

COWAL GOLD OPERATIONS
EROSION AND SEDIMENT CONTROL MANAGEMENT PLAN



March 2022
Document No. 00964952-001
Version: ESCMP 02-B

Revision Status Register

Section/Page/ Annexure	Revision Number	Amendment/Addition	Distribution	DPE Approval Date
All	ESCMP-O (September 2003) Document No. 684736	Original Erosion and Sediment Control Management Plan (ESCMP)	DLWC and EPA	September 2003
Annexure	ESCMP Amendments (i) to (v) (December 2004) Document No. 684887	Amendments to include additional water management and temporary erosion and sediment control measures prior to development of the CGO, and to remove contained water storage D7.	DLWC and EPA	21 December 2004
Addendum	Addendum dated December 2009 Document No. 684889	Revised to reflect Development Consent as modified on 28 August 2009 (in relation to introduction of the saline groundwater borefield within ML 1535).	DECCW, DoP	10 March 2010
Addendum	Addendum dated February 2015 Document No. 00653984	Revised to reflect Development Consent as modified on 22 July 2014.	DPE	21 March 2016
All	ESCMP02-A (July 2017) Document No. 00856137	Revised to reflect Development Consent as modified on 7 February 2017. Incorporates all addenda and annexures.	DPE	28 August 2018
All	ESCMP dated February 2019 Document No: ESCMP 02-B (964952-001)	ESCMP revised in accordance with DA 14/98 condition 9.1(c)(v) to reflect Development Consent as modified on 4 October 2018 and 23 August 2019.	DPE	-
All	ESCMP dated March 2022	ESCMP revised to reflect outcomes of approval of Mod16 to DA 14/98 and SSD 10367 for the Underground Development approved by DPE on 30 September 2021.	DPE	TBC

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1 INTRODUCTION

The Cowal Gold Operations (CGO) is located approximately 38 kilometres (km) north-east of West Wyalong in New South Wales (NSW) (Figure 1). Evolution Mining (Cowal) Pty Limited (Evolution) is the owner and operator of the CGO. All mining activity occurs within Mining Lease (ML) 1535 and ML 1791.

Development Consent no. 14/98 (DA 14/98) for the CGO (including the Bland Creek Palaeochannel Borefield water supply pipeline) was granted by the Minister for Urban Affairs and Planning under Part 4 of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) on 26 February 1999. Development Consent (DA 2011/64) for the operation of the Eastern Saline Borefield was granted by the Forbes Shire Council on 20 December 2010.

The Minister for Planning granted approval for the *Cowal Gold Operations Underground Development Project* as State-significant Development No. 10367 (SSD 10367) under Section 4.38(2) of the EP&A Act on 30 September 2021 and to modify DA 14/98 through *Modification No.16* (herein referred to as Mod 16) under Section 4.55(2) of the EP&A Act.

DA 14/98 generally allows:

- Mining operations until 2040.
- Ore processing at a rate of 9.8 Mtpa.
- Tailings and waste rock emplacement on site.
- Operation of a range of ancillary mining infrastructure.

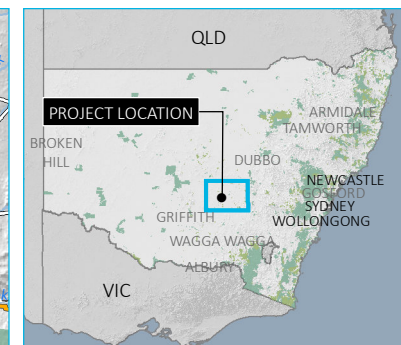
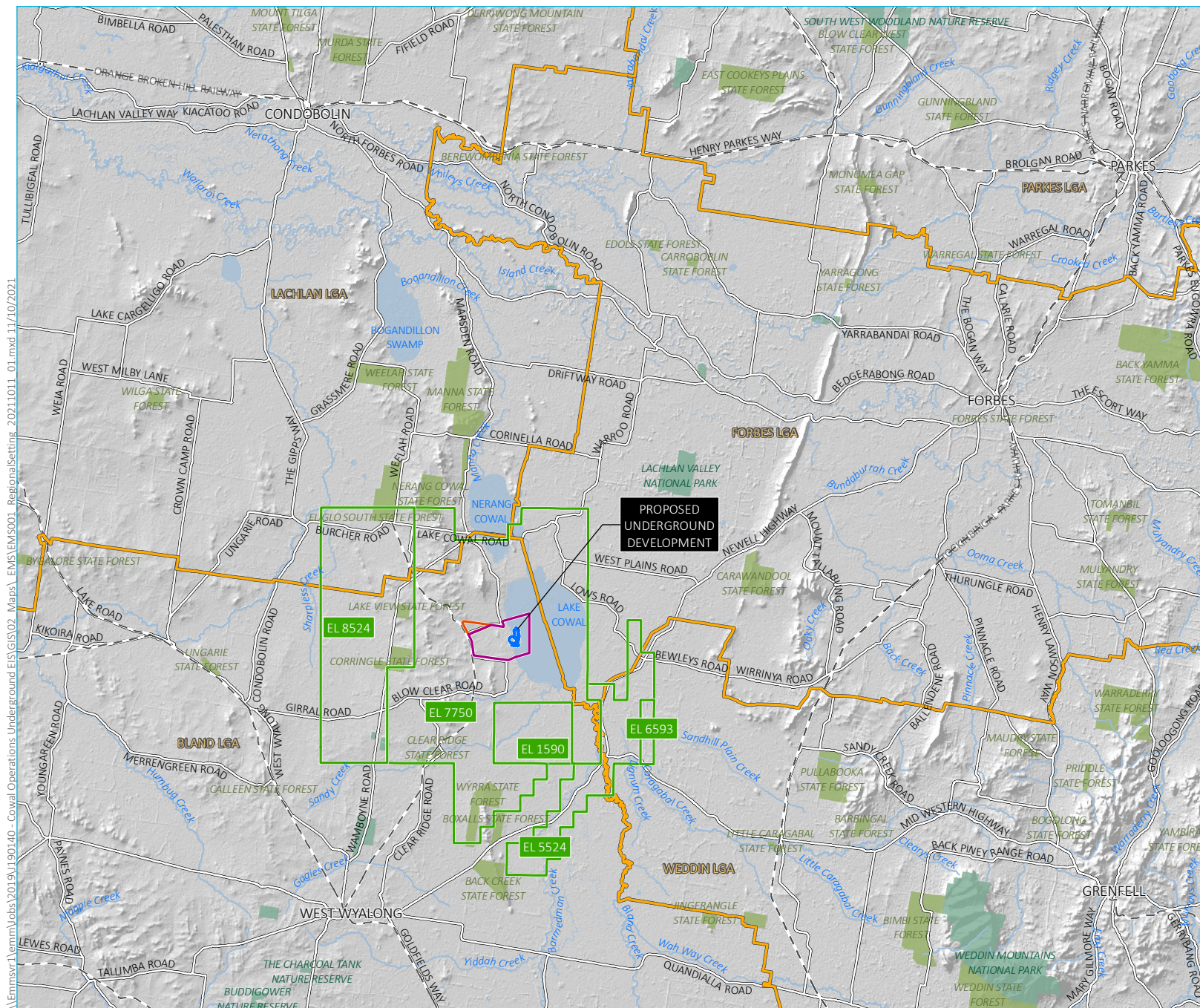
SSD 10367 generally allows:

- Underground stope mining until 2040.
- Backfilling the stopes with cemented paste made from tailings.
- Development of ancillary infrastructure including a box-cut to the underground mine and a paste fill plant.

The general arrangement of the approved CGO is provided in Figure 2.

This ESCMP has been developed as a best practice approach for responsible CGO water management (Commonwealth of Australia, 2016), and has been developed in-line with best practice erosion and sediment control measures listed in *Managing Urban Stormwater Soils and Construction Volume 1* (Landcom, 2004), *Managing Urban Stormwater Soils and Construction Volume 2E – Mines and quarries* (NSW Department of Environment and Climate Change [DECC], 2008), and the International Erosion Control Association (IECA) Australasian guidelines, *Best Practice Erosion & Sediment Control* guidelines (IECA, 2008).

This revised ESCMP has been prepared to reflect the conditions of DA 14/98 and SSD 10367 as approved on 30 September 2021 and supersedes all former versions of the ESCMP. Copies of the approved development consents for Mod 16 and SSD 10367 are available on Evolution's website (www.evolutionmining.com.au).

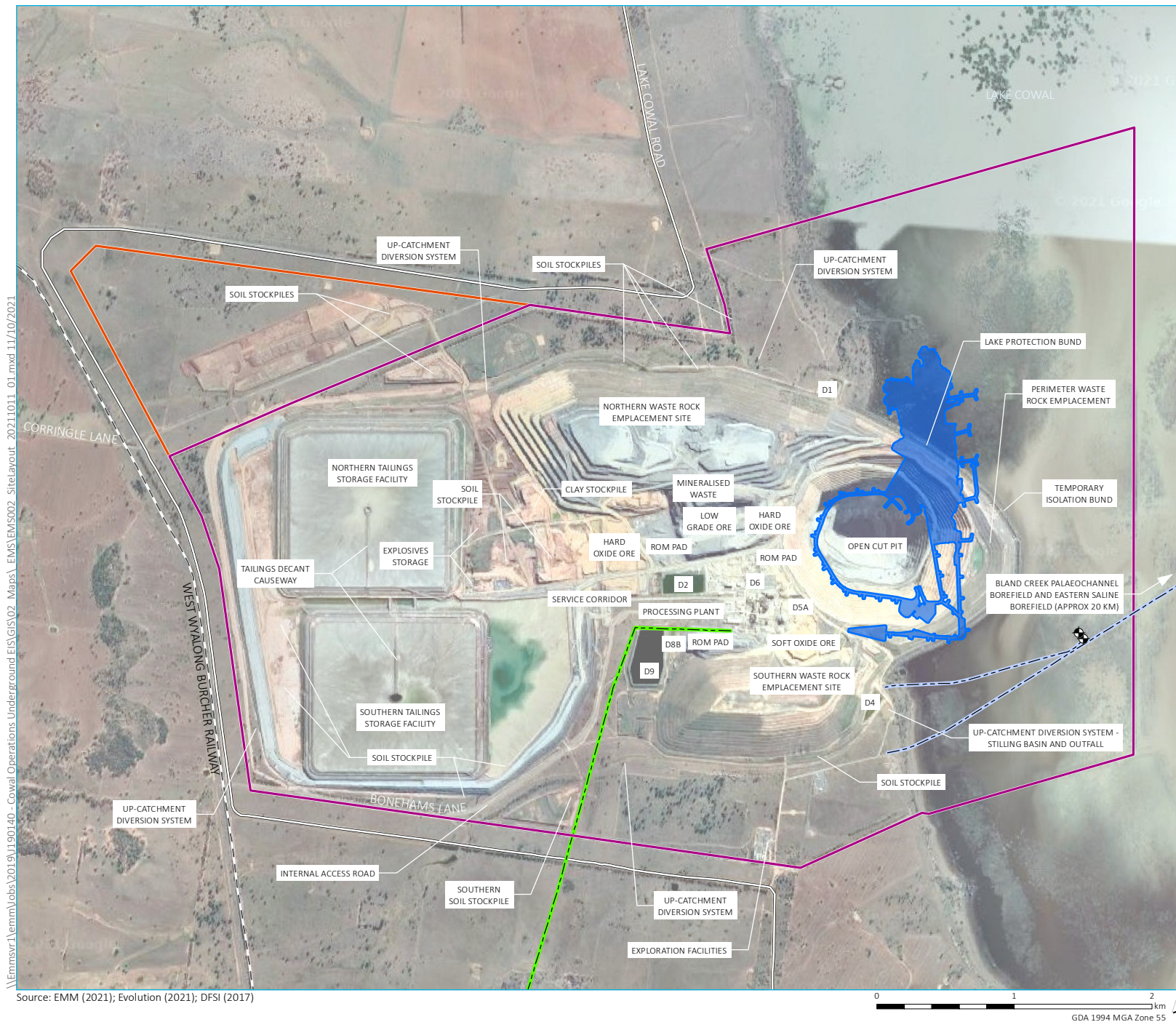


- KEY**
- Proposed underground development
 - Mining lease (ML1535)
 - Mining lease (ML1791)
 - Exploration licence (EL)
 - Rail line
 - Main road
 - Named watercourse
 - Waterbody
 - Local government area
 - NPWS reserve
 - State forest

Evolution Mining
Cowl Gold Operations

Figure 1
Regional location

Source: EMM (2021); Evolution (2021); DFSI (2017); GA (2011); ASGC (2006)



\\Emmsvr1\emmm\Jobs\2019\1901.40 - Cowal Operations Underground EIS\GIS\02 Maps\ EMM\0202 SiteLayout 20211011_01.mxd 11/10/2021

Source: EMM (2021); Evolution (2021); DFIG (2017)

Cowal Gold Operations site layout

Evolution Mining
Cowal Gold Operations
Environmental Management Strategy
Figure 2

1.1 OBJECTIVES

The objective of this ESCMP is to minimise the adverse impacts of soil erosion at the CGO through the effective design and implementation of sediment control strategies throughout the life of the CGO. This includes:

- the protection of water quality in Lake Cowal (via the separation of flows into the Internal Catchment Drainage System and the Up-catchment Diversion System);
- the prevention of sediment-laden runoff from the mine site; and
- compliance with regulatory conditions of approval

The preparation of this ESCMP is a requirement of DA 14/98 condition 3.5(a)(iii) (Section 2.1.1) and also addresses certain Conditions of Authority for ML 1535 (Section 2.2).

1.2 SCOPE

In accordance with the requirements for this ESCMP under DA 14/98 condition 3.5(a) (Section 2.1), this ESCMP:

- will be applied to all mine-related activities within ML 1535 and ML 1791, water supply borefields, pipelines and civil infrastructure (roads, tracks and travelling stock reserves) modified as a result of the approval of the activities at the CGO from time to time;
- details of temporary and permanent sediment and erosion control systems to be used during both mine construction and operation, including for earthworks associated with landscaping;
- details of salinity management; and
- includes a programme for reporting on the effectiveness of the sediment and erosion control systems and performance against objectives contained in this ESCMP.

The remainder of this ESCMP has the following structure:

Section 2	Discusses the relevant legislation and associated conditions of approval, Australian Standards and industry guidelines.
Section 3	Details the specific erosion and sediment control systems for the mine area, Saline Borefield, relocation of the Travelling Stock Reserve (TSR) and the realignment of Lake Cowal Road and the Bland Creek Palaeochannel borefield and pipeline.
Section 4	Provides details for management of salinity issues.
Section 5	Details soil management measures including soil stripping scheduling, techniques and stockpile management.
Section 6	Provides an overview of the CGO's rehabilitation principles and objectives.
Section 7	Summarises stakeholder consultation and complaint receipt processes.
Section 8	Outlines CGO's auditing requirements and review requirements for this ESCMP.
Section 9	Details the CGO's reporting requirements for the performance of erosion and sediment control systems .
Section 10	References cited in this document.
Appendices.	

2 STATUTORY REQUIREMENTS

This ESCMP has been prepared in response to the requirements of various conditions of approval under State legislation. Other relevant policies and guidelines are also outlined in the sections below.

2.1 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

2.1.1 DA 14/98

DA 14/98 condition 3.5(a) is a key influence on the ESCMP (see Table 1).

Table 1
DA 14/98 Requirements for this Plan

Condition		Corresponding Section of this Plan
3.5	<i>Prevention of Soil Erosion</i> <i>The Applicant shall prepare and implement the following plans to the satisfaction of the Planning Secretary:</i> (a) <i>an erosion and sediment control management plan for the site which shall include, but not be limited to:</i> (i) <i>details of temporary and permanent sediment and erosion control systems to be used during both mine construction and operation, including for earthworks associated with landscaping;</i> (ii) <i>details of salinity management; and</i> (iii) <i>a program for reporting on the effectiveness of the sediment and erosion control systems and performance against objectives contained in the approved erosion and sediment control management plan, and EIS; and</i>	Sections 3, 4, 5 and 6 Section 4 Section 9

In addition to DA 14/98 condition 3.5(a) above, other development consent conditions relevant to this ESCMP include:

- DA 14/98 condition 3.4(c)(iv), which requires the preparation of a Biodiversity Offset program including the detailed description of the measures to control erosion.
- DA 14/98 condition 9.1(b), which requires the preparation of an Annual Review. This condition is addressed in Section 9.2.
- DA 14/98 condition 9.1(c), which outlines the revision requirements for the CGO's environmental management plans, strategies and programs, including this ESCMP. This condition is addressed in Section 8.2.
- DA 14/98 condition 9.1(d), which requires the establishment of a Community Environmental Monitoring and Consultative Committee (CEMCC). This condition is addressed in Section 7.1.
- DA 14/98 condition 9.2(a), which requires Independent Environmental Audits to be conducted. These conditions are addressed in Section 8.1.1.
- DA 14/98 condition 9.3, which outlines incident and non-compliance reporting requirements. This condition is addressed in Sections 9.3 and 9.4.
- DA 14/98 condition 9.4(a)(v), which requires the maintenance of a complaints register. This condition is addressed in Section 7.2.

2.1.2 SSD 10367

With its focus primarily on underground activities, SSD 10367 has only a few relevant conditions to this plan. They are:

- Condition B8 (Table 1) which requires that:
Storages are suitably designed, installed and maintained to ensure no discharge of mine water or sediment-laden water outside the ICDS

- Condition C9, which requires the preparation of an Annual Review. This condition is addressed in Section 9.2.
- Condition C5, which outlines the revision requirements for the CGO's environmental management plans, strategies and programs, including this ESCMP. This condition is addressed in Section 8.2.
- Condition A11, which requires the establishment of a Community Environmental Monitoring and Consultative Committee (CEMCC). This condition is addressed in Section 7.1.
- Condition C11, which requires Independent Environmental Audits to be conducted. These conditions are addressed in Section 8.1.1.
- Conditions C7 and C8 which require incident and non-compliance reporting requirements. These conditions are addressed in Sections 9.3 and 9.4.
- Condition C14(a)(ix), which requires the maintenance of a complaints register. This condition is addressed in Section 7.2.

2.2 MINING ACT 1992

The principal regulatory instrument under the Mining Act 1992 are the conditions of authority on CGO's mining leases; ML 1535 and ML 1791. Those on ML 1535 include requirements relevant to soil erosion and pollution prevention, maintenance of roads and rehabilitation requirements. The Authority for ML 1535 also includes reporting requirements, including preparation of a Mining Operations Plan (MOP) and Annual Review (AR). Relevant Conditions of Authority for ML 1535 include:

Prevention of Soil Erosion and Pollution

14. *Operations must be carried out in a manner that does not cause or aggravate air pollution, water pollution (including sedimentation) or soil contamination or erosion, unless otherwise authorised by a relevant approval, and in accordance with an accepted Mining Operations Plan. For the purpose of this condition, water shall be taken to include any watercourse, waterbody or groundwaters. The lease holder must observe and perform any instructions given by the Director-General in this regard.*

This Condition of Authority is addressed in Sections 3 to 6 of this ESCMP.

Rehabilitation

12. (a) *Land disturbed must be rehabilitated to a stable and permanent form suitable for a subsequent land use acceptable to the Director-General and in accordance with the Mining Operations Plan so that:*
- *there is no adverse environmental effect outside the disturbed area and that the land is properly drained and protected from soil erosion.*
 - *the state of the land is compatible with the surrounding land and land use requirements.*
 - *the landforms, soils, hydrology and flora require no greater maintenance than that in the surrounding land.*
 - *in cases where revegetation is required and native vegetation has been removed or damaged, the original species must be re-established with close reference to the flora survey included in the Mining Operations Plan. If the original vegetation was not native, any re-established vegetation must be appropriate to the area and at an acceptable density.*
 - *the land does not pose a threat to public safety.*
- (b) *Any topsoil that is removed must be stored and maintained in a manner acceptable to the Director-General.*
13. *The lease holder must comply with any direction given by the Director-General regarding the stabilisation and revegetation of any mine residues, tailings or overburden dumps situated on the lease area.*

These Conditions of Authority are addressed in Sections 3 to 6 and 9 of this ESCMP.

Mining Operations Plan

- 25(4) *The Plan must present a schedule of proposed mine development for a period of up to seven (7) years and contain diagrams and documentation which identify*

- (i) ...
Surface and groundwater management systems including monitoring (including integrated erosion and sediment controls);

This Condition of Authority is addressed in Sections 3 to 6 and 9 of this ESCMP.

2.3 OTHER LEGISLATIVE REQUIREMENTS

The following Acts contain provisions relevant to erosion and sediment control for the CGO:

Soil Conservation Act, 1938

Under this Act, where the Commissioner of the Soil Conservation Service of NSW considers that any act (or failure to carry out an act) has caused or is likely to cause soil erosion or land degradation, the Commissioner may issue a notice upon the owner or occupier of the land requiring the owner or occupier to abstain from doing the act or to carry out the act as specified in the notice. It is an offence to fail to comply with the notice.

Water Management Act, 2000

Under the *Water Management Act, 2000*, water use, drainage activities and floodplain management should avoid or minimise land degradation, including soil erosion, compaction, geomorphic instability, contamination, acidity, waterlogging, decline of native vegetation or, where appropriate, salinity, where possible, land should be rehabilitated.

Local Land Services Act, 2013

The *Local Land Services Act 2013*, provides a regulatory framework for native vegetation and land management activities in NSW. The *Local Land Services Act, 2013* also establishes a statutory corporation (i.e. Local Land Services) with responsibility for management and delivery of local land services in the social, economic and environmental interests of the State in accordance with any State priorities for local land services. The role of Local Land Services is to provide programs and advisory services associated with agricultural production, biosecurity, natural resource management and emergency management. The CGO is located within the Riverina Local Land Services division.

Protection of the Environment Operations Act, 1997

The *Protection of the Environment Operations Act, 1997* (PoEO Act) and the Protection of the Environment Operations (General) Regulation, 2009 set out the general obligations for environmental protection for development in NSW, which is regulated by the Environment Protection Authority (EPA).

Offences and duties under the PoEO Act relevant to this ESCMP include a person who pollutes any waters is guilty of an offence (s120). Substances that may cause water pollution includes any ashes, soil, earth, mud, stones, sand, clay or similar inorganic matter (Schedule 5 of the Protection of the Environment (General) Regulation, 2009). It is a defence in a prosecution under section 120 that the pollution was regulated by an environment protection licence, the conditions of which had not been contravened.

Under section 148 of the PoEO Act, a duty is imposed on certain persons to notify the EPA or local council where a pollution incident occurs in the course of an activity so that material harm to the environment is caused or threatened. The persons upon whom the duty is imposed include the person carrying on the activity and the occupier of the premises on which the incident occurred.

2.4 POLICIES AND GUIDELINES

Presented below is a summary of government policies and guidelines that may be of relevance to this ESCMP. These documents are referenced within the relevant sections of this ESCMP where appropriate. It is the responsibility of Evolution employees and its contractors to maintain up to date versions of these documents on file and be cognisant of their content.

Wetlands Policy, 2010

The *NSW Wetlands Policy, (DECCW, 2010)* aims to minimise any further loss or degradation of wetlands and to restore degraded wetlands through the improvement of wetland management by providing guidance and support to wetland managers, including individual land holders. Goals and principles relevant to this ESCMP are that water entering natural wetlands will be of sufficient quality so as not to degrade the wetlands, and land use and management practices that maintain or rehabilitate wetland habitats and processes will be encouraged. The Policy is addressed by the implementation of the erosion and sediment control systems outlined in Section 3 to 6 of this ESCMP.

A Resource Guide for Local Councils: Erosion and Sediment Control, Department of Environment and Conservation (DEC), 2006

This document provides for the implementation of erosion and sediment control measures, the preparation of erosion and sediment control plans, the management of stormwater and outlines principles and techniques for revegetating sites during development. Diagrams, formulae and tables are given including for the design and construction of sediment basins, traps and filters, and banks and channels linings. Design information relevant to this ESCMP is dealt with further in the body of the plan. An extract of this handbook is provided in Appendix B.

Managing Urban Stormwater – Soils and Construction Volume 1, Landcom, 2004

The manual focuses on the minimisation of erosion and prevention of sediment movement off site during the construction phase of land and building development. Relevant to this ESCMP, the manual:

- assists in identifying and addressing the various soil and water management issues at the design concept stage;
- outlines the preparation of erosion and pollution control plans;
- describes soil and water management aspects of land clearing and topsoil stripping, stockpiling and reuse in rehabilitation; and
- provides information on control of soil erosion sheet and concentrated flow and subsoil drainage in respect to construction and maintenance of site drainage works.

Design information relevant to this ESCMP is dealt with further in the body of the plan. An extract of this manual is provided in Appendix C.

Managing Urban Stormwater – Soils and Construction Volume 2E: Mines and Quarries, DECCW, 2008

Volume 2E of the Managing Urban Stormwater manual guides the user in the application of the principles and practices of erosion and sediment control described in Volume 1 (Landcom, 2004) to mines and quarries, specifically by:

- outlining an erosion and sediment control strategy development approach;
- summarising the considerations of mine and quarry design relevant to operational erosion and sediment control;
- providing information on rehabilitation relevant to minimising site erosion;
- providing guidance on applicable erosion and sediment control techniques at mines and quarries; and
- outlining the documentation strategy for erosion and sediment control plans.

Best Practice Erosion and Sediment Control Guidelines, IECA, 2008

The IECA's *Best Practice Erosion and Sediment Control Guidelines* contain clearly defined erosion and sediment control guidelines, recommended standards, erosion and sediment control plan development procedures, erosion and sediment control techniques, field guides and guidance on the design, construction and operation of sediment basins.

Guidelines for Erosion and Sediment Control on Building Sites, DLWC, 2001

This handbook provides a guide to best practice to reduce storm water pollution from building sites. The guidelines provide for legislative requirements, suggested erosion and sediment controls, the preparation of erosion and sediment control plans and soil and water management plans and a number of fact sheets providing for soil erosion and sediment prevention and control, clean-up and rehabilitation.

Draft Guidelines for the Design of Stable Drainage Lines on Rehabilitated Minesites in the Hunter Coalfields, Department of Infrastructure, Planning and Natural Resources (DIPNR), undated (the Draft Guidelines)

The Draft Guidelines provide for the long-term stability of drainage lines on mine sites. Drainage lines require the application of control structures to mitigate against erosion and sediment discharge. The Draft Guidelines outline the elements of drainage design that include specific erosion control techniques and revegetation of areas adjacent to the drainage lines to control soil erosion of spill over areas. A copy of the Draft Guidelines is provided in Appendix E.

Erosion and Sediment Control on Unsealed Roads (NSW Office of Environment and Heritage, 2012)

This guide provides practical guidance on soil erosion and sediment control practices to minimise the amount of sediment entering waterways and for routine maintenance of unsealed roads using best practice standards.

Guide to Road Design (Austroads)

The *Austroads Guide to Road Design* is intended to provide designers with a framework that promotes efficiency and economy in design and construction, and consistency and safety for road users.

The Lake Cowal Road realignment (Section 6.2) was constructed in accordance with the *Austroads Guide to Road Design*, under DA 14/98 condition 7.1(b).

Controlled Actions on Waterfront Land Guidelines for Laying Pipes and Cables in Watercourses on Waterfront Land

This guideline provides the design and installation considerations for the laying of pipes and cables on waterfront land. In general, the guideline details measures that should be implemented such that disturbance associated with the laying of cables and pipes across a watercourse or on waterfront land is minimised, and rehabilitation of disturbed areas restores bed and bank stability and the integrity of any existing vegetation on the waterfront.

2.5 LOCAL AND REGIONAL MANAGEMENT PLANS

The *Cowal Gold Project Commission of Inquiry Commissioners Report* (COI) (Commissioners of Inquiry for Environment and Planning, 1999) stated that as part of its ongoing consultative process, the Applicant must ensure that the development remains compatible with the Floodplain Management Plan, the Lake Cowal Land and Water Management Plan, the Bland Creek Land and Water Management Plan, and the Mid Lachlan Regional Vegetation Plan (Commissioners of Inquiry for Environment and Planning, 1999), all of which were in draft form at the time of writing of the COI report.

Evolution will continue to consider the aims of these plans, where practical to facilitate a whole of catchment management objective.

Presented below is a summary of vegetation, land and water management plans relevant to the CGO. These documents are referenced within the relevant sections of this ESCMP where appropriate.

Lachlan River (Jemalong Gap to Condobolin) Floodplain Management Plan, NSW Office of Environment and Heritage and NSW Office of Water, 2012

The *Lachlan River (Jemalong Gap to Condobolin) Floodplain Management Plan* defines the requirements for managing floodwaters within floodplains. The floodplain management principle relevant to this ESCMP seeks to minimise the velocity of flood flow to avoid erosion or increased siltation in a flood event. The plan also provides a list of recording measures to be undertaken after a flood event and specifies that any floodplain management measures implemented must avoid or minimise land degradation, including soil erosion.

Jemalong Land and Water Management Plan, Steering Committee, 2000

The *Jemalong Land and Water Management Plan* (Jemalong Land and Water Management Plan Steering Committee, 2000) provides for the alleviation of land and water degradation, improvement of natural resource management and sustainability of agriculture and the environment in the Jemalong Irrigation District. Relevant to this ESCMP, the plan recommends the remediation of any degraded lands and the reduction of water erosion and sedimentation to reduce salinisation of land and water bodies including Lake Cowal and to protect Lake Cowal wetlands.

Performance indicators include reductions in visible salinity and improved health of wetlands and remnant vegetation. Routine soil salinity surveys are recommended to indicate whether adverse effects on soil and water quality by current land management practices are being minimised. Performance indicators are to be monitored in accordance with a programme based on Jemalong Irrigation Limited's Irrigation Corporation Water Management Works Licence and the CGO Environment Protection Licence (EPL). Issues relating to the effect of erosion and sedimentation on wetlands are proposed to be addressed in more detail in a *Jemalong Irrigation District Wetlands Management Plan*.

Lake Cowal Land and Water Management Plan, Australian Water Technologies Pty Ltd, 1999

This plan identifies environmental issues relevant to Lake Cowal including evidence of soil erosion, declining soil structure and increasing salinity. It recommends that land holders, including Evolution, restrict new scrub clearance to minimise impacts on soil structure and encourage the revegetation of the Lake and margins to slow the rate and volume of runoff, thereby reducing sedimentation of the Lake. It also suggests that landholders participate in, and monitor, trials to develop management options for improving vegetation cover and revegetation.

Lachlan Catchment Action Plan (2013-2023), Lachlan Catchment Management Authority, 2013

The *Lachlan Catchment Action Plan (2013 – 2023)* is a strategic regional plan that builds on the past and addresses the key future natural resource management issues for the catchment (Lachlan Catchment Management Authority [LCMA], 2013). The Lachlan Catchment Action Plan sets out to deliver triple bottom line outcomes for the five social-ecological systems in the catchment and in doing so maintain or improve their resilience (LCMA, 2013).

The CGO sits within the Lachlan Plains social-ecological system. There are no specific 'Priority catchment scale targets' to maintain or increase the Lachlan Plains social-ecological system. However, general strategic priorities for the greater catchment area of relevance to the ESCMP include targets T17 and T18, viz,

T17. Improved water quality

T18. Improved condition of riparian areas, wetlands, flood dependent ecosystems and groundwater dependant ecosystems

The construction and use of sediment and erosion control systems at the CGO (both temporary and permanent) are considered to address Target 17 of the *Lachlan Catchment Action Plan (2013-2023)*. The erosion and sediment control strategies are presented in Sections 3 to 6 of this ESCMP and will be designed to reduce sediment and erosion surface water runoff from within the CGO (ML 1535 and

ML 1791). These strategies are considered consistent with target T17 and T18 of the *Lachlan Catchment Action Plan (2013-2023)*.

The revegetation strategies for the CGO in particular the New Lake Foreshore described in the CGO's Rehabilitation Management Plan and CWMP are considered to be consistent with target T18 of the *Lachlan Catchment Action Plan (2013-2023)*.

Bland Creek Catchment Plan, Bland Creek Catchment Committee, 2002

The Bland Creek Catchment covers an approximate area of 940,950 hectares and is the southern portion of the Lachlan Catchment containing Lake Cowal. There are six sub-catchments within the Bland Creek Catchment, of which the CGO is located in the north of the Barmedman sub-catchment.

The *Bland Creek Catchment Plan* (Bland Catchment Committee, 2002) is divided into two stages. Stage one was developed to address local natural resource and land management issues and an economic analysis of the issues, presenting a 'no-plan' scenario. The Catchment Plan developed by stage one has collated existing information on the Catchment, provides an overview of the Catchment's physical features and socio-economic status and gives an account of the extent and severity of each issue at a sub-catchment level. Stage two was developed from the findings of stage one and provides a Catchment Action Plan, in which priorities are set for future 'on-ground' activities.

The Bland Creek Catchment Action Plan identifies a number of proposed actions to overcome threats and barriers to natural resource management. Actions are provided for soils, water, native vegetation and biodiversity, and salinity.

3 EROSION AND SEDIMENT CONTROL SYSTEMS

3.1 MINE AREA

Details of erosion and sediment control systems for the mine site area (i.e., ML 1535 and ML 1791), for both the construction and operation phases of the CGO are provided in the following subsections. These systems have been developed to meet the objectives of this ESCMP (Section 1.1) include monitoring, ameliorative responses and maintenance activities.

The CGO's initial construction phase included the establishment of major components of the CGO's water management system (i.e. construction of the Temporary Isolation Bund, Lake Protection Bund, Internal Catchment Drainage System, Up-catchment Diversion System and pit dewatering system), process plant and tailings storage facilities. With the exception of the ongoing IWL construction, the CGO is currently in its Operational Phase, which includes all activities associated with resource extraction and development of the approved project.

The CGO has been operational since 2005 however, periodically, parts of the site will be subject to new construction activities such as the new surface facilities associated with the Underground Development approved in September 2021. Further developments of various scales and duration are expected to occur from time to time until the mine eventually closes.

3.1.1 Landscape, Topography and Soils

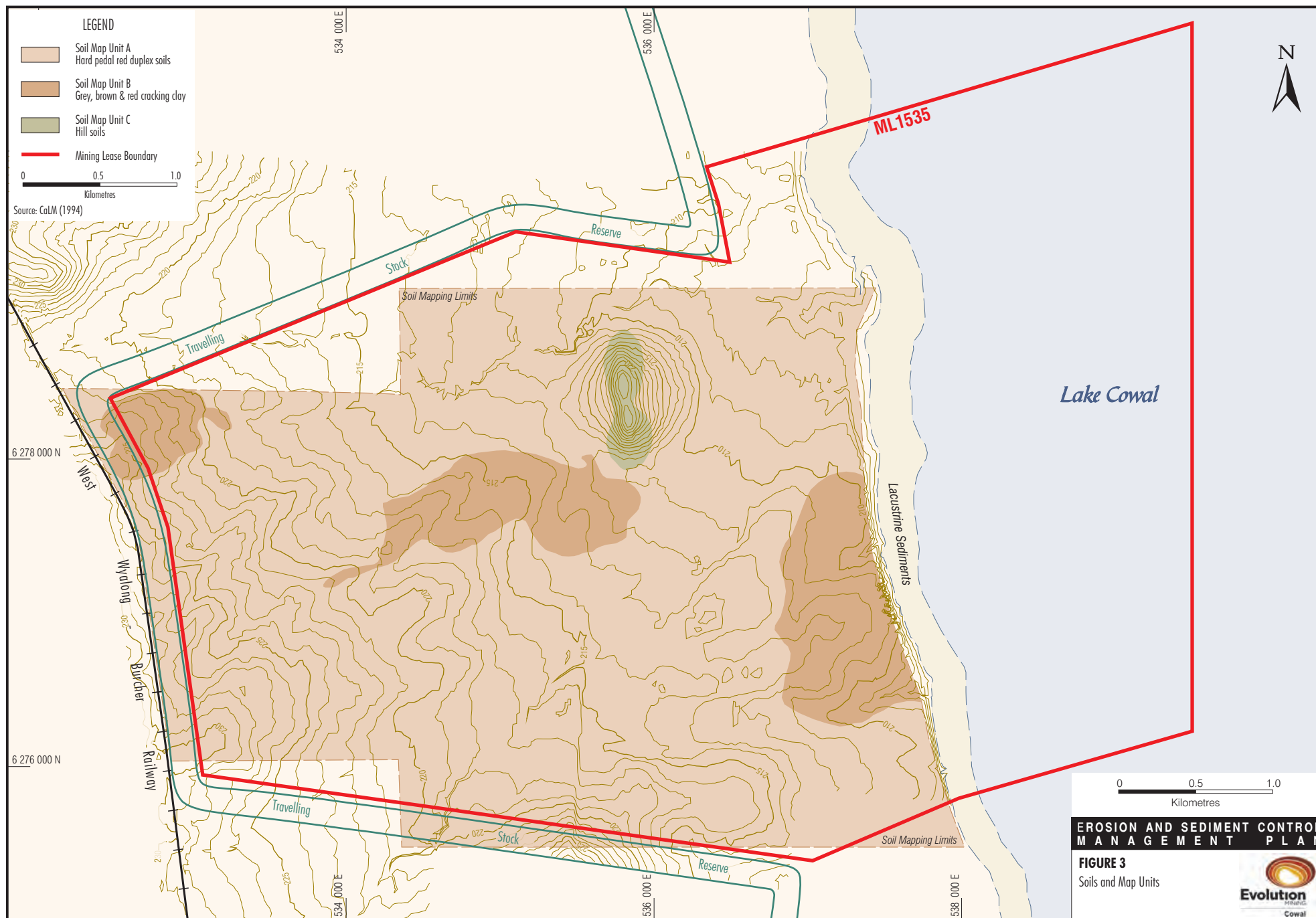
The general landscape of the approved CGO (Figure 2) area is flat to very gently undulating land with occasional rocky outcrops that slope from west to east towards Lake Cowal. It is entirely located within the Bland Creek catchment.

The original suitability assessment of soil types at the CGO was included in North's 1998 EIS (North Limited, 1998a). Appendix B1 (CALM, 1994) and Appendix B2 of the EIS (Resource Strategies, 1997). This assessment included descriptions of soil types, general characterisation of suitable stripping depths for revegetation/rehabilitation activities and formulation of soil stripping and soil stockpiling strategies. The major soil types identified (CALM, 1994) were:

- hard pedal red duplex soils;
- grey, brown and red cracking clays;
- hill soils; and
- lacustrine (lake) sediments.

The soils map units at the CGO are shown on Figure 3.

Descriptions of the soil profile are included in the Soil Stripping Management Plan (SSMP). Soil management measures implemented at the CGO as described in the SSMP are summarised in Section 5 of this ESCMP.



3.1.1 Relevant Standards and Design Criteria

General design criteria for the erosion and sediment control structures used at the CGO are presented below and are largely derived from *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) (Appendix C). Other references are included in Sections 3 to 6 and 10 of this ESCMP. Where there is any contradiction between these other guidelines and the guideline *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004), the latter has taken precedence in the preparation of this document.

Design Average Recurrence Interval

The design average recurrence interval (ARI) used to size individual components of the erosion and sediment control systems presented in this ESCMP is shown in Table 2.

Table 2
Suggested Design Average Recurrence Intervals for Erosion and Sediment Control Measures in Urban Areas

Control Measure	Estimated Design Life	
	0 – 12 Months	> 12 Months
	Design ARI (Years)**	
Diversion Bank	1 – 10	*
Level Spreader	1 – 10	*
Waterway	1 – 10	*
Sediment Basin Primary Outlet	1 – 5	*
Sediment Basin Emergency Outlet	10 – 20	*
Sediment Trap	1 – 5	*
Outlet Protection	1 – 20	*
Grade Stabilisation Structure	1 – 20	*
Detention Basin Primary Outlet	1 – 5	*
Detention Basin Emergency Outlet	10 – 20	*
Waterway Diversion	1 - 2	*

Source: *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004).

* Full design required in accordance with major/minor concept (Institute of Engineers Australia, 1987, revised 2001).

** Designs should generally comply with the upper limit and the ranges specified in the table, unless the consequences of failure are considered low.

Rainfall

Rainfall intensity for the sizing of components of the erosion and sediment control systems uses the method outlined in *Australian Rainfall and Runoff* (Institute of Engineers Australia, 1987, revised 2001) (provided in Appendix D) (or as revised) and *Technical Handbook No. 5 Design Manual for Soil Conservation Works* (Soil Conservation Service of NSW, 1982) (Appendix A) using Intensity-Frequency-Duration (IFD) data. Table 3 contains IFD data for Lake Cowal.

Table 3
Average Storm Recurrence Interval (mm/h) – Lake Cowal

Duration (minutes)	Average Storm Recurrence Interval (years)						
	1	2	5	10	20	50	100
5	59.54	78.38	106.20	123.03	145.87	177.40	202.62
6	55.68	73.28	99.23	114.91	136.20	165.59	189.09
7	52.47	69.04	93.42	108.16	128.17	155.77	177.85
8	49.73	65.42	88.48	102.41	121.33	147.42	168.28
9	47.35	62.28	84.20	97.43	115.40	140.19	160.00
10	45.26	59.52	80.44	93.06	110.20	133.84	152.73
11	43.40	57.07	77.10	89.17	105.58	128.20	146.27
12	41.74	54.87	74.10	85.69	101.44	123.15	140.49
13	40.23	52.89	71.39	82.54	97.70	118.59	135.27
14	38.86	51.08	68.93	79.68	94.29	114.44	130.52
15	37.61	49.42	66.68	77.06	91.19	110.65	126.18
16	36.45	47.90	64.61	74.66	88.33	107.16	122.20
17	35.39	46.50	62.69	72.44	85.69	103.95	118.52
18	34.40	45.20	60.92	70.38	83.25	100.97	115.11
20	32.62	42.85	57.73	66.68	78.85	95.61	108.98
25	29.05	38.15	51.34	59.25	70.04	84.87	96.71
30	26.34	34.57	46.48	53.62	63.35	76.73	87.40
35	24.18	31.73	42.63	49.16	58.06	70.30	80.05
40	22.43	29.42	39.50	45.53	53.76	65.07	74.07
45	20.97	27.50	36.89	42.51	50.17	60.71	69.09
50	19.72	25.86	34.67	39.94	47.13	57.01	64.87
55	18.65	24.45	32.76	37.73	44.51	53.83	61.24
60	17.71	23.22	31.10	35.80	42.23	51.05	58.07
75	15.18	19.86	26.50	30.44	35.83	43.21	49.08
90	13.36	17.46	23.20	26.60	31.26	37.64	42.69
Duration (hours)	Average Storm Recurrence Interval (years)						
	1	2	5	10	20	50	100
2.0	10.89	14.20	18.77	21.45	25.14	30.18	34.17
3.0	8.14	10.58	13.87	15.78	18.43	22.03	24.87
4.0	6.61	8.58	11.18	12.68	14.77	17.61	19.83
5.0	5.63	7.29	9.46	10.71	12.44	14.80	16.64
6.0	4.94	6.38	8.25	9.32	10.82	12.84	14.42
8.0	4.01	5.18	6.66	7.50	8.68	10.27	11.51
10.0	3.42	4.40	5.64	6.33	7.32	8.64	9.67
12.0	3.00	3.86	4.92	5.52	6.36	7.50	8.38
14.0	2.70	3.47	4.42	4.95	5.71	6.72	7.51
16.0	2.46	3.16	4.02	4.50	5.19	6.11	6.82
18.0	2.26	2.91	3.70	4.14	4.77	5.61	6.27
20.0	2.10	2.70	3.43	3.84	4.42	5.20	5.81
22.0	1.97	2.52	3.21	3.59	4.13	4.86	5.42
24.0	1.85	2.37	3.01	3.37	3.88	4.56	5.09
36.0	1.38	1.77	2.24	2.50	2.87	3.37	3.76
48.0	1.11	1.42	1.79	2.00	2.30	2.69	3.00
60.0	.93	1.19	1.50	1.67	1.92	2.25	2.50
72.0	.80	1.02	1.28	1.43	1.64	1.92	2.14

Source: Gilbert and Associates Pty Ltd (September 2003).

mm/h – millimetres per hour.

The depth of rain generated by a rainfall event is determined by multiplying the rainfall intensity of a given ARI event by the duration of the event. For example a 1 in 100 year rainfall event of 48 hours duration corresponds to a rainfall intensity of 3 mm/h, which in turn corresponds to 144 millimetres (mm) of rainfall.

Runoff

Peak flow calculations for components of the erosion and sediment control systems are made using a combination of the Statistical Rational Method (SRM), and the Deterministic Rational Method (DRM) as outlined in Chapter 1, Section 2.2 of the *Technical Handbook No. 5 Design Manual for Soil Conservation Works* (Soil Conservation Service of NSW, 1982) (Appendix A).

The SRM estimates time of concentration as a function of catchment size, and the coefficient of runoff is determined as a function of catchment size, locality and annual exceedance probability (AEP). This method is used on “natural” or untreated catchments to estimate peak discharge. The DRM is used to estimate peak discharge from treated catchments. Time of concentration for the DRM is estimated using flow routing procedures which estimate flow time for individual structures. The runoff coefficient for the DRM is a function of land use, relief, depression storage effects, infiltration and soil factors, and the design AEP, and will be modified using an area correction factor based on catchment size.

Culverts

All culverts are designed and constructed in accordance with details provided in Chapter 5.3.5 of *Managing Urban Stormwater – Soils and Construction Volume 1* (Landcom, 2004) (Appendix C). Culvert crossing capacities are designed in accordance with the methods stated above. Culverts under roads are designed and constructed in accordance with the Austroads *Guide to Road Design*.

Culvert design and construction takes into account a range of factors including purpose, location and materials available. The design storm event is selected based upon an assessment of catchment characteristics and consequence of failure. At a minimum, culverts are designed to convey the 1 in 10 year ARI critical duration flow (i.e. minimum criterion for waterways contained in Table 2).

Sediment Basins

Sediment basins are designed in accordance with procedures detailed in Section 6.3.3 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) (Appendix C). Design particle size and USLE “K” factor are determined from particle size analysis and laboratory testing previously conducted by CALM in 1994.

Attachment 7.1 of Appendix B of the EIS (North Limited, 1998a) provides further advice in relation to the application of USLE “K” factors (CALM, 1994):

Erodibility (USLE K factor)

The Unified Soil Loss Equation includes a soil erodibility factor known as K (Wischmeier and Smith 1978). K factor is a derived index of the susceptibility of a soil to sheet and rill erosion. The formula used to derive the K factor is USLE modified for Australian conditions and based on that used in SOLOSS (Rosewell and Edwards 1988) with profile permeability modified to follow that used by Soil and Water Conservation Society (1993).

Silt and fine sand percentages are derived from fine earth fraction particle size results.

Note: K factor of itself has a very limited value unless used in conjunction with all other factors in USLE.

Attachment 7.3 of Appendix B of the EIS (North Limited, 1998a) indicates that USLE “K” factors range from 0.006 to 0.051 across soil map units A, B, C and K (CALM, 1994). These values correspond to low to moderate erodibility (Attachment 7.3 of Appendix B of the EIS [North Limited, 1998a]). The data presented in Appendix B of the EIS (North Limited, 1998a) is taken into consideration by the design hydrologist when determining sediment basin containment capacities.

As presented in Section 3.1.1 below, containment storages D1 to D10 are, and will continue to be, sized to contain rainfall events ranging from a 1 in 100 year, 48 hour rainfall event to a 1 in 1000 year, 48 hour rainfall event. As a minimum, all other sediment basins have been designed to contain the runoff generated by the 75th percentile 5-day rainfall event as suggested in Section 6.3.3 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) for Type F soils.

The C₁₀ coefficient of runoff used in the Rational Method to estimate average discharge in designing sedimentation basins would be calculated using Table 3.2 in *Urban Erosion and Sediment Control Handbook* (CALM, 1992) (Appendix B) and equations 14.11 and 14.12 in *Australian Rainfall and Runoff* (Institute of Engineers Australia, 1987, revised 2001) (Appendix D) (or as revised).

Diversion Bank Channels and Grassed Waterways

Diversion bank channels and grassed waterways have been designed in accordance with details provided in Chapter 2 of *Design Manual for Soil Conservation Works Technical Handbook No. 5* (Soil Conservation Service of NSW, 1982) (Appendix A) and Section 5.4.4 of *Managing Urban Stormwater - Soils and Construction* (Landcom, 2004) (Appendix C).

Sodicity

Investigations into the dispersivity/stability of CGO soil types (Knight Piesold, 1995) indicated moderate dispersion potential. Further tests conducted using lake water and saline groundwater indicated stability of all water containment structures (including tailings embankments and the temporary isolation bund) would not be compromised by soil dispersion (North Limited, 1998a). Attachment 7.3 of Appendix B of the EIS (North Limited, 1998a) indicates that USLE “K” factors range from 0.006 to 0.051 across soil map units A, B, C and K (CALM, 1994).

Attachment N4 of Appendix N of the EIS (North Limited, 1998a) contains the following in relation to potential soil loss:

The estimate of soil loss due to erosion has been based on the Universal Soil Loss Equation. It is estimated that after rehabilitation the total soil loss from the TSF, waste emplacements and perimeter bund should not exceed 450 tonnes per year. Expressed as an average unit rate this is equivalent to 0.7 tonnes per hectare per year, which is considered to be low. A loss of 1 mm depth of surface soil would equate to about 14 tonnes per hectare.

Measures that have been adopted to mitigate potential impacts on soils at the CGO include (North Limited, 1998a):

- minimising the area disturbed by the CGO and restricting access to non-disturbed areas;
- ripping and rehabilitation of hardstand areas and roads no longer required for access;
- avoidance of soil stripping operations during particularly wet or dry periods, minimising compaction during soil excavation and movement and the use of ameliorants where required (e.g. gypsum application to dispersive soils);
- use of silt fences and temporary sediment traps to minimise sediment movement;
- use of diversion banks, channels and rip-rap structures to divert surface water around disturbed areas and control runoff velocity;
- maintaining soil stockpile slopes at or below maximum acceptable angles to resist erosion;
- constructing all access roads at an appropriate slope along the contour, where practicable;
- the use of spoon drains, table drains and concrete culverts to control surface runoff from access roads; and
- leaving the more saline and dispersive soil horizons *in-situ* beneath mine landforms, where possible.

3.1.2 Construction Phase

The initial construction phase of the CGO has been completed and involved the development of major infrastructure components of the mine in preparation for actual mining of the orebody including (but not limited to):

- internal main access road;
- boundary fences;
- ore stockpile and process plant area;
- soil stockpiles;
- internal mine roads;
- contractors' areas;
- borrow pits;
- earthworks associated with landscaping (earth mounds);
- Up-catchment Diversion System;
- Internal Catchment Drainage System; and
- Lake Isolation System (temporary isolation bund, lake protection bund and perimeter waste emplacement).

The major components of the water management system during the construction pre-production phase included the following:

- (i) Up-catchment Diversion System;
- (ii) Lake Isolation System (including the temporary isolation bund and lake protection bund);
- (iii) Internal Catchment Drainage System ;
- (iv) Integrated Erosion, Sediment and Salinity Control System; and
- (v) Pit Dewatering System.

The Up-catchment Diversion System, Lake Isolation System (including temporary isolation bund, lake protection bund and perimeter waste emplacement) and Internal Catchment Drainage System are described in Section 3.1.2.2 of this ESCMP. The integrated erosion, sediment and salinity control system is described throughout this ESCMP. The pit dewatering system is described in detail in the CGO Water Management Plan (WMP).

Nine contained water storages (D1 to D9) (Figure 4) have been constructed at the CGO to date, with contained water storage D10 yet to be built. A summary of the function, design criteria and capacity of each of the CGO contained water storages is provided in Table 4.

Table 4
Summary of Contained Water Storages

Storage Number	Catchment/Function	Design Criteria	Approximate Storage Capacity (ML)**
Contained Water Storage D1 (Existing)	Runoff from northern perimeter of the northern waste rock emplacement and the IWL. Collected water is pumped to D6.	Runoff from contributing catchment resulting from a 1 in 100 year ARI rainfall event of 48 hours duration	57.8
Contained Water Storage D2 (Existing)	Runoff/seepage from run-of-mine (ROM) and low grade stockpile areas from the northern waste rock emplacement and IWL areas, the southern and eastern batters of the IWL and other areas within the Internal Catchment Drainage System. Collected water is pumped to D6 or D9.	Runoff from contributing catchment resulting from a 1 in 100 year ARI rainfall event of 48 hours duration	198.2
Contained Water Storage D3 (Existing)	Runoff from perimeter catchment surrounding the open pit and the perimeter waste rock emplacement areas. Collected water is pumped to D6.	Runoff from contributing catchment resulting from a 1 in 100 year ARI rainfall event of 48 hours duration	38.1
Contained Water Storage D4 (Existing)	Runoff from the southern perimeter of the southern waste rock emplacement. Collected water is pumped to D6 or D9.	Runoff from contributing catchment resulting from a 1 in 100 year ARI rainfall event of 48 hours duration	62.3
(Process Plant Contained Water Storage) D5A	Process plant area drainage collection. Water is pumped to D6.	Runoff from a 1 in 1,000 year ARI storm of 48 hours duration	78.6
(Process Plant Contained Water Storage) D6 (Existing)	Process water supply storage. Main source of process plant make-up water requirements.	Runoff from a 1 in 1,000 year ARI storm of 48 hours duration above normal operating level	19.3
(Contained Water Storage) D8B (Existing)	Runoff from southern waste rock emplacement, the batters of the southern TSF and other areas within the ICDS Internal Catchment Drainage System. Water is pumped to D9.	Runoff from contributing catchment resulting from a 1 in 100 year ARI rainfall event of 48 hours duration	4330.4
(Process Plant Contained Water Storage) D9 (Existing)	Process water supply storage. Storage for raw water. Water is pumped to D6. Some water used for TSFs lift construction.	Runoff from a 1 in 1,000 year ARI storm of 48 hours duration above normal operating level	726730
(Process Plant Contained Water Storage) D10 (not yet constructed)	Process water supply storage. Storage for raw water. Water is pumped to D9.	Runoff from a 1 in 1,000 year ARI storm of 48 hours duration above normal operating level	1,6371,500

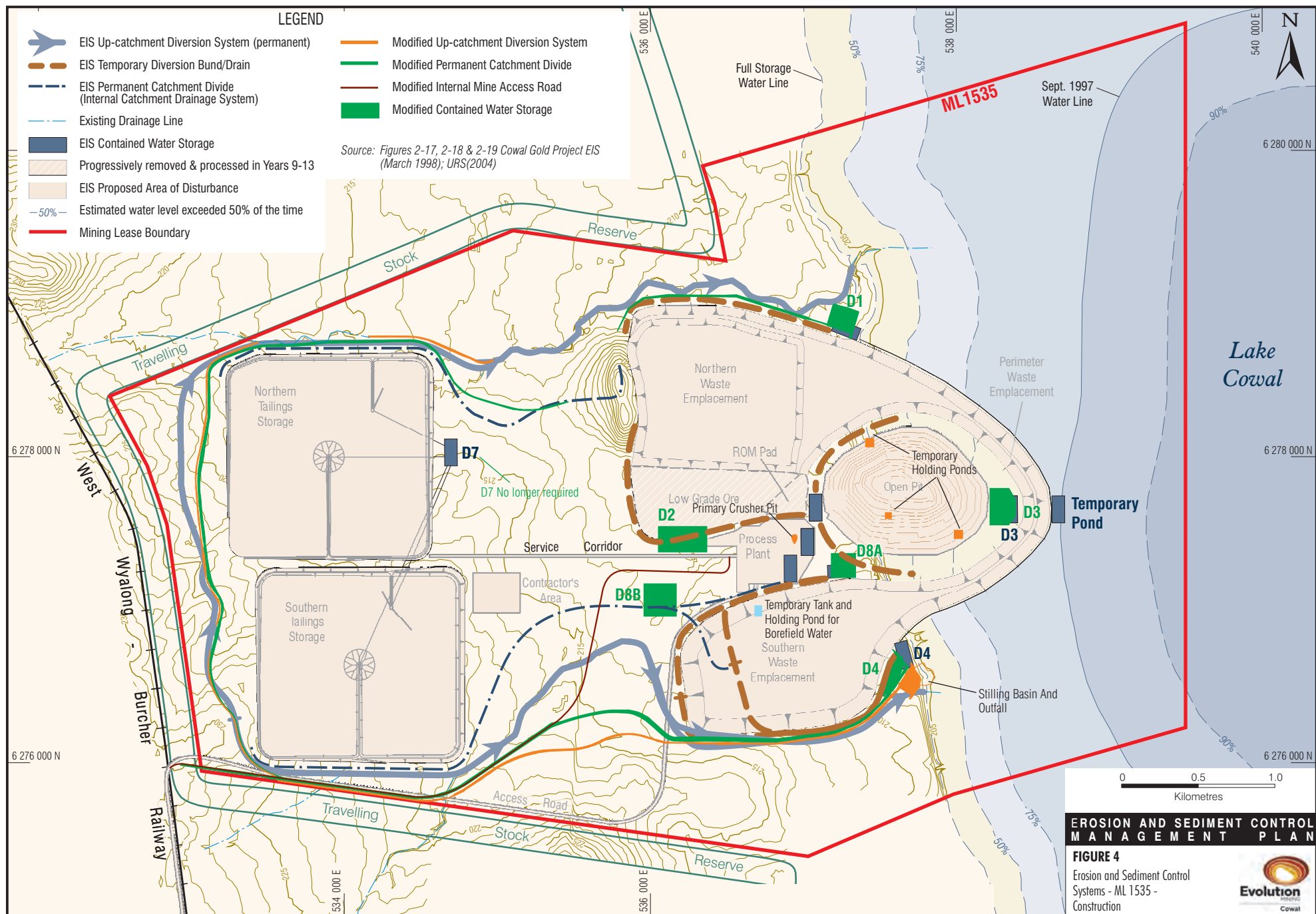
Source: After Hydro Engineering & Consulting (2018).

** Calculated from as-built plans and confirmed by Evolution (HEC, 2018).

ML megalitres.

The potential for erosion and sediment migration in site runoff is high during any construction phase. Given the CGO's proximity to Lake Cowal and the ecological status of the lake, prevention of sediment-laden runoff from the mine site discharging into the lake was, and continues to be, the primary objective of the erosion and sediment control system.

Specific sediment control protection works are put in place prior to initiation of any earthworks at the CGO. Immediately upon completion of earthworks, batter stabilisation and revegetation of disturbed areas commenced.



The CGO water management system includes both permanent features that will continue to operate post-closure (e.g. diversions of surface water around the site, creation of new catchment divides and isolation of the lake from the open pit), and temporary structures (servicing the life of mine requirements only) (North Limited, 1998a).

3.1.2.1 Details of Temporary Erosion and Sediment Control Systems

Soil conservation and water management features that were implemented during the construction phase, where practicable, included (Resource Strategies, 1997):

- *Use of silt fences and sediment traps to minimise soil movement.*
Temporary sediment traps and sediment filters are installed downslope of soil stockpiles where the potential for significant sediment migration was identified in accordance with details provided in Sections 3.4.2 and 3.4.3 of the *Urban Erosion and Sediment Control Handbook* (CALM, 1992) (Appendix B) Straw bales are considered more appropriate where a degree of ponding/energy loss is required, while sediment fences are suited to low energy flows where filtration was the primary objective.
- *Use of diversion banks, channels and rip-rap structures to divert surface water around disturbed areas and control runoff velocity.*
Temporary diversion banks are designed and constructed upslope of disturbance areas where the potential for significant runoff from the upslope undisturbed area to the disturbed area is expected so as to minimise runoff to soil stockpile areas in accordance with details provided in Section 3.3.4.2 of the *Urban Erosion and Sediment Control Handbook* (CALM, 1992) (Appendix B).

Rip-rap structures are designed and constructed to stabilise concentrated water flow paths where the potential for erosion of flow paths by high energy flows is identified in accordance with details provided in Chapter 5.4.5 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) (Appendix C). Rip-rap structures were typically used to dissipate energy where flow paths traversed relatively steep slopes and/or as waters exit constructed channels and enter natural drainage lines.

The CGO disturbance areas have been minimised by using the footprints of other approved disturbance areas for temporary stockpiling of soils during the CGO mine life (SSMP, Section 4.4).

Soil stockpiles from soil stripping operations at the CGO have been constructed in accordance with details provided in Chapter 4.3.2 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) (Appendix C).

Long-term topsoil stockpiles are constructed up to 3 m in height with slopes at a maximum acceptable angle to resist erosion. Subsoil stockpiles vary in height as determined by storage volumes and available space within the footprint of approved disturbance areas. Soil stockpile batters are generally revegetated in accordance with details provided in Section 3.3.6 of the *Urban Erosion and Sediment Control Handbook* (CALM, 1992) (Appendix B).

Measures to control wind-borne dust and soil sediment runoff from soil stockpiles are presented in the CGO Air Quality Management Plan (AQMP). Measures that are implemented during any construction phase include the following:

- avoiding stripping and placement of soil stockpiles during particularly wet or dry periods whenever possible;
- watering of soil stockpiles during construction when conditions indicated the need (i.e. dry conditions when excessive dust is being generated);

- the stabilisation of completed soil stockpiles and monitoring the revegetation of soil stockpiles (either unassisted or assisted, via the application of seed, fertiliser and water) to promote cover and, as a consequence, erosion control;
- use of silt fences and sediment traps to minimise soil movement;
- construction of soil stockpiles of appropriate height and batter angles; and
- minimisation of runoff to soil stockpile areas by using diversion channels or banks to divert surface water around soil stockpiles.

Monitoring and maintenance activities that is undertaken during any construction phase are described in Section 3.4 of this ESCMP.

- *Constructing all access roads at an appropriate slope along the contour, where practicable.*
Internal mine roads were constructed at an appropriate slope along the contour (with the exception of roads within the pit limits) in order to avoid steep grades where practicable. The length of unavoidable steep grades was minimised.
- *The use of spoon drains, table drains and concrete culverts to control surface runoff from access roads.*
Runoff from the road surface was transferred via road side table drains. All drains were designed and constructed in accordance with Section 3.1.1 of this ESCMP and details provided in Chapters 5.4.3 and 5.4.4 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) (Appendix C).

Where the internal mine roads traverse natural drainage lines, culverts were designed and constructed where the potential for significant upslope runoff was identified in accordance with Section 3.1.1 of this ESCMP and details provided in Chapter 5.3.5 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) (Appendix C). Culvert crossing capacities were designed as detailed in Section 3.2 of this ESCMP.

- *Ripping and rehabilitation of roads no longer required for access.*
Decommissioning of the roads no longer required for access involved the ripping, topsoiling and revegetation of the disturbed areas with a cover crop in accordance with details provided in Chapter 7 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) (Appendix C). Rehabilitation was undertaken progressively as described in Section 6 of this ESCMP.

3.1.2.2 Details of Permanent Erosion and Sediment Control Systems

The permanent water management systems/structures which have been constructed for the CGO (thereby providing permanent erosion and sediment control systems) include the following:

- (a) Up-catchment Diversion System;
- (b) Internal Catchment Drainage System; and
- (c) Lake Isolation System (temporary isolation bund, lake protection bund and perimeter waste emplacement).

These permanent water management systems/structures as constructed during the CGO construction phase are shown on Figure 4 and will continue to operate post-closure (e.g. diversions of surface water around the site, creation of new catchment divides and isolation of the lake from the open pit), albeit as modified as a result of approved operations (Section 3.1.3). The operational arrangement of permanent water management systems is also outlined in Figure 4.

(a) Up-catchment Diversion System

The Up-catchment Diversion System is designed to convey upper catchment water around the western edge of the CGO area (near the existing tailings storages) and into the existing drainage lines to the north and south of the CGO site (North Limited, 1998a). The system is designed to manage peak discharge from enhanced “green house” 1 in 1,000 year ARI rainfall event (Gilbert and Sutherland, 1997).

The Up-catchment Diversion System maintains the natural flows of surface runoff to Lake Cowal from the up-catchment (North Limited, 1998b).

Further details are provided in the CGO WMP.

Erosion and Sediment Control System

The erosion and sediment control strategy for the construction of the Up-catchment Diversion System required specific sediment control protection works to be put in place prior to initiation of other earthworks. The key element was the installation of sediment control measures (capable of intercepting and retaining on-site sediment) prior to any surface disturbance associated with construction of the Up-catchment Diversion System occurred (Gilbert and Sutherland, 1997).

The erosion and sediment control measures included the installation of silt fences and hay bale weirs downslope of all disturbed areas (Gilbert and Sutherland, 1997). Temporary sediment traps and sediment filters were installed downslope of all disturbed areas where the potential for significant sediment migration was identified in accordance with details provided in Sections 3.4.2 and 3.4.3 of the *Urban Erosion and Sediment Control Handbook* (CALM, 1992) (Appendix B).

In order to reduce the erosion risk during construction of the Up-catchment Diversion System, dispersive soils (e.g. Gilgai areas commonly associated with Soil Map Unit B [Figure 3]) were excavated and replaced with non-dispersive soils where the potential for significant sediment migration was identified (North Limited, 1998a).

All soils stripped during the construction of the CGO have been managed in accordance with the procedures presented in Section 8 and the SSMP. As described in Section 8.3 of this ESCMP, soils may be treated with gypsum to reduce dispersiveness during stockpiling (North Limited, 1998a). As described in the SSMP and Section 5.2 of this ESCMP, infill testing of soil profiles will be undertaken to confirm the precise depths of soil in a particular area (North Limited, 1998a) and any requirements for amelioration at the time of soil stockpiling.

Immediately upon completion of construction and earthworks associated with the Up-Catchment Diversion System, batter stabilisation and revegetation of disturbed areas was undertaken. As indicated in the former *Mid-Lachlan Regional Vegetation Management Plan – Mid Lachlan Vegetation Guides – Section 3.4 Soils and Soil Conservation*, establishment and/or regeneration of native vegetation in and alongside gullies and creeks is perhaps the most effective use of vegetation for erosion control. Vegetative stabilisation was undertaken generally in accordance with details provided in Chapter 7 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) (Appendix C). Rehabilitation was undertaken progressively.

The Up-catchment Diversion System was designed and rehabilitated generally in accordance with the *Draft Guidelines for the Design of Stable Drainage Lines on Rehabilitated Mine Sites in the Hunter Coal Fields* (DLWC, undated) (Appendix E).

Monitoring and maintenance activities for the Up-catchment Diversion System that were undertaken during the construction phase are described in Section 3.4.

(b) Internal Catchment Drainage System

The Internal Catchment Drainage System is a permanent water management feature which will operate during and after the life of mine. The Internal Catchment Drainage System components constructed during the CGO construction phase included a series of contained water storages (D1 to D9) which were used to contain runoff and sediment from different construction and operational areas, and store water for use in process operations (Figure 4) (North Limited, 1998b).

A key objective of the Internal Catchment Drainage System is that during mining operations water collected within the Internal Catchment Drainage System containment storages is retained within CGO's enclosed water catchment and directed to the Process Water Storage (D6) (Figure 4).

(c) Lake Isolation System

The original Lake Isolation System was designed and constructed to hydrologically isolate and provide a barrier between the open pit and Lake Cowal during CGO development, mining and post-closure. The Lake Isolation System consists of three components that combine to provide a permanent arc around the open pit area, viz. the temporary isolation bund, lake protection bund and perimeter waste rock emplacement. A cross section of the Lake Isolation System is shown on Figure 5. Future developments of the Lake Isolation System may or may not include a perimeter waste rock emplacement.

3.1.2.3 Monitoring and Maintenance

Weekly inspections will be conducted during the course of construction works to ensure that erosion and sediment controls have been installed and performing effectively (i.e. preventing erosion and containing sediment) to minimise erosion and sediment migration. Site inspections will be undertaken by systematically walking around the site to relevant works areas and recording:

- condition of the erosion and sediment control structures;
- maintenance requirements (if necessary) including instructive actions;
- volume of sediment removed (e.g. from sediment basins to retain capacity requirements); and
- sediment disposal locations.

Stockpile areas will also be inspected and where the potential for excessive sediment migration (including dust generation) is identified, remedial/response measures will be enacted as described in the SSMP.

Inspections of sediment control structures and monitoring of water quality and inspections following rainfall events of 20 mm or more in a 24 hour period (within 48 hours of the event) are conducted during construction activities. Rainfall is monitored by the onsite meteorological station and recorded in accordance with DA 14/98 condition 6.2. Sediment control structures are inspected for capacity (i.e. sediment build-up consequently reducing capacity), structural integrity (i.e. stability) and effectiveness (i.e. sediment containment).

A comprehensive water quality monitoring programme (including total suspended solids, total dissolved solids, electrical conductivity, major cations/anions and other key parameters) is maintained in accordance with the Surface Water, Groundwater, Meteorological and Biological Monitoring Programme (SWGMBMP) as required by DA 14/98 condition 4.5(a). Data from water quality monitoring (notably total suspended solids (TSS) indicating settlement of the sediment is occurring) and inspections (sediment build-up) is used to assess the success of sediment control structures and evaluate whether ameliorative or maintenance action is required.

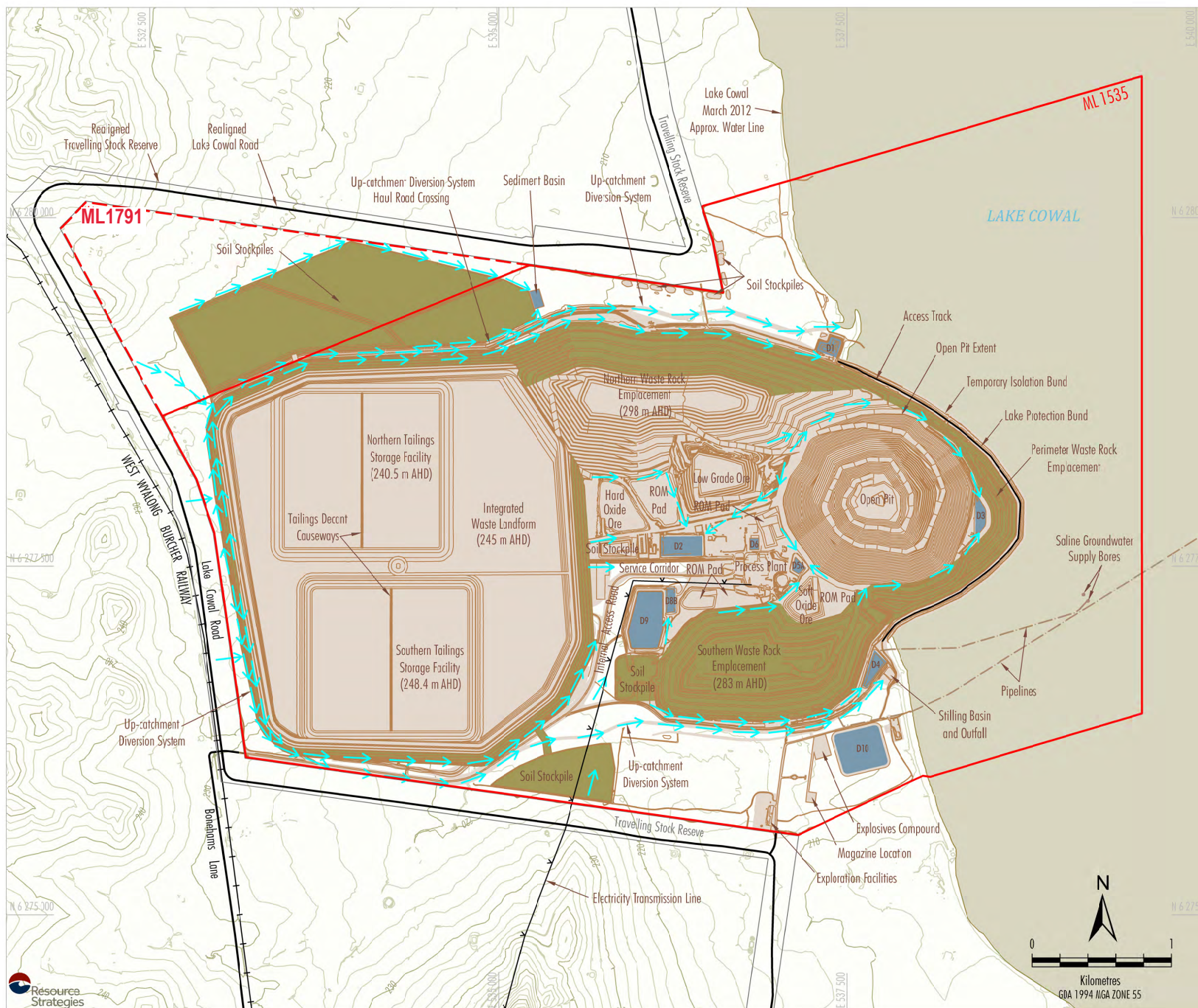
Ameliorative responses and maintenance activities typically used during any construction phase include (from Chapter 8.2 of *Managing Urban Stormwater – Soils and Construction* [Landcom, 2004] [Appendix C]):

- cleaning out of containment structures, diversion drains, etc. where sediment/sand/soil/vegetation builds up;
- repairing of areas of erosion (e.g. lining with a suitable material which may include use of grasses, plastic, geotextile, rock, concrete);
- further application of seed/fertiliser in areas of minor soil erosion and/or inadequate vegetative establishment; and
- installation of additional erosion and sediment control structures.

Ameliorative responses and maintenance activities as described above are conducted generally in accordance with details provided in Chapter 8 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) (Appendix C).

Water quality monitoring of sediment control structures (suspended solids, electrical conductivity and pH) occurs following overflow events (i.e. rainfall events greater than the prescribed design criteria – Section 3.4). Details of monitoring of the Up-catchment Diversion System, contained water storages and temporary storages (e.g. sediment basins) are contained in the SWGMBMP. Generally, water quality monitoring is undertaken monthly in these storages and drains.

Monitoring results are entered into a database and included in the Annual Review.



- LEGEND**
- Mining Lease Boundary (ML 1535)
 - Mining Lease Application Boundary (MLA 1)
 - Approximate Extent of Surface Development
 - Contained Water Storage
 - Rehabilitated Area (shaped and covered with rock mulch and/or topsoil and vegetation)
 - Drainage Path
 - Road
 - Contour m AHD (2 m Interval)

Source: Evolution (2018); © NSW Department of Finance, Services and Innovation (2017)



CGO EROSION AND SEDIMENT CONTROL MANAGEMENT PLAN

Site Arrangement and Water Management Infrastructure

Figure 5

3.1.3 Operational Phase

3.1.3.1 Temporary Erosion and Sediment Control Systems

Temporary erosion and sediment controls for the approved operational phase of the CGO are presented below.

(a) Soil Stockpiles

The temporary systems installed during the construction phase (Section 3.1.2) for soil stockpiles within the Up-catchment Diversion System will continue to function during the operational phase of the CGO. Ongoing monitoring and maintenance will be undertaken as described in Section 3.4.

Additional soil stockpiles will be constructed both in the south of ML 1535, and in north of ML 1535 and in the south of ML 1791 (Figure 4). These soil stockpiles would be located outside of the Up-catchment Diversion System. As such, prior to placement of soil, upslope runoff would be directed around the stockpile area via a system of diversions/drains/bunds.

Runoff from the northern soil stockpile areas would be captured by toe drains (or other suitable structures) and directed to a sediment basin constructed at the eastern boundary of the northern stockpile within ML 1535 (Figure 4). Runoff from the southern soil stockpile area would be captured by toe drains and directed to the Up-catchment Diversion System (also facilitated by an existing internal access road located east of the soil stockpile) and collected by the Stilling and Outfall Basin located to the south-east of the southern waste rock emplacement (Figure 4).

The upslope stockpile diversions and the northern soil stockpile sediment basin would be constructed, operated and maintained in accordance with Landcom's (2004) *Managing Urban Stormwater – Soils and Construction Volume 1* and the Department of Environment and Climate Change (DECC) (2008) *Managing Urban Stormwater – Soils and Construction Volume 2E Mines and Quarries*. In addition, the construction and management of the soil stockpiles will be undertaken in accordance with the measures detailed within the SSMP, WMP and Section 5.

3.1.3.2 Details of Permanent Erosion and Sediment Control Systems

Details of permanent erosion and sediment controls used in the operational phase of the CGO are presented below.

(a) Up-catchment Diversion System

As described in Section 3.1, the Up-catchment Diversion System is a permanent feature designed to direct drainage around the CGO site.

Any future realignment of the Up-catchment Diversion System will be constructed in accordance with the same long-term design criteria as for the existing Up-catchment Diversion System (Table 4) and the design concepts as described in the WMP. Rehabilitation will be undertaken progressively as described in Section 9 of this ESCMP.

Ongoing monitoring and maintenance of the Up-catchment Diversion System including modified sections will be undertaken as described in Section 3.4.

(b) Internal Catchment Drainage System

The Internal Catchment Drainage System comprises a series of cut-off drains and catchment dams that capture potentially contaminated (or sediment-laden) water that falls as rainfall or collected as seepage within the disturbance area of the CGO. After it is collected, the water is pumped to a process water dam for reuse.

When the CGO is finally decommissioned and rehabilitated, the water within the Internal Catchment Drainage System will be directed to any remaining open pit void (North Limited, 1998a).

A decommissioning strategy for the temporary components of the Internal Catchment Drainage System (i.e. the contained water storages) has been developed in accordance with DA 14/98 condition 4.4(b) and is presented in the WMP.

The strategy is during closure, the contained water storages (i.e. D1 to D10) would be dewatered and liners removed. Alternatively, the contained water storages may be retained for local landholder use upon agreement by Evolution and in consultation with Department of Industry – Lands and Water (Dol L&W) and the DRG.

Rehabilitation concepts for the CGO including the Internal Catchment Drainage System are described in the RMP.

(c) Open Pit

The Lake Isolation System (Section 3.1) provides a permanent barrier around the open pit area (Gilbert and Sutherland, 1997), and prevents erosion and sediment flow toward the lake (Figure 4).

The catchment area draining to the open pit during operations will be restricted to the pit itself and to a small perimeter area enclosed by an external bund. Water management structures will be installed to divert water from other areas of the site outside of this bund to site runoff collection ponds (i.e. D3). The pit will also act as a final water containment point in extreme rainfall events (North Limited, 1998a).

The open pit design includes water management structures (face seepage collection drains) and in-pit sumps in the floor of the pit. The in-pit sumps will be sized to store runoff from a medium sized (1 in 10 year) rainfall event (North Limited, 1998a).

Sediment fluxes are expected to reduce as a result of the CGO. Whilst the soil loss rate is likely to be higher from the disturbance areas than under pre-mining conditions, the final void will intercept a large proportion of runoff, preventing a large proportion of suspended sediment from entering the lake (North Limited, 1998b).

(d) Tailings Storages/IWL

Erosion and Sediment Control System

An interceptor drain will be constructed under the outer lower embankment of the IWL to capture any runoff or seepage through the embankment. Water collected in these drains is directed to external sumps and then pumped directly back to the plant. External areas outside the IWL will either run into these interceptor drains and or water runoff will make its way to D1 and D2 (Table 4).

Erosion control of the tailings storages/IWL during operations is designed so that the outer batters are constructed with surface roughness (through addition of cover such as rock mulch or pasture cover) and with reverse grading berms which longitudinally “drain” to low depressions within the berms. Coupled with a deep cover (of subsoil and topsoil) on the top surfaces, the IWL landform will eventually act to absorb and store rainfall.

Rehabilitation Objectives

The rehabilitation objectives for the IWL are (Evolution, 2018):

- to establish permanently stable landforms;
- during operations, stabilise batters so that they provide minimal habitat value for bird life (i.e. rock mulch or pasture cover);
- post-operations, to establish vegetative communities (including Eucalypt and Riverine woodland species and understorey species such as Rush species and grass species) which are suited to the hydrological features and substrate materials of the landforms;

- post-operations, to establish vegetation communities (including native and/or endemic Eucalypt Woodland, shrubland and grassland species) similar to those remnants in the surrounding landscape which are suited to the substrate materials and slope of the embankments; and
- to exclude grazing and agricultural production.

Consistent with the rehabilitation concepts for the outer batters of the waste rock emplacements, benign primary waste rock mulch will be incorporated into the rehabilitation cover system for the outer batters of the IWL to provide long-term stability, control surface water runoff downslope and reduce erosion potential. The rock mulch will be cross-rippled with gypsum-treated topsoil along the contour of the slope to create 'troughs and banks' to further minimise the potential for erosion downslope and enhance vegetation establishment within the troughs. Revegetation would be undertaken with select native and/or endemic Eucalypt Woodland, shrubland and grassland species suited to the slope and substrate materials of the embankment. The depth of soil cover applied would be informed by rehabilitation trial results.

Rehabilitation of the IWL top surface will only be undertaken at the completion of deposition of tailings. The top surface of the IWL would form a low, internally draining landform, with drainage affected by controlled placement of cover materials and a number of shallow swales. The IWL surface would form lower and upper internally draining catchments to minimise surface water runoff from the top surface down the batters of the IWL.

(e) Northern and Southern Waste Rock Emplacements

Waste rock will be placed in a continuous waste emplacement surrounding the open pit consisting of three areas:

- northern waste rock emplacement;
- southern waste rock emplacement; and
- perimeter waste rock emplacement (part of the Lake Isolation System - Section 3.1) of this ESCMP).

Rehabilitation Objectives

The rehabilitation objectives for the waste rock emplacements are to (Evolution, 2018):

- stabilise batter slopes with rock armour (primary waste rock mulch) to control surface water runoff downslope and reduce erosion potential in the long-term;
- provide a stable plant growth medium able to support long-term vegetation growth, including native and/or endemic Eucalypt Woodland, shrubland and grassland species suited to slope and elevated positions similar to those remnants in the surrounding landscape; and
- exclude grazing and agricultural production.

Based on the results of rehabilitation trials and research conducted to date, the rehabilitation cover system for the outer batters of the waste rock emplacements will include benign primary waste rock mulch to provide long-term stability, control surface water runoff downslope and reduce erosion potential. The rock mulch will be cross-rippled with gypsum-treated topsoil along the contour of the slope to create 'troughs and banks' to further minimise the potential for erosion downslope and enhance vegetation establishment within the troughs.

The approved operations include the processing of mineralised material and would therefore remove the mineralised material stockpile as a component of the northern waste rock emplacement landform (dependent on market conditions). Should the mineralised material emplacement remain as a final landform, the rehabilitation objectives and concepts for the waste rock emplacements described in this section would be applied to the mineralised material emplacement and temporary ore stockpiles.

Erosion and Sediment Control System

The northern and southern waste rock emplacements have been designed to meet the long-term goal of containing potentially saline seepage generated from waste rock emplacement areas during operation and post-closure.

Drainage on the top surfaces of the waste rock emplacements would be managed via a series of small shallow basins (depressions) and would include a rehabilitation cover system that absorbs rainfall and comprises woodland vegetation (Evolution, 2018). The use of depressions would be aimed at maximising internal drainage without creating permanent ponding during normal and heavy rainfall events. A bund around the perimeter of the top surfaces of the waste rock emplacement would also be constructed to provide a contained catchment and minimise surface water runoff from the top surface down the batters.

(f) Lake Isolation System

As described in Section 3.1.2.2, the Lake Isolation System has been designed to hydrologically isolate and provide permanent mutual protection between the open pit and Lake Cowal during CGO development, mining and post-closure.

Temporary Isolation Bund

Decommissioning and rehabilitation of the temporary isolation bund will be in accordance with the RMP (Evolution, 2018) including revegetation of the New Lake Foreshore with species as described in the CWMP.

Consistent with the rehabilitation concepts for the outer batters of the waste rock emplacements and IWL, benign primary waste rock mulch will be incorporated into the rehabilitation cover system for the outer batter of the lake protection bund to provide long-term stability, control surface water runoff downslope and reduce erosion potential. The rock mulch will be cross-ripped with gypsum-treated topsoil along the contour of the slope to create 'troughs and banks' to further minimise the potential for erosion downslope and enhance vegetation establishment within the troughs.

During the reworking of the bund during decommissioning, temporary sediment traps and sediment filters (e.g. straw bales and/or sediment fences) will be installed downslope of disturbance areas where the potential for significant sediment migration is identified (as determined by the Sustainability Manager or delegate) in accordance with details provided in Sections 3.4.2 and 3.4.3 of the *Urban Erosion and Sediment Control Handbook* (CALM, 1992) (Appendix B).

Ongoing monitoring and maintenance of the IWL toe drains will be undertaken as described in Section 3.4.

Lake Protection Bund

The lake protection bund forms part of the new lake foreshore (Figure 5).

Rehabilitation of the New Lake Foreshore will be an iterative process and revegetation species will continue to be selected in consideration of:

- Lake Cowal's hydrological regime (wetting and drying cycles);
- species occurring in relevant reference sites (including lake and slope woodland communities);
- species performance during revegetation trials; and
- suitability to substrate conditions.

Subject to these parameters, species may be selected from the following vegetative suites:

- fringing lake vegetation on foreshore batters (i.e. Eucalypt dominated woodland including River Red Gum [*Eucalyptus camaldulensis*], River Cooba [*Acacia stenophylla*], Wilga [*Geijera parviflora*], Kurrajong [*Brachychiton populneus*], Green Wattle [*Acacia deanei*] and Grey Box [*Eucalyptus microcarpa*]); and
- freshwater habitats (i.e. Foxtail [*Austrostipa densiflora*], Rush, Cane Grass [*Eragrostis australasica*] and Lignum).

Revegetation concepts and methods for the New Lake Foreshore are described in detail in the CWMP and RMP.

Erosion and sediment control for the lake protection bund will be affected by the temporary isolation bund. As described above, during the decommissioning phase, the temporary isolation bund will be reworked and breached once the lake protection bund is stabilised and revegetated (i.e. once stabilisation measures are effectively performing to prevent erosion and contain sediment).

Ongoing monitoring and maintenance is described in Section 3.4.

Perimeter Waste Rock Emplacement

The first batter of the perimeter waste rock emplacement is now part of the new lake foreshore (Figure 5). As stated earlier, any future redevelopment of the Lake Isolation System may or may not include a waste rock emplacement.

Erosion and sediment control for the perimeter waste rock emplacement is linked to the temporary isolation bund and lake protection bund. Consistent with the rehabilitation concepts for the outer batters of the waste rock emplacements and IWL, benign primary waste rock mulch has been incorporated into the rehabilitation cover system for the outer batters of the perimeter waste rock emplacement to provide long-term stability, control surface water runoff downslope and reduce erosion potential. The rock mulch has been cross-rippled with topsoil along the contour of the slope to create 'troughs and banks' to further minimise the potential for erosion downslope and enhance vegetation establishment within the troughs.

Ongoing monitoring and maintenance of the perimeter waste rock emplacement is described in Section 3.4.

Earthworks Associated with Landscaping

As described in Section 3.3.2 of this ESCMP, the earth mounds constructed for landscaping/screening purposes will remain as permanent features. Vegetative stabilisation will be generally undertaken in accordance with details provided in Chapter 7 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) (Appendix C). Rehabilitation will be undertaken progressively as described in Section 9 of this ESCMP.

Ongoing monitoring and maintenance is described in Section 3.4.

3.1.3.3 Monitoring and Maintenance

During any future construction phases, regular inspections of erosion and sediment control systems will be conducted by the Sustainability Manager (or delegate) to ensure the systems are performing as designed and that any revegetation areas have properly established. Site inspections will be undertaken by systematically walking around the construction areas to relevant areas and recording:

- condition of the erosion and sediment control structures;
- maintenance requirements (if necessary), including instructive actions;
- volume of sediment removed (e.g. from sediment basins to retain capacity requirements); and
- sediment disposal locations.

Stockpile areas will also be inspected and where the potential for excessive sediment migration (including dust generation) is identified, remedial/response measures will be enacted as described in the SSMP.

Inspections of sediment control structures and monitoring of water quality and inspections following rainfall events of 20 mm or more in a 24 hour period (within 48 hours of the event) will be conducted during the operational phase by the Sustainability Manager (or delegate). Rainfall events will be monitored as part of the meteorological monitoring programme and recorded in accordance with DA 14/98 condition 6.2. Sediment control structures will be inspected for capacity (i.e. sediment build-up consequently reducing capacity), structural integrity (i.e. stability) and effectiveness (sediment containment).

A comprehensive water quality monitoring programme (including total suspended solids, total dissolved solids (TDS), electrical conductivity (EC), major cations/anions and other key parameters) will be undertaken in accordance with the SWGMBMP and DA 14/98 condition 4.5(a) across the site. Data from monitoring of water quality (i.e. low total suspended solids [TSS] indicating settlement of the sediment is occurring) and inspections (sediment build-up) will be used to assess the design of sediment control structures and will be used to evaluate necessary ameliorative responses and maintenance activities (North Limited, 1998a).

Ameliorative responses and maintenance activities may include (from Chapter 8.2 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004)) (Appendix C):

- cleaning out of containment structures, diversion drains, etc. where sediment/sand/soil/vegetation build up;
- repairing of areas of erosion (e.g. lining with a suitable material which may include use of grasses, plastic, geotextile, rock, concrete);
- further application of seed/fertiliser in areas of minor soil erosion and/or inadequate vegetative establishment; and
- installation of additional erosion and sediment control structures.

Ameliorative responses and maintenance activities as described above will be conducted generally in accordance with details provided in Chapter 8 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) (Appendix C).

Maintenance of soil conservation works and revegetated areas is undertaken periodically as part of the rehabilitation programme (Sections 8 and 9 of this ESCMP). Monitoring of previously stabilised and revegetated areas associated with the lake isolation system is part of the rehabilitation programme. Ameliorative responses and maintenance activities as detailed above are carried out when problems are identified.

Water quality monitoring of sediment control structures (including TSS, EC and pH) occurs following overflow events (i.e. rainfall events greater than the prescribed design criteria – Section 3.2 of this ESCMP). Details of monitoring of the up-catchment diversions, contained water storages and temporary sediment storages are contained in the SWGMBMP. Generally, water quality monitoring is undertaken monthly in these storages and drains.

Monitoring results are entered into a database and reported in the Annual Review as described in the SWGMBMP.

3.2 SALINE BOREFIELD (ML 1535)

CGO's saline groundwater supply borefield is situated within ML 1535 and supplies low quality for CGO's process water needs. In accordance with DA 14/98 condition 4.2(a)(i) and (ii), the pipelines from the saline groundwater supply borefield to the site were constructed to the satisfaction of the Department of Primary Industries – Fisheries and the Office of Water; and specifically, laid in such a way as to not impede the passage of fish or other animals, interfere with flood behaviour or the passage of boats and vehicles.

As the pipeline is buried, the erosion and sediment control systems are limited to ongoing monitoring and maintenance activities described in Sections 3.2.1 and 3.2.2 below.

3.2.1 Monitoring and Control Systems

In accordance with DA 14/98 condition 4.2(a)(iii), the water supply pipeline was installed with an automatic shut-down device so water pumping is immediately stopped in the event of any pipe rupture. The water supply will not be restarted until the rupture is located and repaired. The saline groundwater supply borefield is only operated when Lake Cowal is dry and, in this way, negates the risk of any potential impacts on lake water quality (Gilbert and Associates, 2008).

3.2.2 Monitoring and Maintenance

Maintenance activities will be conducted generally in accordance with details provided in Chapter 8 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) (Appendix C).

Maintenance of revegetated lake bed areas will be undertaken periodically as part of the rehabilitation programme (Section 6).

3.3 BOREFIELD AND PIPELINES

CGO's four production bores in the Bland Creek Palaeochannel are located approximately 20 km to the east north-east of the CGO site (Figure 6).

The borefield reticulation system includes (North Limited, 1998a):

- a break pressure/balancing storage after the final bore; and
- a buried 600 mm (approximately) diameter pipeline to the CGO.

The Eastern Saline Borefield is located approximately 10 km east of Lake Cowal's eastern shoreline, and north-east of the Bland Creek Palaeochannel borefield (Figure 6). It has five production bores.

In general, borefields operate in drier times and are rested in wetter times when the site water supply would make-up the supply from this source. Water from the Eastern Saline Borefield is pumped via the Bland Creek Palaeochannel borefield water supply pipelines to the CGO.

As the existing pipeline is buried, the erosion and sediment control systems are limited to ongoing monitoring and maintenance activities during lake dry conditions.

The water supply pipeline from the Bland Creek Palaeochannel Borefield (up to Bore 4) has been duplicated and has similar surveillance and control systems as the original. Construction of the new pipeline and rehabilitation of disturbance areas within the existing pipeline corridor was undertaken in consideration of the DoI L&W's *Controlled Activities on Waterfront Land - Guidelines for Laying of Pipes and Cables in Watercourses on Waterfront Land*, and in accordance with the CGO's RMP, SSMP and WMP.

Decommissioning of the water supply pipelines will be undertaken in accordance with the CGO's Strategy for the Decommissioning of Water Management Structures and Long-term Management of Final Void and Lake Protection Bund described in the WMP.

3.4 MONITORING AND MAINTENANCE

Once construction of the new pipeline was completed, inspections of the pipeline corridor are undertaken by the Sustainability Manager (or delegate) as required to ensure revegetation areas along the pipeline corridor have properly established. Inspections are undertaken systematically to record:

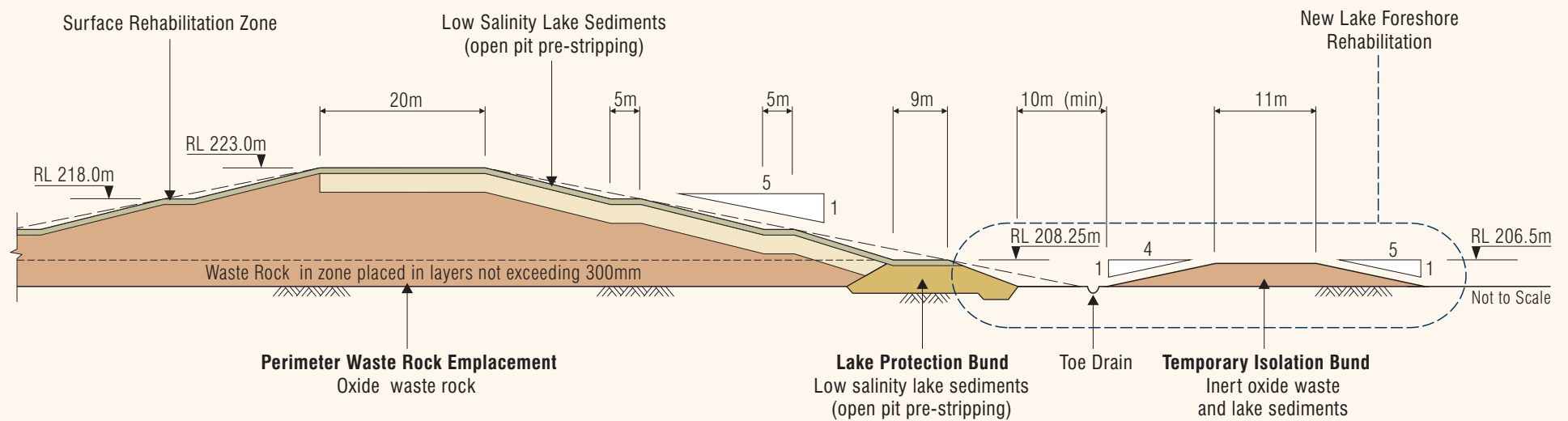
- condition of any temporary erosion and sediment control structures temporarily retained after construction; and
- maintenance requirements (if necessary) including instructive actions or supplementary seeding.

Ameliorative measures for the borefields and pipelines may include (from Chapter 8.2 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) (Appendix C):

- cleaning out of containment structures, diversion drains, etc. where sediment/sand/soil/vegetation builds up;
- repairing of areas of erosion (e.g. lining with a suitable material which may include use of grasses, plastic, geotextile, rock, concrete);
- further application of seed/fertiliser in areas of minor soil erosion and/or inadequate vegetative establishment; and
- installation of additional erosion and sediment control structures.

Maintenance activities as described above are conducted generally in accordance with details provided in Chapter 8 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) (Appendix C).

Maintenance of revegetated areas is undertaken periodically as part of the rehabilitation programme (Section 6).



**EROSION AND SEDIMENT CONTROL
MANAGEMENT PLAN**

FIGURE 6

Lake Isolation System
Construction Details



4 SALINITY MANAGEMENT

Many saline areas in NSW (e.g. inland salt pans, brackish streams, coastal salt marshes and naturally saline soils) are the result of entirely natural processes. Most newly salinised areas however, are often the result of particular land use practices, such as over-clearing, river regulation, irrigation or the cultivation of crops (DLWC, 2003b).

Salinity is often divided into several different categories including:

- (a) Dryland Salinity;
- (b) Irrigation Salinity;
- (c) Urban Salinity;
- (d) River Salinity; and
- (e) Industrial Salinity.

Irrigation salinity (i.e. due to over-irrigation of farmland, inefficient water usage and poor drainage) and urban salinity (i.e. due to dryland salinity processes and over-watering of towns and urban areas) are not relevant to the CGO.

The three different types of salinity relevant to the CGO (i.e. dryland, river and industrial salinity) are described in the following subsections and include details of salinity management measures, where relevant. These measures are provided to meet the objectives relating to salinity management of the relevant local and regional management plans (e.g. *Floodplain Management Plan Steering Committee*, 2000], *Lake Cowal Land and Water Management Plan* [Australian Water Technologies Pty Ltd, 1999], the *Bland Creek Catchment Plan* [Bland Creek Catchment Committee, 2002] and *Lachlan Catchment Action Plan (2013-2023)* [Lachlan Catchment Management Authority, 2013]) described in Section 2.5.

4.1 DRYLAND SALINITY

Dryland salinity is the build-up of salt in the soil, usually as a result of a rising water table. Evaporation of saline water at the soil surface tends to concentrate salts to the point where they affect the environment (DLWC, 2003b).

In rural areas, dryland salinity associated with rising water tables is often caused by the loss of deep-rooted perennial trees, shrubs and grasses. The loss of vegetation is often caused by factors such as clearing, soil acidity, overgrazing or erosion (DLWC, 2003b).

The Lake Cowal Foundation (2013) states that Lake Cowal is under threat by dryland salinity induced by poor catchment management practices. The lake (outside of ML 1535) is subject to grazing and cropping below the lake full storage line when the lake recedes in dryer times (Lake Cowal Foundation, 2013). No grazing of areas occurs within ML 1535 and ML 1791.

Measures that have been adopted to manage the factors that affect dryland salinity as discussed above include:

- *Minimising the areas disturbed by the CGO components and restricting access to non-disturbed areas*
Clearing of areas for the CGO components during the construction and operational phases will be limited and clearly delineated, where appropriate, with barrier mesh (upslope) and sediment fencing (downslope) or similar materials in accordance with details provided in Chapter 4.2 of *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004) (Appendix C). Unrestricted vehicular plant access to undisturbed areas will not be permitted. Vegetation in close proximity to works areas will be demarcated with flagging tape (or similar) so as to prevent disturbance. All employees

undertaking the site induction/training programme will be made aware of the importance of remaining within the defined works areas.

- *Identification of saline soils (infill testing) and selective soil resource management*

As described in the SSMP and summarised in Section 8.1 of this ESCMP, infill testing of soil profiles will be undertaken to confirm the precise depths of soil and any requirements for amelioration at the time of soil stripping. Where possible, the more saline and dispersive soil horizons are left *in-situ* beneath mine landforms (North Limited, 1998a). Topsoil and subsoil resources are stripped and stored in separate stockpiles comprising topsoil; low salinity subsoil; gypsum treated subsoil; and native seed topsoil. Stripped non-saline soils are stored in dedicated stockpile areas for re-use during construction and progressive rehabilitation works. Low salinity topsoils/soils are selectively placed on the outer face of the waste rock emplacement. Stripped soils not suitable for construction or rehabilitation are placed in the waste rock emplacements (North Limited, 1998a) or ameliorated as described within the SSMP.

- *Identification of low salinity construction material (construction fill testing) and selective resource management*

Fill used for construction is tested for geochemical and geotechnical suitability prior to construction commencing. Suitable fill will be sufficiently impermeable, low dispersion, low salinity and not acid forming. Where possible, the more saline and dispersive soil horizons are left *in-situ* beneath mine landforms (North Limited, 1998a). The lake protection bund has been constructed with low salinity lake sediments.

- *Fencing ML 1535 and ML 1791 to restrict stock and prevent overgrazing and erosion*

A fence has been constructed around the perimeter of ML 1535 and ML 1791 (except for the portion of the shared boundary). The fence is currently inspected on a weekly basis for integrity and pest livestock by the Sustainability Manager (or delegate).

- *Implementation of appropriate erosion and sediment control systems and ongoing monitoring and maintenance*

Erosion and sediment control systems as described in Sections 3, 4, 5 and 6 will be implemented to minimise erosion and the loss of vegetation and hence minimise salinity. The monitoring and maintenance activities for erosion and sediment controls described in Sections 3.4 is also undertaken during the life of the CGO in order to manage salinity related issues. Specifically, water quality monitoring of water contained in sediment control structures (i.e. suspended solids, electrical conductivity and pH) will occur following overflow events (i.e. rainfall events greater than the prescribed design criteria – Section 3.1.1). Details of monitoring of the up-catchment diversions, contained water storages and temporary storages are contained in the SWGMBMP. Generally, water quality monitoring is undertaken monthly in these storages and drains.

4.2 RIVER SALINITY

Surface water runoff from areas of dryland, irrigation and urban salinity may flow into creeks and rivers, raising their salinity. According to the Murray-Darling Basin Commission Salinity Audit, salinity is likely to rise to high levels in future in the Bogan, Castlereagh, Lachlan, and Macquarie and Namoi Rivers (DLWC, 2003b).

Measures adopted for the CGO to manage river salinity include:

- *Containment and management of saline surface water runoff*

Soil and waste rock characterisation programmes have identified materials to be disturbed during the construction and development of CGO that have the potential to generate salinity (CALM, 1994; Resource Strategies, 1997; EGi, 1997). Accordingly, the CGO water management strategy incorporates design elements to contain surface runoff or seepage likely to contain increased salt concentrations (Gilbert and Sutherland, 1997). This includes some waste rock and subsoil

materials that have moderately to highly saline runoff and seepage that has the potential to retard revegetation and affect local water resources if not controlled. The CGO's water management systems therefore incorporates interception drains (toe drains) and collection storages (temporary sediment basins and contained water storages) around all stockpile areas, waste rock emplacements, tailings emplacements and structures containing saline materials. Water that accumulates in these storages is captured for reuse in the process water supply. Furthermore, contained water storages D1 and D4 are fitted with pumps capable of transferring the first flush of initial captured runoff waters (typically saline and containing sediment) from the outer batters of the northern and southern waste rock emplacements and IWL to the designated process water contained water storages.

- *Open pit/final void salinity sink*

During CGO operations, water will accumulate within the open pit as a result of controlled drainage of surface water runoff during wet weather and groundwater inflows (Evolution, 2018). This water is managed in accordance with a pit dewatering programme described in the WMP. A large proportion of runoff is directed to the final void will intercept, preventing sediment from entering Lake Cowal. As a result, salt loads entering the lake from the CGO are expected to marginally decrease post-mining as salt will also be trapped by the void (North Limited, 1998b).

In accordance with DA 14/98 condition 4.4(b), a strategy for the long-term management of the final void has been developed in consultation with the DoL L&W, EPA, Division of Resources and Geoscience and the Community Environmental Monitoring and Consultative Committee (CEMCC), and to the satisfaction of the Planning Secretary. The strategy is described in the WMP and includes long-term monitoring of the water quality in the final void and the stability of the void walls.

4.3 INDUSTRIAL SALINITY

Industrial salinity is often related to industrial processes, whereby salt is concentrated in the water used over time. Mine workings often need to manage saline water from groundwater seepage and from rainwater coming into contact with saline mined materials. Abandoned mines are also a major source of salinity in some areas (DLWC, 2003ab).

Measures to be adopted for the CGO to manage industrial salinity include:

- *Isolation of saline groundwaters by the open pit.*

Isolation of groundwaters within the Internal Catchment Drainage System (Section 3.1.2.2) will be achieved by virtue of the permanent groundwater sink that will be formed as a result of open pit dewatering (Gilbert and Sutherland, 1997). Waters that accumulate within the open pit will be managed in accordance with a pit dewatering programme described in the WMP. The effect of the open pit will be to locally depress the groundwater table (potentiometric surface) such that all groundwater movement in the surrounding area will be towards the void (Gilbert and Sutherland, 1997). This effect will also reduce salinity associated with the rising groundwaters which is the greatest long-term threat to the values of the lake and the surrounding area (Williams, 1993 and ERIC, 1996 in Australian Water Technologies Pty Ltd, 1999). More recent groundwater modelling by Coffey (Coffey 2020a,b) predicts no overspill and no connection between the lake and the mine void.

- *Containment of potentially saline seepage generated from waste rock emplacement and IWL areas*

The northern and southern waste rock emplacements have been designed to meet the long-term goal of containing potentially saline seepage generated from waste rock emplacement areas during operation and post-closure. Construction will involve surface preparation works to facilitate the direction of any permeating waters towards the open pit. The existing topography of the footprint has been altered by stripping topsoil and subsoil from the waste rock emplacement footprints. In addition, oxide waste rock has been placed and compacted (using haul truck movements) across

the footprints. The resulting basement for the emplacements slopes towards the open pit to provide drainage control. Any waters permeating through the emplacement are expected to be intercepted by this layer and preferentially flow towards the open pit (North Limited, 1998a).

Similar to the existing tailings storage facilities, the IWL will be constructed with a low permeability basement layer to control seepage. There are a series of interceptor drains and fingers under the rock embankment designed to capture stormwater that permeate through the rock embankment. This water is directed to an external sump and sent back to the mill for reuse. This water is also tested periodically for contaminants. A detailed description of the IWL design is provided in the WMP.

- *Containment and management of saline surface water runoff*
As described above to manage river salinity, the CGO's water management strategy incorporates interception drains (toe drains) and collection storages (temporary sediment basins and contained water storages) around all stockpile areas, waste rock emplacements and IWL to contain saline materials.
- *Final void management and monitoring*
As described above to manage river salinity, a strategy for the long-term management of the final void has been developed and will include long-term monitoring of the water quality in the final void.

5 SOIL MANAGEMENT

The principal strategy in soil resource management at the CGO is to strip suitable soil resources from all proposed disturbance areas within ML 1535 and ML 1791 and directly replace on rehabilitation areas or store in dedicated stockpiles for re-use during progressive rehabilitation works.

The strategies/objectives for management of the CGO soil resources include (Evolution, 2018):

- characterisation of the suitability of the material for rehabilitation purposes prior to stripping;
- soil resources are stripped, stored selectively and managed according to their suitability for rehabilitation purposes;
- sufficient subsoil and stable topsoil are available for rehabilitation purposes;
- progressive rehabilitation of final landforms is conducted as soon as practicable after completion of the landforms or when areas are no longer required; and
- soil resources are stripped and stored in such a manner that their long-term viability is maintained.

5.1 SOIL STRIPPING SCHEDULING

Disturbance areas are stripped progressively, to reduce potential erosion and sediment generation, and to minimise the extent of topsoil stockpiles and the period of soil storage.

Prior to soil stripping, testing of soil profiles is undertaken to confirm the precise depths of suitable soil and any requirements for amelioration at the time of soil stockpiling. Stakes may be used to delineate soil boundaries and to identify suitable stripping depths for equipment operators.

Soil stripping scheduling and details regarding the volume of topsoil proposed to be stripped will continue to be provided in the MOP.

The SSMP provides further detail.

5.2 SOIL STRIPPING PRACTICES

5.2.1 Pre-Stripping Activities

Cultural Heritage Inspection

Soil stripping activities within ML 1535 and ML 1791 (including preliminary soil testing) are managed to comply with the existing requirements of the NPWS Section 87 permits and Section 90 consents granted under the *National Parks and Wildlife Act, 1974* (NPW Act). These permits and consents allow both the collection of visible artefacts prior to soil stripping and also the collection of unknown artefacts that may be contained within the soil profile. In accordance with Condition 11 of the Section 87 permit, “*all areas where soil stripping occurs shall be further inspected following this operation in the event that datable materials might be revealed*”.

An Aboriginal Heritage Impact Permit (AHIP) application for the ML 1791 area has been lodged with the NSW Office for Environment and Heritage under Section 90A of the NPW Act. Once the AHIP has been approved, all disturbance activities within ML 1791 will be undertaken in accordance with requirements of the AHIP.

A comprehensive Ground Disturbance Permit process is in place at the CGO. All land disturbance activities will only take place in approved surface disturbance areas. The permit clearly defines the location and nature of the earthworks activity, with steps required to enable ground survey by Wiradjuri monitors and/or an archaeologist. There are two steps to the process:

- A surface cultural heritage clearance survey, which is designed to inspect the relevant land and

identify surface objects from which a representative sample would be collected.

- A sub-surface cultural heritage clearance survey, which allows for inspection once the grass layer has been removed. Typically at the CGO, this is accomplished by grading several centimetres of topsoil to enable identification of objects and other items (kept with the soil) for collection and storage.

The rationale for this is based on the original archaeological assessments, where it was deemed necessary to verify that no sites or features might be unwittingly destroyed. Standard test-pit excavation by hand was not considered a feasible strategy to deliver this certainty for Wiradjuri.

In accordance with DA 14/98 condition 3.2(c), a Vegetation Clearance Protocol and Threatened Species Management Protocol have been developed for the CGO and are detailed in the Flora and Fauna Management Plan. The clearance protocols outline measures to be undertaken prior to clearing of vegetation within the CGO. Measures include:

- pre-clearance survey for flora, including a targeted survey for any threatened species recorded in the mine site area; and
- preliminary and secondary fauna habitat assessments.

Prior to undertaking soil stripping, the Vegetation Clearance Protocol and Threatened Species Management Protocol will be employed.

5.2.2 Stripping Activities

As required by DA 14/98 condition 3.2(a)(i), the removal of trees and other vegetation from the mine site is restricted to the approved disturbance areas only. Once cleared of woody vegetation, soils are typically stripped using a grader, scraper or bulldozer. Scrapers may be used to strip soils where areas become too large for effective dozer or grader stripping.

Soil is stripped by firstly removing grasses. This is followed by the separate removal of topsoil and subsoil, where required. Stripped soils will be either directly replaced on rehabilitation areas or stored in separate topsoil and subsoil stockpiles where practicable. Where rehandling is necessary, this will typically be undertaken using excavators and dump trucks.

The SSMP provides further detail.

5.3 SOIL STOCKPILE MANAGEMENT

In accordance with DA 14/98 condition 3.5(b)(i), the general protocol for the management of soil stockpiles is provided below. It includes soil handling measures that optimise the retention of soil characteristics (in terms of nutrients and micro-organisms) favourable to plant growth:

- leave the surface of the completed soil stockpiles in a “rough” condition to help promote water infiltration and minimise erosion prior to vegetation establishment;
- deep-rip soil stockpiles and seed (if necessary) to maintain soil organic matter levels, soil structure and microbial activity;
- treat soil stockpiles with gypsum to reduce dispersiveness during stockpiling;
- install signposts for all soil stockpiles with the date of construction and type of soil; and
- record details of all soil stockpiles on a site database which includes the location and volume of each stockpile and the stockpile maintenance records (e.g. ameliorative treatment, weed control, seeding) (Section 5.3).

Where practicable, soil is stripped from one area and immediately transferred to an active rehabilitation area for direct placement. This reduces the size of soil stockpiles and optimise soil fertility for rehabilitation (Section 6).

Following construction, and if adequate unassisted revegetation has not occurred, soil stockpiles are sown with suitable annual or select grass and legume species to maintain soil condition for future revegetation/rehabilitation works to minimise erosion and wind-blown dust and discourage opportunistic weed growth. Soil treatment/amelioration methods undertaken as necessary prior to the use of soil for rehabilitation.

6 REHABILITATION

The approved CGO rehabilitation philosophy is to operate as a non-intrusive land user and to create stable rehabilitated landforms that increase the areas of endemic vegetation in the mine area and the status of land-lake habitats (Evolution, 2018). This philosophy has led to the rehabilitation principles and objectives as described below.

The rehabilitation programme will be undertaken in accordance with the following general principles (Evolution, 2018):

- The rehabilitation of landforms is to be progressive (where possible) and conducted in accordance with approved, verified plans.
- Final landforms are to be stable in the long-term and include native and/or endemic vegetation characteristic of remnant vegetation within the surrounding landscape.
- Native and/or endemic groundcover, understorey, and tree species are to be cultivated and used in the rehabilitation programme.
- Rehabilitation concepts are to be flexible to allow for adjustments, based on investigations, to improve the rehabilitation programme.
- The annual rehabilitation programme and budget is to be prepared by a site team incorporating senior management representatives.

The rehabilitation objectives for the CGO include (Evolution, 2018):

- The water quality of Lake Cowal is not detrimentally affected by the new landforms.
- Revegetating the new landforms with selected native and/or endemic vegetation that is suited to the physiographic and hydrological features of each landform, and which expand on the areas of remnant endemic vegetation in the surrounding landscape.
- Designing final landforms so that they are stable and include revegetation growth materials that are suited to the landform and support self-sustaining vegetation.
- The placement (wherever possible) of soils on final landforms to enable the progressive establishment of vegetation.
- The expansion of habitat opportunities for wetland and terrestrial fauna species. This includes the design and implementation of rehabilitation works at the New Lake Foreshore in a manner consistent with the NSW Wetlands Policy (Department of Environment, Climate Change and Water, 2010).
- The selection of revegetation species in accordance with accepted principles of long-term sustainability (e.g. genotypic variation, vegetation succession, water/drought tolerances).
- Grazing of land within ML 1535 and ML 1791 to be excluded during operations and during rehabilitation of the site. At lease relinquishment, rehabilitated final landforms are conserved (with grazing excluded), with some areas suitable for grazing surrounding the rehabilitated final landforms.

As described in Section 3.1.2.2 and consistent with the approved CGO Rehabilitation Proposal described in the *Cowal Gold Operations Underground Development Project EIS* (Evolution, 2020), rehabilitation concepts for the outer batters of the waste rock emplacements, IWL and the lake protection bund will include rock armouring with primary waste rock mulch to provide long-term slope stability, control surface water runoff downslope and reduce erosion potential.

Rehabilitation concepts and measures are described in detail in the CGO's RMP. Progressive rehabilitation works and proposed soil stripping works and areas are detailed and progressively updated in the MOP as required by the Conditions of Authority for ML 1535. As described in Section 2.2 of this ESCMP, a MOP is prepared to reflect the near-term development plans at the CGO, in accordance with the requirements of the DRG's *ESG3: Mining Operations Plan (MOP) Guidelines*.

7 COMMUNITY CONSULTATION

7.1 COMMUNITY ENVIRONMENTAL MONITORING AND CONSULTATIVE COMMITTEE

A CEMCC has been set up for the CGO in accordance with DA 14/98 condition 9.1(d) and SSD 10367 condition A11. Condition 9.1(d) is reproduced below:

9.1 Environmental Management

(d) *Community Environmental Monitoring and Consultative Committee*

(i) *The Applicant shall establish and operate a Community Environmental Monitoring and Consultative Committee (CEMCC) for the Coal Gold Operations to the satisfaction of the Planning Secretary. This CEMCC must:*

- *be comprised of an independent chair and at least 2 representatives of the Applicant, 1 representative of BSC, 1 representative of the Lake Cowal Environmental Trust (but not a Trust representative of the Applicant), 4 community representatives (including one member of the Lake Cowal Landholders Association);*
- *be operated in general accordance with the Department's Community Consultative Committee Guidelines: State Significant Projects (2019 or its latest version); and*
- *monitor compliance with conditions of this consent and other matters relevant to the operation of the Cowal Gold Operations during the term of the consent.*

Note: The CEMCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Applicant complies with this consent.

(ii) *The Applicant shall establish a trust fund to be managed by the Chair of the CEMCC to facilitate the functioning of the CEMCC, and pay \$2000 per annum to the fund for the duration of gold processing operations. The annual payment shall be indexed according to the Consumer Price Index (CPI) at the time of payment. The first payment shall be made by the date of the first Committee meeting. The Applicant shall also contribute to the Trust Fund reasonable funds for payment of the independent Chairperson, to the satisfaction of the Planning Secretary*

As required by DA 14/98 condition 9.1(d)(i), the CEMCC comprises an independent chair and representatives of the BSC, Forbes Shire Council, Lachlan Shire Council, Lake Cowal Foundation, the Wiradjuri Condobolin Corporation, two Evolution representatives and four community representatives including one from the Lake Cowal Landholders Association.

The CEMCC provides opportunities for members of the community to attend CEMCC meetings to discuss specific issues relevant to them, including any concerns relating to erosion and sediment control. A landholder can make a request to the CEMCC regarding a particular issue, or the landowner can register a complaint in the complaints register. Landowners who register complaints may be invited to join in discussion of the issue at the next CEMCC meeting.

Items of discussion at these meetings will include mine progress, reporting on environmental monitoring, complaints, rehabilitation activities and any environmental assessments undertaken.

The CEMCC meets quarterly and the minutes from CEMCC meetings are provided on Evolution's website (www.evolutionmining.com.au).

7.2 COMPLAINTS REGISTER AND RECORDS

A process for the handling of complaints is provided below in accordance with the requirements of CGO's EPL and DA 14/98 conditions and to facilitate prompt and comprehensive responses to any community concerns.

As required by EPL Condition M6.1, a dedicated Community Complaints Line has been established (via phone [02] 6975 3454 or email community.cowal@evolutionmining.com.au) that is available 24 hours, seven days a week for community members who have enquiries or who wish to lodge complaints in relation to Evolution's activities at the CGO. A complaints register will be maintained by the Sustainability Manager (or relevant equivalent) in accordance with EPL condition M5 and will be made available on Evolution's website in accordance with DA 14/98 condition 9.4(a)(v).

Information recorded in the complaints register with respect to each complaint will include:

- the date and time of the complaint;
- the method by which the complaint was made;
- any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
- the nature of the complaint;
- the action taken by Evolution in relation to the complaint, including any follow-up contact with the complainant; and
- if no action was taken by Evolution, the reasons why no action was taken.

The record of a complaint will be kept for at least four years after the complaint was made. The record will be available for inspection by the EPA.

8 AUDITING AND REVIEW

8.1 EXTERNAL AUDITS

8.1.1 Independent Environmental Audit

An Independent Environmental Audit will be conducted in accordance with DA 14/98 condition 9.2(a) and SSD 10367 condition C11. Condition 9.2(a) is reproduced below:

9.2 Independent Auditing and Review

(a) Independent Environmental Audit

- (i) *By the end of July 2016, and every 3 years thereafter, unless the Secretary directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:*
- be prepared in accordance with the Independent Audit Post Approval Requirements (2020 or as amended from time to time);*
 - be led and conducted by a suitably qualified, experienced and independent team of experts (including ecology and rehabilitation experts, and in field's specified by the Planning Secretary) whose appointment has been endorsed by the Secretary;*
 - be carried out in consultation with the relevant agencies, BSC and the CEMCC;*
 - assess whether the development complies with the relevant requirements in this consent, and any strategy, plan or program required under this consent; and*
 - recommend appropriate measures or actions to improve the environmental performance*

This process provides a mechanism by which environmental management and monitoring at the CGO can be assessed against relevant Development Consent, mining lease and licence conditions.

8.2 REVIEW OF THIS ESCMP

In accordance with condition 9.1(c) of DA 14/98, this ESCMP will be reviewed within three months of:

- the submission of an Annual Review under Condition 9.1(b);
- the submission of an non-compliance or incident notification under Condition 9.3(a) or 9.3(b);
- the submission of an audit under Condition 9.2(a);
- the approval of any modification to the conditions of this consent; or
- any direction of the Planning Secretary under Condition 1.1(b) of this consent.

Where this review leads to revisions of this plan, then within four weeks of the review, the revised ESCMP will be submitted for the approval of the Planning Secretary of the DPE (unless otherwise agreed with the Planning Secretary). The revision status of this ESCMP is indicated after the title page of this ESCMP.

This ESCMP will be made publicly available on Evolution's website (www.evolutionmining.com.au) in accordance with DA 14/98 condition 9.4(a)(iii). A hard copy of the ESCMP will also be kept at the CGO.

9 REPORTING

9.1 EROSION AND SEDIMENT CONTROL SYSTEMS REPORTING

In accordance with DA 14/98 condition 3.5(a)(iii), the effectiveness of the erosion and sediment control systems and the performance of those systems are reported against the objectives contained in the ESCMP to:

- control of the movement of sediment and salinity migration from areas disturbed by mining and construction activities; and
- maintain downstream (lake) water quality.

The programme for reporting on the effectiveness and performance of the erosion and sediment control systems includes:

- Maintaining a site erosion, sediment and salinity database recording the condition of erosion and sediment control systems, maintenance requirements (where maintenance has been conducted) including instructive actions, and how/when the instructive actions had been implemented. The database will be maintained by the environmental department.
- Ongoing monitoring and review of water quality results from the SWGMBMP (i.e. total suspended solids).
- Reporting of the site erosion, sediment and salinity performance and water quality monitoring results in the Annual Review.

The programme enables the assessment of the effectiveness and performance of the erosion and sediment control systems against the objectives contained in the ESCMP by:

- recording the erosion and sediment control systems to control of the movement of sediment and salinity migration from areas disturbed by mining and construction activities; and
- monitoring the downstream (lake) water quality (as part of the SWGMBMP).

9.2 ANNUAL REVIEW

In accordance with condition 9.1(b) of DA 14/98 and condition C9 of SSD 10367, Evolution prepares an Annual Review to report on the environmental performance of the CGO by the end of March each year, or other timing as may be agreed by the Secretary of the DPE. The Annual Review is made publicly available on Evolution's website (www.evolutionmining.com.au) in accordance with DA 14/98 condition 9.4(a)(vii). The Annual Review also addresses the Annual Review requirements of ML 1535 Condition of Authority 26.

9.3 INCIDENT NOTIFICATION AND REPORTING

An incident is defined in DA 14/98 as:

A set of circumstances that causes or threatens to cause material harm to the environment.

SSD 10367 uses a similar, albeit slightly different, definition.

In accordance with DA 14/98 condition 9.3(a) and SSD 10367 condition C7, Evolution will notify the Planning Secretary in writing via the Major Projects website (<https://pp.planningportal.nsw.gov.au/major-projects>) immediately after becoming aware of any incident related to the CGO. Evolution will provide the DPE with a detailed report on the incident in accordance with the conditions.

In addition, in accordance with EPL 11912 Condition R2, Evolution will notify the EPA (and all other relevant authorities) of incidents causing or threatening material harm to the environment immediately after becoming aware of the incident. Evolution will provide written details of the notification to the EPA within seven days of the date on which the incident occurred. Evolution maintains a record of/and report on any cyanide-related incidents.

9.4 NON-COMPLIANCE NOTIFICATION AND REPORTING

A non-compliance is defined within DA 14/98 as:

An occurrence, set of circumstances, or development which is a breach of this consent but is not an incident.

Again, SSD 10367 has a similar, albeit slightly different, definition for a non-compliance.

In accordance with DA 14/98 condition 9.5(b) and SSD 10367 condition C8, Evolution will notify the DPE in writing via the Major Projects website (<https://pp.planningportal.nsw.gov.au/major-projects>) within seven days after becoming aware of any non-compliance. Evolution will provide in writing a detailed report of the non-compliance which identifies, the development application number for the CGO, the development consent condition of which the CGO is non-compliant, the way in which the CGO does not comply and the reason for the non-compliance. Evolution will also provide details around any actions which have been or will be taken to address the non-compliance.

10 REFERENCES

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APPENDIX A

TECHNICAL HANDBOOK NO. 5 DESIGN MANUAL FOR SOIL CONSERVATION WORKS (Soil Conservation Service of NSW, 1982)

APPENDIX B

CHAPTER 3 FROM “URBAN EROSION AND SEDIMENT CONTROL HANDBOOK” (Department of Conservation and Land Management, 1992)

APPENDIX C

CHAPTERS 4 TO 8 FROM “MANAGING URBAN STORMWATER, SOILS AND CONSTRUCTION” (Landcom, 2004)

APPENDIX D

EQUATIONS 14.11 AND 14.12 IN “AUSTRALIAN RAINFALL AND RUNOFF”
(IEAUST, 1987, REVISED 2001)

APPENDIX E
DRAFT GUIDELINES FOR THE DESIGN OF STABLE DRAINAGE LINES ON
REHABILITATED MINESITES IN THE HUNTER COALFIELDS
(NSW Department of Land and Water Conservation, undated)