# Appendix H

Biodiversity Development Assessment Report


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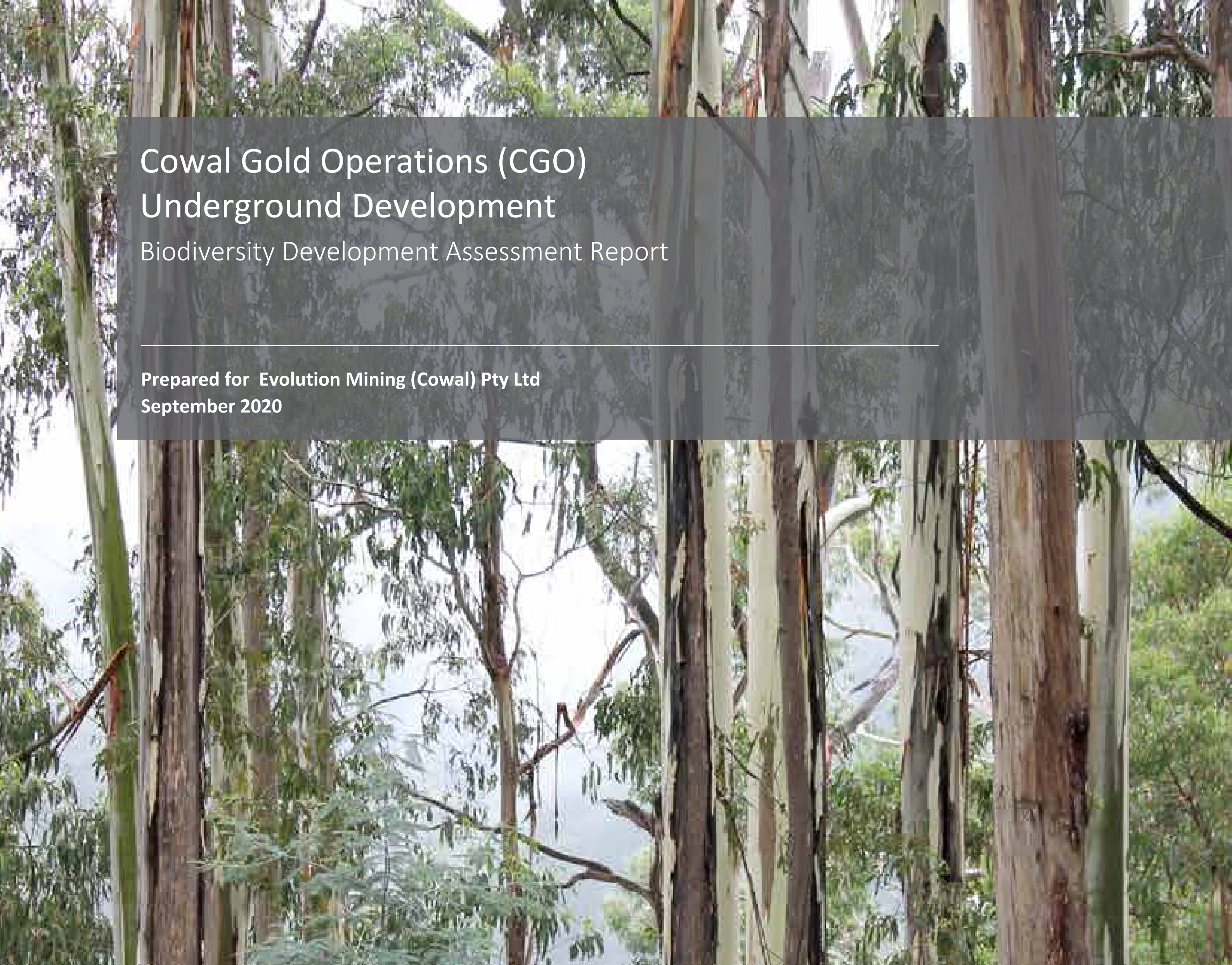

# Cowal Gold Operations (CGO) Underground Development

## Biodiversity Development Assessment Report

**Prepared for Evolution Mining (Cowal) Pty Ltd**
**September 2020**

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# Cowal Gold Operations (CGO) Underground Development

Biodiversity Development Assessment Report

**Report Number**

J190140 RP19

**Client**

Evolution Mining (Cowal) Pty Ltd

**Date**

28 September 2020

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v2 Final


**Prepared by**

**Robert Morris**
Associate Director
28 September 2020

**Approved by**

**Dr Steven Ward**
Associate Ecologist
28 September 2020

# Executive Summary

## ES1 Project description

Evolution Mining (Cowal) Pty Limited (Evolution) is the owner and operator of the Cowal Gold Operations (CGO), an open-cut gold mine located approximately 38 kilometres (km) north-east of West Wyalong. The mine has been operating since 2005 under the authority of Ministerial Development Consent development approval (DA) 14/98. Evolution now seeks approval to construct and operate an underground mine at CGO. All surface works will occur within the DA 14/98 area, and the underground mine extent will pass beneath the adjoining Lake Cowal. Due to the consideration of potential indirect impacts should hydraulic connectivity through to the underground mine occur, this Biodiversity Development Assessment Report (BDAR) focusses on the biodiversity values of Lake Cowal.

## ES2 Landscape features

The project occurs within entirely the NSW South Western Slopes Interim Biogeographic Regionalisation for Australia (IBRA) region, and the Lower Slopes subregion. The majority of the project is within Mitchell Landscape Ardlethan Hills, with a smaller area of Manna Hills and Footslopes, and Cowal Lakes, Swamps and Lunettes.

Lake Cowal is a large ephemeral wetland and is listed in the *Directory of Important Wetlands in Australia*.

## ES3 Native vegetation

No direct impacts to native vegetation as the entirety of the works are within the approved DA 14/98 area. Within the extent Lake Cowal, a total of six plant community types (PCTs) are identified in regional vegetation mapping (VIS_ID 4468).

Two threatened ecological communities (TECs) may be present within Lake Cowal:

- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions critically endangered ecological community (CEEC); and
- Artesian Springs Ecological Community in the Great Artesian Basin CEEC.

## ES4 Threatened species

A total of 41 ecosystem species are predicted by the Biodiversity Assessment Method Calculator (BAMC) to potentially be associated with the PCTs present within Lake Cowal. Further threatened species credit species were also identified by the BAMC as being potentially associated with the lake comprising:

- 13 threatened flora species;
- 2 amphibian species;
- 14 avifauna species;
- 3 mammal species; and
- 1 reptile species.

## ES5 Groundwater-dependent ecosystems

An assessment of groundwater dependent ecosystems was undertaken by Coffey (2020). During the life of the CGO, dewatering from the open pit, stopes and access tunnels will only have a small and localised impact on groundwater. Over the longer term, groundwater will flow towards the open pit, ultimately terminating there and evaporating.

The key findings of the Coffey (2020) assessment with regards to groundwater dependent ecosystems were that:

- High potential aquatic GDE is identified at Lake Cowal immediately east of the CGO, but will not be affected as groundwater modelling and observations to date show that seepage from Lake Cowal into the open cut mine during periods of inundation is negligible.

- High potential terrestrial GDE approximately 4.5 km north of the CGO comprising Grey Box-White Cypress-pine woodland but was considered unlikely to be groundwater dependant (or affected by the underground mining proposal), based on knowledge of local groundwater conditions.

- Moderate potential terrestrial GDE surrounding the CGO within or, at the fringe of, Lake Cowal during periods of inundation. These GDE are also subject to periods when the lake is dry. These will not be affected by mining operations as the seepage from the lake to the open pit, stopes and access tunnels is assessed as being negligible.

- Low potential terrestrial GDE surrounding the CGO comprising tussock grasslands. These areas may be affected by changes in soil moisture depending on the root depths. However, the CGO's impacts on the deeper underlying hard rock aquifers are considered to be unlikely to affect any tussock grasslands.

## ES6 Aquatic and riparian biodiversity

A total of seven threatened aquatic species may utilise Lake Cowal when it is inundated (AMBS 2018a). Two unnamed third order drainage lines, and two unnamed first order drainage lines, pass through the above ground project area associated with DA 14/98. These drainage lines have already been realigned as part of the project's water management strategy.

## ES7 Impact avoidance, minimisation and mitigation

The key means of avoiding impacts is in the design of the mine layout and ensuring that the potential for stope failure (chimneying) to the surface of Lake Cowal is minimised by various means of ground support. This has been undertaken by Evolution by modelling potential subsidence and through geotechnical design. This process identified 19 stopes that were located in close proximity to the weathered rock overlying the mine area, or within the cover sequence layers. These stopes were considered to pose a risk of chimneying and were subsequently removed from the mine design.

A program of monitoring and management responses that would assist in preventing risk of stope failure to surface (chimneying) and reacting to the early signs to prevent failures occurring with instability is detected was also proposed in the subsidence study. A key response will be the prompt and complete backfilling of all stopes and a variety of other actions to monitor, model and strengthen the stopes, particularly those in the upper levels of the mine and those in proximity to major faults.

## ES8 Assessment of impacts under other relevant biodiversity legislation

A referral under the *Environment Protection and Biodiversity Conservation Act 1999* has been submitted, and the project has been determined to not be a Controlled Action.

## ES9 Biodiversity impacts and offsets

As the proposed works do not involve new above ground impacts, and with the implementation of the proposed design and mitigation measures to prevent risk of stope failure to surface (chimneying) no biodiversity impacts to Lake Cowal are anticipated, and therefore no biodiversity offsets are required.

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# 1 Introduction

## 1.1 Background

Evolution Mining (Cowal) Pty Limited (Evolution) is the owner and operator of the Cowal Gold Operations (CGO), an open-cut gold mine located approximately 38 kilometres (km) north-east of West Wyalong, in the central west region of New South Wales (NSW). The location of the existing CGO mine is shown at a regional scale in Figure 1.1 and at a local scale in Figure 1.2.

The mine has been operating since 2005 under the authority of Ministerial Development Consent development approval (DA) 14/98 and within mining leases (ML) ML 1535 and ML 1791 (refer Figure 1.2). DA 14/98 allows Evolution to:

- extract 167 million tonnes (Mt) of ore by open-cut methods until 2032;
- process this ore on-site at a rate of 9.8 million tonnes per annum (Mtpa);
- produce up to 6.1 million ounces (oz) of gold;
- emplace tailings and waste rock on site in an Integrated Waste Landform (IWL) – which includes the current Northern and Southern Tailings Storage Facilities, and in waste rock emplacement areas;
- operate a water supply pipeline to the Bland Creek Palaeochannel Borefield; and
- progressively rehabilitate the site.

DA 2011/64, issued by Bland Shire Council (BSC), provides approval to develop and operate the Eastern Saline Borefield that supplies process water to the mine.

The current open-cut mine and surface infrastructure is wholly contained within ML 1535. ML 1791 accommodates part of the IWL and soil stockpiles.

The CGO site also hosts a range of ancillary infrastructure to support the open-cut mine. This includes an ore processing plant, the IWL, waste rock emplacements, ore stockpiles, workshops, offices, reagent storage and explosives magazine.

The site is directly adjacent to Lake Cowal in the Lachlan Catchment, which is an ephemeral inland wetland system. Lake Cowal is the largest natural inland lake in NSW, and when full is approximately 21 km long (north to south) and 9.5 km wide (east to west) covering an area of over 13,000 hectares (ha).

### 1.1.1 Overview of existing Cowal Gold Operations

Evolution mines gold ore from the open-cut pit at CGO using standard drill and blast techniques. Broken rock is hauled from the pit for either processing through the ore processing plant or, for barren waste rock, to the IWL for disposal. Following gold extraction in a conventional carbon-in-leach (CIL) cyanide leaching circuit, the barren ore residue (known as tailings) is pumped as a slurry to the IWL for permanent disposal.

Under the current approvals, CGO will mine and process approximately 167 Mt of ore over the 28-year life span of the open-cut mine, at a rate of up to 9.8 Mtpa.

Open-cut pit mining operations at the CGO are currently supported by the on-site facilities summarised in Table 1.1.

### Table 1.1 Summary of existing CGO site facilities

| Facility | Description / components |
|---|---|
| Process plant | • primary crusher;<br>• float tails leach circuit; and<br>• carbon in-leach cyanide leaching circuit. |
| Stockpiles | • run-of-mine (ROM) pads;<br>• low-grade and high-grade ore stockpiles;<br>• mineralised material stockpiles; and<br>• soil and clay stockpiles. |
| TSFs | • integrated waste landform;<br>• Northern TSF; and<br>• Southern TSF. |
| Waste rock emplacements surrounding the open-cut pit | • northern waste rock emplacement;<br>• southern waste rock emplacement; and<br>• perimeter waste rock emplacement. |
| Water management structures | • lake protection bund;<br>• temporary isolation bund;<br>• water supply pipeline;<br>• saline groundwater supply bores within ML 1535; and<br>• water diversion systems (including Up-Catchment Diversion System (UCDS) and Internal Catchment Drainage System (ICDS)) and drainage.<br>Evolution also operates the Bland Creek Palaeochannel Borefield, which is approved under DA 14/98. The Bland Creek Palaeochannel Borefield consists of four bores within the Bland Creek Palaeochannel (north-east of Lake Cowal), which are connected to the water supply pipeline. Part of the CGO water supply is sourced from the Bland Creek Palaeochannel Borefield. |
| Ancillary facilities | • access roads, internal roads and haul roads;<br>• electricity transmission lines;<br>• waste storage and transfer facility;<br>• workshop facilities; and<br>• administration and bathhouse buildings. |

Approved heavy vehicle access to the site is via the designated route between the CGO site and West Wyalong (with light vehicle access also available via Condobolin and Forbes. Hazardous goods are transported to site by truck either from Port Botany or their point of production (eg Yarwan, Queensland or Melbourne, Victoria etc.) via the approved local road network.

## 1.2 The project

Evolution now seeks approval to construct and operate an underground mine at CGO, the CGO Underground Development Project (the Project), to provide access to another 1.8 million ounces (Moz) of gold. A summary of existing operations at CGO, proposed new Project components and the approvals approach is provided in the following sub-sections.

### 1.2.1 Overview of the proposed development

The conceptual Project detail is shown in Figure 1.2, and described in detail in the EIS. The Project includes the following key components which will support underground mining:

- Excavation of two declines to provide underground access and ventilation: one decline via a portal on the existing open-cut pit and the other via a box-cut. The declines will be approximately 6 metres (m) wide by 6 m high and will extend approximately 1.5 km to the point at which the first production drive commences. The final depth of the underground will be approximately -850 m AHD.
- Development of a box-cut entry adjacent to the open-cut pit, which will be the main access for personnel and materials to the underground mine and will be used to transport ore to the surface for processing.
- Development of stopes via conventional mechanised drill and blast techniques.
- Production of ore via mechanised sub-level open stoping with paste backfill.
- Load-haul-dump (LHD) vehicles used to remove rock from development and production areas and loading into diesel trucks for transport to the surface.
- Development of a paste fill plant, and backfilling excavated stopes with cemented paste fill made from cement and tailings.
- Installation of services, including power, water and communications, which will be reticulated underground to serve the workings. An underground workshop area will provide facilities including wash bay, heavy vehicle service area, ablutions, crib room and office.

The Project is proposed to produce of up to 1.8 Mtpa of ore until mid-2039 with processing until the end of 2040.

### 1.2.2 Assessment of alternatives

The design of the Project represents the current optimised conceptual configuration for the Project. This conceptual design has been developed by Evolution in a collaborative, multi-disciplinary process through the completion of various concept, pre-feasibility and feasibility studies.

The following sub-sections provide an overview of the assessment stages undertaken by Evolution in the concept design development, including the alternatives considered in selecting the Project configuration that forms the basis of this EIS.

### i Assessment stages

The pre-development phase of a mining project typically involves three phases of assessment, with each phase usually completed and a decision made before proceeding to the next. The three stages are:

- Concept and/or scoping phase: the scoping phase of a project, whereby a conceptual mine plan is outlined and potential production outputs and costs are estimated at a high level (typical accuracy of 30 to 35%).

- Pre-feasibility (PFS) phase: the preliminary assessment phase of a project, whereby more detailed exploration results help to delineate the orebody and proposed mining, processing and waste management methods are identified. Potential significant environmental, social and cultural heritage constraints are also described. Potential production outputs and costs are estimated with more accuracy (typical accuracy of 20 to 25%).

- Feasibility phase: the critical assessment phase of a project used to determine its viability, comprising a detailed mine plan including mining method, production rates, supporting infrastructure and budget forecast. Predicted environmental, social and cultural heritage risks and impacts and potential management measures to address these are also described. Potential production outputs and costs are estimated with more accuracy (typical accuracy of 10 to 15%).

The assessment phases are undertaken with the general objectives being to establish the financial and technical feasibility of the project and to define the project in sufficient detail as to provide a basis for a forward work plan for further investigations. If the proposed mining project is found to be feasible, it may proceed to detailed front-end engineering design for all project infrastructure.

At the time of writing, the PFS phase had been completed for the Underground Development Project, with a feasibility study currently in progress.

### ii Concept design development

The development of the Project is subject to a range of constraints that will influence Evolution's capacity to develop the Project successfully, and the extent to which Project stakeholders (local communities and regulators) support its development. These constraints include:

- Physical: the fixed location of the orebody, site-specific geological, topographic, climatic and other factors.

- Environmental: the existing environmental values, including groundwater, surface water, soils, biodiversity and other factors.

- Social: the characteristics, values, lifestyle, expectations and concerns of community stakeholders.

- Cultural heritage: the cultural heritage values, expectations and concerns of traditional owners.

- Economic – the commercial viability of the Project and the values, expectations and concerns of Evolution's shareholders.

The conceptual design considered in this EIS and supporting assessment represents the current optimisation of the Project, taking into consideration all physical, environmental, social, cultural heritage and economic considerations. Engineering design and other assessments, including environmental studies, are continuing and there is potential that aspects of the proposed Project design, layout and schedule, including the alternatives described, may change.

### iii Alternatives considered

The CGO site is an existing open-cut mining operation with an established disturbance footprint and substantial existing surface infrastructure. Much of the existing surface infrastructure will be utilised to support the Underground Development Project, with some modifications to support processing of underground ore from the GRE46 Mineral Deposit. As such, key alternatives considered by Evolution during concept, scoping and PFS phases focused on:

- the use of conventional open-cut versus underground mining methods; and
- the use of stoping versus other underground mining methods.

During the concept and scoping phase, mining of the GRE46 Mineral Deposit was evaluated using conventional open-cut pit versus underground mining methods. This evaluation concluded that mining the GRE46 Mineral Deposit at depth using conventional open-cut methods was sub-economic, primarily due to the nominal orebody width, high strip ratios and the overall depth of the deposit. A subsequent evaluation was completed to determine whether the GRE46 Mineral Deposit could be economically extracted using conventional underground methods. This evaluation, which was further refined during the PFS phase, demonstrated that sub-level open stoping (SLOS) with paste fill backfilling was economic.

Other underground mining methods, such as sub level caving and block caving were effectively ruled out early in the PFS due to their likely impact on subsidence in Lake Cowal. Mining methods such as sub level caving and block caving also require a much higher upfront capital cost to establish steady state underground operations which would negatively impact the Project economics. SLOS with paste fill was selected as the most suitable option considering all relevant physical, environmental, social, cultural heritage ad economic factors.

Given that the GRE46 Mineral Deposit is situated primarily beneath Lake Cowal, key considerations during the planning and design process were to ensure that;

- there is zero surface disturbance outside of the existing approved disturbance footprint;
- negligible subsidence impacts occur on the surface of Lake Cowal; and
- very importantly, there is negligible possibility of a catastrophic failure (such as chimneying) to the surface.

Stope failure to the surface is commonly known as ‘chimneying’. It is a rare process whereby underground mining, such as stope mining, causes the rock above the stope to collapse inwards and, overtime, the rock above unravels all the way to the surface often in a tubular or ‘chimney’ shape. When it occurs, it is generally because the area being mined intersects with a fault, or an area of weakened or weathered rock. All underground mines are aware of this potential issue and have a suite of controls in place to proactively manage the risk.

A catastrophic failure to the surface would not only have unacceptable and potentially major ecological impacts on Lake Cowal and its biodiversity, assuming the lake was inundated, it would also have the following major impacts and implications for CGO and Evolution Mining:

- it would flood and possibly sterilise the resource in the underground mine;
- it would possibly cause a health and safety incident for its workers;
- it could potentially flood and sterilise the existing open cut pit, as water could back flow through the underground mine access declines into the open cut.

This extremely unlikely event would have major reputational, social and economic implications for Evolution Mining and the regional community, and therefore the mine's design and management will have a singular focus on eliminating this risk.

Evolution Mining (CGO) will continue to evolve the conceptual design of the underground mine during the feasibility, detailed design and operational design processes with a singular focus on ensuring the risk of chimneying is negligible.

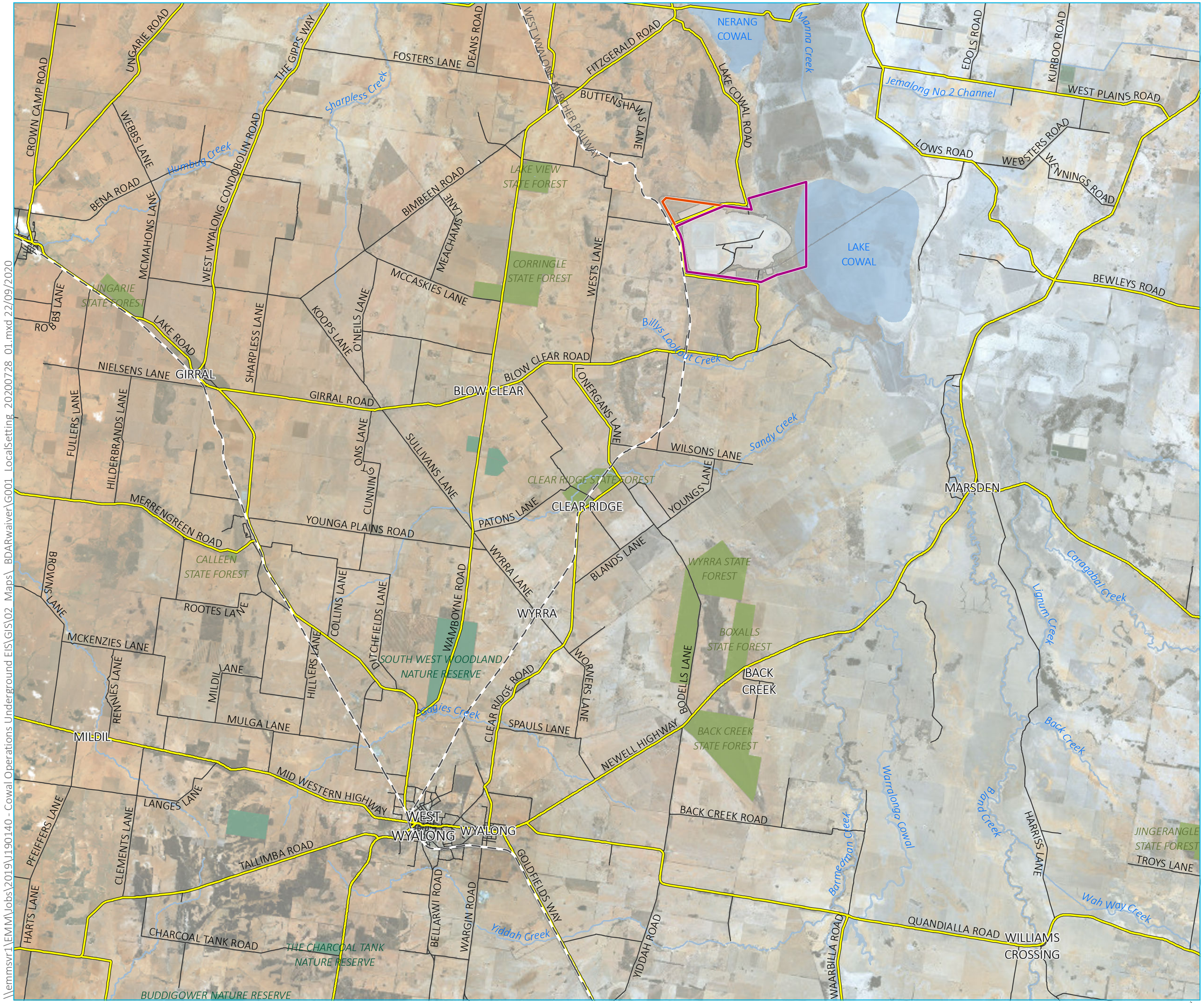
#### iv Design iteration process

The initial stope design that was modelled by Beck Engineering (2020) identified 19 stopes that were located in close proximity to the weathered cover sequence geology, or within the cover sequence layers. Seven of these stopes extended into the hard oxide (a weak to moderate strength rock mass that has been weathered) and some were in close proximity to the top of fresh rock contact with a small crown pillar thickness in strong fresh rock. Some stopes also extended close to the base of the soft oxide, which is weaker. These stopes were seen to have a significantly elevated risk of chimneying to surface due to the close proximity of the weak cover layers. Chimneying to surface would have potentially catastrophic effects on the underground mine should stope failure reach the surface or groundwater table. Due to the elevated risk of crown pillar instability and chimneying potential, these stopes were removed from the mine design.

### 1.2.3 Project objectives

The conceptual Project design identified by Evolution seeks to meet the following objectives:

- to extract a further 1.8 Moz of gold not accessible by the open-cut operations;
- to maintain continuity of mining and extend ore production at the site beyond 2032;
- to optimise the recovery of gold in the underground development area;
- to safely mine an economically extractable resource;
- to provide further stability and secure employment for its workers and to generate economic activity and wealth for the local, regional and State communities; and
- to effectively manage impacts on surrounding residents and the local environment during construction and operations and achieving, at a minimum, compliance with relevant statutory requirements.




Source: EMM (2020); Evolution (2020); DFSI (2017)

KEY

- Mining lease (ML1535)
- Mining lease (ML1791)
- Approved surface disturbance
- Rail line
- Main road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest

Local setting

Evolution Mining
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Figure 1.1

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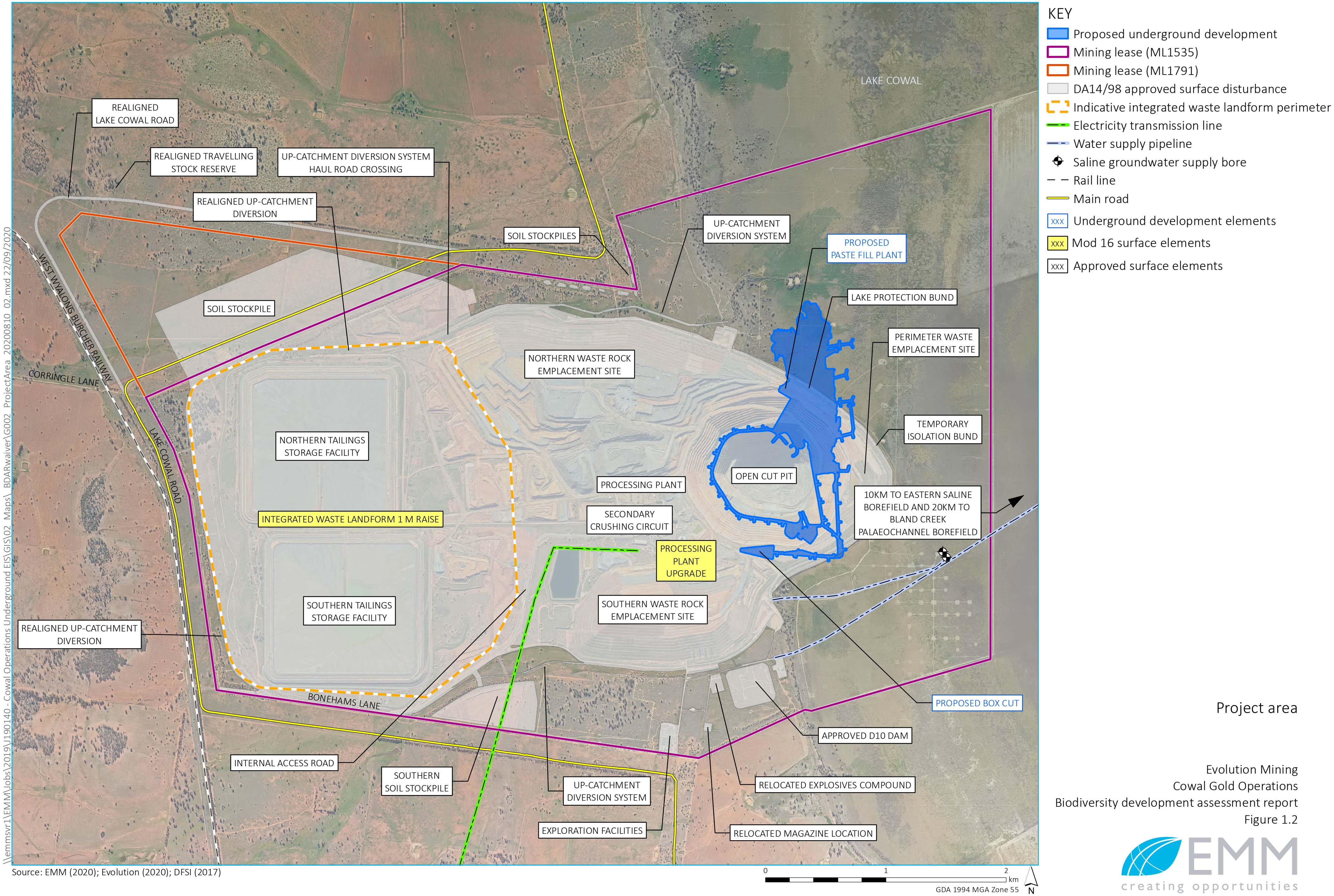


Source: EMM (2020); Evolution (2020); DFSI (2017)

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Project area

Evolution Mining
Cowal Gold Operations
Biodiversity development assessment report
Figure 1.2

EMM creating opportunities

## 1.3 Site description and definitions

### 1.3.1 Lake Cowal

The project is located immediately adjacent to, and underneath Lake Cowal, which is an ephemeral inland wetland system. The following background summary of landuse at and around Lake Cowal and description of Lake Cowal itself is from Lake Cowal Foundation's website (Lake Cowal Foundation 2020):

> *Landuse*
>
> *The general landscape of the area is flat to very gently undulating land with occasional rocky outcrops and low hills. The majority of the vegetation of the area has been heavily cleared with remnant regrowth vegetation restricted to elevated rocky areas. Lake Cowal is located within the 940 000 ha Bland Creek Catchment area which falls steadily from east to west and drains via the Bland Creek into the southern end of Lake Cowal. The region supports mainly dryland agriculture with irrigation farming in the Jemalong/Wyldes Plains irrigation districts located to the north of the lake.*
>
> *Primary land uses include cropping (predominantly wheat, barley, canola and oats) and grazing of both sheep and cattle. Common cropping systems incorporate rotational, minimum tillage systems (direct drilling, stubble retention) with some landholders initiating new farming methods including the use of biological inputs and incorporation of machinery exhaust emissions.*
>
> *Grazing and occasional opportunity cropping below the lake full storage water line occurs as the lake recedes in drier times. The Lake bed provides valuable pastures on recently flooded land as opposed to adjacent lands, particularly during drought conditions.*
>
> *There are a number of State Forests in the local area including Euglo and Nerang to the north, Lake View and Corringle to the west, Clear Ridge, Wyrra, Boxhall and Back Creek to the south and Little Blow Clear, Blow Clear and Hiawatha State Forests to the south west.*
>
> *A game reserve which provided public access and was used for camping during duck hunting season was situated on the western edge of Lake Cowal, but has been relocated to the southern end of Lake Cowal due to the development of the Cowal Gold Mine in 2003. Travelling Stock Reserves are situated along the southern, western and northern ends of the Lake.*
>
> *Historically Lake Cowal was a significant inland commercial fishery in NSW, ranking in the top five producers of fish for 14 of the past 23 years prior to 1980. Several methods of commercial fishing were employed including gill, drum and loop netting and yabby trapping. Golden perch, Redfin, European Carp and the Freshwater Yabby were worth up to $120,500 per annum. Presently yabbies are the main species targeted by commercial fishers using opera house style nets with up to eight licences being issued for the lake under the management of Fisheries New South Wales. Recreational fishing for yabbies is also popular amongst the local community.*
>
> *Lake Cowal*
>
> *Lake Cowal forms part of a large ephemeral inland wetland system in the Lachlan Catchment and is located 43 km northwest of West Wyalong, and approximately 60 km south west of Forbes in Central New South Wales, Australia. Significant concentrations of water birds visit the Lake and the Australian Heritage Commission listed Lake Cowal on the Register of the National Estate in 1992.*
>
> *Lake Cowal is New South Wales' largest natural inland lake at approximately 21 km long and 9.5 km wide with an average depth of around 2.5m and covering an area of over 13,000 hectares when full.*

*During the summer of 2000/2001 Lake Cowal dried out completely and remained dry until March 2010 when it commenced refilling mainly via flows from Bland Creek, reaching capacity and flowing into the smaller Nerang Cowal during March 2011. A small amount of water flowed into Lake Cowal during the spring of 2005 covering approximately 1,200 hectares, but being shallow it dried out within 3 months.*

*Due to the warmer summer weather and hot, dry winds, Lake Cowal completely dried out during the third week of December 2014. Large numbers of dead European carp and some unfortunate waterbirds are concentrated in the lake's centre where the last sheets of water lingered. Following over 85 mm of rain during July 2015, approximately 1,800 ha of Lake Cowal was covered with water leaving some opportunity barley crops standing in water. Lake Cowal completely dried again on 13th December 2015, remaining dry until falls totalling over 200 mm for the months of June/July 2016 saw flows from the Bland and other local creeks cover approximately 8,915 ha (66%) of the lake bed. Significant flooding rains in the Lachlan River and Bland Creek Catchments will be required to further lift water levels in Lake Cowal.*

*The lake is a typical ephemeral inland system with highly variable flooding/drying cycles. It has been known to dry completely for extended periods of up to 30 years in the early part of the 20th Century and since that time for lesser periods typically from 3 to 18 months. Without inflows, Lake Cowal dries from evaporative losses, which usually takes three years from full storage*.

### 1.3.2 Surface infrastructure

To support the underground mining operations, a number of augmentations would be required to surface (above-ground) infrastructure (Figure 1.2), including:

- developing a box-cut to access the underground mine;
- developing a paste fill plant to make paste to backfill the underground stopes;
- a 1 metre raise to the Integrated Waste Landform; and
- other minor additional ancillary mining infrastructure.

All of the above surface project footprint is all located within the DA14/98 approved surface disturbance area (Figure 1.2). Therefore, there will not be any new above-ground impacts, which have not already been covered by DA14/98.

### 1.3.3 Subsurface infrastructure

A new design and footprint is proposed for additional underground mining operations, located as shown in Figure 1.2. This footprint extends under Lake Cowal itself but will not include any above ground vegetation clearance or disturbance.

### 1.3.4 Project terminology

Definitions for project terminology used in this BDAR are provided in Table 1.2.

**Table 1.2 Naming of areas referred to in this BDAR**

| Project elements | Definition |
|---|---|
| Project area | Area subject to all proposed direct impacts. It is noted that all direct impacts are located within the DA14/98 approved surface disturbance area (Figure 1.2) |
| Potential indirect impact area | For the purposes of this report this is considered to be the entirety of Lake Cowal, should a chimney event and hydraulic connection occur (noting that this is extremely unlikely to occur) |

It is noted that a 1,500m buffer of the project footprint (an assessment area surrounding the subject land) has not been applied because it is not relevant in this particular situation, because the assessment is focussed on the potential for chimneying and hydraulic connectivity between the proposed underground mine and Lake Cowal (when inundated). All surface impacts are located within the DA14/98 approved surface disturbance area and therefore no credit calculations have been undertaken.

## 1.4 Assessment requirements

The Planning Secretary's Environmental Assessment Requirements (SEARs) for this project (SSD-10367) were originally issued on 27 September 2019 and revised on 26 August 2020, following a minor design change within the existing mine site. Table 1.3 sets out SEARs requirements that are relevant to this BDAR assessment.

In addition, the Biodiversity and Conservation Division (BCD) responded to Department of Planning, Industry and the Environment (DPIE) regarding the project on the 10 September 2019 and stated the following regarding biodiversity:

*The modification does not involve an expansion of the total footprint of the mine so direct impacts on biodiversity are unlikely. However, more cyanide will be used for gold production so potential impacts of this on biodiversity, particularly threatened species, should be addressed in the EIS. We note that the documents include a Biodiversity Development Assessment Report (BDAR) waiver request. We would typically respond to a BDAR waiver request after providing SEARs. In this case for a BDAR waiver to be granted the EIS will need to address potential impacts of the project on prescribed biodiversity values (Section 6.7.1.4 of the Biodiversity Assessment Method), specifically water sustainability.*

**Table 1.3 Secretary's Environmental Assessment Requirements**

| Requirement | Section addressed |
|---|---|
| **Biodiversity** – including: | |
| – an assessment of the biodiversity values and the likely biodiversity impacts of the development in accordance with Section 7.9 of the Biodiversity Conservation Act 2016 (NSW), the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR), unless the Planning Secretary determines that the proposed development is not likely to have any significant impacts on biodiversity values; and | The application of the BAM to the proposed modification was discussed with BCD as detailed below this table. It is noted that in this instance because the project does not involve new above ground vegetation clearance, that the focus of the report is on identifying biodiversity values associated with Lake Cowal, and assessment of potential indirect impacts associated with the proposed underground mining beneath the surface of Lake Cowal. |
| – the BDAR must document the application of the 'avoid, minimise, offset' framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM; | |

Based on technical assessments relating to groundwater impacts and subsidence impacts of the proposed Underground Project, Evolution's EIS consultant, EMM Consulting Pty Ltd (EMM) wrote to DPIE on 5 August 2020 seeking a BDAR waiver request for the SSD application in accordance with the NSW Office of Environment and Heritage (OEH) BDAR waiver determinations for SSD and SSI applications fact sheet. EMM was satisfied that the project is highly unlikely to have a significant impact on biodiversity values of the area and considered that a BDAR was not warranted for the project. The request included a detailed response to the BDAR waiver request requirements relating also to the SEARs requirements.

On the 7 September 2020, EMM was contacted by DPIE who stated that BCD had declined the BDAR Waiver request and that a BDAR was required to accompany the SSD application. In order to discuss the precise requirements of the BDAR, DPIE, BCD and EMM met on 11 September 2020 to discuss these requirements to ensure the BDAR addressed BCD's concerns. The following issues were raised by BCD:

- firstly, BCD (and experts consulted regarding groundwater) were uncertain about the risks of the project affecting Lake Cowal;
- issuing a waiver would negate BCD's ability to request and influence appropriate mitigation and monitoring controls relating to potential impacts;
- BCD asked to understand more about proactive controls and monitoring that would be used to prevent any mine failures / chimneying to the surface;
- BCD asked for examples of mines that have successfully used stope mining methods, whilst implementing controls like those proposed at Cowal;
- BCD referred to the BAM Stage 2 Operational Manual regarding page 18 (prescribed impacts) and page 23 (uncertain impacts) which should be considered in the assessment.

It is understood from discussion with BCD that vegetation mapping, BAM plots, threatened species surveys, and credit calculations are not required as there are no direct surface impacts associated with this BDAR. Therefore, in a number of sections text identifies that some details are not relevant for this BDAR. The preparation of this BDAR has otherwise been prepared by accredited assessor Dr Steven Ward (BAS17062) in accordance with the Biodiversity Assessment Method (OEH 2017).

## 1.5 Purpose of this report

The specific objectives of this assessment are to:

- describe biodiversity values of the project area;
- assess the likelihood that threatened species and communities (threatened biodiversity) listed under relevant the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) could occur in the indirect impact area (ie. within Lake Cowal);
- document the strategies implemented to avoid and/or minimise impacts of the project on threatened biodiversity;
- assess residual threatened biodiversity impacts, after avoidance and minimisation strategies have been implemented; and
- provide environmental safeguards to mitigate threatened biodiversity impacts during construction and operation.

## 1.6 Information sources

### 1.6.1 Publications and databases

In order to provide context for the project, information about flora and fauna species, populations, communities and habitats from the locality (generally within 10 km) was obtained from the following databases:

- previous ecological reports relating to Cowal Gold Operations and Lake Cowal (see references);
- BioNet Atlas of NSW Wildlife for previous threatened species records; and
- Commonwealth Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST) for Matters of National Environmental Significance (MNES) likely to occur within the project areas; and

### 1.6.2 Other relevant reports

This biodiversity assessment has been prepared with reference to other technical reports that were prepared as part of the project and past projects at CGO. The other relevant reports referenced in this biodiversity assessment are listed below:

- Beck Engineering 2020 – Geotechnical assessment of surface impacts for proposed underground mining at Lake Cowal;
- Coffey 2020 - Mine Site Hydrogeological Assessment; and
- HEC 2020 – Cowal Gold Operation Underground Mine Project Hydrological Assessment.

Other background reports are listed in section 7.1.3.

# 2 Legislative context

This chapter provides a brief outline of the key biodiversity legislation and government policy considered in this assessment.

## 2.1 Commonwealth

### 2.1.1 Environmental Protection and Biodiversity Conservation Act 1999

The *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places and water resources which are defined as Matters of National Environmental Significance (MNES) under the EPBC Act. These are:

- world heritage properties;
- places listed on the National Heritage Register;
- Ramsar wetlands of international significance;
- threatened flora and fauna species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park;
- nuclear actions (including uranium mining); and
- water resources, in relation to coal seam gas or large coal mining development.

Under the EPBC Act, an action that may have a significant impact on a MNES is deemed to be a 'controlled action' and can only proceed with the approval of the Commonwealth Minister for the Environment. An action that may potentially have a significant impact on a MNES is to be referred to DAWE for determination as to whether or not it is a controlled action. If deemed a controlled action the project is assessed under the EPBC Act and a decision made as to whether or not to grant approval.

The project has been referred to the Commonwealth Minister for the Environment and determined as **not a controlled action** on 5 November 2019 (EPBC 2019/5812; Appendix A).

## 2.2 State

### 2.2.1 Environmental Planning and Assessment Act 1979

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) was enacted to encourage the consideration and management of impacts of proposed development or land-use changes on the environment and the community. The EP&A Act is administered by the NSW Department of Planning, Industry and Environment (DPIE).

The EP&A Act provides the overarching structure for planning in NSW; however, is supported by other statutory environmental planning instruments (EPIs) including State Environmental Planning Policies (SEPPs). EPIs relevant to the natural environment are outlined further below.

#### i State Environmental Planning Policy (State and Regional Development) 2011

The project has been declared to be State Significant Development (SSD)/State Significant Infrastructure (SSI)/Critical State Significant Infrastructure (CSSI) by the NSW Minister for Planning under the provisions of the EP&A Act and is defined in clause 9 of Schedule 5 of the SRD SEPP.

#### ii State Environmental Planning Policy (Koala Habitat Protection) 2019

The project is not a development application and does not require approval from Council, and thus consideration of the Koala Habitat Protection SEPP is not triggered under Part 2 of the SEPP. Furthermore, the Bland local government area is not listed in Schedule 1 of the SEPP, and it therefore does not apply to any land within this local government area.

### 2.2.2 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) is the legislation responsible for the conservation of biodiversity in NSW through the protection of threatened flora and fauna species, populations and ecological communities. The BC Act, together with the Biodiversity Conservation Regulation 2017 (BC Regulation), established the Biodiversity Offsets Scheme (BOS).

The BOS includes establishment of the Biodiversity Assessment Method (the BAM, OEH 2017) for use by accredited persons in biodiversity assessment under the scheme. The purpose of the BAM is to assess the impact of actions on threatened species and threatened ecological communities, and their habitats and determine offset requirements. For major projects, use of the BAM is mandatory, unless a BDAR waiver is granted.

The BAM sets out the requirements for a repeatable and transparent assessment of terrestrial biodiversity values on land in order to:

- identify the biodiversity values on land subject to proposed development area;
- determine the impacts of a proposed development, following all measures to avoid, minimise and mitigate impacts; and
- quantify and describe the biodiversity credits required to offset the residual impacts of proposed development on biodiversity values.

This biodiversity assessment has been undertaken in accordance with the requirements of the BAM.

### 2.2.3 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) contains provisions for the conservation of fish stocks, key fish habitat, biodiversity, threatened species, populations and ecological communities. It regulates the conservation of fish, vegetation and some aquatic macroinvertebrates and the development and sharing of the fishery resources of NSW for present and future generations. The FM Act lists threatened species, populations and ecological communities, key threatening processes (KTPs) and declared critical habitat. Assessment guidelines to determine whether a significant impact is expected are detailed in section 220ZZ and 220ZZA of the FM Act.

Another objective of the FM Act is to conserve key fish habitat (KFH). These are defined as aquatic habitats that are important to the sustainability of recreational and commercial fishing industries, the maintenance of fish populations generally and the survival and recovery of threatened aquatic species. Lake Cowal is identified as KFH, but drainage lines in proximity to the project area are not identified as KFH.

### 2.2.4 Biosecurity Act 2015

The NSW *Biosecurity Act 2015* has superseded the *Noxious Weeds Act 1993*, which has now been repealed.

The primary objective of the Biosecurity Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

The Biosecurity Act stipulates management arrangements for weed biosecurity risks in NSW, with the aim to prevent, eliminate and minimise risks. Management arrangements include:

- any land managers and users of land have a responsibility for managing weed biosecurity risks that they know about or could reasonably be expected to know about;
- applies to all land within NSW and all waters within the limits of the State; and
- local strategic weed management plans will provide guidance on the outcomes expected to discharge duty for the weeds in that plan.

The provisions of the Biosecurity Act are discussed further in Section 8.2.

### 2.2.5 Water Management Act 2000

Division 6 of the *Water Management Act 2000* (WM Act) requires consideration of controlled activities (ie activities within 40 m of riparian land) and aquifer interference activities. The NSW Aquifer Interference Policy (NOW 2012) requires an assessment of potential impacts on groundwater users, including groundwater dependent ecosystems. Impacts on groundwater dependent ecosystems are considered in Chapter 6, riparian land are considered in Section 8.3 of this report.

# Stage 1 – Biodiversity assessment

# 3 Landscape features

## 3.1 Landscape features

### 3.1.1 Bioregions and landscapes

The project occurs entirely within the NSW South Western Slopes IBRA region, and within the Lower Slopes subregion.

Mitchell Landscapes defined in BAM as "*landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000*". The majority of the project area is located within the Ardlethan Hills Mitchell Landscape with a smaller area of Manna Hills and Footslopes, and Cowal Lakes, Swamps and Lunettes Mitchell Landscapes. The potential indirect impact area consists of the Cowal Lakes, Swamps and Lunettes Mitchell Landscape.

### 3.1.2 Rivers, streams and estuaries

The area being considered in this BDAR is situated within the Lachlan catchment. The Strahler stream ordering system is used in the BAM, where drainage lines with no other streams flowing into it is designated as being first order. When two drainage lines with the same order join, the resulting drainage line has the next highest order than the joining drainage lines.

The project area includes two unnamed Strahler third order drainage lines (Figure 3.1), but it is noted that these drainage lines have already been realigned as part of the project's water management strategy (Figure 3.2). The project area is immediately adjacent to the Lake Cowal wetland, as described in Section 3.1.3.

### 3.1.3 Wetlands

Lake Cowal is identified on the *Directory of Important Wetlands in Australia* (Environment Australia 2001).

Under the BAM a 50 m riparian buffer distance is applied for the purposes of assessment of this landscape feature. A portion of the project area sits within this buffer and the potential indirect impact area includes Lake Cowal itself.

### 3.1.4 Connectivity

Lake Cowal forms part of a matrix of wetlands in the bioregion and, as such, it is considered to be a connectivity feature for migratory birds (when inundated).

### 3.1.5 Areas of geological significance and soil hazard features

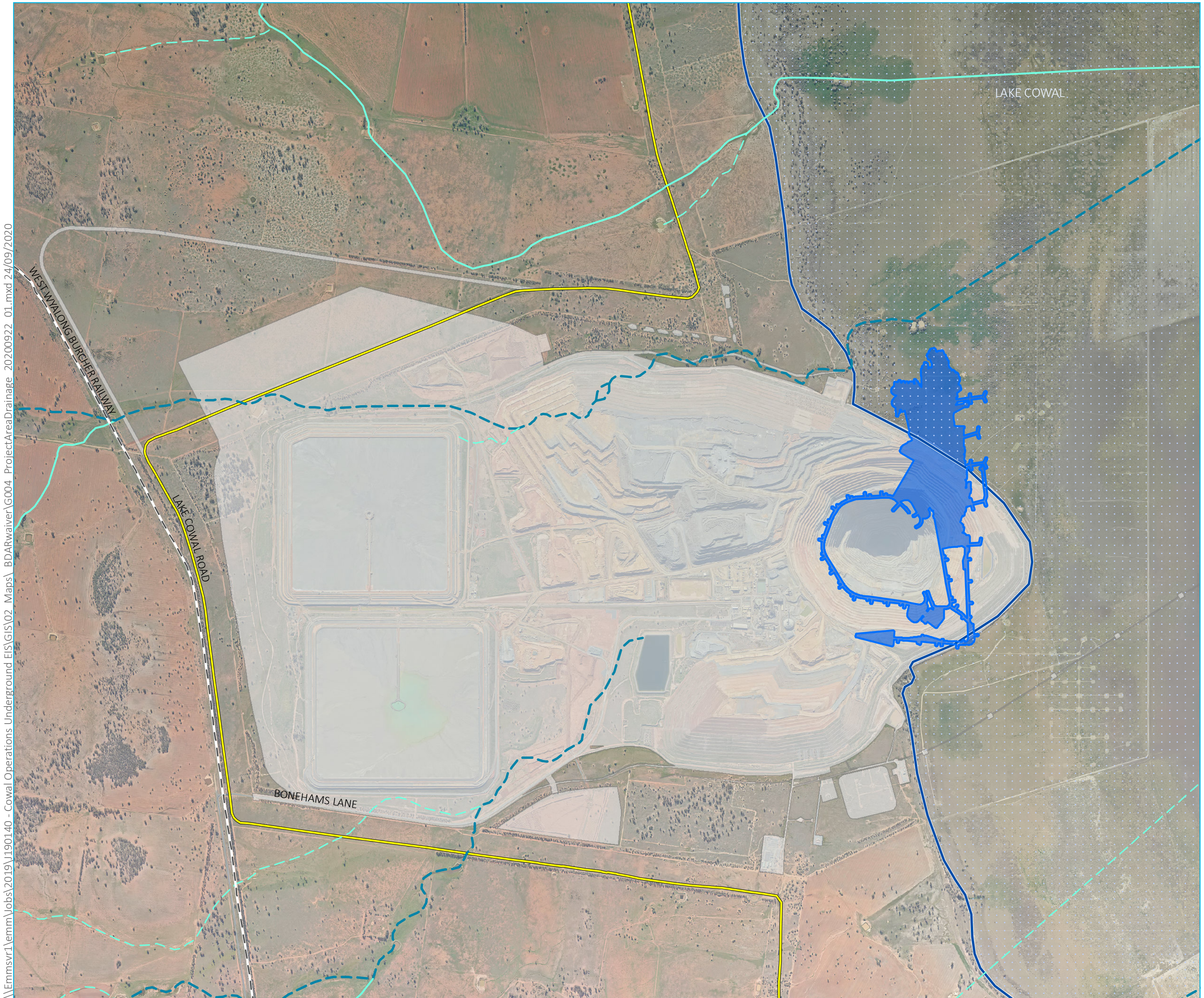
No karst (ie limestone cave systems), caves, crevices, cliffs or areas of geological significance are known to exist within the project area or the potential indirect impact area.

### 3.1.6 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value (AOBV) within or surrounding the project area.

## 3.2 Assessment of site context

The native vegetation cover and patch size have not been calculated for this project, as the project does not require clearance of native vegetation. These landscape attributes are used to assess and score the landscape context for native vegetation clearance but are not relevant for the CGO project assessed in this BDAR.






Source: EMM (2020); Evolution (2020); DFSI (2017); DPI (2015)

0 1 2 km
GDA 1994 MGA Zone 55
N

KEY

- Proposed underground development
- DA14/98 approved surface disturbance
- Extent of Lake Cowal
- Waterbody
- Rail line
- Main road

Strahler stream order

- 1st order
- 2nd order
- 3rd order

Drainage lines in the proximity to the Cowal project area

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Figure 3.1

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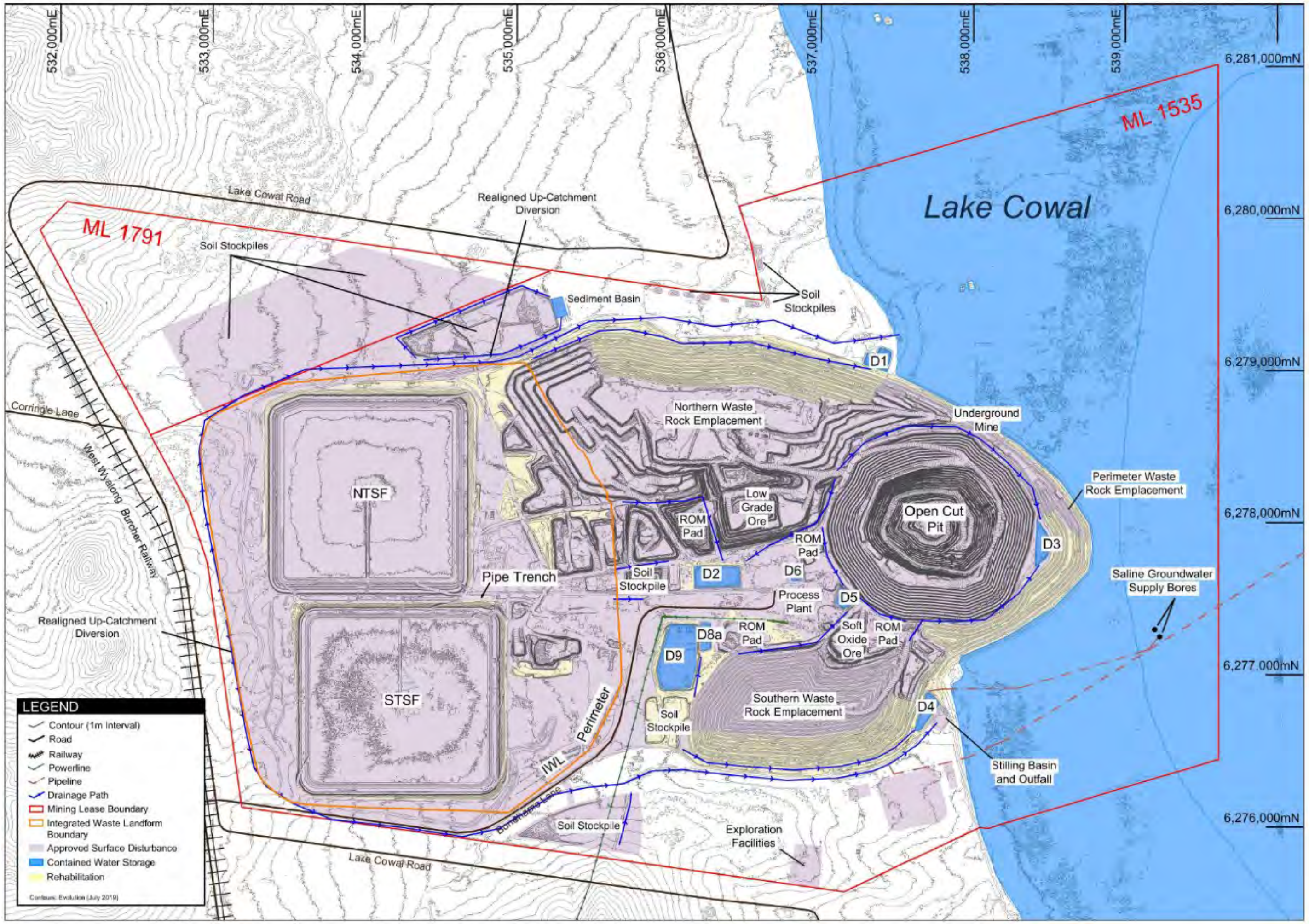


## Figure 3.2 Current CGO general arrangement (figure from HEC 2020)

# 4 Native vegetation

## 4.1 Methods

This project does not have any direct surface impacts, with all surface works within the area approved for impacts under the DA14/98 footprint for the operational mine. As a result, no new ecological field work was undertaken during the environmental assessment process for the CGO Underground Project.

To identify native vegetation plant community types (PCTs) present within the potential indirect impact area (Lake Cowal), regional vegetation mapping for the State Vegetation Map - Central West Lachlan: Central West / Lachlan Region Version 1.4. VIS_ID 4468 was utilised to determine the plant community types.

## 4.2 Results

Lake Cowal is a large ephemeral wetland system, and is immediately adjacent to, and above, the proposed Underground Development. In the lake bed, existing vegetation is mostly drought tolerant, exotic grass species of varying levels of abundance (Photograph 4.1), much of which is used for grazing or other agricultural purposes. The abundance of vegetation species is controlled to an extent by the hydrological processes (periodic inundation and drying) associated with the lake. Whilst the majority (83%) of Lake Cowal is identified as being non-native vegetation, a total of six PCTs are identified as occurring within Lake Cowal from the Central West Lachlan vegetation map (Table 4.1; Figure 4.1).

**Photograph 4.1 The bed of Lake Cowal above the proposed underground mine – June 2019**

**Table 4.1 PCTs, including vegetation formation and vegetation class identified within the study area including direct and indirect impact areas**

| PCT | Vegetation formation | Vegetation class | TEC Associations* | Area (ha) |
|---|---|---|---|---|
| 0 – Non-native/ exotic dominated vegetation (including Exotic planted, Grassland exotic, and Unvegetated) | - | - | | 8017.71 |
| 24 - Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains | Freshwater Wetlands | Inland Floodplain Shrublands | - | 41.58 |
| 45 - Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion | Grasslands | Riverine Plain Grasslands | - | 0.19 |
| 53 - Shallow freshwater wetland sedgeland in depressions on floodplains on inland alluivial plains and floodplains | Freshwater Wetlands | Inland Floodplain Swamps | - | 817.88 |
| 249 - River Red Gum swampy woodland wetland on cowals (lakes) and associated flood channels in central NSW | Forested Wetlands | Inland Riverine Forests | - | 743.14 |
| 250 - Derived tussock grassland of the central western plains and lower slopes of NSW | Grasslands | Western Slopes Grasslands | White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions | 3.86 |
| 251 - Mixed Eucalypt woodlands of floodplains in the southern-eastern Cobar Peneplain Bioregion | Grassy Woodlands | Floodplain Transition Woodlands | - | 0.01 |
| **Total** | | | | 9624.37 |

* Threatened ecological community (TEC) associations is based on associations within the BAMC.

### 4.2.1 Threatened Ecological Communities

One PCT, 250 - Derived tussock grassland of the central western plains and lower slopes of NSW, is identified in the Biodiversity Assessment Method Calculator (BAMC) as being potentially associated with a Critically Endangered Ecological Community (CEEC); White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions, and a total of 3.86 ha of this PCT is mapped as potentially occurring within Lake Cowal (Table 4.1).

PCT's 24, 45, 53 and, 249 are identified in the vegetation information system (VIS) as potentially being associated with Artesian Springs Ecological Community in the Great Artesian Basin CEEC but are not associated with this CEEC in the BAMC. This CEEC has also not been identified in recent vegetation mapping undertaken by AMBS (2018a).

AMBS (2018a) identified two EECs as being present within the project area, though not within Lake Cowal itself:

- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions, and
- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes Bioregions.


Source: EMM (2020); Evolution (2020); DFSI (2017); OEH (2016)

0 1 2 km
N
GDA 1994 MGA Zone 55

KEY

- Proposed underground development
- Mining lease (ML1535)
- Mining lease (ML1791)
- Extent of Lake Cowal
- DA14/98 approved surface disturbance
- Rail line
- Main road

State vegetation

- PCT9 - River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion
- PCT11 - River Red Gum - Lignum very tall open forest or woodland wetland on floodplains of semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
- PCT24 - Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains
- PCT26 - Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion
- PCT45 - Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion
- PCT53 - Shallow freshwater wetland sedgeland in depressions on floodplains on inland alluivial plains and floodplains
- PCT55 - Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions
- PCT56 - Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW
- PCT70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt
- PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
- PCT77 - Yarran shrubland of the NSW central to northern slopes and plains
- PCT80 - Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
- PCT82 - Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
- PCT110 - Western Grey Box - Cypress Pine shrubby woodland on stony footslopes in the NSW South Western Slopes Bioregion and Riverina Bioregion
- PCT176 - Green Mallee - White Cypress Pine very tall mallee woodland on gravel rises mainly in the Cobar Peneplain Bioregion
- PCT182 - Cumbungi rushland wetland of shallow semi-permanent water bodies and inland watercourses
- PCT185 - Dwyers Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion
- PCT186 - Dwyers Red Gum - Black Cypress Pine - Currawang shrubby low woodland on rocky hills mainly in the NSW South Western Slopes Bioregion
- PCT217 - Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion
- PCT248 - Mixed box eucalypt woodland on low sandy-loam rises on alluvial plains in central western NSW
- PCT249 - River Red Gum swampy woodland wetland on cowals (lakes) and associated flood channels in central NSW
- PCT250 - Derived tussock grassland of the central western plains and lower slopes of NSW
- PCT251 - Mixed Eucalypt woodlands of floodplains in the southern-eastern Cobar Peneplain Bioregion
- PCT257 - Dwyers Red Gum - Currawang grassy low woodland of the central western plains of NSW
- PCT796 - Derived grassland of the NSW South Western

Vegetation mapping

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Biodiversity development assessment report
Figure 4.1

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\\emmsvr1\EMM\Jobs\2019\J190140 - Cowal Operations Underground EIS\GIS\02_Maps_BDAR\BDAR001_PCTmapping_20200918_01.mxd 22/09/2020

# 5 Threatened species

## 5.1 Methods

### 5.1.1 Identification of candidate species

Candidate species for further assessment were identified in accordance with Step 1 to 2 (Section 6.4.1.2 to 6.4.1.16) of the BAM. For this assessment, there are no direct impacts, and therefore threatened species are not triggered by the BAMC, as there is no vegetation clearance.

The potential impact on Lake Cowal is an uncertain impact and as such adaptive management is proposed (Section 7.2.2). To assist in the identification of predicted candidate species credit species which could be affected should the project affect Lake Cowal, the native vegetation communities mapped as occurring within Lake Cowal were entered into the BAMC, and the results used to generate a list of predicted and candidate threatened species. In addition, literature was reviewed to identify a list of threatened aquatic species which may potentially exist in Lake Cowal from time to time.

Both ecosystem species and species credit species are identified. Ecosystem credit species and are those threatened species which are considered under the BAM to have habitat that can be reliably predicted to occur with a PCT. Species credit species are those threatened species, which under the BAM, are considered to require assessment of habitat (or components of habitat) for those particular species.

It is noted that the periodic flooding and drying events of Lake Cowal mean that various threatened species will only be present during distinct phases in the hydrological cycle. For example, wetland birds will be present when Lake Cowal is inundated and move on when the lake dries.

## 5.2 Results

### 5.2.1 Predicted species assessment

Ecosystem credit species predicted by the BAMC are provided in Table 5.1.

**Table 5.1 Predicted species assessment for vegetation communities within Lake Cowal**

| Common name | Scientific name |
|---|---|
| Australasian Bittern | *Botaurus poiciloptilus* |
| Australian Painted Snipe | *Rostratula australis* |
| Barking Owl | *Ninox connivens* |
| Black-breasted Buzzard | *Hamirostra melanosternon* |
| Black-chinned Honeyeater (eastern subspecies) | *Melithreptus gularis gularis* |
| Black-tailed Godwit | *Limosa limosa* |
| Blue-billed Duck | *Oxyura australis* |
| Brolga | *Grus rubicunda* |
| Brown Treecreeper (eastern subspecies) | *Climacteris picumnus victoriae* |
| Corben's Long-eared Bat | *Nyctophilus corbeni* |
| Curlew Sandpiper | *Calidris ferruginea* |

## Table 5.1 Predicted species assessment for vegetation communities within Lake Cowal

| Common name | Scientific name |
|---|---|
| Diamond Firetail | *Stagonopleura guttata* |
| Dusky Woodswallow | *Artamus cyanopterus* |
| Flame Robin | *Petroica phoenicea* |
| Freckled Duck | *Stictonetta naevosa* |
| Glossy Black-Cockatoo | *Calyptorhynchus lathami* |
| Grey Falcon | *Falco hypoleucos* |
| Grey-crowned Babbler (eastern subspecies) | *Pomatostomus temporalis* |
| Hooded Robin (south-eastern form) | *Melanodryas cucullata* |
| Koala | *Phascolarctos cinereus* |
| Little Eagle | *Hieraaetus morphnoides* |
| Little Pied Bat | *Chalinolobus picatus* |
| Magpie Goose | *Anseranas semipalmata* |
| Major Mitchell's Cockatoo | *Lophochroa leadbeateri* |
| Masked Owl | *Tyto novaehollandiae* |
| Painted Honeyeater | *Grantiella picta* |
| Pied Honeyeater | *Certhionyx variegatus* |
| Purple-crowned Lorikeet | *Glossopsitta porphyrocephala* |
| Scarlet Robin | *Petroica boodang* |
| Speckled Warbler | *Chthonicola sagittata* |
| Spotted Harrier | *Circus assimilis* |
| Spotted-tailed Quoll | *Dasyurus maculatus* |
| Square-tailed Kite | *Lophoictinia isura* |
| Stripe-faced Dunnart | *Sminthopsis macroura* |
| Superb Parrot | *Polytelis swainsonii* |
| Swift Parrot | *Lathamus discolor* |
| Turquoise Parrot | *Neophema pulchella* |
| Varied Sittella | *Daphoenositta chrysoptera* |
| White-bellied Sea-Eagle | *Haliaeetus leucogaster* |
| White-fronted Chat | *Epthianura albifrons* |
| Yellow-bellied Sheathtail-bat | *Saccolaimus flaviventris* |

### 5.2.2 Candidate species

Candidate species predicted by the BAMC are shown in Table 5.2.

**Table 5.2 Candidate species credit species for vegetation communities within Lake Cowal**

| Common Name | Species Name | EPBC Act | BC Act |
|---|---|---|---|
| **Flora** | | | |
| Floating Swamp Wallaby-grass | *Amphibromus fluitans* | Vulnerable | Vulnerable |
| A spear-grass | *Austrostipa metatoris* | Vulnerable | Vulnerable |
| A spear-grass | *Austrostipa wakoolica* | Endangered | Endangered |
| Claypan Daisy | *Brachyscome muelleroides* | Vulnerable | Vulnerable |
| Mossgiel Daisy | *Brachyscome papillosa* | Vulnerable | Vulnerable |
| Small Scurf-pea | *Cullen parvum* | - | Endangered |
| Spike-Rush | *Eleocharis obicis* | Vulnerable | Vulnerable |
| Spiny Peppercress | *Lepidium aschersonii* | Vulnerable | Vulnerable |
| Winged Peppercress | *Lepidium monoplocoides* | Endangered | Endangered |
| Lanky Buttons | *Leptorhynchos orientalis* | - | Endangered |
| Austral Pillwort | *Pilularia novae-hollandiae* | - | Endangered |
| Slender Darling Pea | *Swainsona murrayana* | Vulnerable | Vulnerable |
| Silky Swainson-pea | *Swainsona sericea* | - | Vulnerable |
| **Fauna - Amphibians** | | | |
| Sloane's Froglet | *Crinia sloanei* | - | Vulnerable |
| Southern Bell Frog | *Litoria raniformis* | Vulnerable | Endangered |
| **Fauna – Aves (Birds)** | | | |
| Bush Stone-curlew | *Burhinus grallarius* | - | Endangered |
| Curlew Sandpiper | *Calidris ferruginea* | Critically Endangered | Endangered |
| Glossy Black-Cockatoo | *Calyptorhynchus lathami* | Critically Endangered | Endangered, and Riverina endangered population |
| White-bellied Sea-Eagle | *Haliaeetus leucogaster* | - | Vulnerable |
| Black-breasted Buzzard | *Hamirostra melanosternon* | - | Vulnerable |
| Little Eagle | *Hieraaetus morphnoides* | - | Vulnerable |
| Swift Parrot | *Lathamus discolor* | Critically Endangered | Endangered |
| Black-tailed Godwit | *Limosa limosa* | - | Vulnerable |
| Major Mitchell's Cockatoo | *Lophochroa leadbeateri* | - | Vulnerable |
| Square-tailed Kite | *Lophoictinia isura* | - | Vulnerable |
| Barking Owl | *Ninox connivens* | - | Vulnerable |
| Osprey* | *Pandion haliaetus* | - | Vulnerable |
| Superb Parrot | *Polytelis swainsonii* | Vulnerable | Vulnerable |
| Masked Owl | *Tyto novaehollandiae* | - | Vulnerable |

**Table 5.2 Candidate species credit species for vegetation communities within Lake Cowal**

| Common Name | Species Name | EPBC Act | BC Act |
|---|---|---|---|
| Squirrel Glider | *Petaurus norfolcensis* | - | Vulnerable |
| **Fauna – Mammals** | | | |
| Koala | *Phascolarctos cinereus* | Vulnerable | Vulnerable |
| Southern Myotis | *Myotis macropus* | - | Vulnerable |
| **Fauna – Reptiles** | | | |
| Pink-tailed Legless Lizard | *Aprasia parapulchella* | Vulnerable | Vulnerable |

* Not predicted by the BAMC and added to the list as recorded in AMBS (2018a).

### 5.2.3 Aquatic species

When it is holding water, Lake Cowal provides habitat to a range of threatened aquatic species, with those species recorded (AMBS 2018a) that may utilise the Lake Cowal wetlands when present summarised in Table 5.3.

**Table 5.3 Potential threatened aquatic species for Lake Cowal**

| Common Name | Species Name | EPBC Act | FM Act |
|---|---|---|---|
| Olive Perchlet (western population) | *Ambassis agassizii* | - | Endangered population |
| Southern Purple Spotted Gudgeon | *Mogurnda adspersa* | - | Endangered |
| Flathead Galaxias | *Galaxias rostratus* | Critically Endangered | Critically Endangered |
| Murray Cod | *Maccullochella peelii* | Vulnerable | - |
| Macquarie Perch | *Macquaria australasica* | Endangered | Endangered |
| Southern Pygmy Perch | *Nannoperca australis* | - | Endangered |
| Eel-tailed Catfish (Murray-Darling Basin population) | *Tandanus tandanus* | - | Endangered population |
| Silver Perch | *Bidyanus bidyanus* | Critically Endangered | Vulnerable |
| Hanley's River Snail | *Notopala hanleyi* | - | Critically Endangered |

# 6 Groundwater dependent ecosystems

Coffey (2020) set out the following relating to groundwater dependant ecosystems (GDEs):

Schedule 4 of the Upper Lachlan Alluvial Groundwater Source Water Sharing Plans nominates two high priority GDEs (Bogolong Springs and Old Man Springs). These GDEs are located more than 60 km to the east of the CGO, on the other side of the Bland Creek Palaeochannel. These GDEs are distant from the CGO and would not be affected by mining operations.

Schedule 3 of the NSW Murray-Darling Basin Fractured Rock Groundwater Sources Water Sharing Plan indicated that the closest high priority GDE to the CGO site is Cartwrights Spring, located more than 5 km east-south-east of the site. Coffey (2020) does not expect this GDE will be affected by the CGO.

A check was carried out on 15 January 2020 on the Bureau of Meteorology's Atlas of Groundwater Dependent Ecosystems. The key findings are as follows:

- High potential aquatic GDE at Lake Cowal immediately east of the CGO. This will not be affected as groundwater modelling and observations to date indicate that seepage from Lake Cowal arising from mining operations during periods of inundation is negligible.

- High potential terrestrial GDE approximately 4.5 km north of the CGO comprising Grey Box-White Cypress-pine woodland. Following a review, Coffey (2020) considers that this vegetation is unlikely to be groundwater dependant, based on knowledge of local groundwater conditions. This area is unlikely to be affected by the mining operation.

- Moderate potential terrestrial GDE surrounding the CGO comprises wetland sedgeland, Mixed Box Eucalypt woodland, and River Red Gum within or at the fringe of Lake Cowal during periods of inundation and is also subject to periods where lake waters are absent between flood events. The movement water in the lake will not be affected by mining operations as the seepage from the lake to the open pit, stopes and access tunnels is assessed as being negligible. Further, these communities are considered more likely to be influenced by soil moisture increases during full lake conditions than by the regional or local groundwater resources. As a result, they are considered unlikely to be affected by the mining operations.

- Low potential terrestrial GDE surrounding the CGO comprising tussock grasslands. These areas may be affected by changes in soil moisture depending on the root depths. However, the CGO's impacts on the deeper underlying hard rock aquifers are considered to be unlikely to affect any tussock grasslands.

During the life of the CGO, dewatering from the open pit, stopes and access tunnels will only have a small and localised (i.e. within ML1535) impact on groundwater levels. Over the longer term, groundwater will flow towards the open pit, ultimately terminating there and evaporating. The groundwater quality in the region surrounding the open pit void is not expected to change significantly due to this process, though the quality of the water within the open pit is expected to change (e.g. salinity will increase due to evaporation). The beneficial use of groundwater is not expected to change due to dewatering or the presence of the open pit.

As the equilibrium surface water level in the open pit (the pit lake) following the end of mining will be well below the ground surface, water from the pit lake will not be released. Thus, it is not classified as a highly connected surface water source and will not interact with Lake Cowal when it is empty or inundated.

# 7 Impact assessment

This chapter identifies the potential impacts of the project on the biodiversity values. Measures taken to date to avoid and minimise impacts are summarised and recommendations to assist in the design a development that further avoids, minimises and mitigates impacts are provided.

## 7.1 Potential direct, indirect and prescribed impacts

### 7.1.1 Direct Impacts

This project is an underground mine and does not have any new direct surface impacts, other than from associated infrastructure on previous disturbed areas and already approved impact footprint within the operational mine.

### 7.1.2 Potential Indirect Impacts

Four technical aspects relating to the operation of the underground mine have been identified that, if they occurred, have the potential cause indirect impacts to the biodiversity values of Lake Cowal. They are:

- subsidence;
- groundwater;
- groundwater quality; and
- surface water.

A broad discussion around potential impacts is given below to assist in focusing the discussion on potential indirect impacts. This information comes from the technical assessments undertaken for the CGO Underground Development EIS process which are contained Beck Engineering (2020), Coffey (2020) and HEC (2020); all of which are Appendices of the EIS, respectively Appendix E, Appendix F, and Appendix G.

#### i Subsidence

#### a Subsidence / upsidence

A subsidence impact assessment has been carried out by Beck Engineering (2020) for the proposed underground development.

This assessment includes a detailed geological assessment and comprehensive mapping of faults. The assessment concluded that the forecast vertical movement above the underground development to end of mine life is negligible and generally less than 15 millimetres. This movement is upwards (upsidence) due to displacement along the Glenfiddich fault. Surface displacements are within the same order of magnitude as the effects of water (shrink/swell) and erosion. It should be noted that the effects of groundwater drawdown on surface subsidence have not been included in the numerical simulation to assess surface subsidence as hydrogeological assessment shows that the underground mining sequence is effectively drained due to current open pit dewatering (ie. the open cut pit water drawdown is greater than any groundwater flow into the proposed underground stopes).

The Glenfiddich fault occurs in the hard saprolite layers in the project area which are well below the transported zone layers. Therefore, any effect on the Glenfiddich fault would not propagate to the surface layers or lakebed.

### b Chimneying

The rock mass in proximity to the underground mine is generally strong with weak fault conditions. The Glenfiddich and Galway splay faults are located in proximity to underground stopes. The numerical modelling undertaken for the subsidence analysis did not identify significant rock mass damage or instability in the upper level stopes. However, as noted in the report, the resolution of the model is limited to the resolution of the input data, which does not include stope-scale geotechnical data. This is perfectly normal at this stage of a project as stope scale information is generally not available until underground development in the area is completed. The recommendations and list of potential controls in the report are provided so that Evolution can implement the required controls based on the conditions encountered. All the other controls rely on additional geotechnical data that will only be available in the future and adopting an observational approach for design, controls and risk management.

Stope failure to surface (chimneying) along major faults is a hazard for all underground stoping mines. Stope failure (or crown pillar failure) to surface is not common, but it does very occasionally happen. However, the risk of chimneying associated with the proposal would be strictly controlled by Evolution Mining adopting the following controls:

- paste filling stopes immediately following extraction;
- stopes will be 100% tight filled with cemented paste fill; and
- all stopes will have crown development (overhead drives) that will be fully supported and accessible for the life of mine to ensure no failure ensues from ongoing operations.
- the stopes have been numerically modelled by Evolution and have been comprehensively assessed by Beck Engineering (20202), and the sequence of extraction and stope size has been selected for stable excavation (for the duration it is open – before being filled) to further mitigate risks of chimneying.
- nineteen stopes that were initially proposed in the weaker saprolite layers (with a higher risk of chimneying) have been removed from the mine plan.

With the implementation of these control measures, the risk of chimneying to the surface is considered highly unlikely.

### ii Groundwater

The CGO site lies within the Lake Cowal Volcanics, which comprise massive and stratified non-welded pyroclastic debris, overlying a partly brecciated lava sequence, overlying volcanic conglomerate interbedded with siltstone and mudstone.

Within the Lake Cowal Volcanic Complex are diorite and gabbro intrusions, one of which is intersected by the CGO open pit. Within the ore body, there are several north-south oriented, near-vertically dipping faults and fractured dykes.

Overlying the Ordovician host rock (Saprock and Primary) is a Tertiary age laterite (Saprolite), which averages about 20 metres and varies in thickness across the CGO site from 15 metres to 55 metres. Quarternary age sediments of predominantly lacustrine clay (Transport Alluvium) characteristically cover the Tertiary laterite. The depth of sediments across the CGO site and surrounds ranges from 10 to 55 metres (10.6 to 20.5 metres thick in the area of the underground mine).

Regionally, groundwater resources are present in the Bland Creek Palaeochannel, and include the following two geological formations:

- Cowra Formation – comprises isolated sand and gravel lenses in predominantly silt and clay alluvial deposits. Groundwater from the Cowra formation is generally higher in salinity; and

- Lachlan Formation – comprises quartz gravel with groundwater of generally lower salinity.

Locally, four hydrogeological units have been identified at the CGO site:

- Transported – comprising alluvium (less permeable thick clay sequences and more permeable zones of gravel within a sandy clay matrix) of the Quarternary-aged Cowra Formation;

- Saprolite – underlies the Transported unit, and is of relatively low hydraulic conductivity;

- Saprock – underlies the Saprolite unit and occurs in the weathered fractured surface of the Lake Cowal Volcanics; and

- Bedrock/Primary Rock – underlies the Saprock unit and is more massive and less permeable.

Since commencement of the CGO, the underlying aquifers surrounding and intercepting the open pit have been depressurised as a result of inflows to the open pit and active pit dewatering.

Despite Lake Cowal becoming inundated in 2010 and 2016, groundwater inflows to the open pit have remained at or below historical records and are relatively stable. This is most likely because the lacustrine sediments that form the lakebed have a very low vertical permeability and act as an aquitard (a low permeability layer) between lake water and underlying aquifers.

It is estimated that groundwater inflow to the open-cut pit is around 1ML/day. About 90% of this inflow is from the Saprolite/Saprock groundwater units and 10% from the Transported unit. No material increase in groundwater inflow to the open pit was observed to have occurred during or following the 2010 and 2016 lake filling events. This is strong evidence that Lake Cowal is a surface fed system which is hydrogeologically isolated from the underlying aquifers.

Coffey 2020 (who have been investigating hydrogeology at the site of the mine since 1995) developed a model to predict the long term (steady state, post mine closure) vertical leakage from Lake Cowal considering the lake was inundated in the presence of the open cut void. The model predicted vertical leakage over the lake area was $3.0 \times 10^{-6}$ cubic metres per day per square metre. This is in the order of 0.1% of the losses in water level apparent due to evaporation of between 3 and 4 millimetres per day. The lake-bed sediments act as an impeding layer to vertical leakage from the lake.

A system of dewatering bores historically operated to control groundwater levels around the pit, commencing January 2005. As inflows reduced, these were progressively decommissioned such that by the end of 2017, no vertical dewatering bores were in use.

The proposed Underground Development is to the north of the existing open pit and below Lake Cowal. The Underground sits at around 130 m metres below the surface at its uppermost point. The cover units above the underground mine consist of transported sediments (generally 20-50 metres thick), soft oxide material (Saprolite/Saprock) generally 20-60 metres thick) and then fresh rock.

Due to the depth of the proposed underground mine and the thickness of cover rock, it is not anticipated that there would be any hydraulic connectivity between the top of the underground mine and Lake Cowal when it is inundated. Accordingly, there are no anticipated indirect impacts to Lake Cowal and the associated wetlands due to ‘leakage’ into groundwater.

This assertion is supported by the low rate of groundwater inflows (ie 2 litres/second) that were experienced during the development of the exploration decline. These assumptions are supported by the groundwater impact assessment that has been prepared by Coffey (2020) and which will accompany the EIS for the Underground Development.

Coffey (2020) concluded that '*Groundwater impacts to Lake Cowal are predicted to be negligible*'.

### iii Groundwater quality

An assessment of groundwater contaminant migration (cyanide), based on a conservative assessment of contaminant transport parameters, was undertaken as part of Coffey (2020). Cyanide is introduced to ore during processing at a maximum concentration of 20 mg/L and is the only significant chemical in the tailings that is not derived from the host rock. This process has been on-going since the start of operations and ore processing rates will not exceed the existing upper limit of 9.8 Mtpa.

Cyanide is subject to gradual decay typically characterised by a half-life (the time for concentration to fall to half its initial value). The rate of decay is uncertain in the conditions beneath the IWL, with half-lives of the order of 300 days quoted for anerobic conditions and much shorter half-lives quoted for aerobic conditions which would apply at the surface of the water in the mine void. For a half-life of 300 days, an initial concentration of 20 mg/L would reduce to below 0.001 mg/L after 12 years.

The modelling assessment predicted that after 100 years the potential for groundwater quality changes due to migration from the IWL stored water will extend a distance of up to approximately 1.7 km from the Integrated Waste Landform (IWL) walls. However, the modelling does not take account of decay in cyanide concentration with time, discussed above. Taking account of decomposition leads to the conclusion that cyanide concentrations are anticipated to fall well below detection levels after 12 years and measurable concentrations of cyanide are not anticipated to migrate beyond 1 km from the perimeter of the IWL. Therefore, cyanide concentrations are predicted to fall well below detectable limits prior to migrating outside the CGO mine area.

Although the IWL is not yet constructed, it is approved, and construction has commenced. The IWL will enclose the two existing (northern and southern) tailings dams. The related proposal (via the Modification 16 application) is to raise the height of the IWL by one metre. Given this, no impacts on Lake Cowal or its biodiversity are predicted. CGO will continue its groundwater and cyanide monitoring regime to ensure this continues.

### iv Surface Water

CGO is located on the western shore of Lake Cowal and partially intrudes across the western shoreline.

Lake Cowal is an ephemeral, freshwater lake that forms part of the Wilbertroy-Cowal Wetlands that are located on the Jemalong Plain. Lake Cowal is in the lower reaches of the Bland Creek catchment. It also receives periodic inflows from the Lachlan River during periods of high flow when flood waters enter Lake Cowal from two main breakout channels from the northeast.

Under the development consent for the existing open-cut mine, surface water on the mine site is permanently isolated from Lake Cowal (and vice versa) through a combination of the bunds (the Lake Protection Bund (LPB) and Temporary Isolation Bund (TIB)) with the Up-Catchment Diversion System (UCDS).

The UCDS directs runoff from areas unaffected by mining around the perimeter of the site. The Internal Catchment Drainage System (ICDS) captures all site runoff and seepage within the mining area for re-use in the processing plant within the mined area and elsewhere on-site.

In the longer term, the ICDS would direct site runoff to the final void which would become a permanent sink for groundwater and surface runoff. This sophisticated and established system ensures that the mine and the lake remain hydraulically separated.

Mining commenced at CGO in 2005. In the last 15 years, the lake has remained dry for significant periods. Lake Cowal remained dry from 2005 until the middle of 2010, after which rainfall led to the lake beginning to fill. By late 2014, the lake was again dry due to evaporation. During winter 2016, a series of rainfall events led to the peak water level of the lake reaching 207.49 metres AHD in October 2016. The lake water dropped rapidly from this peak and the lakebed has been dry since early 2019 until August 2020 when the lake received a minor amount of localised inflows.

During these processes, the open-cut mine was developed and began operating. Throughout mining in the open-cut pit, there has been no hydraulic connection created between the lake and the mine. Therefore, the current CGO open-cut pit is protected from inflow from Lake Cowal by the bunds. Since the commencement of mining operations, the bunds, combined with the UCDS and ICDS, have proven effective in preventing impacts from the mine affecting the surrounding surface water catchment.

The Underground Development does not propose any changes to the UCDS or ICDS. The underground mining would entail developing a series of stopes at depths from 130 m to as deep as 850 m. The mining would occur in the hard oxide rock layers and not in the near surface sediments which form the lake floor. Accordingly, there would be no movement of surface water from Lake Cowal (or other surface water sources) to the mine.

Given the above, it is unlikely that there will be surface water impacts arising from the proposed underground mine affecting the biodiversity values of Lake Cowal.

#### v Summary of potential indirect impacts

The following summarises the potential indirect impacts of the proposed underground mine, identifies levels of certainty and suggests areas for further discussion:

- Regarding the likelihood of subsidence, Beck Engineering (2020) undertook a detailed geological assessment and comprehensive mapping of faults. The assessment concluded that the forecast vertical movement above the underground development to end of mine life is negligible and generally less than 15 millimetres. This movement is upwards (upsidence) due to displacement along the Glenfiddich fault. Surface displacements are within the same order of magnitude as the effects of water (shrink/swell) and erosion. Monitoring on surface is considered unnecessary by Beck Engineering (2020) due to the impact of water, seasonal lake levels, and sediment placement. The measured data would be erroneous and not assist with an understanding of stability. Also, as no subsidence is forecast, it would not assist in understanding the potential for localised failures. Monitoring stope stability underground is what is critical. The only way the surface could be impacted is if there is a large-scale stope failure of the uppermost stopes and the mine is not aware or does not respond quickly enough and continues to mine. There are details in Beck Engineering (2020) report regarding the need to monitor stope stability and how to responds in the unlikely event of stope instability.

- Beck Engineering (2020) discusses the issue of stope failure to surface (chimneying) along major faults, which is a hazard for all underground stoping mines. There initial model identified 19 stopes which were considered a risk to chimneying. Evolution subsequently eliminated these higher risk stopes from the mine design. The numerical modelling undertaken for the subsidence analysis did not identify significant rockmass damage or instability in the upper level stopes which could lead to chimneying. However, as noted in their technical report, the resolution of the model is limited to the resolution of the input data from the current conceptual design, which does not include stope-scale geotechnical data. This is perfectly normal at this stage of a project as stope-scale information is generally not available until underground development in the area is completed. The recommendations and list of potential controls in the Beck Engineering (2020) report are provided so that Evolution can implement the required controls based on the conditions encountered when mining begins. All the other controls rely on additional geotechnical data that will only be available in the future and adopting an observational approach for design, controls and risk management. At this stage, there is enough certainty that the design has eliminated foreseeable risks of chimneying.

The planned controls which rely on further data as the mine develops are a normal part of the mine process. Details of the recommended controls are given in Beck Engineering's full technical study report and summarised below in Section 7.2.3 of this report.

- The hydrogeological assessment has shown that Lake Cowal is isolated from underlying aquifers. The deep (10.6 to 20.5 metres thick in the area of the underground mine), very low permeability lake-bed sediments act as an impeding layer (aquitard) to vertical leakage from the lake. This is known because the open cut pit, which lies on the edge of the lake separated by two bunds, has received a minor, stable and consist flow of groundwater from August 2005 through to the current day, despite Lake Cowal becoming inundated in 2010 and 2016. Connectivity between the lake and underlying aquifers would have seen steep rises in groundwater inflows during these inundation events. Studies and monitoring have also shown that the groundwater in areas around the open cut pit have generally been dewatered. Recent monitoring results from the exploration decline beneath Lake Cowal show that groundwater pressures within 10 m from the exploration decline are generally dry or in an unsaturated condition. Coffey (2020) who has been studying the hydrogeological conditions around CGO since 1995, concluded that '*Groundwater impacts to Lake Cowal are predicted to be negligible*'. Given the operational knowledge and data from CGO regarding groundwater, and data from the exploration decline there is a high degree of certainty over these conclusions. Future work should focus on continuing with existing groundwater monitoring and expanding this to include recently installed bores for the underground mine, to continue to validate the predictions.

- CGO uses cyanide to recover gold during ore processing. This is a normal and well understood process in the industry. The Integrated Waste Landform (IWL) is already approved and construction has commenced. The modelling assessment predicted that after 100 years, the potential for groundwater quality changes due to migration from the IWL stored water will extend a distance of up to approximately 1.7 km from the IWL walls. However, the modelling does not take account of decomposition of the cyanide concentration with time, discussed above. Taking account of decomposition leads to the conclusion that cyanide concentrations are anticipated to fall well below detection levels after 12 years and measurable concentrations of cyanide are not anticipated to migrate beyond 1 km from the perimeter of the IWL. Therefore, cyanide concentrations are predicted to fall well below detectable limits prior to migrating outside the CGO mine area. There is a high degree of certainty that water quality issues will not impact Lake Cowal or its biodiversity. CGO will continue its groundwater and cyanide monitoring regime to ensure this continues.

- There are no significant changes required to the surface water management systems currently operational at CGO. There will be no surface water (hydrological or surface water chemistry) related impacts on Lake Cowal. There is a very high degree of certainty given to this conclusion as the systems are currently operational.

### 7.1.3 Prescribed Impacts

Part 8.2.1.2 of the BC Regulation (clause 6.1) identifies actions that are prescribed as impacts to be assessed under the biodiversity offsets scheme.

## Table 7.1 Prescribed biodiversity impacts not related to the project

| Label from 8.2.1.2 of BAM | Prescribed impact | Justification |
|---|---|---|
| (a) (i) | **Impacts of development on the habitat of threatened species or ecological communities associated with karst caves, crevices, cliffs and other features of geological significance, rocks, human made structure, or non-native vegetation** | No known karst caves, crevices, cliffs and other features of geological significance, rocks, or human made structure being utilised by threatened species are known to be present. Non-native vegetation is present within Lake Cowal. No direct impacts to Lake Cowal are proposed, and potential indirect impacts associated with water are discussed under the response to item d below. |
| (a) (ii) | **Habitat of threatened species or ecological communities associated with rocks** | No human made structures (buildings) have been identified as been impacted on as part of the project. |
| (a) (iii) | **Habitat of threatened species or ecological communities associated with human made structures** | No human made structures (buildings) have been identified as been impacted on as part of the project. |
| (a) (iv) | **Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation** | Potential impacts on the habitat of threatened species or ecological communities associated with non-native vegetation are associated with the potential for indirect impacts on water quality, and thus are discussed under the response to item d below. |
| (b) | **impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range** | No species have been identified as part of the project. |
| (c) | **impacts of development on movement of threatened species that maintains their life cycle** | Not relevant as the proposal is for a modification to a below ground mine |
| (d) | **impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining)** | This prescribed impact is relevant to the project and is discussed in subsections (i) to (xiii) below. |
| (e) | **Impacts of wind turbine strikes on protected animals** | Not relevant to the project. |
| (f) | **impacts of vehicle strikes on threatened species or on animals that are part of a TEC** | The proposal is for a modification to continue underground mining; no new roads are proposed and thus this factor is not relevant to the project. |

Further details relating to this are found in the BAM (2017) which says in part 9.2.1.7 regarding clause (d) above:

> The assessment of the impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including subsidence or upsidence resulting from underground mining or other development) must:
>
> (a) identify water bodies with potential to be habitat for threatened species or threatened ecological communities that are likely to be impacted by the proposal
>
> (b) identify the threatened species and threatened ecological communities likely to use the habitat
>
> (c) identify hydrological processes that sustain threatened species or threatened ecological communities and the species and communities that are dependent on them

(d) describe, with reference to relevant literature and other reliable published sources of information, the importance within the bioregion of the water body or hydrological process to these species or ecological communities

(e) describe the nature, extent and duration of known short and long-term impacts on water bodies and hydrological processes

(f) describe the nature, extent and duration of short and long-term impacts on water quality

(g) predict the consequences of the impacts for the bioregional persistence of the suite of threatened species and communities likely to use these areas as habitat, with reference to relevant literature and other published sources of information

These considerations are discussed sequentially in subsections (i) to (xiii) below:

### i Information relevant to prescribed impacts on hydrological processes that sustain and interact with the rivers, streams and wetlands, including a) volumes and seasonal patterns; b) flow paths and seasonal patterns; and c) baseline water quality data.

A number of surface water studies have been carried out as part of environmental impact assessments for the CGO since the 1990s. These studies are available online at the DPIE Major Projects' website.

Lake Cowal is a large oval shaped lake which when inundated occupies an area of some 105 square kilometres, holds around 150 gigalitres of water, and has a depth of about 4 metres.

It overflows to Nerang Cowal, which is a smaller lake to its north. When flows are sufficient, the lakes ultimately overflow and drain into the Lachlan River via Bogandillon Creek. The Lachlan River is the major regional surface drainage, forming part of the Murray-Darling Basin. Flows in the Lachlan River near Lake Cowal are regulated by releases from Wyangala Dam.

Water quality monitoring programs carried out on behalf of the mine during inundation events have characterised the lake water quality as having:

- a range of pH that was high relative to ANZECC baseline ranges;
- average copper, lead and zinc concentrations that were higher relative to ANZECC baseline ranges;
- average turbidity was significantly higher than ANZECC trigger values; and
- total phosphorous concentrations were significantly higher than ANZECC baseline levels.

These results were comparable to levels identified in locations elsewhere in the lake away from the mine. Because surface water and runoff within the CGO site is fully contained within the ICDS, there is no obvious causal link between mining operations and water quality in the lake.

A surface water impact assessment is being carried out as part of the preparation of the EIS for the Underground Development. As described above, the UCDS, as well as the LPB/TIB ensure that the lake is separated from the mine. The low permeability of the transported material zone layers and the competency of the lower saprolite layers provide a significant barrier to surface water flow between the CGO and the lake.

Therefore, no impacts to the hydrological processes that sustain and interact with rivers, streams and wetlands are expected as a result of the Underground Development Project.

ii (a) identify water bodies with potential to be habitat for threatened species or threatened ecological communities that are likely to be impacted by the proposal

Lake Cowal is a large ephemeral wetland system, and is immediately adjacent to, and above, the proposed Underground Development. This is the water body which could be affected should hydraulic connectivity occur. However, as there will be no changes to hydrological processes as detailed above and an aquitard layer below the lake is known to exist, no impacts to the Lake Cowal waterbody or water quality are expected from the Underground Development project.

iii (b) identify the threatened species and threatened ecological communities likely to use the habitat

Sections 4.2.1 and 5.2 of this report sets out the threatened species at a State or Federal level that could potentially be affected by this development. However, as negligible subsidence impacts are expected it is not considered that these protected species will be affected by the development.

Stope failure to surface (chimneying) along major faults is a hazard to consider for all underground stoping mines. This issue has driven the conceptual design of the underground mine. The potential risks associated with chimneying are known conceptually and are manageable by adopting an observational approach for design, controls and risk management as the project transitions from conceptual to detailed design, and detailed geotechnical information, at a micro level becomes available.

iv (c) identify hydrological processes that sustain threatened species or threatened ecological communities and the species and communities that are dependent on them

Lake Cowal is fed by ephemeral inland drainage lines, with a highly variable flooding/drying cycle. Lake Cowal is located in the alluvial fan of the Lachlan River known as the Jemalong Plains, part of the Riverina landform. It is the largest inland lake in NSW, covering approximately 13,000 ha. When full, the lake measures approximately 21 km north to south and 9.5 km east to west.

These periodic flooding and drying events represent the start or end points in the lives of many of the plant and animal species that inhabit or use Lake Cowal at various times. For example, fish and crustaceans die as the lake dries out, to re-emerge from eggs buried in the sediment or brought in by floodwaters. Grasses repopulate the drying lake bed from windblown seed, and bird species come or go depending on how they use the lake.

Lake Cowal is filled predominantly by Bland Creek from the south, however it is also fed by the Lachlan River during flooding. It is the flooding of this area in times of high rainfall that sustain most of the threatened species in and around Lake Cowal.

Another lake, Nerang Cowal, lies to the immediate north and fills less frequently from overflow from Lake Cowal. Historically, Lake Cowal contains at least some water around 50% of the time, however prolonged dry periods of up to 30 years have occurred since the early 20th century. In more recent years, Lake Cowal has experienced a prolonged dry period.

The lake was completely dry from 2001 to 2010, and again in December 2014. Lake Cowal partially filled in July to December 2015, until rainfall across the region in June, July and September 2016 saw its capacity reach and exceed 100% later in 2016. The lake was dry from early 2019 to August 2020 when the lake received a minor amount of localised inflows. Land on the eastern and western sides of Lake Cowal are drained by ephemeral drainage lines into the lake itself.

Threatened ecological communities and species are identified in are given in sections 4 and 5 of this report.

v (d) describe, with reference to relevant literature and other reliable published sources of information, the importance within the bioregion of the water body or hydrological process to these species or ecological communities

Lake Cowal is considered a nationally important wetland and the Lake Cowal region is well studied. It is described in the Directory of Important Wetlands in Australia as an "important wetland". It has a highly variable flooding/drying cycle.

A number of flora and fauna surveys have been undertaken in the surrounds of the area, including (but not limited to):

- Vestjens (1977);
- Young (1979);
- Anne Clements and Associates (1995);
- Gunninah Consultants Pty Ltd (1995);
- Pease and Grinberg (1995);
- Scribner and Kathuria (1996);
- Bower (1997; 1998a-b; 2003a-b);
- Charles Sturt University (1997);
- Mount King Ecological Surveys (1997); and
- Greg Richards and Associates Pty Ltd (1997a-b).

Waterbird monitoring undertaken from 1989 to present:

- Australian Museum Business Services (2013);
- Gell and Peake (2012, 2013, 2014a-e); and
- Gell (2015a-c, 2016a-c, 2017a-c, 2018a-c)

Studies undertaken to inform the Implementation of the Threatened Species Management Protocol (Barrick, 2003a):

- Barrick (2003a-c); and
- Country Energy (2004).

Studies undertaken for the Cowal Gold Mine E42 Modification Environmental Assessment (Barrick, 2008a):

- FloraSearch (2008); and
- Western Research Institute (2008).

Biodiversity monitoring undertaken from 2008:

- Donato Environmental Services (2006, 2007, 2008a-c, 2009, 2010a-b, 2011a-b, 2012a-b, 2013, 2015a-b, 2016a-b, 2017a-c, 2018);
- Barrick (2005a-c, 2006, 2007, 2008a-b, 2009, 2010, 2011, 2012);
- DnA Environmental (2008, 2010, 2011a-c, 2012a-c, 2013a-c, 2014a-c, 2015a-d, 2016a-b, 2017a-c, 2018a-c); and
- Gursansky (2013a-b, 2014a-b, 2015a-b, 2016a-b, 2017).

Studies undertaken for the Cowal Gold Mine Extension Modification Environmental Assessment (Barrick, 2013a):

- Australian Museum Business Services (2012); and
- Kerle (2013a-b).

Studies undertaken for the Cowal Gold Operations Processing Rate Increase:

- Modification Environmental Assessment (Evolution Mining, 2018 including AMBS Ecology and Heritage (2018a-b).

Additional field surveys undertaken within ML 1535 and immediate surrounds:

- Cenwest Environmental Services (2011); and
- frc environmental (2011, 2012, 2016, 2017).

vi (e) describe the nature, extent and duration of known short and long-term impacts on water bodies and hydrological processes

A previously highlighted in section 7.1.2 above:

- There are no new direct land-take impacts;
- There is minimal surface disturbance within the existing CGO;
- No noticeable subsidence is predicted;
- the new underground mine is not connected hydrogeologically with Lake Cowal and therefore there are no ecological impacts predicted related to hydrogeology; and
- there is no surface water connectivity between CGO and Lake Cowal, and the surface water system will not be changed as part of this project.
- Stope failure to surface (chimneying) along major faults is a potential hazard for all underground stoping mines and has been considered in the conceptual design of the underground mine. The potential risks associated with chimneying are known conceptually and are manageable by adopting an observational approach for design, controls and risk management as the project transitions from conceptual to detailed design, and detailed geotechnical information, at the level of individual stopes, becomes available.

Based on the predicted impacts and known risks, the development and operation of the proposed underground mine is not anticipated to have any short or long-term impacts on water bodies and hydrological processes.

## vii (f) describe the nature, extent and duration of short and long-term impacts on water quality

CGO's processing plant uses cyanide to recover gold. This is a normal and well understood process in the industry. The modelling assessment predicted that after 100 years the potential for groundwater quality changes due to migration from the Integrated Waste Landform (IWL) stored water will extend a distance of up to approximately 1.7 km from the IWL walls. However, the modelling does not take account of decomposition of the cyanide concentration with time, discussed above. Taking account of decomposition leads to the conclusion that cyanide concentrations are anticipated to fall well below detection levels after 12 years and measurable concentrations of cyanide are not anticipated to migrate beyond 1 km from the perimeter of the IWL. Therefore, cyanide concentrations are predicted to fall well below detectable limits prior to migrating outside the CGO mine area. There is a high degree of certainty that water quality issues will not impact Lake Cowal or its biodiversity. CGO will continue its groundwater and cyanide monitoring regime to ensure this continues.

The development and operation of the proposed underground mine is not anticipated to have any short or long-term impacts on water quality.

## viii (g) predict the consequences of the impacts for the bioregional persistence of the suite of threatened species and communities likely to use these areas as habitat, with reference to relevant literature and other published sources of information

The consequences of the development and operation of the proposed underground mine are not anticipated to have any perceptible impacts for the bioregional persistence of the suite of threatened species and communities likely to use these areas as habitat. As previously highlighted:

- There are no new direct land-take impacts;
- There is minimal surface disturbance within the existing CGO;
- There is not predicted to be any noticeable subsidence;
- The new underground mine is not connected hydrogeologically with Lake Cowal and therefore there are no ecological impacts related to hydrogeology; and
- The is no surface water connectivity between CGO and Lake Cowal and the surface water system will not be changed as part of this project.
- Stope failure to surface (chimneying) along major faults is a potential hazard for all underground stoping mines and has been considered in the conceptual design of the underground mine. The potential risks associated with chimneying are known conceptually and are manageable by adopting an observational approach for design, controls and risk management as the project transitions from conceptual to detailed design, and detailed geotechnical information, at the level of individual stopes, becomes available.

Based on the above information, there are no impacts of any significance predicted from the underground mine of the terrestrial or aquatic habitats within or surrounding Lake Cowal.

## ix (h) predict the nature, extent and duration of short and long-term impacts on the habitat and life cycle of species using the natural features of any water dependent plant community

There are no predicted impacts on the habitat and life cycle of species using the natural features of any water dependent plant community. See details in Section 6 and the above under point vii (g) for further details.

x (i) justify predictions of impact on any water dependent plant communities, with appropriate modelling and with reference to relevant literature and other published sources of information

The Beck Engineering (2020) subsidence assessment and the Coffey (2020) groundwater assessment are attached as appendixes to the EIS. GDE information is given in section 6 of this report, and in further detail is given within Coffey (2020) on pages 94-96.

These studies have modelled the potential impacts of the project at the surface and to groundwater resources. Both assessments conclude that there would be negligible impacts as a result of the project. As previously highlighted:

- There are no new direct land-take impacts;
- There is minimal surface disturbance within the existing CGO;
- There is not predicted to be any noticeable subsidence;
- The new underground mine is not connected hydrogeologically with Lake Cowal and therefore, there are no ecological impacts related to hydrogeology; and
- There is no surface water connectivity between CGO and Lake Cowal, and the surface water system will not be changed as part of this project.

Coffey (2020) is not predicting impacts from this development upon any known of potential GDEs in the region or local to CGO.

xi (j) predict the cumulative impacts of the project together with existing mining operations mining underneath the same water dependent plant communities

An inspection of State Vegetation Type Map – Central West Lachlan identified some areas within Lake Cowal mapped as plant community types potentially consistent with Artesian Springs Ecological Community in the Great Artesian Basin CEEC, however, this CEEC has not been identified in recent vegetation mapping undertaken by AMBS (2018a). Coffey (2020) also doubts the present of GDEs in close proximity to CGO. Irrespective of this, as the underground project is predicted to have negligible groundwater impacts on Lake Cowal (as highlighted above) and potential groundwater dependent plant communities (if present) within close proximity of the underground mine are not predicted to affected, it is not possible for there to be any cumulative impacts.

xii (k) based on predictions of impacts on water dependant plant communities and the species they support, calculate the maximum predicted offset liability in accordance with the Upland Swamp Policy

The underground project is predicted to have negligible groundwater impacts on Lake Cowal. There are no known groundwater dependent plant communities identified in the vicinity of CGO, and any potential GDEs would not be impacted by this project.

Lake Cowal is a large, isolated, ephemeral inland wetland, and when wet (which is a periodic event) is utilised by a range of wetland birds. The Upland Swamp Policy (OEH 2016) is a policy which seeks to identify indirect impacts on upland swamps. Under this policy upland swamps are identified as 'perched freshwater wetlands that occur in shallow basins of low hills or mountains. The topography is predominately a flat plain, and thus the area would not satisfy the definition of upland swamps under this policy. Furthermore, no ecological offsets are required if negligible environmental consequences are predicted, which is considered to mean one or more of the following:

- negligible change to the shallow groundwater regime of a swamp compared with control swamps
- negligible change to the composition or distribution of swamp dependent vegetation communities and threatened species

As a surface fed, ephemeral system, Lake Cowal is not relevant to the policy. As such, the wet vs dry periods are determined by climatic conditions, which is outside of impacts of the proposed works.

xiii (l) justify any prediction of 'nil' or 'negligible' environmental consequences for any impact on water dependent plant communities and the species they support.

There are no known groundwater dependent plant communities identified in the vicinity of CGO, and any potential GDEs would not be impacted by this project. As previously highlighted:

- there are no new direct land-take impacts;
- there is minimal surface disturbance within the existing CGO;
- there is not predicted to be any noticeable subsidence;
- the new underground mine is not connected hydrogeologically with Lake Cowal and therefore there are no ecological impacts related to hydrogeology are predicted; and
- the is no surface water connectivity between CGO and Lake Cowal and the surface water system will not be changed as part of this project.

Based on the assessment contained within this BDAR, and within the Coffey (2020) groundwater study and the Beck Engineering (2020) subsidence assessment, negligible environmental impacts and consequences are considered likely.

## 7.2 Avoidance, minimisation and management

### 7.2.1 Avoidance and minimisation strategy

The following section describes the key measures implemented through the design to avoid and minimise biodiversity impacts.

**Table 7.2 Impact avoidance and minimisation strategy**

| Impact | Action | Intended outcome | Timing | Responsibility |
|---|---|---|---|---|
| Potential direct impacts on the surface of Lake Cowal. | Use underground mining methods to eliminate direct impacts on Lake Cowal. | Zero surface disturbance / land-take from Lake Cowal and adjacent areas by designing an underground mine which is accessed from the existing open cut pit. | This happened at the early strategic stages of the study. | Evolution Mining – Cowal Gold Operations. |
| Potential Stope failure (chimneying) to the surface of Lake Cowal along major faults. | Model potential subsidence and stability impacts of the initial mine design. This process identified 19 stopes that were located in close proximity to the weathered cover sequence geology, or within the cover sequence layers. These stopes were considered to pose a risk of chimneying. This issue was communicated to CGO in May 2020.<br>Evolution has removed 19 of the upper stopes from the mine plan. | Minimise the potential for Potential Stope failure (chimneying) to the surface of Lake Cowal. | This occurred during the conceptual design process. | Beck Engineering / Evolution Mining – Cowal Gold Operations. |

### 7.2.2 Adaptive management strategy for prescribed impacts

As noted in the Beck Engineering (2020) the resolution of the model is limited to the resolution of the input data, which does not include stope-scale geotechnical data. This is perfectly normal at this stage of a project as stope scale information is generally not available until underground development in the area is completed. The recommendations and list of potential controls in the report are provided so that Evolution can implement the required controls based on the conditions encountered. All the other controls rely on additional geotechnical data that will only be available in the future and adopting an observational approach for design, controls and risk management.

Whilst Evolution has minimised the risks of stope failure to surface (chimneying) at this conceptual design stage, it is critical that monitoring of underground stope stability occurs during the mine's development, particularly during mining of the upper stopes.

**Table 7.3 Adaptive management strategy**

| Uncertain biodiversity impact | Monitoring strategy | Trigger for management | Response |
|---|---|---|---|
| There is an extremely remote risk of stope failure to surface (chimneying) when the upper stopes are mined. This could lead to water within the lake (assuming it is full) reporting to the underground mine. Depending on the size of the mine at the time and the amount of water in the lake, this could have very significant biodiversity impacts. If the lake was dry, the impacts would be relatively minimal. | It is critical that monitoring of underground stope stability occurs during the mine's development, particularly during mining of the upper stopes. Further details are given below regarding the Trigger Action Response Plans (TARP). | At the first sign of instability an experienced geotechnical engineer will review the seriousness of the instability and implement agreed management measures documented in Section 7.2.3. | A program of monitoring and management responses that would assist in preventing risk of stope failure to surface (chimneying) and reacting to the early signs to prevent failures occurring with instability is detected is proposed (Section 7.2.3).<br>A key response will be ensuring paste lines and other backfill infrastructure is in place prior to firing stopes with potential for instability or in proximity to major faults. |

### 7.2.3 Beck Engineering 2020 Recommendations

Beck Engineering (2020) made the following recommendations arising from their assessment relating to minimising the risk of stope failure to the surface (chimneying):

1. Stopes within the oxide and transported layers are not likely to be stable and should not be planned at this stage of the project. Current geological interpretation demonstrates the depth and thickness of the transported and oxide layers is variable. The mine should continue to update the interpretation of these boundaries with information from ongoing drilling programmes. The location of the top of fresh rock is most important for the underground mine design.

2. Geotechnical characterisation and development of a detailed geotechnical domains model and structural model, particularly in the upper mining areas of the underground mine. The geotechnical and structural models will require on-going refinement over the mine life which is the normal practice in any mine.

3. The mine should review the planned mining sequence and consider delaying the mining of the upper most row of stopes in the upper most stoping blocks. Mining these stopes first, or very early in the mine life is when the mine has the least geological knowledge and understanding of stope performance (relative to other stages of underground mining). This includes the understanding of the hydraulic properties of the faults and (potential) water inflows to the underground mine.

4. Other recommendations and control measures to minimise the potential for stope overbreak or chimney failure that may impact the surface are listed below. Depending on local geological conditions encountered, the mine should review the list below, and select the controls appropriate to the conditions encountered. It is understood that some of these controls are currently being planned. Additional controls, if required would normally be identified and planned as part of the risk assessment and detailed design process.

    a) A detailed crown pillar stability assessment must be conducted for each stope on the upper mining levels. It is recommended that this entails the use of empirical methods as a minimum, or a combination of empirical and numerical methods. The mine must ensure the risk of crown pillar failure is suitably controlled.

    b) Mine single lift stopes in the upper stoping block. Smaller stopes are more stable than large stopes. A smaller stope void increases the potential for stope overbreak and failure material to fill the void due to the swell of the broken material, prior to extensive failure or chimneying to surface.

    c) Stope sequencing to minimise risk of failure and unravelling along faults, particularly where stopes are bounded by multiple faults. Multiple stopes in close proximity should not be mined at the same time.

    d) Top down drilling of the upper stopes will provide access to the top of the stope (the overcut drive) which enables cable bolting of the stope crown and hanging-wall and access for rapid tight filling with paste.

    e) Tight fill stopes, as far as practical.

    f) Backfilling stopes in a timely manner (1-2 weeks).

    g) Developing the overcut drive with a downwards grade from the access. This will enable the stopes to be tight filled to the backs with paste.

    h) Ensuring paste lines and other backfill infrastructure is in place prior to firing stopes with potential for instability or in proximity to major faults.

    i) Reducing the strike length and width of stopes to reduce potential instability. A review of the stope dimensions should be conducted following stope development and structural mapping of the area.

    j) Cable bolting of stope crowns, when appropriate.

    k) Review of a stand-off between stope walls and major faults, such as the Glenfiddich fault is appropriate based on local conditions

    l) Employing a continuous mining sequence. Secondary stopes have a higher risk of instability (generally).

    m) Avoid mining stopes where major faults confluence in proximity to the stope, particularly near sub-vertical faults such as the Glenfiddich fault and Galway splays.

    n) Mine stopes on the upper levels when Lake Cowal is dry.

5. Detailed stope stability assessments using geotechnical information from future drilling programmes, laboratory testing and rock mass characterisation from underground exposures.

6. Stability monitoring of stopes and TARP to backfill stopes that show early signs of large scale instability.

7. The mine should develop a TARP and undertake a detailed risk assessment for potential stope instability in areas deemed to have elevated risk or potential for surface break through.

8. Subsidence monitoring above the underground mining precinct.

9. In situ stress measurement.

10. Additional laboratory strength testing of each rock type.

11. Characterisation of the major faults, including strength properties and hydraulic conductivity/water inflow rates.

12. Ground water characterisation, including an assessment of the impact of the mechanical rock mass response on ground water flow paths and hydraulic conductivity.

These recommendations should be viewed as a suite of mining methods, tools and management practices that can be applied as required to the conditions found in each stope. They would not all be needed for all stopes, and the approaches are likely to vary according to the geotechnical conditions encountered.

## 7.3 Serious and irreversible impacts

The following species credit species are identified as potential SAII entities in the BAMC for the predicted biodiversity values identified for Lake Cowal based on the PCT's entered:

- White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions CEEC (should PCT 250 - Derived tussock grassland of the central western plains and lower slopes of NSW be part of the CEEC);
- Austral Pillwort;
- Claypan Daisy;
- Curlew Sandpiper (see text below);
- Swift Parrot (see text below).

For the Curlew Sandpiper and Swift Parrot, it is noted that SAII applies only to mapped important habitat areas for the species. From inspection of this mapping, it does not apply to Lake Cowal.

Despite being a rare event, stope failure to surface (chimneying) along major faults is a hazard to consider for all underground stoping mines. This is the only potential impact that could lead to serious or irreversible impacts. However, this issue has driven the conceptual design of the underground mine. The potential risks associated with chimneying are known conceptually and are manageable by adopting an observational approach for design, controls and risk management as the project transitions from conceptual to detailed design, and detailed geotechnical information, at a micro level becomes available. An underground stope monitoring system will also need to be installed to pick up early signs of any instability, as part of a Trigger Action Response Plan (TARP).

Given that proposed mitigation measures are proposed to be carried out and are an integral part of the mine plan (as should groundwater intrusion occur through a stope mining would be required to cease, and could involve death of mine personnel), further more detailed assessment of serious or irreversible impacts has not been conducted.

## 7.4 Impacts not requiring offsets

No impacts from this project will require offsets.

## 7.5 Impacts requiring offset

No impacts from this project will require offsets.

# 8 Assessment of other relevant biodiversity legislation

## 8.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth Department of Environment and Energy (now Department of Water, Agriculture and the Environment) determined on 5 November 2019 that the underground development proposal is not a Controlled Action (refer to Appendix A).

## 8.2 Biosecurity Act 2015

The above ground area will continue to be managed for weed species as per the CGO Flora and Fauna Management Plan (Evolution 2015).

## 8.3 Water Management Act 2000

All of the above surface project footprint is all located within the DA14/98 approved surface disturbance area (Figure 1.2). Therefore, there will not be any new above-ground impacts, and no new vegetation clearance with regards to riparian drainage lines or KFH. Whilst the proposed underground mine will be under Lake Cowal itself, which is mapped as KFH, as discussed elsewhere, there will be no hydraulic connectivity between Lake Cowal and the underground mine.

# References


Australian Museum Business Services (2012) Cowal Gold Mine and Surrounds Flora Survey. Report prepared for Barrick (Australia Pacific) Limited.

AMBS Ecology & Heritage (2013) Lake Cowal Waterbird Monitoring (1989 to 2012) Compilation Report. Report prepared for Barrick (Australia Pacific) Limited.

AMBS Ecology & Heritage (2018a) Cowal Gold Operations Processing Rate Modification Flora and Fauna Survey Report.

AMBS Ecology & Heritage (2018b) Cowal Gold Operations Processing Rate Modification Biodiversity Offset Investigation.

Anne Clements and Associates (1995) Terrestrial Flora Report: Lake Cowal District. Appendix F of NSR Environmental Consultants (1995) Lake Cowal Gold Project Environmental Impact Statement.

Barrick (Cowal) Limited (2003a) Cowal Gold Project Implementation of the Threatened Species Management Protocol.

Barrick (Cowal) Limited (2003b) Cowal Gold Project Access Road Implementation of the Threatened Species Management Protocol.

Barrick (Cowal) Limited (2009) Cowal Gold Project 2007-2008 Annual Environmental Management Report.

Barrick (Cowal) Limited (2010) Cowal Gold Project 2008-2009 Annual Environmental Management Report.

Barrick (Cowal) Limited (2011) Cowal Gold Project 2010-2011 Annual Environmental Management Report.

Barrick (Cowal) Limited (2012) Cowal Gold Project 2011-2012 Annual Environmental Management Report.

Barrick (Cowal) Limited (2013b) Cowal Gold Mine Site Water Management Plan.

Barrick Australia Limited (2005a) Cowal Gold Project – Vegetation Clearance Protocol Report – Soil Stockpile 2. September 2005. VCP-R007-B.

Barrick Australia Limited (2005b) Cowal Gold Mine Implementation Plan to Protect Fauna from Interactions with the Tailings Storage Facilities.

Barrick Australia Limited (2005c) Cowal Gold Project 2003-2004 Annual Environmental Management Report.

Barrick Australia Limited (2006) Cowal Gold Project 2004-2005 Annual Environmental Management Report.

Barrick Australia Limited (2007) Cowal Gold Project 2005-2006 Annual Environmental Management Report.

Barrick Australia Limited (2008a) Cowal Gold Mine E42 Modification Environmental Assessment.

Barrick Australia Limited (2008b) Cowal Gold Project 2006-2007 Annual Environmental Management Report.

Barrick Australia Limited (2013a) Cowal Gold Mine Extension Modification Environmental Assessment.

Beck Engineering (2020). Geotechnical assessment of surface impacts for proposed underground mining at Lake Cowal.

Bower, C.C. (1997) Cowal Gold Project: Flora – Threatened Species Assessment. Report prepared for North Limited.

Bower, C.C. (1998a) Survey of the Cowal Project Area and surrounds for the Austral Pillwort (Pilularia novaehollandiae). Unpublished report by Orchid Research to North Limited. 14 pp.

Bower, C.C. (1998b) Survey for the Endangered Peppercress, Lepidium Hyssopifolium Desv. (Brassicaceae), on the Proposed Cowal Gold Project Site and the Route of the Borefield Pipeline. Orchid Research.

Bower, C.C. (2003a) Vegetation Community Mapping along the Pipeline/Borefield Route.

Bower, C.C. (2003b) Vegetation Community Mapping along the Access Road.

Cenwest Environmental Services (2011) Cowal Augmentation Project Amphibian Survey.

Charles Sturt University (1997) Cowal Gold Project Area Botanical Survey. Report prepared for North Limited.

Coffey (2020) Mine Site Hydrogeological Assessment (DRAFT)

Country Energy (2004) Temora to Cowal Electricity Transmission Line – Implementation of the Threatened Species Management Protocol.

Department of Environment and Energy (2019). EPBC Act Protected Matters Report

(18 June 2019, -33.59598 147.39633).

DnA Environmental (2008) Remnant Vegetation Enhancement Program: 2008 Monitoring Results. Report to Barrick (Australia Pacific) Limited.

DnA Environmental (2010) Remnant Vegetation Enhancement Program: 2009 Monitoring Results. Report to Barrick (Australia Pacific) Limited.

DnA Environmental (2011a) Remnant Vegetation Enhancement Program: 2010 Monitoring Results. Report to Barrick (Australia Pacific) Limited.

DnA Environmental (2011b) 2010 Compensatory Wetland Regeneration Monitoring Results for Cowal Gold Mine.

DnA Environmental (2011c) 2010 Rehabilitation Monitoring Report for Cowal Gold Mine.

DnA Environmental (2012a) Remnant Vegetation Enhancement Program: 2011 Monitoring Results. Report to Barrick (Australia Pacific) Limited.

DnA Environmental (2012b) 2011 Compensatory Wetland Regeneration Monitoring Results for Cowal Gold Mine.

DnA Environmental (2012c) 2011 Rehabilitation Monitoring Report for Cowal Gold Mine.

DnA Environmental (2013a) Remnant Vegetation Enhancement Program: 2012 Monitoring Results. Report to Barrick (Australia Pacific) Limited.

DnA Environmental (2013b) 2012 Compensatory Wetland Regeneration Monitoring Results for Cowal Gold Mine.

DnA Environmental (2013c) 2012 Rehabilitation Monitoring Report for Cowal Gold Mine.

DnA Environmental (2014a) 2013 Compensatory Wetland Regeneration Monitoring Results. Report Prepared for Barrick (Cowal) Limited.

DnA Environmental (2014b) 2013 Rehabilitation Monitoring Report. Report prepared for Barrick (Cowal) Limited.

DnA Environmental (2014c) 2013 Remnant Vegetation Enhancement Program Monitoring Report. Report prepared for Barrick (Cowal) Limited.

DnA Environmental (2015a) 2014 Remnant Vegetation Enhancement Program Monitoring Report. Report prepared for Barrick (Cowal) Limited.

DnA Environmental (2015b) 2014 Rehabilitation Monitoring Report. Report Prepared for Barrick (Cowal) Limited.

DnA Environmental (2015c) 2014 Compensatory Wetland Monitoring Report. Report Prepared for Barrick (Cowal) Limited.

DnA Environmental (2015d) 2015 Compensatory Wetland Monitoring Report. Report Prepared for Evolution (Cowal) Limited.

DnA Environmental (2016a) 2015 Rehabilitation Monitoring Report. Report Prepared for Evolution (Cowal) Limited.

DnA Environmental (2016b) 2015 Rehabilitation Monitoring Report. Report Prepared for Evolution Mining Limited.

DnA Environmental (2017a) 2016 Remnant Vegetation Enhancement Program Monitoring Report. Report Prepared for Cowal Gold Corporation.

DnA Environmental (2017b) 2016 Rehabilitation Monitoring Report. Report Prepared for Evolution Mining Limited.

DnA Environmental (2017c) 2016 Rehabilitation Monitoring Report. Report Prepared for Evolution (Cowal) Limited.

DnA Environmental (2018a) 2018 Rehabilitation Monitoring Report. Prepared for Evolution (Cowal) Limited.

DnA Environmental (2018b) 2018 Remnant Vegetation Enhancement Program Monitoring Report. Prepared for Evolution (Cowal) Limited.

DnA Environmental (2018c) 2018 Austral Pillwort Survey. Prepared for Evolution (Cowal) Limited.

Donato Environmental Services (2006) Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility.

Donato Environmental Services (2007) Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: October 2006 to March 2007.

Donato Environmental Services (2008a) Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: April 2007 to September 2008.

Donato Environmental Services (2008b) Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: October 2007 to March 2008.

Donato Environmental Services (2008c) Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: April to September 2007.

Donato Environmental Services (2009) Seasonal Wildlife Use Patterns of the Cowal Gold Project tailings storage facility: 1 October 2008 to 30 March 2009.

Donato Environmental Services (2010a) Seasonal Wildlife Use Patterns of the Cowal Gold Mine tailings storage facility: 1 April 2009 to 30 September 2009.

Donato Environmental Services (2010b) Seasonal Wildlife Use Patterns of the Cowal Gold Mine tailings storage facility: 1 October 2009 to 31 March 2010.

Donato Environmental Services (2011a) Seasonal Wildlife Use Patterns of the Cowal Gold Mine tailings storage facility: 1 April to 30 September 2010.

Donato Environmental Services (2011b) Seasonal Wildlife Use Patterns of the Cowal Gold Mine tailings storage facility: 1 October 2010 to 31 March 2011.

Donato Environmental Services (2012a) Seasonal Wildlife Use Patterns of the Cowal Gold Mine tailings storage facility: 1 April 2011 to 30 September 2011.

Donato Environmental Services (2012b) Seasonal Wildlife Use Patterns of the Cowal Gold Mine tailings storage facility: 1 October 2011 to 31 March 2012.

Donato Environmental Services (2013) Seasonal Wildlife Use Patterns of the Cowal Gold

Mine tailings storage facility: 1 April to 30 September 2012.

Donato Environmental Services (2014) Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: January 2014 to June 2014.

Donato Environmental Services (2015a) Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: July 2014 to December 2014.

Donato Environmental Services (2015b) Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: January 2015 to June 2015.

Donato Environmental Services (2016a) Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: July 2015 to December 2015.

Donato Environmental Services (2016b) Seasonal Wildlife Use Patterns of the Cowal Gold Operations Tailings Storage Facility: 1 January 2016 to 30 June 2016. Prepared for Evolution Mining, Cowal Gold Operations.

Donato Environmental Services (2017a) Seasonal Wildlife Use Patterns of the Cowal Gold Operations Tailings Storage Facility: 1 July 2016 to 31 December 2016. Prepared for Evolution Mining, Cowal Gold Operations.

Donato Environmental Services (2017b) Seasonal Wildlife Use Patterns of the Cowal Gold Operations Tailings Storage Facility: 1 January 2017 to 30 June 2017. Prepared for Evolution Mining, Cowal Gold Operations.

Donato Environmental Services (2017c) Seasonal Wildlife Use Patterns of the Cowal Gold Operations Tailings Storage Facility: 1 July 2017 to 31 December 2017. Prepared for Evolution Mining, Cowal Gold Operations.

Donato Environmental Services (2018) Seasonal Wildlife Use Patterns of the Cowal Gold Operations Tailings Storage Facility: 1 July to 31 December 2018. Prepared for Evolution Mining, Cowal Gold Operations.

Environment Australia (2001). A Directory of Important Wetlands in Australia, Third Edition. Environment Australia, Canberra.

Evolution Mining (Cowal) Pty Limited (2015), Cowal Gold Mine Flora and Fauna Management Plan.

FloraSearch (2008) Cowal Gold Mine E42 Modification Flora Assessment. Report to Barrick Australia Ltd.

frc Environmental (2011) Cowal Gold Mine Compensatory Wetland Habitat and Fish Investigation.

frc Environmental (2012) Cowal Gold Mine Compensatory Wetland Habitat and Fish Investigation 2012.

frc Environmental (2016) Cowal Gold Operations Compensatory Wetland Habitat and Fish Investigation.

frc Environmental (2017) Cowal Gold Operations Compensatory Wetland Habitat and Fish Investigation.

Gell, P. (2015a) Lake Cowal Waterbird Monitoring Survey Progress Report January 2015. Federation University Australia, Centre for Environmental Management. Report Prepared for Cowal Gold Corporation.

Gell, P. (2015b) Lake Cowal Waterbird Monitoring Survey Progress Report August 2015. Federation University Australia, Water Research Network. Report Prepared for Cowal Gold Corporation.

Gell, P. (2015c) Lake Cowal Waterbird Monitoring Survey Progress Report October 2015. Federation University Australia, Water Research Network. Report Prepared for Evolution Mining Limited.

Gell, P. (2016a) Lake Cowal Waterbird Monitoring Survey Progress Report November 2016. Federation University Australia, Water Research Network. Report Prepared for Evolution Mining Limited.

Gell, P. (2016b) Lake Cowal Waterbird Monitoring Survey Progress Report January 2016. Federation University Australia, Water Research Network. Report Prepared for Evolution Mining Limited

Gell, P. (2016c) Lake Cowal Waterbird Monitoring Survey Progress Report August 2016. Federation University Australia, Water Research Network. Report Prepared for Evolution Mining Limited.

Gell (2017a) Lake Cowal Waterbird Monitoring Survey Progress Report – January 2017.

Gell (2017b) Lake Cowal Waterbird Monitoring Survey Progress Report – August 2017.

Gell (2017c) Lake Cowal Waterbird Monitoring Survey Progress Report – October 2017.

Gell (2018a) Lake Cowal Waterbird Monitoring Survey Progress Report – January 2018.

Gell (2018b) Lake Cowal Waterbird Monitoring Survey Progress Report – August 2018.

Gell (2018c) Lake Cowal Waterbird Monitoring Survey Progress Report – October 2018.

Gell, P.A. and Peake, P. (2012) Lake Cowal Waterbird Monitoring Survey Progress Report October 2012.

Gell, P.A. and Peake, P. (2013) Lake Cowal Waterbird Monitoring Survey Progress Report January 2013.

Gell, P and Peake, P. (2014a) Lake Cowal Waterbird Monitoring Survey Progress Report August 2014. Federation University Australia, Centre for Environmental Management. Report Prepared for Barrick Gold Corporation.

Gell, P and Peake, P. (2014b) Lake Cowal Waterbird Monitoring Survey Progress Report January 2014. Federation University Australia, Centre for Environmental Management. Report Prepared for Barrick Gold Corporation.

Gell, P and Peake, P. (2014c) Lake Cowal Waterbird Monitoring Survey Progress Report October 2014. Federation University Australia, Centre for Environmental Management. Report Prepared for Barrick Gold Corporation.

Gell, P and Peake, P. (2014d) Lake Cowal Waterbird Monitoring Survey Progress Report August 2013. Federation University Australia, Centre for Environmental Management. Report Prepared for Barrick Gold Corporation.

Gell, P and Peake, P. (2014e) Lake Cowal Waterbird Monitoring Survey Progress Report October 2013. Federation University Australia, Centre for Environmental Management. Report Prepared for Barrick Gold Corporation.

Greg Richards and Associates Pty Ltd (1997a) Results of a Bat Fauna Survey to Target Threatened Species.

Greg Richards and Associates Pty Ltd (1997b) Cowal Gold Project Significance of Operations on Threatened Bat Species.

Gunninah Consultants Pty Ltd (1995) Fauna Impact Statement.

Gursansky, W. (2013a) Seasonal wildlife use patterns of the Cowal Gold Mine tailings storage facility: 1 October 2012 to 31 March 2013, Draft report, Donato Environmental Services, Darwin. Report Prepared for Barrick Gold Corporation.

Gursansky, W. (2013b) Seasonal wildlife use patterns of the Cowal Gold Mine tailings storage facility: 1 April to 30 June 2013. Draft Report, Donato Environmental Services, Darwin. Report Prepared for Barrick Gold Corporation.

Gursansky, W. (2014a) Seasonal wildlife use patterns of the Cowal Gold Mine tailings storage facility: 1 July to 31 December 2013, Donato Environmental Services, Darwin. Report Prepared for Barrick Gold Corporation.

Gursansky, W. (2014b) Seasonal wildlife use patterns of the Cowal Gold Mine tailings storage facility: 1 January to 30 June 2014. Donato Environmental Services, Darwin. Report Prepared for Barrick Gold Corporation.

Gursansky, W. (2015a) Seasonal wildlife use patterns of the Cowal Gold Mine tailings storage facility: 1 July to 31 December 2014. Donato Environmental Services, Darwin. Report Prepared for Barrick Gold Corporation.

Gursansky, W. (2015b) Seasonal wildlife use patterns of the Cowal Gold Mine tailings storage facility: 1 Jan to 30 June 2015. V2. Donato Environmental Services, Darwin. Report Prepared for Evolution Mining Limited.

Gursansky, W. (2016a) Seasonal wildlife use patterns of the Cowal Gold Mine tailings storage facility: 1 July to 31 December 2015. V2. Donato Environmental Services, Darwin. Report Prepared for Evolution Mining Limited.

Gursansky, W. (2016b) Seasonal wildlife use patterns of the Cowal Gold Operations tailings storage facility: 1 January to 30 June 2016. V2. Donato Environmental Services, Darwin. Report Prepared for Evolution Mining Limited.

Gursansky, W. (2017) Seasonal wildlife use patterns of the Cowal Gold Operations tailings storage facility: 1 July to 31 December 2016. V1. Donato Environmental Services, Darwin. Report Prepared for Evolution Mining Limited.

HEC (2020) Cowal Gold Operation Underground Mine Project Hydrological Assessment, Draft Report (revision d), prepared by Hydro Engineering & Consulting Pty Ltd

Kerle, A. (2013a) Cowal Gold Mine and Surrounds Fauna Report.

Kerle, A. (2013b) Proposed Pump Station – Cowal Gold Mine Extension Modification Potential Fauna Habitat.

Lake Cowal Foundation (2020) website accessed 16/9/2020, http://www.lakecowalfoundation.org.au/

Mount King Ecological Surveys (1997) Fauna Report – Temora to Cowal Gold Project Electricity Transmission Line Fauna Assessment.

OEH (2016) Upland Swamp Policy (Addendum to NSW Biodiversity Offsets Policy for Major Projects: Upland swamps impacted by longwall mining subsidence, Office of Environment and Heritage.

OEH (2017) Biodiversity Assessment Method, Office of Environment and Heritage.

OEH (2019) eSPADE 2.0 NSW Soil and Land Information System Soil Profile Report (Profile 482), Office of Environment and Heritage.

Pease, B.C. and Grinberg, A. (1995) New South Wales Commercial Fisheries Statistics 1940 to 1992. New South Wales Fisheries Research Institute.

Scribner, E.A. and Kathuria, A. (1996) New South Wales Commercial Fisheries Statistics 1992/93. New South Wales Fisheries Research Institute.

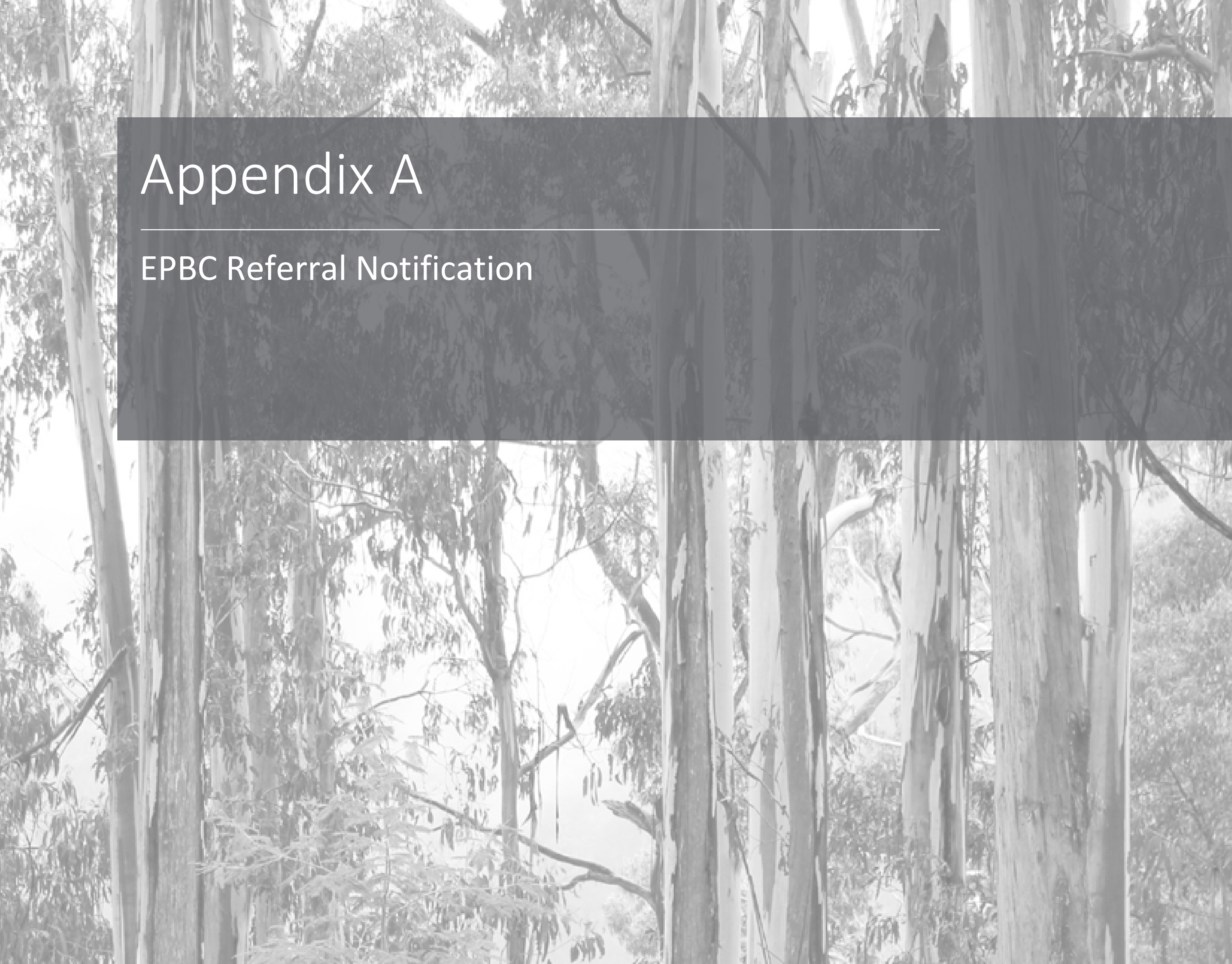
Vestjens, W.J.M. (1977) Status, habitats and food of vertebrates at Lake Cowal, NSW. Division of Wildlife Research Technical Memorandum No. 12 Commonwealth Scientific and Industrial Research Organisation, Canberra.

Western Research Institute (2008) Appendix E Cowal Gold Mine E42 Modification Fauna Assessment.

Young, C.J. (1979) Examination of the Aquatic Fauna of Lake Cowal, NSW. Unpublished Report. Inland Fisheries Research Station, Narrandera, New South Wales.

# Appendix A

## EPBC Referral Notification



Australian Government

Department of the Environment and Energy

## Notification of

## REFERRAL DECISION – not controlled action

### Cowal Gold Operations Underground Development, West Wyalong, NSW

This decision is made under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

### Proposed action

| | |
|---|---|
| **Person proposing to take the action** | Evolution Mining (Cowal) Pty Limited<br><br>ABN: 75 007 857 598 |
| **Proposed action** | The expansion of underground mining associated with the Cowal Gold operations located 38 kilometres (km) north east of West Wyalong, New South Wales [See EPBC Act referral 2019/8512]. |
| **Referral decision:** | **Not a controlled action** |
| **Status of proposed action** | The proposed action is not a controlled action. |

### Person authorised to make decision

| | |
|---|---|
| **Name and position** | Declan O'Connor-Cox<br>A/g Assistant Secretary<br>Environment Approvals Division |
| **Signature** | |
| **Date of decision** | 5/11/19 |

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