

TWELVETH ANNUAL REPORT OF THE INDEPENDENT MONITORING PANEL FOR THE COWAL GOLD PROJECT – OCTOBER 2016

2016 IMP RECOMMENDATIONS

Recommendation 1: CGM should establish a research trial to investigate the most efficient method of controlling rye grass allowing for the successful establishment of native plant species by direct seeding, as first recommended in 2015. The trial design should be developed following a literature review on methods of establishing native species by direct seeding in the presence of rye and other exotic grasses.

Recommendation 2: CGM should (1) endeavour to establish the Substrate Profile Trial in boxes (described in the 10th Annual IMP Report) giving due consideration to the practicalities of watering in dry seasons and (2) excavate near established native trees and shrubs in the SWRE trials to determine root growth into subsoil materials and document the pH and EC trends in each profile. Results from these experiments should provide CGM with essential data on subsoil properties for future rehabilitation planning.

Recommendation 3: CGM should (1) ensure suppliers of bulk gypsum provide an analysis of gypsum purity with each bulk shipment and (2) recalculate the appropriate rate of gypsum to add to the various topsoil and subsoil materials to ensure the rates meet the specifications provided by McKenzie Pty Ltd in its 2013 report on “Soil Stockpile Characterisation Assessment”.

INTRODUCTION

The 2016 Independent Monitoring Panel (IMP; Appendix 1) reviewed:

- The Independent Environmental Audit Report (April 2016; Appendix 2), prepared by Trevor Brown and Robert Drury of Trevor Brown and Associates, Michael Frankcombe of WPS Parsons Brinkerhoff and Matthew Richardson of Niche Environmental. The Independent Environmental Audit Report covered the period from May 2013 to April 2016, the most recent year being the tenth 12 months of operation of the Cowal Gold Mine (CGM).
- Site activities and environmental monitoring information provided to the IMP in Technical Reports and the 2015 Annual Review (AR; covering the period 1 January 2014 to 31 December 2015), as sent to the IMP on 29 July 2016.

The IMP visited the Cowal Gold Mine on the 15th September 2016 to examine progress on rehabilitation and other environmental management activities, and discuss operations with Environmental Management staff. The IMP also met onsite with senior Executives to confirm the ongoing commitment of Evolution Mining to best practice environmental management.

ASSESSMENT OF COMPLIANCE

The independent environmental auditors reviewed the available documentation covering (1) the implementation of the requirements of the development consent conditions (2) licenses and (3) approvals granted by Government for the project, as well as the environmental monitoring documentation held by Evolution Mining at the mine site office in order to verify compliance with the conditions of approval.

The compliance by Evolution Mining against the requirements of the plans listed in Appendix 2 was assessed by the Independent Environmental Auditors, and comments were made against those approval conditions that had been activated. The scope of the Independent Environmental Audit dated April 2016 included the following components:

- review of the implementation of the requirements of the development consent conditions, licences and approvals for the operation of the Cowal Gold Operations;
- conduct of site inspections and review of on-site documentation and monitoring data relevant to the independent environmental audit;
- hold discussions with project staff in relation to the Development Consent conditions and implementation of the requirements;
- assess compliance of the Cowal Gold Operations with the Development Consent conditions and other environmental conditions; and
- prepare an Independent Environmental Audit Report providing assessment of compliance against the environmental conditions.

The IMP has reviewed the reporting process used in the Independent Environmental Audit Report of April 2016. The IMP was easily able to assess and verify the status of environmental management information at the site and the general compliance with development consent conditions, licences and approvals granted to Evolution Mining, as reported by the independent environmental auditors. Overall, it is a well-structured and informative report prepared in accordance with the Australian/New Zealand Standards AS/NZS ISO 19011:2014 – Guidelines for Auditing Management Systems and the Independent Audit Guideline (Department of Planning and Environment, October 2015).

The Independent Environmental Auditors drew the following conclusion in their April 2016 report (Executive Summary):

The Cowal Gold Operations have been developed generally in accordance with the environmental assessments prepared for the project and the audit findings confirm an overall high standard of compliance with the Development Consent Conditions, Environmental Protection Licence and requirements of the environmental conditions attached to the Mining Lease 1535.

Overall the IMP concurs with this assessment based upon its review of all available documents, and the site visit on 15 September 2016. Specific areas for possible improvement are considered below.

REVIEW OF ENVIRONMENTAL MANAGEMENT

The IMP made five recommendations in the 2015 IMP Report concerning environmental management issues sent to the Department of Planning and Environment on 7 September 2015 and subsequently sent by the Department to the Cowal Gold Mine (27 October 2015). These recommendations are assessed below in terms of adequacy of the response by CGM forwarded to the Department of Planning and Environment on 15 January 2016, and new recommendations are made where required.

2015 IMP Recommendation 1: *CGM should establish a research trial to investigate the most efficient method of controlling rye grass allowing for the successful establishment of native plant species by direct seeding.*

In response to the above recommendation, CGM replied -

“Evolution, with assistance from independent revegetation/rehabilitation specialists DnA Environmental, has prepared a preliminary design for a trial to investigate the most efficient method of controlling rye grass allowing for the successful establishment of native plant species by direct seeding.

The trial will be established on the southern slopes of the Southern Waste Rock Emplacement adjacent to the existing surface treatment trial.

The trial will involve two experiments:

- **Experiment 1** will involve immediate native seed mix application onto the newly profiled waste rock emplacement surface prior to any germination or establishment of Rye Grass. Experiment 1 will assess the effectiveness of pre-emergent and post-emergent herbicide treatments.
- **Experiment 2** will involve application of native seed mix once a Rye Grass cover and mulch/litter layer has been established. Experiment 2 will assess the effectiveness of post-emergent herbicide treatment and cultivation (i.e. shallow ripping) of the surface to create bare gaps amongst the Rye Grass for seedling establishment whilst retaining the protective mulch/litter cover.

Evolution has sought the advice of a local agronomist regarding a suitable pre-emergent herbicide that will not affect native species.

Evolution is currently finalising the trial design with DnA Environmental and it is anticipated that the trial will commence in April/May 2016, subject to suitable conditions and seed mix availability. The final design of the trial (including a conceptual view of the trial plots) will be included in the CGO’s 2016 Annual Review.

Monitoring of the trial area will be conducted by DnA Environmental in accordance with the CGO’s existing rehabilitation monitoring programme methodology (as detailed in the CGO’s Rehabilitation Management Plan). Results of the trial will be reported in DnA Environmental’s annual rehabilitation monitoring report and in the CGO’s Annual Reviews.”

During its 2016 mine visit, the IMP was informed that the rye grass trials had not yet commenced owing to the excessively high rainfall in the May to August period (230% of the average for the 4-month period). Inspection of the 2014 Northern Waste Rock Emplacement (NWRE) Trial, that involved planting of native tree and shrub stock into areas where rye grass had become established, showed that very good growth of the native species had occurred in spite of vigorous growth of rye grass. We note that ryegrass cover will decline with shading by tree and shrub cover, but other forms of grass cover suppression may be required to allow natural regeneration through seeding by the planted species.

There was also the opportunity to observe a small portion of the NWRE Trial area, with vigorous growth of rye grass, that had been ripped to see how rapidly rye grass seedlings established from existing seed. From these field observations and subsequent discussions with environmental staff, it was considered that, before the rye grass control experiments were established, more thought should be given to the trial design to ensure that it would provide the necessary output to enable successful direct seeding of native species in an environment where rye seed is ubiquitous.

The IMP members suggested that a review of the literature on methods of controlling exotic grasses (including rye grass) prior to direct seeding of native grass, shrub and tree

species may assist in a revised trial design. This may include treatments to change the C:N ratio in the soil to enable native species to outcompete exotic grasses such as rye grass (e.g. Cole *et al.* 2015. <http://onlinelibrary.wiley.com/doi/10.1111/aec.12293/full>), rather than merely relying on herbicides.

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2015 IMP Recommendation 2: *Every effort should be made to commence the waste rock component of the Substrate Profile Trial as soon as weather conditions permit in order to gain additional information about the value of including subsoil in future rehabilitation.*

In its response to this recommendation, CGM replied -

“Evolution is finalising the design of the waste rock component of the Substrate Profile Trial with DnA Environmental and anticipates commencing the trial in June 2016. Commencement of the trial will be subject to availability of the select tubestock for the trial. Evolution has commissioned Jayfields Nursery (Evolution’s existing supplier for revegetation tubestock) to propagate the tubestock required for the trial.

As described in the CGO’s response to the IMP’s Ninth Annual Report, given the CGO waste rock emplacements and tailings storage facilities are operational and dynamic landforms, the opportunity to implement rehabilitation trials on the top surfaces of these landforms is currently unavailable.

The proposed Substrate Profile Trial will therefore involve placing large boxes (approximately 1 m x 1 m wide and 2 m high) proximal to the waste rock emplacements and tailings storage facilities which include various depths of substrate materials including tailings, waste rock, subsoil and topsoil. Select native tree and shrub species would be planted in the substrate treatments and the trial monitored to assess plant growth, with root system development analysed at the completion of the trial.”

During the 2016 mine visit, the IMP noted that the waste rock component of the Substrate Profile Trial, planned to commence in June 2016, had not been started owing to the excessively wet weather experienced in the May-June period. It is essential that the mine determine the value of saved subsoil in future rehabilitation, particularly in the event of any changes in mine plans which would involve an increase in surface area of rehabilitated waste rock dumps or tailings storage facilities. The Substrate Profile Trial involving large boxes is one way of endeavouring to obtain this information, although there may be difficulties in watering these boxes with the onset of drier weather and for a sufficiently long period of time (several years) to enable roots of planted seedlings to exploit subsurface material.

An additional method of gaining information on the suitability of subsoil as part of a plant growth medium is to selectively excavate the profile adjacent to established native trees and shrubs in the trial plots in the Southern Waste Rock Emplacement (SWRE) established in 2010. At the suggestion of the IMP in its 2011 report, pits were dug near

several trees in these plots, but results were variable. Selection of a larger number of trees and shrubs to excavate next to, combined with pH and electrical conductivity (EC) analyses down the profile (i.e. through the topsoil and into the subsoil) and observation of root penetration, may provide valuable information additional to that derived from large block trials. This information could be obtained more quickly than that from the box trials.

2016 Recommendation 2: *CGM should (1) endeavour to establish the Substrate Profile Trial in boxes (described in the 10th Annual IMP Report) giving due consideration to the practicalities of watering in dry seasons and (2) excavate near established native trees and shrubs in the SWRE trials to determine root growth into subsoil materials and document the pH and EC trends in each profile. Results from these experiments should provide CGM with essential data on subsoil properties for future rehabilitation planning.*

2015 IMP Recommendation 3: *CGM should obtain an analysis of the gypsum product from the suppliers and additionally send a representative sample to an analytical laboratory for (1) a Ca and S analysis to confirm the percentage of gypsum in the product and (2) an X-ray diffraction analysis to identify any mineral contaminants.*

In response to this recommendation, CGM replied –

“Evolution will obtain an analysis of the gypsum product from ECOGypsum (the CGO’s existing gypsum supplier) and send a representative sample of the gypsum to ALS Minerals in Brisbane for:

- Calcium (Ca) and Sulphur (S) analysis to confirm the percentage of gypsum in the product; and
- an X-ray diffraction analysis to identify any mineral contaminants.

Should the results indicate a poor gypsum product, Evolution will source a number of gypsum samples from various suppliers and will conduct the analyses above on each of the gypsum samples. Evolution will then select the most appropriate/best quality gypsum product. If necessary, Evolution may seek advice from McKenzie Soil Management regarding suitable suppliers of quality gypsum products.”

During the 2016 mine visit, members of the IMP were shown chemical analysis data for the gypsum used in treating CGM soils, and these data showed that the various products generally contained less than 100% gypsum. The rates of gypsum to reduce dispersion in the various stockpiled topsoils and subsoils recommended by McKenzie Pty Ltd in the 2013 report titled “Soil Stockpile Characterisation Assessment” were apparently calculated assuming pure (100%) gypsum would be used (enough to reduce the exchangeable sodium percentage to 3). It is thus imperative that the rates of the gypsum product, currently being used, be increased to allow for the purity of the product.

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2015 IMP Recommendation 4: *CGM should calculate, for the current spacing between berms on the waste rock dumps, the runoff for different recurrence intervals and compare this with the estimated berm capacity to provide confidence in the current design parameters for erosion control and dump stability.*

In response to this recommendation, CGM responded -

“The final landform design concepts for the outer batter slopes of the waste rock emplacements include:

- wide, reverse graded berms and berm bunds to reduce the potential for longitudinal runoff downslope;
- rock armouring of slopes (and berms) to stabilise the slope, reduce runoff velocity downslope and reduce erosion potential in the long-term;
- cross-ripping the rock mulch and gypsum-treated soil along the contour of the slope to create ‘troughs and banks’ to minimise the potential for erosion downslope and enhance vegetation establishment within the troughs; and
- revegetation with native and/or endemic Eucalypt woodland, shrubland and grassland species suited to slope and elevated positions similar to remnant vegetation in the surrounding landscape.

Monitoring results of rehabilitation trial plots and rehabilitated areas on waste rock emplacement slopes using the final landform design concepts above have demonstrated that this landform design is likely to stabilise landform slopes and provide a suitable plant growth medium.

Site Environmental Department staff note that no significant instability is occurring on waste rock emplacement slopes which have been rock mulched and cross-ripped along the contour with gypsum-treated soil. Further Environmental Department staff note that no overtopping of the waste rock emplacement berms has occurred to date.

Although in the past berm ponding and downslope erosion has occurred on exposed oxide waste rock surfaces that have not been covered with a rock mulch layer, detailed research and rehabilitation trials have since been undertaken and the landform design concepts described above have been implemented as standard practice for rehabilitation of waste rock emplacement slopes at the CGO.

Evolution notes that the IMP’s comment/observation regarding ponding on the berms of the Southern Waste Rock Emplacement was in relation to areas of incomplete rehabilitation (i.e. on slopes where the rock mulch cover had not yet been cross-ripped, nor had topsoil been applied or revegetation established).”

The 2016 visit by members of the IMP to the mine had been preceded by several days of heavy rain and 3 months of over twice the average rainfall. Although the ability to view all areas of the rehabilitated waste rock dumps was reduced by the wet conditions, IMP members did not see any ponding on berms or evidence of overtopping in the sections visited. The stability of inter-berm and berm areas appeared high with a vigorous rye grass cover (plus the native shrubs and trees in the trial areas). The reply by CGM to the

2015 IMP Recommendation 4, combined with the observations made during the mine visit, give the IMP confidence that the practice of using rock mulch, gypsum- treated soil, cross ripping and wide berms is sound.

The members of the IMP have noted the three observations of erosion and sediment control made in the Independent Environmental Audit (pages 75 and 76). Each is worthy of consideration, although it is considered impractical at this stage to contemplate a complete change in landform.

2015 IMP Recommendation 5: CGM should continue to liaise with Assoc Prof Stephen Cattle, University of Sydney, who conducts the dust analyses for the mine, to ensure that the matter of apparently high metal analyses in dust samples is resolved.

In response to this recommendation, CGM responded -

“To resolve the matter of apparently high metal analyses in dust samples, Evolution will engage Dr Barry Noller, Principal Research Fellow with the Centre for Mined Land Rehabilitation at the University of Queensland, to conduct an expert review of:

- the effectiveness of the dust sample collection procedures and dust sample analysis procedures in the determination of metal concentrations in dust samples; and
- the metal concentrations in depositional dust samples collected by the CGO to date against metal concentrations of regolith materials, geochemical testwork results of CGO waste rock material and Lake Cowal surface water and sediment monitoring results.

Dr Noller has extensive experience in the field of environmental chemistry and industrial toxicology.

Evolution will continue to engage Associate Professor Cattle to review and interpret the CGO’s annual air quality monitoring results and Dr Noller’s review will consider the air quality monitoring reports prepared by Associate Professor Cattle thus far.

Evolution anticipates Dr Noller’s expert review will be complete in the third quarter of 2016. The results of Dr Noller’s review will be reported in the CGO’s 2016 Annual Review.”

The IMP noted that there did not appear to be any anomalous (high) values for copper and zinc in the 2015 Annual Review, as had occurred in previous Annual Reviews. Additionally, it was pleasing to learn that Dr Barry Noller, a scientist with extensive experience in environmental chemistry and industrial toxicology, will be providing a review of the past annual air quality monitoring reports by the end of 2016. Thus the IMP is satisfied with CGM’s response to this recommendation.

ANNUAL STATE OF THE ENVIRONMENT REPORT FOR LAKE COWAL

The mine’s monitoring program was revised following a recommendation by the IMP to focus on potential pathways to impact from the mine to the lake. This monitoring program has confirmed that mine management has kept potential threats to the lake ecosystem

within the boundaries of the mine, and that there has been no release of any hazardous substances or materials that might affect the ecological or physical values of the lake.

Lake Cowal was filling at the time of the 2016 IMP visit, and has subsequently passed the previous recorded maximum height. The previous maximum is indicated by a line of river red gum saplings that established on the isolation bund from seed carried by the flooding. The current flooding extends past this line of native saplings and is quite likely to result in a second line of emergent red gums and other native species. This will increase the ecological value of the lake margin and provide more aesthetic screening of the mine from the lake.

The removal of grazing from the lake bed within the mining lease boundary has meant that much of the native vegetation previously suppressed by agriculture has recovered and is now contributing to the ecological values within the wider landscape. Agriculture is recognised by the IMP as an accepted use of the lake bed during dry seasons, however we note that it is not conducive to the ecological health and condition of the lake ecosystem and commend Evolution Mining for removing grazing in the area under their control.

APPENDIX 1 - OVERVIEW OF THE INDEPENDENT MONITORING PANEL (IMP)

The Independent Monitoring Panel (IMP) was established in accordance with condition 8.8(b) of the Development Consent for the Cowal Gold Project. The members of the IMP are:

- Emeritus Professor L Clive Bell, University of Queensland; former Executive Director, Australian Centre for Minerals Extension and Research (ACMER)
- Dr Craig Miller, Acting General Manager – Science and Solutions, Queensland Healthy Waterways and Catchments
- a NSW Department of Planning and Environment representative

The IMP was established under the Development Consent to:

- provide an overview of the independent audits required under condition 8.8(a) of the Development Consent;
- regularly review all environmental monitoring procedures undertaken by the Applicant and monitoring results; and
- provide an Annual Statement of the Environment Report for Lake Cowal with particular reference to the ongoing interaction between the mine and the lake and any requirements of the Director-General.

The Director-General (Planning & Environment) has not specified any requirements under condition 8.8(b)(ii) for the preparation of this report.

APPENDIX 2 - OVERVIEW OF THE INDEPENDENT ENVIRONMENTAL AUDIT (IEA)

Under the Minister's Condition of Approval (MCoA) (26 February 1999), an Independent Environmental Audit was to be completed:

- six-monthly during construction;
- 12 months after commencement of ore processing;

- then every three years thereafter until decommissioning of the mine and ore processing operations, respectively, or as otherwise directed by the Director-General.

In its report of August 2007, the IMP recognised that the template-based approach, that had been used by Trevor Brown and Associates applied environmental management consultants (aemc) in the four six-monthly reports leading up to the 2007 IMP reporting period, was well-structured for addressing complex environmental compliance requirements, and was a good example of best practice for easily accessible and updated environmental compliance information. Thus the IMP made the recommendation that “Barrick consider continuing use of the template-based approach established by aemc for environmental auditing of operations in order to regularly and systematically update progress on each of the environmental management and monitoring components. This approach would greatly assist the IMP in its annual review.”

The plans reviewed for compliance include:

- Indigenous Archaeology and Cultural Heritage Management Plan
- Non-Indigenous Heritage Management Plan
- Flora and Fauna Management Plan
- Erosion and Sediment Control Management Plan
- Soil Stripping Management Plan
- Rehabilitation Management Plan
- Biodiversity Offset Management Plan
- Bushfire Management Plan
- Land Management Plan
- Compensatory Wetland Management Plan
- Water Management Plan
- Cyanide Management Plan
- Hazardous Waste and Chemical Management Plan
- Air Quality Management Plan
- Blast Management Plan
- Noise Management Plan

APPENDIX 3 – LIST OF REPORTS ASSESSED BY INDEPENDENT MONITORING PANEL

Cowal Gold Mine – 2015 Annual Review Report (July 2016). Evolution Mining.

Independent Environmental Audit – Cowal Gold Mine (April 2016). Trevor Brown and Associates.

Northern Waste Rock Emplacement Rehabilitation Trials. February 2016. DnA Environmental.

2015 Rehabilitation Monitoring Report for Cowal Gold Mine. February 2016. DnA Environmental.

2015 Compensatory Wetland Monitoring Report. February 2016. DnA Environmental.

2015 Remnant Vegetation Enhancement Program Monitoring Report. February 2016. DnA Environmental.

2015 Austral Pillwort Survey. February 2016. DnA Environmental.