



Oceana Gold (NZ) Ltd

Macraes Gold Project

Coronation North Project

Impact Management of Project Ecological Effects

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2 Impact Management

A range of tools are available to address the impact of a project on an area's biodiversity: avoiding the impact, remedying the impact at project end, minimising the scale of the impact, or by undertaking compensatory activities - either as part of a formal biodiversity offset programme, or as a negotiated remediation package. These tools can be employed either individually or in combination to achieve the stated aim of the remediation package.

It is proposed that the Coronation North project follow a high-quality and appropriate approach using an implementation hierarchy of: avoid where possible, then remedy, minimise, offset, and finally undertake ecological compensation activities.

2.1 Impact avoidance

Avoidance refers to changing a project's activity so that it no longer impacts on an ecological feature. Mining, by its very nature, makes it difficult to avoid an ecological feature where it overlays the targeted resource. For this reason, opportunities to avoid ecological features overlying the proposed extent of the Coronation North pit are not possible. However, there may be opportunities to avoid impacts arising from some mine activities where these can either be sited at different locations (or configurations) or operated differently, but this needs to be balanced against the cost of the alternative action or location. The opportunity to avoid ecological features in the Coronation North and Coal Creek projects are restricted to re-configuring waste rock stack (WRS) margins and re-routing dam access routes.

2.1.1 Reconfiguring WRS margin

Some ecological features fall within 20m of the proposed WRS margin. In these instances the ecological feature will be delineated by high-visibility plastic mesh, and the tip-point will be identified by signpost to notify the relevant operator of the need to unload carefully.

It is not considered necessary to construct rock-fall barriers at these sites as: the ecological features are naturally protected by their rock outcrop habitat, or the ecological feature is not of sufficient value to justify the expense of such a barrier.

2.1.2 Re-routing Coal Creek dam access

A map of ecological features has been provided to mine management and will be used to guide selection of the Coal Creek dam access route. If it is impossible to avoid an ecological feature then this impact will be added to the remediation package.

2.2 Remedy impact

Remedying refers to undertaking activities, following cessation of the impact, that rehabilitate the site back to an acceptable ecological state. The opportunities to remedy this project's impact are limited by the technical challenges associated with rehabilitating mine workings in this location to a functioning natural ecological state, and the previously-expressed wish of the local community that the mine is rehabilitated to farming pasture. However, there is opportunity to undertake some rehabilitation in the Coal Creek dam, on the WRS margin, and the completed mine pit.

2.2.1 Coal Creek dam rehabilitation

The Coal Creek dam will create two new habitats that could be eco-engineered to support both seasonally-dry riparian sedgeland (when pond is full) and ephemeral herbfield (when pond is drawn down) plant communities. Both of these communities could provide habitat for waterfowl and indigenous plant species. The ephemeral herbfield could provide important habitat for some highly-endangered plant species that inhabit natural examples of this habitat type nearby.

2.2.2 WRS margin rehabilitation

There is some opportunity to rehabilitate the WRS margin to provide habitat for lizards by depositing only larger aggregate and boulders in some areas on the outer margin. These will be naturally colonised by lizards from the surrounding area, and the population density at these sites should increase as habitat quality increases with plant growth, particularly if this includes fruit-bearing plants. There is also opportunity for some of the south facing WRS slopes, if stock is excluded, to provide habitat for rare plants such as the daisy *Celmisia hookeri* and shrubs *Carmichaelia crassicaulis* and *Coprosma intertexta*.

2.2.3 Coronation North pit rehabilitation

The hole left after excavating the Coronation North pit could be eco-engineered to create a permanently wet riparian margin and lacustrine plant habitat. Both of these communities would provide habitat for waterfowl and indigenous plant species that are rare in this area because of the paucity of open water sites.

2.3 Minimise impact

Minimising refers to adopting a practice that reduces a project's impact on an ecological feature. There are limited opportunities to minimise the impact of this project, being: dust suppression, weed surveillance, fire response and rescue of ecological features.

2.3.1 *Dust suppression*

Dust-fall can be a problem for plants as it inhibits their photosynthetic capacity. Suppressing dust that is created during mine activities would minimise this effect.

2.3.2 *Weed surveillance*

Importation of new weed species into the area during mine operations could, depending on the species, have a huge impact on the area's biodiversity. A regular (every two years) inspection of the area around mine operations for new weed species could alleviate this risk.

2.3.3 *Fire response*

The Macraes area is usually very dry and any fires that do start have the potential to cover large areas and harm significant areas of natural vegetation. A site fire avoidance protocol and rapid response to any suspected fires could alleviate this risk.

2.3.4 *Rescue of ecological features*

Some of the higher-importance ecological features could be rescued by removing them (or propagating parts of them such as seeds or cuttings) and establishing them in a new location. A rescue plan would be required, and the new location would have to be suitable, and have consideration of changing biogeographic patterns and gene flow, as well as the impacts on the recipient site.

2.4 *Offsetting*

Offsetting refers to the use of the 2014 New Zealand Government *Guidance of Good Practice Biodiversity Offsetting in New Zealand* in order to design a suite of off-site activities that will protect similar ecological features and achieve a 'no-net-loss' of biodiversity.

An evaluation of the ability to offset this project's ecological impacts using the above publication as the guiding document concluded that, due to there being no availability of an offset site (or sites) with 'like for like' biodiversity features, a formal biodiversity offset is not achievable.

For these reasons the use of a formal biodiversity offset is not proposed in this instance.

2.5 Ecological compensation

Compensation involves undertaking activities off-site that will result in a gain in ecological value. A range of compensatory activities can be undertaken, either separately or in combination, to address a project's impacts, ranging from: legal covenanting, enhancing habitat through weed or pest control, research to better understand how to manage ecological features, habitat creation, education and interpretation, supporting community-led biodiversity projects, and undertaking activities that protect rare species.

Ecological compensation is viewed as the primary option for impact management of the Coronation North and Coal Creek projects using a fair and appropriate approach. When developing the compensatory activities, the impact management principles adopted in the 2014 New Zealand Government's *Guidance of Good Practice Biodiversity Offsetting in New Zealand*¹ and the Environment Institute of Australia and New Zealand's 2015 *Ecological Impact Assessment guidelines*², together with professional opinion should be considered.

2.5.1 Ecological compensation evaluation criteria

When evaluating the options available for ecological compensation in this project, the following specific criteria should be considered:

- The similarity of ecological features, size and condition.
- The ecological gain that could be achieved.
- Where possible align compensatory activities with the greatest conservation need.
- That the compensatory activities occur as close to the site where the impact occurs so as to provide local benefit.
- That the ecological gain is sufficiently ecologically meaningful to ensure that it is worth undertaking the compensatory activity/ies.
- That the compensatory activities are technically feasible with an acceptable chance of achieving their desired outcome.
- That the compensatory activity is affordable, and delivers benefits appropriate to the cost.
- That ecological resilience is considered when selecting a site for a compensatory activity, to ensure that gains are not eroded over time due to ecological processes that are difficult to manage (e.g. lost ecosystem function).
- That land tenure allows certainty of access to undertake the compensatory activity over time.
- That there is ability to maintain the gain achieved by the compensatory activity over the term of the project impact.
- That the ecological gain can be monitored to ensure that the compensatory activity is achieving its planned outcome.
- There is an ability to add additional mitigation measures in response to additional OceanaGold projects.

¹ Available at <http://www.doc.govt.nz/about-us/our-policies-and-plans/guidance-on-biodiversity-offsetting/>

² Available at <http://www.eianz.org/resources/publications>

- That the outcomes of compensatory activities do not constrain future commercial endeavours of both OceanaGold and the local community, particularly farming.
- There is an acceptable delivery mechanism for implementing the compensatory activities.
- That the process of evaluation and implementation is transparent and of high quality.

The following provide opportunities for undertaking compensatory activities:

2.5.2 Enhancing habitat

Enhancing the habitat of plants or wildlife (usually through either pest or weed control) can provide benefit to both a habitat and its inhabitants, by removing predators that are limiting populations, removing weed species that are displacing their preferred habitat, or creating barriers to movement of trout into high-value aquatic environments.

2.5.3 Protecting rare or important habitats.

A number of New Zealand's habitats are considered rare, either because they were always of very limited distribution (see Williams et al. 2007) or because human activity has reduced their extent and/or intactness. Also, some habitats are now considered Threatened (Holdaway et al. 2012). Several examples of these rare and threatened habitats are present in Otago.

In the Macraes Ecological District (E.D.) saline salt lakes and ephemeral wetlands are considered Critically Endangered, and seepages and flushes as Endangered. Other important communities are the schist bluff communities, dryland shrubland (grey scrub) and riparian margin vegetation as these are of limited extent and host a number of rare species. Without conservation attention these habitats and communities will be lost.

DOC has recently undergone a process of identifying Ecological Management Units (EMU)³: the sites where conservation work would provide the most conservation gain. The Macraes DOC reserves and Mt Watkins are two EMU that are close to the PIA.

Three activities are likely to provide opportunities for ecological compensation: environmental weed control, restoring ephemeral wetlands and dryland forest rehabilitation.

2.5.3.1 Environmental weed control

³ See <http://www.doc.govt.nz/about-us/our-role/managing-conservation/natural-heritage-management/identifying-conservation-priorities/>

Some weeds that have the potential to transform local wetlands are known from just one locality within the Macraes E.D. and only one other locality each in Otago. There are other species that have recently arrived in the Macraes E.D. and which could become a nuisance to agriculture and biodiversity. Eradicating these species will save a large amount of biodiversity protection work into the future. Instigating a weed surveillance programme together with the capacity to remove newly-arrived weed species would have benefit to protecting both biodiversity areas and agricultural areas.

2.5.3.2 Restoring ephemeral wetlands.

Ephemeral wetlands are a Critically Endangered habitat inhabited by a number of Threatened, At Risk and rare species. In the Macraes E.D. there are two Nationally Critical, four Nationally Endangered, four Nationally Vulnerable, two Declining, one Naturally Uncommon, and two Data Deficient species that inhabit ephemeral wetlands. Many of these species are infrequently found in any other habitat. There are a number of ephemeral wetlands in the Macraes E.D. and it has the highest number of schist-based ephemeral wetlands of any site in New Zealand. Unfortunately the majority of these have been smothered by exotic herbs, grasses, rushes and sedges, and their rare inhabitants have either disappeared or are present as only a few plants or isolated patches. A programme of restoring ephemeral wetlands by removing the exotic weeds (as far as practicable) and re-introducing the missing species under a habitat management plan would result in a huge benefit to the ephemeral wetlands and their inhabitants. A similar approach has proved successful in restoring the Sedgemere Tarn ephemeral wetland in Marlborough.

2.5.3.1 Dryland forest rehabilitation.

Central Otago has lost the dryland forest that once covered much of its intermontane basins. Elements of this dryland forest are preserved in fire refugia throughout the district, and some elements such as kanuka are now making a come-back in conservation areas (Walker et al. 2009). The dryland forest could be rehabilitated under a restoration plan that included the cultivation of dryland forest species and replanting into a regenerating shrubland. This project could also include cultivation of rare shrub and tree species together with the delicate understory herbs and grasses, many of which are now very rare.

2.5.4 *Protecting rare species*

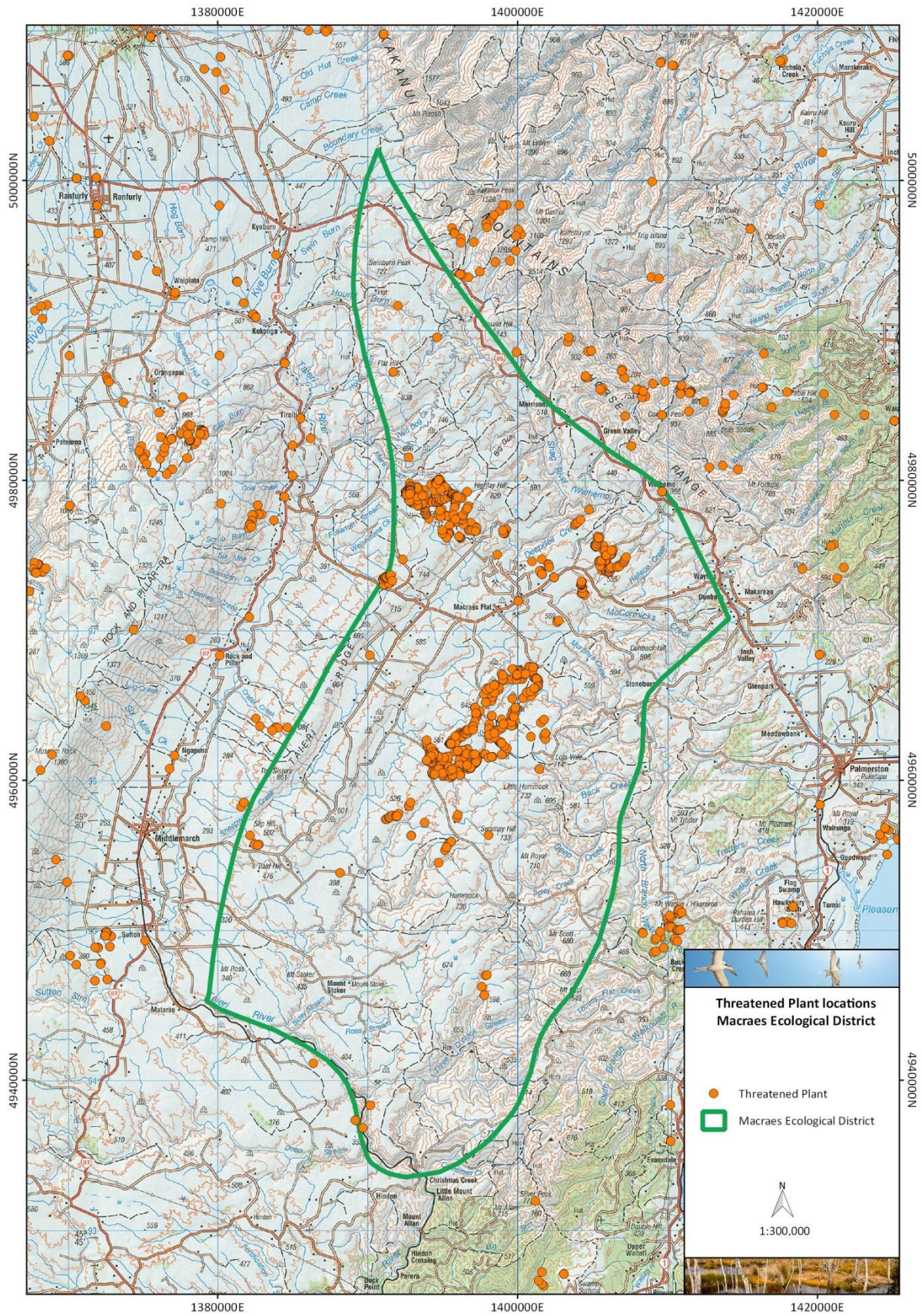
In New Zealand, a number of plant and animal species are considered at risk of extinction. Of plants, there are 243 species which are considered Threatened (i.e. of high risk of extinction) and a further 731 are considered At Risk (de Lange et al. 2013). Many more are rare in a local context. The Macraes E.D. and the adjacent Strath Taieri area of the Maniototo E.D. are known to contain the highest diversity of rare plants of any site in New Zealand (Bibby 1997, Thorsen 2008, Map 1), in addition to the last wild populations of grand and Otago skinks.

The Macraes area hosts many populations of Threatened, At Risk or rare plants (four Nationally Critical, three Nationally Endangered, nine Nationally Vulnerable, nine Declining, 14 Naturally Uncommon, six Data Deficient, 14 rare), with populations of some of these being the largest known nationally. Many of the plant species and the rarer plant communities are facing considerable threat from weed competition and exotic animals. There is currently little focus on management of the site's rare plants or communities beyond control of some woody weed species.

Central Otago is also home to a number of indigenous freshwater fish that are of conservation concern, two of which are known to occur in the Macraes area: the Declining freshwater crayfish *Paranephrops zealandicus*, the Declining long-finned eel *Anguilla dieffenbachii*, and the non-migratory Nationally Vulnerable roundhead galaxias *Galaxias anomalus* and the Nationally Vulnerable Taieri flathead galaxias *Galaxias depressiceps*.

The Macraes area, and the wider Otago Region, has extensive potential for plant and freshwater species-focussed conservation programmes using specific tools such as translocation, cultivation and replanting in order to enhance populations, and to protect populations through building trout barriers, or controlling weeds, browsing mammals, and pest insects.

OceanaGold – Coronation North: Proposed Remediation



Map 1. Locations of Threatened, At Risk and rare plant species in the vicinity of the Macraes E.D.

2.5.5 *Research*

Research on topics that inform our ability to manage ecosystems or species successfully is a valuable remediation tool. Currently, there is little available research to help guide management of most of New Zealand's rare species or habitats. In the Macraes area there is an opportunity to build on past research projects (e.g. ephemeral wetlands by Johnson and Rogers (2003)), as well as build research into the adaptive management component of other compensatory activities.

2.5.6 *Education and interpretation*

Education on conservation issues, particularly biodiversity management in a mine environment, is important to keep people informed on what is being done to alleviate the environmental impacts of a mine.

2.5.7 *Supporting local biodiversity projects*

Local communities undertake a range of important biodiversity projects throughout New Zealand. All of them struggle to be financially sustainable, and this factor alone frequently leads to project failure. There are no active biodiversity conservation groups in the Macraes area, but the Landscape Connections Trust⁴ is planning pest control activities in the east Otago area and the Central Otago Ecological Trust⁵ runs a lizard conservation project centred on the Mokomoko Dryland Sanctuary near Alexandra.

⁴ See <http://www.beyondorokonui.org.nz/>

⁵ See <http://www.coet.org.nz/>

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