.

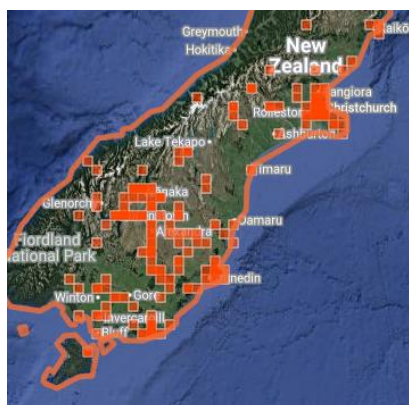


Figure 47. Distribution of *Shawia lineata* in New Zealand from the iNaturalist database No guarantee is given as to the accuracy of the map or the identification of the species.

At Risk – Naturally Uncommon

Agrostis pallescens Cheesem. (wetland grass, Gramineae).

Distribution within project

This small wetland grass³¹ was recorded in three ephemeral wetlands in the Coronation 6 Pit and buffer where it covers an estimated (based on plots) 23% of wetland area (winter measurement) (an estimated cover of 506m²).

Summary of existing information

Agrostis pallescens is a difficult to identify species which occurs in wetland environments in the central North Island and along the Southern Alps but is rare in the eastern South Island. In the wider Macraes area it is very patchily distributed and has been recorded from 3 sites.

It is classified in the Otago Region (which is a stronghold for this species) as Naturally Uncommon and being Data Poor on Recognition, Population Size and Population Trend and the populations being stable, restricted to a particular habitat and in a natural state. It is classified nationally as Naturally Uncommon

³¹ Identification as this species is provisional on obtaining fresh flowering material.

with this classification is qualified by Data Poor on the basis of Recognition, Population Size, Population Trend. The main threat to this species appears to be weed invasion and loss of wet habitats.

Brachyscome longiscapa G.Simpson & J.S.Thomson (a small daisy, Asteraceae).

Distribution within project

Twenty-four plants of this small daisy were recorded in 2016, 2018 and 2022 at three sites in tussock grassland in the Coronation North Pit Disturbance footprint (1 plant), Trimbells WRS Height Raise Footprint (3 plants) and the Coronation Mining Area 80 m buffer (20 plants).

Summary of existing information

Brachyscome longiscapa is an inconspicuous small herb that occurs as often small scattered populations on the Owen Range and the southeastern South Island, particularly in inter-montane basins of Canterbury and Otago. It is a species of dry low short tussock vegetation. In the wider Macraes area it is known at 9 additional sites (though sites are frequently not recorded due to its frequency in appropriate habitat).

It is classified in the Otago Region (which contains the Type Locality, is a range limit, and is a stronghold for this species) as Naturally Uncommon and being Data Poor on Population Size and Population Trend and the populations being stable, restricted to a particular habitat, small and widely separated. It is currently classified nationally as Naturally Uncommon and this classification is qualified by Data Poor on the basis of Population Size, Population Trend. This species is considered to be at risk because of weed invasion and ploughing of dryland habitats, but there is considerable lack of knowledge of its distribution and threats.



Figure 48. Distribution of *Brachyscome longiscapa* in New Zealand from the iNaturalist databases. No guarantee is given as to the accuracy of the maps or the identification of the species.

Carex purpurata (Petrie) K.A.Ford (ex. *Uncinia purpurata*) (a small hookgrass, Cyperaceae).

Distribution within project

This small hookgrass was recorded at one site in the 80 m buffer of the Golden Bar Haul Road.

Summary of existing information

Carex purpurata is an inconspicuous hookgrass that occurs as often small, scattered populations in south Canterbury and Otago. In the wider Macraes area it is known at 14 additional sites, usually in shaded sites at the base of schist outcrops.

It is classified in the Otago Region (which contains the type Locality, is a range limit and a stronghold for this species) as Naturally Uncommon and being Data Poor on Recognition, Population Size and Population Trend and the populations likely to be stable and small and widely separated. It is currently classified nationally as Naturally Uncommon and this classification is qualified by Data Poor on the basis of Population Size, Population Trend. This species is considered to be at risk because of weed invasion, but there is considerable lack of knowledge of its distribution and threats.

Celmisia hookeri Cockayne (*Hooker's mountain daisy*, *Asteraceae*).

Distribution within project

This cliff daisy was recorded as scattered plants and large groups of up to c300 plants on rocky outcrops at 40 sites in the Golden Bar Mining Area, Golden Bar Haul Road and Coronation Mining Area. 17 sites with a total of probably c. 1,500 plants are within the footprints and 20 m buffer.

Summary of existing information

Celmisia hookeri occurs on rock outcrops and bluffs in north-eastern Otago and at one site in northern Southland. In the wider Macraes area it occurs on OceanaGold tenure land at multiple sites, including in the Deepdell Covenant and Cranky Jims Wetland Covenant. Population sizes in these areas are up to 100,000's of plants at some sites, though 20-50 plants at a site is more usual. It inhabits schist rock bluffs, outcrops and rocky areas, and (where stock are absent) steep gully sides.

It is classified in the Otago Region (which contains the Type Locality, is a range limit, and is a stronghold for this species) as Naturally Uncommon and populations restricted to a specific habitat. It is currently classified nationally as Naturally Uncommon, with the qualifier Sparse, on the basis of its range being restricted to two areas: north-eastern Otago and northern Southland, with widely spaced populations. This species is considered to be at risk because of its limited range and susceptibility to browsers.



Figure 49. Distribution of *Celmisia hookeri* in New Zealand from the iNaturalist databases No guarantee is given as to the accuracy of the maps or the identification of the species.

Lagenophora pinnatifida Hook.f. (daisy, Asteraceae).

Distribution within project

One plant forming a 0.5 m x 0.5 m patch of this small creeping daisy was recorded in 2018 on a streamside of the Trimbells WRS Height Raise footprint.

Summary of existing information

Lagenophora pinnatifida is a very poorly known species inhabiting damp areas in the Central North Island and scattered throughout the South Island. Within the Macraes E.D. it has been recorded from 5 sites. Identification of this species is notoriously difficult and misidentification with other *Lagenophora* species is frequent.

It is classified in the Otago Region as Naturally Uncommon and populations are likely to be small and widely separated and some of which are stable. It is currently classified nationally as Not Threatened. It appears to have been displaced from sites where it was previously known due to competition with dense swards of exotic herbs and grasses.

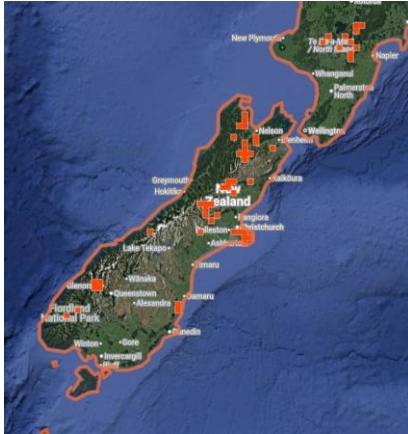


Figure 50. Distribution of *Lagenophora pinnatifida* in New Zealand from the iNaturalist database No guarantee is given as to the accuracy of the map or the identification of the species.

Poa pusilla Berggr. (a grass, *Poaceae*).

Distribution within project

One plant forming a 5 cm x 5cm patch was recorded in 2018 on a rock outcrop in the Trimbells WRS Height Raise footprint.

Summary of existing information

Poa pusilla occurs in the North Island, South Island and Stewart Island and is a very poorly known species inhabiting (in Otago³²) rocky areas and possibly also tussock grassland. Within the Macraes E.D. it has been recorded from 13 sites, all of which are very small. Identification of this species is difficult further complicated by it appearing to have two forms (which may warrant further taxonomic recognition) - a stiff-leaved coastal form similar to *Poa anceps* and a soft-leaved form allied to *Poa infirma* which is the taxon present at Macraes.

It is classified in the Otago Region as Naturally Uncommon and being Data Poor on Recognition, Population Size and Population Trend and the populations likely to be small and widely separated. It is currently classified nationally as Not Threatened. Very little is known about threats to this species but it is likely to be highly palatable and also vulnerable to infestation of its rock outcrop habitat by the hawkweed *Hieracium lepidulum*.

³² In other regions it appears to be coastal.



Figure 51. Distribution of *Poa pusilla* in New Zealand from the iNaturalist database No guarantee is given as to the accuracy of the map or the identification of the species.

Ranunculus aff. reflexus (CHR 394270; Mt Peel) (a buttercup, Ranunculaceae).

Ranunculus aff. reflexus has only recently been recognised as occurring in the Macraes area. It occupies shaded sites at the base of rock outcrops. About 5-10 plants over c. 1 m² were recorded at the base of a rock outcrop in the buffer of the Golden Bar WRS.

There is very little information known about this species – its identification, distribution, population trend, or threats. Within the Macraes area it is frequently encountered in shady places at the base of rock outcrops.

It is classified in the Otago Region (which is a stronghold for this species) as Naturally Uncommon and being Data Poor on Population Size and Population Trend and the populations likely to be small and widely separated and in a natural state. It is classified nationally as Declining on the basis of a total area occupied of >10,000 ha and a predicted decline of 10-70% over the next three generations. This classification is qualified by Data Poor on the basis of recognition, Population Size, Population Trend.

Shawia bullata (H.D.Wilson & Garn.-Jones) Saldivia & Nicol (ex. *Olearia bullata* (a tree daisy, Asteraceae).

Distribution within project

This small leaved shrubby daisy was recorded in the Coronation and Golden Bar Mining Areas as individual trees or small groups.

Summary of existing information

Shawia bullata is distributed throughout the eastern South Island south of Kaikoura, with the majority of the populations in Otago³³. In the wider Macraes area it occurs as mostly mature plants (recruitment appears to be very limited) in many of the damper gullies (109 localities are recorded), including those that are highly degraded, though numbers vary between sites.

It is classified in the Otago Region (which contains the Type Locality, is the range limit and a stronghold for this species) as Naturally Uncommon and being Data Poor on Population Size and Population Trend. It is classified nationally as Not Threatened. The main threat to this species is the absence of regeneration due to the widespread dense exotic grass swards at the sites it occupies.

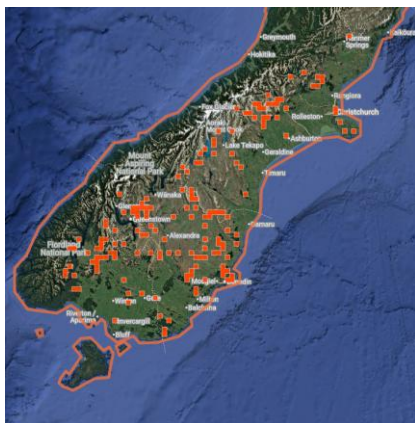


Figure 52. Distribution of *Shawia bullata* in New Zealand from the iNaturalist database No guarantee is given as to the accuracy of the map or the identification of the species.

³³ Heads, M. 1998. Biodiversity in the New Zealand divaricating tree daisies: *Olearia* sect. nov. (Compositae). *Botanical Journal of the Linnean Society* 127: 239–285

Data Deficient

Cardamine grandiscapa Heenan (cress, Brassicaceae).

Distribution within project

Three individuals of this small cress were recorded in a rockfall in the Golden Bar WRS 20 m buffer.

Summary of existing information

Cardamine grandiscapa is a newly-described difficult to identify species which occurs in fertile rocky areas, seeps and forests (and as a garden weed) of Canterbury, Otago and Southland³⁴. In the wider Macraes area it is very patchily distributed and has been recorded from 2 sites. It is a newly described species (previously known as *Cardamine* 'Rata Peaks', *Cardamine* 'Wye') that is classified in the Otago Region (which contains the Type Locality) as Data Deficient on an unrecorded basis (presumably because of a paucity of information on the species in the region). It is classified nationally as Naturally Uncommon because of being restricted to a specific habitat of less than 1,000km². Little is known about threats to this species, but it is likely that diseases and weed invasion can affect some populations.

Melicytus aff. alpinus (c) (CHR 541568; 'Otago') (a porcupine shrub, Violaceae).

It was identified as scattered plants and a group of about 20 in shrubland in the footprint of the Golden Bar WRS.

Plants identified as *Melicytus* 'Otago' are of restricted distribution in the Macraes area, being known from a large population at Highlay Hill and scattered plants at 3 other localities. It is classified in the Otago Region as Data Deficient and nationally as Data Deficient.

Oxalis rubens Haw. (a indigenous oxalis, Oxalidaceae).

Distribution within project

This creeping yellow-flowered oxalis was recorded at one site extending over 1 m x 0.5 m by a schist rock in the Trimbell WRS Height Rise footprint in 2018.

Summary of existing information

³⁴ Heenan, P.B. A taxonomic revision of *Cardamine* L. (Brassicaceae) in New Zealand. Phytotaxa 330: 1-154.

Oxalis rubens is recorded mostly in the northern North Island, but is also present in the South Island and Chatham Islands. In the wider Macraes area it has been recorded at 12 sites but sites where it occurs are not always recorded. It can also be difficult to distinguish from the Not Threatened *Oxalis exilis*, especially when not in flower.

It is classified in the Otago Region (which is likely to be a distributional limit) as Data Deficient on an unrecorded basis (presumably because of a paucity of information on the species in the region). It is classified nationally as Not Threatened and Secure Overseas. Little is known about threats to this species, but it usually occurs amongst other vegetation that protects it from being grazed.



Figure 53. Distribution of *Oxalis rubens* in New Zealand from the iNaturalist database No guarantee is given as to the accuracy of the map or the identification of the species.

Uncommon Species

Fuchsia perscandens (climbing fuchsia, *Onagraceae*).

A single individual of the vine *Fuchsia perscandens* is present in the shrubland at Golden Bar WRS. This species is sparsely distributed in the Macraes E.D., being mainly found in steep rocky areas. In the Otago Region it is classified as Not Threatened.

Sophora microphylla (kowhai, *Fabaceae*).

Kowhai is present as a single plant in the buffer of the Golden Bar WRS. This species is present as scattered mature individuals throughout the Macraes E.D. including the Cranky Jims Shrubland and

Island Block Covenants. Recruitment is rare, but occurs at some steep sites or where stock are not present. In the Otago Region it is classified as Not Threatened.

Nearby rare plant species

The species listed in rare species are recorded within 80 m of the outer margin of the 20 m project impact buffer or are no longer present in the impact area.

Table 14. Rare plant species recorded within 80 m of the impact area.

Regional Threat Status	Species	Mining Area	Locations
Regionally Endangered	Euchiton ensifer (D.G.Drury) Holub	Central Mining Area	Protected Wetland 3
Regionally Endangered	Gratiola aff. concinna (AK 251855; South Island)	Central Mining Area	Protected Wetland 3
Regionally Endangered	Wurmbea novae-zelandiae (Hook.f. ex Kirk) Lekhak, Survesw. & S.R.Yadav	Central Mining Area	Protected Wetland 3
Regionally Vulnerable	Juncus pusillus Buchenau	Central Mining Area	Protected Wetland 3
Regionally Vulnerable	Lachnagrostis striata (Colenso) Zotov	Central Mining Area	Protected Wetland 3
Regionally Vulnerable	Lobelia perpusilla Hook.f.	Central Mining Area	Protected Wetland 3
Regionally Data Deficient	Geranium homeanum Turcz.	Central Mining Area	Protected Wetland 4
Regionally Declining	Carex dipsacea Berggr.	Central Mining Area	Protected Wetland 3, 4
Regionally Naturally Uncommon	Argyrotegium mackayi (Buchanan) J.M.Ward & Breitw.	Central Mining Area	Protected Wetland 3
	Epilobium komarovianum H.Lév.	Central Mining Area	Protected Wetland 3
	Euchiton traversii (Hook.f.) Holub	Central Mining Area	Protected Wetland 3
	Gentianella amabilis (Petrie) Glenny	Central Mining Area	Protected Wetland 5
	Lilaeopsis ruthiana Affolter	Central Mining Area	Protected Wetland 3

Appendix 4. Survey paths

Survey paths of Whirika Consulting Ltd staff during 2025 and 2026.

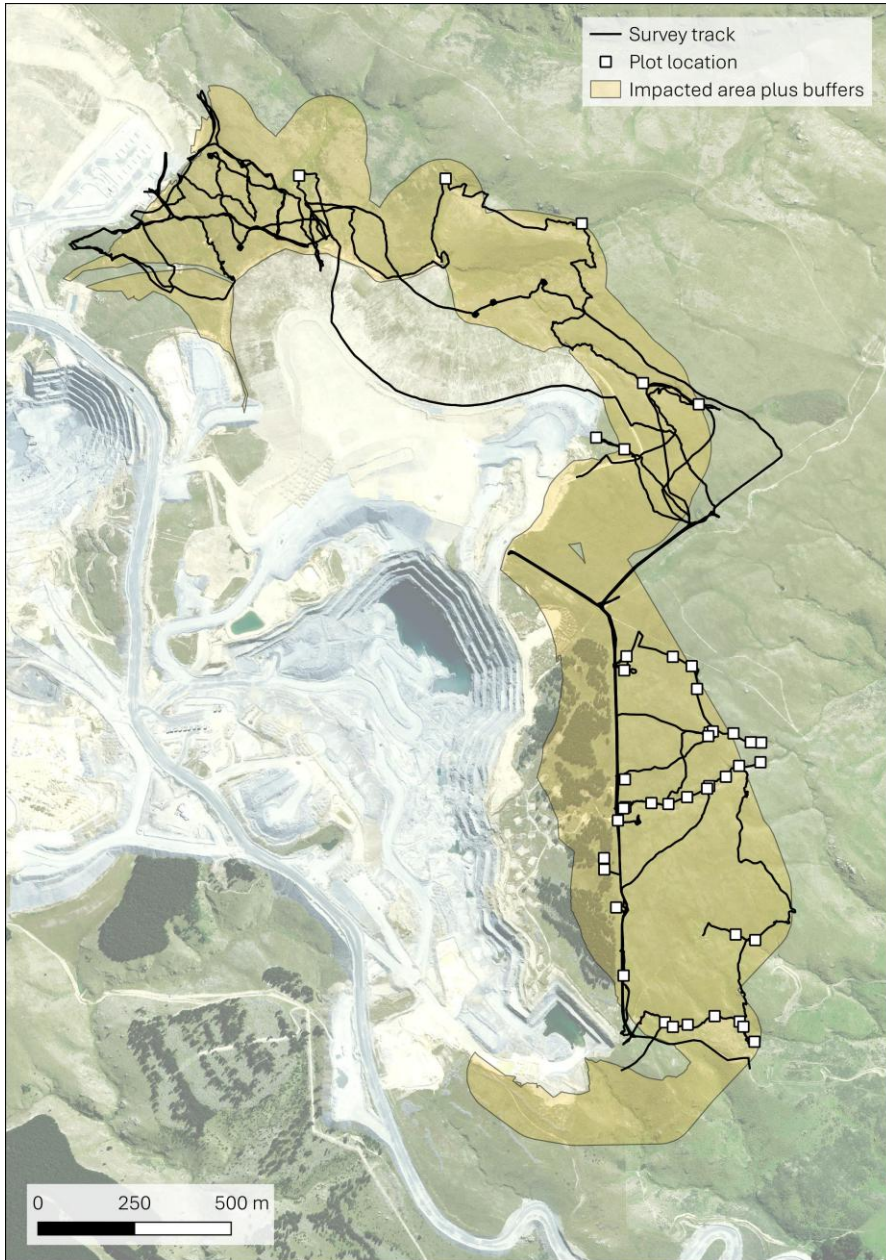


Figure 54. Survey paths during 2025-2026 in the Coronation Mining Area.



Figure 55. Survey paths during 2025-2026 in the Central Mining Area.

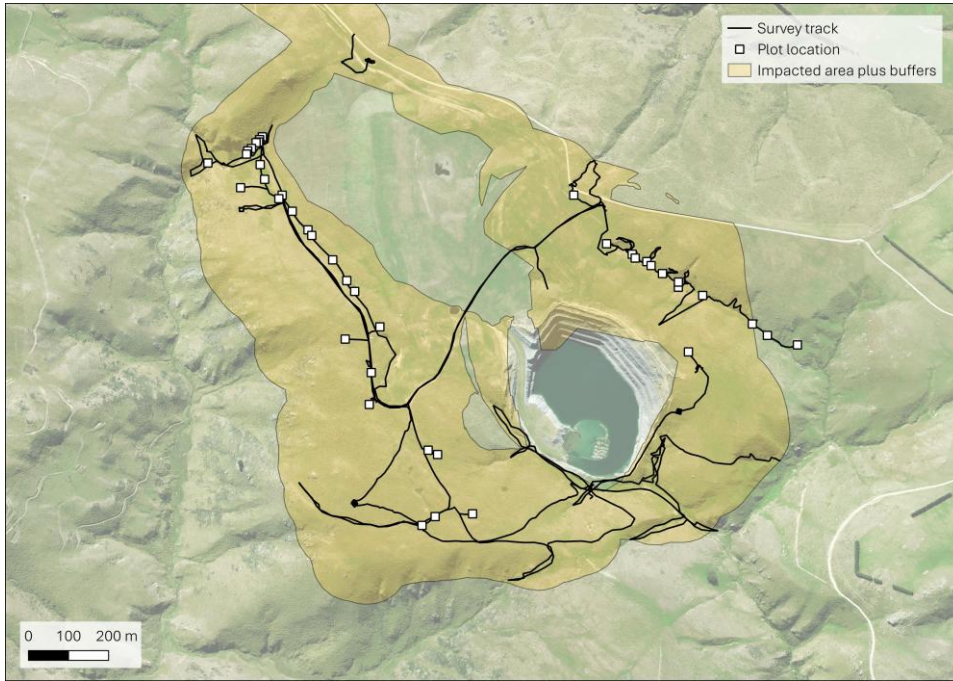


Figure 56. Survey paths during 2025-2026 in the Golden Bar Mining Area.

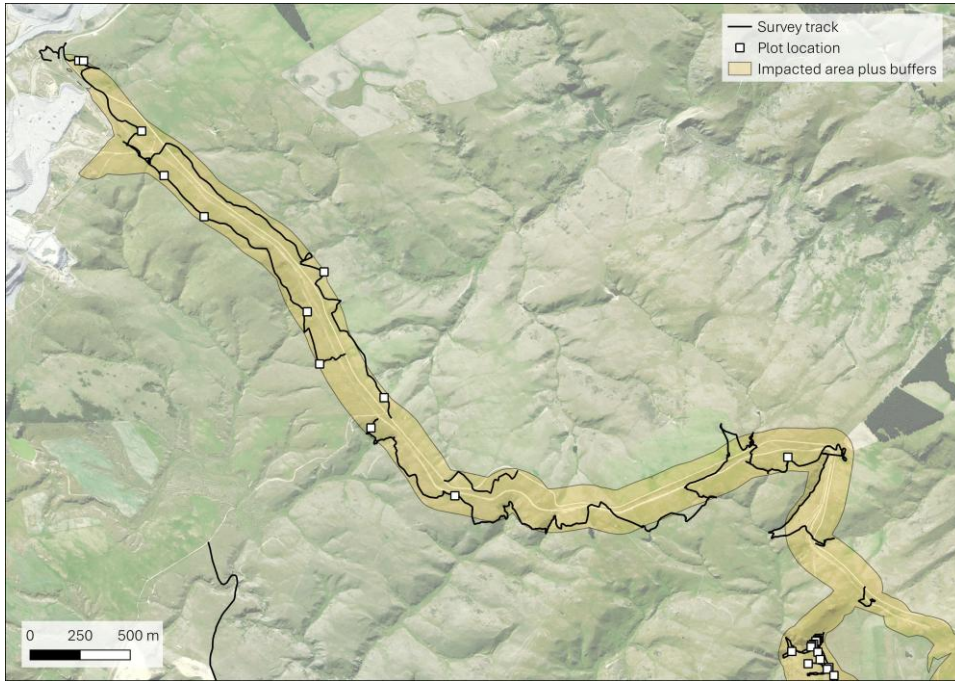


Figure 57. Survey paths during 2025-2026 in the Golden Bar Haul Road Realignment.

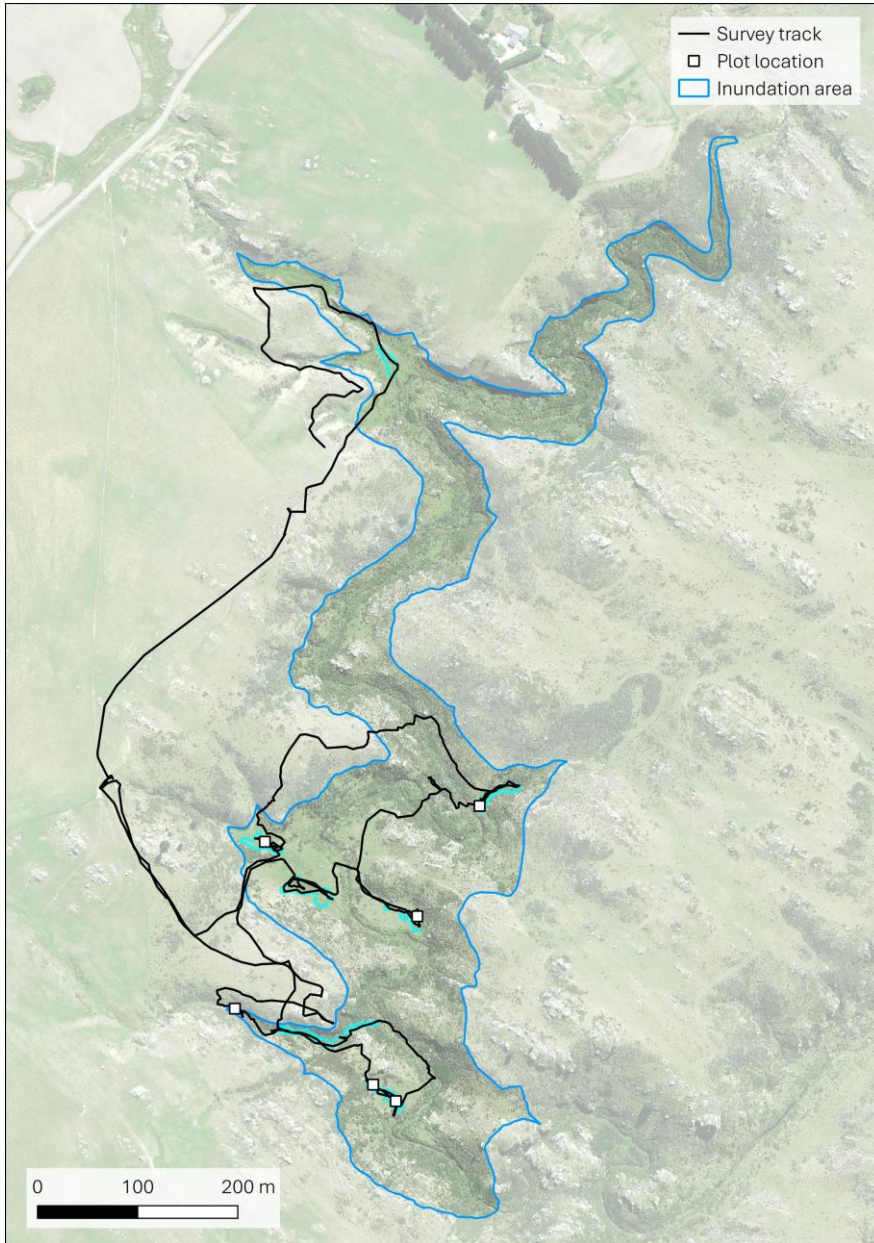


Figure 58. Survey paths during 2025-2026 in the Camp Creek reservoir area.

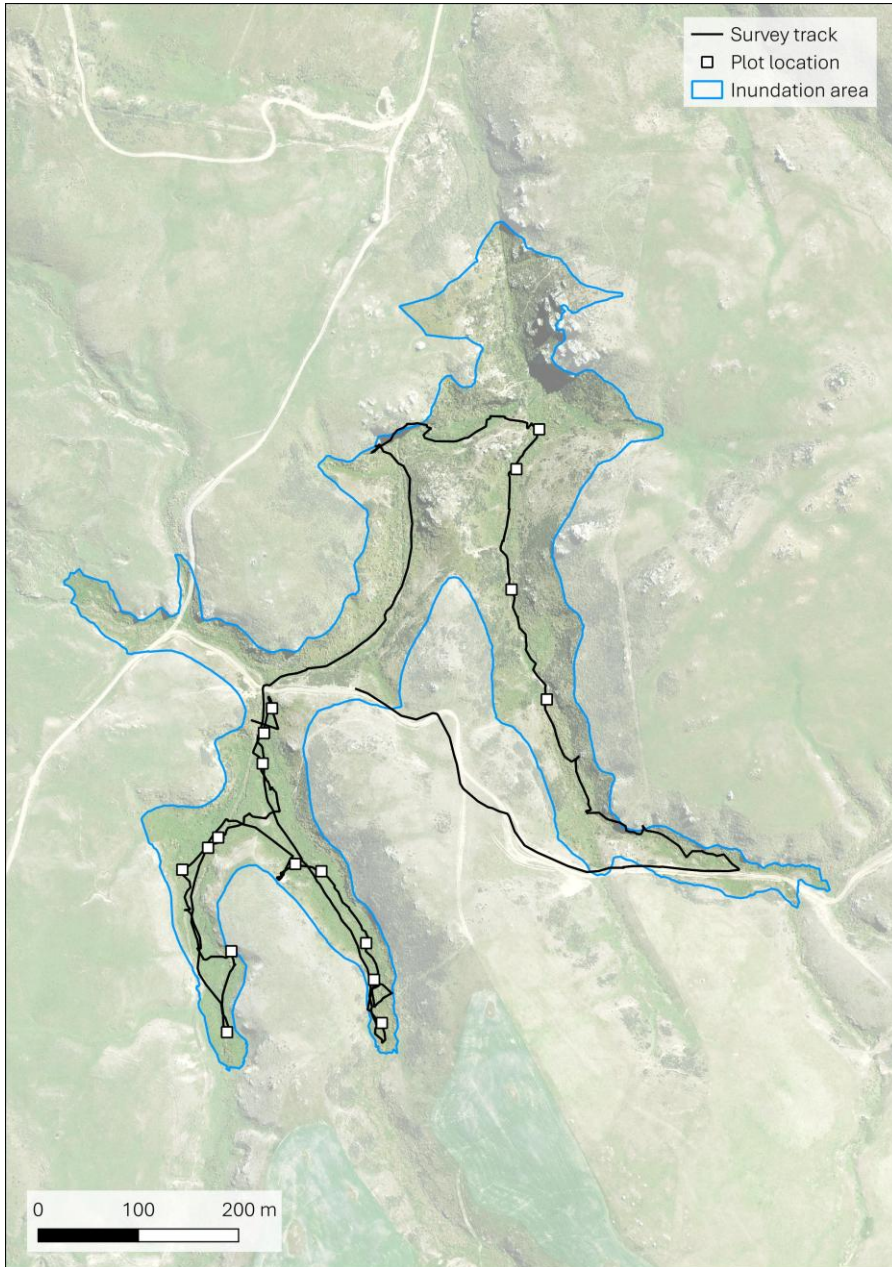


Figure 59. Survey paths during 2025-2026 in the Coal Creek reservoir area.

Appendix 5. Vegetation Plot Locations and Mapping

Figure 60 shows the locations of vegetation plots within the Impact Area. Vegetation plots are located within each of the main vegetation communities (riparian, wetland, ephemeral wetland, tussock, shrubland) and provide replicate data within each mining area.

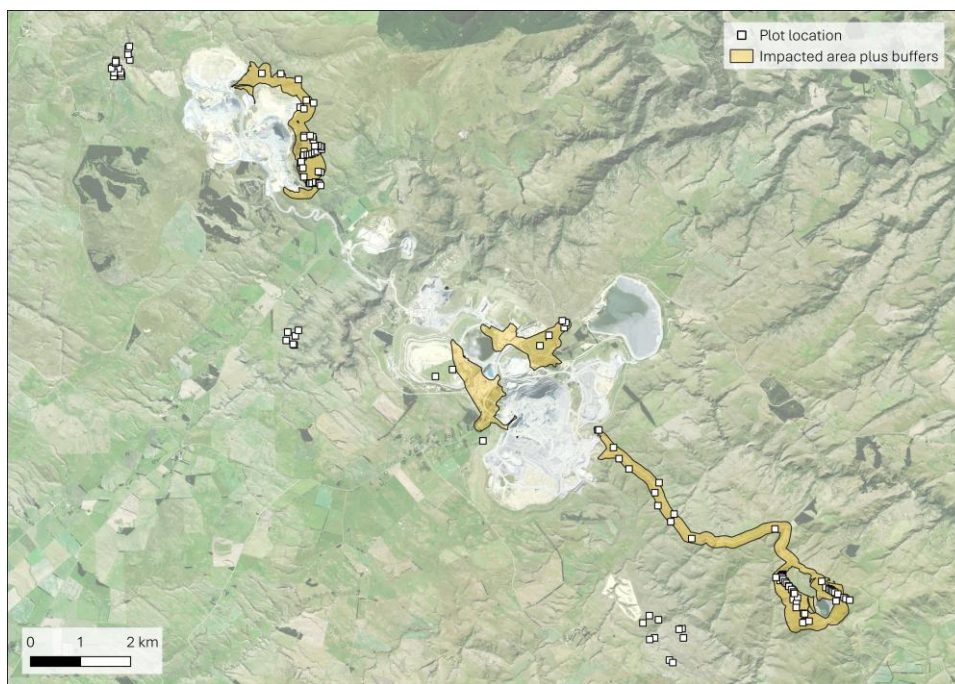


Figure 60. Locations of vegetation plots undertaken during 2025/26.

7.10 Appendix 5. Vegetation plot data for wetlands at Coronation 6.

Plant species presence in 5 x 5 cm squares of a 50 cm x 50 cm vegetation plot randomly located within potential wetlands at Coronation 6. Plots measured in May 2023 by Dr Mike Thorsen.

Wetland Label	Plot Number	Plant species	Number of 5 cm x 5cm squares where species present	Pasture Species?	Wetland Indicator Status
Wetland Coro2	Plot 1	Agrostis capillaris L.	25	Yes	FACU
Wetland Coro2	Plot 1	Ranunculus amphitrichus Colenso	20	No	OBL
Wetland Coro2	Plot 2	Agrostis capillaris L.	25	Yes	FACU
Wetland Coro2	Plot 2	Holcus lanatus L.	1	Yes	FAC
Wetland Coro2	Plot 2	Ranunculus amphitrichus Colenso	5	No	OBL
Wetland Coro2	Plot 3	Agrostis capillaris L.	25	Yes	FACU
Wetland Coro2	Plot 4	Agrostis capillaris L.	25	Yes	FACU
Wetland Coro2	Plot 5	Agrostis capillaris L.	25	Yes	FACU
Wetland Coro2	Plot 5	Agrostis pallescens Cheeseman	5	No	FACW
Wetland Coro2	Plot 5	Juncus effusus L.	2	No	FACW
Wetland Coro3	Plot 1	Agrostis pallescens Cheeseman	2	No	FACW
Wetland Coro3	Plot 1	Alopecurus geniculatus L.	12	No	FACW
Wetland Coro3	Plot 1	Juncus articulatus L.	5	No	FACW
Wetland Coro3	Plot 1	Ranunculus amphitrichus Colenso	23	No	OBL
Wetland Coro3	Plot 10	Agrostis capillaris L.	25	Yes	FACU
Wetland Coro3	Plot 10	Agrostis pallescens Cheeseman	16	No	FACW
Wetland Coro3	Plot 2	Agrostis pallescens Cheeseman	2	No	FACW
Wetland Coro3	Plot 2	Juncus articulatus L.	20	No	FACW
Wetland Coro3	Plot 2	Ranunculus amphitrichus Colenso	25	No	OBL
Wetland Coro3	Plot 3	Agrostis capillaris L.	25	Yes	FACU
Wetland Coro3	Plot 3	Juncus effusus L.	2	No	FACW
Wetland Coro3	Plot 4	Agrostis pallescens Cheeseman	10	No	FACW
Wetland Coro3	Plot 4	Juncus articulatus L.	8	No	FACW
Wetland Coro3	Plot 4	Ranunculus amphitrichus Colenso	25	No	OBL
Wetland Coro3	Plot 5	Agrostis capillaris L.	25	Yes	FACU
Wetland Coro3	Plot 5	Agrostis pallescens Cheeseman	2	No	FACW
Wetland Coro3	Plot 5	Carex sinclairii Boott	5	No	OBL
Wetland Coro3	Plot 6	Agrostis capillaris L.	25	Yes	FACU
Wetland Coro3	Plot 6	Agrostis pallescens Cheeseman	10	No	FACW
Wetland Coro3	Plot 6	Holcus lanatus L.	4	Yes	FAC
Wetland Coro3	Plot 7	Agrostis pallescens Cheeseman	20	No	FACW
Wetland Coro3	Plot 7	Juncus articulatus L.	10	No	FACW
Wetland Coro3	Plot 7	Juncus effusus L.	2	No	FACW
Wetland Coro3	Plot 7	Ranunculus amphitrichus Colenso	25	No	OBL
Wetland Coro3	Plot 8	Agrostis pallescens Cheeseman	22	No	FACW
Wetland Coro3	Plot 8	Carex sinclairii Boott	10	No	OBL

Wetland Coro3	Plot 8	Ranunculus amphitrichus Colenso	25	No	OBL
Wetland Coro3	Plot 9	Agrostis capillaris L.	15	Yes	FACU
Wetland Coro3	Plot 9	Agrostis pallescens Cheeseman	8	No	FACW
Wetland Coro3	Plot 9	Juncus articulatus L.	2	No	FACW
Wetland Coro3	Plot 9	Ranunculus amphitrichus Colenso	11	No	OBL
Wetland Coro4	Plot 1	Agrostis capillaris L.	10	Yes	FACU
Wetland Coro4	Plot 1	Agrostis pallescens Cheeseman	25	No	FACW
Wetland Coro4	Plot 1	Juncus effusus L.	3	No	FACW
Wetland Coro4	Plot 10	Agrostis pallescens Cheeseman	25	No	FACW
Wetland Coro4	Plot 10	Ranunculus amphitrichus Colenso	2	No	OBL
Wetland Coro4	Plot 2	Agrostis pallescens Cheeseman	25	No	FACW
Wetland Coro4	Plot 2	Carex leporina L.	2	No	FACW
Wetland Coro4	Plot 3	Agrostis pallescens Cheeseman	8	No	FACW
Wetland Coro4	Plot 3	Eleocharis acuta R.Br.	6	No	OBL
Wetland Coro4	Plot 3	Juncus articulatus L.	1	No	FACW
Wetland Coro4	Plot 3	Ranunculus amphitrichus Colenso	18	No	OBL
Wetland Coro4	Plot 4	Juncus articulatus L.	17	No	FACW
Wetland Coro4	Plot 4	Juncus effusus L.	8	No	FACW
Wetland Coro4	Plot 4	Ranunculus amphitrichus Colenso	20	No	OBL
Wetland Coro4	Plot 5	Agrostis capillaris L.	5	Yes	FACU
Wetland Coro4	Plot 5	Agrostis pallescens Cheeseman	23	No	FACW
Wetland Coro4	Plot 5	Carex leporina L.	2	No	FACW
Wetland Coro4	Plot 5	Juncus effusus L.	2	No	FACW
Wetland Coro4	Plot 6	Agrostis pallescens Cheeseman	5	No	FACW
Wetland Coro4	Plot 6	Glyceria declinata Bréb.	25	No	OBL
Wetland Coro4	Plot 6	Juncus effusus L.	3	No	FACW
Wetland Coro4	Plot 6	Ranunculus amphitrichus Colenso	17	No	OBL
Wetland Coro4	Plot 7	Glyceria declinata Bréb.	25	No	OBL
Wetland Coro4	Plot 8	Glyceria declinata Bréb.	25	No	OBL
Wetland Coro4	Plot 9	Agrostis pallescens Cheeseman	5	No	FACW
Wetland Coro4	Plot 9	Glyceria declinata Bréb.	10	No	OBL
Wetland Coro4	Plot 9	Ranunculus amphitrichus Colenso	25	No	OBL